South Tahoe Public Utility District

STPUD Water Facilities CIP

Final Report - Appendices

Water System Optimization Plan

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WYA Project No. 489

and

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K/J Project No. 1270004*00

Date: July 21, 2016

List of Appendices

Appendix A for Section 1 (TM 1A)
Appendix A1

Downhole Well Condition Assessment

Downhole Well Inspection Summary
July 2015

	Service Status								
Well	**In**	**Out**	**Abandoned**	**Demolished**	**Reason for Video**	**Date Videoed**	**Who Videoed**	**Attachment (Y/N)**	**PDFed As**
Airport Well		x			General Inspection	2/3/1999	Layne Christensen Co.	Y	Airport Well 1999
Bakersfield Well	x				-	2/3/2003	South Tahoe PUD	N	-
Bayview Test Well	x				New Well Inspection	9/14/2004	Zim Irrigation	Y	Bayview Test Well 2004
Black Rock Well #1		x			-	5/7/1986	Water Well Specialties	N	-
Black Rock Well #2		x			-	5/7/1986	Water Well Specialties	N	-
Clement Well		x			-	10/28/1993	South Tahoe PUD	N	-
College Well		x			-	10/18/1989	South Tahoe PUD	N	-
College Well		x			-	11/3/1989	Layne Christensen Co.	N	-
College Well		x			Casing Inspection	5/14/1998	Welenco	Y	College Well 1998
Country Club Well			x		Repair and Rehab.	11/1/2000	Water Well Technology, Inc.	N	-
Country Club Well			x		After Repair	1/31/2001	South Tahoe PUD	N	-
Country Club Well			x		Carson Pump	8/31/2005	South Tahoe PUD	N	-
Elks Club Well #2	x				-	10/30/2003	Water Well Technology, Inc.	N	-
Glenwood #5	x	x			New Well Inspection	8/2/2002	Zim Industreis	Y	Glenwood #5 2002
Helen Well #2	x	x			-	9/28/1987	-	N	-
Helen Well #2	x	x			-	1993	-	N	-
Helen Well #2	x	x			Video Survey	5/4/1993	South Tahoe PUD	N	-
Helen Well #2	x	x			Video Survey	5/17/1993	South Tahoe PUD	N	
Helen Well #2	x	x			Liner Inspection	6/8/1993	South Tahoe PUD	N	-
Helen Well #2	x	x			-	6/21/1993	-	N	
Industrial Well #2				x	-	-	South Tahoe PUD	N	-
Industrial Well #2				x	Carson Pump	8/31/2005	South Tahoe PUD	N	-
Martin Well			x		-	5/7/1986	Water Well Specialties	N	-
Martin Well			x		-	2/24/1988	Water Well Specialties	N	-
Martin Well			x		-	3/29/1988	Water Well Technology, Inc.	N	-
Martin Well			x		-	12/3/1988	-	N	-
Martin Well			x		-	1/20/1989	South Tahoe PUD	N	-
Middle School				x	-	9/15/1990	Layne Christensen Co.	N	-
Ralph Well				x	Carson Pump	11/20/1989	-	N	-
Sunset	x	x			-	9/15/1990	Layne Christensen Co.	N	-
So. Upper Truckee Well #1				x	-	10/4/1995	South Tahoe PUD	N	-
So. Upper Truckee Well #1				x	New Well Inspection	10/6/1999	Welenco	Y	SUT #1 1999
So. Upper Truckee Well #3	x	x			New Well Inspection	10/7/2004	Zim Industries	Y	SUT #3 2004
Tata Well #2			x		-	4/7/1994	South Tahoe PUD	N	-
Tata Well #2			x		-	4/12/1994	South Tahoe PUD	N	-
Tata Well #2			x		-	6/14/1994	South Tahoe PUD	N	-
Tata Well #3		x			-	6/13/1995	Robertson Engineering	Y	Tata Well #3 1995
Valhallla Well	x				Repair and Rehab.	10/6/1999	-	N	-
Valhalla Well	x				Repair and Rehab.	7/2/2001	Water Well Technology, Inc.	N	-
Valhalla Well	x				Repair and Rehab.	9/29/2001	Water Well Technology, Inc.	N	-

Layne Christensen Company

P.O. Box 1326/275 County Road 98/Woodland, California 95695/Phone: 916/662-2825

VISUAL WELL LOG EVALUATION STUDY

Owner: South Tahoe P.U.D. Date: 2-3-99

Location of Well: Airport

CASING LOG

Wall Thickness: _____

Depth of Casing: _____ Casing Diameter: 12" ID

Type of Perforation: wire wrap

Liners and/or Tapers: _____

VISUAL LOG

Area Scanned: 0 – 370' SWL: 31'

Purpose of Scan: General Inspection Logger: McKay

Remarks: _____

DEPTH From	DEPTH To	VTR Ref.#	CONDITION
186'	236'	8:30	screens
	196'	9:00	scan screens
	227'	11:30	" "
	231'	12:30	screens - plugged
266'	282'	15:20	" "
318'	368'	18:40	" "
	345'	20:20	scan screens
	363'	21:50	" " - plugged
	370'	23:05	bottom

Vid-Pac

Wellbore Video Report

welenco

Company ZIM IRRIGATION | Job Ticket 39813 | Run No. ONE

Address | Well No. BAYVIEW TEST WELL

City | State | Zip | Survey Date 9-14-2004

Requested by | P.O. | Well Owner

Copy to | Camera B 10

Reason for Survey NEW WELL | Zero Datum TOP OF CASING

Operator D. JACKSON | Well Depth | Vehicle No. L-11

Location

Casing I.D. at Surface 23.5" | I.D. Reference WELL RECORDS | Build-Up

SELECTED WELLBORE SNAPSHOTS	SIDESCAN DEPTHS	WELLBORE/CASING INFORMATION
	0	TOP OF CASING SIDESCAN
	36'	STATIC W WATER LEVEL
	169'	TOP OF CAMERA PORT
	171'	BOTTOM OF CAMERA PORT
	173	TOP OF TAPERED REDUCTION
	176	BOTTOM OF TAPERED REDUCTION
	179'	TOP OF STAINLESS
	180	TOP OF JOHNSON SCREEN
	200'	SIDESCAN SCREEN
	220'	SIDESCAN WELD
	230'	SIDESCAN SCREEN
	239'	" " / WELD
	259	SIDESCAN WELD
	275	SIDESCAN WELD
	299'	BOTTOM OF SCREEN
	340	TOP OF SCREEN
	349	SIDESCAN WELD
	369'	BOTTOM OF SCREEN
	410	TOP OF SCREEN
	429	BOTTOM OF SCREEN
534' SIDESCAN SCREEN	509	TOP OF SCREEN
547 FILL	519	SIDESCAN WELD

Notes:

welenco, inc.
5201 Woodmere Dr.
Bakersfield, CA 93313

www.welenco.com
e-mail: welenco@welenco.com
Phone: (800) 445-9914
Fax: (661) 834-2550

welenco
VIDEO SURVEY REPORT

Fax (805) 834-2550 • (800) 445-9914 • (805) 834-8100

Customer: South Tahoe Public Utility Dist.
Address: P.O. Box 70542
City: South Lake Tahoe State: CA Zip: 95705
Request By: Bugenig Cust. P.O.:
Copy To:
Reason for Survey: Casing Inspection

Job No.: 29236 Run No.: ONE
Well No.: College Well Date: 5-14-98
Location: 1275 Meadow Crest Dr.
Zero Datum: Top of Casing
Survey By: Roberti Truck No.: L-17

DEPTH	REMARKS
2'	Begin Survey
35'	Static water Level, water Murky to Bottom
247'	Top of Screen
340	NO Visibility, Bottom of Survey
300'	Stop Survey and Run 100 GPM into well To Clean it up.
300'	Re Start Survey
	Better Visibility - Re Video 50' to 327'
310'	water gets murky
327'	Bottom of Survey.

NOTE:

CASING CONDITION:

ID at Surface 16" Reduces to _____ at _____ : _____ at _____ : _____ at _____

Diameter Reference: ☐ Caliper Survey ☐ Estimate from TV/Photo Survey ☐ Well Records

Corrosion/Incrustation Build-up ☐ Light ☐ Moderate ☐ Heavy ☐ Increases with Depth

Vid-Pac

Wellbore Video Report

welenco

Company ZIM INDUSTRIES | Job Ticket | Run No. 1

Address | Well No. GLENWOOD # 5

City FRESNO State | Zip | Survey Date 8/2/2002

Requested by MELVIN P.O. | Well Owner SOUTH TAHOE

Copy to IVO BERGSOHN | Camera CCV SIDESCAN

Reason for Survey INSPECT NEWLY COMPLETED WELL | Zero Datum TOC

Operator | Well Depth | Vehicle No. L-18

Location SOUTH TAHOE P.U.D.

Casing I.D. at Surface 18" OD 17 1/8 ID | I.D. Reference RECORDS | Build-Up NONE

SELECTED WELLBORE SNAPSHOTS	DEPTHS	WELLBORE/CASING INFORMATION
	0	ZERO DOWN VIEW CAMERA AT TOC
	19	SWL WATER VERY CLEAR
	56	CASING WELD
	89	" "
	119	-2 SIDE SCAN CASING WELD
	148	-2 WALL CASING THICKNESS CHANGE
	150	TOP OF SLOTS
	153	SIDE SCAN TOP OF SLOTS
	182	SIDE SCAN CASING WELD
	172	SIDE SCAN CASING WELD
	223	SIDE SCAN
	230	BOTTOM OF WELL

Notes:

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Fax: 1-(661) 834-2550

Vid-Pac

Wellbore Video Report

welenco

Company ZIM INDUSTRIES
Address
City State Zip
Requested by BRIAN P.O.
Copy to
Reason for Survey NEW WELL INSP.
Operator L. HOLIN Well Depth 320'

Job Ticket 39516 Run No. ONE
Well No. SOUTH LAKE TAHOE #3
Survey Date 10.7.04
Well Owner SOUTH LAKE TAHOE
Camera LAUNCH
Zero Datum G.L.
Vehicle No. L-11

Location SOUTH TRUCKEE RD + EGRET WAY
Casing I.D. at Surface 15 3/8 I.D. Reference ESTIMATED Build-Up NONE

SELECTED WELLBORE SNAPSHOTS	SIDESCAN DEPTHS	WELLBORE/CASING INFORMATION
		DOWNVIEW DEPTHS ARE 2' DEEPER THAN DISPLAYED
	0'	ZEROED @ G.L. WITH SIDEVIEW LENS
	16'	S.W.L @ 18'
	71'	TOP OF SCREEN SECTION
	90	BTM OF SCREEN SECTION
	161	TOP OF SCREEN SECTION
	171	MARK ON SCREEN WALL
	180	BTM OF SCREEN SECTION
	200	TOP OF SCREEN SECTION
	204	SIDEVIEW SCREEN
	240	BTM OF SCREEN SECTION
	260	TOP OF SCREEN SECTION
	270	BTM OF SCREEN SECTION
	280	TOP OF SCREEN SECTION
	300	AIR LINE (2)
	307	TAPE ON AIR LINES
	309	BTM OF SCREEN SECTION
	317	FILL @ 319' END OF DR. SURVEY
	0	END OF SURVEY

Notes:

welenco, inc.
5201 Woodmere Dr.
Bakersfield, CA 93313
www.welenco.com
e-mail: welenco@welenco.com
Phone: (800) 445-9914
Fax: (661) 834-2550

Robertson Engineering

1401 NORTH ROOP STREET • CARSON CITY, NEVADA 89706 • (702) 882-0707

VIDEO WELL SURVEY

CUSTOMER S.T.P.U.D. DATE June 13, 1995

WELL NO. TATA #3 WELL DIA. 8" DEPTH 205

WITNESSED BY _____ LOGGED BY R. R.

DEPTH	ELAP. TIME	COMMENTS
+3		Top of casing
~~0~~		grade
30		widely scattered scale
43		static water level
60		wire wound screen, clean
80		Blank, clean
		scale increasing w/ depth
114		Air line starts
170		2nd air line
205		bottom, no indication of screen or perforations below 80 ft.

189' of 3" pipe on ground plus 3' bury of pitless adapter.

Appendix A for Section 1 (TM 1A)
Appendix A2

District Asset Condition Assessments

Appendix A2

Booster Pump Stations

South Tahoe PUD

Water System Optimization Plan

Summary of Booster Pump Station Condition and Capacity Evaluation

			Failure Mode Scoring Summary - Criticality Scores							
Pump Station Facility Name:	Zone Served	**Pump Station Facility ID #:**	**Pump Station Site**	**Building Structure**	**Pumps**	**Piping & Valves**	**SCADA System**	**Other Critical Mechanical Equipment**	**Electrical Power**	**Overall Total Factored Score (Out of 25) =**
Twin Peaks	Twin Peaks	TPBS1, TPBS2, TPBS3	0.29	0.17	0.91	0.40	0.76	1.04	1.73	5.30
Tata	Gardner Mountain	TATABP, TATABP2	0.39	0.36	1.75	0.41	0.97	0.16	1.68	5.72
Forest Mountain	Angora	FMPUMP1,FMPUMP2,FMPUMP3	0.44	0.24	1.45	0.56	1.02	0.40	1.03	5.14
Cornelian	Christmas Valley	CRNPUMP1,CRNPUMP2, CRNPUMP3	0.37	0.24	1.71	0.40	0.70	0.40	0.92	4.74
Airport	Country Club	APRBS	0.25	0.17	1.31	0.67	1.18	0.56	2.02	6.16
Flagpole	Flagpole	FPBS1,FPBS2,FPBS3	0.35	0.32	1.20	0.56	0.95	0.32	1.03	4.73
Grizzly Mountain	Flagpole	GRIZBP1, GRIZBP2, GRIZBP3	0.27	0.17	0.91	0.37	0.65	0.32	0.83	3.53
Boulder Mountain	Forest Mountain	BMPUMP1, BMPUMP2, BMPUMP3	0.23	0.20	1.74	0.93	1.21	0.64	1.40	6.36
H ST	H Street	HSTBS	0.49	0.48	2.59	0.76	1.58	0.48	1.23	7.61
David Lane	Heavenly	DLBP3	0.36	0.27	1.85	0.37	1.13	0.48	1.23	5.70
South Apache	Iroquois	APBSP1 and APBSP2	0.38	0.56	2.75	0.69	1.13	0.10	1.13	6.75
North Apache	Iroquois	NAPBS1, NAPBS2, and NAPBS3	0.35	0.17	0.90	0.37	0.65	0.32	1.76	4.53
Keller	Keller	KLRBP1 and KLRBP2	0.54	0.25	1.49	0.37	0.97	0.10	1.55	5.27
Cold Creek Fltr Plant	Montgomery Estates	CCBP1 and CCBP2	0.32	0.29	1.76	0.37	0.65	0.26	1.83	5.49
Black Bart	Montgomery Estates	BLBTBP1, BLBTBP2, and BLBTP3	0.37	0.45	1.48	0.41	1.05	0.10	1.85	5.71
Cold Creek Tank	Main	CCBPUMP1 and CCBPUMP2	0.37	0.50	1.79	0.84	0.94	0.10	0.83	5.36

				South Tahoe PUD	**Location Description:**	Lake Tahoe Boulevard Just past Industrial Ave	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pump Station Facility ID #:**	TPBS1, TPBS2, TPBS3	**Date:**	2/23/2012	
					Pump Station Facility Name:	Twin Peaks Booster Station	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Flagpole, Forest Mountain, Angora Highlands, and Stateline Zones	

Notes:

1. Capacity score will be based on hydraulic model
2. For Reliabilty to be determined based on CMMS maintenance records
3. For Criticality Weighting Factors to be determined at District Workshop

Failure Mode Scoring (1 - 5)

	Physical Mortality	Capacity (see note 1)	Level of Service: functionality	Level of Service: reliability	Financial Efficiency	
	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology	
	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
	3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average	
	4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low	
	5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	

				Pump Station Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	2.20	N/A		
				Weighted Final Score (1-25)	N/A	N/A	3.50	9.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Score	N/A	N/A	2.1	3.6	N/A		**5.70**
				Criticality Score					5%		**0.29**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.33	3.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A		
				Factored Score	1.2	N/A	1.67	0.6	N/A		**3.47**
				Criticality Score					5%		**0.17**
				Pumps							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	Calculated	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.00	1.00	1.00		
				Weighted Final Score (1-25)	3.67	4.00	3.50	3.75	3.33		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	0.55	0.8	1.05	0.75	0.5		**3.65**
				Criticality Score					25%		**0.91**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.20	N/A	N/A		
				Weighted Final Score (1-25)	4.00	N/A	4.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	0.8	N/A	3.20	N/A	N/A		**4.00**
				Criticality Score					10%		**0.40**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.60	1.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	4.20	3.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A		
				Factored Score	0.8	N/A	1.68	1.33	N/A		**3.81**
				Criticality Score					20%		**0.76**
				Other Critical Mechanical Equipment							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	4.00	N/A	N/A		
				Weighted Final Score (1-25)	4.00	N/A	12.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	0.8	N/A	9.6	N/A	N/A		**10.40**
				Criticality Score					10%		**1.04**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	3.00	0.80	N/A		
				Weighted Final Score (1-25)	4.00	N/A	9.00	3.60	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Score	0.8	N/A	5.4	0.72	N/A		**6.92**
				Criticality Score					25%		**1.73**
									Overall Total Factored Score (Out of 25) =		**5.30**

				South Tahoe PUD	**Location Description:**	Lake Tahoe Boulevard Just past Industrial Ave	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	TPBS1, TPBS2, TPBS3	**Date:**	2/23/2012
					Pump Station Facility Name:	Twin Peaks Booster Station	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Flagpole, Forest Mountain, Angora Highlands, and Stateline Zones

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	1	4	4.00	adequate vehicle access for maintenance?	Yes
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	3	5	15.00	is site vulnerable to wildfires?	Yes the property is adjacent to open wooded space, however, building is constructed from non-combustible materials and defensible space is provided around structure perimeter
R	4	4	16.00	is site close to known active seismic faults?	Three at 623 feet, 750 feet, and 2,066 feet away
R	1	4	4.00	any unstable site conditions (if yes, describe)?	No unstable sit conditions
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	Yes
Fn	1	3	3.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	Yes the site is completely fenced and well lit
Fn	1	3	3.00	other known problems?	No other known problems with the site
				Building Structure	
Fn	1	3	3.00	adequate security measures and monitoring to prevent unauthorized access?	The building has intrusion alarms which are tied to the SCADA monitoring at the main plant
INFORMATION	N/A	N/A	N/A	date building was constructed?	2009
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	Yes
PM	1	4	4.00	condition of exterior coatings adequate to protect structure?	Yes
Fn	1	3	3.00	adequate openings for ingress/egress?	Yes
Fn	1	3	3.00	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	Yes
R	1	2	2.00	building meets code compliance requirements?	Yes as of design in 2008
R	1	4	4.00	known fire or haz-mat conditions that could be mitigated?	No known haz mat or fire conditions
Fn	1	3	3.00	other known problems?	No other known problems with the building
PM	1	4	4.00	estimated service life remaining?	27 years based on AWU Useful Life
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	3
INFORMATION	N/A	N/A	N/A	pump types?	Vertical Turbines
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Floway Pumps
PM	1	3	3.00	pumps rebuilt (list year) and describe work done?	New in 2009
FE	1	4	4.00	pump curves available for each unit?	Yes
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	No pump or motor failures since construction
R	1	4	4.00	number of service calls/repairs in the last year?	None
C	1	4	4.00	what is firm capacity of pump station based on flow test?	1500 - 1900 gpm (there are three pumps. ea puts out 1,000 when running by itself. Two pump running simultaneously could overpressurize system ("Should be ok now" per district review comments 11/21/12))
PM	1	4	4.00	coatings adequate to provide corrosion protection?	New coatings with no visual defects
FE	1	3	3.00	pumps operate efficiently (>70% bowl efficiency)?	yes
FE	1	3	3.00	motor high efficiency and no excessive noise?	yes
R	1	4	4.00	pumps operate free from excessive vibration?	There is no record of excessive vibration at this station
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	yes
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	1	3	3.00	spare parts readily available?	Seals, Bearings, Shaft Sleeves are stored within the station. Other parts would need to be ordered from the manufacturer
Fn	1	3	3.00	other known problems?	No other known problems
PM	1	4	4.00	estimated service life remaining?	27 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Lake Tahoe Boulevard Just past Industrial Ave	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	TPBS1, TPBS2, TPBS3	**Date:**	2/23/2012
					Pump Station Facility Name:	Twin Peaks Booster Station	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Flagpole, Forest Mountain, Angora Highlands, and Stateline Zones

				Piping & Valves	
PM	1	4	4.00	pipe supports adequate to prevent movement or vibration?	Yes they are coated steel supports that are epoxy bolted to the floor and grouted beneath the plate.
PM	1	4	4.00	coatings adequate to protect piping and valves?	Coatings are new in 2009 and there are no visual defects on the exterior of the piping and valves
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	Pipes are adequately sized
Fn	1	4	4.00	isolation valves provided for all pumps?	All pumps have isolation valves.
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	Valves are new, efficient, and reliable
Fn	2	2	4.00	chemical injection provided?	There is no chemical injection at this site
INFORMATION	N/A	N/A	N/A	type of chemical added?	NA
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Ports with bent copper are available for use to sample water quality and are located next to each of the pressure gages.
PM	1	4	4.00	estimated service life remaining?	57 years for steel piping and 47 years for valves based on AWU Useful Life
				Other Critical Mechanical Equipment	
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA
Fn	4	3	12.00	pressure relief valves?	2" Pressure Relief Valve on discharge of pump number 1 which has been valved off. 12" PRV from the Twin Peaks Zone to Stateline
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA
PM	1	4	4.00	estimated service life remaining?	22 years based on AWU Useful Life
				SCADA system	
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes the flow meter is a Siemens mag meter installed in 2009
Fn	3	2	6.00	flow totals recorded at regular intervals? How frequent?	Daily and hand logged into log book
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	Yes
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District Operations
Fn	2	3	6.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There have been no communication errors in the last year
R	1	3	3.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	Yes there is a permanent backup generator within the station
R	1	3	3.00	spare parts/service support readily available?	Spare parts for the SCADA system are available at the District offices or readily through the manufacturer
PM	1	4	4.00	estimated service life remaining?	9 years based on AWU Useful Life
				Electrical Power	
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	275kW, 422 bhp @1800RPM Diesel
R	1	5	5.00	adequate power available to run all equipment	The generator is sized to handle all three pumps and associated controls
R	1	5	5.00	adequate standby power present and reliable?	Yes
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	200 gallons
R	1	5	5.00	fuel supply adequate for standby power service?	Yes
R	N/A	3	N/A	time needed to mobilize portable generator?	NA, standby generator on site
Fn	3	3	9.00	known electrical hazards that could be mitigated?	Arc Flash labeling has not been completed on the control panels and other electrical equipment
R	1	3	3.00	spare parts/service support readily available?	Yes some parts are housed within the station and others would need to be obtained from the manufacturer
PM	1	4	4.00	estimated service life remaining?	22 years based on AWU Useful Life
				Additional Data	
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):	
INFORMATION				Pump No. 1	Rated Flow=875gpm, Head=275', Size=11JKH, 5 Stage, Power=100hp, 1790 RPM, Impeller setting 0.125" off bottom
INFORMATION				Pump No. 2	Rated Flow=875gpm, Head=275', Size=11JKH, 5 Stage, Power=100hp, 1790 RPM, Impeller setting 0.125" off bottom
INFORMATION				Pump No. 3	Rated Flow=875gpm, Head=275', Size=11JKH, 5 Stage, Power=100hp, 1790 RPM, Impeller setting 0.125" off bottom
INFORMATION				Pump No. 4	

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Lake Tahoe Boulevard Just past Industrial Ave	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	TPBS1, TPBS2, TPBS3	**Date:**	2/23/2012
					Pump Station Facility Name:	Twin Peaks Booster Station	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Flagpole, Forest Mountain, Angora Highlands, and Stateline Zones

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	1128 Tata Lane		**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pump Station Facility ID #:**	TATABP1, TATABP2		**Date:**	2/23/2012	
					Pump Station Facility Name:	Tata Booster		**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Gardner Mountain Zone		**Adjacent Pressure Zones:**	Stateline Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				Pump Station Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.75	2.60	N/A	
				Weighted Final Score (1-25)	N/A	N/A	5.75	11.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Score	N/A	N/A	3.45	4.4	N/A	**7.85**
				Criticality Score					5%	**0.39**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.50	N/A	1.17	1.50	N/A	
				Weighted Final Score (1-25)	14.00	N/A	3.83	5.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A	
				Factored Score	4.2	N/A	1.92	1	N/A	**7.12**
				Criticality Score					5%	**0.36**
				Pumps						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	2.00	1.00	2.00	3.67	
				Weighted Final Score (1-25)	7.33	8.00	3.50	6.75	12.67	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.1	1.6	1.05	1.35	1.9	**7.00**
				Criticality Score					25%	**1.75**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	6.00	N/A	3.67	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.2	N/A	2.93	N/A	N/A	**4.13**
				Criticality Score					10%	**0.41**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	3.00	N/A	
				Weighted Final Score (1-25)	N/A	N/A	2.75	9.33	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A	
				Factored Score	N/A	N/A	1.1	3.73	N/A	**4.83**
				Criticality Score					20%	**0.97**
				Other Critical Mechanical Equipment						
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	2.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	N/A	N/A	1.6	N/A	N/A	**1.60**
				Criticality Score					10%	**0.16**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	N/A	1.00	2.20	N/A	
				Weighted Final Score (1-25)	16.00	N/A	3.00	8.60	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Score	3.2	N/A	1.8	1.72	N/A	**6.72**
				Criticality Score					25%	**1.68**
									Overall Total Factored Score (Out of 25) =	**5.72**

				South Tahoe PUD	**Location Description:**	1128 Tata Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	TATABP1, TATABP2	**Date:**	2/23/2012
					Pump Station Facility Name:	Tata Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Gardner Mountain Zone	**Adjacent Pressure Zones:**	Stateline Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	The site has adequate year round access on a paved driveway
Fn	1	4	4.00	adequate vehicle access for maintenance?	The Booster Station is on a large lot with adequate parking for crew trucks and crane if necessary
R	1	3	3.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	4	5	20.00	is site vulnerable to wildfires?	Yes there are trees and vacant lots near by.
R	4	4	16.00	is site close to known active seismic faults?	1,984 ft. north of a fault line
R	3	4	12.00	any unstable site conditions (if yes, describe)?	There are trees touching the tank and the lot has frequent unauthorized entries
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	There are no drainage issues on this site
Fn	4	3	12.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No, the fencing does not prevent vandalism of the tank
Fn	1	3	3.00	other known problems?	There are no other known site problems
				Building Structure	
Fn	2	3	6.00	adequate security measures and monitoring to prevent unauthorized access?	There is no intrusion alarm on the doors and the facility is secured utilizing pad locks that only have access by District Cyber Key
INFORMATION	N/A	N/A	N/A	date building was constructed?	1968
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	The facility has adequate space to complete O&M
PM	3	4	12.00	condition of exterior coatings adequate to protect structure?	Coatings on block walls are in great condition. The fascia and soffit of the building show water damage on the low side of the single sloped roof. It also appears that animals may at one time had nests within the soffit of the building.
Fn	1	3	3.00	adequate openings for ingress/egress?	The openings are adequate
Fn	1	3	3.00	interior lighting adequate for routine O&M?	The interior lighting is adequate
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	The building meets the design parameters of when it was built and has not had any issue with snow loads since 1968
R	1	2	2.00	building meets code compliance requirements?	As of the constructed date
R	2	4	8.00	known fire or haz-mat conditions that could be mitigated?	there are no known haz-mat or fire conditions that could be mitigated within the interior of the building. Trees on the parcel may increase the risk of fire to the building
Fn	1	3	3.00	other known problems?	No other known problems on the site
PM	4	4	16.00	estimated service life remaining?	Exceed Expected useful life by 14 years based on AWU Useful Life
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	2
INFORMATION	N/A	N/A	N/A	pump types?	End Suction Centrifugal
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Pump #1 - Universal Manufacturing Company, Pump #2 - Jacuzzi
PM	2	3	6.00	pumps rebuilt (list year) and describe work done?	New seals on both pumps in 2002. Pumps out of service for a period of time and station not in use. The station was put back into service in July 2011.
FE	5	4	20.00	pump curves available for each unit?	Yes for Pump #1
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	There is no history of motor failures at this pump station
R	1	4	4.00	number of service calls/repairs in the last year?	there have been no service calls within the last year since the station was restarted in 2011
C	2	4	8.00	what is firm capacity of pump station based on flow test?	Pump No. 1 - 410 GPM, Pump No. 2 - 610 GPM, Qfirm - 410 GPM
PM	1	4	4.00	coatings adequate to provide corrosion protection?	Minor dings in coating but overall in great condition.
FE	5	3	15.00	pumps operate efficiently (>70% bowl efficiency)?	Insufficient data
FE	1	3	3.00	motor high efficiency and no excessive noise?	Assumed yes
R	1	4	4.00	pumps operate free from excessive vibration?	No excessive vibration was noted while pumps were in service running at max
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	Assumed yes
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	5	3	15.00	spare parts readily available?	There are no parts available for these pumps. Everything would need to be ordered from the Manufacturer.
Fn	1	3	3.00	other known problems?	No other known problems with the pumps and motors
PM	3	4	12.00	estimated service life remaining?	Pumps have been out of service for a period of time and maintained within the last year.

				South Tahoe PUD	**Location Description:**	1128 Tata Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	TATABP1, TATABP2	**Date:**	2/23/2012
					Pump Station Facility Name:	Tata Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Gardner Mountain Zone	**Adjacent Pressure Zones:**	Stateline Zone
				Piping & Valves				
Fn	1	4	4.00	pipe supports adequate to prevent movement or vibration?	Pipe supports are steel posts that have been bolted to the concrete floor. No movement or additional vibration was noted or recalled in this station.			
PM	2	4	8.00	coatings adequate to protect piping and valves?	Coatings are adequate to protect the piping there are minor dings in the coating but no rust can be seen. See photos below			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	The pipes are adequately sized.			
Fn	1	4	4.00	isolation valves provided for all pumps?	Isolation valves are installed for both pumps.			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	Valves are reliable and in good condition			
Fn	1	2	2.00	chemical injection provided?	Chemical injection was recently installed at this station			
INFORMATION	N/A	N/A	N/A	type of chemical added?	Sodium Hypochlorite			
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Sample taps are in place and they are turned down with no threads			
PM	1	4	4.00	estimated service life remaining?	Piping has been replaced on the interior of the pump station. Estimate 50 years of Useful Life Left			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	1	1	1.00	pressure relief valves?	NA-No pressure relief valves in station-Assigned score of 1 to prevent artificially lowered scores.			
Fn	1	3	3.00	Altitude Valves?	Altitude valve which controls Tata tank is in good operating condition			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	Chemicals are in 30 gallon drums and there is no secondary containment for them.			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	Yes			
PM	1	4	4.00	estimated service life remaining?	Other mechanical equipment has been added over the life of the station and estimated service life would vary.			
				SCADA system				
INFORMATION	N/A	N/A	N/A	pump station flow meter is adequate to monitor pump performance?	Yes the stations meter is connected to SCADA and is adequate			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Flow totals are logged daily by hand			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	There are numerous pressure gauges around the station but they are not tied to SCADA			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations			
Fn	1	3	3.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year			
R	5	3	15.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site, but during a power outage a portable generator would need to be mobilized to the site to provide adequate power to run telemetry.			
R	3	3	9.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer			
PM	1	4	4.00	estimated service life remaining?	11 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5.00	adequate power available to run all equipment	NA			
R	4	5	20.00	adequate standby power present and reliable?	No, a portable generator would need to be mobilized to the site			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R	N/A	5	N/A	fuel supply adequate for standby power service?	NA			
R	5	3	15.00	time needed to mobilize portable generator?	A generator could be brought to the site within a few hours depending on conditions. There are no quick hookups to the station which means that the hookup process for backup power may take longer than mobilizing the portable generator.			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	No known electrical hazards at this site			
R	1	3	3.00	spare parts/service support readily available?	Some spare parts are available but others would need to be ordered from the manufacturer.			
PM	4	4	16.00	estimated service life remaining?	Older components have exceed the useful life. Some new electrical may exist for changes made in the nineties.			
				Additional Data				
INFORMATION				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	No Head or flow listed on the nameplates. 30HP Pump			
INFORMATION				Pump No. 2	No Head or flow listed on the nameplates. 50HP Pump			
INFORMATION				Pump No. 3				
				Pump No. 4				
				Comments	This pump station was not used for a period of time because it is not necessary for the operation of the system as it is currently run today. The District has evaluated how to get water to the Y area of South Lake Tahoe. As part of this evaluation the booster station was put online to isolate a portion of the Stateline zone creating Gardner mountain zone. The District is still looking at the necessity for this pump station and other alternatives that could be done in order to adequately supply the west end of the Stateline zone most efficiently. It is the hope of the District that the Water System Optimization Plan will aid in showing these more efficient methods of supplying water to the Y area.			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	1128 Tata Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	TATABP1, TATABP2	**Date:**	2/23/2012
					Pump Station Facility Name:	Tata Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Gardner Mountain Zone	**Adjacent Pressure Zones:**	Stateline Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	927 Forest Mountain Dr.	**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Pump Station Facility ID #:**	FMPUMP1, FMPUMP2, FMPUMP3	**Date:**	3/12/2012		
					Pump Station Facility Name:	Forest Mountain Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney		
					Pressure Zones Served:	Angora Highlands Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone		

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	

				Pump Station Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.50	2.20	N/A		
				Weighted Final Score (1-25)	N/A	N/A	8.50	9.40	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Score	N/A	N/A	5.1	3.76	N/A		**8.86**
				Criticality Score					5%		**0.44**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.50	1.00	N/A		
				Weighted Final Score (1-25)	6.00	N/A	4.83	3.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A		
				Factored Score	1.8	N/A	2.42	0.6	N/A		**4.82**
				Criticality Score					5%		**0.24**
				Pumps							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	Calculated	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	2.33	1.00	1.00	1.00	3.67		
				Weighted Final Score (1-25)	8.67	4.00	3.50	3.75	12.67		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	1.3	0.8	1.05	0.75	1.9		**5.80**
				Criticality Score					25%		**1.45**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.67	N/A	N/A		
				Weighted Final Score (1-25)	4.00	N/A	6.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	0.8	N/A	4.8	N/A	N/A		**5.60**
				Criticality Score					10%		**0.56**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.20	1.67	N/A		
				Weighted Final Score (1-25)	8.00	N/A	3.40	5.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A		
				Factored Score	1.6	N/A	1.36	2.13	N/A		**5.09**
				Criticality Score					20%		**1.02**
				Other Critical Mechanical Equipment							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	8.00	N/A	3.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	1.6	N/A	2.4	N/A	N/A		**4.00**
				Criticality Score					10%		**0.40**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	0.80	N/A		
				Weighted Final Score (1-25)	8.00	N/A	3.00	3.60	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Score	1.6	N/A	1.8	0.72	N/A		**4.12**
				Criticality Score					25%		**1.03**
									Overall Total Factored Score (Out of 25) =		**5.14**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Weighted Score**	**CONDITION ASSESSMENT CHECKLIST**

				South Tahoe PUD	**Location Description:**	927 Forest Mountain Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	FMPUMP1, FMPUMP2, FMPUMP3	**Date:**	3/12/2012
					Pump Station Facility Name:	Forest Mountain Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Angora Highlands Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				Pump Station Site				
Fn	1	4	4.00	key O&M staff have access to site?	Yes			
Fn	3	4	12.00	adequate vehicle access for maintenance?	Only in the summer time or periods of low snow fall			
R	1	3	3.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.			
R	4	5	20.00	is site vulnerable to wildfires?	Yes this area was part of the Angora burn area			
R	4	4	16.00	is site close to known active seismic faults?	5,000 feet to the nearest fault line			
R	1	4	4.00	any unstable site conditions (if yes, describe)?	None			
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	Yes			
Fn	5	3	15.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	There is no security around the property			
Fn	1	3	3.00	other known problems?	None			
				Building Structure				
Fn	3	3	9.00	adequate security measures and monitoring to prevent unauthorized access?	The door is locked and there have been no instances of unauthorized access.			
INFORMATION	N/A	N/A	N/A	date building was constructed?	2000			
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	Yes			
PM	2	4	8.00	condition of exterior coatings adequate to protect structure?	There are no coatings on the block but the door coatings are starting to fade			
Fn	2	3	6.00	adequate openings for ingress/egress?	Single door in and out			
Fn	1	3	3.00	interior lighting adequate for routine O&M?	Yes			
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	The building meets the loads when constructed			
R	1	2	2.00	building meets code compliance requirements?	The building meets the codes for when it was constructed			
R	1	4	4.00	known fire or haz-mat conditions that could be mitigated?	None			
Fn	1	3	3.00	other known problems?	None			
PM	1	4	4.00	estimated service life remaining?	18 years based on AWU Useful Life			
				Pumps				
INFORMATION	N/A	N/A	N/A	no. of pumps?	3			
INFORMATION	N/A	N/A	N/A	pump types?	Centrifugal			
INFORMATION	N/A	N/A	N/A	pump manufacturer?	1 and 2 are peerless. Pump 3 is aurora (fire pump)			
PM	2	3	6.00	pumps rebuilt (list year) and describe work done?	No rebuilds, new seals and bearings in 2009 on pumps 1 ands 2			
FE	5	4	20.00	pump curves available for each unit?	No			
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	None			
R	1	4	4.00	number of service calls/repairs in the last year?	None			
C	1	4	4.00	what is firm capacity of pump station based on flow test?	approximately 200 gpm w/ pump no. 3 out of service			
PM	3	4	12.00	coatings adequate to provide corrosion protection?	Coatings have worn away in some locations but are in adequate condition			
FE	5	3	15.00	pumps operate efficiently (>70% bowl efficiency)?	wire-to-water efficiency ranges between 47% - 59%			
FE	1	3	3.00	motor high efficiency and no excessive noise?	Assumed yes			
R	1	4	4.00	pumps operate free from excessive vibration?	Yes			
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	yes			
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA			
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA			
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA			
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA			
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA			
R	1	3	3.00	spare parts readily available?	Readily available in the District's main shop			
Fn	1	3	3.00	other known problems?	None			
PM	2	4	8.00	estimated service life remaining?	18 years based on AWU Useful Life			

				South Tahoe PUD	**Location Description:**	927 Forest Mountain Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	FMPUMP1, FMPUMP2, FMPUMP3	**Date:**	3/12/2012
					Pump Station Facility Name:	Forest Mountain Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Angora Highlands Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				Piping & Valves				
Fn	1	4	4.00	pipe supports adequate to prevent movement or vibration?	Yes steel supports embedded in concrete floor, or steel with no bolts to floor			
PM	1	4	4.00	coatings adequate to protect piping and valves?	Pipe and valve coatings in excellent condition			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	4	4.00	isolation valves provided for all pumps?	Yes			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	Yes no issues with the valving			
Fn	3	2	6.00	chemical injection provided?	None			
INFORMATION	N/A	N/A	N/A	type of chemical added?	None			
Fn	3	5	15.00	sample tap(s) provided to measure water quality?	None			
PM	1	4	4.00	estimated service life remaining?	48 years based on AWU Useful Life			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	1	3	3.00	pressure relief valves?	On site and in good condition no recent issues			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA			
PM	2	4	8.00	estimated service life remaining?	13 years based on AWU Useful Life			
				SCADA system				
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Flow totals are logged daily by hand			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	There are numerous pressure gauges around the station but they are not tied to SCADA			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations			
Fn	2	3	6.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year			
R	3	3	9.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site but during a power outage a portable generator would need to be mobilized to the site			
R	1	3	3.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer			
PM	2	4	8.00	estimated service life remaining?	11 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	125kW			
R	1	5	5.00	adequate power available to run all equipment	Yes			
R	1	5	5.00	adequate standby power present and reliable?	Yes			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	250gal			
R	1	5	5.00	fuel supply adequate for standby power service?	Yes			
R	N/A	3	N/A	time needed to mobilize portable generator?	NA, standby power on site			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	None			
R	1	3	3.00	spare parts/service support readily available?	Yes at District's main plant			
PM	2	4	8.00	estimated service life remaining?	13 years based on AWU Useful Life			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	20hp			
INFORMATION				Pump No. 2	20Hp			
INFORMATION				Pump No. 3	450gpm, 280 ft., 60Hp			
INFORMATION				Pump No. 4				
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	927 Forest Mountain Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	FMPUMP1, FMPUMP2, FMPUMP3	**Date:**	3/12/2012
					Pump Station Facility Name:	Forest Mountain Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Angora Highlands Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Hwy89 and Cornelian Dr.	**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Pump Station Facility ID #:**	CRNPUMP1, CRNPUMP2, CRNPUMP3	**Date:**	3/8/2012		
					Pump Station Facility Name:	Cornelian Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray		
					Pressure Zones Served:	Christmas Valley Zone	**Adjacent Pressure Zones:**	Arrowhead Zone		

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				Pump Station Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.75	2.40	N/A	
				Weighted Final Score (1-25)	N/A	N/A	5.75	10.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Score	N/A	N/A	3.45	4	N/A	**7.45**
				Criticality Score					5%	**0.37**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.50	1.00	N/A	
				Weighted Final Score (1-25)	6.00	N/A	4.83	3.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A	
				Factored Score	1.8	N/A	2.42	0.6	N/A	**4.82**
				Criticality Score					5%	**0.24**
				Pumps						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.67	2.00	1.00	1.50	3.67	
				Weighted Final Score (1-25)	9.67	8.00	3.50	5.25	11.33	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.45	1.6	1.05	1.05	1.7	**6.85**
				Criticality Score					25%	**1.71**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.17	N/A	N/A	
				Weighted Final Score (1-25)	4.00	N/A	4.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	0.8	N/A	3.20	N/A	N/A	**4.00**
				Criticality Score					10%	**0.40**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.20	1.00	N/A	
				Weighted Final Score (1-25)	4.00	N/A	3.40	3.33	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A	
				Factored Score	0.8	N/A	1.36	1.33	N/A	**3.49**
				Criticality Score					20%	**0.70**
				Other Critical Mechanical Equipment						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	8.00	N/A	3.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.6	N/A	2.4	N/A	N/A	**4.00**
				Criticality Score					10%	**0.40**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	1.40	N/A	
				Weighted Final Score (1-25)	4.00	N/A	3.00	5.40	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Score	0.8	N/A	1.8	1.08	N/A	**3.68**
				Criticality Score					25%	**0.92**
									Overall Total Factored Score (Out of 25) =	**4.74**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Weighted Score**	**CONDITION ASSESSMENT CHECKLIST**

				South Tahoe PUD	**Location Description:**	Hwy89 and Cornelian Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	CRNPUMP1, CRNPUMP2, CRNPUMP3	**Date:**	3/8/2012
					Pump Station Facility Name:	Cornelian Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Christmas Valley Zone	**Adjacent Pressure Zones:**	Arrowhead Zone
				Pump Station Site				
Fn	1	4	4.00	key O&M staff have access to site?	Yes			
Fn	1	4	4.00	adequate vehicle access for maintenance?	Yes			
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.			
R	4	5	20.00	is site vulnerable to wildfires?	Yes there are wooded lots adjacent to the facility			
R	4	4	16.00	is site close to known active seismic faults?	3,715 ft. to the nearest fault			
R	1	4	4.00	any unstable site conditions (if yes, describe)?	None			
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	Yes			
Fn	4	3	12.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	None and there is no history of unauthorized access			
Fn	1	3	3.00	other known problems?	None			
				Building Structure				
Fn	4	3	12.00	adequate security measures and monitoring to prevent unauthorized access?	The door is locked but the facility has had issues in the past with vandalism			
INFORMATION	N/A	N/A	N/A	date building was constructed?	2003			
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	Yes			
PM	1	4	4.00	condition of exterior coatings adequate to protect structure?	Block building with no coatings and the roof is in good condition			
Fn	1	3	3.00	adequate openings for ingress/egress?	Yes			
Fn	1	3	3.00	interior lighting adequate for routine O&M?	Yes			
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	Met the requirements at the time of construction			
R	1	2	2.00	building meets code compliance requirements?	Met requirements at the time of construction			
R	1	4	4.00	known fire or haz-mat conditions that could be mitigated?	None			
Fn	1	3	3.00	other known problems?	None			
PM	2	4	8.00	estimated service life remaining?	21 years based on AWU Useful Life			
				Pumps	Pump No. 3 is used as a fire pump, however, it does not appear to be UL/FM rated for fire service.			
INFORMATION	N/A	N/A	N/A	no. of pumps?	3			
INFORMATION	N/A	N/A	N/A	pump types?	Centrifugal Pumps			
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Fairbanks Morse			
PM	3	3	9.00	pumps rebuilt (list year) and describe work done?	No work done and this is really only used in the wintertime			
FE	1	4	4.00	pump curves available for each unit?	Yes			
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	None			
R	1	4	4.00	number of service calls/repairs in the last year?	None			
C	2	4	8.00	what is firm capacity of pump station based on flow test?	firm capacity is 300 gpm based on flow test			
PM	2	4	8.00	coatings adequate to provide corrosion protection?	Exterior coatings are in good condition and show minimal deterioration			
FE	5	3	15.00	pumps operate efficiently (>70% bowl efficiency)?	wire-to-water efficiency ranges between 32% - 42%			
FE	5	3	15.00	motor high efficiency and no excessive noise?	excessive noise observed on pump no. 3 during flow tests			
R	1	4	4.00	pumps operate free from excessive vibration?	None			
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	yes			
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA			
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA			
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA			
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA			
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA			
R	3	3	9.00	spare parts readily available?	No spare parts on hand but have a backup pump to use while parts are ordered			
Fn	1	3	3.00	other known problems?	None			
PM	3	4	12.00	estimated service life remaining?	21 years for pump nos. 1 & 2 based on AWU useful life. Excessive noise observed with pump no. 3 indicates potential life-shortening problem. Estimated useful life remaining for pump no. 3 is 5 years.			

				South Tahoe PUD	**Location Description:**	Hwy89 and Cornelian Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	CRNPUMP1, CRNPUMP2, CRNPUMP3	**Date:**	3/8/2012
					Pump Station Facility Name:	Cornelian Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Christmas Valley Zone	**Adjacent Pressure Zones:**	Arrowhead Zone
				Piping & Valves				
Fn	1	4	4.00	pipe supports adequate to prevent movement or vibration?	Concrete supports as well as steel posts that are bolted to the concrete floor			
PM	1	4	4.00	coatings adequate to protect piping and valves?	Coatings show no signs of defects			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	4	4.00	isolation valves provided for all pumps?	Yes			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	Valves are all in excellent condition			
Fn	2	2	4.00	chemical injection provided?	No			
INFORMATION	N/A	N/A	N/A	type of chemical added?	NA			
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Yes			
PM	1	4	4.00	estimated service life remaining?	51 years based on AWU Useful Life			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	1	3	3.00	pressure relief valves?	No pressure relief but there is a flow control valve to allow water to head back into the Arrowhead zone from Christmas Valley Zone			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA			
PM	2	4	8.00	estimated service life remaining?	14 years based on AWU Useful Life			
				SCADA system				
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes the flow meter is a Siemens mag meter installed			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Daily and hand logged into log book			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	Yes			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District Operations			
Fn	2	3	6.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There have been no communication errors in the last year			
R	1	3	3.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	Yes there is a permanent backup generator within the station			
R	1	3	3.00	spare parts/service support readily available?	Spare parts for the SCADA system are available at the District offices or readily through the manufacturer			
PM	1	4	4.00	estimated service life remaining?	Estimated 10 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	180kW			
R	1	5	5.00	adequate power available to run all equipment	Yes			
R	1	5	5.00	adequate standby power present and reliable?	Yes			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	Natural Gas so there is no tank necessary			
R	1	5	5.00	fuel supply adequate for standby power service?	Yes unless there is a natural gas service interruption as well			
R	3	3	9.00	time needed to mobilize portable generator?	1-2 hours depending on external conditions hookups are available			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	None			
R	1	3	3.00	spare parts/service support readily available?	NA			
PM	1	4	4.00	estimated service life remaining?	14 years based on AWU Useful Life			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	30 hp			
INFORMATION				Pump No. 2	30 hp			
INFORMATION				Pump No. 3	75 hp			
INFORMATION				Pump No. 4				
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	**Location Description:**	Hwy89 and Cornelian Dr.	**K/J Project Number:** 1270004*00
Water System Optimization Plan	**Pump Station Facility ID #:**	CRNPUMP1, CRNPUMP2, CRNPUMP3	**Date:** 3/8/2012
	Pump Station Facility Name:	Cornelian Booster	**Condition Assessment Inspectors:** Peter Lavallee and Mark Gray
	Pressure Zones Served:	Christmas Valley Zone	**Adjacent Pressure Zones:** Arrowhead Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	On airport property	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pump Station Facility ID #:**	APRBS	**Date:**	3/8/2012	
					Pump Station Facility Name:	Airport Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray	
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Stateline Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				Pump Station Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	1.80	N/A	
				Weighted Final Score (1-25)	N/A	N/A	3.50	7.40	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Score	N/A	N/A	2.1	2.96	N/A	**5.06**
				Criticality Score					5%	**0.25**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	1.00	N/A	
				Weighted Final Score (1-25)	4.00	N/A	3.33	3.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A	
				Factored Score	1.2	N/A	1.67	0.6	N/A	**3.47**
				Criticality Score					5%	**0.17**
				Pumps						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	1.00	1.00	1.00	2.33	
				Weighted Final Score (1-25)	10.33	4.00	3.50	3.75	7.33	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.55	0.8	1.05	0.75	1.1	**5.25**
				Criticality Score					25%	**1.31**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.83	N/A	N/A	
				Weighted Final Score (1-25)	8.00	N/A	6.33	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.6	N/A	5.07	N/A	N/A	**6.67**
				Criticality Score					10%	**0.67**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.20	2.33	N/A	
				Weighted Final Score (1-25)	8.00	N/A	3.40	7.33	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A	
				Factored Score	1.6	N/A	1.36	2.93	N/A	**5.89**
				Criticality Score					20%	**1.18**
				Other Critical Mechanical Equipment						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	2.00	N/A	N/A	
				Weighted Final Score (1-25)	4.00	N/A	6.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	0.8	N/A	4.8	N/A	N/A	**5.60**
				Criticality Score					10%	**0.56**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	N/A	1.00	3.00	N/A	
				Weighted Final Score (1-25)	20.00	N/A	3.00	11.40	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Score	4	N/A	1.8	2.28	N/A	**8.08**
				Criticality Score					25%	**2.02**
									Overall Total Factored Score (Out of 25) =	**6.16**

				South Tahoe PUD	**Location Description:**	On airport property	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	APRBS	**Date:**	3/8/2012
					Pump Station Facility Name:	Airport Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Stateline Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	1	4	4.00	adequate vehicle access for maintenance?	Yes
R	1	3	3.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	2	5	10.00	is site vulnerable to wildfires?	It is near a meadow that is developed so there is a slight wildfire risk
R	4	4	16.00	is site close to known active seismic faults?	2,630 ft. to the nearest fault
R	1	4	4.00	any unstable site conditions (if yes, describe)?	None
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	Yes
Fn	1	3	3.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	The facility is within the airport fencing and is protected from entry with their security
Fn	1	3	3.00	other known problems?	None
				Building Structure	
Fn	1	3	3.00	adequate security measures and monitoring to prevent unauthorized access?	The door is locked with a cyber key
INFORMATION	N/A	N/A	N/A	date building was constructed?	1978
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	Yes
PM	1	4	4.00	condition of exterior coatings adequate to protect structure?	Coatings are in good condition
Fn	1	3	3.00	adequate openings for ingress/egress?	Yes Single entry door
Fn	1	3	3.00	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	Building meets the code snow loadings for the time of construction
R	1	2	2.00	building meets code compliance requirements?	Building meets the code requirements for when it was built
R	1	4	4.00	known fire or haz-mat conditions that could be mitigated?	None
Fn	1	3	3.00	other known problems?	None
PM	1	4	4.00	estimated service life remaining?	Exceeds AWU Useful Life
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	1
INFORMATION	N/A	N/A	N/A	pump types?	Centrifugal
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Aurora
PM	5	3	15.00	pumps rebuilt (list year) and describe work done?	Insufficient data
FE	1	4	4.00	pump curves available for each unit?	Yes
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	4	4.00	number of service calls/repairs in the last year?	None
C	1	4	4.00	what is firm capacity of pump station based on flow test?	Pump test at 242 gpm. Pump station does not have a spare pump, so firm capacity is zero.
PM	3	4	12.00	coatings adequate to provide corrosion protection?	Existing external coatings have worn off of pump and motor
FE	5	3	15.00	pumps operate efficiently (>70% bowl efficiency)?	wire-to-water efficiency measured at 37%
FE	1	3	3.00	motor high efficiency and no excessive noise?	no excessive noise noted
R	1	4	4.00	pumps operate free from excessive vibration?	Yes
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	yes
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	1	3	3.00	spare parts readily available?	New pump and motor within pump station
Fn	1	3	3.00	other known problems?	none
PM	1	4	4.00	estimated service life remaining?	Exceeds AWU Useful Life

				South Tahoe PUD	**Location Description:**	On airport property	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	APRBS	**Date:**	3/8/2012
					Pump Station Facility Name:	Airport Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Stateline Zone

				Piping & Valves	
Fn	4	4	16.00	pipe supports adequate to prevent movement or vibration?	no supports pipes resting on bottom of vault
PM	3	4	12.00	coatings adequate to protect piping and valves?	Valve coatings are ok but the piping coatings are lacking
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	yes
Fn	1	4	4.00	isolation valves provided for all pumps?	yes
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	yes
Fn	3	2	6.00	chemical injection provided?	No
INFORMATION	N/A	N/A	N/A	type of chemical added?	NA
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Yes
PM	1	4	4.00	estimated service life remaining?	26 years based on AWU Useful Life
				Other Critical Mechanical Equipment	
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA
Fn	2	3	6.00	pressure relief valves?	No Pressure Relief, but there is a control valve to allow for water to flow back from Country Club to Stateline and it is in good condition
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA
PM	1	4	4.00	estimated service life remaining?	26 years based on AWU Useful Life
				SCADA system	
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes the flow meter is attached to SCADA and has had no issues
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Daily and hand logged into log book
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	Yes
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District Operations
Fn	2	3	6.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There have been no communication errors in the last year
R	5	3	15.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	There is no genset on site
R	1	3	3.00	spare parts/service support readily available?	Spare parts for the SCADA system are available at the District offices or readily through the manufacturer
PM	2	4	8.00	estimated service life remaining?	Estimated 10 years based on AWU Useful Life
				Electrical Power	
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA
R	1	5	5.00	adequate power available to run all equipment	Yes
R	5	5	25.00	adequate standby power present and reliable?	No
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA
R	N/A	5	N/A	fuel supply adequate for standby power service?	NA
R	4	3	12.00	time needed to mobilize portable generator?	1-2 hours depending on external conditions but there are no hookups.
Fn	1	3	3.00	known electrical hazards that could be mitigated?	None
R	5	3	15.00	spare parts/service support readily available?	NA
PM	5	4	20.00	estimated service life remaining?	NA
				Additional Data	Station is in lag to Elks Club Well
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):	
INFORMATION				Pump No. 1	400gpm, 162 ft., 30Hp
INFORMATION				Pump No. 2	
INFORMATION				Pump No. 3	
INFORMATION				Pump No. 4	

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	On airport property	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	APRBS	**Date:**	3/8/2012
					Pump Station Facility Name:	Airport Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Stateline Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	821 W. San Bernadino Ave.	**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Pump Station Facility ID #:**	FPBS1, FPBS2, FPBS3	**Date:**	3/12/2012		
					Pump Station Facility Name:	Flagpole Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney		
					Pressure Zones Served:	Flagpole Zone	**Adjacent Pressure Zones:**	Arrowhead and Twin Peaks Zone		
				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				Pump Station Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	1.80	N/A	
				Weighted Final Score (1-25)	N/A	N/A	6.50	7.60	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Score	N/A	N/A	3.9	3.04	N/A	**6.94**
				Criticality Score					5%	**0.35**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.33	2.50	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.33	9.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A	
				Factored Score	2.4	N/A	2.17	1.8	N/A	**6.37**
				Criticality Score					5%	**0.32**
				Pumps						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	1.00	1.00	1.25	2.00	
				Weighted Final Score (1-25)	7.33	4.00	3.50	4.50	6.33	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.1	0.8	1.05	0.9	0.95	**4.80**
				Criticality Score					25%	**1.20**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.67	N/A	N/A	
				Weighted Final Score (1-25)	4.00	N/A	6.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	0.8	N/A	4.8	N/A	N/A	**5.60**
				Criticality Score					10%	**0.56**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.80	1.00	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.60	3.33	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A	
				Factored Score	1.6	N/A	1.84	1.33	N/A	**4.77**
				Criticality Score					20%	**0.95**
				Other Critical Mechanical Equipment						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	4.00	N/A	3.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	0.8	N/A	2.4	N/A	N/A	**3.20**
				Criticality Score					10%	**0.32**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	0.80	N/A	
				Weighted Final Score (1-25)	8.00	N/A	3.00	3.60	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Score	1.6	N/A	1.8	0.72	N/A	**4.12**
				Criticality Score					25%	**1.03**
									Overall Total Factored Score (Out of 25) =	**4.73**

				South Tahoe PUD	**Location Description:**	821 W. San Bernadino Ave.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	FPBS1, FPBS2, FPBS3	**Date:**	3/12/2012
					Pump Station Facility Name:	Flagpole Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Flagpole Zone	**Adjacent Pressure Zones:**	Arrowhead and Twin Peaks Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	1	4	4.00	adequate vehicle access for maintenance?	Yes
R	1	3	3.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	3	5	15.00	is site vulnerable to wildfires?	Yes it is adjacent to wooded open space
R	3	4	12.00	is site close to known active seismic faults?	1,880 ft. to the nearest fault
R	1	4	4.00	any unstable site conditions (if yes, describe)?	None
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	Yes there are no drainage issues
Fn	5	3	15.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No fence but there is no history of unauthorized access
Fn	1	3	3.00	other known problems?	None
				Building Structure	
Fn	1	3	3.00	adequate security measures and monitoring to prevent unauthorized access?	Yes there have been no unauthorized access
INFORMATION	N/A	N/A	N/A	date building was constructed?	1997
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	There is adequate room
PM	2	4	8.00	condition of exterior coatings adequate to protect structure?	Yes there are some missing shingles but the wood siding is good and the paint is intact
Fn	1	3	3.00	adequate openings for ingress/egress?	There are two openings
Fn	1	3	3.00	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	Yes and met the loadings when it was constructed
R	1	2	2.00	building meets code compliance requirements?	Met the codes for when it was constructed
R	4	4	16.00	known fire or haz-mat conditions that could be mitigated?	There are numerous trees in close proximity to the facility
Fn	3	3	9.00	other known problems?	The ceiling is very low in this building and an engine hoist needs to be used to remove the motors
PM	2	4	8.00	estimated service life remaining?	15 years based on AWU Useful Life
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	3
INFORMATION	N/A	N/A	N/A	pump types?	Centrifugal Pumps
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Peerless
PM	2	3	6.00	pumps rebuilt (list year) and describe work done?	Bearings in all three motors and seals on pump number 2 in 2009
FE	1	4	4.00	pump curves available for each unit?	yes
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	4	4.00	number of service calls/repairs in the last year?	None
C	1	4	4.00	what is firm capacity of pump station based on flow test?	760 gpm based on flow test
PM	2	4	8.00	coatings adequate to provide corrosion protection?	Coatings are in good condition with minor chips and scratches
FE	4	3	12.00	pumps operate efficiently (>70% bowl efficiency)?	wire-to-water efficiency is poor (60%)
FE	1	3	3.00	motor high efficiency and no excessive noise?	yes
R	1	4	4.00	pumps operate free from excessive vibration?	Yes
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	Assumed yes
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	2	3	6.00	spare parts readily available?	Bearings are available but other parts would need to be ordered from a supplier
Fn	1	3	3.00	other known problems?	None
PM	2	4	8.00	estimated service life remaining?	15 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	821 W. San Bernadino Ave.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	FPBS1, FPBS2, FPBS3	**Date:**	3/12/2012
					Pump Station Facility Name:	Flagpole Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Flagpole Zone	**Adjacent Pressure Zones:**	Arrowhead and Twin Peaks Zone
				Piping & Valves				
Fn	1	4	4.00	pipe supports adequate to prevent movement or vibration?	Pipe supports are steel that bolted to the floor or concrete			
PM	1	4	4.00	coatings adequate to protect piping and valves?	The coating on the pipes is in great condition			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	4	4.00	isolation valves provided for all pumps?	Yes			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	Yes			
Fn	3	2	6.00	chemical injection provided?	No			
INFORMATION	N/A	N/A	N/A	type of chemical added?	NA			
Fn	3	5	15.00	sample tap(s) provided to measure water quality?	No			
PM	1	4	4.00	estimated service life remaining?	45 years based on AWU Useful Life			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	Combined with pressure relief and it is in good condition			
Fn	1	3	3.00	pressure relief valves?	Pressure Relief valve is in good condition combined with surge anticipator valve			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA			
PM	1	4	4.00	estimated service life remaining?	10 years based on AWU Useful Life			
				SCADA system				
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Flow totals are logged daily by hand			
Fn	4	2	8.00	pressure instrumentation is adequate to monitor pump performance?	There are numerous pressure gauges around the station but they are not tied to SCADA. No pressure gages between discharge nozzles and discharge control valve.			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations			
Fn	2	3	6.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year			
R	1	3	3.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	There is adequate power with standby generator on site			
R	1	3	3.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer			
PM	2	4	8.00	estimated service life remaining?	Estimate 10 years based on AWU Useful Life			
				Electrical Power	There is significant black discoloring on the sound insulation around the generator			
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	175kW			
R	1	5	5.00	adequate power available to run all equipment	Yes			
R	1	5	5.00	adequate standby power present and reliable?	Designed to run two pumps and when running three it trips out. This occurred at max demand during the Angora Fire. The third pump was supposed to be a standby			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	250gal			
R	1	5	5.00	fuel supply adequate for standby power service?	Yes			
R	N/A	3	N/A	time needed to mobilize portable generator?	NA, standby power on site			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	None			
R	1	3	3.00	spare parts/service support readily available?	Parts at the District's main plant			
PM	2	4	8.00	estimated service life remaining?	10 years based on AWU Useful life			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	60hp			
INFORMATION				Pump No. 2	60hp			
INFORMATION				Pump No. 3	60hp			
INFORMATION				Pump No. 4				
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	821 W. San Bernadino Ave.	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pump Station Facility ID #:**	FPBS1, FPBS2, FPBS3	**Date:**	3/12/2012	
					Pump Station Facility Name:	Flagpole Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Flagpole Zone	**Adjacent Pressure Zones:**	Arrowhead and Twin Peaks Zone	

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	1553 Grizzly Mountain Dr.	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pump Station Facility ID #:**	GRIZBP1, GRIZBP2, GRIZBP3	**Date:**	3/12/2012	
					Pump Station Facility Name:	Grizzly Mountain Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Flagpole, Twin Peaks, and Mt. Rainer Zones	**Adjacent Pressure Zones:**	Same as Zones served depending on demand and valving	

				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology		
				4. Score of 5 was assigned on three occassions to prompt further investigation	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
				(see Condition Assessment Checklist: Pumps)	3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				Pump Station Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.25	1.80	N/A		
				Weighted Final Score (1-25)	N/A	N/A	4.25	7.20	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Score	N/A	N/A	2.55	2.88	N/A		**5.43**
				Criticality Score					5%		**0.27**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.33	3.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A		
				Factored Score	1.2	N/A	1.67	0.6	N/A		**3.47**
				Criticality Score					5%		**0.17**
				Pumps							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.00	1.00	1.00		
				Weighted Final Score (1-25)	3.67	4.00	3.50	3.75	3.33		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	0.55	0.8	1.05	0.75	0.5		**3.65**
				Criticality Score					25%		**0.91**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.67	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	0.8	N/A	2.93	N/A	N/A		**3.73**
				Criticality Score					10%		**0.37**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	2.80	3.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A		
				Factored Score	0.8	N/A	1.12	1.33	N/A		**3.25**
				Criticality Score					20%		**0.65**
				Other Critical Mechanical Equipment							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	0.8	N/A	2.4	N/A	N/A		**3.20**
				Criticality Score					10%		**0.32**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	0.80	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.00	3.60	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Score	0.8	N/A	1.8	0.72	N/A		**3.32**
				Criticality Score					25%		**0.83**
									Overall Total Factored Score (Out of 25) =		**3.53**

				South Tahoe PUD	**Location Description:**	1553 Grizzly Mountain Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	GRIZBP1, GRIZBP2, GRIZBP3	**Date:**	3/12/2012
					Pump Station Facility Name:	Grizzly Mountain Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Flagpole, Twin Peaks, and Mt. Rainer Zones	**Adjacent Pressure Zones:**	Same as Zones served depending on demand and valving

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	1	4	4.00	adequate vehicle access for maintenance?	Yes
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	2	5	10.00	is site vulnerable to wildfires?	Yes the property is adjacent to open wooded space, **however, building is constructed from non-combustible materials and defensible space is provided around structure perimeter**
R	3	4	12.00	is site close to known active seismic faults?	2,760 ft. to nearest fault
R	1	4	4.00	any unstable site conditions (if yes, describe)?	No unstable site conditions
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	Yes
Fn	2	3	6.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	Building is provided. There is no site security around the perimeter of the facility
Fn	1	3	3.00	other known problems?	No other known problems with the site
				Building Structure	
Fn	1	3	3.00	adequate security measures and monitoring to prevent unauthorized access?	The building has intrusion alarms which are tied to the SCADA monitoring at the main plant
INFORMATION	N/A	N/A	N/A	date building was constructed?	2012
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	Yes
PM	1	4	4.00	condition of exterior coatings adequate to protect structure?	Yes
Fn	1	3	3.00	adequate openings for ingress/egress?	Yes
Fn	1	3	3.00	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	Yes
R	1	2	2.00	building meets code compliance requirements?	Yes as of design in 2011
R	1	4	4.00	known fire or haz-mat conditions that could be mitigated?	No known haz mat or fire conditions
Fn	1	3	3.00	other known problems?	No other known problems with the building
PM	1	4	4.00	estimated service life remaining?	30 years based on AWU Useful Life
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	3
INFORMATION	N/A	N/A	N/A	pump types?	Vertical Turbines
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Floway Pumps
PM	1	3	3.00	pumps rebuilt (list year) and describe work done?	New in 2012
FE	1	4	4.00	pump curves available for each unit?	Yes
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	Currently being installed
R	1	4	4.00	number of service calls/repairs in the last year?	None
C	1	4	4.00	what is firm capacity of pump station based on flow test?	Score has been updated using block diagram cases
PM	1	4	4.00	coatings adequate to provide corrosion protection?	New coatings with no visual defects
FE	1	3	3.00	pumps operate efficiently (>70% bowl efficiency)?	New pump sta assume pumps operate efficiently. District to conduct test to confirm this assumption correct.
FE	1	3	3.00	motor high efficiency and no excessive noise?	New pump sta assume pumps operate efficiently. District to conduct test to confirm this assumption correct.
R	1	4	4.00	pumps operate free from excessive vibration?	There is no record of excessive vibration at this station
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	New pump sta assume pumps operate efficiently. District to conduct test to confirm this assumption correct.
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	1	3	3.00	spare parts readily available?	Some parts are in stock for the pumps other parts are available through the manufacturer
Fn	1	3	3.00	other known problems?	No other known problems
PM	1	4	4.00	estimated service life remaining?	30 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	1553 Grizzly Mountain Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	GRIZBP1, GRIZBP2, GRIZBP3	**Date:**	3/12/2012
					Pump Station Facility Name:	Grizzly Mountain Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Flagpole, Twin Peaks, and Mt. Rainer Zones	**Adjacent Pressure Zones:**	Same as Zones served depending on demand and valving
				Piping & Valves				
Fn	1	4	4.00	pipe supports adequate to prevent movement or vibration?	Yes they are coated steel supports that are epoxy bolted to the floor and grouted beneath the plate.			
PM	1	4	4.00	coatings adequate to protect piping and valves?	Coatings are new in 2012 and there are no visual defects on the exterior of the piping and valves			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	Pipes are adequately sized			
Fn	1	4	4.00	isolation valves provided for all pumps?	All pumps have isolation valves.			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	Valves are new, efficient, and reliable			
Fn	1	2	2.00	chemical injection provided?	Yes			
INFORMATION	N/A	N/A	N/A	type of chemical added?	Sodium Hypochlorite			
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Ports with bent copper are available for use to sample water quality and are located next to each of the pressure gages.			
PM	1	4	4.00	estimated service life remaining?	60 years for steel piping and 50 years for valves based on AWU Useful Life			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	1	3	3.00	pressure relief valves?	Pressure Relief Valves on each discharge are new in 2012			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA			
PM	1	4	4.00	estimated service life remaining?	25 years based on AWU Useful Life			
				SCADA system				
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes the flow meter is a Siemens mag meter installed in 2012			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Not online yet			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	Yes			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Not online yet			
Fn	1	3	3.00	alarm log maintained and reviewed annually?	Not online yet			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	Not online yet			
R	1	3	3.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	Yes there is a permanent backup generator within the station			
R	1	3	3.00	spare parts/service support readily available?	Spare parts for the SCADA system are available at the District offices or readily through the manufacturer			
PM	1	4	4.00	estimated service life remaining?	12 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	150kW, 237 bhp @1800RPM Diesel			
R	1	5	5.00	adequate power available to run all equipment	The generator is sized to handle all three pumps and associated controls			
R	1	5	5.00	adequate standby power present and reliable?	Yes			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	200 gallons			
R	1	5	5.00	fuel supply adequate for standby power service?	Yes			
R	N/A	3	N/A	time needed to mobilize portable generator?	NA, standby gen on-site			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	Arc Flash labeling has not been completed on the control panels and other electrical equipment			
R	1	3	3.00	spare parts/service support readily available?	Yes some parts are housed within the station and others would need to be obtained from the manufacturer			
PM	1	4	4.00	estimated service life remaining?	25 years based on AWU Useful Life			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	Pumps have not been installed yet. Information to come			
INFORMATION				Pump No. 2				
INFORMATION				Pump No. 3				
INFORMATION				Pump No. 4				
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	1553 Grizzly Mountain Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	GRIZBP1, GRIZBP2, GRIZBP3	**Date:**	3/12/2012
					Pump Station Facility Name:	Grizzly Mountain Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Flagpole, Twin Peaks, and Mt. Rainer Zones	**Adjacent Pressure Zones:**	Same as Zones served depending on demand and valving

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Corner of Lake Tahoe Boulevard and Boulder Mountain Dr. in a shared building with the Lake Valley Fire Dept.	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pump Station Facility ID #:**	BMPUMP1, BMPUMP2, BMPUMP3	**Date:**	3/12/2012	
					Pump Station Facility Name:	Boulder Mountain Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Forest Mountain Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				Pump Station Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	1.60	N/A	
				Weighted Final Score (1-25)	N/A	N/A	3.50	6.40	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Score	N/A	N/A	2.1	2.56	N/A	**4.66**
				Criticality Score					5%	**0.23**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.00	1.00	N/A	
				Weighted Final Score (1-25)	6.00	N/A	3.33	3.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A	
				Factored Score	1.8	N/A	1.67	0.6	N/A	**4.07**
				Criticality Score					5%	**0.20**
				Pumps						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	1.00	1.00	1.50	5.00	
				Weighted Final Score (1-25)	10.33	4.00	3.50	5.25	16.67	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.55	0.8	1.05	1.05	2.5	**6.95**
				Criticality Score					25%	**1.74**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	N/A	2.33	N/A	N/A	
				Weighted Final Score (1-25)	12.00	N/A	8.67	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	2.4	N/A	6.93	N/A	N/A	**9.33**
				Criticality Score					10%	**0.93**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.67	N/A	
				Weighted Final Score (1-25)	8.00	N/A	2.80	8.33	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A	
				Factored Score	1.6	N/A	1.12	3.33	N/A	**6.05**
				Criticality Score					20%	**1.21**
				Other Critical Mechanical Equipment						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	2.00	N/A	N/A	
				Weighted Final Score (1-25)	8.00	N/A	6.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.6	N/A	4.8	N/A	N/A	**6.40**
				Criticality Score					10%	**0.64**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.60	N/A	
				Weighted Final Score (1-25)	8.00	N/A	3.00	11.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Score	1.6	N/A	1.8	2.2	N/A	**5.60**
				Criticality Score					25%	**1.40**
									Overall Total Factored Score (Out of 25) =	**6.36**

				South Tahoe PUD	**Location Description:**	Corner of Lake Tahoe Boulevard and Boulder Mountain Dr. in a shared building with the Lake Valley Fire Dept.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	BMPUMP1, BMPUMP2, BMPUMP3	**Date:**	3/12/2012
					Pump Station Facility Name:	Boulder Mountain Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Forest Mountain Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	1	4	4.00	adequate vehicle access for maintenance?	Yes there is adequate parking and it is shared with the fire department
R	1	3	3.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	1	5	5.00	is site vulnerable to wildfires?	This site was part of the Angora Burn Area
R	4	4	16.00	is site close to known active seismic faults?	5,000 ft. to the nearest fault line
R	1	4	4.00	any unstable site conditions (if yes, describe)?	None
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	There are no issues with site drainage
Fn	1	3	3.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	The station is attached to the fire department and there are no issues
Fn	1	3	3.00	other known problems?	None
				Building Structure	The District rents this space from the fire department
Fn	1	3	3.00	adequate security measures and monitoring to prevent unauthorized access?	The building is locked with a District cyber key
INFORMATION	N/A	N/A	N/A	date building was constructed?	unknown
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	Yes
PM	1	4	4.00	condition of exterior coatings adequate to protect structure?	Brick building with no coatings
Fn	1	3	3.00	adequate openings for ingress/egress?	There is a single door in and a single door out
Fn	1	3	3.00	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	Building meets the loading for when it was designed
R	1	2	2.00	building meets code compliance requirements?	Building meets the codes for when it was constructed
R	1	4	4.00	known fire or haz-mat conditions that could be mitigated?	None
Fn	1	3	3.00	other known problems?	None
PM	2	4	8.00	estimated service life remaining?	Estimate 10 years based on AWU Useful Life
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	3
INFORMATION	N/A	N/A	N/A	pump types?	Pumps 1 and 2 are multistage vertical turbine and Pump 3 (fire pump) is a centrifugal
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Pumps 1 and 2 are grundfos and pump 3 is a Fairbanks Morse
PM	5	3	15.00	pumps rebuilt (list year) and describe work done?	Pump one was rebuilt in 2009, Pump 2 had new bearings in 2008, Pump 3 had new mech seal installed. Excessive seal leakage on No. 3, and excessive noise from No. 1 motor. Excessive sand in water main interferes w/ backflow preventer, cooling water system must be manually operated
FE	5	4	20.00	pump curves available for each unit?	Yes
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	4	4.00	number of service calls/repairs in the last year?	None
C	1	4	4.00	what is firm capacity of pump station based on flow test?	firm capacity approximately 250 gpm based on pump nos. 1 + 2
PM	2	4	8.00	coatings adequate to provide corrosion protection?	Coatings are in great condition with minor dings and scratches
FE	5	3	15.00	pumps operate efficiently (>70% bowl efficiency)?	wire-to-water efficiency between 47% - 50%
FE	5	3	15.00	motor high efficiency and no excessive noise?	excessive noise from pump motor no. 1 + excessive leakage from mechanical seal on fire pump
R	1	4	4.00	pumps operate free from excessive vibration?	Yes
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	yes
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	3	3	9.00	spare parts readily available?	Parts would need to be ordered from the supplier
Fn	1	3	3.00	other known problems?	None
PM	2	4	8.00	estimated service life remaining?	Estimate 10 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Corner of Lake Tahoe Boulevard and Boulder Mountain Dr. in a shared building with the Lake Valley Fire Dept.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	BMPUMP1, BMPUMP2, BMPUMP3	**Date:**	3/12/2012
					Pump Station Facility Name:	Boulder Mountain Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Forest Mountain Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				Piping & Valves				
Fn	5	4	20.00	pipe supports adequate to prevent movement or vibration?	No pipe supports			
PM	2	4	8.00	coatings adequate to protect piping and valves?	Yes, the coatings are in good condition with minor dings and scratches			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	4	4.00	isolation valves provided for all pumps?	Yes			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	Yes			
Fn	3	2	6.00	chemical injection provided?	No			
INFORMATION	N/A	N/A	N/A	type of chemical added?	NA			
Fn	3	5	15.00	sample tap(s) provided to measure water quality?	No			
PM	4	4	16.00	estimated service life remaining?	Estimate 30 years based on AWU Useful Life - reduced to 5 years based on motor noise and seal leakage			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	2	3	6.00	pressure relief valves?	Yes the connections to the system are lacking coatings and the valve has been reliable			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA			
PM	2	4	8.00	estimated service life remaining?	Estimate 20 years based on AWU Useful Life			
				SCADA system				
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Flow totals are logged daily by hand			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	There are numerous pressure gauges around the station but they are not tied to SCADA			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations			
Fn	1	3	3.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year			
R	5	3	15.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site but during a power outage a portable generator would need to be mobilized to the site			
R	2	3	6.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer			
PM	2	4	8.00	estimated service life remaining?	11 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA Fire pump has a diesel Engine to power and not an electric motor			
R	2	5	10.00	adequate power available to run all equipment	Yes			
R	5	5	25.00	adequate standby power present and reliable?	No and there are no hookups available			
INFORMATION	1	4	4.00	fuel storage capacity (gals)?	250 gals on the fire pump motor			
R	1	5	5.00	fuel supply adequate for standby power service?	Yes			
R	4	3	12.00	time needed to mobilize portable generator?	1-2 hours but there are no hookups so the retrofit would take much longer			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	None			
R	1	3	3.00	spare parts/service support readily available?	Available at the District's main facility			
PM	2	4	8.00	estimated service life remaining?	Estimate 10 years based on AWU Useful Life			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	130gpm, 178ft, 15hp			
INFORMATION				Pump No. 2	130gpm, 178ft, 15hp			
INFORMATION				Pump No. 3	No information on fire pump nameplate. Tests show the pump runs at 820gpm			
INFORMATION				Pump No. 4				
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	Corner of Lake Tahoe Boulevard and Boulder Mountain Dr. in a shared building with the Lake Valley Fire Dept.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	BMPUMP1, BMPUMP2, BMPUMP3	**Date:**	3/12/2012
					Pump Station Facility Name:	Boulder Mountain Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Forest Mountain Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Next to H St Tank		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Pump Station Facility ID #:**	HSTBS		**Date:**	3/8/2012		
					Pump Station Facility Name:	H St. Booster		**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray		
					Pressure Zones Served:	H St. Zone		**Adjacent Pressure Zones:**	Stateline Zone		
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology		
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				Pump Station Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.75	2.40	N/A		
				Weighted Final Score (1-25)	N/A	N/A	9.50	10.40	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Score	N/A	N/A	5.7	4.16	N/A		**9.86**
				Criticality Score					5%		**0.49**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	3.00	N/A	2.50	2.50	N/A		
				Weighted Final Score (1-25)	12.00	N/A	8.33	9.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A		
				Factored Score	3.6	N/A	4.17	1.8	N/A		**9.57**
				Criticality Score					5%		**0.48**
				Pumps							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	4.33	5.00	1.00	1.00	4.33		
				Weighted Final Score (1-25)	15.67	20.00	3.50	3.75	14.67		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	2.35	4	1.05	0.75	2.2		**10.35**
				Criticality Score					25%		**2.59**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	2.50	N/A	2.00	N/A	N/A		
				Weighted Final Score (1-25)	10.00	N/A	7.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	2	N/A	5.6	N/A	N/A		**7.60**
				Criticality Score					10%		**0.76**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	2.00	N/A	2.80	2.67	N/A		
				Weighted Final Score (1-25)	8.00	N/A	7.40	8.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A		
				Factored Score	1.6	N/A	2.96	3.33	N/A		**7.89**
				Criticality Score					20%		**1.58**
				Other Critical Mechanical Equipment							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	3.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	12.00	N/A	3.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	2.4	N/A	2.4	N/A	N/A		**4.80**
				Criticality Score					10%		**0.48**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	5.00	N/A	1.00	2.80	N/A		
				Weighted Final Score (1-25)	N/A	N/A	3.00	7.80	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Score	N/A	N/A	1.8	3.12	N/A		**4.92**
				Criticality Score					25%		**1.23**
									Overall Total Factored Score (Out of 25) =		**7.61**

				South Tahoe PUD	**Location Description:**	Next to H St Tank	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	HSTBS	**Date:**	3/8/2012
					Pump Station Facility Name:	H St. Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	H St. Zone	**Adjacent Pressure Zones:**	Stateline Zone

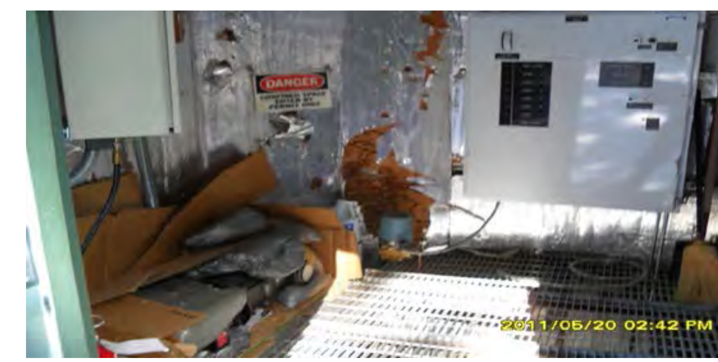
Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	4	4	16.00	adequate vehicle access for maintenance?	Yes but limited in the winter months
R	1	3	3.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	5	5	25.00	is site vulnerable to wildfires?	Yes it is near a wooded lot
R	4	4	16.00	is site close to known active seismic faults?	1,200 feet to the nearest fault
R	1	4	4.00	any unstable site conditions (if yes, describe)?	None
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	Yes
Fn	5	3	15.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No site fencing and the lot has a history of unauthorized access. Garbage observed around tank site.
Fn	1	3	3.00	other known problems?	None
				Building Structure	
Fn	1	3	3.00	adequate security measures and monitoring to prevent unauthorized access?	The door is locked with a master lock
INFORMATION	N/A	N/A	N/A	date building was constructed?	1980
Fn	4	4	16.00	adequate equipment clearances to facilitate routine O&M?	Marginal access to valves and pumps
PM	2	4	8.00	condition of exterior coatings adequate to protect structure?	Coatings are good but have a significant amount of graffiti
Fn	3	3	9.00	adequate openings for ingress/egress?	Yes single door
Fn	3	3	9.00	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	Building met requirements for snow load when it was built
R	1	2	2.00	building meets code compliance requirements?	Building met code requirements at time of construction
R	4	4	16.00	known fire or haz-mat conditions that could be mitigated?	trees and other foliage should be cleared from bldg perimeter
Fn	3	3	9.00	other known problems?	insulation damage at building interior
PM	4	4	16.00	estimated service life remaining?	Exceeds the AWU Useful Life
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	1
INFORMATION	N/A	N/A	N/A	pump types?	multi stage can pump
INFORMATION	N/A	N/A	N/A	pump manufacturer?	grundfos
PM	5	3	15.00	pumps rebuilt (list year) and describe work done?	unknown - insufficient data
FE	5	4	20.00	pump curves available for each unit?	No
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	4	4.00	number of service calls/repairs in the last year?	None
C	5	4	20.00	what is firm capacity of pump station based on flow test?	could not measure pump output - no flowmeter at site
PM	4	4	16.00	coatings adequate to provide corrosion protection?	Existing external coatings have worn off of pump and motor
FE	5	3	15.00	pumps operate efficiently (>70% bowl efficiency)?	pump operates continuously, recirculates excess output to suction side
FE	3	3	9.00	motor high efficiency and no excessive noise?	insufficient data
R	1	4	4.00	pumps operate free from excessive vibration?	Yes
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	yes
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	1	3	3.00	spare parts readily available?	New pump and motor within pump station
Fn	1	3	3.00	other known problems?	none
PM	4	4	16.00	estimated service life remaining?	Exceeds AWU Useful Life

				South Tahoe PUD	**Location Description:**	Next to H St Tank	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	HSTBS	**Date:**	3/8/2012
					Pump Station Facility Name:	H St. Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	H St. Zone	**Adjacent Pressure Zones:**	Stateline Zone
				Piping & Valves				
Fn	5	4	20.00	pipe supports adequate to prevent movement or vibration?	no supports pipes resting on bottom of vault			
PM	3	4	12.00	coatings adequate to protect piping and valves?	coatings are adequate with some rust showing on the valves and piping			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	yes			
Fn	1	4	4.00	isolation valves provided for all pumps?	yes			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	yes			
Fn	3	2	6.00	chemical injection provided?	No			
INFORMATION	N/A	N/A	N/A	type of chemical added?	NA			
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Yes			
PM	2	4	8.00	estimated service life remaining?	28 years according to AWU Useful Life			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	1	3	3.00	pressure relief valves?	Yes the valve is in good condition and holds the system pressure at 50psi			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA			
PM	3	4	12.00	estimated service life remaining?	Exceeds AWU Useful Life			
				SCADA system				
Fn	5	3	15.00	pump station flow meter is adequate to monitor pump performance?	no flowmeter present			
Fn	5	2	10.00	flow totals recorded at regular intervals? How frequent?	?			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	Yes			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District Operations			
Fn	2	3	6.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There have been no communication errors in the last year			
R	5	3	15.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	No adequate power during outage			
R	2	3	6.00	spare parts/service support readily available?	Spare parts for the SCADA system are available at the District offices or readily through the manufacturer			
PM	2	4	8.00	estimated service life remaining?	Estimate 10 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5.00	adequate power available to run all equipment	Yes			
R	5	5	25.00	adequate standby power present and reliable?	No			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R	N/A	5	N/A	fuel supply adequate for standby power service?	NA			
R	3	3	9.00	time needed to mobilize portable generator?	1-2 hours depending on external conditions			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	None			
R	5	3	N/A	spare parts/service support readily available?	NA			
PM	5	4	N/A	estimated service life remaining?	NA			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	150gpm, 137 feet, 7.5hp			
INFORMATION				Pump No. 2				
INFORMATION				Pump No. 3				
INFORMATION				Pump No. 4				
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	**Location Description:** Next to H St Tank	**K/J Project Number:** 1270004*00
Water System Optimization Plan	**Pump Station Facility ID #:** HSTBS	**Date:** 3/8/2012
	Pump Station Facility Name: H St. Booster	**Condition Assessment Inspectors:** Peter Lavallee and Mark Gray
	Pressure Zones Served: H St. Zone	**Adjacent Pressure Zones:** Stateline Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS



				South Tahoe PUD	**Location Description:**	Next to H St Tank	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pump Station Facility ID #:**	HSTBS	**Date:**	3/8/2012	
					Pump Station Facility Name:	H St. Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray	
					Pressure Zones Served:	H St. Zone	**Adjacent Pressure Zones:**	Stateline Zone	

				South Tahoe PUD	**Location Description:**	On David Lane		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Pump Station Facility ID #:**	DLBP3		**Date:**	3/7/2012		
					Pump Station Facility Name:	David Lane Booster		**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney		
					Pressure Zones Served:	Heavenly zone		**Adjacent Pressure Zones:**	Stateline Zone		

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				Pump Station Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.50	2.60	N/A	
				Weighted Final Score (1-25)	N/A	N/A	5.00	10.60	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Score	N/A	N/A	3	4.24	N/A	**7.24**
				Criticality Score					5%	**0.36**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.50	1.00	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.83	3.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A	
				Factored Score	2.4	N/A	2.42	0.6	N/A	**5.42**
				Criticality Score					5%	**0.27**
				Pumps						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	3.00	1.00	1.25	3.67	
				Weighted Final Score (1-25)	7.67	12.00	3.50	4.50	12.67	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.15	2.4	1.05	0.9	1.9	**7.40**
				Criticality Score					25%	**1.85**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	4.00	N/A	3.67	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	0.8	N/A	2.93	N/A	N/A	**3.73**
				Criticality Score					10%	**0.37**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.33	N/A	
				Weighted Final Score (1-25)	8.00	N/A	2.80	7.33	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A	
				Factored Score	1.6	N/A	1.12	2.93	N/A	**5.65**
				Criticality Score					20%	**1.13**
				Other Critical Mechanical Equipment						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	12.00	N/A	3.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	2.4	N/A	2.4	N/A	N/A	**4.80**
				Criticality Score					10%	**0.48**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	N/A	1.00	2.80	N/A	
				Weighted Final Score (1-25)	N/A	N/A	3.00	7.80	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Score	N/A	N/A	1.8	3.12	N/A	**4.92**
				Criticality Score					25%	**1.23**
									Overall Total Factored Score (Out of 25) =	**5.70**

				South Tahoe PUD	**Location Description:**	On David Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	DLBP3	**Date:**	3/7/2012
					Pump Station Facility Name:	David Lane Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Heavenly zone	**Adjacent Pressure Zones:**	Stateline Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	1	4	4.00	adequate vehicle access for maintenance?	Yes
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	3	5	15.00	is site vulnerable to wildfires?	Yes there are wooded lots adjacent to the facility
R	4	4	16.00	is site close to known active seismic faults?	1,190 ft. from the nearest fault
R	3	4	12.00	any unstable site conditions (if yes, describe)?	Potential issue with proximity to trees
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	Yes
Fn	3	3	9.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	None existing at the site
Fn	1	3	3.00	other known problems?	None existing at the site
				Building Structure	
Fn	4	3	12.00	adequate security measures and monitoring to prevent unauthorized access?	The door is locked but the facility has had issues in the past with vandalism
INFORMATION	N/A	N/A	N/A	date building was constructed?	1984
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	Yes
PM	1	4	4.00	condition of exterior coatings adequate to protect structure?	Block building with no coatings and the roof is in good condition
Fn	1	3	3.00	adequate openings for ingress/egress?	Yes
Fn	1	3	3.00	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	Yes
R	1	2	2.00	building meets code compliance requirements?	Met requirements at the time of construction
R	1	4	4.00	known fire or haz-mat conditions that could be mitigated?	None
Fn	1	3	3.00	other known problems?	None
PM	3	4	12.00	estimated service life remaining?	2 years based on AWU Useful Life
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	3
INFORMATION	N/A	N/A	N/A	pump types?	Centrifugal Pumps
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Aurora
PM	1	3	3.00	pumps rebuilt (list year) and describe work done?	Pumps were replaced in 2007
FE	5	4	20.00	pump curves available for each unit?	yes
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	4	4.00	number of service calls/repairs in the last year?	None
C	3	4	12.00	what is firm capacity of pump station based on flow test?	Total for all three pumps running is 1250gpm (rh) firm capacity approx 1,000 gpm w/ one unit out of service
PM	2	4	8.00	coatings adequate to provide corrosion protection?	Exterior coatings are adequate and show minimal deterioration
FE	5	3	15.00	pumps operate efficiently (>70% bowl efficiency)?	wire-to-water efficiency ranges between 54% - 59%
FE	1	3	3.00	motor high efficiency and no excessive noise?	yes
R	1	4	4.00	pumps operate free from excessive vibration?	None
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	yes
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	2	3	6.00	spare parts readily available?	No spare parts on hand but have a backup pumps to use while parts are ordered
Fn	1	3	3.00	other known problems?	None
PM	3	4	12.00	estimated service life remaining?	2 years based on AWU Useful Life (rh) useful life appears to be at least 20 yrs assuming routine maintenance performend

				South Tahoe PUD	**Location Description:**	On David Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	DLBP3	**Date:**	3/7/2012
					Pump Station Facility Name:	David Lane Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Heavenly zone	**Adjacent Pressure Zones:**	Stateline Zone
				Piping & Valves				
Fn	1	4	4.00	pipe supports adequate to prevent movement or vibration?	Concrete supports as well as steel posts that are bolted to the concrete floor			
PM	1	4	4.00	coatings adequate to protect piping and valves?	Coatings show no signs of defects			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	4	4.00	isolation valves provided for all pumps?	Yes			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	Yes. Suction valves are original but the discharge valves are new in 2007			
Fn	1	2	2.00	chemical injection provided?	Yes			
INFORMATION	N/A	N/A	N/A	type of chemical added?	Sodium Hypochlorite			
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Yes			
PM	1	4	4.00	estimated service life remaining?	32 years based on AWU Useful Life			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	1	3	3.00	pressure relief valves?	Yes and in good condition. Valve has add issues with operation in the past			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	30 gal tank onsite but no secondary containment			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	Yes			
PM	3	4	12.00	estimated service life remaining?	Exceeds AWU Useful Life			
				SCADA system				
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes the flow meter is a Siemens mag meter installed in 2009			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Daily and hand logged into log book			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	Yes			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District Operations			
Fn	1	3	3.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There have been no communication errors in the last year			
R	5	3	15.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	There is not adequate power			
R	1	3	3.00	spare parts/service support readily available?	Spare parts for the SCADA system are available at the District offices or readily through the manufacturer			
PM	2	4	8.00	estimated service life remaining?	Estimate 10 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5.00	adequate power available to run all equipment	Yes			
R	5	5	25.00	adequate standby power present and reliable?	No			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R	N/A	5	N/A	fuel supply adequate for standby power service?	NA			
R	3	3	9.00	time needed to mobilize portable generator?	1-2 hours depending on external conditions			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	None			
R	5	3	N/A	spare parts/service support readily available?	NA			
PM	5	4	N/A	estimated service life remaining?	NA			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	500 gpm, 440feet, 100hp			
INFORMATION				Pump No. 2	500 gpm, 440feet, 100hp			
INFORMATION				Pump No. 3	500 gpm, 440feet, 100hp			
INFORMATION				Pump No. 4				
					Portable generator hookup for one pump			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	On David Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	DLBP3	**Date:**	3/7/2012
					Pump Station Facility Name:	David Lane Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Heavenly zone	**Adjacent Pressure Zones:**	Stateline Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Apache Dr. Behind the Tahoe Paradise Golf Course	**K/J Project Number:**	1270004*00			
				Water System Optimization Plan	**Pump Station Facility ID #:**	APBSP1 and APBSP2	**Date:**	3/8/2012			
					Pump Station Facility Name:	South Apache Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray			
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Arrowhead Zone			
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology		
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				Pump Station Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.75	2.60	N/A		
				Weighted Final Score (1-25)	N/A	N/A	5.75	10.60	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Score	N/A	N/A	3.45	4.24	N/A		**7.69**
				Criticality Score					5%		**0.38**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	3.50	N/A	2.83	3.00	N/A		
				Weighted Final Score (1-25)	14.00	N/A	9.50	11.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A		
				Factored Score	4.2	N/A	4.75	2.2	N/A		**11.15**
				Criticality Score					5%		**0.56**
				Pumps							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	4.00	4.00	2.50	1.50	4.33		
				Weighted Final Score (1-25)	14.33	16.00	8.00	5.25	14.67		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	2.15	3.2	2.4	1.05	2.2		**11.00**
				Criticality Score					25%		**2.75**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	4.00	N/A	1.50	N/A	N/A		
				Weighted Final Score (1-25)	16.00	N/A	4.67	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	3.2	N/A	3.73	N/A	N/A		**6.93**
				Criticality Score					10%		**0.69**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.33	N/A		
				Weighted Final Score (1-25)	8.00	N/A	2.80	7.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A		
				Factored Score	1.6	N/A	1.12	2.93	N/A		**5.65**
				Criticality Score					20%		**1.13**
				Other Critical Mechanical Equipment							
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Assigned	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	1.00	N/A	1.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	0.2	N/A	0.8	N/A	N/A		**1.00**
				Criticality Score					10%		**0.10**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	2.40	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.00	9.60	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Score	0.8	N/A	1.8	1.92	N/A		**4.52**
				Criticality Score					25%		**1.13**
									Overall Total Factored Score (Out of 25) =		**6.75**

				South Tahoe PUD	**Location Description:**	Apache Dr. Behind the Tahoe Paradise Golf Course	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	APBSP1 and APBSP2	**Date:**	3/8/2012
					Pump Station Facility Name:	South Apache Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Arrowhead Zone

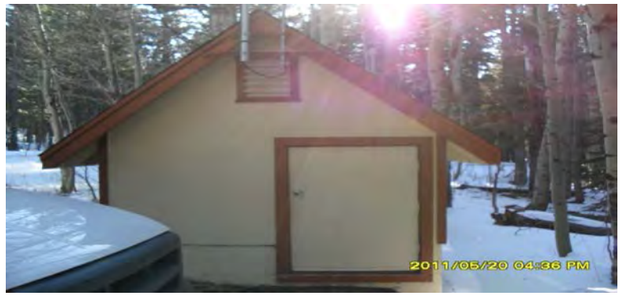
Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	1	4	4.00	adequate vehicle access for maintenance?	Single parking area for vehicles at the booster station
R	3	3	9.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	4	5	20.00	is site vulnerable to wildfires?	Yes
R	4	4	16.00	is site close to known active seismic faults?	5,750 ft. to the nearest fault
R	1	4	4.00	any unstable site conditions (if yes, describe)?	None
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	There are no site drainage issues at this facility
Fn	4	3	12.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No site security but there has not been any indication of unauthorized access
Fn	1	3	3.00	other known problems?	none
				Building Structure	
Fn	2	3	6.00	adequate security measures and monitoring to prevent unauthorized access?	The building is locked
INFORMATION	N/A	N/A	N/A	date building was constructed?	1959
Fn	5	4	20.00	adequate equipment clearances to facilitate routine O&M?	The facility is very confined and there is not enough clearance to work
PM	2	4	8.00	condition of exterior coatings adequate to protect structure?	Yes the wood building is in good condition and the coatings have no visual defects
Fn	5	3	15.00	adequate openings for ingress/egress?	Single door that is shorter than a standard door
Fn	3	3	9.00	interior lighting adequate for routine O&M?	Yes (rh) difficult to see down below catwalk
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	The building met the requirements at the time of construction
R	1	2	2.00	building meets code compliance requirements?	The building met the requirements at the time of construction
R	5	4	20.00	known fire or haz-mat conditions that could be mitigated?	The size of the building is not conducive to work and there are trees that are in contact with the building
Fn	1	3	3.00	other known problems?	none
PM	5	4	20.00	estimated service life remaining?	Exceeds AWU Useful Life
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	3
INFORMATION	N/A	N/A	N/A	pump types?	centrifugal pumps
INFORMATION	N/A	N/A	N/A	pump manufacturer?	A.W. Chesterton
PM	5	3	15.00	pumps rebuilt (list year) and describe work done?	Insufficient data
FE	5	4	20.00	pump curves available for each unit?	No
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	none
R	1	4	4.00	number of service calls/repairs in the last year?	none the facility is in lag to the North Apache Booster Station which replaced it
C	4	4	16.00	what is firm capacity of pump station based on flow test?	515 gpm based on flow test
PM	3	4	12.00	coatings adequate to provide corrosion protection?	Coatings have dings and parts missing and there is rust in some locations
FE	5	3	15.00	pumps operate efficiently (>70% bowl efficiency)?	wire-to-water efficiency ranges from 51% - 60%
FE	3	3	9.00	motor high efficiency and no excessive noise?	high-pitch noise from pump/motor assy (problem correct per district review comments dated 11/28/12)
R	1	4	4.00	pumps operate free from excessive vibration?	Yes
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	yes
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	3	3	9.00	spare parts readily available?	The parts would need to be ordered from the manufacturer
Fn	4	3	12.00	other known problems?	removal of the pumps is difficult
PM	4	4	16.00	estimated service life remaining?	Exceeds AWU Useful Life (rh) estimate 5 yrs based on excessive noise, low efficiency and age

				South Tahoe PUD	**Location Description:**	Apache Dr. Behind the Tahoe Paradise Golf Course	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	APBSP1 and APBSP2	**Date:**	3/8/2012
					Pump Station Facility Name:	South Apache Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Arrowhead Zone
				Piping & Valves				
Fn	1	4	4.00	pipe supports adequate to prevent movement or vibration?	The pipe supports are steel straps that are strapped to the ceiling and they are adequate			
PM	4	4	16.00	coatings adequate to protect piping and valves?	Coatings have deteriorated and there is rust coming through in multiple locations			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	yes			
Fn	1	4	4.00	isolation valves provided for all pumps?	yes			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	yes			
Fn	4	2	8.00	chemical injection provided?	No. There is no space for chemical injection			
INFORMATION	N/A	N/A	N/A	type of chemical added?	NA			
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Yes			
PM	4	4	16.00	estimated service life remaining?	7 years based on AWU Useful Life			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	1	1	1.00	pressure relief valves?	NA- Assigned lowest score of one given to prevent artificially lowered scores			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA			
PM	1	1	1.00	estimated service life remaining?	NA- Assigned lowest score of one given to prevent artificially lowered scores			
				SCADA system				
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes and it is connected to SCADA			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Daily when in operation			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	Yes there are numerous gauges throughout the station			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District Operations			
Fn	1	3	3.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There have been no communication errors in the last year			
R	5	3	15.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	No backup power so not adequate during a power outage			
R	1	3	3.00	spare parts/service support readily available?	Spare parts for the SCADA system are available at the District offices or readily through the manufacturer			
PM	2	4	8.00	estimated service life remaining?	Estimate 10 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5.00	adequate power available to run all equipment	Yes			
R	5	5	25.00	adequate standby power present and reliable?	No			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R	N/A	5	N/A	fuel supply adequate for standby power service?	NA			
R	4	3	12.00	time needed to mobilize portable generator?	1-2 hours depending on external conditions and there are hookups in place for a portable generator			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	None			
R	2	3	6.00	spare parts/service support readily available?	Yes at the District's main plant			
PM	1	4	4.00	estimated service life remaining?	NA			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	40 hp			
INFORMATION				Pump No. 2	40 hp			
INFORMATION				Pump No. 3	40 hp			
INFORMATION				Pump No. 4				
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	Apache Dr. Behind the Tahoe Paradise Golf Course	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pump Station Facility ID #:**	APBSP1 and APBSP2	**Date:**	3/8/2012	
					Pump Station Facility Name:	South Apache Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray	
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Arrowhead Zone	

Photo Evidence for PM, Fn, R, FE

PHOTOS



				South Tahoe PUD	**Location Description:**	Apache Dr.		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Pump Station Facility ID #:**	NAPBS1, NAPBS2, and NAPBS3		**Date:**	3/8/2012		
					Pump Station Facility Name:	North Apache Booster		**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray		
					Pressure Zones Served:	Iroquois Zone		**Adjacent Pressure Zones:**	Comanche and Arrowhead Zones		
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology		
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				Pump Station Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.75	2.20	N/A		
				Weighted Final Score (1-25)	N/A	N/A	5.75	9.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Score	N/A	N/A	3.45	3.6	N/A		**7.05**
				Criticality Score					5%		**0.35**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.33	3.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A		
				Factored Score	1.2	N/A	1.666666667	0.6	N/A		**3.47**
				Criticality Score					5%		**0.17**
				Pumps							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.00	1.25	1.00		
				Weighted Final Score (1-25)	3.67	4.00	3.50	3.50	3.33		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	0.55	0.8	1.05	0.7	0.5		**3.60**
				Criticality Score					25%		**0.90**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.67	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	0.8	N/A	2.93	N/A	N/A		**3.73**
				Criticality Score					10%		**0.37**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	2.80	3.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A		
				Factored Score	0.8	N/A	1.12	1.33	N/A		**3.25**
				Criticality Score					20%		**0.65**
				Other Critical Mechanical Equipment							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	0.8	N/A	2.4	N/A	N/A		**3.20**
				Criticality Score					10%		**0.32**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	3.00	1.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	9.00	4.20	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Score	0.8	N/A	5.4	0.84	N/A		**7.04**
				Criticality Score					25%		**1.76**
									Overall Total Factored Score (Out of 25) =		**4.53**

