Oregon
Kate Brown, Governor

OREGON DEPARTMENT OF AVIATION
3040 -25th Street, SE
Salem, OR 97302-1125
Phone: (503) 378-4880
Toll Free: (800) 874-0102
FAX: (503) 373-1688

January 13, 2016

City of Chiloquin
Mayor Hobbs
P.O. Box 196
Chiloquin, Oregon 97624

RE: Letter of Support

Dear Honorable Mayor Hobbs:

The Oregon Department of Aviation (ODA) met with the City of Chiloquin and discussed the grant opportunity as it relates to the use of the well near the airport. The State is under a Memorandum of Agreement with the City for the City to perform due diligence. In the short term this is to investigate water quality, geology, etc. for the possibility of long term use of the well for domestic water by the City.

The ODA supports the grant application. If the City is successful and receives the Grant, the ODA will work with the City to establish a long term lease. In addition, we grant the City access to the airport grounds for the ability to continue due diligence for this project.

This well is important to us for fire protection and the ability to attract potential airport use by private and public entities.

Sincerely,

Mathew Maass, C.M.
State Airports Manager

City of Chiloquin
INCORPORATED 1926

P.O. Box 196
Chiloquin, OR 97624
(541) 783-2717
Fax (541) 783-2035

January 14, 2016

Jon Unger, Water Resources Grant Administrator
OWRD
725 Summer St. N.E. Suite A
Salem, Oregon 97301-1266

RE: OWRD Water Supply and Development Grant Application

Dear Jon Unger,

The City of Chiloquin voted at our Council Meeting on Monday, January 11, 2016 to support the grant application to the Oregon Department of Water Resources Department for the Water Supply and Development Grant (SB839).

In addition, the Council is committed to providing $28,500.00 in cash or in-kind work to use as match. The remainder of the grant match is anticipated to be cash and in-kind work by the Klamath Tribes. We greatly appreciate the Tribes generosity for this project.

Our support for this project occurs on many levels. Some of the positives we discussed at our Council Meeting were:

1. The ability of our City to have a redundant source of water. Right now we have one well and one tank. If our well fails or needs to be offline for maintenance, our community would be out of water (domestic and fire) in approximately one day.
2. This project will also allow us to retain existing businesses and/or attract new businesses. Right now our capacity to do this is limited. Sometimes, during peak demand our sole well will operate up to 23 hours a day.
3. Implementation of the meter project will allow us to measure water use, implement fair rates, and encourage water conservation (through rate structure and education).

We appreciate the Oregon Water Resources Department in considering our request. Please note our project is phase-able to reduce our funding request. We have a critical need for this project but we also understand there are many communities with similar needs. That being said, our highest priority project is the addition of a redundant well to our system. This could be achieved for an approximate total project cost of $905,000 (our match would remain similar: $28,500 City + $265,000 Tribes).

Thank you for your time. Please let us know if you have any questions or need additional information.

Sincerely,

Joe Hobbs

Joe Hobbs
Mayor

Cc: Jeremy Morris, Adkins Consulting Engineering, LLP

The Klamath Tribes
Tribal Council

Mayor Joe Hobbs
City of Chiloquin
P.O. Box 196
Chiloquin, Oregon 97624

January 19, 2016

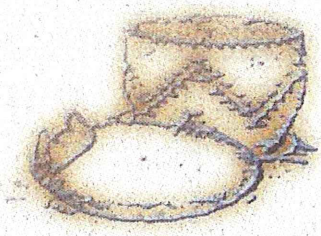
RE: Letter of Support for Water System Improvement Project

Dear Mayor:

The Klamath Tribes is writing this letter to show our support for the City of Chiloquin's Water System Improvements Project. It is our understanding that the City plans on submitting a grant application to the Oregon Department of Water Resources Department for the Water Supply and Development Grant (SB839). We participated in a conference call earlier this month with OWRD and the City. We feel the project is a great opportunity to work together and leverage funding for the community.

The Tribes is committed to providing approximately $265,000 in-kind work to use as match. This equals the commitment of our current project to upgrade Well No. 1 utilizing our own funding and Indian Health Services funding (Federal). It is our understanding that we can provide our own funding and Federal funding to match this grant's request for state funding.

Our support for this project is primarily related to the ability of our community to have a sustainable long term water system. Right now, our currently funded Tribes and IHS project, which we are proposing as in-kind match, cannot proceed due to the City only have one source of water (Well No. 1). If the proposed well near the airport is developed, with OWRD funding, then our project can proceed since the City would have the ability to take Well No. 1 offline for a few months while the Tribes/IHS construction project is completed. Also, this redundant source will help retain and attract other businesses/agencies key to the financial stability of the Tribes and City. It is our understanding that Well No. 1 is greatly utilized by the community and often operates over 23 hours a day in the summer time. This does not appear to be sustainable as it is only a matter of time that the well could breakdown or reach maximum capacity. We also support other aspects of the project, such as installation of functional metering, as we feel it will lead to water conservation in our community, which given the current water situation in the Klamath Basin can only be a benefit to everyone.



501 Chiloquin Blvd. – P.O. Box 436 – Chiloquin, Oregon 97624
(541) 783-2219 – Fax (541) 783-2029

We appreciate the Oregon Water Resources Department in considering the City's request for grant funding for this project. Let us know if you have any questions or need additional information.

Sincerely,

Donald C. Gentry
Klamath Tribes Chairman

Cc: City of Chiloquin
Jeremy Morris, Adkins Consulting Engineering
Tribal Council
George Lopez, Klamath Tribes General Manager

Cost Estimate of Total Project Costs

Project: Chiloquin Water Supply and Metering Improvements

Prepared By: Adkins Consulting Engineering, LLP
Date: December 29, 2015

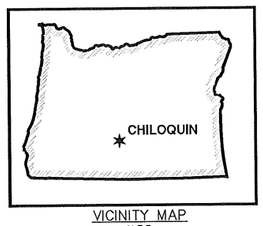
ADKINS CONSULTING ENGINEERING

ITEM NO.	DESCRIPTION OF WORK	UNIT	QUANTITY	UNIT PRICE	ESTIMATED COST
	Airport Well Pump and Pump House Replacement				
1	Mobilization (10% of construction)	LS	1	$38,000	$38,000
2	Site Preparation	LS	1	$1,000	$1,000
3	Ream Existing Well, Case and Seal to 110 feet	LS	1	$20,000	$20,000
4	Pump Test	Hour	24	$250	$6,000
5	Install Pump, Column, Shaft, and Motor	LS	1	$50,000	$50,000
6	Install Pump Station Electrical Supply	LS	1	$35,000	$35,000
7	Motor Control Center	LS	1	$50,000	$50,000
8	Pump House	LS	1	$34,000	$34,000
9	Pump Station Piping, Valves, Flowmeter, etc.	LS	1	$35,000	$35,000
10	Connection to Existing Water Main	LS	1	$10,000	$10,000
11	Furnish and Install Buried 10-inch C900 Polyvinyl Chloride Pipe	LF	310	$70	$22,000
12	Complete Permit Amendment to Water Right (Includes OWRD Fees)	LS	1	$6,000	$6,000
13	Manual Transfer Switch	LS	1	$10,000	$10,000
14	Complete SCADA System	LS	1	$60,000	$60,000
15	Chlorination System	LS	1	$10,000	$10,000
				Airport Well Construction Subtotal=	$377,000
	Meter Replacements				
15	Mobilization (10% of construction)	LS	1	$18,000	$18,000
16	Meter 3/4" to 5/8"	EA	324	$175	$57,000
17	Meter 1-1/2"	EA	6	$550	$3,000
18	Antenna	EA	165	$20	$3,000
19	Software and equipment for Vehicle	LS	1	$2,500	$3,000
20	Training	LS	1	$1,000	$1,000
21	Install meters and clean/modify valve boxes	EA	330	$200	$66,000
22	Grant Administration (city)	LS	1	$6,000	$6,000
23	Construction Administration and Design	LS	1	$22,200	$22,000
24	Traffic Control	LS	1	$3,000	$3,000
				Meter Replacement Construction Subtotal=	$182,000
	Well #1 New Pump and Pump House				
25	Mobilization (10% of construction)	LS	1	$23,000	$23,000
26	Building Demolition and Disposal	LS	1	$25,000	$25,000
27	Site Work	LS	1	$15,000	$15,000
28	Prefabricated Pump House	LS	1	$34,000	$34,000
29	Install Pump, Column, Shaft and Motor	LS	1	$50,000	$50,000
30	Install Variable Frequency Drive	LS	1	$15,000	$15,000
31	Pump Station Piping, Valves, Flowmeter, etc.	LS	1	$35,000	$35,000
32	Motor Control Center	LS	1	$50,000	$50,000
				Well #1 Construction Subtotal =	$224,000
				Easements=	$10,000
				Contingencies (20%)=	$157,000
				Environmental/Archeological Permitting=	$20,000
				Engineering and Construction Administration (20%)=	$157,000
				Grant Administration (City)=	$6,000
	Estimated Total Project Cost (Year 2016 Prices)				**$1,133,000**
	Estimated Total Project Cost (Year 2017 Prices)				**$1,167,000**

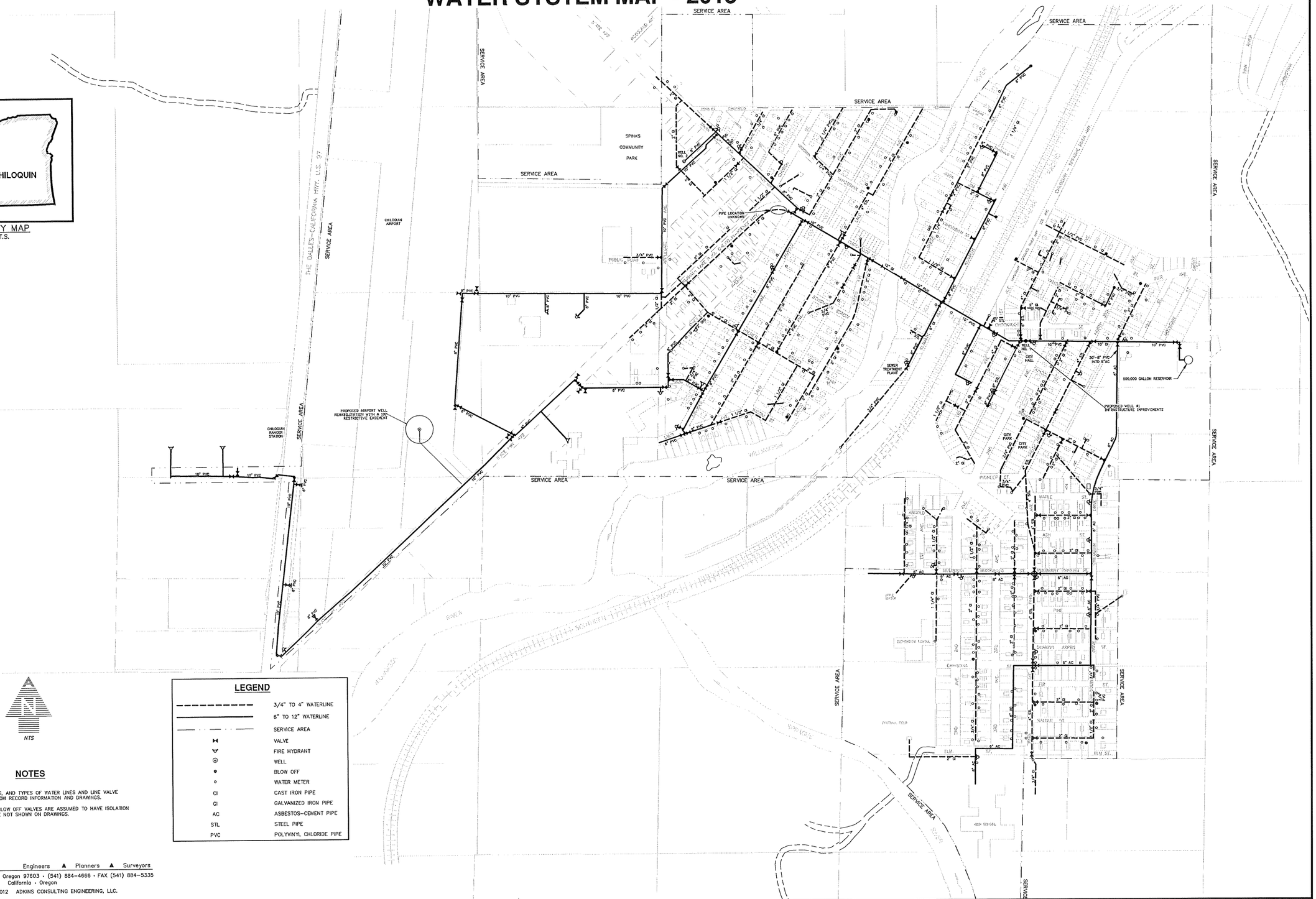
In-Kind Match From City	0.5%	$ 6,000.00
Cash Match From City	2.4%	$ 28,500.00
Secured Match from IHS/EPA	22.7%	$ 265,000.00
Proposed OWRD Water Supply and Development Grant (Year 2017 Construction)	75.0%	$ 875,250.00

Notes: All values rounded to nearest thousand dollars
Adjust total cost by 3% for construction in 2017

CITY OF CHILOQUIN
WATER SYSTEM MAP - 2015



VICINITY MAP
N.T.S.



NTS

LEGEND

----------	3/4" TO 4" WATERLINE
————	6" TO 12" WATERLINE
—— · —— · ——	SERVICE AREA
⋈	VALVE
	FIRE HYDRANT
ⓦ	WELL
●	BLOW OFF
○	WATER METER
CI	CAST IRON PIPE
GI	GALVANIZED IRON PIPE
AC	ASBESTOS-CEMENT PIPE
STL	STEEL PIPE
PVC	POLYVINYL CHLORIDE PIPE

NOTES

1) SIZES, LENGTHS, LOCATIONS, AND TYPES OF WATER LINES AND LINE VALVE LOCATIONS WERE COMPILED FROM RECORD INFORMATION AND DRAWINGS.

2) ALL FIRE HYDRANTS AND BLOW OFF VALVES ARE ASSUMED TO HAVE ISOLATION VALVES AND THEREFORE ARE NOT SHOWN ON DRAWINGS.

ADKINS
CONSULTING ENGINEERING, LLC. Engineers ▲ Planners ▲ Surveyors
2950 Shasta Way · Klamath Falls, Oregon 97603 · (541) 884-4666 · FAX (541) 884-5335
California · Oregon

COPYRIGHT © 2012 ADKINS CONSULTING ENGINEERING, LLC.

SPRING STREET ANALYTICAL
350 S. Spring Street
Klamath Falls, OR 97601
Phone: (541)882-6286
Fax: (541)882-9561

ORELAP: OR100034, ELAP: 2596CA
Water Testing
Waste Water Testing
Environmental Consulting

RECEIVED
AUG 13 2015
City of Chiloquin

Sample Matrix: Water
Collection Date & Time: 4/1/14 & 1030A
Received Date & Time: 4/1/14 & 1115A
Date Reported: 4/2/14

City Of Chiloquin
P.O. Box 196
Chiloquin OR 97624
PWS #00184

The samples submitted were analyzed for Iron& Iron Bacteria. The results are listed below:

Sample ID #	*Source*	*Analysis*	*Results*	*Date Analyzed*	*Initials*
	Airport Well	Hardness	40 mg/L	7/25/15	ME
	Chiloquin OR	Hard Water Limits	120-180 mg/L		
		Calcium	1.78 mg/l		
		EPA Limit	N.L		
		Sulfate	6 mg/l		
		EPA Limit	250 mg/l		

- Method SM9223B, 19th edition CT/100mL
- N.D. stands for Not Detected
- Spring Street Analytical certifies that all analyses and reporting are done according to the NELAC standards.

Analyzed by

Maurene Ehlers
Lab Director

[redacted]

Airport Well
Water quality Results

eurofins

Eaton Analytical

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: (626) 386-1100
Fax: (626) 386-1101
1 800 566 LABS (1 800 566 5227)

ilac-MRA

ACLASS Accredited TESTING
AT-1807

RECEIVED
NOV 16 2015
BY:

RECEIVED
AUG 13 2015
City of
Chiloquin

Laboratory Report

for

Spring Street Analytical
350 South Spring Street
Klamath Falls, OR 97601
Attention: Maurene Ehlers
Fax: 541-882-9561

Date of Issue
08/04/2015
Vanessa Berry
EUROFINS EATON
ANALYTICAL

ZIA8: Vanessa Berry
Project Manager

NELAP ACCREDITED TNI LABORATORY
ORELAP 4034

Report: 542943
Project: RADS
Group: RADS

* Accredited in accordance with TNI 2009 and ISO/IEC 17025:2005.
* Laboratory certifies that the test results meet all **TNI 2009 and ISO/IEC 17025:2005** requirements unless noted under the individual analysis.
* Following the cover page are State Certification List, ISO 17025 Accredited Method List, Acknowledgement of Samples Received, Comments, Hits Report, Data Report, QC Summary, QC Report and Regulatory Forms, as applicable.
* Test results relate only to the sample(s) tested.

eurofins | Eaton Analytical

STATE CERTIFICATION LIST

State	Certification Number	State	Certification Number
Alabama	41060	**Mississippi**	Certified
Alaska	CA00006	**Montana**	Cert 0035
Arizona	AZ0778	**Nebraska**	Certified
Arkansas	Certified	**Nevada**	CA00006-2015
California-Monrovia-ELAP	2813	New Hampshire *	2959
California-Colton- ELAP	2812	New Jersey *	CA 008
California-Folsom- ELAP	2820	**New Mexico**	Certified
California-Fresno- ELAP	2966	New York *	11320
Colorado	Certified	**North Carolina**	06701
Connecticut	PH-0107	**North Dakota**	R-009
Delaware	CA 006	Oregon (Primary AB) *	ORELAP 4034
Florida *	E871024	Pennsylvania *	68-565
Georgia	947	**Rhode Island**	LAO00326
Guam	15-003r	**South Carolina**	87016
Hawaii	Certified	**South Dakota**	Certified
Idaho	Certified	**Tennessee**	TN02839
Illinois *	200033	Texas *	T104704230-14-7
Indiana	C-CA-01	Utah *	CA000062015-8
Kansas *	E-10268	**Vermont**	VT0114
Kentucky	90107	Virginia *	460260
Louisiana *	LA150018	**Washington**	C838
Maine	CA0006	**West Virginia**	9943 C
Maryland	224	**Wisconsin**	998316660
Commonwealth of Northern Marianas Is.	MP0004	**Wyoming**	8TMS-L
Massachusetts	M-CA006	**EPA Region 5**	Certified
Michigan	9906	**Los Angeles County Sanitation Districts**	10264

* NELAP/TNI Recognized Accreditation Bodies

ISO 17025 Accredited Method List

The tests listed below are accredited and meet the requirements of ISO 17025 as verified by the ANSI-ASQ National Accreditation Board/ACLASS.
Refer to Certificate and scope of accreditation (AT 1807) found at: http://www.eatonanalytical.com

SPECIFIC TESTS	METHOD OR TECHNIQUE USED	Drinking Water	Food & Beverage	Waste Water
1,4-Dioxane	EPA 522	x	x	
2,3,7,8-TCDD	Modified EPA 1613B	x	x	
Acrylamide	In House Method	x	x	
Alkalinity	SM 2320B	x	x	x
Ammonia	EPA 350.1		x	x
Ammonia	SM 4500-NH3 H (18th)		x	x
Anions and DBPs by IC	EPA 300.0	x	x	x
Anions and DBPs by IC	EPA 300.1	x	x	
Asbestos	EPA 100.2	x		
Bicarbonate Alkalinity as HCO3	SM 2330B	x	x	x
BOD / CBOD	SM 5210B		x	x
Bromate	In House Method	x	x	
Carbamates	EPA 531.2	x	x	
Carbonate as CO3	SM 2330B	x	x	x
Carbonyls	EPA 556	x	x	
COD	EPA 410.4 / SM 5220D			x
Chloramines	SM 4500-CL G	x	x	x
Chlorinated Acids	EPA 515.4	x	x	
Chlorinated Acids	EPA 555	x	x	
Chlorine Dioxide	SM 4500-CLO2 D	x	x	
Chlorine -Total/Free/ Combined Residual	SM 4500-Cl G	x	x	x
Conductivity	EPA 120.1			x
Conductivity	SM 2510B	x	x	x
Corrosivity (Langelier Index)	SM 2330B	x	x	
Cyanide, Amenable	SM 4500-CN G	x		x
Cyanide, Free	SM 4500CN F	x	x	x
Cyanide, Total	EPA 335.4	x	x	x
Cyanogen Chloride (screen)	In House Method	x	x	
Diquat and Paraquat	EPA 549.2	x	x	
DBP/HAA	SM 6251B	x	x	
Dissolved Oxygen	SM 4500-O G		x	x
E. Coli	(MTF/EC+MUG)	x		
E. Coli	CFR 141.21(f)(6)(i)		x	x
E. Coli	SM 9223			x
E. Coli (Enumeration)	SM 9221B.1/ SM 9221F	x	x	
E. Coli (Enumeration)	SM 9223B	x	x	
EDB/DCBP	EPA 504.1	x		
EDB/DBCP and DBP	EPA 551.1	x	x	
EDTA and NTA	In House Method	x	x	
Endothall	EPA 548.1	x	x	
Enterococci	SM 9230B	x		x
Fecal Coliform	SM 9221 E (MTF/EC)	x		
Fecal Coliform	SM 9221C, E (MTF/EC)			x
Fecal Coliform (Enumeration)	SM 9221E (MTF/EC)	x	x	
Fecal Coliform with Chlorine Present	SM 9221E			x
Fecal Streptococci	SM 9230B	x		x
Fluoride	SM 4500-F C	x	x	x
Glyphosate	EPA 547	x	x	
Gross Alpha/Beta	EPA 900.0	x	x	x
HAAs/ Dalapon	EPA 552.3	x	x	
Hardness	SM 2340B	x	x	x
Heterotrophic Bacteria	In House Method	x	x	
Heterotrophic Bacteria	SM 9215 B	x	x	
Hexavalent Chromium	EPA 218.6	x	x	x
Hexavalent Chromium	EPA 218.7	x	x	
Hexavalent Chromium	SM 3500-Cr B or C (20th)			x

SPECIFIC TESTS	METHOD OR TECHNIQUE USED	Drinking Water	Food & Beverage	Waste Water
Hormones	EPA 539	x	x	
Hydroxide as OH Calc.	SM 2330B	x	x	
Kjeldahl Nitrogen	EPA 351.2			x
Mercury	EPA 245.1	x	x	x
Metals	EPA 200.7 / 200.8	x	x	x
Microcystin LR	ELISA	x	x	
NDMA	EPA 521	x	x	
Nitrate/Nitrite Nitrogen	EPA 353.2	x	x	x
OCL, Pesticides/PCB	EPA 505	x	x	
Ortho Phosphate	EPA 365.1	x	x	
Ortho Phosphate and Total Phosphorous	EPA 365.1/SM 4500-P E			x
Ortho Phosphorous	SM 4500P E	x	x	
Oxyhalides Disinfection Byproducts	EPA 317.0	x	x	
Perchlorate	EPA 331.0	x	x	
Perchlorate	EPA 314.0	x	x	
Perfluorinated Alkyl Acids	EPA 537	x	x	
pH	EPA 150.1	x		
pH	SM 4500-H+B	x	x	x
Phenylurea Pesticides/ Herbicides	In House Method	x	x	
Pseudomonas	IDEXX Pseudalert	x	x	
Radium-226	RA-226 GA	x	x	
Radium-228	RA-228 GA	x	x	
Radon-222	SM 7500RN	x	x	
Residue, Filterable	SM 2540C	x	x	x
Residue, Non-filterable	SM 2540D			x
Residue, Total	SM 2540B		x	x
Residue, Volatile	EPA 160.4			x
Semi-VOC	EPA 525.2	x	x	
Semi-VOC	EPA 625	x	x	x
Silica	SM 4500-Si D	x	x	x
Silica	SM 4500-SiO2 C	x		x
Sulfide	SM 4500-$S^{=}$ D			x
Sulfite	SM 4500-SO^{3}B	x	x	x
Surfactants	SM 5540C	x	x	x
Taste and Odor Analytes	SM 6040E	x	x	
Total Coliform	SM 9221 A, B	x	x	
Total Coliform (Enumeration)	SM 9221 A, B, C	x	x	
Total Coliform / E. coli	Colisure	x	x	
Total Coliform	SM 9221B			x
Total Coliform with Chlorine Present	SM 9221B			x
Total Coliform / E.coli	SM 9223	x	x	
TOC	SM 5310C		x	x
TOC/DOC	SM 5310C	x	x	
TOX	SM 5320B			x
Total Phenols	EPA 420.1			x
Total Phenols	EPA 420.4	x	x	x
Total Phosphorous	SM 4500 P F			x
Turbidity	EPA 180.1	x	x	x
Turbidity	SM 2130B	x		x
Uranium by ICP/MS	EPA 200.8	x	x	
UV 254	SM 5910B	x		
VOC	EPA 524.2/EPA 524.3	x	x	
VOC	EPA 624	x	x	x
VOC	EPA SW 846 8260	x	x	
VOC	In House Method	x	x	
Yeast and Mold	SM 9610	x	x	

eurofins

Acknowledgement of Samples Received

Addr: **Spring Street Analytical**
350 South Spring Street
Klamath Falls, OR 97601

Client ID: SPRINGSTREET
Folder #: 542943
Project: RADS
Sample Group: RADS

Attn: Maurene Ehlers
Phone: 541-882-6286

Project Manager: Vanessa Berry
Phone:

The following samples were received from you on **July 13, 2015** at **1037**. They have been scheduled for the tests listed below each sample. If this information is incorrect, please contact your service representative. Thank you for using Eurofins Eaton Analytical.

Sample #	Sample ID	Sample Date
201507130180	City of Chiloquin Airport Well Special	07/08/2015 0920

@R226EDD	@R228EDD	@RADCWB
Uranium by ICPMS as pCi/L	Uranium ICAP/MS	

Test Description

@R226EDD -- Radium 226 (Sub)

@R228EDD -- Radium 228 (Sub)

@RADCWB -- Gross Alpha/Beta Radiation

eurofins

Eaton Analytical

CHAIN OF CUSTODY RECORD

750 Royal Oaks Drive, Suite 100
Monrovia, CA 91016-3629

Phone: 626 386 1100
Fax: 626 386 1101

800 566 LABS (800 566 5227)

EUROFINS EATON ANALYTICAL USE ONLY:

LOGIN COMMENTS: 464 A

SAMPLES CHECKED AGAINST COC BY: Weena

SAMPLES LOGGED IN BY:

SAMPLES REC'D DAY OF COLLECTION? ☐ (check for yes)

SAMPLE TEMP RECEIVED AT:

☐ Colton / No. California / Arizona _____ °C (Compliance: 4 ± 2 °C)

☑ Monrovia 24.1 -0.3 = 23.8 °C (Compliance: 4 ± 2 °C)

CONDITION OF BLUE ICE: Frozen _____ Partially Frozen _____ Thawed ✓ Wet Ice _____ No Ice _____

METHOD OF SHIPMENT: Pick-Up / Walk-In / FedEx / UPS / DHL / Area Fast / Top Line / Other: _____

TO BE COMPLETED BY SAMPLER:

COMPANY/AGENCY NAME: Spring Street Analytical

PROJECT CODE:

EEA CLIENT CODE: 350 Spring Street Klamath Falls, Or 97601

COC ID:

SAMPLE GROUP:

TAT requested: rush by adv notice only 541-882-6286 STD ___ 1 wk ___ 3 day ___ 2 day ___ 1 day ___

COMPLIANCE SAMPLES ☐ (check for yes) - Requires state forms ☐

NON-COMPLIANCE SAMPLES ☐ (check for yes) REGULATION INVOLVED:

Type of samples (circle one): ROUTINE SPECIAL CONFIRMATION (eg. SDWA, Phase V, NPDES, FDA,...)

SEE ATTACHED BOTTLE ORDER FOR ANALYSES ☐ (check for yes), ***OR***

list ANALYSES REQUIRED (enter number of bottles sent for each test for each sample)

SAMPLE DATE	SAMPLE TIME	SAMPLE ID	CLIENT LAB ID	MATRIX *	FIELD DATA	FIELD DATA	Gross Alpha	Radium	226+	228	Uranium											SAMPLER COMMENTS
		City of Chiloquin		DW			1															
		Airport Well						1														
		Special							1													
											1											

*** MATRIX TYPES:** RSW = Raw Surface Water; RGW = Raw Ground Water; CFW = Chlor(am)inated Finished Water; FW = Other Finished Water; SEAW = Sea Water; WW = Waste Water; BW = Bottled Water; SW = Storm Water; SO = Soil; SL = Sludge; O = Other - Please Identify

	SIGNATURE	PRINT NAME	COMPANY/TITLE	DATE	TIME
SAMPLED BY:	[signature]	MauRene Ehlen		7/9/15	KP
RELINQUISHED BY:					
RECEIVED BY:	[signature]	Weena Tanawosawid	EBA	7-13-15	1037
RELINQUISHED BY:					
RECEIVED BY:					

QA FO 0029 (06/26/2013)

PAGE ____ OF ____

From: (541) 882-6286
Maurene Ehlers
Spring Street Analytical
350 Spring Street

Klamath Falls, OR 97601

Origin ID: LMTA

FedEx Express

J1512150223031uv

Ship Date: 09JUL15
ActWgt: 10.0 LB
CAD: 103335946/NET3610

Delivery Address Bar Code

Ref #
Invoice #
PO #
Dept #

SHIP TO: (626) 386-1100

BILL SENDER

Eurofins
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1. Use the 'Print' button on this page to print your label to your laser or inkjet printer.
2. Fold the printed page along the horizontal line.
3. Place label in shipping pouch and affix it to your shipment so that the barcode portion of the label can be read and scanned.

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Use of this system constitutes your agreement to the service conditions in the current FedEx Service Guide, available on fedex.com. FedEx will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, document your actual loss and file a timely claim. Limitations found in the current FedEx Service Guide apply. Your right to recover from FedEx for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of $100 or the authorized declared value. Recovery cannot exceed actual documented loss. Maximum for items of extraordinary value is $1,000, e.g. jewelry, precious metals, negotiable instruments and other items listed in our ServiceGuide. Written claims must be filed within strict time limits, see current FedEx Service Guide.

eurofins
Eaton Analytical

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: (626) 386-1100
Fax: (626) 386-1101
1 800 566 LABS (1 800 566 5227)

Laboratory Comments
Report: 542943

Spring Street Analytical
Maurene Ehlers
350 South Spring Street
Klamath Falls, OR 97601

Folder Comments

Revised Report: Sample ID amended to match COC. VB 8.4.15

Analytical results for Radium 228 and Radium 226 are submitted by Pace Analytical Services, Greensburg, PA

The Comments Report may be blank if there are no comments for this report.

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Laboratory Hits
Report: 542943

Spring Street Analytical
Maurene Ehlers
350 South Spring Street
Klamath Falls, OR 97601

Samples Received on:
07/13/2015 1037

Analyzed	Analyte	Sample ID	Result	Federal MCL	Units	MRL

SUMMARY OF POSITIVE DATA ONLY

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Laboratory Data
Report: 542943

Spring Street Analytical
Maurene Ehlers
350 South Spring Street
Klamath Falls, OR 97601

Samples Received on:
07/13/2015 1037

Prepared	Analyzed	QC Ref #	Method	Analyte	Result	Units	MRL	Dilution
City of Chiloquin Airport Well Special (201507130180)						**Sampled on 07/08/2015 0920**		
		EPA 200.8 - ICPMS Metals						
7/14/2015	07/15/2015	17:26 850088	(EPA 200.8)	Uranium ICAP/MS	ND	ug/L	1	1
		EPA 200.8 - Uranium by ICPMS as pCi/L						
	07/16/2015	10:20	(EPA 200.8)	Uranium by ICPMS as pCi/L	ND	pCi/L	0.7	1
		EPA 900.0 - Gross Alpha/Beta Radiation						
7/17/2015	07/27/2015	16:12 853035	(EPA 900.0)	Alpha, Gross	ND	pCi/L	3	1
7/17/2015	07/27/2015	16:12 853035	(EPA 900.0)	Alpha, Min Detectable Activity	3.0	pCi/L		1
7/17/2015	07/27/2015	16:12 853035	(EPA 900.0)	Alpha, Two Sigma Error	2.3	pCi/L		1
7/17/2015	07/27/2015	16:12 853035	(EPA 900.0)	Gross Alpha + adjusted error	ND	pCi/L	3	1
		EPA 903.1 - Radium 226 (Sub)						
	07/28/2015	11:18	(EPA 903.1)	Radium 226	<0.264	pCi/L	0.26	1
	07/28/2015	11:18	(EPA 903.1)	Radium 226 Minimal Detectable	0.264	pCi/L		1
	07/28/2015	11:18	(EPA 903.1)	Radium 226 Two Sigma Error	0.191	pCi/L		1
		EPA 904.0 - Radium 228 (Sub)						
	07/23/2015	14:36	(EPA 904.0)	Radium 228	<0.850	pCi/L	0.85	1
	07/23/2015	14:36	(EPA 904.0)	Radium 228 Minimum Detectable	0.85	pCi/L		1
	07/23/2015	14:36	(EPA 904.0)	Radium 228 Two Sigma Error	0.379	pCi/L		1

Rounding on totals after summation.
(c) - indicates calculated results

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Spring Street Analytical

QC Ref # 850088 - ICPMS Metals **Analysis Date: 07/15/2015**

201507130180 City of Chiloquin Airport Well Special Analyzed by: SXK

QC Ref # 853035 - Gross Alpha/Beta Radiation **Analysis Date: 07/27/2015**

201507130180 City of Chiloquin Airport Well Special Analyzed by: MAL

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Laboratory QC
Report: 542943

Spring Street Analytical

QC Type	Analyte	Native	Spiked	Recovered	Units	Yield (%)	Limits (%)	RPDLimit (%)	RPD%
QC Ref# 850088 - ICPMS Metals by EPA 200.8						**Analysis Date: 07/15/2015**			
LCS1	Uranium ICAP/MS		20	20.8	ug/L	104	(85-115)		
LCS2	Uranium ICAP/MS		20	20.3	ug/L	102	(85-115)	20	2.4
MBLK	Uranium ICAP/MS			<1	ug/L				
MRL_CHK	Uranium ICAP/MS		1	1.05	ug/L	105	(50-150)		
MS_201507140083	Uranium ICAP/MS	ND	20	26.1	ug/L	131	(70-130)		
MS2_201507130566	Uranium ICAP/MS	ND	20	22.2	ug/L	111	(70-130)		
MSD_201507140083	Uranium ICAP/MS	ND	20	23.5	ug/L	117	(70-130)	20	11
MSD2_201507130566	Uranium ICAP/MS	ND	20	25.2	ug/L	126	(70-130)	20	13
QC Ref# 853035 - Gross Alpha/Beta Radiation by EPA 900.0						**Analysis Date: 07/23/2015**			
DUP1_201507090209	Alpha, Gross	ND		ND	pCi/L		(0-20)		
DUP2_201505160105	Alpha, Gross	ND		1.60	pCi/L		(0-20)	20	0.19
LCS1	Alpha, Gross		34	39.2	pCi/L	116	(80-120)		
LCS2	Alpha, Gross			35.2	pCi/L				
MBLK	Alpha, Gross			<3	pCi/L				
MS_201507010138	Alpha, Gross	ND	34	39.2	pCi/L	112	(70-130)		

Spike recovery is already corrected for native results.
Spikes which exceed Limits and Method Blanks with positive results are highlighted by Underlining.
Criteria for MS and Dup are advisory only, batch control is based on LCS. Criteria for duplicates are advisory only, unless otherwise specified in the method.
RPD not calculated for LCS2 when different a concentration than LCS1 is used.
RPD not calculated for Duplicates when the result is not five times the MRL (Minimum Reporting Level).
(S) - Indicates surrogate compound.
(I) - Indicates internal standard compound.

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1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

July 30, 2015

Ms. Jaclyn L. Contreras
Eurofins Eaton Analytical
750 Royal Oaks Drive, 100
Monrovia, CA 910163629

RE: Project: PACE PA 542943
Pace Project No.: 30153457

Dear Ms. Contreras:
Enclosed are the analytical results for sample(s) received by the laboratory on July 15, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

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

Sincerely,

Jacquelyn Collins
jacquelyn.collins@pacelabs.com
Project Manager

Enclosures

cc: Mr. Aleksandar D. Tomovich, Eurofins Eaton Analytical

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CERTIFICATIONS

Project: PACE PA 542943
Pace Project No.: 30153457

Pennsylvania Certification IDs
1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ACLASS DOD-ELAP Accreditation #: ADE-1544
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California/TNI Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Guam/PADEP Certification
Hawaii/PADEP Certification
Idaho Certification
Illinois/PADEP Certification
Indiana/PADEP Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188
Utah/TNI Certification #: PA014572014-4
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin/PADEP Certification
Wyoming Certification #: 8TMS-Q

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SAMPLE SUMMARY

Project: PACE PA 542943
Pace Project No.: 30153457

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30153457001	201507130180	Drinking Water	07/08/15 09:20	07/15/15 10:00

REPORT OF LABORATORY ANALYSIS

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SAMPLE ANALYTE COUNT

Project: PACE PA 542943
Pace Project No.: 30153457

Lab ID	Sample ID	Method	Analysts	Analytes Reported
30153457001	201507130180	EPA 904.0	JLW	1

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PROJECT NARRATIVE

Project: PACE PA 542943
Pace Project No.: 30153457

Method: EPA 904.0
Description: 904.0 Radium 228
Client: Eurofins Eaton Analytical
Date: July 30, 2015

General Information:
1 sample was analyzed for EPA 904.0. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: PACE PA 542943
Pace Project No.: 30153457

Sample: 201507130180 **Lab ID: 30153457001** Collected: 07/08/15 09:20 Received: 07/15/15 10:00 Matrix: Drinking Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-228	EPA 904.0	**0.142 ± 0.379 (0.850)** **C:75% T:76%**	pCi/L	07/23/15 14:36	15262-20-1	

REPORT OF LABORATORY ANALYSIS

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QUALITY CONTROL - RADIOCHEMISTRY

Project: PACE PA 542943
Pace Project No.: 30153457

QC Batch: RADC/25219
QC Batch Method: EPA 904.0
Analysis Method: EPA 904.0
Analysis Description: 904.0 Radium 228
Associated Lab Samples: 30153457001

METHOD BLANK: 923833
Matrix: Water
Associated Lab Samples: 30153457001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-228	0.127 ± 0.402 (0.906) C:64% T:80%	pCi/L	07/23/15 14:33	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

REPORT OF LABORATORY ANALYSIS

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QUALIFIERS

Project: PACE PA 542943
Pace Project No.: 30153457

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

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PACE Analytical Services, Inc.
1638 Roseytown Road, Suite 2
Suite 2
Greensburg, PA 15601

Phone: 724-850-5600 Fax: 724-850-5601

Submittal Form & Purchase Order 99-35962

Date: 7/14/2015

*REPORTING REQUIRMENTS: *Do Not Combine Reports with any other samples submitted under different Folder Numbers!*
Report & Invoice must have the Folder# 542943 Sub PO# 99-35962 and Job # 1000014

Report all quality control data according to Method. Include dates analyzed. Date extracted (if extracted) and Method reference on the report.
Results must have Complete data & QC with Approval Signature.

Reports: Jackie Contreras Sub-Contracting Administrator
EMAIL TO: us20_subcontract@eurofinsus.com
Eurofins Eaton Analytical 750 Royal Oaks Drive, Suite 100, Monrovia, CA 91016
Phone (626) 386-1165 Fax (626) 386-1122
Invoices to: Eurofins Eaton Analytical
Accounts Payable 2425 New Holland Pike, Lancaster, PA 17605

Provide in each Report the Specified State Certification # & Exp Date for requested tests + matrix.

Samples from: OREGON

WO#:30153457

Folder #:	Report Due:	Sub PO #:
542943	07/30/2015	99-35962

LS	Lab Sample ID	Client Sample ID for reference only	Analysis Requested	Sample Date & Time	Matrix	PWS Systemcode	PWSID
PA 904.0	201507130180 @R228EDD	City of California Airport Well Special	Radium 228 (Sub)	07/08/15 0920	DW		

Chris Cabrera

JUL 14 2015

Eurofins Eaton Analytical

Relinquished by: Sample Control Date _____ Time _____

Received by: _____ Date _____ Time _____

Relinquished by: Sample Control Date _____ Time _____

Received by: _____ Date _____ Time _____

NOTIFICATION REQUIRED IF RECEIVED OUTSIDE OF 0-6 CELSIUS

An Acknowledgement of Receipt is requested to attn: Jackie Contreras

Page 10 of 35 Pages

Page 1 of 1

Sample Condition Upon Receipt

Pace Analytical

Client Name: Eurofins

Project # 30153457

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____ MOJ

Tracking #: 6376 7636 6218

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals Intact: ☐ yes ☐ no Biological Tissue is Frozen: Yes No

Packing Material: Bubble Wrap ✓ Bubble Bags ___ None ___ Other _____

Thermometer Used 6 Type of Ice: (Wet) Blue None ☑ Samples on ice, cooling process has begun

Cooler Temp.: Observed Temp.: 1.6 °C Correction Factor: -0.2 °C Final Temp: 1.4 °C

Date and Initials of person examining contents: MB 7-16-15

Temp should be above freezing to 6°C

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☐Yes ☑No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC: -Includes date/time/ID/Analysis Matrix: WT	☑Yes ☐No ☐N/A	12.
All containers needing preservation have been checked.	☑Yes ☐No ☐N/A	13. pH<2
All containers needing preservation are found to be in compliance with EPA recommendation.	☑Yes ☐No ☐N/A	
exceptions: VOA, coliform, TOC, O&G, Phenols	☐Yes ☑No	Initial when completed MB / Lot # of added preservative
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☐No ☑N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: [signature] Date: 7/16/15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Quality Control Sample Performance Assessment

Pace Analytical

Test:	Ra-228
Analyst:	JLW
Date:	7/20/2015
Worklist:	25219
Matrix:	DW

Analyst Must Manually Enter All Fields Highlighted in Yellow.

Method Blank Assessment

MB Sample ID	923833
MB concentration:	0.127
M/B Counting Uncertainty:	0.401
MB MDC:	0.906
MB Numerical Performance Indicator:	0.62
MB Status vs Numerical Indicator:	N/A
MB Status vs. MDC:	Pass

Laboratory Control Sample Assessment

	LCSD (Y or N)?	Y
	LCS25219	LCSD25219
Count Date:	7/23/2015	7/23/2015
Spike I.D.:	15-019	15-019
Spike Concentration (pCi/mL):	29.453	29.453
Volume Used (mL):	0.20	0.20
Aliquot Volume (L, g, F):	0.801	0.800
Target Conc. (pCi/L, g, F):	7.353	7.362
Uncertainty (Calculated):	0.529	0.530
Result (pCi/L, g, F):	6.162	6.021
LCS/LCSD Counting Uncertainty (pCi/L, g, F):	0.663	0.712
Numerical Performance Indicator:	-2.75	-2.96
Percent Recovery:	83.80%	81.77%
Status vs Numerical Indicator:	N/A	N/A
Status vs Recovery:	Pass	Pass

Sample Matrix Spike Control Assessment

Sample Collection Date:	7/1/2015
Sample I.D.	30153101001
Sample MS I.D.	30153101001MS
Sample MSD I.D.	
Spike I.D.:	15-019
MS/MSD Decay Corrected Spike Concentration (pCi/mL):	29.671
Spike Volume Used in MS (mL):	0.30
Spike Volume Used in MSD (mL):	
MS Aliquot (L, g, F):	0.807
MS Target Conc.(pCi/L, g, F):	11.030
MSD Aliquot (L, g, F):	
MSD Target Conc. (pCi/L, g, F):	
Spike uncertainty (calculated):	0.794
Sample Result:	-0.143
Sample Result Counting Uncertainty (pCi/L, g, F):	0.396
Sample Matrix Spike Result:	14.606
Matrix Spike Result Counting Uncertainty (pCi/L, g, F):	1.588
Sample Matrix Spike Duplicate Result:	
Matrix Spike Duplicate Result Counting Uncertainty (pCi/L, g, F):	
MS Numerical Performance Indicator:	4.007
MSD Numerical Performance Indicator:	
MS Percent Recovery:	133.71%
MSD Percent Recovery:	
MS Status vs Numerical Indicator:	N/A
MSD Status vs Numerical Indicator:	
MS Status vs Recovery:	Pass
MSD Status vs Recovery:	

Duplicate Sample Assessment

Sample I.D.:	LCS25219	Enter Duplicate sample IDs if other than LCS/LCSD in the space below.
Duplicate Sample I.D.	LCSD25219	
Sample Result (pCi/L, g, F):	6.162	
Sample Result Counting Uncertainty (pCi/L, g, F):	0.663	
Sample Duplicate Result (pCi/L, g, F):	6.021	
Sample Duplicate Result Counting Uncertainty (pCi/L, g, F):	0.712	
Are sample and/or duplicate results below MDC?	NO	
Duplicate Numerical Performance Indicator:	0.285	
Duplicate RPD:	2.33%	
Duplicate Status vs Numerical Indicator:	N/A	
Duplicate Status vs RPD:	Pass	

Matrix Spike/Matrix Spike Duplicate Sample Assessment

Sample I.D.	
Sample MS I.D.	
Sample MSD I.D.	
Sample Matrix Spike Result:	
Matrix Spike Result Counting Uncertainty (pCi/L, g, F):	
Sample Matrix Spike Duplicate Result:	
Matrix Spike Duplicate Result Counting Uncertainty (pCi/L, g, F):	
Duplicate Numerical Performance Indicator:	
MS/ MSD Duplicate RPD:	
MS/ MSD Duplicate Status vs Numerical Indicator:	
MS/ MSD Duplicate Status vs RPD:	

Evaluation of duplicate precision is not applicable if either the sample or duplicate results are below the MDC.

Comments:

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Greensburg, PA 15601
(724)850-5600

July 30, 2015

Ms. Jaclyn L. Contreras
Eurofins Eaton Analytical
750 Royal Oaks Drive, 100
Monrovia, CA 910163629

RE: Project: PACE PA 542943
Pace Project No.: 30153456

Dear Ms. Contreras:
Enclosed are the analytical results for sample(s) received by the laboratory on July 15, 2015. The results relate only to the samples included in this report. Results reported herein conform to the most current TNI standards and the laboratory's Quality Assurance Manual, where applicable, unless otherwise noted in the body of the report.

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

Sincerely,

Jacquelyn Collins
jacquelyn.collins@pacelabs.com
Project Manager

Enclosures

cc: Mr. Aleksandar D. Tomovich, Eurofins Eaton Analytical

NELAP ACCREDITED TNI LABORATORY

REPORT OF LABORATORY ANALYSIS

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www.pacelabs.com

Pace Analytical Services, Inc.
1638 Roseytown Road - Suites 2,3,4
Greensburg, PA 15601
(724)850-5600

CERTIFICATIONS

Project: PACE PA 542943
Pace Project No.: 30153456

Pennsylvania Certification IDs
1638 Roseytown Rd Suites 2,3&4, Greensburg, PA 15601
ACLASS DOD-ELAP Accreditation #: ADE-1544
Alabama Certification #: 41590
Arizona Certification #: AZ0734
Arkansas Certification
California/TNI Certification #: 04222CA
Colorado Certification
Connecticut Certification #: PH-0694
Delaware Certification
Florida/TNI Certification #: E87683
Guam/PADEP Certification
Hawaii/PADEP Certification
Idaho Certification
Illinois/PADEP Certification
Indiana/PADEP Certification
Iowa Certification #: 391
Kansas/TNI Certification #: E-10358
Kentucky Certification #: 90133
Louisiana DHH/TNI Certification #: LA140008
Louisiana DEQ/TNI Certification #: 4086
Maine Certification #: PA00091
Maryland Certification #: 308
Massachusetts Certification #: M-PA1457
Michigan/PADEP Certification
Missouri Certification #: 235
Montana Certification #: Cert 0082
Nebraska Certification #: NE-05-29-14
Nevada Certification
New Hampshire/TNI Certification #: 2976
New Jersey/TNI Certification #: PA 051
New Mexico Certification
New York/TNI Certification #: 10888
North Carolina Certification #: 42706
North Dakota Certification #: R-190
Oregon/TNI Certification #: PA200002
Pennsylvania/TNI Certification #: 65-00282
Puerto Rico Certification #: PA01457
South Dakota Certification
Tennessee Certification #: TN2867
Texas/TNI Certification #: T104704188
Utah/TNI Certification #: PA014572014-4
Vermont Dept. of Health: ID# VT-0282
Virgin Island/PADEP Certification
Virginia/VELAP Certification #: 460198
Washington Certification #: C868
West Virginia DEP Certification #: 143
West Virginia DHHR Certification #: 9964C
Wisconsin/PADEP Certification
Wyoming Certification #: 8TMS-Q

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SAMPLE SUMMARY

Project: PACE PA 542943
Pace Project No.: 30153456

Lab ID	Sample ID	Matrix	Date Collected	Date Received
30153456001	201507130180	Drinking Water	07/08/15 09:20	07/15/15 10:00

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SAMPLE ANALYTE COUNT

Project: PACE PA 542943
Pace Project No.: 30153456

Lab ID	Sample ID	Method	Analysts	Analytes Reported
30153456001	201507130180	EPA 903.1	JC2	1

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PROJECT NARRATIVE

Project: PACE PA 542943
Pace Project No.: 30153456

Method: EPA 903.1
Description: 903.1 Radium 226
Client: Eurofins Eaton Analytical
Date: July 30, 2015

General Information:
1 sample was analyzed for EPA 903.1. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

Hold Time:
The samples were analyzed within the method required hold times with any exceptions noted below.

Method Blank:
All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

Laboratory Control Spike:
All laboratory control spike compounds were within QC limits with any exceptions noted below.

Matrix Spikes:
All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

Additional Comments:

This data package has been reviewed for quality and completeness and is approved for release.

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ANALYTICAL RESULTS - RADIOCHEMISTRY

Project: PACE PA 542943
Pace Project No.: 30153456

Sample: 201507130180 **Lab ID: 30153456001** Collected: 07/08/15 09:20 Received: 07/15/15 10:00 Matrix: Drinking Water
PWS: Site ID: Sample Type:

Parameters	Method	Act ± Unc (MDC) Carr Trac	Units	Analyzed	CAS No.	Qual
Radium-226	EPA 903.1	**0.0976 ± 0.191 (0.264)** **C:NA T:100%**	pCi/L	07/28/15 11:18	13982-63-3	

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QUALITY CONTROL - RADIOCHEMISTRY

Project: PACE PA 542943
Pace Project No.: 30153456

QC Batch: RADC/25274
QC Batch Method: EPA 903.1
Analysis Method: EPA 903.1
Analysis Description: 903.1 Radium-226
Associated Lab Samples: 30153456001

METHOD BLANK: 926297
Matrix: Water
Associated Lab Samples: 30153456001

Parameter	Act ± Unc (MDC) Carr Trac	Units	Analyzed	Qualifiers
Radium-226	0.251 ± 0.383 (0.615) C:NA T:95%	pCi/L	07/28/15 10:30	

Results presented on this page are in the units indicated by the "Units" column except where an alternate unit is presented to the right of the result.

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QUALIFIERS

Project: PACE PA 542943
Pace Project No.: 30153456

DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Act - Activity

Unc - Uncertainty: SDWA = 1.96 sigma count uncertainty, all other matrices = Expanded Uncertainty (95% confidence interval). Gamma Spec = Expanded Uncertainty (95.4% Confidence Interval)

(MDC) - Minimum Detectable Concentration

Trac - Tracer Recovery (%)

Carr - Carrier Recovery (%)

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

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Ship To:
PACE Analytical Services, Inc.
1638 Roseytown Road, Suite 2
Suite 2
Greensburg, PA 15601

Phone: 724-850-5600 Fax: 724-850-5601

Submittal Form & Purchase Order 99-35961

Date: 7/14/2015

*REPORTING REQUIRMENTS: ***Do Not Combine Reports with any other samples submitted under different Folder Numbers!***
Report & Invoice must have the Folder# **542943** Sub PO# **99-35961** and Job # **1000014**

Report all quality control data according to Method. Include dates analyzed. Date extracted (if extracted) and Method reference on the report.
Results must have Complete data & QC with Approval Signature.

Reports: Jackie Contreras Sub-Contracting Administrator
EMAIL TO: us20_subcontract@eurofinsus.com
Eurofins Eaton Analytical 750 Royal Oaks Drive, Suite 100, Monrovia, CA 91016
Phone (626) 386-1165 Fax (626) 386-1122
Invoices to: Eurofins Eaton Analytical
Accounts Payable 2425 New Holland Pike, Lancaster, PA 17605

Provide in each Report the Specified State Certification # & Exp Date for requested tests + matrix.

Samples from: OREGON

WO#:30153456

lder #:	Report Due:	Sub PO #:
2943	07/28/2015	99-35961

S	Eaton Lab Sample ID	Client Sample ID for reference only	Analysis Requested	Sample Date & Time	Matrix	PWS Systemcode	PWSID
A 903.1	201507130180 @R226EDD	City of California Airport Well Special	Radium 226 (Sub)	07/08/15 0920	DW		

Chris Cabrera
JUL 14 2015 1526
Eurofins Eaton Analytical

Relinquished by: Sample Control Date _____ Time _____
Received by: Pace Date 7-15-15 Time 10:00
Relinquished by: Sample Control Date _____ Time _____
Received by: _____ Date _____ Time _____

NOTIFICATION REQUIRED IF RECEIVED OUTSIDE OF 0-6 CELSIUS

An Acknowledgement of Receipt is requested to attn: Jackie Contreras

Sample Condition Upon Receipt

Pace Analytical

Client Name: Eurofins

Project # 30153456

MB

Courier: ☑ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☐ Pace Other _____

Tracking #: 6376 7636 6268

Custody Seal on Cooler/Box Present: ☐ yes ☑ no Seals Intact: ☐ yes ☐ no Biological Tissue Is Frozen: Yes No

Packing Material: Bubble Wrap J Bubble Bags ____ None ____ Other _____

Thermometer Used 6 Type of Ice: (Wet) Blue None ☑ Samples on Ice, cooling process has begun

Cooler Temp.: Observed Temp.: 1.6 °C Correction Factor: -0.2 °C Final Temp: 1.4 °C

Date and Initials of person examining contents: MB 7/15/15

Temp should be above freezing to 6°C

		Comments:
Chain of Custody Present:	☑Yes ☐No ☐N/A	1.
Chain of Custody Filled Out:	☑Yes ☐No ☐N/A	2.
Chain of Custody Relinquished:	☑Yes ☐No ☐N/A	3.
Sampler Name & Signature on COC:	☐Yes ☑No ☐N/A	4.
Samples Arrived within Hold Time:	☑Yes ☐No ☐N/A	5.
Short Hold Time Analysis (<72hr):	☐Yes ☑No ☐N/A	6.
Rush Turn Around Time Requested:	☐Yes ☑No ☐N/A	7.
Sufficient Volume:	☑Yes ☐No ☐N/A	8.
Correct Containers Used:	☑Yes ☐No ☐N/A	9.
-Pace Containers Used:	☑Yes ☐No ☐N/A	
Containers Intact:	☑Yes ☐No ☐N/A	10.
Filtered volume received for Dissolved tests	☐Yes ☐No ☑N/A	11.
Sample Labels match COC: -Includes date/time/ID/Analysis Matrix: WT	☑Yes ☐No ☐N/A	12.
All containers needing preservation have been checked.	☑Yes ☐No ☐N/A	13. pH<2
All containers needing preservation are found to be in compliance with EPA recommendation.	☑Yes ☐No ☐N/A	Initial when completed: MB; Lot # of added preservative:
exceptions: VOA, coliform, TOC, O&G, Phenols	☐Yes ☑No	
Samples checked for dechlorination:	☐Yes ☐No ☑N/A	14.
Headspace in VOA Vials (>6mm):	☐Yes ☐No ☑N/A	15.
Trip Blank Present:	☐Yes ☐No ☑N/A	16.
Trip Blank Custody Seals Present	☐Yes ☐No ☑N/A	
Pace Trip Blank Lot # (if purchased):		

Client Notification/ Resolution: Field Data Required? Y / N

Person Contacted: _____ Date/Time: _____

Comments/ Resolution: _____

Project Manager Review: _____ Date: 7/16/15

Note: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e out of hold, incorrect preservative, out of temp, incorrect containers)

Pace Analytical

page 2

Project Number: 30153456

Client Name: Eurofing

Item No.	Matrix Code	Glass Jar (120 / 250 / 500 / 1L)	Soil kit (2 SB, 1M, soil jar)	Chemistry (250 / 500 / 1L)	Organics (1L)	Nutrient (250 / 500)	Phenolics (250 ml)	TOC (40 ml / 250 ml)	TOX (250 ml)	Total Metals	Dissolved Metals preserved Y N	O & G (1L)	TPH (1L)	VOA (40 ml 30 ml)	Cyanide (250 ml)	Sulfide (500 ml)	Bacteria (120 ml)	Wipes / swipe/ smear/ filter	Radchem Nalgene (125 / 250 / 500 / 1L)	Radchem Nalgene (1/2 gal. / 1 gal.L)	Cubitainer (500 ml / 4L)	Ziploc	Other	Other
001	UAT																				1			

SCURF Back (C016-4 15May2012).xls

Quality Control Sample Performance Assessment

Pace Analytical
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Test:	Ra-226
Analyst:	JC2
Date:	7/23/2015
Worklist:	25274
Matrix:	DW

Analyst Must Manually Enter All Fields Highlighted in Yellow.

Method Blank Assessment

MB Sample ID	926297
MB concentration:	0.251
M/B Counting Uncertainty:	0.366
MB MDC:	0.615
MB Numerical Performance Indicator:	7.18
MB Status vs Numerical Indicator:	N/A
MB Status vs. MDC:	Pass

Laboratory Control Sample Assessment

	LCSD (Y or N)? LCS25274	Y LCSD25274
Count Date:	7/28/2015	7/28/2015
Spike I.D.:	15-008	15-008
Spike Concentration (pCi/mL):	49.552	49.552
Volume Used (mL):	0.10	0.10
Aliquot Volume (L, g, F):	0.510	0.509
Target Conc. (pCi/L, g, F):	9.708	9.727
Uncertainty (Calculated):	0.233	0.233
Result (pCi/L, g, F):	9.173	8.527
LCS/LCSD Counting Uncertainty (pCi/L, g, F):	1.852	1.775
Numerical Performance Indicator:	-0.56	-1.31
Percent Recovery:	94.48%	87.66%
Status vs Numerical Indicator:	N/A	N/A
Status vs Recovery:	Pass	Pass

Sample Matrix Spike Control Assessment

Sample Collection Date:	7/21/2015
Sample I.D.	30154064001
Sample MS I.D.	30154064001MS
Sample MSD I.D.	
Spike I.D.:	15-008
MS/MSD Decay Corrected Spike Concentration (pCi/mL):	49.552
Spike Volume Used in MS (mL):	0.20
Spike Volume Used in MSD (mL):	
MS Aliquot (L, g, F):	0.508
MS Target Conc.(pCi/L, g, F):	19.498
MSD Aliquot (L, g, F):	
MSD Target Conc. (pCi/L, g, F):	
Spike uncertainty (calculated):	0.468
Sample Result:	0.194
Sample Result Counting Uncertainty (pCi/L, g, F):	0.465
Sample Matrix Spike Result:	19.249
Matrix Spike Result Counting Uncertainty (pCi/L, g, F):	2.767
Sample Matrix Spike Duplicate Result:	
Matrix Spike Duplicate Result Counting Uncertainty (pCi/L, g, F):	
MS Numerical Performance Indicator:	-0.305
MSD Numerical Performance Indicator:	
MS Percent Recovery:	97.73%
MSD Percent Recovery:	
MS Status vs Numerical Indicator:	N/A
MSD Status vs Numerical Indicator:	
MS Status vs Recovery:	Pass
MSD Status vs Recovery:	

Duplicate Sample Assessment

Sample I.D.:	LCS25274
Duplicate Sample I.D.	LCSD25274
Sample Result (pCi/L, g, F):	9.173
Sample Result Counting Uncertainty (pCi/L, g, F):	1.852
Sample Duplicate Result (pCi/L, g, F):	8.527
Sample Duplicate Result Counting Uncertainty (pCi/L, g, F):	1.775
Are sample and/or duplicate results below MDC?	NO
Duplicate Numerical Performance Indicator:	0.493
Duplicate RPD:	7.49%
Duplicate Status vs Numerical Indicator:	N/A
Duplicate Status vs RPD:	Pass

Enter Duplicate sample IDs if other than LCS/LCSD in the space below.

