LARAMIE WATER MANAGEMENT PLAN, LEVEL II

APPENDICES

VOLUME II OF II

August 25, 2006

Submitted to:

Wyoming Water Development Commission
Herschler Building
Cheyenne, WY 82001

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3A
WATER PRODUCTION DATA

Appendix A - Water Production Monthly Data

2005	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	54.99	0.00	22.76	43.05	0.45	121.25
February	54.98	0.00	14.41	41.89	3.28	114.56
March	54.61	0.00	7.85	43.76	0.13	106.35
April	54.73	0.00	24.78	46.84	0.14	126.47
May	54.49	0.00	31.54	79.02	1.55	166.60
June	53.88	0.69	26.08	113.22	4.43	198.30
July	48.67	19.73	37.14	149.72	28.06	283.31
August	52.65	0.01	35.33	122.94	11.43	222.35
September	50.38	0.00	43.75	113.12	13.88	221.13
October	54.09	0.02	16.83	55.00	0.20	126.14
November	53.37	0.00	15.33	38.82	0.19	107.71
December	55.20	0.00	4.48	45.32	0.14	105.13
Totals	**642.03**	**20.44**	**280.27**	**892.69**	**63.88**	**1899.30**

These monthly totals were furnished by the City. The monthly total production values (million gallons) are not exactly the same as those that WWC arrived at by performing math on the daily records furnished by the City. Despite this, the differences are small and do not affect the interpretation of the data.

2004	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	56.74	0.00	11.85	37.71	2.15	108.45
February	56.81	0.00	20.48	40.45	1.36	119.11
March	57.24	0.00	23.33	41.11	0.11	121.79
April	57.80	0.00	18.38	54.98	0.94	132.09
May	56.89	0.00	30.91	116.97	0.60	205.37
June	54.88	0.00	36.99	138.85	0.18	230.89
July	55.07	0.00	31.65	141.80	2.27	230.79
August	53.28	5.31	35.20	130.83	0.97	225.60
September	54.12	0.00	24.96	90.57	1.20	170.85
October	54.39	15.05	15.31	52.06	0.61	137.41
November	54.81	0.00	11.67	43.02	0.16	109.67
December	55.00	0.00	11.07	43.74	0.50	110.31
Totals	**667.03**	**20.37**	**271.80**	**932.08**	**11.05**	**1902.32**

2003	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	51.22	0.51	4.80	49.51	2.89	108.92
February	54.63	0.51	6.66	49.95	0.99	112.74
March	54.64	0.51	6.70	50.01	0.99	112.85
April	55.42	0.53	6.77	44.70	0.94	108.36
May	56.00	0.55	24.01	58.82	1.99	141.38
June	55.34	0.57	22.00	111.38	0.17	189.47
July	54.52	1.21	77.45	169.63	19.22	322.03
August	48.62	48.58	38.07	137.51	16.50	289.28
September	50.15	4.05	27.45	96.41	0.96	179.01
October	53.39	0.00	20.12	62.17	5.34	141.03
November	55.08	0.01	5.46	52.29	0.14	112.98
December	55.75	1.41	4.55	39.12	1.40	102.22
Totals	**644.76**	**58.42**	**244.04**	**921.51**	**51.53**	**1920.26**

Appendix A - Water Production Monthly Data

2002	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	55.19	0.03	8.18	50.33	0.79	114.52
February	52.59	0.03	17.09	43.42	0.52	113.65
March	62.61	10.75	25.59	20.40	11.43	130.78
April	59.53	13.84	42.55	9.65	9.35	134.92
May	85.85	0.28	48.43	67.82	22.17	224.55
June	56.74	48.44	76.17	85.05	78.32	344.72
July	76.78	43.91	75.74	9.82	131.20	337.45
August	97.26	53.52	70.04	0.44	93.06	314.32
September	81.75	51.01	42.02	41.75	12.91	229.43
October	37.36	9.30	1.22	84.50	0.00	132.38
November	47.48	0.53	9.26	54.68	2.20	114.16
December	50.60	0.51	3.73	55.74	0.00	110.57
Totals	**763.74**	**232.14**	**420.03**	**523.60**	**361.95**	**2301.45**

These monthly totals were furnished by the City. The monthly total production values (million gallons) are not exactly the same as those that WWC arrived at by performing math on the daily records furnished by the City. Despite this, the differences are small and do not affect the interpretation of the data.