				South Tahoe PUD	**Location Description:**	Apache Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	NAPBS1, NAPBS2, and NAPBS3	**Date:**	3/8/2012
					Pump Station Facility Name:	North Apache Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Comanche and Arrowhead Zones

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	1	4	4.00	adequate vehicle access for maintenance?	Yes
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	3	5	15.00	is site vulnerable to wildfires?	Yes, vacant lots behind but in a residential area with no large open space nearby
R	4	4	16.00	is site close to known active seismic faults?	7,260 feet to the nearest fault
R	1	4	4.00	any unstable site conditions (if yes, describe)?	No unstable site conditions
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	Yes
Fn	4	3	12.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	There is no site security around the perimeter of the facility
Fn	1	3	3.00	other known problems?	No other known problems with the site
				Building Structure	
Fn	1	3	3.00	adequate security measures and monitoring to prevent unauthorized access?	The building has intrusion alarms which are tied to the SCADA monitoring at the main plant
INFORMATION	N/A	N/A	N/A	date building was constructed?	2010
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	Yes
PM	1	4	4.00	condition of exterior coatings adequate to protect structure?	Yes
Fn	1	3	3.00	adequate openings for ingress/egress?	Yes
Fn	1	3	3.00	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	Yes
R	1	2	2.00	building meets code compliance requirements?	Yes as of design in 2009
R	1	4	4.00	known fire or haz-mat conditions that could be mitigated?	No known haz mat or fire conditions
Fn	1	3	3.00	other known problems?	No other known problems with the building
PM	1	4	4.00	estimated service life remaining?	28 years based on AWU Useful Life
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	3
INFORMATION	N/A	N/A	N/A	pump types?	Vertical Turbines
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Floway Pumps
PM	1	3	3.00	pumps rebuilt (list year) and describe work done?	New in 2010
FE	1	4	4.00	pump curves available for each unit?	Yes
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	No pump or motor failures since construction
R	1	4		number of service calls/repairs in the last year?	None
C	1	4	4.00	what is firm capacity of pump station based on flow test?	firm capacity is 900 gpm based on flow test
PM	1	4	4.00	coatings adequate to provide corrosion protection?	New coatings with no visual defects
FE	1	3	3.00	pumps operate efficiently (>70% bowl efficiency)?	wire-to-water efficiency ranges from 72% - 75%
FE	1	3	3.00	motor high efficiency and no excessive noise?	yes
R	1	4	4.00	pumps operate free from excessive vibration?	There is no record of excessive vibration at this station
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	yes
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	2	3	6.00	spare parts readily available?	Some parts are in stock for the pumps other parts are available through the manufacturer
Fn	1	3	3.00	other known problems?	No other known problems
PM	1	4	4.00	estimated service life remaining?	28 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Apache Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	NAPBS1, NAPBS2, and NAPBS3	**Date:**	3/8/2012
					Pump Station Facility Name:	North Apache Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Comanche and Arrowhead Zones
				Piping & Valves				
Fn	1	4	4.00	pipe supports adequate to prevent movement or vibration?	Yes they are coated steel supports that are epoxy bolted to the floor and grouted beneath the plate.			
PM	1	4	4.00	coatings adequate to protect piping and valves?	Coatings are new in 2010 and there are no visual defects on the exterior of the piping and valves			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	Pipes are adequately sized			
Fn	1	4	4.00	isolation valves provided for all pumps?	All pumps have isolation valves.			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	Valves are new, efficient, and reliable			
Fn	1	2	2.00	chemical injection provided?	Yes			
INFORMATION	N/A	N/A	N/A	type of chemical added?	Sodium Hypochlorite			
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Ports with bent copper are available for use to sample water quality and are located next to each of the pressure gages.			
PM	1	4	4.00	estimated service life remaining?	58 years for steel piping and 48 years for valves based on AWU Useful Life			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	1	3	3.00	pressure relief valves?	4" Pressure Relief Valves on discharge			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA			
PM	1	4	4.00	estimated service life remaining?	23 years based on AWU Useful Life			
				SCADA system				
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes the flow meter is a Siemens mag meter installed in 2010			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Daily and hand logged into log book			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	Yes			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District Operations			
Fn	1	3	3.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	1	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There have been no communication errors in the last year			
R	1	3	3.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	Yes there is a permanent backup generator within the station			
R	1	3	3.00	spare parts/service support readily available?	Spare parts for the SCADA system are available at the District offices or readily through the manufacturer			
PM	1	4	4.00	estimated service life remaining?	10 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	150kW, 237 bhp @1800RPM Diesel			
R	1	5	5.00	adequate power available to run all equipment	The generator is sized to handle all three pumps and associated controls			
R	1	5	5.00	adequate standby power present and reliable?	Yes			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	200 gallons			
R	1	5	5.00	fuel supply adequate for standby power service?	Yes			
R	N/A	3	N/A	time needed to mobilize portable generator?	NA			
Fn	3	3	9.00	known electrical hazards that could be mitigated?	Arc Flash labeling has not been completed on the control panels and other electrical equipment			
R	2	3	6.00	spare parts/service support readily available?	Yes some parts are housed within the station and others would need to be obtained from the manufacturer			
PM	1	4	4.00	estimated service life remaining?	23 years based on AWU Useful Life			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	Rated Flow=500gpm, Head=280', Size=10JKL, 7 Stage, Power=50hp, 1785 RPM, Impeller setting 0.125" off bottom			
INFORMATION				Pump No. 2	Rated Flow=500gpm, Head=280', Size=10JKL, 7 Stage, Power=50hp, 1785 RPM, Impeller setting 0.125" off bottom			
INFORMATION				Pump No. 3	Rated Flow=500gpm, Head=280', Size=10JKL, 7 Stage, Power=50hp, 1785 RPM, Impeller setting 0.125" off bottom			
INFORMATION				Pump No. 4				

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Apache Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	NAPBS1, NAPBS2, and NAPBS3	**Date:**	3/8/2012
					Pump Station Facility Name:	North Apache Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Comanche and Arrowhead Zones

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Keller Rd		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Pump Station Facility ID #:**	KLRBP1 and KLRBP2		**Date:**	3/7/2012		
					Pump Station Facility Name:	Keller Booster		**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney		
					Pressure Zones Served:	Keller Zone		**Adjacent Pressure Zones:**	Stateline Zone		
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology		
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				Pump Station Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	3.50	2.40	N/A		
				Weighted Final Score (1-25)	N/A	N/A	11.50	9.60	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Score	N/A	N/A	6.9	3.84	N/A		**10.74**
				Criticality Score					5%		**0.54**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.67	1.00	N/A		
				Weighted Final Score (1-25)	6.00	N/A	5.33	3.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A		
				Factored Score	1.8	N/A	2.67	0.6	N/A		**5.07**
				Criticality Score					5%		**0.25**
				Pumps							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.33	2.00	1.00	1.75	2.33		
				Weighted Final Score (1-25)	5.00	8.00	3.50	6.25	8.67		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	0.75	1.6	1.05	1.25	1.3		**5.95**
				Criticality Score					25%		**1.49**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.67	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	0.8	N/A	2.93	N/A	N/A		**3.73**
				Criticality Score					10%		**0.37**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	2.33	N/A		
				Weighted Final Score (1-25)	4.00	N/A	2.80	7.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A		
				Factored Score	0.8	N/A	1.12	2.93	N/A		**4.85**
				Criticality Score					20%		**0.97**
				Other Critical Mechanical Equipment							
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	N/A	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	1.00	N/A	1.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	0.2	N/A	0.8	N/A	N/A		**1.00**
				Criticality Score					10%		**0.10**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	3.20	N/A		
				Weighted Final Score (1-25)	8.00	N/A	3.00	14.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Score	1.6	N/A	1.8	2.8	N/A		**6.20**
				Criticality Score					25%		**1.55**
									Overall Total Factored Score (Out of 25) =		**5.27**

				South Tahoe PUD	**Location Description:**	Keller Rd	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	KLRBP1 and KLRBP2	**Date:**	3/7/2012
					Pump Station Facility Name:	Keller Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Keller Zone	**Adjacent Pressure Zones:**	Stateline Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	3	4	12.00	adequate vehicle access for maintenance?	Minimal Access-one maybe two vehicles. Small turnout only
R	3	3	9.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	3	5	15.00	is site vulnerable to wildfires?	Yes Adjacent to a large vacant lot but within a residential area
R	4	4	16.00	is site close to known active seismic faults?	925 feet to the nearest fault
R	1	4	4.00	any unstable site conditions (if yes, describe)?	None
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	Yes
Fn	5	3	15.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No this site is terrible. There is lots of graffiti and vandalism. It has been painted a dozen times
Fn	5	3	15.00	other known problems?	Vandalism is a primary concern at this site, access is very difficult and dangerous as crews are forced to back onto a blind curve
				Building Structure	
Fn	5	3	15.00	adequate security measures and monitoring to prevent unauthorized access?	No
INFORMATION	N/A	N/A	N/A	date building was constructed?	1964
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	Yes
PM	1	4	4.00	condition of exterior coatings adequate to protect structure?	Good because it has been painted multiple times and a new roof was installed approximately two years ago
Fn	1	3	3.00	adequate openings for ingress/egress?	Yes
Fn	1	3	3.00	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	Yes
R	1	2	2.00	building meets code compliance requirements?	Met requirements at the time of construction
R	1	4	4.00	known fire or haz-mat conditions that could be mitigated?	None
Fn	1	3	3.00	other known problems?	None
PM	2	4	8.00	estimated service life remaining?	Exceeds AWAU Useful Life (rh) estimated useful life is approx 18 yrs assuming 20-yr roof life
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	2
INFORMATION	N/A	N/A	N/A	pump types?	Vertical multistage turbine
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Gould
PM	1	3	3.00	pumps rebuilt (list year) and describe work done?	Installed about 5 years ago
FE	5	4	20.00	pump curves available for each unit?	Yes
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	None since install
R	2	4	8.00	number of service calls/repairs in the last year?	2 calls in the last year
C	2	4	8.00	what is firm capacity of pump station based on flow test?	252 gpm
PM	1	4	4.00	coatings adequate to provide corrosion protection?	Coatings are adequate at this location for facilities that are visible
FE	1	3	3.00	pumps operate efficiently (>70% bowl efficiency)?	wire-to-water efficiency ranges from 74% - 76%
FE	1	3	3.00	motor high efficiency and no excessive noise?	Assumed yes
R	1	4	4.00	pumps operate free from excessive vibration?	No excessive vibration
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	yes
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	3	3	9.00	spare parts readily available?	No spare pump or spare parts they would need to be ordered
Fn	1	3	3.00	other known problems?	None
PM	2	4	8.00	estimated service life remaining?	Exceeds AWU Useful Life (rh) appears to be 15 yrs useful life based on flow test and observed pump condition

				South Tahoe PUD	**Location Description:**	Keller Rd	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	KLRBP1 and KLRBP2	**Date:**	3/7/2012
					Pump Station Facility Name:	Keller Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Keller Zone	**Adjacent Pressure Zones:**	Stateline Zone
				Piping & Valves				
Fn	1	4	4.00	pipe supports adequate to prevent movement or vibration?	Yes, steel posts bolted to concrete floor and grouted			
PM	1	4	4.00	coatings adequate to protect piping and valves?	Yes the coating is adequate			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	There are no noise or headloss problems			
Fn	1	4	4.00	isolation valves provided for all pumps?	Yes			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	Yes			
Fn	1	2	2.00	chemical injection provided?	None and potential plans for this station			
INFORMATION	N/A	N/A	N/A	type of chemical added?	NA			
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Yes			
PM	1	4	4.00	estimated service life remaining?	12 years based on AWU Useful Life			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	1	1	1.00	pressure relief valves?	NA- Lowest score of one given to prevent artificially lowered scores			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA			
PM	1	1	1.00	estimated service life remaining?	NA- Lowest score of one given to prevent artificially lowered scores			
				SCADA system				
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes the flow meter is a Siemens mag meter installed in 2009			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Daily and hand logged into log book			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	Yes			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District Operations			
Fn	1	3	3.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There have been no communication errors in the last year			
R	5	3	15.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	No generator on site and no backup power in the event of a failure			
R	1	3	3.00	spare parts/service support readily available?	Spare parts for the SCADA system are available at the District offices or readily through the manufacturer			
PM	1	4	4.00	estimated service life remaining?	Estimate 10 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5.00	adequate power available to run all equipment	Yes			
R	5	5	25.00	adequate standby power present and reliable?	No			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R	5	5	25.00	fuel supply adequate for standby power service?	NA			
R	3	3	9.00	time needed to mobilize portable generator?	A couple hours depending on the situation and other external hazards			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	None			
R	2	3	6.00	spare parts/service support readily available?	Yes at District main plant			
PM	2	4	8.00	estimated service life remaining?	NA			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	252			
INFORMATION				Pump No. 2	252			
INFORMATION				Pump No. 3				
INFORMATION				Pump No. 4				
					This station is run off of VFD drives.			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	Keller Rd	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	KLRBP1 and KLRBP2	**Date:**	3/7/2012
					Pump Station Facility Name:	Keller Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Keller Zone	**Adjacent Pressure Zones:**	Stateline Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	On Pioneer Trail		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Pump Station Facility ID #:**	CCBP1 and CCBP2		**Date:**	3/8/2012		
					Pump Station Facility Name:	Cold Creek Tank Booster Station (aka Upper Cold Creek BS)		**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray		
					Pressure Zones Served:	Montgomery Estates		**Adjacent Pressure Zones:**	Stateline Zone		
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology		
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				Pump Station Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.25	2.40	N/A		
				Weighted Final Score (1-25)	N/A	N/A	4.25	9.60	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Score	N/A	N/A	2.55	3.84	N/A		**6.39**
				Criticality Score					5%		**0.32**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	3.00	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	12.00	N/A	3.33	3.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A		
				Factored Score	3.6	N/A	1.666666667	0.6	N/A		**5.87**
				Criticality Score					5%		**0.29**
				Pumps							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	2.33	1.00	1.00	2.00	5.00		
				Weighted Final Score (1-25)	9.00	4.00	3.50	6.75	16.67		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	1.35	0.8	1.05	1.35	2.5		**7.05**
				Criticality Score					25%		**1.76**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.67	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	0.8	N/A	2.933333333	N/A	N/A		**3.73**
				Criticality Score					10%		**0.37**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	2.80	3.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A		
				Factored Score	0.8	N/A	1.12	1.333333333	N/A		**3.25**
				Criticality Score					20%		**0.65**
				Other Critical Mechanical Equipment							
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	N/A	20%		
				Factored Score	0.8	N/A	1.8	N/A	N/A		**2.60**
				Criticality Score					10%		**0.26**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	5.00	N/A	1.00	1.60	N/A		
				Weighted Final Score (1-25)	20.00	N/A	3.00	7.60	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Score	4	N/A	1.8	1.52	N/A		**7.32**
				Criticality Score					25%		**1.83**
									Overall Total Factored Score (Out of 25) =		**5.49**

				South Tahoe PUD	**Location Description:**	On Pioneer Trail	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	CCBP1 and CCBP2	**Date:**	3/8/2012
					Pump Station Facility Name:	Cold Creek Tank Booster Station (aka Upper Cold Creek BS)	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Montgomery Estates	**Adjacent Pressure Zones:**	Stateline Zone

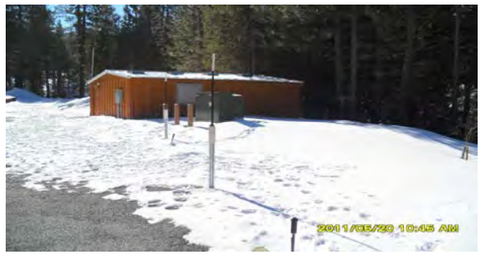
Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	1	4	4.00	adequate vehicle access for maintenance?	Yes
R	3	3	9.00	is site within 100-yr flood plain?	Yes this site is Designated as Zone AE which base flood elevations have been determined for the 100 year flood.
R	3	5	15.00	is site vulnerable to wildfires?	Yes it is sitting next to the meadow
R	4	4	16.00	is site close to known active seismic faults?	2,000 ft. to the nearest fault
R	1	4	4.00	any unstable site conditions (if yes, describe)?	None
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	Yes
Fn	2	3	6.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	Single Forest Service gate to prevent entry to the site. This site is used as parking for the mountain bike trail heads at the back of the property
Fn	1	3	3.00	other known problems?	None
				Building Structure	
Fn	1	3	3.00	adequate security measures and monitoring to prevent unauthorized access?	The building is locked
INFORMATION	N/A	N/A	N/A	date building was constructed?	1970
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	Yes
PM	2	4	8.00	condition of exterior coatings adequate to protect structure?	The exterior paint on the metal building has flaked off in some locations, but is generally in good condition
Fn	1	3	3.00	adequate openings for ingress/egress?	Yes
Fn	1	3	3.00	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	Yes at the design loads at the time of construction
R	1	2	2.00	building meets code compliance requirements?	Yes as of the construction date
R	1	4	4.00	known fire or haz-mat conditions that could be mitigated?	None
Fn	1	3	3.00	other known problems?	None
PM	4	4	16.00	estimated service life remaining?	Exceeds AWU Useful Life
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	2
INFORMATION	N/A	N/A	N/A	pump types?	Centrifugal
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Peerless and Aurora
PM	1	3	3.00	pumps rebuilt (list year) and describe work done?	New seals and bearings in 2012
FE	5	4	20.00	pump curves available for each unit?	No
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	4	4.00	number of service calls/repairs in the last year?	Rebuilt 2012
C	1	4	4.00	what is firm capacity of pump station based on flow test?	Not Completed, but assume it is adequate since pump station has been rebuilt.
PM	3	4	12.00	coatings adequate to provide corrosion protection?	Coatings deteriorated on pumps
FE	5	3	15.00	pumps operate efficiently (>70% bowl efficiency)?	Not Completed
FE	5	3	15.00	motor high efficiency and no excessive noise?	Not Completed
R	1	4	4.00	pumps operate free from excessive vibration?	Yes
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	Assumed yes
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	5	3	15.00	spare parts readily available?	NA
Fn	1	3	3.00	other known problems?	NA
PM	3	4	12.00	estimated service life remaining?	Estimate 10 years on pumps

				South Tahoe PUD	**Location Description:**	On Pioneer Trail	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	CCBP1 and CCBP2	**Date:**	3/8/2012
					Pump Station Facility Name:	Cold Creek Tank Booster Station (aka Upper Cold Creek BS)	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Montgomery Estates	**Adjacent Pressure Zones:**	Stateline Zone
				Piping & Valves				
Fn	1	4	4.00	pipe supports adequate to prevent movement or vibration?	Yes the supports are new as of 2012			
PM	1	4	4.00	coatings adequate to protect piping and valves?	New coatings as of 2012			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	4	4.00	isolation valves provided for all pumps?	Yes			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	Yes			
Fn	1	2	2.00	chemical injection provided?	Yes			
INFORMATION	N/A	N/A	N/A	type of chemical added?	Sodium Hypochloride			
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Yes			
PM	1	4	4.00	estimated service life remaining?	30 years according to AWU Useful Life			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	1	3	3.00	pressure relief valves?	Yes new pressure relief valve in 2012			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	30 gal tanks with no secondary containment			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	Yes			
PM	1	4	4.00	estimated service life remaining?	30 years according to AWU useful life			
				SCADA system				
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes, mag meter installed in 2012			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Daily and hand logged into log book			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	Yes			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District Operations			
Fn	1	3	3.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There have been no communication errors since booster put back into service			
R	1	3	3.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	Yes there is a permanent backup generator within the station			
R	1	3	3.00	spare parts/service support readily available?	Spare parts for the SCADA system are available at the District offices or readily through the manufacturer			
PM	1	4	4.00	estimated service life remaining?	Estimate 10 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	105kW			
R	5	5	25.00	adequate power available to run all equipment	No the power has not been reconnected pending an easement for Liberty Energy			
R	1	5	5.00	adequate standby power present and reliable?	Yes			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	250			
R	1	5	5.00	fuel supply adequate for standby power service?	Yes			
R	N/A	3	N/A	time needed to mobilize portable generator?	NA but hookups are available as backup			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	None			
R	1	3	3.00	spare parts/service support readily available?	At plant if needed			
PM	5	4	20.00	estimated service life remaining?	Exceeds AWU Useful Life			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	60HP, 3525 RPM			
INFORMATION				Pump No. 2	60HP, 3525 RPM			
INFORMATION				Pump No. 3				
INFORMATION				Pump No. 4				
					See Photo below of coupling which has no support and is not seated correctly			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	On Pioneer Trail	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	CCBP1 and CCBP2	**Date:**	3/8/2012
					Pump Station Facility Name:	Cold Creek Tank Booster Station (aka Upper Cold Creek BS)	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Montgomery Estates	**Adjacent Pressure Zones:**	Stateline Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS



				South Tahoe PUD	**Location Description:**	Black Bart Ct & Rd. 2421	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pump Station Facility ID #:**	BLBTBP1, BLBTBP2, and BLBTBP3	**Date:**	3/8/2012	
					Pump Station Facility Name:	Black Bart Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray	
					Pressure Zones Served:	Montgomery Estates Zone	**Adjacent Pressure Zones:**	Stateline Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				Pump Station Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.50	2.80	N/A	
				Weighted Final Score (1-25)	N/A	N/A	5.00	10.80	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Score	N/A	N/A	3	4.32	N/A	**7.32**
				Criticality Score					5%	**0.37**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	N/A	1.50	1.00	N/A	
				Weighted Final Score (1-25)	20.00	N/A	4.83	3.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A	
				Factored Score	6	N/A	2.42	0.6	N/A	**9.02**
				Criticality Score					5%	**0.45**
				Pumps						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	1.00	1.00	1.50	3.67	
				Weighted Final Score (1-25)	7.33	4.00	3.50	5.25	12.67	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.1	0.8	1.05	1.05	1.9	**5.90**
				Criticality Score					25%	**1.48**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	6.00	N/A	3.67	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.2	N/A	2.93	N/A	N/A	**4.13**
				Criticality Score					10%	**0.41**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	2.67	N/A	
				Weighted Final Score (1-25)	4.00	N/A	2.80	8.33	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A	
				Factored Score	0.8	N/A	1.12	3.33	N/A	**5.25**
				Criticality Score					20%	**1.05**
				Other Critical Mechanical Equipment						
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	N/A	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	1.00	N/A	1.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	0.2	N/A	0.8	N/A	N/A	**1.00**
				Criticality Score					10%	**0.10**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	N/A	1.00	2.00	N/A	
				Weighted Final Score (1-25)	20.00	N/A	3.00	8.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Score	4	N/A	1.8	1.6	N/A	**7.40**
				Criticality Score					25%	**1.85**
									Overall Total Factored Score (Out of 25) =	**5.71**

				South Tahoe PUD	**Location Description:**	Black Bart Ct & Rd. 2421	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	BLBTBP1, BLBTBP2, and BLBTBP3	**Date:**	3/8/2012
					Pump Station Facility Name:	Black Bart Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Montgomery Estates Zone	**Adjacent Pressure Zones:**	Stateline Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	1	4	4.00	adequate vehicle access for maintenance?	Yes
R	5	3	15.00	is site within 100-yr flood plain?	Yes this site is Designated as Zone AE which base flood elevations have been determined for the 100 year flood.
R	3	5	15.00	is site vulnerable to wildfires?	Yes it is adjacent to the meadow
R	4	4	16.00	is site close to known active seismic faults?	1,650 ft. to nearest fault
R	1	4	4.00	any unstable site conditions (if yes, describe)?	None
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	There are no site drainage issues
Fn	3	3	9.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No there is no security around the perimeter of the site
Fn	1	3	3.00	other known problems?	None
				Building Structure	
Fn	1	3	3.00	adequate security measures and monitoring to prevent unauthorized access?	Door is locked with a master lock
INFORMATION	N/A	N/A	N/A	date building was constructed?	1967
Fn	1	4	4.00	adequate equipment clearances to facilitate routine O&M?	Yes
PM	5	4	20.00	condition of exterior coatings adequate to protect structure?	Coatings on the exterior of the metal building are starting to flake off
Fn	1	3	3.00	adequate openings for ingress/egress?	Yes
Fn	1	3	3.00	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	The building was designed to the code of its time to handle snow load
R	1	2	2.00	building meets code compliance requirements?	Met the requirements at the time of construction
R	1	4	4.00	known fire or haz-mat conditions that could be mitigated?	None
Fn	4	3	12.00	other known problems?	Insulation is starting to sag in the ceiling
PM	5	4	20.00	estimated service life remaining?	Exceeds AWU Useful Life (rh) building needs major rehab work or complete replacment
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	3
INFORMATION	N/A	N/A	N/A	pump types?	Centrifugal Pumps
INFORMATION	N/A	N/A	N/A	pump manufacturer?	#1 and #2 are Peerless Pumps, and #3 is Aurora
PM	2	3	6.00	pumps rebuilt (list year) and describe work done?	Pump Number 3 rebuilt in 2007
FE	5	4	20.00	pump curves available for each unit?	Yes
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	4	4.00	number of service calls/repairs in the last year?	None
C	1	4	4.00	what is firm capacity of pump station based on flow test?	firm capacity is 360 gpm based on flow test
PM	1	4	4.00	coatings adequate to provide corrosion protection?	Exterior coatings of the parts are in excellent condition
FE	5	3	15.00	pumps operate efficiently (>70% bowl efficiency)?	wire-to-water efficiency is 42% - 45%
FE	1	3	3.00	motor high efficiency and no excessive noise?	yes
R	1	4	4.00	pumps operate free from excessive vibration?	There is not excessive noise or vibration
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	yes
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	3	3	9.00	spare parts readily available?	Order from a supply as there are no parts on hand
Fn	1	3	3.00	other known problems?	None
PM	3	4	12.00	estimated service life remaining?	Exceeds AWU Useful Life (rh) estimated useful life approx 5 years based on extreme low efficiency

				South Tahoe PUD	**Location Description:**	Black Bart Ct & Rd. 2421	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	BLBTBP1, BLBTBP2, and BLBTBP3	**Date:**	3/8/2012
					Pump Station Facility Name:	Black Bart Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Montgomery Estates Zone	**Adjacent Pressure Zones:**	Stateline Zone
				Piping & Valves				
Fn	1	4	4.00	pipe supports adequate to prevent movement or vibration?	Pipe supports are adequate			
PM	1	4	4.00	coatings adequate to protect piping and valves?	Coatings on the piping and the valving is in good condition			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	4	4.00	isolation valves provided for all pumps?	Yes			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	None			
Fn	1	2	2.00	chemical injection provided?	Yes			
INFORMATION	N/A	N/A	N/A	type of chemical added?	Sodium Hypochlorite			
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Yes and turned down non-threaded			
PM	2	4	8.00	estimated service life remaining?	15 years based on AWU Useful Life			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	1	1	1.00	pressure relief valves?	NA- Lowest score of one given to prevent artificially lowered scores			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA			
PM	1	1	1.00	estimated service life remaining?	NA- Lowest score of one given to prevent artificially lowered scores			
				SCADA system				
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes the flow meter is a Siemens mag meter installed in 2009			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Daily and hand logged into log book			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	Yes			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District Operations			
Fn	1	3	3.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There have been no communication errors in the last year			
R	5	3	15.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	No backup generator onsite so lacks adequate power in a filure situation			
R	2	3	6.00	spare parts/service support readily available?	Spare parts for the SCADA system are available at the District offices or readily through the manufacturer			
PM	1	4	4.00	estimated service life remaining?	Estimate 10 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5.00	adequate power available to run all equipment	Yes			
R	4	5	20.00	adequate standby power present and reliable?	Yes with a portable generator			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R	N/A	5	N/A	fuel supply adequate for standby power service?	NA			
R	3	3	9.00	time needed to mobilize portable generator?	1 hour or less due to proximity to main plant			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	None			
R	2	3	6.00	spare parts/service support readily available?	Yes at District Plant			
PM	5	4	20.00	estimated service life remaining?	NA			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	200gpm, 25HP			
INFORMATION				Pump No. 2	200gpm, 25HP			
INFORMATION				Pump No. 3	450gpm, 60HP			
INFORMATION				Pump No. 4				
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	Black Bart Ct & Rd. 2421	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pump Station Facility ID #:**	BLBTBP1, BLBTBP2, and BLBTBP3	**Date:**	3/8/2012	
					Pump Station Facility Name:	Black Bart Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray	
					Pressure Zones Served:	Montgomery Estates Zone	**Adjacent Pressure Zones:**	Stateline Zone	

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Cold Creek Trail		**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pump Station Facility ID #:**	CCBPUMP1 and CCBPUMP2		**Date:**	3/7/2012	
					Pump Station Facility Name:	Cold Creek Tank Booster		**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Upper Montgomery Estates		**Adjacent Pressure Zones:**	Montgomery Estates	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity (see note 1)**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure every > 20 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 7 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 6 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				Pump Station Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.50	2.60	N/A	
				Weighted Final Score (1-25)	N/A	N/A	5.00	10.80	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Score	N/A	N/A	3	4.32	N/A	**7.32**
				Criticality Score					5%	**0.37**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	N/A	2.83	2.50	N/A	
				Weighted Final Score (1-25)	12.00	N/A	9.00	9.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	30%	N/A	50%	20%	N/A	
				Factored Score	3.6	N/A	4.5	1.8	N/A	**9.90**
				Criticality Score					5%	**0.50**
				Pumps						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	1.00	1.00	1.75	4.67	
				Weighted Final Score (1-25)	10.67	4.00	3.50	6.75	15.67	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.6	0.8	1.05	1.35	2.35	**7.15**
				Criticality Score					25%	**1.79**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.50	N/A	2.00	N/A	N/A	
				Weighted Final Score (1-25)	14.00	N/A	7.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	2.8	N/A	5.6	N/A	N/A	**8.40**
				Criticality Score					10%	**0.84**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.20	1.33	N/A	
				Weighted Final Score (1-25)	8.00	N/A	3.40	4.33	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	40%	40%	N/A	
				Factored Score	1.6	N/A	1.36	1.73	N/A	**4.69**
				Criticality Score					20%	**0.94**
				Other Critical Mechanical Equipment						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	N/A	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	1.00	N/A	1.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	0.2	N/A	0.8	N/A	N/A	**1.00**
				Criticality Score					10%	**0.10**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	0.80	N/A	
				Weighted Final Score (1-25)	4.00	N/A	3.00	3.60	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Score	0.8	N/A	1.8	0.72	N/A	**3.32**
				Criticality Score					25%	**0.83**
									Overall Total Factored Score (Out of 25) =	**5.36**

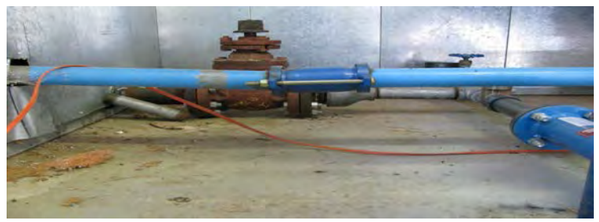
				South Tahoe PUD	**Location Description:**	Cold Creek Trail	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	CCBPUMP1 and CCBPUMP2	**Date:**	3/7/2012
					Pump Station Facility Name:	Cold Creek Tank Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Upper Montgomery Estates	**Adjacent Pressure Zones:**	Montgomery Estates

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Pump Station Site	
Fn	1	4	4.00	key O&M staff have access to site?	Yes
Fn	1	4	4.00	adequate vehicle access for maintenance?	Yes
R	3	3	9.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	5	5	25.00	is site vulnerable to wildfires?	Yes the site is adjacent to a forest
R	3	4	12.00	is site close to known active seismic faults?	3,886 ft. to the nearest fault
R	1	4	4.00	any unstable site conditions (if yes, describe)?	None
R	1	4	4.00	site drainage adequate to prevent flooding of buildings and critical equipment?	Yes
Fn	3	3	9.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No security around the site
Fn	1	3	3.00	other known problems?	None
				Building Structure	
Fn	5	3	15.00	adequate security measures and monitoring to prevent unauthorized access?	The building is locked to prevent access
INFORMATION	N/A	N/A	N/A	date building was constructed?	1980
Fn	2	4	8.00	adequate equipment clearances to facilitate routine O&M?	Yes
PM	3	4	12.00	condition of exterior coatings adequate to protect structure?	It is a metal building and the paint on the exterior is in adequate condition
Fn	3	3	9.00	adequate openings for ingress/egress?	Single door to enter which is adequate for this small pump station
Fn	3	3	9.00	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4.00	building designed to withstand snow load and not create safety issue?	Yes and met the load requirements at the time of construction
R	1	2	2.00	building meets code compliance requirements?	Met the code requirements at the time of construction
R	4	4	16.00	known fire or haz-mat conditions that could be mitigated?	There is insulation that is deteriorating and falling from the ceiling which could create a fire danger
Fn	3	3	9.00	other known problems?	None
PM	3	4	12.00	estimated service life remaining?	Exceeds AWU Useful Life (rh) approx 10 yrs useful life until major maintenance required
				Pumps	
INFORMATION	N/A	N/A	N/A	no. of pumps?	2
INFORMATION	N/A	N/A	N/A	pump types?	Centrifugal Pumps - this is a hydro-pneumatic pump station
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Berkeley Pumps
PM	4	3	12.00	pumps rebuilt (list year) and describe work done?	No rebuilds
FE	5	4	20.00	pump curves available for each unit?	Yes
R	1	4	4.00	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	4	4.00	number of service calls/repairs in the last year?	None
C	1	4	4.00	what is firm capacity of pump station based on flow test?	83 gpm based on flow test - need to verify location of flowmeter (upstream or downstream of hydropneumatic tank)
PM	1	4	4.00	coatings adequate to provide corrosion protection?	coatings on the pumps are adequate
FE	5	3	15.00	pumps operate efficiently (>70% bowl efficiency)?	wire-to-water efficiency 33% - unsure if accurate - verify placment of flowmeter
FE	4	3	12.00	motor high efficiency and no excessive noise?	excessive noise on pump no. 1
R	4	4	16.00	pumps operate free from excessive vibration?	Yes, loud bang on pumps when first turning on but then no issues
Fn	1	4	4.00	adequate NPSH available to prevent cavitation?	Yes, loud bang on pumps when first turning on but then no issues
INFORMATION	N/A	N/A	N/A	dedicated fire pumps available (hydro pneumatic pump stations only)?	None
INFORMATION	N/A	N/A	N/A	all fire pumps are UL/FM rated for fire service (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	date of last fire-pump test (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	measured fire-pump capacity (hydro pneumatic pump stations only)?	NA
INFORMATION	N/A	N/A	N/A	standby power supply available for fire pumps (hydro pneumatic pump stations only)?	NA
R	1	3	3.00	spare parts readily available?	Extra pump in the station
Fn	1	3	3.00	other known problems?	None
PM	4	4	16.00	estimated service life remaining?	Exceeds AWU Useful Life (rh) approx 5 years based on low efficiency and unusual noises at pump/motor assy

				South Tahoe PUD	**Location Description:**	Cold Creek Trail	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	CCBPUMP1 and CCBPUMP2	**Date:**	3/7/2012
					Pump Station Facility Name:	Cold Creek Tank Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Upper Montgomery Estates	**Adjacent Pressure Zones:**	Montgomery Estates
				Piping & Valves				
Fn	5	4	20.00	pipe supports adequate to prevent movement or vibration?	Pipe supports are steel but are not bolted to the floor or connected to the pipe			
PM	5	4	20.00	coatings adequate to protect piping and valves?	Minimal coatings on the exterior of the pipes and coatings have dings and scrapes			
Fn	1	4	4.00	pipes adequately sized to prevent excessive noise or headloss?	Yes (rh) pipe arrangement is awkward which makes maintance difficult			
Fn	1	4	4.00	isolation valves provided for all pumps?	Yes			
Fn	1	3	3.00	valves are suitable for efficient and reliable service?	Yes			
Fn	3	2	6.00	chemical injection provided?	None			
INFORMATION	N/A	N/A	N/A	type of chemical added?	NA			
Fn	1	5	5.00	sample tap(s) provided to measure water quality?	Yes			
PM	2	4	8.00	estimated service life remaining?	28 years according to AWU Useful Life			
				Other Critical Mechanical Equipment				
INFORMATION	N/A	N/A	N/A	surge tank or surge anticipator valve condition?	NA			
Fn	1	1	1.00	pressure relief valves?	NA- Lowest score of one given to prevent artificially lowered scores			
INFORMATION	N/A	N/A	N/A	chemical tanks onsite, volume, and secondary containment provided?	NA			
INFORMATION	N/A	N/A	N/A	chemical additives compliant with NSF 60?	NA			
PM	1	1	1.00	estimated service life remaining?	NA- Lowest score of one given to prevent artificially lowered scores			
				SCADA system				
Fn	1	3	3.00	pump station flow meter is adequate to monitor pump performance?	Yes the flow meter is a Siemens mag meter installed in 2009 (rh) verify placement of flowmeter suitable to measure pump output			
Fn	1	2	2.00	flow totals recorded at regular intervals? How frequent?	Daily and hand logged into log book			
Fn	1	2	2.00	pressure instrumentation is adequate to monitor pump performance?	Yes			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District Operations			
Fn	2	3	6.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There have been no communication errors in the last year			
R	1	3	3.00	adequate power (UPS) available to run all telemetry and instrumentation on main power failure?	Yes there is a permanent backup generator within the station			
R	2	3	6.00	spare parts/service support readily available?	Spare parts for the SCADA system are available at the District offices or readily through the manufacturer			
PM	2	4	8.00	estimated service life remaining?	Estimate 10 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	20kW			
R	1	5	5.00	adequate power available to run all equipment	Yes			
R	1	5	5.00	adequate standby power present and reliable?	Yes			
INFORMATION	1	4	4.00	fuel storage capacity (gals)?	50 gal			
R	1	5	5.00	fuel supply adequate for standby power service?	Yes			
R	N/A	3	N/A	time needed to mobilize portable generator?	NA			
Fn	1	3	3.00	known electrical hazards that could be mitigated?	None			
R	1	3	3.00	spare parts/service support readily available?	Yes at District's Main Plant			
PM	1	4	4.00	estimated service life remaining?	Exceeds AWU Useful Life (rh) appears to be well maintained, estimated useful life is 5 yrs until major rebuild required			
				Additional Data				
				Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
INFORMATION				Pump No. 1	45gpm,7.5hp,			
INFORMATION				Pump No. 2	45gpm,7.5hp,			
INFORMATION				Pump No. 3				
INFORMATION				Pump No. 4				
					See Photo below of coupling which has no support and is not seated correctly			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			
				Photo Evidence for PM, Fn, R, FE				
				PHOTOS				

				South Tahoe PUD	**Location Description:**	Cold Creek Trail	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pump Station Facility ID #:**	CCBPUMP1 and CCBPUMP2	**Date:**	3/7/2012
					Pump Station Facility Name:	Cold Creek Tank Booster	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Upper Montgomery Estates	**Adjacent Pressure Zones:**	Montgomery Estates

PHOTOS



Appendix A2

Wells

South Tahoe PUD
Water System Optimization Plan
Summary of Well Condition and Capacity Evaluation

Failure Mode Scoring Summary - Criticality Scores

Wells Facility Name:	Wells Facility ID #:	California Waterworks Standard	Well Site	Building Structure	Well Pump	Piping & Valves	Supply Well - Sanitary Seal, Casing and Screen	Wellhead Treatment	SCADA System	Electrical Power	Overall Total Factored Score (Out of 25) =
Bayview Well	BVWLHD	0.47	0.26	0.26	1.16	0.32	1.51	0.64	0.21	1.06	5.87
Bakersfield Well	BKWL	0.43	0.21	0.24	1.34	0.37	2.39	0.35	0.19	0.92	6.43
Arrowhead Well #3	ARHDWL3	0.50	0.18	0.17	1.31	0.32	2.37	0.53	0.21	1.19	6.77
So. Upper Truckee Well #3	3658101	0.50	0.21	0.17	1.40	0.32	2.37	0.35	0.19	0.91	6.42
Elks Club Well #2	ECWLHD	0.50	0.21	0.26	1.40	0.32	2.07	0.44	0.19	0.69	6.06
Valhalla Well	VHWL	0.53	0.28	0.18	1.42	0.37	2.01	0.44	0.19	0.69	6.10
Airport Well	APRTWL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Al Tahoe Well #2	ATWL2	0.50	0.26	0.18	1.06	0.37	2.16	0.44	0.23	0.85	6.04
Blackrock Well #2	BRWL2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chris Well	CHRISWL	0.62	0.21	0.29	1.40	0.92	2.44	0.00	0.68	0.38	6.92
Clement Well	CLMTWL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
College Well	CLGWL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Glenwood Well #5	GLWLHD5	0.50	0.18	0.18	1.29	0.34	2.07	0.53	0.18	0.73	6.00
Helen Ave. Well #2	HWLHD2	0.50	0.31	0.19	1.26	0.32	2.07	0.53	0.22	0.77	6.17
Paloma Well	PLWLHD	0.54	0.19	0.18	1.20	0.32	2.24	0.53	0.17	1.09	6.44
Sunset Well	SSWL	0.50	0.27	0.19	1.32	0.32	2.25	0.44	0.22	1.57	7.08
Tata Well #1	TLWL1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tata Well #2	TLWL2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tata Well #3	TLWL3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mountain View Well	MVWL	0.66	0.31	0.23	1.73	0.86	2.38	0.44	0.22	1.57	8.38
Martin Well	MRTNWL	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

				South Tahoe PUD	**Location Description:**	On San Francisco Dr. in the Al Tahoe Neighborhood		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Wells Facility ID #:**	BVWLHD		**Date:**	2/22/2012		
					Wells Facility Name:	Bayview Well		**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick		
					Pressure Zones Served:	Stateline Zone		**Adjacent Pressure Zones:**	Heavenly Valley, Keller, Twin Peaks, and Montgomery Estates Zones		
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standard							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.30	1.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	5.10	3.75	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	3.57	1.125	N/A		**4.70**
				Criticality Score					10%		**0.47**
				Well Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.67	2.50	N/A		
				Weighted Final Score (1-25)	N/A	N/A	3.33	9.25	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	2.33	2.775	N/A		**5.11**
				Criticality Score					5%		**0.26**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	3.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.33	9.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.4	N/A	2	2.7	N/A		**5.10**
				Criticality Score					5%		**0.26**
				Well Pump							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	Calculated	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	2.33	1.00	5.00	1.40	3.67		
				Weighted Final Score (1-25)	9.33	3.00	10.00	3.80	13.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Final Score	1.40	0.60	3.00	0.76	1.95		**7.71**
				Criticality Score					15%		**1.16**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.50	3.00	3.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A		
				Factored Final Score	0.45	1.80	0.90	N/A	N/A		**3.15**
				Criticality Score					10%		**0.32**
				Supply Well - Sanitary Seal, Casing and Screen							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	4.00	2.00	1.00		
				Weighted Final Score (1-25)	3.25	N/A	14.50	9.50	3.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%		
				Factored Final Score	0.33	N/A	7.25	1.90	0.60		**10.08**
				Criticality Score					15%		**1.51**
				Wellhead Treatment							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.60	2.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	5.80	2.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Final Score	N/A	N/A	3.48	0.80	N/A		**4.28**
				Criticality Score					15%		**0.64**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.40	2.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	4.00	4.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.40	N/A	2.40	1.30	N/A		**4.10**
				Criticality Score					5%		**0.21**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	3.20	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.00	13.60	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Final Score	0.80	N/A	1.80	2.72	N/A		**5.32**
				Criticality Score					20%		**1.06**
									Overall Total Factored Score (Out of 25) =		**5.87**

				South Tahoe PUD	**Location Description:**	On San Francisco Dr. in the Al Tahoe Neighborhood	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	BVWLHD	**Date:**	2/22/2012
					Wells Facility Name:	Bayview Well	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Heavenly Valley, Keller, Twin Peaks, and Montgomery Estates Zones

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	Yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn	1	3	3	adequate equipment clearances to facilitate routine O&M?	There are adequate clearances for work to be performed
Fn	1	4	4	equipment accessible for removal?	Yes the well is outside under a fake landscaping rock. All internal piping and mechanical would be removed through double doors.
R	1	5	5	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	No site drainage issues
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	Well head is 21" above the floor
R	1	2	2	well electrical controls not in vault?	Well electrical controls are within the building
Fn	1	3	3	well equipped with ability to add chlorination facilities?	Yes
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Sample taps are before and after disinfection
Fn	2	5	10	sample tap non-threaded downed-turned?	Both sample taps are down turned. Tap before chlorination has no threads but the tap after chlorination is a threaded brass nipple.
Fn	3	5	15	bacti sample tap not screened or aerated?	It is not screened or aerated
Fn	1	2	2	well able to be pumped to waste with waste discharge line protected from backflow?	Discharge to lay flat hoses to sanitary sewer with air gap
Fn	1	3	3	well meter provided?	The well has a Siemens mag meter
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Yes
R	1	3	3	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	4	4	16	is site vulnerable to wildfires?	Yes the proximity to the meadow and vacant wooded lots behind increase the vulnerability to wildfires
R	4	4	16	is site close to known active seismic faults?	Closest fault line is 5780 feet away
R	1	2	2	any unstable site conditions (if yes, describe)?	No known unstable site conditions
Fn	1	2	2	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No site fencing around property. The facility was designed to look like a single family dwelling which reduces unauthorized access to the site
Fn	3	2	6	other known problems?	the district has received noise complaints from the adjacent property owners
				Building Structure	
Fn	1	3	3	adequate security measures and monitoring to prevent unauthorized access?	There are intrusion alarms on the doors which are tied to SCADA and monitored by District Operations
INFORMATION	N/A	N/A	N/A	date building was constructed?	2006
PM	1	3	3	condition of exterior coatings adequate to protect structure?	Yes the building is still in like new condition.
Fn	1	4	4	adequate openings for ingress/egress?	There is adequate openings for ingress/egress
Fn	1	3	3	interior lighting adequate for routine O&M?	The lighting is adequate to perform work
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	The building is designed for snow loads
Fn	1	2	2	building meets code compliance requirements?	building meets the building code requirements of 2006
R	3	3	9	known fire or haz-mat conditions that could be mitigated?	There are trees within 10 feet of the structure
Fn	1	4	4	other known problems?	There are no other known problems with the building structure
PM	1	5	5	estimated service life remaining?	24 years based on AWU Useful Life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Byron Jackson
INFORMATION		3	0	pump capacity?	3898gpm @340ft TDH
PM	1	4	4	pump rebuilt (list year) and describe work done?	None since installed
Fe	1	4	4	pump curves available?	Yes
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	No pump and motor failures have occurred since the well was put into production
R	1	2	2	number of service calls/repairs in the last year?	None
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	3513gpm at 105psi and 1716RPM
C	1	3	3	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
PM	5	4	20	coatings adequate to provide corrosion protection?	Coatings on pump could not be evaluated as the pump was in operation but they were installed in 2006
Fe	5	5	25	pumps operate efficiently (>70% bowl efficiency)	insufficient data
R	1	4	4	pumps operate free from excessive vibration?	No concerns with excessive vibration on this pump
Fn	5	2	10	adequate NPSH available to prevent cavitation?	insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	insufficient data
R	3	2	6	spare parts readily available?	No parts for pump in stock. The pump would need to be pulled and the failure part identified and ordered
R	1	5	5	other known problems?	No other known problems with the pump
PM	1	4	4	estimated service life remaining?	24 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	On San Francisco Dr. in the Al Tahoe Neighborhood	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	BVWLHD	**Date:**	2/22/2012
					Wells Facility Name:	Bayview Well	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Heavenly Valley, Keller, Twin Peaks, and Montgomery Estates Zones
				Piping & Valves				
Fn	1	4	4	pipe supports adequate to prevent movement or vibration?	Steel pipe supports that are bolted to the floor and grouted beneath the bolt plates. They are adequate to prevent movement and vibration			
PM	1	5	5	coatings adequate to protect piping and valves?	Yes the coatings are adequate to protect the piping and there were no visual defects on the exterior of the piping			
C	1	3	3	pipes adequately sized to prevent excessive noise or headloss?	Pipes are adequately sized			
Fn	1	2	2	valves are suitable for efficient and reliable service?	Valves are suitable and the District has had no issues with them since they were installed in 2006			
PM	1	4	4	estimated service life remaining?	54 years for steel pipe based on AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	1	3	3	well casing is in good condition?	Yes no issues since construction			
PM	1	3	3	well screen is in good condition?	Yes no issues since construction			
Fe	1	3	3	well-driller's log is available?	Yes			
R	1	4	4	50 ft. sanitary seal?	Yes 170.5 ft.			
R	3	5	15	safe distance from known groundwater contamination hazards (MTBE, TCE, etc.)?	No contaminants have been found in this location, sentinel wells over 2,250 feet away have indicated an MTBE plume			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	2006 during installation			
PM	1	2	2	last year well was redeveloped?	NA built in 2006			
Fn	3	3	9	sounding tube or other means to measure depth to water surface?	yes but calibration info was not available to determine suction HGL			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	?			
PM	1	5	5	estimated service life remaining?	Typical useful life for a well 50 years. 44 yrs remaining useful life			
				Wellhead Treatment				
Fn	1	2	2	chemical storage tanks have secondary containment?	Secondary containment is provided			
Fn	1	2	2	chemical piping/tubing is in good condition?	There are no visual defects in the piping/tubing that supplies the sodium hypochlorite			
Fn	1	3	3	if multiple chemicals used, adequate separation of different chemicals?	NA only one disinfectant			
Fn	3	4	12	adequate equipment for meter-pump calibration?	Do not calibrate pumps unless an issue arises. When this occurs the pump would be replaced with an in stock pump while it was being recalibrated			
Fn	2	5	10	frequency of dose calibration?	The dosage is checked and adjusted daily and when lab provides downstream residuals			
R	2	1	2	spare parts and service support readily available?	Some spare parts are at the well or at the District offices			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Sodium hypochlorite with two tanks at 300gallons each			
				SCADA system				
Fn	1	4	4	pump flow meter is adequate to monitor pump performance?	Yes the Siemens mag meter is hooked up to SCADA			
Fn	2	1	2	flow totals recorded at regular intervals? How frequent?	the flow totals are recorded daily by hand			
Fn	1	2	2	pressure instrumentation is adequate to monitor pump performance?	There are pressure gauges throughout the well that monitor system pressures			
Fn	1	4	4	automated alarm callout for critical failures and reliability?	Yes and it is monitored by District Operations			
Fn	2	4	8	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	2	2	communication system is reliable (approximate no. of comm. failures in last year)?	No communication issues in the last year			
R	4	2	8	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	A portable back up generator would need to be brought to the site in the event of a power outage			
R	1	3	3	spare parts/service support readily available?	Parts are readily available through the manufacturer or at the District offices			
PM	1	4	4	estimated service life remaining?	6 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5	adequate power available to run all equipment	There is adequate power to run all of the equipment			
R	5	5	25	adequate standby power present and reliable?	There is no backup power onsite. A portable generator would need to be mobilized to the site. However, there are no quick hookups for power at this site so wiring the portable generator in would take some additional time			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R	4	5	20	fuel supply adequate for standby power service?	NA			
R	5	3	15	time needed to mobilize portable generator?	Generator could be onsite in a couple of hours depending on the conditions. However, hookup of the portable generator could take additional time			
Fn	1	3	3	known electrical hazards that could be mitigated?	There are no known electrical hazards and Arc Flash assessment and labeling was just completed			
R	1	3	3	spare parts/service support readily available?	Spare parts are readily available at the District offices or through the manufacturer			
PM	1	4	4	estimated service life remaining?	19 years based on AWU Useful Life			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	3898gpm, 340ft, 450hp			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	**Location Description:**	On San Francisco Dr. in the Al Tahoe Neighborhood	**K/J Project Number:** 1270004*00
Water System Optimization Plan	**Wells Facility ID #:**	BVWLHD	**Date:** 2/22/2012
	Wells Facility Name:	Bayview Well	**Condition Assessment Inspectors:** Peter Lavallee and Glenn Roderick
	Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:** Heavenly Valley, Keller, Twin Peaks, and Montgomery Estates Zones

Photo Evidence for PM, Fn, R, FE

PETER - PHOTO ON FAR RIGHT WITH BLUE PIPE WE BELIEVE IT GOES TO ANOTHER WELL SITE AS OTHER PHOTOS SHOW BLACK PIPE - Tim Williams

TIM- IT IS THE LIGHTING IN THE ROOM. PLEASE SEE THE AIR RELEASE IN THE PICTURE JUST NEXT TO IT FOR COMPARISON. I THOUGHT YOU WERE RIGHT TILL I WENT BACK TO THE STATION!

PHOTOS

				South Tahoe PUD	**Location Description:**	Bakersfield Dr.		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Wells Facility ID #:**	BKWL		**Date:**	2/23/2012		
					Wells Facility Name:	Bakersfield Well		**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney		
					Pressure Zones Served:	Arrowhead		**Adjacent Pressure Zones:**	Flagpole, Country Club, Iroquois, and Christmas Valley Zones		
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standard							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.20	1.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	4.60	3.75	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	3.22	1.125	N/A		**4.35**
				Criticality Score					10%		**0.43**
				Well Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.33	2.25	N/A		
				Weighted Final Score (1-25)	N/A	N/A	2.67	8.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	1.87	2.4	N/A		**4.27**
				Criticality Score					5%		**0.21**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.17	2.00	N/A		
				Weighted Final Score (1-25)	6.50	N/A	3.83	6.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.65	N/A	2.3	1.8	N/A		**4.75**
				Criticality Score					5%		**0.24**
				Well Pump							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	Calculated		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	1.00	5.00	1.40	5.00		
				Weighted Final Score (1-25)	12.00	3.00	10.00	3.80	18.33		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Final Score	1.80	0.60	3.00	0.76	2.75		**8.91**
				Criticality Score					15%		**1.34**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	1.00	1.00	N/A	N/A		
				Weighted Final Score (1-25)	9.50	3.00	3.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A		
				Factored Final Score	0.95	1.80	0.90	N/A	N/A		**3.65**
				Criticality Score					10%		**0.37**
				Supply Well - Sanitary Seal, Casing and Screen							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.25	N/A	5.00	3.00	5.00		
				Weighted Final Score (1-25)	12.50	N/A	17.50	14.50	15.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%		
				Factored Final Score	1.25	N/A	8.75	2.90	3.00		**15.90**
				Criticality Score					15%		**2.39**
				Wellhead Treatment							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	3.20	1.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Final Score	N/A	N/A	1.92	0.40	N/A		**2.32**
				Criticality Score					15%		**0.35**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	1.33	N/A		
				Weighted Final Score (1-25)	8.00	N/A	3.33	3.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.80	N/A	2.00	1.00	N/A		**3.80**
				Criticality Score					5%		**0.19**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	1.50	N/A		
				Weighted Final Score (1-25)	8.00	N/A	3.00	6.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Final Score	1.60	N/A	1.80	1.20	N/A		**4.60**
				Criticality Score					20%		**0.92**
									Overall Total Factored Score (Out of 25) =		**6.43**

				South Tahoe PUD	**Location Description:**	Bakersfield Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	BKWL	**Date:**	2/23/2012
					Wells Facility Name:	Bakersfield Well	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Arrowhead	**Adjacent Pressure Zones:**	Flagpole, Country Club, Iroquois, and Christmas Valley Zones

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	Yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn	1	3	3	adequate equipment clearances to facilitate routine O&M?	Yes the facility as no constraints around the equipment
Fn	1	4	4	equipment accessible for removal?	Most items removed through door ways by access to pump and motor for well is removed through a roof hatch by crane which has adequate parking next to the building for set up
R	1	5	5	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	There are no drainage issues at this site
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	The well head is greater than 18" above the finished grade of the floor
R	1	2	2	well electrical controls not in vault?	The well electrical controls are located outside of the vault
Fn	1	3	3	well equipped with ability to add chlorination facilities?	The well is currently equipped to direct inject sodium hypochlorite
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Sample taps are available before and after disinfection
Fn	1	5	5	sample tap non-threaded downed-turned?	sample taps are copper, turned down, and non-threaded
Fn	3	5	15	bacti sample tap not screened or aerated?	bacti sample tap is not screened or aerated
Fn	1	2	2	well able to be pumped to waste with waste discharge line protected from backflow?	The discharge of the well can occur through a hydrant in the front of the parcel by valving the well directly to the hydrant and then lay flat hose to the sanitary sewer system with an air gap. There is also a port just above the wellhead to attach a lay flat hose to flush to the nearest sanitary sewer manhole with an air gap for backflow prevention.
Fn	1	3	3	well meter provided?	The well is metered with a Siemens mag meter
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes the facility has no constraints around the equipment
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Yes
R	2	3	6	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	2	4	8	is site vulnerable to wildfires?	Yes there is vacant forested land across the street from the site that is part of a larger forested area and state park
R	4	4	16	is site close to known active seismic faults?	4,680 ft. to the nearest fault line
R	1	2	2	any unstable site conditions (if yes, describe)?	No known unstable site conditions
Fn	2	2	4	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No site security with minimal lighting. The facility was designed to look like a home which reduces potential for unauthorized access
Fn	1	2	2	other known problems?	No other known problems
				Building Structure	
Fn	2	3	6	adequate security measures and monitoring to prevent unauthorized access?	No intrusion alarms tied to SCADA and building is secured with door lock that utilizes the District Cyber Keys
INFORMATION	N/A	N/A	N/A	date building was constructed?	1994
PM	1	3	3	condition of exterior coatings adequate to protect structure?	The facility was recently painted in 2011 and the paint appears to still be in good condition. The siding is T-111 and the roof is asphalt shingles.
Fn	1	4	4	adequate openings for ingress/egress?	There is adequate ingress and egress
Fn	1	3	3	interior lighting adequate for routine O&M?	The lighting is adequate
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	The building was designed to meet snow load requirements of 1994
Fn	1	2	2	building meets code compliance requirements?	Building meets the code requirements of the constructed date 1994
R	2	3	6	known fire or haz-mat conditions that could be mitigated?	Proximity of the few trees that remain on the lot
Fn	1	4	4	other known problems?	No other known problems with the building structure
PM	2	5	10	estimated service life remaining?	12 years based on AWU Useful Life Table
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Byron Jackson
INFORMATION		3	0	pump capacity?	1290 gpm based on flow test @ 56 Hz
PM	2	4	8	pump rebuilt (list year) and describe work done?	the pump has not been rebuilt since installation
Fe	5	4	20	pump curves available?	Pump Curves are available for review.
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	No know history of pump or motor failures
R	1	2	2	number of service calls/repairs in the last year?	No service calls within the last year
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	1290 gpm
C	1	3	3	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm	5	4	20	coatings adequate to provide corrosion protection?	Pump column pipe is not coated and evaluation of coatings not possible at this time with the pump being submerged within the well
Fe	5	5	25	pumps operate efficiently (>70% bowl efficiency)	insufficient data
R	1	4	4	pumps operate free from excessive vibration?	The pumps operate free from excessive vibration and have not caused a problem at this well.
Fn	5	2	10	adequate NPSH available to prevent cavitation?	insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	insufficient data
R	3	2	6	spare parts readily available?	No parts available in District offices but parts are readily available from the manufacturer
R	1	5	5	other known problems?	No other known problems with pumps and motors
PM	2	4	8	estimated service life remaining?	12 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Bakersfield Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	BKWL	**Date:**	2/23/2012
					Wells Facility Name:	Bakersfield Well	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Arrowhead	**Adjacent Pressure Zones:**	Flagpole, Country Club, Iroquois, and Christmas Valley Zones
				Piping & Valves				
Fn	1	4	4	pipe supports adequate to prevent movement or vibration?	Pipe supports are steel that are bolted to the concrete floor			
PM	3	5	15	coatings adequate to protect piping and valves?	Coating has started flaking and peeling away from the pipe in locations on exterior of pipe. Some rust has started developing. See photos			
C	1	3	3	pipes adequately sized to prevent excessive noise or headloss?	Pipes are adequately sized			
Fn	1	2	2	valves are suitable for efficient and reliable service?	Valves are reliable and in like new condition and are the original installed valves. Coatings on valves also look to be in good condition with no visual defects			
PM	1	4	4	estimated service life remaining?	42 years based on AWU Useful Life Table			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	5	3	15	well casing is in good condition?	insufficient data			
PM	5	3	15	well screen is in good condition?	insufficient data			
Fe	5	3	15	well-driller's log is available?	insufficient data			
R	1	4	4	50 ft. sanitary seal?	Yes 125ft			
R	5	5	25	safe distance from known groundwater contamination hazards (MTBE, TCE, etc.)?	MTBE has been identified as a contaminant in this well and treatment was put in place at this wellhead if the levels rose above the current policy levels. Arsenic is also a potential contaminant in this well.			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	insufficient data			
PM	5	2	10	last year well was redeveloped?	insufficient data			
Fn	5	3	15	sounding tube or other means to measure depth to water surface?	insufficient data			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	insufficient data			
PM	2	5	10	estimated service life remaining?	Typ well 50 yrs. 38 years of remaining useful life			
				Wellhead Treatment				
Fn	1	2	2	chemical storage tanks have secondary containment?	Storage does have secondary containment			
Fn	1	2	2	chemical piping/tubing is in good condition?	chemical piping and tubing is in good condition and bulk sodium hypochlorite storage was added in 2010			
Fn	1	3	3	if multiple chemicals used, adequate separation of different chemicals?	Single chemical treatment			
Fn	1	4	4	adequate equipment for meter-pump calibration?	No calibration is done on the pump other than dosing calibration			
Fn	1	5	5	frequency of dose calibration?	Dose is observed and modified daily			
R	1	1	1	spare parts and service support readily available?	Yes in District offices			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Direct Injection Sodium Hypochlorite with a 300 gal storage tank.			
				SCADA system				
Fn	1	4	4	pump flow meter is adequate to monitor pump performance?	Flow meter is a Siemens mag meter and is adequate			
Fn	1	1	1	flow totals recorded at regular intervals? How frequent?	Flow totals are recorded manually in a log book daily			
Fn	1	2	2	pressure instrumentation is adequate to monitor pump performance?	Yes			
Fn	1	4	4	automated alarm callout for critical failures and reliability?	Yes and is monitored by District operations			
Fn	1	4	4	alarm log maintained and reviewed annually?	Alarm log is maintained but is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	2	2	communication system is reliable (approximate no. of comm. failures in last year)?	No communication errors in the last year have been recorded			
R	1	2	2	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	Permanent backup generator on site			
R	2	3	6	spare parts/service support readily available?	Spare parts are available at the District offices and through the manufacturer			
PM	2	4	8	estimated service life remaining?	Estimated 10 year service life remaining.			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	300kW			
R	1	5	5	adequate power available to run all equipment	There is adequate power to run all equipment			
R	1	5	5	adequate standby power present and reliable?	The standby power was designed to run all equipment within the well building			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	200 gals Diesel			
R	1	5	5	fuel supply adequate for standby power service?	Yes			
INFORMATION	N/A	N/A	N/A	time needed to mobilize portable generator?	NA			
Fn	1	3	3	known electrical hazards that could be mitigated?	No known electrical hazards and the arc flash labels have been placed in this facility			
R	3	3	9	spare parts/service support readily available?	Spare parts are available from the manufacturer			
PM	2	4	8	estimated service life remaining?	7 years based on AWU Useful Life			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	Well Pump: Head=307 feet, 1500gpm, and 150hp			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	Bakersfield Dr.	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	BKWL	Date: 2/23/2012
	Wells Facility Name:	Bakersfield Well	Condition Assessment Inspectors: Peter Lavallee and Phill Torney
	Pressure Zones Served:	Arrowhead	Adjacent Pressure Zones: Flagpole, Country Club, Iroquois, and Christmas Valley Zones

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Corner of Arrowhead Ave. and Hopi Ave, 1961 Arrowhead Ave	**K/J Project Number:**	1270004*00			
				Water System Optimization Plan	**Wells Facility ID #:**	ARHDWL3	**Date:**	3/8/2012			
					Wells Facility Name:	Arrowhead Well #3	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray			
					Pressure Zones Served:	Arrowhead Zone	**Adjacent Pressure Zones:**	Christmas Valley, Iroquois, and Country Club Zones			
				Notes:			**Failure Mode Scoring (1 - 5)**				
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standard							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.40	1.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	5.60	3.75	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	3.92	1.125	N/A		**5.05**
				Criticality Score					10%		**0.50**
				Well Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	2.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	2.00	7.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	1.4	2.1	N/A		**3.50**
				Criticality Score					5%		**0.18**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	5.50	N/A	3.33	3.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.55	N/A	2	0.9	N/A		**3.45**
				Criticality Score					5%		**0.17**
				Well Pump							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	Calculated		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	1.00	5.00	1.40	3.67		
				Weighted Final Score (1-25)	16.00	3.00	10.00	3.80	13.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Final Score	2.40	0.60	3.00	0.76	1.95		**8.71**
				Criticality Score					15%		**1.31**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.50	3.00	3.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A		
				Factored Final Score	0.45	1.80	0.90	N/A	N/A		**3.15**
				Criticality Score					10%		**0.32**
				Supply Well - Sanitary Seal, Casing and Screen							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	N/A	5.00	3.00	5.00		
				Weighted Final Score (1-25)	11.25	N/A	17.50	14.50	15.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%		
				Factored Final Score	1.13	N/A	8.75	2.90	3.00		**15.78**
				Criticality Score					15%		**2.37**
				Wellhead Treatment							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	1.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	5.25	1.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Final Score	N/A	N/A	3.15	0.40	N/A		**3.55**
				Criticality Score					15%		**0.53**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.00	N/A		
				Weighted Final Score (1-25)	8.00	N/A	3.33	4.67	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.80	N/A	2.00	1.40	N/A		**4.20**
				Criticality Score					5%		**0.21**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	3.25	N/A		
				Weighted Final Score (1-25)	8.00	N/A	3.00	12.75	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Final Score	1.60	N/A	1.80	2.55	N/A		**5.95**
				Criticality Score					20%		**1.19**
									Overall Total Factored Score (Out of 25) =		**6.77**

				South Tahoe PUD	**Location Description:**	Corner of Arrowhead Ave. and Hopi Ave, 1961 Arrowhead Ave	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	ARHDWL3	**Date:**	3/8/2012
					Wells Facility Name:	Arrowhead Well #3	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Arrowhead Zone	**Adjacent Pressure Zones:**	Christmas Valley, Iroquois, and Country Club Zones

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	Yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn	1	3	3	adequate equipment clearances to facilitate routine O&M?	Yes
Fn	1	4	4	equipment accessible for removal?	Yes, the well is a pitless adapter so all removal occurs outside
R	1	5	5	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	Yes
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	Yes
R	1	2	2	well electrical controls not in vault?	Within building
Fn	1	3	3	well equipped with ability to add chlorination facilities?	Chlorination is currently onsite
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Yes
Fn	1	5	5	sample tap non-threaded downed-turned?	Yes they are non-threaded and turned down in the well house and arsenic treatment facility
Fn	5	5	25	bacti sample tap not screened or aerated?	Yes the bacti sample tap is not screened or aerated
Fn	1	2	2	well able to be pumped to waste with waste discharge line protected from backflow?	There is a discharge tank which is separated by an air gap and the water goes into the sewer
Fn	1	3	3	well meter provided?	Yes
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Yes
R	2	3	6	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	1	4	4	is site vulnerable to wildfires?	No
R	4	4	16	is site close to known active seismic faults?	4,600 feet to the nearest fault
R	1	2	2	any unstable site conditions (if yes, describe)?	None
Fn	1	2	2	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	The site is completely fenced and there have been no issues with unauthorized
Fn	1	2	2	other known problems?	None
				Building Structure	Multiple structures. Well Building, Valve Building, Arsenic Treatment, MTBE Treatment, and Waste Tank
Fn	1	3	3	adequate security measures and monitoring to prevent unauthorized access?	The facility is locked and the District has had no issues with unauthorized access into the facility
INFORMATION	N/A	N/A	N/A	date building was constructed?	Well and valve house in 2002, Arsenic in 2009
PM	2	3	6	condition of exterior coatings adequate to protect structure?	Arsenic treatment building is new in 2009 and the exterior coatings are great, Well building is wood exterior and the coatings are starting to fail., the valve building is a metal building with no coating issues. The waste tank coatings are in excellent condition.
Fn	1	4	4	adequate openings for ingress/egress?	Multiple entry and exit points
Fn	1	3	3	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	Met the requirements for its construction date
Fn	1	2	2	building meets code compliance requirements?	Building met requirements of the code for when it was constructed
R	1	3	3	known fire or haz-mat conditions that could be mitigated?	None in any of the buildings
Fn	1	4	4	other known problems?	None
PM	1	5	5	estimated service life remaining?	20 years for well and valve house, 27years for arsenic treatment building
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Gould
INFORMATION		3	0	pump capacity?	394 gpm based on flow test
PM	5	4	20	pump rebuilt (list year) and describe work done?	insufficient data
Fe	1	4	4	pump curves available?	Pump curves are now available
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	2	2	number of service calls/repairs in the last year?	None
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	394 gpm based on flow test
C	1	3	3	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm	5	4	20	coatings adequate to provide corrosion protection?	Pump coatings are unavailable since the pump was not pulled
Fe	5	5	25	pumps operate efficiently (>70% bowl efficiency)	very high specific energy @ 2747 kW-hr/Mgal
R	1	4	4	pumps operate free from excessive vibration?	Yes
Fn	5	2	10	adequate NPSH available to prevent cavitation?	insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	insufficient data
R	3	2	6	spare parts readily available?	Parts are available from the manufacturer and the pump would need to be sent in to be rebuilt
R	1	5	5	other known problems?	None
PM	2	4	8	estimated service life remaining?	20 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Corner of Arrowhead Ave. and Hopi Ave, 1961 Arrowhead Ave	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	ARHDWL3	**Date:**	3/8/2012
					Wells Facility Name:	Arrowhead Well #3	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Arrowhead Zone	**Adjacent Pressure Zones:**	Christmas Valley, Iroquois, and Country Club Zones
				Piping & Valves				
Fn	1	4	4	pipe supports adequate to prevent movement or vibration?	Steel Supports that are bolted to the concrete floor.			
PM	1	5	5	coatings adequate to protect piping and valves?	Coatings are in excellent condition with no visible defects in the valve house, the well house, and the arsenic treatment facility			
C	1	3	3	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	2	2	valves are suitable for efficient and reliable service?	Yes and no problems have been documented			
PM	1	4	4	estimated service life remaining?	52 years based on AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	5	3	15	well casing is in good condition?	insufficient data			
PM	5	3	15	well screen is in good condition?	insufficient data			
Fe	5	3	15	well-driller's log is available?	insufficient data			
R	1	4	4	50 ft. sanitary seal?	Yes it is 240'			
R	5	5	25	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	The facility currently treats Arsenic and there is an MTBE treatment facility also. No other contaminates have been identified at this point.			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	insufficient data			
PM	5	2	10	last year well was redeveloped?	insufficient data			
Fn	5	3	15	sounding tube or other means to measure depth to water surface?	insufficient data			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	insufficient data			
PM	1	5	5	estimated service life remaining?	Typ useful life 50 yrs. 40 yrs remaining useful life			
				Wellhead Treatment				
Fn	5	2	10	chemical storage tanks have secondary containment?	None			
Fn	1	2	2	chemical piping/tubing is in good condition?	Tubing is in good condition with no visible defects			
INFORMATION	N/A	N/A	N/A	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn	1	4	4	adequate equipment for meter-pump calibration?	Yes			
Fn	1	5	5	frequency of dose calibration?	Daily when in operation			
R	1	1	1	spare parts and service support readily available?	Yes			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Sodium Hypochlorite with direct injection. 30 gal drums on site			
				SCADA system				
Fn	1	4	4	pump flow meter is adequate to monitor pump performance?	Yes the flow meter is hooked up to SCADA			
Fn	1	1	1	flow totals recorded at regular intervals? How frequent?	the flow totals are recorded daily by hand			
Fn	1	2	2	pressure instrumentation is adequate to monitor pump performance?	There are pressure gauges throughout the well that monitor system pressures			
Fn	1	4	4	automated alarm callout for critical failures and reliability?	Yes and it is monitored by District Operations			
Fn	1	4	4	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	2	2	communication system is reliable (approximate no. of comm. failures in last year)?	No communication issues in the last year			
R	3	2	6	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	No backup power and no hookups for a portable generator multiple ways to feed without this well in service			
R	2	3	6	spare parts/service support readily available?	Parts are readily available through the manufacturer or at the District offices			
PM	2	4	8	estimated service life remaining?	Estimated 10 years service life left			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5	adequate power available to run all equipment	Yes			
R	5	5	25	adequate standby power present and reliable?	NA			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
INFORMATION	N/A	N/A	N/A	fuel supply adequate for standby power service?	NA			
R	5	3	15	time needed to mobilize portable generator?	1-2 hours depending on outside conditions but no hookups on site			
Fn	1	3	3	known electrical hazards that could be mitigated?	None			
R	2	3	6	spare parts/service support readily available?	Yes at District Plant			
PM	2	4	8	estimated service life remaining?	15 years based on AWU Useful Life			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	There is a booster pump in the well house that is a sterling centrifugal pump with a 60Hp motor			
					This well is currently in lag to Bakersfield and South Upper Truckee. It is run only to keep the well fresh on Wednesdays.			
					The well house also has a surge tank which is in good condition with no visible defects			
					Piping in valve house has been disconnected and is no longer and service			
					Arsenic treatment system is off because the media needs to be replaced			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	**Location Description:**	Corner of Arrowhead Ave. and Hopi Ave, 1961 Arrowhead Ave	**K/J Project Number:** 1270004*00
Water System Optimization Plan	**Wells Facility ID #:**	ARHDWL3	**Date:** 3/8/2012
	Wells Facility Name:	Arrowhead Well #3	**Condition Assessment Inspectors:** Peter Lavallee and Mark Gray
	Pressure Zones Served:	Arrowhead Zone	**Adjacent Pressure Zones:** Christmas Valley, Iroquois, and Country Club Zones

Photo Evidence for PM, Fn, R, FE

PHOTOS




















				South Tahoe PUD	**Location Description:**	Corner of Egret and South Upper Truckee Rd.	**K/J Project Number:**	1270004*00			
				Water System Optimization Plan	**Wells Facility ID #:**	3658101	**Date:**	3/12/2012			
					Wells Facility Name:	So. Upper Truckee Well #3	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney			
					Pressure Zones Served:	Christmas Valley Zone	**Adjacent Pressure Zones:**	Arrowhead Zone			
				Notes:							
				1. Capacity score will be based on hydraulic model			**Failure Mode Scoring (1 - 5)**				
				2. For Reliabilty to be determined based on CMMS maintenance records	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				3. For Criticality Weighting Factors to be determined at District Workshop			**functionality**	**reliability**			
					1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standard							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.40	1.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	5.60	3.75	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	3.92	1.125	N/A		**5.05**
				Criticality Score					10%		**0.50**
				Well Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.33	2.25	N/A		
				Weighted Final Score (1-25)	N/A	N/A	2.67	8.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	1.87	2.4	N/A		**4.27**
				Criticality Score					5%		**0.21**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.33	3.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.4	N/A	2	0.9	N/A		**3.30**
				Criticality Score					5%		**0.17**
				Well Pump							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	Calculated		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.67	1.00	5.00	1.40	5.00		
				Weighted Final Score (1-25)	14.67	3.00	10.00	3.80	18.33		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Final Score	2.20	0.60	3.00	0.76	2.75		**9.31**
				Criticality Score					15%		**1.40**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.50	3.00	3.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A		
				Factored Final Score	0.45	1.80	0.90	N/A	N/A		**3.15**
				Criticality Score					10%		**0.32**
				Supply Well - Sanitary Seal, Casing and Screen							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	N/A	5.00	3.00	5.00		
				Weighted Final Score (1-25)	11.25	N/A	17.50	14.50	15.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%		
				Factored Final Score	1.13	N/A	8.75	2.90	3.00		**15.78**
				Criticality Score					15%		**2.37**
				Wellhead Treatment							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	3.25	1.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Final Score	N/A	N/A	1.95	0.40	N/A		**2.35**
				Criticality Score					15%		**0.35**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	1.33	N/A		
				Weighted Final Score (1-25)	8.00	N/A	3.33	3.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.80	N/A	2.00	1.00	N/A		**3.80**
				Criticality Score					5%		**0.19**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	1.40	N/A		
				Weighted Final Score (1-25)	8.00	N/A	3.00	5.80	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Final Score	1.60	N/A	1.80	1.16	N/A		**4.56**
				Criticality Score					20%		**0.91**
									Overall Total Factored Score (Out of 25) =		**6.42**

				South Tahoe PUD	**Location Description:**	Corner of Egret and South Upper Truckee Rd.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	3658101	**Date:**	3/12/2012
					Wells Facility Name:	So. Upper Truckee Well #3	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Christmas Valley Zone	**Adjacent Pressure Zones:**	Arrowhead Zone

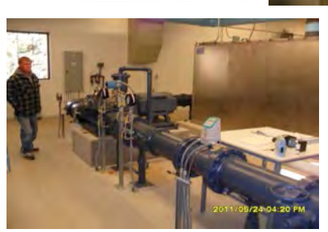
Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	Yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn	1	3	3	adequate equipment clearances to facilitate routine O&M?	Yes
Fn	1	4	4	equipment accessible for removal?	Yes
R	1	5	5	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	No drainage issues
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	Yes
R	1	2	2	well electrical controls not in vault?	Not in vault but in building
Fn	1	3	3	well equipped with ability to add chlorination facilities?	There are chlorination facilities
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Yes
Fn	1	5	5	sample tap non-threaded downed-turned?	Non-threaded and turned down
Fn	5	5	25	bacti sample tap not screened or aerated?	IT is not screened or aerated
Fn	1	2	2	well able to be pumped to waste with waste discharge line protected from backflow?	Dedicated waste discharge
Fn	1	3	3	well meter provided?	Yes
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Yes
R	2	3	6	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	2	4	8	is site vulnerable to wildfires?	This site is near open wooded lots
R	4	4	16	is site close to known active seismic faults?	875 ft. from the nearest fault
R	1	2	2	any unstable site conditions (if yes, describe)?	None
Fn	2	2	4	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No site security but there are no issues of unauthorized access
Fn	1	2	2	other known problems?	None
				Building Structure	
Fn	1	3	3	adequate security measures and monitoring to prevent unauthorized access?	All of the doors are locked
INFORMATION	N/A	N/A	N/A	date building was constructed?	2004
PM	1	3	3	condition of exterior coatings adequate to protect structure?	Excellent condition with no visible defects.
Fn	1	4	4	adequate openings for ingress/egress?	There are numerous doors
Fn	1	3	3	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	It meets the snow loads at the time of construction
Fn	1	2	2	building meets code compliance requirements?	It met the building codes at the time of construction
R	1	3	3	known fire or haz-mat conditions that could be mitigated?	None
Fn	1	4	4	other known problems?	None
PM	1	5	5	estimated service life remaining?	22 years based on AWU Useful life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Byron Jackson
INFORMATION		3	0	pump capacity?	1400 gpm @85 ft. 1400 gpm @ 233 ft. with booster
PM	3	4	12	pump rebuilt (list year) and describe work done?	Never
Fe	5	4	20	pump curves available?	Pump Curves are available
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	2	2	number of service calls/repairs in the last year?	None
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	flow control valve limited output to 620 gpm, which resulted in extreme high specific energy 3,300 kW-hr/Mgal
C	1	3	3	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm	5	4	20	coatings adequate to provide corrosion protection?	Pump is submerged and not pulled to be evaluated
Fe	5	5	25	pumps operate efficiently (>70% bowl efficiency)	very poor energy efficiency
R	1	4	4	pumps operate free from excessive vibration?	Yes
Fn	5	2	10	adequate NPSH available to prevent cavitation?	insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	insufficient data
R	3	2	6	spare parts readily available?	Parts would need to be ordered from the supplier
R	1	5	5	other known problems?	None
PM	3	4	12	estimated service life remaining?	37 years based on AWU Useful Life (rh) reduced service life due to potential for recirculation. Should pull pump every 5 yrs to examine for damage caused by recirculation at low flows

				South Tahoe PUD	**Location Description:**	Corner of Egret and South Upper Truckee Rd.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	3658101	**Date:**	3/12/2012
					Wells Facility Name:	So. Upper Truckee Well #3	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Christmas Valley Zone	**Adjacent Pressure Zones:**	Arrowhead Zone
				Piping & Valves				
Fn	1	4	4	pipe supports adequate to prevent movement or vibration?	Steel Supports that are bolted to the floor			
PM	1	5	5	coatings adequate to protect piping and valves?	Coatings are in excellent condition with no visible signs of deterioration			
C	1	3	3	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	2	2	valves are suitable for efficient and reliable service?	Yes			
PM	1	4	4	estimated service life remaining?	52 years based on AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	5	3	15	well casing is in good condition?	insufficient data			
PM	5	3	15	well screen is in good condition?	insufficient data			
Fe	5	3	15	well-driller's log is available?	insufficient data			
R	1	4	4	50 ft. sanitary seal?	Yes it is 56 feet			
R	5	5	25	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	No known contaminates but there is a CO2 air stripper to reduce the corrosivity of the water from the well			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	insufficient data			
PM	5	2	10	last year well was redeveloped?	insufficient data			
Fn	5	3	15	sounding tube or other means to measure depth to water surface?	insufficient data			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	insufficient data			
PM	1	5	5	estimated service life remaining?	Typ useful life 50 yrs. 42 yrs remaining useful life			
				Wellhead Treatment				
Fn	1	2	2	chemical storage tanks have secondary containment?	Yes			
Fn	1	2	2	chemical piping/tubing is in good condition?	Yes			
INFORMATION	N/A	N/A	N/A	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn	1	4	4	adequate equipment for meter-pump calibration?	Yes			
Fn	1	5	5	frequency of dose calibration?	Daily when in use			
R	1	1	1	spare parts and service support readily available?	Yes			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Sodium Hypochlorite 300 gal Tank			
				SCADA system				
Fn	1	4	4	pump flow meter is adequate to monitor pump performance?	Yes the flow meter is hooked up to SCADA			
Fn	1	1	1	flow totals recorded at regular intervals? How frequent?	the flow totals are recorded daily by hand			
Fn	1	2	2	pressure instrumentation is adequate to monitor pump performance?	There are pressure gauges throughout the well that monitor system pressures			
Fn	1	4	4	automated alarm callout for critical failures and reliability?	Yes and it is monitored by District Operations			
Fn	1	4	4	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	2	2	communication system is reliable (approximate no. of comm. failures in last year)?	No communication issues in the last year			
R	1	2	2	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	There is a backup generator onsite and there are portable hookups also			
R	2	3	6	spare parts/service support readily available?	Parts are readily available through the manufacturer or at the District offices			
PM	2	4	8	estimated service life remaining?	4 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	289kW			
R	1	5	5	adequate power available to run all equipment	Yes			
R	2	5	10	adequate standby power present and reliable?	Adequate to supply power but the facility needs to be operated in hand mode in order to not overload the generator all at once			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	250gal			
R	1	5	5	fuel supply adequate for standby power service?	Yes			
R	N/A	N/A	N/A	time needed to mobilize portable generator?	NA			
Fn	1	3	3	known electrical hazards that could be mitigated?	None			
R	3	3	9	spare parts/service support readily available?	Through the manufacturer or supplier			
PM	2	4	8	estimated service life remaining?	17 years based on AWU Useful Life			
				Additional Data	This well is only run on Wednesdays in the winter time to keep it fresh it is on full time \in the summer time			
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	1400 gpm @ 85ft, 50hp			
				Booster Pump	Aurora Pump, Centrifugal, 400gpm, 33 feet, 125 Hp			
					CO2 Strippers, Water is pumped from well to tanks and then boosted out of the tanks to the system			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	Corner of Egret and South Upper Truckee Rd.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	3658101	**Date:**	3/12/2012
					Wells Facility Name:	So. Upper Truckee Well #3	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Christmas Valley Zone	**Adjacent Pressure Zones:**	Arrowhead Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS



				South Tahoe PUD	**Location Description:**	On Bel Aire Cir		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Wells Facility ID #:**	ECWLHD		**Date:**	3/8/2012		
					Wells Facility Name:	Elks Club Well #2		**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray		
					Pressure Zones Served:	Country Club Zone		**Adjacent Pressure Zones:**	Stateline		
				Notes:			**Failure Mode Scoring (1 - 5)**				
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standard							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.40	1.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	5.60	3.75	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	3.92	1.125	N/A		**5.05**
				Criticality Score					10%		**0.50**
				Well Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	2.50	N/A		
				Weighted Final Score (1-25)	N/A	N/A	2.00	9.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	1.4	2.7	N/A		**4.10**
				Criticality Score					5%		**0.21**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	3.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.33	9.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.4	N/A	2	2.7	N/A		**5.10**
				Criticality Score					5%		**0.26**
				Well Pump							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	Calculated		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.67	1.00	5.00	1.40	5.00		
				Weighted Final Score (1-25)	14.67	3.00	10.00	3.80	18.33		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Final Score	2.20	0.60	3.00	0.76	2.75		**9.31**
				Criticality Score					15%		**1.40**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.50	3.00	3.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A		
				Factored Final Score	0.45	1.80	0.90	N/A	N/A		**3.15**
				Criticality Score					10%		**0.32**
				Supply Well - Sanitary Seal, Casing and Screen							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	N/A	5.00	1.00	5.00		
				Weighted Final Score (1-25)	11.25	N/A	17.50	4.50	15.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%		
				Factored Final Score	1.13	N/A	8.75	0.90	3.00		**13.78**
				Criticality Score					15%		**2.07**
				Wellhead Treatment							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.60	1.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	4.20	1.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Final Score	N/A	N/A	2.52	0.40	N/A		**2.92**
				Criticality Score					15%		**0.44**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	1.33	N/A		
				Weighted Final Score (1-25)	8.00	N/A	3.33	3.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.80	N/A	2.00	1.00	N/A		**3.80**
				Criticality Score					5%		**0.19**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.00	4.20	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Final Score	0.80	N/A	1.80	0.84	N/A		**3.44**
				Criticality Score					20%		**0.69**
									Overall Total Factored Score (Out of 25) =		**6.06**

				South Tahoe PUD	**Location Description:**	On Bel Aire Cir	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	ECWLHD	**Date:**	3/8/2012
					Wells Facility Name:	Elks Club Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Stateline

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	yes
Fn	1	3	3	adequate equipment clearances to facilitate routine O&M?	Yes
Fn	1	4	4	equipment accessible for removal?	Yes, the well is a pitless adapter so all removal occurs outside
R	1	5	5	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	Yes
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	Yes
R	1	2	2	well electrical controls not in vault?	Within building
Fn	1	3	3	well equipped with ability to add chlorination facilities?	Chlorination is currently onsite
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Yes
Fn	1	5	5	sample tap non-threaded downed-turned?	Non threaded and downturned copper
Fn	5	5	25	bacti sample tap not screened or aerated?	Not screened or aerated
Fn	1	2	2	well able to be pumped to waste with waste discharge line protected from backflow?	Connection to a lay flat hose and then out to a sewer manhole
Fn	1	3	3	well meter provided?	Yes
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Yes
R	2	3	6	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	3	4	12	is site vulnerable to wildfires?	Site is adjacent to a meadow and there is a potential for wildfires
R	4	4	16	is site close to known active seismic faults?	9,288 ft. from the nearest fault
R	1	2	2	any unstable site conditions (if yes, describe)?	None
Fn	1	2	2	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	The site as a single fence on the back side of the parcel. The District has not had issues with unauthorized access
Fn	1	2	2	other known problems?	None
				Building Structure	The ceiling in the generator room has a hole in it which insulation is falling through
Fn	1	3	3	adequate security measures and monitoring to prevent unauthorized access?	The facility is locked and the District has had no issues with unauthorized access into the facility
INFORMATION	N/A	N/A	N/A	date building was constructed?	2003 addition to existing well and drilled new well
PM	1	3	3	condition of exterior coatings adequate to protect structure?	Block building with paint which is in good condition. The metal roof is also in good condition.
Fn	1	4	4	adequate openings for ingress/egress?	Multiple entry and exit points
Fn	1	3	3	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	Met the requirements for its construction date
Fn	1	2	2	building meets code compliance requirements?	Building met requirements of the code for when it was constructed
R	3	3	9	known fire or haz-mat conditions that could be mitigated?	Proximity to the meadow but no mitigation has occurred
Fn	1	4	4	other known problems?	None
PM	1	5	5	estimated service life remaining?	21 years according to AWU Useful Life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Byron Jackson
INFORMATION		3	0	pump capacity?	425gpm (rh) well output was 275 gpm during flow test
PM	5	4	20	pump rebuilt (list year) and describe work done?	Not since installation (2004)
Fe	5	4	20	pump curves available?	Pump curves are available
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	2	2	number of service calls/repairs in the last year?	None
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	275 gpm based on flow test
C	1	3	3	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm	5	4	20	coatings adequate to provide corrosion protection?	Pump coatings are unavailable since the pump was not pulled
Fe	5	5	25	pumps operate efficiently (>70% bowl efficiency)	insufficient data
R	1	4	4	pumps operate free from excessive vibration?	Yes
Fn	5	2	10	adequate NPSH available to prevent cavitation?	insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	insufficient data
R	3	2	6	spare parts readily available?	Parts are available from the manufacturer and the pump would need to be sent in to be rebuilt
R	1	5	5	other known problems?	None
PM	1	4	4	estimated service life remaining?	21 Years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	On Bel Aire Cir	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	ECWLHD	**Date:**	3/8/2012
					Wells Facility Name:	Elks Club Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Stateline
				Piping & Valves				
Fn	1	4	4	pipe supports adequate to prevent movement or vibration?	Steel Supports that are bolted to the concrete floor.			
PM	1	5	5	coatings adequate to protect piping and valves?	Coatings are in excellent condition with no viable defects			
C	1	3	3	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	2	2	valves are suitable for efficient and reliable service?	Yes and no problems have been documented			
PM	1	4	4	estimated service life remaining?	51 Years based on AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	5	3	15	well casing is in good condition?	insufficient data			
PM	5	3	15	well screen is in good condition?	insufficient data			
Fe	5	3	15	well-driller's log is available?	insufficient data			
R	1	4	4	50 ft. sanitary seal?	Yes it is 96ft			
R	1	5	5	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	None			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	insufficient data			
PM	5	2	10	last year well was redeveloped?	insufficient data			
Fn	5	3	15	sounding tube or other means to measure depth to water surface?	insufficient data			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	insufficient data			
PM	1	5	5	estimated service life remaining?	Typ useful life 50 yrs. 41 yrs remaining useful life			
				Wellhead Treatment				
Fn	5	2	10	chemical storage tanks have secondary containment?	None			
Fn	1	2	2	chemical piping/tubing is in good condition?	Tubing is in good condition with no visible defects			
Fn	N/A	3	N/A	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn	1	4	4	adequate equipment for meter-pump calibration?	Yes			
Fn	1	5	5	frequency of dose calibration?	Daily when in operation			
R	1	1	1	spare parts and service support readily available?	Yes			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Sodium Hypochlorite with direct injection. 30 gal drums on site			
				SCADA system				
Fn	1	4	4	pump flow meter is adequate to monitor pump performance?	Yes the flow meter is hooked up to SCADA			
Fn	1	1	1	flow totals recorded at regular intervals? How frequent?	the flow totals are recorded daily by hand			
Fn	1	2	2	pressure instrumentation is adequate to monitor pump performance?	There are pressure gauges throughout the well that monitor system pressures			
Fn	1	4	4	automated alarm callout for critical failures and reliability?	Yes and it is monitored by District Operations			
Fn	1	4	4	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	2	2	communication system is reliable (approximate no. of comm. failures in last year)?	No communication issues in the last year			
R	1	2	2	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	There is a backup generator onsite and there are portable hookups also			
R	2	3	6	spare parts/service support readily available?	Parts are readily available through the manufacturer or at the District offices			
PM	2	4	8	estimated service life remaining?	6 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	100kW			
R	1	5	5	adequate power available to run all equipment	Yes			
R	1	5	5	adequate standby power present and reliable?	Yes			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	250gal			
R	1	5	5	fuel supply adequate for standby power service?	Yes			
R	N/A	N/A	N/A	time needed to mobilize portable generator?	NA			
Fn	1	3	3	known electrical hazards that could be mitigated?	None			
R	2	3	6	spare parts/service support readily available?	Yes at District Plant			
PM	1	4	4	estimated service life remaining?	16 Years according to AWU Useful Life			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	425 gpm, 50hp			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	On Bel Aire Cir	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	ECWLHD	Date: 3/8/2012
	Wells Facility Name:	Elks Club Well #2	Condition Assessment Inspectors: Peter Lavallee and Mark Gray
	Pressure Zones Served:	Country Club Zone	Adjacent Pressure Zones: Stateline

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Hwy 89 at corner with Valhalla Access Road		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Wells Facility ID #:**	VHWL		**Date:**	3/13/2012		
					Wells Facility Name:	Valhalla Well		**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale		
					Pressure Zones Served:	Gardner Mountain or Stateline Zone depending on valving		**Adjacent Pressure Zones:**	Stateline depending on valving		
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standard							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.50	1.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	5.90	3.75	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	4.13	1.125	N/A		**5.26**
				Criticality Score					10%		**0.53**
				Well Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.33	2.25	N/A		
				Weighted Final Score (1-25)	N/A	N/A	4.67	8.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	3.27	2.4	N/A		**5.67**
				Criticality Score					5%		**0.28**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	6.50	N/A	3.33	3.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.65	N/A	2	0.9	N/A		**3.55**
				Criticality Score					5%		**0.18**
				Well Pump							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	5.00	5.00	1.80	3.67		
				Weighted Final Score (1-25)	4.00	15.00	10.00	4.60	13.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Final Score	0.60	3.00	3.00	0.92	1.95		**9.47**
				Criticality Score					15%		**1.42**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	1.00	1.00	N/A	N/A		
				Weighted Final Score (1-25)	9.50	3.00	3.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A		
				Factored Final Score	0.95	1.80	0.90	N/A	N/A		**3.65**
				Criticality Score					10%		**0.37**
				Supply Well - Sanitary Seal, Casing and Screen							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.25	N/A	5.00	0.50	5.00		
				Weighted Final Score (1-25)	12.50	N/A	17.50	2.00	15.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%		
				Factored Final Score	1.25	N/A	8.75	0.40	3.00		**13.40**
				Criticality Score					15%		**2.01**
				Wellhead Treatment							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.60	1.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	4.20	1.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Final Score	N/A	N/A	2.52	0.40	N/A		**2.92**
				Criticality Score					15%		**0.44**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	1.33	N/A		
				Weighted Final Score (1-25)	8.00	N/A	3.33	3.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.80	N/A	2.00	1.00	N/A		**3.80**
				Criticality Score					5%		**0.19**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	1.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	3.00	4.20	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Final Score	0.80	N/A	1.80	0.84	N/A		**3.44**
				Criticality Score					20%		**0.69**
									Overall Total Factored Score (Out of 25) =		**6.10**

				South Tahoe PUD	**Location Description:**	Hwy 89 at corner with Valhalla Access Road	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	VHWL	**Date:**	3/13/2012
					Wells Facility Name:	Valhalla Well	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Gardner Mountain or Stateline Zone depending on valving	**Adjacent Pressure Zones:**	Stateline depending on valving

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	Yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn	2	3	6	adequate equipment clearances to facilitate routine O&M?	Working from one side is adequate the piping is close to the south wall
Fn	1	4	4	equipment accessible for removal?	Yes
R	1	5	5	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	There are no issues with site drainage
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	Yes
R	1	2	2	well electrical controls not in vault?	Controls are in the building and not in the vault
Fn	1	3	3	well equipped with ability to add chlorination facilities?	Well has chlorination
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Sample taps are installed before and after disinfection
Fn	1	5	5	sample tap non-threaded downed-turned?	Non threaded and turned down on both
Fn	5	5	25	bacti sample tap not screened or aerated?	It is neither screened nor aerated
Fn	1	2	2	well able to be pumped to waste with waste discharge line protected from backflow?	Fittings to take the well to a manhole to discharge without entering the distribution system
Fn	1	3	3	well meter provided?	Yes
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	There is adequate vehicle access for maintenance and a vacant District lot behind the station
R	2	3	6	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	2	4	8	is site vulnerable to wildfires?	Yes adjacent to open wooded space
R	4	4	16	is site close to known active seismic faults?	2,328 ft. to the nearest fault
R	1	2	2	any unstable site conditions (if yes, describe)?	None
Fn	5	2	10	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	There is no fence around the site
Fn	1	2	2	other known problems?	None
				Building Structure	
Fn	1	3	3	adequate security measures and monitoring to prevent unauthorized access?	Doors are locked and keyed for District personnel. No known unauthorized access has occurred
INFORMATION	N/A	N/A	N/A	date building was constructed?	1999
PM	1	3	3	condition of exterior coatings adequate to protect structure?	Block building is in good condition with no issues seen
Fn	1	4	4	adequate openings for ingress/egress?	Single point of ingress/egress
Fn	1	3	3	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	Yes it met the loadings at the time of construction
Fn	1	2	2	building meets code compliance requirements?	Met requirements at time of construction
R	1	3	3	known fire or haz-mat conditions that could be mitigated?	None
Fn	1	4	4	other known problems?	None
PM	2	5	10	estimated service life remaining?	12 years according to AWU Useful Life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Grundfos
INFORMATION		3	0	pump capacity?	well output was 730 gpm during flow test - pump operated at reduced speed (49.2 Hz)
PM	1	4	4	pump rebuilt (list year) and describe work done?	2012
Fe	1	4	4	pump curves available?	Pump Curve Available
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	Pump new in 2012
R	1	2	2	number of service calls/repairs in the last year?	Pump new in 2012
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	well output was 730 gpm during flow test - pump operated at reduced speed (49.2 Hz)
C	5	3	15	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm	1	4	4	coatings adequate to provide corrosion protection?	Pump new in 2012
Fe	5	5	25	coatings adequate to provide corrosion protection?	insufficient data
R	1	4	4	pumps operate free from excessive vibration?	Yes
Fn	5	2	10	adequate NPSH available to prevent cavitation?	insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	insufficient data
R	5	2	10	spare parts readily available?	Spare parts would need to be ordered from the manufacturer
R	1	5	5	other known problems?	None
PM	1	4	4	estimated service life remaining?	30 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Hwy 89 at corner with Valhalla Access Road	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	VHWL	**Date:**	3/13/2012
					Wells Facility Name:	Valhalla Well	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Gardner Mountain or Stateline Zone depending on valving	**Adjacent Pressure Zones:**	Stateline depending on valving
				Piping & Valves				
Fn	1	4	4	pipe supports adequate to prevent movement or vibration?	Steel supports			
PM	3	5	15	coatings adequate to protect piping and valves?	Some coatings have worn off and some rust is visible on some of the components			
C	1	3	3	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	2	2	valves are suitable for efficient and reliable service?	Yes			
PM	1	4	4	estimated service life remaining?	47 years based on AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	5	3	15	well casing is in good condition?	insufficient data			
PM	5	3	15	well screen is in good condition?	insufficient data			
Fe	5	3	15	well-driller's log is available?	insufficient data			
R	1	4	4	50 ft. sanitary seal?	yes it is 100ft			
R		5	0	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	None			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	insufficient data			
PM	5	2	10	last year well was redeveloped?	insufficient data			
Fn	5	3	15	sounding tube or other means to measure depth to water surface?	insufficient data			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	insufficient data			
PM	2	5	10	estimated service life remaining?	Typ useful life 50 yrs. 37 yrs remaining useful life			
				Wellhead Treatment				
Fn	5	2	10	chemical storage tanks have secondary containment?	No secondary containment			
Fn	1	2	2	chemical piping/tubing is in good condition?	No visible issues with the piping			
Fn	N/A	3	N/A	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn	1	4	4	adequate equipment for meter-pump calibration?	Yes			
Fn	1	5	5	frequency of dose calibration?	Adjusted when the pump is in service			
R	1	1	1	spare parts and service support readily available?	Yes			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Sodium Hypochlorite with direct injection multiple 30 gal tanks onsite			
				SCADA system				
Fn	1	4	4	pump flow meter is adequate to monitor pump performance?	Yes the flow meter is hooked up to SCADA			
Fn	1	1	1	flow totals recorded at regular intervals? How frequent?	the flow totals are recorded daily by hand			
Fn	1	2	2	pressure instrumentation is adequate to monitor pump performance?	There are pressure gauges throughout the well that monitor system pressures			
Fn	1	4	4	automated alarm callout for critical failures and reliability?	Yes and it is monitored by District Operations			
Fn	1	4	4	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	2	2	communication system is reliable (approximate no. of comm. failures in last year)?	No communication issues in the last year			
R	1	2	2	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	A portable back up generator would need to be brought to the site in the event of a power outage			
R	2	3	6	spare parts/service support readily available?	Parts are readily available through the manufacturer or at the District offices			
PM	2	4	8	estimated service life remaining?	11 Years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	300kW			
R	1	5	5	adequate power available to run all equipment	Yes			
R	1	5	5	adequate standby power present and reliable?	Yes			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	250 gal			
R	1	5	5	fuel supply adequate for standby power service?	Yes			
R	N/A	1	N/A	time needed to mobilize portable generator?	None			
Fn	1	3	3	known electrical hazards that could be mitigated?	None			
R	2	3	6	spare parts/service support readily available?	At the Districts main Plant			
PM	1	4	4	estimated service life remaining?	16 years based on AWU Useful Life			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	1200gpm @ 400ft, 150hp			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	**Location Description:**	Hwy 89 at corner with Valhalla Access Road	**K/J Project Number:** 1270004*00
Water System Optimization Plan	**Wells Facility ID #:**	VHWL	**Date:** 3/13/2012
	Wells Facility Name:	Valhalla Well	**Condition Assessment Inspectors:** Peter Lavallee and Jeremy Rutherdale
	Pressure Zones Served:	Gardner Mountain or Stateline Zone depending on valving	**Adjacent Pressure Zones:** Stateline depending on valving