Matrix Spike/Matrix Spike Duplicate Sample Assessment

Sample I.D.	
Sample MS I.D.	
Sample MSD I.D.	
Sample Matrix Spike Result:	
Matrix Spike Result Counting Uncertainty (pCi/L, g, F):	
Sample Matrix Spike Duplicate Result:	
Matrix Spike Duplicate Result Counting Uncertainty (pCi/L, g, F):	
Duplicate Numerical Performance Indicator:	
MS/ MSD Duplicate RPD:	
MS/ MSD Duplicate Status vs Numerical Indicator:	
MS/ MSD Duplicate Status vs RPD:	

Evaluation of duplicate precision is not applicable if either the sample or duplicate results are below the MDC.

Comments:

7/30/15

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Acknowledgement of Samples Received

Addr: **Spring Street Analytical**
350 South Spring Street
Klamath Falls, OR 97601

Attn: Maurene Ehlers
Phone: 541-882-6286

Client ID: SPRINGSTREET
Folder #: 542943
Project: RADS
Sample Group: RADS

Project Manager: Vanessa Berry
Phone:

The following samples were received from you on **July 13, 2015** at **1037**. They have been scheduled for the tests listed below each sample. If this information is incorrect, please contact your service representative. Thank you for using Eurofins Eaton Analytical.

Sample #	Sample ID	Sample Date
201507130180	City of Chiloquin Airport Well Special	07/08/2015 0920

@R226EDD	@R228EDD	@RADCWB
Uranium by ICPMS as pCi/L	Uranium ICAP/MS	

Test Description

@R226EDD -- Radium 226 (Sub)

@R228EDD -- Radium 228 (Sub)

@RADCWB -- Gross Alpha/Beta Radiation

750 Royal Oaks Drive, Suite 100, Monrovia, CA 91016 Tel (626) 386-1100 Fax (626) 386-1101 http://www.EatonAnalytical.com

eurofins

Eaton Analytical

CHAIN OF CUSTODY RECORD

750 Royal Oaks Drive, Suite 100
Monrovia, CA 91016-3629

Phone: 626 386 1100
Fax: 626 386 1101

800 566 LABS (800 566 5227)

EUROFINS EATON ANALYTICAL USE ONLY:

LOGIN COMMENTS: 464 A

SAMPLES CHECKED AGAINST COC BY: Weena

SAMPLES LOGGED IN BY:

SAMPLES REC'D DAY OF COLLECTION? ☐ (check for yes)

SAMPLE TEMP RECEIVED AT:

☐ Colton / No. California / Arizona _____ °C (Compliance: 4 ± 2 °C)

☑ Monrovia 24.1 -0.3 = 23.8 °C (Compliance: 4 ± 2 °C)

CONDITION OF BLUE ICE: Frozen _____ Partially Frozen _____ Thawed ✓ Wet Ice _____ No Ice _____

METHOD OF SHIPMENT: Pick-Up / Walk-In / FedEx / UPS / DHL / Area Fast / Top Line / Other: _____

TO BE COMPLETED BY SAMPLER:

COMPANY/AGENCY NAME: Spring Street Analytical

PROJECT CODE:

EEA CLIENT CODE: 350 Spring Street Rancho Cucamonga Falls, Dr 97601

COC ID:

SAMPLE GROUP:

TAT requested: rush by adv notice only 541-882-6286 STD ___ 1 wk ___ 3 day ___ 2 day ___ 1 day ___

COMPLIANCE SAMPLES ☐ (check for yes) - Requires state forms ☐

NON-COMPLIANCE SAMPLES ☐ (check for yes) REGULATION INVOLVED: _____

Type of samples (circle one): ROUTINE SPECIAL CONFIRMATION (eg. SDWA, Phase V, NPDES, FDA,...)

SEE ATTACHED BOTTLE ORDER FOR ANALYSES ☐ (check for yes), ***OR***

list ANALYSES REQUIRED (enter number of bottles sent for each test for each sample)

SAMPLE DATE	SAMPLE TIME	SAMPLE ID	CLIENT LAB ID	MATRIX *	FIELD DATA	FIELD DATA	Gross Alpha	Radium	226+	228	Uranium											SAMPLER COMMENTS
		City of Chiloquin		DW			1															
		Airport Well						1														
		Special							1													
											1											

*** MATRIX TYPES:** RSW = Raw Surface Water; RGW = Raw Ground Water; CFW = Chlor(am)inated Finished Water; FW = Other Finished Water; SEAW = Sea Water; WW = Waste Water; BW = Bottled Water; SW = Storm Water; SO = Soil; SL = Sludge; O = Other - Please Identify

	SIGNATURE	PRINT NAME	COMPANY/TITLE	DATE	TIME
SAMPLED BY:	[signature]	Maurene Ehlers		7/9/15	KP
RELINQUISHED BY:					
RECEIVED BY:	[signature]	Weena Tanaworawid	EBA	7-13-15	1037
RELINQUISHED BY:					
RECEIVED BY:					

QA FO 0029 (06/26/2013)

PAGE ____ OF ____

From: (541) 882-0286
Maurene Ehlers
Spring Street Analytical
350 Spring Street

Klamath Falls, OR 97601

Origin ID: LMTA

J151215022303uv

SHIP TO: (626) 386-1100

BILL SENDER

Eurofins
750 Royal Oaks Drive

MONROVIA, CA 91016

Ship Date: 09JUL15
ActWgt: 10.0 LB
CAD: 103335946/INET3610

Delivery Address Bar Code

Ref #
Invoice #
PO #
Dept #

FRI - 10 JUL AA
STANDARD OVERNIGHT

TRK# 7740 2046 6784
0201

WZ WHPA

91016
CA-US
BUR

537J3/1A15/EE4B

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CITY OF CHILOQUIN OREGON

WATER MASTER PLAN
2016

The City of Chiloquin, Oregon, has reviewed this Water System Master Plan and adopted it.

_____ _____

Signature and Title Date

Preparation of this Plan was funded in part by in part by federal grant funds through USDA's SEARCH Grant Program and the State of Oregon's Infrastructure Finance Authority's Water/Wastewater Technical Assistance Financing Program.

ADKINS CONSULTING ENGINEERING, LLP

Engineers Δ Planners Δ Surveyors

Klamath Falls, Oregon

10/22/05

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DRAFT

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EXECUTIVE SUMMARY

This section is pending and will be added at the 90-percent draft

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CHAPTER 1
BACKGROUND INFORMATION

SECTION 1: PURPOSE OF STUDY

This study presents a completed Water System Master Plan (WSMP) for the City of Chiloquin's (City) municipal water system. This WSMP is intended to satisfy the requirements of a WSMP for public drinking water systems according to Oregon Administrative Rule (OAR) 333-061-0060(5) and a Water Management and Conservation Plan (WMCP) is accordance with OAR 690-086. Preparation of this WSMP was authorized by an agreement made between the City and Adkins Consulting Engineering LLP. (Adkins) dated June 09, 2015. In order to assist the City in operating the water system for the next twenty years the purpose of this WSMP is to: examine the current state of the water system; evaluate the ability of the system to meet water quality and level of service requirements; propose improvements for infrastructure, operation and maintenance, and management and conservation practices; and assist in planning the implementation of proposed improvements.

According to OAR 333-061-0060(5), community water systems with 300 or more service connections shall maintain a current master plan. Up until 2011 the City had not exceeded this threshold and as such was not required to maintain a current plan. Currently the City's water system has approximately 330 active service connections. In 2011 and 2014 the City received notices from the Klamath County Department of Public Health (DPH) regarding the violation of OAR 333-061-0060(5). These notices were issued after DPH performed water system surveys to evaluate the ability of the water system to supply safe drinking water to the public. Receipt of these notices prompted the City to begin the process of acquiring funding for planning and technical assistance projects and contracting professional services to perform the study.

SECTION 2: INFORMATION SOURCES

The conclusions and recommendations presented in this WSMP are in part based on information and data provided by the City. This includes but is not limited to: flow records (supply and use); financial records (operational costs, revenues, and budgets, etc.); descriptions of system operations, existing conditions of system components, and problem areas; system layout and sizing; water quality data. Therefore, these conclusions and recommendations are dependent to some degree on the completeness and accuracy of the information provided. In addition to information and data provided by the City, information and data was also sourced from various state and federal government agencies.

SECTION 3: PERIODIC PLAN REVIEW

According to OAR 333-061-0060(5), water system master plans shall evaluate the needs of a system for at least a twenty year period. In order to stay current with population growth, water system demands, and changing state or federal regulations, this plan should be periodically updated. It is recommended that this WSMP be reviewed at five year intervals and updated at ten year intervals (or sooner as growth requires). Maintaining a current plan is beneficial to the City because smaller more frequent updates will be less costly in the long term than redeveloping a new plan once the previous plan has become obsolete. Additionally, update requirements for the Water Management and Conservation Plan coincide with this schedule as required by OAR 690-086-0125(6).

SECTION 4: PLAN SUMMARY

This WSMP is divided into eight main chapters with an Executive Summary. These sections are summarized as follows:

Executive Summary

Chapter 1 – Background Information

Chapter 2 – Water System Requirements

Chapter 3 – Water Supply and Treatment

Chapter 4 – Water Storage

Chapter 5 – Distribution System

Chapter 6 – Recommended System Improvements

Chapter 7 – Water Management and Conservation Plan

Chapter 8 – Project Financing and Implementation

SECTION 5: REGIONAL SETTING

Located in the shadow of the Cascade Mountains, the City of Chiloquin is situated at the confluence of the Williamson and Sprague Rivers in Klamath County, Oregon. Klamath County is boarded by California to the south, Jackson and Douglas Counties to the west, Lane and Deschutes Counties to the north, and Lake County to the east. The primary geographical

features of Klamath County are the eastern slopes of the Cascade Mountains, the northern section of the Modoc Plateau, and the northwestern corner of the Basin and Range Province.

Klamath County lies mostly in the Upper Klamath sub-basins of the Klamath River Basin. These sub-basins include: Upper Klamath East, Upper Klamath Lake, Williamson, Sprague, Lost, and the Butte. Amidst these sub-basins is the outline of the historic Lake Modoc. Lake Modoc is believed to have stretched over 70 miles from the southern slopes of Mt Mazama (present day Crater Lake) to the northern slopes of Medicine Lake Volcano in northern California while reaching into the numerous valleys located in between.

The elevation in Klamath County varies from approximately 2,800 feet above sea level in the Klamath River Canyon at the Oregon-California border to 8,934 feet at the summit of Mt Scott in Crater Lake National Park. Annual precipitation levels fluctuate across the County as well ranging from as much as 70in/yr in along the mountainous western boundary to less than 20in/yr in areas to the south.

SECTION 6: SOILS

Soils in the City of Chiloquin and surrounding area vary greatly because of its geographical setting. Being located near the Williamson and Sprague Rivers as well as the neighboring Upper Klamath Lake, as one would expect, alluvial and lacustrine deposits are present. Chiloquin's proximity to the former volcanic Mt Mazama (present day Crater Lake) renders the presence of soils derived from volcanic ash and rock, pumice, and cinders. In general, the soils in The City of Chiloquin and surrounding areas are categorized as a variety of sandy, course, and gravelly loams.

Most of these soils with the exceptions of "Tutni Coarse Sandy Loam" and "Klamath-Ontko-Dilman Association" have a natural drainage class of moderately to well drained. For a map of the soils in the study area and abbreviated descriptions refer to Figure 1-1 and 1-2. For more detailed information see "Soil Survey of Klamath County, Oregon, Southern Part" completed by the Natural Resources Conservation Service.

SECTION 7: WETLANDS

According to the National Wetlands Inventory, wetlands are present in the study area. The total acreage of land classified as wetland in the city limits is approximately 10 acres. For a map of these areas see Figure 1-3. These lands are not anticipated to be impacted by the maintenance and operation of the existing system. There is one wetland area that is in the

vicinity of the City's water distribution system at the north end of Baker Street. This section of the distribution system is not expected to be expanded or upsized during the planning period.

Should the need for maintenance or work arise in a wetland area, the City (or party involved) should take the following actions:

- Provide the Department of State Lands a 30 notice before beginning work;
- Apply for a joint Army Corps/Department of State Lands Permit if the total cumulative removal and fill is greater than 50 cubic-yards or only an Army Corps permit if the total cumulative removal and fill is less than 50 cubic-yards;
- Use best management practices (BMPs) to prevent drainage of wetlands during work;
- Remove and preserve topsoil prior to excavations for use as final surface layer in backfilling operations.

SECTION 8: FLOOD PLAINS

Areas of 100yr flood plains exist along the Williamson and Sprague Rivers and areas of 500yr flood plains exist between Wiconi Street and Wasco Avenue. See Figure 1-4 for FEMA floodplain maps of the City of Chiloquin and surrounding areas. All of the City's existing above ground water system infrastructure is outside of the mapped flood plains and therefore not impacted by the presence of flood plains.

SECTION 9: HISTORY

On March 9, 1926 the City of Chiloquin was officially incorporated and shortly after, the existing but privately owned water system was purchased by the City. The privately operated water works company began operation in 1924 and only served the community east of the Williamson River. Residents on the west side of the river were still served from a private source operated by local resident Mr. Spinks. Originally, both of these systems drew water directly from the river but had changed to wells for supply by the late 1920's. Neither of these original wells are in operation today. The existing wells (Well No.1 and Well No.2) were put online in 1940 and 1978 respectively and to this day the City retains surface water rights to draw water from the Williamson River.

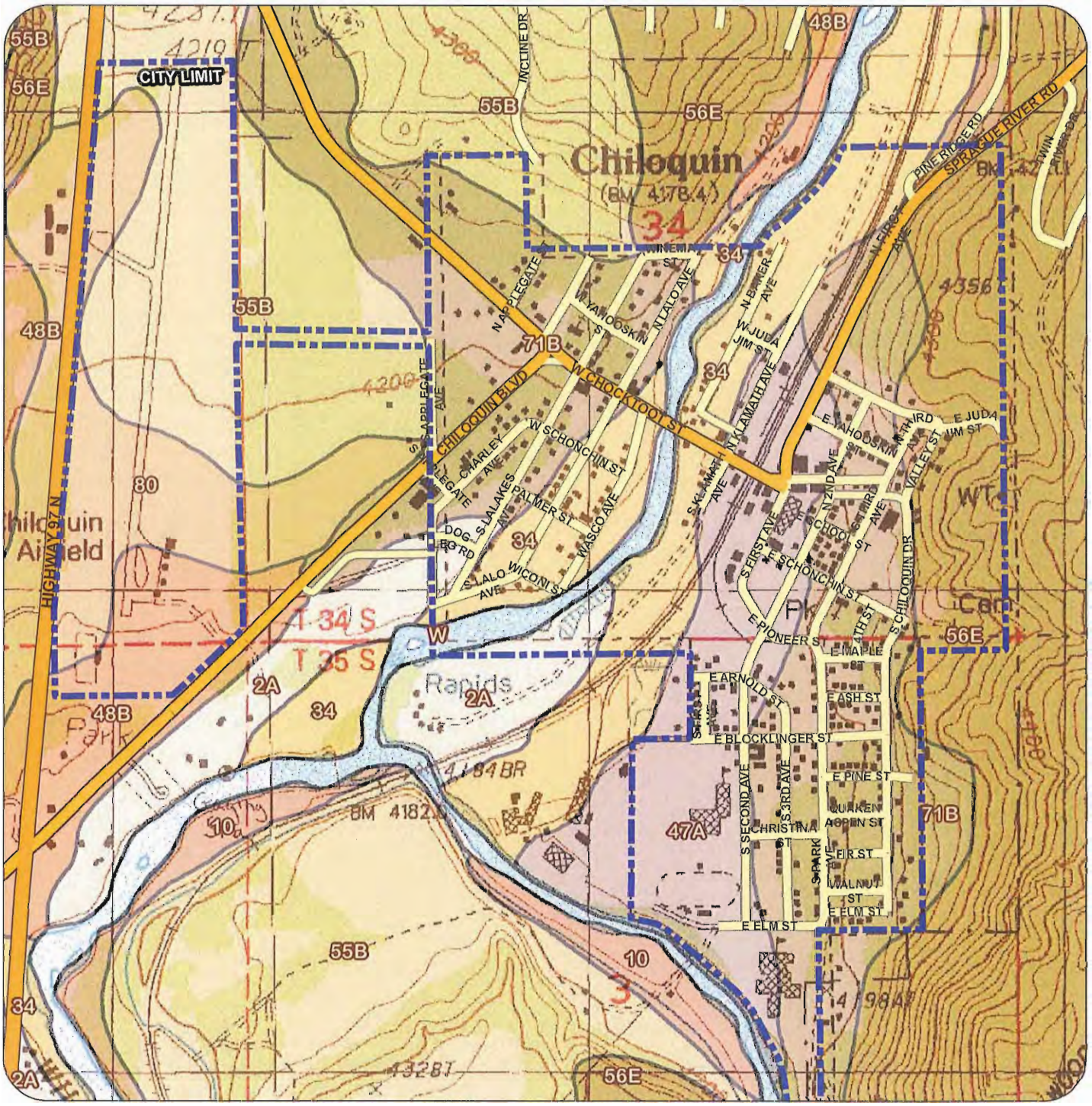
The existing distribution system has developed over time from the combination of two separate systems on either side of the river. Around the time that Well No. 1 was drilled in 1940 the two systems were connected. At that time the system consisted primarily of galvanized iron and steel pipes which were predominantly 2-inches or less in diameter with a few 4-inch lines

and a single 6-inch line connecting Well No. 1 to the storage tanks. In 1962 a 6-inch asbestos cement (AC) pipe was constructed from the reservoir line, at Valley Street, south to the Chiloquin High School. Around 1975 an 8-inch AC line was constructed along Blocklinger Street from Park Avenue to Second Avenue and a 6-Inch AC line was constructed Second Avenue into the mill property on Blocklinger Street. In 1978 the City drilled Well No. 2 at Spinks Community Park and constructed an 8-inch polyvinyl chloride (PVC) line from the new well to Lalakes Avenue. At the same time, a 10-inch line was constructed along Chocktoot Street from Lalakes Avenue to Well No. 1. Shortly after Well No. 2 was put in service it began to produce hydrogen sulfide odor and sand. Multiple attempts were made to filter the sand but in 1982 the well was taken out of service, to be used only in emergency situations. In 1981 the City installed a 10-inch PVC line from Well No. 1 to the east, adjacent to the existing 6-inch reservoir line, to the two 115,000 gallon reservoirs. Due to the numerous service connections on the 6-inch steel reservoir line it was left in service but disconnected from the reservoirs.

In 1985 a Water System Study was conducted by Adkins Consulting Engineering which proposed various improvements to the water system. These improvements are summarized as follows:

- Develop a second reliable and acceptable water source for supply to improve system redundancy;
- Install a flow meter on Well No. 1 for monitoring pumped volumes;
- Install meters on all service connections (and require meters on all new services) in order to measure leaks and conduct a rate study;
- Construct a third reservoir with 750,000 gallon capacity to augment storage and provide up to three days of emergency storage;
- Adopt a standard fire hydrant for City-wide use;
- Complete various improvements to the distribution system including replacing many of the older pipes and constructing extensions/loops to increase performance.

Of these proposed tasks - meters have been installed on service lines, a new reservoir has been constructed (although only 500,000 gallons), Kennedy fire hydrants have been installed in place of most of the existing standpipes/hydrants, and a flow meter has been installed on Well No. 1. Some improvements have been made to the distribution system although not nearly to the extent that was proposed in the 1985 study.



SOIL CLASS

- 10 - Chiloquin Loam
- 2A - Barkley Loam
- 34 - Klamath-Ontko-Dilman association
- 47A - Lobert Sandy Loam
- 48B - Lobert Loam
- 55B - Maset Coarse Sandy Loam
- 56E - Maset Coarse Sandy Loam
- 67E - Rock Outcrop - Nuss Complex
- 71B - Shanahan Gravelly Loamy Coarse Sand
- 80 - Tutni Coarse Sandy Loam

0 1,000

Feet

ADKINS CONSULTING ENGINEERING

CITY OF CHILOQUIN SOILS DATA

FIGURE 1-1

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Soil Class	Soil Class Number	Natural Drainage Class	Permeability (Ksat)	Fequency of Flooding	Depth to Water Table
Chiloquin Loam	10	Moderately Well Drained	Moderately High to High	Occasional	About 12" to 36"
Barkley Loam	2A	Well Drained	Very Low	None	>80"
Klamath-Ontko-Dilman Association	34	Poorly Drained	Moderatly Low to Moderatly High	Frequent	About 0 to 36"
Lobert Sandy Loam	47A	Well Drained	Moderately High to High	None	>80"
Lobert Loam	48B	Well Drained	Moderately High to High	None	>80"
Maset Coarse Sandy Loam	55B	Well Drained	Moderately High	None	>80"
Maset Coarse Sandy Loam	56E	Well Drained	Moderately High	None	>80"
Rook Outcropp - Nuss Complex	67E	Well Drained	Moderately High to High	None	>80"
Shanahan Gravelly Loamy Coarse Sand	71B	Somewhat Excessively Drained	High	None	>80"
Tutni Coarse Sandy Loam	80	Somewhat Poorly Drained	High to Very High	None	About 42" to 60"

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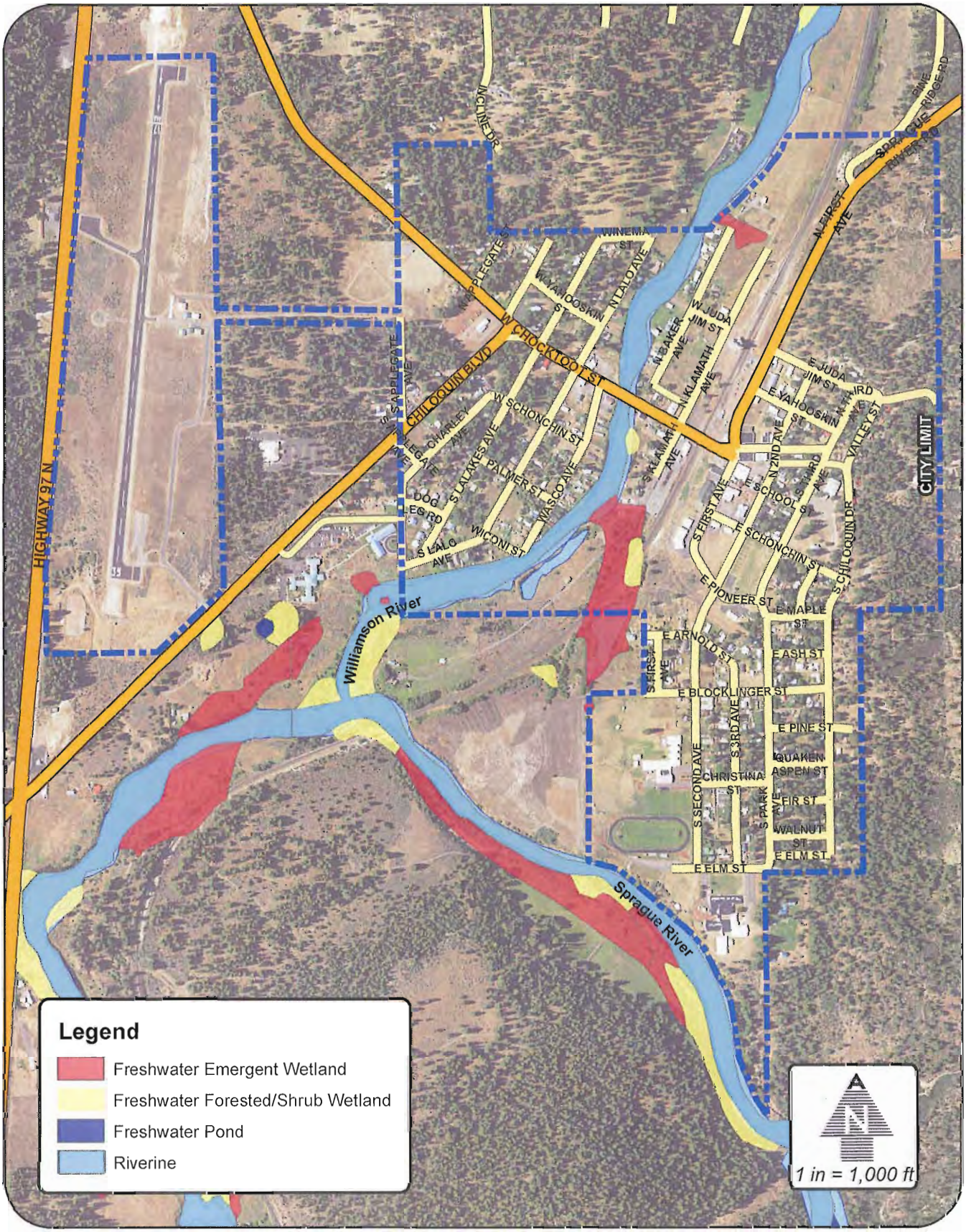
ADKINS CONSULTING ENGINEERING

CITY OF CHILOQUIN SOIL DESCRIPTIONS

FIGURE 1-2



ADKINS CONSULTING ENGINEERING

CITY OF CHILOQUIN WETLANDS MAP

FIGURE 1-3

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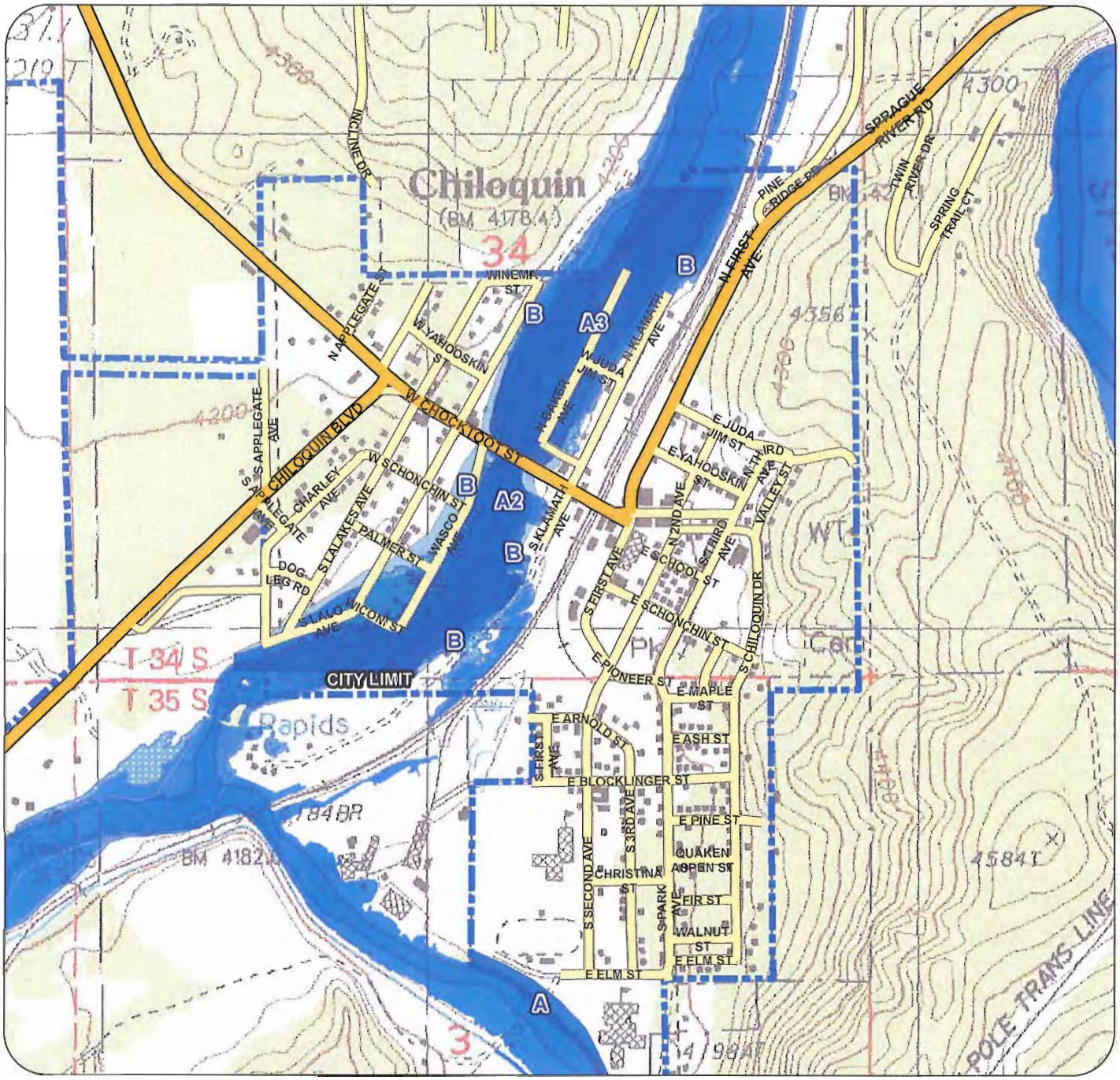

ZONE	EXPLANATION
A1-A30	Areas of 100-year flood; base flood elevations and flood hazard factors determined.
B	Areas between limits of the 100-year flood abd 500-year flood; or certain areas subject to 100-year flooding with average depth less than one (1) foot or where the contributing drainage area is less that one square mile; or areas protected by levees from the base flood.

0 1,000
Feet

ADKINS CONSULTING ENGINEERING

CITY OF CHILOQUIN FLOOD ZONES

FIGURE 1-4

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Of the improvements proposed to the distribution system in 1985 the following have been implemented:

- Upsize line at the south end of Lalo Avenue to 8-inch PVC;
- Upsize line along Lalakes Avenue south of Chocktoot to 8-inch PVC;
- Upsize line on Klamath Avenue to 8-inch PVC from Chocktoot Street to Juda- Jim Street (2005);
- Upsize line at the north end of Baker to 6-inch PVC.

In addition to the distribution system improvements, the system has received a couple extensions since 1985. Most notable of these is the 8-inch PVC main that runs through the airport from Oregon State Highway 422 and loops back towards Applegate Avenue (2001). A second 10-inch PVC main extends from the aforementioned line, leads out Oregon State Highway 422 to the Chiloquin Ranger Station.

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CHAPTER 2
WATER SYSTEM REQUIREMENTS

SECTION 1: STUDY AREA LOCATION

The study area for this WSMP is mostly coincident with the City's urban growth boundary with a focus primarily on the City limits. The City limits are located largely in Section 34 of Township 34 South, Range 07 East, W.M. and Section 3 of Township 35 South, Range 07 East, W.M. with the exception of the property occupied by the airport and Chiloquin Ranger Station which is located in Section 33 of Township 34 South, Range 07 East W.M. The general vicinity of the City of Chiloquin is shown in Figure 2-1.

SECTION 2: SERVICE POPULATION AND PLANNING PERIOD

In order to estimate the demands that may be placed upon the municipal water system, a determination of the population to be served must be made with reference to time. Projections are usually made on the basis of an annual percentage increase estimated from past growth rates, tempered by future expectations. It can be very difficult to accurately predict the population of a small community over an extended period of time. The addition or removal of a major business, industry, or recreation use in the area could significantly affect the population and overall water system needs.

The period of time over which the population is to be projected usually depends on the type of improvements to be considered. Improvements that will require long-term financing should be designed for no less than the term of financing. Facilities that are readily expanded or modified are normally designed for a period of 10 to 20 years. Facilities that are not easily modified or expanded, such as buried pipelines and storage reservoirs, may be designed for their expected life, which is usually 40 to 50 years or more.

Based on estimates by the United States Census Bureau, the City of Chiloquin's current population is approximately 716. Past trends for the City comparing data from 1970 through the present shows that the population has declined 13.4% from a high of 826 in 1970 to 716 today. In recent years however (2000 to present), the population fluctuated slightly but experienced little net change. In 2000 the population was 716 growing to 734 in 2010 before settling back to present day estimates.

The Oregon Office of Economic Analysis publishes long-term population forecasts for counties in the Oregon. The population for Klamath County is forecasted to have an average

annual growth rate of 0.4% which corresponds to a total growth of approximately 7% from 2015 to 2035. The Population Research Center (PRC) at Portland State University also publishes population forecasts for counties and sub-regions within the state. According to the PRC, the population of the Chiloquin UGB sub-region is forecasted to increase at an average annual growth rate of 0.2% for the 20 year period of 2015 to 2035 resulting in 745 total persons. This corresponds to a net population increase of 3.9% of the 20 year study period.

SECTION 3: LAND USE

Land use zones and classifications in the City of Chiloquin are defined in Chapter 2 of the City of Chiloquin's Community Development Code, Articles 4 through 8. According to Section 4.010 of the Community Development Code, the City is divided into four zones: Residential I (R-1), Residential II (R-2), Commercial (C), and Industrial (I). These zones are briefly defined as follows:

> Residential I – Establishes area suitable for single family and duplex dwelling units; mobile home and multi-family dwellings subject to specific siting standards; and necessary accessory uses.
>
> Residential II – Establishes areas suitable for residential development and accessory uses including mobile homes.
>
> Commercial – Establishes areas suitable for the development of a full range of retail, service, and accessory uses.
>
> Industrial – Establishes areas suitable for a full range of industrial activities and accessory uses.

For complete descriptions of the zoning classifications including permitted uses, conditional uses, and development standards refer to Articles 5 through 8 of the City of Chiloquin Community Development Code. For a map of the City zonings see Figure 2-2

SECTION 4: REGULATORY REQUIREMENTS

The City of Chiloquin's water system falls under the jurisdiction of the Oregon Health Authority – Drinking Water Program (DWP). The DWP assumed responsibility from the U.S. Environmental Protection Agency (EPA) in February 1986 for enforcement of the federal Safe Drinking Water Act (SDWA). Therefore, the City of Chiloquin is currently working with, and will be dealing primarily with, the DWP as the regulating agency with regard to their water system.

4.1: Regulatory History

The federal "Interim Primary Drinking Water Regulations" went into effect in 1977 as a result of the Safe Drinking Water Act of 1974 (Public Law No. 93-523). The primary regulations address requirements concerning elements, trace minerals, compounds, and micro-organisms that may affect the health of water consumers. The Act provides for monitoring, testing requirements, reporting, record keeping, and public notification procedures in the event of non-compliance. In 1986, amendments became effective that required the EPA to develop additional rules for drinking water with which purveyors must comply. As the new rules were developed, the DWP has been adopting them. A brief overview of the EPA Administrative Rules is listed below:

- Considerably increased the number of samples and tests the City has to perform for regulated and unregulated contaminants.
- Required continuous disinfection of surface water supplies and groundwater supplies when used in conjunction with surface water.
- Required filtration of most surface water sources.
- Initiated expanded monitoring for all systems.
- Changed current public notification requirements.
- Ensured more aggressive enforcement on the part of the EPA.

Prior to the 1986 amendments, the maximum contaminate level (MCL) had been set by the EPA for 22 regulated contaminants. The 1986 amendments contain a list of 83 contaminants to be regulated. These include volatile organic compounds (VOCs), synthetic organic compounds (SOCs), trihalomethanes (THMs), six contaminants relating to microbiology and turbidity forms, 18 inorganic contaminants, 40 organic contaminants, and five radionucliotides. A majority of these contaminants are regulated by the EPA as of June 1989 and the state adopted the regulations in 1991.

In the 1986 amendments, Congress directed the EPA to add 25 contaminants to the list every three years. The 1996 reform bill changed these requirements, allowing the EPA to consider adding only five contaminants to the list every five years. Therefore, the list of contaminants the City will have to test for may not expand as rapidly as before, but will likely continue to expand in the future. Additionally, amendments for disinfection requirements will be adopted in the future. With the growing list of regulated contaminants, communities will be faced with the responsibility of more sampling and testing in order to remain in compliance.

The EPA has developed regulations that will provide for different types and frequencies of public notification of violations based on frequency and severity of the violations. The revised public notification requirements included in the 1986 amendments, which took effect April 1989, require water systems to notify the persons they serve when the following instances occur:

1. When a violation of a National Primary Drinking Water Regulation or its monitoring requirements occurs.
2. When variances of exemptions are in effect.
3. When the water system does not comply with any schedule associated with a variance or exemption.

The DWP is responsible for administering the public notification system for the public water systems in Oregon. They work closely with the public water systems to make sure public notification is made in accordance with regulatory guidelines, when required.

The 1986 amendments also forbid the use of pipe, solder, or flux that is not "lead-free" in public water systems or any plumbing connected to a public water system after June 1988. Lead-free is defined as 8 percent or less for lead pipes and fittings and 0.2 percent or less for solder or flux. This requirement will not affect any pipe, fittings, etc., already in place. However, those systems with lead materials in their distribution systems must provide notice to "persons that may be affected by lead contamination of their drinking water." This notice must be provided even if lead concentrations in the water do not violate allowable concentrations. This provision does not apply to leaded joints necessary for the repair of cast iron pipes.

4.2: Safe Drinking Water Act Reform Bill

On August 6, 1996, the SDWA reform bill was signed. The SDWA amendments of 1996 give the EPA new ranking orders for developing rules to ensure the safety of public water supplies. The reform bill emphasized controlling the greatest risks at the best price, preventing contamination or source water, informing consumers annually of contaminant levels and health effects, and providing states with new flexibility to implement regulations and small systems compliance relief and assistance. Some of the key items of the reform bill that have already been passed into law are summarized below.

1. **Operator Certification**, which requires every water supplier to employ an operator to supervise the water system. The operator is required to be certified at a grade equal to the classification of the water system.

2. **Consumer Confidence Report (CCR)**, which requires community water systems serving 15 or more year-round customers to prepare an annual CCR to provide customers with information about the quality of their drinking water. Annual CCR reports were first due in October 1999. A copy of the City's *year* report is included in Appendix A.
3. **The Arsenic Rule**, which became effective in March 2001, lowers the MCL for arsenic allowed in a community water system from 50 parts per billion (ppb) to 10 ppb.
4. **The Enhanced Surface Water Treatment Rule (ESWTR)**, which improves control of microbial pathogens, including cryptosporidium, in drinking water, and addresses risk trade-offs with the Disinfectants/Disinfection By-Product Rule (D/DBPR). The Long-Term 1 Enhanced Surface Water Treatment Rule (LT1ESWTR) became effective in February 2002. This rule does not apply to the City of Chiloquin because the City's water supply has been classified as groundwater and is not under the direct influence of surface water.
5. **The Disinfectants/Disinfection By-Product Rule (D/DBPR)**, which reduces levels of disinfectants and DBPs in drinking water supplies to provide public health protection from exposure to trihalomethanes, haloacetic acids, chlorite, and bromate. This rule applies to community water systems that treat their water with a chemical disinfectant, such as chlorine, for either primary or residual treatment. Groundwater and small surface water supplied systems were required to comply with the Stage 1 D/DBPR by January 2004. Stage 2 D/DBPR is now in effect for the larger community systems but eventually all community water systems will be required to comply.
6. **The Groundwater Rule**, which specifies the appropriate use of disinfection while addressing other components of groundwater systems to ensure public health protection. This rule stresses Best Management Practices, source water monitoring, and contamination control. The Groundwater Rule went into effect December 1, 2009.

Another key item of the 1996 reform bill that is not yet law, but is anticipated to be law in the future, is the **Radon in Drinking Water Rule,** which attempts to reduce airborne and waterborne radon concentrations to limit exposure levels. This rule will apply to community water systems serving 25 or more people that use groundwater or mixed ground and surface water.

Fluoride MCLs may also be lowered in the future as the health impacts of fluoride are fully realized. The current MCL of 4 parts per million (ppm) could be reduced to one or less. This

lower MCL could require systems with naturally occurring fluoride above the MCL to treat to reduce levels.

4.3: Radionuclides Rule

Regulations for radionuclides in drinking water were first discussed in 1976 as interim regulations under the authority of the 1974 SDWA. The 1986 and 1996 SDWA Amendments revised the rule, and the revised Radionuclides Rule was published on December 7, 2000. The Radionuclides Rule sets standards for beta and photon emitters, radium (isotopes 226 and 228), gross alpha radiation, and uranium.

The DWP accepted radionuclide data collected prior to December 8, 2003, to substitute for the initial compliance monitoring required by the rule. Water systems had to monitor once at each supply point to the water system for gross alpha, combined radium-226/228, and uranium by December 8, 2003, in order to avoid the four consecutive quarterly samples.

4.4: Regulatory Violations

Chiloquin's water system has operated fairly well with the exception of a few reporting violations as noted by the Oregon Health Authority (OHA). In the last five years these violations include five instances of not enough reporting and two instances of no reports for routine coliform reporting. All of these reporting violations were remedied shortly after the violation was issued. Historically, the City has experienced lead and copper violations in November of 1994 and coliform violation in August 1996, where shortly after the system was brought back into compliance. Additionally, as of the writing of this plan the City is out of compliance with (OAR) 333-061-0060(5) and (OAR) 690-315 which states the need for a Water System Master Plan and a Water Management and Conservation Plan, respectively, thus the need for this plan as stated in Chapter 1. Printouts from the OHA, DWP website can be found in Appendix B.

4.5: Regulatory Requirements Summary

In summary, there are many regulations that affect operation of the City of Chiloquin's water system. The information presented herein is intended to provide the City with a brief summary of the regulations and possible future regulations that will likely affect operation of the City's water system. These regulations continue to expand and will require careful attention to maintain compliance. It is recommended that the City of Chiloquin periodically consult with the DWP to ensure compliance with current regulatory requirements and to address any regulatory questions or issues.

SECTION 5: SANITARY SURVEY

The DWP conducts sanitary surveys of drinking water systems in Oregon to ensure public safety and proper operation of drinking water systems. These surveys are conducted every 5 years for outstanding performing drinking water suppliers and every 3 years for non-outstanding performers.

The City's most recent sanitary survey was conducted in August of 2014. A copy of the sanitary survey can be found in Appendix C. The only deficiency listed in the survey was the lack of a current WSMP and the requirements for bringing the City into compliance with this deficiency. Additionally, the survey listed comments and recommendations for the City's water system operations as written below:

> "1. The Drinking Water Program has established criteria for determining whether a system should be considered to have "outstanding performance." Systems that are designated outstanding performers may have their water system frequency reduced from every 3 years to every 5 years. Although your system did not meet the established criteria, please review the enclosed handout to see what steps you can take in the future towards receiving the designation.
> 2. As we discussed during the survey, the operation and maintenance manual will be enhanced by the addition of photos of key elements of the water system. This is especially true of the second well operation if it is to be used as an emergency source.
> 3. A summary of your monitoring requirements can be found on page 11. Please maintain a copy of this page and refer to it for future monitoring scheduling."

Attention should be brought to page 11 of the sanitary survey, Water Quality Monitoring. This table of water quality monitoring checkpoints should be periodically reviewed by the water system operator to ensure compliance with monitoring requirements. Other checklists in the survey are also important to review as they will help the City to avoid any future violations or deficiencies.

SECTION 6: WATER DEMAND

Future water demands, for the purpose of identifying needed future water system improvements, can be estimated from past water use data and population projections. Water use data are usually expressed in terms of various rates of water used for various periods of time. This allows components of the water system to be sized for the maximum demands that will be placed on them. The rates of water use that are important in evaluation of a water supply

system are the average daily demand, which is the total amount of water used during a one-year period divided by 365 days; the peak daily demand, which is the maximum total amount of water used during any 24-hour period; and the peak hour or peak instantaneous demand, which is a measure of the maximum typical flow of water at any given time (not considering fire flows). Historical water usage as reported by the City and population trends will be utilized for projections of future demands and water system modeling.

Water supply facilities are normally designed for peak daily demands. As a general rule, a well would be sized for supplying the needed water during the peak day, without continuous 24-hour operation. In most cases well pumps are sized for no more than an 18 hour run time during peak daily demand while balancing motor size, flow rates and storage tank supply pipe size. Distribution pipelines are generally sized to deliver peak instantaneous demands while maintaining relatively low velocities and minimum residual pressures during delivery of fire flows. Storage reservoirs are sized to make up the difference between water supply capacity and peak water use rates, at a minimum, while additional reserves are usually provided for both emergencies and fire suppression.

6.1: Per Capita Water Use

In order to be utilized for projecting future water demands, past water use data can be converted to a per capita (per person) rate of use. This is done by dividing the average day, peak day, and peak instantaneous water use rates by the number of people being served by the water system. These water demand rates are then expressed as gallons per capita day (gpcd). These values multiplied by a population projected for some future year would then give estimated total demand rates for that year.

The City has reported its water use for its main water source, Well No. 1, to the Oregon Department of Water Resources as required by the City's water right permit. These monthly water use reports have been consistently reported from 2000 to 2014 and will be used for the analysis of historical water use. The City's Well No. 2 (Spinks Park Well) has not been used during this period, therefore will not be included in historical water supply. Monthly water production for Well No. 1 is shown in Figure 2-3. The gallons per capita day for water pumped from Well No. 1 from 2000 to 2014 is presented in Figure 2-4.

Based on data for water years 2000 through 2014, the City's per person water use has varied from a high of 471 gpcd in year 2000 to a low of 267 gpcd in year 2014. The average of the values shown on the table is approximately 373 gpcd. For this WSMP, an average daily flow

of 373 gpcd was selected for design purposes (using a current population estimate of 716). It is assumed that this value represents typical annual water use for the City of Chiloquin.

6.2: Peak Daily Water Use

Peak daily flows usually occur during a particular day in June, July, August, or September, which is when water use is normally at its greatest due to irrigation and other summer uses. Peak daily flows can occur in other months, but normally occur during the hottest period of the year. In Chiloquin, an average peak daily demand occurred in July of 2003 of 835,678 gallons, with similar peak daily volumes recorded on other dates. The 835,678 gallon average peak daily use translates to 1,167 gpcd (peak day demand) using the Census population estimate of 716. This peak daily demand was used for design purposes in this WSMP. Chiloquin's ratio of peak daily demand to average daily demand (or peaking factor) is 3.1.

6.3: Water Use Based on Account Type

To help determine water use by account type, a listing of annual water use for non-residential accounts (currently the City only reads non-residential meters on a consistent basis) was obtained from the City for the period from November 2013 through Ocotber 2014. A more detailed discussion of the water accounts is presented in Chapter 7. Water use for residential accounts was calculated as the difference between water pumped from Well No. 1 and metered non-residential accounts. A summary of the account type and associated water use is presented on the following table.

Account Type	Number of Accounts	Total Use (gallons)	Average Annual Use Per Account	Percentage of Total Water Use
Residential	296	62,475,217	211,065	89.4
Non-Residential	34	7,429,690	225,142	10.6
Total	330	69,904,907	N/A	100

Based on this comparison, it can be seen that the majority of the water use for the City of Chiloquin is residential vs non-residential.

SECTION 7: FIRE DEMAND

7.1: Fire Protection Ratings.

Flow rates for fire suppression in residential, commercial, and industrial areas within developed communities are usually determined from the size, density, and occupancy of buildings, type of construction materials, and desired fire insurance rating. Incorporated cities and some rural areas are given a fire suppression rating by Insurance Services Office Commercial Risk Services, Inc. (ISO). The rating is used by insurance companies to determine the cost for providing fire insurance to home and business owners. ISO's fire suppression rating schedule is used to review those features of available public fire protection that have a significant influence on minimizing damage once a fire has begun. These features include the receiving and handling of fire alarms, the fire district's manpower, equipment, and training, and the capability of the water system to provide the needed fire flows.

ISO periodically evaluates fire suppression capabilities of incorporated cities and rural fire districts. The numerical ratings range from Class 1 down to Class 10, with Class 1 indicating the highest fire suppression capability and Class 10 the lowest. A Class 10 rating is reserved for unprotected areas that have no fire department and no water supply system. Most protected areas outside of cities have a Class 9 rating, and most small rural cities with municipal water systems are rated Class 8, 7, or 6, depending on the strength of their water system and fire department. The City of Chiloquin is part of the Chiloquin-Agency Lake Rural Fire Protection District, for which the ISO rating is 4/4Y, based on the March 2015 evaluation. The ISO rating information is presented in Appendix D.

ISO's fire suppression rating schedule evaluates the City's capability and the domestic water supply on an approximately equal basis (50 percent and 40 percent of the rating schedule, respectively). In order to reduce the cost of fire insurance in a community, improvements usually must be made to the fire department, the water system, or both, depending on their present condition. It is difficult to determine possible fire insurance savings on commercial buildings because the insurance costs are determined by many other factors related to the type of occupancy and the type of building construction. The fire district has a fairly high rating compared to other rural fire districts of similar size in Oregon.

7.2: Recommended Fire Flows

ISO also recommends fire flows for various conditions in both residential and commercial settings. Recommended fire flows for residential areas with 1- and 2- family

dwellings not exceeding 2 stories, are set forth in the 2008 ISO Fire Suppression Rating Schedule as shown below.

Distance Between Buildings	Required Fire Flows
Over 100 feet	500 gallons per minute (gpm)
31 to 100 feet	750 gpm
11 to 30 feet	1,000 gpm
10 feet or less	1,500 gpm

Recommended fire flows for commercial buildings are based on many factors including building size, construction materials used, and what is housed in the building.

The International Fire Code (IFC) requires a minimum flow of 1,000 gpm in residential areas and a minimum flow of 1,500 gpm for at least two hours in all other occupancies. These requirements increase with square footage of the building and can be quite large for commercial and institutional buildings (schools). These fire flows must be maintained with a system-wide minimum of 20 pounds per square inch residual pressure. Attaining the required fire flows for commercial areas may not be realistically achievable. The IFC has an allowance for decreases in fire flows for small communities (if approved by the local fire chief), where development of full fire flow is impracticable.

The March 2015 ISO Hydrant Flow Data Summary provided recommended fire flow protection rates for both residential and commercial districts to receive full credit ratings. ISO does not consider needed fire flows over 3,500 gpm in determining the Public Protection classification for cities. The fire flow design criteria for this WSMP are based on the typical maximum fire flow recommended by ISO, which is 3,500 gpm for a two-hour duration. This maximum fire flow is typically recommended for school areas and other high-density developments.

SECTION 8: DESIGN CRITERIA

In establishing design criteria for a water system, primary consideration must be given to state and federal rules and regulations governing water quality and construction standards for water systems. These regulations, as previously stated, are set by both the EPA and the DWS. In addition to these public health and safety requirements, many other factors control the design parameters for municipal water systems. The City must evaluate many other factors such as financial feasibility, philosophy, and policies of the City Council, past system performance and service, and expectations of the water users. All of these factors are important and can influence the standards by which water system improvements are made.

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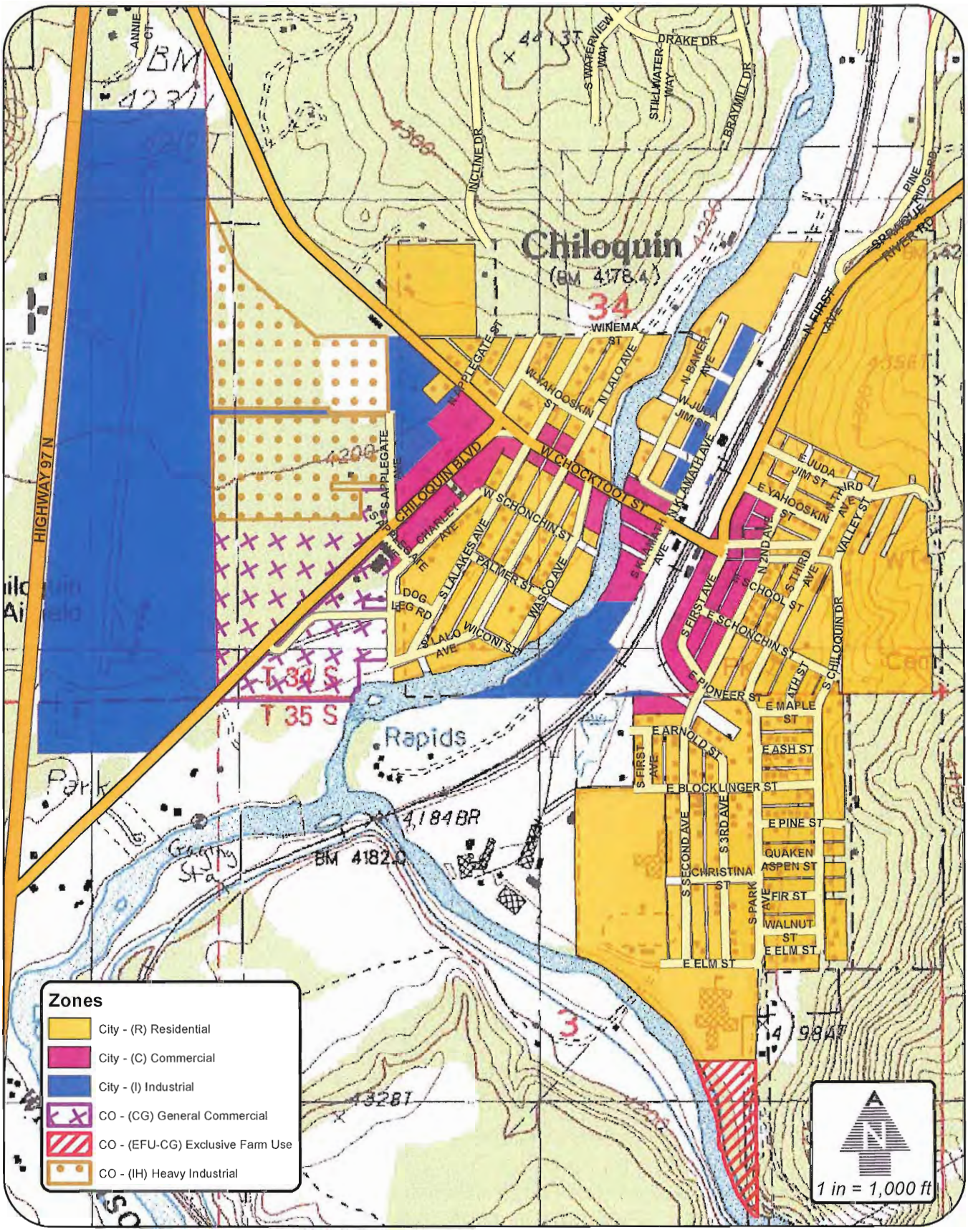
CITY OF CHILOQUIN VICINITY MAP

FIGURE 2-1

Document Path: H:\1011-71 City of Chiloquin Water Master Plan\GIS\Vicinity.mxd

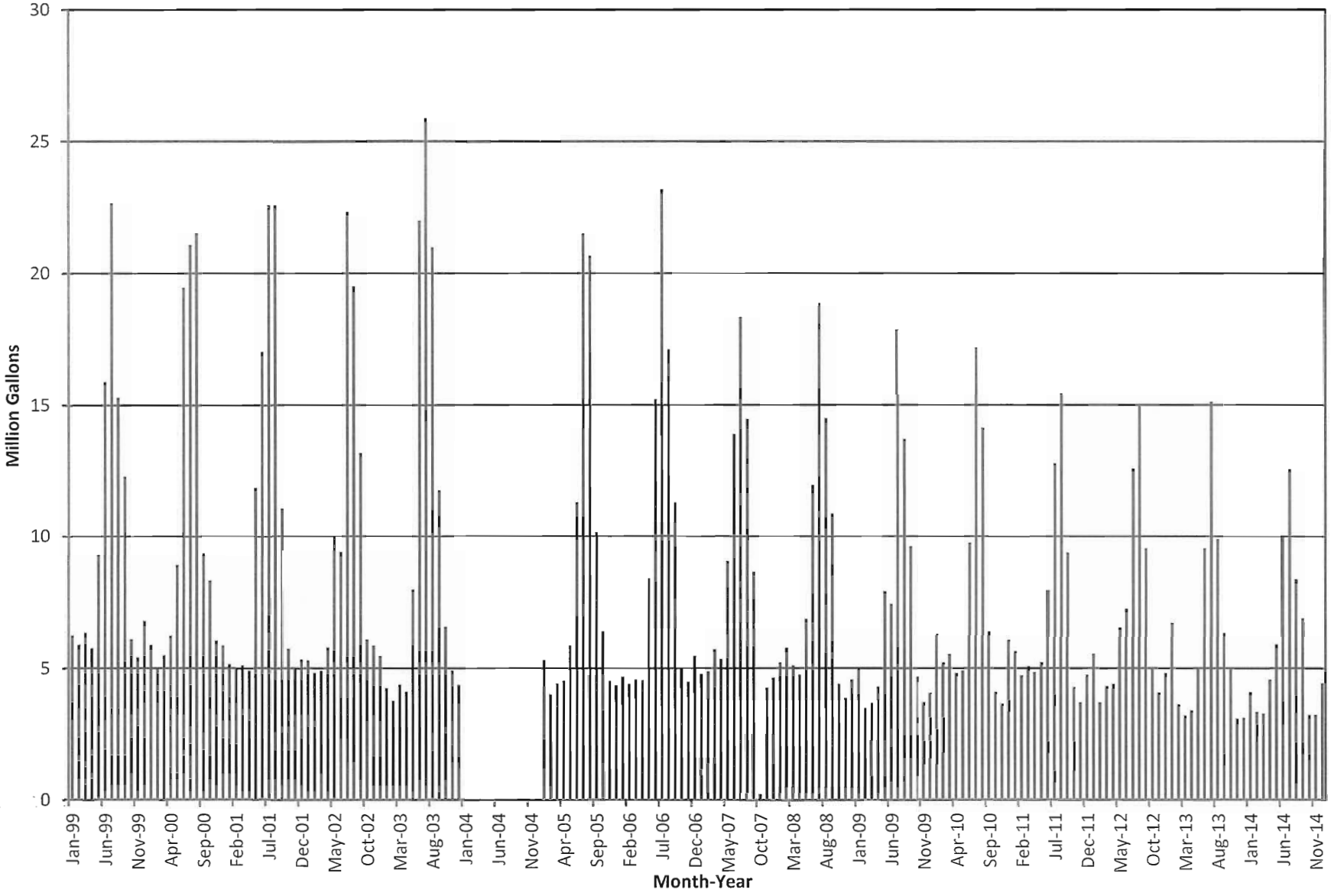


Document Path: H:\1011-71 City of Chiloquin Water Master Plan\GIS\Zone.mxd

ADKINS CONSULTING ENGINEERING

CITY OF CHILOQUIN ZONING MAP

FIGURE 2-2

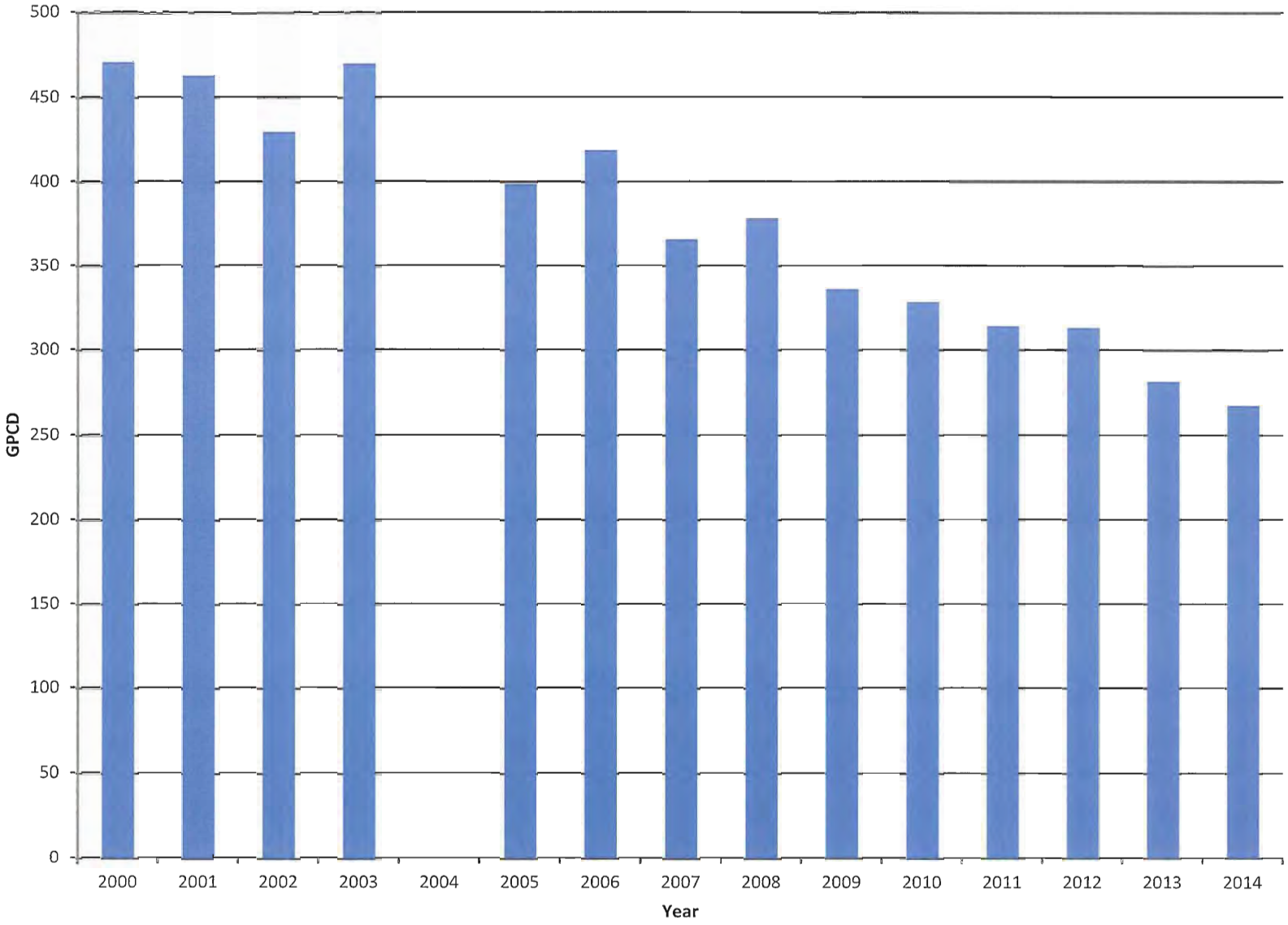


ADKINS CONSULTING ENGINEERING

WELL NO. 1 MONTHLY PRODUCTION JANUARY 1999 to DECEMBER 2014

FIGURE 2-3

H:\1011-71 City of Chiloquin Water Master Plan\Docs\Report\Tables and Figures\Fig 2-3 Well 1 monthly production.mxd



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WELL NO. 1 PRODUCTION GALLONS PER CAPITA DAY

FIGURE 2-4

H:\1011-71 City of Chiloquin Water Master Plan\Docs\Report\Tables and Figures\Fig 2-4 Well 1 gpcd.mxd

	Year 2015	Year 2035
Design Population [1]	716	745
Residential Service Connections	296	308
Commerical Service Connections	34	35
Supply		
Average Daily Demand (gpcd)	373	373
Average Daily Volume (gpd)	266,857	277,665
Average Daily Flow Rate (gpm)	185	193
Peak Daily Demand (gpcd)	1,167	1,167
Peak Daily Volume (gpd)[2]	835,678	869,525
Peak Daily Flow Rate (gpm)	580	604
Peak Hourly Flow[3] (gpm)	1,451	1,510
Supply Flow Required[4] (gpm)	774	805
Estimated Available Supply Flow[5] (gpm)	480	499
Fire Demand		
Residential (gpm)	1,000	1,000
Commercial/School (gpm)	3,500	3,500
Duration (hrs)	2	2
Minimum Residual Line Pressure Under Peak Demands Plus Fire Flow (psi)	20	20
Storage		
Operation Storage (gal)[6]	129,000	129,000
Equalization Storage (gal)[7]	145,624	151,523
Fire Reserve (gal)[8]	420,000	420,000
Emergency Reserve (gal)[9]	266,857	277,665
Total of Storage Components	961,481	978,188
Existing Storage Capacity	500,000	500,000
Potential Additional Storage Needed	461,481	478,188

Notes:

[1]Year 2015 population from U.S. Census Estimates. Year 2035 population estimate is based on growth rate projections for the Chiloquin UGB as estimted by PSU Population Research Center.