2001	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	49.56	0.27	0.00	63.35	4.93	118.11
February	46.46	0.24	0.00	58.69	3.35	108.74
March	64.15	0.32	32.60	9.85	21.10	128.02
April	62.95	0.28	20.16	46.78	1.06	131.23
May	59.35	0.28	43.96	77.04	12.75	193.38
June	56.49	15.71	91.90	107.70	55.13	326.93
July	54.24	26.24	38.56	165.00	58.28	342.32
August	59.98	8.86	62.38	146.90	25.63	303.75
September	59.85	0.97	58.39	114.20	1.72	235.13
October	62.97	0.28	25.59	68.63	3.04	160.51
November	59.19	0.27	10.34	50.14	0.83	120.77
December	54.04	0.28	10.00	51.23	0.66	116.21
Totals	**689.23**	**54.00**	**393.88**	**959.51**	**188.48**	**2285.10**

2000	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	64.50	0.30	1.60	52.70		119.10
February	49.90	0.20	17.60	51.40		119.10
March	59.30	0.30	45.70	55.70		161.00
April	61.80	0.20	33.80	64.90		160.70
May	66.80	0.20	28.10	121.70		216.80
June	78.80	39.50	52.20	131.70		302.20
July	80.60	54.70	40.10	182.50		357.90
August	101.10	25.20	46.70	130.70		303.70
September	48.51	0.00	63.52	84.16		196.19
October	57.89	0.01	23.60	67.73		149.23
November	59.44	0.26	0.28	60.13		120.11
December	54.34	0.28	2.44	54.12	6.40	117.58
Totals	**782.98**	**121.15**	**355.64**	**1057.44**	**6.40**	**2323.61**

1999	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	64.10	1.40	41.80	39.70		147.00
February	54.80	0.70	51.60	56.60		163.70
March	59.00	0.30	10.20	65.10		134.60
April	60.00	0.20	6.20	65.30		131.70
May	63.80	0.10	23.70	65.80		153.40
June	60.00	0.10	62.40	95.00		217.50
July	43.50	102.90	52.90	176.30		375.60
August	42.50	42.20	55.60	140.80		281.10
September	48.40	37.80	29.00	95.70		210.90
October	62.90	0.30	27.00	63.40		153.60
November	62.60	0.20	15.50	57.20		135.50
December	64.10	0.30	1.90	54.60		120.90
Totals	**685.70**	**186.50**	**377.80**	**975.50**	**0.00**	**2225.50**

Appendix A - Water Production Monthly Data

1998	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	47.70	0.00	23.50	50.40		121.60
February	41.10	0.00	25.10	46.50		112.70
March	60.60	0.00	16.00	48.50		125.10
April	59.90	0.00	26.50	47.10		133.50
May	29.20	88.00	56.80	57.00		231.00
June	2.60	117.90	33.80	88.40		242.70
July	0.10	116.50	44.60	138.10		299.30
August	34.00	47.40	59.40	112.20		253.00
September	45.90	10.80	42.00	149.00		247.70
October	56.00	1.40	22.80	64.60		144.80
November	57.50	0.09	41.40	33.90		132.89
December	62.00	0.01	27.60	37.26		126.87
Totals	**496.60**	**382.10**	**419.50**	**872.96**	**0.00**	**2171.16**

These monthly totals were furnished by the City. The monthly total production values (million gallons) are not exactly the same as those that WWC arrived at by performing math on the daily records furnished by the City. Despite this, the differences are small and do not affect the interpretation of the data.