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	On Airport Property		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Wells Facility ID #:**	APRTWL		**Date:**	3/8/2012		
					Wells Facility Name:	Airport Well		**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray		
					Pressure Zones Served:	Stateline Zone		**Adjacent Pressure Zones:**	Country Club and Twin Peaks Zones		
				WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL - WELL NOT RATED							
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standard							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					10%		**0.00**
				Well Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					5%		**0.00**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					5%		**0.00**
				Well Pump							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					15%		**0.00**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					10%		**0.00**
				Supply Well - Sanitary Seal, Casing and Screen							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					15%		**0.00**
				Wellhead Treatment							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					15%		**0.00**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	0.00	N/A	0.00	0.00	N/A		
				Weighted Final Score (1-25)	0.00	N/A	0.00	0.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.00	N/A	0.00	0.00	N/A		**0.00**
				Criticality Score					5%		**0.00**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					20%		**0.00**
									Overall Total Factored Score (Out of 25) =		**0.00**

				South Tahoe PUD	**Location Description:**	On Airport Property	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	APRTWL	**Date:**	3/8/2012
					Wells Facility Name:	Airport Well	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Country Club and Twin Peaks Zones
				WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL - WELL NOT RATED				

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R		4	0	compliant with Calif. DWR Bulletin 74-81?	Yes
R		4	0	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn		3	0	adequate equipment clearances to facilitate routine O&M?	Yes
Fn		4	0	equipment accessible for removal?	Yes there is a roof hatch
R		5	0	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	Yes
Fn		3	0	wellhead minimum 18" above finished grade or floor?	Yes
R		2	0	well electrical controls not in vault?	Within building but not in vault
Fn		3	0	well equipped with ability to add chlorination facilities?	No chlorine injection because the well has been taken offline
Fn		4	0	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	NA
Fn		5	0	sample tap non-threaded downed-turned?	Yes
Fn		5	0	bacti sample tap not screened or aerated?	Yes
Fn		2	0	well able to be pumped to waste with waste discharge line protected from backflow?	Connection to a lay flat hose and then out to a sewer manhole
Fn		3	0	well meter provided?	Yes when in service
Fn		4	0	chemical additives NSF 60 compliant?	NA
				Well Site	
Fn		2	0	adequate vehicle access for year-round maintenance?	Yes
R		3	0	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R		4	0	is site vulnerable to wildfires?	Site is adjacent to a meadow and there is a potential for wildfires
R		4	0	is site close to known active seismic faults?	1,116 ft. to the nearest fault line
R		2	0	any unstable site conditions (if yes, describe)?	None
Fn		2	0	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	The site is within the security of the airport
Fn		2	0	other known problems?	None
				Building Structure	
Fn		3	0	adequate security measures and monitoring to prevent unauthorized access?	The facility is locked and the District has had no issues with unauthorized access into the facility
PM	N/A	N/A	N/A	date building was constructed?	1979
PM		3	0	condition of exterior coatings adequate to protect structure?	Metal Building
Fn		4	0	adequate openings for ingress/egress?	Two doors
Fn		3	0	interior lighting adequate for routine O&M?	Yes
Fn		4	0	building designed to withstand snow load and not create safety issue?	Yes for the time when it was constructed
Fn		2	0	building meets code compliance requirements?	Building met requirements of the code for when it was constructed
R		3	0	known fire or haz-mat conditions that could be mitigated?	Proximity to the meadow but no mitigation has occurred
Fn		4	0	other known problems?	None
PM		5	0	estimated service life remaining?	Past AWU Useful Life by 3 years
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Ingersol-Dresser Model 8488
INFORMATION		3	0	pump capacity?	800gpm @ 80psi
PM		4	0	pump rebuilt (list year) and describe work done?	Pump has been off since the well exceeded the Arsenic MCL and is in standby for high peak days. Has not been rebuilt recently
Fe		4	0	pump curves available?	No
R		2	0	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R		2	0	number of service calls/repairs in the last year?	None this well is out of service
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	600gpm
C		3	0	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm		4	0	coatings adequate to provide corrosion protection?	Pump coatings are unavailable since the pump was not pulled
Fe		5	0	pumps operate efficiently (>70% bowl efficiency)	
R		4	0	pumps operate free from excessive vibration?	Yes
Fn		2	0	adequate NPSH available to prevent cavitation?	
Fe		2	0	motor high efficiency and no excessive noise?	
R		2	0	spare parts readily available?	Parts are available from the manufacturer and the pump would need to be sent in to be rebuilt
R		5	0	other known problems?	None
PM		4	0	estimated service life remaining?	Past AWU Useful Life by 3 years

				South Tahoe PUD	**Location Description:**	On Airport Property	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	APRTWL	**Date:**	3/8/2012
					Wells Facility Name:	Airport Well	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Country Club and Twin Peaks Zones
				WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL - WELL NOT RATED				
				Piping & Valves				
Fn		4	0	pipe supports adequate to prevent movement or vibration?	Steel supports that are not bolted to the concrete floor			
PM		5	0	coatings adequate to protect piping and valves?	Some coating missing and rust can be seen on the piping			
C		3	0	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn		2	0	valves are suitable for efficient and reliable service?	Yes and no problems have been documented			
PM		4	0	estimated service life remaining?	27 years based on AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM		3	0	well casing is in good condition?				
PM		3	0	well screen is in good condition?				
Fe		3	0	well-driller's log is available?				
R		4	0	50 ft. sanitary seal?	No it is 46 ft.			
R		5	0	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	Arsenic Levels exceed the MCL			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?				
PM		2	0	last year well was redeveloped?				
Fn		3	0	sounding tube or other means to measure depth to water surface?				
Fn		4	0	gravel-fill pipe provided at well head to monitor condition of filter pack?				
PM		5	0	estimated service life remaining?				
				Wellhead Treatment				
Fn		2	0	chemical storage tanks have secondary containment?	None			
Fn		2	0	chemical piping/tubing is in good condition?	Tubing is in good condition with no visible defects			
Fn		3	0	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn		4	0	adequate equipment for meter-pump calibration?	Yes			
Fn		5	0	frequency of dose calibration?	Daily when in operation			
R		1	0	spare parts and service support readily available?	Yes			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Sodium Hypochlorite with direct injection. 30 gal drums on site			
				SCADA system				
Fn		4	0	pump flow meter is adequate to monitor pump performance?	Yes the mag meter is hooked up to SCADA			
Fn		1	0	flow totals recorded at regular intervals? How frequent?	the flow totals are recorded daily by hand			
Fn		2	0	pressure instrumentation is adequate to monitor pump performance?	There are pressure gauges throughout the well that monitor system pressures			
Fn		4	0	automated alarm callout for critical failures and reliability?	Yes and it is monitored by District Operations			
Fn		4	0	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R		2	0	communication system is reliable (approximate no. of comm. failures in last year)?	No communication issues in the last year			
R		2	0	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	A portable back up generator would need to be brought to the site in the event of a power outage but there are no hookups			
R		3	0	spare parts/service support readily available?	Parts are readily available through the manufacturer or at the District offices			
PM		4	0	estimated service life remaining?	Estimate 10 years based on AWU Useful Life			
				Electrical Power				
R		1	0	standby generator size (kW)?	NA			
R		5	0	adequate power available to run all equipment	Yes			
R		5	0	adequate standby power present and reliable?	NA			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R		5	0	fuel supply adequate for standby power service?	NA			
R		1	0	time needed to mobilize portable generator?	1-2 hours but there are no hookups			
Fn		2	0	known electrical hazards that could be mitigated?	None			
R		3	0	spare parts/service support readily available?	Yes at District Plant			
PM		4	0	estimated service life remaining?	NA			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	800gpm @ 80psi			
					Well in the off position because of Arsenic levels.			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	On Airport Property	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	APRTWL	Date: 3/8/2012
	Wells Facility Name:	Airport Well	Condition Assessment Inspectors: Peter Lavallee and Mark Gray
	Pressure Zones Served:	Stateline Zone	Adjacent Pressure Zones: Country Club and Twin Peaks Zones

WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL - WELL NOT RATED

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Corner of Sacramento and Tallac Ave.	**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Wells Facility ID #:**	ATWL2	**Date:**	3/7/2012		
					Wells Facility Name:	Al Tahoe Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney		
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone		
				Notes:						
				1. Capacity score will be based on hydraulic model						
				2. For Reliabilty to be determined based on CMMS maintenance records						
				3. For Criticality Weighting Factors to be determined at District Workshop						

					Failure Mode Scoring (1 - 5)					
					Physical Mortality	**Capacity**	**Level of Service**		**Financial Efficiency**	
							functionality	**reliability**		
					1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standard						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.40	1.00	N/A	
				Weighted Final Score (1-25)	N/A	N/A	5.60	3.75	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Final Score	N/A	N/A	3.92	1.125	N/A	**5.05**
				Criticality Score					10%	**0.50**
				Well Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.33	1.75	N/A	
				Weighted Final Score (1-25)	N/A	N/A	4.67	6.25	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Final Score	N/A	N/A	3.27	1.875	N/A	**5.14**
				Criticality Score					5%	**0.26**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.00	1.00	N/A	
				Weighted Final Score (1-25)	6.50	N/A	3.33	3.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Final Score	0.65	N/A	2	0.9	N/A	**3.55**
				Criticality Score					5%	**0.18**
				Well Pump						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	1.00	5.00	1.60	4.00	
				Weighted Final Score (1-25)	4.00	3.00	10.00	4.20	13.33	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Final Score	0.60	0.60	3.00	0.84	2.00	**7.04**
				Criticality Score					15%	**1.06**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	1.00	1.00	N/A	N/A	
				Weighted Final Score (1-25)	9.50	3.00	3.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A	
				Factored Final Score	0.95	1.80	0.90	N/A	N/A	**3.65**
				Criticality Score					10%	**0.37**
				Supply Well - Sanitary Seal, Casing and Screen						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.25	N/A	5.00	1.50	5.00	
				Weighted Final Score (1-25)	12.50	N/A	17.50	7.00	15.00	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%	
				Factored Final Score	1.25	N/A	8.75	1.40	3.00	**14.40**
				Criticality Score					15%	**2.16**
				Wellhead Treatment						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.60	1.00	N/A	
				Weighted Final Score (1-25)	N/A	N/A	4.20	1.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Final Score	N/A	N/A	2.52	0.40	N/A	**2.92**
				Criticality Score					15%	**0.44**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.67	N/A	
				Weighted Final Score (1-25)	8.00	N/A	3.33	6.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Final Score	0.80	N/A	2.00	1.80	N/A	**4.60**
				Criticality Score					5%	**0.23**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	1.00	N/A	
				Weighted Final Score (1-25)	8.00	N/A	3.00	4.20	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Final Score	1.60	N/A	1.80	0.84	N/A	**4.24**
				Criticality Score					20%	**0.85**
									Overall Total Factored Score (Out of 25) =	**6.04**

				South Tahoe PUD	**Location Description:**	Corner of Sacramento and Tallac Ave.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	ATWL2	**Date:**	3/7/2012
					Wells Facility Name:	Al Tahoe Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	Yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn	1	3	3	adequate equipment clearances to facilitate routine O&M?	Yes
Fn	1	4	4	equipment accessible for removal?	Yes
R	1	5	5	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	There are no issues with site drainage
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	Yes
R	1	2	2	well electrical controls not in vault?	Controls are in the building and not in the vault
Fn	1	3	3	well equipped with ability to add chlorination facilities?	Well has chlorination
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Sample taps are installed before and after disinfection
Fn	1	5	5	sample tap non-threaded downed-turned?	Non threaded and turned down on both
Fn	5	5	25	bacti sample tap not screened or aerated?	It is neither screened nor aerated
Fn	1	2	2	well able to be pumped to waste with waste discharge line protected from backflow?	Fittings to take the well to a manhole to discharge without entering the distribution system
Fn	1	3	3	well meter provided?	Yes
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	There is adequate vehicle access for maintenance and a vacant District lot behind the station
R	1	3	3	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	1	4	4	is site vulnerable to wildfires?	No
R	4	4	16	is site close to known active seismic faults?	4,029 ft. to the nearest fault
R	1	2	2	any unstable site conditions (if yes, describe)?	None
Fn	5	2	10	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	Minimal site security available back lot is fenced but adjacent land owners have entered the site before
Fn	1	2	2	other known problems?	None
				Building Structure	
Fn	1	3	3	adequate security measures and monitoring to prevent unauthorized access?	Doors are locked and keyed for District personnel. No known unauthorized access has occurred
INFORMATION	N/A	N/A	N/A	date building was constructed?	1994
PM	1	3	3	condition of exterior coatings adequate to protect structure?	Block building is in good condition with no issues seen
Fn	1	4	4	adequate openings for ingress/egress?	There are multiple points of entry into the well
Fn	1	3	3	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	Yes
Fn	1	2	2	building meets code compliance requirements?	Met requirements at time of construction
R	1	3	3	known fire or haz-mat conditions that could be mitigated?	None
Fn	1	4	4	other known problems?	None
PM	2	5	10	estimated service life remaining?	12 years according to AWU Useful Life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Vertical Turbine
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Byron Jackson
INFORMATION		3	0	pump capacity?	2500gpm @90psi
PM		4	0	pump rebuilt (list year) and describe work done?	Pump has been pulled and rebuilt a few times the last time being 1993
Fe	5	4	20	pump curves available?	Pump curves are available
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	2	2	number of service calls/repairs in the last year?	None
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	2400gpm
C	1	3	3	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm	1	4	4	coatings adequate to provide corrosion protection?	There are no visible defect in the coating
Fe	2	5	10	pumps operate efficiently (>70% bowl efficiency)	insufficient data to determine pump efficiency, but specific energy is low (1200 kW-hr/Mgal) relative to other District well pumps.
R	1	4	4	pumps operate free from excessive vibration?	Yes
Fn	5	2	10	adequate NPSH available to prevent cavitation?	insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	insufficient data
R	4	2	8	spare parts readily available?	none readily available contact supplier
R	1	5	5	other known problems?	None
PM	2	4	8	estimated service life remaining?	12 years according to AWU Useful Life

				South Tahoe PUD	**Location Description:**	Corner of Sacramento and Tallac Ave.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	ATWL2	**Date:**	3/7/2012
					Wells Facility Name:	Al Tahoe Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				Piping & Valves				
Fn	1	4	4	pipe supports adequate to prevent movement or vibration?	Steel Pipe supports that are bolted to the floor			
PM	3	5	15	coatings adequate to protect piping and valves?	Some coatings have worn off and some rust is visible on some of the components			
C	1	3	3	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	2	2	valves are suitable for efficient and reliable service?	Yes			
PM	1	4	4	estimated service life remaining?	42 years based on AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	5	3	15	well casing is in good condition?	insufficient data			
PM	5	3	15	well screen is in good condition?	insufficient data			
Fe	5	3	15	well-driller's log is available?	insufficient data			
R	1	4	4	50 ft. sanitary seal?	Yes it is 105ft			
R	2	5	10	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	Sentinel Wells around the outskirs of the Al Tahoe Neighborhood have indicated MTBE but these do not affect this well			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	insufficient data			
PM	5	2	10	last year well was redeveloped?	insufficient data			
Fn	5	3	15	sounding tube or other means to measure depth to water surface?	insufficient data			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	insufficient data			
PM	2	5	10	estimated service life remaining?	Typ useful life 50 yrs. 32 yrs remaining useful life			
				Wellhead Treatment				
Fn	5	2	10	chemical storage tanks have secondary containment?	No secondary containment			
Fn	1	2	2	chemical piping/tubing is in good condition?	No visible issues with the piping			
Fn	N/A	N/A	N/A	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn	1	4	4	adequate equipment for meter-pump calibration?	Yes			
Fn	1	5	5	frequency of dose calibration?	Adjusted when the pump is in service			
R	1	1	1	spare parts and service support readily available?	Yes			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Sodium Hypochlorite with direct injection multiple 30 gal tanks onsite			
				SCADA system				
Fn	1	4	4	pump flow meter is adequate to monitor pump performance?	Yes the turbine flow meter is hooked up to SCADA			
Fn	1	1	1	flow totals recorded at regular intervals? How frequent?	the flow totals are recorded daily by hand			
Fn	1	2	2	pressure instrumentation is adequate to monitor pump performance?	There are pressure gauges throughout the well that monitor system pressures			
Fn	1	4	4	automated alarm callout for critical failures and reliability?	Yes and it is monitored by District Operations			
Fn	1	4	4	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	2	2	communication system is reliable (approximate no. of comm. failures in last year)?	No communication issues in the last year			
R	5	2	10	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	A portable back up generator would need to be brought to the site in the event of a power outage			
R	2	3	6	spare parts/service support readily available?	Parts are readily available through the manufacturer or at the District offices			
PM	2	4	8	estimated service life remaining?	11 Years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA kW 250hp			
R	1	5	5	adequate power available to run all equipment	Yes			
R	1	5	5	adequate standby power present and reliable?	No. Standby generator on site has a right angle connection to the pump so the generator runs the pump directly by wither diesel or propane.			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	250 gal			
R	1	5	5	fuel supply adequate for standby power service?	Yes			
R	N/A	1	N/A	time needed to mobilize portable generator?	None			
Fn	1	3	3	known electrical hazards that could be mitigated?	None			
R	2	3	6	spare parts/service support readily available?	At the Districts main Plant			
PM	2	4	8	estimated service life remaining?	7 years based on AWU Useful Life			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	2500gpm @90psi, 250hp			
					Well is generally in the off position but is run and tested on Wednesdays to keep the well fresh			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	Corner of Sacramento and Tallac Ave.	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	ATWL2	Date: 3/7/2012
	Wells Facility Name:	Al Tahoe Well #2	Condition Assessment Inspectors: Peter Lavallee and Phill Torney
	Pressure Zones Served:	Stateline Zone	Adjacent Pressure Zones: Twin Peaks Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS











				South Tahoe PUD	**Location Description:**	Corner of Black Rock Rd and North Rd	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Wells Facility ID #:**	BRWL2	**Date:**	3/13/2012	
					Wells Facility Name:	Blackrock Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone	
				WELL OFFLINE DUE TO MTBE LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.					
				Notes:	**Failure Mode Scoring (1 - 5)**				
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**	
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced
				California Waterworks Standard					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					10%
				Well Site					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					5%
				Building Structure					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					5%
				Well Pump					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					15%
				Piping & Valves					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					10%
				Supply Well - Sanitary Seal, Casing and Screen					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					15%
				Wellhead Treatment					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					15%
				SCADA System					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	0.00	N/A	0.00	0.00	N/A
				Weighted Final Score (1-25)	0.00	N/A	0.00	0.00	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A
				Factored Final Score	0.00	N/A	0.00	0.00	N/A
				Criticality Score					5%
				Electrical Power					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					20%
								Overall Total Factored Score (Out of 25) =	

	Total Factored Score
	0.00
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	Total Factored Score
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				South Tahoe PUD	**Location Description:**	Corner of Black Rock Rd and North Rd	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	BRWL2	**Date:**	3/13/2012
					Wells Facility Name:	Blackrock Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				WELL OFFLINE DUE TO MTBE LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.				

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R			0	compliant with Calif. DWR Bulletin 74-81?	Yes
R			0	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn			0	adequate equipment clearances to facilitate routine O&M?	The piping has adequate clearance but the well head is next to the door
Fn			0	equipment accessible for removal?	Equipment removed through roof hatches
R			0	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	This is an artesian well and water is pooling on the west side of the building
Fn			0	wellhead minimum 18" above finished grade or floor?	Yes
R			0	well electrical controls not in vault?	Electrical boxes are within the building
Fn			0	well equipped with ability to add chlorination facilities?	Chlorination facilities are in place
Fn			0	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Yes
Fn			0	sample tap non-threaded downed-turned?	Yes
Fn			0	bacti sample tap not screened or aerated?	Not screened or aerated
Fn			0	well able to be pumped to waste with waste discharge line protected from backflow?	Connection is available to flush to a manhole with an air gap
Fn			0	well meter provided?	Yes
Fn			0	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn			0	adequate vehicle access for year-round maintenance?	Yes
R			0	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R			0	is site vulnerable to wildfires?	No
R			0	is site close to known active seismic faults?	1,944 feet to nearest fault
R			0	any unstable site conditions (if yes, describe)?	None
Fn			0	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	The facility needs to be painted multiple times per year due to graffiti
Fn			0	other known problems?	None
				Building Structure	
Fn			0	adequate security measures and monitoring to prevent unauthorized access?	The building is locked and there has been no history of unauthorized access
PM			0	date building was constructed?	1959
PM			0	condition of exterior coatings adequate to protect structure?	Yes it has been repainted numerous times due to graffiti
Fn			0	adequate openings for ingress/egress?	Yes but one door is blocked by the well head
Fn			0	interior lighting adequate for routine O&M?	Yes
Fn			0	building designed to withstand snow load and not create safety issue?	Yes at the time of construction
Fn			0	building meets code compliance requirements?	Yes at the time of construction
R			0	known fire or haz-mat conditions that could be mitigated?	None
Fn			0	other known problems?	None
PM			0	estimated service life remaining?	Exceeds AWU Useful Life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Berkeley
INFORMATION			0	pump capacity?	unknown
PM			0	pump rebuilt (list year) and describe work done?	None
Fe			0	pump curves available?	No
R			0	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R			0	number of service calls/repairs in the last year?	None
INFORMATION			0	what is firm capacity of well pump based on flow test?	unknown
C		3	0	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm			0	coatings adequate to provide corrosion protection?	Submersible pump that was not pulled so could not evaluate the coatings
Fe			0	pumps operate efficiently (>70% bowl efficiency)	
R			0	pumps operate free from excessive vibration?	
Fn			0	adequate NPSH available to prevent cavitation?	
Fe			0	motor high efficiency and no excessive noise?	
R			0	spare parts readily available?	The pump would need to be pulled to determine the issue and parts order from the supplier
R			0	other known problems?	None
PM			0	estimated service life remaining?	

				South Tahoe PUD	**Location Description:**	Corner of Black Rock Rd and North Rd	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	BRWL2	**Date:**	3/13/2012
					Wells Facility Name:	Blackrock Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				WELL OFFLINE DUE TO MTBE LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.				
				Piping & Valves				
Fn			0	pipe supports adequate to prevent movement or vibration?	No pipe supports			
PM			0	coatings adequate to protect piping and valves?	Not all pipes have coatings and some of the flanges are rusted			
C			0	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn			0	valves are suitable for efficient and reliable service?	No issues with nay of the valving and they are adequate			
PM			0	estimated service life remaining?	7 years based on AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM			0	well casing is in good condition?				
PM			0	well screen is in good condition?				
Fe			0	well-driller's log is available?	No			
R			0	50 ft. sanitary seal?	Unknown			
R			0	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	This well has had positive hits for MTBE and is within a known plume of MTBE			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?				
PM			0	last year well was redeveloped?				
Fn			0	sounding tube or other means to measure depth to water surface?				
Fn			0	gravel-fill pipe provided at well head to monitor condition of filter pack?				
PM			0	estimated service life remaining?				
				Wellhead Treatment				
Fn			0	chemical storage tanks have secondary containment?	No			
Fn			0	chemical piping/tubing is in good condition?	Yes			
Fn			0	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn			0	adequate equipment for meter-pump calibration?	Yes			
Fn			0	frequency of dose calibration?	would be daily but it is not in use			
R			0	spare parts and service support readily available?	Yes			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	30 gal direct injection sodium hypochlorite			
				SCADA system	Nothing in this well is connected to SCADA			
Fn			0	pump flow meter is adequate to monitor pump performance?	NA			
Fn			0	flow totals recorded at regular intervals? How frequent?	NA			
Fn			0	pressure instrumentation is adequate to monitor pump performance?	NA			
Fn			0	automated alarm callout for critical failures and reliability?	NA			
Fn			0	alarm log maintained and reviewed annually?	NA			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	NA			
R			0	communication system is reliable (approximate no. of comm. failures in last year)?	NA			
R			0	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	NA			
R			0	spare parts/service support readily available?	NA			
PM			0	estimated service life remaining?	NA			
				Electrical Power				
R			0	standby generator size (kW)?	NA			
R			0	adequate power available to run all equipment	yes			
R			0	adequate standby power present and reliable?	no			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R			0	fuel supply adequate for standby power service?	NA			
R			0	time needed to mobilize portable generator?	There are no hookups for a portable generator so 1-2 hours plus time to retrofit connections			
Fn			0	known electrical hazards that could be mitigated?	None			
R			0	spare parts/service support readily available?	Yes at the District's main plant			
PM			0	estimated service life remaining?	NA			
				Additional Data	This well has been off due to MTBE			
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	15hp			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	Corner of Black Rock Rd and North Rd	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	BRWL2	Date: 3/13/2012
	Wells Facility Name:	Blackrock Well #2	Condition Assessment Inspectors: Peter Lavallee and Jeremy Rutherdale
	Pressure Zones Served:	Stateline Zone	Adjacent Pressure Zones: Twin Peaks Zone

WELL OFFLINE DUE TO MTBE LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Chris Ave.		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Wells Facility ID #:**	CHRISWL		**Date:**	3/8/2012		
					Wells Facility Name:	Chris Well		**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray		
					Pressure Zones Served:	Stateline Zone		**Adjacent Pressure Zones:**	Twin Peaks Zone		
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standard							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.80	1.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	7.30	3.75	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	5.11	1.125	N/A		**6.24**
				Criticality Score					10%		**0.62**
				Well Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.67	1.75	N/A		
				Weighted Final Score (1-25)	N/A	N/A	3.33	6.25	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	2.333333333	1.875	N/A		**4.21**
				Criticality Score					5%		**0.21**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.33	3.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	4.33	9.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.4	N/A	2.6	2.7	N/A		**5.70**
				Criticality Score					5%		**0.29**
				Well Pump							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.33	1.00	5.00	1.40	4.33		
				Weighted Final Score (1-25)	17.33	3.00	10.00	3.80	15.67		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Final Score	2.60	0.60	3.00	0.76	2.35		**9.31**
				Criticality Score					15%		**1.40**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	2.00	3.00	N/A	N/A		
				Weighted Final Score (1-25)	22.50	6.00	11.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A		
				Factored Final Score	2.25	3.60	3.30	N/A	N/A		**9.15**
				Criticality Score					10%		**0.92**
				Supply Well - Sanitary Seal, Casing and Screen							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	N/A	5.00	3.00	5.00		
				Weighted Final Score (1-25)	16.25	N/A	17.50	14.50	15.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%		
				Factored Final Score	1.63	N/A	8.75	2.90	3.00		**16.28**
				Criticality Score					15%		**2.44**
				Wellhead Treatment							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					15%		**0.00**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	0.00	N/A	5.00	5.00	N/A		
				Weighted Final Score (1-25)	0.00	N/A	16.67	11.67	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.00	N/A	10.00	3.50	N/A		**13.50**
				Criticality Score					5%		**0.68**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	3.00	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	9.40	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Final Score	N/A	N/A	N/A	1.88	N/A		**1.88**
				Criticality Score					20%		**0.38**
									Overall Total Factored Score (Out of 25) =		**6.92**

				South Tahoe PUD	**Location Description:**	Chris Ave.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	CHRISWL	**Date:**	3/8/2012
					Wells Facility Name:	Chris Well	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	Yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn	1	3	3	adequate equipment clearances to facilitate routine O&M?	Yes
Fn	1	4	4	equipment accessible for removal?	Yes through a roof hatch in the building.
R	1	5	5	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	There are no drainage issues at this location
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	Yes
R	1	2	2	well electrical controls not in vault?	Electrical controls are in the building but not in the vault
Fn	1	3	3	well equipped with ability to add chlorination facilities?	Chlorination is available to be connected
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Yes
Fn	4	5	20	sample tap non-threaded downed-turned?	Threaded and not fully turned down
Fn	5	5	25	bacti sample tap not screened or aerated?	not screened or aerated
Fn	2	2	4	well able to be pumped to waste with waste discharge line protected from backflow?	Lay flat connection to manhole with air gap
Fn	1	3	3	well meter provided?	Yes
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Yes
R	1	3	3	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	1	4	4	is site vulnerable to wildfires?	No
R	4	4	16	is site close to known active seismic faults?	1,670 ft. to nearest fault
R	1	2	2	any unstable site conditions (if yes, describe)?	None
Fn	3	2	6	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No site fencing or security. Well in building
Fn	1	2	2	other known problems?	None
				Building Structure	
Fn	3	3	9	adequate security measures and monitoring to prevent unauthorized access?	The buildings only door is locked.
INFORMATION	N/A	N/A	N/A	date building was constructed?	2000
PM	1	3	3	condition of exterior coatings adequate to protect structure?	Yes no visible defects
Fn	1	4	4	adequate openings for ingress/egress?	Yes
Fn	1	3	3	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	Yes at time of construction
Fn	1	2	2	building meets code compliance requirements?	Yes at time of construction
R	3	3	9	known fire or haz-mat conditions that could be mitigated?	Located in wooded area and has compisition roof and wood sided building
Fn	1	4	4	other known problems?	None
PM	1	5	5	estimated service life remaining?	18 years according to AWU Useful Life
				Well Pump	Well has been turned off due to MTBE hits but could be turned back on pending the review of the MTBE policy. Well was turned off in October 2011.
INFORMATION	N/A	N/A	N/A	pump type?	Submersible Pump
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Goulds
INFORMATION	3	3	9	pump capacity?	unknown
PM	3	4	12	pump rebuilt (list year) and describe work done?	No recent work done on this pump
Fe	3	4	12	pump curves available?	No
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R		2	0	number of service calls/repairs in the last year?	Turned off
INFORMATION	1	3	3	what is firm capacity of well pump based on flow test?	117gpm in August 2002
C	1	3	3	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm	5	4	20	coatings adequate to provide corrosion protection?	Pump coatings are unavailable since the pump was not pulled
Fe	5	5	25	pumps operate efficiently (>70% bowl efficiency)	Insufficient data
R	1	4	4	pumps operate free from excessive vibration?	No issues
Fn	5	2	10	adequate NPSH available to prevent cavitation?	Insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	Insufficient data
R	4	2	8	spare parts readily available?	Parts would need to be ordered from the manufacturer
R	1	5	5	other known problems?	None
PM	5	4	20	estimated service life remaining?	Well was installed in 1960. Estimate that the well pump has exceeded it AWU Useful life by 10 to 20 years

				South Tahoe PUD	**Location Description:**	Chris Ave.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	CHRISWL	**Date:**	3/8/2012
					Wells Facility Name:	Chris Well	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				Piping & Valves				
Fn	5	4	20	pipe supports adequate to prevent movement or vibration?	No pipe supports			
PM	5	5	25	coatings adequate to protect piping and valves?	No coatings and the pipe has corrosion on it			
C	2	3	6	pipes adequately sized to prevent excessive noise or headloss?	Piping is small (3.5" Discharge) but may be adequate for low flow from well			
Fn	1	2	2	valves are suitable for efficient and reliable service?	Yes			
PM	5	4	20	estimated service life remaining?	0-10 years based on AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	5	3	15	well casing is in good condition?	Insufficient data			
PM	5	3	15	well screen is in good condition?	Insufficient data			
Fe	5	3	15	well-driller's log is available?	Insufficient data			
R	1	4	4	50 ft. sanitary seal?	Yes it is 50 ft.			
R	5	5	25	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	This well had 5 consecutive hits of MTBE			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?				
PM	5	2	10	last year well was redeveloped?	Insufficient data			
Fn	5	3	15	sounding tube or other means to measure depth to water surface?	Insufficient data			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	Insufficient data			
PM	5	5	25	estimated service life remaining?	Well was installed in 1960. Estimate that the well pump has exceeded it AWU Useful life by 2 years			
				Wellhead Treatment	Chlorine treatment has been removed from the site but the connections are still available.			
Fn	N/A	2	N/A	chemical storage tanks have secondary containment?	NA			
Fn	N/A	2	N/A	chemical piping/tubing is in good condition?	NA			
Fn	N/A	N/A	N/A	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn	N/A	4	N/A	adequate equipment for meter-pump calibration?	NA			
Fn	N/A	5	N/A	frequency of dose calibration?	NA			
R	N/A	1	N/A	spare parts and service support readily available?	NA			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	NA			
				SCADA system	Station has never been connected to SCADA			
Fn	3	4	12	pump flow meter is adequate to monitor pump performance?	Yes			
Fn	5	1	5	flow totals recorded at regular intervals? How frequent?	NA			
Fn	5	2	10	pressure instrumentation is adequate to monitor pump performance?	NA			
Fn	5	4	20	automated alarm callout for critical failures and reliability?	NA			
Fn	5	4	20	alarm log maintained and reviewed annually?	NA			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	NA			
R	5	2	10	communication system is reliable (approximate no. of comm. failures in last year)?	NA			
R	5	2	10	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	NA			
R	5	3	15	spare parts/service support readily available?	NA			
PM	N/A	4	N/A	estimated service life remaining?	NA			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5	adequate power available to run all equipment	yes			
R	5	5	25	adequate standby power present and reliable?	No			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R	N/A	5	N/A	fuel supply adequate for standby power service?	NA			
R	5	1	5	time needed to mobilize portable generator?	No hookups so the site would need to be retrofitted			
Fn	N/A	3	N/A	known electrical hazards that could be mitigated?	None			
R	4	3	12	spare parts/service support readily available?	They would need to be ordered from the manufacturer			
PM	N/A	4	N/A	estimated service life remaining?	NA			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	15Hp			
					This well has been turned off due to MTBE hits. The policy is under review and the well may be put back into service.			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	Chris Ave.	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	CHRISWL	Date: 3/8/2012
	Wells Facility Name:	Chris Well	Condition Assessment Inspectors: Peter Lavallee and Mark Gray
	Pressure Zones Served:	Stateline Zone	Adjacent Pressure Zones: Twin Peaks Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	On Clement Ave near intersection with Gardner St.	**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Wells Facility ID #:**	CLMTWL	**Date:**	3/8/2012		
					Wells Facility Name:	Clement Well	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray		
					Pressure Zones Served:	Gardner Mountain or Stateline zone depending on valving	**Adjacent Pressure Zones:**	Twin peaks zone or Stateline zone depending on valving		
				WELL OFFLINE DUE TO CONTAMINATE LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.						
				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standard						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					10%	**0.00**
				Well Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					5%	**0.00**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					5%	**0.00**
				Well Pump						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					15%	**0.00**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					10%	**0.00**
				Supply Well - Sanitary Seal, Casing and Screen						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					15%	**0.00**
				Wellhead Treatment						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					15%	**0.00**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	0.00	N/A	0.00	0.00	N/A	
				Weighted Final Score (1-25)	0.00	N/A	0.00	0.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Final Score	0.00	N/A	0.00	0.00	N/A	**0.00**
				Criticality Score					5%	**0.00**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					20%	**0.00**
									Overall Total Factored Score (Out of 25) =	**0.00**

				South Tahoe PUD	**Location Description:**	On Clement Ave near intersection with Gardner St.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	CLMTWL	**Date:**	3/8/2012
					Wells Facility Name:	Clement Well	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Gardner Mountain or Stateline zone depending on valving	**Adjacent Pressure Zones:**	Twin peaks zone or Stateline zone depending on valving
				WELL OFFLINE DUE TO CONTAMINATE LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.				

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R			0	compliant with Calif. DWR Bulletin 74-81?	Yes
R			0	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn			0	adequate equipment clearances to facilitate routine O&M?	Yes
Fn			0	equipment accessible for removal?	Yes
R			0	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	Yes
Fn			0	wellhead minimum 18" above finished grade or floor?	Yes
R			0	well electrical controls not in vault?	They are within the building and not in the vault
Fn			0	well equipped with ability to add chlorination facilities?	Yes but is not currently needed
Fn			0	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Sample taps are available at multiple points through the treatment chain
Fn			0	sample tap non-threaded downed-turned?	yes they are downturned and non-threaded
Fn			0	bacti sample tap not screened or aerated?	Yes it is not screened or aerated
Fn			0	well able to be pumped to waste with waste discharge line protected from backflow?	Flush to manhole with lay flat hose
Fn			0	well meter provided?	Yes
Fn			0	chemical additives NSF 60 compliant?	Yes when installed
				Well Site	
Fn			0	adequate vehicle access for year-round maintenance?	Yes
R			0	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R			0	is site vulnerable to wildfires?	No
R			0	is site close to known active seismic faults?	2,160 ft. to the nearest fault
R			0	any unstable site conditions (if yes, describe)?	None
Fn			0	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	The property is fully fenced
Fn			0	other known problems?	None
				Building Structure	
Fn			0	adequate security measures and monitoring to prevent unauthorized access?	Yes
PM			0	date building was constructed?	Unknown. The building was inherited from an existing water company. Estimate pre 1960s.
PM			0	condition of exterior coatings adequate to protect structure?	Conditions of the exterior coatings are adequate and show no visible defects
Fn			0	adequate openings for ingress/egress?	Yes
Fn			0	interior lighting adequate for routine O&M?	Yes
Fn			0	building designed to withstand snow load and not create safety issue?	Yes at time of construction
Fn			0	building meets code compliance requirements?	Yes at time of construction
R			0	known fire or haz-mat conditions that could be mitigated?	None
Fn			0	other known problems?	None
PM			0	estimated service life remaining?	Estimate the building has exceeded its useful life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Goulds
INFORMATION			0	pump capacity?	Unknown
PM			0	pump rebuilt (list year) and describe work done?	Unknown
Fe			0	pump curves available?	No
R			0	known history of pump/motor failures? If so, explain the nature of the failure(s).	None since it has been off for over 12 years
R			0	number of service calls/repairs in the last year?	None since it has been off for over 12 years
INFORMATION			0	what is firm capacity of well pump based on flow test?	Unknown
C		3	0	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm			0	coatings adequate to provide corrosion protection?	Unknown as the pump has not been pulled recently
Fe			0	pumps operate efficiently (>70% bowl efficiency)	Unknown
R			0	pumps operate free from excessive vibration?	Unknown
Fn			0	adequate NPSH available to prevent cavitation?	Unknown
Fe			0	motor high efficiency and no excessive noise?	Unknown
R			0	spare parts readily available?	Unknown
R			0	other known problems?	This well has an air stripper attached to it to treat for PCE and has also had MTBE hits so the pump has not been run consistently for more than a decade. Problems may arise if the well is put back into service
PM			0	estimated service life remaining?	9 years according to AWU Useful Life

				South Tahoe PUD	**Location Description:**	On Clement Ave near intersection with Gardner St.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	CLMTWL	**Date:**	3/8/2012
					Wells Facility Name:	Clement Well	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Gardner Mountain or Stateline zone depending on valving	**Adjacent Pressure Zones:**	Twin peaks zone or Stateline zone depending on valving
				WELL OFFLINE DUE TO CONTAMINATE LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.				
				Piping & Valves				
Fn			0	pipe supports adequate to prevent movement or vibration?	Pipe supports are angle iron and are adequate			
PM			0	coatings adequate to protect piping and valves?	Yes			
C			0	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn			0	valves are suitable for efficient and reliable service?	Yes			
PM			0	estimated service life remaining?	39 years left according to AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM			0	well casing is in good condition?	Unknown			
PM			0	well screen is in good condition?	Unknown			
Fe			0	well-driller's log is available?	No			
R			0	50 ft. sanitary seal?	Unknown			
R			0	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	PCE and MTBE			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	Unknown			
PM			0	last year well was redeveloped?	Unknown			
Fn			0	sounding tube or other means to measure depth to water surface?	Unknown			
Fn			0	gravel-fill pipe provided at well head to monitor condition of filter pack?	Unknown			
PM			0	estimated service life remaining?	Well drilled in 1991 but no way to determine useful life based on tables provided			
				Wellhead Treatment				
Fn			0	chemical storage tanks have secondary containment?	None on site as well is out of service			
Fn			0	chemical piping/tubing is in good condition?	NA			
Fn			0	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn			0	adequate equipment for meter-pump calibration?	NA			
Fn			0	frequency of dose calibration?	NA			
R			0	spare parts and service support readily available?	NA			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	NA			
				SCADA system	well is out of service			
Fn			0	pump flow meter is adequate to monitor pump performance?	NA			
Fn			0	flow totals recorded at regular intervals? How frequent?	NA			
Fn			0	pressure instrumentation is adequate to monitor pump performance?	NA			
Fn			0	automated alarm callout for critical failures and reliability?	NA			
Fn			0	alarm log maintained and reviewed annually?	NA			
Fn			0	flow totals recorded at regular intervals? How frequent?	NA			
Fn			0	pressure instrumentation is adequate to monitor pump performance?	NA			
Fn			0	automated alarm callout for critical failures and reliability?	NA			
Fn			0	alarm log maintained and reviewed annually?	NA			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	NA			
R			0	communication system is reliable (approximate no. of comm. failures in last year)?	NA			
R			0	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	NA			
R			0	spare parts/service support readily available?	NA			
PM			0	estimated service life remaining?	NA			
				Electrical Power				
R			0	standby generator size (kW)?	NA			
R			0	adequate power available to run all equipment	Yes			
R			0	adequate standby power present and reliable?	NA			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R			0	fuel supply adequate for standby power service?	NA			
R			0	time needed to mobilize portable generator?	NA			
Fn			0	known electrical hazards that could be mitigated?	NA			
R			0	spare parts/service support readily available?	NA			
PM			0	estimated service life remaining?	NA			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
					This well has not been in operation in over 12 years but has been on a regular flushing cycle to test the water from the well. Most data for this well is absent due to its inoperation. The well is mostly used for storage of excess parts and equipment. Well			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	Location Description:	On Clement Ave near intersection with Gardner St.	K/J Project Number: 1270004*00
				Water System Optimization Plan	Wells Facility ID #:	CLMTWL	Date: 3/8/2012
					Wells Facility Name:	Clement Well	Condition Assessment Inspectors: Peter Lavallee and Mark Gray
					Pressure Zones Served:	Gardner Mountain or Stateline zone depending on valving	Adjacent Pressure Zones: Twin peaks zone or Stateline zone depending on valving
				WELL OFFLINE DUE TO CONTAMINATE LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.			
				Photo Evidence for PM, Fn, R, FE			

PHOTOS

South Tahoe PUD	**Location Description:** City Playfields behind District's main treatment plant	**K/J Project Number:** 1270004*00	
Water System Optimization Plan	**Wells Facility ID #:** CLGWL	**Date:** 3/13/2012	
	Wells Facility Name: College Well	**Condition Assessment Inspectors:** Peter Lavallee and Jeremy Rutherdale	
	Pressure Zones Served: Stateline Zone	**Adjacent Pressure Zones:** Twin Peaks Zone	

WELL OFFLINE DUE TO URANIUM LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.

Notes:	**Failure Mode Scoring (1 - 5)**				
	Physical Mortality	**Capacity**	**Level of Service**		**Financial Efficiency**
1. Capacity score will be based on hydraulic model			**functionality**	**reliability**	
2. For Reliabilty to be determined based on CMMS maintenance records	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology
3. For Criticality Weighting Factors to be determined at District Workshop	2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high
	3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average
	4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low
	5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced

			Physical Mortality	Capacity	Functionality	Reliability	Financial Efficiency	
		California Waterworks Standard						
		Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
		Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
		Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
		Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
		Criticality Score					10%	**0.00**
		Well Site						
		Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
		Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
		Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
		Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
		Criticality Score					5%	**0.00**
		Building Structure						
		Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
		Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
		Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
		Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
		Criticality Score					5%	**0.00**
		Well Pump						
		Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
		Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
		Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
		Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
		Criticality Score					15%	**0.00**
		Piping & Valves						
		Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
		Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
		Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A	
		Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
		Criticality Score					10%	**0.00**
		Supply Well - Sanitary Seal, Casing and Screen						
		Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
		Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
		Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%	
		Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
		Criticality Score					15%	**0.00**
		Wellhead Treatment						
		Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
		Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
		Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
		Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
		Criticality Score					15%	**0.00**
		SCADA System						
		Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
		Unweighted Failure Mode Score (1-5)	0.00	N/A	0.00	0.00	N/A	
		Weighted Final Score (1-25)	0.00	N/A	0.00	0.00	N/A	
CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
		Factored Final Score	0.00	N/A	0.00	0.00	N/A	**0.00**
		Criticality Score					5%	**0.00**
		Electrical Power						
		Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
		Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
		Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
		Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
		Criticality Score					20%	**0.00**
							Overall Total Factored Score (Out of 25) =	**0.00**

				South Tahoe PUD	**Location Description:**	City Playfields behind District's main treatment plant	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	CLGWL	**Date:**	3/13/2012
					Wells Facility Name:	College Well	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				WELL OFFLINE DUE TO URANIUM LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.				

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R			0	compliant with Calif. DWR Bulletin 74-81?	Yes
R			0	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn			0	adequate equipment clearances to facilitate routine O&M?	Yes
Fn			0	equipment accessible for removal?	Yes
R			0	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	There are no issues with site drainage
Fn			0	wellhead minimum 18" above finished grade or floor?	Yes
R			0	well electrical controls not in vault?	Controls are in the building and not in the vault
Fn			0	well equipped with ability to add chlorination facilities?	Well has chlorination
Fn			0	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Sample taps are installed before and after disinfection
Fn			0	sample tap non-threaded downed-turned?	Non threaded and turned down on both
Fn			0	bacti sample tap not screened or aerated?	It is neither screened nor aerated
Fn			0	well able to be pumped to waste with waste discharge line protected from backflow?	Fittings to take the well to a manhole to discharge without entering the distribution system
Fn			0	well meter provided?	Yes
Fn			0	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn			0	adequate vehicle access for year-round maintenance?	This site is not accessible by vehicle in the winter time
R			0	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R			0	is site vulnerable to wildfires?	Yes it is near the meadow
R			0	is site close to known active seismic faults?	1,485 ft. to nearest fault
R			0	any unstable site conditions (if yes, describe)?	none
Fn			0	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	There is no site security except around the propane tank there is a fence. There is a history of unauthorized access at this well
Fn			0	other known problems?	None
				Building Structure	
Fn			0	adequate security measures and monitoring to prevent unauthorized access?	The building is secured and there is no history unauthorized access
PM			0	date building was constructed?	1981
PM			0	condition of exterior coatings adequate to protect structure?	The exterior condition of the facility is in good condition
Fn			0	adequate openings for ingress/egress?	There are multiple areas of ingress/egress
Fn			0	interior lighting adequate for routine O&M?	Yes
Fn			0	building designed to withstand snow load and not create safety issue?	The building meets the loads required at the time of construction
Fn			0	building meets code compliance requirements?	Met the codes at the time of construction
R			0	known fire or haz-mat conditions that could be mitigated?	None
Fn			0	other known problems?	None
PM			0	estimated service life remaining?	Exceeds AWU Useful Life
				Well Pump	Right angle drive motor powered by propane
INFORMATION	N/A	N/A	N/A	pump type?	Vertical Turbine
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Peabody Floway
INFORMATION			0	pump capacity?	unknown
PM			0	pump rebuilt (list year) and describe work done?	Well is offline due to Uranium
Fe			0	pump curves available?	No
R			0	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R			0	number of service calls/repairs in the last year?	None
INFORMATION			0	what is firm capacity of well pump based on flow test?	unknown
C		3	0	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm			0	coatings adequate to provide corrosion protection?	The coatings are adequate and there are no visual defects
Fe			0	pumps operate efficiently (>70% bowl efficiency)	unknown
R			0	pumps operate free from excessive vibration?	Yes
Fn			0	adequate NPSH available to prevent cavitation?	unknown
Fe			0	motor high efficiency and no excessive noise?	unknown
R			0	spare parts readily available?	No
R			0	other known problems?	None
PM			0	estimated service life remaining?	Exceeds AWU Useful Life

				South Tahoe PUD	**Location Description:**	City Playfields behind District's main treatment plant	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	CLGWL	**Date:**	3/13/2012
					Wells Facility Name:	College Well	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				WELL OFFLINE DUE TO URANIUM LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.				
				Piping & Valves				
Fn			0	pipe supports adequate to prevent movement or vibration?	There are steel pipe supports which are bolted to the floor			
PM			0	coatings adequate to protect piping and valves?	The coatings have worn off in places and there is a significant amount of rust			
C			0	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn			0	valves are suitable for efficient and reliable service?	None			
PM			0	estimated service life remaining?	29 years according to AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM			0	well casing is in good condition?				
PM			0	well screen is in good condition?				
Fe			0	well-driller's log is available?	No			
R			0	50 ft. sanitary seal?	Unknown			
R			0	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	High Uranium has been detected in this well. There have not been any other contaminants identified			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?				
PM			0	last year well was redeveloped?				
Fn			0	sounding tube or other means to measure depth to water surface?				
Fn			0	gravel-fill pipe provided at well head to monitor condition of filter pack?				
PM			0	estimated service life remaining?				
				Wellhead Treatment	All treatment has been removed from the well			
Fn			0	chemical storage tanks have secondary containment?	NA			
Fn			0	chemical piping/tubing is in good condition?	NA			
Fn			0	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn			0	adequate equipment for meter-pump calibration?	NA			
Fn			0	frequency of dose calibration?	NA			
R			0	spare parts and service support readily available?	NA			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	NA			
				SCADA system	The SCADA system has been disconnected			
Fn			0	pump flow meter is adequate to monitor pump performance?	NA			
Fn			0	flow totals recorded at regular intervals? How frequent?	NA			
Fn			0	pressure instrumentation is adequate to monitor pump performance?	NA			
Fn			0	automated alarm callout for critical failures and reliability?	NA			
Fn			0	alarm log maintained and reviewed annually?	NA			
Fn			0	flow totals recorded at regular intervals? How frequent?	NA			
Fn			0	pressure instrumentation is adequate to monitor pump performance?	NA			
Fn			0	automated alarm callout for critical failures and reliability?	NA			
Fn			0	alarm log maintained and reviewed annually?	NA			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	NA			
R			0	communication system is reliable (approximate no. of comm. failures in last year)?	NA			
R			0	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	NA			
R			0	spare parts/service support readily available?	NA			
PM			0	estimated service life remaining?	NA			
				Electrical Power				
R			0	standby generator size (kW)?	NA			
R			0	adequate power available to run all equipment	Yes			
R			0	adequate standby power present and reliable?	The standby right angle drive is run by propane and is adequate to run the well but not to power the system			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	250 gal exterior propane tank			
R			0	fuel supply adequate for standby power service?	Yes			
R			0	time needed to mobilize portable generator?	There are no hookups for a portable generator so it would take a significant amount of time to connect in			
Fn			0	known electrical hazards that could be mitigated?	None			
R			0	spare parts/service support readily available?	Yes			
PM			0	estimated service life remaining?	Exceeds AWU Useful Life			
				Additional Data	This well is used to shave peaks when necessary. The District is restricted as to when and how long the well can be run.			
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	200hp			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	City Playfields behind District's main treatment plant	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	CLGWL	Date: 3/13/2012
	Wells Facility Name:	College Well	Condition Assessment Inspectors: Peter Lavallee and Jeremy Rutherdale
	Pressure Zones Served:	Stateline Zone	Adjacent Pressure Zones: Twin Peaks Zone

WELL OFFLINE DUE TO URANIUM LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Corner of Rancho Way and Glenwood Way.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	GLWLHD5	**Date:**	3/7/2012
					Wells Facility Name:	Glenwood Well #5	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standard						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.40	1.00	N/A	
				Weighted Final Score (1-25)	N/A	N/A	5.60	3.75	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Final Score	N/A	N/A	3.92	1.125	N/A	**5.05**
				Criticality Score					10%	**0.50**
				Well Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	2.00	N/A	
				Weighted Final Score (1-25)	N/A	N/A	2.00	7.25	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Final Score	N/A	N/A	1.4	2.175	N/A	**3.58**
				Criticality Score					5%	**0.18**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.00	1.00	N/A	
				Weighted Final Score (1-25)	6.50	N/A	3.33	3.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Final Score	0.65	N/A	2	0.9	N/A	**3.55**
				Criticality Score					5%	**0.18**
				Well Pump						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.33	1.00	5.00	1.40	4.33	
				Weighted Final Score (1-25)	13.33	3.00	10.00	3.80	15.00	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Final Score	2.00	0.60	3.00	0.76	2.25	**8.61**
				Criticality Score					15%	**1.29**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.50	1.00	1.00	N/A	N/A	
				Weighted Final Score (1-25)	7.00	3.00	3.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A	
				Factored Final Score	0.70	1.80	0.90	N/A	N/A	**3.40**
				Criticality Score					10%	**0.34**
				Supply Well - Sanitary Seal, Casing and Screen						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	N/A	5.00	1.00	5.00	
				Weighted Final Score (1-25)	11.25	N/A	17.50	4.50	15.00	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%	
				Factored Final Score	1.13	N/A	8.75	0.90	3.00	**13.78**
				Criticality Score					15%	**2.07**
				Wellhead Treatment						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	1.00	N/A	
				Weighted Final Score (1-25)	N/A	N/A	5.25	1.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Final Score	N/A	N/A	3.15	0.40	N/A	**3.55**
				Criticality Score					15%	**0.53**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	1.33	N/A	
				Weighted Final Score (1-25)	8.00	N/A	3.00	3.33	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Final Score	0.80	N/A	1.80	1.00	N/A	**3.60**
				Criticality Score					5%	**0.18**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	1.25	N/A	
				Weighted Final Score (1-25)	4.00	N/A	3.00	5.25	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Final Score	0.80	N/A	1.80	1.05	N/A	**3.65**
				Criticality Score					20%	**0.73**
									Overall Total Factored Score (Out of 25) =	**6.00**

				South Tahoe PUD	**Location Description:**	Corner of Rancho Way and Glenwood Way.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	GLWLHD5	**Date:**	3/7/2012
					Wells Facility Name:	Glenwood Well #5	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	Yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn	1	3	3	adequate equipment clearances to facilitate routine O&M?	Yes
Fn	1	4	4	equipment accessible for removal?	Yes, the well is a pitless adapter so all removal occurs outside
R	1	5	5	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	Yes
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	Yes
R	1	2	2	well electrical controls not in vault?	Within building
Fn	1	3	3	well equipped with ability to add chlorination facilities?	Chlorination is currently onsite
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Yes before and after the disinfection
Fn	1	5	5	sample tap non-threaded downed-turned?	They are non-threaded and down turned
Fn	5	5	25	bacti sample tap not screened or aerated?	The sample taps are not screened or aerated
Fn	1	2	2	well able to be pumped to waste with waste discharge line protected from backflow?	Connection to a lay flat hose and then out to a sewer manhole
Fn	1	3	3	well meter provided?	Yes
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Yes
R	1	3	3	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	2	4	8	is site vulnerable to wildfires?	Site is adjacent to a meadow and there is a potential for wildfires
R	4	4	16	is site close to known active seismic faults?	1,778 to nearest fault to the east, 2,460 ft. to nearest fault to the west
R	1	2	2	any unstable site conditions (if yes, describe)?	None
Fn	1	2	2	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	The site is fenced and gated and the District has not had major problems. Some graffiti and tagging has occurred
Fn	1	2	2	other known problems?	None
				Building Structure	
Fn	1	3	3	adequate security measures and monitoring to prevent unauthorized access?	The facility is locked and the District has had no issues with unauthorized access into the facility
INFORMATION	N/A	N/A	N/A	date building was constructed?	2002
PM	1	3	3	condition of exterior coatings adequate to protect structure?	Block building with paint which is in good condition. The roof is also in good condition.
Fn	1	4	4	adequate openings for ingress/egress?	Multiple entry and exit points
Fn	1	3	3	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	Yes
Fn	1	2	2	building meets code compliance requirements?	Building met requirements of the code for when it was constructed
R	1	3	3	known fire or haz-mat conditions that could be mitigated?	Proximity to the meadow but no mitigation has occurred
Fn	1	4	4	other known problems?	None
PM	2	5	10	estimated service life remaining?	20 years according to AWU Useful Life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Ingersoll Dresser Pumps-Pleuger
INFORMATION		3	0	pump capacity?	1200 gpm @ 260 ft.
PM	3	4	12	pump rebuilt (list year) and describe work done?	No rebuilds on this pump
Fe	5	4	20	pump curves available?	Pump Curves are available
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	2	2	number of service calls/repairs in the last year?	None
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	1010gpm based on flow test
C	1	3	3	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm	5	4	20	coatings adequate to provide corrosion protection?	Pump coatings are unavailable since the pump was not pulled
Fe	3	5	15	pumps operate efficiently (>70% bowl efficiency)	unknown pump efficiency, but specific energy is relatively low (1700 kW-hr/Mgal)
R	1	4	4	pumps operate free from excessive vibration?	Yes
Fn	5	2	10	adequate NPSH available to prevent cavitation?	insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	insufficient data
R	3	2	6	spare parts readily available?	Parts are available from the manufacturer and the pump would need to be sent in to be rebuilt
R	1	5	5	other known problems?	None
PM	2	4	8	estimated service life remaining?	20 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Corner of Rancho Way and Glenwood Way.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	GLWLHD5	**Date:**	3/7/2012
					Wells Facility Name:	Glenwood Well #5	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				Piping & Valves				
Fn	1	4	4	pipe supports adequate to prevent movement or vibration?	Steel Supports that are bolted to the concrete floor.			
PM	2	5	10	coatings adequate to protect piping and valves?	Minor dings in the piping coatings but no other visual defects			
C	1	3	3	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	2	2	valves are suitable for efficient and reliable service?	Yes and no problems have been documented			
PM	1	4	4	estimated service life remaining?	50 years based on AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	5	3	15	well casing is in good condition?	insufficient data			
PM	5	3	15	well screen is in good condition?	insufficient data			
Fe	5	3	15	well-driller's log is available?	insufficient data			
R	1	4	4	50 ft. sanitary seal?	Yes 140 ft.			
R	1	5	5	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	None			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	insufficient data			
PM	5	2	10	last year well was redeveloped?	insufficient data			
Fn	5	3	15	sounding tube or other means to measure depth to water surface?	insufficient data			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	insufficient data			
PM	1	5	5	estimated service life remaining?	Typ useful life 50 yrs. 40 yrs remaining useful life			
				Wellhead Treatment				
Fn	5	2	10	chemical storage tanks have secondary containment?	None			
Fn	1	2	2	chemical piping/tubing is in good condition?	Tubing is in good condition with no visible defects			
INFORMATION	N/A	N/A	N/A	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn	1	4	4	adequate equipment for meter-pump calibration?	Yes			
Fn	1	5	5	frequency of dose calibration?	Daily when in operation			
R	1	1	1	spare parts and service support readily available?	Yes			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Sodium Hypochlorite with direct injection. 30 gal drums on site			
				SCADA system				
Fn	1	4	4	pump flow meter is adequate to monitor pump performance?	Yes the Siemens mag meter is hooked up to SCADA			
Fn	1	1	1	flow totals recorded at regular intervals? How frequent?	the flow totals are recorded daily by hand			
Fn	1	2	2	pressure instrumentation is adequate to monitor pump performance?	There are pressure gauges throughout the well that monitor system pressures			
Fn	1	4	4	automated alarm callout for critical failures and reliability?	Yes and it is monitored by District Operations			
Fn	1	4	4	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	2	2	communication system is reliable (approximate no. of comm. failures in last year)?	No communication issues in the last year			
R	1	2	2	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	There is a backup generator on site			
R	2	3	6	spare parts/service support readily available?	Parts are readily available through the manufacturer or at the District offices			
PM	2	4	8	estimated service life remaining?	6 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	220kW			
R	1	5	5	adequate power available to run all equipment	Yes			
R	1	5	5	adequate standby power present and reliable?	Yes			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	250gal			
R	1	5	5	fuel supply adequate for standby power service?	Yes			
INFORMATION	N/A	N/A	N/A	time needed to mobilize portable generator?	NA			
Fn	1	3	3	known electrical hazards that could be mitigated?	None			
R	2	3	6	spare parts/service support readily available?	Yes at District Plant			
PM	1	4	4	estimated service life remaining?	15 years according to AWU Useful Life			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	1200 gpm, 260 ft., 125 hp			
					Well off in winter time to allow for aquifer recharge. Operated in hand in the summer time. Complaints about white cloudy water have been logged.			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	**Location Description:**	Corner of Rancho Way and Glenwood Way.	**K/J Project Number:** 1270004*00
Water System Optimization Plan	**Wells Facility ID #:**	GLWLHD5	**Date:** 3/7/2012
	Wells Facility Name:	Glenwood Well #5	**Condition Assessment Inspectors:** Peter Lavallee and Phill Torney
	Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:** Twin Peaks Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

k				South Tahoe PUD	Location Description:	End of Helen Ave. near the Meadow	K/J Project Number:	1270004*00	
				Water System Optimization Plan	Wells Facility ID #:	HWLHD2	Date:	3/8/2012	
					Wells Facility Name:	Helen Ave. Well #2	Condition Assessment Inspectors:	Peter Lavallee and Mark Gray	
					Pressure Zones Served:	Stateline Zone	Adjacent Pressure Zones:	Twin Peaks Zone	

				Notes:	Failure Mode Scoring (1 - 5)					
					Physical Mortality	Capacity	Level of Service		Financial Efficiency	
							functionality	reliability		
				1. Capacity score will be based on hydraulic model						
				2. For Reliabilty to be determined based on CMMS maintenance records						
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standard						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.40	1.00	N/A	
				Weighted Final Score (1-25)	N/A	N/A	5.60	3.75	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Final Score	N/A	N/A	3.92	1.125	N/A	**5.05**
				Criticality Score					10%	**0.50**
				Well Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.33	2.75	N/A	
				Weighted Final Score (1-25)	N/A	N/A	4.67	9.50	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Final Score	N/A	N/A	3.27	2.85	N/A	**6.12**
				Criticality Score					5%	**0.31**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	1.00	N/A	
				Weighted Final Score (1-25)	9.00	N/A	3.33	3.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Final Score	0.9	N/A	2	0.9	N/A	**3.80**
				Criticality Score					5%	**0.19**
				Well Pump						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.33	1.00	5.00	1.40	3.00	
				Weighted Final Score (1-25)	17.33	3.00	10.00	3.80	9.67	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Final Score	2.60	0.60	3.00	0.76	1.45	**8.41**
				Criticality Score					15%	**1.26**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.00	N/A	N/A	
				Weighted Final Score (1-25)	4.50	3.00	3.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A	
				Factored Final Score	0.45	1.80	0.90	N/A	N/A	**3.15**
				Criticality Score					10%	**0.32**
				Supply Well - Sanitary Seal, Casing and Screen						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	N/A	5.00	1.00	5.00	
				Weighted Final Score (1-25)	11.25	N/A	17.50	4.50	15.00	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%	
				Factored Final Score	1.13	N/A	8.75	0.90	3.00	**13.78**
				Criticality Score					15%	**2.07**
				Wellhead Treatment						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	1.00	N/A	
				Weighted Final Score (1-25)	N/A	N/A	5.25	1.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Final Score	N/A	N/A	3.15	0.40	N/A	**3.55**
				Criticality Score					15%	**0.53**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.67	N/A	
				Weighted Final Score (1-25)	8.00	N/A	3.00	6.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Final Score	0.80	N/A	1.80	1.80	N/A	**4.40**
				Criticality Score					5%	**0.22**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	3.25	N/A	
				Weighted Final Score (1-25)	N/A	N/A	3.00	10.25	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Final Score	N/A	N/A	1.80	2.05	N/A	**3.85**
				Criticality Score					20%	**0.77**
									Overall Total Factored Score (Out of 25) =	**6.17**

k				**South Tahoe PUD**	**Location Description:**	End of Helen Ave. near the Meadow	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	HWLHD2	**Date:**	3/8/2012
					Wells Facility Name:	Helen Ave. Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	Yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn	1	3	3	adequate equipment clearances to facilitate routine O&M?	Yes
Fn	1	4	4	equipment accessible for removal?	Yes via a roof hatch
R	1	5	5	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	No issues with drainage
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	Yes
R	1	2	2	well electrical controls not in vault?	Electrical controls are in building but not in vault
Fn	1	3	3	well equipped with ability to add chlorination facilities?	Yes
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Yes
Fn	1	5	5	sample tap non-threaded downed-turned?	Yes
Fn	5	5	25	bacti sample tap not screened or aerated?	Yes it is neither screened nor aerated.
Fn	1	2	2	well able to be pumped to waste with waste discharge line protected from backflow?	Connect a lay flat hose to air gap to manhole
Fn	1	3	3	well meter provided?	Yes a Siemens mag meter
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Yes
R	4	3	12	is site within 100-yr flood plain?	Yes this site is Designated as Zone AE which base flood elevations have been determined for the 100 year flood.
R	2	4	8	is site vulnerable to wildfires?	Yes it is adjacent to the meadow
R	4	4	16	is site close to known active seismic faults?	2,390 ft. to the nearest fault
R	1	2	2	any unstable site conditions (if yes, describe)?	None
Fn	5	2	10	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	The site does not have any security around the perimeter
Fn	1	2	2	other known problems?	None
				Building Structure	
Fn	1	3	3	adequate security measures and monitoring to prevent unauthorized access?	The building is locked using the District's cyber key system
INFORMATION	N/A	N/A	N/A	date building was constructed?	1960
PM	1	3	3	condition of exterior coatings adequate to protect structure?	The exterior and interior block wall coatings are in good condition as is the roof
Fn	1	4	4	adequate openings for ingress/egress?	Yes multiple points of egress and ingress
Fn	1	3	3	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	The building met the loading requirements at the time of construction
Fn	1	2	2	building meets code compliance requirements?	The building met code requirements at the time of construction
R	1	3	3	known fire or haz-mat conditions that could be mitigated?	None
Fn	1	4	4	other known problems?	None
PM	3	5	15	estimated service life remaining?	Exceed AWU Useful Service life (rh) building needs paint & probably new roof within next 5 yrs
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Submersible Pump with 3" discharge
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Goulds 225 H25-7
INFORMATION		3	0	pump capacity?	260 @ ??psi
PM	5	4	20	pump rebuilt (list year) and describe work done?	insufficient data
Fe	1	4	4	pump curves available?	Pump Curves are available
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	2	2	number of service calls/repairs in the last year?	None the pump was offline and new piping was installed
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	260 gpm based on flow test
C	1	3	3	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm	5	4	20	coatings adequate to provide corrosion protection?	Pump coatings are unavailable since the pump was not pulled
Fe	3	5	15	pumps operate efficiently (>70% bowl efficiency)	unknown pump efficiency, but specific energy is relatively low (1700 kW-hr/Mgal)
R	1	4	4	pumps operate free from excessive vibration?	Yes
Fn	5	2	10	adequate NPSH available to prevent cavitation?	insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	insufficient data
R	3	2	6	spare parts readily available?	Pump would need to be pulled and parts would need to be ordered
R	1	5	5	other known problems?	None
PM	3	4	12	estimated service life remaining?	Exceeds AWU Useful Service Life (rh) pump should be pulled within next 5 yrs and inspected

k				**South Tahoe PUD**	**Location Description:**	End of Helen Ave. near the Meadow	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	HWLHD2	**Date:**	3/8/2012
					Wells Facility Name:	Helen Ave. Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				Piping & Valves	Piping and valves were rehabbed or replaced in February 2012			
Fn	1	4	4	pipe supports adequate to prevent movement or vibration?	Yes, both steel posts and angle iron are utilized for pipe supports			
PM	1	5	5	coatings adequate to protect piping and valves?	All coatings are in new condition			
C	1	3	3	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	2	2	valves are suitable for efficient and reliable service?	All valves were recently replaced or rehabbed.			
PM	1	4	4	estimated service life remaining?	60 years the piping was replaced in February 2012			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	5	3	15	well casing is in good condition?	insufficient data			
PM	5	3	15	well screen is in good condition?	insufficient data			
Fe	5	3	15	well-driller's log is available?	insufficient data			
R	1	4	4	50 ft. sanitary seal?	Yes it is 52 ft.			
R	1	5	5	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	No contaminant plumes have been notated within close proximity to this well			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	insufficient data			
PM	5	2	10	last year well was redeveloped?	insufficient data			
Fn	5	3	15	sounding tube or other means to measure depth to water surface?	insufficient data			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	insufficient data			
PM	1	5	5	estimated service life remaining?	Typ useful life 50 yrs. Zero yrs remaining useful life since well 2 yrs beyond useful life			
				Wellhead Treatment				
Fn	5	2	10	chemical storage tanks have secondary containment?	No			
Fn	1	2	2	chemical piping/tubing is in good condition?	Yes			
INFORMATION	N/A	N/A	N/A	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn	1	4	4	adequate equipment for meter-pump calibration?	Yes			
Fn	1	5	5	frequency of dose calibration?	Daily			
R	1	1	1	spare parts and service support readily available?	Yes			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Sodium Hypochlorite direct injection and 30 gal drums			
				SCADA system				
Fn	1	4	4	pump flow meter is adequate to monitor pump performance?	Yes the Siemens mag meter is hooked up to SCADA			
Fn	1	1	1	flow totals recorded at regular intervals? How frequent?	the flow totals are recorded daily by hand			
Fn	1	2	2	pressure instrumentation is adequate to monitor pump performance?	There are pressure gauges throughout the well that monitor system pressures			
Fn	1	4	4	automated alarm callout for critical failures and reliability?	Yes and it is monitored by District Operations			
Fn	1	4	4	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	2	2	communication system is reliable (approximate no. of comm. failures in last year)?	No communication issues in the last year			
R	5	2	10	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	A portable back up generator would need to be brought to the site in the event of a power outage			
R	2	3	6	spare parts/service support readily available?	Parts are readily available through the manufacturer or at the District offices			
PM	2	4	8	estimated service life remaining?	12 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5	adequate power available to run all equipment	Yes			
R	5	5	25	adequate standby power present and reliable?	No			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
INFORMATION	N/A	N/A	N/A	fuel supply adequate for standby power service?	NA			
R	5	1	5	time needed to mobilize portable generator?	No hookups at the site so long time to retrofit if necessary			
Fn	1	3	3	known electrical hazards that could be mitigated?	None			
R	2	3	6	spare parts/service support readily available?	Yes at the District Plant			
PM	N/A	4	N/A	estimated service life remaining?	NA			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	260gpm, 25 hp			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

k				**South Tahoe PUD**	**Location Description:**	End of Helen Ave. near the Meadow	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Wells Facility ID #:**	HWLHD2	**Date:**	3/8/2012	
					Wells Facility Name:	Helen Ave. Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray	
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone	

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Corner of Paloma and Nevada	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Wells Facility ID #:**	PLWLHD	**Date:**	3/7/2012	
					Wells Facility Name:	Paloma Well	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone	

				Notes:			**Failure Mode Scoring (1 - 5)**				
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standard							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.50	1.00	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	N/A	N/A	6.10	3.75	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	4.27	1.125	N/A		**5.40**
				Criticality Score					10%		**0.54**
				Well Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.33	1.75	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	N/A	N/A	2.67	6.25	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	1.87	1.875	N/A		**3.74**
				Criticality Score					5%		**0.19**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.00	1.00	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	6.50	N/A	3.33	3.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.65	N/A	2	0.9	N/A		**3.55**
				Criticality Score					5%		**0.18**
				Well Pump							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated		
				Unweighted Failure Mode Score (1-5)	4.00	1.00	5.00	0.80	3.00		**Total Factored Score**
				Weighted Final Score (1-25)	16.00	3.00	10.00	2.60	9.67		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Final Score	2.40	0.60	3.00	0.52	1.45		**7.97**
				Criticality Score					15%		**1.20**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A		
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.00	N/A	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	4.50	3.00	3.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A		
				Factored Final Score	0.45	1.80	0.90	N/A	N/A		**3.15**
				Criticality Score					10%		**0.32**
				Supply Well - Sanitary Seal, Casing and Screen							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated		
				Unweighted Failure Mode Score (1-5)	4.25	N/A	5.00	2.00	5.00		**Total Factored Score**
				Weighted Final Score (1-25)	12.50	N/A	17.50	9.50	15.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%		
				Factored Final Score	1.25	N/A	8.75	1.90	3.00		**14.90**
				Criticality Score					15%		**2.24**
				Wellhead Treatment							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	1.00	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	N/A	N/A	5.25	1.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Final Score	N/A	N/A	3.15	0.40	N/A		**3.55**
				Criticality Score					15%		**0.53**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	1.00	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	8.00	N/A	3.00	2.33	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.80	N/A	1.80	0.70	N/A		**3.30**
				Criticality Score					5%		**0.17**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	3.25	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	8.00	N/A	3.00	10.25	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Final Score	1.60	N/A	1.80	2.05	N/A		**5.45**
				Criticality Score					20%		**1.09**
									Overall Total Factored Score (Out of 25) =		**6.44**

				South Tahoe PUD	**Location Description:**	Corner of Paloma and Nevada	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	PLWLHD	**Date:**	3/7/2012
					Wells Facility Name:	Paloma Well	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	Yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn	1	3	3	adequate equipment clearances to facilitate routine O&M?	Yes
Fn	1	4	4	equipment accessible for removal?	Yes through a roof hatch
R	1	5	5	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	Yes
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	Yes
R	1	2	2	well electrical controls not in vault?	Well Electrical is in building not in vault
Fn	1	3	3	well equipped with ability to add chlorination facilities?	Chlorination is onsite currently
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Sample taps are provided
Fn	2	5	10	sample tap non-threaded downed-turned?	Sample taps are down turned but have threads
Fn	5	5	25	bacti sample tap not screened or aerated?	It is not screened or aerated
Fn	1	2	2	well able to be pumped to waste with waste discharge line protected from backflow?	Adapt an air release valve at the wellhead to connect lay flat hose to go to sewer
Fn	1	3	3	well meter provided?	Yes
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Single car driveway
R	1	3	3	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	1	4	4	is site vulnerable to wildfires?	No
R	4	4	16	is site close to known active seismic faults?	4,010 ft. to the nearest fault
R	1	2	2	any unstable site conditions (if yes, describe)?	None
Fn	2	2	4	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No fence around yard but no vandalism issues as the facility looks like a home
Fn	1	2	2	other known problems?	None
				Building Structure	
Fn	1	3	3	adequate security measures and monitoring to prevent unauthorized access?	The facility is adequately locked
INFORMATION	N/A	N/A	N/A	date building was constructed?	1995
PM	1	3	3	condition of exterior coatings adequate to protect structure?	The exterior is in good condition for wood siding and the roof is also in good condition
Fn	1	4	4	adequate openings for ingress/egress?	Yes, Multiple points for entry and exit
Fn	1	3	3	interior lighting adequate for routine O&M?	Interior Lighting is very good
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	Yes
Fn	1	2	2	building meets code compliance requirements?	Building meets requirements at time of construction
R	1	3	3	known fire or haz-mat conditions that could be mitigated?	None
Fn	1	4	4	other known problems?	None
PM	2	5	10	estimated service life remaining?	13 years according to AWU Useful Life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Submersible pump
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Byron Jackson
INFORMATION		3	0	pump capacity?	2500gpm @ 322ft
PM	4	4	16	pump rebuilt (list year) and describe work done?	this pump has not been rebuilt (rh) pump should be pulled and inspected
Fe	1	4	4	pump curves available?	Pump curves are available
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	2	2	number of service calls/repairs in the last year?	None
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	1630 gpm based on flow test
C	1	3	3	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm	5	4	20	coatings adequate to provide corrosion protection?	Pump coatings are unavailable since the pump was not pulled
Fe	3	5	15	pumps operate efficiently (>70% bowl efficiency)	unknown pump efficiency, but specific energy is relatively low (1700 kW-hr/Mgal)
R	1	4	4	pumps operate free from excessive vibration?	Yes
Fn	5	2	10	adequate NPSH available to prevent cavitation?	insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	insufficient data
R		2	0	spare parts readily available?	Pump would need to be pulled and parts would need to be ordered
R	1	5	5	other known problems?	None
PM	3	4	12	estimated service life remaining?	13 years according to AWU Useful Life

				South Tahoe PUD	**Location Description:**	Corner of Paloma and Nevada	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	PLWLHD	**Date:**	3/7/2012
					Wells Facility Name:	Paloma Well	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				Piping & Valves				
Fn	1	4	4	pipe supports adequate to prevent movement or vibration?	Steel supports that are bolted to the floor			
PM	1	5	5	coatings adequate to protect piping and valves?	Coatings are in excellent condition with no visible signs of defects			
C	1	3	3	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	2	2	valves are suitable for efficient and reliable service?	Yes			
PM	1	4	4	estimated service life remaining?	43 years according to AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	5	3	15	well casing is in good condition?	insufficient data			
PM	5	3	15	well screen is in good condition?	insufficient data			
Fe	5	3	15	well-driller's log is available?	insufficient data			
R	1	4	4	50 ft. sanitary seal?	Yes 172ft			
R	3	5	15	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	MTBE has been identified in sentinel wells near this well head but non has been found within the well itself			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	insufficient data			
PM	5	2	10	last year well was redeveloped?	insufficient data			
Fn	5	3	15	sounding tube or other means to measure depth to water surface?	insufficient data			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	insufficient data			
PM	2	5	10	estimated service life remaining?	Typ useful life 50 yrs. 33 yrs remaining useful life			
				Wellhead Treatment				
Fn	5	2	10	chemical storage tanks have secondary containment?	No			
Fn	1	2	2	chemical piping/tubing is in good condition?	Tubing appears new with no visual defects			
INFORMATION	N/A	N/A	N/A	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn	1	4	4	adequate equipment for meter-pump calibration?	Yes			
Fn	1	5	5	frequency of dose calibration?	Daily when in operation			
R	1	1	1	spare parts and service support readily available?	Yes			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Sodium Hypochlorite direct injection 30 gal drums			
				SCADA system				
Fn	1	4	4	pump flow meter is adequate to monitor pump performance?	The flow meter is connected to SCADA			
Fn	1	1	1	flow totals recorded at regular intervals? How frequent?	the flow totals are recorded daily by hand			
Fn	1	2	2	pressure instrumentation is adequate to monitor pump performance?	There are pressure gauges throughout the well that monitor system pressures			
Fn	1	4	4	automated alarm callout for critical failures and reliability?	Yes and it is monitored by District Operations			
Fn	1	4	4	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	2	2	communication system is reliable (approximate no. of comm. failures in last year)?	No communication issues in the last year			
R	1	2	2	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	A portable back up generator would need to be brought to the site in the event of a power outage			
R	1	3	3	spare parts/service support readily available?	Parts are readily available through the manufacturer or at the District offices			
PM	2	4	8	estimated service life remaining?	Typ useful life 50 yrs. 33 yrs remaining useful life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5	adequate power available to run all equipment	Yes			
R	5	5	25	adequate standby power present and reliable?	No			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
INFORMATION	N/A	N/A	N/A	fuel supply adequate for standby power service?	NA			
R	5	1	5	time needed to mobilize portable generator?	1-2 hours depending on outside factors such as weather			
Fn	1	3	3	known electrical hazards that could be mitigated?	None			
R	2	3	6	spare parts/service support readily available?	Yes at the District plant			
PM	2	4	8	estimated service life remaining?	11 years based on AWU Useful Life			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	2500gpm, 322 ft. head, 250hp			
					There are no hookups for a portable generator at this facility. The Well is only run on Wednesdays to keep the well fresh as Bayview is adequate for supply to the zone.			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	Corner of Paloma and Nevada	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	PLWLHD	Date: 3/7/2012
	Wells Facility Name:	Paloma Well	Condition Assessment Inspectors: Peter Lavallee and Phill Torney
	Pressure Zones Served:	Stateline Zone	Adjacent Pressure Zones: Twin Peaks Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	919 Sunset Dr.	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Wells Facility ID #:**	SSWL	**Date:**	3/8/2012	
					Wells Facility Name:	Sunset Well	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray	
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standard						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.40	1.00	N/A	
				Weighted Final Score (1-25)	N/A	N/A	5.60	3.75	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Final Score	N/A	N/A	3.92	1.125	N/A	**5.05**
				Criticality Score					10%	**0.50**
				Well Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.33	2.00	N/A	
				Weighted Final Score (1-25)	N/A	N/A	4.67	7.25	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Final Score	N/A	N/A	3.27	2.175	N/A	**5.44**
				Criticality Score					5%	**0.27**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	1.00	N/A	
				Weighted Final Score (1-25)	9.00	N/A	3.33	3.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Final Score	0.9	N/A	2	0.9	N/A	**3.80**
				Criticality Score					5%	**0.19**
				Well Pump						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.67	1.00	5.00	1.40	4.33	
				Weighted Final Score (1-25)	14.67	3.00	10.00	3.80	15.00	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Final Score	2.20	0.60	3.00	0.76	2.25	**8.81**
				Criticality Score					15%	**1.32**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.00	N/A	N/A	
				Weighted Final Score (1-25)	4.50	3.00	3.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A	
				Factored Final Score	0.45	1.80	0.90	N/A	N/A	**3.15**
				Criticality Score					10%	**0.32**
				Supply Well - Sanitary Seal, Casing and Screen						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.50	N/A	5.00	2.00	5.00	
				Weighted Final Score (1-25)	13.75	N/A	17.50	9.50	15.00	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%	
				Factored Final Score	1.38	N/A	8.75	1.90	3.00	**15.03**
				Criticality Score					15%	**2.25**
				Wellhead Treatment						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.60	1.00	N/A	
				Weighted Final Score (1-25)	N/A	N/A	4.20	1.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Final Score	N/A	N/A	2.52	0.40	N/A	**2.92**
				Criticality Score					15%	**0.44**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.67	N/A	
				Weighted Final Score (1-25)	8.00	N/A	3.00	6.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Final Score	0.80	N/A	1.80	1.80	N/A	**4.40**
				Criticality Score					5%	**0.22**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	N/A	1.00	3.25	N/A	
				Weighted Final Score (1-25)	20.00	N/A	3.00	10.25	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Final Score	4.00	N/A	1.80	2.05	N/A	**7.85**
				Criticality Score					20%	**1.57**
									Overall Total Factored Score (Out of 25) =	**7.08**

				South Tahoe PUD	**Location Description:**	919 Sunset Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	SSWL	**Date:**	3/8/2012
					Wells Facility Name:	Sunset Well	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	Yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn	1	3	3	adequate equipment clearances to facilitate routine O&M?	Yes
Fn	1	4	4	equipment accessible for removal?	Yes
R	1	5	5	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	Yes
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	Yes
R	1	2	2	well electrical controls not in vault?	Within electrical box not in vault
Fn	1	3	3	well equipped with ability to add chlorination facilities?	Yes
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Yes
Fn	1	5	5	sample tap non-threaded downed-turned?	Yes
Fn	5	5	25	bacti sample tap not screened or aerated?	Not screened or aerated
Fn	1	2	2	well able to be pumped to waste with waste discharge line protected from backflow?	Hookup a lay flat hose to go to a sewer with an air gap
Fn	1	3	3	well meter provided?	Yes impeller
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Yes
R	1	3	3	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	2	4	8	is site vulnerable to wildfires?	Yes it is very close in proximity to both forested lots and the meadow
R	4	4	16	is site close to known active seismic faults?	3,150 ft. top the nearest fault
R	1	2	2	any unstable site conditions (if yes, describe)?	None
Fn	5	2	10	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No site security for the parcel
Fn	1	2	2	other known problems?	None
				Building Structure	
Fn	1	3	3	adequate security measures and monitoring to prevent unauthorized access?	The building is locked
INFORMATION	N/A	N/A	N/A	date building was constructed?	1990
PM	1	3	3	condition of exterior coatings adequate to protect structure?	Excellent condition
Fn	1	4	4	adequate openings for ingress/egress?	Single entry into the building
Fn	1	3	3	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	The building was designed to the standards of the date of construction
Fn	1	2	2	building meets code compliance requirements?	Met the requirements as of construction
R	1	3	3	known fire or haz-mat conditions that could be mitigated?	None
Fn	1	4	4	other known problems?	None
PM	3	5	15	estimated service life remaining?	8 years according to AWU Useful Life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	8 stage Submersible Type
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Goulds
INFORMATION		3	0	pump capacity?	740 gpm @ 145psi
PM	3	4	12	pump rebuilt (list year) and describe work done?	None
Fe	5	4	20	pump curves available?	Pump Curves are available
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	None
R	1	2	2	number of service calls/repairs in the last year?	None
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	600 gpm based on flow test
C	1	3	3	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm	5	4	20	coatings adequate to provide corrosion protection?	Pump coatings are unavailable since the pump was not pulled
Fe	3	5	15	pumps operate efficiently (>70% bowl efficiency)	unknown pump efficiency, but specific energy is relatively low (1800 kW-hr/Mgal)
R	1	4	4	pumps operate free from excessive vibration?	Yes
Fn	5	2	10	adequate NPSH available to prevent cavitation?	insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	insufficient data
R	3	2	6	spare parts readily available?	Pump would need to be pulled and parts ordered
R	1	5	5	other known problems?	None
PM	3	4	12	estimated service life remaining?	8 years according to AWU Useful Life

				South Tahoe PUD	**Location Description:**	919 Sunset Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	SSWL	**Date:**	3/8/2012
					Wells Facility Name:	Sunset Well	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				Piping & Valves				
Fn	1	4	4	pipe supports adequate to prevent movement or vibration?	Yes they are steel posts bolted to the concrete floor			
PM	1	5	5	coatings adequate to protect piping and valves?	Yes the coating is adequate			
C	1	3	3	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	1	2	2	valves are suitable for efficient and reliable service?	Yes			
PM	1	4	4	estimated service life remaining?	38 years based on AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	5	3	15	well casing is in good condition?	insufficient data			
PM	5	3	15	well screen is in good condition?	insufficient data			
Fe	5	3	15	well-driller's log is available?	insufficient data			
R	1	4	4	50 ft. sanitary seal?	Yes 255ft			
R	3	5	15	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	No MTBE but Hydrogen Sulfide has been identified and has caused odor complaints in the past			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	insufficient data			
PM	5	2	10	last year well was redeveloped?	insufficient data			
Fn	5	3	15	sounding tube or other means to measure depth to water surface?	insufficient data			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	insufficient data			
PM	3	5	15	estimated service life remaining?	Typ useful life 50 yrs. 28 yrs remaining useful life			
				Wellhead Treatment				
Fn	5	2	10	chemical storage tanks have secondary containment?	NO			
Fn	1	2	2	chemical piping/tubing is in good condition?	Yes			
Fn	N/A	3	N/A	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn	1	4	4	adequate equipment for meter-pump calibration?	Yes			
Fn	1	5	5	frequency of dose calibration?	Daily when in operation. The well currently is flushed on Wednesdays and Helen well is in lead to this well.			
R	1	1	1	spare parts and service support readily available?	Yes			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Sodium Hypochlorite direct injection and 30 gal drum			
				SCADA system				
Fn	1	4	4	pump flow meter is adequate to monitor pump performance?	Yes the Siemens mag meter is hooked up to SCADA			
Fn	1	1	1	flow totals recorded at regular intervals? How frequent?	the flow totals are recorded daily by hand			
Fn	1	2	2	pressure instrumentation is adequate to monitor pump performance?	There are pressure gauges throughout the well that monitor system pressures			
Fn	1	4	4	automated alarm callout for critical failures and reliability?	Yes and it is monitored by District Operations			
Fn	1	4	4	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	2	2	communication system is reliable (approximate no. of comm. failures in last year)?	No communication issues in the last year			
R	5	2	10	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	A portable back up generator would need to be brought to the site in the event of a power outage			
R	2	3	6	spare parts/service support readily available?	Parts are readily available through the manufacturer or at the District offices			
PM	2	4	8	estimated service life remaining?	11 years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5	adequate power available to run all equipment	Yes			
R	5	5	25	adequate standby power present and reliable?	NA			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
INFORMATION	N/A	N/A	N/A	fuel supply adequate for standby power service?	NA			
R	5	1	5	time needed to mobilize portable generator?	No hookups at the site so long time to retrofit if necessary			
Fn	1	3	3	known electrical hazards that could be mitigated?	None			
R	2	3	6	spare parts/service support readily available?	Yes at the District Plant			
PM	5	4	20	estimated service life remaining?	3 years based on AWU Useful Life			
				Additional Data				
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	740gpm @ 145psi, 100 hp			
					This well has a 10" casing due to some decisions of previous board members. The well is expected to be able to produce a significant amount more of water but a large enough pump can not be fit into the 10" casing.			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	919 Sunset Dr.	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	SSWL	Date: 3/8/2012
	Wells Facility Name:	Sunset Well	Condition Assessment Inspectors: Peter Lavallee and Mark Gray
	Pressure Zones Served:	Stateline Zone	Adjacent Pressure Zones: Twin Peaks Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	1128 Tata Lane	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Wells Facility ID #:**	TLWL1	**Date:**	3/8/2012	
					Wells Facility Name:	Tata Well #1	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray	
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone or Gardner Mountain Zone depending on valving	
				WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.					
				Notes:	**Failure Mode Scoring (1 - 5)**				
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**	
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced
				California Waterworks Standard					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					10%
				Well Site					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					5%
				Building Structure					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					5%
				Well Pump					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					15%
				Piping & Valves					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					10%
				Supply Well - Sanitary Seal, Casing and Screen					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					15%
				Wellhead Treatment					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					15%
				SCADA System					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					5%
				Electrical Power					
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A
				Factored Final Score	N/A	N/A	N/A	N/A	N/A
				Criticality Score					20%
								Overall Total Factored Score (Out of 25) =	**0.00**

				South Tahoe PUD	**Location Description:**	1128 Tata Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	TLWL1	**Date:**	3/8/2012
					Wells Facility Name:	Tata Well #1	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone or Gardner Mountain Zone depending on valving
				WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.				

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R			0	compliant with Calif. DWR Bulletin 74-81?	Yes
R			0	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn			0	adequate equipment clearances to facilitate routine O&M?	Yes
Fn			0	equipment accessible for removal?	Yes through a roof hatch
R			0	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	There are no site drainage issues
Fn			0	wellhead minimum 18" above finished grade or floor?	Yes
R			0	well electrical controls not in vault?	Well controls are within the building and not in a vault
Fn			0	well equipped with ability to add chlorination facilities?	Yes
Fn			0	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	NA Well not in use
Fn			0	sample tap non-threaded downed-turned?	NA Well not in use
Fn			0	bacti sample tap not screened or aerated?	NA Well not in use
Fn			0	well able to be pumped to waste with waste discharge line protected from backflow?	NA Well not in use
Fn			0	well meter provided?	NA Well not in use
Fn			0	chemical additives NSF 60 compliant?	NA Well not in use
				Well Site	
Fn			0	adequate vehicle access for year-round maintenance?	Yes this is a large parcel shared with Tata Booster and Tata Tank
R			0	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R			0	is site vulnerable to wildfires?	No
R			0	is site close to known active seismic faults?	2,020 ft. to the nearest fault line
R			0	any unstable site conditions (if yes, describe)?	Trees are close to the well heads and building
Fn			0	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	This parcel has a fence around the perimeter but unauthorized access has occurred in the past
Fn			0	other known problems?	None
				Building Structure	
Fn			0	adequate security measures and monitoring to prevent unauthorized access?	The building has a lock on the door. Stand alone shed
PM			0	date building was constructed?	1960
PM			0	condition of exterior coatings adequate to protect structure?	Exterior coatings are acceptable
Fn			0	adequate openings for ingress/egress?	There is a single door for ingress/egress
Fn			0	interior lighting adequate for routine O&M?	Yes
Fn			0	building designed to withstand snow load and not create safety issue?	Met the requirements for when it was constructed
Fn			0	building meets code compliance requirements?	Met the requirements for when it was constructed
R			0	known fire or haz-mat conditions that could be mitigated?	None
Fn			0	other known problems?	None
PM			0	estimated service life remaining?	Exceeds AWU Useful Life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Goulds
INFORMATION			0	pump capacity?	unknown
PM			0	pump rebuilt (list year) and describe work done?	None
Fe			0	pump curves available?	No
R			0	known history of pump/motor failures? If so, explain the nature of the failure(s).	None the well is out of service
R			0	number of service calls/repairs in the last year?	None the well is out of service
INFORMATION			0	what is firm capacity of well pump based on flow test?	Unknown
C		3	0	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm			0	coatings adequate to provide corrosion protection?	Submersible pump that has not been pulled
Fe			0	pumps operate efficiently (>70% bowl efficiency)	Unknown
R			0	pumps operate free from excessive vibration?	unknown
Fn			0	adequate NPSH available to prevent cavitation?	unknown
Fe			0	motor high efficiency and no excessive noise?	Unknown
R			0	spare parts readily available?	No the pumps would need to be pulled and parts ordered
R			0	other known problems?	None
PM			0	estimated service life remaining?	Exceeds AWU Useful Life

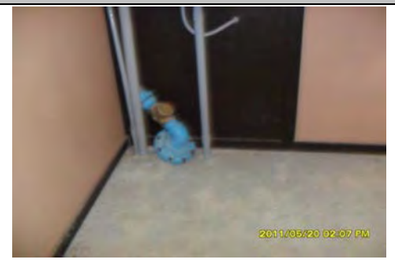
				South Tahoe PUD	**Location Description:**	1128 Tata Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	TLWL1	**Date:**	3/8/2012
					Wells Facility Name:	Tata Well #1	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone or Gardner Mountain Zone depending on valving
				WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.				
				Piping & Valves				
Fn			0	pipe supports adequate to prevent movement or vibration?	NA			
PM			0	coatings adequate to protect piping and valves?	NA			
C			0	pipes adequately sized to prevent excessive noise or headloss?	NA			
Fn			0	valves are suitable for efficient and reliable service?	NA			
PM			0	estimated service life remaining?	NA			
				Supply Well - Sanitary Seal, Casing and Screen				
PM			0	well casing is in good condition?	unknown			
PM			0	well screen is in good condition?	unknown			
Fe			0	well-driller's log is available?	unknown			
R			0	50 ft. sanitary seal?	unknown			
R			0	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	MTBE has been identified within this well and it has been shut down.			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	unknown			
PM			0	last year well was redeveloped?	unknown			
Fn			0	sounding tube or other means to measure depth to water surface?	unknown			
Fn			0	gravel-fill pipe provided at well head to monitor condition of filter pack?	unknown			
PM			0	estimated service life remaining?	unknown			
				Wellhead Treatment				
Fn			0	chemical storage tanks have secondary containment?	well is out of service and chlorine injection equipment has been removed			
Fn			0	chemical piping/tubing is in good condition?	NA			
Fn			0	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn			0	adequate equipment for meter-pump calibration?	NA			
Fn			0	frequency of dose calibration?	NA			
R			0	spare parts and service support readily available?	NA			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	NA			
				SCADA system				
Fn			0	pump flow meter is adequate to monitor pump performance?	The well is out of service so the flow meter is not connected			
Fn			0	flow totals recorded at regular intervals? How frequent?	NA			
Fn			0	pressure instrumentation is adequate to monitor pump performance?	NA			
Fn			0	automated alarm callout for critical failures and reliability?	NA			
Fn			0	alarm log maintained and reviewed annually?	NA			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	NA			
R			0	communication system is reliable (approximate no. of comm. failures in last year)?	NA			
R			0	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	NA			
R			0	spare parts/service support readily available?	NA			
PM			0	estimated service life remaining?	NA			
				Electrical Power				
R			0	standby generator size (kW)?	NA			
R			0	adequate power available to run all equipment	yes			
R			0	adequate standby power present and reliable?	NA			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R			0	fuel supply adequate for standby power service?	NA			
R			0	time needed to mobilize portable generator?	Time needed to mobilize a portable generator is high because there are no connections			
Fn			0	known electrical hazards that could be mitigated?	None			
R			0	spare parts/service support readily available?	At the District's main plant			
PM			0	estimated service life remaining?	NA			
				Additional Data	Well not in use due to MTBE and discharge piping has been separated.			
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	Unknown			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	1128 Tata Lane	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	TLWL1	Date: 3/8/2012
	Wells Facility Name:	Tata Well #1	Condition Assessment Inspectors: Peter Lavallee and Mark Gray
	Pressure Zones Served:	Stateline Zone	Adjacent Pressure Zones: Twin Peaks Zone or Gardner Mountain Zone depending on valving

WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.

Photo Evidence for PM, Fn, R, FE

PHOTOS



				South Tahoe PUD	**Location Description:**	1128 Tata Lane		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Wells Facility ID #:**	TLWL2		**Date:**	3/8/2012		
					Wells Facility Name:	Tata Well #2		**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray		
					Pressure Zones Served:	Stateline Zone		**Adjacent Pressure Zones:**	Twin Peaks Zone or Gardner Mountain Zone depending on Valving		
				WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.							
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standard							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					10%		**0.00**
				Well Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					5%		**0.00**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					5%		**0.00**
				Well Pump							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					15%		**0.00**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					10%		**0.00**
				Supply Well - Sanitary Seal, Casing and Screen							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					15%		**0.00**
				Wellhead Treatment							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					15%		**0.00**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					5%		**0.00**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					20%		**0.00**
									Overall Total Factored Score (Out of 25) =		**0.00**

				South Tahoe PUD	**Location Description:**	1128 Tata Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	TLWL2	**Date:**	3/8/2012
					Wells Facility Name:	Tata Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone or Gardner Mountain Zone depending on Valving
				WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.				

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R			0	compliant with Calif. DWR Bulletin 74-81?	Yes
R			0	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn			0	adequate equipment clearances to facilitate routine O&M?	Yes
Fn			0	equipment accessible for removal?	Yes through roof hatch
R			0	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	There are no site drainage issues
Fn			0	wellhead minimum 18" above finished grade or floor?	Yes
R			0	well electrical controls not in vault?	Well controls are within the building and not in a vault
Fn			0	well equipped with ability to add chlorination facilities?	Yes
Fn			0	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Not Connected
Fn			0	sample tap non-threaded downed-turned?	NA Well not in use
Fn			0	bacti sample tap not screened or aerated?	NA Well not in use
Fn			0	well able to be pumped to waste with waste discharge line protected from backflow?	NA Well not in use
Fn			0	well meter provided?	NA Well not in use
Fn			0	chemical additives NSF 60 compliant?	NA Well not in use
				Well Site	
Fn			0	adequate vehicle access for year-round maintenance?	Yes this is a large parcel shared with Tata Booster and Tata Tank
R			0	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R			0	is site vulnerable to wildfires?	No
R			0	is site close to known active seismic faults?	2,020 ft. to the nearest fault line
R			0	any unstable site conditions (if yes, describe)?	Trees are close to the well heads and building
Fn			0	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	This parcel has a fence around the perimeter but unauthorized access has occurred in the past
Fn			0	other known problems?	None
				Building Structure	
Fn			0	adequate security measures and monitoring to prevent unauthorized access?	The building has a lock on the door
PM			0	date building was constructed?	1960
PM			0	condition of exterior coatings adequate to protect structure?	Coatings on block walls are in great condition. The fascia and soffit of the building show water damage on the low side of the single sloped roof. It also appears that animals may at one time had nests within the soffit of the building.
Fn			0	adequate openings for ingress/egress?	There is a single door for ingress/egress
Fn			0	interior lighting adequate for routine O&M?	Yes
Fn			0	building designed to withstand snow load and not create safety issue?	Met the requirements for when it was constructed
Fn			0	building meets code compliance requirements?	Met the requirements for when it was constructed
R			0	known fire or haz-mat conditions that could be mitigated?	None
Fn			0	other known problems?	None
PM			0	estimated service life remaining?	Exceeds AWU Useful Life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Goulds
INFORMATION			0	pump capacity?	unknown
PM			0	pump rebuilt (list year) and describe work done?	None
Fe			0	pump curves available?	No
R			0	known history of pump/motor failures? If so, explain the nature of the failure(s).	None the well is out of service
R			0	number of service calls/repairs in the last year?	None the well is out of service
INFORMATION			0	what is firm capacity of well pump based on flow test?	Unknown
C		3	0	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm			0	coatings adequate to provide corrosion protection?	Submersible pump that has not been pulled
Fe			0	pumps operate efficiently (>70% bowl efficiency)	Unknown
R			0	pumps operate free from excessive vibration?	unknown
Fn			0	adequate NPSH available to prevent cavitation?	unknown
Fe			0	motor high efficiency and no excessive noise?	Unknown
R			0	spare parts readily available?	No the pumps would need to be pulled and parts ordered
R			0	other known problems?	None
PM			0	estimated service life remaining?	Exceeds AWU Useful Life

				South Tahoe PUD	**Location Description:**	1128 Tata Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	TLWL2	**Date:**	3/8/2012
					Wells Facility Name:	Tata Well #2	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone or Gardner Mountain Zone depending on Valving
				WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.				
				Piping & Valves				
Fn			0	pipe supports adequate to prevent movement or vibration?	NA			
PM			0	coatings adequate to protect piping and valves?	NA			
C			0	pipes adequately sized to prevent excessive noise or headloss?	NA			
Fn			0	valves are suitable for efficient and reliable service?	NA			
PM			0	estimated service life remaining?	NA			
				Supply Well - Sanitary Seal, Casing and Screen				
PM			0	well casing is in good condition?	unknown			
PM			0	well screen is in good condition?	unknown			
Fe			0	well-driller's log is available?	unknown			
R			0	50 ft. sanitary seal?	unknown			
R			0	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	MTBE has been identified within this well and it has been shut down.			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	unknown			
PM			0	last year well was redeveloped?	unknown			
Fn			0	sounding tube or other means to measure depth to water surface?	unknown			
Fn			0	gravel-fill pipe provided at well head to monitor condition of filter pack?	unknown			
PM			0	estimated service life remaining?	unknown			
				Wellhead Treatment				
Fn			0	chemical storage tanks have secondary containment?	well is out of service and chlorine injection equipment has been removed			
Fn			0	chemical piping/tubing is in good condition?	NA			
Fn			0	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn			0	adequate equipment for meter-pump calibration?	NA			
Fn			0	frequency of dose calibration?	NA			
R			0	spare parts and service support readily available?	NA			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	NA			
				SCADA system				
Fn			0	pump flow meter is adequate to monitor pump performance?	The well is out of service so the flow meter is not connected			
Fn			0	flow totals recorded at regular intervals? How frequent?	NA			
Fn			0	pressure instrumentation is adequate to monitor pump performance?	NA			
Fn			0	automated alarm callout for critical failures and reliability?	NA			
Fn			0	alarm log maintained and reviewed annually?	NA			
Fn			0	flow totals recorded at regular intervals? How frequent?	NA			
Fn			0	pressure instrumentation is adequate to monitor pump performance?	NA			
Fn			0	automated alarm callout for critical failures and reliability?	NA			
Fn			0	alarm log maintained and reviewed annually?	NA			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	NA			
R			0	communication system is reliable (approximate no. of comm. failures in last year)?	NA			
R			0	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	NA			
R			0	spare parts/service support readily available?	NA			
PM			0	estimated service life remaining?	NA			
				Electrical Power				
R			0	standby generator size (kW)?	NA			
R			0	adequate power available to run all equipment	yes			
R			0	adequate standby power present and reliable?	NA			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R			0	fuel supply adequate for standby power service?	NA			
R			0	time needed to mobilize portable generator?	Time needed to mobilize a portable generator is high because there are no connections			
Fn			0	known electrical hazards that could be mitigated?	None			
R			0	spare parts/service support readily available?	At the District's main plant			
PM			0	estimated service life remaining?	NA			
				Additional Data	Well not in use due to MTBE and discharge piping has been separated.			
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	15hp			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	1128 Tata Lane	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	TLWL2	Date: 3/8/2012
	Wells Facility Name:	Tata Well #2	Condition Assessment Inspectors: Peter Lavallee and Mark Gray
	Pressure Zones Served:	Stateline Zone	Adjacent Pressure Zones: Twin Peaks Zone or Gardner Mountain Zone depending on Valving

WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	1128 Tata Lane	**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Wells Facility ID #:**	TLWL3	**Date:**	3/8/2012		
					Wells Facility Name:	Tata Well #3	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray		
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone or Gardner Mountain Zone depending on valving		
				WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.						
				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standard						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					10%	**0.00**
				Well Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					5%	**0.00**
				Building Structure						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					5%	**0.00**
				Well Pump						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					15%	**0.00**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					10%	**0.00**
				Supply Well - Sanitary Seal, Casing and Screen						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					15%	**0.00**
				Wellhead Treatment						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					15%	**0.00**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					5%	**0.00**
				Electrical Power						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A	
				Factored Final Score	N/A	N/A	N/A	N/A	N/A	**0.00**
				Criticality Score					20%	**0.00**
									Overall Total Factored Score (Out of 25) =	**0.00**

				South Tahoe PUD	**Location Description:**	1128 Tata Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	TLWL3	**Date:**	3/8/2012
					Wells Facility Name:	Tata Well #3	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone or Gardner Mountain Zone depending on valving
				WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.				