[2]Based on average peak daily flow during July 2003.

[3]2.5 times the peak daily flow rate.

[4]Assumes 18-hour well operation to meet peak daily flow demand.

[5]Current operational flow at Well No. 1 is 480 gpm but historically in peak operational condition operates at 650 gpm.

[6]Based on 6ft operational storage as stated by Public Works Department.

[7]Difference between peak hourly flow and available supply for a 2.5 hour period.

[8]3,500 gpm flow for a two-hour duration.

[9]One-day supply at average daily demand.

Abbreviations:

gal = gallons
gpcd = gallons per capita day
gpd = gallons per day
gpm = gallons per minute
hrs = hours
psi = pounds per square inch

ADKINS CONSULTING ENGINEERING

SUMMARY OF WATER SYSTEM DESIGN CRITERIA

TABLE 2-1

H:\1011-71 City of Chiloquin Water Master Plan\GIS\Design Criteria.mxd

Table 2-1 presents a summary of the water system design criteria for evaluating the existing water system and developing improvements to satisfy present and future needs. The application of these criteria is discussed further in the specific chapters that address the water supply, storage, and distribution system facilities. The table presents design criteria using the most recent Census population of 716 and current estimated average and peak daily demands. Design criteria are shown for 2035 based on 0.2 percent growth per year in the City. Storage volumes are derived from calculations summarized in Chapter 4. The design criteria presented on Table 2-1 are used as base information in later chapters for evaluating existing and future system needs and capability.

DRAFT

CHAPTER 3
WATER SUPPLY AND TREATMENT

SECTION 1: INTRODUCTION

This chapter of the Water System Master Plan (WSMP) includes a description of the City's present water supply system and a discussion of its capacity to meet present and future needs. Alternatives for solving deficiencies with the present system and for meeting future needs are outlined. Cost estimates for the preferred alternative are presented in Chapter 6.

SECTION 2: PRESENT WATER SUPPLY, TREATMENT AND CONTROLS

Two wells are owned by the City and located within the city limits (Well No. 1 and Well No. 2). Only Well No. 1 is currently used by the City and serves as the primary water source. Shortly after Well No. 2 was put in service it began to produce hydrogen sulfide odor and sand. Multiple attempts were made to filter the sand but due to the sand and odor issues, the well was taken out of service in 1982, to be used only in emergency situations. The water system is a stand-alone system with no interties and no intergovernmental agreements exist to provide or receive water from another entity. A summary of each well is as follows (all references to well depth are feet below ground surface):

2.1: Well No. 1

Well No. 1 does not have an official well log, but Oregon Water Resources Department (OWRD) has gathered data on this well and recorded it on Well Log number **KLAM 58404.** According to these data the well was constructed in 1940 with a 12" bore hole to a depth of 1240 feet with a flow of 650 gallons per minute, whereas recently the flow has dropped to 480 gallons per minute. This well was placed into service in 1940 and has continued to be used as the primary water source to the present. The pump is driven with a 50 horsepower motor and the pumping plant was tested during the writing of this plan to have a combined efficiency of 37%. Additional infrastructure installations in the fall of 2013 include a pressure transducer at the storage tank with telemetry communication to control pump starts and stops, as well as an Auto-dial Call-out for high water level, low water level and power outage. During peak demand periods the pump may operate continuously for 24 hours per day until demand decreases.

2.2: Well No. 2

Well No. 2 was constructed in 1978 with a 16 inch casing to 40 feet, 12 inch casing to 232 feet and uncased to 750 feet. This well was put into service in 1978, but with constant sand

and odor issues, it's use was discontinued in 1982. The pump, motor, sand separator, and associated piping remain intact to this day.

2.3: Airport Well

Recently, the city has begun to investigate the use of an existing well at the Chiloquin Airport. No official well log exists for the Airport well, but OWRD has gathered information about this well and reported it in a well record as **KLAM 949.** This record reports the well as having a 10 inch casing to a depth of 10 feet and the rest of the bore hole uncased to a depth of 425 feet. The water level was reported at 9 feet in 1940 with a capacity of 500 gallons per minute. The City of Chiloquin has a 12 month due diligence agreement with the Department of Transportation Aeronautics Division to investigate the feasibility of using the Airport Well as a back-up water source to replace Well No. 2.

Table 3-1 presents comparable information for wells related to the City.

2.4: Water Supply Disinfection and Treatment

Although there have been a hand full of instances were coliforms were detected in the water supply, these results were still below the maximum allowable levels (as reported to Oregon Health Authority). Therefore, the City does not treat the water supply, nor is treatment required by State or Federal law.

2.5: Controls

The operation of Well No. 1 is controlled by a pressure transducer located in a utility vault at the base of the water storage tank (See Appendix E for photos of pressure transducer). Communication from this pressure transducer to the well pump controls is made via telemetry and controls the start and stop of the well pump.

SECTION 3: WATER RIGHTS

The City of Chiloquin has permits to appropriate groundwater from the Oregon Water Resources Department (OWRD), allowing use of the water for municipal purposes within specified areas for Wells No. 1 and 2. The City also has a certificated water right for a surface water diversion from the Williamson River for municipal purposes with a diversion rate up to 3 cubic feet per second. A summary of water rights information is presented on Table 3-2. Copies of the City's water rights and well permit information are presented in Appendix F.

The majority of Klamath County lies in the Upper Klamath River Basin which is situated upstream of the Wild and Scenic section of the Klamath River (Wild and Scenic section extends from John C. Boyle Dam to the Oregon-California Border). As established in ORS 390.805-ORS 390.925, OWRD has declared that no new water rights will be allocated that will decrease stream flows in a Scenic Waterway. According to a report published by the United States Geologic Survey in 2010, *Ground Water Hydrology of the Upper Klamath Basin, Oregon and California,* all water in the Klamath Basin (including groundwater) has the potential to be connected hydraulically. Therefore, it is difficult, if not impossible, to permit new groundwater water rights in the Klamath Basin. In order for the City of Chiloquin to bring the Airport Well into service the City would need to apply for an additional Point of Appropriation (POA) to access the same aquifer currently used under their existing groundwater water right.

SECTION 4: WATER SUPPLY ANALYTICAL TESTING

4.1: General Supply Well Testing Data

Summaries of analytical data related to the City's water quality testing for Well No. 1 were obtained from the Oregon Health Authority - Drinking Water Services (DWS) website. The City's wells have been sampled for the constituents required by the DWS, including total coliform and fecal coliform, E. coli, volatile organic chemicals, synthetic organic chemicals, inorganic chemicals, radiological agents, pesticides, fluoride, nitrates, nitrites, arsenic, and several metals.

As shown in the City's testing data, presented in Appendix G, most of the constituents were not detected in samples obtained from the City's water system. Of those detected, the concentrations were significantly less than their corresponding Environmental Protection Agency (EPA) Primary Drinking Water Maximum Contaminant Levels (MCLs), except during the 1988 test where cadmium was found to be at the MCL of 0.005 MG/L. Based on the latest chemical results, groundwater from the City's supply well does not contain bacteriological or chemical constituents at concentrations greater than the corresponding EPA Primary Drinking Water MCLs.

4.2: Distribution System

Although the distribution system is discussed in greater detail in Chapter 5, a brief discussion of distribution system sample analytical testing is presented here for completeness. The City routinely obtains samples from the distribution system each month for analysis of total coliform and *E. coli*. In general, coliform are not present in routine distribution system samples, although the water has tested positive for total coliform on seven different occasions. Total coliforms were detected in January and September of 2002, August of 2004, March and June of 2005, October of 2006 and May of 2007. These occurrences were low enough that the Oregon Health Authority reported alerts for each event, but did not report violations

The City also obtains samples from the distribution system for chemical analysis of lead and copper concentrations every 3 years. Only one occurrence of lead and copper results has triggered a violation. In November of 1994 the results yielded levels equal to the MCL for lead and copper. The City remedied the violation shortly after in November of 1994 and March of 1995. Results from the City's coliform, lead, and copper tests are shown in the DWS's water quality testing summaries in Appendix G.

SECTION 5: STATIC WATER LEVEL TRENDS

The static water level is the depth to water in a well when the well is not being pumped. Over time, static water levels of a well can be the best indicator of the status and condition of the underlying aquifer. A reduction in static water levels could indicate the aquifer is being depleted faster than it can be recharged. It is very important to observe any trends in static and pumping water levels in the City's wells. Data collected can then be plotted over time (several years) to observe any trends. These data will be invaluable to the City in predicting long-term usability of the City's existing and proposed wells. City staff does not routinely measure static water levels; therefore these data are unavailable for this plan. It is recommended that the City maintain static water level measuring equipment and routinely collect these data to examine the long-term trend.

SECTION 6: SOURCE WATER ASSESSMENT

The 1996 amendments to the Safe Drinking Water Act require states to provide information needed by public water systems to develop drinking water protection plans if they choose to do so. The information provided includes the identification of the area most critical to maintaining safe drinking water, i.e., the Drinking Water Protection Area (DWPA), an inventory of potential sources of contamination within the DWPA, and an assessment of the relative threat

that these potential sources pose to the water system. In Oregon, the principal agencies involved with source water assessments are the Department of Environmental Quality and the DWS. These agencies completed a Source Water Assessment Report (SWAR) for the City of Chiloquin's water supply wells in 2004. A copy of the DWS's SWAR is included in Appendix H.

The SWAR includes information related to the City's water sources, including delineation of the source water protection area, sensitivity analysis, inventory of potential contamination sources, susceptibility of the wells to contamination, and recommended uses of the SWAR. It is recommended the reader of this WSMP refer to Appendix H for information relative to the City's water supply well and the aquifers present beneath the Chiloquin area.

The DWPA is intended to approximate the next 10 to 15 years of groundwater supply for the City of Chiloquin's wells. Figures showing the DWPA, the times of travel (TOT) for groundwater to the wells (2-year, 5-year, and 10-year), and potential contamination sources are included in the SWAR.

According to the SWAR, Well No. 1 is constructed in a confined aquifer consisting of gravel and clay approximately 17 feet thick separated from the surface by a clay layer. The SWAR indicates that the aquifer supplying the well is considered highly sensitive primarily based on a high traverse potential (an estimate of the weighted permeability of the material between the surface and the aquifer) and lack of well construction information.

The delineated DWPA is dominated by residential and commercial land use. Thirteen potential contamination sources were identified within the 1-year TOT zone. Five potential contaminant sources were identified within the 2-year TOT zone of the DWPA. Three and five potential sources were found in the 5-year and 10-year TOT zone, respectively. The potential contaminant sources in this area include various different sources from campgrounds to a landfill. Most notable contaminant sources that pose a high risk are seven underground storage tanks, Century Tel storage yard and various automobile repair shops. The SWAR concluded that the source is considered highly sensitive, and based on potential virus sources present within the 2-year TOT, the drinking water source is susceptible to viral contamination as well.

SECTION 7: WATER SUPPLY DESIGN CRITERIA

As presented in Chapter 2, the planning period for this WSMP extends to the year 2035. The estimated population for the City of Chiloquin, according to the 2010 Census estimates, is 716. With the assumed 0.2 percent per year population growth, the projected population for the

year 2035 is 768. Based on these population data and the City's current water use characteristics, the current and year 2035 average day and peak day demands are as follows:

CITY OF CHILOQUIN WATER SUPPLY DESIGN CRITERIA

Year	Population	Average Daily Flow (gpm)	Peak Daily Flow (gpm)	Supply Flow Required* (gpm)
2015	716	185	580	774
2035	745	193	604	805

*Assuming 18 hours per day maximum well operation.

The 0.2 percent annual growth rate selected for this WSMP results in an increase in population of 3.9% by the year 2035. The City of Chiloquin has experienced low to moderate population growth during the last 20 years. Water supply improvements recommended in this chapter have been developed to meet the City's current needs as well as projected future needs through the year 2035.

Water supply facilities (well pumps) are normally designed to meet peak daily demands without having to provide 24-hour service. It is preferable that well pumps operate a maximum of 18 hours per day, if possible. The current total production capability of Well No. 1 is in the range of 480 gpm. This 480 gpm capacity does not currently meet the design standard of supplying the peak daily demand in 18 hours, and during peak use Well No. will commonly run 24 hours a day. Therefore, the current water supply will not be able to meet any additional future demand due to increases in population. This suggests that the existing system operation and well capacity are inadequate and need to be upgraded. It is recommended that the City consider replacing Well No. 1 pump with a pump that can meet the design criteria as presented here.

SECTION 8: WATER SUPPLY RELIABILITY

The reliability of the water supply is one of the most important components of any water system. Because the health and safety of the community depends on a reliable water source, high priority should be given to help ensure a municipal water system has the ability to always meet the water needs of its customers. A number of factors, such as mechanical failures, water quality concerns, power outages, primary water transmission line failures, etc., can affect the reliability of a water supply. It is nearly impossible to ensure 100 percent reliability of any

system. However, having proper system components in place can reduce the risk of a water supply failure.

Currently, the existing water system components provide the City with a very limited degree of redundancy. In the event of a power outage, the City will be totally reliant on their storage reserves. There is no backup generator or engine-driven fire pump to supply water. In addition, Well No. 2 is on the same power grid as Well No. 1 and would also be inoperable in a power outage impacting the local area. Therefore, installation of a generator at the Well No. 1 site as well as increased storage would improve the ability to supply water during a power outage. However, some redundancy associated with water supply alternatives may also be desired by the City.

Many communities in eastern Oregon rely on wells as their primary water source, and properly constructed wells have proven to be dependable and reliable. When possible, it is preferred that communities have a backup supply well available in addition to the well(s) used to meet daily demands. This helps to provide redundancy to the system by allowing one well to be taken out of service while others continue to operate. In the City of Chiloquin's case, the backup supply is currently Well No. 2. However, this well has extensive sand, taste and odor issues associated with hydrogen sulfide. For this reason, the connection is normally closed but can be opened in the event of an emergency. If a failure occurs with Well No. 1, the City would be dependent on Well No. 2 since an equivalent backup supply is currently not available.

SECTION 9: AREA WELLS, GEOLOGY, AND AQUIFERS

In order to assess potential opportunities for the City to develop an additional backup water supply source, area well information was reviewed. Available copies of well logs for the City of Chiloquin area were obtained from the OWRD website. Area well logs were reviewed to evaluate where and at what depths higher yield wells are located and if an existing well could potentially be available for use by the City. Well logs were reviewed for an area approximately within two miles surrounding the City of Chiloquin, specifically in Township 34 South, Range 7 East, Willamette Meridian, Section 27, 33, 34 and Township 35 South, Range 7 East, Willamette Meridian, Section 3. In these areas, approximately 14 well logs were selected from the OWRD website search. Well yield and depth varied greatly, therefore a variety of wells were selected that best represented the area including the City wells. Copies of well logs for wells in the City of Chiloquin and surrounding area are presented in Appendix H.

A summary of the well log information is also shown on Table 3-3. Figure 3-1 also depicts the approximate locations for wells that are located within close proximity of the City of Chiloquin. It should be noted that the well locations were estimated based on legal descriptions provided on the well logs that generally identify the location to the nearest 40 acres, if the descriptions are correct. Therefore, the locations shown on Figure 3-1 should be considered approximate.

Information obtained from the 14 well logs was used to complete a preliminary evaluation of wells in the Chiloquin area for planning purposes. Interviews with well owners were not completed to verify the accuracy of the well log information presented herein. In some cases, well logs may not be available or significant alterations may have been completed to a well that are not shown on the OWRD well log or that have not been reported to the OWRD.

Based on the well log information, only those wells that the City operates plus one additional private well have sufficient capacity to be considered as potential wells for the City. The wells are identified with well logs with KLAM numbers 58404 (Well No. 1), 51957 (Well No. 2), 960 (Airport Well) and 11087 (private well), and are shown on Table 3-3 and on Figure 3-1. Based on the location of these wells the current City Well No. 2 and Airport Well seem to be the most feasible to use as an additional supply source. The private well with log number 11087 is further from the distribution system and would require the similar easements, agreements or land acquisition as the Airport Well. Therefore, the Airport Well holds higher preference than the private well for potential use.

Based on this limited review of area well logs, subsurface materials beneath the City of Chiloquin generally appear to include an aquifer consisting of gravel and clay overlain by a clay layer. Other well logs in the area generally consist of alternating layers of clay with rock, sandstone or sand. Some well logs terminate into a basalt layer, where depth is variable between well locations.

SECTION 10: WATER SUPPLY SOURCE ALTERNATIVES

Outlined hereafter are four feasible alternatives that have been considered for an additional water supply source for the City of Chiloquin. These alternatives include:

1. Rehabilitate the Airport Well and extend a water line to the distribution system.
2. Construct a new well on the east side of the river.
3. Install hydrogen sulfide reducing equipment on Well No.2.

Utilization of the City's surface water right on the Williamson River has not been considered in this evaluation of alternatives due to the high cost associated with treating surface water.

Three feasible alternatives for a backup water supply source are outlined hereafter, including a discussion of the advantages and disadvantages of each.

10.1: Alternative 1 – Rehabilitate Airport Well

This alternative would involve the rehabilitation of the Airport Well to meet Oregon well construction standards and tie into the existing system. Improvements would include the removal of the existing well casing, reaming the existing well, installation of a new seal and casing to Oregon standards, salvaging and installing the pump and controls from Well No.2 and the construction of a transmission line tying into the 10-inch PVC mainline along State Highway 422. The tie-in would consist of a 10-inch buried PVC water main.

This alternative would be dependent on an intergovernmental agreement with the City of Chiloquin and the State of Oregon for the use of the Airport Well. Additionally, the City would need to secure a utility easement for the proposed 10-inch water main from the well to the boundary of the City's property on Tax Lot R-3407-03300-01200-000. According to Oregon well construction standards OAR 333-061-0050(2)(a)(B) the City would need to secure a restrictive easement with a radius of 100 feet around the well to prevent development that may cause water supply contamination issues. A permit issued by the public entity to the water supplier shall suffice in lieu of an easement. Said permit shall state that no existing or potential public health hazard shall be permitted within a minimum of 100 feet of the well site.

No water rights exist for the Airport Well, thus the City of Chiloquin will need to apply for a permit amendment to add an additional point of appropriation to the existing ground water permit. When adding an additional point of appropriation to a permit, the Oregon Water Resources will require that the new well appropriate water from the same aquifer as the existing wells in the permit. The Airport Well aquifer must be investigated prior to submitting the application for a permit amendment to ensure success of the water right. Additionally, the permit amendment will require that the new well meet Oregon State well construction standards, thus the need to rehabilitate the Airport Well.

Some of the advantages to the City of Chiloquin with this alternative are:

- Utilizes an existing well.

- No long term water treatment cost.
- Known water source, yield, and quality.
- Increased reliability and redundancy to Chiloquin's water supply.
- Majority of proposed pipeline is located within City property.
- Potential to reduce contamination sensitivity over existing water source.
- Ability to supplement Well No. 1 during peak demand.
- Potential to utilize existing equipment from Well No. 2.

Some of the disadvantages to the City of Chiloquin with this alternative are:

- Initial cost to rehabilitate well.
- Operation of the well based on an approved agreement with the State.
- Initial cost of easements.
- Continued cost of operational agreement with State
- Water in the transmission line must be kept fresh, requiring periodic pump operation.
- Permit amendment to water right is required.

For planning purposes, the estimated improvement cost to rehabilitate the Airport Well and tie into the existing system is $616,800.

10.2: Alternative 2 - Construct a New Well Near the Airport Well

A new well would be fiscally advantageous to the City because a new City-owned water supply source would be available. This would provide a backup supply source and supplement the existing water supply well without the need to pay perpetual fees to the State for the use of the Airport Well. A new well of similar capacity to Well No. 1 would be needed to have adequate water supply capacity to meet peak day demands when Well No. 1 is out of service. The City would need to apply for a permit amendment to add the new well to their existing water right permit as an additional point of appropriation as would be required of Alternative 1.

This new well would be located near Highway 422 on the City's property near the rodeo grounds on Tax Lot R-3407-03300-01100-000. This location would meet several criteria of a new water supply well, including: land owned by the City, close proximity to existing power supply and the City's water distribution system. Additionally, the location of this new well (as well as the Airport Well) on the east side of the Williamson River would add redundancy in the event that the water main that spans the Williamson River would become compromised. The close proximity of this well to an existing well (Airport Well) with known quality and yield increases the probability of accessing an aquifer with similar characteristics. Lastly, a 12-inch buried PVC water main would be installed from the well to the existing distribution system along Highway 422.

Some of the advantages to the City of Chiloquin with this alternative are:

- City-owned well.
- No long term water treatment cost.
- Increased reliability and redundancy to Chiloquin's water supply.
- No continued cost of operational agreement with the State
- Potential to reduce contamination sensitivity over existing water source.
- Ability to supplement Well No. 1 during peak demand.
- No easements.
- Known water source, yield, and quality.
- Potential to utilize existing equipment from Well No. 2.

Some of the disadvantages to the City of Chiloquin with this alternative are:

- Initial cost for new well.
- Permit amendment to water right is required.
- Water in the transmission line must be kept fresh, requiring periodic pump operation.
- Permit amendment to water right is required.

The major disadvantage of a new well is the initial expense of the well. Should this alternative be pursued, it is recommended that a more detailed geological investigation be completed to help evaluate possible well sites.

Estimating the required location and depth of a new well to obtain the desired yield of 650 to 850 gpm can be difficult. Although, the yield and quality of the nearby Airport Well is known, the aquifer material, casing and seal depth are unknown. At the time of the preparation of this plan the City has scheduled OWRD to investigate the Airport Well with a downhole camera. This will allow the City to make a better decision on drilling a new well. Regardless of the depth and location, the ultimate yield from a well can be determined only after drilling is completed and well testing has been conducted. For planning purposes, the estimated improvement cost of drilling a new well near the Airport Well with an estimated depth of 425 feet (depth was taken from well record KLAM 949) is approximately $200,000. The additional estimated improvement cost to fully equip this well with a pump house structure, well pump, motor, controls, system controls, flowmeter, pipeline and valves, etc., is approximately $389,100. The anticipated improvement cost of constructing 120 linear feet of new 10-inch connection main is approximately $42,000. Combining these, the total improvement cost for Alternative 2 is estimated to be approximately $631,100.

10.3: Alternative 3 – Install Hydrogen Sulfide Reducing Equipment on Well No. 2

The last alternative for water supply options is to bring Well No. 2 back into service. This well was initially shutdown due to sand and hydrogen sulfide production. The well currently has a sand separator that was reported to be somewhat ineffective when installed in 1978. A timer was installed in 1981 to automatically purge the separator and reduce operator purge times. The current status of the performance of sand reduction in Well No. 2 is unknown. The current rate of sand production would need to be analyzed and subsequently a new sand separator sized and installed to properly remove sand from the well. Additionally, the flow rate may be able to be reduced with the addition of a variable frequency drive or throttling valve in order to reduce sand production from the well.

Current methods of hydrogen sulfide reduction vary based on the concentration of hydrogen sulfide and the presence of other elements within the water source. The three most common methods are aeration, filtration and chlorination.

Aeration equipment can vary from air diffusion to water-fall aerators and is generally only used to treat small amounts of hydrogen sulfide. This equipment would be difficult to implement for the City of Chiloquin without a storage reservoir nearby the Spinks Well. At this time, aeration is not recommended unless further analysis of the hydrogen sulfide concentration is completed and an option to place a reservoir near the Spinks Well is pursued. Filtration can also be utilized to remove medium amounts of hydrogen sulfide. Filtration equipment can be fairly costly to install and difficult to operate for inexperienced water system operators. Lastly, chlorination is a widely used treatment technique for drinking water systems to reduce hydrogen sulfide. In the past, residents have expressed concerns about using chlorination to treat the Chiloquin water supply. Therefore, this concern would have to be weighed against the cost to install and operate the chlorination equipment. Chlorination is generally the least expensive alternative to treat hydrogen sulfide, but may be limiting if concentrations are too high. The cost to add chlorination equipment to the Spinks Well is estimated at approximately $10,000. To replace the existing sand separator and add a flow control valve to reduce sand production from the well it is estimated to be approximately $20,000.

Some of the advantages to the City of Chiloquin with this alternative are:

- City-owned well.
- Increased reliability and redundancy to Chiloquin's water supply.
- No continued cost of operational agreement with the State
- Potential to reduce contamination sensitivity over existing water source.

- Ability to supplement Well No. 1 during peak demand.
- No easements.
- Known water source and yield.
- Relatively low capital cost.

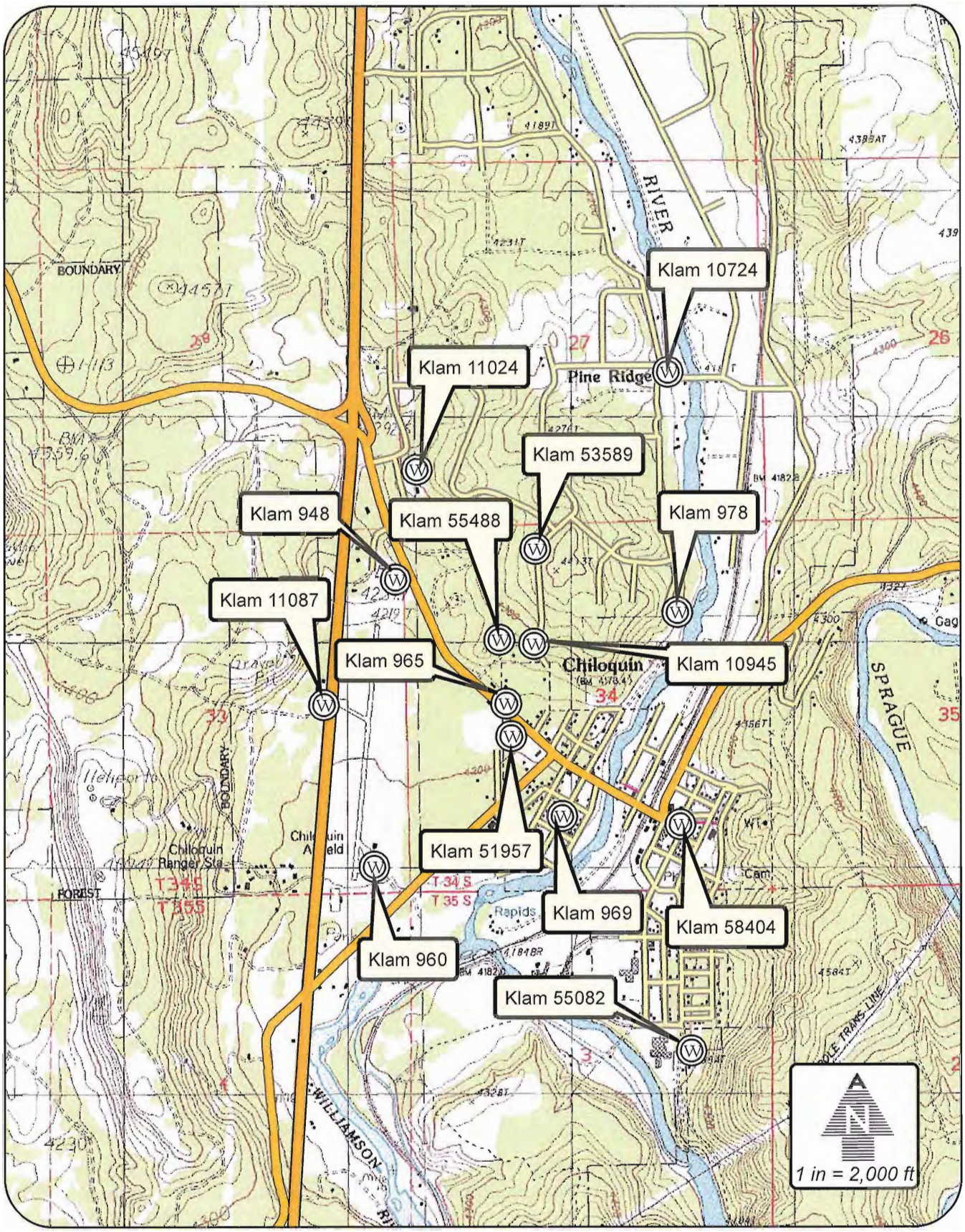
Some of the disadvantages to the City of Chiloquin with this alternative are:

- Continued cost of chemicals.
- Community acceptance of drinking water treatment with chlorine.

SECTION 11: PREFERRED OPTION

This section is pending and will be added at the 90-percent draft

DRAFT



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CITY OF CHILOQUIN AREA WELL DATA

FIGURE 3-1

Document Path: H:\1011-71 City of Chiloquin Water Master Plan\GIS\Area Well Data.mxd

Water Source	Application Number	Permit Number	Water Right Certificate	Transfer Number	Allowed Flow Volume (cfs/gpm)	Priority Date	Current Well Production (cfs/gpm)	Allowed Use	Status	Comments
Well No.1	G-12465	G-11503	---	---	1.4/650[1,2]	4/1/1991	.23/133 seasonal	Municipal	Extended completion Date 10/1/2049	Primary source for city water supply
Well No. 2	G-12465	G-11503	---	---	1.6/700[1,2]	4/2/1991	0	Municipal	Extended completion Date 10/1/2050	Well not used due to bad water quality; Emergency use only
Airport Well	---	---	---	---	---	---	1.1/500	None	No water right	Currently seeking to acquire water right

Legend: cfs = cubic feet per second
gpm = gallons per minute

Notes:

1 The use is limited to not more than 1350 gallons per minute (GPM), being 650 gpm from well 1 and 700 gpm from well 2, or its equivalent in case of rotation, measured at the wells

2 Diversion of any water beyond 1029 gpm under Permit G-11504 shall only be authorized upon issuance of a final order approving a Water Management and Conservation Plan under OAR Chapter 690, Division 86.

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CITY OF CHILOQUIN WATER RIGHTS SUMMARY

TABLE 3-2

H:\1011-72 Chiloquin WWFP, ER, and I-I Study\GIS\Soils Map.mxd

Well Identification	Well Owner	Date Drilled	Depth Drilled (feet)	Smallest Liner/Casing Diameter (inches)	Geological Formation	Static Water Depth (feet)	Tested Well Yield (gpm)
KLAM 58404 (well 1)	City of Chiloquin	1940	1240'	Data Unavailable	Data Unavailable	Data Unavailable	650
Klam 51957 (well 2)	City of Chiloquin	6/6/1977 (?)	750'	12"	Pumice / Clay / Gravel / Rock / Lava Rock	Data Unavailable	700
Klam 960 (Airport Well)	Town of Chiloquin	Data Unavailable	350' (?)	10"	Data Unavailable	Data Unavailable	500
Klam 965	Noel Lane	6/30/1987	308'	6"	Clay / Sandstone/ Sand / Claystone	58'	20
Klam 969	L. B. Martela	6/22/1975	220'	21"	Clay	8'	10
Klam 978	Mr. & Mrs. Robert Wampler	9/30/1977	275'	6 5/8"	Clay / Cinder	36'	60
Klam 10945	Marty Zwang	3/23/1994	291'	6"	Claystone / Clay / Rock	176'	50
Klam 53589	Harry Bell	10/18/2002	302'	6"	Pumice / Clay / Sandstone / Sand	142'	35
Klam 55082	Wesley Pray	8/30/2005	220'	6"	Clay / Claystone / Sandstone / Basalt	25'	35
Klam 55488	Ray & Heather Stacey	7/11/2006	342'	6"	Clay / Sand	120'	30
Klam 11024	Monty Hardt	6/16/1994	349'	6"	Claystone / Sandrock / Clay / Pumice / Sand	120'	75
Klam 10724	Ernie Garrison	5/18/1993	647'	6"	Sand / Clay / Sandtone / Claystone	Data Unavailable	20
Klam 11087	Lonnie and Christine Sanborn	11/17/1989	208'	8"	Clay / Claystone / Boulders / Sand / Rock	27'	500
Klam 948	Henry Anchondo	9/29/1987	253'	6"	Clay / Sandstone / Rock	64'	150

Table Notes:

1 See Figure 3-3 for approximate well locations

2 Unless otherwise noted, static and pumping water levels, tested yeild, etc., were generally obtained just after drilling. Well Yeilds were tested by air methods, bailers, or pumps and should be considered approximate. Actual yield may vary substantially under continous prolonged condidtions

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AREA WELL LOG INFORMATION

TABLE 3-3

H:\1011-72 Chiloquin WWFP, ER, and I-I Study\GIS\Soils Map.mxd

SECTION 12: SUMMARY

Regardless of which alternative is selected, it is critical that the City develop a viable alternative water source other than Well No. 1. Switching to the backup water source will allow the pump in Well No. 1 to be overhauled as its existing pumping plant efficiency is 37%. As of the preparation of this report, according to City staff the City has secured funds from the United States Indian Health Services to overhaul the pump in Well No. 1.

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CHAPTER 4
WATER STORAGE

SECTION 1: INTRODUCTION

This chapter presents information on the City's water storage facility. The purpose for storage in municipal water systems is discussed, and the types of storage facilities generally available are outlined. The condition and needs of the City's existing storage reservoir are outlined and recommended storage requirements to meet 2035 design criteria are presented.

SECTION 2: GENERAL

Water storage facilities are constructed to meet several purposes. First, storage reservoirs are often used to provide control for well or booster pump system operation. When a reservoir drops a few feet or more from the full level, the water level can be used as a control for well pump or booster pump activation. The amount of storage required for this type of control is called "operating storage." Second, stored water must be available to supply water during periods in which the demand for water exceeds the available water supply. This reserve is called "equalization storage." Third, reserve storage is usually provided to supply unusually large demands such as fire flows. This is referred to as "fire reserve." Finally, reserve storage is often provided for emergencies that may arise and interfere with production from water supply sources. Such emergencies could be created by power outages, mechanical equipment failure, or sudden water contamination. The amount of storage to be provided for an emergency depends on the likelihood and the impact of such an occurrence. The amount of emergency storage provided usually becomes a balance between what is needed and what can be afforded. This storage allowance is usually called "emergency reserve."

Storage facilities can be located at approximately the same elevation as the entrance to the water distribution system. Storage facilities of this type require continuous operation of a booster pump system to maintain distribution system pressure. Storage facilities can also be elevated, i.e., the water is stored at an elevation considerably above the distribution system in order to generate adequate system pressures. For example, a water elevation of 120 feet above a distribution system would generate a distribution system static pressure of approximately 50 pounds per square inch (psi). Reservoirs may be elevated by locating them on natural higher ground above the service area, or by construction on top of a structural support system.

Storage reservoirs are generally constructed of steel or reinforced or prestressed concrete. The choice is usually based on an economic analysis made for the particular installation. Reservoirs may be constructed either aboveground or buried, with the choice made on cost, location, and community acceptance. The remainder of this chapter reviews the City's existing storage facility, presents a discussion of future storage needs, and evaluates alternatives for satisfying those needs.

SECTION 3: EXISTING FACILITIES

The City of Chiloquin's existing municipal water storage consists of one ground-level steel reservoir located at a base elevation of approximately 4,340 feet above mean sea level (MSL). The reservoir is located on the hillside east of downtown, as shown on the Existing System Map. The reservoir, constructed in 1993, has a height of approximately 25 feet and is approximately 60.5 feet in diameter. Water in the reservoir is assumed to reach a maximum depth of approximately 22 feet. At 22 feet of water depth, the full water service elevation of the reservoir is approximately 4362 feet above MSL. The reservoir holds approximately 21,500 gallons per foot of depth and at the full water service elevation has a capacity of approximately 473,070 gallons. Well No. 1 fills this reservoir through the distribution system.

Based on visual inspection, sediment buildup is present on the floor of the reservoir. The depth and extent of sediment is unknown at this time. The reservoir has been painted in places to cover vandalism and graffiti but has not been recoated since it was originally constructed. See Appendix E for photos of storage tank.

SECTION 4: DISTRIBUTION SYSTEM PRESSURE

Although the distribution system is discussed in greater detail in Chapter 5, distribution system pressures are discussed hereafter as they relate to the City's storage reservoir system. Fire flow capabilities, as well as other distribution system issues, are also discussed in Chapter 5.

The City of Chiloquin currently has one pressure zone serving the existing distribution system. Pressure to the system is provided by the elevation of the water in the existing reservoir. Elevations within the City's distribution system service area vary from approximately 4165 to 4261 feet above MSL. This represents a static water system pressure difference of approximately 42 psi within the system. Based on the elevation of the City's existing reservoir, static water pressures ranging from approximately 46 to 88 psi can be delivered to existing

customers within the City limits by gravity flow from the reservoir. Distribution system pressure is discussed in more detail in Chapter 5.

SECTION 5: STORAGE REQUIREMENTS

Water storage is usually provided for several purposes. Various methods are used to calculate the volumes of each type of storage component required. Most involve a rational approach to estimating the volume of each storage component consisting of operational, equalization, emergency, and fire reserve. The decision can then be made as to which component controls and which storage volumes will actually be necessary. For example, the decision may be made to provide storage for operational, equalization, and fire reserve only, assuming any emergency storage would be available from the fire reserve. If this option were selected, there may not be adequate fire storage available if there is a sustained power outage or if a well pump is out of service for some reason.

5.1: Fire Reserve Storage

Reserve storage for fire suppression is usually determined from either the Insurance Services Office Commercial Risk Services, Inc. (ISO) recommended fire flow or the fire flow recommended by a city's fire chief. Based on typical maximum fire flow recommended by ISO, a 3,500 gallons per minute (gpm) fire flow with a two-hour duration has been utilized as the maximum design fire flow for Chiloquin. A total of 420,000 gallons of fire reserve storage is needed to sustain a fire flow of 3,500 gpm for a two-hour duration.

5.2: Emergency Reserve

Emergency storage is usually provided for a minimum of one to three days' supply in the event of a power outage, mechanical problems, or other problems that would interrupt the reliable supply of water. In most cases this would be the minimum amount of time to repair or replace a well pump or other equipment. The City of Chiloquin does not have an emergency power supply to operate the well in the event of a power outage.

A minimum one-day storage reserve is typically assumed to meet small cities' emergency storage needs. This assumes a water supply source will be available to fill the reservoir within 24 hours after a water supply source failure. Maintaining emergency reserve can be critical due to the reliance on well pumps to meet the City's water demands. To provide a minimum one-day emergency reserve at the present estimated average water use rates and population, a total emergency storage volume of 266,857 gallons would be required. This one-day emergency storage volume would increase to 286,238 gallons at the projected year 2035

population of 768, based on the present estimated average use rate. As previously discussed, the emergency reserve storage volume has been assumed to be available from the City's fire reserve in this WSMP.

5.3: Operating Storage

Operating storage is generally provided to facilitate operation of wells or booster pumps in a water system. For example, when water system demands result in the water level lowering in a reservoir, the water level will reach a certain point that can be used to trigger activation of well pumps to refill the reservoir. This allows the City's well pump an opportunity to rest while the operating storage reserve meets the City's demands. The storage needed to activate water supply sources is typically referred to as operating storage. This zone of operation can be set as desired, but is often set to help ensure circulation occurs during each pump run cycle, allowing water to cycle through the reservoir to help maintain water quality while keeping the reservoir as full as possible. For purposes of this WSMP, 6.0 feet of operational storage volume has been assumed. The calculated operating storage volume is 129,000 gallons. Adjustments to the set points for well operation could be made to reduce or increase this volume.

5.4: Equalization Storage

Equalization storage must be provided to balance out the difference between peak hour demand and water supply capacity during a peak day demand period. An empirical method for estimating the required equalization storage uses the difference between the peak hour flow and the peak water supply availability for a specific number of peak hours per day. Based on 2.5 peak hours during a peak day with an available supply flow of 480 gpm available from Well No. 1, the City's current equalization storage needs to be approximately 145,624 gallons. Using the same formula, the year 2035 equalization storage with the City's system would need to be 156,201 gallons.

5.5: Summary of Storage Components

Considering all four storage components described above, a total of approximately 961,481 gallons and 991,438 gallons of storage, respectively, may be needed to meet current and projected future needs. (Refer to Table 2-1 in Chapter 2 for the breakdown of storage components.) However, based on the consideration of emergency storage as a component of the fire reserve storage, this storage requirement could be reduced to 705,200 gallons to meet year 2035 demands. Reducing the needed storage volume from 991,438 gallons to 705,200 gallons would only be recommended if an emergency supply source were developed as described in Chapter 3. Ideally the emergency water source would also contain a backup

generator. In any event, the City would have to weigh the cost of additional emergency storage with the risk that if a fire were to occur when water supplies were unavailable, emergency reserves would be depleted quickly.

SECTION 6: PRESERVING RESERVOIR WATER QUALITY

In order to preserve water quality in storage reservoirs, water needs to fully circulate through the reservoir. This is often done by connecting a well source directly to the reservoir. When the water level in the reservoir drops, the well turns on and fills the reservoir, providing a continuous fresh supply of water from the reservoir into the water system.

If the City develops a future water source at a location remote from the storage reservoir, the mode of operation would be for water to flow out from the reservoir and then, when the reservoir needed to be filled, water would have to be pumped back into the reservoir by reversing flow in the transmission line back up to the reservoir. Unless a significant volume of water is taken from the reservoir in each cycle, the water would not get fully exchanged in the transmission line and could stagnate. This could result in a water quality problem. Since the City water supply is un-treated, reservoir water quality needs to be considered both in operating the existing storage reservoir and with any future storage reservoir improvements.

SECTION 7: POTENTIAL FUTURE STORAGE IMPROVEMENTS

The City is dependent on one storage reservoir to meet their water storage needs. Should this reservoir need to be taken out of service for repairs, contamination related events, or other reasons, the City would be without stored water reserves or a means of automatically controlling the well. The City may wish to consider a long-term improvement of constructing a second storage reservoir to assist with system operations should such events occur, as well as meet fire and emergency reserves. The City would have storage and transmission line redundancy if the future reservoir is constructed at a new location away from the existing reservoir. With construction of a second reservoir, the City would also be able to drain one reservoir for inspection while leaving the other reservoir in service, eliminating the need for underwater inspection and the associated costs. Ideally, the second reservoir would be located on the west side of the Williamson River, utilizing existing topography to elevate the tank, which would increase redundancy in the event that the water main crossing the river would become compromised. The proposed location of the new reservoir would be to the west of the U.S. Forest Service Ranger Station, placed at the same elevation and same height as the existing storage tank.

For planning purposes, it is estimated that the project cost for a new 500,000-gallon steel ground-level storage reservoir would be between $981,000 and $1,180,000 including a new 1,800-foot long 10-inch diameter transmission pipeline to connect it to the distribution system. These costs are estimated based on year 2016 construction costs and should be inflated by 3 to 5 percent annual inflation if constructed in future years.

SECTION 8: EXISTING RESERVOIR MAINTENANCE

Maintenance is required on the existing storage reservoir so that it will continue to provide reliable service. As previously discussed, the City's 500,000-gallon reservoir is in good condition with the exception of sediment build-up. Based on a recent site visit during the writing of this plan no surface corrosion was observed. Therefore, exterior recoating is not recommended at this time. Although, City staff should continue to observe the exterior condition of the tank and recoat as necessary. Cost for cleaning the tank is presented in Chapter 6.

It has been a significant amount of time since the inside of the tank has been inspected for corrosion. Although, it is not recommended to inspect the interior of the tank at this time, as the City may be planning to construct additional storage in the near future. If the additional tank is constructed or the existing tank cleaned, then the interior of the existing tank should be inspected at that time.

SECTION 9: SUMMARY

It is recommended that the City continue to complete routine maintenance on the existing tank to ensure that it can provide reliable storage in the future. The exterior of the reservoir does not appear to be in need of recoating at this time. The interior of the reservoir should be cleaned and thoroughly inspected approximately every five years. Monitoring of the interior coating system ratings provided through reservoir inspection reports will be critical. The existing reservoir may need to have a new interior coating system applied within the 20-year planning period covered by this WSMP. It is recommended that the City set aside reserve funds to complete such repairs when needed.

CHAPTER 5
DISTRIBUTION SYSTEM

SECTION 1: INTRODUCTION

This chapter discusses the City's existing water distribution system that delivers water to residential, commercial, and other users. Components of the distribution system include pipelines, valves, water service lines, and fire hydrants. The distribution system has been evaluated for both present and future City needs. Alternatives have been developed to correct existing deficiencies and provide future service to help meet both the Oregon Health Authority - Drinking Water Services (DWS) requirements and the Insurance Services Office (ISO) fire flow requirements. Cost estimates for the identified distribution system needs are presented in Chapter 6.

SECTION 2: EXISTING SYSTEM

Historical information for the City of Chiloquin's water distribution system was obtained from City records, the 1985 Water System Study, 1999 Water Management and Conservation Plan and conversations with City staff. At this time the City owns approximately 14.9 miles of water line in their distribution system consisting of galvanized iron (GI), steel, polyvinyl chloride (PVC), asbestos cement (AC), ductile iron, and cast iron piping. The advanced age of the pipe is a primary concern regarding the distribution system. Of the existing 14.9 miles approximately 40%, or 6 miles, of GI and steel pipe is presumed to have been installed in 1940 (coincident with the drilling of Well No. 1) or earlier. That would make this portion of the system 76 years old at the publishing of this plan. Another 7%, or 1 mile, of AC pipe is approximately 40-50 years old at the publishing of this plan. 52% of the existing system is PVC which the City began installing in the late 1970's however, much of the PVC piping is only 15 years old at this time. The remaining 1% of the system is ductile iron or cast iron. Pipe quantities for the entire system are broken down by pipe size and type in the following table.

Pipe Quantities (feet) According to Pipe Type and Diameter.

	Pipe Diameter (Inches)										
Pipe Type	**3/4**	**1 1/4**	**1 1/2**	**1**	**2**	**4**	**6**	**8**	**10**	**12**	**Total**
Galvanized Iron	2,360	1,795	2,380	-	18,370	980	990	185	30	-	27,090
Steel	-	-	-	-	-	3,795	635	-	-	-	4,430
Polyvinyl Chloride	14,800	605	860	160	1,030	1,440	1,200	9,630	11,245	-	40,970
Asbestos-Cement	-	-	-	-	-	-	4,980	500	-	-	5,480
Ductile Iron Pipe	-	-	-	-	-	-	-	-	-	230	230
Cast-Iron	-	-	-	-	-	290	-	-	-	-	290
Total	17,160	2,400	3,240	160	19,400	6,505	7,805	10,315	11,275	230	**78,490**

In general, the distribution system is fairly well looped but has some sections of small diameter dead-end main lines. The City indicated that the water main lines in the distribution system range from poor to decent condition. The City has a fairly adequate distribution of valves. Based on ISO reported fire flows (see Appendix D), the hydraulic capacity of the distribution system appears to be a bit low for typical residential fire flows (1,000 gpm). Only two of the tested hydrants had available fire flows in excess of needed flows. The City has installed water meters on all commercial and residential services; however, the meters are extremely old and City staff is fairly confident that they are not reading correctly.

The existing distribution system layout, including fire hydrants, valves, the storage reservoir, and pipe location, size, and material, is shown on the Existing System Map located in Appendix I. Water main lines and associated valves have been color coded based on pipe type and size for easy reference by City staff.

The map was prepared using existing water system maps and information obtained from the City. Available resources were utilized to make the map as accurate as possible. The map is intended to be a schematic representation of the City's water system only; therefore inaccuracies may exist in the depiction of the water distribution system layout.

SECTION 3: DISTRIBUTION SYSTEM PRESSURE AND SERVICE TO CUSTOMERS

The City of Chiloquin currently has one pressure zone serving its customers. Water level in the City's existing 500,000-gallon reservoir control pressures within the City.

A minimum pressure of 20 pounds per square inch (psi) under all conditions is required by the DWS and, in the State of Oregon's Plumbing Specialty Code, an upper limit of 80 psi is suggested to be maintained at residences. Typically, pressures in the distribution system should be higher than the minimum pressure suggested by the DWS and can be slightly higher than the maximum residential pressure suggested by the Plumbing Code. Minimum distribution system pressures are generally considered to be 20 psi at the property line, as suggested by the DWS.

3.1: Water System Model

For this WSMP a water system model was developed from the information gathered about the Chiloquin water system. EPANET is a public domain water system modeling software developed by the U.S. Environmental Protection Agency. Pipe types, lengths, diameters, and locations, as well as service connections, pump and tank were modeled with EPANET. A base demand of 0.67 gallons per minute with a diurnal demand curve was used based on AWWA Manual M32. Additionally, average flow rates were obtained from meters for non-residential customers and entered into the model as base flow. The model was run with this base demand to develop a total daily volume used. This daily volume was then compared to metered volume pumped by Chiloquin Well No.1, and the model calibrated accordingly. Fire hydrant testing data was then entered and subsequent scenarios per hydrant were modeled. Residual pressures were compared to tested pressures and again the model was calibrated accordingly. As discussed in Chapter 4, static water pressures range from approximately 46 to 88 psi in the existing distribution system. Model scenarios that used the AWWA daily diurnal flow and a reservoir operating range of 6 feet show dynamic pressures in the range of approximately 30 to 87 psi.

SECTION 4: DISTRIBUTION SYSTEM WATER QUALITY

4.1: Coliform Testing

As discussed in Chapter 3, the City obtains one routine sample per month from the distribution system for analysis of total coliform and *E. coli.* Water withdrawn from the City's well has generally met federal and state water quality criteria. In recent years, total and/or fecal coliform have been detected several times. The DWS issued alerts in 2002 and 2004 through

2007 regarding water quality tests with analytical results indicating the presence of total and/or fecal coliform. The DWS has also issued seven violations against the City in the previous five years. These violations include five instances of not enough reporting and two instances of no reports for routine coliform reporting. All of these reporting violations were remedied shortly after the violation was issued. Additionally, the City received notices from Klamath County Department of Public Health for not having a current Water System Master Plan for a water system with more than 300 connections.

4.2: Lead and Copper

The City also obtains samples from the distribution system for chemical analysis of lead and copper concentrations every 3 years. Only one occurrence of lead and copper results has triggered a violation. In November of 1994 the results yielded levels equal to the MCL for lead and copper. The City remedied the violation shortly after in November of 1994 and March of 1995. Results from the City's lead and copper analytical data reports are summarized in the DWS's water quality testing summaries in Appendix G.

4.3: Disinfectants/Disinfection Byproducts

The City is not currently disinfecting water supplied by the City's well. Therefore, no disinfectants or disinfection byproducts have been tested for.

SECTION 5: FIRE PROTECTION

5.1: General

The City's water supply, storage, and distribution systems combined together provide fairly adequate fire protection, but the hydrants themselves are somewhat inadequate. Fire flow tests were performed on some of the City's fire hydrants during the most recent report by ISO in 2015. The results of the hydrant flow tests are presented in Appendix D. Based on the test results, ISO has estimated that the City of Chiloquin's water system is generally able to deliver fire flows ranging from approximately 750 to 2,300 gallons per minute (gpm) while maintaining the minimum required 20 psi residual pressure. All tested fire flows within the City limits were below the ISO recommended flow of 3,500 gpm. However, actual fire flows available while maintaining the required 20 psi residual pressure throughout the City are likely to differ, as discussed hereafter.

5.2: Physical Limitations

It is very important to realize that physical limitations exist in most water systems that do not normally allow fire flows as high as those calculated by the ISO tests. For example, the fire

flows available at 20 psi were determined by ISO using a theoretical formula. The formula assumes the water supply "feeding" the tested area is generally not limited and the 20 psi residual pressure resulting from the fire flow will occur in the general area of the fire hydrants that are tested. In reality, there are likely other connections in the distribution system, such as higher elevation users in the City, that would fall below 20 psi sooner than the formula predicts due to their elevation and/or small diameter distribution lines. In this situation, the theoretical formula overestimates the available fire flows and the available fire flows are likely less than predicted by ISO.

5.3: Fire Hydrant Limitations

The fire flow tests completed by ISO were conducted by opening a fire hydrant and measuring the flow at the hydrant fully open. The next nearest hydrant is then tested for residual pressure. Six hydrants were tested and each hydrant provided flows ranging from approximately 650 gpm to 920 gpm. Based on these flows and the residual system pressures, ISO estimates up to 2,400 gpm is available for fire flows in the City's system. Realistically, individual fire hydrants can only provide maximum flows in the range of 800 to 1,000 gpm from a small port to nearly 2,000 gpm from both small ports and the large "pumper" port, assuming the hydrant has a large port. To achieve fire flows in excess of 1,500 to 2,000 gpm, several fire hydrants would need to be completely opened at one time, which may not be representative of actual conditions during a fire. Also, during a fire there will be some water use from others on the system, so the actual available flow in the distribution system will be less due to other uses and pipeline pressure losses resulting from higher flows.

5.4: Distribution Piping Limitations

Another limitation typically encountered when analyzing actual fire flow capabilities is the supply of water feeding the area of the fire. The City's distribution system is generally well looped and mostly contains 4-, 6-, and 8-inch diameter water main lines except where the 10-inch reservoir outlet pipe and transmission main connects to the distribution system. The limited size of the transmission main serving Chiloquin and the smaller diameter piping serving some areas of the system may limit fire flow availability. The main area of concern is near the High School and Elementary School where tested fire flows were relatively low for the adjacent structures. These low flows are primarily a consequence of inadequate water main size, of which both school fire hydrants are serviced by 6-inch mains.

5.5: Summary of Fire Protection

The City's water system is a bit inadequate when it comes to providing fire flows across the city. The discussion presented above is intended to provide caution concerning the actual available fire flows from the City's distribution system and fire hydrants. The EPANET water modeling software was utilized to verify tested fire flows. Each hydrant that was tested was also modeled to verify maximum flow available. Most of the hydrants fall short of the estimated available flow by ISO as previously mentioned. Although the Chiloquin Fire Chief feels confident about most of the system in providing adequate fire flows, there is concern that there is not enough flow for both the Elementary and High Schools. Additionally, if industries or large commercial enterprises develop in the future, or if further development and expansion occurs the City should review the fire flow limitations discussed above and determine if adequate fire protection is available for those facilities.

SECTION 6: FIRE HYDRANT COVERAGE

The City of Chiloquin's existing fire hydrants, as identified on Existing System Map located in Appendix I, cover approximately half the City adequately. Where hydrants exist they are typically spaced 300 to 600 feet apart, depending on the area of the City. The 2010 edition of the Oregon Fire Code outlines maximum recommended fire hydrant spacing depending on several factors, such as fire flow requirements of the area, the number of fire hydrants in the area, if the area is on a dead-end street or has limited access, etc. As required by the Oregon Fire Code, the maximum spacing between any two hydrants for a fire flow requirement of 1,750 gpm or less is 500 feet, and as little as 350 feet for a fire flow requirement of 3,500 to 4,000 gpm. Per the Oregon Fire Code, fire flow requirements are based on building area and type of construction. The minimum required fire flow is 1,500 gpm. The maximum required distance from any point of a street or road frontage to a hydrant is 250 feet for 1,750 gpm or less and 210 feet for 3,500 to 4,000 gpm.

The spacing of the City of Chiloquin's existing hydrants was analyzed to identify areas that are not covered in accordance with the maximum spacing and frontage distance to a fire hydrant as recommended in the Oregon Fire Code. It should be recognized that this analysis was completed for general compliance to the maximum recommended spacing and frontage distance to a hydrant. The City may wish to reduce these requirements, depending on the fire flow demands of a particular area, to more stringent requirements of the Oregon Fire Code or as recommended by the local Fire Chief. This analysis is intended to provide the City with a basic idea of areas lacking fire coverage.

Generally, the City of Chiloquin's fire hydrant spacing provides approximately half of most developed areas inside the City limits with adequate coverage. Therefore, there are some areas where fire hydrant coverage could be improved. The primary recommended fire hydrant coverage improvements are as follows:

- North from Chocktoot Street and East of the railroad – This area would greatly benefit from the addition of more fire hydrants with the proper spacing.
- 2nd and 3rd Avenue – These streets south of Blocklinger Street would benefit from additional hydrants with proper spacing.
- Lalakes and Lalo Avenue – Both streets north and Lalo Avenue south of Chocktoot Street would benefit from additional hydrants with proper spacing.
- Elementary and High School – Each school could benefit from the addition of one hydrant each.

Areas along the river are assumed to have adequate fire flows supplied from the river, therefore were not analyzed with the above areas. Additionally, some small areas within the distribution system may not quite meet recommended fire code spacing. It is recommended the City continue to locate hydrants within 500 feet of each other (or less as required) with new water line additions to the system. All fire hydrant installations should be reviewed and approved by the City's fire chief, when possible.

SECTION 7: RECOMMENDED DISTRIBUTION SYSTEM IMPROVEMENTS

In general, much of the City's distribution system is aging and needs replacement. The system has a few areas that need to be looped and some undersized main lines that cause fire flow capacity limitations. Also, a 6-inch AC main line along Chiloquin Drive and the 6-inch AC main line that supplies the High School are in poor condition and are undersized for much needed fire flows. It is likely not financially feasible for the City to address all needed distribution system improvements *at one* time; therefore, recommended improvements have been prioritized, as follows:

7.1: High Priority Improvements

Key piping replacements, as well as water meter replacements, are recommended to be completed by the City as part of a system improvements project.

- **AC Water Main Along South Chiloquin Drive.** It is recommended the City replace the 6-inch AC line in South Chiloquin Drive from the 10-inch main line to the High School with 10-inch C-900 PVC piping. The areas recommended for improvement are shown in red on Figure 5-1.