1997	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	40.50	2.90	54.10	32.40		129.90
February	37.80	0.00	65.60	29.40		132.80
March	41.40	0.00	53.60	32.60		127.60
April	40.70	0.00	55.40	31.40		127.50
May	37.90	0.00	59.70	104.70		202.30
June	12.00	39.40	44.20	105.90		201.50
July	35.00	65.60	52.50	189.40		342.50
August	40.20	1.40	22.00	144.40		208.00
September	42.00	0.00	22.90	126.30		191.20
October	45.00	0.00	23.90	86.60		155.50
November	44.60	0.00	25.20	51.70		121.50
December	46.40	0.00	21.60	50.90		118.90
Totals	**463.50**	**109.30**	**500.70**	**985.70**	**0.00**	**2059.20**

1996	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	39.70	0.10	6.00	78.90		124.70
February	53.70	3.60	1.70	67.50		126.50
March	48.90	0.60	9.60	77.00		136.10
April	51.60	8.10	30.10	45.00		134.80
May	46.20	6.30	46.50	95.10		194.10
June	43.40	27.10	70.80	147.30		288.60
July	31.10	112.30	38.50	178.30		360.20
August	30.70	64.20	69.50	139.10		303.50
September	33.60	24.90	76.40	118.90		253.80
October	40.20	0.10	71.00	58.90		170.20
November	37.60	7.40	52.10	33.00		130.10
December	39.90	0.10	51.70	32.60		124.30
Totals	**496.60**	**254.80**	**523.90**	**1071.60**	**0.00**	**2346.90**

1995	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	31.50	40.10	64.40	8.80		144.80
February	32.60	26.40	68.40	27.30		154.70
March	44.10	13.80	1.70	101.40		161.00
April	48.20	0.00	5.70	94.50		148.40
May	45.10	1.30	54.70	47.10		148.20
June	38.80	24.00	57.80	91.10		211.70
July	46.70	72.20	56.90	135.50		311.30
August	45.60	72.70	59.40	160.30		338.00
September	23.60	68.30	56.80	55.60		204.30
October	27.20	13.60	27.50	74.40		142.70
November	36.00	2.20	5.30	84.60		128.10
December	41.60	9.70	46.20	33.00		130.50
Totals	**461.00**	**344.30**	**504.80**	**913.60**	**0.00**	**2223.70**

Appendix A - Water Production Monthly Data

1994	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	44.90	45.40	54.70	3.60		148.60
February	34.60	39.50	52.20	9.70		136.00
March	48.30	32.80	47.30	15.10		143.50
April	38.70	31.70	46.10	43.60		160.10
May	7.50	37.90	58.70	111.90		216.00
June	26.30	74.90	74.70	177.80		353.70
July	25.80	87.90	61.50	183.60		358.80
August	28.40	29.30	56.60	209.30		323.60
September	34.90	13.00	50.80	157.50		256.20
October	32.00	2.10	7.20	110.60		151.90
November	34.50	36.90	74.50	0.90		146.80
December	29.10	40.50	67.40	7.60		144.60
Totals	**385.00**	**471.90**	**651.70**	**1031.20**	**0.00**	**2539.80**

These monthly totals were furnished by the City. The monthly total production values (million gallons) are not exactly the same as those that WWC arrived at by performing math on the daily records furnished by the City. Despite this, the differences are small and do not affect the interpretation of the data.

1993	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	36.10	45.4	59.9	5.6		147.00
February	33.00	42.1	55.6	2.7		133.40
March	38.30	41.6	56.6	4.8		141.30
April	46.20	25.3	37.7	30.7		139.90
May	46.40	15.6	44.2	96.3		202.50
June	37.10	26.2	26.7	161.2		251.20
July	45.60	54.4	78.5	155.2		333.70
August	44.20	21.5	35.2	152.1		253.00
September	30.80	33.1	26.6	92		182.50
October	31.60	47.9	38.9	43.5		161.90
November	37.60	25.7	81.1	3.2		147.60
December	40.20	29.1	62.2	5.7		137.20
Totals	**467.10**	**407.90**	**603.20**	**753.00**	**0.00**	**2231.20**

1992	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January	55.50	36.80	40.90	1.80		135.00
February	37.00	36.00	46.70	8.70		128.40
March	49.20	35.80	43.90	8.40		137.30
April	44.00	3.00	14.90	98.20		160.10
May	39.80	0.20	53.50	128.50		222.00
June	37.90	8.90	11.40	140.80		199.00
July	42.10	32.90	12.20	176.20		263.40
August	42.30	23.70	12.70	180.10		258.80
September	40.90	25.10	6.60	158.90		231.50
October	45.80	31.30	5.00	89.20		171.30
November	46.80	35.40	51.10	3.10		136.40
December	35.40	41.50	52.70	3.20		132.80
Totals	**516.70**	**310.60**	**351.60**	**997.10**	**0.00**	**2176.00**