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R			0	compliant with Calif. DWR Bulletin 74-81?	Yes
R			0	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn			0	adequate equipment clearances to facilitate routine O&M?	Yes
Fn			0	equipment accessible for removal?	Yes the well head is outside
R			0	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	There are no site drainage issues
Fn			0	wellhead minimum 18" above finished grade or floor?	Yes
R			0	well electrical controls not in vault?	Well controls are within the building and not in a vault
Fn			0	well equipped with ability to add chlorination facilities?	Yes
Fn			0	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	NA Well not in use
Fn			0	sample tap non-threaded downed-turned?	NA Well not in use
Fn			0	bacti sample tap not screened or aerated?	NA Well not in use
Fn			0	well able to be pumped to waste with waste discharge line protected from backflow?	NA Well not in use
Fn			0	well meter provided?	NA Well not in use
Fn			0	chemical additives NSF 60 compliant?	NA Well not in use
				Well Site	
Fn			0	adequate vehicle access for year-round maintenance?	Yes this is a large parcel shared with Tata Booster and Tata Tank
R			0	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R			0	is site vulnerable to wildfires?	No
R			0	is site close to known active seismic faults?	2,020 ft. to the nearest fault line
R			0	any unstable site conditions (if yes, describe)?	Trees are close to the well heads and building
Fn			0	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	This parcel has a fence around the perimeter but unauthorized access has occurred in the past
Fn			0	other known problems?	None
				Building Structure	
Fn			0	adequate security measures and monitoring to prevent unauthorized access?	The building has a lock on the door
PM			0	date building was constructed?	1960
PM			0	condition of exterior coatings adequate to protect structure?	Well is outside treatment in same building as Tata #2
Fn			0	adequate openings for ingress/egress?	There is a single door for ingress/egress
Fn			0	interior lighting adequate for routine O&M?	Yes
Fn			0	building designed to withstand snow load and not create safety issue?	Met the requirements for when it was constructed
Fn			0	building meets code compliance requirements?	Met the requirements for when it was constructed
R			0	known fire or haz-mat conditions that could be mitigated?	None
Fn			0	other known problems?	None
PM			0	estimated service life remaining?	Exceeds AWU Useful Life
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Goulds
INFORMATION			0	pump capacity?	unknown
PM			0	pump rebuilt (list year) and describe work done?	None
Fe			0	pump curves available?	No
R			0	known history of pump/motor failures? If so, explain the nature of the failure(s).	None the well is out of service
R			0	number of service calls/repairs in the last year?	None the well is out of service
INFORMATION			0	what is firm capacity of well pump based on flow test?	Unknown
C		3	0	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm			0	coatings adequate to provide corrosion protection?	Submersible pump that has not been pulled
Fe			0	pumps operate efficiently (>70% bowl efficiency)	Unknown
R			0	pumps operate free from excessive vibration?	unknown
Fn			0	adequate NPSH available to prevent cavitation?	unknown
Fe			0	motor high efficiency and no excessive noise?	Unknown
R			0	spare parts readily available?	No the pumps would need to be pulled and parts ordered
R			0	other known problems?	None
PM			0	estimated service life remaining?	Exceeds AWU Useful Life

				South Tahoe PUD	**Location Description:**	1128 Tata Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	TLWL3	**Date:**	3/8/2012
					Wells Facility Name:	Tata Well #3	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone or Gardner Mountain Zone depending on valving
				WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.				
				Piping & Valves				
Fn			0	pipe supports adequate to prevent movement or vibration?	Well discharge piping has been removed			
PM			0	coatings adequate to protect piping and valves?	NA			
C			0	pipes adequately sized to prevent excessive noise or headloss?	NA			
Fn			0	valves are suitable for efficient and reliable service?	NA			
PM			0	estimated service life remaining?	NA			
				Supply Well - Sanitary Seal, Casing and Screen				
PM			0	well casing is in good condition?	unknown			
PM			0	well screen is in good condition?	unknown			
Fe			0	well-driller's log is available?	unknown			
R			0	50 ft. sanitary seal?	unknown			
R			0	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	MTBE has been identified within this well and it has been shut down.			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	unknown			
PM			0	last year well was redeveloped?	unknown			
Fn			0	sounding tube or other means to measure depth to water surface?	unknown			
Fn			0	gravel-fill pipe provided at well head to monitor condition of filter pack?	unknown			
PM			0	estimated service life remaining?	unknown			
				Wellhead Treatment				
Fn			0	chemical storage tanks have secondary containment?	well is out of service and chlorine injection equipment has been removed			
Fn			0	chemical piping/tubing is in good condition?	NA			
Fn			0	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn			0	adequate equipment for meter-pump calibration?	NA			
Fn			0	frequency of dose calibration?	NA			
R			0	spare parts and service support readily available?	NA			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	NA			
				SCADA system				
Fn			0	pump flow meter is adequate to monitor pump performance?	The well is out of service so the flow meter is not connected			
Fn			0	flow totals recorded at regular intervals? How frequent?	NA			
Fn			0	pressure instrumentation is adequate to monitor pump performance?	NA			
Fn			0	automated alarm callout for critical failures and reliability?	NA			
Fn			0	alarm log maintained and reviewed annually?	NA			
Fn			0	flow totals recorded at regular intervals? How frequent?	NA			
Fn			0	pressure instrumentation is adequate to monitor pump performance?	NA			
Fn			0	automated alarm callout for critical failures and reliability?	NA			
Fn			0	alarm log maintained and reviewed annually?	NA			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	NA			
R			0	communication system is reliable (approximate no. of comm. failures in last year)?	NA			
R			0	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	NA			
R			0	spare parts/service support readily available?	NA			
PM			0	estimated service life remaining?	NA			
				Electrical Power				
R			0	standby generator size (kW)?	NA			
R			0	adequate power available to run all equipment	yes			
R			0	adequate standby power present and reliable?	NA			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R			0	fuel supply adequate for standby power service?	NA			
R			0	time needed to mobilize portable generator?	Time needed to mobilize a portable generator is high because there are no connections			
Fn			0	known electrical hazards that could be mitigated?	None			
R			0	spare parts/service support readily available?	At the District's main plant			
PM			0	estimated service life remaining?	NA			
				Additional Data	Well not in use due to MTBE and discharge piping has been separated.			
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	Unknown			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	1128 Tata Lane	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	TLWL3	Date: 3/8/2012
	Wells Facility Name:	Tata Well #3	Condition Assessment Inspectors: Peter Lavallee and Mark Gray
	Pressure Zones Served:	Stateline Zone	Adjacent Pressure Zones: Twin Peaks Zone or Gardner Mountain Zone depending on valving

WELL OFFLINE DUE TO ARSENIC LEVELS THAT HAVE BEEN DETECTED WITHIN THE WELL. WELL NOT RATED.

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	1329 Mountain Meadow Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	MVWL	**Date:**	3/12/2012
					Wells Facility Name:	Mountain View Well	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Stateline and Flagpole Zones

				Notes:			**Failure Mode Scoring (1 - 5)**				
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standard							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.60	1.75	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	N/A	N/A	6.20	7.50	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	4.34	2.25	N/A		**6.59**
				Criticality Score					10%		**0.66**
				Well Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.33	3.00	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	N/A	N/A	4.67	9.50	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	3.27	2.85	N/A		**6.12**
				Criticality Score					5%		**0.31**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		
				Unweighted Failure Mode Score (1-5)	4.00	N/A	1.00	1.00	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	16.00	N/A	3.33	3.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	1.6	N/A	2	0.9	N/A		**4.50**
				Criticality Score					5%		**0.23**
				Well Pump							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated		
				Unweighted Failure Mode Score (1-5)	4.33	5.00	5.00	1.20	4.33		**Total Factored Score**
				Weighted Final Score (1-25)	17.33	15.00	10.00	3.40	15.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Final Score	2.60	3.00	3.00	0.68	2.25		**11.53**
				Criticality Score					15%		**1.73**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A		
				Unweighted Failure Mode Score (1-5)	5.00	1.00	5.00	N/A	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	22.50	3.00	15.00	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A		
				Factored Final Score	2.25	1.80	4.50	N/A	N/A		**8.55**
				Criticality Score					10%		**0.86**
				Supply Well - Sanitary Seal, Casing and Screen							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	Calculated		
				Unweighted Failure Mode Score (1-5)	5.00	N/A	5.00	3.00	5.00		**Total Factored Score**
				Weighted Final Score (1-25)	16.25	N/A	17.50	12.50	15.00		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%		
				Factored Final Score	1.63	N/A	8.75	2.50	3.00		**15.88**
				Criticality Score					15%		**2.38**
				Wellhead Treatment							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.60	1.00	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	N/A	N/A	4.20	1.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Final Score	N/A	N/A	2.52	0.40	N/A		**2.92**
				Criticality Score					15%		**0.44**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.67	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	8.00	N/A	3.00	6.00	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	0.80	N/A	1.80	1.80	N/A		**4.40**
				Criticality Score					5%		**0.22**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		
				Unweighted Failure Mode Score (1-5)	5.00	N/A	1.00	3.25	N/A		**Total Factored Score**
				Weighted Final Score (1-25)	20.00	N/A	3.00	10.25	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Final Score	4.00	N/A	1.80	2.05	N/A		**7.85**
				Criticality Score					20%		**1.57**
									Overall Total Factored Score (Out of 25) =		**8.38**

				South Tahoe PUD	**Location Description:**	1329 Mountain Meadow Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	MVWL	**Date:**	3/12/2012
					Wells Facility Name:	Mountain View Well	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Stateline and Flagpole Zones

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R	1	4	4	compliant with Calif. DWR Bulletin 74-81?	Yes
R	1	4	4	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn	3	3	9	adequate equipment clearances to facilitate routine O&M?	No this well does not have adequate clearances
Fn	1	4	4	equipment accessible for removal?	Yes through a roof hatch
R	4	5	20	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	No this site has terrible drainage and due to the artesian nature has ponding on the north east side of the building
Fn	1	3	3	wellhead minimum 18" above finished grade or floor?	Yes
R	1	2	2	well electrical controls not in vault?	The are not in a vault
Fn	1	3	3	well equipped with ability to add chlorination facilities?	Yes there is Cl available on site now
Fn	1	4	4	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Yes
Fn	1	5	5	sample tap non-threaded downed-turned?	They are down turned and non-threaded
Fn	5	5	25	bacti sample tap not screened or aerated?	Neither screened nor aerated
Fn	1	2	2	well able to be pumped to waste with waste discharge line protected from backflow?	Discharge with an air gap
Fn	1	3	3	well meter provided?	Yes
Fn	1	4	4	chemical additives NSF 60 compliant?	Yes
				Well Site	
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Yes
R	2	3	6	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	2	4	8	is site vulnerable to wildfires?	The site is adjacent to an open meadow and is vulnerable to wildfires
R	4	4	16	is site close to known active seismic faults?	4,300 ft. to the nearest fault line
R	4	2	8	any unstable site conditions (if yes, describe)?	There is terrible drainage issues around the building as seen below in the pictures
Fn	5	2	10	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	There is no security and there is evidence of attempted break ins on the door
Fn	1	2	2	other known problems?	None
				Building Structure	
Fn	1	3	3	adequate security measures and monitoring to prevent unauthorized access?	No attempts have been made to get in
INFORMATION	N/A	N/A	N/A	date building was constructed?	1967
PM	4	3	12	condition of exterior coatings adequate to protect structure?	Adequate but could be updated, Shingles are missing from the roof and paint is starting to peel
Fn	1	4	4	adequate openings for ingress/egress?	Single door in and out
Fn	1	3	3	interior lighting adequate for routine O&M?	Yes
Fn	1	4	4	building designed to withstand snow load and not create safety issue?	Yes for the time when it was constructed
Fn	1	2	2	building meets code compliance requirements?	Yes for the time when it was constructed
R	1	3	3	known fire or haz-mat conditions that could be mitigated?	None
Fn	1	4	4	other known problems?	None
PM	4	5	20	estimated service life remaining?	Exceeds AWU Useful Life (rh) needs rehab within nxt 5 yrs
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	Submersible
INFORMATION	N/A	N/A	N/A	pump manufacturer?	Goulds
INFORMATION		3	0	pump capacity?	225gpm
PM	4	4	16	pump rebuilt (list year) and describe work done?	Replaced the pump and motor in 1996
Fe	5	4	20	pump curves available?	Pump Curves are available
R	1	2	2	known history of pump/motor failures? If so, explain the nature of the failure(s).	None since replacement
R	1	2	2	number of service calls/repairs in the last year?	None
INFORMATION		3	0	what is firm capacity of well pump based on flow test?	110 gpm based on flow test
C	5	3	15	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm	5	4	20	coatings adequate to provide corrosion protection?	Pump is submerged and unable to be evaluated
Fe	3	5	15	pumps operate efficiently (>70% bowl efficiency)	unknown pump efficiency, but specific energy is relatively low (1500 kW-hr/Mgal)
R	1	4	4	pumps operate free from excessive vibration?	Yes
Fn	5	2	10	adequate NPSH available to prevent cavitation?	insufficient data
Fe	5	2	10	motor high efficiency and no excessive noise?	insufficient data
R	2	2	4	spare parts readily available?	Yes at the District shops and through the manufacturer
R	1	5	5	other known problems?	None
PM	4	4	16	estimated service life remaining?	Estimate that it exceeds the AWU Useful Life (rh) pump should be pulled and inspected within nxt 5 yrs

				South Tahoe PUD	**Location Description:**	1329 Mountain Meadow Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	MVWL	**Date:**	3/12/2012
					Wells Facility Name:	Mountain View Well	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Stateline and Flagpole Zones
				Piping & Valves	Old piping through concrete floor is thin walled and had numerous leaks just outside the building			
Fn	5	4	20	pipe supports adequate to prevent movement or vibration?	Steel Support that is not bolted to the floor			
PM	5	5	25	coatings adequate to protect piping and valves?	Most coatings are in good condition but others are worn, cracked, rusted, and need to be replaced			
C	1	3	3	pipes adequately sized to prevent excessive noise or headloss?	Yes			
Fn	5	2	10	valves are suitable for efficient and reliable service?	Yes, butterfly valve on discharge is rusted and in bad condition			
PM	5	4	20	estimated service life remaining?	Estimate that the piping is near or has exceeded AWU Useful Life			
				Supply Well - Sanitary Seal, Casing and Screen				
PM	5	3	15	well casing is in good condition?	insufficient data			
PM	5	3	15	well screen is in good condition?	insufficient data			
Fe	5	3	15	well-driller's log is available?	No			
R	5	4	20	50 ft. sanitary seal?	No it is 24 ft.			
R	1	5	5	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	None measured nearby			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	insufficient data			
PM	5	2	10	last year well was redeveloped?	insufficient data			
Fn	5	3	15	sounding tube or other means to measure depth to water surface?	insufficient data			
Fn	5	4	20	gravel-fill pipe provided at well head to monitor condition of filter pack?	insufficient data			
PM	5	5	25	estimated service life remaining?	Typ useful life 50 yrs. 5 yrs remaining useful life			
				Wellhead Treatment				
Fn	5	2	10	chemical storage tanks have secondary containment?	No			
Fn	1	2	2	chemical piping/tubing is in good condition?	Yes			
Fn	N/A	3	N/A	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn	1	4	4	adequate equipment for meter-pump calibration?	Yes			
Fn	1	5	5	frequency of dose calibration?	Daily when in use			
R	1	1	1	spare parts and service support readily available?	Yes			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	Sodium Hypochlorite and 30gal drums			
				SCADA system				
Fn	1	4	4	pump flow meter is adequate to monitor pump performance?	Yes the meter is hooked up to SCADA			
Fn	1	1	1	flow totals recorded at regular intervals? How frequent?	the flow totals are recorded daily by hand			
Fn	1	2	2	pressure instrumentation is adequate to monitor pump performance?	There are pressure gauges throughout the well that monitor system pressures			
Fn	1	4	4	automated alarm callout for critical failures and reliability?	Yes and it is monitored by District Operations			
Fn	1	4	4	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	2	2	communication system is reliable (approximate no. of comm. failures in last year)?	No communication issues in the last year			
R	5	2	10	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	A portable back up generator would need to be brought to the site in the event of a power outage			
R	2	3	6	spare parts/service support readily available?	Parts are readily available through the manufacturer or at the District offices			
PM	2	4	8	estimated service life remaining?	11 Years based on AWU Useful Life			
				Electrical Power				
INFORMATION	N/A	N/A	N/A	standby generator size (kW)?	NA			
R	1	5	5	adequate power available to run all equipment	Yes			
R	5	5	25	adequate standby power present and reliable?	No			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
INFORMATION	N/A	N/A	N/A	fuel supply adequate for standby power service?	NA			
R	5	1	5	time needed to mobilize portable generator?	1-2 hours but there are no hookups so retrofit would take longer			
Fn	1	3	3	known electrical hazards that could be mitigated?	None			
R	2	3	6	spare parts/service support readily available?	At the District's main shop			
PM	5	4	20	estimated service life remaining?	Exceeds useful life of controls by 20 yrs			
				Additional Data	Casing extends 2.5 feet above floor elevation; artesian overflow discharges through 2 inch line to meadow, 50 feet east of well building			
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):	225gpm, 40hp			
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	Location Description:	1329 Mountain Meadow Dr.	K/J Project Number: 1270004*00
Water System Optimization Plan	Wells Facility ID #:	MVWL	Date: 3/12/2012
	Wells Facility Name:	Mountain View Well	Condition Assessment Inspectors: Peter Lavallee and Phill Torney
	Pressure Zones Served:	Twin Peaks Zone	Adjacent Pressure Zones: Stateline and Flagpole Zones

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Barbara Ave and Martin Ave		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Wells Facility ID #:**	MRTNWL		**Date:**	3/13/2012		
					Wells Facility Name:	Martin Well		**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale		
					Pressure Zones Served:	Stateline Zone		**Adjacent Pressure Zones:**	Twin Peaks Zone		
				Well has been abandoned but not destroyed. It was very high in iron and manganese and it does not have any of the equipment the pump has been pulled as well. Well not rated.							
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 40 yrs	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 21 to 40 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 20 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standard							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					10%		**0.00**
				Well Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	0.75	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					5%		**0.00**
				Building Structure							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					5%		**0.00**
				Well Pump							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					15%		**0.00**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	60%	30%	N/A	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					10%		**0.00**
				Supply Well - Sanitary Seal, Casing and Screen							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	50%	20%	20%		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					15%		**0.00**
				Wellhead Treatment							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	60%	40%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					15%		**0.00**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					5%		**0.00**
				Electrical Power							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	N/A	N/A	N/A		
				Weighted Final Score (1-25)	N/A	N/A	N/A	N/A	N/A		
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	60%	20%	N/A		
				Factored Final Score	N/A	N/A	N/A	N/A	N/A		**0.00**
				Criticality Score					20%		**0.00**
									Overall Total Factored Score (Out of 25) =		**0.00**

				South Tahoe PUD	**Location Description:**	Barbara Ave and Martin Ave	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	MRTNWL	**Date:**	3/13/2012
					Wells Facility Name:	Martin Well	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				Well has been abandoned but not destroyed. It was very high in iron and manganese and it does not have any of the equipment the pump has been pulled as well. Well not rated.				

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
R			0	compliant with Calif. DWR Bulletin 74-81?	Yes
R			0	compliant with AWWA Standards A100-06 (wells)?	Yes
Fn			0	adequate equipment clearances to facilitate routine O&M?	Yes
Fn			0	equipment accessible for removal?	Yes
R			0	site drainage adequate to prevent flooding of well, buildings, and critical equipment?	There are no drainage issues at this location
Fn			0	wellhead minimum 18" above finished grade or floor?	Yes
R			0	well electrical controls not in vault?	The electrical controls are inside the building but not in the vault
Fn			0	well equipped with ability to add chlorination facilities?	Removed
Fn			0	sample taps available to obtain water quality prior to disinfection (between wellhead and check valve) and after disinfection?	Removed
Fn			0	sample tap non-threaded downed-turned?	Removed
Fn			0	bacti sample tap not screened or aerated?	Removed
Fn			0	well able to be pumped to waste with waste discharge line protected from backflow?	Removed
Fn			0	well meter provided?	Removed
Fn			0	chemical additives NSF 60 compliant?	Removed
				Well Site	
Fn			0	adequate vehicle access for year-round maintenance?	Yes
R			0	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R			0	is site vulnerable to wildfires?	The site is vulnerable and adjacent to a meadow
R	3		0	is site close to known active seismic faults?	1,375 ft. to the nearest fault
R			0	any unstable site conditions (if yes, describe)?	None
Fn			0	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No there is a swing gate and that is it
Fn			0	other known problems?	None
				Building Structure	
Fn			0	adequate security measures and monitoring to prevent unauthorized access?	The building is locked
PM			0	date building was constructed?	1960
PM			0	condition of exterior coatings adequate to protect structure?	No problems
Fn			0	adequate openings for ingress/egress?	Yes
Fn			0	interior lighting adequate for routine O&M?	Yes
Fn			0	building designed to withstand snow load and not create safety issue?	Met loads at the time of construction
Fn			0	building meets code compliance requirements?	Met codes at the time of construction
R			0	known fire or haz-mat conditions that could be mitigated?	None
Fn			0	other known problems?	None
PM			0	estimated service life remaining?	
				Well Pump	
INFORMATION	N/A	N/A	N/A	pump type?	NA
INFORMATION	N/A	N/A	N/A	pump manufacturer?	NA
INFORMATION			0	pump capacity?	NA
PM			0	pump rebuilt (list year) and describe work done?	NA
Fe			0	pump curves available?	NA
R			0	known history of pump/motor failures? If so, explain the nature of the failure(s).	NA
R			0	number of service calls/repairs in the last year?	NA
INFORMATION			0	what is firm capacity of well pump based on flow test?	NA
C		3	0	Does zone serviced by pump have adaquate capacity to be served?	Evaluation in block diagram
Pm			0	coatings adequate to provide corrosion protection?	NA
Fe			0	pumps operate efficiently (>70% bowl efficiency)	NA
R			0	pumps operate free from excessive vibration?	NA
Fn			0	adequate NPSH available to prevent cavitation?	NA
Fe			0	motor high efficiency and no excessive noise?	NA
R			0	spare parts readily available?	NA
R			0	other known problems?	NA
PM			0	estimated service life remaining?	NA

				South Tahoe PUD	**Location Description:**	Barbara Ave and Martin Ave	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Wells Facility ID #:**	MRTNWL	**Date:**	3/13/2012
					Wells Facility Name:	Martin Well	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone
				Well has been abandoned but not destroyed. It was very high in iron and manganese and it does not have any of the equipment the pump has been pulled as well. Well not rated.				
				Piping & Valves				
Fn			0	pipe supports adequate to prevent movement or vibration?	NA			
PM			0	coatings adequate to protect piping and valves?	NA			
C			0	pipes adequately sized to prevent excessive noise or headloss?	NA			
Fn			0	valves are suitable for efficient and reliable service?	NA			
PM			0	estimated service life remaining?	NA			
				Supply Well - Sanitary Seal, Casing and Screen				
PM			0	well casing is in good condition?	NA			
PM			0	well screen is in good condition?	NA			
Fe			0	well-driller's log is available?	NA			
R			0	50 ft. sanitary seal?	NA			
R			0	approximate distance from closest known groundwater contamination hazards (septic tank, leachfield, MTBE/TCE plume, etc.)?	NA			
INFORMATION	N/A	N/A	N/A	last year of down-hole inspection and what defects were noted?	NA			
PM			0	last year well was redeveloped?	NA			
Fn			0	sounding tube or other means to measure depth to water surface?	NA			
Fn			0	gravel-fill pipe provided at well head to monitor condition of filter pack?	NA			
PM			0	estimated service life remaining?	NA			
				Wellhead Treatment				
Fn			0	chemical storage tanks have secondary containment?	NA			
Fn			0	chemical piping/tubing is in good condition?	NA			
Fn			0	if multiple chemicals used, adequate separation of different chemicals?	NA			
Fn			0	adequate equipment for meter-pump calibration?	NA			
Fn			0	frequency of dose calibration?	NA			
R			0	spare parts and service support readily available?	NA			
INFORMATION	N/A	N/A	N/A	treatment system type and capacity (tank storage)?	NA			
				SCADA system				
Fn			0	pump flow meter is adequate to monitor pump performance?	NA			
Fn			0	flow totals recorded at regular intervals? How frequent?	NA			
Fn			0	pressure instrumentation is adequate to monitor pump performance?	NA			
Fn			0	automated alarm callout for critical failures and reliability?	NA			
Fn			0	alarm log maintained and reviewed annually?	NA			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	NA			
R			0	communication system is reliable (approximate no. of comm. failures in last year)?	NA			
R			0	uninterrupted power system (UPS) available to run all telemetry and instrumentation on main power failure?	NA			
R			0	spare parts/service support readily available?	NA			
PM			0	estimated service life remaining?	NA			
				Electrical Power				
R			0	standby generator size (kW)?	NA			
R			0	adequate power available to run all equipment	NA			
R			0	adequate standby power present and reliable?	NA			
INFORMATION	N/A	N/A	N/A	fuel storage capacity (gals)?	NA			
R			0	fuel supply adequate for standby power service?	NA			
R			0	time needed to mobilize portable generator?	NA			
Fn			0	known electrical hazards that could be mitigated?	NA			
R			0	spare parts/service support readily available?	NA			
PM			0	estimated service life remaining?	NA			
				Additional Data	Well has been abandoned but not destroyed. It was very high in iron and manganese and it does not have any of the equipment the pump has been pulled as well.			
INFORMATION	N/A	N/A	N/A	Nameplate duty conditions (rated flow and head, nominal motor horsepower):				
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

South Tahoe PUD	**Location Description:**	Barbara Ave and Martin Ave	**K/J Project Number:** 1270004*00
Water System Optimization Plan	**Wells Facility ID #:**	MRTNWL	**Date:** 3/13/2012
	Wells Facility Name:	Martin Well	**Condition Assessment Inspectors:** Peter Lavallee and Jeremy Rutherdale
	Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:** Twin Peaks Zone

Well has been abandoned but not destroyed. It was very high in iron and manganese and it does not have any of the equipment the pump has been pulled as well. Well not rated.

Photo Evidence for PM, Fn, R, FE

PHOTOS

No photos taken since well has been all but filled in.

Appendix A2

Pressure Reducing Valves

South Tahoe PUD
Water System Optimization Plan
Summary of PRV Condition and Capacity Evaluation

Failure Mode Scoring Summary - Criticality Scores

PRV Facility Name:	PRV Facility ID #:	PRV Site	PRV Piping, Valves & Instrumentation	Overall Total Factored Score (Out of 25) =
Keller #4	R22-009	2.48	6.36	8.84
Comanche PRV	L38-014	1.24	3.88	5.12
Ottawa	K-39-014	1.47	6.17	7.65
Country Club PRV	K36-002	2.27	5.40	7.66
Oflying PRV	L37-012	1.26	3.33	4.59
Saddle #1	R23-019	2.22	5.44	7.65
Keller #1	R22-006	1.53	4.66	6.19
Keller #2	R23-007	1.40	3.74	5.13
Keller #3	R23-008	2.26	4.75	7.01
Keller #5	Q22-010	1.82	4.54	6.35
Pioneer #1 (Pioneer-Marshall)	O29-014	1.96	4.62	6.58
Pioneer #2 (Pioneer-Kokanee)	O29-015	1.96	4.64	6.60
Price Rd. PRV	Q23-018	1.58	4.33	5.90
Rock Point PRV	Q21-018	1.80	4.71	6.51
Terrace PRV	Q22-023	1.77	5.48	7.25
Overlook PRV	Not Assigned	0.00	0.00	15 (see Note 5)
Saddle #3	Q23-021	2.69	5.06	7.75
Saddle #2	R23-021	1.47	3.55	5.02
Susquehana PRV	N32-022	1.47	4.47	5.95
Pine Valley PRV	M34-016	1.37	6.24	7.60

				South Tahoe PUD	**Location Description:**	Intersection of Keller and Regina	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	R22-009	**Date:**	2/22/2012	
					PRV Facility Name:	Keller #4	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Heavenly Valley Zone	**Adjacent Pressure Zones:**	Keller Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records		**(See note 1)**	**functionality**	**reliability (see note 2)**		
				3. For Criticality Weighting Factor to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology	
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				PRV Site						
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	3.50	3.00	4.00	
				Weighted Final Score (1-25)[4]	4.00	N/A	10.33	9.00	8.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%	
				Factored Score	0.80	N/A	3.62	2.25	1.60	**8.27**
				Criticality Score					30%	**2.48**
				PRV Piping, Valves & Instrumentation						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.50	1.00	3.40	3.00	3.00	
				Weighted Final Score (1-25)	9.00	3.00	10.80	15.00	6.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.35	0.60	3.24	3	0.9	**9.09**
				Criticality Score					70%	**6.36**
									Overall Total Factored Score (Out of 25) =	**8.84**

Failure Mode Type	**Score**	**Importance Weighting Factor (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	4	1	4	site is secured adequately to prevent unauthorized access/vandalism?	The site is in a vault within the roadway and the lid is not locked
Fn	3	2	6	adequate vehicle access for year-round maintenance?	Yes
Fn	4	3	12	site/vault drainage adequate to prevent flooding of valve vault?	The vault has not flooded in the past but there is no way to prevent the vault from flooding. Also the vault does not have a concrete floor it is just resting on compacted earth.
Fn	4	4	16	PRV vault adequately designed to prevent vehicle damage?	The vault was designed to prevent vehicle damage but the lid ring has damaged by snow plows
Fn	3	5	15	any site stability issues (if yes, describe)	No external site stability issues but the vault resting on compacted earth could lead to problems in the future
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6624 from Google Earth
Fn	3	3	9	other known problems?	Potential traffic issues during maintenance due to proximity to the Heavenly Ski Resort California Base Lodge
				Piping, Valves and Instrumentation	
Fn	5	1	5	pipe supports adequate to prevent movement or vibration?	Pipe supports are not adequate. They are currently wood blocks resting on compacted earth
PM	5	2	10	coatings adequate to protect piping and valves?	Severe Rust issue at this PRV and associated piping
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	4" PRV tied to 6" main on downstream side. No reported problems with noise but headloss may be a concern
Fn	5	4	20	valves are suitable for efficient and reliable service?	Upstream valve appears to have lost its coating and it is missing the valve nut to operate the valve
Fn	5	5	25	site has flowmeter?	No flowmeter on site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	Yes
PM	4	2	8	estimated service life remaining?	Assume 5 years based on AWU Useful Life
Fn	1	3	3	other known problems?	None
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	4" PRV feeding a 6" main downstream
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	Inlet=90psi Outlet=44psi

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Intersection of Keller and Regina	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	R22-009	**Date:**	2/22/2012
					PRV Facility Name:	Keller #4	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Heavenly Valley Zone	**Adjacent Pressure Zones:**	Keller Zone

Photo Evidence for PM, Fn, R, FE Bolts appear rusted and unservicable, requires confined space entry, not adequate space to work on piping and valves

PHOTOS

				South Tahoe PUD	**Location Description:**	In westbound lane of Comanche Rd near intersection of Comanche and Apache	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	L38-014	**Date:**	2/23	
					PRV Facility Name:	Comanche PRV	**Condition Assessment Inspectors:**	Peter Lavallee	
					Pressure Zones Served:	Comanche Zone	**Adjacent Pressure Zones:**	Arrowhead Zone	

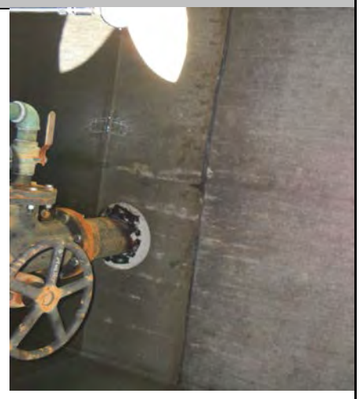
				Notes:	**Failure Mode Scoring (1 - 5)**				
					Physical Mortality	**Capacity**	**Level of Service**		**Financial Efficiency**
							functionality	**reliability**	
				1. Capacity score will be based on hydraulic model					
				2. For Reliabilty to be determined based on CMMS maintenance records					
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced
				PRV Site					
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned
				Unweighted Failure Mode Score (1-5)	1.00	N/A	2.33	1.00	1.00
				Weighted Final Score (1-25)[4]	5.00	N/A	5.67	3.00	2.00
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%
				Factored Score	1.00	N/A	1.98	0.75	0.40
				Criticality Score					30%
				PRV Piping, Valves & Instrumentation					
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.80	2.00	2.00
				Weighted Final Score (1-25)	2.00	3.00	6.80	10.00	4.00
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%
				Factored Score	0.3	0.6	2.04	2	0.6
				Criticality Score					70%
									Overall Total Factored Score (Out of 25) =

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	The facility is in the roadway and can be accessed easily as the lid is not locked
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Within roadway so no access issues
Fn	5	3	15	site/vault drainage adequate to prevent flooding of valve vault?	No drain and when opened the vault had standing water a few inches below the piping. However, a water mark on the walls indicated that the water level in the box had at one time been higher than the piping.
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Vault is designed to prevent vehicle damage
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6427 from Google Earth
Fn	1	3	3	other known problems?	No other known problems
				Piping, Valves and Instrumentation	
Fn	1	1	1	pipe supports adequate to prevent movement or vibration?	Yes pipe supports are steel posts that are bolted to the floor of the vault. Connection to floor was underwater and could not be inspected though the facility was constructed in 2010
PM	1	2	2	coatings adequate to protect piping and valves?	Yes the coatings remain adequate and in good condition
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	The valves are still in new condition and there have been no operational issues with the new valves
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	1	2	2	estimated service life remaining?	30 years based on AWU Useful Life
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	6" PRV with a 2" Bypass
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	122 Upstream and 65 Downstream
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	In westbound lane of Comanche Rd near intersection of Comanche and Apache		**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	L38-014		**Date:**	2/23/
					PRV Facility Name:	Comanche PRV		**Condition Assessment Inspectors:**	Peter Lavallee a
					Pressure Zones Served:	Comanche Zone		**Adjacent Pressure Zones:**	Arrowhead Zone a

Photo Evidence for PM, Fn, R, FE

PHOTOS



/2012
nd Phill Torney
nd Iroquois Zones
Total Factored Score
4.13
1.24
Total Factored Score
5.54
3.88
5.12

'2012

nd Phill Torney

nd Iroquois Zones

				South Tahoe PUD	**Location Description:**	Intersection of Apache and Ottawa	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	K-39-014	**Date:**	5/1/2012	
					PRV Facility Name:	Ottawa	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Ottawa Zone	**Adjacent Pressure Zones:**	Arrowhead Zone and Iroqouis Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology		
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				PRV Site							
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	2.17	3.00	2.00		
				Weighted Final Score (1-25)[4]	4.00	N/A	5.17	6.00	4.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%		
				Factored Score	0.80	N/A	1.81	1.50	0.80		**4.91**
				Criticality Score					30%		**1.47**
				PRV Piping, Valves & Instrumentation							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	1.00	4.00	3.00	2.00		
				Weighted Final Score (1-25)	8.00	3.00	11.40	15.00	4.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	1.2	0.6	3.42	3	0.6		**8.82**
				Criticality Score					70%		**6.17**
									Overall Total Factored Score (Out of 25) =		**7.65**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	The facility is in the roadway and can be accessed easily as the lid is not locked
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Within roadway so no access issues
Fn	1	3	3	site/vault drainage adequate to prevent flooding of valve vault?	No flooding issues
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Vault is designed to prevent vehicle damage
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6387 from Google Earth
Fn	4	3	12	other known problems?	The small box fills with sediment and it must be removed on a regular basis
				Piping, Valves and Instrumentation	
Fn	4	1	4	pipe supports adequate to prevent movement or vibration?	Dirt bottom that the PRV rests on
PM	5	2	10	coatings adequate to protect piping and valves?	Can not be evaluated due to amount of sediment within the box. Top portion of the PRV is in poor condition
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	5	4	20	valves are suitable for efficient and reliable service?	no isolation valves
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	5	1	5	site has pressure upstream/downstream pressure gages?	no pressure gauges at this site
PM	3	2	6	estimated service life remaining?	Assume 20 years based on AWU Useful Life
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	2" PRV
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	150 Upstream and 62 Downstream
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Intersection of Apache and Ottawa	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	K-39-014	**Date:**	5/1/2012
					PRV Facility Name:	Ottawa	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Ottawa Zone	**Adjacent Pressure Zones:**	Arrowhead Zone and Iroqouis Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	On Bakersfield near intersection with Country Club Drive	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	K36-002	**Date:**	5/1/2012	
					PRV Facility Name:	Country Club PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Iroquois and Arrowhead Zones	

Notes:

1. Capacity score will be based on hydraulic model
2. For Reliabilty to be determined based on CMMS maintenance records
3. For Criticality Weighting Factors to be determined at District Workshop
4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score

Failure Mode Scoring (1 - 5)

Physical Mortality	Capacity	Level of Service		Financial Efficiency
		functionality	reliability	
1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology
2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high
3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average
4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low
5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced

				PRV Site				
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	N/A	2.83	3.00	1.00	
				Weighted Final Score (1-25)[4]	12.00	N/A	7.17	9.00	2.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%	
				Factored Score	2.40	N/A	2.51	2.25	0.40	**7.56**
				Criticality Score					30%	**2.27**
				PRV Piping, Valves & Instrumentation						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.50	1.00	2.80	3.00	2.00	
				Weighted Final Score (1-25)	7.00	3.00	8.20	15.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.05	0.6	2.46	3	0.6	**7.71**
				Criticality Score					70%	**5.40**
									Overall Total Factored Score (Out of 25) =	**7.66**

Failure Mode Type	Score	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	The facility is in the roadway and can be accessed easily as the lid is not locked
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Within roadway so no access issues
Fn	5	3	15	site/vault drainage adequate to prevent flooding of valve vault?	No drain and when opened the vault had standing water above PRV
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Vault is designed to prevent vehicle damage
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6299 from Google Earth
Fn	4	3	12	other known problems?	The vault has minimal space and maintenance is very difficult within the vault
				Piping, Valves and Instrumentation	
Fn	5	1	5	pipe supports adequate to prevent movement or vibration?	No pipe supports
PM	4	2	8	coatings adequate to protect piping and valves?	PRV Coating is in good condition but the pipe coatings are deteriorated
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	Valves are adequate and reliable
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	3	2	6	estimated service life remaining?	Assume 20 years based on AWU Useful life
Fn	2	3	6	other known problems?	Vault cover is marked sewer and not water. Replace lid.
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	6" PRV
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	116 Upstream and 80 Downstream
					Generally this PRV is off and not used. Downstream Isolation valves are closed.
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	On Bakersfield near intersection with Country Club Drive	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	K36-002	**Date:**	5/1/2012
					PRV Facility Name:	Country Club PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Iroquois and Arrowhead Zones
				Photo Evidence for PM, Fn, R, FE				

PHOTOS

				South Tahoe PUD	**Location Description:**	Oflying Rd	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	L37-012	**Date:**	5/1/2012	
					PRV Facility Name:	Oflying PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Iroqouis Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology		
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				PRV Site							
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	2.33	2.00	2.00		
				Weighted Final Score (1-25)[4]	2.00	N/A	5.67	4.00	4.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%		
				Factored Score	0.40	N/A	1.98	1.00	0.80		**4.18**
				Criticality Score					30%		**1.26**
				PRV Piping, Valves & Instrumentation							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	1.00	2.20	2.00	2.00		
				Weighted Final Score (1-25)	4.00	3.00	7.20	4.00	4.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	0.6	0.6	2.16	0.8	0.6		**4.76**
				Criticality Score					70%		**3.33**
									Overall Total Factored Score (Out of 25) =		**4.59**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	The facility is in the roadway and can be accessed easily as the lid is not locked
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Within roadway so no access issues
Fn	5	3	15	site/vault drainage adequate to prevent flooding of valve vault?	No drain and when opened the vault had standing water at springline of piping.
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Vault is designed to prevent vehicle damage
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6419 from Google Earth
Fn	1	3	3	other known problems?	No other known problems
				Piping, Valves and Instrumentation	
Fn	3	1	3	pipe supports adequate to prevent movement or vibration?	Pipe supports are steel and they were underwater at time of inspection
PM	1	2	2	coatings adequate to protect piping and valves?	Yes the coatings remain adequate and in good condition
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	Valves are adequate with no history of failure
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	3	2	6	estimated service life remaining?	Assume 20 years based on AWU Useful life
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	6" PRV
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	120 Upstream and 60 Downstream
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Oflying Rd	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	L37-012	**Date:**	5/1/2012
					PRV Facility Name:	Oflying PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Iroqouis Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	In front of 3914 Saddle Rd.	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	R23-019	**Date:**	5/1/2012	
					PRV Facility Name:	Saddle #1	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Four Seasons	**Adjacent Pressure Zones:**	Sweeping Turn and Upper Saddle Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology	
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				PRV Site						
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	N/A	2.83	3.00	3.00	
				Weighted Final Score (1-25)[4]	8.00	N/A	6.67	9.00	6.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%	
				Factored Score	1.60	N/A	2.33	2.25	1.20	**7.38**
				Criticality Score					30%	**2.22**
				PRV Piping, Valves & Instrumentation						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.50	1.00	3.20	3.00	2.00	
				Weighted Final Score (1-25)	9.00	3.00	9.40	12.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.35	0.6	2.82	2.4	0.6	**7.77**
				Criticality Score					70%	**5.44**
									Overall Total Factored Score (Out of 25) =	**7.65**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	Lid is not locked
Fn	4	2	8	adequate vehicle access for year-round maintenance?	Behind curb and gutter and the box is raised above grade by 3 inches but can be covered by snow in the wintertime
Fn	5	3	15	site/vault drainage adequate to prevent flooding of valve vault?	Dirt floor and there has been no issue with flooding in the past
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Not necessary as it is outside of the roadway
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6728 from Google Earth
Fn	1	3	3	other known problems?	No other known problems
				Piping, Valves and Instrumentation	
Fn	5	1	5	pipe supports adequate to prevent movement or vibration?	Resting on the dirt
PM	5	2	10	coatings adequate to protect piping and valves?	No coatings left
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	Valves have no issues
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	4	2	8	estimated service life remaining?	Valve coatings are completely gone - assume 5 yr life remaining before complete rebuild
Fn	4	3	12	other known problems?	Inlet pipe is deflected between inlet of PRV and Vault wall
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	6" PRV
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	100 Upstream and 100 Downstream
					Feeds a single fire hydrant with an closed valve after the hydrant same pressure due to closed valve on D/S side of PRV.
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	In front of 3914 Saddle Rd.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	R23-019	**Date:**	5/1/2012
					PRV Facility Name:	Saddle #1	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Four Seasons	**Adjacent Pressure Zones:**	Sweeping Turn and Upper Saddle Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Intersection of Keller Rd and Saddle Rd. (End of Keller Rd.)	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	R22-006	**Date:**	5/1/2012	
					PRV Facility Name:	Keller #1	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Upper Saddle	**Adjacent Pressure Zones:**	Keller, Sweeping Turn and Needle Peak Zones	

				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology		
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				PRV Site							
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	2.33	2.00	2.00		
				Weighted Final Score (1-25)[4]	4.00	N/A	5.67	6.00	4.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%		
				Factored Score	0.80	N/A	1.98	1.50	0.80		**5.08**
				Criticality Score					30%		**1.53**
				PRV Piping, Valves & Instrumentation							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	1.00	2.80	3.00	3.00		
				Weighted Final Score (1-25)	6.00	3.00	8.20	9.00	6.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	0.9	0.6	2.46	1.8	0.9		**6.66**
				Criticality Score					70%		**4.66**
									Overall Total Factored Score (Out of 25) =		**6.19**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	The facility is in the roadway and can be accessed easily as the lid is not locked
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Within roadway so no access issues
Fn	5	3	15	site/vault drainage adequate to prevent flooding of valve vault?	No drain and when opened the vault had standing water a few inches above the PRV
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Vault is designed to prevent vehicle damage
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6877 from Google Earth
Fn	1	3	3	other known problems?	No other known problems
				Piping, Valves and Instrumentation	
Fn	5	1	5	pipe supports adequate to prevent movement or vibration?	No pipe supports
PM	3	2	6	coatings adequate to protect piping and valves?	Coatings on the piping are in poor condition and the coating on the prv shows signs of rust
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	No operational issues with the valves
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	3	2	6	estimated service life remaining?	Assume 20 years based on AWU Useful Life
Fn	2	3	6	other known problems?	There are no other known problems with this prv however the bypass has had a number of leaks
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	6" PRV with a 1/2" low flow Bypass
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	70 Upstream and 40 Downstream
					3 Isolation valves for this PRV
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Intersection of Keller Rd and Saddle Rd. (End of Keller Rd.)	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	R22-006	**Date:**	5/1/2012
					PRV Facility Name:	Keller #1	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Upper Saddle	**Adjacent Pressure Zones:**	Keller, Sweeping Turn and Needle Peak Zones

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	In front of 1647 Keller Rd	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	R23-007	**Date:**	5/1/2012	
					PRV Facility Name:	Keller #2	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Middle Keller	**Adjacent Pressure Zones:**	Keller, Sweeping Turn, and Heavenly Valley Zones	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology	
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				PRV Site						
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.67	2.00	2.00	
				Weighted Final Score (1-25)[4]	3.00	N/A	5.00	6.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%	
				Factored Score	0.60	N/A	1.75	1.50	0.80	**4.65**
				Criticality Score					30%	**1.40**
				PRV Piping, Valves & Instrumentation						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	1.00	1.80	2.00	2.00	
				Weighted Final Score (1-25)	6.00	3.00	6.80	6.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	0.9	0.6	2.04	1.2	0.6	**5.34**
				Criticality Score					70%	**3.74**
									Overall Total Factored Score (Out of 25) =	**5.13**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	1	1	1	site is secured adequately to prevent unauthorized access/vandalism?	The facility is in the roadway and the lid is locked
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Within roadway so no access issues
Fn	5	3	15	site/vault drainage adequate to prevent flooding of valve vault?	No drain and when opened the vault had standing water a few inches below the top of the PRV
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Vault is designed to prevent vehicle damage
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6847 from Google Earth
Fn	1	3	3	other known problems?	No other known problems
				Piping, Valves and Instrumentation	
Fn	1	1	1	pipe supports adequate to prevent movement or vibration?	No supports
PM	3	2	6	coatings adequate to protect piping and valves?	PRV Coating is acceptable, but starting to deteriorate and pipe wrap appears to be in adequate condition. Fasteners are unservicable and bolts rusted.
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	Valves are suitable and efficient
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	3	2	6	estimated service life remaining?	Assume 20 years based on AWU Useful Life
Fn	1	3	3	other known problems?	No other known problems.
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	6" PRV
INFORMATION		1	0	setpoint pressure(s)?	94 Upstream and 60 Downstream
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	In front of 1647 Keller Rd	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	R23-007	**Date:**	5/1/2012
					PRV Facility Name:	Keller #2	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Middle Keller	**Adjacent Pressure Zones:**	Keller, Sweeping Turn, and Heavenly Valley Zones

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Keller Rd by Heavenly California Base Camp	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	R23-008	**Date:**		
					PRV Facility Name:	Keller #3	**Condition Assessment Inspectors:**	Peter Lavallee	
					Pressure Zones Served:	Sweeping Turn	**Adjacent Pressure Zones:**	Middle Keller, Heavenly Valley, Four Seasons, Upper Saddle, and Needle Peak Zoen	

				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology		
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				PRV Site							
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned		
				Unweighted Failure Mode Score (1-5)	2.00	N/A	3.00	3.00	3.00		**Total Factored Score**
				Weighted Final Score (1-25)[4]	4.00	N/A	7.67	9.00	9.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%		
				Factored Score	0.80	N/A	2.68	2.25	1.80		**7.53**
				Criticality Score					30%		**2.26**
				PRV Piping, Valves & Instrumentation							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	1.00	2.60	3.00	2.00		
				Weighted Final Score (1-25)	6.00	3.00	7.60	12.00	4.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	0.9	0.6	2.28	2.4	0.6		**6.78**
				Criticality Score					70%		**4.75**
									Overall Total Factored Score (Out of 25) =		**7.01**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	The facility is in the roadway and can be accessed easily as the lid is not locked
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Within roadway so no access issues
Fn	5	3	15	site/vault drainage adequate to prevent flooding of valve vault?	Always filled with water and there is no drain. The vault must be pumped out whenver work is to be completed.
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Vault is designed to prevent vehicle damage
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6752 from Google Earth
Fn	5	3	15	other known problems?	PRV is on a blind corner and is extremely dangerous to perform maintenance on
				Piping, Valves and Instrumentation	
Fn	5	1	5	pipe supports adequate to prevent movement or vibration?	No pipe supports
PM	3	2	6	coatings adequate to protect piping and valves?	Wrapped steel pipe with some deterioration and PRV coatings are acceptable, but showing some wear
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	Valves are in good condition and there is new stainless steel tubing within the vault and 2 gate valves outside the vault operate the 2" Bypass
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	3	2	6	estimated service life remaining?	Assume 20 years based on AWU Useful Life
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	6" PRV with a 2" low flow Bypass
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	85 Upstream and 45 Downstream
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Keller Rd by Heavenly California Base Camp	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	R23-008	**Date:**	
					PRV Facility Name:	Keller #3	**Condition Assessment Inspectors:**	Peter Lavallee
					Pressure Zones Served:	Sweeping Turn	**Adjacent Pressure Zones:**	Middle Keller, Heavenly Valley, Four Seasons, Upper Saddle, and Needle Peak Zoer
				Photo Evidence for PM, Fn, R, FE				

PHOTOS

				South Tahoe PUD	**Location Description:**	Intersection Keller Rd. andNeedle Peak	**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**PRV Facility ID #:**	Q22-010	**Date:**	5/1/2012		
					PRV Facility Name:	Keller #5	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick		
					Pressure Zones Served:	Needle Peak	**Adjacent Pressure Zones:**	Heavenly Valley and Sweeping Turn Zones		

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology	
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				PRV Site						
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	2.33	3.00	2.00	
				Weighted Final Score (1-25)[4]	6.00	N/A	5.17	9.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%	
				Factored Score	1.20	N/A	1.81	2.25	0.80	**6.06**
				Criticality Score					30%	**1.82**
				PRV Piping, Valves & Instrumentation						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	1.00	2.60	3.00	2.00	
				Weighted Final Score (1-25)	8.00	3.00	7.60	9.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.2	0.6	2.28	1.8	0.6	**6.48**
				Criticality Score					70%	**4.54**
									Overall Total Factored Score (Out of 25) =	**6.35**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	Facility on the side of the road with no lid on the lock
Fn	4	2	8	adequate vehicle access for year-round maintenance?	No access issues but can be covered in snow in the winter
Fn	1	3	3	site/vault drainage adequate to prevent flooding of valve vault?	No flooding issues
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Not designed for traffic since outside of the roadway
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6616 from Google Earth
Fn	2	3	6	other known problems?	Lid marked with Sewer and Not Water. Replace lid.
				Piping, Valves and Instrumentation	
Fn	5	1	5	pipe supports adequate to prevent movement or vibration?	There are no supports and there is minimal clearance between the vault wall and the side of the pipe
PM	5	2	10	coatings adequate to protect piping and valves?	Coatings are deteriorated and there is visiable rust
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	No issues with the isolation valves
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	3	2	6	estimated service life remaining?	Assume 20 years based on AWU Useful Life
Fn	1	3	3	other known problems?	No other known problems
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	6" PRV with a 3/4" Low Flow Bypass
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	105 Upstream and 50 Downstream
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Intersection Keller Rd. andNeedle Peak	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	Q22-010	**Date:**	5/1/2012
					PRV Facility Name:	Keller #5	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Needle Peak	**Adjacent Pressure Zones:**	Heavenly Valley and Sweeping Turn Zones

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Intersection of Pioneer Trail and Marshall	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	O29-014	**Date:**	5/1/2012	
					PRV Facility Name:	Pioneer #1 (Pioneer-Marshall)	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Montgomery Estates	**Adjacent Pressure Zones:**	Stateline Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology		
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				PRV Site							
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	3.00	3.00	2.00		
				Weighted Final Score (1-25)[4]	4.00	N/A	7.67	9.00	4.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%		
				Factored Score	0.80	N/A	2.68	2.25	0.80		**6.53**
				Criticality Score					30%		**1.96**
				PRV Piping, Valves & Instrumentation							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	1.00	3.00	3.00	2.00		
				Weighted Final Score (1-25)	8.00	3.00	8.00	9.00	4.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	1.2	0.6	2.4	1.8	0.6		**6.60**
				Criticality Score					70%		**4.62**
										Overall Total Factored Score (Out of 25) =	**6.58**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	The facility is in the roadway and can be accessed easily as the lid is not locked
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Within roadway so no access issues
Fn	5	3	15	site/vault drainage adequate to prevent flooding of valve vault?	No drain and when opened the vault had standing water a few inches below the piping
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Vault is designed to prevent vehicle damage
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6297 from Google Earth
Fn	5	3	15	other known problems?	No other known problems, but in a high traffic area and is very dangerous to set up traffic control and perform maintenance
				Piping, Valves and Instrumentation	
Fn	5	1	5	pipe supports adequate to prevent movement or vibration?	No supports
PM	5	2	10	coatings adequate to protect piping and valves?	The coatings on the piping are severely deteriorated and the coating on the valves has started to fail.
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	Valves are adequate for use
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	3	1	3	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	3	2	6	estimated service life remaining?	Assume 10 years based on AWU Useful Life due to extensive external corrosion
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	8" PRV with a 4" Bypass
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	140 Upstream and 65 Downstream
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Intersection of Pioneer Trail and Marshall	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	O29-014	**Date:**	5/1/2012	
					PRV Facility Name:	Pioneer #1 (Pioneer-Marshall)	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Montgomery Estates	**Adjacent Pressure Zones:**	Stateline Zone	
				Photo Evidence for PM, Fn, R, FE					

PHOTOS

				South Tahoe PUD	**Location Description:**	South Side of the Intersection of Pioneer Trail and Marshall Trail	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	O29-015	**Date:**	5/1/2012	
					PRV Facility Name:	Pioneer #2 (Pioneer-Kokanee)	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Montgomery Estates	**Adjacent Pressure Zones:**	Stateline Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology		
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				PRV Site							
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned		
				Unweighted Failure Mode Score (1-5)	2.00	N/A	3.00	3.00	2.00		**Total Factored Score**
				Weighted Final Score (1-25)[4]	4.00	N/A	7.67	9.00	4.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%		
				Factored Score	0.80	N/A	2.68	2.25	0.80		**6.53**
				Criticality Score					30%		**1.96**
				PRV Piping, Valves & Instrumentation							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned		
				Unweighted Failure Mode Score (1-5)	4.50	1.00	2.60	3.00	2.00		**Total Factored Score**
				Weighted Final Score (1-25)	9.00	3.00	7.60	9.00	4.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	1.35	0.6	2.28	1.8	0.6		**6.63**
				Criticality Score					70%		**4.64**
										Overall Total Factored Score (Out of 25) =	**6.60**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	The facility is in the roadway and can be accessed easily as the lid is not locked
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Within roadway so no access issues
Fn	5	3	15	site/vault drainage adequate to prevent flooding of valve vault?	No drain and when opened the vault had standing water a few inches above the piping.
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Vault is designed to prevent vehicle damage
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6427 from Google Earth
Fn	5	3	15	other known problems?	No other known problems, but in a high traffic area and is very dangerous to set up traffic control and perform maintenance
				Piping, Valves and Instrumentation	
Fn	5	1	5	pipe supports adequate to prevent movement or vibration?	No supports
PM	5	2	10	coatings adequate to protect piping and valves?	Coatings are deteriorated and there is significant rust
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	Valves are adequate for use
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	4	2	8	estimated service life remaining?	Assume 5 years based on extensive external corrosion
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	6" PRV with a 2-1/2" Bypass
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	115 Upstream and 80 Downstream
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	South Side of the Intersection of Pioneer Trail and Marshall Trail	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	O29-015	**Date:**	5/1/2012	
					PRV Facility Name:	Pioneer #2 (Pioneer-Kokanee)	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Montgomery Estates	**Adjacent Pressure Zones:**	Stateline Zone	
				Photo Evidence for PM, Fn, R, FE					

PHOTOS

				South Tahoe PUD	**Location Description:**	End of Frontier Ct.	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	Q23-018	**Date:**	5/1/2012	
					PRV Facility Name:	Price Rd. PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Price Rd. Zone	**Adjacent Pressure Zones:**	Heavenly Valley Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology		
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average		
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced		
				PRV Site							
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Calculated		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	2.67	2.00	2.00		
				Weighted Final Score (1-25)[4]	4.00	N/A	6.17	6.00	4.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%		
				Factored Score	0.80	N/A	2.16	1.50	0.80	**5.26**	
				Criticality Score					30%	**1.58**	
				PRV Piping, Valves & Instrumentation							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	1.00	2.60	3.00	2.00		
				Weighted Final Score (1-25)	6.00	3.00	7.60	9.00	4.00		
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%		
				Factored Score	0.9	0.6	2.28	1.8	0.6	**6.18**	
				Criticality Score					70%	**4.33**	
									Overall Total Factored Score (Out of 25) =	**5.90**	

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	Manhole Lid with no lock
Fn	4	2	8	adequate vehicle access for year-round maintenance?	Outside of roadway and is buried by snow during winter months
Fn	3	3	9	site/vault drainage adequate to prevent flooding of valve vault?	Little to no water at time of inspection but a hiustory of the vault being flooded
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Not necessary due to location outside of roadway
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6452 from Google Earth
Fn	2	3	6	other known problems?	The manhole lid is marked sewer and not water
				Piping, Valves and Instrumentation	
Fn	5	1	5	pipe supports adequate to prevent movement or vibration?	No pipe supports
PM	3	2	6	coatings adequate to protect piping and valves?	Coatings in Poor condition with lots of rust on pipes and prv. Coatings on the valves are in great condition
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	No valving issues
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	3	2	6	estimated service life remaining?	Assume 20 years based on AWU Useful Life
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	6" PRV with a 4" Bypass
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	107 Upstream and 36 Downstream
					The manhole lid is marked sewer and not water
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	End of Frontier Ct.		**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	Q23-018		**Date:**	5/1/2012
					PRV Facility Name:	Price Rd. PRV		**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Price Rd. Zone		**Adjacent Pressure Zones:**	Heavenly Valley Zone
				Photo Evidence for PM, Fn, R, FE					

PHOTOS

				South Tahoe PUD	**Location Description:**	Intersection of Rocky Point and Pine Hill Rd.	**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**PRV Facility ID #:**	Q21-018	**Date:**	5/1/2012		
					PRV Facility Name:	Rock Point PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick		
					Pressure Zones Served:	Rocky Point Zone	**Adjacent Pressure Zones:**	Heavenly Valley Zone, Stateline Zone, and Upper Saddle Zone		

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology	
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				PRV Site						
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	2.67	3.00	2.00	
				Weighted Final Score (1-25)[4]	4.00	N/A	6.17	9.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%	
				Factored Score	0.80	N/A	2.16	2.25	0.80	**6.01**
				Criticality Score					30%	**1.80**
				PRV Piping, Valves & Instrumentation						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.50	1.00	2.60	2.00	2.00	
				Weighted Final Score (1-25)	9.00	3.00	7.60	8.00	6.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.35	0.6	2.28	1.6	0.9	**6.73**
				Criticality Score					70%	**4.71**
									Overall Total Factored Score (Out of 25) =	**6.51**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	The facility is in the roadway and can be accessed easily as the lid is not locked
Fn	4	2	8	adequate vehicle access for year-round maintenance?	Within roadway so no access issues
Fn	4	3	12	site/vault drainage adequate to prevent flooding of valve vault?	No drain and when opened the vault had standing water at springliune of piping
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Vault is designed to prevent vehicle damage
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6456 from Google Earth
Fn	1	3	3	other known problems?	No other known problems
				Piping, Valves and Instrumentation	
Fn	5	1	5	pipe supports adequate to prevent movement or vibration?	No pipe supports
PM	5	2	10	coatings adequate to protect piping and valves?	Coatings are gone and there is visable rust
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	No valving issues
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	4	2	8	estimated service life remaining?	Assume 5 years based on AWU Useful Life
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	4" PRV with a 2" Direct action bypass and a 1/2" low flow bypass
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	120 Upstream and 55 Downstream
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Intersection of Rocky Point and Pine Hill Rd.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	Q21-018	**Date:**	5/1/2012
					PRV Facility Name:	Rock Point PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Rocky Point Zone	**Adjacent Pressure Zones:**	Heavenly Valley Zone, Stateline Zone, and Upper Saddle Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Intersection of Terrace and Wildwood	**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**PRV Facility ID #:**	Q22-023	**Date:**	5/1/2012		
					PRV Facility Name:	Terrace PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick		
					Pressure Zones Served:	Terrace	**Adjacent Pressure Zones:**	Heavenly Valley Zone		

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology	
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				PRV Site						
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	2.17	3.00	2.00	
				Weighted Final Score (1-25)[4]	6.00	N/A	4.67	9.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%	
				Factored Score	1.20	N/A	1.63	2.25	0.80	**5.88**
				Criticality Score					30%	**1.77**
				PRV Piping, Valves & Instrumentation						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.50	5.00	2.60	3.00	2.00	
				Weighted Final Score (1-25)	5.00	15.00	7.60	6.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	0.75	3	2.28	1.2	0.6	**7.83**
				Criticality Score					70%	**5.48**
									Overall Total Factored Score (Out of 25) =	**7.25**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	No lock on box
Fn	4	2	8	adequate vehicle access for year-round maintenance?	Outside of roadway and is buried by snow during winter months
Fn	1	3	3	site/vault drainage adequate to prevent flooding of valve vault?	No flooding issues
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Not necessary due to location outside of roadway
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6480 from Google Earth
Fn	1	3	3	other known problems?	No other known problems
				Piping, Valves and Instrumentation	
Fn	5	1	5	pipe supports adequate to prevent movement or vibration?	No pipe supports
PM	2	2	4	coatings adequate to protect piping and valves?	PRV Coating in good condition with galvenized pipes
C	5	3	15	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	No valving issues
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	3	2	6	estimated service life remaining?	Assume 20 years based on AWU Useful Life
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	2" PRV with 1" Low flow Bypass
INFORMATION		N/A	#VALUE!	setpoint pressure(s)?	92 Upstream and 65 Downstream
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Intersection of Terrace and Wildwood	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	Q22-023	**Date:**	5/1/2012
					PRV Facility Name:	Terrace PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Terrace	**Adjacent Pressure Zones:**	Heavenly Valley Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Intersection of Overlook and Wildwood	**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**PRV Facility ID #:**	Not Assigned	**Date:**	5/1/2012		
					PRV Facility Name:	Overlook PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick		
					Pressure Zones Served:	Heavenly Valley/Overlook	**Adjacent Pressure Zones:**	Heavenly Valley Zone, Stateline Zone, and Terrace Zone		
				This PRV has been buried and was unknown until recently when the zone boundaries were being evaluated. As such this PRV can not be evaluated.						
				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology	
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
				5. Assigned score of 15 was given since PRV is buried and could not be assessed on the condition.	3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				PRV Site						
				Is Failure Mode Score Calculated or Assigned?	Assigned		Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)						
				Weighted Final Score (1-25)[4]						
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%	
				Factored Score	0.00	0.00	0.00	0.00	0.00	**0.00**
				Criticality Score					30%	**0.00**
				PRV Piping, Valves & Instrumentation						
				Is Failure Mode Score Calculated or Assigned?	Assigned	Assigned	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)						
				Weighted Final Score (1-25)						
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	0.00	0.00	0.00	0	0	**0.00**
				Criticality Score					70%	**0.00**
									Overall Total Factored Score (Out of 25) =	**15 (see Note 5)**

Failure Mode Type	Score	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				PRV Site	This PRV has been buried and was unknown until recently when the zone boundaries were being evaluated. As such this PRV can not be evaluated.
Fn		1	0	site is secured adequately to prevent unauthorized access/vandalism?	
Fn		2	0	adequate vehicle access for year-round maintenance?	
Fn		3	0	site/vault drainage adequate to prevent flooding of valve vault?	
Fn		4	0	PRV vault adequately designed to prevent vehicle damage?	
Fn		5	0	any site stability issues (if yes, describe)	
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6429 from Google Earth
Fn		3	0	other known problems?	
				Piping, Valves and Instrumentation	
Fn		1	0	pipe supports adequate to prevent movement or vibration?	
PM		2	0	coatings adequate to protect piping and valves?	
C		3	0	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	
Fn		4	0	valves are suitable for efficient and reliable service?	
Fn		5	0	site has flowmeter?	
Fn		1	0	site has pressure upstream/downstream pressure gages?	
PM		2	0	estimated service life remaining?	Assume 20 years based on AWU Useful Life
Fn		3	0	other known problems?	
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	2" PRV
Fn		1	0	setpoint pressure(s)?	Unknown
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

South Tahoe PUD	**Location Description:**	Intersection of Overlook and Wildwood	**K/J Project Number:** 1270004*00
Water System Optimization Plan	**PRV Facility ID #:**	Not Assigned	**Date:** 5/1/2012
	PRV Facility Name:	Overlook PRV	**Condition Assessment Inspectors:** Peter Lavallee and Glenn Roderick
	Pressure Zones Served:	Heavenly Valley/Overlook	**Adjacent Pressure Zones:** Heavenly Valley Zone, Stateline Zone, and Terrace Zone

This PRV has been buried and was unknown until recently when the zone boundaries were being evaluated. As such this PRV can not be evaluated.

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Intersection of Saddle and Wildwood	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	Q23-021	**Date:**	5/1/2012	
					PRV Facility Name:	Saddle #3	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Heavenly Valley Zone	**Adjacent Pressure Zones:**	Stateline Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology	
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				PRV Site						
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.00	N/A	3.50	3.00	2.00	
				Weighted Final Score (1-25)[4]	12.00	N/A	10.00	9.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%	
				Factored Score	2.40	N/A	3.50	2.25	0.80	**8.95**
				Criticality Score					30%	**2.69**
				PRV Piping, Valves & Instrumentation						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.50	1.00	2.60	4.00	2.00	
				Weighted Final Score (1-25)	9.00	3.00	7.60	12.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.35	0.6	2.28	2.4	0.6	**7.23**
				Criticality Score					70%	**5.06**
									Overall Total Factored Score (Out of 25) =	**7.75**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	3 ft manhole lid with No lock on box
Fn	4	2	8	adequate vehicle access for year-round maintenance?	Outside of roadway and is buried by snow during winter months
Fn	5	3	15	site/vault drainage adequate to prevent flooding of valve vault?	Dirt floor with ground water level marked on interior of vault with natural spring flowing down curb line adjacent to PRV vault
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Not necessary due to location outside of roadway
Fn	5	5	25	any site stability issues (if yes, describe)	Natural Spring flowing year round down curb and gutter
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6552 from Google Earth
Fn	1	3	3	other known problems?	No other known problems
				Piping, Valves and Instrumentation	
Fn	5	1	5	pipe supports adequate to prevent movement or vibration?	No pipe supports
PM	5	2	10	coatings adequate to protect piping and valves?	Coatings are gone and there is significcant rusting
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	No valving issues
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	4	2	8	estimated service life remaining?	Assume 5 years based on AWU Useful Life
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	6" PRV
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	110 Upstream and 58 Downstream
					Vault is a CMP
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Intersection of Saddle and Wildwood	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	Q23-021	**Date:**	5/1/2012
					PRV Facility Name:	Saddle #3	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Heavenly Valley Zone	**Adjacent Pressure Zones:**	Stateline Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Intersection of Saddle and Keller	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	R23-021	**Date:**	5/1/2012	
					PRV Facility Name:	Saddle #2	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Heavenly Valley Zone	**Adjacent Pressure Zones:**	Stateline Zone and Sweeping Turn PRV	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology	
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				PRV Site						
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	2.33	3.00	2.00	
				Weighted Final Score (1-25)[4]	6.00	N/A	5.17	6.00	2.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%	
				Factored Score	1.20	N/A	1.81	1.50	0.40	**4.91**
				Criticality Score					30%	**1.47**
				PRV Piping, Valves & Instrumentation						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.50	1.00	2.40	3.00	2.00	
				Weighted Final Score (1-25)	5.00	3.00	7.40	6.00	2.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	0.75	0.6	2.22	1.2	0.3	**5.07**
				Criticality Score					70%	**3.55**
									Overall Total Factored Score (Out of 25) =	**5.02**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	Manhole Lid with no lock behind curb and gutter
Fn	4	2	8	adequate vehicle access for year-round maintenance?	Outside of roadway and is buried by snow during winter months
Fn	1	3	3	site/vault drainage adequate to prevent flooding of valve vault?	Low water in vault and no histroy of flooding
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Not necessary due to location outside of roadway
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6665 from Google Earth
Fn	2	3	6	other known problems?	Lid is mismarked "sewer"
				Piping, Valves and Instrumentation	
Fn	1	1	1	pipe supports adequate to prevent movement or vibration?	Steel Supports appear to be adequate
PM	2	2	4	coatings adequate to protect piping and valves?	Rust seen near bolts otherwise the coatings are in good condition
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	No valving issues
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	4	1	4	site has pressure upstream/downstream pressure gages?	Single pressure gauge on outlet
PM	3	2	6	estimated service life remaining?	Assume 20 years based on AWU Useful Life
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	10" PRV with 6" PRV BYPASS
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	160 Upstream and 75 Downstream
					10" Line is not in service and PRV is used as back up to heavenly valley zone when Heavenly Tank is not inservice. The lid is marked sewer and not water
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Intersection of Saddle and Keller		**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	R23-021		**Date:**	5/1/2012
					PRV Facility Name:	Saddle #2		**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Heavenly Valley Zone		**Adjacent Pressure Zones:**	Stateline Zone and Sweeping Turn PRV
				Photo Evidence for PM, Fn, R, FE					

PHOTOS

				South Tahoe PUD	**Location Description:**	Intersection of Susquehana and Minniconjou	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	N32-022	**Date:**	5/1/2012	
					PRV Facility Name:	Susquehana PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Susquehana Zone	**Adjacent Pressure Zones:**	Pine Valley	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology	
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				PRV Site						
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.83	3.00	2.00	
				Weighted Final Score (1-25)[4]	4.00	N/A	4.17	9.00	2.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%	
				Factored Score	0.80	N/A	1.46	2.25	0.40	**4.91**
				Criticality Score					30%	**1.47**
				PRV Piping, Valves & Instrumentation						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.50	1.00	1.80	3.00	2.00	
				Weighted Final Score (1-25)	9.00	3.00	6.80	9.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.35	0.6	2.04	1.8	0.6	**6.39**
				Criticality Score					70%	**4.47**
									Overall Total Factored Score (Out of 25) =	**5.95**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	The facility is in the roadway and can be accessed easily as the lid is not locked
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Within roadway so no access issues
Fn	2	3	6	site/vault drainage adequate to prevent flooding of valve vault?	No drain within the vault but no sign of any water
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Vault is designed to prevent vehicle damage
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6404 from Google Earth
Fn	1	3	3	other known problems?	No other known problems
				Piping, Valves and Instrumentation	
Fn	1	1	1	pipe supports adequate to prevent movement or vibration?	Yes there are steel pipe supports that are bolted to the wall of the vault
PM	5	2	10	coatings adequate to protect piping and valves?	There is a severe rust problem on the pipe and prv. Coatings appear to be gone
C	1	3	3	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	No valving issues and the valves are adequate
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	4	2	8	estimated service life remaining?	Assume 5 years based on AWU Useful Life
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	4" PRV with a 2" Direct action bypass
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	100 Upstream and 48 Downstream
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Intersection of Susquehana and Minniconjou	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**PRV Facility ID #:**	N32-022	**Date:**	5/1/2012
					PRV Facility Name:	Susquehana PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick
					Pressure Zones Served:	Susquehana Zone	**Adjacent Pressure Zones:**	Pine Valley

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	In front of 1393 Pine Valley Rd.	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**PRV Facility ID #:**	M34-016	**Date:**	5/1/2012	
					PRV Facility Name:	Pine Valley PRV	**Condition Assessment Inspectors:**	Peter Lavallee and Glenn Roderick	
					Pressure Zones Served:	Pine Valley zone	**Adjacent Pressure Zones:**	Susquehana, Country Club, and Iroqouis Zones	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >20 yrs	1: best available technology	
				4. If Failure Mode is "Assigned," then for Weighted Final Score, manually assign Importance Weighting Factor and multiply by Unweighted Failure Mode Score	2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 11 to 20 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 6 to 10 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 3 to 5 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 3 yrs	5: asset should be replaced	
				PRV Site						
				Is Failure Mode Score Calculated or Assigned?	Assigned	N/A	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.83	3.00	2.00	
				Weighted Final Score (1-25)[4]	4.00	N/A	4.17	6.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	20%	N/A	35%	25%	20%	
				Factored Score	0.80	N/A	1.46	1.50	0.80	**4.56**
				Criticality Score					30%	**1.37**
				PRV Piping, Valves & Instrumentation						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Assigned	Assigned	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.50	5.00	2.20	3.00	2.00	
				Weighted Final Score (1-25)	9.00	15.00	7.20	9.00	4.00	
check	100%			**Criticality Weighting Factor (0 - 100%)**	15%	20%	30%	20%	15%	
				Factored Score	1.35	3.00	2.16	1.8	0.6	**8.91**
				Criticality Score					70%	**6.24**
									Overall Total Factored Score (Out of 25) =	**7.60**

Failure Mode Type	**Score**	**Importance Weighting (1-5)**	**Final Score**	**CONDITION ASSESSMENT CHECKLIST**	
				PRV Site	
Fn	5	1	5	site is secured adequately to prevent unauthorized access/vandalism?	The facility is in the roadway and can be accessed easily as the lid is not locked
Fn	1	2	2	adequate vehicle access for year-round maintenance?	Within roadway so no access issues
Fn	1	3	3	site/vault drainage adequate to prevent flooding of valve vault?	No draing but the site is always dry with no issue
Fn	1	4	4	PRV vault adequately designed to prevent vehicle damage?	Vault is designed to prevent vehicle damage
Fn	1	5	5	any site stability issues (if yes, describe)	None
INFORMATION	N/A	N/A	N/A	valve elevation (use Google earth, as-builts, or surveyed elevation)?	6488 from Google Earth
Fn	2	3	6	other known problems?	Lid is mismarked "sewer"
				Piping, Valves and Instrumentation	
Fn	3	1	3	pipe supports adequate to prevent movement or vibration?	Concrete blocking but nothing is strapped down
PM	5	2	10	coatings adequate to protect piping and valves?	Coatings are worn away and flaking. Pipes are corroded
C	5	3	15	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	The pipes are sized adequately and there is no excessive noise or headloss noted
Fn	1	4	4	valves are suitable for efficient and reliable service?	Valves are adequate
Fn	5	5	25	site has flowmeter?	No flowmeter at this site
Fn	1	1	1	site has pressure upstream/downstream pressure gages?	There are pressure gages on both sides of the prv
PM	4	2	8	estimated service life remaining?	Assume 5 years based on AWU Useful Life
Fn	1	3	3	other known problems?	There are no other known problems with this prv station
				Additional Data	
INFORMATION	N/A	N/A	N/A	nominal size (e.g. 6-inch)?	4" PRV with a 3" Direct action bypass
INFORMATION	N/A	N/A	N/A	setpoint pressure(s)?	90 Upstream and 50 Downstream
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

South Tahoe PUD	Location Description:	In front of 1393 Pine Valley Rd.	K/J Project Number: 1270004*00
Water System Optimization Plan	PRV Facility ID #:	M34-016	Date: 5/1/2012
	PRV Facility Name:	Pine Valley PRV	Condition Assessment Inspectors: Peter Lavallee and Glenn Roderick
	Pressure Zones Served:	Pine Valley zone	Adjacent Pressure Zones: Susquehana, Country Club, and Iroqouis Zones

Photo Evidence for PM, Fn, R, FE

PHOTOS

Appendix A2

Tanks

South Tahoe PUD
Water System Optimization Plan
Summary of Tank Condition and Capacity Evaluation

Failure Mode Scoring Summary - Criticality Scores

Tank Facility Name:	Tank Facility ID #:	California Waterworks Standards	Tank Site	Tank Structure	Piping & Valves	SCADA System	Overall Total Factored Score (Out of 25) =
Lookout Tank	LOTK	1.36	3.47	0.89	0.38	0.60	6.70
Echo View Tank	3362312	1.15	2.91	0.62	0.38	0.44	5.50
Tata Tank	TATATK	2.54	2.19	1.75	1.16	0.50	8.14
Angora Tank	EVTK	1.00	2.91	0.77	0.38	0.44	5.50
Arrowhead Tank	AHTK	1.92	3.22	0.69	0.42	0.48	6.73
Christmas Valley Tank	XMVTK	2.28	1.66	1.67	0.53	0.50	6.65
Country Club Tank	CCTK	1.00	3.34	1.54	0.38	0.50	6.77
Flagpole Tank #1	FPTK1	1.48	3.22	1.65	0.65	0.48	7.49
Flagpole Tank #2	FPTK2	1.44	3.22	1.72	0.65	0.48	7.52
Forest Mountain Tank	FMTK	1.44	2.91	1.53	0.38	0.50	6.76
Gardner Mountain Tank #1	GMTK1	1.44	3.46	1.56	0.38	0.48	7.32
Gardner Mountain Tank #2	GMTK2	1.44	3.46	1.56	0.38	0.48	7.32
H. St. Tank	HSTTK	1.44	3.27	0.80	0.38	0.50	6.40
Heavenly Valley Tank	HVTK	1.95	3.34	0.79	1.78	0.50	8.36
Iroquois Tank #1	ITK1	1.61	3.46	2.03	0.88	0.50	8.48
Iroquois Tank #2	ITK2	1.61	3.46	1.84	0.79	0.50	8.21
Keller Tank #1	KTK1	1.32	3.94	2.16	0.83	0.50	8.76
Keller Tank #2	KTK2	1.32	3.94	2.24	0.83	0.62	8.95
Stateline Tank #1	STLTK1	1.65	3.46	0.87	0.38	0.50	6.87
Stateline Tank #2	STLTK2	1.65	3.46	0.87	0.38	0.50	6.87
Cold Creek Tank	CCKTK	2.47	1.71	1.11	1.06	0.50	6.85

				South Tahoe PUD	**Location Description:**	Access Rd from Lookout point circle, 807 Lookout Point Circle		**K/J Project Number:**	1270004*00		
				Water System Optimization Plan	**Tank Facility ID #:**	LOTK		**Date:**	3/12/2012		
					Tank Facility Name:	Lookout Tank		**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney		
					Pressure Zones Served:	Twin Peaks Zone		**Adjacent Pressure Zones:**	Stateline, Forest Mountain, and Flagpole Zones		
				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standards							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.64	N/A	N/A		
				Weighted Final Score (1-25)	5.00	N/A	7.27	N/A	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	1.00	N/A	5.82	N/A	N/A		**6.82**
				Criticality Score					20%		**1.36**
				Tank Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.50	1.60	N/A		
				Weighted Final Score (1-25)	N/A	N/A	10.00	5.60	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Score	N/A	N/A	7.00	1.68	N/A		**8.68**
				Criticality Score					40%		**3.47**
				Tank Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.67	1.00	1.75	1.00	N/A		
				Weighted Final Score (1-25)	7.00	5.00	6.75	3.43	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A		
				Factored Score	0.70	1.50	3.38	0.34	N/A		**5.92**
				Criticality Score					15%		**0.89**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.50	N/A	3.50	N/A	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A		
				Factored Score	0.45	N/A	2.10	N/A	N/A		**2.55**
				Criticality Score					15%		**0.38**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.50	2.00	N/A		
				Weighted Final Score (1-25)	8.00	N/A	6.00	5.25	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Score	0.80	N/A	3.60	1.58	N/A		**5.98**
				Criticality Score					10%		**0.60**
									Overall Total Factored Score (Out of 25) =		**6.70**

				South Tahoe PUD	**Location Description:**	Access Rd from Lookout point circle, 807 Lookout Point Circle	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	LOTK	**Date:**	3/12/2012
					Tank Facility Name:	Lookout Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Stateline, Forest Mountain, and Flagpole Zones

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	4	5	20.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	No mixer and single main in and out
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	1	3	3.00	tank draining removes residual sediments?	Yes
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access (e.g., lighting, fencing, & security monitoring)?	No vandalism has occurred at this site already
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Tank not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes the tank was constructed to prevent external water from entering the tank
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Inside of the tank was 2011 and exterior was 2008*
				Tank Site	
Fn	5	4	20.00	adequate vehicle access for year-round maintenance?	Access in the winter is isolated
R	1	3	3.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	1	5	5.00	is site vulnerable to wildfires?	Yes it was within the Angora Burn area
R	1	5	5.00	any unstable site conditions (if yes, describe)?	There is a ground water seep on the west side of the tank and homes just below the tank have had to divert groundwater around their homes
R	4	3	12.00	is site close to known active seismic faults?	3,189 ft. to nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	Yes there are no drainage issues here
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	JULIE - do we eliminate this question since a duplicate under Calif WW Stds Row 61? TIM
INFORMATION	N/A	N/A	N/A	other known problems?	none
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	300,000
INFORMATION		5	0.00	what is operational storage requirement?	
INFORMATION		5	0.00	what is fire storage requirement?	
INFORMATION		5	0.00	what is emergency storage available?	0
C	1	5	5.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1998
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	Inside of tank was recoated within the last 5 years
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	3 ft. of freeboard which is adequate based on current standards at time of construction
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes
PM	2	5	10.00	condition of exterior coatings adequate to protect structure?	The coatings are adequate but on the north side of the tank there is some discoloration near the top of the tank
Fn	1	4	4.00	adequate openings for ingress/egress?	Yes there are two manways and one roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2011 another planned in 2012 for follow-up coating inspection
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Passive anodes will be installed in 2012
R	1	1	1.00	space available to add solar panels?	Yes
R	1	2	2.00	known fire or haz-mat conditions that could be mitigated?	None
R	1	3	3.00	tank foundation type?	Concrete Ring with anchor bolts
R	1	4	4.00	tank foundation condition?	Excellent Condition
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	Seismic stability was evaluated at time of construction, but has not been reevaluated since
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	4	4	16.00	other known problems (e.g. adequate freeboard, stagnant water)?	There are issues with stagnant water at this tank in the wintertime. This tank is tied to Echo View Tank.
PM	2	4	8.00	estimated service life remaining?	36 years according to AWU Useful Life
				Piping & Valves	
PM	1	5	5.00	coatings adequate to protect piping and valves?	Coatings were redone on internal piping in 2011
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes - JULIE - did the hydraulic analysis identify any tank inlet or outlet pipe size issues? Once we know the answer for all the tanks we should assign a score and change to Fn - TIM
Fn	1	3	3.00	tank-piping connections designed to accommodate settlement or movement?	Yes
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes
INFORMATION	N/A	N/A	N/A	other known problems?	None
PM	1	4	4.00	estimated service life remaining?	46 years according t AWU Useful Life

				South Tahoe PUD	**Location Description:**	Access Rd from Lookout point circle, 807 Lookout Point Circle	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	LOTK	**Date:**	3/12/2012
					Tank Facility Name:	Lookout Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Stateline, Forest Mountain, and Flagpole Zones

				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Transmitter calibration is done when a problem is identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations
Fn	2	4	8.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site
R	1	3	3.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer
INFORMATION	N/A	N/A	N/A	other known problems?	No other known electrical problems at this site
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.
				Additional Data	Altitude valve is installed on this tank. It is not used on a regular bases but is used when necessary.

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Access Rd from Lookout point circle, 807 Lookout Point Circle	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	LOTK	**Date:**	3/12/2012
					Tank Facility Name:	Lookout Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Stateline, Forest Mountain, and Flagpole Zones

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	Top of Echo View Estates Landlocked by adjacent property owner. 1045 Lamor Court	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	3362312	**Date:**	2/23/2012	
					Tank Facility Name:	Echo View Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Forest Mountain, Angora Highlands, and Flagpole Zones	

				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standards							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.36	N/A	N/A		
				Weighted Final Score (1-25)	5.00	N/A	5.91	N/A	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	1.00	N/A	4.73	N/A	N/A		**5.73**
				Criticality Score					20%		**1.15**
				Tank Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	1.60	N/A		
				Weighted Final Score (1-25)	N/A	N/A	8.00	5.60	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Score	N/A	N/A	5.60	1.68	N/A		**7.28**
				Criticality Score					40%		**2.91**
				Tank Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.00	1.00	N/A		
				Weighted Final Score (1-25)	4.00	5.00	3.75	3.43	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A		
				Factored Score	0.40	1.50	1.88	0.34	N/A		**4.12**
				Criticality Score					15%		**0.62**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.50	N/A	3.50	N/A	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A		
				Factored Score	0.45	N/A	2.10	N/A	N/A		**2.55**
				Criticality Score					15%		**0.38**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	2.00	N/A		
				Weighted Final Score (1-25)	4.00	N/A	4.00	5.25	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Score	0.40	N/A	2.40	1.58	N/A		**4.38**
				Criticality Score					10%		**0.44**
									Overall Total Factored Score (Out of 25) =		**5.50**

				South Tahoe PUD	**Location Description:**	Top of Echo View Estates Landlocked by adjacent property owner. 1045 Lamor Court	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	3362312	**Date:**	2/23/2012
					Tank Facility Name:	Echo View Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Forest Mountain, Angora Highlands, and Flagpole Zones

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	1	5	5.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Mixing System
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	1	3	3.00	tank draining removes residual sediments?	Yes kick plate at floor with valve to drain tank to floor
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access (e.g., lighting, fencing, & security monitoring)?	Adjacent to private home and is landlocked. No site fencing or lighting in place at the site.
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes there is one roof hatch and two manways which provide adequate natural light when opened on the interior of the tank
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	There are adequate isolation valves
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Tank not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes the tank was constructed to prevent external water from entering the tank
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Coatings are new and were inspected in 2011 during the installation of the passive cathodic protection system
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	This tank can be accessed through a private driveway year round but is dependant on the homeowner clearing the driveway
R	1	3	3.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	1	5	5.00	is site vulnerable to wildfires?	Yes
R	1	5	5.00	any unstable site conditions (if yes, describe)?	None known
R	4	3	12.00	is site close to known active seismic faults?	Closest Fault line 4,610 feet from tank
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	Yes
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No site fencing or lighting in place at the site
INFORMATION	N/A	N/A	N/A	other known problems?	No other known site problems
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	welded steel with internal and external coatings
INFORMATION	N/A	N/A	N/A	what is tank volume?	203,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	1	5	5.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	2010
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	Constructed new in 2010, Cathodic protection installed in 2011
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes, access to most of tank site is by foot due to 50 foot by 50 foot parcel size
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	Tank freeboard is 3 feet which was designed for sloshing due to seismic activity at time of construction and is therefore adequate
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes
PM	1	5	5.00	condition of exterior coatings adequate to protect structure?	Yes coating new in 2010
Fn	1	4	4.00	adequate openings for ingress/egress?	Yes
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	Fall 2011
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Passive Cathodic installed 2011
R	1	1	1.00	space available to add solar panels?	Unistruts were installed on the tank for this purpose
R	1	2	2.00	known fire or haz-mat conditions that could be mitigated?	No known hazmat or fire conditions
R	1	3	3.00	tank foundation type?	Ring concrete Foundation with anchor bolts
R	1	4	4.00	tank foundation condition?	New
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	Yes when designed in 2009/2010
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	No other known site problems with the tank structure
PM	1	4	4.00	estimated service life remaining?	48 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Top of Echo View Estates Landlocked by adjacent property owner. 1045 Lamor Court	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	3362312	**Date:**	2/23/2012
					Tank Facility Name:	Echo View Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Forest Mountain, Angora Highlands, and Flagpole Zones

				Piping & Valves	
PM	1	5	5.00	coatings adequate to protect piping and valves?	Yes coatings installed in 2010
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Everything is sized adequately and appropriately
Fn	1	3	3.00	tank-piping connections designed to accommodate settlement or movement?	Yes
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Valves are new in 2010
INFORMATION	N/A	N/A	N/A	other known problems?	There are no other known piping and valving issues with this tank
PM	1	4	4.00	estimated service life remaining?	Steel interior Piping has 58 years and valving has 48 years based on AWU Useful life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Calibrated when a problem has been identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	Alarm log is maintained but it is not reviewed annually
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	No communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	Yes and monitored by District operations
R	1	3	3.00	spare parts/service support readily available?	Yes and monitored by District operations
INFORMATION	N/A	N/A	N/A	other known problems?	No other known problems with the SCADA
PM	1	4	4.00	estimated service life remaining?	10 years based on AWU Useful Life
				Additional Data	The tank had a one year follow up inspection and while down the passive cathodic protection system was installed. This occurred in the fall of 2011.

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Top of Echo View Estates Landlocked by adjacent property owner. 1045 Lamor Court	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	3362312	**Date:**	2/23/2012
					Tank Facility Name:	Echo View Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Twin Peaks Zone	**Adjacent Pressure Zones:**	Forest Mountain, Angora Highlands, and Flagpole Zones

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	On Tata Lane	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	TATATK	**Date:**	2/23/2012	
					Tank Facility Name:	Tata Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Stateline Zone or Gardner Mountain Zone depending on Valving	**Adjacent Pressure Zones:**	Stateline Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	N/A	2.18	N/A	N/A	
				Weighted Final Score (1-25)	25.00	N/A	9.64	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	5.00	N/A	7.71	N/A	N/A	**12.71**
				Criticality Score					20%	**2.54**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	0.50	3.20	N/A	
				Weighted Final Score (1-25)	N/A	N/A	2.00	13.60	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	1.40	4.08	N/A	**5.48**
				Criticality Score					40%	**2.19**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.67	1.00	3.75	4.43	N/A	
				Weighted Final Score (1-25)	18.33	5.00	13.75	14.29	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	1.83	1.50	6.88	1.43	N/A	**11.64**
				Criticality Score					15%	**1.75**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	4.50	N/A	3.00	N/A	N/A	
				Weighted Final Score (1-25)	20.50	N/A	9.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	2.05	N/A	5.70	N/A	N/A	**7.75**
				Criticality Score					15%	**1.16**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.25	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	6.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.80	N/A	**5.00**
				Criticality Score					10%	**0.50**
									Overall Total Factored Score (Out of 25) =	**8.14**

				South Tahoe PUD	**Location Description:**	On Tata Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	TATATK	**Date:**	2/23/2012
					Tank Facility Name:	Tata Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone or Gardner Mountain Zone depending on Valving	**Adjacent Pressure Zones:**	Stateline Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes, there have been no issues with contamination from outside sources at this tank
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes, these taps are provided with easy access on the east side of the tank
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	No, there is a single pipe into the tank which is also the discharge pipe from the tank
Fn	4	5	20.00	air-gap provided for tank drain and overflow piping?	This tank has a questionable air gap.
Fn	3	3	9.00	tank draining removes residual sediments?	The tank drain is not adequate and does not remove residual sediment from the bottom of the tank
Fn	1	1	1.00	staff gage provided to manually check level?	No District tank has a staff gauge. CDPH has indicated that they do not like staff gauges and the District removed them from older tanks
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	There is a DP Cell on the tank which is connected to SCADA to provide real-time level feedback to the main plant
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	No, This facility has many problems with unauthorized entry to the site and graffiti on the exterior of the tank. The fencing does not prevent vandalism of the tank.
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	There is not adequate lighting within the tank. There is a single hatch on the roof and a single manway which when opened does not provide adequate lighting.
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	The tank can be isolated easily and maintain water service.
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	This tank is not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	The tank does prevent entry of exterior flows into the tank
PM	5	5	25.00	condition of interior coatings adequate to protect structure?	Condition of the interior of the tank has been identified to be faulty and in need of recoating
				Tank Site	
Fn	1	4	4.00	adequate vehicle access for year-round maintenance?	The site is accessible year round with no issues and shares the lot with three wellheads and a booster station
R	1	3	3.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	5	5	25.00	is site vulnerable to wildfires?	Yes there are trees and vacant lots near by but is nearly in the center of a residential track
R	5	5	25.00	any unstable site conditions (if yes, describe)?	There are trees touching the tank and the lot has frequent unauthorized entries
R	4	3	12.00	is site close to known active seismic faults?	1,984 ft. north of a fault line
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	There are no drainage issues on this site
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No, the fencing does not prevent vandalism of the tank
INFORMATION	N/A	N/A	N/A	other known problems?	No other known site problems
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	bolted with internal and external coatings
INFORMATION	N/A	N/A	N/A	what is tank volume?	395,328
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	1	5	5.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1968
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	No work has been completed on this tank recently
Fn	5	3	15.00	adequate perimeter clearance to facilitate routine O&M?	No, there are trees within five feet of the tank
Fn	4	4	16.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	There is 0.83 feet from the tank overflow to the top of the tank. This may not be adequate freeboard in a seismic event
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Met construction standards at the time of construction and has withstood snow loadings since 1968
PM	4	5	20.00	condition of exterior coatings adequate to protect structure?	No the tank coating is flaking in places and has been discolored due to sun exposure
Fn	1	4	4.00	adequate openings for ingress/egress?	The roof hatch and manway are adequate for accessing the tank but a second manway should be necessary
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2010
PM	5	3	15.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	NO
R	5	1	5.00	space available to add solar panels?	There are no unistruts installed for solar panels at this tank. Tank life expectancy not recommend adding solar panels unless tank replaced.
R	5	2	10.00	known fire or haz-mat conditions that could be mitigated?	The proximity to trees on the parcel
R	5	3	15.00	tank foundation type?	Metal Ring Foundation and no bolted connections from tank to foundation
R	5	4	20.00	tank foundation condition?	The Tank Foundation is stable but would not meet current seismic standards on this bolted steel tank
R	5	5	25.00	has seismic stability been evaluated by a qualified engineer?	No
R	5	4	20.00	concern with tank compliance with seismic requirements?	Seismic stability in this tank is questionable
Fn	5	4	20.00	other known problems (e.g. adequate freeboard, stagnant water)?	The bottom panel of the bolted steel tank has started bulging with age
PM	5	4	20.00	estimated service life remaining?	6 years based on AWU Useful life

				South Tahoe PUD	**Location Description:**	On Tata Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	TATATK	**Date:**	2/23/2012
					Tank Facility Name:	Tata Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone or Gardner Mountain Zone depending on Valving	**Adjacent Pressure Zones:**	Stateline Zone

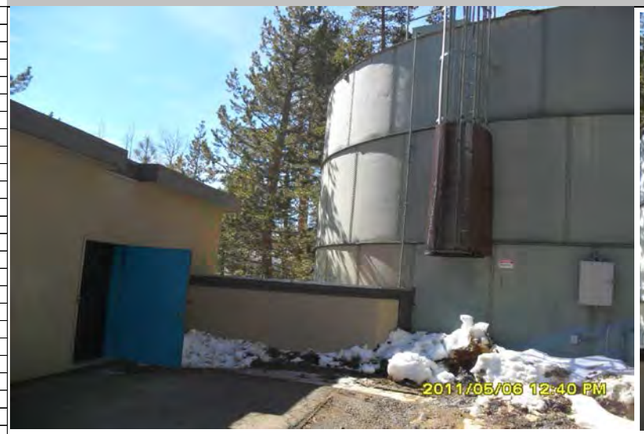
				Piping & Valves	
PM	5	5	25.00	coatings adequate to protect piping and valves?	Cannot see internal piping but rest of tank has coating issues and assume internal piping is in similar condition
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	No noise or headloss has been noticed during normal operation
Fn	5	3	15.00	tank-piping connections designed to accommodate settlement or movement?	There are no records of the connection type at this tank.
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	The valves are reliable
INFORMATION	N/A	N/A	N/A	other known problems?	There are no known problems with the tank piping and valves
PM	4	4	16.00	estimated service life remaining?	16 years for steel piping and 6 years based on AWU Useful Life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Transmitter calibration is not done until a problem is identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site
R	2	3	6.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer
INFORMATION	N/A	N/A	N/A	other known problems?	No other known electrical problems at this site
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.
				Additional Data	This tank is a bolted steel tank that is drained only frequently enough to maintain good water quality. District staff has discussed the necessity for this tank as it is not currently being used for the purpose it was originally designed which was to take water directly from the Tata wells for treatment and distribution.