- **Water Meters.** The City indicated that their existing water meters are far beyond their service life, and thus, have concerns related to their accuracy. Replacing the water meters and upgrading the system to automatic meter reading (AMR) could increase City revenues by allowing more accurate usage related billing while also reducing operational time needed to read and record meter readings. Although the City has already begun the process for implementing meter replacement, costs for this improvement are presented in Chapter 6. This improvement will help to accurately monitor water use, identify system leaks, improve water audit calculations, and can increase revenue to the Water Department while reducing operational costs.

- **Key Fire Hydrant Installations.** The City's public works staff has expressed concerns about not enough hydrants near the elementary and high schools. In addition to these hydrants near the schools, it is recommended that the City consider installing fire hydrants in the primary identified areas needing improved coverage as part of an overall water system improvements project. Figure 5-1 shows the recommended hydrant locations.

7.2: Other Potential Improvements

These improvements are recommended as City funds permit and/or development occurs. Long-term improvements to system hydraulics, fire coverage, and system operations are as follows:

- **3-inch and Smaller Diameter Main Lines.** Existing 3-inch and smaller diameter main lines in residential areas were not identified as the highest priority for replacement, but should be replaced as funds allow. Eliminating these undersized lines will improve potential low pressure problems, circulation, and fire flow capacity. Many of these small diameter lines are part of the original system and are potentially a source of substantial leaks. As such, these leaks should be continuously identified and corresponding main lines replaced.

It should be noted that service lines are recommended to be replaced when a new water main is installed. With future main line installations, it is generally recommended that the City install 8-inch diameter pipes, unless a hydraulic analysis shows that larger pipes may be needed or 6-inch diameter pipes, at a minimum, would meet the needs of a small development.

- **System Looping.** Most of the distribution system is fairly well looped with the exception of several small diameter water lines within residential areas. These looped lines should be replaced as resources are available. Figure 5-1 shows recommended lines to be looped.

SECTION 8: WATER LOSS

One important monitoring activity that should be performed by the City is to conduct a periodic audit of system water loss. In order to complete an accurate audit, the City would need to compare the volume of water supplied to the volume of water used. This is done by totaling the meter readings from every source and the meter readings from every user. The key to completing this task is consistency in meter reading. At this time, each connection in the City is metered; however, only commercial services are tracked. The City's Public Work Department is currently in the process of purchasing new meters which will enable the meter readings to be collected via wireless electronic devices. Once new meters are installed the City will meter all service connections. An initial water audit should be performed as a baseline for water system improvements.

Implementation of a good method of water auditing would help ensure that water is being adequately accounted for in the City's distribution system and would help determine if leaks are present. Monitoring water loss in the system can reduce the cost of operating and maintaining the system, whether it is through decreased power costs to operate pumps or the amount of maintenance performed in the field by the City. Leaking service lines can be identified prior to failure, areas of system leakage can be isolated, and many other operational advantages can be realized. The details of conducting a comprehensive water audit can be provided to the City through multiple resources, including the American Water Works Association.

SECTION 9: MAINTENANCE RECORDS

One of the important operational functions for the City's distribution system is to keep accurate records of various system components. These records become valuable as time

passes in terms of planning future improvements and replacing old or deteriorated components. It is recommended that the City keep accurate records on all water meters installed so that, in the future, these meters can be periodically pulled, checked for accuracy, and replaced as appropriate. The distribution system evaluation in this WSMP did not include determining existing fire hydrant, valve, and water meter condition. The City does keep records of fire hydrant flushing and conditions observed, as well as staff knowledge of the system. However, it would be beneficial for the City to keep accurate records on valves, meters, and other distribution system components as possible. Hydrants should be checked, at least annually, for proper operation, and all water valves should be exercised, at least annually, with records kept on their operating condition, location, etc.

SECTION 10: SUMMARY

Most of the City's system is aging and should be replaced as resources become available. Additionally, some small diameter lines should be looped and the 6-inch AC main line to the High School should be replaced to reduce leakage and supply adequate fire flow. The improvements recommended in this chapter include installing water main lines to replace undersized lines and AC lines, installing fire hydrants to improve hydrant coverage and upgrading water meters. The high priority improvements and the recommended new fire hydrant locations are shown on Figure 5-1. Estimated costs for the recommended distribution system improvements are outlined in Chapter 6.

DRAFT

CHAPTER 6
RECOMMENDED SYSTEM IMPROVEMENTS

SECTION 1: INTRODUCTION

This chapter summarizes proposed water system improvements and outlines the estimated costs of the improvements. These proposed improvements have been developed in cooperation with the City Council and City staff. Detailed descriptions of the proposed improvements for the water supply system, storage system, and distribution system are presented in Chapters 3, 4, and 5, respectively.

SECTION 2: SUMMARY OF PROPOSED SYSTEM IMPROVEMENTS

As outlined in previous chapters, a number of system improvements have been identified for the City of Chiloquin's water system. The development of an additional well for water supply is considered to be high priority along with the high priority distribution improvements discussed in Chapter 5. The proposed system improvements are summarized hereafter.

2.1: ***Water Supply Improvements.*** The proposed water supply improvements include development of the Airport Well as an additional water supply well. In order to implement this improvement easements (or an agreement with the State would need to be secured. The year 2016 estimated costs for these items are summarized on Table 6-1. Proposed water supply improvements include the following:

a. The City's main supply well, Well No. 1, delivers 100 percent of the City's total needs; however, the backup water supply is dependent on City Well No. 2, which has taste, odor and sand issues. The City does not have another backup water supply with similar capacity to Well No. 1 and cannot operate Well No. 2 for any appreciable amount of time longer than what would be required for an emergency. As a result, the development of a new water supply well is preferred by the City to improve water supply reliability.

b. This new supply is dependent on an agreement with the State of Oregon to use the well located on the airport property. Currently the City of Chiloquin has a one-year due-diligence agreement with the State to investigate the feasibility of the Airport well as a water supply for the City.

c. In order to meet current Oregon State standards for well construction, it is expected that the Airport Well would need to be rehabilitated. This would include the removal of the existing well casing and the installation of a new casing, column, pump, motor and well house.

2.2: ***Storage Reservoir Improvements.*** As discussed in Chapter 4 and according to the design criteria used, the City is lacking in total storage needed. By constructing a new 500,000 gallon reservoir on the west side of the Williamson River, the City will meet the estimated storage needs as well as added redundancy in the system. Additionally, an 1,800-foot long 12-inch PVC transmission pipe would need to be installed to connect the reservoir to the existing distribution system. The estimated cost for the new reservoir is shown on Table 6-2.

2.3: ***Water Distribution System Improvements.*** High priority water distribution system improvements include replacing the existing 6-inch asbestos cement line in South Chiloquin Drive from the 10-inch main line to the High School, with 10-inch C-900 PVC piping. Primary fire hydrant locations include the addition of hydrants near the elementary and high schools. Secondary hydrant concerns include various locations throughout the residential areas. Replacement and upgrading of existing customer meters to an automatic meter reading system is also recommended. The year 2016 estimated costs for the distribution system improvements are summarized on Table 6-3.

SECTION 3: COST SUMMARY

The year 2016 estimated costs for the high priority improvements and overall estimated project costs for the water system improvements are summarized on Table 6-4.

The total estimated project costs summarized on Table 6-4 are for 2016, if any project were to be implemented after year2016 the cost estimate should be increased by an inflation rate of 5 percent. The total project cost includes construction, administration, legal, engineering, contingencies, land acquisition, environmental, permitting, and regulatory agency associated costs. The year 2016 estimated costs are briefly summarized hereafter:

Rehabilitate Airport Well	$616,800
New 500,000 Gallon Storage Reservoir	$1,059,000
High Priority Distribution System Improvements	
10-inch Water Main Replacement to High School	$613,900
Fire Hydrant Replacements	$121,000
Loop Dead End Lines	$153,400
*Other Project Related Costs	$280,000
Total Estimated Improvement Costs	**$ 2,564,100**

* Includes environmental, permitting, and regulatory agency associated costs.

If the City does not receive funding to complete the proposed improvements by the year 2016, it is recommended that the estimated costs be increased by an annual inflation rate of approximately 5 percent to account for potential increases in project costs.

SECTION 4: GENERAL OPERATION AND MAINTENANCE RECOMMENDATIONS

As the City of Chiloquin continues to develop and expand its water system, diligent operation and maintenance (O&M) activities for the various system components will be critical to providing a reliable water system that is operated efficiently. City staff currently provides these services, but it will be important for the Council to recognize that an expanded system will require additional O&M activities.

The following recommendations are intended to provide general guidance on some additional O&M activities that may be associated with the improved water system.

CITY OF CHILOQUIN, OREGON
ESTIMATED COST
WATER SUPPLY IMPROVEMENTS
(YEAR 2016 COST)

No.	Description	Unit	Qty.	Unit Price	Cost
	Supply Alternative 1: Rehabilitate Airport Well				
1	Mobilization (5%)	LS	1	$20,000	$20,000
2	Site Preparation	LS	1	$1,000	$1,000
3	Removal of Existing Pump, Motor, Shaft and Column	LS	1	$1,600	$1,600
4	Drilling for surface casing	LF	50	$150	$7,500
5	Furnish, Install and Grout Seal of Surface Casing	LF	50	$110	$5,500
6	Drill for 12-inch Casing and Seal	LF	500	$100	$50,000
7	Furnish and install 12-inch x 0.375-inch Casing	LF	500	$90	$45,000
8	Furnish Grout Seal Stab-in Cementing Shoe	EA	1	$5,500	$5,500
9	Furnish Grout seal for 12-inch Casing	LF	500	$60	$30,000
10	Furnish and Install 12-inch Well Screen	LF	50	$150	$7,500
11	Well Development	Hour	12	$350	$4,200
12	Pump Test	Hour	24	$250	$6,000
13	*Install Pump, Column, Shaft and Motor	LS	1	$50,000	$50,000
14	Install Pump Station Electrical Supply	LS	1	$35,000	$35,000
15	*Motor Control Center	LS	1	$65,000	$65,000
16	Pump House	LS	1	$20,000	$20,000
17	*Pump Station Piping, Valves, Flowmeter, etc.	LS	1	$30,000	$30,000
18	Furnish and Install Buried 10-inch C900 PVC Pipe	LF	600	$70	$42,000
	Estimated Construction Cost Subtotal:				**$425,800**
	Construction Contingency	20%			$85,000
	Total Estimated Construction Cost:				**$510,800**
	Estimated Design, Construction Engineering and Other Professional Services	25%			$106,000
	TOTAL YEAR 2016 ESTIMATED COST				**$616,800**

Note: * Assumes new materials will be used, cost may be able to be reduced if materials can be salvaged from Well No. 2

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CITY OF CHILOQUIN
ESTIMATED COST OF IMPROVEMENTS

TABLE 6-1

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CITY OF CHILOQUIN, OREGON
ESTIMATED COST
WATER SUPPLY IMPROVEMENTS
(YEAR 2016 COST)

No.	Description	Unit	Qty.	Unit Price	Cost
	Supply Alternative 2: Drill New Well on City Property				
1	Mobilization (5%)	LS	1	$21,000	$21,000
2	Site Preparation	LS	1	$10,000	$10,000
3	Drilling for surface casing	LF	50	$300	$15,000
4	Furnish, Install and Grout Seal of Surface Casing	LF	50	$110	$5,500
5	Drill for 12-inch Casing and Seal	LF	500	$200	$100,000
6	Furnish and install 12-inch x 0.375-inch Casing	LF	500	$90	$45,000
7	Furnish Grout Seal Stab-in Cementing Shoe	EA	1	$5,500	$5,500
8	Furnish Grout seal for 12-inch Casing	LF	500	$60	$30,000
9	Furnish and Install 12-inch Well Screen	LF	50	$150	$7,500
10	Well Development	Hour	12	$350	$4,200
11	Pump Test	Hour	24	$250	$6,000
12	*Install Pump, Column, Shaft and Motor	LS	1	$50,000	$50,000
13	Install Pump Station Electrical Supply	LS	1	$30,000	$30,000
14	Motor Control Center	LS	1	$65,000	$65,000
15	Pump House	LS	1	$2,000	$2,000
16	*Pump Station Piping, Valves, Flowmeter, etc.	LS	1	$30,000	$30,000
17	Furnish and Install Buried 10-inch C900 PVC Pipe	LF	120	$70	$8,400
	Estimated Construction Cost Subtotal:				**$435,100**
	Construction Contingency	20%			$87,000
	Total Estimated Construction Cost:				**$522,100**
	Estimated Design, Construction Engineering and Other Professional Services	25%			$109,000
	TOTAL YEAR 2016 ESTIMATED COST				**$631,100**

Note: * Assumes new materials will be used, cost may be able to be reduced if materials can be salvaged from Well No. 2

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CITY OF CHILOQUIN
ESTIMATED COST OF IMPROVEMENTS

TABLE 6-2

H:\1011-71 City of Chiloquin Water Master Plan\GIS\table 6-2.mxd

CITY OF CHILOQUIN, OREGON
ESTIMATED COST
WATER SUPPLY IMPROVEMENTS
(YEAR 2016 COST)

No.	Description	Unit	Qty.	Unit Price	Cost
	Supply Alternative 3: Install Hydrogen Sulfide Reducing Equipment				
1	Mobilization (5%)	LS	1	$2,000	$2,000
2	Furnish and Install Chlorination Equipment	EA	1	$10,000	$10,000
3	Furnish and Install New Sand Seperator	EA	1	$15,000	$15,000
4	Furnish and Install New Flow Control Valve	EA	1	$5,000	$5,000
	Estimated Construction Cost Subtotal:				**$32,000**
	Construction Contingency	20%			$6,000
	Total Estimated Construction Cost:				**$38,000**
	Estimated Design, Construction Engineering and Other Professional Services	15%			$5,000
	TOTAL YEAR 2016 ESTIMATED COST				**$43,000**

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CITY OF CHILOQUIN
ESTIMATED COST OF IMPROVEMENTS

TABLE 6-3

CITY OF CHILOQUIN, OREGON
ESTIMATED COST
WATER STORAGE IMPROVEMENTS
(YEAR 2016 COST)

No.	Description	Unit	Qty.	Unit Price	Cost
	Storage Improvement: Construct 500,000 Gallon Storage Tank and Supply Pipe				
1	Mobilization (5%)	LS	1	$35,000	$35,000
2	Site Work Including Excavation, Base Rock and Access Road	LS	1	$50,000	$50,000
3	Tank Foundation	LS	1	$60,000	$60,000
4	Construct 500,000 Gallon Water Storage Tank	LS	1	$400,000	$400,000
5	Piping, Valves, Vaults, etc.	LS	1	$30,000	$30,000
6	Control System Radio Telemetry	LS	1	$20,000	$20,000
7	Furnish and Install Buried 10-inch C900 PVC Pipe	LF	1800	$75	$135,000
	Estimated Construction Cost Subtotal:				**$730,000**
	Construction Contingency	20%			$146,000
	Total Estimated Construction Cost:				**$876,000**
	Estimated Design, Construction Engineering and Other Professional Services	25%			$183,000
	TOTAL YEAR 2016 ESTIMATED COST				**$1,059,000**

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CITY OF CHILOQUIN
ESTIMATED COST OF IMPROVEMENTS

TABLE
6-4

CITY OF CHILOQUIN, OREGON
ESTIMATED COST
WATER DISTRIBUTION SYSTEM
(YEAR 2016 COST)

No.	Description	Unit	Qty.	Unit Price	Cost
	Distribution System Improvements: 10-inch Water Main to High School				
1	Mobilization (5%)	LS	1	$20,000	$20,000
2	Temporary Protection and Direction of Traffic/Project Safety	LS	1	$10,000	$10,000
3	Furnish and Install Buried 10-inch C900 PVC Pipe with Adphalt Surface Restoration	LF	3800	$90	$342,000
5	10-inch Valve	EA	10	$2,000	$20,000
6	6-inch Valve	EA	1	$1,250	$1,300
8	4-inch Valve	EA	2	$800	$1,600
9	2-inch valve	EA	8	$500	$4,000
10	Install Fire Hydrant,Valve, Lateral Line, Tee and Surface Restoration	EA	4	$6,000	$24,000
	Estimated Construction Cost Subtotal:				**$422,900**
	Construction Contingency	20%			$85,000
	Total Estimated Construction Cost:				**$507,900**
	Estimated Design, Construction Engineering and Other Professional Services	25%			$106,000
	TOTAL YEAR 2016 ESTIMATED COST				**$613,900**

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CITY OF CHILOQUIN
ESTIMATED COST OF IMPROVEMENTS

TABLE 6-5

CITY OF CHILOQUIN, OREGON
ESTIMATED COST
WATER DISTRIBUTION SYSTEM
(YEAR 2016 COST)

No.	Description	Unit	Qty.	Unit Price	Cost
	Distribution System Improvements: Install Hydrants				
1	Mobilization (5%)	LS	1	$3,000	$3,000
2	*Install Fire Hydrant, Valve, Lateral Line, Tee and Surface Restoration	LS	15	$6,000	$90,000
	Estimated Construction Cost Subtotal:				**$93,000**
	Construction Contingency	20%			$19,000
	Total Estimated Construction Cost:				**$112,000**
	Estimated Design, Construction Engineering and Other Professional Services	10%			$9,000
	TOTAL YEAR 2016 ESTIMATED COST				**$121,000**

Note: *Includes labor and materials

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CITY OF CHILOQUIN
ESTIMATED COST OF IMPROVEMENTS

TABLE 6-6

CITY OF CHILOQUIN, OREGON
ESTIMATED COST
WATER DISTRIBUTION SYSTEM
(YEAR 2016 COST)

No.	Description	Unit	Qty.	Unit Price	Cost
	Distribution System Improvements: Loop Dead End Lines				
1	Mobilization (5%)	LS	1	$5,000	$5,000
2	Temporary Protection and Direction of Traffic/Project Safety	LS	1	$10,000	$10,000
3	Furnish and Install Buried 1-1/2-inch C900 PVC Pipe with Adphalt Surface Restoration	LF	1000	$30	$30,000
4	Furnish and Install Buried 2-inch C900 PVC Pipe with Adphalt Surface Restoration	LF	1400	$38	$53,200
5	Furnish and Install Buried 3-inch C900 PVC Pipe with Adphalt Surface Restoration	LF	230	$40	$9,200
6	Furnish and Install Buried 6-inch C900 PVC Pipe with Adphalt Surface Restoration	LF	40	$50	$2,000
	Estimated Construction Cost Subtotal:				**$109,400**
	Construction Contingency	20%			$22,000
	Total Estimated Construction Cost:				**$131,400**
	Estimated Design, Construction Engineering and Other Professional Services	20%			$22,000
	TOTAL YEAR 2016 ESTIMATED COST				**$153,400**

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CITY OF CHILOQUIN
ESTIMATED COST OF IMPROVEMENTS

TABLE 6-7

CITY OF CHILOQUIN, OREGON
ESTIMATED COST SUMMARY
WATER SYSTEM IMPROVEMENTS
(YEAR 2016 COST)

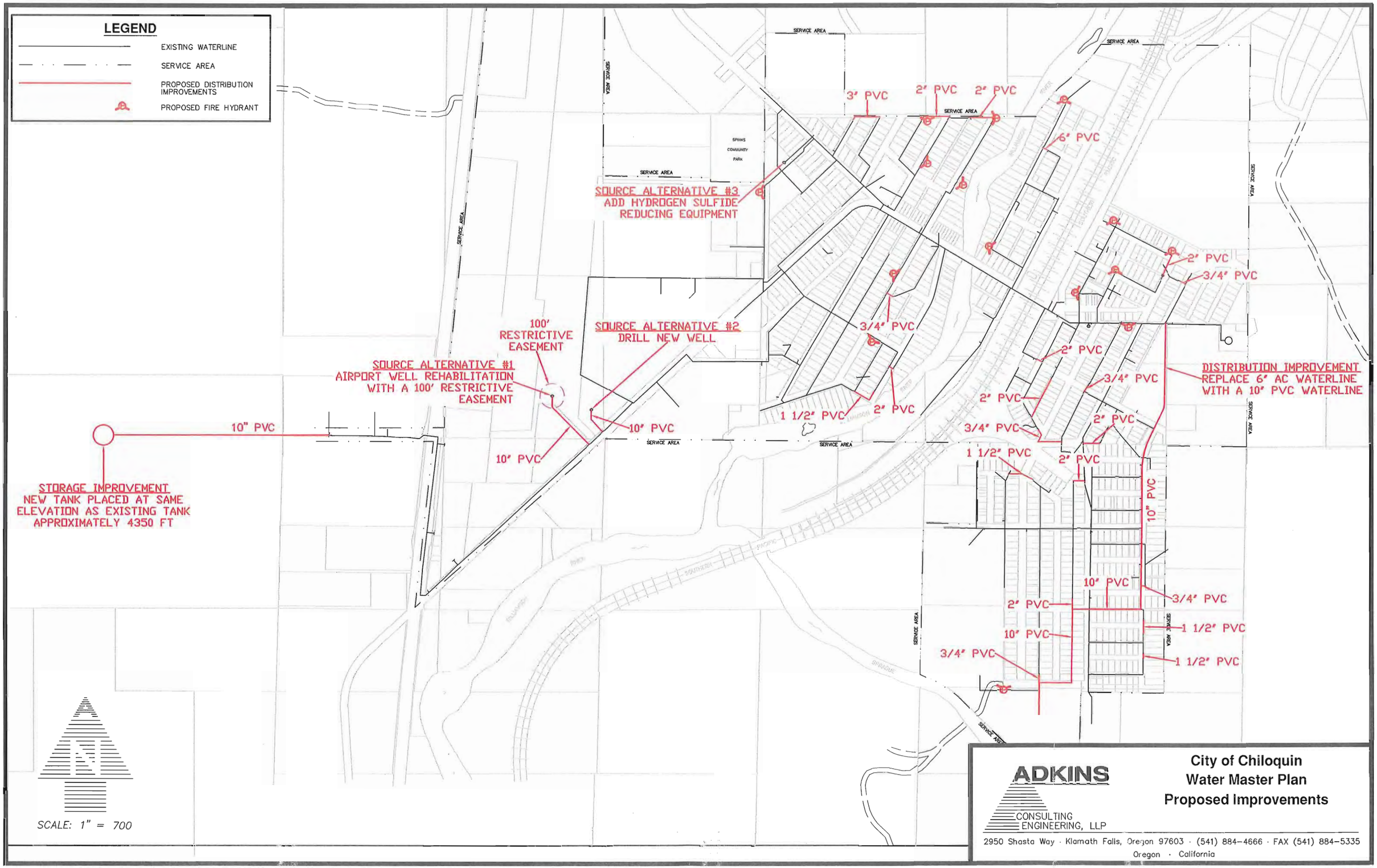
Projects	2016 Estimated Project Cost	2017 Estimated Project Cost
Rehabilitate Airport Well	$616,800	$647,640
New 500,000-gallon Reservoir	$1,059,000	$1,111,950
New 10-inch Water Main to High School	$613,900	$644,595
Install New Fire Hydrants	$121,000	$127,050
Loop Dead End Lines	$153,400	$161,070
Total Estimated Improvement Costs:	$2,564,100	$2,692,305
Other Costs		
Estimated Land Acquisition Costs	$100,000	$105,000
Estimated Enviromental Review Report Costs	$20,000	$21,000
Cultural Monitoring (Assumes 6-month Construction)	$100,000	$105,000
Estimated Grant Administration Cost (Two Contracts)	$60,000	$63,000
Total Other Costs:	$280,000	$231,000
TOTAL ESTIMATED PROJECT COSTS	$2,844,100	$2,923,305

H:\1011-71 City of Chiloquin Water Master Plan\GIS\table 6-8.mxd

ADKINS CONSULTING ENGINEERING

CITY OF CHILOQUIN
SUMMARY OF ESTIMATED COSTS

TABLE 6-8


LEGEND
EXISTING WATERLINE
SERVICE AREA
PROPOSED DISTRIBUTION IMPROVEMENTS
PROPOSED FIRE HYDRANT
SERVICE AREA
SPINKS COMMUNITY PARK
SOURCE ALTERNATIVE #3
ADD HYDROGEN SULFIDE REDUCING EQUIPMENT
SOURCE ALTERNATIVE #2
DRILL NEW WELL
100' RESTRICTIVE EASEMENT
SOURCE ALTERNATIVE #1
AIRPORT WELL REHABILITATION WITH A 100' RESTRICTIVE EASEMENT
STORAGE IMPROVEMENT
NEW TANK PLACED AT SAME ELEVATION AS EXISTING TANK APPROXIMATELY 4350 FT
DISTRIBUTION IMPROVEMENT
REPLACE 6" AC WATERLINE WITH A 10" PVC WATERLINE
10" PVC
10" PVC
10" PVC
10" PVC
10" PVC
10" PVC
10" PVC
3" PVC
2" PVC
2" PVC
6" PVC
2" PVC
3/4" PVC
3/4" PVC
2" PVC
3/4" PVC
2" PVC
1 1/2" PVC
2" PVC
3/4" PVC
2" PVC
1 1/2" PVC
2" PVC
3/4" PVC
1 1/2" PVC
1 1/2" PVC
SCALE: 1" = 700
ADKINS
CONSULTING ENGINEERING, LLP
City of Chiloquin
Water Master Plan
Proposed Improvements
2950 Shasta Way · Klamath Falls, Oregon 97603 · (541) 884-4666 · FAX (541) 884-5335
Oregon · California

- Monitor water quality from different sources.
- Record daily water meter readings at every supply source. Try to record the readings at the same time of day so the data from each source are comparable over equal time periods.
- Periodically record static and pumping water levels at all City wells to track groundwater trends.
- Keep maintenance records on all valves, fire hydrants, and miscellaneous system components in the City.
- Exercise fire hydrants once per year and record information on their condition.
- Exercise valves once per year and record operational data and any problems experienced.
- Develop an annual replacement schedule for individual service meters in the system.
- Exercise and lubricate pumps per the manufacturer's recommendations.
- Clean and inspect the reservoir. This is generally done every five to seven years.
- Annually review system water loss to identify potential leaks or improperly operating water meters (i.e., conduct a water audit).
- Replace leaking water mains as they are identified in a water audit.

Implementation and continued practice of these measures, many of which the City of Chiloquin already completes, should help the City's water system to continue to serve the community as expected.

DRAFT

CHAPTER 7
WATER MANAGEMENT AND CONSERVATION PLAN

SECTION 1: INTRODUCTION AND WMCP ELEMENTS

1.1: Introduction

This chapter of the Water System Master Plan (WSMP) addresses the City's need for a Water Management and Conservation Plan (WMCP) as required by Oregon Administrative Rule (OAR) 690-315. Some information required for this WMCP is also required by the WSMP, therefore will not be repeated in this chapter, but rather referenced using the WMCP Checklist (See Table 7.1).

1.2: Plan Requirement

The City applied for a groundwater permit April 1, 1991 and received a permit to appropriate ground water on May 26, 1992 which had an initial completion date of October 1, 1999. The City applied for a time extension February 28, 2008 and received the final order for the time extension on September 15, 2009 that extends the completion date to October 1, 2049. The conditions of this time extension require the City to develop and implement a WMCP.

In 1998 a WMCP was prepared by Adkins Consulting Engineering, Inc. and submitted to the Oregon Department of Water Resources. The final order approving the WMCP was signed on February 3, 1999. The initial plan was required to have a full update every 10 years as required by OAR 690-086. Since the acceptance of the initial plan an update has not been completed, therefore this WMCP will serve as an update of the initial WMCP and will address all applicable requirements of OAR 690-086.

1.3: Plan Organization

The City of Chiloquin serves 330 active service connections, therefore by OAR 333-061-0060(5) is required to develop a WSMP. This WSMP will serve as the source of reference information for the WMCP. Table 7-1 references the plan element and where to find it within the WSMP and WMCP, as well as Oregon Administrative Rule that guides the plan element. Below is a list of the WMCP elements:

- ***Water Supplier Description***: This WMCP element is mostly contained within the WSMP and describes the current service area, existing water supply, water use, water rights, distribution system and other pertinent water suppler information.

- ***Water Conservation***: This element is somewhat unique to the WMCP. Whereas the WSMP makes recommendations for the system infrastructure, it's operation and maintenance, this WMCP element includes system wide conservation measures as well as conservation measures for water users. Additionally, this element builds on the previous WMCP conservation measures.
- ***Water Curtailment:*** Some aspects of this element are located in the WSMP, such as an assessment of the water supply and past deficiencies. Other aspects presented in this element are: stages, triggers and actions for water curtailments.
- ***Water Supply:*** This plan element has supporting information described in the WSMP, such as historical and future population estimates leading to current and projected water demand. The WMCP presents the certification schedule for the City's water right permit, analysis of alternative supply sources and water development limitations as described in the water right permit extension.

1.4: Affected Local Governments

This WMCP was supplied to Klamath County Planning and the Klamath Tribes for review and comments 30 days prior to submitting to OWRD. Comments from Klamath County Planning and Tribes, and responses to the comments have been included in this final draft in Appendix XX.

1.5: Plan Update Schedule

Water Management and Conservation Plans are commonly updated every 10 years with a progress report and every 5 years as required by OAR 690-086-0125(6). The City plans on submitting a progress report in 5 years (2020) and an updated WMCP in 10 years (2025).

1.6: Request for Additional Time for Metering or Benchmarks

The City currently has meters on all its service lines, but it has not implemented a meter reading program. The current meters where installed in XXXX and have reached the end of their service life. As of the preparation of this report the City has researched the replacement of their meters, including cost estimates for implementation. Therefore, the City requests additional time to implement its metering program as required by OAR 690-086-0150(4)(b).

		Items and Tasks	OAR Reference	Section No.
WMCP Plan Elements				
✓		Notice to affected local government(s)	690-086-0125(5)	7-1.4
✓		Proposed WMCP update schedule	690-086-0125(6)	7-1.5
		Additional time to implement conservation benchmarks	690-086-0125(7)	7-1.6
Water Supplier Description				
✓		Supplier's source(s)	690-086-0140(1)	3-2
✓		Current service area and population served	690-086-0140(2)	2-1, 2-2
✓		Assessment of adequacy and reliability of existing water supplies	690-086-0140(3)	3-6, 3-8
✓		Present and historic water use	690-086-0140(4)	2-6.1
✓		Water rights inventory table and environmental resource issues	690-086-0140(5)	3-3
✓		Customers served and water use summary	690-086-0140(6)	2-6
✓		Interconnections with other systems	690-086-0140(7)	3-2
✓		System schematic	690-086-0140(8)	Appendix I
✓		Quantification of system leakage	690-086-0140(9)	5-8
Water Conservation Element				
✓		Progress report on implementation of conservation measures scheduled in a previously approved WMCP (*N/A if 1st WMCP*)	690-086-0150(1)	8-3.1
✓		Water use measurement and reporting program	690-086-0150(2)	8-3.2
✓		Currently implemented conservation measures	690-086-0150(3)	8-3.3
✓		Annual water audit	690-086-0150(4)(a)	8-3.4.1
✓		Full metering of system	690-086-0150(4)(b)	
✓		Meter testing and maintenance program	690-086-0150(4)(c)	
✓		Rate structure based on quantity of water metered	690-086-0150(4)(d)	
		Leak detection program	690-086-0150(4)(e)	
✓		Public education program	690-086-0150(4)(f)	
		System leakage reduction program <15%	690-086-0150(5)	
		System leakage reduction program <10%	690-086-0150(6)(a)	
		Technical and financial assistance programs	690-086-0150(6)(b)	
		Retrofit/replacement of inefficient fixtures	690-086-0150(6)(c)	
		Rate structure and billing practices to encourage conservation	690-086-0150(6)(d)	
		Reuse, recycling, and non-potable opportunities	690-086-0150(6)(e)	
		Other proposed conservation measures	690-086-0150(6)(f)	
Water Curtailment Element				
✓		Water supply assessment and description of past deficiencies	690-086-0160(1)	
✓		Stages of alert	690-086-0160(2)	
✓		Triggers for each stage of alert	690-086-0160(3)	
✓		Curtailment actions	690-086-0160(4)	
Water Supply Element				
✓		Future service area and population projections	690-086-0170(1)	
✓		Schedule to fully exercise each permit (*i.e., certification*)	690-086-0170(2)	
✓		Demand forecast	690-086-0170(3)	
✓		Comparison of projected need and available sources	690-086-0170(4)	
		Analysis of alternative sources	690-086-0170(5) and (8)	
		Maximum rate and monthly volume quantification	690-086-0170(6)	
		Mitigation actions under state and federal laws	690-086-0170(7)	
		Greenlight Water Request – Conservation measure schedule and cost effectiveness	690-086-0130(7)(a)	
		Greenlight Water Request – Justification that selected source is most feasible and appropriate	690-086-0130(7)(b)	
		Greenlight Water Request – Mitigation requirements	690-086-0130(7)(c)	

Table 7-1: Water Management and Conservation Plan Elements

SECTION 2: MUNICIPAL SUPPLIER DESCRIPTION

The information in this section is contained earlier in this document within the Water System Master Plan. See Table 7.1 to locate each element of this section.

SECTION 3: WATER CONSERVATION ELEMENT

The City of Chiloquin submitted its first Water Management and Conservation Plan (WMCP) to Oregon Water Resources Department (OWRD) in October 1998. The Development of this plan was initiated by request for a time extension for Permit No. G-11503. Issuance of this time extension was conditional upon the approval of a WMCP under OAR 690-086.

3.1: Progress Report – Scheduled Conservation Measures from 1998 WMCP

A conservation measures progress report has not been submitted to OWRD since the original submittal of the WMCP in 1998. Listed below are the measures that have been implemented since the 1998 WMCP.

- Meter Testing and Maintenance – Approximately 10% of the non-residential meters that are read, are periodically removed and calibrated.
- Public Education – During times of high usage City staff has conducted verbal outreach with high water users or water users that might be observed wasting water.

3.2 Water Use Measurement and Reporting Program

City staff record monthly flow meter measurements from the Well #1 flow meter (Sensus 4" totalizing flow meter). These water use reports are submitted annually to OWRD as required by OAR 690-085-0010.

3.3 Currently Implemented Conservation Measures

The City of Chiloquin does not implement any conservation measures other than what is described in Section 3.1 of this chapter.

3.4 Required Conservation Measures

All municipal water suppliers are required to implement six basic conservation measures as described in OAR 690-086-0150(4) and include a schedule that establishes five-year benchmarks for implementing the measures. The six measures are listed below:

- Annual Water Audit
- Full Metering
- Meter Testing and Maintenance

- A Rate Structure Based at Least Partially on Water Metered at Service Connections
- Leak Detection Program if Loss Exceeds 10%
- Public Education

The remainder of section 3.4 is pending and will be added at the 90-percent draft

3.4.1 Annual Water Audit

Currently the majority of residential meters within the City are beyond their service life and require replacing. City staff is working towards replacing these meters and expects to have all service connections metered within the next five years. Following the metering of all service connections the City will begin to implement an annual water audit that will account for all residential accounts, non-residential accounts and non-revenue water use. This water audit will be utilized by the City to implement water conservation efforts.

3.4.2 Full Metering

As described in Section 8-3.4.1 the City is currently working towards replacing all non-functioning meters. City staff expects all service connections to be metered within 5 years.

3.4.3 Meter Testing and Maintenance

The remainder of Chapter 7 is pending and will be added at the 90-percent draft

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CHAPTER 8
PROJECT FINANCING AND IMPLEMENTATION

INTRODUCTION

This chapter evaluates the financial status of Chiloquin's Water Department and outlines alternatives for financing the City's water system improvements, should the City elect to pursue an improvements project. A summary of state and federal funding programs is presented, including a review of funding options available to the City for the water system improvements. In order to construct some or all of the proposed improvements, a financing plan that is acceptable to the City of Chiloquin must be developed to complete the improvements. Because of the estimated cost of the improvements, financing resources are anticipated to include a low interest loan coupled with grant funds, if available.

Although a detailed analysis of Chiloquin's current water rate structure is beyond the scope of this Water System Master Plan (WSMP), some discussion of the existing rate structure and evaluation of current and future water system budgets is included for the purpose of supporting calculations for funding scenarios. As a general rule, most utility rate structures include funding for day-to-day operation and maintenance items, payroll costs for staff, and a set-aside for both equipment replacement and future improvements. A summary of the current water rate structure is presented hereafter.

CURRENT WATER USE RATES AND REVENUE

The operation and maintenance of the existing water system is financed through the City's annual budget. Water system revenue is obtained primarily from water user fees. Currently, residential users are charged a base rate of $30.00 per month with 10,000 gallon limit and no overage charges are implemented at this time. However, there are a number of non-residential customer meters that are read and overage charges are implemented. Copies of the City of Chiloquin's current 2015 and previous water rate structures are presented in Appendix J. The water rates (per month) in effect at the time this WSMP was developed are summarized hereafter.

City of Chiloquin Monthly Water Rate Information

Usage Type	Allowable Use for Base Fee (Gallons)	Monthly Cost (Dollars)
Residential	10,000	$30.00.
Non-residential	10,000	$30.00 for base rate and $2.90 per 1,000 gallons over 10,000 gallons.

Currently, the City of Chiloquin has the following number of water service accounts that were billed:

City of Chiloquin Water Service Accounts

Account Type	Total Number of Accounts
Residential	296
Non-residential	34
TOTAL	**330**

The remander of this section is pending and will be added at the 90-percent draft

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APPENDIX A

This section to be included in the 90% report

APPENDIX B

Oregon Public Health
Drinking Water Data Online

Oregon Health Authority

PWS ID: 00184 ---- CHILOQUIN MUNICIPAL WATER DEPT

For questions regarding these violations contact: KLAMATH COUNTY — Ramona Quinn/Darlene Sheldon/Susan Burch — (541) 883-1122 ext 3054

Violations are displayed for the last 5 years only.
Group Abbreviations: TCR = Total Coliform Rule
Gray shading indicates return to compliance.

Hide Auto-RTC | Show Determination Dates

Click here to see public notices.

Violation History

Violation Number	Auto-RTC?	Monitoring Period Begin	End	Facility ID	Analyte Group	Violation Type - Analyte Count *Show analytes for all violations*	Enforcement Action - Date *Show history*	Points
901616614	Y	Feb 01, 2015	Feb 28, 2015		TCR	Routine Coliform - Did Not Report Enough - 1	Returned To Compliance - Mar 17, 2015	1
901616612	Y	Jan 01, 2015	Jan 31, 2015		TCR	Routine Coliform - Did Not Report Enough - 1	Returned To Compliance - Mar 17, 2015	1
901616611	Y	Dec 01, 2014	Dec 31, 2014		TCR	Routine Coliform - Did Not Report Enough - 1	Returned To Compliance - Mar 17, 2015	1
901616610	Y	Nov 01, 2014	Nov 30, 2014		TCR	Routine Coliform - Did Not Report Enough - 1	Returned To Compliance - Mar 17, 2015	1
901616609	Y	Oct 01, 2014	Oct 31, 2014		TCR	Routine Coliform - Did Not Report Enough - 1	Returned To Compliance - Mar 17, 2015	1
901616608	Y	Feb 01, 2013	Feb 28, 2013		TCR	Routine Coliform - Did Not Report ANY - 1	Returned To Compliance - Mar 21, 2013	1
901616606	Y	Nov 01, 2010	Nov 30, 2010		TCR	Routine Coliform - Did Not Report ANY - 1	Returned To Compliance - Dec 10, 2010	1

SYSTEM SCORE SUMMARY

Unaddressed Points:	0
Number of years the oldest violation has been unaddressed (*n*):	0
System Score:	**0**
Points under formal enforcement:	0
Points RTC'd:	7

For all compliance errors, please contact Chuck Michael, DWS Compliance Specialist, at 971-673-0420.

Click here for more information on system scores and how they are calculated, including the point values of specific violations.

Violation history last updated 09/15/2015, 9 hours ago.

For further information on this public water system, click on the area of interest below:
System Info :: Report for Lenders :: Alerts :: Violations :: Enforcements :: Contacts :: Site Visits :: Public Notice :: Plan Review
Coliform Summary :: Coliform Results :: Sampling Schedule for Coliform :: Groundwater/GWUDI Source Details
Chemical Group Summary :: Latest Chemical Results :: Entry Point Detects :: Single Analyte Results
Chemical Schedule Summary :: Chemical Schedule Details
Lead & Copper :: Corrosion Control (LCR) :: Nitrate :: Arsenic :: Radionuclides :: GWR 4-Log :: LT2
DBPs :: TOC & Alkalinity :: DBP Sample Sites :: FANLs :: MRDL :: Turbidity :: SWTR :: RAA :: LRAA

APPENDIX C

Outstanding Performance Criteria

OHA-Drinking Water Program

The Drinking Water Program (DWP) has identified criteria for determining whether a Community public water system should be considered to have outstanding performance. This designation is given at the completion of a water system survey, formerly referred to a sanitary survey. A water system survey is an on-site review of a system's sources, treatment, storage facilities, distribution system, operation and maintenance procedures, monitoring, and management, for the purpose of evaluating the system's capability of providing safe water to the public. Systems that are designated outstanding performers will have their water system survey frequency reduced from every 3 years to every 5 years.

The criteria for outstanding performance are:

1) No Maximum Contaminant Level (MCL), Action Level, or Treatment Technique violations in the last 5 years;
2) No more than one Monitoring and Reporting violation in the last 3 years. The one violation must be resolved (results submitted);
3) No significant deficiencies or rule violations identified during the current water system survey; and
4) Has not had a waterborne disease outbreak attributable to the water system in the last 5 years.

To check your water system's violation history, go to http://healthoregon.org/dwp and in the "More Resources" box on the right, click on "Drinking Water Data Online." Type in your water system name or PWS ID number. The date of the last survey is listed on this page. Towards the bottom of that page, under "For further information…," click on "Violations".

- An MCL violation will have "MCL" in the Violation Type column.
- Treatment Technique violations are for inadequate surface water treatment or corrosion control.
- If the system has one Monitoring and Reporting violation during the last 3 years, there must be a subsequent monitoring result for that contaminant on record in order to meet criterion #2.

We strongly encourage all systems to meet the Outstanding Performance criteria. We will review your system's designation for Outstanding Performance after completion of each water system survey. The designation will remain in effect as long as the criteria continue to be met.

If you have any questions relating to compliance with any of these criteria, please contact your regional Drinking Water Program or County Health Department staff person, or contact the DWP Phone Duty person at 971-673-0405.

Rev. 3/12/12

Deficiency Summary

Surveyor: Ramona Quinn

Date Corrective Action Plan is due: 10/7/2014 **County:** Klamath

Yes	No	Significant Deficiencies and Rule Violations:	Date to be corrected	Date corrected
☐	☒	**Source:**		
		Well construction:		
		Spring/other source:		
☐	☒	**Treatment:**		
		Surface water treatment:		
		Disinfection:		
		Other treatment:		
☐	☒	**Finished Water Storage:**		
☐	☒	**Distribution:**		
☐	☒	**Monitoring:**		
☒	☐	**Management & Operations:**		
		Master Plan has not been developed	1/13/2015	
☐	☒	**Operator Certification:**		
☐	☒	**Other Rule Violations:**		

Comments:

☐ **Source Deficiencies:**

Well Construction Deficiencies (OAR 333-061-0076):

- ☐⊕ Sanitary seal and casing not watertight
- ☐⊕ Does not meet setbacks from hazards
- ☐⊕ Wellhead not protected from flooding
- ☐⊕ No raw water sample tap
- ☐⊕ No treated sample tap (if applicable)
- ☐⊕ No screen on existing well vent

Spring Source Deficiencies (OAR 333-061-0076):

- ☐⊕ Springbox not impervious durable material
- ☐⊕ No watertight access hatch/entry
- ☐⊕ No screened overflow
- ☐⊕ Does not meet setbacks from hazards
- ☐⊕ No raw water sample tap
- ☐⊕ No treated sample tap (if applicable)

☐ **Treatment Deficiencies/Violations:**

Surface Water Treatment Deficiencies:

- ☐+ Turbidity standards not met-0030(3)
- ☐+ Turbidimeters not calibrated per manufacturer or at least quarterly-0036(5)(b)(A)
- ☐⊕ Incorrect location for compliance turbidity monitoring
- ☐⊕ If serving > 3,300 people no alarm or auto plant shut off for low chlorine residual
- ☐⊕ For conventional or direct filtration: No alarm or plant shut off for high turbidity
- ☐⊕ For conventional filtration: Settled water not measured daily
- ☐⊕ For conventional or direct filtration: Turbidity profile not conducted on individual filters at least quarterly
- ☐⊕ For cartridge filtration: No pressure gauges before and after cartridge filter
- ☐⊕ For diatomaceous earth filtration: Body feed not added with influent flow
- ☐+ For membrane filtration: Turbidimeter not present on each unit-0050(4)(c)(G)
- ☐+ For membrane filtration: Direct integrity testing not done at least daily-0036(5)(b)(F)

Disinfection Deficiencies/Violations:

- ☐+ DPD or EPA approved method not used-0036(9).
- ☐+ Free chlorine residual not maintained-0032(3/5)
- ☐+ Chlorine not measured & recorded as required-0036(9)
- ☐+ Minimum CT requirement not met all times-0032(3/5)
- ☐⊕ No means to adequately determine flow rate on contact chamber effluent line
- ☐+ pH, Temperature, and chlorine residual not measured daily at first user-0036(5)(a/b)
- ☐⊕ Failure to calculate CT values correctly
- ☐⊕ No means to adequately determine disinfection contact time under peak flow and minimum storage conditions
- ☐+ Annual raw water sampling past due-0036(6)(w)

UV Disinfection Violations (OAR 333-0050(5)(k)):

- ☐+ Bypass around UV system
- ☐+ Lamp sleeve not cleaned
- ☐+ Lamp not replaced per manufacturer
- ☐+ No intensity sensor with alarm or shut-off
- ☐+ Annual raw water sampling past due-0036(6)(w)

Other Treatment Violations:

- ☐+ Non-NSF approved chemicals-0087(6)
- ☐+ Corrosion control parameters not met-0034

☐ **Distribution System Violations:**

- ☐+ System pressure < 20 psi. -0025(7)

Cross Connection (OAR 333-061-0070):

- ☐+ No ordinance or enabling authority (CWS)
- ☐+ Annual Summary Report not issued (CWS)
- ☐+ Testing records not current (CWS, NTNC, TNC)
- ☐+ No Cross Connection Control Specialist (CWS ≥ 300 connections)

☐ **Finished Water Storage Deficiencies:**

- ☐⊕ Hatch not locked or adequately secured
- ☐⊕ Roof and access hatch not watertight
- ☐⊕ No flap valve, screen, or equivalent on drain.
- ☐⊕ No screened vent

☐ **Monitoring Violations:**

- ☐+ Monitoring not current-0025(1)
- ☐+ MCL violations-0030
- ☐+ No Coliform Sampling Plan-0036(6)(b)(G)

☒ **Management & Operations Violations:**

- ☐+ No operations and maintenance manual. -0065(4)
- ☐+ Emergency response plan not completed. -0064(1)
- ☐+ Major modifications not approved (plan review). -0050
- ☒+ Master plan not current (≥ 300 con.)-0060(5)
- ☐+ Annual CCR not submitted (CWS)-0043(1)(a)
- ☐+ SNC or out of compliance with AO
- ☐+ Public notice not issued as required-0042

☐ **Operator Certification Violations:**

- ☐+ No certified operator at required level-0065(2).
- ☐+ No protocol for under certified operator-0225(5).

☐ **Other Rule Violations:** _____

⊕ Significant deficiency per OAR 333-061-0076
+ Significant rule violation per OAR 333-061-XXX

Inventory and Narrative

☐ **Outstanding Performer** **County:** Klamath

Type	**Status**	**Size**	**Season**
☒ Community (C)	Population:	1500	☒ All year ☐ Seasonal
☐ Non Transient Non-Community (NTNC)	Connections:	330	Begins: (mm/dd) /
	Service Chars:	MU	Ends: (mm/dd) /
☐ Transient Non-Community (TNC)	Ownership:	4	**Coliform Sampling**
☐ State Reg/Non EPA (NP)	**License**		**Period:** ☒ Monthly ☐ Quarterly
	☒ Not Lic ☐ HD ☐ Ag		Samples Required: 1

Operator Certification Required			**Responsible Agency**
WD I	WT	FE ☐ Small WS ☐	☐ State ☒ County ☐ Dept of Agriculture

Primary Administrative Contact (Mailing Address):

Contact Name: Pete Pate — Phone: (541) 891-9243
Title: Public Works Director — Cell: ( )
Street Address: PO Box 196 — Emergency #: ( )
City/State/Zip: Chiloquin, OR 97624 — Email: Petepate53@gmail.com

Legal/Owner Address:

Contact Name: City of Chiloquin — Phone: (541) 891-9243
Title: — Cell: ( )
Street Address: PO Box 196 — Emergency #: ( )
City/State/Zip: Chiloquin, OR 97624 — Email: Chiloquin@centurylink.net

System Physical Address:

Contact Name: Charles Case — Phone: (541) 891-9234
Title: Assistant Public Works — Cell: ( )
Street Address: 122 South 2nd — Emergency #: ( )
City/State/Zip: Chiloquin, OR 97624 — Email: Petepate53@gmail.com

Emergency Systems Available:

Name: none — **PWS ID#:** 41

Narrative:

This water system services a small municipality. The town has a current population of 720 and the combined enrollment of the high school and the elementary school is about 600. There are 3 restaurants and one store/deli on this water system that serve residents as well as non-residents of the city. There are tribal administration and health care services connected as well as forestry offices. Also encluded are 2 parks and a few businesses.

There are two wells, one of which is active, and the other is inactive but can be available for emergency use. There is one reservoir for the water system. Two old reservoirs are still standing but have been disconnected from the system.

Service area characteristic and owner type codes:

Service Area Characteristics		
Primary	**Secondary**	**CODE**
Residential	City or Town	**MU**
	Mobile Home Park	**MP**
	Subdivision	**SU**
	Rural	**RA**
	Other	**OR**
Transient	Recreation (parks, campground, beaches, ski areas, marinas)	**PA**
	Service Station	**SS**
	Summer Camp	**SK**
	Restaurant/Store	**RS**
	Highway Rest Area	**HR**
	Hotel/Motel, B&B	**HM**
	Other (visitor ctr, church)	**OT**
Non-Transient Non-Community	School	**SC**
	Institution	**IN**
	Medical Facility	**MF**
	Industrial/Agricultural	**IA**
	Day Care Center	**DC**
	Other	**OA**
Other	Interstate Carrier	**IC**
	Wholesaler (sells water)	**WH**
	Other Area	**OT**

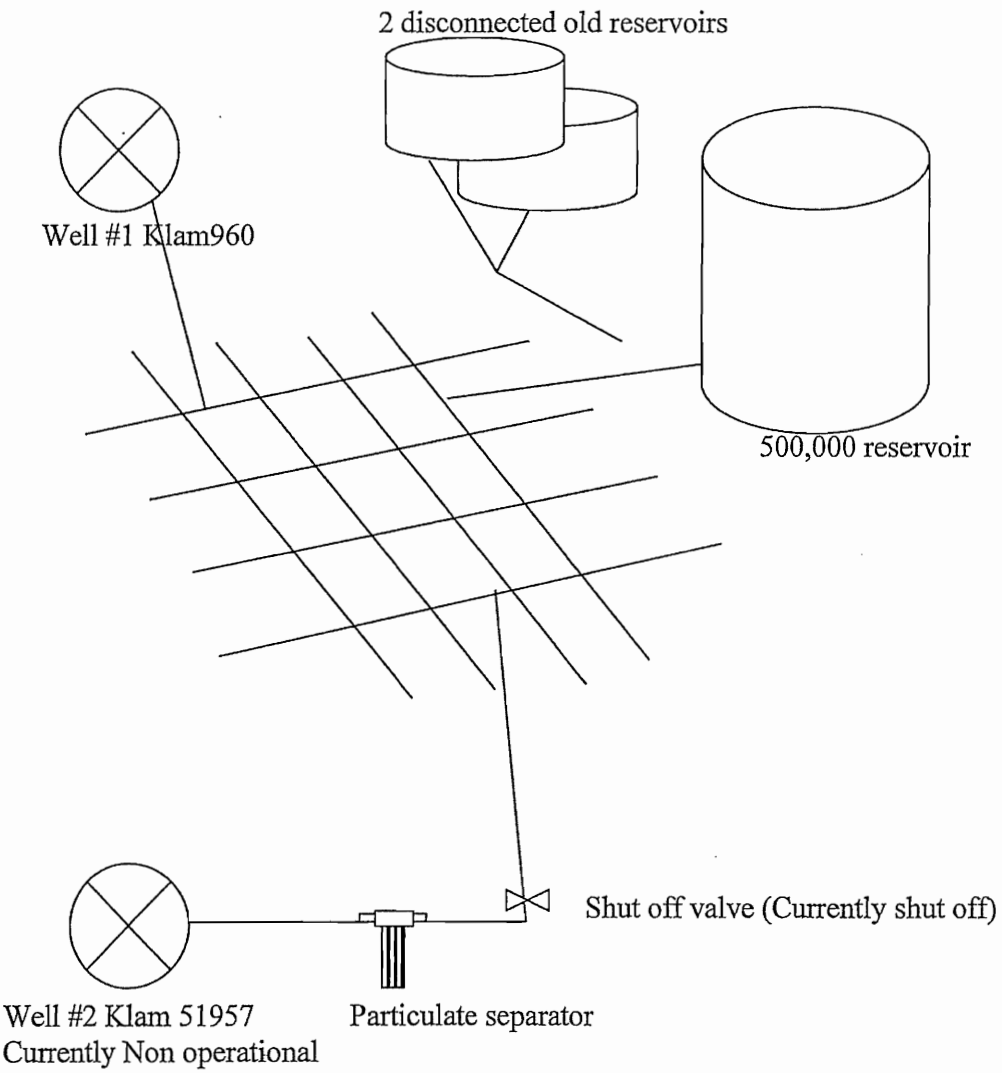
Determining System Type				
Population/ Daily Use	**Number of Connections**	**>25 Same Daily Users**	**≥25 Year Round Residents**	**System Type**
<10	**<4**	**No**	**No**	**Not a System**
10 – 24	**4-14**	**_**	**_**	**State Reg/Non-EPA**
25+	**_**	**No**	**No**	**Transient Non-Community**
25+	**_**	**Yes**	**No**	**Non-Transient Non-Community**
25+	**15+**	**Yes**	**Yes**	**Community**

Coliform Bacteria Sampling			
Community systems	Monthly samples based on population*		
Non-Transient, Transient, State-Regulated Systems	**Groundwater population served**		**Surface water**
	≤1000 1 per quarter	>1000 Monthly based on population*	Monthly sampling based on population*

Owner Type	Code
Federal Government	**1**
Private	**2**
State Government	**3**
Local Government	**4**
Mixed Public/Private	**5**

* Population	Samples per month
Up to 1,000	**1**
1,001 to 2,500	**2**
2,501 to 3,300	**3**
etc	**See rules or call DWP**

Water System Schematic



Source Information

ID	Entry Points	Source Type					Availability					Treatment	
ID	(Location where water enters distribution and is sampled) Name	Ground	Surface	GWUDI	Pur. ground	Pur. surface	Permanent	Seasonal	Begins	Ends	Emergency	None	Treatment Codes**
A	Well house #1	☒	☐	☐	☐	☐	☒	☐			☐	☒	
B	Well Hosue #2	☒	☐	☐	☐	☐	☐	☐			☒	☐	
		☐	☐	☐	☐	☐	☐	☐			☐	☐	
		☐	☐	☐	☐	☐	☐	☐			☐	☐	

ID	Individual Sources			Source Type					Availability					Treatment	
ID	(Contributing to Entry Point) Name	*Land Use	Capacity (GPM)	Ground	Surface	GWUDI	Pur. ground	Pur. surface	Permanent	Seasonal	Emergency	Abandoned	Disconnected	None	Treatment Codes**
AA	Klam 960	G	unk	☒	☐	☐	☐	☐	☒	☐	☐	☐	☐	☒	
BA	Klam 51957	G	unk	☒	☐	☐	☐	☐	☐	☐	☒	☐	☒	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	
				☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	

*Land Use Codes: (A) **Pristine Forest** (B) **Irrigated Crops** (C) **Non-Irrigated Crops** (D) **Pasture** (E) **Light Industry** (F) **Heavy Industry** (G) **Urban-Sewered Area** (H) **Rural On-Site Sewage Disposal** (I) **Urban On-Site Sewage Disposal** (J) **Rangeland** (K) **Managed Forest** (L) **Commercial** (M) **Recreational Use**
**See "Treatment" page for treatment code descriptions.

List current operational patterns for all sources (e.g., Well 1 used continuously @ 100 gpm. Be as specific as possible)
Well #1 used 100%, Well #2- disconnected.

Yes No

☒ ☐ Does the water system have water rights for all sources? ☐ Not Required

☐ ☒ For GW systems, have there been any modifications to the existing well(s) or spring(s) (e.g. deepened, change in screened interval, springbox reconstruction, etc.)? Describe below:

☐ ☐ Has a Source Water Assessment been completed by ☒ DWP or ☐ DEQ? If yes, attach delineation map and review boundaries with operator.

☐ ☒ Has system implemented source water protection strategies? If yes, describe below:

☐ ☒ Is the water system interested in source water protection? If yes, contact regional geologist at 541-726-2587.

Comments:

Well Information

	Source ID#:	EP-A		EP-B									
	Source Name:	Well#1		Well #2									
	Well Tag ID (e.g. L12345):	L											
	(if no well tag ID, enter WRD Well Log ID below)	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
	Well Log on File:	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	WRD Well Log ID (e.g. COLU123):	Klam960		Klam51957									
Wellhead Construction	Well still active	☒	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
	Depth of well (ft.)	350		750									
	Depth of grout seal (ft.)	unk		40									
	Year of installation (yr.)	1954		1975									
	Casing diameter (in.)	16		12									
	• Sanitary seal & casing watertight	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	• If vented, properly screened	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	• Wellhead protected from flooding	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	• Well meets setbacks from hazards	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Nearest hazard (ft)	>100		>100									
	Water level device	☒	☐	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
	Concrete slab around casing	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Casing height ≥ 12-in. above slab/grade	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Pitless adapter	☐	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
	Constructed properly per SWA report	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
Control Building	Protective housing	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Flowmeter	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Pressure gauge	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Pump to waste piping	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	• Raw sample tap	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	• Treated sample tap ☒N/A	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Heated	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Lighted	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Floor drain	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Well pump removal provision	☒	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
Pump	Pump type*	VT		VT									
	Bearing lubrication (FG oil/water)	w											
	Pumping capacity (gpm)	500											
	Amount of water pumped per year (gallons)	74M		0									
	Percent of total well supply provided (%)**	100		0									
	Static water level (ft below ground surface)	210		95									
	Static water level date	2014		1975									

* **Pump Types:** (VT) Vertical Turbine (SU) Submersible (CE) Centrifugal (SJ) Shallow Jet (DJ) Deep Jet (OT) Other

** The sum of the % for all the wells should equal 100% (e.g. for 2 wells, if well #1 provides 80%, then well #2 must provide 20%).

Comments:

Potential Sanitary Hazards
(From OAR 333-061-0050(2)(a)(F))

The following sanitary hazards are not allowed within 100 feet of a well:

- Any existing or proposed pit privy
- Subsurface sewage disposal drain field
- Cesspool
- Solid Waste disposal site
- Pressure sewer line
- Buried fuel storage tank
- Animal yard, feedlot, or animal waste storage
- Untreated storm water or gray water disposal
- Chemical (including solvent, pesticides, and fertilizers)storage, usage, or application)
- Fuel transfer or storage
- Mineral resource extraction
- Vehicle or machinery maintenance or long term storage
- Junk / auto / scrap yard
- Cemetery
- Unapproved well
- Well that has not been properly abandoned or of unknown or suspect construction
- Source of pathogenic organisms
- Any other similar public health hazards

The following are not allowed within 50 feet of a well:

- Gravity sewer line
- Septic Tank

Exemptions to these setbacks must be listed and documented within the plan approval letter.

If a surface water source is located within 500 feet of a well or spring, please note the water body name and the distance to the well or spring. All groundwater sources within 500 feet to a surface water source should be considered for potential surface water influence. Check the file for correspondence. If a review has been done indicate results in comment section. If not, contact the Springfield office 541-726-2587.