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	On Tata Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	TATATK	**Date:**	2/23/2012
					Tank Facility Name:	Tata Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone or Gardner Mountain Zone depending on Valving	**Adjacent Pressure Zones:**	Stateline Zone

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS



				South Tahoe PUD	**Location Description:**	On Top of Angora Ridge access via Aberdeen Circle	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	EVTK	**Date:**	3/12/2012	
					Tank Facility Name:	Angora Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Angora Highlands	**Adjacent Pressure Zones:**	Forest Mountain	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.18	N/A	N/A	
				Weighted Final Score (1-25)	5.00	N/A	5.00	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.00	N/A	4.00	N/A	N/A	**5.00**
				Criticality Score					20%	**1.00**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	1.60	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	5.60	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	1.68	N/A	**7.28**
				Criticality Score					40%	**2.91**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.50	1.00	N/A	
				Weighted Final Score (1-25)	4.00	5.00	5.75	3.43	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	0.40	1.50	2.88	0.34	N/A	**5.12**
				Criticality Score					15%	**0.77**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	4.50	N/A	3.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	0.45	N/A	2.10	N/A	N/A	**2.55**
				Criticality Score					15%	**0.38**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	2.00	N/A	
				Weighted Final Score (1-25)	4.00	N/A	4.00	5.25	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.40	N/A	2.40	1.58	N/A	**4.38**
				Criticality Score					10%	**0.44**
									Overall Total Factored Score (Out of 25) =	**5.50**

				South Tahoe PUD	**Location Description:**	On Top of Angora Ridge access via Aberdeen Circle	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	EVTK	**Date:**	3/12/2012
					Tank Facility Name:	Angora Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Angora Highlands	**Adjacent Pressure Zones:**	Forest Mountain

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	1	5	5.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Yes, Mixing System
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	1	3	3.00	tank draining removes residual sediments?	Yes kick plate at floor with valve to drain tank to floor
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	3	5	15.00	adequate security measures and monitoring to prevent unauthorized access?	The site is accessed through a forest service gate and the entire parcel is fenced. No barbed wire and neighbors have indicated unauthorized access has occurred.
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes there is one roof hatch and two manways which provide adequate natural light when opened on the interior of the tank
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	There are adequate isolation valves
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Tank not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes the tank was constructed to prevent external water from entering the tank
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Coatings are new and were inspected in 2011 during the installation of the passive cathodic protection system
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	The site is inaccessible during periods of heavy snowfall and District crews do not generally access the site from October to May. The TRPA prohibits plowing the dirt access road to remove snow.
R	1	3	3.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	1	5	5.00	is site vulnerable to wildfires?	Yes, the tank is on the edge of the Angora Burn Area
R	1	5	5.00	any unstable site conditions (if yes, describe)?	No
R	4	3	12.00	is site close to known active seismic faults?	5,390.5 ft. from the nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	Yes, the site has adequate drainage.
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No, the site is completely fenced but neighbors have indicated unauthorized access to the site
INFORMATION	N/A	N/A	N/A	other known problems?	None the tank is new in 2010
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel Tank with coatings inside and out
INFORMATION	N/A	N/A	N/A	what is tank volume?	249,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	1	5	5.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	2010
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	The tank was constructed in 2010 so no renewal needed
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	3	4	12.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	2.1 feet of freeboard, less than 3 ft. standard at time of construction.
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes
PM	1	5	5.00	condition of exterior coatings adequate to protect structure?	New coatings that were inspected in 2011
Fn	1	4	4.00	adequate openings for ingress/egress?	Yes
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2011
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	passive cathodic protection which is new and maintained
R	1	1	1.00	space available to add solar panels?	Unistruts were added to the roof for this purpose
R	1	2	2.00	known fire or haz-mat conditions that could be mitigated?	None
R	1	3	3.00	tank foundation type?	Concrete ring foundation with anchor bolts
R	1	4	4.00	tank foundation condition?	Excellent installed in 2009
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	Yes and meets current code
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	1	4	4.00	estimated service life remaining?	48 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	On Top of Angora Ridge access via Aberdeen Circle	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	EVTK	**Date:**	3/12/2012
					Tank Facility Name:	Angora Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Angora Highlands	**Adjacent Pressure Zones:**	Forest Mountain

				Piping & Valves	
PM	1	5	5.00	coatings adequate to protect piping and valves?	Yes coatings installed in 2010
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Everything is sized adequately and appropriately
Fn	1	3	3.00	tank-piping connections designed to accommodate settlement or movement?	Yes
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Valves are new in 2010
INFORMATION	N/A	N/A	N/A	other known problems?	There are no other known piping and valving issues with this tank
PM	1	4	4.00	estimated service life remaining?	Steel interior Piping has 58 years and valving has 48 years based on AWU Useful life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Calibrated when a problem has been identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	Alarm log is maintained but it is not reviewed annually
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	No communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	Yes and monitored by District operations
R	1	3	3.00	spare parts/service support readily available?	Yes and monitored by District operations
INFORMATION	N/A	N/A	N/A	other known problems?	No other known problems with the SCADA
PM	1	4	4.00	estimated service life remaining?	10 years based on AWU Useful Life
				Additional Data	
					The tank had a one year follow up inspection and while down the passive cathodic protection system was installed. This occurred in the fall of 2011.
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	On Top of Angora Ridge access via Aberdeen Circle	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	EVTK	**Date:**	3/12/2012
					Tank Facility Name:	Angora Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Angora Highlands	**Adjacent Pressure Zones:**	Forest Mountain

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	Through Swing gate off of Pinewood Dr	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	AHTK	**Date:**	3/15/2012	
					Tank Facility Name:	Arrowhead Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Arrowhead Zone	**Adjacent Pressure Zones:**	Iroquois and Christmas Valley Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	N/A	1.91	N/A	N/A	
				Weighted Final Score (1-25)	15.00	N/A	8.27	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	3.00	N/A	6.62	N/A	N/A	**9.62**
				Criticality Score					20%	**1.92**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	2.20	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	8.20	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	2.46	N/A	**8.06**
				Criticality Score					40%	**3.22**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.67	1.00	1.00	2.00	N/A	
				Weighted Final Score (1-25)	7.33	5.00	3.75	4.86	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	0.73	1.50	1.88	0.49	N/A	**4.59**
				Criticality Score					15%	**0.69**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.50	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	7.00	N/A	3.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	0.70	N/A	2.10	N/A	N/A	**2.80**
				Criticality Score					15%	**0.42**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.00	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	5.25	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.58	N/A	**4.78**
				Criticality Score					10%	**0.48**
									Overall Total Factored Score (Out of 25) =	**6.73**

				South Tahoe PUD	**Location Description:**	Through Swing gate off of Pinewood Dr	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	AHTK	**Date:**	3/15/2012
					Tank Facility Name:	Arrowhead Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Arrowhead Zone	**Adjacent Pressure Zones:**	Iroquois and Christmas Valley Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Single inlet/outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	3	3	9.00	tank draining removes residual sediments?	Some residual sediments remain in the bottom of the tank after draining
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	This tank site has had a history of graffiti, damage to coatings from vandals throwing rocks at the tank, and other unauthorized access
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Tank not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes the tank was constructed to prevent external water from entering the tank
PM	3	5	15.00	condition of interior coatings adequate to protect structure?	Some rust has started developing through the coating at joints and at center column support based on the 2008 inspection report.
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	No the site is inaccessible after heavy snowfall
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	3	5	15.00	is site vulnerable to wildfires?	Yes it is surrounded by forest
R	1	5	5.00	any unstable site conditions (if yes, describe)?	No
R	4	3	12.00	is site close to known active seismic faults?	5,134.1 ft. from the nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	Yes, the site has adequate drainage.
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No the tank has been pelted with rocks and scratch graffiti
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	welded steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	1,078,513
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	1	5	5.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1995
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	The tank was cleaned and inspected in 2008
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	6.25 ft. of freeboard which is adequate
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes
PM	3	5	15.00	condition of exterior coatings adequate to protect structure?	Exterior coatings is in great condition except for the scratches and dings caused by rocks being thrown at the tank
Fn	1	4	4.00	adequate openings for ingress/egress?	Yes there are two manways and one roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	This tank was inspected in 2008
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Active Cathodic Protection
R	5	1	5.00	space available to add solar panels?	No
R	4	2	8.00	known fire or haz-mat conditions that could be mitigated?	Proximity to trees creates a potential for damage due to wildfire
R	1	3	3.00	tank foundation type?	Concrete ring with anchor bolts
R	1	4	4.00	tank foundation condition?	Excellent there are no visual defects
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	No
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	1	4	4.00	estimated service life remaining?	33 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Through Swing gate off of Pinewood Dr	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	AHTK	**Date:**	3/15/2012	
					Tank Facility Name:	Arrowhead Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Arrowhead Zone	**Adjacent Pressure Zones:**	Iroquois and Christmas Valley Zone	

				Piping & Valves	
PM	2	5	10.00	coatings adequate to protect piping and valves?	Inspection in 2008 shows that coatings on internal piping is adequate
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Everything is sized adequately and appropriately
Fn	1	3	3.00	tank-piping connections designed to accommodate settlement or movement?	Yes
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes
INFORMATION	N/A	N/A	N/A	other known problems?	None
PM	1	4	4.00	estimated service life remaining?	48 years based on AWU Useful Life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Calibrated when a problem has been identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	Alarm log is maintained but it is not reviewed annually
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	No communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	Yes and monitored by District operations
R	1	3	3.00	spare parts/service support readily available?	Yes and monitored by District operations
INFORMATION	N/A	N/A	N/A	other known problems?	No other known problems with the SCADA
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.
				Additional Data	

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Through Swing gate off of Pinewood Dr	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	AHTK	**Date:**	3/15/2012
					Tank Facility Name:	Arrowhead Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Arrowhead Zone	**Adjacent Pressure Zones:**	Iroquois and Christmas Valley Zone

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	Off of	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	XMVTK	**Date:**	3/12/2012	
					Tank Facility Name:	Christmas Valley Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Christmas Valley Zone	**Adjacent Pressure Zones:**	Arrowhead Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	N/A	1.82	N/A	N/A	
				Weighted Final Score (1-25)	25.00	N/A	8.00	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	5.00	N/A	6.40	N/A	N/A	**11.40**
				Criticality Score					20%	**2.28**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	0.50	2.40	N/A	
				Weighted Final Score (1-25)	N/A	N/A	2.00	9.20	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	1.40	2.76	N/A	**4.16**
				Criticality Score					40%	**1.66**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	5.00	1.00	2.00	N/A	
				Weighted Final Score (1-25)	12.67	25.00	3.75	4.86	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	1.27	7.50	1.88	0.49	N/A	**11.13**
				Criticality Score					15%	**1.67**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	14.50	N/A	3.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	1.45	N/A	2.10	N/A	N/A	**3.55**
				Criticality Score					15%	**0.53**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.25	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	6.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.80	N/A	**5.00**
				Criticality Score					10%	**0.50**
									Overall Total Factored Score (Out of 25) =	**6.65**

				South Tahoe PUD	**Location Description:**	Off of	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	XMVTK	**Date:**	3/12/2012
					Tank Facility Name:	Christmas Valley Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Christmas Valley Zone	**Adjacent Pressure Zones:**	Arrowhead Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Same inlet and outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	There is an air gap
Fn	2	3	6.00	tank draining removes residual sediments?	Some residual sediments are left on the bottom of the tank and must be removed
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	There is no fence or other site security
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes there are two manways and a roof hatch which let in a lot of light
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Not used for CT
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes
PM	5	5	25.00	condition of interior coatings adequate to protect structure?	Tank is planned to be recoated in 2012
				Tank Site	
Fn	1	4	4.00	adequate vehicle access for year-round maintenance?	The District is responsible for plowing the road to the tank as part of the agreement with the adjacent land owners
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	4	5	20.00	is site vulnerable to wildfires?	Yes it is in a densely wooded area
R	1	5	5.00	any unstable site conditions (if yes, describe)?	None
R	4	3	12.00	is site close to known active seismic faults?	2,950 ft. to the nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	There are no drainage issues
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No fencing at this location
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Tank
INFORMATION	N/A	N/A	N/A	what is tank volume?	
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	5	5	25.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1998
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	The tank is planned to be recoated in 2012
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	There is adequate clearance around the outside of the tank
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	Yes, there is 3.8 ft. which complies with standard at time of construction. Freeboard is adequate.
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Tank is designed to withstand snow load
PM	5	5	25.00	condition of exterior coatings adequate to protect structure?	Coatings need to be replaced and are planned to be replaced in 2012
Fn	1	4	4.00	adequate openings for ingress/egress?	There are two manways and one roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2011
PM	3	3	9.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Impressed current cathodic protection but it is not maintained
R	5	1	5.00	space available to add solar panels?	no
R	4	2	8.00	known fire or haz-mat conditions that could be mitigated?	Wildfire risk to the tank
R	1	3	3.00	tank foundation type?	Concrete Ring with anchor bolts
R	1	4	4.00	tank foundation condition?	Excellent
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	When it was constructed
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	1	4	4.00	estimated service life remaining?	36 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Off of	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	XMVTK	**Date:**	3/12/2012
					Tank Facility Name:	Christmas Valley Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Christmas Valley Zone	**Adjacent Pressure Zones:**	Arrowhead Zone

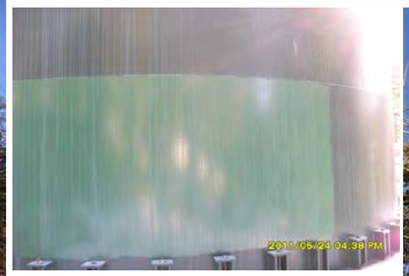
				Piping & Valves	
PM	5	5	25.00	coatings adequate to protect piping and valves?	Coatings on the piping will be completed in 2012 with the rest of the tank
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes
Fn	1	3	3.00	tank-piping connections designed to accommodate settlement or movement?	Yes
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes
INFORMATION	N/A	N/A	N/A	other known problems?	None
PM	1	4	4.00	estimated service life remaining?	46 years based on AWU Useful Life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Transmitter calibration is not done unless a problem is identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site
R	2	3	6.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer
INFORMATION	N/A	N/A	N/A	other known problems?	No other known electrical problems at this site
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.
				Additional Data	The access road to the tank is asphalt and the road is deteriorating rapidly

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Off of	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	XMVTK	**Date:**	3/12/2012
					Tank Facility Name:	Christmas Valley Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Christmas Valley Zone	**Adjacent Pressure Zones:**	Arrowhead Zone

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS



				South Tahoe PUD	**Location Description:**	Off of Skyline Dr within cluster of homes, 1697 Skyline Dr	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	CCTK	**Date:**	3/13/2012	
					Tank Facility Name:	Country Club Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Arrowhead and Iroquois Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.18	N/A	N/A	
				Weighted Final Score (1-25)	5.00	N/A	5.00	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.00	N/A	4.00	N/A	N/A	**5.00**
				Criticality Score					20%	**1.00**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	2.40	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	9.20	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	2.76	N/A	**8.36**
				Criticality Score					40%	**3.34**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	5.00	1.00	2.14	N/A	
				Weighted Final Score (1-25)	4.00	25.00	3.75	5.14	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	0.40	7.50	1.88	0.51	N/A	**10.29**
				Criticality Score					15%	**1.54**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	4.50	N/A	3.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	0.45	N/A	2.10	N/A	N/A	**2.55**
				Criticality Score					15%	**0.38**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.25	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	6.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.80	N/A	**5.00**
				Criticality Score					10%	**0.50**
									Overall Total Factored Score (Out of 25) =	**6.77**

				South Tahoe PUD	**Location Description:**	Off of Skyline Dr within cluster of homes, 1697 Skyline Dr	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	CCTK	**Date:**	3/13/2012
					Tank Facility Name:	Country Club Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Arrowhead and Iroquois Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	1	5	5.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Yes, Mixing System
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	1	3	3.00	tank draining removes residual sediments?	Yes kick plate at floor with valve to drain tank to floor
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicated a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	3	5	15.00	adequate security measures and monitoring to prevent unauthorized access?	The site is accessed through a forest service gate and is in a cluster of houses
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes there is one roof hatch and two manways which provide adequate natural light when opened on the interior of the tank
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	There are adequate isolation valves
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Tank not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes the tank was constructed to prevent external water from entering the tank
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Coatings are new and were inspected in 2009 during installation of the passive cathodic protection anodes
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	The site is inaccessible during periods of heavy snowfall and District crews do not generally access the site from October to May. The TRPA prohibits plowing the dirt access road to remove snow.
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	4	5	20.00	is site vulnerable to wildfires?	Yes but is within a cluster of homes within a residential neighborhood
R	1	5	5.00	any unstable site conditions (if yes, describe)?	No
R	4	3	12.00	is site close to known active seismic faults?	10,050 ft. to the nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	Yes, the site has adequate drainage.
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	The site is accessed through a forest service gate and is in a cluster of houses
INFORMATION	N/A	N/A	N/A	other known problems?	None the tank is new in 2010
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Bolted Steel Tank
INFORMATION	N/A	N/A	N/A	what is tank volume?	355,000
INFORMATION		5	0.00	what is operational storage requirement?	
INFORMATION		5	0.00	what is fire storage requirement?	
INFORMATION		5	0.00	what is emergency storage available?	
C	5	5	25.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	2008
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	The tank was constructed in 2008 so no upgrades needed
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	4ft and it is adequate per standard at time of construction
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes
PM	1	5	5.00	condition of exterior coatings adequate to protect structure?	Coatings were inspected in 2009
Fn	1	4	4.00	adequate openings for ingress/egress?	Yes
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2009
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	passive cathodic protection which is new and maintained
R	5	1	5.00	space available to add solar panels?	No
R	5	2	10.00	known fire or haz-mat conditions that could be mitigated?	There are trees within close proximity to the tank which could cause fire damage or damage the tank if they were to fall
R	1	3	3.00	tank foundation type?	Concrete ring foundation with anchor bolts
R	1	4	4.00	tank foundation condition?	Excellent installed in 2008
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	Yes and meets current code
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	1	4	4.00	estimated service life remaining?	46 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Off of Skyline Dr within cluster of homes, 1697 Skyline Dr	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	CCTK	**Date:**	3/13/2012
					Tank Facility Name:	Country Club Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Arrowhead and Iroquois Zone

				Piping & Valves	
PM	1	5	5.00	coatings adequate to protect piping and valves?	Yes installed in 2008
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Everything is sized adequately and appropriately
Fn	1	3	3.00	tank-piping connections designed to accommodate settlement or movement?	Yes
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Valves are new in 2008
INFORMATION	N/A	N/A	N/A	other known problems?	There are no other known piping and valving issues with this tank
PM	1	4	4.00	estimated service life remaining?	56 years based on AWU Useful life.
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Calibrated when a problem has been identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	Alarm log is maintained but it is not reviewed annually
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	No communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	Yes and monitored by District operations
R	2	3	6.00	spare parts/service support readily available?	Yes and monitored by District operations
INFORMATION	N/A	N/A	N/A	other known problems?	No other known problems with the SCADA
PM	2	4	8.00	estimated service life remaining?	8 years based on AWU Useful Life
				Additional Data	

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Off of Skyline Dr within cluster of homes, 1697 Skyline Dr	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	CCTK	**Date:**	3/13/2012
					Tank Facility Name:	Country Club Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Arrowhead and Iroquois Zone

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	Access Road from Chiapa Dr.	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	FPTK1	**Date:**	3/15/2012	
					Tank Facility Name:	Flagpole Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Flagpole Zone	**Adjacent Pressure Zones:**	Arrowhead and Twin Peaks Zones	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.82	N/A	N/A	
				Weighted Final Score (1-25)	5.00	N/A	8.00	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.00	N/A	6.40	N/A	N/A	**7.40**
				Criticality Score					20%	**1.48**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	2.20	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	8.20	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	2.46	N/A	**8.06**
				Criticality Score					40%	**3.22**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.67	5.00	1.25	2.00	N/A	
				Weighted Final Score (1-25)	7.00	25.00	4.50	5.71	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	0.70	7.50	2.25	0.57	N/A	**11.02**
				Criticality Score					15%	**1.65**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	2.00	N/A	N/A	
				Weighted Final Score (1-25)	4.50	N/A	6.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	0.45	N/A	3.90	N/A	N/A	**4.35**
				Criticality Score					15%	**0.65**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.00	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	5.25	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.58	N/A	**4.78**
				Criticality Score					10%	**0.48**
									Overall Total Factored Score (Out of 25) =	**7.49**

				South Tahoe PUD	**Location Description:**	Access Road from Chiapa Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	FPTK1	**Date:**	3/15/2012
					Tank Facility Name:	Flagpole Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Flagpole Zone	**Adjacent Pressure Zones:**	Arrowhead and Twin Peaks Zones

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Same inlet and outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	There is an air gap
Fn	2	3	6.00	tank draining removes residual sediments?	No
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	There is no fence or other site security
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes there are two manways and a roof hatch which let in a lot of light
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	No
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	This is a concrete block tank with no internal coatings on the concrete
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	No the site is inaccessible during periods of heavy snow
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	3	5	15.00	is site vulnerable to wildfires?	Yes it is surrounded by wooded lots and vacant land
R	1	5	5.00	any unstable site conditions (if yes, describe)?	None
R	4	3	12.00	is site close to known active seismic faults?	1,750 ft. to nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	No site drainage issues
Fn		4	0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	There is no site lighting or fencing
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Reinforced Concrete Block Tank
INFORMATION	N/A	N/A	N/A	what is tank volume?	221,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	5	5	25.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1964
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	Work was completed to repair spalling concrete and cracked blocks in the past. Date of work is unknown
Fn	2	3	6.00	adequate perimeter clearance to facilitate routine O&M?	There are bushes that are against this tank but work can still be completed
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	Yes there is 1 ft. of freeboard
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes
PM	2	5	10.00	condition of exterior coatings adequate to protect structure?	There is some spalling on the south east corner of the tank
Fn	1	4	4.00	adequate openings for ingress/egress?	Single roof hatch. The tank is buried into the hill
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2008
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	None
R	5	1	5.00	space available to add solar panels?	No
R	2	2	4.00	known fire or haz-mat conditions that could be mitigated?	Location of trees in proximity to the tank
R	1	3	3.00	tank foundation type?	Concrete but cannot be determined the tank is buried into the hill
R	1	4	4.00	tank foundation condition?	Cannot be determined the tank is buried into the hill
R	3	5	15.00	has seismic stability been evaluated by a qualified engineer?	No
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	2	4	8.00	estimated service life remaining?	2 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Access Road from Chiapa Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	FPTK1	**Date:**	3/15/2012
					Tank Facility Name:	Flagpole Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Flagpole Zone	**Adjacent Pressure Zones:**	Arrowhead and Twin Peaks Zones
				Piping & Valves				
PM	1	5	5.00	coatings adequate to protect piping and valves?	Coatings on piping in inspection report look adequate			
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes			
Fn	3	3	9.00	tank-piping connections designed to accommodate settlement or movement?	Unknown			
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	There have been no issues with and of the valving			
INFORMATION	N/A	N/A	N/A	other known problems?	None			
PM	1	4	4.00	estimated service life remaining?	12 years based on AWU Useful Life			
				SCADA system				
R	5	2	10.00	frequency of level transmitter calibration?	Calibrated when a problem has been identified			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District operations			
Fn	1	4	4.00	alarm log maintained and reviewed annually?	Alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	No communication failures within the last year			
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	Yes and monitored by District operations			
R	1	3	3.00	spare parts/service support readily available?	Yes and monitored by District operations			
INFORMATION	N/A	N/A	N/A	other known problems?	No other known problems with the SCADA			
PM	2	4	8.00	estimated service life remaining?	Estimated 10 years based on AWU Useful Life			
				Additional Data				
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	Access Road from Chiapa Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	FPTK1	**Date:**	3/15/2012
					Tank Facility Name:	Flagpole Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Flagpole Zone	**Adjacent Pressure Zones:**	Arrowhead and Twin Peaks Zones

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	Access Road from end of Chiapa Dr	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	FPTK2	**Date:**	3/15/2012	
					Tank Facility Name:	Flagpole Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Flagpole Zone	**Adjacent Pressure Zones:**	Arrowhead and Twin Peaks Zones	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.73	N/A	N/A	
				Weighted Final Score (1-25)	5.00	N/A	7.73	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.00	N/A	6.18	N/A	N/A	**7.18**
				Criticality Score					20%	**1.44**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	2.20	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	8.20	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	2.46	N/A	**8.06**
				Criticality Score					40%	**3.22**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.67	5.00	1.50	1.86	N/A	
				Weighted Final Score (1-25)	6.67	25.00	5.75	4.57	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	0.67	7.50	2.88	0.46	N/A	**11.50**
				Criticality Score					15%	**1.72**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	2.00	N/A	N/A	
				Weighted Final Score (1-25)	4.50	N/A	6.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	0.45	N/A	3.90	N/A	N/A	**4.35**
				Criticality Score					15%	**0.65**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.00	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	5.25	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.58	N/A	**4.78**
				Criticality Score					10%	**0.48**
									Overall Total Factored Score (Out of 25) =	**7.52**

				South Tahoe PUD	**Location Description:**	Access Road from end of Chiapa Dr	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	FPTK2	**Date:**	3/15/2012
					Tank Facility Name:	Flagpole Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Flagpole Zone	**Adjacent Pressure Zones:**	Arrowhead and Twin Peaks Zones

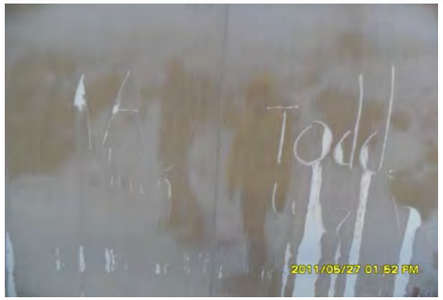
Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Same inlet and outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	There is an air gap
Fn	1	3	3.00	tank draining removes residual sediments?	There are minimal sediments left in the tank when draining which are removed.
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	There is no fence, site lighting, or other site security
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes there are two manways and a roof hatch which let in a lot of light
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	No
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Interior coatings are still in good condition as of inspection in 2008
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	No the site is inaccessible during periods of heavy snow
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	3	5	15.00	is site vulnerable to wildfires?	Yes it is surrounded by wooded lots and vacant land
R	1	5	5.00	any unstable site conditions (if yes, describe)?	None
R	4	3	12.00	is site close to known active seismic faults?	1,750 ft. to nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	No site drainage issues
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	There is no site lighting or fencing
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	176,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	5	5	25.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1999
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	Nothing since construction
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	There is adequate clearances
Fn	3	4	12.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	1.90 feet of freeboard. 3 ft. freeboard standard. Freeboard not adequate.
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes
PM	2	5	10.00	condition of exterior coatings adequate to protect structure?	There is some scratch graffiti on one side of the tank but the coatings are in excellent condition
Fn	1	4	4.00	adequate openings for ingress/egress?	There are two manways and a roof hatch which are adequate
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2008
PM	2	3	6.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Active Cathodic Protection and it is adequate but not maintained
R	5	1	5.00	space available to add solar panels?	No
R	3	2	6.00	known fire or haz-mat conditions that could be mitigated?	Location of trees in proximity to the tank
R	1	3	3.00	tank foundation type?	Concrete Ring foundation with anchor bolts
R	1	4	4.00	tank foundation condition?	The foundation is in excellent condition
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	At time of design and construction.
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	1	4	4.00	estimated service life remaining?	37 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Access Road from end of Chiapa Dr	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	FPTK2	**Date:**	3/15/2012
					Tank Facility Name:	Flagpole Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Flagpole Zone	**Adjacent Pressure Zones:**	Arrowhead and Twin Peaks Zones
				Piping & Valves				
PM	1	5	5.00	coatings adequate to protect piping and valves?	Coatings on piping in inspection report look adequate			
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes			
Fn	3	3	9.00	tank-piping connections designed to accommodate settlement or movement?	Unknown			
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	There have been no issues with and of the valving			
INFORMATION	N/A	N/A	N/A	other known problems?	None			
PM	1	4	4.00	estimated service life remaining?	47 years based on AWU Useful Life			
				SCADA system				
R	5	2	10.00	frequency of level transmitter calibration?	Calibrated when a problem has been identified			
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District operations			
Fn	1	4	4.00	alarm log maintained and reviewed annually?	Alarm log is maintained but it is not reviewed annually			
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio			
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	No communication failures within the last year			
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	Yes and monitored by District operations			
R	1	3	3.00	spare parts/service support readily available?	Yes and monitored by District operations			
INFORMATION	N/A	N/A	N/A	other known problems?	No other known problems with the SCADA			
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.			
				Additional Data				
				Legend				
				PM	Physical Mortality			
				Fn	Functionality			
				R	Reliability			
				FE	Financial Efficiency			
				C	Capacity			

				South Tahoe PUD	**Location Description:**	Access Road from end of Chiapa Dr	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	FPTK2	**Date:**	3/15/2012
					Tank Facility Name:	Flagpole Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Flagpole Zone	**Adjacent Pressure Zones:**	Arrowhead and Twin Peaks Zones

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS



				South Tahoe PUD	**Location Description:**	Access Rd off of Forest Mountain Dr.	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	FMTK	**Date:**	3/12/2012	
					Tank Facility Name:	Forest Mountain Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Forest Mountain and Zone	**Adjacent Pressure Zones:**	Angora Highlands and Twin Peaks Zones	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.73	N/A	N/A	
				Weighted Final Score (1-25)	5.00	N/A	7.73	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.00	N/A	6.18	N/A	N/A	**7.18**
				Criticality Score					20%	**1.44**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	1.60	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	5.60	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	1.68	N/A	**7.28**
				Criticality Score					40%	**2.91**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	5.00	1.00	1.57	N/A	
				Weighted Final Score (1-25)	4.00	25.00	3.75	4.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	0.40	7.50	1.88	0.40	N/A	**10.18**
				Criticality Score					15%	**1.53**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	4.50	N/A	3.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	0.45	N/A	2.10	N/A	N/A	**2.55**
				Criticality Score					15%	**0.38**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.25	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	6.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.80	N/A	**5.00**
				Criticality Score					10%	**0.50**
									Overall Total Factored Score (Out of 25) =	**6.76**

				South Tahoe PUD	**Location Description:**	Access Rd off of Forest Mountain Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	FMTK	**Date:**	3/12/2012
					Tank Facility Name:	Forest Mountain Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Forest Mountain and Zone	**Adjacent Pressure Zones:**	Angora Highlands and Twin Peaks Zones

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Same inlet and outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	There is an air gap
Fn	1	3	3.00	tank draining removes residual sediments?	Yes
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	There is no fence or other site security
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes there are two manways and a roof hatch which let in a lot of light
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	No
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Tank was recoated in 2008
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	No access in the wintertime by vehicle but can be walked to
R	1	3	3.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	1	5	5.00	is site vulnerable to wildfires?	Yes it was in the Angora Burn Area
R	1	5	5.00	any unstable site conditions (if yes, describe)?	None
R	4	3	12.00	is site close to known active seismic faults?	5,000 ft. from nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	There are no drainage issues
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No fencing at this location
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Tank
INFORMATION	N/A	N/A	N/A	what is tank volume?	158,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	5	5	25.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	2001
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	The tank was recoated in 2008
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	There is adequate clearance around the outside of the tank
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	3.9 ft. of freeboard and it is adequate as it complies with standard at time of construction
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Tank is designed to withstand snow load
PM	1	5	5.00	condition of exterior coatings adequate to protect structure?	Coatings are in like new condition
Fn	1	4	4.00	adequate openings for ingress/egress?	There are two manways and one roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2008
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Passive cathodic protection
R	5	1	5.00	space available to add solar panels?	no
R	1	2	2.00	known fire or haz-mat conditions that could be mitigated?	None
R	1	3	3.00	tank foundation type?	Concrete Ring with anchor bolts
R	1	4	4.00	tank foundation condition?	Excellent
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	Yes at time of installation
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	1	4	4.00	estimated service life remaining?	39 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Access Rd off of Forest Mountain Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	FMTK	**Date:**	3/12/2012
					Tank Facility Name:	Forest Mountain Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Forest Mountain and Zone	**Adjacent Pressure Zones:**	Angora Highlands and Twin Peaks Zones

				Piping & Valves	
PM	1	5	5.00	coatings adequate to protect piping and valves?	Yes the coatings on the interior of the tank were done after the Angora fire
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes
Fn	1	3	3.00	tank-piping connections designed to accommodate settlement or movement?	Yes
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes
INFORMATION	N/A	N/A	N/A	other known problems?	None
PM	1	4	4.00	estimated service life remaining?	49 years based on AWU Useful Life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Transmitter calibration is done when a problem is identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site
R	2	3	6.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer
INFORMATION	N/A	N/A	N/A	other known problems?	No other known electrical problems at this site
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.
				Additional Data	
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Access Rd off of Forest Mountain Dr.	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	FMTK	**Date:**	3/12/2012
					Tank Facility Name:	Forest Mountain Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Forest Mountain and Zone	**Adjacent Pressure Zones:**	Angora Highlands and Twin Peaks Zones

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	Access Rd from end of Panther Lane	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	GMTK1	**Date:**	3/15/2012	
					Tank Facility Name:	Gardner Mountain Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Gardner Mountain Zone/Stateline Zone depending on Valving	**Adjacent Pressure Zones:**	Stateline Zone depending on Valving	

				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standards							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.73	N/A	N/A		
				Weighted Final Score (1-25)	5.00	N/A	7.73	N/A	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	1.00	N/A	6.18	N/A	N/A		**7.18**
				Criticality Score					20%		**1.44**
				Tank Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	2.60	N/A		
				Weighted Final Score (1-25)	N/A	N/A	8.00	10.20	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Score	N/A	N/A	5.60	3.06	N/A		**8.66**
				Criticality Score					40%		**3.46**
				Tank Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	5.00	1.00	2.43	N/A		
				Weighted Final Score (1-25)	4.00	25.00	3.75	6.14	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A		
				Factored Score	0.40	7.50	1.88	0.61	N/A		**10.39**
				Criticality Score					15%		**1.56**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A		
				Weighted Final Score (1-25)	4.50	N/A	3.50	N/A	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A		
				Factored Score	0.45	N/A	2.10	N/A	N/A		**2.55**
				Criticality Score					15%		**0.38**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**	
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.00	N/A		
				Weighted Final Score (1-25)	8.00	N/A	4.00	5.25	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Score	0.80	N/A	2.40	1.58	N/A		**4.78**
				Criticality Score					10%		**0.48**
									Overall Total Factored Score (Out of 25) =		**7.32**

				South Tahoe PUD	**Location Description:**	Access Rd from end of Panther Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	GMTK1	**Date:**	3/15/2012
					Tank Facility Name:	Gardner Mountain Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Gardner Mountain Zone/Stateline Zone depending on Valving	**Adjacent Pressure Zones:**	Stateline Zone depending on Valving

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Same inlet and outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	There is an air gap
Fn	1	3	3.00	tank draining removes residual sediments?	Yes
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	There is no fence or other site security The graffiti and unauthorized access is a problem at this site
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes there are two manways and a roof hatch which let in a lot of light
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Not used for CT
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Yes
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	Adequate except for periods of heavy snow
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	5	5	25.00	is site vulnerable to wildfires?	Yes it is adjacent to open space and wooded lots. The tank is at the edge of the Angora Burn Area and is within the forest
R	1	5	5.00	any unstable site conditions (if yes, describe)?	None
R	4	3	12.00	is site close to known active seismic faults?	900 ft. from nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	Yes
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No there is graffiti in all accessible areas of the tank and on the roof of the tank
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	212,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	5	5	25.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	2002
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	Exterior has been repainted numerous times due to graffiti
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	3 ft. of freeboard which is adequate and complies with standard at time of construction
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes it met the design loads at the time of construction
PM	1	5	5.00	condition of exterior coatings adequate to protect structure?	The coatings are adequate but have been spray painted numerous times
Fn	1	4	4.00	adequate openings for ingress/egress?	Yes there are two manways and one roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2008
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	impressed current cathodic protection
R	5	1	5.00	space available to add solar panels?	No
R	4	2	8.00	known fire or haz-mat conditions that could be mitigated?	None other than potential for wildfire
R	4	3	12.00	tank foundation type?	concrete ring with anchor bolts most of the nuts have been removed by vandals
R	1	4	4.00	tank foundation condition?	Excellent
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	No
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	1	4	4.00	estimated service life remaining?	40 years based on AWU Useful Life

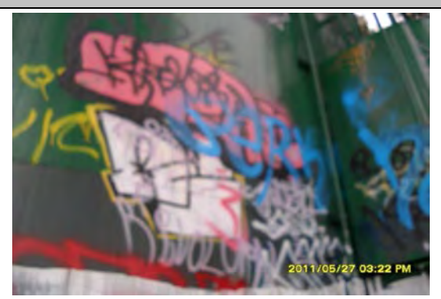
				South Tahoe PUD	**Location Description:**	Access Rd from end of Panther Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	GMTK1	**Date:**	3/15/2012
					Tank Facility Name:	Gardner Mountain Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Gardner Mountain Zone/Stateline Zone depending on Valving	**Adjacent Pressure Zones:**	Stateline Zone depending on Valving

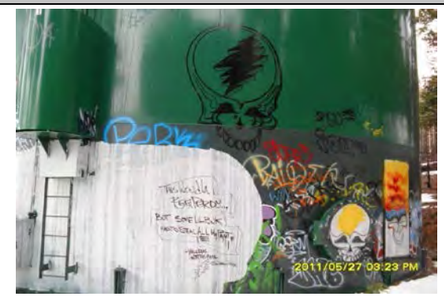
				Piping & Valves	
PM	1	5	5.00	coatings adequate to protect piping and valves?	Yes
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes
Fn	1	3	3.00	tank-piping connections designed to accommodate settlement or movement?	Yes
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes there have been no issues with valving since they were installed
INFORMATION	N/A	N/A	N/A	other known problems?	None
PM	1	4	4.00	estimated service life remaining?	50 years based on AWU Useful Life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Calibrated when a problem has been identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	Alarm log is maintained but it is not reviewed annually
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	No communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	Yes and monitored by District operations
R	1	3	3.00	spare parts/service support readily available?	Yes and monitored by District operations
INFORMATION	N/A	N/A	N/A	other known problems?	No other known problems with the SCADA
PM	2	4	8.00	estimated service life remaining?	11 years remaining according to AWU Useful Life
				Additional Data	
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Access Rd from end of Panther Lane	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	GMTK1	**Date:**	3/15/2012
					Tank Facility Name:	Gardner Mountain Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Gardner Mountain Zone/Stateline Zone depending on Valving	**Adjacent Pressure Zones:**	Stateline Zone depending on Valving

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS





				South Tahoe PUD	**Location Description:**	Access road from end of Panther Ln	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	GMTK2	**Date:**	3/15/2012	
					Tank Facility Name:	Gardner Mountain Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Gardner Mountain and Stateline Zone depending on valving	**Adjacent Pressure Zones:**	Stateline Zone depending on valving	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.73	N/A	N/A	
				Weighted Final Score (1-25)	5.00	N/A	7.73	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.00	N/A	6.18	N/A	N/A	**7.18**
				Criticality Score					20%	**1.44**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	8.00	10.20	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	10.20	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	3.06	N/A	**8.66**
				Criticality Score					40%	**3.46**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	5.00	1.00	2.43	N/A	
				Weighted Final Score (1-25)	4.00	25.00	3.75	6.14	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	0.40	7.50	1.88	0.61	N/A	**10.39**
				Criticality Score					15%	**1.56**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	4.50	N/A	3.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	0.45	N/A	2.10	N/A	N/A	**2.55**
				Criticality Score					15%	**0.38**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.00	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	5.25	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.58	N/A	**4.78**
				Criticality Score					10%	**0.48**
									Overall Total Factored Score (Out of 25) =	**7.32**

				South Tahoe PUD	**Location Description:**	Access road from end of Panther Ln	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	GMTK2	**Date:**	3/15/2012
					Tank Facility Name:	Gardner Mountain Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Gardner Mountain and Stateline Zone depending on valving	**Adjacent Pressure Zones:**	Stateline Zone depending on valving

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Same inlet and outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	There is an air gap
Fn	1	3	3.00	tank draining removes residual sediments?	Yes
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	There is no fence or other site security The graffiti and unauthorized access is a problem at this site
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes there are two manways and a roof hatch which let in a lot of light
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Not used for CT
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Yes
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	Adequate except for periods of heavy snow
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	5	5	25.00	is site vulnerable to wildfires?	Yes it is adjacent to open space and wooded lots. The tank is at the edge of the Angora Burn Area and is within the forest
R	1	5	5.00	any unstable site conditions (if yes, describe)?	None
R	4	3	12.00	is site close to known active seismic faults?	900 ft. from nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	Yes
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No there is graffiti in all accessible areas of the tank and on the roof of the tank
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	212,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	5	5	25.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1998
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	Exterior has been repainted numerous times due to graffiti
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	3 feet which is adequate freeboard and complies with standard at time of construction
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes it met the design loads at the time of construction
PM	1	5	5.00	condition of exterior coatings adequate to protect structure?	The coatings are fine but the graffiti is thick on the lower section
Fn	1	4	4.00	adequate openings for ingress/egress?	Yes there are two manways and one roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2008
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	impressed current cathodic protection
R	5	1	5.00	space available to add solar panels?	No
R	4	2	8.00	known fire or haz-mat conditions that could be mitigated?	None other than potential for wildfire
R	4	3	12.00	tank foundation type?	concrete ring with anchor bolts and some of the nuts have been removed
R	1	4	4.00	tank foundation condition?	Excellent
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	No
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	1	4	4.00	estimated service life remaining?	36 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Access road from end of Panther Ln	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	GMTK2	**Date:**	3/15/2012	
					Tank Facility Name:	Gardner Mountain Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Gardner Mountain and Stateline Zone depending on valving	**Adjacent Pressure Zones:**	Stateline Zone depending on valving	
				Piping & Valves					
PM	1	5	5.00	coatings adequate to protect piping and valves?	Yes				
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes				
Fn	1	3	3.00	tank-piping connections designed to accommodate settlement or movement?	Yes				
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes there have been no issues with valving since they were installed				
INFORMATION	N/A	N/A	N/A	other known problems?	None				
PM	1	4	4.00	estimated service life remaining?	46 years based on AWU Useful Life				
				SCADA system					
R	5	2	10.00	frequency of level transmitter calibration?	Calibrated when a problem has been identified				
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes and monitored by District operations				
Fn	1	4	4.00	alarm log maintained and reviewed annually?	Alarm log is maintained but it is not reviewed annually				
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio				
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	No communication failures within the last year				
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	Yes and monitored by District operations				
R	1	3	3.00	spare parts/service support readily available?	Yes and monitored by District operations				
INFORMATION	N/A	N/A	N/A	other known problems?	No other known problems with the SCADA				
PM	2	4	8.00	estimated service life remaining?	11 years remaining according to AWU Useful Life				
				Additional Data					
				Legend					
				PM	Physical Mortality				
				Fn	Functionality				
				R	Reliability				
				FE	Financial Efficiency				
				C	Capacity				

				South Tahoe PUD	**Location Description:**	Access road from end of Panther Ln	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	GMTK2	**Date:**	3/15/2012
					Tank Facility Name:	Gardner Mountain Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Gardner Mountain and Stateline Zone depending on valving	**Adjacent Pressure Zones:**	Stateline Zone depending on valving

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	Access road from corner of H St. and Tata Lane, 1389 Tata Ln	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	HSTTK	**Date:**	3/8/2012	
					Tank Facility Name:	H. St. Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray	
					Pressure Zones Served:	H. St. Zone	**Adjacent Pressure Zones:**	Stateline Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.73	N/A	N/A	
				Weighted Final Score (1-25)	5.00	N/A	7.73	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.00	N/A	6.18	N/A	N/A	**7.18**
				Criticality Score					20%	**1.44**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	8.00	8.60	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	8.60	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	2.58	N/A	**8.18**
				Criticality Score					40%	**3.27**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.33	1.00	1.00	3.14	N/A	
				Weighted Final Score (1-25)	10.33	5.00	3.75	9.57	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	1.03	1.50	1.88	0.96	N/A	**5.37**
				Criticality Score					15%	**0.80**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	4.50	N/A	3.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	0.45	N/A	2.10	N/A	N/A	**2.55**
				Criticality Score					15%	**0.38**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.25	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	6.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.80	N/A	**5.00**
				Criticality Score					10%	**0.50**
									Overall Total Factored Score (Out of 25) =	**6.40**

				South Tahoe PUD	**Location Description:**	Access road from corner of H St. and Tata Lane, 1389 Tata Ln	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	HSTTK	**Date:**	3/8/2012
					Tank Facility Name:	H. St. Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	H. St. Zone	**Adjacent Pressure Zones:**	Stateline Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	No mixing system or separated inlet outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	1	3	3.00	tank draining removes residual sediments?	Yes
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	No as there is inadequate site security and numerous problems with unauthorized access to the site
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Interior coating was replaced in 2011
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	Yes but is limited during periods of heavy snow
R	1	3	3.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone X on the FEMA flood map.
R	4	5	20.00	is site vulnerable to wildfires?	Yes near forested area at edge of residential neighborhood
R	1	5	5.00	any unstable site conditions (if yes, describe)?	None
R	4	3	12.00	is site close to known active seismic faults?	1,177 ft. to the nearest fault line
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	Yes
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No the site has a history of unauthorized access
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	106,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	1	5	5.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1980
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	The coatings on the tank have been rehabbed on the interior in 2011 and will be repainted on the exterior in 2012
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	Yes and complies with standard at time of construction
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Met the requirements of its construction date
PM	4	5	20.00	condition of exterior coatings adequate to protect structure?	Not currently but planned to be recoated in the summer of 2012
Fn	1	4	4.00	adequate openings for ingress/egress?	two manways and one roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2010
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	A passive cathodic protection system has been planned and is waiting for the one year inspection on the interior coatings before anodes are installed
R	5	1	5.00	space available to add solar panels?	Not at this tank
R	4	2	8.00	known fire or haz-mat conditions that could be mitigated?	Fire hazard and fall hazard from trees in close proximity to the tank
R	3	3	9.00	tank foundation type?	Concrete ring with no anchor bolts
R	1	4	4.00	tank foundation condition?	No spalling of concrete and in good condition
R	4	5	20.00	has seismic stability been evaluated by a qualified engineer?	no
R	4	4	16.00	concern with tank compliance with seismic requirements?	yes
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	2	4	8.00	estimated service life remaining?	18 years according to AWU Useful Life

				South Tahoe PUD	**Location Description:**	Access road from corner of H St. and Tata Lane, 1389 Tata Ln	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	HSTTK	**Date:**	3/8/2012
					Tank Facility Name:	H. St. Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	H. St. Zone	**Adjacent Pressure Zones:**	Stateline Zone

				Piping & Valves	
PM	1	5	5.00	coatings adequate to protect piping and valves?	Pining inside the tank was recoated in 2011
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes
Fn	1	3	3.00	tank-piping connections designed to accommodate settlement or movement?	Yes
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes
INFORMATION	N/A	N/A	N/A	other known problems?	None
PM	1	4	4.00	estimated service life remaining?	28 years according to AWU Useful Life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Transmitter calibration is only done when a problem is identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site
R	2	3	6.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer
INFORMATION	N/A	N/A	N/A	other known problems?	No other known electrical problems at this site
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.
				Additional Data	
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Access road from corner of H St. and Tata Lane, 1389 Tata Ln	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	HSTTK	**Date:**	3/8/2012
					Tank Facility Name:	H. St. Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	H. St. Zone	**Adjacent Pressure Zones:**	Stateline Zone

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	Access Road through Heavenly Ski Resort's CA Base Lodge	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	HVTK	**Date:**	3/15/2012	
					Tank Facility Name:	Heavenly Valley Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Heavenly Valley Zone	**Adjacent Pressure Zones:**	Stateline Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	N/A	1.36	N/A	N/A	
				Weighted Final Score (1-25)	25.00	N/A	5.91	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	5.00	N/A	4.73	N/A	N/A	**9.73**
				Criticality Score					20%	**1.95**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	2.40	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	9.20	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	2.76	N/A	**8.36**
				Criticality Score					40%	**3.34**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.67	1.00	1.00	3.71	N/A	
				Weighted Final Score (1-25)	7.33	5.00	3.75	11.71	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	0.73	1.50	1.88	1.17	N/A	**5.28**
				Criticality Score					15%	**0.79**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	N/A	4.50	N/A	N/A	
				Weighted Final Score (1-25)	22.50	N/A	16.00	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	2.25	N/A	9.60	N/A	N/A	**11.85**
				Criticality Score					15%	**1.78**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.25	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	6.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.80	N/A	**5.00**
				Criticality Score					10%	**0.50**
									Overall Total Factored Score (Out of 25) =	**8.36**

				South Tahoe PUD	**Location Description:**	Access Road through Heavenly Ski Resort's CA Base Lodge	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	HVTK	**Date:**	3/15/2012
					Tank Facility Name:	Heavenly Valley Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Heavenly Valley Zone	**Adjacent Pressure Zones:**	Stateline Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	1	5	5.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Separated inlet and outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	1	3	3.00	tank draining removes residual sediments?	Yes
Fn	1	1	1.00	staff gage provided to manually check level?	There is a staff gauge on this tank but it has been removed from operation and a DP cell is now connected to the tank
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	There is no fencing or other security on the site and there is minimal graffiti around the tank. It is adjacent to a Heavenly Ski Resort Run
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes
PM	5	5	25.00	condition of interior coatings adequate to protect structure?	The interior of this tank needs to be recoated
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	Yes but is limited during periods of heavy snow
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	4	5	20.00	is site vulnerable to wildfires?	Yes it is on wooded lots and adjacent to a large open space Within a forested area.
R	1	5	5.00	any unstable site conditions (if yes, describe)?	None
R	4	3	12.00	is site close to known active seismic faults?	3,907 ft. to nearest fault line
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	There are no drainage issues at this tank
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	There is no fence around this tank and it is easily accessible by skiers
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel tank
INFORMATION	N/A	N/A	N/A	what is tank volume?	1,050,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	1	5	5.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1984
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	None
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	Yes and complies with standard at time of construction
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	It was designed for the snow loads of the day
PM	3	5	15.00	condition of exterior coatings adequate to protect structure?	The coatings have graffiti on them and there are minor locations of rust where coatings have already worn off
Fn	1	4	4.00	adequate openings for ingress/egress?	Yes there were two manways and a roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2006
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Impressed current cathodic protection
R	5	1	5.00	space available to add solar panels?	No
R	4	2	8.00	known fire or haz-mat conditions that could be mitigated?	None other than wildfire hazard
R	4	3	12.00	tank foundation type?	Concrete ring foundation with no anchor bolts
R	4	4	16.00	tank foundation condition?	Foundation is good but the grout between the metal tank ring and the concrete ring has started pulling away and is missing in some locations
R	4	5	20.00	has seismic stability been evaluated by a qualified engineer?	No
R	4	4	16.00	concern with tank compliance with seismic requirements?	Yes
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	1	4	4.00	estimated service life remaining?	22 years according to AWU Useful Life

				South Tahoe PUD	**Location Description:**	Access Road through Heavenly Ski Resort's CA Base Lodge	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	HVTK	**Date:**	3/15/2012	
					Tank Facility Name:	Heavenly Valley Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Heavenly Valley Zone	**Adjacent Pressure Zones:**	Stateline Zone	
				Piping & Valves					
PM	5	5	25.00	coatings adequate to protect piping and valves?	Coatings on the interior piping needs to be replaced				
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes				
Fn	4	3	12.00	tank-piping connections designed to accommodate settlement or movement?	No				
Fn	5	4	20.00	valves are suitable for efficient and reliable service?	None				
INFORMATION	N/A	N/A	N/A	other known problems?	None				
PM	5	4	20.00	estimated service life remaining?	32 years according to AWU Useful Life				
				SCADA system					
R	5	2	10.00	frequency of level transmitter calibration?	Transmitter calibration is only done when a problem is identified				
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations				
Fn	1	4	4.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis				
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio				
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year				
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site				
R	2	3	6.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer				
INFORMATION	N/A	N/A	N/A	other known problems?	No other known electrical problems at this site				
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.				
				Additional Data	There is a pipe that pulls water for Heavenly snowmaking at this tank. Heavenly is allowed to take water starting at 22' and above.				
				Legend					
				PM	Physical Mortality				
				Fn	Functionality				
				R	Reliability				
				FE	Financial Efficiency				
				C	Capacity				

				South Tahoe PUD	**Location Description:**	Access Road through Heavenly Ski Resort's CA Base Lodge	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	HVTK	**Date:**	3/15/2012
					Tank Facility Name:	Heavenly Valley Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Heavenly Valley Zone	**Adjacent Pressure Zones:**	Stateline Zone

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	Access Road from Iroquois Circle	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	ITK1	**Date:**	3/13/2012	
					Tank Facility Name:	Iroquois Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Country Club and Arrowhead Zones	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	2.09	N/A	N/A	
				Weighted Final Score (1-25)	5.00	N/A	8.82	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.00	N/A	7.05	N/A	N/A	**8.05**
				Criticality Score					20%	**1.61**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	2.60	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	10.20	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	3.06	N/A	**8.66**
				Criticality Score					40%	**3.46**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	5.00	2.00	4.29	N/A	
				Weighted Final Score (1-25)	8.00	25.00	7.75	13.71	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	0.80	7.50	3.88	1.37	N/A	**13.55**
				Criticality Score					15%	**2.03**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.50	N/A	2.50	N/A	N/A	
				Weighted Final Score (1-25)	10.50	N/A	8.00	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	1.05	N/A	4.80	N/A	N/A	**5.85**
				Criticality Score					15%	**0.88**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.25	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	6.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.80	N/A	**5.00**
				Criticality Score					10%	**0.50**
									Overall Total Factored Score (Out of 25) =	**8.48**

				South Tahoe PUD	**Location Description:**	Access Road from Iroquois Circle	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	ITK1	**Date:**	3/13/2012
					Tank Facility Name:	Iroquois Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Country Club and Arrowhead Zones

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score		CONDITION ASSESSMENT CHECKLIST
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	No mixing system same inlet and outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	3	3	9.00	tank draining removes residual sediments?	No
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	No. Vandalism has occurred at this site already. There is a history of unauthorized access, there is no fencing. There are numerous trail head in this location.
Fn	3	3	9.00	adequate lighting & access to interior for inspections, cleaning and repair?	No
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Tank not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes the tank was constructed to prevent external water from entering the tank
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Yes
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	No this site is accessible only by foot in the winter time
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	5	5	25.00	is site vulnerable to wildfires?	The site is adjacent to open wooded areas
R	1	5	5.00	any unstable site conditions (if yes, describe)?	None
R	4	3	12.00	is site close to known active seismic faults?	10900 ft. to nearest fault line
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	There are no drainage issues at this tank site
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	There is a history of unauthorized access at this tank site and no fencing. There are numerous trail heads in this location
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	230,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	5	5	25.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1959
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	Interior coated in 2011
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	5	4	20.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	No freeboard in this tank
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes
PM	1	5	5.00	condition of exterior coatings adequate to protect structure?	Exterior coatings are in good condition with no visible defects
Fn	1	4	4.00	adequate openings for ingress/egress?	Yes two manways and a roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2011
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Impressed current cathodic protection
R	5	1	5.00	space available to add solar panels?	No
R	5	2	10.00	known fire or haz-mat conditions that could be mitigated?	Potential for wild fire based on proximity to forest
R	5	3	15.00	tank foundation type?	metal ring not anchored
R	5	4	20.00	tank foundation condition?	Poor condition
R	5	5	25.00	has seismic stability been evaluated by a qualified engineer?	Not since construction
R	4	4	16.00	concern with tank compliance with seismic requirements?	Yes
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	4	4	16.00	estimated service life remaining?	Exceeds AWU Useful life

				South Tahoe PUD	**Location Description:**	Access Road from Iroquois Circle	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	ITK1	**Date:**	3/13/2012
					Tank Facility Name:	Iroquois Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Country Club and Arrowhead Zones

				Piping & Valves	
PM	1	5	5.00	coatings adequate to protect piping and valves?	Interior coated in 2011
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes
Fn	4	3	12.00	tank-piping connections designed to accommodate settlement or movement?	Unknown
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes
INFORMATION	N/A	N/A	N/A	other known problems?	None
PM	4	4	16.00	estimated service life remaining?	7 years based on AWU Useful Life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Transmitter calibration is only done when a problem is identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site
R	2	3	6.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer
INFORMATION	N/A	N/A	N/A	other known problems?	No other known electrical problems at this site
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.
				Additional Data	
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Access Road from Iroquois Circle	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	ITK1	**Date:**	3/13/2012
					Tank Facility Name:	Iroquois Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Country Club and Arrowhead Zones

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	Access Road from Iroquois Circle	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	ITK2	**Date:**		
					Tank Facility Name:	Iroquois Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee	
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Country Club and Arrowhead Zones	

				Notes:	**Failure Mode Scoring (1 - 5)**						
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**		
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**			
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology		
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high		
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average		
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low		
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced		
				California Waterworks Standards							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	2.09	N/A	N/A		
				Weighted Final Score (1-25)	5.00	N/A	8.82	N/A	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A		
				Factored Score	1.00	N/A	7.05	N/A	N/A		**8.05**
				Criticality Score					20%		**1.61**
				Tank Site							
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	2.60	N/A		
				Weighted Final Score (1-25)	N/A	N/A	8.00	10.20	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A		
				Factored Score	N/A	N/A	5.60	3.06	N/A		**8.66**
				Criticality Score					40%		**3.46**
				Tank Structure							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	5.00	2.00	2.14	N/A		
				Weighted Final Score (1-25)	4.00	25.00	7.75	5.14	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A		
				Factored Score	0.40	7.50	3.88	0.51	N/A		**12.29**
				Criticality Score					15%		**1.84**
				Piping & Valves							
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	2.50	N/A	N/A		
				Weighted Final Score (1-25)	4.50	N/A	8.00	N/A	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A		
				Factored Score	0.45	N/A	4.80	N/A	N/A		**5.25**
				Criticality Score					15%		**0.79**
				SCADA System							
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A		**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.25	N/A		
				Weighted Final Score (1-25)	8.00	N/A	4.00	6.00	N/A		
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A		
				Factored Score	0.80	N/A	2.40	1.80	N/A		**5.00**
				Criticality Score					10%		**0.50**
									Overall Total Factored Score (Out of 25) =		**8.21**

				South Tahoe PUD	**Location Description:**	Access Road from Iroquois Circle	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	ITK2	**Date:**	
					Tank Facility Name:	Iroquois Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Country Club and Arrowhead Zones

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	No mixing system same inlet and outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	3	3	9.00	tank draining removes residual sediments?	No
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	No vandalism has occurred at this site already. There is history of unauthorized access at this tank site and no fencing. There are numerous trail heads in this location.
Fn	3	3	9.00	adequate lighting & access to interior for inspections, cleaning and repair?	No
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Tank not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes the tank was constructed to prevent external water from entering the tank
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Yes
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	No this site is accessible only by foot in the winter time
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	5	5	25.00	is site vulnerable to wildfires?	The site is adjacent to open wooded areas
R	1	5	5.00	any unstable site conditions (if yes, describe)?	None
R	4	3	12.00	is site close to known active seismic faults?	10900 ft. to nearest fault line
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	There are no drainage issues at this tank site
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	There is a history of unauthorized access at this tank site and no fencing. There are numerous trail heads in this location
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	300,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	5	5	25.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	2001
	N/A		N/A	date and describe work done to renew or upgrade tank and tank facilities?	None since construction
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	5	4	20.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	No
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes
PM	1	5	5.00	condition of exterior coatings adequate to protect structure?	Exterior coatings are in good condition with no visible defects
Fn	1	4	4.00	adequate openings for ingress/egress?	Yes two manways and a roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2011
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Impressed current cathodic protection
R	5	1	5.00	space available to add solar panels?	No
R	5	2	10.00	known fire or haz-mat conditions that could be mitigated?	Potential for wild fire based on proximity to forest
R	1	3	3.00	tank foundation type?	concrete ring with anchor bolts
R	1	4	4.00	tank foundation condition?	Excellent condition with no cracking or spalling
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	Not since construction
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	1	4	4.00	other known problems (e.g. adequate freeboard, stagnant water)?	None
PM	1	4	4.00	estimated service life remaining?	39 years based on AWU Useful Life

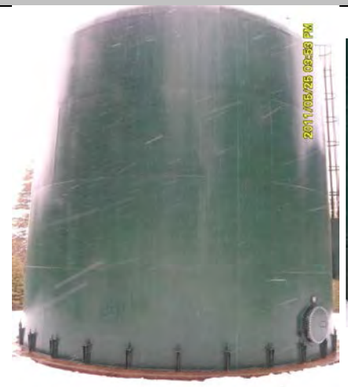
				South Tahoe PUD	**Location Description:**	Access Road from Iroquois Circle	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	ITK2	**Date:**	
					Tank Facility Name:	Iroquois Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Country Club and Arrowhead Zones

				Piping & Valves	
PM	1	5	5.00	coatings adequate to protect piping and valves?	Coatings are adequate
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes
Fn	4	3	12.00	tank-piping connections designed to accommodate settlement or movement?	Unknown
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes
INFORMATION	N/A	N/A	N/A	other known problems?	None
PM	1	4	4.00	estimated service life remaining?	49 years based on AWU Useful Life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Transmitter calibration is only done when a problem is identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site
R	2	3	6.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer
INFORMATION	N/A	N/A	N/A	other known problems?	No other known electrical problems at this site
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.
				Additional Data	
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Access Road from Iroquois Circle	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	ITK2	**Date:**	
					Tank Facility Name:	Iroquois Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee
					Pressure Zones Served:	Iroquois Zone	**Adjacent Pressure Zones:**	Country Club and Arrowhead Zones

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS



				South Tahoe PUD	**Location Description:**	Access Road from Sherman Way, 1696 Sherman Way	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	KTK1	**Date:**	3/14/2012	
					Tank Facility Name:	Keller Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Keller Zone	**Adjacent Pressure Zones:**	Middle Keller and Upper Saddle zones	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.73	N/A	N/A	
				Weighted Final Score (1-25)	5.00	N/A	7.00	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.00	N/A	5.60	N/A	N/A	**6.60**
				Criticality Score					20%	**1.32**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	3.40	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	14.20	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	4.26	N/A	**9.86**
				Criticality Score					40%	**3.94**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.67	5.00	2.25	4.29	N/A	
				Weighted Final Score (1-25)	11.33	25.00	8.75	14.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	1.13	7.50	4.38	1.40	N/A	**14.41**
				Criticality Score					15%	**2.16**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.50	N/A	2.00	N/A	N/A	
				Weighted Final Score (1-25)	16.50	N/A	6.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	1.65	N/A	3.90	N/A	N/A	**5.55**
				Criticality Score					15%	**0.83**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.25	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	6.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.80	N/A	**5.00**
				Criticality Score					10%	**0.50**
									Overall Total Factored Score (Out of 25) =	**8.76**

				South Tahoe PUD	**Location Description:**	Access Road from Sherman Way, 1696 Sherman Way	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	KTK1	**Date:**	3/14/2012
					Tank Facility Name:	Keller Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Keller Zone	**Adjacent Pressure Zones:**	Middle Keller and Upper Saddle zones

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	1	5	5.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Separate inlet and outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	3	3	9.00	tank draining removes residual sediments?	No
Fn	1	1	1.00	staff gage provided to manually check level?	There is a staff gage at this location but it has been disconnected and no a DP cell is used
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	No vandalism has occurred at this site already and there is no fencing
Fn	3	3	9.00	adequate lighting & access to interior for inspections, cleaning and repair?	No
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Tank not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes the tank was constructed to prevent external water from entering the tank
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Yes
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	No the site is inaccessible during the winter time
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	5	5	25.00	is site vulnerable to wildfires?	Yes open wooded space adjacent to tank
R	5	5	25.00	any unstable site conditions (if yes, describe)?	There is a large boulder that is perched above the tank that has been strapped back with cables to prevent the boulder from rolling down hill into the tanks. Also the tanks sit above a private residence and if the tanks fail they will flood the home. There are
R	4	3	12.00	is site close to known active seismic faults?	4,595 ft. to the nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	There are no site drainage issues
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	There are issues with unauthorized access to these tanks
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	208,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	5	5	25.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1963
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	None
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	3	4	12.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	0.75 ft. and it is adequate
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Met the loadings at the time of installation and it does not create a safety issue
PM	3	5	15.00	condition of exterior coatings adequate to protect structure?	The coatings are worn off in locations
Fn	1	4	4.00	adequate openings for ingress/egress?	There are two manways and one roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	unknown
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Active cathodic protection
R	5	1	5.00	space available to add solar panels?	No
R	4	2	8.00	known fire or haz-mat conditions that could be mitigated?	None other than proximity to forested land
R	5	3	15.00	tank foundation type?	Metal Ring
R	5	4	20.00	tank foundation condition?	The tank foundation is undermined in locations and in poor condition
R	5	5	25.00	has seismic stability been evaluated by a qualified engineer?	No
R	5	4	20.00	concern with tank compliance with seismic requirements?	Yes
Fn	4	4	16.00	other known problems (e.g. adequate freeboard, stagnant water)?	Stagnant water can be a minor issue at this tank
PM	4	4	16.00	estimated service life remaining?	1 year according to AWU Useful Life

				South Tahoe PUD	**Location Description:**	Access Road from Sherman Way, 1696 Sherman Way	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	KTK1	**Date:**	3/14/2012
					Tank Facility Name:	Keller Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Keller Zone	**Adjacent Pressure Zones:**	Middle Keller and Upper Saddle zones

				Piping & Valves	
PM	5	5	25.00	coatings adequate to protect piping and valves?	Piping coatings need to be replaced
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes
Fn	3	3	9.00	tank-piping connections designed to accommodate settlement or movement?	Unknown
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes there are no problems with the valving at this location
INFORMATION	N/A	N/A	N/A	other known problems?	None
PM	2	4	8.00	estimated service life remaining?	11 years according to AWU Useful Life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Transmitter calibration is only done when a problem is identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site
R	2	3	6.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer
INFORMATION	N/A	N/A	N/A	other known problems?	No other known electrical problems at this site
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.
				Additional Data	
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Access Road from Sherman Way, 1696 Sherman Way	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	KTK1	**Date:**	3/14/2012
					Tank Facility Name:	Keller Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Keller Zone	**Adjacent Pressure Zones:**	Middle Keller and Upper Saddle zones

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	Access Road from Sherman Way, 1696 Sherman Way	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	KTK2	**Date:**	3/13/2012	
					Tank Facility Name:	Keller Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale	
					Pressure Zones Served:	Keller Zone	**Adjacent Pressure Zones:**	Middle Keller and Upper Saddle zones	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.73	N/A	N/A	
				Weighted Final Score (1-25)	5.00	N/A	7.00	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.00	N/A	5.60	N/A	N/A	**6.60**
				Criticality Score					20%	**1.32**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	3.40	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	14.20	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	4.26	N/A	**9.86**
				Criticality Score					40%	**3.94**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.67	5.00	2.50	4.29	N/A	
				Weighted Final Score (1-25)	11.33	25.00	9.75	14.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	1.13	7.50	4.88	1.40	N/A	**14.91**
				Criticality Score					15%	**2.24**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.50	N/A	2.00	N/A	N/A	
				Weighted Final Score (1-25)	16.50	N/A	6.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	1.65	N/A	3.90	N/A	N/A	**5.55**
				Criticality Score					15%	**0.83**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	N/A	1.00	2.25	N/A	
				Weighted Final Score (1-25)	20.00	N/A	4.00	6.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	2.00	N/A	2.40	1.80	N/A	**6.20**
				Criticality Score					10%	**0.62**
									Overall Total Factored Score (Out of 25) =	**8.95**

				South Tahoe PUD	**Location Description:**	Access Road from Sherman Way, 1696 Sherman Way	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	KTK2	**Date:**	3/13/2012
					Tank Facility Name:	Keller Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Keller Zone	**Adjacent Pressure Zones:**	Middle Keller and Upper Saddle zones

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	1	5	5.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	Separate inlet and outlet
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	3	3	9.00	tank draining removes residual sediments?	No
Fn	1	1	1.00	staff gage provided to manually check level?	There is a staff gage at this location but it has been disconnected and no a DP cell is used
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	No, vandalism has occurred at this site already and there is no fencing
Fn	3	3	9.00	adequate lighting & access to interior for inspections, cleaning and repair?	No
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Tank not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes the tank was constructed to prevent external water from entering the tank
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Yes
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	No the site is inaccessible during the winter time
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	5	5	25.00	is site vulnerable to wildfires?	Yes open wooded space adjacent to tank
R	5	5	25.00	any unstable site conditions (if yes, describe)?	There is a large boulder that is perched above the tank that has been strapped back with cables to prevent the boulder from rolling down hill into the tanks. Also the tanks sit above a private residence and if the tanks fail they will flood the home. There are
R	4	3	12.00	is site close to known active seismic faults?	4,595 ft. to the nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	There are no site drainage issues
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	There are issues with unauthorized access to these tanks
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	123,000
INFORMATION	N/A	5	N/A	what is operational storage requirement?	
INFORMATION	N/A	5	N/A	what is fire storage requirement?	
INFORMATION	N/A	5	N/A	what is emergency storage available?	
C	5	5	25.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1963
	N/A		N/A	date and describe work done to renew or upgrade tank and tank facilities?	None
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	4	4	16.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	0.75 ft. and it is not adequate, does not comply with standard at time of construction
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Met the loadings at the time of installation and it does not create a safety issue
PM	3	5	15.00	condition of exterior coatings adequate to protect structure?	The coatings are worn off in locations
Fn	1	4	4.00	adequate openings for ingress/egress?	There are two manways and one roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	unknown
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Active cathodic protection
R	5	1	5.00	space available to add solar panels?	No
R	4	2	8.00	known fire or haz-mat conditions that could be mitigated?	None other than proximity to forested land
R	5	3	15.00	tank foundation type?	Metal Ring
R	5	4	20.00	tank foundation condition?	The tank foundation is undermined in locations and in poor condition
R	5	5	25.00	has seismic stability been evaluated by a qualified engineer?	No
R	5	4	20.00	concern with tank compliance with seismic requirements?	Yes
Fn	4	4	16.00	other known problems (e.g. adequate freeboard, stagnant water)?	Stagnant water can be a minor issue at this tank
PM	4	4	16.00	estimated service life remaining?	1 year according to AWU Useful Life

				South Tahoe PUD	**Location Description:**	Access Road from Sherman Way, 1696 Sherman Way	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	KTK2	**Date:**	3/13/2012
					Tank Facility Name:	Keller Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Keller Zone	**Adjacent Pressure Zones:**	Middle Keller and Upper Saddle zones

				Piping & Valves	
PM	5	5	25.00	coatings adequate to protect piping and valves?	Piping coatings need to be replaced
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes
Fn	3	3	9.00	tank-piping connections designed to accommodate settlement or movement?	Unknown
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes there are no problems with the valving at this location
INFORMATION	N/A	N/A	N/A	other known problems?	None
PM	2	4	8.00	estimated service life remaining?	11 years according to AWU Useful Life
				SCADA system	No SCADA on Keller #2
R	5	2	10.00	frequency of level transmitter calibration?	NA
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	NA
Fn	1	4	4.00	alarm log maintained and reviewed annually?	NA
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	NA
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	NA
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	NA
R	2	3	6.00	spare parts/service support readily available?	NA
INFORMATION	N/A	N/A	N/A	other known problems?	NA
PM	5	4	20.00	estimated service life remaining?	NA
				Additional Data	

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Access Road from Sherman Way, 1696 Sherman Way	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	KTK2	**Date:**	3/13/2012
					Tank Facility Name:	Keller Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Jeremy Rutherdale
					Pressure Zones Served:	Keller Zone	**Adjacent Pressure Zones:**	Middle Keller and Upper Saddle zones

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

				South Tahoe PUD	**Location Description:**	Access road off of Park Ave through Van Sickle Bi-State Park	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	STLTK1	**Date:**	3/7/2012	
					Tank Facility Name:	Stateline Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks and Gardner Mountain Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	2.18	N/A	N/A	
				Weighted Final Score (1-25)	5.00	N/A	9.09	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.00	N/A	7.27	N/A	N/A	**8.27**
				Criticality Score					20%	**1.65**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	2.60	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	10.20	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	3.06	N/A	**8.66**
				Criticality Score					40%	**3.46**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.75	2.14	N/A	
				Weighted Final Score (1-25)	4.00	5.00	6.75	5.14	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	0.40	1.50	3.38	0.51	N/A	**5.79**
				Criticality Score					15%	**0.87**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	4.50	N/A	3.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	0.45	N/A	2.10	N/A	N/A	**2.55**
				Criticality Score					15%	**0.38**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.25	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	6.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.80	N/A	**5.00**
				Criticality Score					10%	**0.50**
									Overall Total Factored Score (Out of 25) =	**6.87**

				South Tahoe PUD	**Location Description:**	Access road off of Park Ave through Van Sickle Bi-State Park	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	STLTK1	**Date:**	3/7/2012
					Tank Facility Name:	Stateline Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks and Gardner Mountain Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score		CONDITION ASSESSMENT CHECKLIST
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	No mixing system and dead zones have been identified
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	3	3	9.00	tank draining removes residual sediments?	No
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	No, vandalism has occurred at this site already
Fn	4	3	12.00	adequate lighting & access to interior for inspections, cleaning and repair?	No
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Tank not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes the tank was constructed to prevent external water from entering the tank
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Yes
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	Yes if the road is plowed
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	5	5	25.00	is site vulnerable to wildfires?	Site is vulnerable to wildfires
R	1	5	5.00	any unstable site conditions (if yes, describe)?	No
R	4	3	12.00	is site close to known active seismic faults?	4,563 ft. to the nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	Yes
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No site security
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	2.25 MG
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	1	5	5.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1994
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	None since construction
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	3 ft. of freeboard which is adequate
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes
PM	1	5	5.00	condition of exterior coatings adequate to protect structure?	Exterior coatings are in good condition with no visible defects
Fn	1	4	4.00	adequate openings for ingress/egress?	Yes two manways and a roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2011
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Impressed current cathodic protection
R	5	1	5.00	space available to add solar panels?	No
R	5	2	10.00	known fire or haz-mat conditions that could be mitigated?	Potential for wild fire based on proximity to forest
R	1	3	3.00	tank foundation type?	Concrete ring with anchor bolts
R	1	4	4.00	tank foundation condition?	Excellent condition with no cracking or spalling
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	Not since construction
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	4	4	16.00	other known problems (e.g. adequate freeboard, stagnant water)?	Stagnant Water issues when tied to Gardner Mountain Zone. The tanks "flat line" a lot. Crews turn off the wells occasionally to allow for turnover.
PM	1	4	4.00	estimated service life remaining?	32 years according to AWU Useful Life

				South Tahoe PUD	**Location Description:**	Access road off of Park Ave through Van Sickle Bi-State Park	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	STLTK1	**Date:**	3/7/2012
					Tank Facility Name:	Stateline Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks and Gardner Mountain Zone

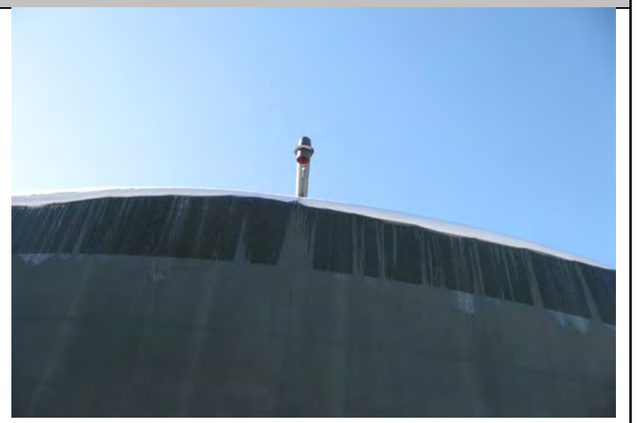
				Piping & Valves	
PM	1	5	5.00	coatings adequate to protect piping and valves?	Yes
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes
Fn	1	3	3.00	tank-piping connections designed to accommodate settlement or movement?	Yes
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes
INFORMATION	N/A	N/A	N/A	other known problems?	Building in between tank with valving inside a vault. Altitude valve at the tanks and it is not currently being used
PM	1	4	4.00	estimated service life remaining?	42 years according to AWU Useful Life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Transmitter calibration is only done when a problem is identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site
R	2	3	6.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer
INFORMATION	N/A	N/A	N/A	other known problems?	No other known electrical problems at this site
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.
				Additional Data	Valve House photos are in Stateline Tank #2

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Access road off of Park Ave through Van Sickle Bi-State Park	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	STLTK1	**Date:**	3/7/2012
					Tank Facility Name:	Stateline Tank #1	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Twin Peaks and Gardner Mountain Zone

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS



				South Tahoe PUD	**Location Description:**	Access road off of Park Ave through Van Sickle Bi-State Park	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	STLTK2	**Date:**	3/7/2012	
					Tank Facility Name:	Stateline Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Gardner Mountain and Twin Peaks Zones	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	2.18	N/A	N/A	
				Weighted Final Score (1-25)	5.00	N/A	9.09	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	1.00	N/A	7.27	N/A	N/A	**8.27**
				Criticality Score					20%	**1.65**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	2.00	2.60	N/A	
				Weighted Final Score (1-25)	N/A	N/A	8.00	10.20	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	5.60	3.06	N/A	**8.66**
				Criticality Score					40%	**3.46**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	1.00	1.75	2.14	N/A	
				Weighted Final Score (1-25)	4.00	5.00	6.75	5.14	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	0.40	1.50	3.38	0.51	N/A	**5.79**
				Criticality Score					15%	**0.87**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.00	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	4.50	N/A	3.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	0.45	N/A	2.10	N/A	N/A	**2.55**
				Criticality Score					15%	**0.38**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.25	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	6.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.80	N/A	**5.00**
				Criticality Score					10%	**0.50**
									Overall Total Factored Score (Out of 25) =	**6.87**

				South Tahoe PUD	**Location Description:**	Access road off of Park Ave through Van Sickle Bi-State Park	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	STLTK2	**Date:**	3/7/2012
					Tank Facility Name:	Stateline Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Gardner Mountain and Twin Peaks Zones

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score		CONDITION ASSESSMENT CHECKLIST
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	No mixing system and dead zones have been identified
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	3	3	9.00	tank draining removes residual sediments?	No
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	No, vandalism has occurred at this site already
Fn	4	3	12.00	adequate lighting & access to interior for inspections, cleaning and repair?	No
Fn	1	5	5.00	adequate isolation valves and bypass to take tank offline and maintain water service?	Yes
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Tank not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes the tank was constructed to prevent external water from entering the tank
PM	1	5	5.00	condition of interior coatings adequate to protect structure?	Yes
				Tank Site	
Fn	4	4	16.00	adequate vehicle access for year-round maintenance?	Yes if the road is plowed
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	5	5	25.00	is site vulnerable to wildfires?	Site is vulnerable to wildfires
R	1	5	5.00	any unstable site conditions (if yes, describe)?	No
R	4	3	12.00	is site close to known active seismic faults?	4,563 ft. to the nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	Yes
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No site security
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	1.25 MG
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	1	5	5.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1994
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	None
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	3 ft. of freeboard which is adequate
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes
PM	1	5	5.00	condition of exterior coatings adequate to protect structure?	Exterior coatings are in good condition with no visible defects
Fn	1	4	4.00	adequate openings for ingress/egress?	Yes two manways and a roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2011
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Impressed current cathodic protection
R	5	1	5.00	space available to add solar panels?	No
R	5	2	10.00	known fire or haz-mat conditions that could be mitigated?	Potential for wild fire based on proximity to forest
R	1	3	3.00	tank foundation type?	Concrete ring with anchor bolts
R	1	4	4.00	tank foundation condition?	Excellent condition with no cracking or spalling
R	1	5	5.00	has seismic stability been evaluated by a qualified engineer?	Not since construction
R	1	4	4.00	concern with tank compliance with seismic requirements?	No
Fn	4	4	16.00	other known problems (e.g. adequate freeboard, stagnant water)?	Stagnant Water issues when tied to Gardner Mountain Zone. The tanks "flat line" a lot. Turning off the wells occasionally to allow for turnover.
PM	1	4	4.00	estimated service life remaining?	32 years based on AWU Useful Life

				South Tahoe PUD	**Location Description:**	Access road off of Park Ave through Van Sickle Bi-State Park	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	STLTK2	**Date:**	3/7/2012
					Tank Facility Name:	Stateline Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Gardner Mountain and Twin Peaks Zones

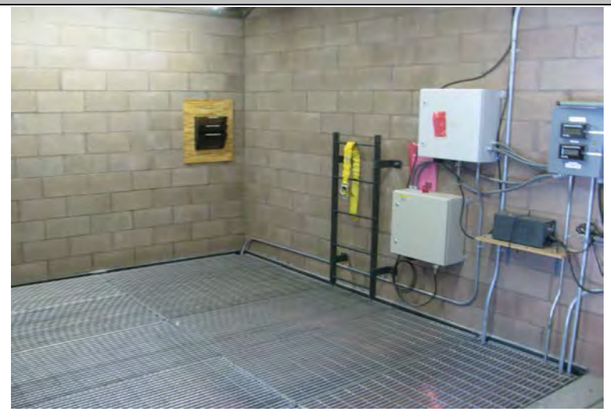
				Piping & Valves	
PM	1	5	5.00	coatings adequate to protect piping and valves?	Yes
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes
Fn	1	3	3.00	tank-piping connections designed to accommodate settlement or movement?	Yes
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes
INFORMATION	N/A	N/A	N/A	other known problems?	Building in between tank with valving inside a vault. Altitude valve at the tanks and it is not currently being used
PM	1	4	4.00	estimated service life remaining?	42 years based on AWU Useful life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Transmitter calibration is only done when a problem is identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site
R	2	3	6.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer
INFORMATION	N/A	N/A	N/A	other known problems?	No other known electrical problems at this site
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.
				Additional Data	

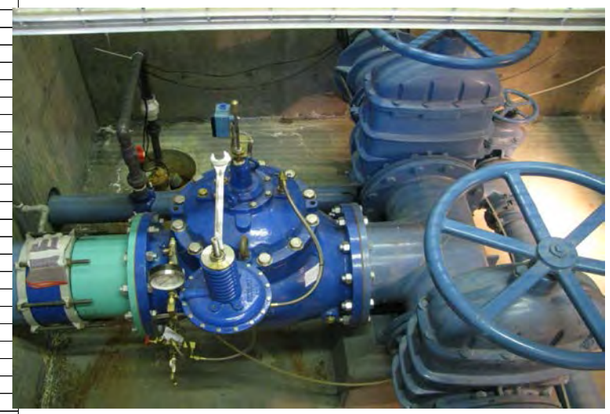
Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Access road off of Park Ave through Van Sickle Bi-State Park	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	STLTK2	**Date:**	3/7/2012
					Tank Facility Name:	Stateline Tank #2	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Stateline Zone	**Adjacent Pressure Zones:**	Gardner Mountain and Twin Peaks Zones

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS





				South Tahoe PUD	**Location Description:**	Access Road from Cold Creek Drive	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Tank Facility ID #:**	CCKTK	**Date:**	3/7/2012	
					Tank Facility Name:	Cold Creek Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Montgomery Estates and Upper Montgomery Estates	**Adjacent Pressure Zones:**	Stateline Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: meets or exceeds design requirements	1: exceeds all requirements	1: failure every > 25 years	1: best available technology	
					2: minor defects only	2: greater than 95% of design requirements	2: exceeds some requirements	2: failure every 16 to 25 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: greater than 90% of design requirements	3: meets all requirements	3: failure every 11 to 15 yrs	3: financial efficiency is average	
					4: significant deterioration	4: greater than 85% of design requirements	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: less than 85% of design requirements	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	5.00	N/A	2.09	N/A	N/A	
				Weighted Final Score (1-25)	25.00	N/A	9.18	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	20%	N/A	80%	N/A	N/A	
				Factored Score	5.00	N/A	7.35	N/A	N/A	**12.35**
				Criticality Score					20%	**2.47**
				Tank Site						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	0.50	2.40	N/A	
				Weighted Final Score (1-25)	N/A	N/A	2.00	9.60	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	N/A	N/A	70%	30%	N/A	
				Factored Score	N/A	N/A	1.40	2.88	N/A	**4.28**
				Criticality Score					40%	**1.71**
				Tank Structure						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	1.00	1.75	3.86	N/A	
				Weighted Final Score (1-25)	13.33	5.00	6.75	12.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	50%	10%	N/A	
				Factored Score	1.33	1.50	3.38	1.20	N/A	**7.41**
				Criticality Score					15%	**1.11**
				Piping & Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.00	N/A	3.00	N/A	N/A	
				Weighted Final Score (1-25)	13.50	N/A	9.50	N/A	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	30%	60%	N/A	N/A	
				Factored Score	1.35	N/A	5.70	N/A	N/A	**7.05**
				Criticality Score					15%	**1.06**
				SCADA System						
				Is Failure Mode Score Calculated or Assigned?	Calculated	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.00	N/A	1.00	2.25	N/A	
				Weighted Final Score (1-25)	8.00	N/A	4.00	6.00	N/A	
		CHECK	100%	**Criticality Weighting Factor (0 - 100%)**	10%	N/A	60%	30%	N/A	
				Factored Score	0.80	N/A	2.40	1.80	N/A	**5.00**
				Criticality Score					10%	**0.50**
									Overall Total Factored Score (Out of 25) =	**6.85**

				South Tahoe PUD	**Location Description:**	Access Road from Cold Creek Drive	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	CCKTK	**Date:**	3/7/2012
					Tank Facility Name:	Cold Creek Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Montgomery Estates and Upper Montgomery Estates	**Adjacent Pressure Zones:**	Stateline Zone

Failure Mode Type	Score	Importance Weighting (1-5)	Weighted Score	CONDITION ASSESSMENT CHECKLIST	
				Calif. Waterworks Standards	
Fn	1	5	5.00	tank openings designed to prevent contamination (e.g., rainwater, runoff, insects, birds, rodents, or other animals)?	Yes
Fn	1	3	3.00	sample tap(s) provided to measure water quality into, out of and inside tank and protected from freezing?	Yes
Fn	5	5	25.00	tank designed to minimize dead zones (separate inlet/outlet or mixer)?	No mixer and single main in and out
Fn	1	5	5.00	air-gap provided for tank drain and overflow piping?	Yes
Fn	3	3	9.00	tank draining removes residual sediments?	This tank has not been cleaned. Probably not though
Fn	1	1	1.00	staff gage provided to manually check level?	No CDPH has indicate a dislike for staff gages and the District utilizes a DP Cell attached to SCADA
Fn	1	5	5.00	tank level transmitter provides real-time level feedback to SCADA master?	Yes
Fn	5	5	25.00	adequate security measures and monitoring to prevent unauthorized access?	No, vandalism has occurred at this site already. There is no fencing or lighting at this tank, but there has not been any issuues with unauthorized access.
Fn	1	3	3.00	adequate lighting & access to interior for inspections, cleaning and repair?	Yes
Fn	3	5	15.00	adequate isolation valves and bypass to take tank offline and maintain water service?	This tank can not be bypassed easily but it can be valved off
INFORMATION	N/A	N/A	N/A	tank used for CT compliance? yes - bypass pipes blind flanged?	Tank not used for CT compliance
Fn	1	5	5.00	tank prevent entry of runoff, subsurface flow, or drainage into the tank?	Yes the tank was constructed to prevent external water from entering the tank
PM	5	5	25.00	condition of interior coatings adequate to protect structure?	No planned recoating in 2012
				Tank Site	
Fn	1	4	4.00	adequate vehicle access for year-round maintenance?	Yes
R	2	3	6.00	is site within 100-yr flood plain?	No. This site is indicated as other areas Zone D on the FEMA flood map. Which means flood hazards are undetermined but possible.
R	5	5	25.00	is site vulnerable to wildfires?	Yes at urban wildland interface on edge of residential neighborhood
R	1	5	5.00	any unstable site conditions (if yes, describe)?	None
R	3	3	9.00	is site close to known active seismic faults?	3,872 ft. to nearest fault
R	1	3	3.00	site drainage adequate to prevent flooding of tank foundation, buildings and critical equipment?	No issues with site drainage
Fn			0.00	site lighting, fencing, and security monitoring adequate to discourage unauthorized access/vandalism?	No there is no fencing or lighting at this tank but we have not had any issues with unauthorized access
INFORMATION	N/A	N/A	N/A	other known problems?	None
				Tank Structure	
INFORMATION	N/A	N/A	N/A	describe tank structure type (e.g., welded steel, bolted steel, reinforced concrete, prestressed concrete, etc.)	Welded Steel
INFORMATION	N/A	N/A	N/A	what is tank volume?	500,000
INFORMATION	N/A	N/A	N/A	what is operational storage requirement?	
INFORMATION	N/A	N/A	N/A	what is fire storage requirement?	
INFORMATION	N/A	N/A	N/A	what is emergency storage available?	
C	1	5	5.00	overall tank volume to meet District sizing requirements?	
INFORMATION	N/A	N/A	N/A	date tank was constructed?	1980
INFORMATION	N/A	N/A	N/A	date and describe work done to renew or upgrade tank and tank facilities?	Planned recoating internal and external to occur in 2012
Fn	1	3	3.00	adequate perimeter clearance to facilitate routine O&M?	Yes
Fn	1	4	4.00	tank freeboard dimension from operating high water level to top of tank overflow? adequate?	3 ft. of freeboard which is adequate
R	1	5	5.00	tank designed to withstand snow load and not create safety issue?	Yes
PM	5	5	25.00	condition of exterior coatings adequate to protect structure?	No
Fn	1	4	4.00	adequate openings for ingress/egress?	2 manways and 1 roof hatch
INFORMATION	N/A	N/A	N/A	date of last interior inspection?	2011
PM	1	3	3.00	passive or active cathodic protection in place (yes or no) and is it maintained and adequate?	Hanging passive cathodic protection has been removed new anodes will be installed after one year coating inspection in 2013.
R	5	1	5.00	space available to add solar panels?	No
R	5	2	10.00	known fire or haz-mat conditions that could be mitigated?	Proximity to forest
R	4	3	12.00	tank foundation type?	concrete foundation with no anchoring
R	4	4	16.00	tank foundation condition?	Adequate condition where I could see it
R	4	5	20.00	has seismic stability been evaluated by a qualified engineer?	No
R	4	4	16.00	concern with tank compliance with seismic requirements?	Yes
Fn	4	4	16.00	other known problems (e.g. adequate freeboard, stagnant water)?	There is expected stagnant water concerns
PM	3	4	12.00	estimated service life remaining?	18 years according to AWU Useful life

				South Tahoe PUD	**Location Description:**	Access Road from Cold Creek Drive	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	CCKTK	**Date:**	3/7/2012
					Tank Facility Name:	Cold Creek Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Montgomery Estates and Upper Montgomery Estates	**Adjacent Pressure Zones:**	Stateline Zone

				Piping & Valves	
PM	3	5	15.00	coatings adequate to protect piping and valves?	Coating on piping could no be seen. Internal piping will be recoated in 2012
INFORMATION		3	0.00	pipes adequately sized to prevent excessive noise (e.g. rattling) or headloss (velocity > 10 fps)?	Yes
Fn	5	3	15.00	tank-piping connections designed to accommodate settlement or movement?	No
Fn	1	4	4.00	valves are suitable for efficient and reliable service?	Yes
INFORMATION	N/A	N/A	N/A	other known problems?	None
PM	3	4	12.00	estimated service life remaining?	28 years according to AWU Useful life
				SCADA system	
R	5	2	10.00	frequency of level transmitter calibration?	Transmitter calibration is only done when a problem is identified
Fn	1	4	4.00	automated alarm callout for critical failures and reliability?	Yes all alarms are monitored by District Operations
Fn	1	4	4.00	alarm log maintained and reviewed annually?	The alarm log is maintained but it is not reviewed on an annual basis
INFORMATION	N/A	N/A	N/A	type of telemetry used (radio, fiber optic, leased line, cell modem, etc.)?	Radio
R	1	4	4.00	communication system is reliable (approximate no. of comm. failures in last year)?	There are no communication failures within the last year
R	1	4	4.00	adequate power available to run all telemetry and instrumentation on main power failure?	There is adequate power to the site
R	2	3	6.00	spare parts/service support readily available?	Parts are readily available at the plant and through the manufacturer
INFORMATION	N/A	N/A	N/A	other known problems?	No other known electrical problems at this site
PM	2	4	8.00	estimated service life remaining?	Estimated 10 year service life remaining.
				Additional Data	

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Access Road from Cold Creek Drive	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Tank Facility ID #:**	CCKTK	**Date:**	3/7/2012
					Tank Facility Name:	Cold Creek Tank	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Montgomery Estates and Upper Montgomery Estates	**Adjacent Pressure Zones:**	Stateline Zone

Photo Evidence for PM, Fn, R, FE Is the downslope portion of the tank constructed on fill? Yes Does tank overflow drain adequately to protect tank foundation? Yes Any bacterilogical exceedance at this tank? Will Verify

PHOTOS

Appendix A2

Critical Pipelines

South Tahoe PUD
Water System Optimization Plan
Summary of Pipeline Condition and Capacity Evaluation

Failure Mode Scoring Summary - Criticality Scores

Pipeline Facility Name:	Pipeline Facility ID #:	Zone Served	California Waterworks Standards	Pipeline Route/Alignment	Piping and Valves	Overall Total Factored Score (Out of 25) =
10" AC Upper Truckee River Waterline Crossing (UTR Crossing)	J38-052-J38-022	Flagpole/ Arrowhead	0.20	7.05	4.51	11.76
12" Lake Tahoe Boulevard Waterline (UTR Bridge Crossing Hwy 50)	M26-047-M26-071	Main/Gardner Mountain	0.20	3.38	4.49	8.07
8" Steel line through meadow (Airport Runway Crossing)	L32-005-M32-004	Country Club/ Stateline	0.20	6.23	3.68	10.10
6" dedicated Keller tank steel line (6" High Pressure Line)	Multiple facility ids due to length: Q21-048-CP0911, B0119-CP0911, B0068-B0119, B0068-B0114,	Keller	0.80	5.70	4.69	11.19

Pipeline Facility Name:	Pipeline Facility ID #:	Pipe Size (in)	Pipe Area (in2)	MDD (gpm)	Velocity (ft/s)	Capacity (gpm)	% Capacity > MDD	Score
10" AC Upper Truckee River Waterline Crossing (UTR Crossing)	J38-052-J38-022	10	0.545	260	1.06	1224	371%	1
12" Lake Tahoe Boulevard Waterline (UTR Bridge Crossing Hwy 50)	M26-047-M26-071	12	0.785	2450	6.95	1762	-28%	5
8" Steel line through meadow (Airport Runway Crossing)	L32-005-M32-004	8	0.349	90	0.57	783	770%	1
6" dedicated Keller tank steel line (6" High Pressure Line)	Multiple facility ids due to length: Q21-048-CP0911, B0119-CP0911, B0068-B0119, B0068-B0114,	6	0.196	390	4.43	441	13%	1

Notes:
MDD provided by Brenda Estrada of West Yost

				South Tahoe PUD	**Location Description:**	Waterline under Upper Truckee River at San Bernadino in Meyers	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pipeline Facility ID #:**	J38-052-J38-022	**Date:**	2/23/2012	
					Pipeline Facility Name:	Upper Truckee River Waterline Crossing (UTR Crossing)	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney	
					Pressure Zones Served:	Flagpole and Arrowhead Zones	**Adjacent Pressure Zones:**		

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >50 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 26 to 50 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 11 to 25 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	4.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	0%	0%	100%	0%	0%	
				Factored Score	N/A	N/A	4	N/A	N/A	**4.00**
				Criticality Score					5%	**0.20**
				Pipeline Route/Alignment						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	5.00	3.67	N/A	
				Weighted Final Score (1-25)	N/A	N/A	15.00	16.33	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	0%	0%	50%	50%	0%	
				Factored Score	N/A	N/A	7.5	8.17	N/A	**15.67**
				Criticality Score					45%	**7.05**
				Pipeline and Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	1.67	2.00	4.00	1.50	N/A	
				Weighted Final Score (1-25)	5.67	9.50	20.00	6.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	40%	30%	15%	15%	0%	
				Factored Score	2.27	2.85	3	0.9	N/A	**9.02**
				Criticality Score					50%	**4.51**
									Overall Total Factored Score (Out of 25) =	**11.76**

				South Tahoe PUD	**Location Description:**	Waterline under Upper Truckee River at San Bernadino in Meyers	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pipeline Facility ID #:**	J38-052-J38-022	**Date:**	2/23/2012
					Pipeline Facility Name:	Upper Truckee River Waterline Crossing (UTR Crossing)	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Flagpole and Arrowhead Zones	**Adjacent Pressure Zones:**	

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				California Waterworks Standards	
Fn	1	4	4	adequate spacing of isolation valves?	
				Pipeline Route/Alignment	
Fn	5	3	15	easement and/or right-of-way adequate for routine maintenance and repairs?	Currently there is no easement associated with this river crossing. This line will be included in the USFS Master Use Permit which is in negotiations currently. This permit will allow for a 25 foot temporary easement to do regular maintenance and to respond
R	4	5	20	pipeline route/alignment crosses known seismic fault or other natural hazard (e.g. creek crossing, major highway)?	Pipeline is in the Upper Truckee River and is currently exposed with concrete encasement.
INFORMATION	N/A	N/A	N/A	pipe provides sole source of water for critical customers (e.g. commercial or institutional) and how many connections?	Feeds residential areas within the Flagpole Zone
R	3	3	9	pipe provides sole source of water for a pressure zone?	Currently the pipeline is the only source of water to the Flagpole Zone. The completion of the Grizzly Mountain Booster Station in April 2012 will make this crossing a redundant feed to the flagpole zone.
R	4	5	20	any unstable site conditions (if yes, describe)?	The line is in the river and in heavy runoff years excessive erosion could expose the line within the river
				other known problems?	
				Piping and Valves	
INFORMATION	N/A	N/A	N/A	pipe material?	Asbestos Cement
C	1	4	4	nominal size?	10 inch
C	3	5	15	test pressure and pressure rating?	Unknown what the pipe was tested to or what the material is rated at. Currently operates at approximately 65 psi. Blow out in 1986 was caused by consistent high pressures near 165 psi.
PM	3	3	9	pipelines protected from external corrosion (coatings, inert pipe material, cathodic protection)?	Inert pipe material
PM	1	4	4	pipelines known internal corrosion condition?	none
INFORMATION	N/A	N/A	N/A	date installed?	Early 70's by the Tahoe Paradise Water Company
R	2	4	8	frequency of repairs?	No repairs on this portion of line in the last 5 years
R	1	4	4	air release valves properly located/protected from flooding?	NA
PM	1	4	4	estimated service life remaining?	43 Years based on AWU Useful Life
Fn	4	5	20	other known problems?	Line previously blew out in 1986. The line is untraceable due to materials from isolation valve to isolation valve.
				Additional Data	In order to protect the waterline in 1986 a coffer dam was installed downstream of the line.

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	Waterline under Upper Truckee River at San Bernadino in Meyers	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pipeline Facility ID #:**	J38-052-J38-022	**Date:**	2/23/2012
					Pipeline Facility Name:	Upper Truckee River Waterline Crossing (UTR Crossing)	**Condition Assessment Inspectors:**	Peter Lavallee and Phill Torney
					Pressure Zones Served:	Flagpole and Arrowhead Zones	**Adjacent Pressure Zones:**	

Photo Evidence for PM, Fn, R, FE

PHOTOS

No photos due to snow cover. Will take photos when the snow melts in this location.

				South Tahoe PUD	**Location Description:**	Bridge over Upper Truckee River	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pipeline Facility ID #:**	M26-047-M26-071	**Date:**	3/8/2012
					Pipeline Facility Name:	12" Lake Tahoe Boulevard Waterline (UTR Bridge Crossing Hwy 50)	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone and all Zones dependent on the Twin Peaks Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >50 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 26 to 50 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 11 to 25 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	4.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	0%	0%	100%	0%	0%	
				Factored Score	N/A	N/A	4	N/A	N/A	**4.00**
				Criticality Score					5%	**0.20**
				Pipeline Route/Alignment						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	2.67	N/A	
				Weighted Final Score (1-25)	N/A	N/A	3.00	12.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	0%	0%	50%	50%	0%	
				Factored Score	N/A	N/A	1.5	6	N/A	**7.50**
				Criticality Score					45%	**3.38**
				Pipeline and Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	2.67	1.00	4.00	1.50	N/A	
				Weighted Final Score (1-25)	9.33	4.50	20.00	6.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	40%	30%	15%	15%	0%	
				Factored Score	3.73	1.35	3	0.9	N/A	**8.98**
				Criticality Score					50%	**4.49**
									Overall Total Factored Score (Out of 25) =	**8.07**

				South Tahoe PUD	**Location Description:**	Bridge over Upper Truckee River	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pipeline Facility ID #:**	M26-047-M26-071	**Date:**	3/8/2012
					Pipeline Facility Name:	12" Lake Tahoe Boulevard Waterline (UTR Bridge Crossing Hwy 50)	**Condition Assessment Inspectors:**	Peter Lavallee and Mark Gray
					Pressure Zones Served:	Stateline Zone and all Zones dependent on the Twin Peaks Zone	**Adjacent Pressure Zones:**	Twin Peaks Zone

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				California Waterworks Standards	
Fn	1	4	4	adequate spacing of isolation valves?	Yes on either side of the bridge
				Pipeline Route/Alignment	
Fn	1	3	3	easement and/or right-of-way adequate for routine maintenance and repairs?	The line is within CalTrans right of Way and access to the facility is easy with use of a crane for supporting the pipe
R	5	5	25	pipeline route/alignment crosses known seismic fault or other natural hazard (e.g. creek crossing, major highway)?	Line crosses the Upper Truckee River
INFORMATION	N/A	N/A	N/A	pipe provides sole source of water for critical customers (e.g. commercial or institutional) and how many connections?	This line is the main connection between large areas of production on the east side of the bridge and water supply to multiple zones west of the bridge
R	2	3	6	pipe provides sole source of water for a pressure zone?	No but loss of source to the west side of the town would require switching the current pumping from Twin Peaks Booster to meet demands in the Flagpole Zone
R	1	5	5	any unstable site conditions (if yes, describe)?	No
R	4	5	20	other known problems?	Pipeline failed at a victaulic coupling due to a suspected freeze cycle
				Piping and Valves	
INFORMATION	N/A	N/A	N/A	pipe material?	Steel
C	1	4	4	nominal size?	12"
C	1	5	5	test pressure and pressure rating?	150psi
PM	4	3	12	pipelines protected from external corrosion (coatings, inert pipe material, cathodic protection)?	There is no cathodic protection on this line other than the coatings that are on the steel
PM	3	4	12	pipelines known internal corrosion condition?	Not known
INFORMATION	N/A	N/A	N/A	date installed?	2002
R	2	4	8	frequency of repairs?	None except the failure
R	1	4	4	air release valves properly located/protected from flooding?	NA
PM	1	4	4	estimated service life remaining?	50 years based on AWU Useful Life
Fn	4	5	20	other known problems?	Potential freeze thaw in this location
				Additional Data	One option for the Water to the Y issue is to install a check valve at this location. In the photos below there are two red victaulic couplings. This is where the line failed in 2005.

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

South Tahoe PUD	**Location Description:**	Bridge over Upper Truckee River	**K/J Project Number:** 1270004*00
Water System Optimization Plan	**Pipeline Facility ID #:**	M26-047-M26-071	**Date:** 3/8/2012
	Pipeline Facility Name:	12" Lake Tahoe Boulevard Waterline (UTR Bridge Crossing Hwy 50)	**Condition Assessment Inspectors:** Peter Lavallee and Mark Gray
	Pressure Zones Served:	Stateline Zone and all Zones dependent on the Twin Peaks Zone	**Adjacent Pressure Zones:** Twin Peaks Zone

Photo Evidence for PM, Fn, R, FE

PHOTOS

				South Tahoe PUD	**Location Description:**	Crossing under airport runway	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pipeline Facility ID #:**	L32-005-M32-004	**Date:**		
					Pipeline Facility Name:	8" Steel line through meadow (Airport Runway Crossing)	**Condition Assessment Inspectors:**	Peter Lavallee	
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Stateline Zone	

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >50 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 26 to 50 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 11 to 25 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	1.00	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	4.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	0%	0%	100%	0%	0%	
				Factored Score	N/A	N/A	4	N/A	N/A	**4.00**
				Criticality Score					5%	**0.20**
				Pipeline Route/Alignment						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	5.00	2.67	N/A	
				Weighted Final Score (1-25)	N/A	N/A	15.00	12.67	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	0%	0%	50%	50%	0%	
				Factored Score	N/A	N/A	7.5	6.33	N/A	**13.83**
				Criticality Score					45%	**6.23**
				Pipeline and Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	N/A	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.33	1.00	N/A	1.00	N/A	
				Weighted Final Score (1-25)	12.00	4.50	N/A	4.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	40%	30%	0%	30%	0%	
				Factored Score	4.8	1.35	N/A	1.2	N/A	**7.35**
				Criticality Score					50%	**3.68**
									Overall Total Factored Score (Out of 25) =	**10.10**

				South Tahoe PUD	**Location Description:**	Crossing under airport runway	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pipeline Facility ID #:**	L32-005-M32-004	**Date:**	
					Pipeline Facility Name:	8" Steel line through meadow (Airport Runway Crossing)	**Condition Assessment Inspectors:**	Peter Lavallee
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Stateline Zone

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				California Waterworks Standards	
Fn	1	4	4	adequate spacing of isolation valves?	Yes the valves are on either side of the meadow
				Pipeline Route/Alignment	
Fn	5	3	15	easement and/or right-of-way adequate for routine maintenance and repairs?	There is currently no easement granted from the forest service for this line through the meadow and should be included in the USFS Master Use Water Permit
R	5	5	25	pipeline route/alignment crosses known seismic fault or other natural hazard (e.g. creek crossing, major highway)?	Crosses the Upper Truckee River and underneath the Airport Runway
INFORMATION	N/A	N/A	N/A	pipe provides sole source of water for critical customers (e.g. commercial or institutional) and how many connections?	This is a redundant source for the Country Club Zone
R	1	3	3	pipe provides sole source of water for a pressure zone?	No
R	2	5	10	any unstable site conditions (if yes, describe)?	The river has exposed other water and sewer line crossings and this site could have the same issue.
R	5	5	25	other known problems?	The Forest Service is also planning to relocate the river over top of this water main as part of a larger project
				Piping and Valves	
INFORMATION	N/A	N/A	N/A	pipe material?	Steel
C	1	4	4	nominal size?	8"
C	1	5	5	test pressure and pressure rating?	150psi
PM	4	3	12	pipelines protected from external corrosion (coatings, inert pipe material, cathodic protection)?	No
PM	4	4	16	pipelines known internal corrosion condition?	Not known
INFORMATION	N/A	N/A	N/A	date installed?	1978
R	1	4	4	frequency of repairs?	None
R	1	4	4	air release valves properly located/protected from flooding?	No air release valves o this line
PM	2	4	8	estimated service life remaining?	26 years based on AWU Useful life
INFORMATION	N/A	5	N/A	other known problems?	None
				Additional Data	
				Legend	
				PM	Physical Mortality
				Fn	Functionality
				R	Reliability
				FE	Financial Efficiency
				C	Capacity

				South Tahoe PUD	**Location Description:**	Crossing under airport runway	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pipeline Facility ID #:**	L32-005-M32-004	**Date:**	
					Pipeline Facility Name:	8" Steel line through meadow (Airport Runway Crossing)	**Condition Assessment Inspectors:**	Peter Lavallee
					Pressure Zones Served:	Country Club Zone	**Adjacent Pressure Zones:**	Stateline Zone
				Photo Evidence for PM, Fn, R, FE				
				PHOTOS				

				South Tahoe PUD	**Location Description:**	6" Line from Keller Booster to Keller Tanks along Keller Rd	**K/J Project Number:**	1270004*00	
				Water System Optimization Plan	**Pipeline Facility ID #:**	Multiple facility ids due to length: Q21-048-CP0911, B0119-CP0911, B0068-B0119, B0068-B0114,	**Date:**		
					Pipeline Facility Name:	6: dedicated Keller tank steel line (6" High Pressure Line)	**Condition Assessment Inspectors:**	Peter Lavallee	
					Pressure Zones Served:	Stateline but it is a dedicated line to Keller Tanks	**Adjacent Pressure Zones:**		

				Notes:	**Failure Mode Scoring (1 - 5)**					
				1. Capacity score will be based on hydraulic model	**Physical Mortality**	**Capacity**	**Level of Service**		**Financial Efficiency**	
				2. For Reliabilty to be determined based on CMMS maintenance records			**functionality**	**reliability**		
				3. For Criticality Weighting Factors to be determined at District Workshop	1: new or excellent condition	1: significantly exceeds design requirement	1: exceeds all requirements	1: failure >50 yrs	1: best available technology	
					2: minor defects only	2: exceeds design requirement	2: exceeds some requirements	2: failure every 26 to 50 yrs	2: financial efficiency is high	
					3: moderate deterioration	3: meets design requirement	3: meets all requirements	3: failure every 11 to 25 yrs	3: financial efficiency is average	
					4: significant deterioration	4: less than design requirement	4: fails some requirements	4: failure every 5 to 10 yrs	4: financial efficiency is low	
					5: virtually unserviceable	5: significantly less than design requirement	5: Fails all requirements	5: failure < 5 yrs	5: asset should be replaced	
				California Waterworks Standards						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	N/A	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	4.00	N/A	N/A	
				Weighted Final Score (1-25)	N/A	N/A	16.00	N/A	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	0%	0%	100%	0%	0%	
				Factored Score	N/A	N/A	16	N/A	N/A	**16.00**
				Criticality Score					5%	**0.80**
				Pipeline Route/Alignment						
				Is Failure Mode Score Calculated or Assigned?	N/A	N/A	Calculated	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	N/A	N/A	5.00	2.33	N/A	
				Weighted Final Score (1-25)	N/A	N/A	15.00	10.33	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	0%	0%	50%	50%	0%	
				Factored Score	N/A	N/A	7.5	5.17	N/A	**12.67**
				Criticality Score					45%	**5.70**
				Pipeline and Valves						
				Is Failure Mode Score Calculated or Assigned?	Calculated	Calculated	N/A	Calculated	N/A	**Total Factored Score**
				Unweighted Failure Mode Score (1-5)	3.67	2.00	N/A	1.00	N/A	
				Weighted Final Score (1-25)	13.33	9.50	N/A	4.00	N/A	
CHECK	100%			**Criticality Weighting Factor (0 - 100%)**	40%	30%	0%	30%	0%	
				Factored Score	5.33	2.85	N/A	1.2	N/A	**9.38**
				Criticality Score					50%	**4.69**
									Overall Total Factored Score (Out of 25) =	**11.19**

				South Tahoe PUD	**Location Description:**	6" Line from Keller Booster to Keller Tanks along Keller Rd	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pipeline Facility ID #:**	Multiple facility ids due to length: Q21-048-CP0911, B0119-CP0911, B0068-B0119, B0068-B0114,	**Date:**	
					Pipeline Facility Name:	6: dedicated Keller tank steel line (6" High Pressure Line)	**Condition Assessment Inspectors:**	Peter Lavallee
					Pressure Zones Served:	Stateline but it is a dedicated line to Keller Tanks	**Adjacent Pressure Zones:**	

Failure Mode Type	Score (1 - 5)	Importance Weighting (1-5)	Final Score	CONDITION ASSESSMENT CHECKLIST	
				California Waterworks Standards	
Fn	4	4	16	adequate spacing of isolation valves?	Single isolation valve at the Keller Booster Discharge
				Pipeline Route/Alignment	
Fn	5	3	15	easement and/or right-of-way adequate for routine maintenance and repairs?	Line runs through the public right of way on Keller Rd and Sherman Way. A short run of line is across a private parcel between Sherman Way and the Tanks
R	1	5	5	pipeline route/alignment crosses known seismic fault or other natural hazard (e.g. creek crossing, major highway)?	No
INFORMATION	N/A	N/A	N/A	pipe provides sole source of water for critical customers (e.g. commercial or institutional) and how many connections?	Pipe is a dedicated line to Keller Tanks with no services off of it
R	2	3	6	pipe provides sole source of water for a pressure zone?	No but sole source to Keller Tanks
R	4	5	20	any unstable site conditions (if yes, describe)?	Soils have not been tested but have the potential to be corrosive to the steel pipe
				other known problems?	None
				Piping and Valves	
INFORMATION	N/A	N/A	N/A	pipe material?	Steel
C	1	4	4	nominal size?	6"
C	3	5	15	test pressure and pressure rating?	Unknown test pressure or material rating
PM	4	3	12	pipelines protected from external corrosion (coatings, inert pipe material, cathodic protection)?	No
PM	4	4	16	pipelines known internal corrosion condition?	Not known
INFORMATION	N/A	N/A	N/A	date installed?	1963 or 1966
R	1	4	4	frequency of repairs?	None
R	1	4	4	air release valves properly located/protected from flooding?	No air release on this line
PM	3	4	12	estimated service life remaining?	11 or 14 years depending on construction date based on AWU Useful Life
INFORMATION	N/A	5	N/A	other known problems?	None
				Additional Data	There is a large concern that this pipe could have corrosion problems due to its age and high pressure.