Storage and Pressure Tanks

Number	Name	Tank Type*	Tank Material	Year Built	Volume (gal.)
1	Storage reservoir	G	Steel		

* (G) Ground (E) Elevated (P) Pressure — **Total Volume:**

	Reservoir Number:	1								
	Reservoir Features	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Hatch	● Secured (e.g. locked, bolted, etc)	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	● Watertight	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Curbed lid (shoe box style)	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
Features	Drain to daylight	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Overflow	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	● Overflow/drain protected (screen/flap/valve)	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	● Screened vent	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Water level gauge	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Bypass piping	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
	Fence/gate	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Cathodic plates watertight ☒ N/A	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Alarm for high or low levels	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
Maintenance	Exterior in good condition	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Interior in good condition	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Approved interior coating	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Inspection schedule	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Cleaning schedule	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
	Continuously disinfected (● post '81 redwood)	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Plumbing Config.	Separate inlet/outlet	☒	☐	☐	☐	☐	☐	☐	☐	☐	☐
	Baffling	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
	Used for contact time	☐	☒	☐	☐	☐	☐	☐	☐	☐	☐
	Pressure Tanks **Number:**					**Comments**					
Pressure Tanks	Used for contact time	☐	☐	☐	☐	Cleaned 2013. Two old reservoirs have been disconnected.					
	Accessible for maintenance	☐	☐	☐	☐						
	Separate inlet/outlet	☐	☐	☐	☐						
	Bypass piping	☐	☐	☐	☐						
	Access port ☐ N/A	☐	☐	☐	☐						
	Drain	☐	☐	☐	☐						
	Pressure relief device	☐	☐	☐	☐						
	Air bladder/diaphragm	☐	☐	☐	☐						
	Valve for adding air	☐	☐	☐	☐						
	Water level sight glass ☐ N/A	☐	☐	☐	☐						

Distribution System Information

Service Area and Facility Map

Yes	No	
☒	☐	Does the system have a service area and facility map (indicate features on map):

- ☐ Booster pumps
- ☐ Pressure regulating valves
- ☐ Pressure zones
- ☒ Sampling points
- ☒ Sources-wells & withdrawal points
- ☒ Storage facilities (reservoirs)
- ☐ Treatment facilities
- ☒ Water lines (including size and material)

Distribution Data

Yes	No		Comments
☒	☐	• System pressure >20 psi	
☒	☐	Are service connections metered? (what %)	99%- however they are not read
☐	☒	Water system leakage <10%	Expect 10-20%- leaks repaired as found
☒	☐	Waterline depth >30"	
☒	☐	Piping looped	
☒	☐	Hydrants or blowoffs on all dead ends	
☒	☐	Routine flushing (How often)	annual
☒	☐	Adequate valving	
☒	☐	Routine valve turning (How often)	annual
☒	☐	Asbestos cement (AC) pipe absent from system	

Comments:

Cross Connection Control (CWS, NTNC, and TNC)

Yes	No	N/A		Comments
☒	☐	☐	• Ordinance or enabling authority (CWS)	
☐	☒	☐	List of installed devices (CWS, NTNC, TNC)	
☒	☐	☐	• Devices tested annually (CWS, NTNC, TNC)	
☒	☐	☐	• Annual Summary Report submitted (CWS)	
☒	☐	☐	• Certified Cross Connection Control Specialist (CWS ≥ 300 connections)	Charles case

Comments:

Booster Pumps

Number	Name (location)	Deficiencies or Comments	HP	GPM	Aux. Power Yes	Aux. Power No
none					☐	☐
					☐	☐
					☐	☐
					☐	☐
					☐	☐
					☐	☐

Comments:

Water Quality Monitoring

Contaminant	N/A	Frequency	Next Tests Due
Entry Point Sampling:			
Nitrate	☐	yearly	2015 2016 2017
Arsenic	☐	1 / 9 years	2019
Inorganic Chemicals (Including Nitrite) (sw)	☒		
Inorganic Chemicals (Including Nitrite) (gw)	☐	1 / 9 years	2019
SOCs	☐	1 / 3 years	2016
VOCs (sw)	☒		
VOCs (gw)	☐	1 / 3 years	2016
Radionuclides (Community Water Systems Only):			
Gross Alpha	☐	1 / 9 years	2016
Radium 226/228	☐	1 / 9 years	2016
Uranium	☐	1 / 9 years	2016
Distribution System Sampling:			
Coliform Bacteria	☐	1 / month	Sept, Oct, Nov 2014
Asbestos (for AC pipe/asbestos geologic areas)	☒		
TTHMs and HAA5s	☒		
Lead and Copper, # sites: 10	☐	1 / 3 years	2015
Other Sampling:			
TOC	☒		
Turbidity	☒		
Source Water Coliform	☒		
Other (specify) _____	☐		

Yes **No**

☒ ☐ • Is all required monitoring current?

Comments:

Yes **No**

☐ ☐ Has the system experienced chemical (last 5 years) or bacteriological (last 2 years) detections?
If yes, list what contaminant and when?

☐ ☐ • Have all MCL violations been addressed? ☒ N/A

☒ ☐ Does the system have any monitoring reductions granted? Explain:

Yes – Rads

☒ ☐ • Does the system have a written coliform sampling plan?

Does the plan include:

Yes	No		Yes	No	
☒	☐	Brief narrative	☒	☐	Rotation schedule
☒	☐	Distribution map	☒	☐	Repeat locations
☒	☐	Sample site locations	☒	☐	Source(s) ☐ N/A

☐ ☐ Are TTHM and HAA5 samples taken at location of maximum residence time? (☒ Not required)
Where in the system are the monitoring sites for TTHM and HAA5?

Comments:

Management & Operations

O&M Manual and Emergency Response Plan

Yes	No	
☒	☐	• Does system have an operation and maintenance manual?
☒	☐	• Does system have an emergency response plan?

Operator Certification

Requirements for system: WD: 1 WT: ____ ☐ FE required Small System: ☐

Name	Certification Number	WT Level	WD Level	FE	Small System
DRC:*Pete Pate			II	☐	☐
Charles Case				☐	☒
Allen Harris		III		☐	☐
Floyd Hescock				☐	☒
				☐	☐

*DRC= direct responsible charge. Attach additional sheets if necessary to list all certified personnel.

Yes	No	
☒	☐	Is DRC identified?
☒	☐	• Is DRC certified at appropriate level?
☐	☒	• Does system have written operating protocols for other operators? ☐ N/A

If DRC is a Contract Operator:

Yes	No	
☐	☒	Does DWP have contract on file? ☐ N/A
		How does contract operator work with system? ☐ N/A

Plan Review/Master Plan

Yes	No	
☒	☐	• Have all major modifications (since 8/21/81) been approved by DWP?
☐	☒	Does system have a current plan review exemption for water main extensions?
☐	☒	• Does the system have a current (<20 yr. old) master plan? (☐ Not required if < 300 connections)
		What year was the plan completed? ____
☐	☐	Does the master plan include a water conservation plan?

Compliance Status

Yes	No	
☒	☐	• Is water system in compliance (all orders resolved and not a significant non-complier)?
		How many violations has the system had in the past two years? ____
☐	☐	• Does the system issue Public Notice for Violations as required? ☒ No violations requiring public notice

Other

☐	☒	Has a capacity assessment been completed by DWP? If yes, list deficiencies noted:
☒	☐	• Are consumer confidence reports sent to users each year and certified?

Comments:
Master Plan letter of intent has been signed by Chiloquin to Adkin Engineers. Grant Letter of Award for part of the funding for plan has been given to Chiloquin.

APPENDIX D

ISO
4B Eves Drive, Suite 200
P.O. Box 961
Marlton, NJ 08053-3112

t 1.800.444.4554 Opt. 2
f 1.800.777.3929

March 30, 2015

Mr. Joe Hobbs, Mayor
Chiloquin Agency Lake FD
PO Box 196
Chiloquin, Oregon, 97624

RE: Chiloquin Agency Lake FD, Klamath County, Oregon
Public Protection Classification: 04/4Y , Chiloquin 04
Effective Date: July 01, 2015

Dear Mr. Joe Hobbs,

We wish to thank you Mr. Pete Pate, Mr. Dell Havird and Chief Dewaine Holster for your cooperation during our recent Public Protection Classification (PPC) survey. ISO has completed its analysis of the structural fire suppression delivery system provided in your community. The resulting classification is

Enclosed is a summary of the ISO analysis of your fire suppression services. If you would like to know more about your community's PPC classification, or if you would like to learn about the potential effect of proposed changes to your fire suppression delivery system, please call us at the phone number listed below.

ISO's Public Protection Classification Program (PPC) plays an important role in the underwriting process at insurance companies. In fact, most U.S. insurers – including the largest ones – use PPC information as part of their decision- making when deciding what business to write, coverage's to offer or prices to charge for personal or commercial property insurance.

Each insurance company independently determines the premiums it charges its policyholders. The way an insurer uses ISO's information on public fire protection may depend on several things – the company's fire-loss experience, ratemaking methodology, underwriting guidelines, and its marketing strategy.

Through ongoing research and loss experience analysis, we identified additional differentiation in fire loss experience within our PPC program, which resulted in the revised classifications. We based the differing fire loss experience on the fire suppression capabilities of each community. The new classifications will improve the predictive value for insurers while benefiting both commercial and residential property owners. We've published the new classifications as "X" and "Y" — formerly the "9" and "8B" portion of the split classification, respectively. For example:

- A community currently graded as a split 6/9 classification will now be a split 6/6X classification; with the "6X" denoting what was formerly classified as "9."
- Similarly, a community currently graded as a split 6/8B classification will now be a split 6/6Y classification, the "6Y" denoting what was formerly classified as "8B."
- Communities graded with single "9" or "8B" classifications will remain intact.

PPC is important to communities and fire departments as well. Communities whose PPC improves may get lower insurance prices. PPC also provides fire departments with a valuable benchmark, and is used by many departments as a valuable tool when planning, budgeting and justifying fire protection improvements.

ISO appreciates the high level of cooperation extended by local officials during the entire PPC survey process. The community protection baseline information gathered by ISO is an essential foundation upon which determination of the relative level of fire protection is made using the Fire Suppression Rating Schedule.

The classification is a direct result of the information gathered, and is dependent on the resource levels devoted to fire protection in existence at the time of survey. Material changes in those resources that occur after the survey is completed may affect the classification. Although ISO maintains a pro-active process to keep baseline information as current as possible, in the event of changes or questions, please call customer service at 1-800-444-4554, option 2 to expedite the update activity.

ISO is the leading supplier of data and analytics for the property/casualty insurance industry. Most insurers use PPC classifications for underwriting and calculating premiums for residential, commercial and industrial properties. The PPC program is not intended to analyze all aspects of a comprehensive structural fire suppression delivery system program. It is not for purposes of determining compliance with any state or local law, nor is it for making loss prevention or life safety recommendations.

If you have any questions about your classification, please let us know.

Sincerely,

Dominic Santanna

Dominic Santanna
Manager - National Processing Center

Encl.

cc: Mr. Norman Fowler, Board Chairman, Chiloquin Agency Lake FD
Mr. Pete Pate, Water Superintendent, CHILOQUIN WATER DEPARTMENT
Mr. Dell Havird, Manager, Jeldwin Water System
Mr. Corey Wells, Water Superintendent, Klamath Tribes Pine Grove Water Station
Mr. Nick Rich, Water Superintendent, Klamoya Casino
Mr. Charles Brumble, Water Superintendent, Oregon Shores Recreational Club
Chief Dewaine Holster, Chief, Chiloquin Agency Lake Fire Department
Mr. KEITH ENDACOTT, 911 Director, KLAMATH 911 COMMUNICATION DISTRICT

Public Protection Classification

(PPC™)

Summary Report

Chiloquin Agency Lake FD

OREGON

Prepared by

Insurance Services Office, Inc.
4B Eves Drive, Suite 200
P.O. Box 961
Marlton, New Jersey 08053-3112
(856) 985-5600

March 27, 2015

PPC is a registered trademark of Insurance Services Office, Inc.

Background Information

Introduction

ISO collects and evaluates information from communities in the United States on their structure fire suppression capabilities. The data is analyzed using our Fire Suppression Rating Schedule (FSRS) and then a Public Protection Classification (PPC™) grade is assigned to the community. The surveys are conducted whenever it appears that there is a possibility of a PPC change. As such, the PPC program provides important, up-to-date information about fire protection services throughout the country.

The FSRS recognizes fire protection features only as they relate to suppression of first alarm structure fires. In many communities, fire suppression may be only a small part of the fire department's overall responsibility. ISO recognizes the dynamic and comprehensive duties of a community's fire service, and understands the complex decisions a community must make in planning and delivering emergency services. However, in developing a community's PPC grade, only features related to reducing property losses from structural fires are evaluated. Multiple alarms, simultaneous incidents and life safety are not considered in this evaluation. The PPC program evaluates the fire protection for small to average size buildings. Specific properties with a Needed Fire Flow in excess of 3,500 gpm are evaluated separately and assigned an individual PPC grade.

A community's investment in fire mitigation is a proven and reliable predictor of future fire losses. Statistical data on insurance losses bears out the relationship between excellent fire protection – as measured by the PPC program – and low fire losses. So, insurance companies use PPC information for marketing, underwriting, and to help establish fair premiums for homeowners and commercial fire insurance. In general, the price of fire insurance in a community with a good PPC grade is substantially lower than in a community with a poor PPC grade, assuming all other factors are equal.

ISO is an independent company that serves insurance companies, communities, fire departments, insurance regulators, and others by providing information about risk. ISO's expert staff collects information about municipal fire suppression efforts in communities throughout the United States. In each of those communities, ISO analyzes the relevant data and assigns a PPC grade – a number from 1 to 10. Class 1 represents an exemplary fire suppression program, and Class 10 indicates that the area's fire suppression program does not meet ISO's minimum criteria.

ISO's PPC program evaluates communities according to a uniform set of criteria, incorporating nationally recognized standards developed by the National Fire Protection Association and the American Water Works Association. A community's PPC grade depends on:

- **Needed Fire Flows**, which are representative building locations used to determine the theoretical amount of water necessary for fire suppression purposes.
- **Emergency Communications**, including emergency reporting, telecommunicators, and dispatching systems.
- **Fire Department**, including equipment, staffing, training, geographic distribution of fire companies, operational considerations, and community risk reduction.
- **Water Supply**, including inspection and flow testing of hydrants, alternative water supply operations, and a careful evaluation of the amount of available water compared with the amount needed to suppress fires up to 3,500 gpm.

PPC is a registered trademark of Insurance Services Office, Inc.

Data Collection and Analysis

ISO has evaluated and classified over 48,000 fire protection areas across the United States using its FSRS. A combination of meetings between trained ISO field representatives and the dispatch center coordinator, community fire official, and water superintendent is used in conjunction with a comprehensive questionnaire to collect the data necessary to determine the PPC grade. In order for a community to obtain a grade better than a Class 9, three elements of fire suppression features are reviewed. These three elements are Emergency Communications, Fire Department, and Water Supply.

A review of the **Emergency Communications** accounts for 10% of the total classification. This section is weighted at **10 points,** as follows:

- Emergency Reporting 3 points
- Telecommunicators 4 points
- Dispatch Circuits 3 points

A review of the **Fire Department** accounts for 50% of the total classification. ISO focuses on a fire department's first alarm response and initial attack to minimize potential loss. The fire department section is weighted at **50 points,** as follows:

- Engine Companies 6 points
- Reserve Pumpers 0.5 points
- Pump Capacity 3 points
- Ladder/Service Companies 4 points
- Reserve Ladder/Service Trucks 0.5 points
- Deployment Analysis 10 points
- Company Personnel 15 points
- Training 9 points
- Operational considerations 2 points
- Community Risk Reduction 5.5 points (In addition to the 50 points above)

A review of the **Water Supply** system accounts for 40% of the total classification. ISO reviews the water supply a community uses to determine the adequacy for fire suppression purposes. The water supply system is weighted at **40 points,** as follows:

- Credit for Supply System 30 points
- Hydrant Size, Type & Installation 3 points
- Inspection & Flow Testing of Hydrants 7 points

There is one additional factor considered in calculating the final score – **Divergence**.

Even the best fire department will be less than fully effective if it has an inadequate water supply. Similarly, even a superior water supply will be less than fully effective if the fire department lacks the equipment or personnel to use the water. The FSRS score is subject to modification by a divergence factor, which recognizes disparity between the effectiveness of the fire department and the water supply.

The Divergence factor mathematically reduces the score based upon the relative difference between the fire department and water supply scores. The factor is introduced in the final equation.

PPC Grade

The PPC grade assigned to the community will depend on the community's score on a 100-point scale:

PPC	Points
1	90.00 or more
2	80.00 to 89.99
3	70.00 to 79.99
4	60.00 to 69.99
5	50.00 to 59.99
6	40.00 to 49.99
7	30.00 to 39.99
8	20.00 to 29.99
9	10.00 to 19.99
10	0.00 to 9.99

The classification numbers are interpreted as follows:

- Class 1 through (and including) Class 8 represents a fire suppression system that includes an FSRS creditable dispatch center, fire department, and water supply.
- Class 8B is a special classification that recognizes a superior level of fire protection in otherwise Class 9 areas. It is designed to represent a fire protection delivery system that is superior except for a lack of a water supply system capable of the minimum FSRS fire flow criteria of 250 gpm for 2 hours.
- Class 9 is a fire suppression system that includes a creditable dispatch center, fire department but no FSRS creditable water supply.
- Class 10 does not meet minimum FSRS criteria for recognition, including areas that are beyond five road miles of a recognized fire station.

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New PPC program changes effective July 1, 2014

We have revised the PPC program to capture the effects of enhanced fire protection capabilities that reduce fire loss and fire severity in Split Class 9 and Split Class 8B areas (as outlined below). This new structure benefits the fire service, community, and property owner.

New classifications

Through ongoing research and loss experience analysis, we identified additional differentiation in fire loss experience within our PPC program, which resulted in the revised classifications. We based the differing fire loss experience on the fire suppression capabilities of each community. The new PPC classes will improve the predictive value for insurers while benefiting both commercial and residential property owners. Here are the new classifications and what they mean.

Split classifications

When we develop a split classification for a community — for example 5/9 — the first number is the class that applies to properties within 5 road miles of the responding fire station and 1,000 feet of a creditable water supply, such as a fire hydrant, suction point, or dry hydrant. The second number is the class that applies to properties within 5 road miles of a fire station but beyond 1,000 feet of a creditable water supply. We have revised the classification to reflect more precisely the risk of loss in a community, replacing Class 9 and 8B in the second part of a split classification with revised designations.

What's changed with the new classifications?

We've published the new classifications as "X" and "Y" — formerly the "9" and "8B" portion of the split classification, respectively. For example:

- A community currently displayed as a split 6/9 classification will now be a split 6/6X classification; with the "6X" denoting what was formerly classified as "9".
- Similarly, a community currently graded as a split 6/8B classification will now be a split 6/6Y classification, the "6Y" denoting what was formerly classified as "8B".
- Communities graded with single "9" or "8B" classifications will remain intact.

Prior Classification	New Classification
1/9	1/1X
2/9	2/2X
3/9	3/3X
4/9	4/4X
5/9	5/5X
6/9	6/6X
7/9	7/7X
8/9	8/8X
9	9

Prior Classification	New Classification
1/8B	1/1Y
2/8B	2/2Y
3/8B	3/3Y
4/8B	4/4Y
5/8B	5/5Y
6/8B	6/6Y
7/8B	7/7Y
8/8B	8/8Y
8B	8B

What's changed?
As you can see, we're still maintaining split classes, but it's how we represent them to insurers that's changed. The new designations reflect a reduction in fire severity and loss and have the potential to reduce property insurance premiums.

Benefits of the revised split class designations

- To the fire service, the revised designations identify enhanced fire suppression capabilities used throughout the fire protection area
- To the community, the new classes reward a community's fire suppression efforts by showing a more reflective designation
- To the individual property owner, the revisions offer the potential for decreased property insurance premiums

New water class
Our data also shows that risks located more than 5 but less than 7 road miles from a responding fire station with a creditable water source within 1,000 feet had better loss experience than those farther than 5 road miles from a responding fire station with no creditable water source. We've introduced a new classification —10W — to recognize the reduced loss potential of such properties.

What's changed with Class 10W?
Class 10W is property-specific. Not all properties in the 5-to-7-mile area around the responding fire station will qualify. The difference between Class 10 and 10W is that the 10W-graded risk or property is within 1,000 feet of a creditable water supply. Creditable water supplies include fire protection systems using hauled water in any of the split classification areas.

What's the benefit of Class 10W?
10W gives credit to risks within 5 to 7 road miles of the responding fire station and within 1,000 feet of a creditable water supply. That's reflective of the potential for reduced property insurance premiums.

What does the fire chief have to do?
Fire chiefs don't have to do anything at all. The revised classifications went in place automatically effective July 1, 2014 (July 1, 2015 for Texas).

What if I have additional questions?
Feel free to contact ISO at 800.444.4554 or email us at PPC-Cust-Serv@iso.com.

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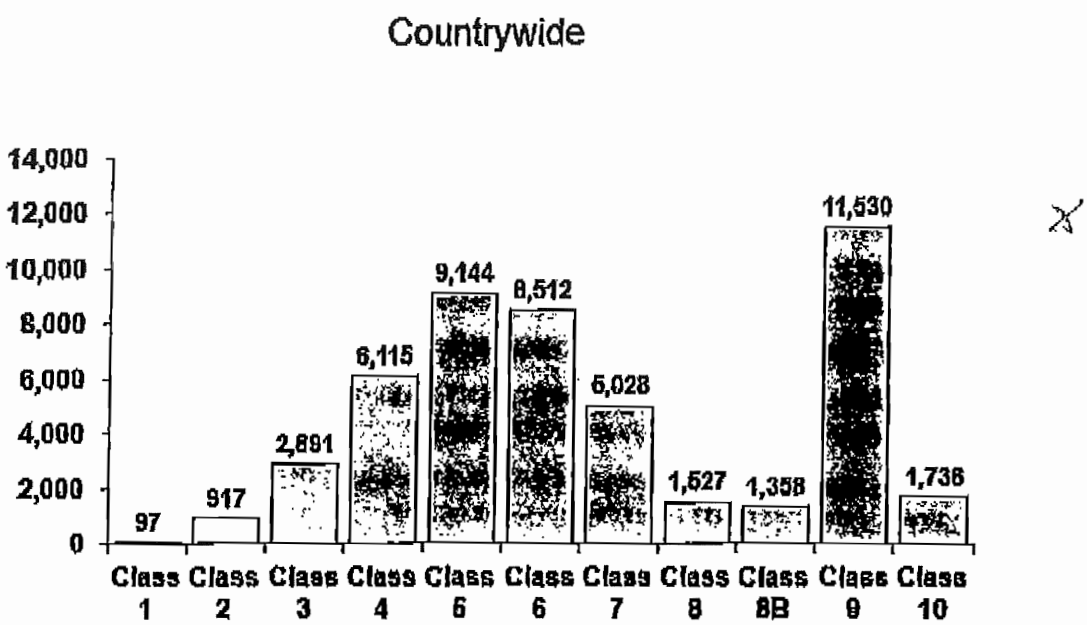
Distribution of PPC Grades

The 2015 published countrywide distribution of communities by the PPC grade is as follows:



Assistance

The PPC program offers help to communities, fire departments, and other public officials as they plan for, budget, and justify improvements. ISO is also available to assist in the understanding of the details of this evaluation.

The PPC program representatives can be reached by telephone at (800) 444-4554. The technical specialists at this telephone number have access to the details of this evaluation and can effectively speak with you about your questions regarding the PPC program. What's more, we can be reached via the Internet at www.isomitigation.com/talk/.

We also have a website dedicated to our Community Hazard Mitigation Classification programs at www.isomitigation.com. Here, fire chiefs, building code officials, community leaders and other interested citizens can access a wealth of data describing the criteria used in evaluating how cities and towns are protecting residents from fire and other natural hazards. This website will allow you to learn more about the PPC program. The website provides important background information, insights about the PPC grading processes and technical documents. ISO is also pleased to offer Fire Chiefs Online — a special, secured website with information and features that can help improve your PPC grade, including a list of the Needed Fire Flows for all the commercial occupancies ISO has on file for your community. Visitors to the site can download information, see statistical results and also contact ISO for assistance.

In addition, on-line access to the FSRS and its commentaries is available to registered customers for a fee. However, fire chiefs and community chief administrative officials are given access privileges to this information without charge.

To become a registered fire chief or community chief administrative official, register at www.isomitigation.com.

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PPC Review

ISO concluded its review of the fire suppression features being provided for Chiloquin Agency Lake FD. The resulting community classification is **Class 04/4Y**.

If the classification is a single class, the classification applies to properties with a Needed Fire Flow of 3,500 gpm or less in the community. If the classification is a split class (e.g., 6/XX):

- The first class (e.g., "6" in a 6/XX) applies to properties within 5 road miles of a recognized fire station and within 1,000 feet of a fire hydrant or alternate water supply.
- The second class (XX or XY) applies to properties beyond 1,000 feet of a fire hydrant but within 5 road miles of a recognized fire station.
- Alternative Water Supply: The first class (e.g., "6" in a 6/10) applies to properties within 5 road miles of a recognized fire station with no hydrant distance requirement.
- Class 10 applies to properties over 5 road miles of a recognized fire station.
- Class 10W applies to properties within 5 to 7 road miles of a recognized fire station with a recognized water supply within 1,000 feet.
- Specific properties with a Needed Fire Flow in excess of 3,500 gpm are evaluated separately and assigned an individual classification.

FSRS Feature	Earned Credit	Credit Available
Emergency Communications		
414. Credit for Emergency Reporting	3.00	3
422. Credit for Telecommunicators	4.00	4
432. Credit for Dispatch Circuits	1.80	3
440. Credit for Receiving and Handling Fire Alarms	8.80	10
Fire Department		
513. Credit for Engine Companies	5.21	6
523. Credit for Reserve Pumpers	0.18	0.50
532. Credit for Pump Capacity	3.00	3
549. Credit for Ladder Service	1.93	4
553. Credit for Reserve Ladder and Service Trucks	0.00	0.50
561. Credit for Deployment Analysis	6.70	10
571. Credit for Company Personnel	2.90	15
581. Credit for Training	5.26	9
730. Credit for Operational Considerations	2.00	2
590. Credit for Fire Department	27.18	50
Water Supply		
616. Credit for Supply System	16.98	30
621. Credit for Hydrants	2.88	3
631. Credit for Inspection and Flow Testing	5.51	7
640. Credit for Water Supply	25.37	40
Divergence	-1.81	--
1050. Community Risk Reduction	5.09	5.50
Total Credit	64.63	105.50

Emergency Communications

Ten percent of a community's overall score is based on how well the communications center receives and dispatches fire alarms. Our field representative evaluated:

- Communications facilities provided for the general public to report structure fires
- Enhanced 9-1-1 Telephone Service including wireless
- Computer-aided dispatch (CAD) facilities
- Alarm receipt and processing at the communication center
- Training and certification of telecommunicators
- Facilities used to dispatch fire department companies to reported structure fires

	Earned Credit	Credit Available
414. Credit Emergency Reporting	3.00	3
422. Credit for Telecommunicators	4.00	4
432. Credit for Dispatch Circuits	1.80	3
Item 440. Credit for Emergency Communications:	**8.80**	**10**

Item 414 - Credit for Emergency Reporting (3 points)

The first item reviewed is Item 414 "Credit for Emergency Reporting (CER)". This item reviews the emergency communication center facilities provided for the public to report fires including 911 systems (Basic or Enhanced), Wireless Phase I and Phase II, Voice over Internet Protocol, Computer Aided Dispatch and Geographic Information Systems for automatic vehicle location. ISO uses National Fire Protection Association (NFPA) 1221, *Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems* as the reference for this section.

Item 410. Emergency Reporting (CER)	Earned Credit	Credit Available
A./B. Basic 9-1-1, Enhanced 9-1-1 or No 9-1-1 For maximum credit, there should be an Enhanced 9-1-1 system, Basic 9-1-1 and No 9-1-1 will receive partial credit.	20.00	20
1. E9-1-1 Wireless Wireless Phase I using Static ALI (automatic location identification) Functionality (10 points); Wireless Phase II using Dynamic ALI Functionality (15 points); Both available will be 25 points	25.00	25
2. E9-1-1 Voice over Internet Protocol (VoIP) Static VoIP using Static ALI Functionality (10 points); Nomadic VoIP using Dynamic ALI Functionality (15 points); Both available will be 25 points	25.00	25
3. Computer Aided Dispatch Basic CAD (5 points); CAD with Management Information System (5 points); CAD with Interoperability (5 points)	15.00	15
4. Geographic Information System (GIS/AVL) The PSAP uses a fully integrated CAD/GIS management system with automatic vehicle location (AVL) integrated with a CAD system providing dispatch assignments.	15.00	15
Review of Emergency Reporting total:	100.00	100

Item 422- Credit for Telecommunicators (4 points)

The second item reviewed is Item 422 "Credit for Telecommunicators (TC)". This item reviews the number of Telecommunicators on duty at the center to handle fire calls and other emergencies. All emergency calls including those calls that do not require fire department action are reviewed to determine the proper staffing to answer emergency calls and dispatch the appropriate emergency response. NFPA 1221, *Standard for the Installation, Maintenance and Use of Emergency Services Communications Systems,* recommends that ninety-five percent of emergency calls shall be answered within 15 seconds and ninety-nine percent of emergency calls shall be answered within 40 seconds. In addition, NFPA recommends that ninety percent of emergency alarm processing shall be completed within 60 seconds and ninety-nine percent of alarm processing shall be completed within 90 seconds of answering the call.

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To receive full credit for operators on duty, ISO must review documentation to show that the communication center meets NFPA 1221 call answering and dispatch time performance measurement standards. This documentation may be in the form of performance statistics or other performance measurements compiled by the 9-1-1 software or other software programs that are currently in use such as Computer Aided Dispatch (CAD) or Management Information System (MIS).

Item 420. Telecommunicators (CTC)	Earned Credit	Credit Available
A1. Alarm Receipt (AR) Receipt of alarms shall meet the requirements in accordance with the criteria of NFPA 1221	20.00	20
A2. Alarm Processing (AP) Processing of alarms shall meet the requirements in accordance with the criteria of NFPA 1221	20.00	20
B. Emergency Dispatch Protocols (EDP) Telecommunicators have emergency dispatch protocols (EDP) containing questions and a decision-support process to facilitate correct call categorization and prioritization.	20.00	20
C. Telecommunicator Training and Certification (TTC) Telecommunicators meet the qualification requirements referenced in NFPA 1061, *Standard for Professional Qualifications for Public Safety Telecommunicator,* and/or the Association of Public-Safety Communications Officials - International (APCO) *Project 33.* Telecommunicators are certified in the knowledge, skills, and abilities corresponding to their job functions.	20.00	20
D. Telecommunicator Continuing Education and Quality Assurance (TQA) Telecommunicators participate in continuing education and/or in-service training and quality-assurance programs as appropriate for their positions	20.00	20
Review of Telecommunicators total:	100.00	100

Item 432 - Credit for Dispatch Circuits (3 points)

The third item reviewed is Item 432 "Credit for Dispatch Circuits (CDC)". This item reviews the dispatch circuit facilities used to transmit alarms to fire department members. A "Dispatch Circuit" is defined in NFPA 1221 as "A circuit over which an alarm is transmitted from the communications center to an emergency response facility (ERF) or emergency response units (ERUs) to notify ERUs to respond to an emergency". All fire departments (except single fire station departments with full-time firefighter personnel receiving alarms directly at the fire station) need adequate means of notifying all firefighter personnel of the location of reported structure fires. The dispatch circuit facilities should be in accordance with the general criteria of NFPA 1221. "Alarms" are defined in this Standard as "A signal or message from a person or device indicating the existence of an emergency or other situation that requires action by an emergency response agency".

There are two different levels of dispatch circuit facilities provided for in the Standard – a primary dispatch circuit and a secondary dispatch circuit. In jurisdictions that receive 730 alarms or more per year (average of two alarms per 24-hour period), two separate and dedicated dispatch circuits, a primary and a secondary, are needed. In jurisdictions receiving fewer than 730 alarms per year, a second dedicated dispatch circuit is not needed. Dispatch circuit facilities installed but not used or tested (in accordance with the NFPA Standard) receive no credit.

The score for Credit for Dispatch Circuits (CDC) is influenced by monitoring for integrity of the primary dispatch circuit. There are up to 0.90 points available for this item. Monitoring for integrity involves installing automatic systems that will detect faults and failures and send visual and audible indications to appropriate communications center (or dispatch center) personnel. ISO uses NFPA 1221 to guide the evaluation of this item. ISO's evaluation also includes a review of the communication system's emergency power supplies.

Item 432 "Credit for Dispatch Circuits (CDC)" = 1.80 points

Fire Department

Fifty percent of a community's overall score is based upon the fire department's structure fire suppression system. ISO's field representative evaluated:

- Engine and ladder/service vehicles including reserve apparatus
- Equipment carried
- Response to reported structure fires
- Deployment analysis of companies
- Available and/or responding firefighters
- Training

	Earned Credit	Credit Available
513. Credit for Engine Companies	**5.21**	6
523. Credit for Reserve Pumpers	**0.18**	0.5
532. Credit for Pumper Capacity	**3.00**	3
549. Credit for Ladder Service	**1.93**	4
553. Credit for Reserve Ladder and Service Trucks	**0.00**	0.5
561. Credit for Deployment Analysis	**6.70**	10
571. Credit for Company Personnel	**2.90**	15
581. Credit for Training	**5.26**	9
581. Credit for Operational Considerations	**2.00**	2
Item 590. Credit for Fire Department:	**27.18**	**50**

Basic Fire Flow

The Basic Fire Flow for the community is determined by the review of the Needed Fire Flows for selected buildings in the community. The fifth largest Needed Fire Flow is determined to be the Basic Fire Flow. The Basic Fire Flow has been determined to be 3500 gpm.

Item 513 - Credit for Engine Companies (6 points)

The first item reviewed is Item 513 "Credit for Engine Companies (CEC)". This item reviews the number of engine companies, their pump capacity, hose testing, pump testing and the equipment carried on the in-service pumpers. To be recognized, pumper apparatus must meet the general criteria of NFPA 1901, *Standard for Automotive Fire Apparatus* which include a minimum 250 gpm pump, an emergency warning system, a 300 gallon water tank, and hose. At least 1 apparatus must have a permanently mounted pump rated at 750 gpm or more at 150 psi.

The review of the number of needed pumpers considers the response distance to built-upon areas; the Basic Fire Flow; and the method of operation. Multiple alarms, simultaneous incidents, and life safety are not considered.

The greatest value of A, B, or C below is needed in the fire district to suppress fires in structures with a Needed Fire Flow of 3,500 gpm or less: **3 engine companies**

a) **3 engine companies** to provide fire suppression services to areas to meet NFPA 1710 criteria or within 1½ miles.

b) **3 engine companies** to support a Basic Fire Flow of 3500 gpm.

c) **3 engine companies** based upon the fire department's method of operation to provide a minimum two engine response to all first alarm structure fires.

The FSRS recognizes that there are **3 engine companies** in service.

The FSRS also reviews Automatic Aid. Automatic Aid is considered in the review as assistance dispatched automatically by contractual agreement between two communities or fire districts. That differs from mutual aid or assistance arranged case by case. ISO will recognize an Automatic Aid plan under the following conditions:

- It must be prearranged for first alarm response according to a definite plan. It is preferable to have a written agreement, but ISO may recognize demonstrated performance.
- The aid must be dispatched to all reported structure fires on the initial alarm.
- The aid must be provided 24 hours a day, 365 days a year.

FSRS Item 512.D "Automatic Aid Engine Companies" responding on first alarm and meeting the needs of the city for basic fire flow and/or distribution of companies are factored based upon the value of the Automatic Aid plan (up to 1.00 can be used as the factor). The Automatic Aid factor is determined by a review of the Automatic Aid provider's communication facilities, how they receive alarms from the graded area, inter-department training between fire departments, and the fire ground communications capability between departments.

For each engine company, the credited Pump Capacity (PC), the Hose Carried (HC), the Equipment Carried (EC) all contribute to the calculation for the percent of credit the FSRS provides to that engine company.

Item 513 "Credit for Engine Companies (CEC)" = 5.21 points

Item 523 - Credit for Reserve Pumpers (0.50 points)

The item is Item 523 "Credit for Reserve Pumpers (CRP)". This item reviews the number and adequacy of the pumpers and their equipment. The number of needed reserve pumpers is 1 for each 8 needed engine companies determined in Item 513, or any fraction thereof.

Item 523 "Credit for Reserve Pumpers (CRP)" = 0.18 points

Item 532 – Credit for Pumper Capacity (3 points)

The next item reviewed is Item 532 "Credit for Pumper Capacity (CPC)". The total pump capacity available should be sufficient for the Basic Fire Flow of 3500 gpm. The maximum needed pump capacity credited is the Basic Fire Flow of the community.

Item 532 "Credit for Pumper Capacity (CPC)" = 3.00 points

Item 549 – Credit for Ladder Service (4 points)

The next item reviewed is Item 549 "Credit for Ladder Service (CLS)". This item reviews the number of response areas within the city with 5 buildings that are 3 or more stories or 35 feet or more in height, or with 5 buildings that have a Needed Fire Flow greater than 3,500 gpm, or any combination of these criteria. The height of all buildings in the city, including those protected by automatic sprinklers, is considered when determining the number of needed ladder companies. Response areas not needing a ladder company should have a service company. Ladders, tools and equipment normally carried on ladder trucks are needed not only for ladder operations but also for forcible entry, ventilation, salvage, overhaul, lighting and utility control.

The number of ladder or service companies, the height of the aerial ladder, aerial ladder testing and the equipment carried on the in-service ladder trucks and service trucks is compared with the number of needed ladder trucks and service trucks and an FSRS equipment list. Ladder trucks must meet the general criteria of NFPA 1901, *Standard for Automotive Fire Apparatus* to be recognized.

The number of needed ladder-service trucks is dependent upon the number of buildings 3 stories or 35 feet or more in height, buildings with a Needed Fire Flow greater than 3,500 gpm, and the method of operation.

The FSRS recognizes that there are **0 ladder companies** in service. These companies are needed to provide fire suppression services to areas to meet NFPA 1710 criteria or within 2½ miles and the number of buildings with a Needed Fire Flow over 3,500 gpm or 3 stories or more in height, or the method of operation.

The FSRS recognizes that there are **2 service companies** in service.

Item 549 "Credit for Ladder Service (CLS)" = 1.93 points

Item 553 – Credit for Reserve Ladder and Service Trucks (0.50 points)

The next item reviewed is Item 553 "Credit for Reserve Ladder and Service Trucks (CRLS)". This item considers the adequacy of ladder and service apparatus when one (or more in larger communities) of these apparatus are out of service. The number of needed reserve ladder and service trucks is 1 for each 8 needed ladder and service companies that were determined to be needed in Item 540, or any fraction thereof.

Item 553 "Credit for Reserve Ladder and Service Trucks (CRLS)" = 0.00 points

Item 561 – Deployment Analysis (10 points)

Next, Item 561 "Deployment Analysis (DA)" is reviewed. This item examines the number and adequacy of existing engine and ladder-service companies to cover built-upon areas of the city.

To determine the Credit for Distribution, first the Existing Engine Company (EC) points and the Existing Engine Companies (EE) determined in Item 513 are considered along with Ladder Company Equipment (LCE) points, Service Company Equipment (SCE) points, Engine-Ladder Company Equipment (ELCE) points, and Engine-Service Company Equipment (ESCE) points determined in Item 549.

Secondly, as an alternative to determining the number of needed engine and ladder/service companies through the road-mile analysis, a fire protection area may use the results of a systematic performance evaluation. This type of evaluation analyzes computer-aided dispatch (CAD) history to demonstrate that, with its current deployment of companies, the fire department meets the time constraints for initial arriving engine and initial full alarm assignment in accordance with the general criteria of in NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.*

A determination is made of the percentage of built upon area within 1½ miles of a first-due engine company and within 2½ miles of a first-due ladder-service company.

Item 561 "Credit Deployment Analysis (DA)" = 6.70 points

Item 571 – Credit for Company Personnel (15 points)

Item 571 "Credit for Company Personnel (CCP)" reviews the average number of existing firefighters and company officers available to respond to reported first alarm structure fires in the city.

The on-duty strength is determined by the yearly average of total firefighters and company officers on-duty considering vacations, sick leave, holidays, "Kelley" days and other absences. When a fire department operates under a minimum staffing policy, this may be used in lieu of determining the yearly average of on-duty company personnel.

Firefighters on apparatus not credited under Items 513 and 549 that regularly respond to reported first alarms to aid engine, ladder, and service companies are included in this Item as increasing the total company strength.

Firefighters staffing ambulances or other units serving the general public are credited if they participate in fire-fighting operations, the number depending upon the extent to which they are available and are used for response to first alarms of fire.

On-Call members are credited on the basis of the average number staffing apparatus on first alarms. Off-shift career firefighters and company officers responding on first alarms are considered on the same basis as on-call personnel. For personnel not normally at the fire station, the number of responding firefighters and company officers is divided by 3 to reflect the time needed to assemble at the fire scene and the reduced ability to act as a team due to the various arrival times at the fire location when compared to the personnel on-duty at the fire station during the receipt of an alarm.

The number of Public Safety Officers who are positioned in emergency vehicles within the jurisdiction boundaries may be credited based on availability to respond to first alarm structure fires. In recognition of this increased response capability the number of responding Public Safety Officers is divided by 2.

The average number of firefighters and company officers responding with those companies credited as Automatic Aid under Items 513 and 549 are considered for either on-duty or on-call company personnel as is appropriate. The actual number is calculated as the average number of company personnel responding multiplied by the value of AA Plan determined in Item 512.D.

The maximum creditable response of on-duty and on-call firefighters is 12, including company officers, for each existing engine and ladder company and 6 for each existing service company.

Chief Officers are not creditable except when more than one chief officer responds to alarms; then extra chief officers may be credited as firefighters if they perform company duties.

The FSRS recognizes **1.30 on-duty personnel** and an average of **10.00 on-call personnel** responding on first alarm structure fires.

Item 571 "Credit for Company Personnel (CCP)" = 2.90 points

Item 581 – Credit for Training (9 points)

Training	Earned Credit	Credit Available
A. Facilities, and Use For maximum credit, each firefighter should receive 18 hours per month in structure fire related subjects as outlined in NFPA 1001.	21.0(	35
B. Company Training For maximum credit, each firefighter should receive 16 hours per month in structure fire related subjects as outlined in NFPA 1001.	18.75	25
C. Classes for Officers For maximum credit, each officer should be certified in accordance with the general criteria of NFPA 1021. Additionally, each officer should receive 12 hours of continuing education on or off site.	6.20	12
D. New Driver and Operator Training For maximum credit, each new driver and operator should receive 60 hours of driver/operator training per year in accordance with NFPA 1002 and NFPA 1451.	3.33	5
E. Existing Driver and Operator Training For maximum credit, each existing driver and operator should receive 12 hours of driver/operator training per year in accordance with NFPA 1002 and NFPA 1451.	5.00	5
F. Training on Hazardous Materials For maximum credit, each firefighter should receive 6 hours of training for incidents involving hazardous materials in accordance with NFPA 472.	1.00	1
G. Recruit Training For maximum credit, each firefighter should receive 240 hours of structure fire related training in accordance with NFPA 1001 within the first year of employment or tenure.	3.13	5
H. Pre-Fire Planning Inspections For maximum credit, pre-fire planning inspections of each commercial, industrial, institutional, and other similar type building (all buildings except 1-4 family dwellings) should be made annually by company members. Records of inspections should include up-to date notes and sketches.	0.00	12

Item 580 "Credit for Training (CT)" = 5.26 points

Item 730 – Operational Considerations (2 points)

Item 730 "Credit for Operational Considerations (COC)" evaluates fire department standard operating procedures and incident management systems for emergency operations involving structure fires.

Operational Considerations	Earned Credit	Credit Available
Standard Operating Procedures The department should have established SOPs for fire department general emergency operations	50	50
Incident Management Systems The department should use an established incident management system (IMS)	50	50
Operational Considerations total:	100	100

Item 730 "Credit for Operational Considerations (COC)" = 2.00 points

Water Supply

Forty percent of a community's overall score is based on the adequacy of the water supply system. The ISO field representative evaluated:

- the capability of the water distribution system to meet the Needed Fire Flows at selected locations up to 3,500 gpm.
- size, type and installation of fire hydrants.
- inspection and flow testing of fire hydrants.

	Earned Credit	Credit Available
616. Credit for Supply System	16.98	30
621. Credit for Hydrants	2.88	3
631. Credit for Inspection and Flow Testing	5.51	7
Item 640. Credit for Water Supply:	25.37	40

Item 616 – Credit for Supply System (30 points)

The first item reviewed is Item 616 "Credit for Supply System (CSS)". This item reviews the rate of flow that can be credited at each of the Needed Fire Flow test locations considering the supply works capacity, the main capacity and the hydrant distribution. The lowest flow rate of these items is credited for each representative location. A water system capable of delivering 250 gpm or more for a period of two hours plus consumption at the maximum daily rate at the fire location is considered minimum in the ISO review.

Where there are 2 or more systems or services distributing water at the same location, credit is given on the basis of the joint protection provided by all systems and services available.

The supply works capacity is calculated for each representative Needed Fire Flow test location, considering a variety of water supply sources. These include public water supplies, emergency supplies (usually accessed from neighboring water systems), suction supplies (usually evidenced by dry hydrant installations near a river, lake or other body of water), and supplies developed by a fire department using large diameter hose or vehicles to shuttle water from a source of supply to a fire site. The result is expressed in gallons per minute (gpm).

The normal ability of the distribution system to deliver Needed Fire Flows at the selected building locations is reviewed. The results of a flow test at a representative test location will indicate the ability of the water mains (or fire department in the case of fire department supplies) to carry water to that location.

The hydrant distribution is reviewed within 1,000 feet of representative test locations measured as hose can be laid by apparatus.

For maximum credit, the Needed Fire Flows should be available at each location in the district. Needed Fire Flows of 2,500 gpm or less should be available for 2 hours; and Needed Fire Flows of 3,000 and 3,500 gpm should be obtainable for 3 hours.

Item 616 "Credit for Supply System (CSS)" = 16.98 points

Item 621 – Credit for Hydrants (3 points)

The second item reviewed is Item 621 "Credit for Hydrants (CH)". This item reviews the number of fire hydrants of each type compared with the total number of hydrants.

There are a total of 79 hydrants in the graded area.

620. Hydrants, - Size, Type and Installation	Number of Hydrants
A. With a 6 -inch or larger branch and a pumper outlet with or without 2½ -inch outlets	74
B. With a 6 -inch or larger branch and no pumper outlet but two or more 2½ -inch outlets, or with a small foot valve, or with a small barrel	1
C./D. With only a 2½ -inch outlet or with less than a 6 -inch branch	4
E./F. Flush Type, Cistern, or Suction Point	0

Item 621 "Credit for Hydrants (CH)" = 2.88 points

Item 630 – Credit for Inspection and Flow Testing (7 points)

The third item reviewed is Item 630 "Credit for Inspection and Flow Testing (CIT)". This item reviews the fire hydrant inspection frequency, and the completeness of the inspections. Inspection of hydrants should be in accordance with AWWA M-17, *Installation, Field Testing and Maintenance of Fire Hydrants.*

Frequency of Inspection (FI): Average interval between the 3 most recent inspections.

Frequency	Points
1 year	30
2 years	20
3 years	10
4 years	5
5 years or more	No Credit

Note: The points for inspection frequency are reduced by 10 points if the inspections are incomplete or do not include a flushing program. An additional reduction of 10 points are made if hydrants are not subjected to full system pressure during inspections. If the inspection of cisterns or suction points does not include actual drafting with a pumper, or back-flushing for dry hydrants, 20 points are deducted.

Total points for Inspections = 3.64 points

Frequency of Fire Flow Testing (FF): Average interval between the 3 most recent inspections.

Frequency	Points
5 years	40
6 years	30
7 years	20
8 years	10
9 years	5
10 years or more	No Credit

Total points for Fire Flow Testing = 1.87 points

Item 631 "Credit for Inspection and Fire Flow Testing (CIT)" = 5.51 points

Divergence = -1.81

The Divergence factor mathematically reduces the score based upon the relative difference between the fire department and water supply scores. The factor is introduced in the final equation.

Community Risk Reduction

	Earned Credit	Credit Available
1025. Credit for Fire Prevention and Code Enforcement (CPCE)	2.06	2.2
1033. Credit for Public Fire Safety Education (CFSE)	1.93	2.2
1044. Credit for Fire Investigation Programs (CIP)	1.10	1.1
Item 1050. Credit for Community Risk Reduction	**5.09**	**5.50**

Item 1025 – Credit for Fire Prevention Code Adoption and Enforcement (2.2 points)	Earned Credit	Credit Available
Fire Prevention Code Regulations (PCR) Evaluation of fire prevention code regulations in effect.	10.00	10
Fire Prevention Staffing (PS) Evaluation of staffing for fire prevention activities.	7.44	8
Fire Prevention Certification and Training (PCT) Evaluation of the certification and training of fire prevention code enforcement personnel.	4.50	6
Fire Prevention Programs (PCP) Evaluation of fire prevention programs.	15.60	16
Review of Fire Prevention Code and Enforcement (CPCE) subtotal:	37.54	40

Item 1033 – Credit for Public Fire Safety Education (2.2 points)	Earned Credit	Credit Available
Public Fire Safety Educators Qualifications and Training (FSQT) Evaluation of public fire safety education personnel training and qualification as specified by the authority having jurisdiction.	10.00	10
Public Fire Safety Education Programs (FSP) Evaluation of programs for public fire safety education.	25.00	30
Review of Public Safety Education Programs (CFSE) subtotal:	35.00	40

Item 1044 – Credit for Fire Investigation Programs (1.1 points)	Earned Credit	Credit Available
Fire Investigation Organization and Staffing (IOS) Evaluation of organization and staffing for fire investigations.	8.00	8
Fire Investigator Certification and Training (IQT) Evaluation of fire investigator certification and training.	6.00	6
Use of National Fire Incident Reporting System (IRS) Evaluation of the use of the National Fire Incident Reporting System (NFIRS) for the 3 years before the evaluation.	6.00	6
Review of Fire Prevention Code and Enforcement (CPCE) subtotal:	20.00	20

[redacted]

FSRS Item	Earned Credit	Credit Available
Emergency Reporting		
414. Credit for Emergency Reporting	3.00	3
422. Credit for Telecommunicators	4.00	4
432. Credit for Dispatch Circuits	1.80	3
440. Credit for Receiving and Handling Fire Alarms	8.80	10
Fire Department		
513. Credit for Engine Companies	5.21	6
523. Credit for Reserve Pumpers	0.18	0.5
532. Credit for Pumper Capacity	3.00	3
549. Credit for Ladder Service	1.93	4
553. Credit for Reserve Ladder and Service Trucks	0.00	0.5
561. Credit for Deployment Analysis	6.70	10
571. Credit for Company Personnel	2.90	15
581. Credit for Training	5.26	9
730. Credit for Operational Considerations	2.00	2
590. Credit for Fire Department	27.18	50
Water Supply		
616. Credit for Supply System	16.98	30
621. Credit for Hydrants	2.88	3
631. Credit for Inspection and Flow Testing	5.51	7
640. Credit for Water Supply	25.37	40
Divergence	-1.81	--
1050. Community Risk Reduction	5.09	5.50
Total Credit	64.63	105.5

Final Community Classification = 04/4Y

INSURANCE SERVICES OFFICE, INC.

HYDRANT FLOW DATA SUMMARY

City Chiloquin Agency Lake Fd

County Oregon(Klamath), State OREGON (36) Witnessed by: Insurance Services Office Date: Nov 6, 2014

TEST NO.	TYPE DIST.*	TEST LOCATION	SERVICE	FLOW - GPM Q=(29.83(C(d²)p^0.5)) INDIVIDUAL HYDRANTS			TOTAL	PRESSURE PSI STATIC	PRESSURE PSI RESID.	FLOW -AT 20 PSI NEEDED **	FLOW -AT 20 PSI AVAIL.	REMARKS***	MODEL TYPE
1		Christina St x Park St	CHILOQUIN WATER DEPARTMENT, 1	650	0	0	650	75	40	750	850		
1 A		Christina St x Park St	CHILOQUIN WATER DEPARTMENT, 1	650	0	0	650	75	40	5500	850	(D)-(1436 gpm)	
1 B		Christina St x Park St	CHILOQUIN WATER DEPARTMENT, 1	650	0	0	650	75	40	3500	850	(C)-(1894 gpm)	
I0		SW Corner of Casino	Klamoya Casino, 1	820	0	0	820	150	105	2500	1500	(B)-(400 gpm)	
2		2nd Ave x Blocklinger St	CHILOQUIN WATER DEPARTMENT, 1	680	0	0	680	80	30	2500	750		
2 A		2nd Ave x Blocklinger St	CHILOQUIN WATER DEPARTMENT, 1	680	0	0	680	80	30	4000	750	(D)-(1436 gpm)	
3		Chiloquin Dr x Maple St	CHILOQUIN WATER DEPARTMENT, 1	690	0	0	690	65	40	750	950		
4		2nd Ave x Chocktoot St	CHILOQUIN WATER DEPARTMENT, 1	900	0	0	900	75	65	3000	2300	(C)-(1894 gpm)	
5		Lalo St x Chocktoot St	CHILOQUIN WATER DEPARTMENT, 1	910	0	0	910	80	70	2500	2400		
6		Lalakes St x Alley	CHILOQUIN WATER DEPARTMENT, 1	920	0	0	920	82	70	3500	2200	(C)-(1894 gpm)	
7		Duke Dr X Margi Way	Oregon Shores Recreational Club, 1	860	0	0	860	80	70	500	2300		
8		Lot of Jeld-Wen NE	Jeldwin Water System, 1	1360	0	0	1360	132	125	6000	6100		
8 A		Lot of Jeld-Wen -NE	Jeldwin Water System, 1	1360	0	0	1360	132	125	1250	6100		
9		Cloutier Dr & Sundance Dr	Oregon Shores Recreational Club, 1	1060	0	0	1060	50	30	1750	1300	(B)-(1506 gpm)	

THE ABOVE LISTED NEEDED FIRE FLOWS ARE FOR PROPERTY INSURANCE PREMIUM CALCULATIONS ONLY AND ARE *NOT* INTENDED TO PREDICT THE MAXIMUM AMOUNT OF WATER REQUIRED FOR A LARGE SCALE FIRE CONDITION.

THE AVAILABLE FLOWS ONLY INDICATE THE CONDITIONS THAT EXISTED AT THE TIME AND AT THE LOCATION WHERE TESTS WERE WITNESSED.

*Comm = Commercial; Res = Residential.

**Needed is the rate of flow for a specific duration for a full credit condition. Needed Fire Flows greater than 3,500 gpm are not considered in determining the classification of the city when using the Fire Suppression Rating Schedule.

*** (A)-Limited by available hydrants to gpm shown. Available facilities limit flow to gpm shown plus consumption for the needed duration of (B)-2 hours, (C)-3 hours or (D)-4 hours.

APPENDIX E

This section to be included in the 90% report

APPENDIX F

Permit A-1—250—10-35

STATE OF OREGON

COUNTY OF KLAMATH

CERTIFICATE OF WATER RIGHT

This Is to Certify, *That* CITY OF CHILOQUIN

of Chiloquin *, State of* Oregon *, has made proof to the satisfaction of the STATE ENGINEER of Oregon, of a right to the use of the waters of* Williamson River and Spring Creek

a tributary of *for the purpose of* Municipal

under Permit No. 7146 *of the State Engineer, and that said right to the use of said waters has been perfected in accordance with the laws of Oregon; that the priority of the right hereby confirmed dates from* November 12, 1925;

that the amount of water to which such right is entitled and hereby confirmed, for the purposes aforesaid, is limited to an amount actually beneficially used for said purposes, and shall not exceed 3.0 cubic feet per second,

or its equivalent in case of rotation.

The point of diversion is located in the

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,*

and shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the place of use under the right hereby confirmed, and to which such right is appurtenant, is as follows:

PLACE OF USE:

Lot 12, Section 34,
Township 34 South, Range 7 East, W. M.

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

After the expiration of fifty years from the date of this certificate or on the expiration of any federal power license issued in connection with this right, and after not less than two years' notice in writing to the holder hereof, the State of Oregon, or any municipality thereof, shall have the right to take over the dams, plants and other structures and all appurtenances thereto which have been constructed for the purpose of devoting to beneficial use the water rights specified herein, upon condition that before taking possession the State or municipality shall pay not to exceed the fair value of the property so taken, plus such reasonable damages, if any, to valuable, serviceable and dependable property of the holder of this certificate, not taken over, as may be caused by the severance therefrom of the property taken in accordance with the provisions of section 47-508, Oregon Code 1930.

WITNESS the signature of the State Engineer, affixed

this 27th *day of* April *, 193* 6 .

CHAS. E. STRICKLIN
State Engineer

Recorded in State Record of Water Right Certificates, Volume 10 *, page* 11452

STATE OF OREGON

COUNTY OF KLAMATH

PERMIT TO APPROPRIATE THE PUBLIC WATERS

THIS PERMIT IS HEREBY ISSUED TO

CITY OF CHILOQUIN
P.O. BOX 196 503-783-2717
CHILOQUIN, OREGON 97624

to use the waters of WELLS 1 & 2 in the WILLIAMSON RIVER BASIN for MUNICIPAL USE.

This permit is issued approving Application G-12465. The date of priority is APRIL 1, 1991. The use is limited to not more than 1350 GALLONS PER MINUTE (GPM), BEING 650 GPM FROM WELL 1 AND 700 GPM FROM WELL 2, or its equivalent in case of rotation, measured at the wells.

The wells are located as follows:

SE 1/4 SE 1/4, NE 1/4 SW 1/4, SECTION 34, T 34 S, R 7 E, W.M.; WELL 1 - 964 FEET NORTH AND 1267 FEET WEST FROM SE CORNER, SECTION 34, WELL 2 - 379 FEET SOUTH AND 1532 FEET EAST FROM W 1/4 CORNER, SECTION 34.

The use shall conform to such reasonable rotation system as may be ordered by the proper state officer.

A description of the proposed place of use under this permit is as follows:

CITY OF CHILOQUIN
E 1/2 NE 1/4
E 1/2 SE 1/4
SECTION 33
S 1/2 NE 1/4
NW 1/4 NW 1/4
S 1/2 NW 1/4
S 1/2
SECTION 34
TOWNSHIP 34 SOUTH, RANGE 7 EAST W.M.

NE 1/4
N 1/2 NW 1/4
SE 1/4 NW 1/4
NW 1/4 SE 1/4
SECTION 3
N 1/2 NE 1/4
SECTION 4
TOWNSHIP 35 SOUTH, RANGE 7 EAST, W.M.

Within one year from the date the Water Resources Commission adopts rules describing the schedules, standards and procedures for water conservation management plans by water suppliers, the city shall submit a plan which is consistent with said rules.

Within one year of permit issuance, the city shall prepare a plan/timetable for the Water Resources Commission which shall indicate the steps which the City intends to pursue to obtain a long-term water supply.

The well shall be constructed in accordance with the General Standards for the Construction and Maintenance of Water Wells in Oregon. The works shall be equipped with a usable access port, and may also include an air line and pressure gauge adequate to determine water level elevation in the well at all times. When required by the department, the permittee shall install and maintain a weir, meter, or other suitable measuring device, and shall keep a complete record of the amount of ground water withdrawn.

Prior to receiving a certificate of water right, the permit holder shall submit the results of a pump test meeting the department's standards, to the Water Resources Department. The Director may require water level or pump test results every ten years thereafter.

Actual construction work shall begin on or before May 26, 1993, and shall be completed on or before October 1, 1994. Complete application of the water shall be made on or before October 1, 1995.

Failure to comply with any of the provisions of this permit may result in action including, but not limited to, restrictions on the use, civil penalties, or cancellation of the permit.

This permit is for beneficial use of water without waste. The water user is advised that new regulations may require use of best practical technologies or conservation practices to achieve this end.

By law, the land use associated with this water use must be in compliance with statewide land-use goals and any local acknowledged land-use plan.

The use of water shall be limited when it interferes with any prior surface or ground water rights.

Issued this date, MAY 26, 1992.

/s/ MARTHA O. PAGEL

Water Resources Department
Martha O. Pagel
Director

Ext. BC99

Oregon Water Resources Department
Water Rights Division

Water Rights Application
Number G-12465

Final Order
Extension of Time for Permit Number G-11503

Appeal Rights

This is a final order in other than a contested case. This order is subject to judicial review under ORS 183.484. A request for judicial review must be filed within the 60 day time period specified by ORS 183.484(2). Pursuant to ORS 536.075 and OAR 137-004-0080 you may either file for judicial review, or 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.