Legend	
PM	Physical Mortality
Fn	Functionality
R	Reliability
FE	Financial Efficiency
C	Capacity

				South Tahoe PUD	**Location Description:**	6" Line from Keller Booster to Keller Tanks along Keller Rd	**K/J Project Number:**	1270004*00
				Water System Optimization Plan	**Pipeline Facility ID #:**	Multiple facility ids due to length: Q21-048-CP0911, B0119-CP0911, B0068-B0119, B0068-B0114,	**Date:**	
					Pipeline Facility Name:	6: dedicated Keller tank steel line (6" High Pressure Line)	**Condition Assessment Inspectors:**	Peter Lavallee
					Pressure Zones Served:	Stateline but it is a dedicated line to Keller Tanks	**Adjacent Pressure Zones:**	
				Photo Evidence for PM, Fn, R, FE				
				PHOTOS				

Appendix B for Section 3 (TM 2)

Water System Optimization Plan
LOS Workshop Meeting Notes

Meeting Notes

SOUTH TAHOE PUBLIC UTILITY DISTRICT

Water System Optimization Project
Level of Service Workshop
Wednesday, April 25, 2012
10 am to 2:30 pm
KJ Project No. 1270004*00

A. Introductions (5 min.)

Name	Title	Email
Paul Sciuto	Assistant General Manager, STPUD	psciuto@stpud.dst.ca.us
Julie Ryan	Senior Engineer, STPUD	jryan@stpud.dst.ca.us
John Thiel	Engineer, STPUD	jthiel@stpud.dst.ca.us
Randy Curtis	Manager of Field Operations, STPUD	rcurtis@stpud.dst.ca.us
Phil Torney	Pump Station Supervisor, STPUD	ptorney@stpud.dst.ca.us
Pete Lavallee	Assistant Engineer, STPUD	plavallee@stpud.dst.ca.us
James (Cuz) Cullen	Inspection Supervisor, STPUD	jcullen@stpud.dst.ca.us
Michele Pinkel	Preventative Maintenance Coordinator, STPUD	mpinkel@stpud.dst.ca.us
Chris Stanley	URW Supervisor, STPUD	cstanley@stpud.dst.ca.us
Ivo Bergsohn	Hyrdro-geologist, STPUD	ibergsohn@stpud.dst.ca.us
Tim Williams	Project Manager, Kennedy/Jenks	timwilliams@kennedyjenks.com
Tom Keown	Project Engineer, Kennedy/Jenks	thomaskeown@kennedyjenks.com
Charles Duncan	Project Manager, West Yost	cduncan@westyost.com

B. Level of Service Introduction by Tom Keown

a. How Does LOS fit with Asset Management?
   i. An integrative optimization process that enables a utility to determine how to minimize the life cycle cost of owning and operating infrastructure assets while continuously delivering *service levels* demanded by customers.
   ii. Asset management is a structured approach to delivering desired *service levels* at lowest life cycle costs.
   iii. How does the District see LOS fit into your Asset Management program?

b. What are Levels of Service?
   i. Characteristics or attributes of a service that describe its required level of performance;
   ii. These characteristics typically describe “how much”, “of what nature” and “how frequently” about the service.
   iii. What our customers expect:
      1. Examples – High quality water, reliable water service, low cost
   iv. Are their LOS areas that are not currently covered or too many covered in the current table?

c. The development of the Levels of Service for the water system will drive the Water System Optimization Plan and ultimately result in what Capital Improvement Projects are recommended.

C. Overview of Current Level of Service Tables
   a. Why are we using these tables?
   b. How were they developed?
   c. Review and definition of each item.
   d. All individuals share their comments and input to the tables
      i. P Torney – requested LOS focus on practical goals as LOS statements are developed.
      ii. P. Torney & P. Sciuto – Break occurred in Montgomery Estates Zone and out of service a couple of hours. Customer Service received 20 calls on dirty water. District needs to review its standard procedures to see if there are changes to address how STPUD responds to a break and minimize customer responses.
      iii. P. Sciuto – do not want to repeat what occurred with Wastewater Collection System Master Plan in which the District Board did not adopt the developed LOS.
      iv. T. Keown – LOS is a living document and can and will be changed over time.
      v. J. Thiel – Important when presenting LOS to District Board also present level of cost.
      vi. P. Sciuto – Provide High Quality Water Goal – example, currently District in compliance with Lead and Copper Rule, but if regulators change to compliance by pressure zone, then the District would have to address this issue.
      vii. P. Sciuto – District has used aeration treatment instead of chemical treatment for pH control due to cost differences.
      viii. P. Torney & P. Sciuto – Seven tanks last year had bact samples that came back positive. District addressed this issue using several approaches – resampled, added intermediate chlorine addition at booster pump stations, provided Tideflex mixing systems for tanks with single inlet and outlet pipelines. Also currently modify tank operation to force tank water turn-over as part of the standard operating procedure. The District asked if using more Tideflex mixing units, more booster pump station intermediate chlorine stations, and changing the tank operating levels by season another option to address water quality issues in tanks?
      ix. P. Sciuto – Strategic Plan goals were updated in 2005. This is an asset driven Level of Service Study, not safety, which continues to be very important to the District and addressed separately.
      x. Group – flushing justified by LOS quantifiable goals:
         1. T. Keown shared – District could combine flushing with valve exercise program, and meet two goals at once
         2. Add more intermediate chlorine injection at booster pump stations
         3. Flushing is restricted in some areas to less than ideal velocities because sewer capacity is not adequate. Possibly consider dechlorinating and flushing to storm drain if can get regulatory permission.
      xi. Group – typically water maintenance crews record response to a customer service request by noting time of call, time arrive, and time work order completed. P. Sciuto wants sewer maintenance crews to do the same.
      xii. J. Cullen & P. Sciuto – A number of the condominiums at Lakeland Village have single check backflow preventers (BFPs), which is not compliant with current backflow prevention code. Not sure how to address this in these economically challenge times. T. Williams shared City of Davis added backflow preventers at point of service for commercial establishments when they added water meters, but he was not familiar with if the City or the business was responsible for paying for the BFP devices.

D. Lunch Break (30 min)

E. Get to *Gemba*!
   a. Refine Engineering LOS Statements (55 minutes) – comments were received and the District and Kennedy/Jenks will work together to update the tables. A conference call will be held on 5-1-12 to complete review of the elements of the table that were not completed.
   b. Refine O&M LOS Statements (55 minutes) - comments were received and the District and Kennedy/Jenks will work together to update the tables.

F. Action Items

1. District (Julie Ryan) to review customer complaint data on levels of chlorine residuals (taste and odor) to determine the minimum and maximum chlorine residuals for Water Quality quantifiable goal.
2. District (Peter Lavallee and Michele Pinkel) will look at monthly customer complaints for taste, color, and odor over the last 10 years.
3. District (Paul Sciuto) to evaluate policy of backflow and how to require commercial businesses to update out of compliance backflow protection conditions.
4. District (Paul Sciuto) will update the Risk Assessment Methodology for Water (RAMW) for the existing Vulnerability Assessment.
5. District (Michele Pinkel) will determine what percent of maintenance hours are spent in overtime.
6. District (Michele Pinkel) will determine the number of unscheduled service repairs and main breaks to compare with the Quantifiable Goal listed.
7. District (Michele Pinkel) will determine based on maintenance department hours the percent of preventative vs. percent of reactive maintenance for the Underground Department and the Pump Station Department.
8. District (Paul Sciuto) will determine the policy for level of fire protection.
9. District (Paul Sciuto) will determine the cost per million gallons to deliver water from Tahoe City PUD and Incline Village GID to compare with the District's current cost per million gallons (over $10K/mg), which will be a better mark to compare with than Qual Serve.
10. Julie Ryan to send updated tables in Excel format and pdf of notes on the LOS worksheet tables that she took at the workshop (done 4-26-12).

G. Next Steps

a. K/J to update LOS Tables based on group feedback – Conference call 5-1-12 to complete review and final update du 5-4-12
b. District Staff Review/Approval Final LOS statements – due 5-11-12
c. LOS Board Workshop – 5-17-12
d. LOS Study outline – Kennedy/Jenks provided copies of the draft outline to P. Sciuto, J. Ryan, and P. Lavallee.

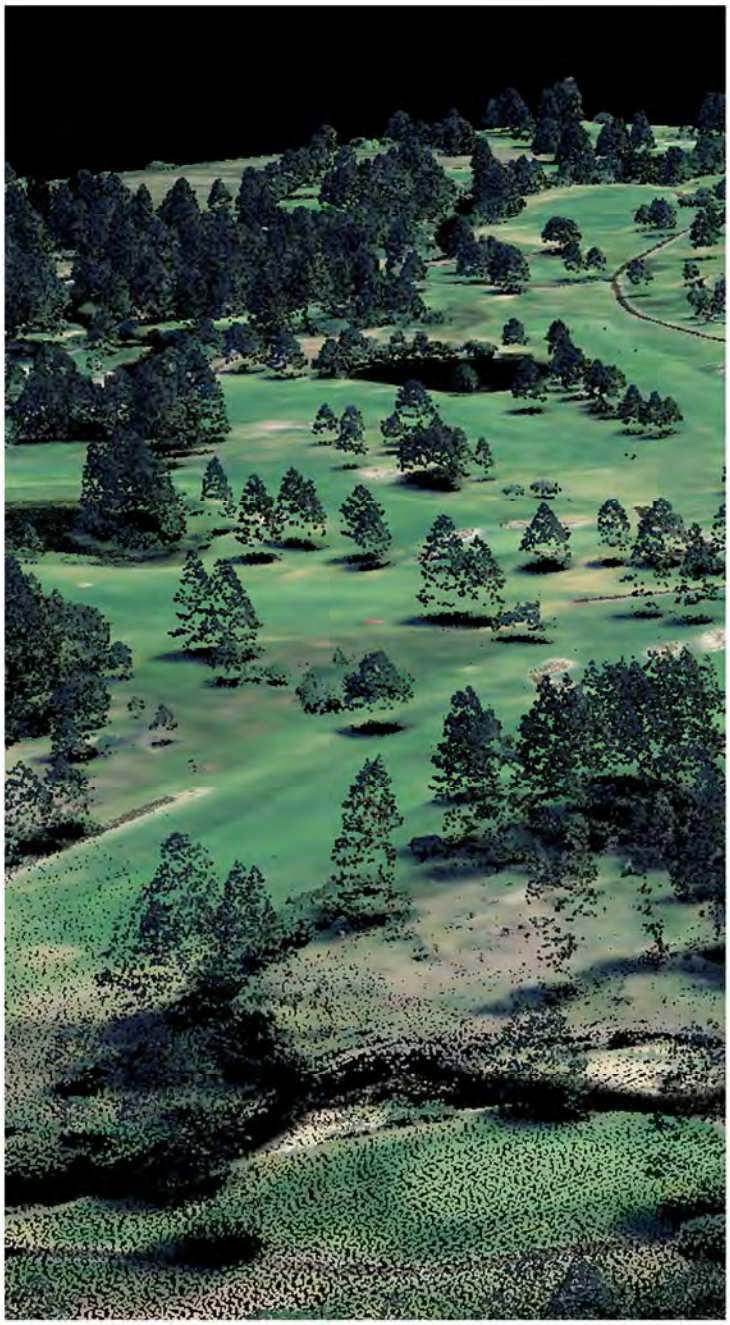
Appendix C for Section 4 (TM 3)
Appendix C1

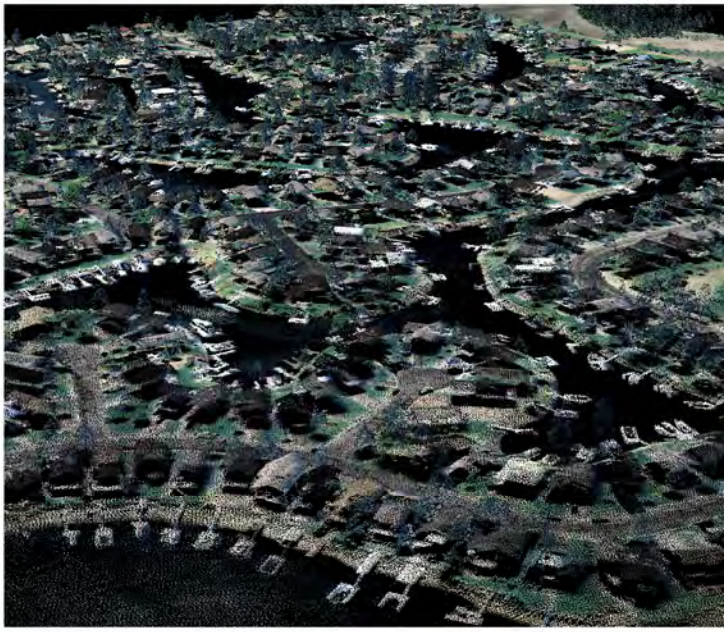
LiDAR Remote Sensing Data Collection

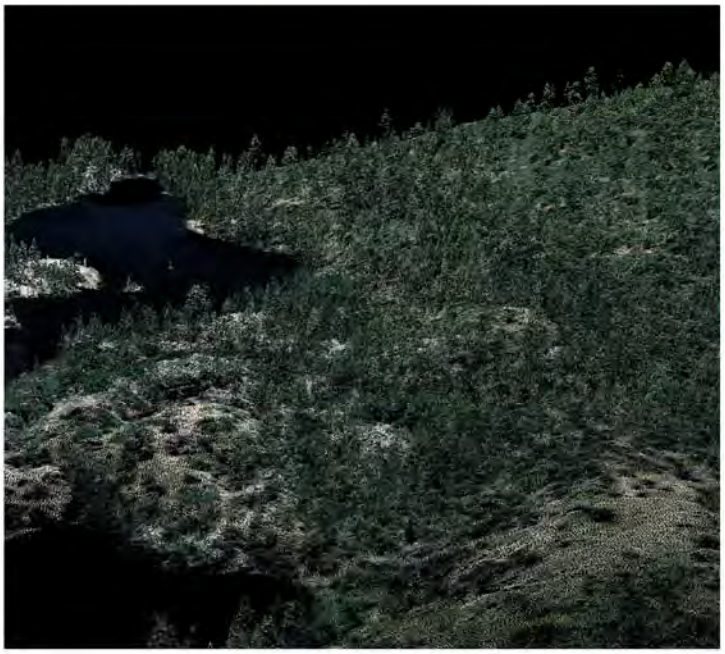
LiDAR REMOTE SENSING

LAKE TAHOE WATERSHED • CALIFORNIA / NEVADA

January 31, 2011







TAHOE REGIONAL PLANNING AGENCY

J. SHANE ROMSOS - PO Box 5310 - Stateline, NV 89449

WATERSHED SCIENCES • 517 SW 2nd Street, Suite 400 - Corvallis, OR 97333

LiDAR Remote Sensing Data Collection: Lake Tahoe

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1. Overview

Watershed Sciences, Inc. (WSI) collected Light Detection and Ranging (LiDAR) data of land surrounding Lake Tahoe from August 11th to August 24th, 2010. This report documents the data acquisition, processing methods, accuracy assessment, and deliverables of that data. The requested area of interest (AOI), excluding the actual lake, was 224,725 acres. The area was expanded to include a 100m buffer to ensure complete coverage and adequate point densities around survey area boundaries, resulting in 232,536 acres of delivered LiDAR data. (**Figure 1**).

Figure 1. Lake Tahoe Area of Interest (AOI)

2. Acquisition

2.1 Airborne Survey – Instrumentation and Methods

The LiDAR survey used two Leica ALS50 Phase II laser systems mounted in a Cessna Caravan 208B. The Leica systems were set to acquire ≥83,000 – 105,900 laser pulses per second (i.e., 83 – 105.9 kHz pulse rate) and flown at 900 - 1300 meters above ground level (AGL) depending on weather and terrain, capturing a scan angle of ±14° from nadir. These settings were developed to yield points with an average native pulse density of ≥8 pulses per square meter over terrestrial surfaces. It is not uncommon for some types of surfaces (e.g. dense vegetation or water) to return fewer pulses than the laser originally emitted. These discrepancies between 'native' and 'delivered' density will vary depending on terrain, land cover, and the prevalence of water bodies.

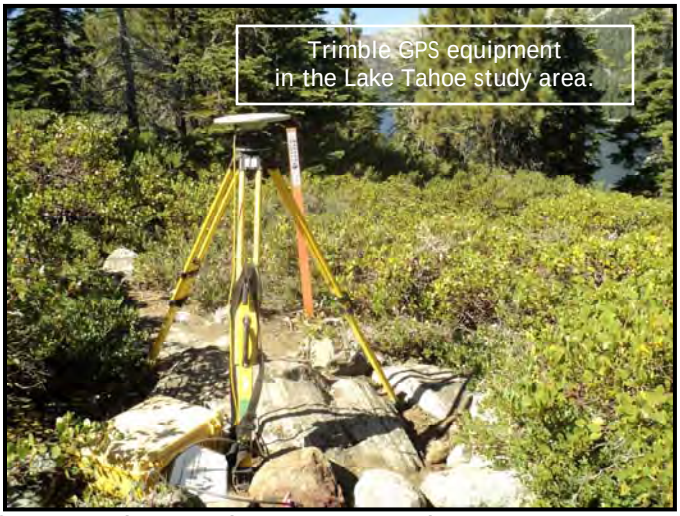
The Cessna Caravan is a stable platform, ideal for flying slow and low for high density projects. The Leica ALS50 sensor head installed in the Caravan is shown on the left.

All areas were surveyed with an opposing flight line side-lap of ≥50% (≥100% overlap) to reduce laser shadowing and increase surface laser painting. The Leica laser systems allow up to four range measurements (returns) per pulse, and all discernable laser returns were processed for the output dataset.

To accurately solve for laser point position (geographic coordinates x, y, z), the positional coordinates of the airborne sensor and the attitude of the aircraft were recorded continuously throughout the LiDAR data collection mission. Aircraft position was measured twice per second (2 Hz) by an onboard differential GPS unit. Aircraft attitude was measured 200 times per second (200 Hz) as pitch, roll and yaw (heading) from an onboard inertial measurement unit (IMU). To allow for post-processing correction and calibration, aircraft/sensor position and attitude data are indexed by GPS time.

2.2 Ground Survey – Instrumentation and Methods

Andregg Geomatics, Auburn, CA (CA PLS 4567) located and certified all survey monuments and collected independent quality control checkpoints used for the LiDAR data collection. The survey control plan was designed to provide redundant control within 13 nm of the mission areas for LiDAR flights. The controls were set prior to the airborne missions (see **Appendix B**). Monument coordinates are provided in **Table 1** and shown in **Figure 2**.


Trimble GPS equipment in the Lake Tahoe study area.

Simultaneous with the airborne data collection mission, Watershed Sciences conducted multiple static (1 Hz recording frequency) ground surveys over the survey monuments. Indexed by time, these GPS data are used to correct the continuous onboard measurements of aircraft position recorded throughout the mission. After the airborne survey, the static GPS data are processed using triangulation with Continuously Operating Reference Stations (CORS) and checked using the Online Positioning User Service (OPUS[1]) to quantify daily variance. Multiple sessions are processed over the same monument to confirm antenna height measurements and reported position accuracy.

2.2.1 Instrumentation

For this project area, a Trimble GPS receiver model R7 with Zephyr Geodetic antenna with ground plane was deployed for all static control A Trimble model R8 GNSS unit was used for collecting check points using real time kinematic (RTK) survey techniques. For RTK data, the collector begins recording after remaining stationary for 5 seconds then calculating the pseudo range position from at least three epochs with the relative error under 1.5 cm horizontal and 2 cm vertical. All GPS measurements are made with dual frequency L1-L2 receivers with carrier-phase correction.

2.2.2 Monumentation

Watershed Sciences incorporated 16 control monuments that were set and certified by Andregg Geomatics, Inc (see Andregg Geomatics' *13910_Report found in Appendix B*). Monuments selected were found to have good visibility and optimal location to support a LiDAR Acquisition flight. (**Table 1**)

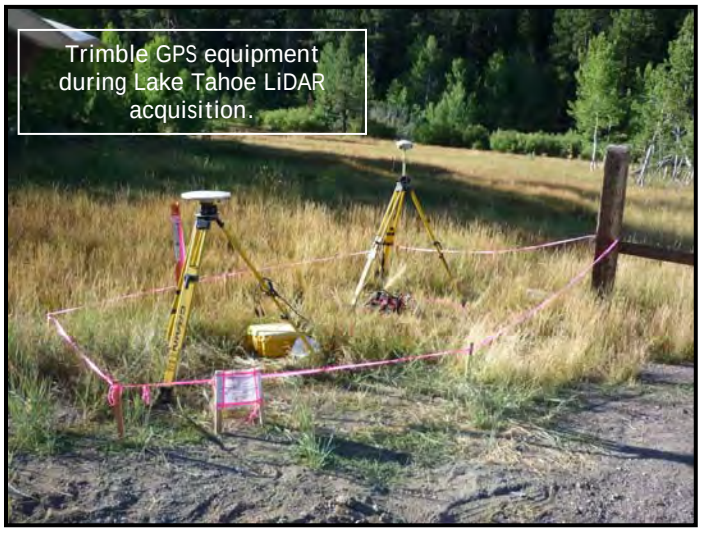
[1] Online Positioning User Service (OPUS) is run by the National Geodetic Survey to process corrected monument positions.

Table 1. Base Station control coordinates for the Lake Tahoe LiDAR Project. Controls were selected and certified by Andregg Geomatics (CA PLS 4567), see Appendix C

Base Station ID	Datum: NAD83 (CORS96)		GRS80
	Latitude	Longitude	Ellipsoid Z (meters)
ARP	38°53'38.467561"N	119°59'45.348090"W	1883.108
BROCKWAY	39°16'11.925401"N	120°05'07.603597"W	2020.251
D836	39°20'50.420265"N	120°07'39.964029"W	1754.035
DOT1	39°09'22.298820"N	119°45'48.327370"W	1416.321
EMERALD	38°57'50.378787"N	120°04'46.794268"W	1924.275
HPGN03FS	38°55'54.067100"N	119°58'43.741166"W	1880.323
MEEKS	39°02'12.183033"N	120°07'41.593703"W	1878.370
Q208	39°05'59.726160"N	119°54'37.633096"W	2120.177
RNO1	39°32'16.451590"N	119°53'08.880400"W	1531.169
ROSE 1	39°18'06.070485"N	119°55'06.476538"W	2580.882
ROSE 2	39°18'05.124461"N	119°55'02.339995"W	2577.916
SPOONER	39°06'02.964665"N	119°54'35.637736"W	2123.353
STAA	38°54'18.944475"N	119°59'29.784238"W	1881.291
TAHOE	39°10'03.168465"N	120°08'48.062822"W	1879.144
V1201	39°19'02.066917"N	120°19'03.604739"W	2046.179
ZOLE	39°25'17.998300"N	119°45'12.033760"W	1357.826

2.2.3 Methodology

Each aircraft is assigned a ground crew member with two Trimble R7 receivers and an R8 receiver. The ground crew vehicles are equipped with standard field survey supplies and equipment including safety materials. All control monuments are observed for a minimum of two survey sessions lasting no fewer than 6 hours. At the beginning of every session the tripod and antenna are reset, resulting in two independent instrument heights and data files. Data is collected at a rate of 1Hz using a 10 degree mask on the antenna.


Trimble GPS equipment during Lake Tahoe LiDAR acquisition.

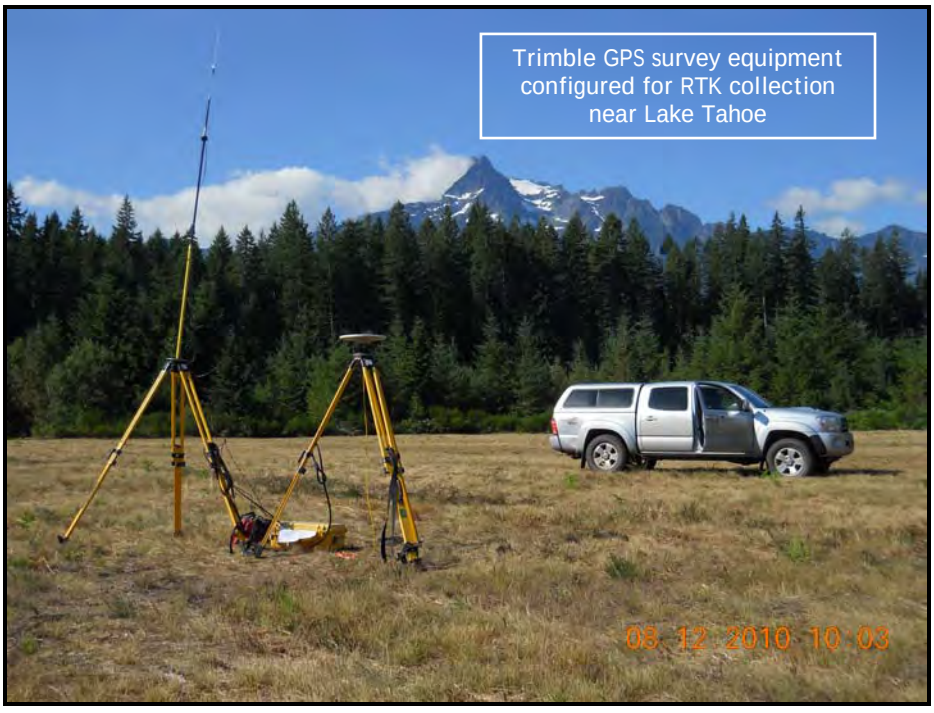
The ground crew uploads the static GPS data collected during the flight to our FTP site on a daily basis to be returned to the office for Professional Land Surveyor (PLS) oversight, QA/QC review and processing. OPUS processing triangulates the monument position using 3 CORS stations resulting in a fully adjusted position. After multiple days of data have been collected at each monument, accuracy and error ellipses are calculated from the OPUS reports. This information

leads to a rating of the monument based on FGDC-STD-007.2-1998[2] Part 2 table 2.1 at the 95% confidence level. When a statistical stable position is found CORPSCON[3] 6.0.1 software is used to convert the UTM positions to geodetic positions. Simultaneously to Watershed Sciences' internal review, all data was sent to Andregg Geomatics to include in their official analysis and certification. This geodetic position is used for processing the LiDAR data (see **Appendix C**).

RTK and aircraft mounted GPS measurements are made during periods with PDOP[4] less than or equal to 3.0 and with at least 6 satellites in view of both a stationary reference receiver and the roving receiver. Static GPS data collected in a continuous session average the high PDOP into the final solution in the method used by CORS stations. RTK positions are collected on bare earth locations such as paved, gravel or stable dirt roads, and other locations where the ground is clearly visible (and is likely to remain visible) from the sky during the data acquisition and RTK measurement period(s).

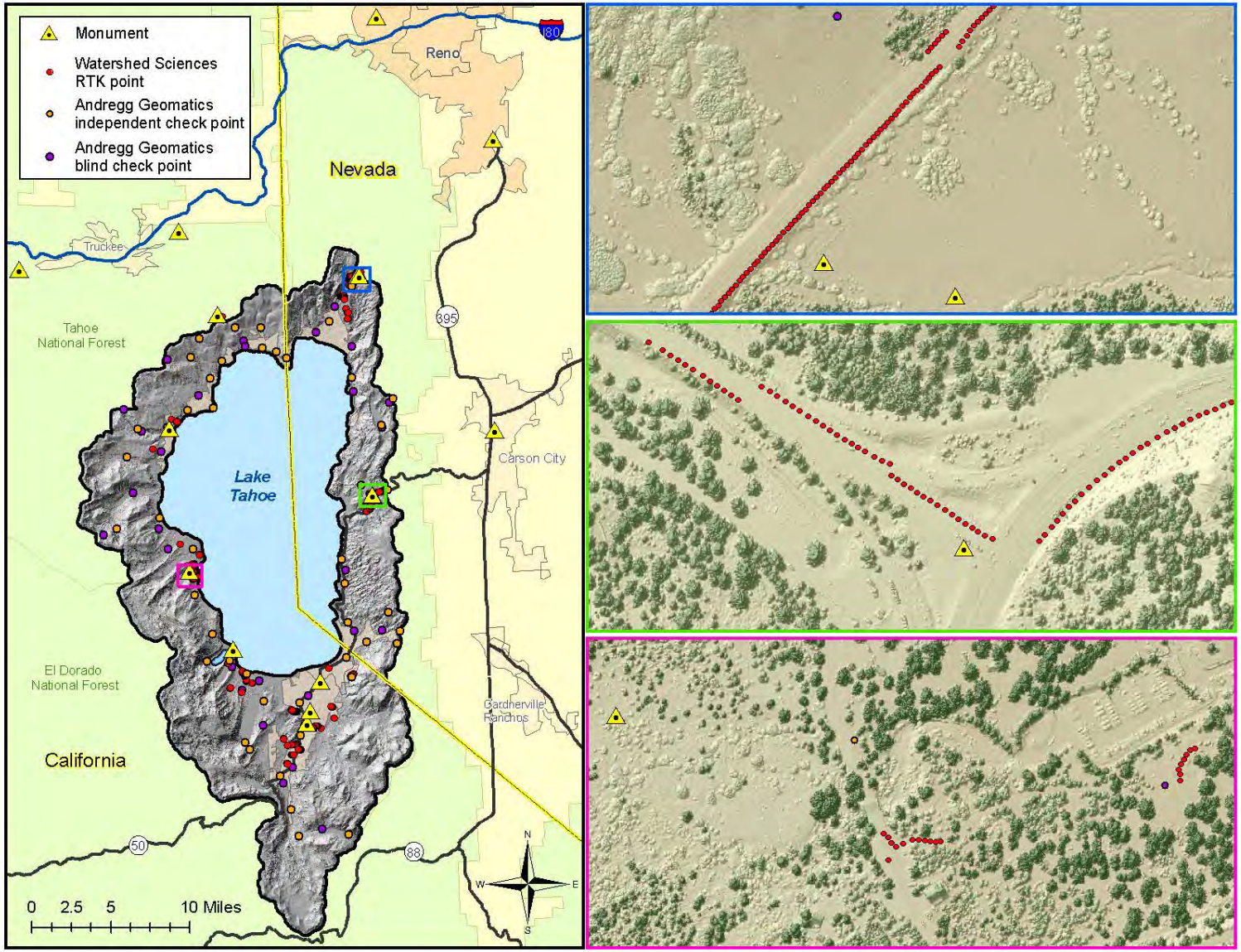
In order to facilitate comparisons with LiDAR measurements, RTK measurements are not taken on highly reflective surfaces such as center line stripes or lane markings on roads. RTK points were taken no closer than one meter to any nearby terrain breaks such as road edges or drop offs.

Andregg Geomatics, Inc. collected additional fast static check points within the Lake Tahoe study area. The locations of these points can be seen along with Watershed Sciences RTK points in **Figure 2**.



[2] Federal Geographic Data Committee Draft Geospatial Positioning Accuracy Standards
[3] U.S. Army Corps of Engineers , Engineer Research and Development Center Topographic Engineering Center software
[4]PDOP: Point Dilution of Precision is a measure of satellite geometry, the smaller the number the better the geometry between the point and the satellites.

Figure 2. RTK and fast static check point and control monument locations used for Lake Tahoe data acquisition, processing, and accuracy checks



3. LiDAR Data Processing

3.1 Applications and Work Flow Overview

1. Resolved kinematic corrections for aircraft position data using kinematic aircraft GPS and static ground GPS data.

   Software: Waypoint GPS v.8.10, Trimble Geomatics Office v.1.62

2. Developed a smoothed best estimate of trajectory (SBET) file that blends post-processed aircraft position with attitude data. Sensor head position and attitude were calculated throughout the survey. The SBET data were used extensively for laser point processing.

   Software: IPAS v.1.35

3. Calculated laser point position by associating SBET position to each laser point return time, scan angle, intensity, etc. Created raw laser point cloud data for the entire survey in *.las (ASPRS v. 1.2) format. Data were converted to orthometric elevations (NAVD88) by applying a Geoid09 correction.

   Software: ALS Post Processing Software v.2.70, Corpscon 6

4. Imported raw laser points into manageable blocks (less than 500 MB) to perform manual relative accuracy calibration and filter for pits/birds. Ground points were then classified for individual flight lines (to be used for relative accuracy testing and calibration).

   Software: TerraScan v.10.009

5. Using ground classified points per each flight line, the relative accuracy was tested. Automated line-to-line calibrations were then performed for system attitude parameters (pitch, roll, heading), mirror flex (scale) and GPS/IMU drift. Calibrations were performed on ground classified points from paired flight lines. Every flight line was used for relative accuracy calibration.

   Software: TerraMatch v.10.006

6. Position and attitude data were imported. Resulting data were classified as ground and non-ground points. Statistical absolute accuracy was assessed via direct comparisons of ground classified points to ground RTK survey data. **Software:** TerraScan v.10.009, TerraModeler v.10.004

7. Bare Earth models were created as a triangulated surface and exported as ERDAS Imagine grids at a .5–meter pixel resolution. Highest Hit models were created for any class at .5-meter grid spacing and exported as ERDAS Imagine grids.

   Software: TerraScan v.10.009, ArcMap v. 9.3.1, TerraModeler v.10.004

3.2 Aircraft Kinematic GPS and IMU Data

LiDAR survey datasets were referenced to the 1 Hz static ground GPS data collected over pre-surveyed monuments with known coordinates. While surveying, the aircraft collected 2 Hz kinematic GPS data, and the onboard inertial measurement unit (IMU) collected 200 Hz

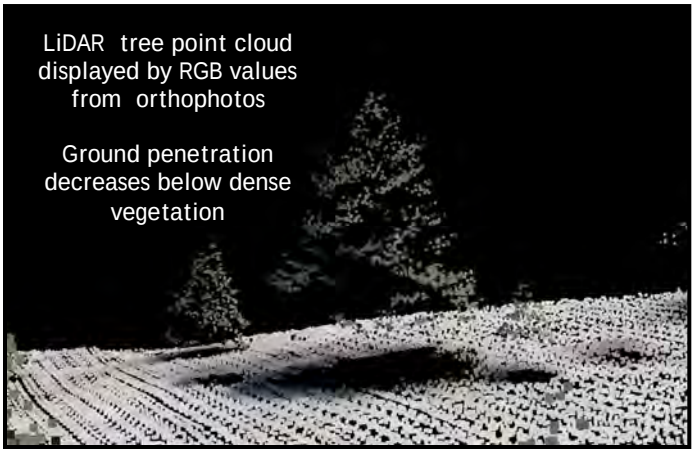
aircraft attitude data. Waypoint GPS v.8.10 was used to process the kinematic corrections for the aircraft. The static and kinematic GPS data were then post-processed after the survey to obtain an accurate GPS solution and aircraft positions. IPAS v.1.35 was used to develop a trajectory file that includes corrected aircraft position and attitude information. The trajectory data for the entire flight survey session were incorporated into a final smoothed best estimated trajectory (SBET) file that contains accurate and continuous aircraft positions and attitudes.

3.3 Laser Point Processing

Laser point coordinates were computed using the IPAS and ALS Post Processor software suites based on independent data from the LiDAR system (pulse time, scan angle), and aircraft trajectory data (SBET). Laser point returns (first through fourth) were assigned an associated (x, y, z) coordinate along with unique intensity values (0-255). The data were output into large LAS v. 1.2 files with each point maintaining the corresponding scan angle, return number (echo), intensity, and x, y, z (easting, northing, and elevation) information.

These initial laser point files were too large for subsequent processing. To facilitate laser point processing, bins (polygons) were created to divide the dataset into manageable sizes (< 500 MB). Flightlines and LiDAR data were then reviewed to ensure complete coverage of the survey area and positional accuracy of the laser points.

Laser point data were imported into processing bins in TerraScan, and manual calibration was performed to assess the system offsets for pitch, roll, heading and scale (mirror flex). Using a geometric relationship developed by Watershed Sciences, each of these offsets was resolved and corrected if necessary.



LiDAR points were then filtered for noise, pits (artificial low points), and birds (true birds as well as erroneously high points) by screening for absolute elevation limits, isolated points and height above ground. Each bin was then manually inspected for remaining pits and birds and spurious points were removed. In a bin containing approximately 7.5-9.0 million points, an average of 50-100 points are typically found to be artificially low or high. Common sources of non-terrestrial returns are clouds, birds, vapor, haze, decks, brush piles, etc.

Internal calibration was refined using TerraMatch. Points from overlapping lines were tested for internal consistency and final adjustments were made for system misalignments (i.e., pitch, roll, heading offsets and scale). Automated sensor attitude and scale corrections yielded 3-5 cm improvements in the relative accuracy. Once system misalignments were corrected, vertical GPS drift was then resolved and removed per flight line, yielding a slight improvement (<1 cm) in relative accuracy.

The TerraScan software suite is designed specifically for classifying near-ground points (Soininen, 2004). The processing sequence began by 'removing' all points that were not 'near' the earth based on geometric constraints used to evaluate multi-return points. The resulting bare earth (ground) model was visually inspected and additional ground point modeling was performed in site-specific areas to improve ground detail. This manual editing of ground often occurs in areas with known ground modeling deficiencies, such as: bedrock outcrops, cliffs, deeply incised stream banks, and dense vegetation. In some cases, automated ground point classification erroneously included known vegetation (i.e., understory, low/dense shrubs, etc.). These points were manually reclassified as default. Ground surface rasters were then developed from triangulated irregular networks (TINs) of ground points.

Once the points were finalized, GPS week was incorporated into the ASCII format of LiDAR points.

4. LiDAR Accuracy Assessment

4.1 Laser Noise and Relative Accuracy

Laser point absolute accuracy is largely a function of laser noise and relative accuracy. To minimize these contributions to absolute error, we first performed a number of noise filtering and calibration procedures prior to evaluating absolute accuracy.

Laser Noise
For any given target, laser noise is the breadth of the data cloud per laser return (i.e., last, first, etc.). Lower intensity surfaces (roads, rooftops, still/calm water) experience higher laser noise. The laser noise range for this survey was approximately 0.02 meters.

Relative Accuracy
Relative accuracy refers to the internal consistency of the data set - the ability to place a laser point in the same location over multiple flight lines, GPS conditions, and aircraft attitudes. Affected by system attitude offsets, scale, and GPS/IMU drift, internal consistency is measured as the divergence between points from different flight lines within an overlapping area. Divergence is most apparent when flight lines are opposing. When the LiDAR system is well calibrated, the line-to-line divergence is low (<10 cm). See Appendix A for further information on sources of error and operational measures that can be taken to improve relative accuracy.

Relative Accuracy Calibration Methodology

1. Manual System Calibration: Calibration procedures for each mission require solving geometric relationships that relate measured swath-to-swath deviations to misalignments of system attitude parameters. Corrected scale, pitch, roll and heading offsets were calculated and applied to resolve misalignments. The raw divergence between lines was computed after the manual calibration was completed and reported for each survey area.

2. Automated Attitude Calibration: All data were tested and calibrated using TerraMatch automated sampling routines. Ground points were classified for each individual flight line and used for line-to-line testing. System misalignment offsets (pitch, roll and heading) and scale were solved for each individual mission and applied to respective mission datasets. The data from each mission were then blended when imported together to form the entire area of interest.
3. Automated Z Calibration: Ground points per line were used to calculate the vertical divergence between lines caused by vertical GPS drift. Automated Z calibration was the final step employed for relative accuracy calibration.

4.2 Absolute Accuracy

To minimize the contributions of laser noise and relative accuracy to absolute error, a number of noise filtering and calibration procedures were performed prior to evaluating absolute accuracy. The LiDAR quality assurance process uses the data from the real-time kinematic (RTK) ground survey conducted in the AOI. For this project a total of 1912 RTK GPS measurements were collected by Watershed Sciences, Inc. on hard surfaces distributed among multiple flight swaths. Andregg Geomatics, Inc. also independently collected 48 fast static check points within the study area on hard surfaces with varying degrees of slope. To assess absolute accuracy, the location coordinates of these known ground points were compared to those calculated for the closest ground-classified laser points**.**

The vertical accuracy of the LiDAR data is described as the mean and standard deviation (sigma ~ σ) of divergence of LiDAR point coordinates from RTK ground survey point coordinates. To provide a sense of the model predictive power of the dataset, the root mean square error (RMSE) for vertical accuracy is also provided. These statistics assume the error distributions for x, y, and z are normally distributed, thus we also consider the skew and kurtosis of distributions when evaluating error statistics.

Statements of statistical accuracy apply to fixed terrestrial surfaces only and may not be applied to areas of dense vegetation or steep terrain (See Appendix A).

In addition to the 48 fast static check points, Andregg Geomatics, Inc. also collected 31 blind checkpoints on hard surfaces with varying degrees of slope. Watershed Sciences was given the x and y coordinates of these points and calculated the z value from the LiDAR data. Andregg Geomatics was then given the LiDAR derived z for a comparison with the known z value. (**Table 5, Figure 2, Appendix B**)

6. Study Area Results

Summary statistics for point resolution and accuracy (relative and absolute) of the LiDAR data collected in the Lake Tahoe survey area are presented below in terms of central tendency, variation around the mean, and the spatial distribution of the data (for point resolution by tile).

6.1 Data Summary

Table 2. LiDAR Resolution and Accuracy - Specifications and Achieved Values

	Targeted	Achieved
Resolution:	≥ 8 points/m^2	11.82 points/m^2
Vertical Accuracy (1 σ):	<15 cm	3.5 cm

6.2 Data Density/Resolution

The average first-return density of delivered dataset is 11.82 points per square meter (Table 2). The initial dataset, acquired to be ≥8 points per square meter, was filtered as described previously to remove spurious or inaccurate points. Additionally, some types of surfaces (i.e., dense vegetation, breaks in terrain, water, steep slopes) may return fewer pulses (delivered density) than the laser originally emitted (native density).

Ground classifications were derived from automated ground surface modeling and manual, supervised classifications where it was determined that the automated model had failed. Ground return densities will be lower in areas of dense vegetation, water, or buildings. **Figures 5** and **6** show the distribution of average native and ground point densities for each 1/100th USGS quad tile.

Cumulative LiDAR data resolution for the Lake Tahoe AOI:

- Average Point (First Return) Density = 11.82 points/m^2
- Average Ground Point Density = 2.26 points/m^2

Figure 3. Density distribution for first return laser points

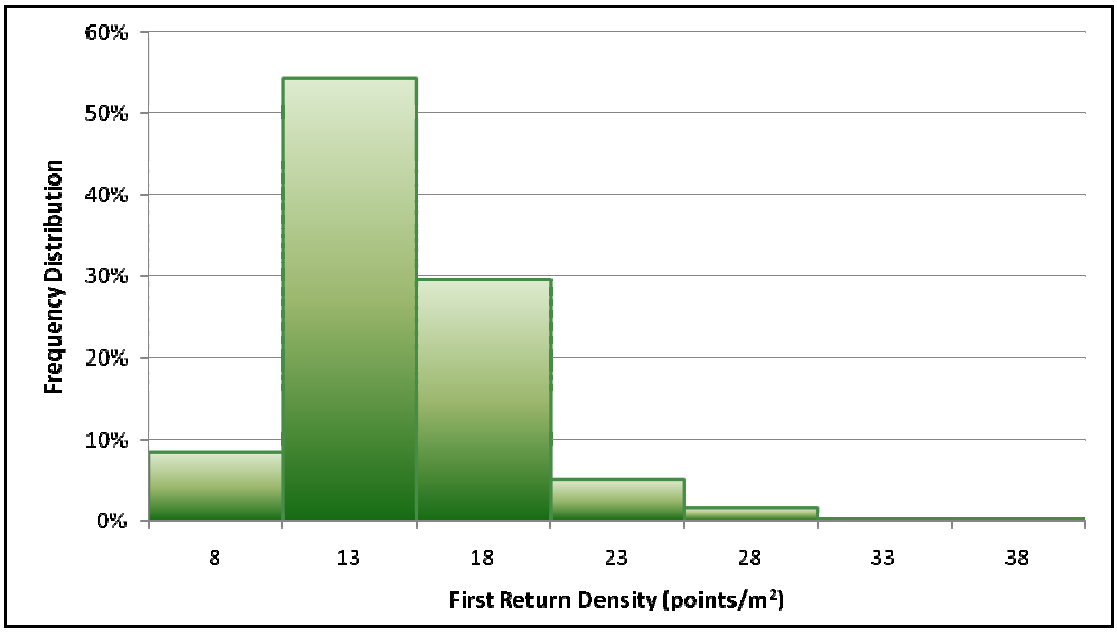


Figure 4. Density distribution for ground classified laser points

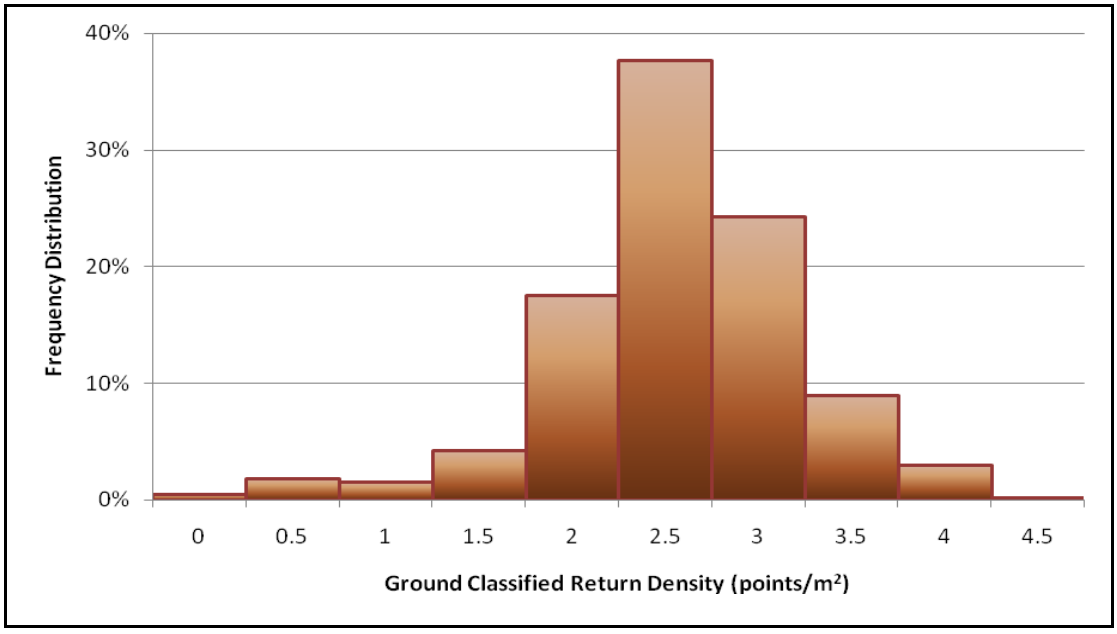


Figure 5. Density distribution map for first return points by 1/100th USGS Quad

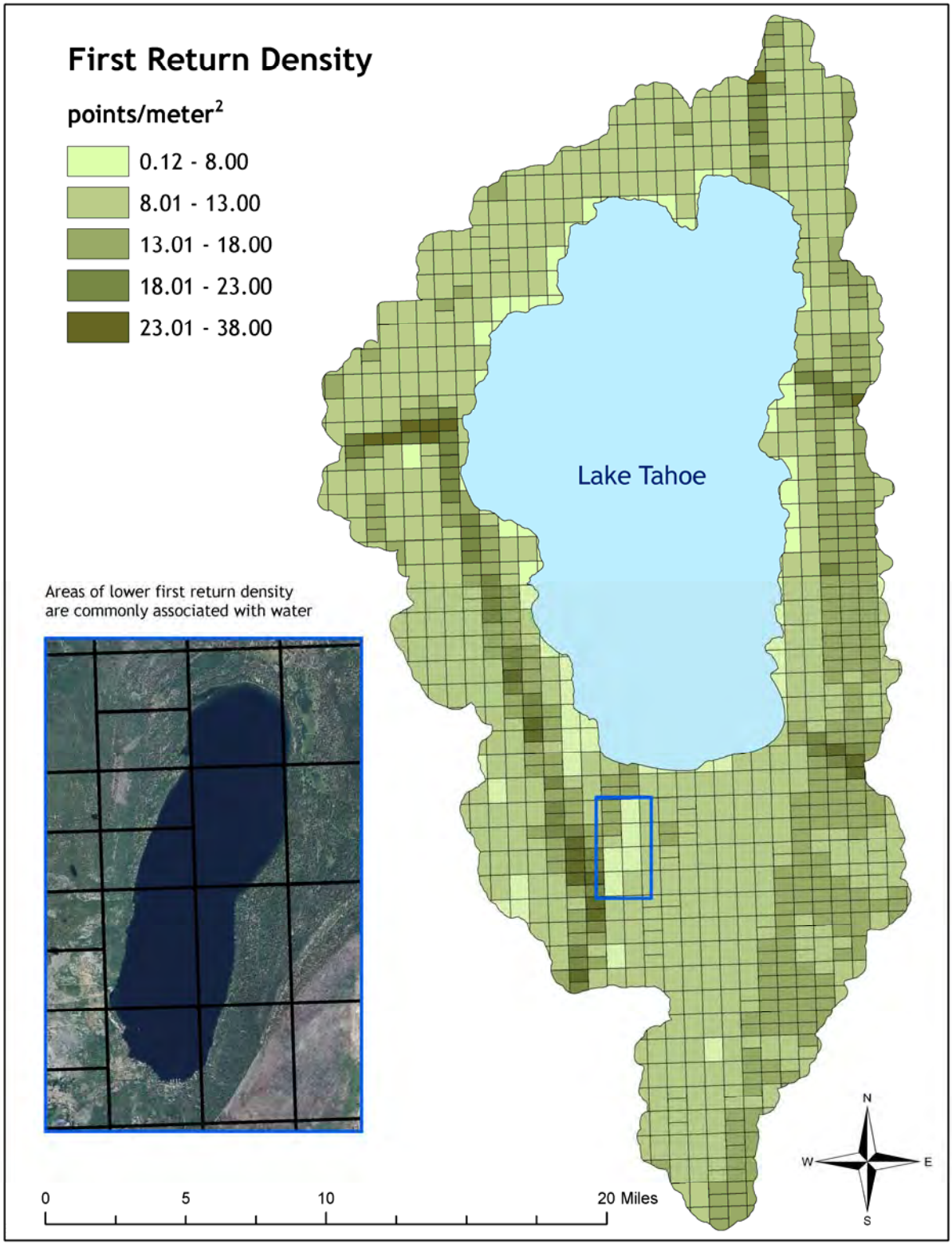
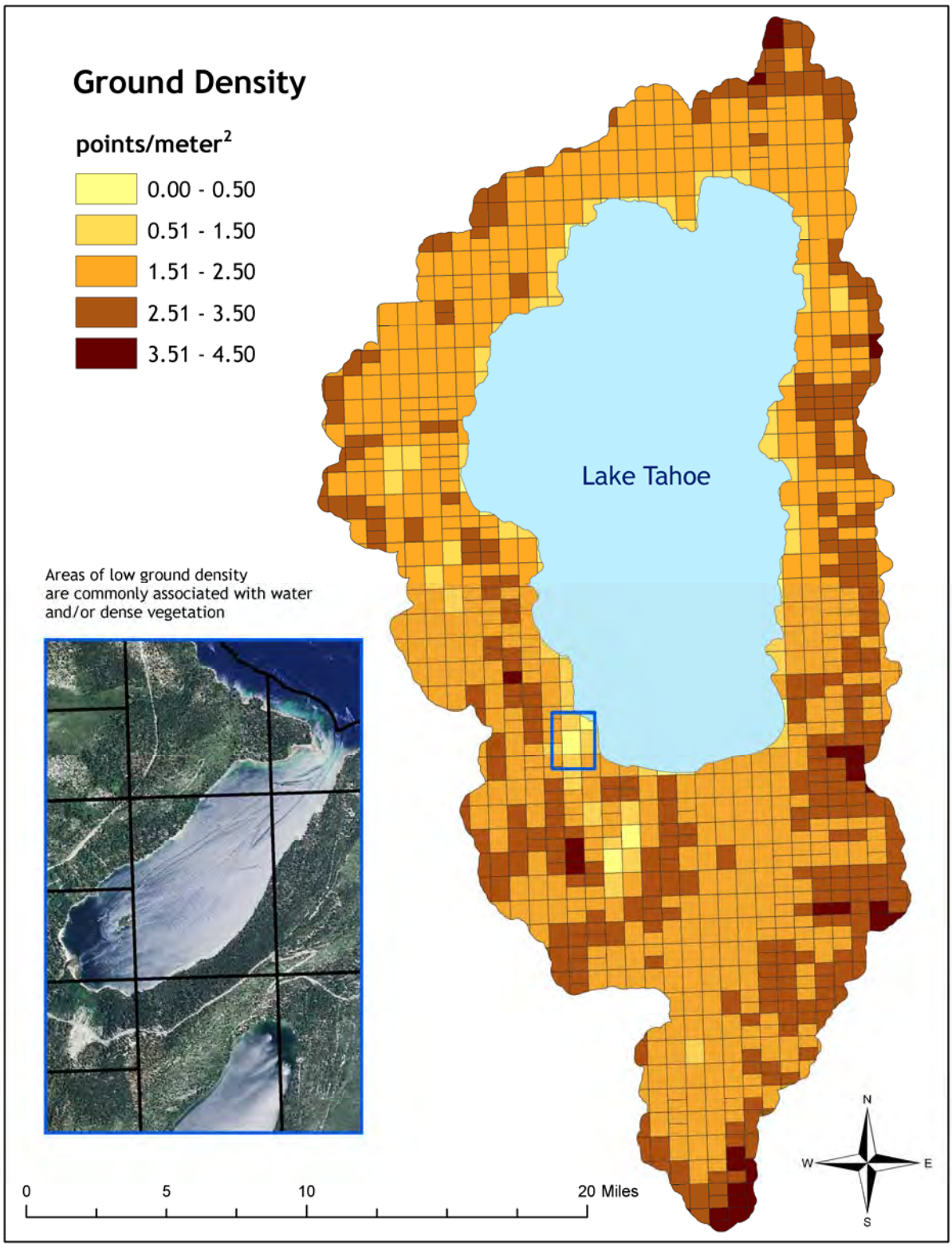


Figure 6. Density distribution map for ground return points by 1/100th USGS Quad

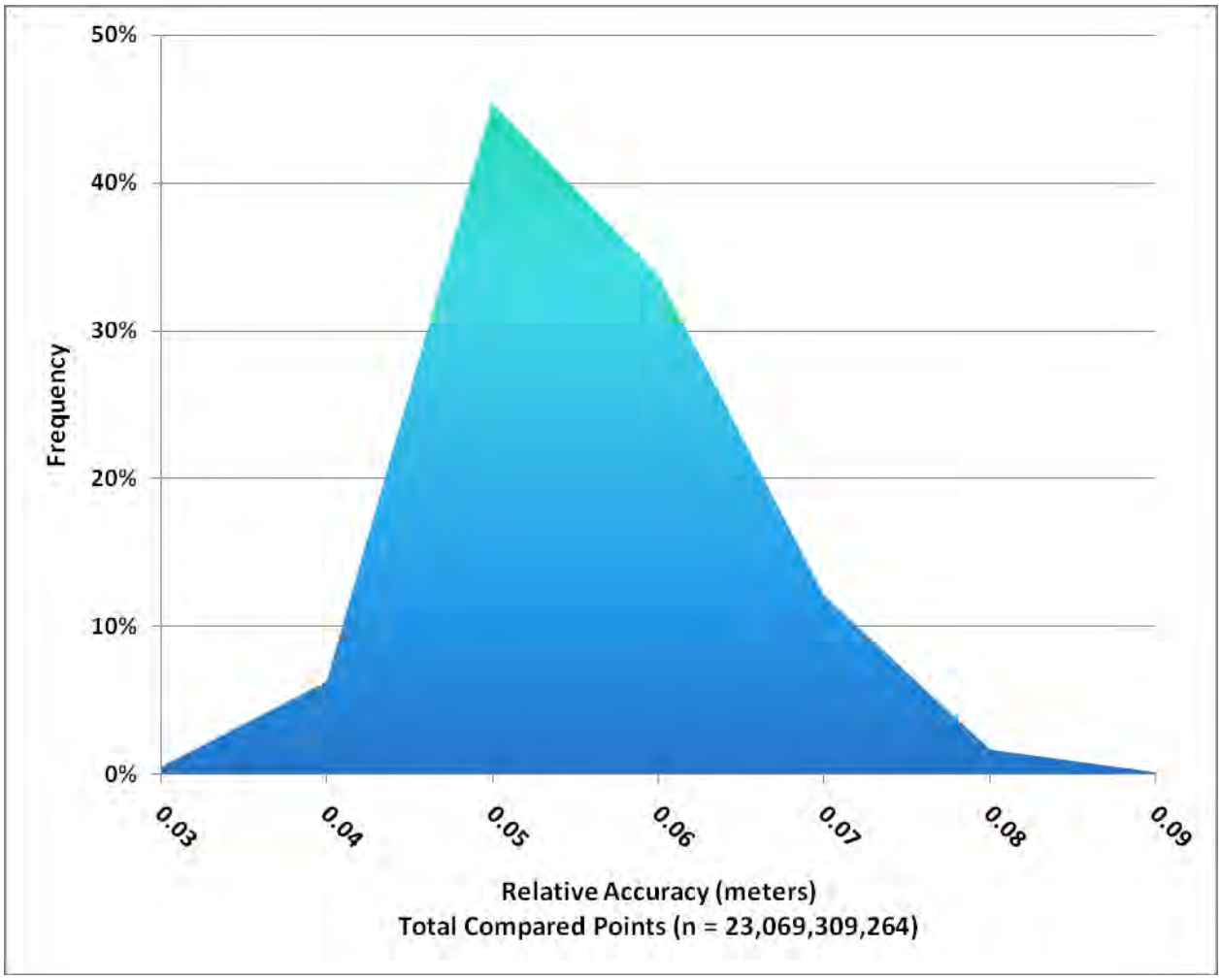


6.3 Relative Accuracy Calibration Results

Relative accuracy statistics for the Lake Tahoe dataset measure the full survey calibration including areas outside the delivered boundary:

- Project Average = 0.053 m
- Median Relative Accuracy = 0.050 m
- 1σ Relative Accuracy = 0.008 m
- 1.96σ Relative Accuracy = 0.016 m

Figure 7. Distribution of relative accuracies per flight line, non slope-adjusted



6.4 Absolute Accuracy

Absolute accuracies for the Lake Tahoe survey area:

Table 3. Watershed Sciences Absolute Accuracy – Deviation between laser points and RTK hard surface survey points

Watershed Sciences, Inc. Absolute Accuracy Assessment	
RTK Survey Sample Size (n): 1912	
Root Mean Square Error (RMSE) = 0.036 m	Minimum Δz = -0.113 m
Standard Deviations 1 sigma (σ): 0.035 m 1.96 sigma (σ): 0.068 m	Maximum Δz = 0.093 m Average Δz = -0.008 m

Figure 8. Absolute Accuracy - Histogram Statistics

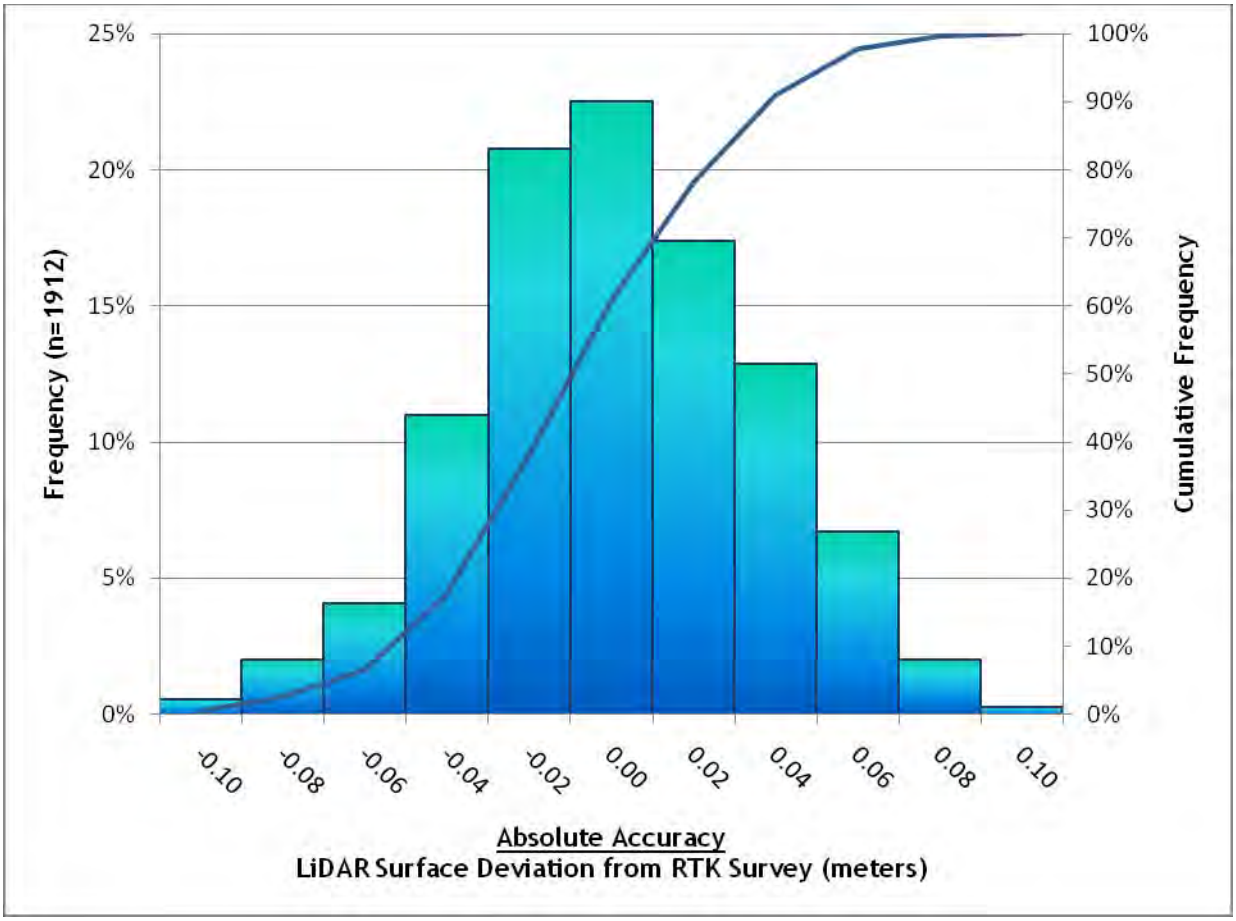


Table 4. Andregg Geomatics Absolute Accuracy – Deviation between laser points and RTK fast static check points

Andregg Geomatics, Inc. Independent Accuracy Assessment	
Sample Size (n): 48	
Root Mean Square Error (RMSE) = 0.057 m	Minimum Δz = -0.120 m
Standard Deviations 1 sigma (σ): 0.057 m 1.96 sigma (σ): 0.111 m	Maximum Δz = 0.130 m Average Δz = -0.012 m

Figure 9. Absolute Accuracy - Histogram Statistics

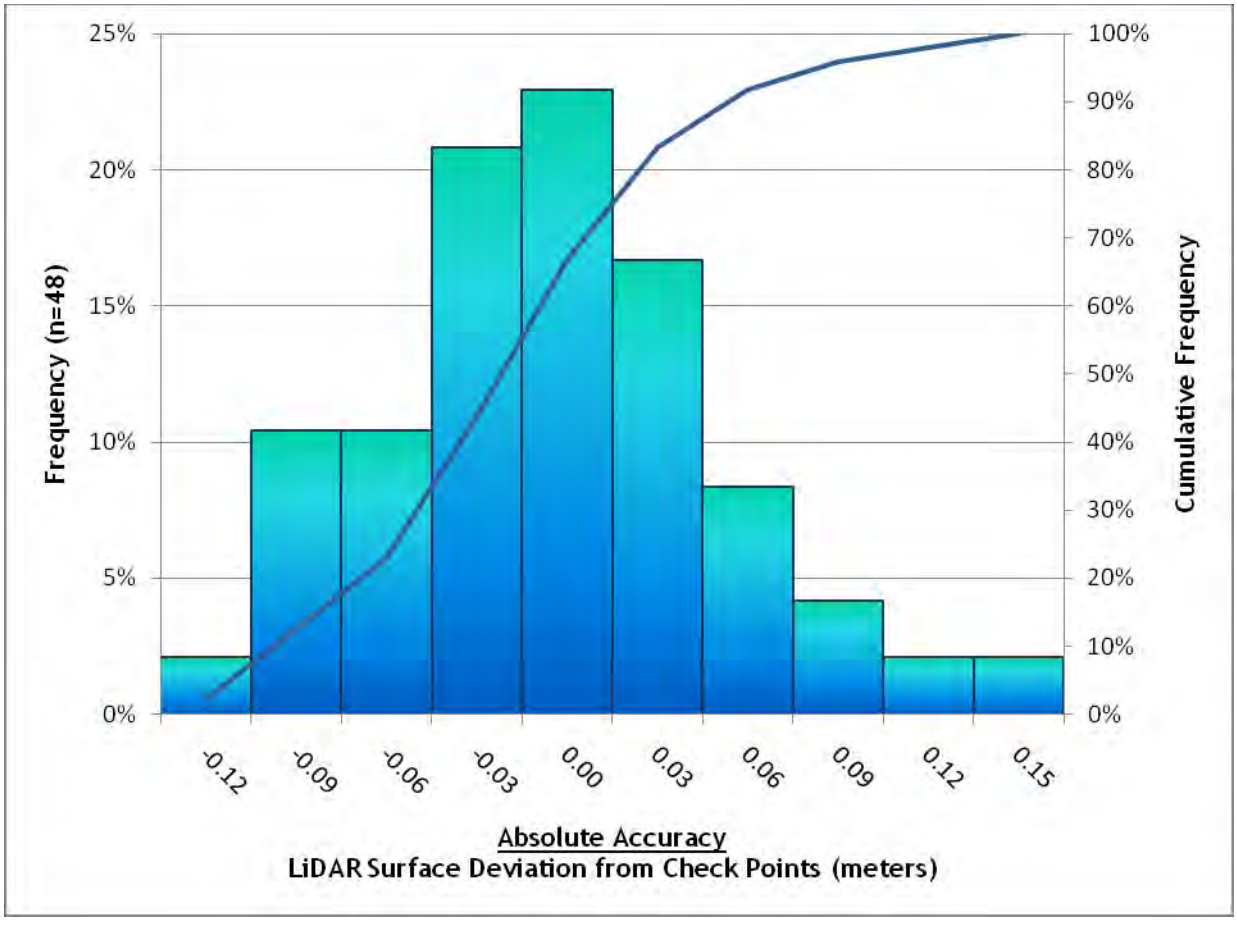


Table 5. Andregg Geomatic blind check point elevations compared with Watershed Science's LiDAR-derived elevations (see Appendix B)

Northing (m)	Easting (m)	Andregg Geomatics Elevation (m)	Watershed Sciences Elevation (m)	Elevation Difference (m)	Slope (degrees)
4341217.456	741910.542	1908.35	1908.36	-0.01	18.96
4329068.691	745496.960	2028.48	2028.45	0.03	15.77
4315106.077	752984.795	1970.29	1970.28	0.01	4.52
4309141.692	756112.695	2116.53	2116.53	0.00	23.84
4332411.342	767114.222	2149.18	2149.24	-0.06	4.62
4354971.457	765734.385	2616.27	2616.34	-0.07	8.84
4351669.767	763430.525	2184.00	2183.97	0.03	3.8
4348221.356	754169.466	1954.60	1954.64	-0.04	2.13
4342659.288	749549.896	2019.46	2019.58	-0.12	2.15
4339010.970	743763.546	1895.73	1895.73	0.00	5.39
4336956.483	745714.562	2003.25	2003.28	-0.03	4.12
4332737.575	742916.643	1940.29	1940.26	0.03	0.84
4313668.431	755726.440	1911.65	1911.67	-0.02	0.45
4312673.541	753986.546	1955.90	1955.92	-0.03	2.19
4312164.137	760706.880	1901.83	1901.93	-0.10	1.46
4303297.157	758153.229	1939.43	1939.51	-0.08	0.61
4298580.135	762147.591	2341.19	2341.40	-0.21	19.04
4318744.155	765371.059	1926.69	1926.81	-0.12	2.87
4318809.772	768236.427	2158.64	2158.64	0.00	19.52
4341933.718	768956.079	2520.95	2521.07	-0.12	1.91
4339417.893	768253.576	2433.43	2433.62	-0.19	16.61
4349090.236	761469.845	1955.78	1955.85	-0.07	27.46
4324714.073	749059.612	1901.46	1901.48	-0.02	0.29
4327019.010	746478.525	1965.80	1965.73	0.07	1.29
4328457.629	739899.058	2337.73	2337.70	0.03	8.49
4346275.471	746360.302	2403.99	2403.99	0.00	3.77
4343063.191	765324.516	1903.30	1903.33	-0.03	3.2
4304879.781	759109.667	1933.04	1933.12	-0.08	1.42
4324872.024	764540.643	1985.39	1985.58	-0.19	14.37
4347667.943	765171.283	1929.72	1929.68	0.04	2.66
4347617.901	754274.762	1902.06	1902.08	-0.02	1.21

100% of Points	RMSEz (m)	ACCURACYz (m) 1.96xRMSEz Spec=0.20m	Mean (m)	Std Dev (m)	# of Points	Min (m)	Max (m)
	0.08	0.16	0.01	0.01	31	0.0	0.04

7. Model Development

7.1 Hydro Flattened & Breakline Enforced Terrain Models

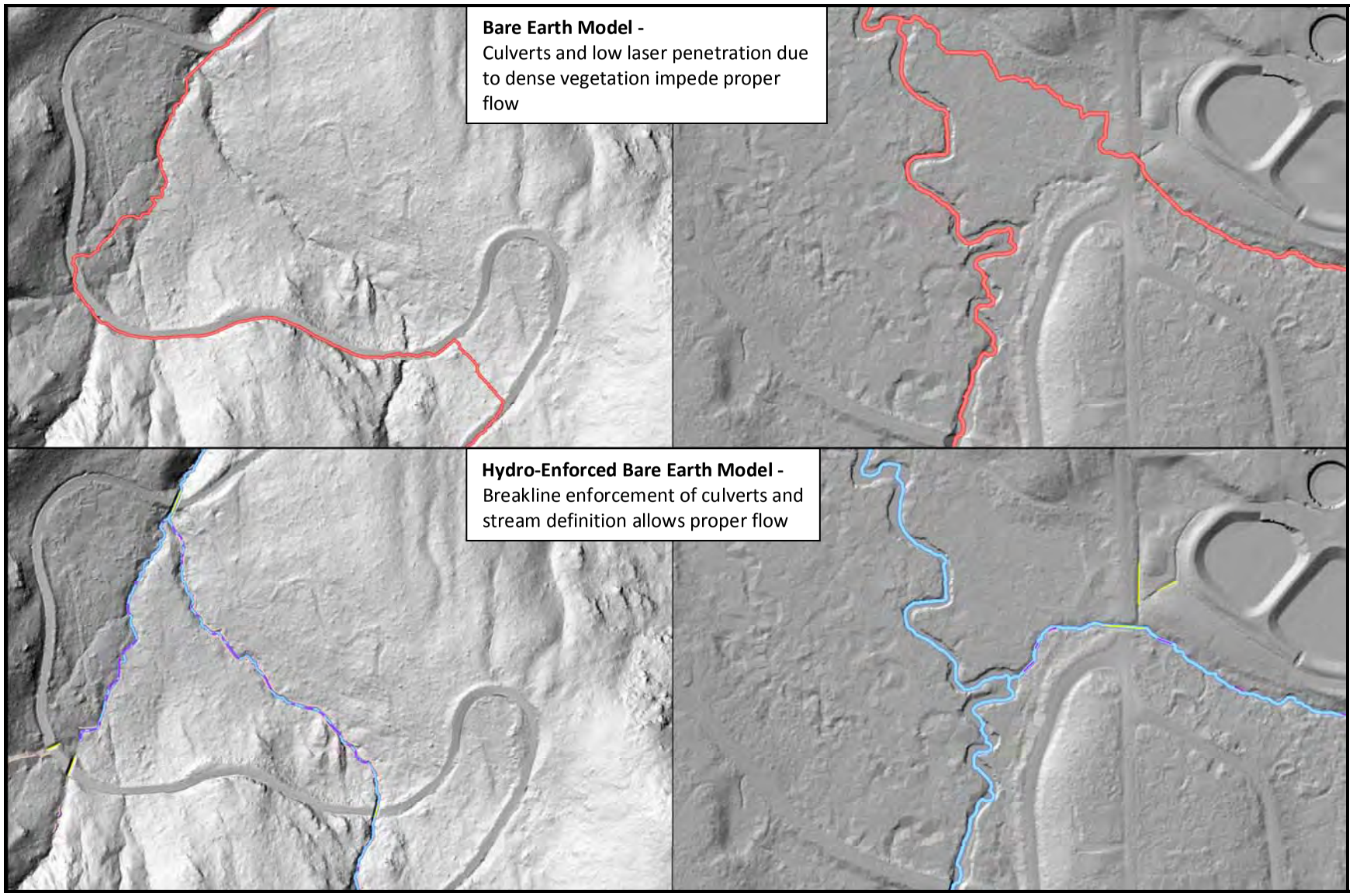
David C. Smith and Associates (DSA), Portland, OR created breaklines for the Lake Tahoe study area using LiDAR-grammetry. **Table 6** describes the type and definition of each breakline collected. The breaklines were used to supplement the LiDAR data in creation of a hydro-flattened and hydro-enforced ground model.

- Water boundaries were enforced using hard breaklines and water surfaces were flattened based on the elevation from the breaklines. The breakline boundaries were also used to reassign any ground classified points within the water delineated areas to a water class.
- Hard breaklines (lake edges, islands, etc.) were incorporated into the TIN by enforcing triangle edges (adjacent to the breakline) to the elevation values derived from the LiDAR-grammetric breakline. This implementation corrected interpolation along the hard edge.
- Culverts and artificial impediments to drainage flow were identified with hard breaklines. LiDAR data points within three meters of a culvert breakline were ignored from the ground classification, giving precedence to breakline Z values. This enforces proper drainage flow in development of the ground model.
- ArcHydro Tools 9 was run on resulting ground models as a quality inspection of stream definition. (**Figure 15**) In areas where stream definition deviated from bare earth ground model and breaklines, LiDAR data was reexamined to provide increased detail (adding or subtracting appropriate ground classified points).

Table 6. Breaklines collected for the Lake Tahoe study area.

Feature	Implementation	Description
Water_Lake	Hard Breakline	Lake Bodies
Water_Stream	Hard Breakline	Streams wider than ~3 meters
Water_Island	Hard Breakline	Islands
Hydro_Breakline	Hard Breakline	High Confidence breakline to enforce flow
Hydro_Connector	Hard Breakline	Low Confidence breakline to enforced flow
Culvert_Breakline	Hard Breakline	High Confidence breakline through culvert
Culvert Connector	Hard Breakline	Low Confidence breakline through culvert
Breakline	Hard Breakline	High Confidence breakline to supplement LiDAR data
Breakline_Obscured	Hard Breakline	Low confidence breakline to supplement LiDAR data

Figure 10. ArcHydro Tools 9 Stream Direction laid over LiDAR bare earth and hydro-enforced bare earth hillshaded models



Projection/Datum and Units

	Projection:	UTM Zone 10, NAD 83
Datum	**Vertical:**	NAVD88 Geoid09
	Horizontal:	NAD83 (CORS 96)
	Units:	meters

8. Deliverables

Point Data:	LAS 1.2 format • All Returns ASCII format • All Returns
Vector Data:	• Tile Index of LiDAR Points (1/100 USGS quad, shapefile format) • Tile Index of DEMs (1/4 USGS quad, shapefile format) • SBETs (shapefile format) • Ground points (ESRI file geodatabase format) • Lake Edge Boundaries (ESRI file geodatabase format) • Hydrologic Breaklines (ESRI file geodatabase format)
Raster Data:	• Elevation Models (0.5 m resolution) • Hydro-Flattened Bare Earth Model (IMG format) • Hydro-flattened/Hydro-Enforced Bare Earth Model (IMG format) • Highest Hit Model (IMG format) • Intensity Images (0.5 m resolution, IMG format)
Data Report:	• Full report containing introduction, methodology, and accuracy

9. Selected Images

Figure 11. 3D point cloud of Lake Tahoe Airport (colored by 2009 NAIP)

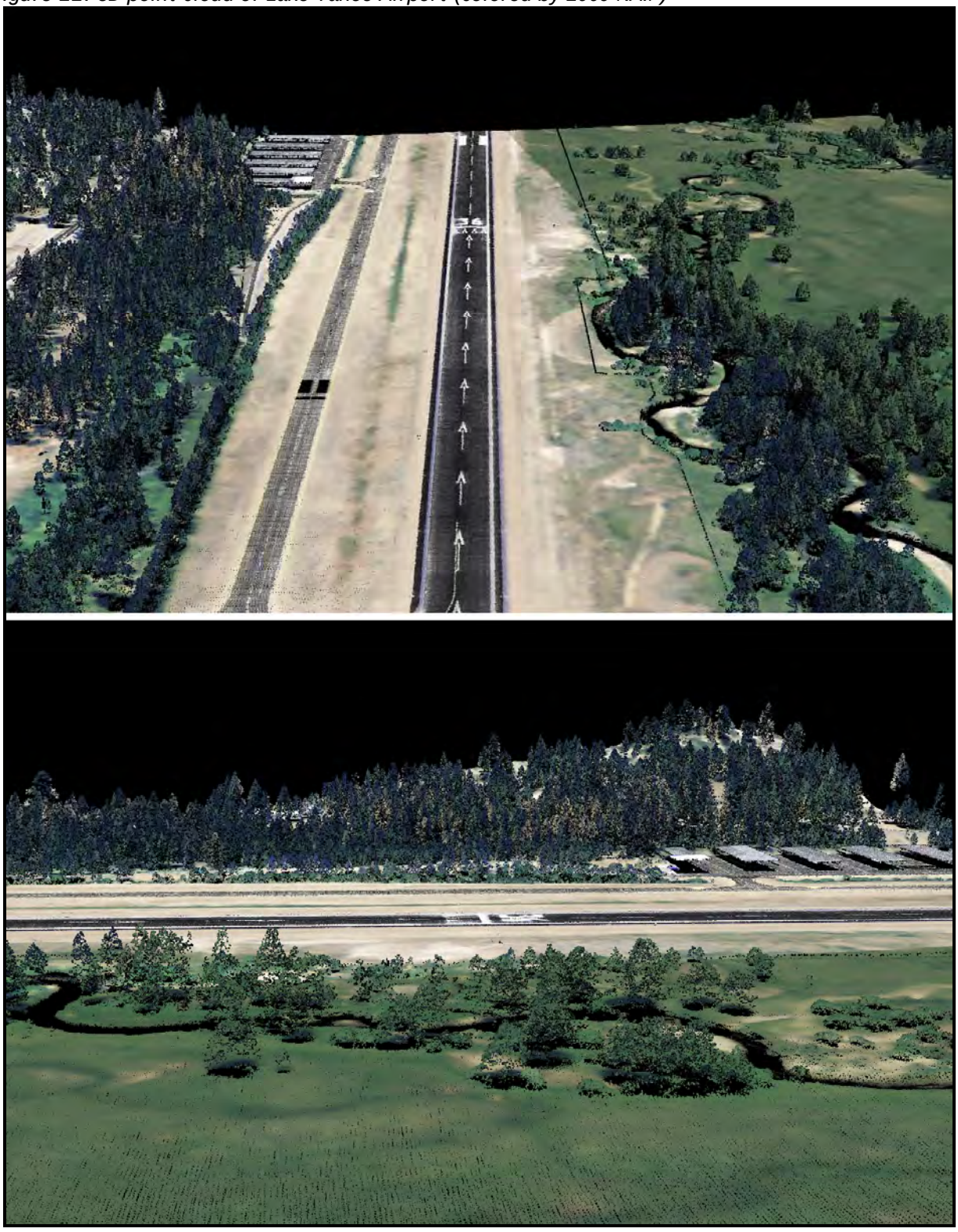


Figure 12. 3D LiDAR point cloud looking southwest from the marina at Tahoe Keys Resort (colored by 2009 NAIP)

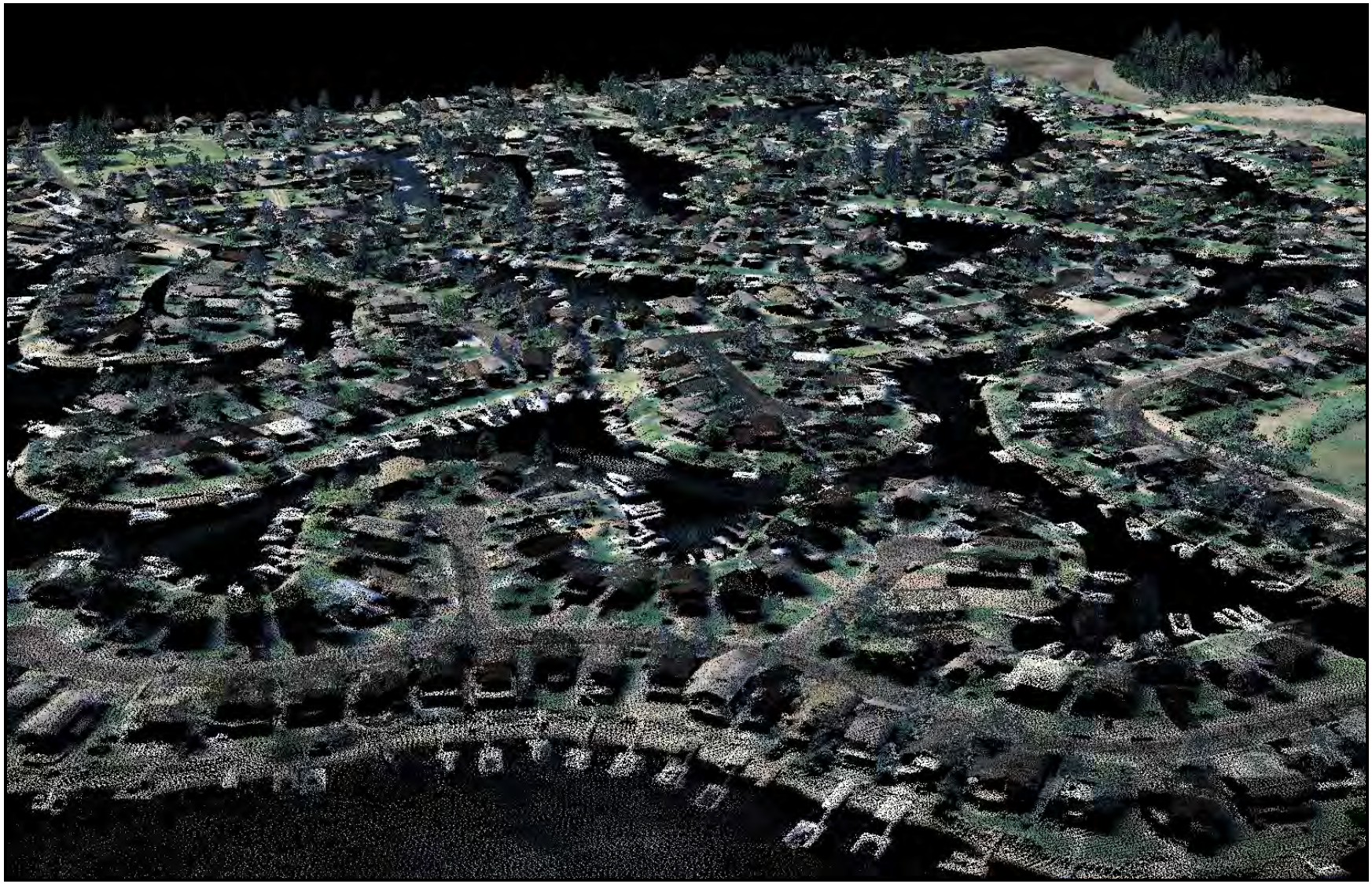


Figure 13. 3D LiDAR point cloud looking west over Lake Tahoe Dam (colored by 2009 NAIP)

Figure 14. 3D LiDAR point cloud, looking northwest across Crag Lake (colored by 2009 NAIP)

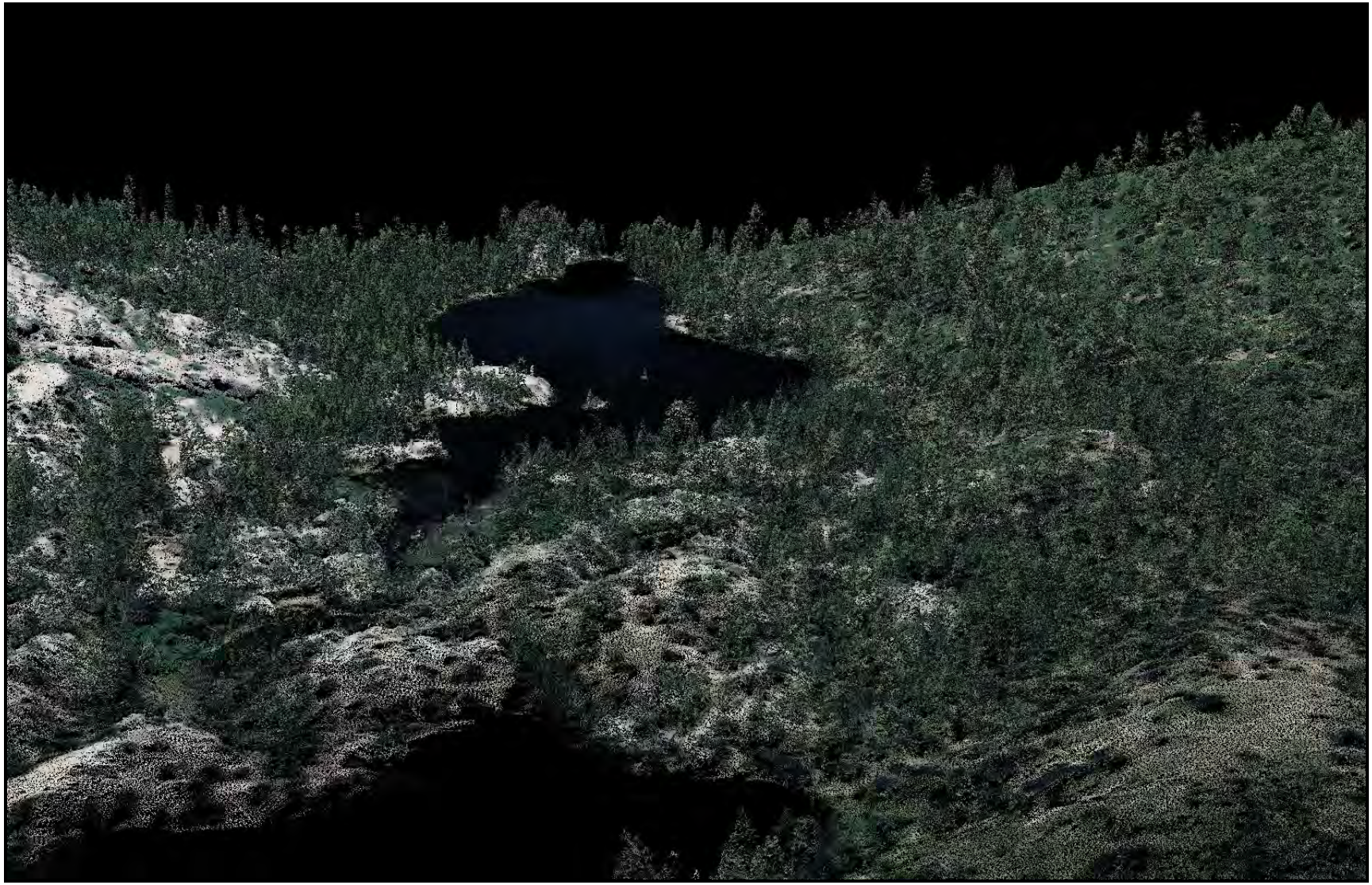


Figure 15. 3D LiDAR point cloud looking at Heavenly Ski Resort slopes (colored by 2009 NAIP)

Figure 16. 3D LiDAR point cloud looking northeast over the golf course at Lake Valley State Recreation Area (colored by 2009 NAIP)

10. Glossary

1-sigma (σ) Absolute Deviation: Value for which the data are within one standard deviation (approximately 68th percentile) of a normally distributed data set.

1.96-sigma (σ) Absolute Deviation: Value for which the data are within two standard deviations (approximately 95th percentile) of a normally distributed data set.

Root Mean Square Error (RMSE): A statistic used to approximate the difference between real-world points and the LiDAR points. It is calculated by squaring all the values, then taking the average of the squares and taking the square root of the average.

Pulse Rate (PR): The rate at which laser pulses are emitted from the sensor; typically measured as thousands of pulses per second (kHz).

Pulse Returns: For every laser pulse emitted, the Leica ALS 50 Phase II system can record *up to four* wave forms reflected back to the sensor. Portions of the wave form that return earliest are the highest element in multi-tiered surfaces such as vegetation. Portions of the wave form that return last are the lowest element in multi-tiered surfaces.

Accuracy: The statistical comparison between known (surveyed) points and laser points. Typically measured as the standard deviation (sigma, σ) and root mean square error (RMSE).

Intensity Values: The peak power ratio of the laser return to the emitted laser. It is a function of surface reflectivity.

Data Density: A common measure of LiDAR resolution, measured as points per square meter.

Spot Spacing: Also a measure of LiDAR resolution, measured as the average distance between laser points.

Nadir: A single point or locus of points on the surface of the earth directly below a sensor as it progresses along its flight line.

Scan Angle: The angle from nadir to the edge of the scan, measured in degrees. Laser point accuracy typically decreases as scan angles increase.

Overlap: The area shared between flight lines, typically measured in percents; 100% overlap is essential to ensure complete coverage and reduce laser shadows.

DTM / DEM: These often-interchanged terms refer to models made from laser points. The digital elevation model (DEM) refers to all surfaces, including bare ground and vegetation, while the digital terrain model (DTM) refers only to those points classified as ground.

Real-Time Kinematic (RTK) Survey: GPS surveying is conducted with a GPS base station deployed over a known monument with a radio connection to a GPS rover. Both the base station and rover receive differential GPS data and the baseline correction is solved between the two. This type of ground survey is accurate to 1.5 cm or less.

11. Citations

Soininen, A. 2004. TerraScan User's Guide. TerraSolid.

Appendix A

LiDAR accuracy error sources and solutions:

Type of Error	Source	Post Processing Solution
GPS (Static/Kinematic)	Long Base Lines	None
	Poor Satellite Constellation	None
	Poor Antenna Visibility	Reduce Visibility Mask
Relative Accuracy	Poor System Calibration	Recalibrate IMU and sensor offsets/settings
	Inaccurate System	None
Laser Noise	Poor Laser Timing	None
	Poor Laser Reception	None
	Poor Laser Power	None
	Irregular Laser Shape	None

Operational measures taken to improve relative accuracy:

1. Low Flight Altitude: Terrain following is employed to maintain a constant above ground level (AGL). Laser horizontal errors are a function of flight altitude above ground (i.e., ~ $1/3000^{th}$ AGL flight altitude).
2. Focus Laser Power at narrow beam footprint: A laser return must be received by the system above a power threshold to accurately record a measurement. The strength of the laser return is a function of laser emission power, laser footprint, flight altitude and the reflectivity of the target. While surface reflectivity cannot be controlled, laser power can be increased and low flight altitudes can be maintained.
3. Reduced Scan Angle: Edge-of-scan data can become inaccurate. The scan angle was reduced to a maximum of $\pm 15^{o}$ from nadir, creating a narrow swath width and greatly reducing laser shadows from trees and buildings.
4. Quality GPS: Flights took place during optimal GPS conditions (e.g., 6 or more satellites and PDOP [Position Dilution of Precision] less than 3.0). Before each flight, the PDOP was determined for the survey day. During all flight times, a dual frequency DGPS base station recording at 1–second epochs was utilized and a maximum baseline length between the aircraft and the control points was less than 19 km (11.5 miles) at all times.
5. Ground Survey: Ground survey point accuracy (i.e. <1.5 cm RMSE) occurs during optimal PDOP ranges and targets a minimal baseline distance of 4 miles between GPS rover and base. Robust statistics are, in part, a function of sample size (n) and distribution. Ground survey RTK points are distributed to the extent possible throughout multiple flight lines and across the survey area.
6. 50% Side-Lap (100% Overlap): Overlapping areas are optimized for relative accuracy testing. Laser shadowing is minimized to help increase target acquisition from multiple scan angles. Ideally, with a 50% side-lap, the most nadir portion of one flight line coincides with the edge (least nadir) portion of overlapping flight lines. A minimum of 50% side-lap with terrain-followed acquisition prevents data gaps.
7. Opposing Flight Lines: All overlapping flight lines are opposing. Pitch, roll and heading errors are amplified by a factor of two relative to the adjacent flight line(s), making misalignments easier to detect and resolve.

Appendix B

Tahoe Regional Planning Agency
High-Resolution LiDAR Data for the Lake Tahoe Watershed

REPORT BY: Michael Farrauto, LSIT
Sr. PROJECT MANAGER: Mark J. Bardakjian, PLS

I. Project Background:
The Tahoe Regional Planning Agency (TRPA) in coordination with the US Geological Survey was interested in acquiring a terrestrial LiDAR dataset for the entire Lake Tahoe Watershed (~1,100km^2), California, Nevada, including a 1km buffer surrounding the watershed boundary. Post-processed LiDAR data will be used to derive thematic derivative products necessary for planning, monitoring and research.

II. Overview:
ANDREGG Geomatics conducted office and field work for this project to develop and certify a survey control network within the study region to be used in airborne LiDAR data acquisition and the collection/processing of ground check points (GCPs). These efforts were conducted between the months of June 2010 – January 2011 under contract with Watershed Sciences through the direction of Russell Faux.

Horizontal Datum:
The horizontal datum is based on the North American Datum of 1983 (NAD83) UTM Zone 10, Meters.

Vertical Datum:
The vertical datum is based on the North American Vertical Datum of 1988 (NAVD88), Meters and derived from Geoid09.

Task 1: Develop and Certify a Survey Control Network:

Network Design and Reconnaissance:
This task required initial research of all NGS published stations, county & local agencies benchmarks or other stations that could be incorporated into a Primary Control Network. This process involved searching the National Geodetic Survey's Database, contacting County Surveyors, and other local agencies for information of all stations within project.

Once the initial research was completed and flightlines were received from Watershed Sciences, a preliminary Primary Control Network of "ideal" locations was prepared in order to determine areas for reconnaissance. In discussions with Watershed Sciences, it was decided that in order to reach all project accuracy specifications these Primary Control Network stations would need to be located within 13 nautical miles (24km) of all flightlines.

As part of the reconnaissance effort, any stations that existed within the approximated "ideal" area it was then necessary to determine each station's condition and assess the station based on the criteria listed below. To encourage its future use and to perpetuate the network, the stations should be situated in easy access locations, preferably near highways and road systems. The actual site location for all stations must meet the following conditions in order to be incorporated into the network.
Ease of access by vehicle, personnel and equipment without disturbing property owners. The site must be safe to occupy by personnel, vehicles, and equipment.
Permanence and security of the site for protection and preservation of the monument. Preferably within public rights of way or improved areas.
GPS visibility, that the site is visible to the majority of GPS satellites.

As part of the reconnaissance, all stations were visited to confirm their existence and suitability to support the airborne LiDAR data acquisition requirements. Sketches of the stations were prepared with drive-to directions and photographs, (see Attachment 1). This reconnaissance was necessary in finalizing the Primary Control Network design.

After completion of the reconnaissance efforts, the Primary Network Design was finalized (see Attachment 2). The network included eight National Geodetic Surveys (NGS) published stations, three NGS CORS stations and five newly established stations.
NGS Published Stations:

Designation	PID
AP 1967 STA A	JR1334
ARP	JR0864
BROCKWAY	DH6447
D836	KS0133
HPGH D CA 03 FS	AE9848
EMERALD	DH6450
Q 208 RESET	AI3453
V 1201	KS0107

NGS CORS Stations:

CORS ID	PID

DOT1	DH8860
RNO1	DE6254
ZOLE	DE6252

New Stations:

Station Name
MEEKS
ROSE 1
ROSE 2
SPOONER
TAHOE CITY

GPS Observations and Data Collection

All receivers are owned and operated by ANDREGG GEOMATICS. The equipment used included 4 Trimble 4000SSi dual-frequency, full-wavelength GPS receivers with Compact L1/L2 geodetic-quality antennas with ground planes. Different makes and models of antennas have different phase patterns and if not accounted for could result in vertical discrepancies up to 10cm. A 2-meter fixed-height, force centered tripods were used to minimize station occupation errors. The fixed height tripods are checked and calibrated weekly. The equipment models, both receivers and antennas, have been tested and approved on the Federal Geodetic Control Subcommittee test network.

GPS observations of the Primary Control Network stations were conducted in accordance to the project specifications. Existing (published) stations were observed with a minimum of one session of at least two hours and newly established stations were observed with a minimum of two sessions of at least two hours. Three NGS CORS stations were incorporated in the post processing; all of these NGS CORS stations were located with 80 km of the Primary Control Network. Additional observation data of the Primary Network Control collected by Watershed Sciences were incorporated into the processing and adjustment, adding redundancy to the network.

Each baseline was observed at least twice on 2 different days at 2 different times of day. Satellite coverage and positional dilution of precision (PDOP) charts were reviewed to insure a difference in satellite geometry and atmospheric conditions between the multiple observations. All GPS measurements were made during periods with PDOP less than or equal to 3.0 and with at least six common satellites. Observation log sheets were created at each station setup and occupation. The log sheets contain station names, PID (if applicable), session number, operator name, Julian date, date & time (local and UTC), monument description and receiver/antenna make and model information. Each station setup included a pre- and post-observation checklist to insure proper antenna height, magnetic north orientation, tripod plumb and eccentricity.

Data Processing

Trimble's GPSurvey software (Version 2.35a) was used in reviewing, analyzing and processing of the GPS data. GPSurvey was used for baseline vector processing of the data to optimal double differenced fixed integer ionosphere free solutions for all observed vectors. Station and vector

solutions were reviewed to insure station naming and occupations were consistent. Redundant vectors were reviewed for consistency and discrepancies and analyzed for errors and blunders.