Application History

Permit G-11503 was issued by the Department on May 26, 1992. The permit called for completion of construction by October 1, 1994, and complete application of water to beneficial use by October 1, 1995. On March 5, 2008 the City of Chiloquin submitted an application to the Department for an extension of time for Permit G-11503. In accordance with OAR 690-315-0050(2), on July 28, 2009 the Department issued a Proposed Final Order proposing to extend the time to complete construction and to extend the time to apply water to full beneficial use to October 1, 2049. The protest period closed September 11, 2009 in accordance with OAR 690-315-0060(1). No protest was filed.

At time of issuance of the Proposed Final Order the Department concluded that, based on the factors demonstrated by the applicant, the permit may be extended subject to the following conditions:

CONDITIONS

1. **Development Limitations**

Diversion of any water beyond 1029 gpm under Permit G-11503 shall only be authorized upon issuance of a final order approving a Water Management and Conservation Plan (WMCP) under OAR Chapter 690, Division 86. The required WMCP shall be submitted to the Department within 3 years of an approved extension application. Use of water

under Permit G-11503 must be consistent with this and subsequent WMCP's approved under OAR Chapter 690, Division 86 on file with the Department.

The deadline established in this PFO for submittal of a WMCP shall not relieve a permit holder of any existing or future requirement for submittal of a WMCP at an earlier date as established through other orders of the Department. A WMCP submitted to meet the requirements of this order may also meet the WMCP submittal requirements of other Department orders

The applicant has demonstrated good cause for the permit extension pursuant to ORS 537.630, 539.010(5) and OAR 690-315-0080(3).

Order

The extension of time for Application G-12465, Permit G-11503, therefore, is approved subject to conditions contained herein. The deadline for completing construction is extended to October 1, 2049. The deadline for applying water to full beneficial use is extended to October 1, 2049.

DATED: September 15, 2009

Dwight French, Administrator of
Water Rights and Adjudications
for
Phillip C. Ward, Director

If you have any questions about statements contained in this document, please contact Scott Kudlemyer at (503) 986-0813.

If you have other questions about the Department or any of its programs, please contact our Water Resources Customer Service Group at (503) 986-0900.

APPENDIX G

Oregon Public Health
Drinking Water Data Online

Oregon Health Authority

Introduction :: Data Search Options :: WS Name Look Up :: WS ID Look Up :: DWS Home :: Quick Data Links

Coliform fact sheet

PWS ID: 00184 ---- CHILOQUIN MUNICIPAL WATER DEPT

Current Coliform Summary History

Samples Required	Sample Type	Sampling Period Type
1	RT	MONTH

Spreadsheet

Number of Samples Reported

Period End Date	Routines Reported	Routine TC+	Routine FC+	Repeats Reported	Repeat TC+	Repeat FC+	Period Type
Sep 30, 2015	1	0	0	0	0	0	MN
Aug 31, 2015	1	0	0	0	0	0	MN
Jul 31, 2015	1	0	0	0	0	0	MN
Jun 30, 2015	1	0	0	0	0	0	MN
May 31, 2015	1	0	0	0	0	0	MN
Apr 30, 2015	1	0	0	0	0	0	MN
Mar 31, 2015	1	0	0	0	0	0	MN
Feb 28, 2015	1	0	0	0	0	0	MN
Jan 31, 2015	1	0	0	0	0	0	MN
Dec 31, 2014	1	0	0	0	0	0	MN
Dec 31, 2014	0	0	0	0	0	0	YR
Nov 30, 2014	1	0	0	0	0	0	MN
Oct 31, 2014	1	0	0	0	0	0	MN
Sep 30, 2014	1	0	0	0	0	0	MN
Aug 31, 2014	1	0	0	0	0	0	MN
Jul 31, 2014	1	0	0	0	0	0	MN
Jun 30, 2014	1	0	0	0	0	0	MN
May 31, 2014	1	0	0	0	0	0	MN
Apr 30, 2014	1	0	0	0	0	0	MN
Mar 31, 2014	1	0	0	0	0	0	MN
Feb 28, 2014	1	0	0	0	0	0	MN
Jan 31, 2014	1	0	0	0	0	0	MN
Dec 31, 2013	0	0	0	0	0	0	3Y
Dec 31, 2013	1	0	0	0	0	0	MN
Dec 31, 2013	0	0	0	0	0	0	YR
Nov 30, 2013	1	0	0	0	0	0	MN
Oct 31, 2013	1	0	0	0	0	0	MN
Sep 30, 2013	1	0	0	0	0	0	MN
Aug 31, 2013	1	0	0	0	0	0	MN
Jul 31, 2013	1	0	0	0	0	0	MN
Jun 30, 2013	1	0	0	0	0	0	MN
May 31, 2013	1	0	0	0	0	0	MN
Apr 30, 2013	1	0	0	0	0	0	MN
Mar 31, 2013	1	0	0	0	0	0	MN
Jan 31, 2013	1	0	0	0	0	0	MN
Dec 31, 2012	1	0	0	0	0	0	MN
Dec 31, 2012	0	0	0	0	0	0	YR
Nov 30, 2012	1	0	0	0	0	0	MN
Oct 31, 2012	1	0	0	0	0	0	MN
Sep 30, 2012	1	0	0	0	0	0	MN
Aug 31, 2012	1	0	0	0	0	0	MN
Jul 31, 2012	1	0	0	0	0	0	MN
Jun 30, 2012	1	0	0	0	0	0	MN
May 31, 2012	1	0	0	0	0	0	MN
Apr 30, 2012	1	0	0	0	0	0	MN
Mar 31, 2012	1	0	0	0	0	0	MN
Feb 29, 2012	1	0	0	0	0	0	MN
Jan 31, 2012	1	0	0	0	0	0	MN
Dec 31, 2011	1	0	0	0	0	0	MN
Dec 31, 2011	0	0	0	0	0	0	YR
Nov 30, 2011	1	0	0	0	0	0	MN
Oct 31, 2011	1	0	0	0	0	0	MN

Sep 30, 2011	1	0	0	0	0	0	MN
Aug 31, 2011	1	0	0	0	0	0	MN
Jul 31, 2011	1	0	0	0	0	0	MN
Jun 30, 2011	1	0	0	0	0	0	MN
May 31, 2011	1	0	0	0	0	0	MN
Apr 30, 2011	1	0	0	0	0	0	MN
Mar 31, 2011	1	0	0	0	0	0	MN
Feb 28, 2011	1	0	0	0	0	0	MN
Jan 31, 2011	1	0	0	0	0	0	MN
Dec 31, 2010	0	0	0	0	0	0	3Y
Dec 31, 2010	0	0	0	0	0	0	9Y
Dec 31, 2010	1	0	0	0	0	0	MN
Dec 31, 2010	0	0	0	0	0	0	YR
Oct 31, 2010	1	0	0	0	0	0	MN
Sep 30, 2010	1	0	0	0	0	0	MN
Aug 31, 2010	1	0	0	0	0	0	MN
Jul 31, 2010	1	0	0	0	0	0	MN
Jun 30, 2010	1	0	0	0	0	0	MN
May 31, 2010	1	0	0	0	0	0	MN
Apr 30, 2010	1	0	0	0	0	0	MN
Mar 31, 2010	1	0	0	0	0	0	MN
Feb 28, 2010	1	0	0	0	0	0	MN
Jan 31, 2010	1	0	0	0	0	0	MN
Dec 31, 2009	1	0	0	0	0	0	MN
Dec 31, 2009	0	0	0	0	0	0	YR
Nov 30, 2009	1	0	0	0	0	0	MN
Oct 31, 2009	1	0	0	0	0	0	MN
Sep 30, 2009	1	0	0	0	0	0	MN
Aug 31, 2009	1	0	0	0	0	0	MN
Jul 31, 2009	1	0	0	0	0	0	MN
Jun 30, 2009	1	0	0	0	0	0	MN
May 31, 2009	1	0	0	0	0	0	MN
Apr 30, 2009	1	0	0	0	0	0	MN
Mar 31, 2009	1	0	0	0	0	0	MN
Feb 28, 2009	1	0	0	0	0	0	MN
Jan 31, 2009	1	0	0	0	0	0	MN
Dec 31, 2008	1	0	0	0	0	0	MN
Dec 31, 2008	0	0	0	0	0	0	YR
Nov 30, 2008	1	0	0	0	0	0	MN
Oct 31, 2008	1	0	0	0	0	0	MN
Sep 30, 2008	1	0	0	0	0	0	MN
Aug 31, 2008	1	0	0	0	0	0	MN
Jul 31, 2008	1	0	0	0	0	0	MN
Jun 30, 2008	1	0	0	0	0	0	MN
May 31, 2008	1	0	0	0	0	0	MN
Apr 30, 2008	1	0	0	0	0	0	MN
Mar 31, 2008	1	0	0	0	0	0	MN
Feb 29, 2008	1	0	0	0	0	0	MN
Jan 31, 2008	1	0	0	0	0	0	MN
Dec 31, 2007	0	0	0	0	0	0	3Y
Dec 31, 2007	1	0	0	0	0	0	MN
Dec 31, 2007	0	0	0	0	0	0	YR
Nov 30, 2007	1	0	0	0	0	0	MN
Oct 31, 2007	1	0	0	0	0	0	MN
Sep 30, 2007	1	0	0	0	0	0	MN
Aug 31, 2007	1	0	0	0	0	0	MN
Jul 31, 2007	1	0	0	0	0	0	MN
May 31, 2007	1	1	0	9	0	0	MN
Apr 30, 2007	1	0	0	0	0	0	MN
Mar 31, 2007	1	0	0	0	0	0	MN
Feb 28, 2007	1	0	0	0	0	0	MN
Jan 31, 2007	1	0	0	0	0	0	MN
Dec 31, 2006	1	0	0	0	0	0	MN
Dec 31, 2006	0	0	0	0	0	0	YR
Nov 30, 2006	5	0	0	0	0	0	MN
Oct 31, 2006	1	1	0	4	0	0	MN
Sep 30, 2006	1	0	0	0	0	0	MN
Aug 31, 2006	1	0	0	0	0	0	MN

Jul 31, 2006	1	0	0	0	0	0	MN
Jun 30, 2006	1	0	0	0	0	0	MN
May 31, 2006	1	0	0	0	0	0	MN
Apr 30, 2006	1	0	0	0	0	0	MN
Mar 31, 2006	1	0	0	0	0	0	MN
Feb 28, 2006	1	0	0	0	0	0	MN
Jan 31, 2006	1	0	0	0	0	0	MN
Dec 31, 2005	1	0	0	0	0	0	MN
Dec 31, 2005	0	0	0	0	0	0	YR
Nov 30, 2005	1	0	0	0	0	0	MN
Oct 31, 2005	1	0	0	0	0	0	MN
Sep 30, 2005	1	0	0	0	0	0	MN
Aug 31, 2005	2	0	0	0	0	0	MN
Jul 31, 2005	2	0	0	0	0	0	MN
Jun 30, 2005	4	2	0	0	0	0	MN
May 31, 2005	2	0	0	0	0	0	MN
Mar 31, 2005	6	1	0	5	1	0	MN
Feb 28, 2005	1	0	0	0	0	0	MN
Jan 31, 2005	2	0	0	0	0	0	MN
Dec 31, 2004	0	0	0	0	0	0	3Y
Dec 31, 2004	2	0	0	0	0	0	MN
Dec 31, 2004	0	0	0	0	0	0	YR
Nov 30, 2004	2	0	0	0	0	0	MN
Oct 31, 2004	2	0	0	0	0	0	MN
Aug 31, 2004	2	1	0	13	2	0	MN
Jul 31, 2004	2	0	0	0	0	0	MN
Jun 30, 2004	2	0	0	0	0	0	MN
May 31, 2004	2	0	0	0	0	0	MN
Apr 30, 2004	2	0	0	0	0	0	MN
Mar 31, 2004	2	0	0	0	0	0	MN
Feb 29, 2004	2	0	0	0	0	0	MN
Jan 31, 2004	2	0	0	0	0	0	MN
Dec 31, 2003	0	0	0	0	0	0	YR
Nov 30, 2003	2	0	0	0	0	0	MN
Oct 31, 2003	1	0	0	0	0	0	MN
Sep 30, 2003	1	0	0	0	0	0	MN
Aug 31, 2003	3	0	0	0	0	0	MN
Jul 31, 2003	2	0	0	0	0	0	MN
Jun 30, 2003	2	0	0	0	0	0	MN
May 31, 2003	2	0	0	0	0	0	MN
Apr 30, 2003	2	0	0	0	0	0	MN
Mar 31, 2003	2	0	0	0	0	0	MN
Feb 28, 2003	2	0	0	0	0	0	MN
Jan 31, 2003	2	0	0	0	0	0	MN
Dec 31, 2002	3	0	0	0	0	0	MN
Dec 31, 2002	0	0	0	0	0	0	YR
Nov 30, 2002	1	0	0	0	0	0	MN
Sep 30, 2002	1	0	0	4	2	0	MN
Sep 30, 2002	2	2	0	12	1	0	QT
Aug 31, 2002	2	0	0	0	0	0	MN
Jun 30, 2002	2	0	0	0	0	0	MN
May 31, 2002	1	0	0	0	0	0	MN
Apr 30, 2002	2	0	0	0	0	0	MN
Mar 31, 2002	2	0	0	0	0	0	MN
Feb 28, 2002	2	0	0	0	0	0	MN
Jan 31, 2002	5	1	0	5	2	0	MN

Show results prior to 01/01/2002

ND = Not Detected at the Minimum Reporting Level

Spreadsheet

Latest Chemical Results - PWS ID: 00184 ---- CHILOQUIN MUNICIPAL WATER DEPT

Sample ID	Sample Date	Receive Date	Chemical	Source ID	Results	Current MCL	UOM
N15174-I	5/19/2015	5/21/2015	NITRATE	EP-A	ND	10	MG/L
140796101A-I	7/30/2014	8/4/2014	NITRATE	EP-A	ND	10	MG/L
131206301A-S	12/3/2013	12/23/2013	1,2-DIBROMO-3-CHLOROPROPANE	EP-A	ND	0.0002	MG/L
131206301A-S	12/3/2013	12/23/2013	2,4,5-TP	EP-A	ND	0.05	MG/L
131206301A-S	12/3/2013	12/23/2013	2,4-D	EP-A	ND	0.07	MG/L
131206301A-S	12/3/2013	12/23/2013	ATRAZINE	EP-A	ND	0.003	MG/L
131206301A-S	12/3/2013	12/23/2013	BENZO(A)PYRENE	EP-A	ND	0.0002	MG/L
131206301A-S	12/3/2013	12/23/2013	BHC-GAMMA	EP-A	ND	0.0002	MG/L
131206301A-S	12/3/2013	12/23/2013	CARBOFURAN	EP-A	ND	0.04	MG/L
131206301A-S	12/3/2013	12/23/2013	CHLORDANE	EP-A	ND	0.002	MG/L
131206301A-S	12/3/2013	12/23/2013	DALAPON	EP-A	ND	0.2	MG/L
131206301A-S	12/3/2013	12/23/2013	DI(2-ETHYLHEXYL) ADIPATE	EP-A	ND	0.4	MG/L
131206301A-S	12/3/2013	12/23/2013	DI(2-ETHYLHEXYL) PHTHALATE	EP-A	ND	0.006	MG/L
131206301A-S	12/3/2013	12/23/2013	DINOSEB	EP-A	ND	0.007	MG/L
131206301A-S	12/3/2013	12/23/2013	DIQUAT	EP-A	ND	0.02	MG/L
131206301A-S	12/3/2013	12/23/2013	ENDOTHALL	EP-A	ND	0.1	MG/L
131206301A-S	12/3/2013	12/23/2013	ENDRIN	EP-A	ND	0.002	MG/L
131206301A-S	12/3/2013	12/23/2013	ETHYLENE DIBROMIDE	EP-A	ND	0.00005	MG/L
131206301A-S	12/3/2013	12/23/2013	GLYPHOSATE	EP-A	ND	0.7	MG/L
131206301A-S	12/3/2013	12/23/2013	HEPTACHLOR	EP-A	ND	0.0004	MG/L
131206301A-S	12/3/2013	12/23/2013	HEPTACHLOR EPOXIDE	EP-A	ND	0.0002	MG/L
131206301A-S	12/3/2013	12/23/2013	HEXACHLOROBENZENE	EP-A	ND	0.001	MG/L
131206301A-S	12/3/2013	12/23/2013	HEXACHLOROCYCLOPENTADIENE	EP-A	ND	0.05	MG/L
131206301A-S	12/3/2013	12/23/2013	LASSO	EP-A	ND	0.002	MG/L
131206301A-S	12/3/2013	12/23/2013	METHOXYCHLOR	EP-A	ND	0.04	MG/L
131206301A-S	12/3/2013	12/23/2013	OXAMYL	EP-A	ND	0.2	MG/L
131206301A-S	12/3/2013	12/23/2013	PENTACHLOROPHENOL	EP-A	ND	0.001	MG/L
131206301A-S	12/3/2013	12/23/2013	PICLORAM	EP-A	ND	0.5	MG/L
131206301A-S	12/3/2013	12/23/2013	SIMAZINE	EP-A	ND	0.004	MG/L
131206301A-S	12/3/2013	12/23/2013	TOTAL POLYCHLORINATED BIPHENYLS (PCB)	EP-A	ND	0.0005	MG/L
131206301A-S	12/3/2013	12/23/2013	TOXAPHENE	EP-A	ND	0.003	MG/L
1312606301B-V	12/3/2013	12/23/2013	1,1,1-TRICHLOROETHANE	EP-A	ND	0.2	MG/L
1312606301B-V	12/3/2013	12/23/2013	1,1,2-TRICHLOROETHANE	EP-A	ND	0.005	MG/L
1312606301B-V	12/3/2013	12/23/2013	1,1-DICHLOROETHYLENE	EP-A	ND	0.007	MG/L
1312606301B-V	12/3/2013	12/23/2013	1,2,4-TRICHLOROBENZENE	EP-A	ND	0.07	MG/L
1312606301B-V	12/3/2013	12/23/2013	1,2-DICHLOROETHANE	EP-A	ND	0.005	MG/L
1312606301B-V	12/3/2013	12/23/2013	1,2-DICHLOROPROPANE	EP-A	ND	0.005	MG/L
1312606301B-V	12/3/2013	12/23/2013	BENZENE	EP-A	ND	0.005	MG/L
1312606301B-V	12/3/2013	12/23/2013	CARBON TETRACHLORIDE	EP-A	ND	0.005	MG/L
1312606301B-V	12/3/2013	12/23/2013	CHLOROBENZENE	EP-A	ND	0.1	MG/L
1312606301B-V	12/3/2013	12/23/2013	CIS-1,2-DICHLOROETHYLENE	EP-A	ND	0.07	MG/L
1312606301B-V	12/3/2013	12/23/2013	DICHLOROMETHANE	EP-A	ND	0.005	MG/L
1312606301B-V	12/3/2013	12/23/2013	ETHYLBENZENE	EP-A	ND	0.7	MG/L
1312606301B-V	12/3/2013	12/23/2013	O-DICHLOROBENZENE	EP-A	ND	0.6	MG/L
1312606301B-V	12/3/2013	12/23/2013	P-DICHLOROBENZENE	EP-A	ND	0.075	MG/L
1312606301B-V	12/3/2013	12/23/2013	STYRENE	EP-A	ND	0.1	MG/L
1312606301B-V	12/3/2013	12/23/2013	TETRACHLOROETHYLENE	EP-A	ND	0.005	MG/L
1312606301B-V	12/3/2013	12/23/2013	TOLUENE	EP-A	ND	1	MG/L
1312606301B-V	12/3/2013	12/23/2013	TRANS-1,2-DICHLOROETHYLENE	EP-A	ND	0.1	MG/L
1312606301B-V	12/3/2013	12/23/2013	TRICHLOROETHYLENE	EP-A	ND	0.005	MG/L
1312606301B-V	12/3/2013	12/23/2013	VINYL CHLORIDE	EP-A	ND	0.002	MG/L
1312606301B-V	12/3/2013	12/23/2013	XYLENES, TOTAL	EP-A	ND	10	MG/L
130776501A-I	7/25/2013	7/30/2013	NITRATE	EP-A	ND	10	MG/L
N12340-I	10/10/2012	10/22/2012	NITRATE	EP-A	0.256	10	MG/L
120929901A	9/11/2012	10/1/2012	COPPER	DIST-A	0.00537	1.3	MG/L
120929901A	9/11/2012	10/1/2012	LEAD	DIST-A	0.000136	0.015	MG/L
120929902A	9/11/2012	10/1/2012	COPPER	DIST-A	ND	1.3	MG/L
120929902A	9/11/2012	10/1/2012	LEAD	DIST-A	0.000233	0.015	MG/L
120929903A	9/11/2012	10/1/2012	COPPER	DIST-A	0.00901	1.3	MG/L

120929903A	9/11/2012	10/1/2012	LEAD	DIST-A	ND	0.015	MG/L
120929904A	9/11/2012	10/1/2012	COPPER	DIST-A	0.000977	1.3	MG/L
120929904A	9/11/2012	10/1/2012	LEAD	DIST-A	ND	0.015	MG/L
120929905A	9/11/2012	10/1/2012	COPPER	DIST-A	ND	1.3	MG/L
120929905A	9/11/2012	10/1/2012	LEAD	DIST-A	ND	0.015	MG/L
120929906A	9/11/2012	10/1/2012	COPPER	DIST-A	0.000647	1.3	MG/L
120929906A	9/11/2012	10/1/2012	LEAD	DIST-A	ND	0.015	MG/L
120929907A	9/11/2012	10/1/2012	COPPER	DIST-A	0.000633	1.3	MG/L
120929907A	9/11/2012	10/1/2012	LEAD	DIST-A	ND	0.015	MG/L
120929908A	9/11/2012	10/1/2012	COPPER	DIST-A	0.00497	1.3	MG/L
120929908A	9/11/2012	10/1/2012	LEAD	DIST-A	0.00125	0.015	MG/L
120929909A	9/11/2012	10/1/2012	COPPER	DIST-A	0.00767	1.3	MG/L
120929909A	9/11/2012	10/1/2012	LEAD	DIST-A	0.00701	0.015	MG/L
120929910A	9/11/2012	10/1/2012	COPPER	DIST-A	0.0104	1.3	MG/L
120929910A	9/11/2012	10/1/2012	LEAD	DIST-A	0.000118	0.015	MG/L
N11048-I	8/5/2011	8/15/2011	NITRATE	EP-A	0.753	10	MG/L
100848501A-S	8/16/2010	9/8/2010	1,2-DIBROMO-3-CHLOROPROPANE	EP-A	ND	0.0002	MG/L
100848501A-S	8/16/2010	9/8/2010	2,4,5-TP	EP-A	ND	0.05	MG/L
100848501A-S	8/16/2010	9/8/2010	2,4-D	EP-A	ND	0.07	MG/L
100848501A-S	8/16/2010	9/8/2010	ATRAZINE	EP-A	ND	0.003	MG/L
100848501A-S	8/16/2010	9/8/2010	BENZO(A)PYRENE	EP-A	ND	0.0002	MG/L
100848501A-S	8/16/2010	9/8/2010	BHC-GAMMA	EP-A	ND	0.0002	MG/L
100848501A-S	8/16/2010	9/8/2010	CARBOFURAN	EP-A	ND	0.04	MG/L
100848501A-S	8/16/2010	9/8/2010	CHLORDANE	EP-A	ND	0.002	MG/L
100848501A-S	8/16/2010	9/8/2010	DALAPON	EP-A	ND	0.2	MG/L
100848501A-S	8/16/2010	9/8/2010	DI(2-ETHYLHEXYL) ADIPATE	EP-A	ND	0.4	MG/L
100848501A-S	8/16/2010	9/8/2010	DI(2-ETHYLHEXYL) PHTHALATE	EP-A	ND	0.006	MG/L
100848501A-S	8/16/2010	9/8/2010	DINOSEB	EP-A	ND	0.007	MG/L
100848501A-S	8/16/2010	9/8/2010	DIQUAT	EP-A	ND	0.02	MG/L
100848501A-S	8/16/2010	9/8/2010	ENDOTHALL	EP-A	ND	0.1	MG/L
100848501A-S	8/16/2010	9/8/2010	ENDRIN	EP-A	ND	0.002	MG/L
100848501A-S	8/16/2010	9/8/2010	ETHYLENE DIBROMIDE	EP-A	ND	0.00005	MG/L
100848501A-S	8/16/2010	9/8/2010	GLYPHOSATE	EP-A	ND	0.7	MG/L
100848501A-S	8/16/2010	9/8/2010	HEPTACHLOR	EP-A	ND	0.0004	MG/L
100848501A-S	8/16/2010	9/8/2010	HEPTACHLOR EPOXIDE	EP-A	ND	0.0002	MG/L
100848501A-S	8/16/2010	9/8/2010	HEXACHLOROBENZENE	EP-A	ND	0.001	MG/L
100848501A-S	8/16/2010	9/8/2010	HEXACHLOROCYCLOPENTADIENE	EP-A	ND	0.05	MG/L
100848501A-S	8/16/2010	9/8/2010	LASSO	EP-A	ND	0.002	MG/L
100848501A-S	8/16/2010	9/8/2010	METHOXYCHLOR	EP-A	ND	0.04	MG/L
100848501A-S	8/16/2010	9/8/2010	OXAMYL	EP-A	ND	0.2	MG/L
100848501A-S	8/16/2010	9/8/2010	PENTACHLOROPHENOL	EP-A	ND	0.001	MG/L
100848501A-S	8/16/2010	9/8/2010	PICLORAM	EP-A	ND	0.5	MG/L
100848501A-S	8/16/2010	9/8/2010	SIMAZINE	EP-A	ND	0.004	MG/L
100848501A-S	8/16/2010	9/8/2010	TOTAL POLYCHLORINATED BIPHENYLS (PCB)	EP-A	ND	0.0005	MG/L
100848501A-S	8/16/2010	9/8/2010	TOXAPHENE	EP-A	ND	0.003	MG/L
100848501B-I	8/16/2010	9/8/2010	ARSENIC	EP-A	0.00229	0.01	MG/L
100848501B-I	8/16/2010	9/8/2010	NITRATE	EP-A	ND	10	MG/L
100848501C-V	8/16/2010	9/8/2010	1,1,1-TRICHLOROETHANE	EP-A	ND	0.2	MG/L
100848501C-V	8/16/2010	9/8/2010	1,1,2-TRICHLOROETHANE	EP-A	ND	0.005	MG/L
100848501C-V	8/16/2010	9/8/2010	1,1-DICHLOROETHYLENE	EP-A	ND	0.007	MG/L
100848501C-V	8/16/2010	9/8/2010	1,2,4-TRICHLOROBENZENE	EP-A	ND	0.07	MG/L
100848501C-V	8/16/2010	9/8/2010	1,2-DICHLOROETHANE	EP-A	ND	0.005	MG/L
100848501C-V	8/16/2010	9/8/2010	1,2-DICHLOROPROPANE	EP-A	ND	0.005	MG/L
100848501C-V	8/16/2010	9/8/2010	BENZENE	EP-A	ND	0.005	MG/L
100848501C-V	8/16/2010	9/8/2010	CARBON TETRACHLORIDE	EP-A	ND	0.005	MG/L
100848501C-V	8/16/2010	9/8/2010	CHLOROBENZENE	EP-A	ND	0.1	MG/L
100848501C-V	8/16/2010	9/8/2010	CIS-1,2-DICHLOROETHYLENE	EP-A	ND	0.07	MG/L
100848501C-V	8/16/2010	9/8/2010	DICHLOROMETHANE	EP-A	ND	0.005	MG/L
100848501C-V	8/16/2010	9/8/2010	ETHYLBENZENE	EP-A	ND	0.7	MG/L
100848501C-V	8/16/2010	9/8/2010	O-DICHLOROBENZENE	EP-A	ND	0.6	MG/L
100848501C-V	8/16/2010	9/8/2010	P-DICHLOROBENZENE	EP-A	ND	0.075	MG/L
100848501C-V	8/16/2010	9/8/2010	STYRENE	EP-A	ND	0.1	MG/L
100848501C-V	8/16/2010	9/8/2010	TETRACHLOROETHYLENE	EP-A	ND	0.005	MG/L
100848501C-V	8/16/2010	9/8/2010	TOLUENE	EP-A	ND	1	MG/L
100848501C-V	8/16/2010	9/8/2010	TRANS-1,2-DICHLOROETHYLENE	EP-A	ND	0.1	MG/L
100848501C-V	8/16/2010	9/8/2010	TRICHLOROETHYLENE	EP-A	ND	0.005	MG/L
100848501C-V	8/16/2010	9/8/2010	VINYL CHLORIDE	EP-A	ND	0.002	MG/L

100848501C-V	8/16/2010	9/8/2010	XYLENES, TOTAL	EP-A	ND	10 MG/L
090825201A-I	8/10/2009	9/2/2009	NITRATE	EP-A	ND	10 MG/L
080928801A-I	9/9/2008	10/8/2008	NITRATE	EP-A	ND	10 MG/L
711176	11/8/2007	12/4/2007	ANTIMONY, TOTAL	EP-A	ND	0.006 MG/L
711176	11/8/2007	12/4/2007	ARSENIC	EP-A	0.00265	0.01 MG/L
711176	11/8/2007	12/4/2007	BARIUM	EP-A	ND	2 MG/L
711176	11/8/2007	12/4/2007	BERYLLIUM, TOTAL	EP-A	ND	0.004 MG/L
711176	11/8/2007	12/4/2007	CADMIUM	EP-A	ND	0.005 MG/L
711176	11/8/2007	12/4/2007	CHROMIUM	EP-A	ND	0.1 MG/L
711176	11/8/2007	12/4/2007	CYANIDE	EP-A	ND	0.2 MG/L
711176	11/8/2007	12/4/2007	FLUORIDE	EP-A	ND	4 MG/L
711176	11/8/2007	12/4/2007	MERCURY	EP-A	ND	0.002 MG/L
711176	11/8/2007	12/4/2007	NICKEL	EP-A	ND	0.1 MG/L
711176	11/8/2007	12/4/2007	NITRATE	EP-A	ND	10 MG/L
711176	11/8/2007	12/4/2007	NITRATE-NITRITE	EP-A	ND	10 MG/L
711176	11/8/2007		NITRITE	EP-A	ND	1 MG/L
711176	11/8/2007	12/4/2007	SELENIUM	EP-A	ND	0.05 MG/L
711176	11/8/2007	12/4/2007	SODIUM	EP-A	16.7	MG/L
711176	11/8/2007	12/4/2007	THALLIUM, TOTAL	EP-A	ND	0.002 MG/L
0711176-S	11/8/2007	12/4/2007	1,2-DIBROMO-3-CHLOROPROPANE	EP-A	ND	0.0002 MG/L
0711176-S	11/8/2007	12/4/2007	2,4,5-TP	EP-A	ND	0.05 MG/L
0711176-S	11/8/2007	12/4/2007	2,4-D	EP-A	ND	0.07 MG/L
0711176-S	11/8/2007	12/4/2007	ATRAZINE	EP-A	ND	0.003 MG/L
0711176-S	11/8/2007	12/4/2007	BENZO(A)PYRENE	EP-A	ND	0.0002 MG/L
0711176-S	11/8/2007	12/4/2007	BHC-GAMMA	EP-A	ND	0.0002 MG/L
0711176-S	11/8/2007	12/4/2007	CARBOFURAN	EP-A	ND	0.04 MG/L
0711176-S	11/8/2007	12/4/2007	CHLORDANE	EP-A	ND	0.002 MG/L
0711176-S	11/8/2007	12/4/2007	DALAPON	EP-A	ND	0.2 MG/L
0711176-S	11/8/2007	12/4/2007	DI(2-ETHYLHEXYL) ADIPATE	EP-A	ND	0.4 MG/L
0711176-S	11/8/2007	12/4/2007	DI(2-ETHYLHEXYL) PHTHALATE	EP-A	ND	0.006 MG/L
0711176-S	11/8/2007	12/4/2007	DINOSEB	EP-A	ND	0.007 MG/L
0711176-S	11/8/2007	12/4/2007	DIQUAT	EP-A	ND	0.02 MG/L
0711176-S	11/8/2007	12/4/2007	ENDOTHALL	EP-A	ND	0.1 MG/L
0711176-S	11/8/2007	12/4/2007	ENDRIN	EP-A	ND	0.002 MG/L
0711176-S	11/8/2007	12/4/2007	ETHYLENE DIBROMIDE	EP-A	ND	0.00005 MG/L
0711176-S	11/8/2007	12/4/2007	GLYPHOSATE	EP-A	ND	0.7 MG/L
0711176-S	11/8/2007	12/4/2007	HEPTACHLOR	EP-A	ND	0.0004 MG/L
0711176-S	11/8/2007	12/4/2007	HEPTACHLOR EPOXIDE	EP-A	ND	0.0002 MG/L
0711176-S	11/8/2007	12/4/2007	HEXACHLOROBENZENE	EP-A	ND	0.001 MG/L
0711176-S	11/8/2007	12/4/2007	HEXACHLOROCYCLOPENTADIENE	EP-A	ND	0.05 MG/L
0711176-S	11/8/2007	12/4/2007	LASSO	EP-A	ND	0.002 MG/L
0711176-S	11/8/2007	12/4/2007	METHOXYCHLOR	EP-A	ND	0.04 MG/L
0711176-S	11/8/2007	12/4/2007	OXAMYL	EP-A	ND	0.2 MG/L
0711176-S	11/8/2007	12/4/2007	PENTACHLOROPHENOL	EP-A	ND	0.001 MG/L
0711176-S	11/8/2007	12/4/2007	PICLORAM	EP-A	ND	0.5 MG/L
0711176-S	11/8/2007	12/4/2007	SIMAZINE	EP-A	ND	0.004 MG/L
0711176-S	11/8/2007	12/4/2007	TOTAL POLYCHLORINATED BIPHENYLS (PCB)	EP-A	ND	0.0005 MG/L
0711176-S	11/8/2007	12/4/2007	TOXAPHENE	EP-A	ND	0.003 MG/L
071117601C	11/8/2007	12/4/2007	1,1,1-TRICHLOROETHANE	EP-A	ND	0.2 MG/L
071117601C	11/8/2007	12/4/2007	1,1,2-TRICHLOROETHANE	EP-A	ND	0.005 MG/L
071117601C	11/8/2007	12/4/2007	1,1-DICHLOROETHYLENE	EP-A	ND	0.007 MG/L
071117601C	11/8/2007	12/4/2007	1,2,4-TRICHLOROBENZENE	EP-A	ND	0.07 MG/L
071117601C	11/8/2007	12/4/2007	1,2-DICHLOROETHANE	EP-A	ND	0.005 MG/L
071117601C	11/8/2007	12/4/2007	1,2-DICHLOROPROPANE	EP-A	ND	0.005 MG/L
071117601C	11/8/2007	12/4/2007	BENZENE	EP-A	ND	0.005 MG/L
071117601C	11/8/2007	12/4/2007	CARBON TETRACHLORIDE	EP-A	ND	0.005 MG/L
071117601C	11/8/2007	12/4/2007	CHLOROBENZENE	EP-A	ND	0.1 MG/L
071117601C	11/8/2007	12/4/2007	CIS-1,2-DICHLOROETHYLENE	EP-A	ND	0.07 MG/L
071117601C	11/8/2007	12/4/2007	DICHLOROMETHANE	EP-A	ND	0.005 MG/L
071117601C	11/8/2007	12/4/2007	ETHYLBENZENE	EP-A	ND	0.7 MG/L
071117601C	11/8/2007	12/4/2007	O-DICHLOROBENZENE	EP-A	ND	0.6 MG/L
071117601C	11/8/2007	12/4/2007	P-DICHLOROBENZENE	EP-A	ND	0.075 MG/L
071117601C	11/8/2007	12/4/2007	STYRENE	EP-A	ND	0.1 MG/L
071117601C	11/8/2007	12/4/2007	TETRACHLOROETHYLENE	EP-A	ND	0.005 MG/L
071117601C	11/8/2007	12/4/2007	TOLUENE	EP-A	ND	1 MG/L
071117601C	11/8/2007	12/4/2007	TRANS-1,2-DICHLOROETHYLENE	EP-A	ND	0.1 MG/L
071117601C	11/8/2007	12/4/2007	TRICHLOROETHYLENE	EP-A	ND	0.005 MG/L

071117601C	11/8/2007	12/4/2007	VINYL CHLORIDE	EP-A	ND	0.002 MG/L
071117601C	11/8/2007	12/4/2007	XYLENES, TOTAL	EP-A	ND	10 MG/L
070342201A	3/21/2007	4/5/2007	NITRATE	EP-A	ND	10 MG/L
060878101A	8/30/2006	10/3/2006	ARSENIC	EP-A	0.00236	0.01 MG/L
606680	6/28/2006	8/22/2006	COMBINED RADIUM (-226 & -228)	EP-A	ND	5 PCI/L
606680	6/28/2006	8/22/2006	COMBINED URANIUM	EP-A	ND	0.03 MG/L
606680	6/28/2006	8/22/2006	GROSS ALPHA, EXCL. RADON & U	EP-A	ND	15 PCI/L
0603635-01A	3/28/2006	4/6/2006	NITRATE	EP-A	ND	10 MG/L
0603636R	3/28/2006	5/22/2006	COMBINED RADIUM (-226 & -228)	EP-A	ND	5 PCI/L
0603636R	3/28/2006	5/22/2006	COMBINED URANIUM	EP-A	ND	0.03 MG/L
0603636R	3/28/2006	5/22/2006	GROSS ALPHA, EXCL. RADON & U	EP-A	ND	15 PCI/L
0512372R	12/16/2005	2/6/2006	COMBINED RADIUM (-226 & -228)	EP-A	ND	5 PCI/L
0512372R	12/16/2005	2/6/2006	COMBINED URANIUM	EP-A	ND	0.03 MG/L
0512372R	12/16/2005	2/6/2006	GROSS ALPHA, EXCL. RADON & U	EP-A	ND	15 PCI/L
509630	9/26/2005	10/3/2006	COMBINED RADIUM (-226 & -228)	EP-A	ND	5 PCI/L
509630	9/26/2005	10/3/2006	COMBINED URANIUM	EP-A	ND	0.03 MG/L
509630	9/26/2005	10/3/2006	GROSS ALPHA, EXCL. RADON & U	EP-A	ND	15 PCI/L
050963001A	9/26/2005	10/3/2006	COMBINED RADIUM (-226 & -228)	EP-A	ND	5 PCI/L
050963001A	9/26/2005	10/3/2006	COMBINED URANIUM	EP-A	ND	0.03 MG/L
050963001A	9/26/2005	10/3/2006	GROSS ALPHA, EXCL. RADON & U	EP-A	ND	15 PCI/L
0509630R	9/26/2005	11/18/2005	COMBINED RADIUM (-226 & -228)	EP-A	ND	5 PCI/L
0509630R	9/26/2005	11/18/2005	COMBINED URANIUM	EP-A	ND	0.03 MG/L
0509630R	9/26/2005	11/18/2005	GROSS ALPHA, EXCL. RADON & U	EP-A	ND	15 PCI/L
0503486-01B	3/24/2005	3/31/2005	NITRATE	EP-A	ND	10 MG/L
0408099I	8/4/2004	9/2/2004	ANTIMONY, TOTAL	EP-A	ND	0.006 MG/L
0408099I	8/4/2004	9/2/2004	ARSENIC	EP-A	0.0022	0.01 MG/L
0408099I	8/4/2004	9/2/2004	BARIUM	EP-A	ND	2 MG/L
0408099I	8/4/2004	9/2/2004	BERYLLIUM, TOTAL	EP-A	ND	0.004 MG/L
0408099I	8/4/2004	9/2/2004	CADMIUM	EP-A	ND	0.005 MG/L
0408099I	8/4/2004	9/2/2004	CHROMIUM	EP-A	0.001	0.1 MG/L
0408099I	8/4/2004	9/2/2004	CYANIDE	EP-A	ND	0.2 MG/L
0408099I	8/4/2004	9/2/2004	FLUORIDE	EP-A	ND	4 MG/L
0408099I	8/4/2004	9/2/2004	MERCURY	EP-A	ND	0.002 MG/L
0408099I	8/4/2004	9/2/2004	NICKEL	EP-A	ND	0.1 MG/L
0408099I	8/4/2004	9/2/2004	NITRATE	EP-A	ND	10 MG/L
0408099I	8/4/2004	9/2/2004	NITRATE-NITRITE	EP-A	ND	10 MG/L
0408099I	8/4/2004		NITRITE	EP-A	ND	1 MG/L
0408099I	8/4/2004	9/2/2004	SELENIUM	EP-A	ND	0.05 MG/L
0408099I	8/4/2004	9/2/2004	SODIUM	EP-A	16.9	MG/L
0408099I	8/4/2004	9/2/2004	THALLIUM, TOTAL	EP-A	ND	0.002 MG/L
0408099S	8/4/2004	9/2/2004	1,2-DIBROMO-3-CHLOROPROPANE	EP-A	ND	0.0002 MG/L
0408099S	8/4/2004	9/2/2004	2,4,5-TP	EP-A	ND	0.05 MG/L
0408099S	8/4/2004	9/2/2004	2,4-D	EP-A	ND	0.07 MG/L
0408099S	8/4/2004	9/2/2004	ATRAZINE	EP-A	ND	0.003 MG/L
0408099S	8/4/2004	9/2/2004	BENZO(A)PYRENE	EP-A	ND	0.0002 MG/L
0408099S	8/4/2004	9/2/2004	BHC-GAMMA	EP-A	ND	0.0002 MG/L
0408099S	8/4/2004	9/2/2004	CARBOFURAN	EP-A	ND	0.04 MG/L
0408099S	8/4/2004	9/2/2004	CHLORDANE	EP-A	ND	0.002 MG/L
0408099S	8/4/2004	9/2/2004	DALAPON	EP-A	ND	0.2 MG/L
0408099S	8/4/2004	9/2/2004	DI(2-ETHYLHEXYL) ADIPATE	EP-A	ND	0.4 MG/L
0408099S	8/4/2004	9/2/2004	DI(2-ETHYLHEXYL) PHTHALATE	EP-A	ND	0.006 MG/L
0408099S	8/4/2004	9/2/2004	DINOSEB	EP-A	ND	0.007 MG/L
0408099S	8/4/2004	9/2/2004	DIQUAT	EP-A	ND	0.02 MG/L
0408099S	8/4/2004	9/2/2004	ENDOTHALL	EP-A	ND	0.1 MG/L
0408099S	8/4/2004	9/2/2004	ENDRIN	EP-A	ND	0.002 MG/L
0408099S	8/4/2004	9/2/2004	ETHYLENE DIBROMIDE	EP-A	ND	0.00005 MG/L
0408099S	8/4/2004	9/2/2004	GLYPHOSATE	EP-A	ND	0.7 MG/L
0408099S	8/4/2004	9/2/2004	HEPTACHLOR	EP-A	ND	0.0004 MG/L
0408099S	8/4/2004	9/2/2004	HEPTACHLOR EPOXIDE	EP-A	ND	0.0002 MG/L
0408099S	8/4/2004	9/2/2004	HEXACHLOROBENZENE	EP-A	ND	0.001 MG/L
0408099S	8/4/2004	9/2/2004	HEXACHLOROCYCLOPENTADIENE	EP-A	ND	0.05 MG/L
0408099S	8/4/2004	9/2/2004	LASSO	EP-A	ND	0.002 MG/L
0408099S	8/4/2004	9/2/2004	METHOXYCHLOR	EP-A	ND	0.04 MG/L
0408099S	8/4/2004	9/2/2004	OXAMYL	EP-A	ND	0.2 MG/L
0408099S	8/4/2004	9/2/2004	PENTACHLOROPHENOL	EP-A	ND	0.001 MG/L
0408099S	8/4/2004	9/2/2004	PICLORAM	EP-A	ND	0.5 MG/L
0408099S	8/4/2004	9/2/2004	SIMAZINE	EP-A	ND	0.004 MG/L

0408099S	8/4/2004	9/2/2004	TOTAL POLYCHLORINATED BIPHENYLS (PCB)	EP-A	ND	0.0005	MG/L
0408099S	8/4/2004	9/2/2004	TOXAPHENE	EP-A	ND	0.003	MG/L
0408099V	8/4/2004	9/2/2004	1,1,1-TRICHLOROETHANE	EP-A	ND	0.2	MG/L
0408099V	8/4/2004	9/2/2004	1,1,2-TRICHLOROETHANE	EP-A	ND	0.005	MG/L
0408099V	8/4/2004	9/2/2004	1,1-DICHLOROETHYLENE	EP-A	ND	0.007	MG/L
0408099V	8/4/2004	9/2/2004	1,2,4-TRICHLOROBENZENE	EP-A	ND	0.07	MG/L
0408099V	8/4/2004	9/2/2004	1,2-DICHLOROETHANE	EP-A	ND	0.005	MG/L
0408099V	8/4/2004	9/2/2004	1,2-DICHLOROPROPANE	EP-A	ND	0.005	MG/L
0408099V	8/4/2004	9/2/2004	BENZENE	EP-A	ND	0.005	MG/L
0408099V	8/4/2004	9/2/2004	CARBON TETRACHLORIDE	EP-A	ND	0.005	MG/L
0408099V	8/4/2004	9/2/2004	CHLOROBENZENE	EP-A	ND	0.1	MG/L
0408099V	8/4/2004	9/2/2004	CIS-1,2-DICHLOROETHYLENE	EP-A	ND	0.07	MG/L
0408099V	8/4/2004	9/2/2004	DICHLOROMETHANE	EP-A	ND	0.005	MG/L
0408099V	8/4/2004	9/2/2004	ETHYLBENZENE	EP-A	ND	0.7	MG/L
0408099V	8/4/2004	9/2/2004	O-DICHLOROBENZENE	EP-A	ND	0.6	MG/L
0408099V	8/4/2004	9/2/2004	P-DICHLOROBENZENE	EP-A	ND	0.075	MG/L
0408099V	8/4/2004	9/2/2004	STYRENE	EP-A	ND	0.1	MG/L
0408099V	8/4/2004	9/2/2004	TETRACHLOROETHYLENE	EP-A	ND	0.005	MG/L
0408099V	8/4/2004	9/2/2004	TOLUENE	EP-A	ND	1	MG/L
0408099V	8/4/2004	9/2/2004	TRANS-1,2-DICHLOROETHYLENE	EP-A	ND	0.1	MG/L
0408099V	8/4/2004	9/2/2004	TRICHLOROETHYLENE	EP-A	ND	0.005	MG/L
0408099V	8/4/2004	9/2/2004	VINYL CHLORIDE	EP-A	ND	0.002	MG/L
0408099V	8/4/2004	9/2/2004	XYLENES, TOTAL	EP-A	ND	10	MG/L
0311520-01A	11/26/2003	12/15/2003	NITRATE	EP-A	ND	10	MG/L
0212363-01A	12/18/2002	12/30/2002	NITRATE	EP-A	ND	10	MG/L

Archived Results

Sample Date	Receive Date	Chemical	Source ID	Results	MCL
12/17/2001	8/27/2002	Nickel	A	0.034	0.1
12/17/2001	8/27/2002	Sodium	A	15.5	
12/17/2001	2/4/2002	1,1,1-Trichloroethane	AA	ND	0.2
12/17/2001	2/4/2002	1,1,2-Trichloroethane	AA	ND	0.005
12/17/2001	2/4/2002	1,1-Dichloroethylene	AA	ND	0.007
12/17/2001	2/4/2002	1,2,4-Trichlorobenzene	AA	ND	0.07
12/17/2001	2/4/2002	1,2-Dibromo-3-Chloropropane (DBCP)	AA	ND	0.0002
12/17/2001	2/4/2002	1,2-Dichloroethane	AA	ND	0.005
12/17/2001	2/4/2002	1,2-Dichloropropane	AA	ND	0.005
12/17/2001	2/4/2002	2,4,5-TP Silvex	AA	ND	0.05
12/17/2001	2/4/2002	2,4-D	AA	ND	0.07
12/17/2001	2/4/2002	Adipates (Di(2-Ethylhexyl))	AA	ND	0.4
12/17/2001	2/4/2002	Alachlor (Lasso)	AA	ND	0.002
12/17/2001	2/4/2002	Antimony Total	AA	ND	0.006
12/17/2001	2/4/2002	Arsenic	AA	ND	0.05
12/17/2001	2/4/2002	Atrazine	AA	ND	0.003
12/17/2001	2/4/2002	Barium	AA	ND	2
12/17/2001	2/4/2002	Benzene	AA	ND	0.005
12/17/2001	2/4/2002	Benzo (A) Pyrene	AA	ND	0.0002
12/17/2001	2/4/2002	Beryllium Total	AA	ND	0.004
12/17/2001	2/4/2002	BHC-gamma (Lindane)	AA	ND	0.0002
12/17/2001	2/4/2002	Cadmium	AA	ND	0.005
12/17/2001	2/4/2002	Carbofuran	AA	ND	0.04
12/17/2001	2/4/2002	Carbon Tetrachloride	AA	ND	0.005
12/17/2001	2/4/2002	Chlordane	AA	ND	0.002
12/17/2001	2/4/2002	Chromium	AA	ND	0.1
12/17/2001	2/4/2002	Cis-1,2-Dichloroethylene	AA	ND	0.07
12/17/2001	2/4/2002	Cyanide	AA	ND	0.2
12/17/2001	2/4/2002	Dalapon	AA	ND	0.2
12/17/2001	2/4/2002	Dichloromethane (Methylene Chloride)	AA	ND	0.005
12/17/2001	2/4/2002	Dinoseb	AA	ND	0.007
12/17/2001	2/4/2002	Diquat	AA	ND	0.02
12/17/2001	2/4/2002	Endothall	AA	ND	0.1
12/17/2001	2/4/2002	Endrin	AA	ND	0.002
12/17/2001	2/4/2002	Ethylbenzene	AA	ND	0.7
12/17/2001	2/4/2002	Ethylene Dibromide (EDB)	AA	ND	0.00005
12/17/2001	2/4/2002	Fluoride	AA	0.24	4
12/17/2001	2/4/2002	Glyphosate	AA	ND	0.7

12/17/2001	2/4/2002	Heptachlor	AA	ND	0.0004
12/17/2001	2/4/2002	Heptachlor Epoxide	AA	ND	0.0002
12/17/2001	2/4/2002	Hexachlorobenzene (HCB)	AA	ND	0.001
12/17/2001	2/4/2002	Hexachlorocyclopentadiene	AA	ND	0.05
12/17/2001	2/4/2002	Mercury	AA	ND	0.002
12/17/2001	2/4/2002	Methoxychlor	AA	ND	0.04
12/17/2001	2/4/2002	Monochlorobenzene (Chlorobenzene)	AA	ND	0.1
12/17/2001	2/4/2002	Nitrate	AA	0.38	10
12/17/2001	2/4/2002	Nitrate-Nitrite	AA	0.38	10
12/17/2001	2/4/2002	Nitrite	AA	ND	1
12/17/2001	2/4/2002	O-Dichlorobenzene	AA	ND	0.6
12/17/2001	2/4/2002	P-Dichlorobenzene	AA	ND	0.075
12/17/2001	2/4/2002	Pentachlorophenol	AA	ND	0.001
12/17/2001	2/4/2002	Phthalates (Di(2-Ethylhexyl))	AA	ND	0.006
12/17/2001	2/4/2002	Picloram	AA	ND	0.5
12/17/2001	2/4/2002	Selenium	AA	ND	0.05
12/17/2001	2/4/2002	Simazine	AA	ND	0.004
12/17/2001	2/4/2002	Styrene	AA	ND	0.1
12/17/2001	2/4/2002	Tetrachloroethylene	AA	ND	0.005
12/17/2001	2/4/2002	Thallium Total	AA	ND	0.002
12/17/2001	2/4/2002	Toluene	AA	ND	1
12/17/2001	2/4/2002	Total Polychlorinated Biphenyls (PCB)	AA	ND	0.0005
12/17/2001	2/4/2002	Total Xylenes	AA	ND	10
12/17/2001	2/4/2002	Toxaphene	AA	ND	0.003
12/17/2001	2/4/2002	Trans-1,2-Dichloroethylene	AA	ND	0.1
12/17/2001	2/4/2002	Trichloroethylene	AA	ND	0.005
12/17/2001	2/4/2002	Vinyl Chloride	AA	ND	0.002
12/17/2001	2/4/2002	Vydate (Oxamyl)	AA	ND	0.2
9/16/1997	2/23/1998	Nitrate	AA	0.15	10
10/16/1996	12/23/1996	Gross Alpha, Excl. Radon & U	AA	ND	15
9/27/1996	12/23/1996	1,1,1,2-Tetrachloroethane	AA	ND	
9/27/1996	12/23/1996	1,1,1-Trichloroethane	AA	ND	0.2
9/27/1996	12/23/1996	1,1,2,2,-Tetrachloroethane	AA	ND	
9/27/1996	12/23/1996	1,1,2-Trichloroethane	AA	ND	0.005
9/27/1996	12/23/1996	1,1-Dichloroethane	AA	ND	
9/27/1996	12/23/1996	1,1-Dichloroethylene	AA	ND	0.007
9/27/1996	12/23/1996	1,1-Dichloropropene	AA	ND	
9/27/1996	12/23/1996	1,2,3-Trichloropropane	AA	ND	
9/27/1996	12/23/1996	1,2,4-Trichlorobenzene	AA	ND	0.07
9/27/1996	12/23/1996	1,2-Dichloroethane	AA	ND	0.005
9/27/1996	12/23/1996	1,2-Dichloropropane	AA	ND	0.005
9/27/1996	12/23/1996	1,3-Dichloropropane	AA	ND	
9/27/1996	12/23/1996	1,3-Dichloropropene	AA	ND	
9/27/1996	12/23/1996	2,2-Dichloropropane	AA	ND	
9/27/1996	12/23/1996	Benzene	AA	ND	0.005
9/27/1996	12/23/1996	Bromobenzene	AA	ND	
9/27/1996	12/23/1996	Bromodichloromethane	AA	ND	
9/27/1996	12/23/1996	Bromoform	AA	ND	
9/27/1996	12/23/1996	Bromomethane	AA	ND	
9/27/1996	12/23/1996	Carbon Tetrachloride	AA	ND	0.005
9/27/1996	12/23/1996	Chloroethane	AA	ND	
9/27/1996	12/23/1996	Chloroform	AA	ND	
9/27/1996	12/23/1996	Chloromethane	AA	ND	
9/27/1996	12/23/1996	Cis-1,2-Dichloroethylene	AA	ND	0.07
9/27/1996	12/23/1996	Dibromochloromethane	AA	ND	
9/27/1996	12/23/1996	Dibromomethane	AA	ND	
9/27/1996	12/23/1996	Dichloromethane (Methylene Chloride)	AA	ND	0.005
9/27/1996	12/23/1996	Ethylbenzene	AA	ND	0.7
9/27/1996	12/23/1996	M-Dichlorobenzene	AA	ND	
9/27/1996	12/23/1996	Monochlorobenzene (Chlorobenzene)	AA	ND	0.1
9/27/1996	12/23/1996	O-Chlorotoluene	AA	ND	
9/27/1996	12/23/1996	O-Dichlorobenzene	AA	ND	0.6
9/27/1996	12/23/1996	P-Chlorotoluene	AA	ND	
9/27/1996	12/23/1996	P-Dichlorobenzene	AA	ND	0.075
9/27/1996	12/23/1996	Styrene	AA	ND	0.1
9/27/1996	12/23/1996	Tetrachloroethylene	AA	ND	0.005
9/27/1996	12/23/1996	Toluene	AA	ND	1

9/27/1996	12/23/1996	Total Xylenes	AA	ND	10
9/27/1996	12/23/1996	Trans-1,2-Dichloroethylene	AA	ND	0.1
9/27/1996	12/23/1996	Trichloroethylene	AA	ND	0.005
9/27/1996	12/23/1996	Vinyl Chloride	AA	ND	0.002
9/26/1996	12/23/1996	1,2-Dibromo-3-Chloropropane (DBCP)	AA	ND	0.0002
9/26/1996	12/23/1996	2,4,5-TP Silvex	AA	ND	0.05
9/26/1996	12/23/1996	2,4-D	AA	ND	0.07
9/26/1996	12/23/1996	3-Hydroxycarbofuran	AA	ND	
9/26/1996	12/23/1996	Adipates (Di(2-Ethylhexyl))	AA	ND	0.4
9/26/1996	12/23/1996	Alachlor (Lasso)	AA	ND	0.002
9/26/1996	12/23/1996	Aldicarb	AA	ND	
9/26/1996	12/23/1996	Aldicarb Sulfone	AA	ND	
9/26/1996	12/23/1996	Aldicarb Sulfoxide	AA	ND	
9/26/1996	12/23/1996	Aldrin	AA	ND	
9/26/1996	12/23/1996	Antimony Total	AA	ND	0.006
9/26/1996	12/23/1996	Arsenic	AA	ND	0.05
9/26/1996	12/23/1996	Atrazine	AA	ND	0.003
9/26/1996	12/23/1996	Barium	AA	ND	2
9/26/1996	12/23/1996	Benzo (A) Pyrene	AA	ND	0.0002
9/26/1996	12/23/1996	Beryllium Total	AA	ND	0.004
9/26/1996	12/23/1996	BHC-gamma (Lindane)	AA	ND	0.0002
9/26/1996	12/23/1996	Butachlor	AA	ND	
9/26/1996	12/23/1996	Cadmium	AA	ND	0.005
9/26/1996	12/23/1996	Carbaryl	AA	ND	
9/26/1996	12/23/1996	Carbofuran	AA	ND	0.04
9/26/1996	12/23/1996	Chlordane	AA	ND	0.002
9/26/1996	12/23/1996	Chromium	AA	ND	0.1
9/26/1996	12/23/1996	Cyanide	AA	ND	0.2
9/26/1996	12/23/1996	Dalapon	AA	ND	0.2
9/26/1996	12/23/1996	Dicamba	AA	ND	
9/26/1996	12/23/1996	Dieldrin	AA	ND	
9/26/1996	12/23/1996	Dinoseb	AA	ND	0.007
9/26/1996	12/23/1996	Diquat	AA	ND	0.02
9/26/1996	12/23/1996	Endothall	AA	ND	0.1
9/26/1996	12/23/1996	Endrin	AA	ND	0.002
9/26/1996	12/23/1996	Ethylene Dibromide (EDB)	AA	ND	0.00005
9/26/1996	12/23/1996	Fluoride	AA	0.11	4
9/26/1996	12/23/1996	Glyphosate	AA	ND	0.7
9/26/1996	12/23/1996	Heptachlor	AA	ND	0.0004
9/26/1996	12/23/1996	Heptachlor Epoxide	AA	ND	0.0002
9/26/1996	12/23/1996	Hexachlorobenzene (HCB)	AA	ND	0.001
9/26/1996	12/23/1996	Hexachlorocyclopentadiene	AA	ND	0.05
9/26/1996	12/23/1996	Mercury	AA	ND	0.002
9/26/1996	12/23/1996	Methomyl	AA	ND	
9/26/1996	12/23/1996	Methoxychlor	AA	ND	0.04
9/26/1996	12/23/1996	Metolachlor	AA	ND	
9/26/1996	12/23/1996	Metribuzin	AA	ND	
9/26/1996	12/23/1996	Nickel	AA	0.019	0.1
9/26/1996	12/23/1996	Nitrate	AA	0.11	10
9/26/1996	12/23/1996	Nitrite	AA	0.01	1
9/26/1996	12/23/1996	Pentachlorophenol	AA	ND	0.001
9/26/1996	12/23/1996	Phthalates (Di(2-Ethylhexyl))	AA	ND	0.006
9/26/1996	12/23/1996	Picloram	AA	ND	0.5
9/26/1996	12/23/1996	Propachlor	AA	ND	
9/26/1996	12/23/1996	Selenium	AA	ND	0.05
9/26/1996	12/23/1996	Simazine	AA	ND	0.004
9/26/1996	12/23/1996	Sodium	AA	18.3	
9/26/1996	12/23/1996	Sulfate	AA	9	
9/26/1996	12/23/1996	Thallium Total	AA	ND	0.002
9/26/1996	12/23/1996	Total Polychlorinated Biphenyls (PCB)	AA	ND	0.0005
9/26/1996	12/23/1996	Toxaphene	AA	ND	0.003
9/26/1996	12/23/1996	Vydate (Oxamyl)	AA	ND	0.2
4/22/1993	10/11/1993	1,1,1,2-Tetrachloroethane	AA	ND	
4/22/1993	10/11/1993	1,1,1-Trichloroethane	AA	ND	0.2
4/22/1993	10/11/1993	1,1,2,2,-Tetrachloroethane	AA	ND	
4/22/1993	10/11/1993	1,1,2-Trichloroethane	AA	ND	0.005
4/22/1993	10/11/1993	1,1-Dichloroethane	AA	ND	
4/22/1993	10/11/1993	1,1-Dichloroethylene	AA	ND	0.007

4/22/1993	10/11/1993	1,1-Dichloropropene	AA	ND	
4/22/1993	10/11/1993	1,2,3-Trichloropropane	AA	ND	
4/22/1993	10/11/1993	1,2,4-Trichlorobenzene	AA	ND	0.07
4/22/1993	10/11/1993	1,2-Dibromo-3-Chloropropane (DBCP)	AA	ND	0.0002
4/22/1993	10/11/1993	1,2-Dichloroethane	AA	ND	0.005
4/22/1993	10/11/1993	1,2-Dichloropropane	AA	ND	0.005
4/22/1993	10/11/1993	1,3-Dichloropropane	AA	ND	
4/22/1993	10/11/1993	1,3-Dichloropropene	AA	ND	
4/22/1993	10/11/1993	2,2-Dichloropropane	AA	ND	
4/22/1993	10/11/1993	2,4,5-TP Silvex	AA	ND	0.05
4/22/1993	10/11/1993	2,4-D	AA	ND	0.07
4/22/1993	10/11/1993	3-Hydroxycarbofuran	AA	ND	
4/22/1993	10/11/1993	Adipates (Di(2-Ethylhexyl))	AA	ND	0.4
4/22/1993	10/11/1993	Alachlor (Lasso)	AA	ND	0.002
4/22/1993	10/11/1993	Aldicarb	AA	ND	
4/22/1993	10/11/1993	Aldicarb Sulfone	AA	ND	
4/22/1993	10/11/1993	Aldicarb Sulfoxide	AA	ND	
4/22/1993	10/11/1993	Aldrin	AA	ND	
4/22/1993	10/11/1993	Antimony Total	AA	ND	0.006
4/22/1993	10/11/1993	Arsenic	AA	ND	0.05
4/22/1993	10/11/1993	Asbestos	AA	ND	7
4/22/1993	10/11/1993	Atrazine	AA	ND	0.003
4/22/1993	10/11/1993	Barium	AA	ND	2
4/22/1993	10/11/1993	Benzene	AA	ND	0.005
4/22/1993	10/11/1993	Benzo (A) Pyrene	AA	ND	0.0002
4/22/1993	10/11/1993	Beryllium Total	AA	ND	0.004
4/22/1993	10/11/1993	BHC-gamma (Lindane)	AA	ND	0.0002
4/22/1993	10/11/1993	Bromobenzene	AA	ND	
4/22/1993	10/11/1993	Bromodichloromethane	AA	ND	
4/22/1993	10/11/1993	Bromoform	AA	ND	
4/22/1993	10/11/1993	Bromomethane	AA	ND	
4/22/1993	10/11/1993	Butachlor	AA	ND	
4/22/1993	10/11/1993	Cadmium	AA	ND	0.005
4/22/1993	10/11/1993	Carbaryl	AA	ND	
4/22/1993	10/11/1993	Carbofuran	AA	ND	0.04
4/22/1993	10/11/1993	Carbon Tetrachloride	AA	ND	0.005
4/22/1993	10/11/1993	Chlordane	AA	ND	0.002
4/22/1993	10/11/1993	Chloroethane	AA	ND	
4/22/1993	10/11/1993	Chloroform	AA	ND	
4/22/1993	10/11/1993	Chloromethane	AA	ND	
4/22/1993	10/11/1993	Chromium	AA	0.0011	0.1
4/22/1993	10/11/1993	Cis-1,2-Dichloroethylene	AA	ND	0.07
4/22/1993	10/11/1993	Cyanide	AA	ND	0.2
4/22/1993	10/11/1993	Dalapon	AA	ND	0.2
4/22/1993	10/11/1993	Dibromochloromethane	AA	ND	
4/22/1993	10/11/1993	Dibromomethane	AA	ND	
4/22/1993	10/11/1993	Dicamba	AA	ND	
4/22/1993	10/11/1993	Dichloromethane (Methylene Chloride)	AA	ND	0.005
4/22/1993	10/11/1993	Dieldrin	AA	ND	
4/22/1993	10/11/1993	Dinoseb	AA	ND	0.007
4/22/1993	10/11/1993	Diquat	AA	ND	0.02
4/22/1993	10/11/1993	Endothall	AA	ND	0.1
4/22/1993	10/11/1993	Endrin	AA	ND	0.002
4/22/1993	10/11/1993	Ethylbenzene	AA	ND	0.7
4/22/1993	10/11/1993	Ethylene Dibromide (EDB)	AA	ND	0.00005
4/22/1993	10/11/1993	Fluoride	AA	0.11	4
4/22/1993	10/11/1993	Glyphosate	AA	ND	0.7
4/22/1993	10/11/1993	Heptachlor	AA	ND	0.0004
4/22/1993	10/11/1993	Heptachlor Epoxide	AA	ND	0.0002
4/22/1993	10/11/1993	Hexachlorobenzene (HCB)	AA	ND	0.001
4/22/1993	10/11/1993	Hexachlorocyclopentadiene	AA	ND	0.05
4/22/1993	10/11/1993	M-Dichlorobenzene	AA	ND	
4/22/1993	10/11/1993	Mercury	AA	ND	0.002
4/22/1993	10/11/1993	Methomyl	AA	ND	
4/22/1993	10/11/1993	Methoxychlor	AA	ND	0.04
4/22/1993	10/11/1993	Metolachlor	AA	ND	
4/22/1993	10/11/1993	Metribuzin	AA	ND	

4/22/1993	10/11/1993	Monochlorobenzene (Chlorobenzene)	AA	ND	0.1
4/22/1993	10/11/1993	Nickel	AA	ND	0.1
4/22/1993	10/11/1993	Nitrate	AA	0.1	10
4/22/1993	10/11/1993	Nitrite	AA	ND	1
4/22/1993	10/11/1993	O-Chlorotoluene	AA	ND	
4/22/1993	10/11/1993	O-Dichlorobenzene	AA	ND	0.6
4/22/1993	10/11/1993	P-Chlorotoluene	AA	ND	
4/22/1993	10/11/1993	P-Dichlorobenzene	AA	ND	0.075
4/22/1993	10/11/1993	Pentachlorophenol	AA	ND	0.001
4/22/1993	10/11/1993	Phthalates (Di(2-Ethylhexyl))	AA	ND	0.006
4/22/1993	10/11/1993	Picloram	AA	ND	0.5
4/22/1993	10/11/1993	Propachlor	AA	ND	
4/22/1993	10/11/1993	Selenium	AA	ND	0.05
4/22/1993	10/11/1993	Simazine	AA	ND	0.004
4/22/1993	10/11/1993	Styrene	AA	ND	0.1
4/22/1993	10/11/1993	Tetrachloroethylene	AA	ND	0.005
4/22/1993	10/11/1993	Thallium Total	AA	ND	0.002
4/22/1993	10/11/1993	Toluene	AA	ND	1
4/22/1993	10/11/1993	Total Xylenes	AA	ND	10
4/22/1993	10/11/1993	Toxaphene	AA	ND	0.003
4/22/1993	10/11/1993	Trans-1,2-Dichloroethylene	AA	ND	0.1
4/22/1993	10/11/1993	Trichloroethylene	AA	ND	0.005
4/22/1993	10/11/1993	Vinyl Chloride	AA	ND	0.002
4/22/1993	10/11/1993	Vydate (Oxamyl)	AA	ND	0.2
4/22/1993	10/12/1993	1,2-Dibromo-3-Chloropropane (DBCP)	BA	ND	0.0002
4/22/1993	10/12/1993	2,4,5-TP Silvex	BA	ND	0.05
4/22/1993	10/12/1993	2,4-D	BA	ND	0.07
4/22/1993	10/12/1993	3-Hydroxycarbofuran	BA	ND	
4/22/1993	10/12/1993	Adipates (Di(2-Ethylhexyl))	BA	ND	0.4
4/22/1993	10/12/1993	Alachlor (Lasso)	BA	ND	0.002
4/22/1993	10/12/1993	Aldicarb	BA	ND	
4/22/1993	10/12/1993	Aldicarb Sulfone	BA	ND	
4/22/1993	10/12/1993	Aldicarb Sulfoxide	BA	ND	
4/22/1993	10/12/1993	Aldrin	BA	ND	
4/22/1993	10/12/1993	Antimony Total	BA	ND	0.006
4/22/1993	10/12/1993	Arsenic	BA	ND	0.05
4/22/1993	10/12/1993	Asbestos	BA	ND	7
4/22/1993	10/12/1993	Atrazine	BA	ND	0.003
4/22/1993	10/12/1993	Barium	BA	ND	2
4/22/1993	10/12/1993	Benzo (A) Pyrene	BA	ND	0.0002
4/22/1993	10/12/1993	Beryllium Total	BA	ND	0.004
4/22/1993	10/12/1993	BHC-gamma (Lindane)	BA	ND	0.0002
4/22/1993	10/12/1993	Butachlor	BA	ND	
4/22/1993	10/12/1993	Cadmium	BA	ND	0.005
4/22/1993	10/12/1993	Carbaryl	BA	ND	
4/22/1993	10/12/1993	Carbofuran	BA	ND	0.04
4/22/1993	10/12/1993	Chlordane	BA	ND	0.002
4/22/1993	10/12/1993	Chromium	BA	0.0018	0.1
4/22/1993	10/12/1993	Cyanide	BA	ND	0.2
4/22/1993	10/12/1993	Dalapon	BA	ND	0.2
4/22/1993	10/12/1993	Dicamba	BA	ND	
4/22/1993	10/12/1993	Dieldrin	BA	ND	
4/22/1993	10/12/1993	Dinoseb	BA	ND	0.007
4/22/1993	10/12/1993	Diquat	BA	ND	0.02
4/22/1993	10/12/1993	Endothall	BA	ND	0.1
4/22/1993	10/12/1993	Endrin	BA	ND	0.002
4/22/1993	10/12/1993	Ethylene Dibromide (EDB)	BA	ND	0.00005
4/22/1993	10/12/1993	Fluoride	BA	0.11	4
4/22/1993	10/12/1993	Glyphosate	BA	ND	0.7
4/22/1993	10/12/1993	Heptachlor	BA	ND	0.0004
4/22/1993	10/12/1993	Heptachlor Epoxide	BA	ND	0.0002
4/22/1993	10/12/1993	Hexachlorobenzene (HCB)	BA	ND	0.001
4/22/1993	10/12/1993	Hexachlorocyclopentadiene	BA	ND	0.05
4/22/1993	10/12/1993	Mercury	BA	ND	0.002
4/22/1993	10/12/1993	Methomyl	BA	ND	
4/22/1993	10/12/1993	Methoxychlor	BA	ND	0.04
4/22/1993	10/12/1993	Metolachlor	BA	ND	
4/22/1993	10/12/1993	Metribuzin	BA	ND	

4/22/1993	10/12/1993	Nickel	BA	ND	0.1
4/22/1993	10/12/1993	Nitrate	BA	0.13	10
4/22/1993	10/12/1993	Nitrite	BA	0.02	1
4/22/1993	10/12/1993	Pentachlorophenol	BA	ND	0.001
4/22/1993	10/12/1993	Phthalates (Di(2-Ethylhexyl))	BA	ND	0.006
4/22/1993	10/12/1993	Picloram	BA	ND	0.5
4/22/1993	10/12/1993	Propachlor	BA	ND	
4/22/1993	10/12/1993	Selenium	BA	ND	0.05
4/22/1993	10/12/1993	Simazine	BA	ND	0.004
4/22/1993	10/12/1993	Thallium Total	BA	ND	0.002
4/22/1993	10/12/1993	Total Polychlorinated Biphenyls (PCB)	BA	ND	0.0005
4/22/1993	10/12/1993	Toxaphene	BA	ND	0.003
4/22/1993	10/12/1993	Vydate (Oxamyl)	BA	ND	0.2
3/18/1992	8/25/1992	Gross Alpha, Excl. Radon & U	A	ND	15
3/18/1992	8/25/1992	Gross Alpha, Excl. Radon & U	B	ND	15
8/26/1991	8/25/1992	Arsenic	A	ND	0.05
8/26/1991	8/25/1992	Barium	A	ND	2
8/26/1991	8/25/1992	Cadmium	A	ND	0.005
8/26/1991	8/25/1992	Chromium	A	ND	0.1
8/26/1991	8/25/1992	Fluoride	A	ND	4
8/26/1991	8/25/1992	Lead	A	ND	0.015
8/26/1991	8/25/1992	Mercury	A	ND	0.002
8/26/1991	8/25/1992	Nitrate	A	0.25	10
8/26/1991	8/25/1992	Selenium	A	ND	0.05
8/26/1991	8/25/1992	Silver	A	ND	0.1
8/26/1991	8/25/1992	Sodium	A	15.6	
8/26/1991	8/25/1992	Arsenic	B	ND	0.05
8/26/1991	8/25/1992	Barium	B	ND	2
8/26/1991	8/25/1992	Cadmium	B	ND	0.005
8/26/1991	8/25/1992	Chromium	B	ND	0.1
8/26/1991	8/25/1992	Fluoride	B	0.084	4
8/26/1991	8/25/1992	Lead	B	ND	0.015
8/26/1991	8/25/1992	Mercury	B	ND	0.002
8/26/1991	8/25/1992	Nitrate	B	ND	10
8/26/1991	8/25/1992	Selenium	B	ND	0.05
8/26/1991	8/25/1992	Silver	B	ND	0.1
8/26/1991	8/25/1992	Sodium	B	15.6	
4/19/1991	6/24/1991	1,1,1-Trichloroethane	A	ND	0.2
4/19/1991	6/24/1991	1,1-Dichloroethylene	A	ND	0.007
4/19/1991	6/24/1991	1,2-Dichloroethane	A	ND	0.005
4/19/1991	6/24/1991	Benzene	A	ND	0.005
4/19/1991	6/24/1991	Carbon Tetrachloride	A	ND	0.005
4/19/1991	6/24/1991	P-Dichlorobenzene	A	ND	0.075
4/19/1991	6/24/1991	Trichloroethylene	A	ND	0.005
4/19/1991	6/24/1991	TThm	A	ND	0.1
4/19/1991	6/24/1991	Vinyl Chloride	A	ND	0.002
3/8/1990	6/19/1990	1,1,1-Trichloroethane	A	ND	0.2
3/8/1990	6/19/1990	1,1-Dichloroethylene	A	ND	0.007
3/8/1990	6/19/1990	1,2-Dichloroethane	A	ND	0.005
3/8/1990	6/19/1990	Benzene	A	ND	0.005
3/8/1990	6/19/1990	Carbon Tetrachloride	A	ND	0.005
3/8/1990	6/19/1990	P-Dichlorobenzene	A	ND	0.075
3/8/1990	6/19/1990	Trichloroethylene	A	ND	0.005
3/8/1990	6/19/1990	Vinyl Chloride	A	ND	0.002
3/8/1990	6/19/1990	1,1,1-Trichloroethane	B	ND	0.2
3/8/1990	6/19/1990	1,1-Dichloroethylene	B	ND	0.007
3/8/1990	6/19/1990	1,2-Dichloroethane	B	ND	0.005
3/8/1990	6/19/1990	Benzene	B	ND	0.005
3/8/1990	6/19/1990	Carbon Tetrachloride	B	ND	0.005
3/8/1990	6/19/1990	P-Dichlorobenzene	B	ND	0.075
3/8/1990	6/19/1990	Trichloroethylene	B	ND	0.005
3/8/1990	6/19/1990	Vinyl Chloride	B	ND	0.002
8/15/1988	9/27/1988	Arsenic	A	0.005	0.05
8/15/1988	9/27/1988	Barium	A	0.05	2
8/15/1988	9/27/1988	Cadmium	A	0.005	0.005
8/15/1988	9/27/1988	Chromium	A	0.005	0.1
8/15/1988	9/27/1988	Lead	A	0.005	0.015
8/15/1988	9/27/1988	Mercury	A	ND	0.002

8/15/1988	9/27/1988	Nitrate	A	ND	10
8/15/1988	9/27/1988	Selenium	A	0.005	0.05
8/15/1988	9/27/1988	Silver	A	0.005	0.1
3/18/1988	4/22/1988	Gross Alpha, Excl. Radon & U	A	ND	15
8/29/1985	8/29/1985	Arsenic	A	ND	0.05
8/29/1985	8/29/1985	Barium	A	ND	2
8/29/1985	8/29/1985	Cadmium	A	ND	0.005
8/29/1985	8/29/1985	Chromium	A	ND	0.1
8/29/1985	8/29/1985	Fluoride	A	0.15	4
8/29/1985	8/29/1985	Lead	A	ND	0.015
8/29/1985	8/29/1985	Mercury	A	ND	0.002
8/29/1985	8/29/1985	Nitrate	A	0.16	10
8/29/1985	8/29/1985	Selenium	A	ND	0.05
8/29/1985	8/29/1985	Silver	A	ND	0.1
1/5/1983	1/5/1983	2,4,5-TP Silvex	A	ND	0.05
1/5/1983	1/5/1983	2,4-D	A	ND	0.07
1/5/1983	1/5/1983	BHC-gamma (Lindane)	A	ND	0.0002
1/5/1983	1/5/1983	Endrin	A	ND	0.002
1/5/1983	1/5/1983	Methoxychlor	A	ND	0.04
1/5/1983	1/5/1983	Toxaphene	A	ND	0.003

A blank or a 0 in the MCL column indicates that a MCL has not been set for that chemical
This list represents the latest test results for ***all*** *sources and entry points the system has. For systems with multiple sources the list will probably be a mix of results from all sources. But these are the latest results.*

For further information on this public water system, click on the area of interest below:
System Info :: Report for Lenders :: Alerts :: Violations :: Enforcements :: Contacts :: Site Visits :: Public Notice :: Plan Review
Coliform Summary :: Coliform Results :: Sampling Schedule for Coliform :: Groundwater/GWUDI Source Details
Chemical Group Summary :: Latest Chemical Results :: Entry Point Detects :: Single Analyte Results
Chemical Schedule Summary :: Chemical Schedule Details
Lead & Copper :: Corrosion Control (LCR) :: Nitrate :: Arsenic :: Radionuclides :: GWR 4-Log :: LT2
DBPs :: TOC & Alkalinity :: DBP Sample Sites :: FANLs :: MRDL :: Turbidity :: SWTR :: RAA :: LRAA

Information by county:
Inventory :: Surface Water Systems :: Water System Surveys :: Outstanding Performers :: Plan Reviews :: System Scores :: Exceedances
Alerts :: Violations :: Open Enforcements :: Significant Deficiencies :: Cross Connection ASRs :: Treatment Plant Inspections :: Fluoride

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Inventory List for all Oregon Drinking Water Systems in Excel or printable screen format
Lab Help: Tools for Laboratories

Introduction :: Data Search Options :: WS Name Look Up :: WS ID Look Up :: DWS Home

APPENDIX H

SOURCE WATER ASSESSMENT REPORT

Summary of Analysis

Chiloquin Municipal Water Department
Chiloquin, Oregon
Klamath County
PWS #4100184

February 24, 2004

Prepared By

Oregon Department of Human Services
Health Services
Drinking Water Program

And

Oregon Department of Environmental Quality
Water Quality Division
Drinking Water Protection

State of Oregon
Department of
Environmental
Quality

Available in Alternate Formats by contacting the DHS DWP at (541) 726-2587

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Chiloquin Municipal Water Department
Source Water Assessment Report

Summary

The Source Water Assessment Program, mandated by the 1996 Amendments to the Safe Drinking Water Act, requires that states provide the information needed by public water systems to develop drinking water protection plans if they choose. The information that is provided includes the identification of the area most critical to maintaining safe drinking water, i.e., the Drinking Water Protection Area, an inventory of potential sources of contamination within the Drinking Water Protection Area, and an assessment of the relative threat that these potential sources pose to the water system.

This report is intended to provide Chiloquin Municipal Water Department with our conclusions regarding the source water assessment analysis. It is our hope that the information provided will be used as a basis for reducing the risk of contamination to your water source through the development of a voluntary Drinking Water Protection Plan (DWPP). Should you decided to proceed with the development of a DWPP, a comprehensive assessment analysis can be made available to you by contacting either the DHS Project Manager or the DHS Drinking Water Program Groundwater Coordinator. The Comprehensive analysis includes a more in-depth description of the local hydrogeology, water system susceptibility, and the water system specific assumptions built into the source water assessment process.

The Drinking Water Protection Area for the Chiloquin Municipal Water District is identified as the area at the surface overlying the critical portion of the aquifer that supplies groundwater to the wells. The aquifer supplying drinking water to the System's wells has been identified as an unconsolidated sedimentary aquifer of Quaternary age. Locally, the water bearing zones consist of gravel and clay. According to well log information, groundwater occurs at minimum depths of approximately 95 feet below the surface. The aquifer is deep and confined.

The aquifer supplying the wells is considered highly sensitive because of the lack of specific casing seal information and the elevated traverse potential. In addition, the age of the well, the elevated infiltration potential, and soil characteristics may contribute to the sensitivity of the aquifer.

An inventory of potential contamination sources was performed within the Chiloquin Municipal Water Department drinking water protection area. The primary intent of the inventory was to identify and locate significant potential contaminant sources of concern. The inventory was conducted by reviewing applicable state and federal regulatory databases and land use maps, interviewing persons knowledgeable of the area, and conducting a windshield survey by driving through the drinking water protection area to field locate and verify as many of the potential contaminant source activities as possible. It is important to remember the sites and areas

identified are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

The delineated drinking water protection area is primarily dominated by commercial and residential land use. Seventeen potential contaminant source locations were identified in the two-year time-of-travel zone including a sewage treatment plant, a park, transportation corridors, several above ground and buried fuel tanks, bulk fuel companies, a salvage yard, a gas station, a historic gas station, residences, sewer lines, the fire station with associated underground tank, a hardware store, construction/demolition areas, and a utility station. A total of eight potential contaminant source locations were identified within the five-year and ten-year time-of-travel zones of the drinking water protection area. The potential contaminant sources in this area include a road maintenance station, an auto repair, a car wash, several medical facilities, a school with associated above ground tank, and a transfer station. The residential areas and transportation corridors extend from the two-year time-of-travel zone into the ten-year time-of-travel zone. All of the potential contaminant sources identified pose a relatively higher to moderate risk to the drinking water supply.

Under a "worst-case" scenario, our susceptibility analysis suggests that the Chiloquin Municipal Water Department water supply is most susceptible to those high and moderate risk potential contaminant sources inside the 2-year time-of-travel zone including wastewater treatment plants/collection stations, above ground storage tanks, railroads, underground storage tanks, chemical/petroleum processing/storage, automobile repair shops, junk/scrap/salvage yards, historic gas stations, utility stations, high density housing, city maintenance shops, parks, furniture/lumber/parts stores/hardware stores, transportation corridors, construction/demolition areas, sewer lines, and state cleanup sites. **Therefore, we recommend that these potential contaminant sources not only be addressed in any Drinking Water Protection Plan but also in any Water System Emergency Response Plan.**

The size of the Drinking Water Protection Area is designed to approximate the next 10 to 15 years of groundwater supply for the Chiloquin Municipal Water Department Public Water System, depending on the type of delineation method. The DWPA for Chiloquin Municipal Water Department is shown in Figure 1 (Appendix B). Additional 5-year, 2-year, and 1-year "time-of-travel" zones are identified inside the DWPA. The 2-year time-of-travel zone shown on the map is specifically used as a conservative estimate of the survival time of some viruses in groundwater. **Based on assessment results, the aquifer supplying the well is considered highly sensitive to contamination. In addition, potential sources of viruses occur within the DWPA. Therefore, the drinking water supply is considered susceptible to viral contamination.**

The costs associated with contaminated drinking water are high. Developing an approach to protect that resource will reduce the risk of a contamination event occurrence. In this report, we have summarized the local geology and well construction issues as they pertain to the quality of your drinking water source. We have identified the area we believe to be most critical to preserving your water quality (the Drinking Water Protection Area) and have identified potential sources of contamination within that area. In addition, we provide you with recommendations, i.e., Best Management Practices, regarding the proper use and practices associated with some

common potential contamination sources. We believe public awareness is a powerful tool for protecting drinking water. The information in this report will help you increase public awareness about the relationship between land use activities and drinking water quality.

1. Introduction

1.1 Source Water Assessment Project

Traditionally, water systems have relied on proper water system management, water quality monitoring, and if necessary, water treatment to ensure that the water they serve meets drinking water standards. In spite of the best of these efforts, contamination of drinking water still occurs. The costs, both tangible and intangible, to a water system contending with a contaminated water supply are significant. At a minimum, there is the cost of increased monitoring that will be required to make certain that the water does not pose a significant health risk. At contaminant concentrations exceeding a drinking water standard, the system may be dealing with the cost of installing and maintaining treatment, the loss of the drinking water source, i.e., a well, and most assuredly, a concerned and often frightened public.

Beginning with the 1986 Amendments to the Safe Drinking Water Act, an additional "barrier to contamination" was recognized at the federal level. A shift from the "reactive" approach of water treatment to a "proactive" approach of prevention began to occur. Although water treatment may be necessary in some cases, it is much more cost effective to prevent the contamination from happening in the first place. The Oregon Department of Environmental Quality (DEQ) and the Department of Human Services (DHS) Drinking Water Program recently compared the estimated cost of prevention (less the $15 per resident) to the actual cost of investigation and treatment (more than $1500 per resident) in a small Oregon community (population 330) impacted by a volatile organic contaminant that exceeded the drinking water standard.

Oregon has a Drinking Water Protection Program in place for groundwater systems, i.e., wells and springs. In order to protect a drinking water resource, a water system must know where the drinking water comes from, what potential sources of pollution exist, and what level of threat each presents to the system's drinking water. Until recently, the costs associated with acquiring this information were the responsibility of the water system, a financial burden that even the most proactive water systems found difficult to meet. The 1996 Amendments to the Safe Drinking Water Act lifted that burden from water systems by requiring that the states conduct Source Water Assessments for federally recognized public water systems that fall under state regulatory authority. The purpose of the Assessment is to provide water systems with the information that they need to develop a strategy to protect their source of drinking water if they choose.

As mandated by the 1996 Amendments, a Source Water Assessment consists of the following:

1. The identification of the area that directly overlies that part of the aquifer supplying drinking water to the well or spring,

2. An inventory of potential sources of contamination within that area, and

3. The evaluation of the susceptibility of the water system to contamination from those sources.

Funding for assessments was provided to the states through the Act as part of the state's Drinking Water Revolving Loan Fund.

The DEQ and DHS worked with a citizen's advisory committee and with the DHS Drinking Water Advisory Committee to design a program that would meet the needs of Oregon's public water systems. The Environmental Protection Agency (EPA) has certified that Oregon's plan meets the requirements of the Safe Drinking Water Act. Within the program, DHS has the responsibility of working with groundwater systems and the DEQ works with surface water systems and conducts all potential contaminant inventories.

Within this report, you will find general descriptions of the various elements of the Source Water Assessment Program, as well as specific information identifying the Drinking Water Protection Area for your water system and an inventory of the potential threats to your drinking water quality. Although developing a Drinking Water Protection Plan is voluntary in Oregon, we hope that the information provided in the Source Water Assessment Report will be used as a basis for reducing the risk of contamination to your water supply. Risk reduction can be accomplished by correcting intake construction and/or set back deficiencies that contribute to water system susceptibility and by implementing Best Management Practices for identified potential contaminant sources. The bulk of our risk reduction recommendations center on developing a "state certified" Drinking Water Protection Plan, and providing information to those residences, agricultural operations and businesses, etc., that live or operate within the identified protection area.

A more comprehensive description of the assessment analysis can be made available to you, should you decide to proceed with the development of a drinking water protection plan. This comprehensive description will include a more in-depth discussion of the local hydrogeology and the parameters and assumptions used in the model. Resources are not available for the DHS Drinking Water Program to gather new information. However, the incorporation of new data discovered by the system or its contractors will be considered by the DHS Drinking Water Program as time permits.

1.2 Groundwater Basics

In order to protect a groundwater source of drinking water, it is important to understand how the groundwater system works, e.g., where groundwater comes from, how it occurs in the subsurface, how it moves, and how it becomes contaminated. Included in Appendix F of this report is a Fact Sheet about groundwater that you can use to help increase the awareness of others regarding groundwater and its susceptibility to contamination.

When a well is drilled, the drilling equipment first passes through the vadose zone until it encounters the water-table. Within the vadose zone, the open pore spaces between soil and

sediment particles and/or the open fractures within the bedrock material are only partially filled with water. Most of the open pore/fracture space is filled with air, therefore, little if any water can be obtained from the vadose zone. The water-table marks the top of the saturated zone, where the open pore/fracture spaces are, for the most part, completely saturated (full) with groundwater. It should be understood that within the saturated zone, groundwater does not occur as underground rivers, lakes, or veins. An aquifer is any geologic material located below the water-table (and is therefore water saturated) that can yield an adequate water supply to a well. Geologic materials that tend to yield large quantities of water to wells include sand and gravel deposits, porous lava flows, and fractured bedrock.

Groundwater is part of the hydrologic cycle which controls the distribution of water on the earth's surface. Groundwater is therefore linked to other water sources, notably surface water such as streams, rivers, and lakes. Virtually without exception, groundwater originates as precipitation at the earth's surface which sinks through the soil and percolates down to the water-table. The fact that groundwater originates at the surface is what makes it vulnerable to contamination. As recharging groundwater moves downward through the soil and vadose zone, it comes in contact not only with the geologic materials present, but also with any contaminants contained within the soil and/or vadose zone. Therefore, recharging groundwater can carry contaminants downward to the aquifer. Likewise liquid chemicals, if present in large enough quantities, can enter the aquifer by following the same path as recharging groundwater.

The direction and speed with which groundwater moves is controlled by the slope of the water-table and aquifer permeability. The slope of the water-table often mimics, in a subdued sense, the earth's surface with groundwater moving from high areas to low areas. Aquifer permeability is a measure of how easy it is for groundwater to move through the geologic material that makes up the aquifer. Geologic materials with greater permeability allow groundwater to move with less restriction. In general, groundwater movement is measured in terms of a few inches to a few feet per day. A pumping well can significantly influence the speed and direction of groundwater movement by drawing the water-table down in its' vicinity, creating a depression in the water-table. As the well continues to pump, the depression in the water-table spreads out through the aquifer and leads to the formation of a "capture zone". Groundwater inside the capture zone is eventually pumped to the earth's surface by the well.

When wells are used as a water source, we identify the drinking water protection area for the water system by delineating those portions of the capture zone around the well(s) where, on average, it will take 10 or 15 years (depending on the delineation technique used) for water moving through the aquifer to arrive at the well. We have also identified the 5-, 2-, and 1- year capture zones around the well(s) to enhance the overall usefulness of the drinking water protection area.

2. Chiloquin Municipal Water Department Water System Information

Chiloquin Municipal Water District is located in Klamath County and serves approximately 755 people through 387 connections. Drinking water is supplied by two wells.

2.1 Location of the Drinking Water Source

We have located your source(s) using a Trimble GeoExplorer II Global Positioning System (GPS) unit. The data has been differentially corrected to remove some of the common positioning errors. The location of the source(s), with the corresponding Drinking Water Protection Area, has been placed in a Geographic Information System (GIS) layer and projected onto a U.S.G.S. 7.5 minute topographic map that is included within this report. In order to be consistent with the topographic map, the projection uses the NAD1972 datum. The latitude and longitude given on the map and below, however, reflects a projection in the more commonly used WGS1984 datum.

Data collection specifics include:

- 150 individual measurements,
- linked to a minimum of four satellites,
- a PDOP of less than 6 (pertains to precision of measurement), and
- a signal to noise ratio of greater than 5.

The raw data was subjected to differential correction using the PATHFINDER software. The location data for your well using the WGS84 datum is as follows:

Source	Latitude	Longitude
Well #1-Source AA	42° 34' 34.326" N	121° 51' 43.164" W
Well #2-Source BA	42° 34' 47.600" N	121° 52' 15.974" W

2.2 Source Construction

Well #1(AA) does not have a well construction log. Nothing is known of its casing seal construction.

Well #2 (BA) was initially completed in 1974. A 24-inch borehole was drilled to 40 feet, with a 16-inch hole drilled to 195 feet, and a 12-inch hole was drilled to 400 feet. Acceptable water production was likely encountered at 95 feet; the static water level (level when well is not being pumped) was reported as 28 feet below the surface. There is no record of casing seal

construction. The casing seal is considered to be inadequate. Water likely enters the well through the open portion of the well. A copy of the well report for this well is included in Appendix D.

2.3 Nature and Characteristics of the Aquifer

The aquifer supplying the drinking water to the Chiloquin Municipal Water District well likely consists of clay and gravel of Quaternary age.

As described in the well construction discussion above, the depth to first water encountered in the wells and the static water level after well completion differ considerably. This implies that the groundwater is under lithostatic pressure and that the aquifer should be considered confined. Based on the well report, the aquifer consists of gravel and clay and is overlain by clay. The water-bearing zone exploited in the aquifer is approximately 17 feet thick.

3. Delineation of the Drinking Water Protection Area

3.1 Methodology

The delineation of the Drinking Water Protection Area (DWPA) is a fundamental aspect of the source water assessment for a public water system. When information regarding the DWPA location is provided to the community, it enables the community to develop management strategies that will have the most impact with regard to preserving long-term drinking water quality. For groundwater systems, the DWPA identifies the area on the surface which directly overlies the portion of aquifer that supplies enough groundwater to the well, wellfield, or spring to meet long-term water demand (i.e., 10 to 15 years). Once delineated, the DWPA outline is placed on a map and provides the community with the knowledge of the geographic area providing water to the well. This is the area where contamination poses the greatest threat to the drinking water supply.

The delineation exercise requires the use of site-specific information so that the identified DWPA adequately reflects the hydraulic characteristics of the aquifer and the operation of the water system. The level of hydrogeologic assessment performed during the delineation depends on the population served, the presence of potentially interfering wells, and the complexity of the local hydrogeology. The delineation methods are described in the text and table below. The method used for your delineation is indicated in Appendix E (Parameters Used in the Delineation Model).

Calculated Fixed Radius (CFR): The CFR method determines the volume of the aquifer that would be needed to supply the system for the next 15 years assuming a flat water-table. The delineation is circular in shape, centered on the well.

Enhanced CFR: If the water system has more than one well or a groundwater boundary is present near the well(s) and there is a potential for interference between the wells and/or the groundwater boundary, a more sophisticated analytical method is used. In such cases we specifically use an analytical model that allows interference to be accommodated. However, like the CFR, this delineation method does not account for groundwater flow direction (i.e., it assumes a flat water-table). As with the CFR, the next 15 years of groundwater supply is identified.

Analytical: Neither the CFR or Enhanced CFR method takes into account the direction and rate of groundwater flow. Analytical models incorporate the groundwater gradient into the calculations. Because of the more site-specific nature of this model, only the next 10 years of groundwater supply is identified. For systems serving 501 to 50,000 from aquifer sources lacking complex hydrogeologic boundaries, the groundwater gradient is either estimated from water-levels indicated on well logs or taken from published reports. For water systems that fall in this category and serve more than 3,300, the gradient may be determined directly by field measurement.

Analytic or Numerical: These more sophisticated models allow for the incorporation of complex boundaries such as streams and formation contacts, can be checked with local water levels, and can incorporate spatial variations in aquifer properties.

Hydrogeologic Mapping: This delineation method involves identifying the hydrogeologic boundaries of the aquifer and is most often used in conjunction with the analytical, analytic element, and/or numerical delineation methods. Hydrogeologic boundaries include constant head boundaries (i.e. streams and/or reservoirs) and no-flow boundaries which occur when an aquifer comes in direct contact with a relatively impermeable material. Hydrogeologic mapping may be used as a stand alone delineation technique when identifying DWPAs for springs and/or wells where there is no means of determining aquifer properties.

Population	Interfering Wells?	Complex Hydrogeology?	Delineation Method	Parameters Needed[1]
25-500	N	N	CFR	Q, n, b
25-500	N	Y	Enhanced CFR	Q, b, n, K
25-500	Y	Y/N	Enhanced CFR	Q, b, n, K
501-3,300	Y/N	N	Analytical	Q, b, n, K, i
501-3,300	Y/N	Y	Analytic or Numerical	Q, b, n, K, i, h
3,301-50,000	Y/N	N	Analytical	Q, b, n, K, i, h
3,301-50,000	Y/N	Y	Analytic or Numerical	Q, b, n, K, i, h
50,000+	Y/N	Y/N	Numerical	Q, b, n, K, i, h
Spring	NA	Y/N	Hydrogeologic Mapping	Local Geology

1. Q = pump rate; n = aquifer porosity, b = aquifer thickness; K = hydraulic conductivity (permeability); i = gradient (slope of the water table); h = hydraulic head (elevation of the water table).

3.2 Results

DHS Drinking Water Program staff have collected and reviewed data for the purpose of delineating the DWPA for the Chiloquin Municipal Water Department. The scope of work for this report included collecting information from the water system operator, researching written reports and establishing a base map of the delineated area. **Based on the available data and the population the analytical method was used to delineate the DWPAs for the System's wells.** The resulting DWPA for the System's Well is shown in Appendix B, Figure 1.

Specific information regarding the parameters used in the delineation process including the delineation method, estimated pump rate of each well, and aquifer characteristics can be found in Appendix E.

4. Sensitivity Analysis

After the Drinking Water Protection Area (DWPA) has been identified, aquifer susceptibility to potential contaminant sources inside the DWPA can be evaluated. Aquifer susceptibility is dependent on two factors, the natural environment's characteristics that permit migration of a contaminant into the aquifer (i.e., aquifer sensitivity) and the presence, distribution, and nature of the potential contaminant sources within the DWPA. It should be understood that the public water system's drinking water source cannot be susceptible to contamination, even if the aquifer is sensitive, unless potential contaminant sources are present within the DWPA. Therefore, the intent of the sensitivity analysis is to identify those areas within the DWPA where the aquifer is most sensitive to contamination. The analysis is based on data collected or generated during the DWPA delineation process and is designed to meet the needs of other existing or developing programs such as Monitoring Waivers and the Groundwater Rule.

4.1 Sensitivity Analysis Methodology

Aquifer sensitivity refers to those factors characteristic of the aquifer and overlying materials, in addition to those that are imposed upon the aquifer, such as well construction, that increase the potential for both surface and subsurface contaminants to gain access to the aquifer. The aquifer sensitivity analysis depends on a number of factors that can collectively or individually allow the aquifer to become contaminated. Factors considered during the sensitivity analysis are described below. Characteristic factors pertaining to sensitivity are categorized as highly or moderately sensitive. **Those factors related directly to the well or wellfield are conditions that can be corrected by the water system, thus potentially lowering the overall sensitivity.** However, those factors related to the aquifer tend to be a direct result of natural conditions and in most cases can not be modified.

4.1.1 Depth to first water-bearing zone below casing seal

The depth to the first water-bearing zone below the casing seal is important in controlling the aquifer's sensitivity because it relates to the time of travel from the surface to groundwater. The greater the distance and estimated travel time, the greater the potential for the contaminant to be degraded to insignificant levels. Although not specifically evaluated as a sensitivity criterion, the depth to the first water-bearing zone below the casing seal is used in the traverse potential and infiltration potential calculations described later.

4.1.2 Aquifer Characteristics and Hydraulic Nature

Aquifer characteristics refer to the geologic material (lithology) that groundwater is moving through and how the lithology controls groundwater movement. Aquifer characteristics that contribute to sensitivity include materials that provide large open pore spaces and/or short pathways for contaminants to travel through the aquifer. Therefore, we consider aquifer

materials such as gravels, boulders, and fractured bedrock to contribute to overall aquifer sensitivity. These types of materials do not provide for natural filtration of contaminants as water can move with relative ease through the large diameter pore spaces and/or fractures. The presence of fractured bedrock at the surface inside the DWPA is also an indication that contaminants could move quickly from the surface into the local aquifer system. Therefore, our concern is raised if the characteristics and hydraulic nature of the aquifer cannot be determined.

For the purpose of the source water assessment, the hydraulic nature of the water inside the aquifer is described as unconfined, confined, semi-confined, and/or fractured confined. Unconfined aquifers are often shallow and are not separated from the surface by a protective low-permeability layer. Confined aquifers are often deeper and are overlain by a protective low-permeability layer. As a result, unconfined aquifers have minimal protection from downward percolating contaminants and are considered sensitive to potential contaminant sources. However, the overall protective nature of the overlying low-permeability (confining) layer for a confined aquifer may be limited if it is thinner than 15 feet. Under such conditions the aquifer may be considered semi-confined, raising concern that the confining layer may be absent or ineffective within large portions of the DWPA. Likewise, concern is raised if a well or spring is drawing water from a fractured aquifer exhibiting confined characteristics which lies within 50 feet of the surface. At shallow depths, the potential for fractures to intercept the surface or near surface increases. Any fracture reaching the shallow subsurface can provide a pathway for contaminated shallow groundwater to enter the aquifer, effectively raising aquifer sensitivity.

4.1.3 Overburden Thickness and Characteristics

The material resting between the surface and the aquifer can have a significant impact on the aquifer sensitivity analysis. Overburden thickness can be related to the time of travel from the surface to the aquifer. The greater the distance and time, the greater the potential for contaminants to be degraded to insignificant levels. In addition, laterally persistent materials of low permeability, such as silt, clay, and unfractured bedrock, will restrict the downward movement of contaminants. Therefore, the presence of a thick (greater than 15 feet) confining unit resting on top of the aquifer offers the greatest amount of natural protection to a drinking water supply. Confining units consisting of plastic clay and/or unfractured bedrock are much more protective than those consisting of silt.

4.1.4 Soil Types

Although soils usually compose a very small portion of the overburden above the aquifer, they are the first natural barrier between the surface and the water-table. Therefore, the amount of time it takes for water to pass through the soil zone can be used as a factor in determining overall aquifer sensitivity. Even over short distances, the permeability and thickness of different soil types can be highly variable as some soils are thinner and/or have a higher permeability than others. Therefore, for the purposes of the source water assessment, we identify soils with high, moderate, and low sensitivity based on the amount of time it takes for water to pass through a specific soil under saturated conditions. Highly sensitive soils are those soils for which it has

been estimated to take less than 65 hours for water to pass through their profile under saturated conditions. This means that there is little opportunity for degradation of a contaminant, such as nitrate, within the soil zone. In addition, the travel time through the soil indicates the amount of response time available before an accidental spill becomes significantly more difficult to clean up.

Moderately sensitive soils are those for which it has been estimated to take between 65 and 256 hours (approximately 2.7 to 10.7 days) for water to pass through their profile and low sensitivity soils are those which it has been estimated to take more than 256 hours for water to pass through. Recognition of these soil types and their occurrence within the Drinking Water Protection Area can indicate those parts of the protection area where contamination may pose a greater risk to the water system; therefore it is useful to compare the distribution of these soil types with respect to potential contaminant sources. The distribution and relative sensitivity of soils within the Drinking Water Protection Area and the distribution of potential contaminant sources with respect to soils is shown on the Susceptibility Map (Appendix B, Figure 3).

4.1.5 Infiltration Potential

The Infiltration Potential (IP) is an estimate of the ability of water to infiltrate from the surface to the aquifer. It is based on (1) the depth to the aquifer, (2) an estimate of the weighted permeability of the material between the surface and the aquifer, a parameter referred to as the Traverse Potential (TP), and (3) the hydraulic surplus, or amount of water available from precipitation and/or irrigation at the surface that is able to infiltrate into the aquifer. Both IP and TP values are determined for each drinking water source and are used as factors for determining overall aquifer sensitivity near the wellhead and/or spring outflow (i.e., within the 100 foot sanitary setback or 2-year Time-of-Travel Zone). If enough well log data is available for the surrounding area, DWPA sensitivity and susceptibility (Appendix B, Figure 3) can be based on TP and IP data rather than soil sensitivity for those water systems serving more than 500 people.

Both IP and TP scoring in Oregon vary from 1 to 10. A low TP value of 1 indicates that the materials above the aquifer are of very low permeability and/or are of great thickness. Conversely, a high TP value of 10 indicates materials above the aquifer have a very high permeability and/or are very thin. Therefore, we interpret TP values greater than 5 as an indication of areas where the potential for movement of water (and/or contaminants contained in the water) from the surface to the aquifer is greatest and we classify the Drinking Water Protection Area (or portions thereof, if TP is mapped) as highly sensitive to contamination.

IP values are determined using TP values and an estimate of the available water at the surface for aquifer recharge. Our estimate of available water at the surface assumes that rainfall, evaporation, plant uptake, and runoff remain constant throughout the DWPA; however we do recognize that irrigation practices can vary with regard to land use and/or crop type. Therefore, for those water systems where TP and IP have been mapped, IP values can vary even if TP values are constant throughout the DWPA. A low IP value of 1 indicates that it takes the available recharge water a long time to reach the aquifer. Conversely, a high IP value of 10 indicates that surface water is recharging the aquifer very quickly and therefore has the potential

to transport large quantities of contaminants into the aquifer with little or no reduction in concentration. We classify the DWPA (or portions thereof, if IP is mapped) as having a high, moderate, or low sensitivity to contamination with respect to the calculated IP value as follows:

Sensitivity	Infiltration Potential
High	>7
Moderate	4 to ≤7
Low	<4

4.1.6 Source Construction

A groundwater based public water system's sensitivity to contamination is dependent not only on aquifer characteristics but also the integrity of the well(s) and/or spring boxes used to extract or collect water for distribution. If improperly constructed, these structures can also serve as conduits for contamination to move from the surface or near-surface environment into the well and/or spring. We have evaluated the sensitivity of the water system's intakes to potential contamination by reviewing construction deficiencies reported on recent sanitary surveys, the construction and depth of casing seal for the public water supply well(s), and age of the constructed intake.

When a well is drilled in soft or loose materials, a casing (steel or plastic pipe) is inserted to hold the hole open during and after drilling. The casing does not in itself provide adequate protection from contaminated shallow water gaining assess to the well. Contaminated shallow groundwater can migrate to the casing and follow the casing directly down to the well intake. The real protection from potentially contaminated shallow water is the casing seal. This seal is put in place by drilling a hole that is at least four inches greater in diameter than the final casing. After the larger hole is drilled, the casing is installed and the annular space between the casing and the bore hole wall is filled with a sealant, either bentonite (an expanding clay), cement, or a combination of the two materials. The casing seal must, by law, be placed a minimum of 18 feet below the surface, however, it should be placed to a depth that is controlled by the local geology, e.g., for a confined aquifer, the casing seal should extend a minimum of five feet into the confining layer. Having a well drilled by a licensed well constructor greatly reduces the risk that the well will be improperly constructed.

4.1.7 Other Wells

Other wells that fall in close proximity to the public water supply well and/or spring may provide a conduit for contaminants to reach the local aquifer if their construction is inadequate or has been compromised. We assume that the risk of encountering an improperly constructed or compromised well increases as the density of wells in the vicinity of the public water supply well and/or spring increases. Even a properly constructed well has a given life-time, after which the casing seal may begin to deteriorate and eventually fail, allowing shallow water to gain access to the aquifer. Therefore, overall risk becomes significantly greater when older wells are present,

in part due to age and also due to the less stringent construction standards that were in effect prior to 1979.

We evaluate aquifer sensitivity to contamination posed by other wells in the DWPA by totaling the number of well reports on file at the Oregon Water Resources Department that are within the same section containing the public water system's well(s) and/or spring(s) and develop a score based on the number of wells and their age. The equation for determining the Other Wells Score is as follows:

Other Well Score = (No. of wells 1979 or younger) + 4 x (No. of wells older than 1979)

The above expression assumes that wells drilled before 1979 are four times more likely to lead to water quality problems than those wells drilled after 1978. An "Other Wells Score" greater than 400 is assumed to represent a high density of wells and a moderate risk to local groundwater resources. In addition, a score that falls between 225 and 400 indicates a moderate density of wells, which is not an immediate cause for concern, unless a large number of wells are observed inside the DWPA or routine water quality monitoring suggests an ongoing degradation of source water quality. In either case, local well owners can obtain useful information regarding private wells over the internet at www.wellowner.org or at http://wellwater.orst.edu. It might also be useful to provide Home-A-Syst assessment packets, available through the OSU Extension Service, to local well owners who are interested in protecting their private wells (and in turn, local groundwater resources) from contamination. For more information regarding the Home-A-Syst program contact:

Gail Glick Andrews
Oregon Home-A-Syst Coordinator
Bioresource Engineering
116 Gilmore Hall
Corvallis, OR 97331-3906
Phone: (541) 737-6294

4.1.8 Monitoring History

Most groundwater contamination originates at the surface (accidental/deliberate spills, chemical applications, roadway/parking lot runoff, etc...) or in the shallow subsurface (underground storage tanks, septic systems, shallow injection wells, etc...) therefore, a review of water quality monitoring results for each water system can provide valuable information regarding aquifer sensitivity. Clearly, if a contaminant has been detected in the water source, a pathway from the surface to the aquifer must exist. As a means of protecting public health, public water systems in Oregon are required to routinely monitor drinking water quality for contaminants identified by the U.S. Environmental Protection Agency as hazardous to human health. However, it is important to understand that the results from a given sample only provide information regarding water quality at the time that the sample was collected. Water quality within an aquifer can change with time for a number of reasons, including contamination and seasonal recharge. **The**

fact that a water sample, or series of water samples, is free of contaminants is no guarantee that contamination of the aquifer can not happen in the future. Therefore, if a water system is determined to have a moderate or low sensitivity with respect to monitoring history, it still may in fact be highly sensitive to contamination with respect to one or more other sensitivity analysis criteria.

Our review of water quality monitoring history included all Volatile Organic Compounds (VOCs), Synthetic Organic Compounds (SOCs), Inorganic Compounds (IOCs), nitrate, and coliform monitoring results available in the DHS Drinking Water Program SDWIS on-line database. Required routine monitoring for nitrate and coliform occurs more frequently than that for VOCs, SOCs, and IOCs, therefore both nitrate and coliform are particularly useful as indicators of contaminant pathways into the aquifer. Coliform bacteria are ubiquitous in the environment and their presence in source water (i.e., the aquifer) may indicate a microbial source nearby. Likewise nitrate provides similar information and is highly mobile compared to most contaminants and in some cases will act as a precursor to other contaminants entering the aquifer. Therefore, we consider an aquifer yielding water that meets any of the following criteria to be highly sensitive to contamination:

- Any VOC or SOC detections,
- IOC detections greater than 50% of the EPA established Maximum Contaminant Level (MCL),
- Source-related coliform detections, and/or
- Nitrate concentration of 5mg/L or greater.

4.2 Sensitivity Analysis Results

The results of the sensitivity analysis are provided in the tables that follow. Information and sensitivity ratings regarding the aquifer and water quality are provided in Table 4.1 while information and sensitivity ratings regarding the wells and their construction is provided in Table 4.2. Clarification of the ratings are provided as comments where appropriate.

Based on this analysis, the drinking water source is considered highly sensitive to contamination.

Table 4.1 Aquifer Sensitivity Analysis				
	Sensitivity			
Parameter	**H**	**M**	**L**	**Comments**
Depth to first water-bearing zone below casing seal				95 feet
Aquifer characteristics and hydraulic nature			✔	
Overburden thickness and characteristics			✔	
Highest soil sensitivity in Protection Area		✔		High
Traverse potential score (10 = High)	✔			Score = 8
Infiltration potential score (10 = High)		✔		Score = 4
Organic chemical detections			✔	
Inorganic chemical detections			✔	
Source related coliform detections			✔	
Nitrate concentrations (Drinking Water Standard = 10 mg/L)			✔	
Fractured bedrock in Protection Area			✔	
Other wells score (Significant Risk = 400)			✔	Score = 53
Surface water within 500 feet of wellhead			✔	None

Table 4.2 Well Construction Sensitivity Analysis				
	Sensitivity			
Parameter	**H**	**M**	**L**	**Comments**
Casing depth				Unknown
Casing seal depth				Unknown
Well construction setback deficiencies from site visit			✔	
Well report information missing or unknown	✔			Well #1
Casing seal information missing or unknown	✔			No seal information
Casing seal material			✔	
Well open to multiple aquifers (commingling suspected)			✔	
Casing seal construction	✔			Unknown
Age of well		✔		1974

5. Inventory of Potential Contaminant Sources

5.1 Methodology

The primary intent of an inventory is to identify and locate significant potential sources of any of the contaminants of concern within the drinking water protection area. Significant sources of contamination can be defined as any facility or activity that stores, uses, or produces the contaminants of concern and has a sufficient likelihood of releasing such contaminants to the environment at levels that could contribute significantly to the concentration of these contaminants in the source water of the public water supply. The inventory is a very valuable tool for the local community in that it:

- Provides information on the locations of potential contaminant sources, especially those that present the greatest risks to the water supply,
- Provides an effective means of educating the local public about potential problems, and
- Provides a reliable basis for developing a local management plan to reduce the risks to the water supply.

Inventories were focused primarily on the potential sources of contaminants regulated under the federal Safe Drinking Water Act (SDWA). This includes contaminants with a maximum contaminant level (MCL), contaminants regulated under the Surface Water Treatment Rule, and the microorganism Cryptosporidium. The inventory was designed to identify several categories of potential sources of contaminants including micro-organisms (i.e., viruses, Giardia lamblia, cryptosporidium, and bacteria); inorganic compounds (i.e., nitrates and metals), and organic compounds (i.e., solvents, petroleum compounds and pesticides). Contaminants can reach a water body (groundwater, rivers, lakes, etc.) from activities occurring on the land surface or below it. Contaminant releases to water bodies can also occur on an area-wide basis or from a single point source.

It is advantageous to identify as many potential risks as possible within the drinking water protection area during the inventory. It is important to remember the sites and areas identified in this section are only **potential** sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly. Not all of these inventoried activities pose actual high risks to your public water supply. The day-to-day operating practices and environmental (contamination) awareness varies considerably from one facility of land use activity to another.

When identifying potential risks to a public water supply, it is necessary to make "worst-case" assumptions. This is important because it is the potential risk that we are attempting to determine. The worst-case assumption that has to be made when considering potential risks to water bodies is that the facility or activity is not employing good management or pollution

prevention practices. Also, assumptions are made about what sources are included in particular types of land use. For example, it is assumed that rural residences associated with farming operations have specific potential contamination sources such as fuel storage, chemical storage and mixing areas, and machinery repair shops. Any errors in these assumptions can be easily corrected as the community moves beyond the assessment to develop a protection plan.

Past, current, and possible future potential sources of contaminants were identified through a variety of methods and resources. In completing this inventory, DEQ used readily available information including a review of DEQ and other agencies' databases of currently listed sites, interviews with the public water system operator, and field observation as discussed below. In-depth analysis or research was not completed to assess each specific facility's compliance status with local, state and/or federal programs or laws. Further, the inventory process did not include an attempt to identify unique contamination risk at individual sites such as facilities (permitted or not) that do not safely store potentially hazardous materials.

The process for completing the inventory for the Chiloquin Municipal Water Department drinking water protection area included several steps, which are summarized as follows:

1. Relevant information as of March 2000 were collected from applicable state and federal regulatory databases including the following lists:

- DEQ Environmental Cleanup Site Information System (ECSI) which includes the U.S. EPA National Priorities List (NPL) and the U.S. EPA Comprehensive Environmental Response, Compensation and Liability Information System (CERCLA) list;
- DEQ leaking underground storage tank (LUST) list;
- DEQ registered underground storage tank (UST) list;
- DEQ Source Information System (for water discharge permit sites including National Pollutant Discharge Elimination System (NPDES) permits, Water Pollution Control Facility (WPCF) permits, storm water discharge permits, and on-site sewage (septic) system permits);
- DEQ Active Solid Waste Disposal Permits list;
- DEQ Dry Cleaners list;
- DEQ Underground Injection Control (UIC) list of facilities with registered underground injection control systems;
- State Fire Marshall Hazardous Material Handlers (HAZMAT) site list (information on materials in a gas-form was not used since gaseous compounds rarely pose a threat to surface water or groundwater); and

- DEQ Hazardous Waste Management Information System (HWIMSY) list which includes U.S. EPA Resource Conservation Recovery Act (RCRA) generators or notifiers and U.S. EPA RCRA Treatment, Storage, and Disposal Facility (TSDF) Permits.

  Because of the way various state and federal databases are set up, the specific location of listed sites is not always given or accurate within the database. DEQ verified the presence and approximate location of potential contaminant sources within the drinking water protection area by consulting with local community members and/or by driving through the area (windshield survey) as discussed below in subsequent inventory steps.

2. Public water system officials, or someone they designated as knowledgeable of the area, were interviewed to identify potential sources that are not listed elsewhere in databases or on maps and to assist in locating potential sources listed in the state and federal databases.

3. A windshield survey was conducted by driving through the drinking water protection area to field locate and verify as many as possible of the potential contaminant source activities. We looked for potential contaminant sources within four general categories of land use: residential/municipal, commercial/industrial, agricultural/forest, and other land uses (see Appendix C, Table 1).

4. Relative risk rankings of higher-, moderate-, or lower-risk were assigned to each potential contaminant source based on the Oregon Source Water Assessment Plan (1999). A summary of the types of potential contaminant sources and level of assigned risk is presented in Appendix C, Table 1 (Summary of Potential Contaminant Sources by Land Use). The comments section of Appendix C, Table 2 (Inventory Results- List of Potential Contaminant Sources) provides justification for any modifications to the risk rating that may have resulted from field observations that were different from what is typically expected for the specific facility. For example, a "random dumpsite" is typically considered a moderate risk to groundwater. However, if disposal of hazardous or toxic substances was observed during the field visit, the risk rating may be modified to "higher". Relative risk ratings are considered an effective way for the water supply officials and community to prioritize management efforts for the drinking water protection area. When the local water supply officials and community "team" enhance the inventory for use in developing management options, further analysis may need to be conducted to more closely evaluate the actual level of risk.

5. A final summary of the inventoried sources and the GIS base map were prepared and included in this report.

Not all of the activities that are potential contaminant sources were inventoried in the entire drinking water protection area. The inventory of sources of microorganisms such as bacteria, viruses and cryptosporidium focused primarily on areas within the 2-year time-of-travel because of limitations on survivability of the organism. Potential sources of microbes are highlighted on Appendix C, Table 1.

5.2 Results

The results of the inventory were analyzed in terms of current, past, and future land uses; their time of travel (TOT) relationship to the well site; and their associated risk rating. In general, land uses that are closest to the well and those with the highest risk rating pose the greatest threat to your drinking water supply. Inventory results are summarized in Appendix C, Tables 1 through 3 and are shown on Figure 2 (Appendix B). Very small quantities of certain contaminants can significantly impact water bodies. Therefore, the following review of the presence of potential contaminant sources within the Chiloquin Municipal Water Department drinking water protection area provides a quick look at the potential sources of contaminants that could, if improperly managed, adversely impact the drinking water source. No facilities or sites identified on the regulatory databases were searched (see Step 1 in the previous section).

5.2.1 Within Two-Year Time of Travel for the Wells

The delineated two-year time of travel zone is primarily dominated by commercial and residential land use. Seventeen potential contaminant source locations (Reference Numbers 6-16, 19-22 and 24-25 on Figure 2 and Appendix C, Table 2) were identified in the two-year time-of-travel zone. The potential contaminant sources within the two-year time-of-travel all have relatively higher to moderate risk rankings to the drinking water supply. These sites include: a sewage treatment plant, a park, transportation corridors, several above ground and buried fuel tanks, bulk fuel companies, a salvage yard, a gas station, a historic gas station, residences, sewer lines, the fire station with associated underground tank, a hardware store, construction/demolition areas, and a utility station. Only one of the potential contaminant sources, the sewer lines, has a high risk of transmitting micro-organisms to the groundwater.

5.2.2 Overview of Inventory Results within Five-Year and Ten-Year Time of Travel for the Wells

The drinking water protection area within the five-year and ten-year time-of-travel zones is primarily occupied by commercial and residential land use. Eight potential contaminant source locations were identified in this area which are detailed on Table 2 in Appendix C and include a road maintenance station, an auto repair, a car wash, several medical facilities, a school with associated above ground tank, and a transfer station. The potential contaminant sources within the five-year and ten-year time-of-travel all pose a relatively higher to moderate risk to the drinking water supply. The residential areas and transportation corridors extend from the two-year time-of-travel zone into the ten-year time-of-travel zone. These land uses occur throughout the drinking water protection area yet are shown on Figure 2 in the location nearest to the well.