Minimally Constrained Network Adjustment:

A minimally constrained least squares adjustment was performed to determine the integrity of the baseline observations. For this adjustment only one NGS CORS station was constrained to its published NAD83 (CORS96) geodetic latitude, longitude and ellipsoid height. All statistics were evaluated at the 95% confidence level.

The final network consisted of 154 accepted GPS vectors between 16 stations. The observational standard error of each vector component was used as the initial, or a priori, weighting of the vector observation. The average a priori standard errors for each vector component were 0.02009 seconds of arc for azimuth, 0.01397 meters for ellipsoid height difference, and 0.00256 meters for distance.

The standard error of unit weight (Reference Variance Factor) for the minimally constrained network was determined at 1.00 by applying a priori station weighting and scaling of the observational standard errors with 492 degrees of freedom. Using an a priori error scalar of 5.92 for adjusted weighting of the GPS observational errors and a station occupation error of 0.01 ft in both antenna height and centering the Chi Square statistical test passed indicating good agreement between a priori error weighting estimation and the a posteriori adjusted values. The average standard error, at 95% confidence, was 0.0042 m (0.013 ft) in latitude, 0.0036 m (0.011 ft) in longitude and 0.0141 m (0.043 ft) in ellipsoid height. The average precision on all possible lines was 0.391 PPM. These statistics indicate the network observations are of high quality and the network integrity is very strong. With the network fitting well within itself, indicating no blunders or other unreasonable errors, a final fully constrained adjustment was undertaken, (see Attachment 3).

Fully Constrained Network Adjustment:

The final fully constrained least squares adjustment consisted of constraining to the NGS NAD83 (CORS96) published horizontal of 3 NGS CORS Stations. In addition, 1 NAVD88 First Order Vertical Control station (V 1201) was constrained to its published orthometric height (elevations) and with 6 other Height Modernization and NGS CORS Stations. The orthometric values for these six were computed from the published high order ellipsoid height and applying the Geoid separation. All observations were adjusted in the network by least squares to fit these constraints.

Before proceeding with the horizontal and vertical adjustment, however, another set of observations, i.e. geoid heights, were introduced into the network. The geoid height is the difference between the orthometric height (elevation) and ellipsoid height (mathematical surface) and is a non-linear relationship. These modeled estimated values for separation obtained from Geoid09 typically have standard errors larger than those of GPS observations. Using the standard error as the initial *a priori* weighting in the observation network adjustment the Geoid09 correlated separation values will be subjected to the least squares adjustment for best fit. Using the published high order values as constraints for ellipsoid heights and values of separation for the published stations, all of the orthometric heights for the stations in the network were adjusted

to fit. Therefore the adjusted Geoid09 modeled estimated geoid heights, constrained to the higher order values for ellipsoid and separation values, were subjected to a least squares adjustment in order to derive the best value for orthometric heights of the stations that were not constrained.

In an iterative manner, beginning with the minimally constrained adjustment, individual station constraints were added to the network adjustment. Following each adjustment, the adjusted values for horizontal and vertical positions were compared to their published values. If those values agreed within 0.05m then they were held as constraints in the next adjustment. And so on, until all available constraints had been considered and those that fell within the acceptable range were used. Using the same station weighting and an a priori error scalar of 7.19 the fully constrained Network Reference Variance Factor (Standard Error of Unit Weight) was found to be 1.00 with the Chi Square test passing. The fully constrained average standard error in horizontal position, at the 95% confidence level, for both latitude and longitude in the fully constrained adjustment were 0.0492m (0.015 ft) and 0.0427m (0.013 ft) respectively. The fully constrained average standard error, again at 95% confidence, for the ellipsoid height and orthometric height was 0.157m (0.048 ft) and 0.174m (0.053 ft) respectively. The average precision over all possible baselines was 0.067 PPM. The average adjusted geoid height for the network was –78.315 meters, (see Attachment 4).

Adjustment Conclusion:

The procedures, methodology and techniques implemented through the acquisition and processing of the data, introducing reasonable error weighting and a logical progression of the least squares adjustment process, along with the statistical results of the minimally and fully constrained adjustments all lead to the conclusion that the data collected is sound, the errors are reasonable, small and random, the weighting schemes are judicious, the constraints are good within their own published positional standard errors and the resultant values for horizontal and vertical positions of the new unconstrained stations are precise and accurate for the intended purposes. With these indications of precision and accuracy there is a high expectation that the actual directly observed measurements and resulting positional and height values should fall within the project specifications.

The final fully constrained adjustment results, in both US Survey feet and meters, geodetic positions with ellipsoid and orthometric heights along with their associated standard errors and NAD83 (CORS96) UTM Zone 10, grid coordinates in meters are shown in Attachment 5.

Task 2: Collection and Processing of Ground Check Points (GCPs):

The intent of the GCPs survey was to provide a minimum of 50 LiDAR Calibration points to Watershed Resources to use to register and calibrate the LiDAR data sets to bare earth and a minimum of 30 ‘blind’ points for an internal vertical accuracy assessment. The horizontal values for the ‘blind’ points would be sent to Watershed Sciences and the LiDAR elevation values would be returned and compared to the actual surveyed vertical value as an internal quality control check. Elevation residuals of the ‘blind’ points would be reviewed and analyzed to determine if there were any problems to correct or adjustments to be made to the LiDAR data sets.

Initial locations for the GCPs were provided to Watershed Sciences for review of their geographic location in comparison to the proposed acquisition flight lines, (see Attachment 6). The locations of the GCPs were evenly distributed throughout the limits of airborne LiDAR data acquisition to obtain a wide area assessment of the LiDAR dataset and to obtain internal checks of data in the different terrain types. The 'blind' points were also positioned outside of the vicinity of the LiDAR calibration points to avoid any bias. Using available imagery and local knowledge of the project area, GCP locations were approximated. Both the LiDAR calibration and 'blind' points were field adjusted to conform to the required terrain types and to accommodate any rights of entry issues. Public outreach efforts were conducted to gain access to private property in remote areas where the point could not be established within public access. Continual communications between office and field personal assisted in proper placement of all GCPs and overall work flow progress. Each location was selected on flat or uniformly sloping terrain within 5 meters in all directions and marked by a survey marker set flush with surface. A lath was set at each location with a station ID number written on it. Photographs were taken at all locations to verify the terrain type. All field materials were collected and processed weekly to insure that all the data was being collected and recorded in compliance with specifications.

Standard GPS data collection methods were followed for all GCPs. These procedures and methodologies included the use of Fast Static techniques and incorporation of Primary Control Network stations that had recently been adjusted to final network values. This was accomplished using a 3-person crew with dual frequency geodetic GPS receivers together with geodetic antenna with ground planes. To eliminate instrument height errors, 2 meter fixed height, force center antenna tripods were used. The field survey data collection was designed and coordinated so that there were always 2 known base stations occupied while 3 roving receivers occupied the desired GCPs. Vector observations were designed so that nearest adjacent stations were directly observed promoting the use of short baselines and to obtain ionospheric free solutions tying into previously established control stations. All data collection was at least 20 minutes with 5 satellites. 5 Trimble 4000 SSI dual frequency GPS receivers were used for the GPS observations.

Post Processing

Using the above mentioned procedures and methodology for post processing of the GCPs; it was anticipated that final coordinates and elevations of all of the GCPs would achieve acceptable accuracies and precision. The final GCPs survey consisted of 1101 accepted GPS vectors between 92 stations, including 845 redundant observations.

'Blind' GCP Internal Vertical Accuracy Assessment:

A spreadsheet containing the 'Blind GCP's X and Y values were provided to Watershed Sciences. The spreadsheet was returned with the elevation data of each 'blind' GCPs based on

the LiDAR dataset, (see Attachment 7). The following tables summarize the statistical and residual results of the 'blind' GCP surveys compared to the LiDAR data point readings.

Vertical Accuracy Analysis:

100% of Points	RMSEz (m)	ACCURACYz (m) 1.96xRMSEz Spec=0.20m	Mean (m)	Std Dev (m)	# of Points	Min (m)	Max (m)
	0.08	0.16	0.01	0.01	31	0.0	0.04

The Fundamental Vertical Accuracy$_z$ (FVA) at the 95% confidence level is equal to 1.96 times the RMSE$_z$. The FVA was calculated for the all 'blind' GCPs and was below the project specification of 0.20m at 0.16m. Any systematic errors or problems with the LiDAR sensor would be exposed if this specification was not met.

It is with confidence that the adjustment values resulting from this effort meet project specifications. I therefore certify that this work was done correctly and professionally by me or under my direct supervision.

Respectfully Submitted;
ANDREGG GEOMATICS

Mark J. Bardakjian PLS 4567
Principal, Chief Operations Officer

Appendix C

Andregg Geomatics' Certification of Control Network:

TRPA - LAKE TAHOE LiDAR CONTROL NETWORK
NAD83(CORS 2002.0) - NAVD88 BM V1201 EL:2069.513
UTM ZONE 10 METERS

POINT No.	LATITUDE	Error(m)	LONGITUDE	Error(m)	NORTHING(m)	Error(m)	EASTING(m)	Error(m)	ORTHO ELEV(m)	Error(m)	ELLIPSOID HEIGHTS(m)	Comb. Factor
ARP	38º53'38.467561"N	0.0043	119º59'45.348090"W	0.0040	4309306.581	0.0043	760540.803	0.0040	1907.011	0.0158	1883.108	0.999624840
BROCKWAY	39º16'11.925401"N	0.0030	120º05'07.603597"W	0.0027	4350787.042	0.0030	751436.257	0.0027	2043.860	----	2020.251	0.999603050
D836	39º20'50.420265"N	0.0049	120º07'39.964029"W	0.0040	4359257.508	0.0049	747511.586	0.0040	1777.664	0.0140	1754.035	0.999650050
DOT1	39º09'22.298820"N	----	119º45'48.327370"W	----	4339100.655	----	779673.974	----	1440.721	----	1416.321	0.999693300
EMERALD	38º57'50.378787"N	0.0058	120º04'46.794268"W	0.0052	4316837.865	0.0058	753028.182	0.0052	1948.135	----	1924.275	0.999615090
HPGN03FS	38º55'54.067100"N	0.0058	119º58'43.741166"W	0.0055	4313536.707	0.0058	761886.685	0.0055	1904.323	----	1880.323	0.999623320
MEEKS	39º02'12.183033"N	0.0061	120º07'41.593703"W	0.0052	4324776.329	0.0061	748565.580	0.0052	1902.217	0.0229	1878.370	0.999620430
Q208	39º05'59.726160"N	0.0034	119º54'37.633096"W	0.0030	4332410.867	0.0034	767179.285	0.0030	2144.234	0.0140	2120.177	0.999582200
RNO1	39º32'16.451590"N	----	119º53'08.880400"W	----	4381103.722	----	767635.582	----	1555.089	----	1531.169	0.999705740
ROSE 1	39º18'06.070485"N	0.0040	119º55'06.476538"W	0.0037	4354784.432	0.0040	765724.191	0.0037	2604.623	0.0171	2580.882	0.999517090
ROSE 2	39º18'05.124461"N	0.0043	119º55'02.339995"W	0.0037	4354758.640	0.0043	765824.288	0.0037	2601.661	0.0174	2577.916	0.999517540
SPOONER	39º06'02.964665"N	0.0034	119º54'35.637736"W	0.0030	4332512.358	0.0034	767223.827	0.0030	2147.411	0.0137	2123.353	0.999581710
STAA	38º54'18.944475"N	0.0043	119º59'29.784238"W	0.0040	4310567.006	0.0043	760874.644	0.0040	1905.225	0.0155	1881.291	0.999624500
TAHOE	39º10'03.168465"N	0.0040	120º08'48.062822"W	0.0034	4339248.229	0.0040	746510.683	0.0034	1902.860	0.0152	1879.144	0.999621000
V1201	39º19'02.066917"N	0.0070	120º19'03.604739"W	0.0058	4355413.169	0.0070	731243.895	0.0058	2069.513	----	2046.179	0.999601980
ZOLE	39º25'17.998300"N	----	119º45'12.033760"W	----	4368602.454	----	779486.711	----	1381.986	----	1357.826	0.999718950

Appendix C for Section 4 (TM 3)
Appendix C2

Summary of Hydrant (C-factor) Test Results

APPENDIX C2
Summary of Hydrant (C-factor) Test Results

Hydrant Flow Tests

Hydrant flow testing was scheduled and performed for South Tahoe Public Utilities District (District) on Thursday, July 5 and Friday, July 6, 2012. Of the original 19 scheduled hydrant tests, 18 hydrant tests were performed. One hydrant test (Hydrant Test No. 14) was canceled due to constraints identified by District staff. Because the District does not have specific information on individual pipeline age and material type for the entire water distribution system, hydrant tests were developed to collect general pipeline friction loss information in targeted areas, rather than attempt to estimate friction losses for individual pipelines. These hydrant tests were used to "spot-check" the preliminary pipeline friction factors (C-factors) assigned and to calibrate the model to ensure that the hydraulic model closely represents observed pressure conditions in the field.

Hydrant flow tests were simulated using the updated hydraulic model of the District's water system, and estimated C-factor values. Results were compared to the actual field data to verify the C-factors and determine the accuracy of the model. C-factors were then adjusted where necessary to minimize differences between static and residual hydrant pressures observed in the field to pressures simulated with the hydraulic model, (see Tables C2-1 through C2-19). The goal of the calibration effort was to achieve no greater than a 5 pounds per square inch (psi) differential between the field hydrant test data and the model simulated data.

The following sections describe each of the specific hydrant testing locations and discuss a comparison of the predicted model pressures compared to pressures observed in the field. A schematic describing the locations of the flowing and observed fire hydrants is also provided for each hydrant flow test.

Summary of Hydrant Test Results

The results of the simulated hydrant flow tests generally validate the water system pipeline configuration and the assigned C-factors. However, based on the comparison of the collected hydrant flow test data and model simulation results, four of the hydrant flow tests (Test Nos. 6, 12, 13, and 19) required further review and evaluation because they did not meet the ±5 psi tolerance limit established for calibration. The results from the remaining hydrant tests indicate that the hydraulic model accurately simulates the District's water system, and is able to closely replicate field-observed pressures and flows. Further discussions regarding Test Nos. 6, 12, 13, and 19 are provided below.

Test 6: 6-inch AC Pipelines Unknown Construction Date

Initial model simulation results indicate that there may be system configuration issues (e.g., partially closed valve(s), inaccurate representation of pipeline connectivity, etc.) within the area of Test 6. The initial static pressures were in excess of 150 psi and the initial observed pressure differential ranged from 53 to 104 psi. This pressure differential could not be simulated in the model without assuming a partially closed valve east of the intersection of San Bernardino Avenue and Shawnee Street and an increase in the observed flow. West Yost Associates (West Yost) recommends that District operations staff verify the status of the valves at the intersection of San Bernardino Avenue and Shawnee Street.

Test 12: 8-inch STL Pipelines Constructed Approximately in 1960

Initial model simulation results indicate that there may have been an error with the residual pressure reading at the observed hydrants. The hydraulic grade line is not consistent across the hydrants leading to the flowing hydrant. This may have to do with the high turbidity of the water when Hydrant Test No. 11 was run and the residual effects of stirring up the water along this pipeline. Since the C-factor for 8-inch STL pipelines was validated in Test No. 18, West Yost does not recommend re-testing this pipeline.

Test 13: 6-inch STL Pipelines Unknown Construction Date

Initial model simulation results indicate that there may have been an error with the residual pressure reading at observed Hydrant 13A. However, model simulation results from observed Hydrants 13B and 13C were well within the ±5 psi tolerance limit. In addition, the C-factor for 6-inch STL pipelines was previously validated in Test Nos. 7 and 8. Therefore, it is recommended that the data from Hydrant 13A not be used.

Test 19: 8-inch C900 Pipelines Constructed Approximately in 2005

Initial model simulation results indicate that there may be system configuration issues (e.g., partially closed valve(s), inaccurate representation of pipeline connectivity, etc.) within the area of Test 19. West Yost recommends that District staff verify the status of the valves northeast of the intersection of N. Marlette Circle and Johnson Boulevard, and northeast of the intersection of S. Marlette Circle and Johnson Boulevard.

Hydrant Test No. 1

Hydrant Test No. 1 was performed on South Upper Truckee Road, south of Morton Drive. This test was intended to confirm the C-factor (initially assumed to equal 140) assigned to 8-inch diameter, C900 pipelines constructed approximately in 2002.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±3 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-1 and indicates that the use of a C-factor equal to 140 for 8-inch diameter C900 pipelines, constructed after 2000, is valid.

Appendix C2

Summary of Hydrant (C-factor) Test Results

Table C2-1. Hydrant Test No. 1

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	55	NA	NA	54	NA	NA	NA
1A[3]	57	14	43	57	16	41	2
1B[4]	60	21	39	61	25	36	3
1C[5]	60	24	36	60	23	36	0

(1) Location of fire hydrants can be found on Figure C2-1.
(2) The "Flowing Hydrant" is located on South Upper Truckee Road, south of Morton Drive.
(3) Hydrant 1A is located on South Upper Truckee Road, north of flowing hydrant.
(4) Hydrant 1B is located on South Upper Truckee Road, north of Hydrant 1A.
(5) Hydrant 1C is located on South Upper Truckee Road, north of Hydrant 1B.
NA = Not Applicable

Appendix C2

Summary of Hydrant (C-factor) Test Results

Insert schematic for Test 1

Hydrant Test No. 2

Hydrant Test No. 2 was performed on East River Park Drive, northeast of the south end of Beaver Brae. This test was intended to confirm the C-factor (initially assumed to equal 130) assigned to 6-inch diameter, AC pipelines constructed approximately in 1959.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±4 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-2 and indicates that the use of a C-factor equal to 130 for 6-inch diameter AC pipelines, constructed after 1955, is valid.

Table C2-2. Hydrant Test No. 2

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	62	NA	NA	62	NA	NA	NA
2A[3]	63	16	47	64	14	51	-4
2B[4]	65	27	39	66	28	38	1
2C[5]	68	38	30	68	40	28	2

(1) Location of fire hydrants can be found on Figure C2-2.
(2) The "Flowing Hydrant" is located on East River Park Drive, northeast of the south end of Beaver Brae.
(3) Hydrant 2A is located on East River Park, northeast of flowing hydrant.
(4) Hydrant 2B is located on Beaver Brae, north of East River Park Drive.
(5) Hydrant 2C is located on Beaver Brae, north of Hydrant 2B.
NA = Not Applicable

Insert schematic for Test 2

Hydrant Test No. 3

Hydrant Test No. 3 was performed on South Upper Truckee Road, north of West River Park Road. This test was intended to confirm the C-factor (initially assumed to equal 130) assigned to 8-inch diameter, AC pipelines constructed approximately in 1962.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±2 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-3 and indicates that the use of a C-factor equal to 130 for 8-inch diameter AC pipelines, constructed after 1960, is valid.

Table C2-3. Hydrant Test No. 3

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	72	NA	NA	72	NA	NA	NA
3A[3]	72	26	46	73	26	47	-1
3B[4]	81	39	42	80	41	40	2
3C[5]	80	44	36	81	46	35	1

(1) Location of fire hydrants can be found on Figure C2-3.
(2) The "Flowing Hydrant" is located on South Upper Truckee Road, north of West River Park Road.
(3) Hydrant 3A is located on South Upper Truckee Road, north of flowing hydrant.
(4) Hydrant 3B is located on South Upper Truckee Road, north of Ermine Court.
(5) Hydrant 3C is located on South Upper Truckee Road, south of Panorama Court.
NA = Not Applicable

Insert schematic for Test 3

Hydrant Test No. 4

Hydrant Test No. 4 was performed on Yokut Street, southwest of Henderson Street. This test was intended to confirm the C-factor (initially assumed to equal 130) assigned to 6-inch diameter, AC pipelines constructed approximately in 1968.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±4 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-4 and indicates that the use of a C-factor equal to 130 for 6-inch diameter AC pipelines, constructed after 1965, is valid.

Table C2-4A. Hydrant Test No. 4

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	92	NA	NA	90	NA	NA	NA
4A[3]	88	26	62	89	23	65	-3
4B[4]	84	26	59	82	25	58	1
4C[5]	90	30	60	88	32	56	4

(1) Location of fire hydrants can be found on Figure C2-4.
(2) The "Flowing Hydrant" is located on Yokut Street, southwest of Henderson Street.
(3) Hydrant 4A is located on Yokut Street, north of Nahane Drive.
(4) Hydrant 4B is located on Nahane Drive, northwest of the south end of Yokut Street
(5) Hydrant 4C is located on Nahane Drive, southwest of Henderson Street
NA = Not Applicable

Insert schematic for Test 4

Hydrant Test No. 5

Hydrant Test No. 5 was performed on Iroquois Circle, northwest of Chippewa Street. This test was intended to confirm the C-factor (initially assumed to equal 130) assigned to 4-inch diameter, AC pipelines constructed approximately in 1960.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±3 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-5 and indicates that the use of a C-factor equal to 130 for 4-inch diameter AC pipelines, constructed after 1960, is valid.

Table C2-5. Hydrant Test No. 5

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	65	NA	NA	73	NA	NA	NA
5A[3]	50	13	37	57	17	40	-3
5B[4]	52	37	16	58	41	17	-1
5C[5]	64	12	52	68	15	53	-1

(1) Location of fire hydrants can be found on Figure C2-5.
(2) The "Flowing Hydrant" is located on Iroquois Circle, northwest of Chippewa Street.
(3) Hydrant 5A is located on Iroquois Circle, southwest of Maya Way.
(4) Hydrant 5B is located in the Middle of Chippewa Street.
(5) Hydrant 5C is located on Iroquois Circle, northeast of Maya Way.
NA = Not Applicable

Insert schematic for Test 5

Hydrant Test No. 6

Hydrant Test No. 6 was performed on Oaxaco Street, northwest of the southeast end. This test was intended to confirm the C-factor (initially assumed to equal 130) assigned to 6-inch diameter, AC pipelines constructed approximately in 1967.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are not within ±5 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-6.

Since the C-factor required for the model to simulate within the ±5 psi pressure differential for Test 5 is unreasonable for this pipeline diameter and material, the results from the hydraulic model simulation indicate that there may be system configuration issues (*e.g.*, partially closed valve(s), inaccurate representation of pipeline connectivity, etc.) within the area of Test No. 6.

As shown in Table C2-6A, Test No. 6 simulates within a 3 psi differential from the field hydrant test data after West Yost assumed a partially closed valve east of the intersection of San Bernardino Avenue and Shawnee Street and an increase in the observed flow. West Yost recommends that District operations staff verify the status of the valves at the intersection of San Bernardino Avenue and Shawnee.

Table C2-6. Hydrant Test No. 6

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	160	NA	NA	162	NA	NA	NA
6A[3]	160	55	105	161	97	64	41
6B[4]	164	81	83	164	114	50	33
6C[5]	156	103	53	157	123	34	19

(1) Location of fire hydrants can be found on Figure C2-6.
(2) The "Flowing Hydrant" is located on Oaxaco Street, northwest of the southeast end.
(3) Hydrant 6A is located on Oaxaco Street, south of Algonquin Court.
(4) Hydrant 6B is located on Oaxaco Street, southeast of Shawnee Street.
(5) Hydrant 6C is located on Shawnee Street, east of E. San Bernardino Avenue.
NA = Not Applicable

Table C2-6A. Hydrant Test No. 6

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	160	NA	NA	157	NA	NA	NA
6A[3]	160	55	105	157	50	107	-2
6B[4]	164	81	83	160	77	83	0
6C[5]	156	103	53	152	96	56	-3

(1) Location of fire hydrants can be found on Figure C2-6.
(2) The "Flowing Hydrant" is located on Oaxaco Street, northwest of the southeast end.
(3) Hydrant 6A is located on Oaxaco Street, south of Algonquin Court.
(4) Hydrant 6B is located on Oaxaco Street, southeast of Shawnee Street.
(5) Hydrant 6C is located on Shawnee Street, east of E. San Bernardino Avenue.
NA = Not Applicable

Insert schematic for Test 6

Hydrant Test No. 7

Hydrant Test No. 7 was performed on Koru Street, west of North Upper Truckee Road. This test was intended to confirm the C-factor (initially assumed to equal 120) assigned to 6-inch diameter, STL pipelines constructed approximately in 1967.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±5 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-7 and indicates that the use of a C-factor equal to 120 for 6-inch diameter STL pipelines, constructed after 1965, is valid.

Table C2-7. Hydrant Test No. 7

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	71	NA	NA	74	NA	NA	NA
7A[3]	64	11	53	65	14	51	2
7B[4]	66	24	42	67	29	38	5
7C[5]	72	44	28	75	50	24	4

(1) Location of fire hydrants can be found on Figure C2-7.
(2) The "Flowing Hydrant" is located on Koru Street, west of North Upper Truckee Road.
(3) Hydrant 7A is located on Koru Street, west of flowing hydrant.
(4) Hydrant 7B is located on Kiowa Drive, east of Koru Street.
(5) Hydrant 7C is located on Kiowa Drive, west of North Upper Truckee Road.
NA = Not Applicable

Insert schematic for Test 7

Hydrant Test No. 8

Hydrant Test No. 8 was performed on Southeast end of Chochise Circle, west of North Upper Truckee Road. This test was intended to confirm the C-factor (initially assumed to equal 120) assigned to 6-inch diameter, STL pipelines constructed approximately in 1961.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±3 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-8 and indicates that the use of a C-factor equal to 120 for 6-inch diameter STL pipelines, constructed after 1961, is valid.

Table C2-8A. Hydrant Test No. 8

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	85	NA	NA	88	NA	NA	NA
8A[3]	80	20	60	81	21	60	0
8B[4]	85	41	44	86	42	44	-1
8C[5]	87	55	32	90	62	29	3

(1) Location of fire hydrants can be found on Figure C2-8.
(2) The "Flowing Hydrant" is located on Southeast end of Chochise Circle, west of North Upper Truckee Road.
(3) Hydrant 8A is located on Cochise Circle, northwest of flowing hydrant.
(4) Hydrant 8B is located on Cochise Circle, on the northwest curve.
(5) Hydrant 8C is located on Cochise Circle, northeast end, west of North Upper Truckee Road.
NA = Not Applicable

Insert schematic for Test 8

Hydrant Test No. 9

Hydrant Test No. 9 was performed on Grizzly Mountain Drive, northeast of Grizzly Mountain Court. This test was intended to confirm the C-factor (initially assumed to equal 75) assigned to 6-inch diameter, STL pipelines constructed approximately in 1991.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±4 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-9 and indicates that the use of a C-factor equal to 120 for 6-inch diameter STL pipelines, constructed after 1990, is valid.

Table C2-9. Hydrant Test No. 9

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	100	NA	NA	107	NA	NA	NA
9A[3]	120	46	74	125	47	78	-4
9B[4]	137	75	62	138	77	62	0
9C[5]	129	79	50	129	83	46	4

(1) Location of fire hydrants can be found on Figure C2-9.
(2) The "Flowing Hydrant" is located on Grizzly Mountain Drive, northeast of Grizzly Mountain Court.
(3) Hydrant 9A is located on Grizzly Mountain Drive, northeast of flowing hydrant.
(4) Hydrant 9B is located on Grizzly Mountain Drive, northeast of Hydrant 9A.
(5) Hydrant 9C is located on Grizzly Mountain Drive, south of Zuni Street.
NA = Not Applicable

Insert schematic for Test 9

Hydrant Test No. 10

Hydrant Test No. 10 was performed on Grizzly Mountain Drive, northeast of Little Bear Lane. This test was intended to confirm the C-factor (initially assumed to equal 120) assigned to 6-inch diameter, STL pipelines constructed approximately in 1960.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±5 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-10 and indicates that the use of a C-factor equal to 120 for 6-inch diameter STL pipelines, constructed after 1960, is valid.

Table C2-10. Hydrant Test No. 10

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	72	NA	NA	71	NA	NA	NA
10A[3]	77	51	26	73	52	21	5
10B[4]	88	47	41	88	47	40	1
10C[5]	79	24	55	80	20	60	-5

(1) Location of fire hydrants can be found on Figure C2-10.
(2) The "Flowing Hydrant" is located on Grizzly Mountain Drive, northeast of Little Bear Lane.
(3) Hydrant 10A is located on Middle of Little Bear Lane.
(4) Hydrant 10B is located on Grizzly Mountain Drive, north of Little Bear Lane.
(5) Hydrant 10C is located on Grizzly Mountain Drive, west of Estate Court.
NA = Not Applicable

Insert schematic for Test 10

Hydrant Test No. 11

Hydrant Test No. 11 was performed on Lake Tahoe Boulevard, north of North Upper Truckee Road. This test was intended to confirm the C-factor (initially assumed to equal 150) assigned to 12-inch diameter, PVC pipelines constructed approximately in 2011.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±4 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-11 and indicates that the use of a C-factor equal to 150 for 12-inch diameter PVC pipelines, constructed after 2010, is valid.

Table C2-11. Hydrant Test No. 11

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	101	NA	NA	111	NA	NA	NA
11A[3]	102	48	54	102	46	56	-2
11B[4]	94	36	58	92	36	56	2
11C[5]	80	20	60	80	23	56	4

(1) Location of fire hydrants can be found on Figure C2-11.
(2) The "Flowing Hydrant" is located on Lake Tahoe Boulevard, north of North Upper Truckee Road.
(3) Hydrant 11A is located on North Upper Truckee Road, southwest of Lake Tahoe Boulevard.
(4) Hydrant 11B is located on North Upper Truckee Road, southwest of Hydrant 11A.
(5) Hydrant 11C is located on North Upper Truckee Road, southwest of Hydrant 11B.
NA = Not Applicable

Insert schematic for Test 11

Hydrant Test No. 12

Hydrant Test No. 12 was performed on Lake Tahoe Boulevard, northwest of View Circle. This test was intended to confirm the C-factor (initially assumed to equal 120) assigned to 8-inch diameter, STL pipelines constructed approximately in 1960.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are not within ±5 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-12.

Initial model simulation results indicate that there may have been an error with the residual pressure reading at the observed hydrants. The hydraulic grade line is not consistent across the hydrants leading to the flowing hydrant. This may have to do with the high turbidity of the water when Hydrant Test No. 11 (previous test) was run and the residual effects of stirring up the water along this pipeline. Since the C-factor for 8-inch STL pipelines is validated in Test 18, West Yost does not recommend re-testing this pipeline and indicates that the use of a C-factor equal to 120 for 8-inch diameter STL pipelines, constructed after 1960, is valid.

Table C2-12. Hydrant Test No. 12

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	95	NA	NA	96	NA	NA	NA
12A[3]	96	18	78	101	42	59	19
12B[4]	103	49	54	106	52	54	0
12C[5]	102	66	36	103	55	48	-12

(1) Location of fire hydrants can be found on Figure C2-12.
(2) The "Flowing Hydrant" is located on Lake Tahoe Boulevard, northwest of View Circle.
(3) Hydrant 12A is located on Lake Tahoe Boulevard, southeast of View Circle.
(4) Hydrant 12B is located on Lake Tahoe Boulevard, north of Little Mountain Lane.
(5) Hydrant 12C is located on Lake Tahoe Boulevard, north of North Upper Truckee Road.
NA = Not Applicable

Insert schematic for Test 12

Hydrant Test No. 13

Hydrant Test No. 13 was performed on Angora Creek Drive, northeast of Lake Tahoe Boulevard. This test was intended to confirm the C-factor (initially assumed to equal 120) assigned to 6-inch diameter, STL pipelines constructed approximately in 1956.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are not within ±5 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-13.

Initial model simulation results indicate that there may have been an error with the residual pressure reading at observed Hydrant 13A. The difference between field-observed and model-simulated pressures for Hydrant 13A was 9 psi. However, model simulation results from observed Hydrants 13B and 13C were well within the ±5 psi tolerance limit. In addition, the C-factor for 6-inch STL pipelines was previously validated in Test Nos. 7 and 8. Therefore, it is recommended that the data from Hydrant 13A not be used.

Table C2-13. Hydrant Test No. 13

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	97	NA	NA	98	NA	NA	NA
13A[3]	98	29	69	102	42	60	9
13B[4]	104	61	43	110	65	45	-2
13C[5]	110	84	26	112	82	30	-4

(1) Location of fire hydrants can be found on Figure C2-13.
(2) The "Flowing Hydrant" is located on Angora Creek Drive, northeast of Lake Tahoe Boulevard.
(3) Hydrant 13A is located on Angora Creek Drive, northeast of flowing hydrant.
(4) Hydrant 13B is located on Angora Creek Drive, east of Hydrant 13A.
(5) Hydrant 13C is located on Angora Creek Drive, south of View Circle.
NA = Not Applicable

Insert schematic for Test 13

Hydrant Test No. 14

Hydrant Test No. 14 was performed on Boulder Mountain Road, northeast of Brush Road. This test was intended to confirm the C-factor (initially assumed to equal 150) assigned to 10-inch diameter, C900 pipelines constructed approximately in 1996.

This test was cancelled in the field due to the difficulty in changing the operating conditions of the pump station.

Table C2-14. Hydrant Test No. 14

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	34	NA	NA	44	NA	NA	NA
14A[3]	0	4	26	44	5	9	-3
14B[4]	1	1	25	49	2	23	-1
14C[5]	45	23	22	42	18	24	-2

CANCELED

(1) Location of fire hydrants can be found on Figure C2-14.
(2) The "Flowing Hydrant" is located on Boulder Mountain Road, northeast of Brush Road.
(3) Hydrant 14A is located on Boulder Mountain Road, north of Cone Road.
(4) Hydrant 14B is located on Boulder Mountain Road, south of Cone Road.
(5) Hydrant 14C is located on Boulder Mountain Road, south of Lake Tahoe Boulevard.
NA = Not Applicable

Insert schematic for Test 14

Hydrant Test No. 15

Hydrant Test No. 15 was performed on Glenmore Way, southwest of Highlands Drive. This test was intended to confirm the C-factor (initially assumed to equal 120) assigned to 6-inch diameter, STL pipelines constructed approximately in 1972.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±3 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-15 and indicates that the use of a C-factor equal to 120 for 6-inch diameter STL pipelines, constructed after 1970, is valid.

Table C2-15. Hydrant Test No. 15

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	110	NA	NA	112	NA	NA	NA
15A[3]	107	36	71	107	33	74	-3
15B[4]	98	47	51	98	43	54	-3
15C[5]	79	45	34	79	44	35	-1

(1) Location of fire hydrants can be found on Figure C2-15.
(2) The "Flowing Hydrant" is located on Glenmore Way, southwest of Highlands Drive.
(3) Hydrant 15A is located on 234 Glenmore Way.
(4) Hydrant 15B is located on 274 Glenmore Way.
(5) Hydrant 15C is located on 306 Glenmore Way.
NA = Not Applicable

Insert schematic for Test 15

Hydrant Test No. 16

Hydrant Test No. 16 was performed on Sawmill Road, southeast of Lake Tahoe Boulevard. This test was intended to confirm the C-factor (initially assumed to equal 140) assigned to 8-inch diameter, C900 pipelines constructed approximately in 1997.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±5 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-16, and indicates that the use of a C-factor equal to 140 for 8-inch diameter C900 pipelines is valid.

Table C2-16. Hydrant Test No. 16

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	108	NA	NA	107	NA	NA	NA
16A[3]	106	18	88	102	12	90	-2
16B[4]	110	24	86	111	27	84	2
16C[5]	96	16	80	98	23	75	5

(1) Location of fire hydrants can be found on Figure C2-16.
(2) The "Flowing Hydrant" is located on Sawmill Road, southeast of Lake Tahoe Boulevard.
(3) Hydrant 16A is located on Sawmill Road, south of flowing hydrant.
(4) Hydrant 16B is located on Sawmill Road, south of Hydrant 16A.
(5) Hydrant 16C is located on Echo View Drive, southeast of Mountain Canary Drive.
NA = Not Applicable

Insert schematic for Test 16

Hydrant Test No. 17

Hydrant Test No. 17 was performed on Mountain Canary Drive, northeast of Echo View Drive. This test was intended to confirm the C-factor (initially assumed to equal 120) assigned to 6-inch diameter STL pipelines.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±3 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-17 and indicates that the use of a C-factor equal to 120 for 6-inch diameter STL pipelines is valid.

Table C2-17. Hydrant Test No. 17

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	82	NA	NA	84	NA	NA	NA
17A[3]	73	16	57	76	21	55	2
17B[4]	54	13	41	56	16	40	1
17C[5]	33	20	13	31	15	16	-3

(1) Location of fire hydrants can be found on Figure C2-17.
(2) The "Flowing Hydrant" is located on Mountain Canary Drive, northeast of Echo View Drive.
(3) Hydrant 17A is located on Mountain Canary Drive, north of East Court.
(4) Hydrant 17B is located on Mountain Canary Drive, southeast of Lamor Court.
(5) Hydrant 17C is located on Lamor Court, northeast of Summit Drive.
NA = Not Applicable

Insert schematic for Test 17

Hydrant Test No. 18

Hydrant Test No. 18 was performed on Industrial Avenue, west of Shop Street. This test was intended to confirm the C-factor (initially assumed to equal 120) assigned to 8-inch diameter, STL pipelines constructed approximately in 1963.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are within ±2 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-18 and indicates that the use of a C-factor equal to 120 for 8-inch diameter STL pipelines, constructed after 1960, is valid.

Table C2-18. Hydrant Test No. 18

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	77	NA	NA	59	NA	NA	NA
18A[3]	66	28	38	60	24	37	1
18B[4]	72	46	26	64	40	24	2
18C[5]	73	59	14	66	54	12	2

(1) Location of fire hydrants can be found on Figure C2-18.
(2) The "Flowing Hydrant" is located on Industrial Avenue, west of Shop Street.
(3) Hydrant 18A is located on Industrial Avenue, east of flowing hydrant.
(4) Hydrant 18B is located on Industrial Avenue, northeast of Hydrant 18A.
(5) Hydrant 18C is located on Industrial Avenue, south of D Street.
NA = Not Applicable

Insert schematic for Test 18

Hydrant Test No. 19

Hydrant Test No. 19 was performed on Treehaven Drive, west of Johnson Boulevard. This test was intended to confirm the C-factor (initially assumed to equal 140) assigned to 8-inch diameter, C900 pipelines constructed approximately in 2005.

A comparison of the differential pressure readings predicted by the hydraulic model, compared to pressures actually measured in the field, demonstrates that the pressures predicted by the model are not within ±5 psi of the measured field value. A comparison between the calibrated model results and the field data is shown in Table C2-19.

Initial model simulation results indicate that there may be system configuration issues (e.g., partially closed valve(s), inaccurate representation of pipeline connectivity, etc.) within the area of Test 19. West Yost recommends that District staff verify the status of the valves northeast of the intersection of N. Marlette Circle and Johnson Boulevard, and northeast of the intersection of S. Marlette Circle and Johnson Boulevard.

As shown in Table C2-19A, Test 19 simulates within a 5 psi differential from the field hydrant test data after West Yost assumed a partially closed valve north of Marlette Circle and Johnson Boulevard, or northeast of the intersection of S. Marlette Circle and Johnson Boulevard.

Table C2-19. Hydrant Test No. 19

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	100	NA	NA	99	NA	NA	NA
19A[3]	98	21	77	97	53	44	33
19B[4]	94	28	66	98	63	35	31
19C[5]	100	29	71	96	67	29	42

(1) Location of fire hydrants can be found on Figure C2-19.
(2) The "Flowing Hydrant" is located on Treehaven Drive, west of Johnson Boulevard.
(3) Hydrant 19A is located on Bijou Street, south of Treehaven Drive.
(4) Hydrant 19B is located on Johnson Boulevard, south of Freel Street.
(5) Hydrant 19C is located on Johnson Boulevard, north of the northeast end of Marlette Circle.
NA = Not Applicable

Table C2-19A. Hydrant Test No. 19

Hydrant[1]	Field Data			Modeled Data			Comparison of Differential Pressures, psi (g = c-f)
	Static Pressure, psi (a)	Residual Pressure, psi (b)	Differential Pressure, psi (c = a-b)	Static Pressure, psi (d)	Residual Pressure, psi (e)	Differential Pressure, psi (f = d-e)	
Flowing[2]	100	NA	NA	99	NA	NA	NA
19A[3]	98	21	77	97	16	81	-4
19B[4]	94	28	66	98	27	71	-5
19C[5]	100	29	71	96	31	66	5

(1) Location of fire hydrants can be found on Figure C2-19.
(2) The "Flowing Hydrant" is located on Treehaven Drive, west of Johnson Boulevard.
(3) Hydrant 19A is located on Bijou Street, south of Treehaven Drive.
(4) Hydrant 19B is located on Johnson Boulevard, south of Freel Street.
(5) Hydrant 19C is located on Johnson Boulevard, north of the northeast end of Marlette Circle.
NA = Not Applicable

Insert schematic for Test 19

Appendix D for Section 5 (TM 4)
Appendix D1

Water System Hydraulic Profile

EL 7000 EL7000
EL 6900 EL 6900
EL 6800 EL 6800
EL 6700 EL 6700
EL 6600 EL 6600
EL 6500 EL 6500
EL 6400 EL 6400
EL 6300 EL 6300
EL 6200 EL 6200

KELLER TANKS 0.208 MG EL 7030'
KELLER TANKS 0.123 MG EL 7030'
KELLER ZONE
UPPER SADDLE PRV ZONE
MIDDLE KELLER ZONE
UPPER KELLER # 1 0.5", 6" 90/50 PSI EL 6851'
MIDDLE KELLER # 2 0.5", 6" 80/50PSI EL 6822'
SWEEPING TURN ZONE
FOUR SEASONS ZONE
SADDLE # 1 6" 107/50 PSI (FEEDS SEASONS FIRE LINE DEAD ENDS AT HYDRANT) EL 6717'
HEAVENLY KELLER # 3 2", 6" 80/50 PSI EL 6730'
NC
HEAVENLY VALLEY TANK 1.051 MG EL 6787'
HEAVENLY SKI RESORT SUPPLY LINE
JUNE WAY ZONE
SADDLE # 2 6" 160/75 PSI (OUT OF SERVICE) EL 6652'
KELLER # 4 REGINA 4" 100/38 PSI EL 6616'
HEAVENLY VALLEY
UPPER MONTGOMERY ESTATES ZONE
COLD CREEK TANK BOOSTER 80 GPM BOOSTER (2 PUMPS) EL 6606'
COLD CREEK TANK 0.480 MG EL 6604'
NEEDLE PEAK ZONE
NEEDLE PEAK KELLER # 5 0.75", 6" 95/55 PSI EL 6607'
WILDWOOD SADDLE # 3 0.75", 6" 112/44 PSI EL 6556'
MONTGOMERY ESTATES ZONE
TERRACE ZONE
TERRACE/ WILDWOOD 1", 2" 105/60PSI EL 6478'
RALPH ZONE
PRICE /FRONTIER 4", 5" 110/40 PSI EL 6448'
RALPH PRESSURE RELIEF VALVE
OVERLOOK ZONE
OVERLOOK PRV 2" ~EL 6431'
GOLDEN BEAR ZONE
KOKANEE ZONE
"H" STREET TANK ZONE
H STREET PRESSURE RELIEF VALVE
"H" STREET BOOSTER EL 6300 '
"H" STREET TANK 0.090 MG EL 6425'
ALTITUDE VALVE
TO GARDNER MTN. ZONE SEE PLATE 2
TO TAHOE KEYS WATER
TO LUKINS WATER
TO LAKESIDE WATER
STATELINE TANKS Tank 1 1.284 MG Tank 2 2.284 MG EL 6434'
ROCKY POINT ZONE
ROCKY POINT 0.5", 2", 4" 120/45 PSI EL 6441'
VFD
KELLER BOOSTER (2 PUMPS) EL 6320'
DAVID LANE BOOSTER (3 PUMPS) EL 6323'
BLACK BART BOOSTER (3 PUMPS) EL 6282'
PIONEER # 1 MARSHALL TRAIL 4", 8" 140/120 PSI EL 6302'
PIONEER # 2 KOKANEE 2.5", 6" 115/80 PSI EL 6303'
LOWER COLD CREEK BOOSTER (2 PUMPS AND GENERATOR) -EL 6291'
TATA BOOSTER (2 PUMPS) EL 6284
FROM GARDNER MOUNTAIN ZONE
TATA TANK 0.396 MG EL 6281' (OUT OF SERVICE)
ALTITUDE VALVE
AIRPORT BOOSTER (1 PUMP) BYPASS EL 6259'
TO COUNTRY CLUB ZONE SEE PLATE 2
AIRPORT EL 6281' (ARSENIC) 502 GPM
HELEN WELL # 2 EL 6249' 260 GPM
SUNSET WELL EL 6251' 570 GPM
SHARI'S WELL EL 6250'
PALOMA WELL EL 6207' 1,200 GPM
BAYVIEW WELL EL 6256' 3,513 GPM
AL TAHOE WELL # 2 EL 6255' 2,400 GPM
COLLEGE WELL EL 6281' (URANIUM) (Stand by)
GLENWOOD # 5 EL 6261' 1010 GPM
BLACKROCK # 2 EL 6241' (MTBE)
STATELINE ZONE

LEGEND

A	AUXILIARY POWER	ISOLATION VALVE	FLOW CONTROL VALVE	PRESSURE REDUCING VALVE	WELL (INACTIVE)	TANK
NC	NORMALLYCLOSED	BOOSTER PUMP	PRESSURE RELIEF VALVE	ALTITUDE VALVE	WELL (ACTIVE)	
NO	NORMALLYOPENED					
*	VARIES BY SEASON					
VFD	VARIABLE FREQUENCY DRIVE					

Note: Elevations and dimensions on this figure are from various sources and should be verified with best available information if being used for critical purposes.

PLATE 1

SOUTH TAHOE PUBLIC UTILITY DISTRICT
MAIN WATER SYSTEM
HYDRAULIC PROFILE

WEST YOST ASSOCIATES Consulting Engineers

X:\Projects\Water\2012 Water Optimization Plan WSOP\HGL\48900-1201-HGL FIGURE2 102113 VDL tim's.dwg 03-19-14 03:25:04 PM tim

EL 7000 EL7000
EL 6900 EL 6900
EL 6800 EL 6800
EL 6700 EL 6700
EL 6600 EL 6600
EL 6500 EL 6500
EL 6400 EL 6400
EL 6300 EL 6300
EL 6200 EL 6200

ANGORA TANK
0.249 MG
EL 6950'

ANGORA HIGHLANDS ZONE

FLAGPOLE TANK #1
0.172 MG
EL 6738'

FLAGPOLE TANK #2
0.204 MG
EL 6711'

FLAGPOLE ZONE

FOREST MTN TANK
0.159 MG
EL 6704'

VFD

FOREST MTN BOOSTER
(2 PUMPS & FIRE PUMP)
EL 6704'

FOREST MOUNTAIN ZONE

IROQUOIS TANK #1
0.333 MG
EL 6685'

IROQUOIS TANK #2
0.252 MG
EL 6685'

IROQUOIS ZONE

CHRISTMAS VALLEY TANK
0.185 MG
EL 6549'

CHRISTMAS VALLEY ZONE

COMANCHE ZONE

COUNTRY CLUB TANK
0.345 MG
EL 6530'

LOOKOUT TANK
0.304 MG
EL 6555'

ALTITUDE VALVE

ECHO VIEW TANK 0.204 MG
EL 6560'

ALTITUDE VALVE

TWIN PEAKS ZONE

MT RAINIER ZONE

PINE VALLEY
2.5", 6"
90/50PSI
EL 6498'

PINE VALLEY ZONE

COUNTRY CLUB ZONE

GARDNER MTN.
TANK 1 0.212 MG
TANK 2 0.187 MG
EL 6448'

ARROWHEAD TANK 1.080 MG
EL 6454'

ARROWHEAD ZONE

OTTOWA ZONE

COMANCHE PRV
2', 6"
122/65 PSI
EL 6432'

NC

OTTOWA CT
2"
165/50 PSI
EL 6384'

SUSQUEHANNA
2", 8"
90/48 PSI
EL 6406'

SUSQUEHANNA ZONE

OFLYING PRV
6"
124/60 PSI
EL 6415'

MT. RAINER
2", 8"
135/72 PSI
EL 6458'

GRIZZLY MTN BOOSTER
(3 PUMPS)
EL 6454'

GRIZZLY MTN. PRV
3", 8"
135/65 PSI
EL 6454'

BOULDER MTN BOOSTER
(2 PUMPS & FIRE PUMP)
EL 6385'

VALHALLA
670 GPM
EL 6257'

GARDNER MOUNTAIN ZONE

TO STATELINE ZONE
SEE PLATE 1

FROM TATA TANK BOOSTER PUMP
SEE PLATE 1

TO LUKINS WATER COMPANY
SEE PLATE 1

FROM AIRPORT BOOSTER PUMP
SEE PLATE 1

SOUTH UPPER TRUCKEE WELL # 3
EL 6403'
1,250 GPM

CORNELIAN FLOW CONTROL VALVE
EL 6365'
400 GPM

CORNELIAN BOOSTER
(2 PUMPS & FIRE PUMP)
EL 6359'

ARROWHEAD WELL # 3
& MTBE TREATMENT PLANT
EL 6339'
800 GPM

BAKERSFIELD WELL &
MTBE TREATMENT PLANT
EL 6311'
1,290 GPM

FLAGPOLE BOOSTER
(3 PUMPS)
EL 6322'

NORTH APPACHE BOOSTER
(3 PUMPS)
EL 6376'

SOUTH APPACHE BOOSTER
(3 PUMPS)
EL 6319'

COUNTRY CLUB
6"
116/80 PSI
EL 6288'

BLKS CLUB WELL # 3
EL 6287'
275 GPM

MOUNTAIN VIEW WELL
(ARTESIAN)
EL 6316'
OUT OF SERVICE

TWIN PEAKS (D ST.) PRV
12"
110/55 PSI
EL 6321'

TWIN PEAKS BOOSTER
(3 PUMPS)
EL 6321'

AIR STRIPPER

GARDNER MTN BOOSTER NO 1 & 2
(INACTIVE)

CLEMENT WELL
EL 6283'
(MTBE)
180 GPM

LEGEND

A	AUXILIARY POWER	ISOLATION VALVE	FLOW CONTROL VALVE	PRESSURE REDUCING VALVE	WELL (INACTIVE)	TANK
NC	NORMALLYCLOSED	BOOSTER PUMP	PRESSURE RELIEF VALVE	ALTITUDE VALVE	WELL (ACTIVE)	
*	VARIES BY SEASON					
VFD	VARIABLE FREQUENCY DRIVE					

Note: Elevations and dimensions on this figure are from various sources and should be verified with best available information if being used for critical purposes.

PLATE 2

SOUTH TAHOE PUBLIC UTILITY DISTRICT
ANGORA/TAHOE PARADISE WATER SYSTEM
HYDRAULIC PROFILE

WEST YOST ASSOCIATES
Consulting Engineers

Appendix D for Section 5 (TM 4)
Appendix D2

STPUD Storage and Pumping Capacity Scenario Evaluations

Heavenly to Keller

Storage Zone	Zone	Case 1 Additional Storage Required (gal)	Case 2 Additional Storage Required (gal)	Case 2A Additional Storage Required (gal)	Case 3 Additional Storage Required (gal)	Case 4 Additional Storage Required (gal)	Worst Case Additional Storage Required (gal)
Heavenly Storage	Heavenly Valley	-	-	-	-	-	-
	Price Road						
	Terrace						
Keller Storage	Keller						
	Four Seasons						
	Middle Keller						
	Needle Peak						
	Rocky Point						
	Sweeping Turn						
	Upper Saddle						
Iroquois Storage	Iroquois	-	-	-	-	-	-
	Comanche						
	Ottawa						
	Pine Valley						
	Susquehana						
Country Club Storage	Country Club	-	-	-	-	-	-
Arrowhead Storage	Arrowhead	-	-	-	-	-	-
Christmas Valley Storage	Christmas Valley	115,000	115,000	115,000	115,000	115,000	115,000
Flagpole Storage	Flagpole	-	-	-	-	-	-
	Mt. Rainier						
Angora Highlands Storage	Angora Highlands	-	-	-	-	-	-
Forest Mountain Storaage	Forest Mountain	-	-	-	-	-	-
Twin Peaks Storage	Twin Peaks	-	-	-	-	-	-
Gardner Mountain Storage	Gardner Mountain	-	-	-	-	-	-
Stateline Storage	Stateline	-	-	-	-	-	-
Montgomery Estates Storage	Montgomery Estates	-	-	-	-	-	-
N/A	H Street	120,000	120,000	125,040	120,000	121,663	125,040
N/A	Upper Montgomery Estates	120,000	120,000	146,262	120,000	124,665	146,262

Table B2 - 2A Scenario 1 Modified Water System with Heavenly Serving Keller

	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]
		Demand Summary			Supply Summary			Fire Storage Summary						
Storage Zone	Zone	PHD (gpm)	Exported MDD (gpm)	Total Demand (gpm)	Zone Supply From Wells (gpm)	Imported Supply from Adjacent Zones (gpm)	Total Supply Capacity (gpm)	Fire Demand (gpm)	Fire Duration (hr)	Fire Volume (gal)	Operational Storage Requirement (gal)	Total Supply Requirement (gal)	Existing Available Storage (gal)	Additional Storage Required (gal)
Heavenly Storage	Heavenly Valley	244	280	524	-	786	786	3,000	3	540,000	-	540,000	1,050,000	-
	Price Road	59	-	59	-	92	92							
	Terrace	13	-	13	-	19	19							
Keller Storage	Keller	5	225	231	-	413	413							
	Four Seasons	-	-	-	-	-	-							
	Middle Keller	0	210	210	-	382	382							
	Needle Peak	59	11	70	-	225	225							
	Rocky Point	16	-	16	-	183	183							
	Sweeping Turn	220	53	273	-	381	381							
	Upper Saddle	21	-	21	-	28	28							
Iroquois Storage	Iroquois	383	333	716	-	945	945	2,500	2	300,000	-	300,000	530,000	-
	Comanche	8	-	8	-	11	11							
	Ottawa	2	-	2	-	-	-							
	Pine Valley	192	43	235	-	363	363							
	Susquehana	60	-	60	-	226	226							
Country Club Storage	Country Club	207	-	207	275	298	573	2,500	2	300,000	-	300,000	345,000	-
Arrowhead Storage	Arrowhead	358	921	1,279	1,290	400	1,690	2,500	2	300,000	-	300,000	1,080,000	-
Christmas Valley Storage	Christmas Valley	377	400	777	1,250	-	1,250	2,500	2	300,000	-	300,000	185,000	115,000
Flagpole Storage	Flagpole	363	55	418	-	490	490	2,500	2	300,000	-	300,000	376,000	-
	Mt. Rainier	77	-	77	-	230	230							
Angora Highlands Storage	Angora Highlands	40	-	40	-	780	780	1,000	2	120,000	-	120,000	249,000	-
Forest Mountain Storaage	Forest Mountain	21	29	50	-	970	970	1,000	2	120,000	-	120,000	158,000	-
Twin Peaks Storage	Twin Peaks	164	44	208	-	1,087	1,087	1,000	2	120,000	-	120,000	503,000	-
Gardner Mountain Storage (Note 2)	Gardner Mountain	648	161	809	550	1,000	1,550	3,000	3	540,000	-	540,000	544,440	-
Stateline Storage	Stateline	8,374	1,378	9,753	9,864	-	9,864	3,000	3	540,000	-	540,000	3,590,000	-
Montgomery Estates Storage	Montgomery Estates	393	5	398	-	804	804	2,500	2	300,000	-	300,000	480,000	-
N/A	H Street	21	-	21	-	42	42	1,000	2	120,000	-	120,000	-	120,000
N/A	Upper Montgomery Estates	6	-	6	-	523	523	1,000	2	120,000	-	120,000	-	120,000

Notes: 1. Equations for Estimating Data:

[C] = PHD or Peak Hour Demand

[D] = "Exported PHD" value represents all of the flow provided to tributary zones as well as flow distributed to other storage areas.

[E] = [C] + [D]

[G] = Sum of wells, boosters, and PRVs (per Case) feeding a combined zone, plus contingency supplies that would be activated during a fire event. References Wells, Tanks, and PRVs worksheets.

[H] = [F] + [G]

[I] = Fire storage required for duration based on Pressure Zone Demand worksheet. The single greatest fire supply requirement for a combined zone (ie., tank zone plus subzones gravity fed by tank) is referenced.

[K] = [I] * [J] * 60

[L] = 4hr x (PHD-Firm Capacity) where PHD = 1.4 x MDD. References Pressure Zone Demand worksheet for PHD.

[M] = [K] + [L]

[O] = ([M] - [N]) > 0

2. For Gardner Mountain assume excess Supply of 1456 gpm - Demand of 648 gpm = 808 gpm available for fire supply over 3 hours. This provides 145,440 gallons of storage over 3 hours for fire storage.

Table B2 - 3A Scenario 2 Modified Water System with Heavenly Serving Keller

	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]
		Demand Summary			Supply Summary			Fire Storage Summary						
Storage Zone	Zone	PHD (gpm)	Exported MDD (gpm)	Total Demand (gpm)	Zone Supply From Wells (gpm)	Imported Supply from Adjacent Zones (gpm)	Total Supply Capacity (gpm)	Fire Demand (gpm)	Fire Duration (hr)	Fire Volume (gal)	Operational Storage Requirement (gal)	Total Supply Requirement (gal)	Existing Available Storage (gal)	Additional Storage Required (gal)
Heavenly Storage	Heavenly Valley	244	280	524	-	836	836	3,000	3	540,000	-	540,000	1,050,000	-
	Price Road	59	-	59	-	99	99							
	Terrace	13	-	13	-	21	21							
Keller Storage	Keller	5	225	231	-	413	413							
	Four Seasons	-	-	-	-	-	-							
	Middle Keller	0	210	210	-	382	382							
	Needle Peak	59	11	70	-	225	225							
	Rocky Point	16	-	16	-	183	183							
	Sweeping Turn	220	53	273	-	381	381							
	Upper Saddle	21	-	21	-	28	28							
Iroquois Storage	Iroquois	383	333	716	-	530	530	2,500	2	300,000	44,764	344,764	530,000	-
	Comanche	8	-	8	-	4	4							
	Ottawa	2	-	2	-	-	-							
	Pine Valley	192	43	235	-	138	138							
	Susquehana	60	-	60	-	1	1							
Country Club Storage	Country Club	207	-	207	275	114	389	2,500	2	300,000	-	300,000	345,000	-
Arrowhead Storage	Arrowhead	358	1,082	1,440	800	400	1,200	2,500	2	300,000	57,528	357,528	1,080,000	-
Christmas Valley Storage	Christmas Valley	377	400	777	1,250	-	1,250	2,500	2	300,000	-	300,000	185,000	115,000
Flagpole Storage	Flagpole	363	216	579	-	415	415	2,500	2	300,000	39,404	339,404	376,000	-
	Mt. Rainier	77	-	77	-	39	39							
Angora Highlands Storage	Angora Highlands	40	-	40	-	101	101	1,000	2	120,000	-	120,000	249,000	-
Forest Mountain Storaage	Forest Mountain	21	29	50	-	116	116	1,000	2	120,000	-	120,000	158,000	-
Twin Peaks Storage	Twin Peaks	164	44	208	-	116	116	1,000	2	120,000	22,064	142,064	503,000	-
Gardner Mountain Storage (Note 2)	Gardner Mountain	648	-	648	550	906	1,456	3,000	3	540,000	-	540,000	544,440	-
Stateline Storage	Stateline	8,374	1,217	9,592	8,364	-	8,364	3,000	3	540,000	294,672	834,672	3,590,000	-
Montgomery Estates Storage	Montgomery Estates	393	5	398	-	558	558	2,500	2	300,000	-	300,000	480,000	-
N/A	H Street	21	-	21	-	29	29	1,000	2	120,000	-	120,000	-	120,000
N/A	Upper Montgomery Estates	6	-	6	-	278	278	1,000	2	120,000	-	120,000	-	120,000

Notes: 1. Equations for Estimating Data:
[C] = PHD or Peak Hour Demand
[D] = "Exported PHD" value represents all of the flow provided to tributary zones as well as flow distributed to other storage areas.
[E] = [C] + [D]
[G] = Sum of wells, boosters, and PRVs (per Case) feeding a combined zone, plus contingency supplies that would be activated during a fire event. References Wells, Tanks, and PRVs worksheets.
[H] = [F] + [G]
[I] = Fire storage required for duration based on Pressure Zone Demand worksheet. The single greatest fire supply requirement for a combined zone (ie., tank zone plus subzones gravity fed by tank) is referenced
[K] = [I] * [J] * 60
[L] = 4hr x (PHD-Firm Capacity) where PHD = 1.4 x MDD. References Pressure Zone Demand worksheet for PHD.
[M] = [K] + [L]
[O] = ([M] - [N]) > 0
2. For Gardner Mountain assume excess Supply of 1456 gpm - Demand of 648 gpm = 808 gpm available for fire supply over 3 hours. This provides 145,440 gallons of storage over 3 hours for fire storage

Table B2 - 4A Scenario 2A Modified Water System with Heavenly Serving Keller

	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]
		Demand Summary			Supply Summary			Fire Storage Summary						
Storage Zone	Zone	PHD (gpm)	Exported MDD (gpm)	Total Demand (gpm)	Zone Supply From Wells (gpm)	Imported Supply from Adjacent Zones (gpm)	Total Supply Capacity (gpm)	Fire Demand (gpm)	Fire Duration (hr)	Fire Volume (gal)	Operational Storage Requirement (gal)	Total Supply Requirement (gal)	Existing Available Storage (gal)	Additional Storage Required (gal)
Heavenly Storage	Heavenly Valley	244	280	524	-	273	273	3,000	3	540,000	60,281	600,281	1,050,000	-
	Price Road	59	-	59	-	15	15							
	Terrace	13	-	13	-	3	3							
Keller Storage	Keller	5	225	231	-	138	138							
	Four Seasons	-	-	-	-	-	-							
	Middle Keller	0	210	210	-	12	12							
	Needle Peak	59	11	70	-	(145)	(145)							
	Rocky Point	16	-	16	-	(187)	(187)							
	Sweeping Turn	220	53	273	-	12	12							
	Upper Saddle	21	-	21	-	9	9							
Iroquois Storage	Iroquois	383	333	716	-	622	622	2,500	2	300,000	22,572	322,572	530,000	-
	Comanche	8	-	8	-	6	6							
	Ottawa	2	-	2	-	-	-							
	Pine Valley	192	43	235	-	188	188							
	Susquehana	60	-	60	-	51	51							
Country Club Storage	Country Club	207	-	207	275	-	275	2,500	2	300,000	-	300,000	345,000	-
Arrowhead Storage	Arrowhead	358	921	1,279	800	400	1,200	2,500	2	300,000	18,936	318,936	1,080,000	-
Christmas Valley Storage	Christmas Valley	377	400	777	1,250	-	1,250	2,500	2	300,000	-	300,000	185,000	115,000
Flagpole Storage	Flagpole	363	55	418	-	322	322	2,500	2	300,000	23,004	323,004	376,000	-
	Mt. Rainier	77	-	77	-	63	63							
Angora Highlands Storage	Angora Highlands	40	-	40	-	225	225	1,000	2	120,000	-	120,000	249,000	-
Forest Mountain Storaage	Forest Mountain	21	29	50	-	240	240	1,000	2	120,000	-	120,000	158,000	-
Twin Peaks Storage	Twin Peaks	164	44	208	-	476	476	1,000	2	120,000	-	120,000	503,000	-
Gardner Mountain Storage (Note 2)	Gardner Mountain	648	161	809	550	388	938	3,000	3	540,000	-	540,000	544,440	-
Stateline Storage	Stateline	8,374	1,378	9,753	6,840	-	6,840	3,000	3	540,000	699,024	1,239,024	3,590,000	-
Montgomery Estates Storage	Montgomery Estates	393	5	398	-	178	178	2,500	2	300,000	52,782	352,782	480,000	-
N/A	H Street	21	-	21	-	-	-	1,000	2	120,000	5,040	125,040	-	125,040
N/A	Upper Montgomery Estates	6	-	6	-	(103)	(103)	1,000	2	120,000	26,262	146,262	-	146,262

Notes:

1. Equations for Estimating Data:
[C] = PHD or Peak Hour Demand
[D] = "Exported PHD" value represents all of the flow provided to tributary zones as well as flow distributed to other storage areas
[E] = [C] + [D]
[G] = Sum of wells, boosters, and PRVs (per Case) feeding a combined zone, plus contingency supplies that would be activated during a fire event. References Wells, Tanks, and PRVs worksheets.
[H] = [F] + [G]
[I] = Fire storage required for duration based on Pressure Zone Demand worksheet. The single greatest fire supply requirement for a combined zone (ie., tank zone plus subzones gravity fed by tank) is referenced
[K] = [I] * [J] * 60
[L] = 4hr x (PHD-Firm Capacity) where PHD = 1.4 x MDD. References Pressure Zone Demand worksheet for PHD.
[M] = [K] + [L]
[O] = ([M] - [N]) > 0
2. For Gardner Mountain assume excess Supply of 1456 gpm - Demand of 648 gpm = 808 gpm available for fire supply over 3 hours. This provides 145,440 gallons of storage over 3 hours for fire storage

Table B2 - 5A Scenario 3 Modified Water System with Heavenly Serving Keller

	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]
		Demand Summary			Supply Summary			Fire Storage Summary						
Storage Zone	Zone	PHD (gpm)	Exported MDD (gpm)	Total Demand (gpm)	Zone Supply From Wells (gpm)	Imported Supply from Adjacent Zones (gpm)	Total Supply Capacity (gpm)	Fire Demand (gpm)	Fire Duration (hr)	Fire Volume (gal)	Operational Storage Requirement (gal)	Total Supply Requirement (gal)	Existing Available Storage (gal)	Additional Storage Required (gal)
Heavenly Storage	Heavenly Valley	244	280	524	-	1,600	1,600	3,000	3	540,000	-	540,000	1,050,000	-
	Price Road	59	-	59	-	95	95							
	Terrace	13	-	13	-	20	20							
Keller Storage	Keller	5	225	231	-	350	350							
	Four Seasons	-	-	-	-	-	-							
	Middle Keller	0	210	210	-	323	323							
	Needle Peak	59	11	70	-	166	166							
	Rocky Point	16	-	16	-	124	124							
	Sweeping Turn	220	53	273	-	323	323							
	Upper Saddle	21	-	21	-	23	23							
Iroquois Storage	Iroquois	383	333	716	-	717	717	2,500	2	300,000	-	300,000	530,000	-
	Comanche	8	-	8	-	7	7							
	Ottawa	2	-	2	-	-	-							
	Pine Valley	192	43	235	-	239	239							
	Susquehana	60	-	60	-	102	102							
Country Club Storage	Country Club	207	-	207	275	197	472	2,500	2	300,000	-	300,000	345,000	-
Arrowhead Storage	Arrowhead	358	876	1,234	1,290	-	1,290	2,500	2	300,000	-	300,000	1,080,000	-
Christmas Valley Storage	Christmas Valley	377	-	377	1,250	318	1,568	2,500	2	300,000	-	300,000	185,000	115,000
Flagpole Storage	Flagpole	363	55	418	-	820	820	2,500	2	300,000	-	300,000	376,000	-
	Mt. Rainier	77	-	77	-	560	560							
Angora Highlands Storage	Angora Highlands	40	-	40	-	103	103	1,000	2	120,000	-	120,000	249,000	-
Forest Mountain Storaage	Forest Mountain	21	29	50	-	118	118	1,000	2	120,000	-	120,000	158,000	-
Twin Peaks Storage	Twin Peaks	164	358	522	-	1,087	1,087	1,000	2	120,000	-	120,000	503,000	-
Gardner Mountain Storage (Note 2)	Gardner Mountain	648	475	1,123	550	1,000	1,550	3,000	3	540,000	-	540,000	544,440	-
Stateline Storage	Stateline	8,374	2,717	11,092	9,864	-	9,864	3,000	3	540,000	294,672	834,672	3,590,000	-
Montgomery Estates Storage	Montgomery Estates	393	5	398	-	408	408	2,500	2	300,000	-	300,000	480,000	-
N/A	H Street	21	-	21	-	21	21	1,000	2	120,000	-	120,000	-	120,000
N/A	Upper Montgomery Estates	6	-	6	-	127	127	1,000	2	120,000	-	120,000	-	120,000

Notes:

1. Equations for Estimating Data:
[C] = PHD or Peak Hour Demand
[D] = "Exported PHD" value represents all of the flow provided to tributary zones as well as flow distributed to other storage areas
[E] = [C] + [D]
[G] = Sum of wells, boosters, and PRVs (per Case) feeding a combined zone, plus contingency supplies that would be activated during a fire event. References Wells, Tanks, and PRVs worksheets.
[H] = [F] + [G]
[I] = Fire storage required for duration based on Pressure Zone Demand worksheet. The single greatest fire supply requirement for a combined zone (ie., tank zone plus subzones gravity fed by tank) is referenced
[K] = [I] * [J] * 60
[L] = 4hr x (PHD-Firm Capacity) where PHD = 1.4 x MDD. References Pressure Zone Demand worksheet for PHD.
[M] = [K] + [L]
[O] = ([M] - [N]) > 0
2. For Gardner Mountain assume excess Supply of 1456 gpm - Demand of 648 gpm = 808 gpm available for fire supply over 3 hours. This provides 145,440 gallons of storage over 3 hours for fire storage

Table B2 - 6A Scenario 4 Modified Water System with Heavenly Serving Keller

	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]
		Demand Summary			Supply Summary			Fire Storage Summary						
Storage Zone	Zone	PHD (gpm)	Exported MDD (gpm)	Total Demand (gpm)	Zone Supply From Wells (gpm)	Imported Supply from Adjacent Zones (gpm)	Total Supply Capacity (gpm)	Fire Demand (gpm)	Fire Duration (hr)	Fire Volume (gal)	Operational Storage Requirement (gal)	Total Supply Requirement (gal)	Existing Available Storage (gal)	Additional Storage Required (gal)
Heavenly Storage	Heavenly Valley	244	280	524	-	1,173	1,173	3,000	3	540,000	-	540,000	1,050,000	-
	Price Road	59	-	59	-	30	30							
	Terrace	13	-	13	-	6	6							
Keller Storage	Keller	5	225	231	-	215	215							
	Four Seasons	-	-	-	-	-	-							
	Middle Keller	0	210	210	-	197	197							
	Needle Peak	59	11	70	-	40	40							
	Rocky Point	16	-	16	-	(2)	(2)							
	Sweeping Turn	220	53	273	-	197	197							
	Upper Saddle	21	-	21	-	14	14							
Iroquois Storage	Iroquois	383	333	716	-	377	377	2,500	2	300,000	81,359	381,359	530,000	-
	Comanche	8	-	8	-	2	2							
	Ottawa	2	-	2	-	-	-							
	Pine Valley	192	43	235	-	56	56							
	Susquehana	60	-	60	-	(81)	(81)							
Country Club Storage	Country Club	207	-	207	275	46	321	2,500	2	300,000	-	300,000	345,000	-
Arrowhead Storage	Arrowhead	358	876	1,234	800	-	800	2,500	2	300,000	104,064	404,064	1,080,000	-
Christmas Valley Storage	Christmas Valley	377	-	377	1,250	167	1,417	2,500	2	300,000	-	300,000	185,000	115,000
Flagpole Storage	Flagpole	363	55	418	-	746	746	2,500	2	300,000	-	300,000	376,000	-
	Mt. Rainier	77	-	77	-	487	487							
Angora Highlands Storage	Angora Highlands	40	-	40	-	89	89	1,000	2	120,000	-	120,000	249,000	-
Forest Mountain Storaage	Forest Mountain	21	29	50	-	104	104	1,000	2	120,000	-	120,000	158,000	-
Twin Peaks Storage	Twin Peaks	164	358	522	-	967	967	1,000	2	120,000	-	120,000	503,000	-
Gardner Mountain Storage (Note 2)	Gardner Mountain	648	475	1,123	550	880	1,430	3,000	3	540,000	-	540,000	544,440	-
Stateline Storage	Stateline	8,374	2,539	10,914	8,364	-	8,364	3,000	3	540,000	611,928	1,151,928	3,590,000	-
Montgomery Estates Storage	Montgomery Estates	393	5	398	-	268	268	2,500	2	300,000	31,185	331,185	480,000	-
N/A	H Street	21	-	21	-	14	14	1,000	2	120,000	1,663	121,663	-	121,663
N/A	Upper Montgomery Estates	6	-	6	-	(13)	(13)	1,000	2	120,000	4,665	124,665	-	124,665

Notes:

1. Equations for Estimating Data:
[C] = PHD or Peak Hour Demand
[D] = "Exported PHD" value represents all of the flow provided to tributary zones as well as flow distributed to other storage areas
[E] = [C] + [D]
[G] = Sum of wells, boosters, and PRVs (per Case) feeding a combined zone, plus contingency supplies that would be activated during a fire event. References Wells, Tanks, and PRVs worksheets.
[H] = [F] + [G]
[I] = Fire storage required for duration based on Pressure Zone Demand worksheet. The single greatest fire supply requirement for a combined zone (ie., tank zone plus subzones gravity fed by tank) is referenced
[K] = [I] * [J] * 60
[L] = 4hr x (PHD-Firm Capacity) where PHD = 1.4 x MDD. References Pressure Zone Demand worksheet for PHD.
[M] = [K] + [L]
[O] = ([M] - [N]) > 0
2. For Gardner Mountain assume excess Supply of 1456 gpm - Demand of 648 gpm = 808 gpm available for fire supply over 3 hours. This provides 145,440 gallons of storage over 3 hours for fire storage

Table B2-1B: Summary of Storage Current Water System

Storage Zone	Zone	Case 1 Additional Storage Required (gal)	Case 2 Additional Storage Required (gal)	Case 2A Additional Storage Required (gal)	Case 3 Additional Storage Required (gal)	Case 4 Additional Storage Required (gal)	Worst Case Additional Storage Required (gal)
Keller Storage	Keller	209,000	209,000	230,102	209,000	216,140	230,102
	Four Seasons						
	Middle Keller						
	Needle Peak						
	Rocky Point						
	Sweeping Turn						
	Upper Saddle						
Heavenly Storage	Heavenly Valley	-	-	-	-	-	-
	Price Road						
	Terrace						
Iroquois Storage	Iroquois	-	-	-	-	-	-
	Comanche						
	Ottawa						
	Pine Valley						
	Susquehana						
Country Club Storage	Country Club	-	-	-	-	-	-
Arrowhead Storage	Arrowhead	-	-	-	-	-	-
Christmas Valley Storage	Christmas Valley	115,000	115,000	115,000	115,000	115,000	115,000
Flagpole Storage	Flagpole	-	-	-	-	-	-
	Mt. Rainier						
Angora Highlands Storage	Angora Highlands	-	-	-	-	-	-
Forest Mountain Storaage	Forest Mountain	-	-	-	-	-	-
Twin Peaks Storage	Twin Peaks	-	-	-	-	-	-
Gardner Mountain Storage	Gardner Mountain	-	-	-	-	-	-
Stateline Storage	Stateline	-	-	-	-	-	-
Montgomery Estates Storage	Montgomery Estates	-	-	-	-	-	-
N/A	H Street	120,000	120,000	125,040	120,000	121,884	125,040
N/A	Upper Montgomery Estates	120,000	120,000	146,262	120,000	128,876	146,262

Table B2 - 2B Scenario 1 Current Water System

	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]
		Demand Summary			Supply Summary			Fire Storage Summary						
Storage Zone	Zone	PHD (gpm)	Exported MDD (gpm)	Total Demand (gpm)	Zone Supply From Wells (gpm)	Imported Supply from Adjacent Zones (gpm)	Total Supply Capacity (gpm)	Fire Demand (gpm)	Fire Duration (hr)	Fire Volume (gal)	Operational Storage Requirement (gal)	Total Supply Requirement (gal)	Existing Available Storage (gal)	Additional Storage Required (gal)
Keller Storage	Keller	5	313	318	-	413	413	3,000	3	540,000	-	540,000	331,000	209,000
	Four Seasons	-	-	-	-	-	-							
	Middle Keller	0	298	298	-	389	389							
	Needle Peak	59	11	70	-	88	88							
	Rocky Point	16	-	16	-	46	46							
	Sweeping Turn	220	141	360	-	389	389							
	Upper Saddle	21	-	21	-	20	20							
Heavenly Storage	Heavenly Valley	244	51	295	-	532	532	2,500	2	300,000	-	300,000	1,050,000	-
	Price Road	59	-	59	-	295	295							
	Terrace	13	-	13	-	62	62							
Iroquois Storage	Iroquois	383	333	716	-	945	945	2,500	2	300,000	-	300,000	530,000	-
	Comanche	8	-	8	-	11	11							
	Ottawa	2	-	2	-	-	-							
	Pine Valley	192	43	235	-	363	363							
	Susquehana	60	-	60	-	226	226							
Country Club Storage	Country Club	207	-	207	275	298	573	2,500	2	300,000	-	300,000	345,000	-
Arrowhead Storage	Arrowhead	358	921	1,279	1,290	400	1,690	2,500	2	300,000	-	300,000	1,080,000	-
Christmas Valley Storage	Christmas Valley	377	400	777	1,250	-	1,250	2,500	2	300,000	-	300,000	185,000	115,000
Flagpole Storage	Flagpole	363	55	418	-	490	490	2,500	2	300,000	-	300,000	376,000	-
	Mt. Rainier	77	-	77	-	230	230							
Angora Highlands Storage	Angora Highlands	40	-	40	-	780	780	1,000	2	120,000	-	120,000	249,000	-
Forest Mountain Storaage	Forest Mountain	21	29	50	-	970	970	1,000	2	120,000	-	120,000	158,000	-
Twin Peaks Storage	Twin Peaks	164	44	208	-	1,087	1,087	1,000	2	120,000	-	120,000	503,000	-
Gardner Mountain Storage (Note 2)	Gardner Mountain	648	161	809	550	1,000	1,550	3,000	3	540,000	-	540,000	544,440	-
Stateline Storage	Stateline	8,374	1,378	9,753	9,864	-	9,864	3,000	3	540,000	-	540,000	3,590,000	-
Montgomery Estates Storage	Montgomery Estates	393	5	398	-	804	804	2,500	2	300,000	-	300,000	480,000	-
N/A	H Street	21	-	21	-	42	42	1,000	2	120,000	-	120,000	-	120,000
N/A	Upper Montgomery Estates	6	-	6	-	523	523	1,000	2	120,000	-	120,000	-	120,000

Notes:

1. Equations for Estimating Data:

[C] = PHD or Peak Hour Demand

[D] = "Exported PHD" value represents all of the flow provided to tributary zones as well as flow distributed to other storage areas.

[E] = [C] + [D]

[G] = Sum of wells, boosters, and PRVs (per Case) feeding a combined zone, plus contingency supplies that would be activated during a fire event. References Wells, Tanks, and PRVs worksheets.

[H] = [F] + [G]

[I] = Fire storage required for duration based on Pressure Zone Demand worksheet. The single greatest fire supply requirement for a combined zone (ie., tank zone plus subzones gravity fed by tank) is referenced.

[K] = [I] * [J] * 60

[L] = 4hr x (PHD-Firm Capacity) where PHD = 1.4 x MDD. References Pressure Zone Demand worksheet for PHD.

[M] = [K] + [L]

[O] = ([M] - [N]) > 0

2. For Gardner Mountain assume excess Supply of 1456 gpm - Demand of 648 gpm = 808 gpm available for fire supply over 3 hours. This provides 145,440 gallons of storage over 3 hours for fire storage.

Table B2 - 3B Scenario 2 Current Water System

	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]
		Demand Summary			Supply Summary			Fire Storage Summary						
Storage Zone	Zone	PHD (gpm)	Exported MDD (gpm)	Total Demand (gpm)	Zone Supply From Wells (gpm)	Imported Supply from Adjacent Zones (gpm)	Total Supply Capacity (gpm)	Fire Demand (gpm)	Fire Duration (hr)	Fire Volume (gal)	Operational Storage Requirement (gal)	Total Supply Requirement (gal)	Existing Available Storage (gal)	Additional Storage Required (gal)
Keller Storage	Keller	5	225	231	-	413	413	3,000	3	540,000	-	540,000	331,000	209,000
	Four Seasons	-	-	-	-	-	-							
	Middle Keller	0	210	210	-	382	382							
	Needle Peak	59	11	70	-	225	225							
	Rocky Point	16	-	16	-	183	183							
	Sweeping Turn	220	53	273	-	381	381							
	Upper Saddle	21	-	21	-	28	28							
Heavenly Storage	Heavenly Valley	244	51	295	-	441	441	2,500	2	300,000	-	300,000	1,050,000	-
	Price Road	59	-	59	-	220	220							
	Terrace	13	-	13	-	47	47							
Iroquois Storage	Iroquois	383	333	716	-	530	530	2,500	2	300,000	44,764	344,764	530,000	-
	Comanche	8	-	8	-	4	4							
	Ottawa	2	-	2	-	-	-							
	Pine Valley	192	43	235	-	138	138							
	Susquehana	60	-	60	-	1	1							
Country Club Storage	Country Club	207	-	207	275	114	389	2,500	2	300,000	-	300,000	345,000	-
Arrowhead Storage	Arrowhead	358	1,082	1,440	800	400	1,200	2,500	2	300,000	57,528	357,528	1,080,000	-
Christmas Valley Storage	Christmas Valley	377	400	777	1,250	-	1,250	2,500	2	300,000	-	300,000	185,000	115,000
Flagpole Storage	Flagpole	363	216	579	-	415	415	2,500	2	300,000	39,404	339,404	376,000	-
	Mt. Rainier	77	-	77	-	39	39							
Angora Highlands Storage	Angora Highlands	40	-	40	-	101	101	1,000	2	120,000	-	120,000	249,000	-
Forest Mountain Storaage	Forest Mountain	21	29	50	-	116	116	1,000	2	120,000	-	120,000	158,000	-
Twin Peaks Storage	Twin Peaks	164	44	208	-	116	116	1,000	2	120,000	22,064	142,064	503,000	-
Gardner Mountain Storage (Note 2)	Gardner Mountain	648	-	648	550	906	1,456	3,000	3	540,000	-	540,000	544,440	-
Stateline Storage	Stateline	8,374	1,217	9,592	8,364	-	8,364	3,000	3	540,000	294,672	834,672	3,590,000	-
Montgomery Estates Storage	Montgomery Estates	393	5	398	-	558	558	2,500	2	300,000	-	300,000	480,000	-
N/A	H Street	21	-	21	-	29	29	1,000	2	120,000	-	120,000	-	120,000
N/A	Upper Montgomery Estates	6	-	6	-	278	278	1,000	2	120,000	-	120,000	-	120,000

Notes: 1. Equations for Estimating Data:

[C] = PHD or Peak Hour Demand

[D] = "Exported PHD" value represents all of the flow provided to tributary zones as well as flow distributed to other storage areas.

[E] = [C] + [D]

[G] = Sum of wells, boosters, and PRVs (per Case) feeding a combined zone, plus contingency supplies that would be activated during a fire event. References Wells, Tanks, and PRVs worksheets.

[H] = [F] + [G]

[I] = Fire storage required for duration based on Pressure Zone Demand worksheet. The single greatest fire supply requirement for a combined zone (ie., tank zone plus subzones gravity fed by tank) is referenced.

[K] = [I] * [J] * 60

[L] = 4hr x (PHD-Firm Capacity) where PHD = 1.4 x MDD. References Pressure Zone Demand worksheet for PHD.

[M] = [K] + [L]

[O] = ([M] - [N]) > 0

2. For Gardner Mountain assume excess Supply of 1456 gpm - Demand of 648 gpm = 808 gpm available for fire supply over 3 hours. This provides 145,440 gallons of storage over 3 hours for fire storage.

Table B2 - 4B Scenario 2A Current Water System

	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]
		Demand Summary			Supply Summary			Fire Storage Summary						
Storage Zone	Zone	PHD (gpm)	Exported MDD (gpm)	Total Demand (gpm)	Zone Supply From Wells (gpm)	Imported Supply from Adjacent Zones (gpm)	Total Supply Capacity (gpm)	Fire Demand (gpm)	Fire Duration (hr)	Fire Volume (gal)	Operational Storage Requirement (gal)	Total Supply Requirement (gal)	Existing Available Storage (gal)	Additional Storage Required (gal)
Keller Storage	Keller	5	225	231	-	143	143	3,000	3	540,000	21,102	561,102	331,000	230,102
	Four Seasons	-	-	-	-	-	-							
	Middle Keller	0	210	210	-	12	12							
	Needle Peak	59	11	70	-	(145)	(145)							
	Rocky Point	16	-	16	-	(187)	(187)							
	Sweeping Turn	220	53	273	-	12	12							
	Upper Saddle	21	-	21	-	9	9							
Heavenly Storage	Heavenly Valley	244	51	295	-	140	140	2,500	2	300,000	37,117	337,117	1,050,000	-
	Price Road	59	-	59	-	(28)	(28)							
	Terrace	13	-	13	-	(6)	(6)							
Iroquois Storage	Iroquois	383	333	716	-	622	622	2,500	2	300,000	22,572	322,572	530,000	-
	Comanche	8	-	8	-	6	6							
	Ottawa	2	-	2	-	-	-							
	Pine Valley	192	43	235	-	188	188							
	Susquehana	60	-	60	-	51	51							
Country Club Storage	Country Club	207	-	207	275	-	275	2,500	2	300,000	-	300,000	345,000	-
Arrowhead Storage	Arrowhead	358	921	1,279	800	400	1,200	2,500	2	300,000	18,936	318,936	1,080,000	-
Christmas Valley Storage	Christmas Valley	377	400	777	1,250	-	1,250	2,500	2	300,000	-	300,000	185,000	115,000
Flagpole Storage	Flagpole	363	55	418	-	322	322	2,500	2	300,000	23,004	323,004	376,000	-
	Mt. Rainier	77	-	77	-	63	63							
Angora Highlands Storage	Angora Highlands	40	-	40	-	225	225	1,000	2	120,000	-	120,000	249,000	-
Forest Mountain Storaage	Forest Mountain	21	29	50	-	240	240	1,000	2	120,000	-	120,000	158,000	-
Twin Peaks Storage	Twin Peaks	164	44	208	-	476	476	1,000	2	120,000	-	120,000	503,000	-
Gardner Mountain Storage (Note 2)	Gardner Mountain	648	161	809	550	388	938	3,000	3	540,000	-	540,000	544,440	-
Stateline Storage	Stateline	8,374	1,378	9,753	6,840	-	6,840	3,000	3	540,000	699,024	1,239,024	3,590,000	-
Montgomery Estates Storage	Montgomery Estates	393	5	398	-	178	178	2,500	2	300,000	52,782	352,782	480,000	-
N/A	H Street	21	-	21	-	-	-	1,000	2	120,000	5,040	125,040	-	125,040
N/A	Upper Montgomery Estates	6	-	6	-	(103)	(103)	1,000	2	120,000	26,262	146,262	-	146,262

Notes:

1. Equations for Estimating Data:

[C] = PHD or Peak Hour Demand

[D] = "Exported PHD" value represents all of the flow provided to tributary zones as well as flow distributed to other storage areas.

[E] = [C] + [D]

[G] = Sum of wells, boosters, and PRVs (per Case) feeding a combined zone, plus contingency supplies that would be activated during a fire event. References Wells, Tanks, and PRVs worksheets.

[H] = [F] + [G]

[I] = Fire storage required for duration based on Pressure Zone Demand worksheet. The single greatest fire supply requirement for a combined zone (ie., tank zone plus subzones gravity fed by tank) is referenced.

[K] = [I] * [J] * 60

[L] = 4hr x (PHD-Firm Capacity) where PHD = 1.4 x MDD. References Pressure Zone Demand worksheet for PHD.

[M] = [K] + [L]

[O] = ([M] - [N]) > 0

2. For Gardner Mountain assume excess Supply of 1456 gpm - Demand of 648 gpm = 808 gpm available for fire supply over 3 hours. This provides 145,440 gallons of storage over 3 hours for fire storage.

Table B2 - 5B - Storage Scenario 3 Current Water System

	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]
		Demand Summary			Supply Summary			Fire Storage Summary						
Storage Zone	Zone	PHD (gpm)	Exported MDD (gpm)	Total Demand (gpm)	Zone Supply From Wells (gpm)	Imported Supply from Adjacent Zones (gpm)	Total Supply Capacity (gpm)	Fire Demand (gpm)	Fire Duration (hr)	Fire Volume (gal)	Operational Storage Requirement (gal)	Total Supply Requirement (gal)	Existing Available Storage (gal)	Additional Storage Required (gal)
Keller Storage	Keller	5	225	231	-	327	327	3,000	3	540,000	-	540,000	331,000	209,000
	Four Seasons	-	-	-	-	-	-							
	Middle Keller	0	210	210	-	302	302							
	Needle Peak	59	11	70	-	145	145							
	Rocky Point	16	-	16	-	103	103							
	Sweeping Turn	220	53	273	-	301	301							
	Upper Saddle	21	-	21	-	22	22							
Heavenly Storage	Heavenly Valley	244	51	295	-	1,250	1,250	2,500	2	300,000	-	300,000	1,050,000	-
	Price Road	59	-	59	-	42	42							
	Terrace	13	-	13	-	9	9							
Iroquois Storage	Iroquois	383	333	716	-	717	717	2,500	2	300,000	-	300,000	530,000	-
	Comanche	8	-	8	-	7	7							
	Ottawa	2	-	2	-	-	-							
	Pine Valley	192	43	235	-	239	239							
	Susquehana	60	-	60	-	102	102							
Country Club Storage	Country Club	207	-	207	275	197	472	2,500	2	300,000	-	300,000	345,000	-
Arrowhead Storage	Arrowhead	358	876	1,234	1,290	-	1,290	2,500	2	300,000	-	300,000	1,080,000	-
Christmas Valley Storage	Christmas Valley	377	-	377	1,250	318	1,568	2,500	2	300,000	-	300,000	185,000	115,000
Flagpole Storage	Flagpole	363	55	418	-	820	820	2,500	2	300,000	-	300,000	376,000	-
	Mt. Rainier	77	-	77	-	560	560							
Angora Highlands Storage	Angora Highlands	40	-	40	-	103	103	1,000	2	120,000	-	120,000	249,000	-
Forest Mountain Storaage	Forest Mountain	21	29	50	-	118	118	1,000	2	120,000	-	120,000	158,000	-
Twin Peaks Storage	Twin Peaks	164	358	522	-	1,087	1,087	1,000	2	120,000	-	120,000	503,000	-
Gardner Mountain Storage (Note 2)	Gardner Mountain	648	475	1,123	550	1,000	1,550	3,000	3	540,000	-	540,000	544,440	-
Stateline Storage	Stateline	8,374	2,717	11,092	9,864	-	9,864	3,000	3	540,000	294,672	834,672	3,590,000	-
Montgomery Estates Storage	Montgomery Estates	393	5	398	-	408	408	2,500	2	300,000	-	300,000	480,000	-
N/A	H Street	21	-	21	-	21	21	1,000	2	120,000	-	120,000	-	120,000
N/A	Upper Montgomery Estates	6	-	6	-	127	127	1,000	2	120,000	-	120,000	-	120,000

Notes: 1. Equations for Estimating Data:

[C] = PHD or Peak Hour Demand

[D] = "Exported PHD" value represents all of the flow provided to tributary zones as well as flow distributed to other storage areas

[E] = [C] + [D]

[G] = Sum of wells, boosters, and PRVs (per Case) feeding a combined zone, plus contingency supplies that would be activated during a fire event. References Wells, Tanks, and PRVs worksheets

[H] = [F] + [G]

[I] = Fire storage required for duration based on Pressure Zone Demand worksheet. The single greatest fire supply requirement for a combined zone (ie., tank zone plus subzones gravity fed by tank) is referencec

[K] = [I] * [J] * 60

[L] = 4hr x (PHD-Firm Capacity) where PHD = 1.4 x MDD. References Pressure Zone Demand worksheet for PHD.

[M] = [K] + [L]

[O] = ([M] - [N]) > 0

2. For Gardner Mountain assume excess Supply of 1456 gpm - Demand of 648 gpm = 808 gpm available for fire supply over 3 hours. This provides 145,440 gallons of storage over 3 hours for fire storage

Table B2 - 6B - Storage Scenario 4 Current Water System

	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]
		Demand Summary			Supply Summary			Fire Storage Summary						
Storage Zone	Zone	PHD (gpm)	Exported MDD (gpm)	Total Demand (gpm)	Zone Supply From Wells (gpm)	Imported Supply from Adjacent Zones (gpm)	Total Supply Capacity (gpm)	Fire Demand (gpm)	Fire Duration (hr)	Fire Volume (gal)	Operational Storage Requirement (gal)	Total Supply Requirement (gal)	Existing Available Storage (gal)	Additional Storage Required (gal)
Keller Storage	Keller	5	225	231	-	201	201	3,000	3	540,000	7,140	547,140	331,000	216,140
	Four Seasons	-	-	-	-	-	-							
	Middle Keller	0	210	210	-	184	184							
	Needle Peak	59	11	70	-	27	27							
	Rocky Point	16	-	16	-	(15)	(15)							
	Sweeping Turn	220	53	273	-	184	184							
	Upper Saddle	21	-	21	-	13	13							
Heavenly Storage	Heavenly Valley	244	51	295	-	1,096	1,096	2,500	2	300,000	-	300,000	1,050,000	-
	Price Road	59	-	59	-	(85)	(85)							
	Terrace	13	-	13	-	(18)	(18)							
Iroquois Storage	Iroquois	383	333	716	-	377	377	2,500	2	300,000	81,359	381,359	530,000	-
	Comanche	8	-	8	-	2	2							
	Ottawa	2	-	2	-	-	-							
	Pine Valley	192	43	235	-	56	56							
	Susquehana	60	-	60	-	(81)	(81)							
Country Club Storage	Country Club	207	-	207	275	46	321	2,500	2	300,000	-	300,000	345,000	-
Arrowhead Storage	Arrowhead	358	876	1,234	800	-	800	2,500	2	300,000	104,064	404,064	1,080,000	-
Christmas Valley Storage	Christmas Valley	377	-	377	1,250	167	1,417	2,500	2	300,000	-	300,000	185,000	115,000
Flagpole Storage	Flagpole	363	55	418	-	696	696	2,500	2	300,000	-	300,000	376,000	-
	Mt. Rainier	77	-	77	-	436	436							
Angora Highlands Storage	Angora Highlands	40	-	40	-	82	82	1,000	2	120,000	-	120,000	249,000	-
Forest Mountain Storaage	Forest Mountain	21	29	50	-	96	96	1,000	2	120,000	-	120,000	158,000	-
Twin Peaks Storage	Twin Peaks	164	358	522	-	910	910	1,000	2	120,000	-	120,000	503,000	-
Gardner Mountain Storage (Note 2)	Gardner Mountain	648	475	1,123	550	822	1,372	3,000	3	540,000	-	540,000	544,440	-
Stateline Storage	Stateline	8,374	2,717	11,092	8,364	-	8,364	3,000	3	540,000	654,672	1,194,672	3,590,000	-
Montgomery Estates Storage	Montgomery Estates	393	5	398	-	250	250	2,500	2	300,000	35,396	335,396	480,000	-
N/A	H Street	21	-	21	-	13	13	1,000	2	120,000	1,884	121,884	-	121,884
N/A	Upper Montgomery Estates	6	-	6	-	(31)	(31)	1,000	2	120,000	8,876	128,876	-	128,876

Notes:

1. Equations for Estimating Data:

[C] = PHD or Peak Hour Demand

[D] = "Exported PHD" value represents all of the flow provided to tributary zones as well as flow distributed to other storage areas.

[E] = [C] + [D]

[G] = Sum of wells, boosters, and PRVs (per Case) feeding a combined zone, plus contingency supplies that would be activated during a fire event. References Wells, Tanks, and PRVs worksheets.

[H] = [F] + [G]

[I] = Fire storage required for duration based on Pressure Zone Demand worksheet. The single greatest fire supply requirement for a combined zone (ie., tank zone plus subzones gravity fed by tank) is referenced.

[K] = [I] * [J] * 60

[L] = 4hr x (PHD-Firm Capacity) where PHD = 1.4 x MDD. References Pressure Zone Demand worksheet for PHD.

[M] = [K] + [L]

[O] = ([M] - [N]) > 0

2. For Gardner Mountain assume excess Supply of 1456 gpm - Demand of 648 gpm = 808 gpm available for fire supply over 3 hours. This provides 145,440 gallons of storage over 3 hours for fire storage.

Appendix E for Section 6 (TM 5)

Cost Estimates

High-Priority Projects

ENGINEER'S ESTIMATE OF PROBABLE COST

Project A (HIGH PRIORITY)
Project: STPUD Water System Optimization Plan

KENNEDY/JENKS CONSULTANTS

Prepared By: RH/NR
Date Updated: 17-Feb-15
K/J Proj. No.: 1270004*00

Reviewed By: TW

Date Reviewed: 17-Feb-15

ITEM NO.[1]	PROJECT NAME	TM 1 SECTION/PAGE NUMBER OR TM 4 PROJECT NUMBER REFERENCE	BENEFITS OF THIS PROJECT	SITE	TOTAL[2]	DEPT	RECOMMENDED IMPLEMENTATION FISCAL YEAR	NOTES
A1	Critical Waterline Evaluation	TM 1: Section 5.5, pg 1-16	Determine condition of critical pipelines to determine remaining useful life and replacement/rehab needed to extend the useful life of these critical assets	Airport Runway/Trout Creek/UTR Meyer Crossing/Keller Discharge/David Lane Discharge	$ 105,000	Engineering	13/14	
A2	Water Supply to the Y - Engineering Study	TM 4: 33 to 36	Determine the optimal improvements required to improve reliable water service west of the Upper Truckee River Bridge in the Stateline and Gardner Mountain zones.	Upper Truckee River Crossing	$ 42,000	Engineering	13/14	
A3	H-Street Booster Station Improvements	TM 4: 9	Improve reliabiltiy and redudancy of pressure zone to provide emergency water service	H Street Booster PS	$ 104,000	Engineering	16/17	
A4	Site Drainage and BMP Improvements	TM 1: Section 4.1, Table 7 and Section 4.2, Table 8	Implement site drainage improvements to protect Lake Tahoe water quality	MULTIPLE	$ 348,000	Engineering / Pumps /URW	13/14	
A5	Mountain View Well Abandonment	TM 1: Section 4.2, Table 8	Abandon existing well to protect groundwater basin from surface water contamination because of poor well sanitary seal	Mountain View Well	$ 218,000	Engineering	14/15	**Project completed by District late summer 2014**
A6	Chemical Safety Improvements at Well Buildings	TM 1: Section 4.2, Table 8	Prevent spillage of sodium hypochlorite to protect workers and the environment	MULTIPLE	$ 20,000	Pumps	14/15	
A7	Arcflash Assessment Wells and Booster Stations	TM 1: Section 4.1, Table 7 and Section 4.2, Table 8	Electrical Safety and Reliability Improvements	MULTIPLE	$ 233,000	Engineering / Electrical	21/22	
A8	PRV Replacement and Reliability Improvements	TM 1: Section 4.3, Table 9	Improve access, security, extend useful life of the PRV, add redundancy, and improve operations of PRVs	MULTIPLE	$ 836,000	Engineering / Pumps	21/22 (18%) & 22/23 (82%)	18% of the project completed in FY 21/22 and 82% of the project completed in FY 22/23
A9a	Keller Tank Alternatives - Engineering Study	TM 4: 11 to 19	Determine the preferred alternative to correct storage shortage by providing additional storage of 0.24 MG and fire protection for the Keller, Upper Saddle, and Sweeping Turn zones by evaluating Projects 9B, 9C, and 9D.	Keller Zone, Upper Saddle Zone, Sweeping Turn Zone, Middle Keller, Needle Peak, Rocky Point	$ 79,000	Engineering/Pumps	14/15	
A9b	Keller Booster Station Relocation	TM 4[3]:11 to 19	Corrects a shortage of storage and fire flow for these multiple zones	Keller Zone, Upper Saddle Zone, Sweeping Turn Zone	$ 1,861,000	Engineering / Pumps	14/15, 16/17 & 17/18	Not used for budget planning
A9c	Keller Tanks Relocation	TM 1/TM 4[3]: Project 20, Alternative for projects 11 to 19	Corrects a shortage of storage and fire flow for these multiple zones	Keller Tank	$ 3,125,000	Engineering / Pumps	14/15	(serves same purpose as Alt A9a & A9c). Used in budget planning purposes
A9d	Keller Tanks Replacement	TM 1/TM 4[3]: Project 20, Alternative for projects 11 to 19	Corrects a shortage of storage and fire flow for these multiple zones	Keller Tank	$ 1,778,000	Engineering / Pumps	14/15	(serves same purpose as Alt A9A & A9B). Not used in budget planning purposes
A10	Tank Access and Site Improvements	TM 1: Section 4.4, Table 10	Improve access, protection from fire, and minimize impacts from runoff to Lake Tahoe water quality	MULTIPLE	$ 444,000	Engineering / Pumps / URW	16/17	
A11	Tank Seismic Improvements	TM 1: Section 4.4, Table 10	Extend useful life and enhance tank protection from earthquake damage	MULTIPLE	$ 137,000	Engineering / Pumps	16/17	
A12	Well Inspections	TM 1: Section 4.2, Table 8	Extend useful life of Palolma and Sunset Well assets	MULTIPLE	$ 53,000	Engineering / Pumps	14/15	
A13	Crest-Bonita PRV Installation	TM 4: 38	Provides a redundant supply connection that will improve reliability, redudnacy, fire flow and pressures	Crest Rd. & Bonita Rd. (Upper Saddle Zone to Sweeping Turn Zone)	$ 118,000	Engineering / Pumps	14/15	**Project completed by District late summer 2014**
A14	Pioneer-Norma Check Valve Installation	TM 4: 30	Enhances fire flow service and improves redundancy	Pioneer Trail & Norma Drive	$ 122,000	Engineering / Pumps	17/18	
A15	Forest Fire Capability Assessment - Engineering Study	TM 4: 59	Evaluate existing water system performance and identify operational procedures and system improvements to increase fire flows for extended periods of time.	MULTIPLE	$ 26,000	Engineering/Pumps	15/16	
A16	Pioneer-Busch PRV Installation	TM 1/TM 4: 25	Improve reliability and redundancy and provide improved fire flows	Pioneer Trail & Busch Way (Iroquois to Pine Valley zone)	$ 122,000	Engineering / Pumps	17/18	
A17	Pioneer Trail Waterline Installation	TM 4: 26	Improves fire protection and redundancy	Pioneer Trail from Elks Club Dr to Busch Way	$ 1,356,000	Engineering / Pumps	17/18 (42%) and 18/19 (58%)	42% of the project completed in FY 17/18 and 58% of the project completed in FY 18/19
A18	Washoan-Nadowa PRV Installation	TM 4: 2	Improve fire flow and service redundancy	Washoan Blvd & Nadowa St at normally closed valve (M33-047) Pine Valley to Country Club	$ 118,000	Engineering / Pumps	17/18	
A19	Glen Eagle PRV Installation	TM 4: 3	Improve fire flow and service redundancy	Glen Eagle Rd at normally closed valve M34-021NC (Pine Valley to Country Club)	$ 118,000	Engineering / Pumps	17/18	
A20	Water Supply to Stateline Zone - Engineering Study	TM 1/TM 4: 37	Determine preferred alternative to correct supply capacity shortfall	Stateline Zone	$ 79,000	Engineering / Pumps	22/23	
A21	Critical Valve Assessment	TM 1: 60	Correct "panhandle areas" and non-valved areas that are vulnerable during emergency and shut-down conditions to improve reliability of service	MULTIPLE	$ 26,000	Engineering / Pumps	18/19	
A22	SCADA Improvements	TM 4: 55	Improves data to develop diurnal curve to improve hydraulic model tool and enhance operations of water system	MULTIPLE	$ 11,000	Engineering / Pumps	18/19	
A23	Water Model Demand Allocation Improvements	TM 4: 56	Improve hydraulic model with actual data will improve future optimization of the water system evaluations	MULTIPLE	$ 11,000	Engineering	18/19	
A24	Pine Valley - Susquehanna Waterline	TM 4: 27, 28, & 29	Improves fire flow and redundancy	Pine Valley & Susquehanna Zones	$ 258,000	Engineering / Pumps	17/18	
A25	Montgomery Estates Zone Evaluation - Engineering Study	TM 4: 23 & 24	Determine optimal pressure zone configuration to improve areas that experience low pressure and improve other areas that experience high pressures that exceed the District's LOS standards	Montgomery Estates and Upper Montgomery Estates Zones	$ 53,000	Engineering / Pumps	15/16	
A26	Fire Flow Calibration Testing	TM 4: 57	Improve the hydraulic model tool to enhance predictability and reliability of predicting fire flow capabilities	MULTIPLE	$ 21,000	Engineering/Pumps	15/16	
A27	Fire Hydrants on 4-inch Waterlines - Engineering Study	TM 4: 58	Improve fire protection and life safety for the community served by the District	MULTIPLE	$ 11,000	Engineering	15/16	
A28	Cornelian Fire Pump and Waterline Installation	TM 4: 1	Improve fire flow protection for the Christmas Valley zone	Cornelian Booster Pump Station site	$ 635,000	Engineering / Pumps	28/29	
A29	Upper Montgomery Estates Pump Station Replacement	TM 4: 53	Improves fire protection and redundancy in emergency conditions	Upper Montgomery Estates	$ 1,153,000	Engineering / Pumps	15/16	
A30	Install New Standby Generators	TM 2: LOS	Provide Water Reliable; Provide Redundancy Within System; 100% of critical facilities have backup power capabilities	Keller Zone - Keller Booster Pump Station and Heavenly Zone - David Lane Booster Pump Station	$ 762,000	Engineering / Pumps	17/18	

Total High-Priority Projects[3] **$ 11,000,000**

NOTE:

(1) Project-number designations do not necessarily reflect the sequence or priority of implementation

(2) Total Project Cost Estimates are based on JULY 1, 2014 costs and **are not** escalated to the recommended implementation year.