6. Susceptibility of the Drinking Water Source

Drinking water susceptibility can be defined as the potential for contamination within the Drinking Water Protection Area (DWPA) to reach the well(s) and/or spring(s) being used by a Public Water System. The overall purpose of the susceptibility analysis is to identify the potential threats to drinking water quality and help prioritize community efforts for minimizing the contamination risk associated with those threats. Therefore, the susceptibility analysis is dependent on four factors; (1) identifying the location of the DWPA, (2) the sensitivity of the constructed intake (i.e. well or spring), (3) the sensitivity of the aquifer to contamination, and (4) the occurrence and distribution of high- and moderate-risk potential contaminant sources within the DWPA. These four steps were accomplished during the delineation, sensitivity analysis, and potential contaminant source inventory phases of this assessment.

The susceptibility analysis is a management guidance tool that should be used to recognize and identify environmental conditions that are favorable for contamination of the drinking water supply. For example, if a contaminant is released to soils or groundwater in an area of high sensitivity, it is likely that contamination of the aquifer will occur if remedial action is not taken. However, the susceptibility analysis should **not** be used to predict when or if contamination will actually occur.

The susceptibility analysis is completed by overlaying the potential contaminant source inventory results onto a map of the highly and moderately sensitive aquifer areas inside the DWPA (Appendix B, Figure 3) which were identified using either soil sensitivity, traverse potential (TP), or infiltration potential (IP). These are areas within the DWPA where rapid infiltration of water from the surface is most likely to occur. Potential contaminant source inventory results are analyzed in terms of current, past, and future land uses; their time of travel relationship or proximity to the well and/or spring location(s); and their associated risk rating (Appendix B, Figure 2). High- and moderate-risk contaminant sources have been defined as any facility or activity that stores, uses, or produces a contaminant of concern in large enough quantities that if released, could be detectable in the public water supply.

In general, land use activities which pose the greatest threat to the drinking water supply are those which are closest to the well(s) and/or spring(s) and have the highest associated risk rating. Therefore, the DEQ and DHS Drinking Water Program strongly recommend that the community address all high- and moderate-risk potential contaminant sources that occur within their DWPA in order to reduce the risk of their drinking water supply becoming contaminated. How the potential contaminant sources are prioritized and the level of management strategies that are appropriate depend on the proximity of the potential contaminant source to the well and/or spring and whether the sensitivity of the aquifer at the PCS site is high, moderate, or low.

If a public water system's drinking water source is considered susceptible to contamination, it is recommended that the system identify those condition(s) that lead to the susceptibility and take steps to protect the resource (i.e., work directly with the public and facility operators to implement sound management practices, etc.). Public water systems that are not considered

susceptible should identify factors that could lead to future susceptibility and are encouraged to take action to preserve future water quality by developing a management strategy that will ensure on-going resource protection.

6.1 Potential Contaminant Sources and Time-of-Travel Zones

In general, PCSs within the shorter time-of-travel zones pose greater risk than those in the longer time-of-travel zones. Also of concern is the location and distribution of these sources with respect to high and moderately sensitive areas. Overlaying the PCS location map on top of the sensitivity map for the Water System provides a tool to determine the susceptibility of the community's drinking water supply to contamination from each PCS (see Appendix B, Figure 3). The table below indicates the relationship between potential contaminant source risk, aquifer sensitivity, and estimated contaminant arrival time at the well, wellfield, and/or spring. The community can use the PCS location numbers on the inventory map in conjunction with the displayed aquifer sensitivity and relative risk rankings for each PCS from Table 2 (Appendix C) to identify the susceptibility of the drinking water source to contamination from each PCS and take steps to reduce the risk accordingly.

We have attempted to quantify the relative susceptibility of the water system with regard to the PCSs present in the DWPA using the table below. Across the top of the table, each Time-of-Travel (TOT) zone is subdivided to account for areas of high, moderate, and low sensitivity that may exist between each TOT. Potential contaminant source risk categories (high, moderate, and low) are listed down the left hand side of the table. The relative aquifer susceptibility to each PCS is demonstrated by the shading of each cell in the table. Cells that are shaded dark grey indicate a highly-susceptible condition, light grey shaded cells indicate a moderately-susceptible condition, and white cells indicate conditions of low susceptibility. The number in each cell indicates the number of potential contaminant sources that meet the conditions for that cell. Cells that do not contain a number indicate that there are no known potential contaminant sources that meet the conditions for the cell. Potential contaminant sources that meet the specific criteria for a cell in the table can be identified by reviewing Table 2 in Appendix C. The number of potential contaminant sources is totaled across the bottom of the table.

Table. Chiloquin Municipal Water Department Susceptibility as a Function of PCS Risk, TOT Zone, and Aquifer Sensitivity									
	2-Yr TOT			2- to 5-Yr TOT			5- to 10-Yr TOT		
	High	Mod	Low	High	Mod	Low	High	Mod	Low
High Risk PCSs	17			1		1	4		
Moderate Risk PCSs	11			5		2	7		
Low Risk PCSs	1						1		
Total PCSs	29			6		3	12		

The distribution of high, moderate, and low sensitivity areas inside the Drinking Water Protection Area can be determined using either soil sensitivity of the mapped distribution of Traverse Potential (TP) or Infiltration Potential (IP). In the case of the Chiloquin Municipal Water Department, the sensitive area designation was determined using soil permeability.

A total of 50 potential contaminant sources were identified inside the Drinking Water Protection Area. If any of the potential contaminant sources are identified as an area-wide source, we will evaluate that source with respect to each time-of-travel in which it occurs. As a result, the total potential contaminant sources evaluated in the susceptibility table may exceed the number identified on the potential contaminant source map. As indicated in the above table, 29 potential contaminant sources occur inside the 2-year TOT, nine sources fall between the 2- and 5-year TOTs, and the remaining sources are located between the 5- and 10-year TOTs. Of the PCSs identified inside the 2-year TOT, 17 are of high-risk, 11 are of moderate-risk, and one is of low-risk. Based on the analysis results shown in the relative susceptibility table, we consider the Chiloquin Municipal Water Department to be highly susceptible to potential contaminants #6-#16, #19 - #22, #24 and #25 inside the 2-year TOT (PCSs Referenced on Figure 3, Appendix B). **Therefore we recommend that these potential contaminant sources not only be addressed in any Drinking Water Protection Plan but also in any Water System Emergency Response Plan.**

The water supply also appears to be highly susceptible to 17 PCSs identified between the 2- and 10-year time-of-travel zones. As a result of this analysis, we recommend that the water system develop a Drinking Water Protection Plan that addresses all high and moderate risk potential contaminant sources within the DWPA, beginning with those sources which represent the greatest susceptibility risk. At a minimum, the water system should work with representatives from those PCSs posing a moderate to high susceptibility risk within the DWP to (1) determine the level of environmental protection employed in the day-to-day operations of the facility and

(2) identify any reasonable Best Management Practices that will lead to an overall reduction of contamination risk.

6.2 Susceptibility to Microbial Contaminant Sources

The U.S. EPA is authorized under the Safe Drinking Water Act to develop disinfection requirements for all public water systems. The EPA has already established such requirements for drinking water sources identified as surface water and groundwater under the direct influence of surface water through the Surface Water Treatment Rule. Currently, the EPA is in the process of developing a National Primary Drinking Water Regulation that will address disinfection requirements for drinking water sources identified as groundwater. The purpose of the Groundwater Rule will be to protect the public from microbial (i.e., fecal) pathogens in groundwater and to prevent other waterborne disease outbreaks.

Under the Groundwater Rule, groundwater-based public water systems will have to disinfect their drinking water unless they can demonstrate that their source is not susceptible to fecal contamination. This demonstration will likely comprise four different elements: (1) enhanced sanitary surveys, (2) source water monitoring, (3) correction of source water intake defects, and (4) hydrogeologic assessments. The hydrogeologic assessment is based on determining the groundwater (aquifer) sensitivity with respect to microbial contamination. **If a sensitive aquifer exists in conjunction with a source of fecal contamination, the drinking water source is considered to be susceptible to microbial contamination.** In addition, it is also recognized that the source water intake construction may be significant in contributing to the susceptibility of a groundwater source to microbial contamination. **Specifically, if the current construction or condition of the source water intake (well or spring box) allows for the migration of shallow waters into the aquifer and/or the distribution system, the drinking water source should be considered susceptible.**

The susceptibility analysis used in the Source Water Assessment was developed with the pending Groundwater Rule in mind. The Source Water Assessment specifically includes an evaluation of aquifer characteristics, well construction, and estimated time for recharging surface water to reach the aquifer within the Drinking Water Protection Area, which are the critical factors in determining aquifer susceptibility to microbial contamination. In addition, the delineation effort includes the identification of the 2-year time-of travel boundary where potential microbial sources of contamination (identified in the potential contaminant source inventory) may present an acute (immediate) risk to public health. Potential sources of microbial contamination include, but are not limited to, surface water bodies (lakes, rivers, streams), septic tanks and drainfields, sewer lines, parking lots, confined animal feed lots, landfills/dumps, cemeteries, and land application sites for sewage sludge.

The 2-year time-of-travel identifies the next two years of groundwater supply for the Chiloquin Municipal Water Department. The two year time frame is used as a conservative estimate of the survival time for some viruses. **Based on assessment results, the aquifer supplying the well is considered highly sensitive to contamination. In addition, potential sources of viruses occur**

within the DWPA. Therefore, the drinking water supply is considered susceptible to viral contamination. Regardless of the assessment results, it is in the water system's best interest to reduce the potential for future viral contamination through compliance with all Oregon Department of Human Services setback standards related to public drinking water sources.

7. Recommended Use of the Source Water Assessment Report

The process for developing a Drinking Water Protection Plan can be summarized as follows:

Assessment Phase (Source Water Assessment Provided by DHS and DEQ)

- Delineate the area that serves as the source of the public water supply (Drinking Water Protection Area (DWPA))
- Inventory the potential risks or sources of contamination within the DWPA
- Determine the areas most susceptible to contamination

Protection Phase (performed by the water system or community)

- Assemble a local Drinking Water Protection Team
- Enhance the Source Water Assessment if necessary
- Develop a plan to reduce the risk of contamination (protect the resource)
- Develop a contingency plan to address the potential loss of the drinking water supply
- Certify (optional) and implement the Drinking Water Protection Plan

The assessment phase was funded by the federal Safe Drinking Water Act. Its purpose is to supply the water system with the information necessary to develop a Drinking Water Protection Plan. In Oregon, development of a protection plan is voluntary.

Prior to moving into the protection phase, DEQ recommends the inventory presented in this document be reviewed in detail to clarify the presence, location, operational practices, actual risks, etc., of the identified facilities and land use activities. The SWA inventory should be regarded as a preliminary review of potential sources of contamination within the drinking water protection area. Resources within the community should be used to do an "enhanced inventory" to refine this preliminary list of potential sources of contamination.

It is also important to remember that not all of the inventoried activities will need to be addressed if you choose to develop a Drinking Water Protection Plan. When developing a protection plan, sources which pose little or no threat to your drinking water source can be screened out. For example, if any of the land use activities are conducted in a manner that already significantly reduces the risk of a contamination release, the facility would not need to re-evaluate their practices based on drinking water protection "management". One of the goals of developing a plan based on the inventory results is to address those land use activities that do pose high or moderate risks to your public water supply. The system should target these facilities with greater levels of education and technical assistance to minimize the risk of contamination.

Limited technical assistance is available through the DEQ and Drinking Water Program at DHS for water systems that choose to move beyond the assessments and voluntarily develop a

Drinking Water Protection Plan. Using the results of the assessment, the water system/community can form a Drinking Water Protection Team of individuals that have a stake in the plan's implementation.

Forming a local team to help with the development of a protection plan is very important. Oregon's drinking water protection approach relies upon the concept of "community based protection", as are many other water quality programs. This simply refers to the concept of allowing local control and decision-making to implement the water quality protection effort. Community-based protection is successful only with significant local citizen stakeholder involvement. Community-based protection can draw on the knowledge and successful adaptive practices within the area. Landowners generally know best how to achieve water resource restoration and protection as long as a thorough explanation of the problem is provided, the objectives to solve the problem are clearly defined and technical assistance is available.

In community-based protection, citizens have more control and are therefore more likely to participate in the program and be more willing to assist with the educational and outreach effort which will make the plan successful. We recommend that the protection plan be developed so as to minimize any burdens on individual property owners, but maximize the equity in responsibility for reducing the risks of future contamination.

Protecting the drinking water supply in a community can also be a very effective way to encourage all citizens to participate in issues which directly affect everyone in that community. This often leads to more public involvement in other significant local decisions concerning future livability issues, e.g., land use planning. In communities already developing and implementing Drinking Water Protection Plans, the process has served to bring many diverse interests together on a common goal and strengthen the local rural and urban relationships through communication and increased understanding. The risks and sources of water quality problems are not only from industries, farmers, and managed forest, but every individual living, commuting, and working in that area.

Communities/water systems interested in developing Drinking Water Protection Plans may contact the Department of Environmental Quality (503-229-5413) or the DHS Drinking Water Program (541-726-2587) for further information.

Appendices

A. References

B. Figures

C. Inventory of Potential Contaminant Sources

D. Well Reports

E. Parameters Used in Delineation Model

F. Groundwater Fact Sheet

G. BMPs for Activities Commonly found in Drinking Water Protection Areas

H. Drinking Water Protection in Oregon

Additional copies of the appendix materials are available upon written request to the following address:

Groundwater Coordinator
Drinking Water Program
Department of Human Services
442 A Street
Springfield, OR 97477

Appendix A: References

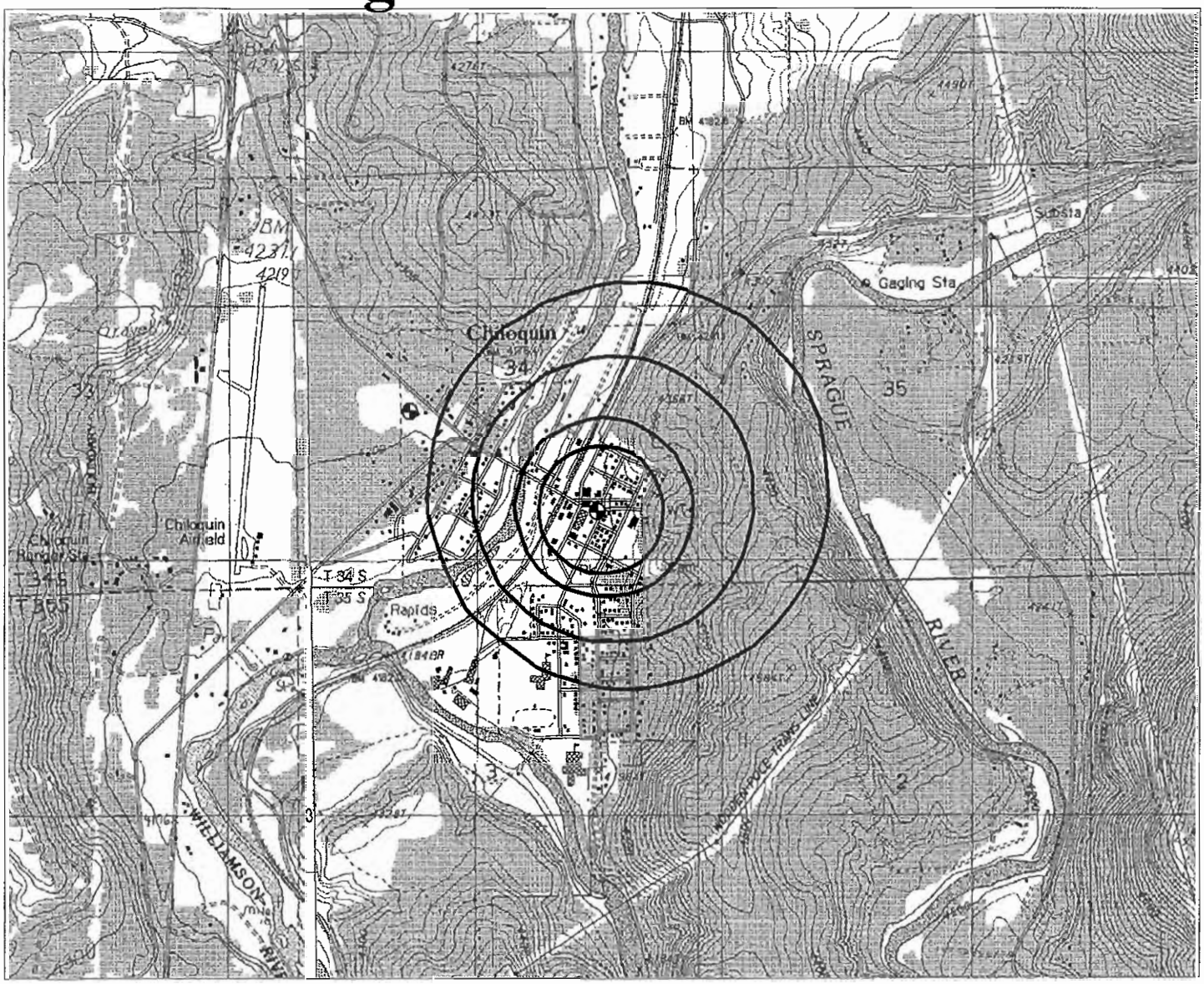
Leonard, A. R. and Harris, A. B., 1974, Ground Water in Selected Areas in the Klamath Basin, Oregon, Ground Water Report No. 21, 104 p.

Stewart, S. and Nelson, D., 1999, Source Water Assessment Plan: Implementation of the Safe Drinking Water Act 1996 Amendments. Oregon Department of Environmental Quality and Oregon Health Division.

Todd, D. K., 1980, Groundwater Hydrology. John Wiley & Sons, New York, 535 p.

Figure 1

Chiloquin Municipal Water Drinking Water Protection Area



2000 0 2000 4000 6000 Feet

1:24,000

N

Drinking Water Protection Area (DWPA)
1,2, 5, and 10 Year Time of Travel (TOT)
Analytical Method

Model Parameters
Delineation Area (mi^2): 0.78
Transmissivity (ft*ft/day): 18.5
Production Interval (ft): 17
Effective Porosity: 0.25
Usage (gal/day): 193,746

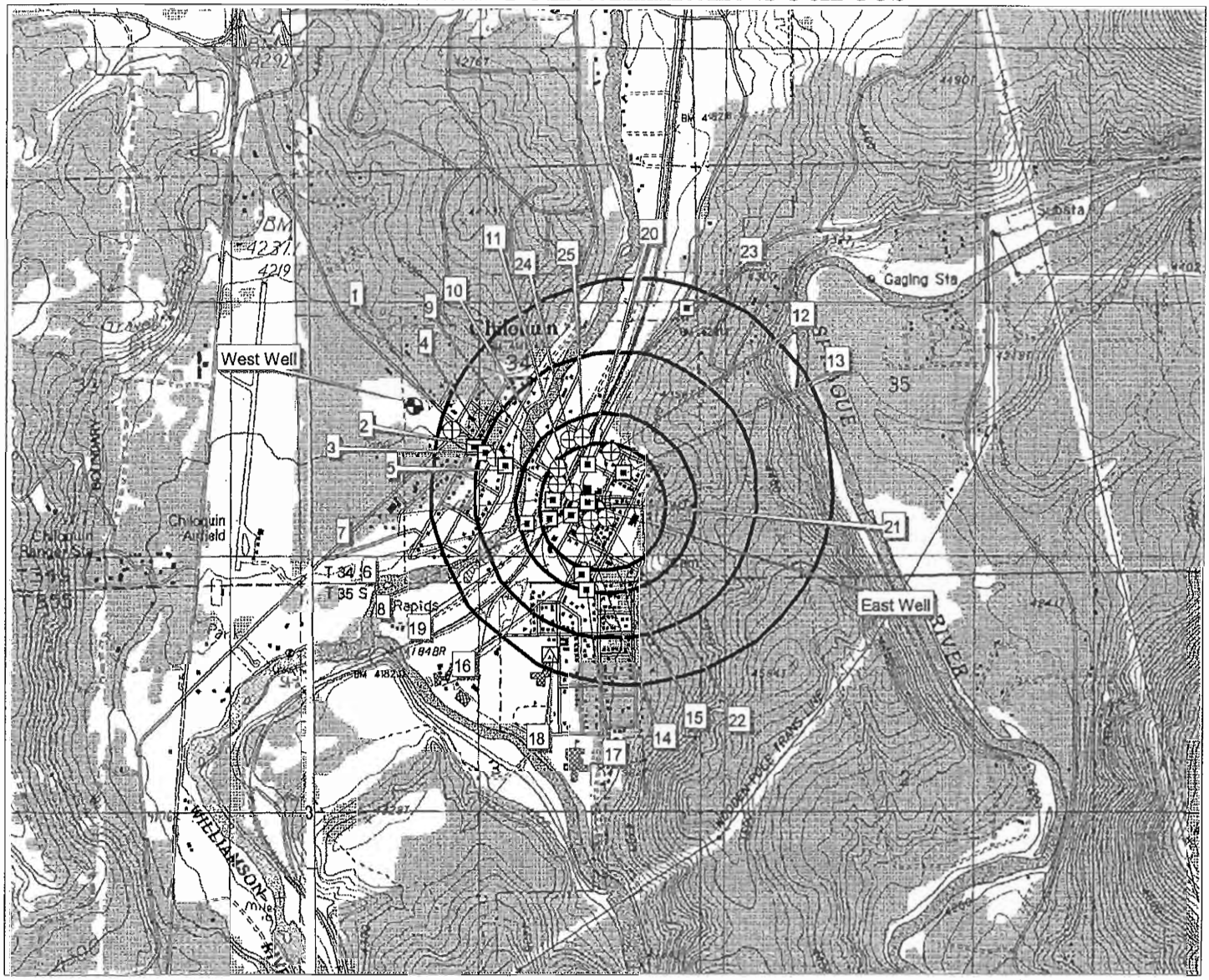
Prepared by: JF 02/17/04
Project Manager: JF RG#: 1867
File # 4100184

Well Location: Township 34S Range 7E Section 34
Klamath County
WGS84 Datum
East Well 42°34'34.326"N 121°51'43.164"W
West Well 42°34'47.600"N 121°52'15.974"W

USGS Chiloquin OR Quadrangle
(part section) 7.5' Series (Topographic)

Chiloquin Municipal Water Department
Drinking Water Protection Area
Potential Contaminant Sources

Figure 2



2000 0 2000 4000 Feet

1:24,000

USGS Chiloquin OR Quadrangle
(part section) 7.5' Series (Topographic)

Drinking Water Protection Area (DWPA)
1,2, 5, and 15 Year Time of Travel (TOT)
Calculated Fixed Radius Method

Potential Contaminant Sources
- ⊕ **Higher Relative Risk**
- ▣ **Moderate Relative Risk**
- ⚠ **Low Relative Risk**

N

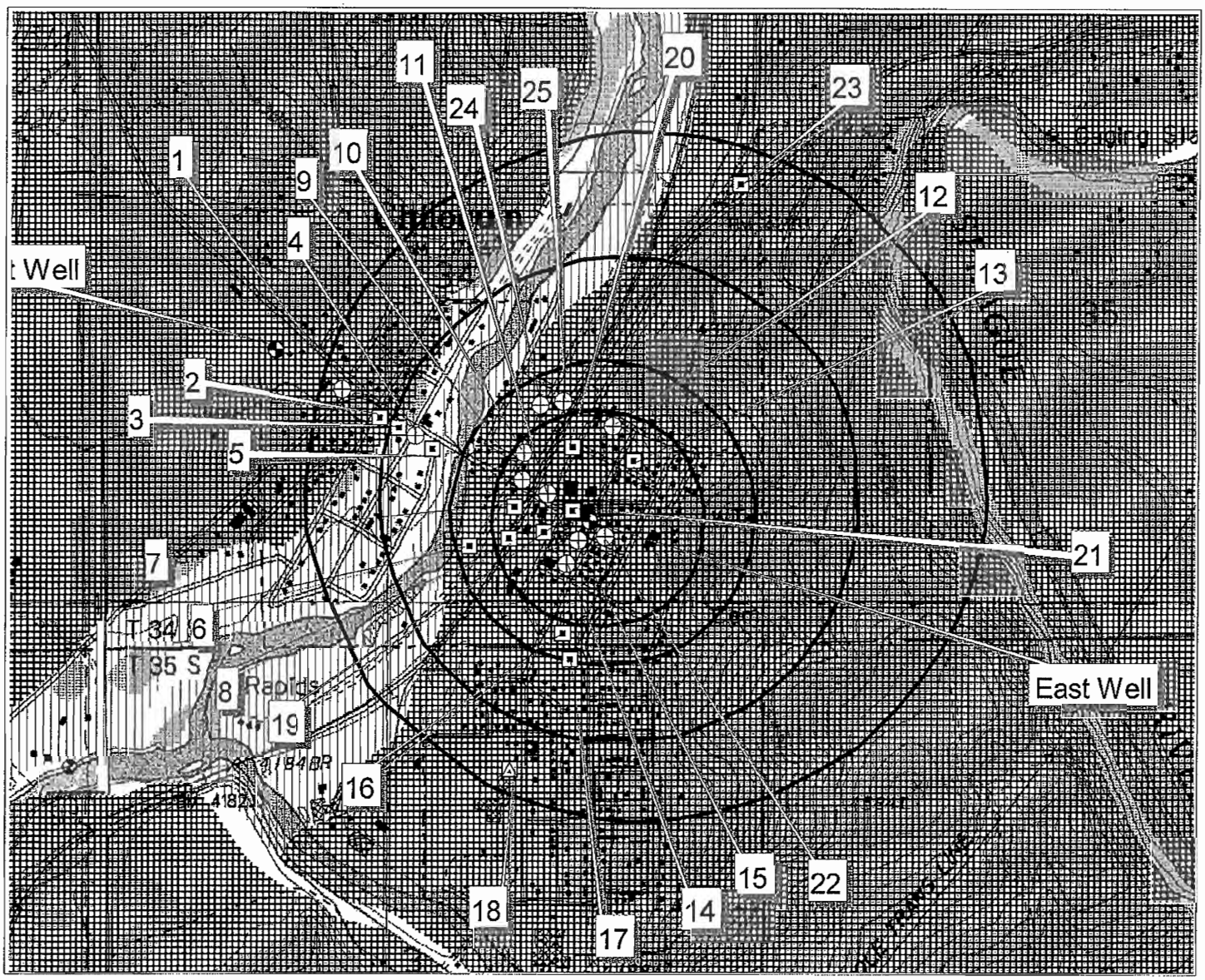
Prepared by: JF 02/17/04
Project Manager: JF RG#1867
File # 4100184

Well Location: Township 34S Range 7E Section 34
Klamath County
WGS84 Datum
East Well 42°34'34.326"N 121°51'43.164"W
West Well 42°34'47.600"N 121°52'15.974"W

Note: Sites and areas noted in this figure are potential sources of contamination to the drinking water as identified by Oregon Drinking Water Protection Staff. Environmental contamination is not likely to occur when chemicals are used and managed properly. Numbers indicate potential contaminant sources indexed to Appendic C, Table 2.

Figure 3

Chiloquin Municipal Water Drinking Water Protection Area
Potential Contaminant Sources and Sensitivity Analysis



1000 0 1000 2000 3000 Feet

1:14,000

USGS Chiloquin, OR Quadrangle
(part section) 7.5' Series (Topographic)

Drinking Water Protection Area (DWPA)
1,2, 5, and 10 Year Time of Travel (TOT)
Analytical Method

Potential Contaminant Sources
- **Higher Relative Risk**
- **Moderate Relative Risk**
- **Low Relative Risk**

Sensitivity Analysis
- **High Soil Sensitivity**
- **Medium Soil Sensitivity**
- **Low Soil Sensitivity**
- **No Data**

N

Prepared by: JF 02/17/04
Project Manager: JF RG#1867
File # 4100184

Well Location: Township 34S Range 7E Section 34
Klamath County
WGS84 Datum
East Well 42°34'34.326"N 121°51'43.164"W
West Well 42°34'47.600"N 121°52'15.974"W

Note: Sites and areas noted in this figure are potential sources of contamination to the drinking water as identified by Oregon Drinking Water Protection Staff. Environmental contamination is not likely to occur when chemicals are used and managed properly. Numbers indicate potential contaminant sources indexed to Appendic C, Table 2.

APPENDIX C - INVENTORY OF POTENTIAL CONTAMINANT SOURCES
CHILOQUIN MUNICIPAL WATER DEPT - PWS # 4100184
OREGON SOURCE WATER ASSESSMENT

Inventory Results

Table 1. Summary of Potential Contaminant Sources by Land Use

Table 2. Inventory Results - List of Potential Contaminant Sources

Table 3. Results of Regulatory Database Search

Notes for Tables:

Sites and areas identified in these Tables are only potential sources of contamination to the drinking water. Environmental contamination is not likely to occur when contaminants are used and managed properly.

Total number of sources listed in Table 1 in the DWPA may not add up to the total number of potential contaminants sources in Table 2 because more than one type of potential contaminant source may be present at any given facility.

Data collected by Debbie Croom Oregon DEQ on 10/30/2000.

Acronyms:

AST - Aboveground Storage Tank
DC - DEQ's Dry Cleaner database
DEQ - Oregon Department of Environmental Quality
DWPA - Drinking Water Protection Area
ECSI - DEQ's Environmental Cleanup Site Information database
HWIMSY - DEQ's Hazardous Waste Information Management System database
LUST - DEQ's Leaking Underground Storage Tank database
NPDES - National Pollution Discharge Elimination System
PCS - Potential Contaminant Source
PWS - Public Water System
SFM - State Fire Marshall's database of hazardous materials
SIS - DEQ's Source Information System database (includes WPCF & NPDES permits)
SWMS - DEQ's Solid Waste Management System database
UST - DEQ's Underground Storage Tank database or Underground Storage Tank
WPCF - Water Pollution Control Facility
WRD - Oregon Water Resources Division database for water rights information

TABLE 1. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100184 CHILOQUIN MUNICIPAL WATER DEPT

Residential/Municipal Land Uses

Potential Contamination Source	Notes	Relative Risk Level	Total in DWPA
Airport - Maintenance/Fueling Area		Higher	0
Apartments and Condominiums		Lower	0
Campgrounds/RV Parks	(1)	Lower	0
Cemeteries - Pre-1945		Moderate	0
Drinking Water Treatment Plants		Moderate	0
Fire Station		Lower	1
Fire Training Facilities		Moderate	0
Golf Courses		Moderate	0
Housing - High Density (> 1 House/0.5 acres)		Moderate	1
Landfill/Dumps	(1)	Higher	0
Lawn Care - Highly Maintained Areas		Moderate	0
Motor Pools		Moderate	0
Parks		Moderate	1
Railroad Yards/Maintenance/Fueling Areas		Higher	0
Schools		Lower	1
Septic Systems - High Density (> 1 system/acre)	(1)	Higher	0
Sewer Lines - Close Proximity to PWS	(1)	Higher	1
Utility Stations - Maintenance Transformer Storage		Higher	1
Waste Transfer/Recycling Stations	(1)	Moderate	1
Wastewater Treatment Plants/Collection Stations	(1)	Moderate	1
Other			0

NOTES:
Sites and areas identified in this Table are only potential sources of contamination to the drinking water.
Environmental contamination is not likely to occur when contaminants are used and managed properly.
(1) - Potential source of microbial contamination
(2) - Drip irrigated crops, such as vineyards and some vegetables, are considered lower risk than spray irrigation
(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100184 CHILOQUIN MUNICIPAL WATER DEPT

Commercial/Industrial Land Uses

Potential Contamination Source	Notes	Relative Risk Level	Total in DWPA
Automobiles - Body Shops		Higher	0
Automobiles - Car Washes		Moderate	1
Automobiles - Gas Stations		Higher	1
Automobiles - Repair Shops		Higher	2
Boat Services/Repair/Refinishing		Higher	0
Cement/Concrete Plants		Moderate	0
Chemical/Petroleum Processing/Storage		Higher	2
Dry Cleaners		Higher	0
Electrical/Electronic Manufacturing		Higher	0
Fleet/Trucking/Bus Terminals		Higher	1
Food Processing		Moderate	0
Furniture/Lumber/Parts Stores		Moderate	1
Home Manufacturing		Higher	0
Junk/Scrap/Salvage Yards		Higher	1
Machine Shops		Higher	0
Medical/Vet Offices	(1)	Moderate	3
Metal Plating/Finishing/Fabrication		Higher	0
Mines/Gravel Pits		Higher	0
Office Buildings/Complexes		Lower	0
Parking Lots/Malls (> 50 Spaces)		Higher	0
Photo Processing/Printing		Higher	0
Plastics/Synthetics Producer		Higher	0
Research Laboratories		Higher	0
RV/Mini Storage		Lower	0
Wood Preserving/Treating		Higher	0
Wood/Pulp/Paper Processing and Mills		Higher	0
Other: City Maintenance Shop		Moderate	1

NOTES:
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(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100184 CHILOQUIN MUNICIPAL WATER DEPT

Agricultural/Forest Land Uses

Potential Contamination Source	Notes	Relative Risk Level	Total in DWPA
Auction Lots	(1)	Higher	0
Boarding Stables	(1)	Moderate	0
Confined Animal Feeding Operations (CAFOs)	(1)	Higher	0
Crops - Irrigated (inc. orchards, vineyards, nurseries, greenhouses)	(2)	Moderate	0
Crops - Nonirrigated (inc. Christmas trees, grains, grass seed, pasture)		Lower	0
Farm Machinery Repair		Higher	0
Grazing Animals (> 5 large animals or equivalent/acre)	(1)	Moderate	0
Lagoons/Liquid Wastes	(1)	Higher	0
Land Application Sites	(1)	Moderate	0
Managed Forest Land - Broadcast Fertilized Areas		Lower	0
Managed Forest Land - Clearcut Harvest (< 35 yrs.)		Moderate	0
Managed Forest Land - Partial Harvest (< 10 yrs.)		Moderate	0
Managed Forest Land - Road Density (> 2 mi./sq. mi.)		Moderate	0
Pesticide/Fertilizer/Petroleum Storage, Handling, Mixing, & Cleaning Ar		Higher	0
Recent Burn Areas (< 10 yrs.)		Lower	0
Managed Forest Lands - Status Unknown		Moderate	0
Other			0

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(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 1. SUMMARY OF POTENTIAL CONTAMINANT SOURCES BY LAND USE

PWS # 4100184 CHILOQUIN MUNICIPAL WATER DEPT

Miscellaneous Land Uses

Potential Contamination Source	Notes	Relative Risk Level	Total in DWPA
Above Ground Storage Tanks - Excluding Water		Moderate	4
Channel Alterations - Heavy		Lower	0
Combined Sewer Outfalls	(1)	Lower	0
Stormwater Outfalls	(1)	Lower	0
Composting Facilities	(1)	Moderate	0
Historic Gas Stations		Higher	1
Historic Waste Dumps/Landfills	(1)	Higher	0
Homesteads - Rural - Machine Shops/Equipment Maintenance		Higher	0
Homesteads - Rural - Septic Systems (< 1/acre)	(1)(3)	Lower	0
Injection/Dry Wells, Sumps - Class V UICs	(1)	Higher	0
Kennels (> 20 Pens)	(1)	Lower	0
Military Installations		Higher	0
Random Dump Sites		Moderate	0
River Recreation - Heavy Use (inc. campgrounds)	(1)	Lower	0
Sludge Disposal Areas	(1)	Moderate	0
Stormwater Retention Basins	(1)	Moderate	0
Transmission Lines - Right-of-Ways		Lower	0
Transportation - Freeways/State Highways/Other Heavy Use Roads		Moderate	1
Transportation - Railroads		Moderate	1
Transportation - Right-Of-Ways - Herbicide Use Areas		Moderate	0
Transportation - River Traffic - Heavy		Lower	0
Transportation - Stream Crossing - Perennial		Lower	0
UST - Confirmed Leaking Tanks - DEQ List		Higher	4
UST - Decommissioned/Inactive		Lower	0
UST - Nonregulated Tanks (< 1,100 gals or Large Heating Oil Tanks)		Higher	0
UST - Not Upgraded and/or Registered Tanks		Higher	0
UST - Upgraded/Registered - Active		Lower	0
UST - Status Unknown		Higher	6
Upstream Reservoirs/Dams		Lower	0
Wells/Abandoned Wells		Higher	0
Large Capacity Septic Systems (serves > 20 people) - Class V UICs	(1)	Higher	0
Construction/Demolition Areas		Moderate	1
Other: Recent State Cleanup Site ECSI # 2559		Higher	1

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(3) - For groundwater public water systems, septic systems located within the 2-year time-of-travel (TOT) are considered moderate risks.

TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100184 CHILOQUIN MUNICIPAL WATER DEPT

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (2)	Potential Impacts	Comments
1	UST - Confirmed Leaking Tanks - DEQ List	ODOT	Hwy 422	Chiloquin	Database (2) Field-Observation Interview	Between 5-yr and 10-yr TOT	Higher	Existing contamination from spills, leaks, or improper handling of stored materials may impact the drinking water supply.	
	UST - Status Unknown						Higher	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	
	Fleet/Trucking/Bus Terminals						Higher	Spills, leaks, or improper handling of fuels, grease, solvents, and other materials from vehicle service, fueling, and parking areas may impact the drinking water supply.	
2	Automobiles - Car Washes	Car wash	Hwy 422	Chiloquin	Field-Observation	Between 5-yr and 10-yr TOT	Moderate	Improper management of vehicle wash water may result in soaps, oils, greases, and metals impacting the drinking water supply.	
3	Medical/Vet Offices	Chiloquin Family Practice	Hwy 422 & Wasco Ave	Chiloquin	Field-Observation	Between 2-yr and 5-yr TOT	Moderate	Spills, leaks, or improper handling of x-ray, biological, chemical, and radioactive wastes and other materials during transportation, use, storage and disposal may impact the drinking water supply.	
4	Automobiles - Repair Shops	Paul's Automotive	Hwy 422	Chiloquin	Field-Observation	Between 2-yr and 5-yr TOT	Higher	Spills, leaks, or improper handling of automotive fluids, solvents, and repair materials during transportation, use, storage and disposal may impact the drinking water supply.	
5	Medical/Vet Offices	The Village Clinic	Hwy 422	Chiloquin	Field-Observation	Between 2-yr and 5-yr TOT	Moderate	Spills, leaks, or improper handling of x-ray, biological, chemical, and radioactive wastes and other materials during transportation, use, storage and disposal may impact the drinking water supply.	
6	Wastewater Treatment Plants/Collection Stations	Chiloquin Sewage Treatment Plant	Klamath Ave	Chiloquin	Database (2) Field-Observation Interview	Between 2-yr and 5-yr TOT	Moderate	Improper management of wastewater, treatment chemicals, or equipment maintenance materials may impact drinking water supply.	
7	Above Ground Storage Tanks - Excluding Water	Above Ground Fuel Tank	Klamath Ave	Chiloquin	Field-Observation Interview	Within the 2-yr TOT.	Moderate	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	

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(1) Where multiple potential contaminant sources exist at a site, the highest level of risk is used.

(2) See Table 3 for database listings (if necessary).

TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100184 CHILOQUIN MUNICIPAL WATER DEPT

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (2)	Potential Impacts	Comments
8	Transportation - Railroads	Railroad	Runs through 2 yr TOT	Chiloquin	Field-Observation Interview	Within the 2-yr TOT.	Moderate	Rail transport elevates the risk for leaks/spills of fuel & other haz. materials. Installation/maintenance of tracks may increase erosion & slope failure causing turbidity. Over-application/improper handling of pesticides may impact the water supply.	
9	UST - Status Unknown	Ferrell's Fuel Bulk Plant (Prev. May-Slade Oil)	Chocktoot St	Chiloquin	Database (2) Field-Observation Interview	Within the 2-yr TOT.	Higher	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	
	UST - Confirmed Leaking Tanks - DEQ List						Higher	Existing contamination from spills, leaks, or improper handling of stored materials may impact the drinking water supply.	
	Chemical/Petroleum Processing/Storage						Higher	Spills, leaks, or improper handling of chemicals and other materials during transportation, use, storage and disposal may impact the drinking water supply.	
	Above Ground Storage Tanks - Excluding Water						Moderate	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	
10	Automobiles - Repair Shops	Equipment Repair/Salvage Yard (Historic Gas Station)	Klamath Ave	Chiloquin	Field-Observation Interview	Within the 2-yr TOT.	Higher	Spills, leaks, or improper handling of automotive fluids, solvents, and repair materials during transportation, use, storage and disposal may impact the drinking water supply.	
	Junk/Scrap/Salvage Yards						Higher	Spills, leaks, or improper handling of automotive chemicals, batteries, and other waste materials during storage and disposal may impact the drinking water supply.	
	Historic Gas Stations						Higher	Historic spills, leaks, or improper handling of solvents and petroleum products may impact the drinking water supply. Abandoned underground storage tanks may be present.	

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TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100184 CHILOQUIN MUNICIPAL WATER DEPT

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (2)	Potential Impacts	Comments
11	UST - Confirmed Leaking Tanks - DEQ List	Tesoro Gas Station	Chocktoot	Chiloquin	Database (2) Field-Observation Interview	Within the 2-yr TOT.	Higher	Existing contamination from spills, leaks, or improper handling of stored materials may impact the drinking water supply.	
	Automobiles - Gas Stations						Higher	Spills, leaks, or improper handling of fuels and other materials during transportation, transfer, and storage may impact the drinking water supply.	
	UST - Status Unknown						Higher	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	
12	Utility Stations - Maintenance Transformer Storage	Century Tel	Yahooskin St	Chiloquin	Database (2) Field-Observation	Within the 2-yr TOT.	Higher	Spills, leaks, or improper handling of chemicals and other materials including PCBs during transportation, use, storage and disposal may impact the drinking water supply.	
	UST - Status Unknown						Higher	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	
13	Above Ground Storage Tanks - Excluding Water	Residences	Throughout DWPA	Chiloquin	Field-Observation Interview	Within the 2-yr TOT.	Moderate	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	
	Housing - High Density (> 1 House/0.5 acres)						Moderate	Improper use, storage, and disposal of household chemicals may impact the drinking water supply. Stormwater run-off or infiltration may carry contaminants to drinking water supply.	
14	UST - Status Unknown	Chiloquin Agency Fire District	2nd Ave	Chiloquin	Database (2) Field-Observation Interview	Within the 2-yr TOT.	Higher	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	
	Fire Station						Lower	Spills, leaks, or improper handling of chemicals and other materials during transportation, use, storage and disposal may impact the drinking water supply.	
15	Other City Maintenance Shop	City Hall	2nd Ave	Chiloquin	Database (2) Field-Observation	Within the 2-yr TOT.	Moderate	Spills, leaks, or improper handling of chemicals and other materials during transportation, use, storage, and disposal may impact the drinking water supply.	
	UST - Status Unknown						Higher	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	

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(1) Where multiple potential contaminant sources exist at a site, the highest level of risk is used.

(2) See Table 3 for database listings (if necessary).

TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100184 CHILOQUIN MUNICIPAL WATER DEPT

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (2)	Potential Impacts	Comments
16	Parks	City Park	2nd Ave	Chiloquin	Field-Observation	Between 2-yr and 5-yr TOT	Moderate	Over-application or improper handling of pesticides/fertilizers may impact drinking water. Excessive irrigation may cause transport of contaminants through runoff. Heavy use along edge of waterbody may contribute to erosion, causing turbidity.	
17	Medical/Vet Offices	Tribal Family Health Clinic	South of well	Chiloquin	Field-Observation	Between 2-yr and 5-yr TOT	Moderate	Spills, leaks, or improper handling of x-ray, biological, chemical, and radioactive wastes and other materials during transportation, use, storage and disposal may impact the drinking water supply.	
18	Above Ground Storage Tanks - Excluding Water	Chiloquin Elementary School	2nd Ave	Chiloquin	Database (2) Field-Observation Interview	Between 5-yr and 10-yr TOT	Moderate	Spills, leaks, or improper handling of stored materials may impact the drinking water supply.	
	Schools						Lower	Over-application or improper handling of cleaning products, pesticides or fertilizers used on the school grounds may impact drinking water. Vehicle maintenance wastes may contribute contaminants.	
19	Furniture/Lumber/Parts Stores Hardware Store	Kirchers Hardware	1st Ave	Chiloquin	Field-Observation	Within the 2-yr TOT.	Moderate	Spills, leaks, or improper handling of hazardous chemical products and other materials in inventory during transportation, use, storage and disposal may impact the drinking water supply.	
20	Transportation - Freeways/State Highways/Other Heavy Use Roads	Highway 422 & Sprague River Rd	Runs through DWPA	Chiloquin	Field-Observation Interview	Within the 2-yr TOT.	Moderate	Vehicle use increases the risk for leaks or spills of fuel & other haz. materials. Road building, maintenance & use can increase erosion/slope failure causing turbidity. Over-application or improper handling of pesticides/fertilizers may impact water.	
21	Construction/Demolition Areas PWS needs to evaluate risk	Demolition & Construction	Behind well	Chiloquin	Field-Observation	Within the 2-yr TOT.	Moderate	Construction/demolition activities may contribute to erosion and increased turbidity in surface water drinking water supplies. Equipment usage increases the risks of leaks or spills of fuels and other chemicals.	Potential risk should be verified during enhanced inventory.

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TABLE 2. INVENTORY RESULTS - LIST OF POTENTIAL CONTAMINANT SOURCES

PWS# 4100184 CHILOQUIN MUNICIPAL WATER DEPT

Reference No. (See Figure)	Potential Contaminant Source Type	Name	Approximate Location	City	Method for Listing	Proximity to Sensitive Areas	Relative Risk Level (2)	Potential Impacts	Comments
22	Sewer Lines - Close Proximity to PWS	Sewer Lines	Close proximity to well	Chiloquin	Field-Observation Interview	Within the 2-yr TOT.	Higher	If not properly designed, installed, and maintained, sewer lines can impact drinking water, especially adjacent to a waterbody or within the 2-year time-of-travel zone for drinking water wells.	
23	Waste Transfer/Recycling Stations	Chiloquin Transfer Station	North of well	Chiloquin	Field-Observation Interview	Between 5-yr and 10-yr TOT	Moderate	Improper management of water contacting waste material may impact the drinking water supply.	
24	Chemical/Petroleum Processing/Storage	Standard Oil Bulk Plant (Closed)	NW of well	Chiloquin	Database (2) Field-Observation Interview	Between 2-yr and 5-yr TOT	Higher	Spills, leaks, or improper handling of chemicals and other materials during transportation, use, storage and disposal may impact the drinking water supply.	Recent contamination detected-DEQ notified and site evaluation performed
	Other Recent State Cleanup Site ECSI # 2559						Higher	The impacts of this potential contaminant source will be addressed during the enhanced inventory.	Recent contamination detected-DEQ notified and site evaluation performed
25	UST - Confirmed Leaking Tanks - DEQ List Locals confirmed historic leaking tank and cleanup efforts	Copeland Lumber (Closed)	Klamath Ave	Chiloquin	Field-Observation Interview	Between 2-yr and 5-yr TOT	Higher	Existing contamination from spills, leaks, or improper handling of stored materials may impact the drinking water supply.	Potential risk should be verified during enhanced inventory. PWS needs to evaluate

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TABLE 3. RESULTS OF REGULATORY DATABASE SEARCH

PWS# 4100184 CHILOQUIN MUNICIPAL WATER DEPT

Reference No. (1)	Name	Database Listings (2)
1	ODOT	LUST list with unknown status
		SFM - ANTIFREEZE stored in STEEL DRUM
		SFM - DEXRON II ATF stored in STEEL DRUM
		SFM - GEAR LUBRICANT SAE 80-90 stored in STEEL DRUM
		SFM - GREASE EP-2 stored in STEEL DRUM
		SFM - HYDRAULIC OIL stored in STEEL DRUM
		SFM - INDUSTRIAL DEGREASER stored in PLASTIC OR NON-METALLIC DRUM
		SFM - MOTOR OIL stored in STEEL DRUM
		SFM - SOLVENT stored in STEEL DRUM
		SFM - USED OIL stored in UNDERGROUND TANK
		UST list-PWS needs to verify tank permit status
		LUST cleanup initiated on 9/24/1998. PWS should verify cleanup progress.
6	Chiloquin Sewage Treatment Plant	SFM - BACTICIDE stored in PLASTIC OR NON-METALLIC DRUM
		SIS list with a individual NPDES permit.
9	Ferrell's Fuel Bulk Plant (Prev. May-Slade Oil)	SFM - DIESEL stored in ABOVEGROUND TANK
		ECSI site with suspected contamination.
		SFM - GASOLINE, UNLEADED stored in ABOVEGROUND TANK
		SFM - STOVE OIL stored in ABOVEGROUND TANK
		UST list-PWS needs to verify tank permit status
		LUST cleanup initiated on 8/1/1991. PWS should verify cleanup progress.

Notes: (1) See Table 2 and Figure. (2) For State Fire Marshals (SFM) list, information on materials in a gaseous-form is not presented since gaseous compounds rarely pose a threat to groundwater or surface water.

TABLE 3. RESULTS OF REGULATORY DATABASE SEARCH

PWS# 4100184 CHILOQUIN MUNICIPAL WATER DEPT

Reference No. (1)	Name	Database Listings (2)
11	Tesoro Gas Station	SFM - GASOLINE, UNLEADED MIDGRADE stored in UNDERGROUND TANK
		SFM - GASOLINE, UNLEADED stored in UNDERGROUND TANK
		SFM - GASOLINE, SUPER UNLEADED stored in UNDERGROUND TANK
		LUST cleanup initiated on 7/15/1994. PWS should verify cleanup progress.
		UST list with a status of 3 UST(s) upgraded and 0 not upgraded to DEQ 1998 technical standards.
12	Century Tel	SFM - DIESEL FUEL stored in ABOVEGROUND TANK
		UST list-PWS needs to verify tank permit status
14	Chiloquin Agency Fire District	SFM - FUEL OIL #1 stored in UNDERGROUND TANK
		UST list-PWS needs to verify tank permit status
15	City Hall	SFM - FUEL OIL stored in UNDERGROUND TANK
18	Chiloquin Elementary School	SFM - DIESEL stored in ABOVEGROUND TANK

Notes: (1) See Table 2 and Figure. (2) For State Fire Marshals (SFM) list, information on materials in a gaseous-form is not presented since gaseous compounds rarely pose a threat to groundwater or surface water.

NOTICE TO WATER WELL CONTRACTOR
The original and first copy of this report are to be filed with the
STATE ENGINEER, SALEM, OREGON 97310
within 30 days from the date of well completion.

Incomplete well, 6,5, 1974

WATER WELL REPORT

STATE OF OREGON

(Please type or print)

(Do not write above this line)

State Well No. .....

State Permit No. .....

(1) OWNER:

#2 not in use

Name City of Chiloquin

Address

Chiloquin, Oregon 97624

(2) TYPE OF WORK (check):

New Well ☒ Deepening ☐ Reconditioning ☐ Abandon ☐

If abandonment, describe material and procedure in Item 12.

(3) TYPE OF WELL:

Rotary ☐ Driven ☐
Cable ☒ Jetted ☐
Dug ☐ Bored ☐

(4) PROPOSED USE (check):

Domestic ☐ Industrial ☐ Municipal ☒
Irrigation ☐ Test Well ☐ Other ☐

(5) CASING INSTALLED:

Threaded ☐ Welded ☒

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

(6) PERFORATIONS:

Perforated? ☐ Yes ☐ No.

Type of perforator used

Size of perforations ..... in. by ..... in.

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

(7) SCREENS:

Well screen installed? ☐ Yes ☐ No

Manufacturer's Name .....

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

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

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

(8) WELL TESTS:

Drawdown is amount water level is lowered below static level

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

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

" ..... " ..... " .....

" ..... " ..... " .....

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

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

Temperature of water ..... Depth artesian flow encountered ..... ft.

(9) CONSTRUCTION:

Well seal—Material used .....

Well sealed from land surface to ..... ft.

Diameter of well bore to bottom of seal ..... in.

Diameter of well bore below seal ..... in.

Number of sacks of cement used in well seal ..... sacks

Number of sacks of bentonite used in well seal ..... sacks

Brand name of bentonite .....

Number of pounds of bentonite per 100 gallons of water ..... lbs./100 gals.

Was a drive shoe used? ☐ Yes ☐ No Plugs ..... Size: location ..... ft.

Did any strata contain unusable water? ☐ Yes ☐ No

Type of water? ..... depth of strata .....

Method of sealing strata off .....

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

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

(10) LOCATION OF WELL:

County Klamath Driller's well number 2 (2?)

NW ¼ SW ¼ Section 34 T. 34S R. 7E W.M.

Bearing and distance from section or subdivision corner .....

(11) WATER LEVEL: Completed well.

Depth at which water was first found 95 ft.

Static level 28 ft. below land surface. Date 5,1,74

Artesian pressure none lbs. per square inch. Date .....

(12) WELL LOG:

Diameter of well below casing .....

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

Formation: Describe color, texture, grain size and structure of materials; and show thickness and nature of each stratum and aquifer penetrated, with at least one entry for each change of formation. *Report each change in position of Static Water Level and indicate principal water-bearing strata.*

MATERIAL	From	To	SWL
Top soil (pumice)	0	6	
Brown clay and gravel mixed	6	15	
Yellow clay	15	30	
Blue clay	30	95	
Blue clay and gravel mixed	95	130	28'
Coarse sand	130	132	
Blue clay and gravel mixed	132	140	
Blue clay	140	222	
Black rock	222	335	28'
Blue clay	335	400	
24" hole to 40'			
16" hole from 40' to 195'			
12" hole from 195' to 400'			

Work started ..... 19 Completed 19

Date well drilling machine moved off of well 19

Drilling Machine Operator's Certification:

This well was constructed under my direct supervision. Materials used and information reported above are true to my best knowledge and belief.

[Signed] Norm Sevey (Drilling Machine Operator) Date ....., 19.....

Drilling Machine Operator's License No. 196

Water Well Contractor's Certification:

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

Name Norm Sevey Well Drilling (Person, firm or corporation) (Type or print)

Address 5619 Leland Dr. Klamath Falls, Oregon 97601

[Signed] Norm Sevey (Water Well Contractor)

Contractor's License No. 408 Date 6/15, 1974

(USE ADDITIONAL SHEETS IF NECESSARY)

SP*45856-119

Appendix E: Parameters Used in Delineation Model

Delineation Method: ☐ Calculated Fixed Radius ☐ Enhanced CFR ☒ Analytical
☐ Numerical ☐ Hydrogeologic Mapping

Pump Rate (Q in ft^3/day): 25902

Source: ☐ System ☐ Water Resources Dept ☐ Comparable Community
☐ Pump Capacity ☒ Population Estimate ☐ 90% of Safe Yield

Nature of the Aquifer: ☐ Unknown ☐ Unconfined
☐ Semiconfined ☒ Confined
Confining unit lithology: clay
Depth to 1st confining unit: 6 feet
Thickness of confining unit: 89 feet

Depth to Aquifer: 95 feet

Aquifer name: **Quaternary unconsolidated sediments**

Aquifer Characteristics:
Lithology:
☐ Unknown ☐ Sandy Silt ☐ Layered Volcanic Rocks
☐ Sand ☐ Sand & Gravel ☐ Fractured Volcanic Rocks
☒ Gravel ☐ Cobbles/Gravel ☐ Fractured Sedimentary Rocks
☐ Other:

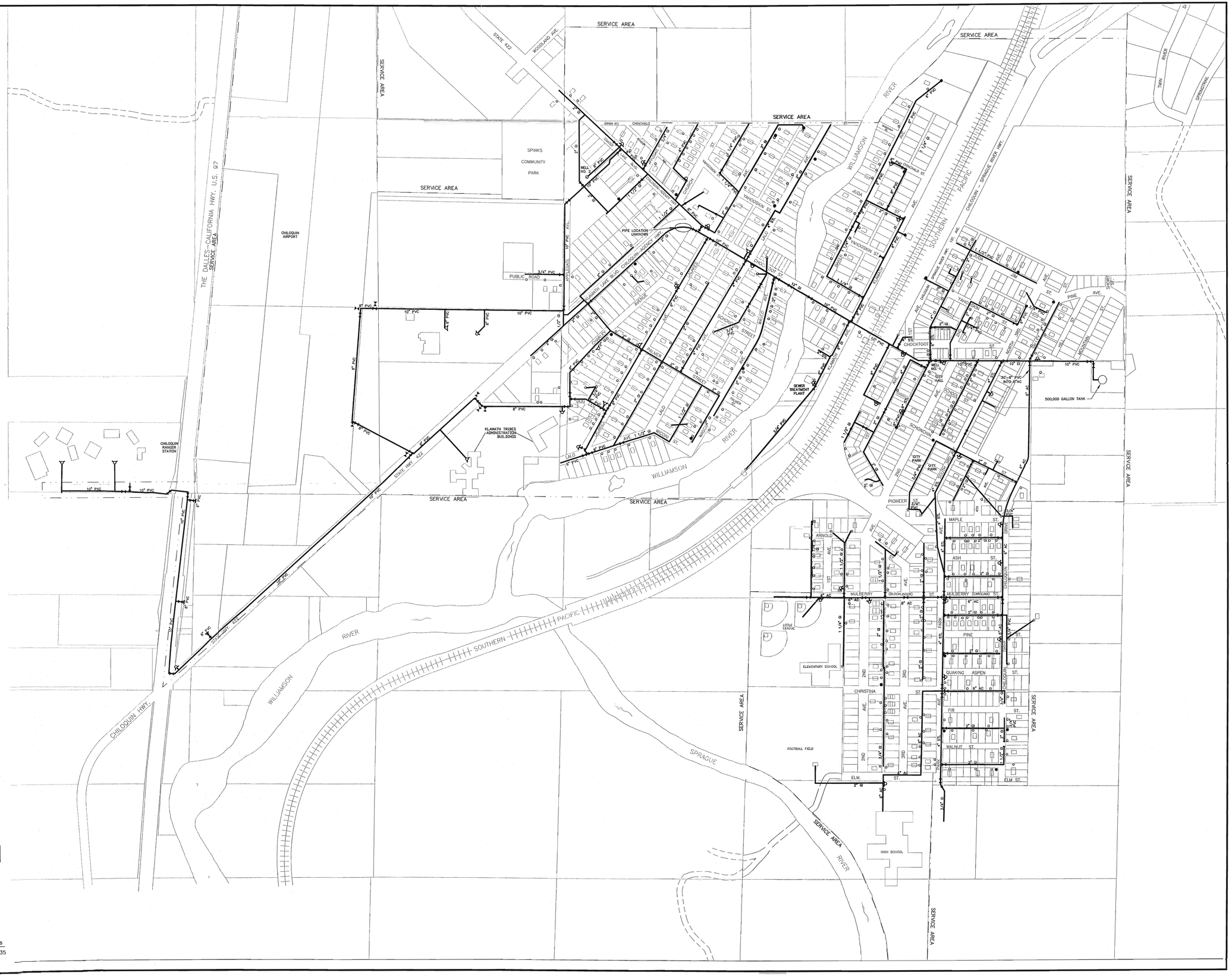
Thickness (b): 17 feet

Effective Porosity (n): 0.26

Hydraulic Conductivity (Permeability): ___ ft/day ☒ N/A
☐ Estimated from lithology ☐ Specific Capacity (Well Report)
☐ Published Report ☐ Aquifer Test

Hydraulic Gradient: ____ Flow Direction: ☒ N/A
☐ Published Report ☐ Graphical Solution ☐ Estimate
☐ Field Measurements ☐ Model Results

APPENDIX I



LEGEND

	EXISTING WATERLINE
	SERVICE AREA
	VALVE
	FIRE HYDRANT
	WELL
	BLOW OFF
	WATER METER
CI	CAST IRON PIPE
GI	GALVANIZED IRON PIPE
AC	ASBESTOS-CEMENT PIPE
STL	STEEL PIPE
PVC	POLYVINYL CHLORIDE PIPE

NOTES

1) SIZES, LENGTHS, LOCATIONS, AND TYPES OF WATER LINES AND LINE VALVE LOCATIONS WERE COMPILED FROM RECORD INFORMATION AND DRAWINGS.

2) ALL FIRE HYDRANTS AND BLOW OFF VALVES ARE ASSUMED TO HAVE ISOLATION VALVES AND THEREFORE ARE NOT SHOWN ON DRAWINGS.

CITY OF CHILOQUIN SERVICE AREA

ADKINS
CONSULTING ENGINEERING, LLP
Engineers ▲ Planners ▲ Surveyors
2950 Shasta Way · Klamath Falls, Oregon 97603 · (541) 884-4666 · FAX (541) 884-5335
Oregon California

APPENDIX J

This section to be included in the 90% report