(3) Projects A9c was used in the Total Project Cost determination and Projects A9b and A9d are not used in determining the Total Project Cost

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A1
Project Name: Critical Waterline Evaluation
Site: Airport Runway/Trout Creek/UTR Meyer Crossing/Keller Discharge/David Lane Discharge
General Description: Pipeline Evaluation
Benefits of this Project: Determine condition of critical pipelines to determine remaining useful life and replacement/rehab needed to extend the useful life of these critical assets

STPUD Water System Optimization Plan
Prepared By: RH/NR
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15
ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	ENGINEERING STUDY TO ESTABLISH THE REMAINING USEFUL LIFE OF CRITICAL PIPELINES	$ 100,000

Subtotals	**$**	**100,000**	
	$	-	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**100,000**	
	$	-	Contractor OH&P
Subtotal	**$**	**100,000**	
	$	-	Estimate Contingency
Total Construction	**$**	**100,000**	
	$	-	Engineering & CM
	$	-	Administration/Permitting
	$	**100,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	105,000	Escalation Factor
Total Project	**$**	**105,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A2
Project Name: Water Supply to the Y - Engineering Study
Site: Upper Truckee River Crossing
General Description: Water-to-Y Engineering Study
Benefits of this Project: Determine the optimal improvements required to improve reliable water service west of the Upper Truckee River Bridge in the Stateline and Gardner Mountain zones.

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
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ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	ENGINEERING STUDY	$ 40,000

Subtotals	**$**	**40,000**	
	$	-	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**40,000**	
	$	-	Contractor OH&P
Subtotal	**$**	**40,000**	
	$	-	Estimate Contingency
Total Construction	**$**	**40,000**	
	$	-	Engineering & CM
	$	-	Administration/Permitting
	$	**40,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	42,000	Escalation Factor
Total Project	**$**	**42,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A3
Project Name: H-Street Booster Station Improvements
Site: H Street Booster PS
General Description: Add new check valve around pump station to supply H-Street Zone w/o pumping
Benefits of this Project: Improve reliabiltiy and redudancy of pressure zone to provide emergency water service

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	8" check valve	$ 2,000
	Valve Vault Traffic Rated	$ 20,000
	Piping	$ 7,000
	Cut and Patch AC	$ 5,000
	Traffic Control	$ 2,000
	Locking Hatch	$ 2,000
	Isolation Valve x 2	$ 4,000
	Pressure Gauges	$ 2,000
	Flowmeter	$ 3,000
	Pipe Supports	$ 1,000

Subtotals	**$**	**48,000**	
7.75%	$	1,239	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**49,239**	
15%	$	7,386	Contractor OH&P
Subtotal	**$**	**56,625**	
30%	$	16,987	Estimate Contingency
Total Construction	**$**	**73,612**	
25%	$	18,403	Engineering & CM
10%	$	7,361	Administration/Permitting
	$	**99,376**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	104,000	Escalation Factor
Total Project	**$**	**104,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A4
Project Name: Site Drainage and BMP Improvements
Site: MULTIPLE
General Description: Site Drainage Improvements (mandatory BMPs)
Benefits of this Project: Implement site drainage improvements to protect Lake Tahoe water quality

STPUD Water System Optimization Plan
Prepared By: NR/RH
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K/J Proj. No.: 1270004*00
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Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	CLEAR VEGETATION & OTHER BMPS	
1	AIRPORT BOOSTER	$ 1,000
2	BLACK BART BOOSTER	$ 15,000
3	BOULDER MOUNTAIN BOOSTER	$ 1,000
4	COLD CREEK TANK BOOSTER	$ 40,000
5	CORNEILIAN BOOSTER	$ 1,000
6	DAVID LANE BOOSTER	$ 10,000
7	FLAGPOLE BOOSTER	$ 1,000
8	H STREET BOOSTER	$ 40,000
9	KELLER BOOSTER	$ 10,000
10	SOUTH APACHE BOOSTER	$ 6,000
	IMPROVE SITE DRAINAGE & OTHER BMPS	
1	AIRPORT WELL (OFFLINE)	$ 10,000
2	AL TAHOE NO. 2	$ 1,000
3	BAKERSFIELD WELL	$ 1,000
4	BAYVIEW WELL	$ 1,000
5	BLACKROCK NO. 2 (OFFLINE)	$ 10,000
6	CHRIS WELL (OFFLINE)	$ 10,000
7	CLEMENT WELL (OFFLINE)	$ 15,000
8	COLLEGE WELL (OFFLINE - URANIUM)	$ 10,000
9	ELKS CLUB NO. 2	$ 1,000
10	GLENWOOD WELL NO. 5	$ 1,000
11	HELEN WELL NO. 2	$ 20,000
12	MARTIN WELL (OFFLINE - IRON/MANGANESE)	$ 40,000
13	MOUNTAIN VIEW WELL	$ 40,000
14	PALOMA WELL	$ 1,000
15	SUNSET WELL	$ 5,000
16	TATA WELL NO. 1 (OFFLINE - ARSENIC)	$ 40,000

Note: markups for sales tax on materials, contractor OH&P, estimated contingency, engineering & CM, and administration/permitting are included in the cost listed for each line item

Subtotals	**$**	**331,000**	
7.75%			Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**331,000**	
15%			Contractor OH&P
Subtotal	**$**	**331,000**	
30%			Estimate Contingency
Total Construction	**$**	**331,000**	
25%			Engineering & CM
10%			Administration/Permitting
	$	**331,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	348,000	Escalation Factor
Total Project	**$**	**348,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A5
Project Name: Mountain View Well Abandonment
Site: Mountain View Well
General Description: Groundwater Protection
Benefits of this Project: Abandon existing well to protect groundwater basin from surface water contamination because of poor well sanitary seal

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
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Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.		TOTAL
	Abandon Well	$ 100,000

Subtotals	**$**	**100,000**	
7.75%	$	2,581	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**102,581**	
15%	$	15,387	Contractor OH&P
Subtotal	**$**	**117,968**	
30%	$	35,390	Estimate Contingency
Total Construction	**$**	**153,358**	
25%	$	38,340	Engineering & CM
10%	$	15,336	Administration/Permitting
	$	**207,034**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	218,000	Escalation Factor
Total Project	**$**	**218,000**	

NOTE: PROJECT COMPLETED BY DISTRICT IN LATE SUMMER OF 2014

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A6
Project Name: Chemical Safety Improvements at Well Buildings
Site: MULTIPLE
General Description: Safety Improvements
Benefits of this Project: Prevent spillage of sodium hypochlorite to protect workers and the environment

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	PROVIDE SPILL SKID FOR SODIUM HYPOCHLORITE DRUM(S)	
	AL TAHOE NO. 2	$ 1,000
	ARROWHEAD WELL NO. 3	$ 1,000
	ELKS CLUB NO. 2	$ 1,000
	GLENWOOD WELL NO. 5	$ 1,000
	HELEN WELL NO. 2	$ 1,000
	MOUNTAIN VIEW WELL	$ 1,000
	PALOMA WELL	$ 1,000
	SUNSET WELL	$ 1,000
	VALHALLA WELL	$ 1,000

Subtotals	**$**	**9,000**	
7.75%	$	232	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**9,232**	
15%	$	1,385	Contractor OH&P
Subtotal	**$**	**10,617**	
30%	$	3,185	Estimate Contingency
Total Construction	**$**	**13,802**	
25%	$	3,451	Engineering & CM
10%	$	1,380	Administration/Permitting
	$	**18,633**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	20,000	Escalation Factor
Total Project	**$**	**20,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A7
Project Name: Arcflash Assessment Wells and Booster Stations
Site: MULTIPLE

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

General Description: Perform ARC-FLASH study improve emergency generator facilities, and useful life evaluation of electrical equipment
Benefits of this Project: Electrical Safety and Reliability Improvements

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	PERFORM ARC-FLASH STUDY	
	GRIZZLY MOUNTAIN BOOSTER	$ 2,000
	NORTH APACHE BOOSTER	$ 2,000
	TWIN PEAKS BOOSTER	$ 2,000
	PROVIDE PIN-AND-SLEEVE SOCKET AND MANUAL TRANSFER SWITCH	
	HELEN WELL NO. 2	$ 4,000
	MOUNTAIN VIEW WELL	$ 4,000
	PALOMA WELL	$ 7,000
	SUNSET WELL	$ 4,000
	BOULDER MOUNTAIN BOOSTER	$ 4,000
	H STREET BOOSTER	$ 4,000
	TATA BOOSTER	$ 4,000
	EVALUATE PHYSICAL MORTALITY OF ELECTRICAL GEAR	
	AL TAHOE NO. 2	$ 5,000
	HELEN WELL NO. 2	$ 5,000
	MOUNTAIN VIEW WELL	$ 5,000
	SUNSET WELL	$ 5,000
	VALHALLA WELL	$ 5,000
	BLACK BART BOOSTER	$ 5,000
	BOULDER MOUNTAIN BOOSTER	$ 5,000
	COLD CREEK TANK BOOSTER	$ 5,000
	DAVID LANE BOOSTER	$ 5,000
	FLAGPOLE BOOSTER	$ 5,000
	FOREST MOUNTAIN BOOSTER	$ 5,000
	KELLER BOOSTER	$ 5,000
	SOUTH APACHE BOOSTER	$ 5,000
	TATA BOOSTER	$ 5,000

Subtotals	**$**	**107,000**	
7.75%	$	2,761	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**109,761**	
15%	$	16,464	Contractor OH&P
Subtotal	**$**	**126,226**	
30%	$	37,868	Estimate Contingency
Total Construction	**$**	**164,093**	
25%	$	41,023	Engineering & CM
10%	$	16,409	Administration/Permitting
	$	**221,526**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	233,000	Escalation Factor
Total Project	**$**	**233,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST | **KENNEDY/JENKS CONSULTANTS**

Item No: A8
Project Name: PRV Replacement and Reliability Improvements
Site: MULTIPLE
General Description: PRV Improvements
Benefits of this Project: Improve access, security, extend useful life of the PRV, add redundancy, and improve operations of PRVs

STPUD Water System Optimization Plan
Prepared By: NR/RH
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K/J Proj. No.: 1270004*00
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Date Reviewed: 17-Feb-15
ENR Index Jul 2014: 10,897.59
Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	CONSTRUCT/RELOCATE TRAFFIC RATED VAULT & PIPING, PATCH AC, TRAFFIC CONTROL	
	COUNTRY CLUB	$ 34,000
	KELLER NO. 3	$ 34,000
	OVERLOOK	$ 34,000
	PIONEER NO. 2	$ 34,000
	PIONEER NO. 1	$ 34,000
	SADDLE NO. 3	$ 34,000
	INSTALL TWO PRV 8" FIREFLOW AND 6" DOMESTIC	
	COUNTRY CLUB	$ 18,000
	KELLER NO. 3	$ 18,000
	OVERLOOK	$ 18,000
	PIONEER NO. 2	$ 18,000
	PIONEER NO. 1	$ 18,000
	SADDLE NO. 3	$ 18,000
	INSTALL LOCKING HATCH	
	COUNTRY CLUB	$ 2,000
	KELLER NO. 3	$ 2,000
	OVERLOOK	$ 2,000
	PIONEER NO. 2	$ 2,000
	PIONEER NO. 1	$ 2,000
	SADDLE NO. 3	$ 2,000
	INSTALL ISOLATION VALVES	
	COUNTRY CLUB	$ 4,000
	KELLER NO. 3	$ 4,000
	OVERLOOK	$ 4,000
	PIONEER NO. 2	$ 4,000
	PIONEER NO. 1	$ 4,000
	SADDLE NO. 3	$ 4,000
	INSTALL PRESSURE GAGES	
	COUNTRY CLUB	$ 2,000
	KELLER NO. 3	$ 2,000
	OVERLOOK	$ 2,000
	PIONEER NO. 2	$ 2,000
	PIONEER NO. 1	$ 2,000
	SADDLE NO. 3	$ 2,000
	INSTALL FLOWMETER	
	COUNTRY CLUB	$ 3,000
	KELLER NO. 3	$ 3,000
	OVERLOOK	$ 3,000
	PIONEER NO. 2	$ 3,000
	PIONEER NO. 1	$ 3,000
	SADDLE NO. 3	$ 3,000
	INSTALL PIPE SUPPORTS	
	COUNTRY CLUB	$ 1,000
	KELLER NO. 3	$ 1,000
	OVERLOOK	$ 1,000
	PIONEER NO. 2	$ 1,000
	PIONEER NO. 1	$ 1,000
	SADDLE NO. 3	$ 1,000

Subtotals	**$**	**384,000**	
7.75%	$	9,910	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**393,910**	
15%	$	59,087	Contractor OH&P
Subtotal	**$**	**452,997**	
30%	$	135,899	Estimate Contingency
Total Construction	**$**	**588,896**	
25%	$	147,224	Engineering & CM
10%	$	58,890	Administration/Permitting
	$	**795,009**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	836,000	Escalation Factor
Total Project	**$**	**836,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A9a
Project Name: Keller Tank Alternatives - Engineering Study
Site: Keller Zone, Upper Saddle Zone, Sweeping Turn Zone, Middle Keller, Needle Peak, Rocky Point
General Description: Storage and Fire Protection
Benefits of this Project: Determine the preferred alternative to correct storage shortage by providing additional storage of 0.24 MG and fire protection for the Keller, Upper Saddle, and Sweeping Turn zones by evaluating Projects 9B, 9C,

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Escalation Factor: 1.05

Keller Zone Optimization

Item No.	ITEM DESCRIPTION	TOTAL
	ENGINEERING STUDY	$ 75,000

Subtotals	**$**	**75,000**	
	$	-	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**75,000**	
	$	-	Contractor OH&P
Subtotal	**$**	**75,000**	
	$	-	Estimate Contingency
Total Construction	**$**	**75,000**	
	$	-	Engineering & CM
	$	-	Administration/Permitting
	$	**75,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	79,000	Escalation Factor
Total Project	**$**	**79,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST | **KENNEDY/JENKS CONSULTANTS**

Item No: A9b
Project Name: Keller Booster Station Relocation
Site: Keller Zone, Upper Saddle Zone, Sweeping Turn Zone
General Description: Replace existing Keller Booster and tanks w/ new pump station @ Heavenly tank site
Benefits of this Project: Corrects a shortage of storage and fire flow for these multiple zones

STPUD Water System Optimization Plan
Prepared By: NR/RH
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Escalation Factor: 1.05

Keller Zone Optimization

Item No.	ITEM DESCRIPTION	TOTAL
	demolish 2 tanks	$ 20,000
	1000 gpm fire pump	$ 80,000
	3 domestic water pumps (115 gpm/pump @ 15 hp ea)	$ 54,000
	wood framed building	$ 100,000
	site work	$ 50,000
	100 LF X 10" pipeline	$ 22,000
	add isolation valves	$ 4,000
	abandon 2800 LF 6"	$ 1,000
	remove Keller PRV Nos. 2 & 3 from service	$ 1,000
	2800 LF X 8"	$ 493,000
	hydropneumatic tank	$ 30,000

Subtotals	**$**	**855,000**	
7.75%	$	22,065	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**877,065**	
15%	$	131,560	Contractor OH&P
Subtotal	**$**	**1,008,625**	
30%	$	302,588	Estimate Contingency
Total Construction	**$**	**1,311,213**	
25%	$	327,803	Engineering & CM
10%	$	131,121	Administration/Permitting
	$	**1,770,137**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	1,861,000	Escalation Factor
Total Project	**$**	**1,861,000**	

Note

1. REMOVE KELLER TANKS 1 AND 2 FROM SERVICE.

2. ADD NEW BOOSTER PUMP STATION AT SADDLE RD AND KELLER RD (BOOST FROM JUNE WAY ZONE TO KELLER ZONE). HYD. TANK FIRE RATED PUMP

3. ADD 10-INCH DIAMETER PIPELINE FROM NEW BOOSTER PUMP STATION TO EXISTING KELLER TANK FILL 6-INCH DIAMETER PIPELINE (HIGH PRESSURE PIPELINE) (APPROXIMATELY 100').

4. ADD ISOLATION VALVES AT CONNECTION TO HIGH PRESSURE PIPELINE TO ALLOW HIGH PRESSURE LINE TO BE CLOSED NORTHWEST OF TIE-IN LOCATION.

5. Abandon parallel 6-inch diameter pipeline in Keller Rd from Saddle Rd to Sherman Way (approximately 2,800').

6. Add new 8-inch diameter pipeline in Keller Rd from Saddle Rd to Sherman Way. Tie new pipeline in to existing pipeline near 1621 Keller Rd and existing 6-inch diameter pipeline at Sherman Way (approximately 2,800').

7. Middle Keller Zone and Keller Zone become a single zone. Upper Saddle Zone continues to be fed from the Keller Zone through the Keller PRV #1. Sweeping Turn Zone (as modified in Figures 1 and 5 in TM 4) is now fed through new PRVs added as shown in Figure 1 (TM 4).

8. Keller booster pump station may be maintained as a back-up option to the new Saddle Rd booster pump station or altered to be lower pressure booster pump and be the main feed to the Sweeping Turn Zone.

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A9c
Project Name: Keller Tanks Relocation
Site: Keller Tank
General Description: Tank Replacement at alternate location TBD (alternative to projects A9 and A9C)
Benefits of this Project: Corrects a shortage of storage and fire flow for these multiple zones

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Escalation Factor: 1.05

Keller Zone Optimization

Item No.	ITEM DESCRIPTION	TOTAL
	new 561,000 gallon tank (includes allowance for site development	$ 1,122,000
	1000 LF of 12" pipe (allowance)	$ 264,000
	demolish existing Keller tanks	$ 50,000

Subtotals	**$**	**1,436,000**	
7.75%	$	37,060	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**1,473,060**	
15%	$	220,959	Contractor OH&P
Subtotal	**$**	**1,694,019**	
30%	$	508,206	Estimate Contingency
Total Construction	**$**	**2,202,224**	
25%	$	550,556	Engineering & CM
10%	$	220,222	Administration/Permitting
	$	**2,973,002**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	3,125,000	Escalation Factor
Total Project	**$**	**3,125,000**	

Note

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A9d
Project Name: Keller Tanks Replacement
Site: Keller Tank
General Description: Tank Replacement at existing site
Benefits of this Project: Corrects a shortage of storage and fire flow for these multiple zones

STPUD Water System Optimization Plan
Prepared By: RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15
ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Keller Zone Optimization

Item No.	ITEM DESCRIPTION	TOTAL
	new 561,000 gallon tank	$ 614,000
	200 LF of 12" pipe (allowance)	$ 52,800
	demolish existing Keller tanks	$ 50,000
	mitigate rock hazard	$ 100,000

Subtotals	**$**	**816,800**	
7.75%	$	21,080	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**837,880**	
15%	$	125,682	Contractor OH&P
Subtotal	**$**	**963,562**	
30%	$	289,068	Estimate Contingency
Total Construction	**$**	**1,252,630**	
25%	$	313,157	Engineering & CM
10%	$	125,263	Administration/Permitting
	$	**1,691,050**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	1,778,000	Escalation Factor
Total Project	**$**	**1,778,000**	

Note

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A10
Project Name: Tank Access and Site Improvements
Site: MULTIPLE
General Description: Tank Site Improvements
Benefits of this Project: Improve access, protection from fire, and minimize impacts from runoff to Lake Tahoe water quality

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	CLEAR VEGETATION & OTHER BMPS	
	ARROWHEAD TANK	$ 1,000
	HEAVENLY VALLEY TANK	$ 33,000
	IROQUOIS TANK NO. 1	$ 70,000
	INSTALL ACCESS ROAD IMPROVEMENTS	
	IROQUOIS TANK NO. 1	$ 100,000

Subtotals	**$**	**204,000**	
7.75%	$	5,265	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**209,265**	
15%	$	31,390	Contractor OH&P
Subtotal	**$**	**240,654**	
30%	$	72,196	Estimate Contingency
Total Construction	**$**	**312,851**	
25%	$	78,213	Engineering & CM
10%	$	31,285	Administration/Permitting
	$	**422,349**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	444,000	Escalation Factor
Total Project	**$**	**444,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A11
Project Name: Tank Seismic Improvements
Site: MULTIPLE
General Description: Tank Seismic Improvements
Benefits of this Project: Extend useful life and enhance tank protection from earthquake damage

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
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Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	PERFORM SEISMIC EVALUATION	
	ARROWHEAD TANK	$ 10,000
	COLD CREEK TANK	$ 10,000
	FLAGPOLE TANK NO. 1	$ 10,000
	H STREET TANK	$ 10,000
	HEAVENLY VALLEY TANK	$ 10,000
	IROQUOIS TANK NO. 1	$ 10,000
	REPLACE ANCHOR-BOLT FASTENERS	
	ARROWHEAD TANK	$ 1,000
	GARDNER MOUNTAIN TANK NO. 1	$ 1,000
	GARDNER MOUNTAIN TANK NO. 2	$ 1,000

Subtotals	**$**	**63,000**	
7.75%	$	1,626	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**64,626**	
15%	$	9,694	Contractor OH&P
Subtotal	**$**	**74,320**	
30%	$	22,296	Estimate Contingency
Total Construction	**$**	**96,616**	
25%	$	24,154	Engineering & CM
10%	$	9,662	Administration/Permitting
	$	**130,431**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	137,000	Escalation Factor
Total Project	**$**	**137,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A12
Project Name: Well Inspections
Site: MULTIPLE
General Description: Paloma and Sunset Well Inspections
Benefits of this Project: Extend useful life of Palolma and Sunset Well assets

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	PULL PUMP & PERFORM DETAILED INSPECTION	
	PALOMA WELL	$ 10,000
	SUNSET WELL	$ 10,000
	PERFORM DOWN-HOLE CCTV INSPECTION	
	PALOMA WELL	$ 1,000
	SUNSET WELL	$ 1,000
		$ 1,000

Subtotals	**$**	**23,000**	
7.75%	$	1,783	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**24,783**	
15%	$	3,717	Contractor OH&P
Subtotal	**$**	**28,500**	
30%	$	8,550	Estimate Contingency
Total Construction	**$**	**37,050**	
25%	$	9,262	Engineering & CM
10%	$	3,705	Administration/Permitting
	$	**50,017**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	53,000	Escalation Factor
Total Project	**$**	**53,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A13
Project Name: Crest-Bonita PRV Installation
Site: Crest Rd. & Bonita Rd. (Upper Saddle Zone to Sweeping Turn Zone)
General Description: Add 6-inch PRV (improve fire flow, pressures and service redundancy)
Benefits of this Project: Provides a redundant supply connection that will improve reliability, redudnacy, fire flow and pressures

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15
ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Sweeping Turn Zone / Four Seasons Zone / Upper Saddle Zone Optimization

Item No.	ITEM DESCRIPTION	TOTAL
	6-INCH PRV	$ 8,000
	Valve Vault Traffic Rated	$ 20,000
	Piping	$ 7,000
	Cut and Patch AC	$ 5,000
	Traffic Control	$ 2,000
	Locking Hatch	$ 2,000
	Isolation Valve x 2	$ 4,000
	Pressure Gauges	$ 2,000
	Flowmeter	$ 3,000
	Pipe Supports	$ 1,000

Subtotals	**$**	**54,000**	
7.75%	$	1,394	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**55,394**	
15%	$	8,309	Contractor OH&P
Subtotal	**$**	**63,703**	
30%	$	19,111	Estimate Contingency
Total Construction	**$**	**82,813**	
25%	$	20,703	Engineering & CM
10%	$	8,281	Administration/Permitting
	$	**111,798**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	118,000	Escalation Factor
Total Project	**$**	**118,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A14
Project Name: Pioneer-Norma Check Valve Installation
Site: Pioneer Trail & Norma Drive
General Description: Add 8-inch check valve at normally closed valve (P25-042NC)
Benefits of this Project: Enhances fire flow service and improves redundancy

Price Rd/. (Ralph) Zone Optimization

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
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Date Reviewed: 17-Feb-15
ENR Index Jul 2012: 10,366.54
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	8-INCH CHECK VALVE	$ 10,000
	Valve Vault Traffic Rated	$ 20,000
	Piping	$ 7,000
	Cut and Patch AC	$ 5,000
	Traffic Control	$ 2,000
	Locking Hatch	$ 2,000
	Isolation Valve x 2	$ 4,000
	Pressure Gauges	$ 2,000
	Flowmeter	$ 3,000
	Pipe Supports	$ 1,000

Subtotals	**$**	**56,000**	
7.75%	$	1,445	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**57,445**	
15%	$	8,617	Contractor OH&P
Subtotal	**$**	**66,062**	
30%	$	19,819	Estimate Contingency
Total Construction	**$**	**85,881**	
25%	$	21,470	Engineering & CM
10%	$	8,588	Administration/Permitting
	$	**115,939**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	122,000	Escalation Factor
Total Project	**$**	**122,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A15
Project Name: Forest Fire Capability Assessment - Engineering Study
Site: MULTIPLE
General Description: Improve capability to fight forest fires
Benefits of this Project: Evaluate existing water system performance and identify operational procedures and system improvements to increase fire flows for extended periods of time.

STPUD Water System Optimization Plan
Prepared By: NR/RH
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K/J Proj. No.: 1270004*00
Reviewed By: TW

Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	ENGINEERING STUDY - use hydraulic model to evaluate water system capabilities to fight urban forest fires and identify operational procedures and system improvements to enhance extended periods of time to fight forest fires	$ 25,000

Subtotals	**$**	**25,000**	
	$	-	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**25,000**	
	$	-	Contractor OH&P
Subtotal	**$**	**25,000**	
	$	-	Estimate Contingency
Total Construction	**$**	**25,000**	
	$	-	Engineering & CM
	$	-	Administration/Permitting
	$	**25,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	26,000	Escalation Factor
Total Project	**$**	**26,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A16
Project Name: Pioneer-Busch PRV Installation
Site: Pioneer Trail & Busch Way (Iroquois to Pine Valley zone)
General Description: Add 8-inch PRV
Benefits of this Project: Improve reliability and redundancy and provide improved fire flows

Pine Valley Zone / Susquehana Zone Optimization

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15
ENR Index Jul 2012: 10,366.54
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	8-INCH PRV	$ 10,000
	Valve Vault Traffic Rated	$ 20,000
	Piping	$ 7,000
	Cut and Patch AC	$ 5,000
	Traffic Control	$ 2,000
	Locking Hatch	$ 2,000
	Isolation Valve x 2	$ 4,000
	Pressure Gauges	$ 2,000
	Flowmeter	$ 3,000
	Pipe Supports	$ 1,000

Subtotals	**$**	**56,000**	
7.75%	$	1,445	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**57,445**	
15%	$	8,617	Contractor OH&P
Subtotal	**$**	**66,062**	
30%	$	19,819	Estimate Contingency
Total Construction	**$**	**85,881**	
25%	$	21,470	Engineering & CM
10%	$	8,588	Administration/Permitting
	$	**115,939**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	122,000	Escalation Factor
Total Project	**$**	**122,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A17
Project Name: Pioneer Trail Waterline Installation
Site: Pioneer Trail from Elks Club Dr to Busch Way
General Description: Add 2,250 ft. long 12-inch pipeline
Benefits of this Project: Improves fire protection and redundancy

Pine Valley Zone / Susquehana Zone Optimization

STPUD Water System Optimization Plan

Prepared By:	NR/RH
Updated:	17-Feb-15
K/J Proj. No.:	1270004*00
Reviewed By:	TW
Date Reviewed:	17-Feb-15
ENR Index Jul 2012:	10,366.54
ENR Index Jul 2014:	10,897.59
Escalation Factor:	1.05

Item No.	ITEM DESCRIPTION	TOTAL
	INSTALL 2,250 LF 12-INCH WATER MAIN	$ 603,000
	TRAFFIC CONTROL	$ 20,000

Subtotals	**$**	**623,000**	
7.75%	$	16,078	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**639,078**	
15%	$	95,862	Contractor OH&P
Subtotal	**$**	**734,940**	
30%	$	220,482	Estimate Contingency
Total Construction	**$**	**955,422**	
25%	$	238,855	Engineering & CM
10%	$	95,542	Administration/Permitting
	$	**1,289,819**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	1,356,000	Escalation Factor
Total Project	**$**	**1,356,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A18
Project Name: Washoan-Nadowa PRV Installation
Site: Washoan Blvd & Nadowa St at normally closed valve (M33-047) Pine Valley to Country Club
General Description: Add 6-inch PRV
Benefits of this Project: Improve fire flow and service redundancy

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15
ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Country Club Zone Optimization

Item No.	ITEM DESCRIPTION	TOTAL
	6-INCH PRV	$ 8,000
	Valve Vault Traffic Rated	$ 20,000
	Piping	$ 7,000
	Cut and Patch AC	$ 5,000
	Traffic Control	$ 2,000
	Locking Hatch	$ 2,000
	Isolation Valve x 2	$ 4,000
	Pressure Gauges	$ 2,000
	Flowmeter	$ 3,000
	Pipe Supports	$ 1,000

Subtotals	**$**	**54,000**	
7.75%	$	1,394	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**55,394**	
15%	$	8,309	Contractor OH&P
Subtotal	**$**	**63,703**	
30%	$	19,111	Estimate Contingency
Total Construction	**$**	**82,813**	
25%	$	20,703	Engineering & CM
10%	$	8,281	Administration/Permitting
	$	**111,798**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	118,000	Escalation Factor
Total Project	**$**	**118,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A19
Project Name: Glen Eagle PRV Installation
Site: Glen Eagle Rd at normally closed valve M34-021NC (Pine Valley to Country Club)
General Description: Add 6-inch PRV
Benefits of this Project: Improve fire flow and service redundancy

STPUD Water System Optimization Plan
Prepared By: NR/RH
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ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Country Club Zone Optimization

Item No.	ITEM DESCRIPTION	TOTAL
	6-INCH PRV	$ 8,000
	Valve Vault Traffic Rated	$ 20,000
	Piping	$ 7,000
	Cut and Patch AC	$ 5,000
	Traffic Control	$ 2,000
	Locking Hatch	$ 2,000
	Isolation Valve x 2	$ 4,000
	Pressure Gauges	$ 2,000
	Flowmeter	$ 3,000
	Pipe Supports	$ 1,000

Subtotals	**$**	**54,000**	
7.75%	$	1,394	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**55,394**	
15%	$	8,309	Contractor OH&P
Subtotal	**$**	**63,703**	
30%	$	19,111	Estimate Contingency
Total Construction	**$**	**82,813**	
25%	$	20,703	Engineering & CM
10%	$	8,281	Administration/Permitting
	$	**111,798**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	118,000	Escalation Factor
Total Project	**$**	**118,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A20
Project Name: Water Supply to Stateline Zone - Engineering Study
Site: Stateline Zone
General Description: Evaluate alternatives to correct insufficient supply capacity for Stateline Zone
Benefits of this Project: Determine preferred alternative to correct supply capacity shortfall

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

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Date Reviewed: 17-Feb-15
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Escalation Factor: 1.05

Stateline Zone Optimization

Item No.	ITEM DESCRIPTION	TOTAL
	Engineering Study: Complete study to evaluate the water quality risks of increasing the production of the Poloma Well from 1,200 gpm to 2,400 gpm and using Twin Peaks PRV to provide 200 gpm vs. drilling a new 1,400 gpm well in the Stateline Zone.	$ 75,000

Subtotals	**$**	**75,000**	
	$	-	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**75,000**	
	$	-	Contractor OH&P
Subtotal	**$**	**75,000**	
	$	-	Estimate Contingency
Total Construction	**$**	**75,000**	
	$	-	Engineering & CM
	$	-	Administration/Permitting
	$	**75,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	79,000	Escalation Factor
Total Project	**$**	**79,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A21
Project Name: Critical Valve Assessment
Site: MULTIPLE
General Description: Valve criticality study
Benefits of this Project:

Correct "panhandle areas" and non-valved areas that are vulnerable during emergency and shut-down conditions to improve reliability of service

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
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Escalation Factor: 1.05

Multiple Zones Optimization

Item No.	ITEM DESCRIPTION	TOTAL
	Conduct an engineering study using the hydraulic model to evaluate valve criticality to determine where inline isolation valves need to be added so that not too many customers are impacted by water service during a water main repair.	$ 25,000

Subtotals	**$**	**25,000**	
	$	-	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**25,000**	
	$	-	Contractor OH&P
Subtotal	**$**	**25,000**	
	$	-	Estimate Contingency
Total Construction	**$**	**25,000**	
	$	-	Engineering & CM
	$	-	Administration/Permitting
	$	**25,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	26,000	Escalation Factor
Total Project	**$**	**26,000**	

Note

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A22
Project Name: SCADA Improvements
Site: MULTIPLE
General Description: Improve SCADA collection to hourly or less
Benefits of this Project: Improves data to develop diurnal curve to improve hydraulic model tool and enhance operations of water system

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

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ENR Index Jul 2012: 10,366.54
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Escalation Factor: 1.05

MULTIPLE

Item No.	ITEM DESCRIPTION	TOTAL
	SCADA Data Collection improvements	$ 10,000

Subtotals	**$**	**10,000**	
	$	-	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**10,000**	
	$	-	Contractor OH&P
Subtotal	**$**	**10,000**	
	$	-	Estimate Contingency
Total Construction	**$**	**10,000**	
	$	-	Engineering & CM
	$	-	Administration/Permitting
	$	**10,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	11,000	Escalation Factor
Total Project	**$**	**11,000**	

Note

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A23
Project Name: Water Model Demand Allocation Improvements
Site: MULTIPLE
General Description: Improve Water System Hydraulic Model Demand Allocation
Benefits of this Project: Improve hydraulic model with actual data will improve future optimization of the water system evaluations

STPUD Water System Optimization Plan
Prepared By: NR/RH
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Date Reviewed: 17-Feb-05
ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL	
	Conduct hydraulic model demand allocation using real water meter data	$ 10,000	
	Subtotals	**$ 10,000**	
		$ -	Sales tax on materials (materials cost = 33% of total cost)
	Subtotal	**$ 10,000**	
		$ -	Contractor OH&P
	Subtotal	**$ 10,000**	
		$ -	Estimate Contingency
	Total Construction	**$ 10,000**	
		$ -	Engineering & CM
		$ -	Administration/Permitting
		$ 10,000	Subtotal Total Construction; Engr & CM and Admin/Permitting
		$ 11,000	Escalation Factor
	Total Project	**$ 11,000**	

Note

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A24
Project Name: Pine Valley - Susquehanna Waterline
Site: Pine Valley & Susquehanna Zones
General Description: Add loop system to improve fire flow and redundancy and combine with Project A18
Benefits of this Project: Improves fire flow and redundancy

STPUD Water System Optimization Plan
Prepared By: NR/RH
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ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	300 LF X 6" pipeline, Loop Susquehanna Dr. & Ibache St.	$ 40,000
	250 LF X 6" pipeline, Loop Ibache St. and Guadalupe St.	$ 33,000
	300 LF X 6" pipeline, Loop Guadalupe St and Arawaipa St	$ 40,000

Subtotals	**$**	**113,000**	
7.75%	$	8,758	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**121,758**	
15%	$	18,264	Contractor OH&P
Subtotal	**$**	**140,021**	
30%	$	42,006	Estimate Contingency
Total Construction	**$**	**182,027**	
25%	$	45,507	Engineering & CM
10%	$	18,203	Administration/Permitting
	$	**245,737**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	258,000	Escalation Factor
Total Project	**$**	**258,000**	

Note

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A25
Project Name: Montgomery Estates Zone Evaluation - Engineering Study
Site: Montgomery Estates and Upper Montgomery Estates Zones
General Description: Re-configuration of Pressure Zones Evaluation
Benefits of this Project: Determine optimal pressure zone configuration to improve areas that experience low pressure and improve other areas that experience high pressures that exceed the District's LOS standards

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	ENGINEERING STUDY	$ 50,000

Subtotals	**$**	**50,000**	
	$	-	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**50,000**	
	$	-	Contractor OH&P
Subtotal	**$**	**50,000**	
	$	-	Estimate Contingency
Total Construction	**$**	**50,000**	
	$	-	Engineering & CM
	$	-	Administration/Permitting
	$	**50,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	53,000	Escalation Factor
Total Project	**$**	**53,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A26
Project Name: Fire Flow Calibration Testing
Site: MULTIPLE
General Description: Fire Flow Field Calibration
Benefits of this Project: Improve the hydraulic model tool to enhance predictability and reliability of predicting fire flow capabilities

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15

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ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	ENGINEERING STUDY - perform additional fire flow field testing	$ 20,000

Subtotals	**$**	**20,000**	
	$	-	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**20,000**	
	$	-	Contractor OH&P
Subtotal	**$**	**20,000**	
	$	-	Estimate Contingency
Total Construction	**$**	**20,000**	
	$	-	Engineering & CM
	$	-	Administration/Permitting
	$	**20,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	21,000	Escalation Factor
Total Project	**$**	**21,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A27
Project Name: Fire Hydrants on 4-inch Waterlines - Engineering Study
Site: MULTIPLE
General Description: Determine where to effectively add fire hydrants on 4" pipelines
Benefits of this Project: Improve fire protection and life safety for the community served by the District

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15
ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	ENGINEERING STUDY - using the hydraulic model determine from the "all nodes" scenario where additional fire hydrants would be effectively added on 4" water distribution mains	$ 10,000

Subtotals	**$**	**10,000**	
	$	-	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**10,000**	
	$	-	Contractor OH&P
Subtotal	**$**	**10,000**	
	$	-	Estimate Contingency
Total Construction	**$**	**10,000**	
	$	-	Engineering & CM
	$	-	Administration/Permitting
	$	**10,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	11,000	Escalation Factor
Total Project	**$**	**11,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A28
Project Name: Cornelian Fire Pump and Waterline Installation
Site: Cornelian Booster Pump Station site
General Description: Provide additional fire flow for fire protection
Benefits of this Project: Improve fire flow protection for the Christmas Valley zone

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
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Date Reviewed: 17-Feb-15
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ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Christmas Valley Zone Optimization

Item No.	ITEM DESCRIPTION	TOTAL	
	INSTALL NEW 2,500 gpm fire pump at Cornelian Booster Pump Station (estimated horsepower @ 130)	$ 150,000	
	Add 200 ft of 12" pipeline to loop the pump station discharge to existing dead-end line in Keetak St.	$ 52,800	
	Addition to Booster Pump Station Building for Fire Pump and Controls (150 sf approximately, slump block with metal roof)	$ 75,000	
	Subtotals	**$ 277,800**	
	7.75%	$ 21,530	Sales tax on materials (materials cost = 33% of total cost)
	Subtotal	**$ 299,330**	
	15%	$ 44,899	Contractor OH&P
	Subtotal	**$ 344,229**	
	30%	$ 103,269	Estimate Contingency
	Total Construction	**$ 447,498**	
	25%	$ 111,874	Engineering & CM
	10%	$ 44,750	Administration/Permitting
		$ 604,122	Subtotal Total Construction; Engr & CM and Admin/Permitting
		$ 635,000	Escalation Factor
	Total Project	**$ 635,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A29
Project Name: Upper Montgomery Estates Pump Station Replacement
Site: Upper Montgomery Estates
General Description: Add 1,000 gpm pump station with back up power
Benefits of this Project: Improves fire protection and redundancy in emergency conditions

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15
ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	3 pumps 500 gpm X 215' tdh	$ 192,000
	mechanical piping	$ 50,000
	New masonry block building (625 sf)	$ 113,000
	New standby generator inside building	$ 50,000
	hyrdopneumatic tank	$ 75,000
	Site work	$ 50,000

Subtotals	**$**	**530,000**	
7.75%	$	13,678	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**543,678**	
15%	$	81,552	Contractor OH&P
Subtotal	**$**	**625,230**	
30%	$	187,569	Estimate Contingency
Total Construction	**$**	**812,799**	
25%	$	203,200	Engineering & CM
10%	$	81,280	Administration/Permitting
	$	**1,097,278**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	1,153,000	Escalation Factor
Total Project	**$**	**1,153,000**	

Note

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: A30

Project Name: Install New Standby Generators

Site: Keller Zone - Keller Booster Pump Station and Heavenly Zone - David Lane Booster Pump Station

General Description: Add 1,000 gpm pump station with back up power

Benefits of this Project: Provide Water Reliable; Provide Redundancy Within System; 100% of critical facilities have backup power capabilities

STPUD Water System Optimization Plan

Prepared By: NR/RH

Updated: 17-Feb-15

K/J Proj. No.: 1270004*00

Reviewed By: TW

Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	Keller Pump Station	$ -
	Install new 30KW Standby Generator with Auto Transfer Switch	$ 50,000
	New masonry block building (10' x 10' = 100 sf)	$ 50,000
	Misc improvements	$ 10,000
	David Lane Booster Pump Station	
	Install new 200KW Standby Generator with Auto Transfer Switch	$ 120,000
	New masonry block building (20' x 10' = 200 sf)	$ 100,000
	Misc improvements	$ 20,000

Subtotals	**$**	**350,000**	
7.75%	$	9,033	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**359,033**	
15%	$	53,855	Contractor OH&P
Subtotal	**$**	**412,888**	
30%	$	123,866	Estimate Contingency
Total Construction	**$**	**536,754**	
25%	$	134,188	Engineering & CM
10%	$	53,675	Administration/Permitting
	$	**724,618**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	762,000	Escalation Factor
Total Project	**$**	**762,000**	

Note

Medium-Priority Projects

ENGINEER'S ESTIMATE OF PROBABLE COST

Project B (MEDIUM PRIORITY)
Project: STPUD Water System Optimization Plan

KENNEDY/JENKS CONSULTANTS

Prepared By: RH/NR
Date Updated 17-Feb-15
K/J Proj. No.: 1270004*00

Reviewed By: TW

Date Reviewed: 17-Feb-15

ITEM NO.(1)	PROJECT NAME	TM 1 SECTION/PAGE NUMBER OR TM 4 PROJECT NUMBER REFERENCE	BENEFITS OF THIS PROJECT	SITE	TOTAL(2)	DEPT	RECOMMENDED IMPLEMENTATION FISCAL YEAR	NOTES
B1	UTR Bridge Freeze Protection	TM 1: Section 4.5, Table 11	Pipeline Reliability Improvements	UTR Bridge Crossing	$ 44,000	Engineering / URW	14/15	
B2	SCADA Improvements, Phase 2, Monitoring, Security	TM 1: Section 4.4, Table 10	Improve operational flexibility and performance and enhance security	MULTIPLE	$ 286,000	Engineering / Electrical	17/18 & 23/24 to 32/33	
B3	Tank Coatings - Interior Repair and Replacement	TM 1: Section 4.4, Table 10	Extend the useful life of the tank structures	MULTIPLE	$ 1,400,000	Engineering	16/17, 21/22	
B4	Security Fencing at Tanks	TM 1: Section 4.4, Table 10	Improve site security to protect the tank structures from vandalism	MULTIPLE	$ 470,000	Pumps	14/15	
B5	Building Coatings,Insulation, and Security Improvements	TM 1: Section 4.1, Table 7 and Section 4.2, Table 8	Extend the useful life of the Wells and Booster Pump Structures and enhance site security	MULTIPLE	$ 279,000	Pumps	17/18 & 21/22 to 31/32	
B6	Pump Reliability and Efficiency Assessments	TM 1: Section 4.1, Table 7	Improve the pump reliability and efficiency by modifying inspection and condition assessment frequency	MULTIPLE	$ 104,000	Engineering / Pumps	14/15	
B7	Stateline Zone Capacity Improvements	TM 4: 33 to 36	Solves pressure problems, increases reliability and redundancy for Gardner Mountain zone with new well and piping.	MULTIPLE	$ 6,453,000	Engineering	19/20	
B8	Airport Waterline Improvement	TM 1: Section 4.5, Table 11	Improve critical pipeline reliability by replacing pipeline that has reached its useful life	Airport Runway Crossing	$ 10,011,000	Engineering	23/24 to 32/33	
B9	Trout Creek Waterline Improvement	TM 1: Section 4.5, Table 11	Improve critical pipeline reliability by replacing pipeline that has reached its useful life	Trout Creek Crossing	$ 521,000	Engineering	16/17	
B10	Keller Booster Waterline Improvement	TM 1: Section 4.5, Table 11	Improve critical pipeline reliability by protecting and repairing pipeline to extend its useful life	Keller Tank Supply	$ 200,000	Engineering	16/17	
B11	UTR Meyers Waterline Reliability Improvements	TM 1: Section 4.5, Table 11	Improve critical pipeline reliability by replacing pipeline that has reached its useful life	UTR Meyer Waterline Crossing	$ 522,000	Engineering	23/24 to 32/33	
B12	Well Assessment and Replacement Program	TM 1: Section 4.2, Table 8	Extend the useful life of well assets	MULTIPLE	$ 154,000	Engineering / URW	16/17	
B13	Fire Hydrant Installations	TM 1: Section 5.5	Improve fire protection	MULTIPLE	$ 1,143,000	Engineering	13/14 to 26/27 (3)	
B14	Rocky Saddle Multiple Zone Improvements	TM 4: 44 to 47	Improve fire flow, pressures and redundancy for Sweeping Turn, Four Seasons, Upper Saddle Zones, Needle Peak, and Rocky Point Zones	MULTIPLE	$ 440,000	Engineering	17/18	
B15a	H-Street Booster Station Replacement	TM 4(3): 10	Improve Fire Flow, Pressures and Service Redundancy	H Street Zone	$ 710,000	Engineering	15/16	
B15b	H-Street Booster Pump Spare	TM 1(3): Section 4.1, Table 8	Improve redundancy and reliability of pump station	H Street Pump Station	$ 13,000	Engineering	14/15	
B16	Kokanee - Golden Bear PRV Abandonment	TM 4: 21 & 22	Provides emergency water supply, improves fire protection, provides redundancy and enhances pressure in Kokane and Golden Bear Zones	Kokanee and Golden Bear	$ 68,000	Engineering	15/16	
B17	Upper Saddle-Sweeping Turn Zone Improvements	TM 4: 39 to 43	Improve fire flow, system pressure and service redundancy	Sweeping Turn, Four Seasons & Upper Saddle Zones	$ 2,653,000	Engineering	14/15	**Project completed by District late summer 2014**
B18	Price-Ralph Improvements	TM 4: 31 & 32	Improve Fire Flow and Service Redundancy	Price Rd (Ralph)	$ 631,000	Engineering	15/16	
B19	Terrace Zone Improvements	TM 4: 48 to 52	Improve fire flow and service redundancy	Terrace PRV	$ 1,230,000	Engineering	15/16	

Total Project(3)	**$ 28,000,000**

NOTE:

(1) Project-number designations do not necessarily reflect the sequence or priority of implementation
(2) Total Project Cost Estimates are based on July 1, 2014 costs and not escalated to the recommended implementation year.
(3) If project 15a is constructed prior to implementing project 15b then eliminate project 15b. Total project cost does not include project 15b.

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B1
Project Name: UTR Bridge Freeze Protection
Site: UTR Bridge Crossing
General Description: Install insulation on exposed pipelines on Upper Truckee River pipeline crossing
Benefits of this Project: Pipeline Reliability Improvements

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Prepared By: NR/RH
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K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	INSTALL INSULATION TO PREVENT FREEZE DAMAGE	$ 20,000

Subtotals	**$**	**20,000**	
7.75%	$	516	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**20,516**	
15%	$	3,077	Contractor OH&P
Subtotal	**$**	**23,594**	
30%	$	7,078	Estimate Contingency
Total Construction	**$**	**30,672**	
25%	$	7,668	Engineering & CM
10%	$	3,067	Administration/Permitting
	$	**41,407**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	44,000	Escalation Factor
Total Project	**$**	**44,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B2
Project Name: SCADA Improvements, Phase 2, Monitoring, Security
Site: MULTIPLE
General Description: Miscellaneous SCADA Improvements - Monitoring and Security
Benefits of this Project: Improve operational flexibility and performance and enhance security

STPUD Water System Optimization Plan
Prepared By: NR/RH
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ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	ADJUST WATER-LEVEL CONTROLS TO PROVIDE FREEBOARD	
	IROQUOIS TANK NO. 1	$ 500
	IROQUOIS TANK NO. 2	$ 500
	STATELINE TANK NO. 1	$ 500
	STATELINE TANK NO. 2	$ 500
	PERFORM REGULAR CALIBRATION OF LEVEL TRANSMITTER	
	ANGORA TANK	$ 200
	ARROWHEAD TANK	$ 200
	CHRISTMAS VALLEY TANK	$ 200
	COLD CREEK TANK	$ 200
	COUNTRY CLUB TANK	$ 200
	ECHO VIEW TANK	$ 200
	FLAGPOLE TANK NO. 1	$ 200
	FLAGPOLE TANK NO. 2	$ 200
	FOREST MOUNTAIN TANK	$ 200
	GARDNER MOUNTAIN TANK NO. 1	$ 200
	GARDNER MOUNTAIN TANK NO. 2	$ 200
	H STREET TANK	$ 200
	HEAVENLY VALLEY TANK	$ 200
	IROQUOIS TANK NO. 1	$ 200
	IROQUOIS TANK NO. 2	$ 200
	LOOKOUT TANK	$ 200
	STATELINE TANK NO. 1	$ 200
	STATELINE TANK NO. 2	$ 200
	INSTALL SURVEILLANCE CAMERAS	
	ANGORA TANK	$ 10,000
	GARDNER MOUNTAIN TANK NO. 1	$ 10,000
	GARDNER MOUNTAIN TANK NO. 2	$ 10,000
	H STREET TANK	$ 10,000
	HEAVENLY VALLEY TANK	$ 10,000
	IROQUOIS TANK NO. 1	$ 10,000
	IROQUOIS TANK NO. 2	$ 10,000
	STATELINE TANK NO. 1	$ 10,000
	STATELINE TANK NO. 2	$ 10,000
	INSTALL INTRUSION ALARMS ON LADDER AND ROOF HATCH	
	ANGORA TANK	$ 2,000
	ARROWHEAD TANK	$ 2,000
	CHRISTMAS VALLEY TANK	$ 2,000
	COLD CREEK TANK	$ 2,000
	COUNTRY CLUB TANK	$ 2,000
	ECHO VIEW TANK	$ 2,000
	FLAGPOLE TANK NO. 1	$ 2,000
	FLAGPOLE TANK NO. 2	$ 2,000
	FOREST MOUNTAIN TANK	$ 2,000
	GARDNER MOUNTAIN TANK NO. 1	$ 2,000
	GARDNER MOUNTAIN TANK NO. 2	$ 2,000
	H STREET TANK	$ 2,000
	HEAVENLY VALLEY TANK	$ 2,000
	IROQUOIS TANK NO. 1	$ 2,000
	IROQUOIS TANK NO. 2	$ 2,000
	LOOKOUT TANK	$ 2,000
	STATELINE TANK NO. 1	$ 2,000
	STATELINE TANK NO. 2	$ 2,000

Subtotals	**$**	**131,600**	
7.75%	$	3,396	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**134,996**	
15%	$	20,249	Contractor OH&P
Subtotal	**$**	**155,246**	
30%	$	46,574	Estimate Contingency
Total Construction	**$**	**201,819**	
25%	$	50,455	Engineering & CM
10%	$	20,182	Administration/Permitting
	$	**272,456**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	286,000	Escalation Factor
Total Project	**$**	**286,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B3
Project Name: Tank Coatings - Interior Repair and Replacement
Site: MULTIPLE
General Description: Tank Coating Replacement (interior)
Benefits of this Project: Extend the useful life of the tank structures

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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	REPLACE/REPAIR COATING DEFECTS (INTERIOR)	
	COLD CREEK TANK	$ 124,960
	FLAGPOLE TANK NO. 2	$ 49,700
	FOREST MOUNTAIN TANK	$ 36,920
	GARDNER MOUNTAIN TANK NO. 2	$ 53,960
	H STREET TANK	$ 26,980
	HEAVENLY VALLEY TANK	$ 213,000
	IROQUOIS TANK NO. 1	$ 62,480
	LOOKOUT TANK	$ 75,260

Subtotals	**$**	**643,260**	
7.75%	$	16,601	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**659,861**	
15%	$	98,979	Contractor OH&P
Subtotal	**$**	**758,840**	
30%	$	227,652	Estimate Contingency
Total Construction	**$**	**986,492**	
25%	$	246,623	Engineering & CM
10%	$	98,649	Administration/Permitting
	$	**1,331,764**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	1,400,000	Escalation Factor
Total Project	**$**	**1,400,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B4
Project Name: Security Fencing at Tanks
Site: MULTIPLE
General Description: Tank-Site Security Projects (fencing)
Benefits of this Project: Improve site security to protect the tank structures from vandalism

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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	PERIMETER FENCE	
	ARROWHEAD TANK	$ 24,000
	FOREST MOUNTAIN TANK	$ 24,000
	H STREET TANK	$ 24,000
	HEAVENLY VALLEY TANK	$ 24,000
	IROQUOIS TANK NO. 1	$ 24,000
	IROQUOIS TANK NO. 2	$ 24,000
	LOOKOUT TANK	$ 24,000
	STATELINE TANK NO. 1	$ 24,000
	FOREST MOUNTAIN BOOSTER	$ 12,000
	KELLER BOOSTER	$ 12,000

Subtotals	**$**	**216,000**	
7.75%	$	5,574	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**221,574**	
15%	$	33,236	Contractor OH&P
Subtotal	**$**	**254,811**	
30%	$	76,443	Estimate Contingency
Total Construction	**$**	**331,254**	
25%	$	82,813	Engineering & CM
10%	$	33,125	Administration/Permitting
	$	**447,193**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	470,000	Escalation Factor
Total Project	**$**	**470,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B5
Project Name: Building Coatings,Insulation, and Security Improvements
Site: MULTIPLE
General Description: Improve Site Security and Building Maintenance Projects
Benefits of this Project: Extend the useful life of the Wells and Booster Pump Structures and enhance site security

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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	MISC REPAIRS & COATINGS TO BUILDING	
	BLACK BART BOOSTER	$ 10,000
	DAVID LANE BOOSTER	$ 10,000
	FLAGPOLE BOOSTER	$ 10,000
	TATA BOOSTER	$ 10,000
	REPAIR INSULATION	
	COLD CREEK TANK BOOSTER	$ 2,000
	TATA BOOSTER	$ 2,000
	ASSESS SITE-SECURITY	
	AIRPORT WELL (OFFLINE)	$ 2,000
	AL TAHOE NO. 2	$ 2,000
	ARROWHEAD WELL NO. 3	$ 2,000
	BAKERSFIELD WELL	$ 2,000
	BAYVIEW WELL	$ 2,000
	BLACKROCK NO. 2 (OFFLINE)	$ 2,000
	CHRIS WELL (OFFLINE)	$ 2,000
	CLEMENT WELL (OFFLINE)	$ 2,000
	COLLEGE WELL (OFFLINE - URANIUM)	$ 2,000
	ELKS CLUB NO. 2	$ 2,000
	GLENWOOD WELL NO. 5	$ 2,000
	HELEN WELL NO. 2	$ 2,000
	MARTIN WELL (OFFLINE - IRON/MANGANESE)	$ 2,000
	MOUNTAIN VIEW WELL	$ 2,000
	PALOMA WELL	$ 2,000
	UPPER TRUCKEE WELL NO. 3	$ 2,000
	SUNSET WELL	$ 2,000
	TATA WELL NO. 1 (OFFLINE - ARSENIC)	$ 2,000
	TATA WELL NO. 2 (OFFLINE - ARSENIC)	$ 2,000
	TATA WELL NO. 3 (OFFLINE - ARSENIC)	$ 2,000
	VALHALLA WELL	$ 2,000
	INSTALL INTRUSION ALARMS ON ALL ENTRANCES	
	AIRPORT WELL (OFFLINE)	$ 2,000
	AL TAHOE NO. 2	$ 2,000
	ARROWHEAD WELL NO. 3	$ 2,000
	BAKERSFIELD WELL	$ 2,000
	BAYVIEW WELL	$ 2,000
	BLACKROCK NO. 2 (OFFLINE)	$ 2,000
	CHRIS WELL (OFFLINE)	$ 2,000
	CLEMENT WELL (OFFLINE)	$ 2,000
	COLLEGE WELL (OFFLINE - URANIUM)	$ 2,000
	ELKS CLUB NO. 2	$ 2,000
	GLENWOOD WELL NO. 5	$ 2,000
	HELEN WELL NO. 2	$ 2,000
	MARTIN WELL (OFFLINE - IRON/MANGANESE)	$ 2,000
	MOUNTAIN VIEW WELL	$ 2,000
	PALOMA WELL	$ 2,000
	UPPER TRUCKEE WELL NO. 3	$ 2,000
	SUNSET WELL	$ 2,000
	TATA WELL NO. 1 (OFFLINE - ARSENIC)	$ 2,000
	TATA WELL NO. 2 (OFFLINE - ARSENIC)	$ 2,000
	TATA WELL NO. 3 (OFFLINE - ARSENIC)	$ 2,000
	VALHALLA WELL	$ 2,000

Subtotals	**$**	**128,000**	
7.75%	$	3,303	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**131,303**	
15%	$	19,696	Contractor OH&P
Subtotal	**$**	**150,999**	
30%	$	45,300	Estimate Contingency
Total Construction	**$**	**196,299**	
25%	$	49,075	Engineering & CM
10%	$	19,630	Administration/Permitting
	$	**265,003**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	279,000	Escalation Factor
Total Project	**$**	**279,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B6
Project Name: Pump Reliability and Efficiency Assessments
Site: MULTIPLE
General Description: Pump Reliability and Efficiency Projects
Benefits of this Project: Improve the pump reliability and efficiency by modifying inspection and condition assessment frequency

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15
K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15
ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	PERFORM DETAIL PUMP INSPECTION	
	COLD CREEK TANK BOOSTER	$ 4,000
	CORNELIAN BOOSTER	$ 4,000
	EVALUATE PUMP CONTROLS & DUTY CONDITIONS	
	BLACK BART BOOSTER	$ 5,000
	BOULDER MOUNTAIN BOOSTER	$ 5,000
	COLD CREEK TANK BOOSTER	$ 5,000
	CORNELIAN BOOSTER	$ 5,000
	DAVID LANE BOOSTER	$ 5,000
	FLAGPOLE BOOSTER	$ 5,000
	FOREST MOUNTAIN BOOSTER	$ 5,000
	TATA BOOSTER	$ 5,000

Subtotals	**$**	**48,000**	
7.75%	$	1,239	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**49,239**	
15%	$	7,386	Contractor OH&P
Subtotal	**$**	**56,625**	
30%	$	16,987	Estimate Contingency
Total Construction	**$**	**73,612**	
25%	$	18,403	Engineering & CM
10%	$	7,361	Administration/Permitting
	$	**99,376**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	104,000	Escalation Factor
Total Project	**$**	**104,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B7
Project Name: Stateline Zone Capacity Improvements
Site: MULTIPLE
General Description: Water to the Y Water System Improvement Project
Benefits of this Project: Solves pressure problems, increases reliability and redundancy for Gardner Mountain zone with new well and piping.

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	NEW WELL AT STATE ST.	
	New 1,000 gpm Well with pump, building and controls at State St.	$ 1,500,000
	NEW PIPELINE	
	Replace 580 LF of 6" pipeline in Sunset Dr. and Conestoga St. from Sunset Well to Lodi Ave. with a new 12" water main	$ 77,000
	Construct new 800 LF of 12" water main in Lodi Ave from Conestoga St. to Lake Tahoe Blvd.	$ 212,000
	Construct new 1,400 LF of 14" trenchless pipeline in Lake Tahoe Blvd. from Lodi Ave. to southwest side of the Upper Truckee River Bridge	$ 1,176,000

Subtotals	**$**	**2,965,000**	
7.75%	$	76,519	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**3,041,519**	
15%	$	456,228	Contractor OH&P
Subtotal	**$**	**3,497,747**	
30%	$	1,049,324	Estimate Contingency
Total Construction	**$**	**4,547,071**	
25%	$	1,136,768	Engineering & CM
10%	$	454,707	Administration/Permitting
	$	**6,138,546**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	6,453,000	Escalation Factor
Total Project	**$**	**6,453,000**	

Note: Estimate contingent upon Water to the Y Condition Assessment Project A20. If the alternative to increase production at Paloma Well is chosen this project is no longer necessary.

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B8
Project Name: Airport Waterline Improvement
Site: Airport Runway Crossing
General Description: Pipeline Replacement
Benefits of this Project: Improve critical pipeline reliability by replacing pipeline that has reached its useful life

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
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Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	REALIGN PIPE (12" DIA x 1.2 MILES) TRENCHLESS CONSTRUCTION	$ 4,600,000

Subtotals	**$**	**4,600,000**	
7.75%	$	118,715	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**4,718,715**	
15%	$	707,807	Contractor OH&P
Subtotal	**$**	**5,426,522**	
30%	$	1,627,957	Estimate Contingency
Total Construction	**$**	**7,054,478**	
25%	$	1,763,620	Engineering & CM
10%	$	705,448	Administration/Permitting
	$	**9,523,546**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	10,011,000	Escalation Factor
Total Project	**$**	**10,011,000**	

Note Estimate Contingent upon Pipeline Condition Assessment Project A1

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B9
Project Name: Trout Creek Waterline Improvement
Site: Trout Creek Crossing
General Description: Pipeline Replacement
Benefits of this Project: Improve critical pipeline reliability by replacing pipeline that has reached its useful life

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	REALIGN PIPE (12" DIA x 340 LF) TRENCHLESS CONSTRUCTION	$ 240,000

Subtotals	**$**	**240,000**	
7.25%	$	5,794	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**245,794**	
15%	$	36,869	Contractor OH&P
Subtotal	**$**	**282,663**	
30%	$	84,799	Estimate Contingency
Total Construction	**$**	**367,462**	
25%	$	91,866	Engineering & CM
10%	$	36,746	Administration/Permitting
	$	**496,074**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	521,000	Escalation Factor
Total Project	**$**	**521,000**	

Note Estimate Contingent upon Pipeline Condition Assessment Project A1

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B10
Project Name: Keller Booster Waterline Improvement
Site: Keller Tank Supply
General Description: Pipeline Improvements
Benefits of this Project: Improve critical pipeline reliability by protecting and repairing pipeline to extend its useful life

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	NEGOTIATE PUBLIC UTILITY EASEMENT FOR PORTION OF PIPELINE	$ 10,000
	INSTALL CATHODIC PROTECTION SYSTEM	$ 80,000
	PERFORM LEAK SURVEY	$ 2,000

Subtotals	**$**	**92,000**	
7.75%	$	2,374	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**94,374**	
15%	$	14,156	Contractor OH&P
Subtotal	**$**	**108,530**	
30%	$	32,559	Estimate Contingency
Total Construction	**$**	**141,090**	
25%	$	35,272	Engineering & CM
10%	$	14,109	Administration/Permitting
	$	**190,471**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	200,000	Escalation Factor
Total Project	**$**	**200,000**	

Note Estimate Contingent upon Pipeline Condition Assessment Project A1

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B11
Project Name: UTR Meyers Waterline Reliability Improvements
Site: UTR Meyer Waterline Crossing
General Description: Pipeline Replacement
Benefits of this Project: Improve critical pipeline reliability by replacing pipeline that has reached its useful life

STPUD Water System Optimization Plan
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K/J Proj. No.: 1270004*00
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ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	REALIGN PIPE (12" DIA x 340 LF) TRENCHLESS CONSTRUCTION	$ 240,000

Subtotals	**$**	**240,000**	
7.75%	$	6,194	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**246,194**	
15%	$	36,929	Contractor OH&P
Subtotal	**$**	**283,123**	
30%	$	84,937	Estimate Contingency
Total Construction	**$**	**368,060**	
25%	$	92,015	Engineering & CM
10%	$	36,806	Administration/Permitting
	$	**496,881**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	522,000	Escalation Factor
Total Project	**$**	**522,000**	

Note Estimate Contingent upon Pipeline Condition Assessment Project A1

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B12
Project Name: Well Assessment and Replacement Program
Site: MULTIPLE
General Description: Develop a downhole well condition assessment and well replacement program
Benefits of this Project: Extend the useful life of well assets

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
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Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL	
	Gather data on existing wells based on criteria to evaluate condition and estimate remaining useful life	$ 50,000	
	Develop a prioritization for replacing wells and location of potential new wells	$ 25,000	
	Develop capital improvement projects for well replacement	$ 10,000	
	Complete Tech Memo	$ 15,000	
	Subtotals	**$ 100,000**	
	7.75%	$ 2,581	Sales tax on materials (materials cost = 33% of total cost)
	Subtotal	**$ 102,581**	
		$ -	Contractor OH&P
	Subtotal	**$ 102,581**	
	30%	$ 30,774	Estimate Contingency
	Total Construction	**$ 133,355**	
		$ -	Engineering & CM
	10%	$ 13,335	Administration/Permitting
		$ 146,690	Subtotal Total Construction; Engr & CM and Admin/Permitting
		$ 154,000	Escalation Factor
	Total Project	**$ 154,000**	

Note Once the Capital Improvement Projects are identified add them to the CIP based on a prioritization

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B13

Project Name: Fire Hydrant Installations

Site: MULTIPLE

General Description: Installation of 75 new Fire Hydrants on Pipelines > 6" in diam with no fire hydrants within 500 ft. in developed areas and 1,000 ft. spacing in urban/forest undeveloped areas

Benefits of this Project: Improve fire protection

STPUD Water System Optimization Plan

Prepared By: NR/RH

Updated: 17-Feb-15

K/J Proj. No.: 1270004*00

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Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	Hot tapping existing water mains @ 75 ea	$ 97,500
	Install new fire hydrant with shut off valve @ 75 ea	$ 427,500

Subtotals	**$**	**525,000**	
7.75%	$	13,549	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**538,549**	
15%	$	80,782	Contractor OH&P
Subtotal	**$**	**619,331**	
30%	$	185,799	Estimate Contingency
Total Construction	**$**	**805,131**	
25%	$	201,283	Engineering & CM
10%	$	80,513	Administration/Permitting
	$	**1,086,926**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	1,143,000	Escalation Factor
Total Project	**$**	**1,143,000**	

Note See WSOP Fire Hydrant Install CIP Figures 1-16

FH infill spacing based on 500 ft. radius for urban developed areas and 1,000 ft. radius for urban / forest undeveloped areas per the LOS Study

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B14

Project Name: Rocky Saddle Multiple Zone Improvements

Site: MULTIPLE

General Description: Reconfigure Pressure Zones, add pipelines between zones, and replace undersized pipelines

Benefits of this Project: Improve fire flow, pressures and redundancy for Sweeping Turn, Four Seasons, Upper Saddle Zones, Needle Peak, and Rocky Point Zones

STPUD Water System Optimization Plan

Prepared By: NR/RH

Updated: 17-Feb-15

K/J Proj. No.: 1270004*00

Reviewed By: TW

Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	Close existing valve Q22-008 located on Keller Rd. near Keller PRV #5. Transfers portion of Needle Peak and Sweeping Turn Zones south of Keller Rd. to Heavenly Zone. Rocky Point Zone now fed from Heavenly Zone through Rocky Point PRV.	$ -
	Using 185 LF x 8" pipeline connect existing 6" pipeline in Needle Peak Rd. to existing 6" pipeline in Keller downstream of Keller PRV #5, in progress	$ 25,000
	Replace existing 6" pipeline in Needle Peak from Keller Rd. to 3809 Needle Peak Rd. with 600 ft. of 8" pipeline	$ 106,000
	Add 8" x 400 LF of pipeline in Needle Peak Rd. from Wildwood Ave. to replace existing 6" pipeline to approx. 3809 Needle Peak Rd.	$ 71,000

Subtotals	**$**	**202,000**	
7.75%	$	5,213	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**207,213**	
15%	$	31,082	Contractor OH&P
Subtotal	**$**	**238,295**	
30%	$	71,489	Estimate Contingency
Total Construction	**$**	**309,784**	
25%	$	77,446	Engineering & CM
10%	$	30,978	Administration/Permitting
	$	**418,208**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	440,000	Escalation Factor
Total Project	**$**	**440,000**	

Note

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B15a
Project Name: H-Street Booster Station Replacement
Site: H Street Zone
General Description: Replace existing H Street Pump Station
Benefits of this Project: Improve Fire Flow, Pressures and Service Redundancy

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15
ENR Index Jul 2012: 10,366.54
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	NEW PRE-ENGINEERED BUILDING (PRESERVE EXISTING ELECTRICAL)	$ 75,000
	DEMOLISH OLD BUILDING	$ 5,000
	NEW SCADA EQUIPMENT	$ 20,000
	NEW DOMESTIC PUMPS (2 x 20 gpm @ 5HP each)	$ 12,000
	PIPING & APPURTENANCES	$ 50,000
	PROVIDE HYDROPNEUMATIC TANK	$ 20,000
	ENGINE-DRIVEN FIRE PUMP (1,000 gpm)	$ 80,000
	PROVIDE PIN & SLEEVE CONNECTOR AND MANUAL XFR SWITCH	$ 4,000
	REPLACE ELECTRICAL GEAR	$ 10,000
	SITE WORK	$ 50,000

Subtotals	**$**	**326,000**	
7.75%	$	8,413	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**334,413**	
15%	$	50,162	Contractor OH&P
Subtotal	**$**	**384,575**	
30%	$	115,373	Estimate Contingency
Total Construction	**$**	**499,948**	
25%	$	124,987	Engineering & CM
10%	$	49,995	Administration/Permitting
	$	**674,930**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	710,000	Escalation Factor
Total Project	**$**	**710,000**	

Note

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B15b
Project Name: H-Street Booster Pump Spare
Site: H Street Pump Station
General Description: Provide Spare Pump
Benefits of this Project: Improve redundancy and reliability of pump station

STPUD Water System Optimization Plan
Prepared By: NR/RH
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	provide spare pump on the shelf (1 X 20 gpm @ 5 hp)	$ 6,000

Subtotals	**$**	**6,000**	
7.75%	$	155	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**6,155**	
15%	$	923	Contractor OH&P
Subtotal	**$**	**7,078**	
30%	$	2,123	Estimate Contingency
Total Construction	**$**	**9,201**	
25%	$	2,300	Engineering & CM
10%	$	920	Administration/Permitting
	$	**12,422**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	13,000	Escalation Factor
Total Project	**$**	**13,000**	

Note

If project 15A is elected to move forward before project 15B is implemented then eliminate project 15B

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B16
Project Name: Kokanee - Golden Bear PRV Abandonment
Site: Kokanee and Golden Bear
General Description: Improve Fire Flow, Pressures And Redundancy For Kokane, And Golden Bear Zones
Benefits of this Project: Provides emergency water supply, improves fire protection, provides redundancy and enhances pressure in Kokane and Golden Bear Zones

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

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ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	150 LF X 8" pipeline	$ 26,400
	Remove Pioneer Kokanee PRV from service, replace with pipe spool	$ 5,000

Subtotals	**$**	**31,400**	
7.75%	$	810	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**32,210**	
15%	$	4,832	Contractor OH&P
Subtotal	**$**	**37,042**	
30%	$	11,113	Estimate Contingency
Total Construction	**$**	**48,154**	
25%	$	12,039	Engineering & CM
10%	$	4,815	Administration/Permitting
	$	**65,009**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	68,000	Escalation Factor
Total Project	**$**	**68,000**	

Notes:

1. ADD SECONDARY 8-INCH DIAMETER CONNECTION (APPROXIMATELY 150 FT) TO STATELINE ZONE AT PIONEER TRAIL AND MARSHALL TRAIL WITH A NORMALLY CLOSED VALVE. STATELINE OPERATES AT A LOWER PRESSURE BUT WOULD PROVIDE SUPPLY AT A REDUCED PRESSURE FOR EMERGENCY CONDITIONS. THIS CONNECTION WOULD ALSO PROVIDE EMERGENCY SUPPLY TO THE SOUTHEAST AREA OF STATELINE ZONE ALONG PLATEAU CIRCLE AND FAIR MEADOW TRAIL WHICH IS RELIANT ON A SINGLE PIPELINE APPROXIMATELY 4,800 FT LONG LOCATED IN PIONEER TRAIL.
2. Remove Pioneer Kokanee PRV from service

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B17

Project Name: Upper Saddle-Sweeping Turn Zone Improvements

Site: Sweeping Turn, Four Seasons & Upper Saddle Zones

General Description: Upgrade by removing PRVs, adding PRV, replacing under sized pipelines with fire hydrants, adding pipeline interconnections to improve low pressure areas, and abandon undersized pipelines

Benefits of this Project: Improve fire flow, system pressure and service redundancy

STPUD Water System Optimization Plan

Prepared By: NR/RH

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Date Reviewed: 17-Feb-15

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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	Remove Saddle PRV No. 1 serving Four Seasons hydrant	$ 1,000
	1390 LF X 8" pipeline to replace parallel 4" and 6" pipelines in Saddle Rd. between Bridal Rd. and Keller Rd.	$ 245,000
	3 fire hydrants	$ 17,000
	350 LF X 8" pipeline to connect 6" pipeline in Needle Peak to low pressure 6" pipeline in Keller Rd.	$ 62,000
	4750 LF X 8" pipeline to replace all 4" pipelines in Bonita, Crest, and Bridle Rd.	$ 836,000
	Add 10 fire hydrants to meet min. 500 ft. spacing	$ 57,000
	Abandon 4-inch pipeline in Bridal Rd. between Saddle Rd. and Bonita Rd. (steep area, no services)	$ 1,000

Subtotals	**$**	**1,219,000**	
7.75%	$	31,459	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**1,250,459**	
15%	$	187,569	Contractor OH&P
Subtotal	**$**	**1,438,028**	
30%	$	431,408	Estimate Contingency
Total Construction	**$**	**1,869,437**	
25%	$	467,359	Engineering & CM
10%	$	186,944	Administration/Permitting
	$	**2,523,740**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	2,653,000	Escalation Factor
Total Project	**$**	**2,653,000**	

Note **PROJECT COMPLETED BY DISTRICT IN LATE SUMMER 2014**

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B18
Project Name: Price-Ralph Improvements
Site: Price Rd (Ralph)
General Description: Provide redundant service from Heavenly to Price Road.
Benefits of this Project: Improve Fire Flow and Service Redundancy

STPUD Water System Optimization Plan
Prepared By: NR/RH
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	6" PRV	$ 8,000
	Valve Vault Traffic Rated	$ 20,000
	Piping	$ 7,000
	Cut and Patch AC	$ 5,000
	Traffic Control	$ 2,000
	Locking Hatch	$ 2,000
	Isolation Valve x 2	$ 4,000
	Pressure Gauges	$ 2,000
	Flowmeter	$ 3,000
	Pipe Supports	$ 1,000
	1340 LF X 8" pipeline	$ 236,000

Subtotals	**$**	**290,000**	
7.75%	$	7,484	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**297,484**	
15%	$	44,623	Contractor OH&P
Subtotal	**$**	**342,107**	
30%	$	102,632	Estimate Contingency
Total Construction	**$**	**444,739**	
25%	$	111,185	Engineering & CM
10%	$	44,474	Administration/Permitting
	$	**600,397**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	631,000	Escalation Factor
Total Project	**$**	**631,000**	

Note

Rd (Ralph) Zone). Redundant service.
Pioneer Trail with 8-inch diameter pipeline (approximately 1,340 ft).

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: B19
Project Name: Terrace Zone Improvements
Site: Terrace PRV
General Description: Fire Flow And Service Redundancy
Benefits of this Project: Improve fire flow and service redundancy

STPUD Water System Optimization Plan
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	Replace 2-inch and 4-inch diameter pipeline in Terrace Zone with 6-inch diameter pipeline (approximately 1,950')	$ 257,000
	Connect new 500 LF X 6" pipeline in Knoll Ln to existing 6" pipeline in Needle Peak Rd. at Verdon Ln, rock excavation	$ 198,000
	Hot tap connection 6" pipeline in Needle Peak Rd. at Verdon Ln.	$ 1,300
	Remove Terrace PRV at Wildwood Ave & Terrace Dr	$ 1,000
	Add 5 each fire hydrants on new 6" pipelines	$ 15,000
	Connect 700 LF of new 6" pipeline at Terrace Dr (north) to existing 4" pipeline in Wildwood Dr.	$ 93,000

Subtotals	**$**	**565,300**	
7.75%	$	14,589	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**579,889**	
15%	$	86,983	Contractor OH&P
Subtotal	**$**	**666,872**	
30%	$	200,062	Estimate Contingency
Total Construction	**$**	**866,934**	
25%	$	216,734	Engineering & CM
10%	$	86,693	Administration/Permitting
	$	**1,170,361**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	1,230,000	Escalation Factor
Total Project	**$**	**1,230,000**	

Note

Low-Priority Projects

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Project C (LOW PRIORITY)
Project: STPUD Water System Optimization Plan

Prepared By: NR/RH
Date Updated 17-Feb-15
K/J Proj. No.: 1270004*00

Reviewed By: TW
Date Reviewed: 17-Feb-15

ITEM NO.[1]	PROJECT NAME	TM 1 SECTION/PAGE NUMBER OR TM 4 PROJECT NUMBER REFERENCE	BENEFITS OF THIS PROJECT	SITE	TOTAL[2]	DEPT	RECOMMENDED IMPLEMENTATION FISCAL YEAR
C1	PRV Improvements	TM 1: Section 4.3, Table 9	Extend useful life, improve reliability, and increase security of this PRV	Multiple PRV sites	$ 592,000	Pumps	Beyond FY 2033-2034
C2	Well Electrical Equipment Evaluation	TM 1: Section 4.2, Table 8	Extend useful life of electrical gear	Multiple Well sites	$ 47,000	Wells	Beyond FY 2033-2034
C3	Water Quality Evaluation - Engineering Study	TM 4: 62	Evaluate the water system during low demand periods to determine operational improvements to maintain adequate water quality	Water System-wide	$ 37,000	Engineering/Pumps	Beyond FY 2033-2034
C4	Well Sites Pipe Coating Improvements	TM 1: Section 4.2, Table 8	Extend useful life and improve reliability of piping	Multiple Well Sites	$ 58,000	Pumps	Beyond FY 2033-2034
C5	SCADA Improvements - Phase 3, Flowmeters	TM 1: Section 4.2, Table 8	Improve reliability of well operation	Multiple Well Sites	$ 550,000	Electrical	Beyond FY 2033-2034
C6	Boulder Mountain and Cold Creek Tank Booster Pipe Coating Improvements	TM 1: Section 4.1, Table 7	Extend useful life and improve reliability of piping	Boulder Mountain and Cold Creek Tank booster pump stations	$ 13,000	Pumps	Beyond FY 2033-2034
C7	SCADA Improvements - Phase 3, Flowmeters	TM 1: Section 4.1, Table 7	Improve reliability of booster pump station operation	Multiple pump stations	$ 805,000	Electrical	Beyond FY 2033-2034
C8	South Apache Booster Improvements	TM 1: Section 4.1, Table 7	Replace useful life of building, and improve electrical/controls reliability	South Apache Booster	$ 337,000	Engineering	Beyond FY 2033-2034
C9	Airport Booster Improvements	TM 1: Section 4.1, Table 7	Replace useful life of building, improve redundancy and reliability, extend useful life of piping and electrical/controls, improve fire flow, and improve site security	Airport Booster	$ 436,000	Engineering	Beyond FY 2033-2034
C10	Tank Inlet / Outlet Piping Retrofits	TM 1: Section 4.4, Table 10	Improve water quality, reliability, and extend useful life of tanks	Multiple Tank sites	$ 1,698,000	Engineering	Beyond FY 2033-2034
C11	Tata Tank Removal	TM 1: Section 4.4, Table 10	Eliminate a tank asset that has reached its useful life and is not needed	Tata Tank	$ 54,000	Engineering	Beyond FY 2033-2034
C12	Flagpole Zone Improvements	TM 4: 4 to 8	Reduce system pressures that exceed 120 psi	Flagpole Zone	$ 748,000	Engineering	Beyond FY 2019-2020
C13	Unidirectional Flushing Program	TM 4: 63	Consulting services to train District staff to develop and implement a District-wide flushing program to improve the District's ability to maintain system-wide water quality	Water System-wide	$ 21,000	Engineering	FY 2019-2020
C14	Pipeline Replacement Program	TM 4: 61	Improve Redundancy and Reliability for All Zones	Water System-wide	$ 347,000	Engineering	FY 2019-2020

Total Project	**$ 5,800,000**

NOTE:

(1) Project-number designations do not necessarily reflect the sequence or priority of implementation
(2) Total Project Cost Estimates are based on July 1, 2014 costs and **are not** escalated to the recommended implementation year.

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C1
Project Name: PRV Improvements
Site: Multiple PRV sites
General Description: PRV improvements
Benefits of this Project: Extend useful life, improve reliability, and increase security of this PRV

STPUD Water System Optimization Plan
Prepared By: NR/RH
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K/J Proj. No.: 1270004*00
Reviewed By: TW

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ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL	
	INSTALL LOCKING HATCH @ 1) Comanche PRV; 2) Country Club PRV; 3) Keller PRV No. 1; 4) Keller PRV No. 5; 5) Oflying PRV; 6) Pine Valley PRV; 7) Price Rd PRV; 8) Rocky Point PRV; 9) Saddle No. 2 PRV; and 10) Susquehana PRV	$ 20,000	
	CONTROL WATER INTRUSION @ 1) Comanche PRV; 2) Country Club PRV; 3) Keller PRV No. 1; 4) Oflying PRV; 5) Rocky Point PRV; and 6) Saddle No. 2 PRV	$ 12,000	
	INSTALL FLOWMETER @ 1) Comanche PRV; 2) Country Club PRV; 3) Keller PRV No. 1; 4) Keller PRV No. 5; 5) Oflying PRV; 6) Pine Valley PRV; 7) Price Rd PRV; 8) Rocky Point PRV; 9) Saddle No. 2 PRV; and 10) Susquehana PRV	$ 30,000	
	REPAIR PROTECTIVE COATINGS @ 1) Country Club PRV; and 2) Keller PRV No. 5	$ 2,000	
	REPAIR BYPASS CONNECTION @ 1) Keller No. 1 PRV	$ 5,000	
	REMOVE "SEWER" DESIGNATION FROM HATCH @ 1) Keller No. 5 PRV; 2) Pine Valley PRV; 3) Price Rd PRV; and 4) Saddle No. 2 PRV	$ 800	
	REPLACE OR REBUILD PRV @ 1) Pine Valley PRV; 2) Price Rd PRV; 3) Rocky Point PRV; and 4) Susquehana PRV	$ 32,000	
	INSTALL PIPE SUPPORTS @ 1) Pine Valley PRV; 2) Price Rd PRV; and 3) Rocky Point PRV	$ 1,500	
	INSTALL PRESSURE GAGES @ 1) Saddle No. 2 PRV	$ 2,000	
	INSTALL FLOWMETERS, PRESSURE GAUGES, BATTERY BACKUP POWER (AS NEEDED), AND SCADA COMMUNICATIONS AT 18 PRV STATIONS	$ 166,500	
	Subtotals	**$ 271,800**	
	7.75%	$ 7,014	Sales tax on materials (materials cost = 33% of total cost)
	Subtotal	**$ 278,814**	
	15%	$ 41,822	Contractor OH&P
	Subtotal	**$ 320,637**	
	30%	$ 96,191	Estimate Contingency
	Total Construction	**$ 416,828**	
	25%	$ 104,207	Engineering & CM
	10%	$ 41,683	Administration/Permitting
		$ 562,717	Subtotal Total Construction; Engr & CM and Admin/Permitting
		$ 592,000	Escalation Factor
	Total Project	**$ 592,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C2
Project Name: Well Electrical Equipment Evaluation
Site: Multiple Well sites
General Description: EVALUATE PHYSICAL MORTALITY OF ELECTRICAL GEAR
Benefits of this Project: Extend useful life of electrical gear

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
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ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	ENGINEERING STUDY: EVALUATE PHYSICAL MORTALITY OF ELECTRICAL GEAR	
	AIRPORT WELL (OFFLINE)	$ 5,000.00
	BLACKROCK NO. 2 (OFFLINE)	$ 5,000.00
	CHRIS WELL (OFFLINE)	$ 5,000.00
	CLEMENT WELL (OFFLINE)	$ 5,000.00
	COLLEGE WELL (OFFLINE - URANIUM)	$ 5,000.00
	MARTIN WELL (OFFLINE - IRON/MANGANESE)	$ 5,000.00
	TATA WELL NO. 1 (OFFLINE - ARSENIC)	$ 5,000.00
	TATA WELL NO. 2 (OFFLINE - ARSENIC)	$ 5,000.00
	TATA WELL NO. 3 (OFFLINE - ARSENIC)	$ 5,000.00

Subtotals	**$ 45,000**	
	$ -	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$ 45,000**	
	$ -	Contractor OH&P
Subtotal	**$ 45,000**	
	$ -	Estimate Contingency
Total Construction	**$ 45,000**	
	$ -	Engineering & CM
	$ -	Administration/Permitting
	$ 45,000	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$ 47,000	Escalation Factor
Total Project	**$ 47,000**	

Note

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C3
Project Name: Water Quality Evaluation - Engineering Study
Site: Water System-wide
General Description: Conduct system-wide water quality evaluation for low-water demand periods
Benefits of this Project: Evaluate the water system during low demand periods to determine operational improvements to maintain adequate water quality

STPUD Water System Optimization Plan
Prepared By: NR/RH
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	ENGINEERING STUDY: Using the hydraulic model evaluate system-wide water quality to determine potential water quality problem areas and identify operational options to maintain water quality during low water demand periods.	$ 35,000

Subtotals	**$**	**35,000**
	$ -	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**35,000**
	$ -	Contractor OH&P
Subtotal	**$**	**35,000**
	$ -	Estimate Contingency
Total Construction	**$**	**35,000**
	$ -	Engineering & CM
	$ -	Administration/Permitting
	$	**35,000** Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	37,000 Escalation Factor
Total Project	**$**	**37,000**

Note

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C4
Project Name: Well Sites Pipe Coating Improvements
Site: Multiple Well Sites
General Description: Piping improvements
Benefits of this Project: Extend useful life and improve reliability of piping

STPUD Water System Optimization Plan
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ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	SECURE PIPE SUPPORTS TO CONCRETE FLOOR @ 1) Airport Well (Offline); 2) Chris Well (Offline); and 3) Tata Well No. 3 (Offline - arsenic);	$ 1,500
	APPLY NEW COATINGS TO PIPING AND VALVES @ 1) Airport Well (Offline); 2) Al Tahoe Well; 3) Chris Well (Offline); 4) Tata Well No. 3 (Offline - arsenic); and 5) Valhalla Well	$ 25,000

Subtotals	**$**	**26,500**	
7.75%	$	684	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**27,184**	
15%	$	4,078	Contractor OH&P
Subtotal	**$**	**31,261**	
30%	$	9,378	Estimate Contingency
Total Construction	**$**	**40,640**	
25%	$	10,160	Engineering & CM
10%	$	4,064	Administration/Permitting
	$	**54,864**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	58,000	Escalation Factor
Total Project	**$**	**58,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C5
Project Name: SCADA Improvements - Phase 3, Flowmeters
Site: Multiple Well Sites
General Description: SCADA improvements
Benefits of this Project: Improve reliability of well operation

STPUD Water System Optimization Plan
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	INTEGRATE FLOWMETER TO SCADA SYSTEM	
	AIRPORT WELL (OFFLINE)	
	AL TAHOE NO. 2	$ 22,990
	ARROWHEAD WELL NO. 3	$ 22,990
	BAKERSFIELD WELL	$ 22,990
	BAYVIEW WELL	$ 22,990
	CLEMENT WELL (OFFLINE)	
	ELKS CLUB NO. 2	$ 22,990
	GLENWOOD WELL NO. 5	$ 22,990
	HELEN WELL NO. 2	$ 22,990
	MOUNTAIN VIEW WELL (OFFLINE)	
	PALOMA WELL	$ 22,990
	UPPER TRUCKEE WELL NO. 3	$ 22,990
	SUNSET WELL	$ 22,990
	TATA WELL NO. 3 (OFFLINE - ARSENIC)	
	VALHALLA WELL	$ 22,990

Subtotals	**$**	**252,890**	
7.75%	$	6,526	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**259,416**	
15%	$	38,912	Contractor OH&P
Subtotal	**$**	**298,329**	
30%	$	89,499	Estimate Contingency
Total Construction	**$**	**387,828**	
25%	$	96,957	Engineering & CM
10%	$	38,783	Administration/Permitting
	$	**523,567**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	550,000	Escalation Factor
Total Project	**$**	**550,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C6
Project Name: Boulder Mountain and Cold Creek Tank Booster Pipe Coating Improvements
Site: Boulder Mountain and Cold Creek Tank booster pump stations
General Description: Piping improvements
Benefits of this Project: Extend useful life and improve reliability of piping

STPUD Water System Optimization Plan
Prepared By: NR/RH
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K/J Proj. No.: 1270004*00
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Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54

ENR Index Jul 2014: 10,897.59

Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	SECURE PIPE SUPPORTS TO FLOOR	
	BOULDER MOUNTAIN BOOSTER	$ 500
	COLD CREEK TANK BOOSTER	$ 500
	APPLY NEW EXTERIOR COATINGS TO PIPING	
	COLD CREEK TANK BOOSTER	$ 5,000

Subtotals	**$**	**6,000**	
7.75%	$	155	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**6,155**	
15%	$	923	Contractor OH&P
Subtotal	**$**	**7,078**	
30%	$	2,123	Estimate Contingency
Total Construction	**$**	**9,201**	
25%	$	2,300	Engineering & CM
10%	$	920	Administration/Permitting
	$	**12,422**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	13,000	Escalation Factor
Total Project	**$**	**13,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C7
Project Name: SCADA Improvements - Phase 3, Flowmeters
Site: Multiple pump stations
General Description: SCADA improvements
Benefits of this Project: Improve reliability of booster pump station operation

STPUD Water System Optimization Plan
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ENR Index Jul 2012: 10,366.54
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	PROVIDE FLOWMETER	
	H STREET BOOSTER FLOWMETER	$ 2,000
	INTEGRATE FLOWMETER INTO SCADA SYSTEM	
	AIRPORT BOOSTER	$ 22,990
	BLACK BART BOOSTER	$ 22,990
	BOULDER MOUNTAIN BOOSTER	$ 22,990
	COLD CREEK FILTER PLANT BOOSTER (NOT EVALUATED)	$ 22,990
	COLD CREEK TANK BOOSTER	$ 22,990
	CORNELIAN BOOSTER	$ 22,990
	DAVID LANE BOOSTER	$ 22,990
	FLAGPOLE BOOSTER	$ 22,990
	FOREST MOUNTAIN BOOSTER	$ 22,990
	GRIZZLY MOUNTAIN BOOSTER	$ 22,990
	H STREET BOOSTER	$ 22,990
	KELLER BOOSTER	$ 22,990
	NORTH APACHE BOOSTER	$ 22,990
	SOUTH APACHE BOOSTER	$ 22,990
	TATA BOOSTER	$ 22,990
	TWIN PEAKS BOOSTER	$ 22,990

Subtotals	**$**	**369,840**	
7.75%	$	9,545	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**379,385**	
15%	$	56,908	Contractor OH&P
Subtotal	**$**	**436,292**	
30%	$	130,888	Estimate Contingency
Total Construction	**$**	**567,180**	
25%	$	141,795	Engineering & CM
10%	$	56,718	Administration/Permitting
	$	**765,693**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	805,000	Escalation Factor
Total Project	**$**	**805,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C8
Project Name: South Apache Booster Improvements
Site: South Apache Booster
General Description: Building replacement
Benefits of this Project: Replace useful life of building, and improve electrical/controls reliability

STPUD Water System Optimization Plan
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ENR Index Jul 2012: 10,366.54
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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	NEW PRE-ENGINEERED BUILDING (PRESERVE EXISTING ELECTRICAL	$ 150,000
	EVALUATE PUMP CONTROLS & DUTY CONDITIONS	$ 5,000

Subtotals	**$**	**155,000**	
7.75%	$	4,000	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**159,000**	
15%	$	23,850	Contractor OH&P
Subtotal	**$**	**182,850**	
30%	$	54,855	Estimate Contingency
Total Construction	**$**	**237,705**	
25%	$	59,426	Engineering & CM
10%	$	23,771	Administration/Permitting
	$	**320,902**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	337,000	Escalation Factor
Total Project	**$**	**337,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C9
Project Name: Airport Booster Improvements
Site: Airport Booster
General Description: Miscellaneous improvements
Benefits of this Project: Replace useful life of building, improve redundancy and reliability, extend useful life of piping and electrical/controls, improve fire flow, and improve site security

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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	NEW PRE-ENGINEERED BUILDING (PRESERVE EXISTING ELECTRICAL	$ 150,000
	PROVIDE STANDBY PUMP (1 X 400 gpm @ 30 hp)	$ 36,000
	SECURE PIPE SUPPORTS TO FLOOR	$ 500
	APPLY NEW EXTERIOR COATINGS TO PIPING	$ 5,000
	PROVIDE PIN & SLEEVE CONNECTOR AND MANUAL XFR SWITCH	$ 4,000
	EVALUATE PHYSICAL MORTALITY OF ELECTRICAL GEAR	$ 5,000

Subtotals	**$**	**200,500**	
7.75%	$	5,174	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**205,674**	
15%	$	30,851	Contractor OH&P
Subtotal	**$**	**236,526**	
30%	$	70,958	Estimate Contingency
Total Construction	**$**	**307,483**	
25%	$	76,871	Engineering & CM
10%	$	30,748	Administration/Permitting
	$	**415,102**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	436,000	Escalation Factor
Total Project	**$**	**436,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C10
Project Name: Tank Inlet / Outlet Piping Retrofits
Site: Multiple Tank sites
General Description: Piping and coating improvements
Benefits of this Project: Improve water quality, reliability, and extend useful life of tanks

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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	INSTALL SEPARATE INLET/OUTLET OR OTHER MIXING SYSTEM	
	ARROWHEAD TANK	$ 50,000
	CHRISTMAS VALLEY TANK	$ 50,000
	COLD CREEK TANK	$ 50,000
	FLAGPOLE TANK NO. 1	$ 50,000
	FLAGPOLE TANK NO. 2	$ 50,000
	FOREST MOUNTAIN TANK	$ 50,000
	GARDNER MOUNTAIN TANK NO. 1	$ 50,000
	GARDNER MOUNTAIN TANK NO. 2	$ 50,000
	H STREET TANK	$ 50,000
	HEAVENLY VALLEY TANK	$ 50,000
	IROQUOIS TANK NO. 1	$ 50,000
	IROQUOIS TANK NO. 2	$ 50,000
	LOOKOUT TANK	$ 50,000
	STATELINE TANK NO. 1	$ 50,000
	STATELINE TANK NO. 2	$ 50,000
	INSTALL FLEXIBLE INLET/OUTLET TANK CONNECTIONS	
	COLD CREEK TANK	$ 5,000
	HEAVENLY VALLEY TANK	$ 5,000
	IROQUOIS TANK NO. 1	$ 5,000
	IROQUOIS TANK NO. 2	$ 5,000
	REPLACE TANK COATINGS	
	FLAGPOLE TANK NO. 1	$ 5,000
	HEAVENLY VALLEY TANK	$ 5,000

Subtotals	**$**	**780,000**	
7.75%	$	20,130	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**800,130**	
15%	$	120,019	Contractor OH&P
Subtotal	**$**	**920,149**	
30%	$	276,045	Estimate Contingency
Total Construction	**$**	**1,196,194**	
25%	$	299,049	Engineering & CM
10%	$	119,619	Administration/Permitting
	$	**1,614,862**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	1,698,000	Escalation Factor
Total Project	**$**	**1,698,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C11
Project Name: Tata Tank Removal
Site: Tata Tank
General Description: Remove Storage Tank
Benefits of this Project: Eliminate a tank asset that has reached its useful life and is not needed

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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	Remove and dispose of tank	$ 25,000

Subtotals	**$**	**25,000**	
7.75%	$	645	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**25,645**	
15%	$	3,847	Contractor OH&P
Subtotal	**$**	**29,492**	
30%	$	8,848	Estimate Contingency
Total Construction	**$**	**38,340**	
25%	$	9,585	Engineering & CM
10%	$	3,834	Administration/Permitting
	$	**51,758**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	54,000	Escalation Factor
Total Project	**$**	**54,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C12
Project Name: Flagpole Zone Improvements
Site: Flagpole Zone
General Description: Pipeline projects to address excessive system pressures
Benefits of this Project: Reduce system pressures that exceed 120 psi

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Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	10" Angle PRV @ Flagpole Booster Pump Stations	$ 8,000
	10" Piping & Fittings	$ 7,000
	10" BFV (Isolation) Valve	$ 2,500
	Close Existing 6" Gate Valve at 1863 Normuck St.	$ -
	Connect new 8" pipeline to existing 6" pipelines at intersections of Shawnee St., Normuk St., and Cholula St. with San Bernardino Ave.	$ 12,000
	1,700 LF X 8" pipeline	$ 299,200
	Connect new 8" pipeline at Flagpole Booster Pump Station and at North Upper Truckee Rd./San Bernardino Ave. Intersection	$ 15,000

Subtotals	**$**	**343,700**	
7.75%	$	8,870	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**352,570**	
15%	$	52,886	Contractor OH&P
Subtotal	**$**	**405,456**	
30%	$	121,637	Estimate Contingency
Total Construction	**$**	**527,092**	
25%	$	131,773	Engineering & CM
10%	$	52,709	Administration/Permitting
	$	**711,574**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	748,000	Escalation Factor
Total Project	**$**	**748,000**	

Note

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C13
Project Name: Unidirectional Flushing Program
Site: Water System-wide
General Description: On-call Engineering Support for System-Wide Unidirectional Flushing Program
Benefits of this Project: Consulting services to train District staff to develop and implement a District-wide flushing program to improve the District's ability to maintain system-wide water quality

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW

Date Reviewed: 17-Feb-15

ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Item No.	ITEM DESCRIPTION	TOTAL
	ENGINEERING STUDY: Develop a system-wide unidirectional flushing program over phases. This has been done for a small part of the water system to address a sanding problem. It is suggested to be done in four phases, breaking up the entire water system into four areas by combining pressure zones and to spread the impacts to District staff implementing the program over four consecutive years.	$ 20,000

Subtotals	**$**	**20,000**	
	$	-	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**20,000**	
	$	-	Contractor OH&P
Subtotal	**$**	**20,000**	
	$	-	Estimate Contingency
Total Construction	**$**	**20,000**	
	$	-	Engineering & CM
	$	-	Administration/Permitting
	$	**20,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	21,000	Escalation Factor
Total Project	**$**	**21,000**	

ENGINEER'S ESTIMATE OF PROBABLE COST

KENNEDY/JENKS CONSULTANTS

Item No: C14
Project Name: Pipeline Replacement Program
Site: Water System-wide
General Description: Conduct an evaluation to develop a pipeline replacement priority program
Benefits of this Project: Improve Redundancy and Reliability for All Zones

STPUD Water System Optimization Plan
Prepared By: NR/RH
Updated: 17-Feb-15

K/J Proj. No.: 1270004*00
Reviewed By: TW
Date Reviewed: 17-Feb-15

Item No.	ITEM DESCRIPTION	TOTAL
	ENGINEERING STUDY: Develop systematic pipe replacement program to upgrade aging infrastructure that has outlived its useful service life. Use pipeline physical attributes, leak history; conduct a consequence of failure analysis using the hydraulic model to identify pipelines critical to maintain the District established Level of Service requirements.	$ 300,000

ENR Index Jul 2012: 10,366.54
ENR Index Jul 2014: 10,897.59
Escalation Factor: 1.05

Subtotals	**$**	**300,000**	
	$	-	Sales tax on materials (materials cost = 33% of total cost)
Subtotal	**$**	**300,000**	
	$	-	Contractor OH&P
Subtotal	**$**	**300,000**	
	$	-	Estimate Contingency
Total Construction	**$**	**300,000**	
	$	-	Engineering & CM
10%	$	30,000	Administration/Permitting
	$	**330,000**	Subtotal Total Construction; Engr & CM and Admin/Permitting
	$	347,000	Escalation Factor
Total Project	**$**	**347,000**	

Note