1991	Soldier Spring	Pope Wellfield	City Springs (Turner)	Water Treatment Plant	Spur Wells	Total
January				3.30		3.30
February				2.70		2.70
March				7.00		7.00
April				67.90		67.90
May				104.30		104.30
June				135.50		135.50
July				188.00		188.00
August				159.90		159.90
September	46.70	20.00	10.70	130.40		207.80
October	47.00	17.50	5.30	119.50		189.30
November	45.90	24.30	48.00	5.00		123.20
December	47.50	27.00	28.90	6.50		109.90
Totals	**187.10**	**88.80**	**92.90**	**930.00**	**0.00**	**1298.80**

Appendix A

[redacted] Per Capita Demand Estimates

	Raw Data		GPCD, Calc.		AVERAGE DAY 92-05	AVERAGE DAY 92-05	AVERAGE DAY 00-05	PEAK DAY 92-05	PEAK DAY 92-05	PEAK DAY 92-05
Season	Production Total (mg)	Peak Day (mg)	Ave Day	Peak Day	GPCD Ave.	GPCD Std. Dev.	GPCD Ave.	GPCD Ave.	Ratio Peak day to Average Day	Ave. PD/AD
May and Sept										
1992	452.55	10.26	271	375					1.38	
1993	380.04	11.75	223	421					1.89	
1994	466.12	10.82	272	385					1.42	
1995	351.99	10.54	204	373					1.83	
1996	449.65	11.34	257	395					1.54	
1997	393.02	9.57	229	340					1.49	
1998	475.00	12.40	276	443					1.59	
1999	361.03	9.34	212	334					1.58	
2000	446.69	10.28	264	370					1.40	
2001	436.56	11.77	261	429					1.64	
2002	437.12	12.00	264	441					1.67	
2003	320.39	8.04	192	294					1.53	
2004	376.21	8.66	227	318					1.40	
2005	387.72	8.26	228	296	241	27	239	372	1.30	1.55
April and Oct										
1992	338.08	9.36	202	342					1.69	
1993	299.28	8.06	176	289					1.64	
1994	320.52	7.55	187	269					1.44	
1995	290.80	6.32	169	224					1.33	
1996	303.52	7.42	173	258					1.49	
1997	283.12	6.88	165	245					1.48	
1998	277.55	6.72	162	240					1.48	
1999	284.84	6.39	167	228					1.37	
2000	317.21	8.12	187	292					1.56	
2001	295.70	8.88	177	324					1.83	
2002	264.71	7.05	160	259					1.62	
2003	249.39	6.24	150	228					1.53	
2004	269.50	7.72	162	284					1.75	
2005	252.61	7.70	148	276	170	14	164	268	1.86	1.58
Summer June,July, Aug										
1992	716.89	12.25	285	448					1.57	
1993	840.98	14.25	328	511					1.56	
1994	1008.44	14.59	390	519					1.33	
1995	874.72	14.36	337	509					1.51	
1996	977.04	15.28	370	532					1.44	
1997	763.41	14.98	295	532					1.81	
1998	789.22	13.54	306	484					1.58	
1999	845.41	14.41	329	515					1.57	
2000	969.33	14.40	380	519					1.37	
2001	983.39	15.24	390	556					1.43	
2002	977.32	16.96	391	624					1.60	
2003	800.77	12.37	319	453					1.42	
2004	687.28	11.05	274	406					1.48	
2005	703.97	12.65	274	453	333	42	338	504	1.65	1.52
Winter Nov., Dec., Jan., Feb., March										
1991-92	639.79	6.98	155	255					1.65	
1992-93	692.91	7.52	165	270					1.64	
1993-94	721.08	7.65	170	272					1.60	
1994-95	718.15	6.94	168	246					1.46	
1995-96	643.88	7.31	148	254					1.71	
1996-97	639.77	6.26	151	222					1.48	
1997-98	600.32	6.28	142	224					1.58	
1998-99	690.25	6.92	163	247					1.51	
1999-2000	661.81	8.01	158	288					1.83	
2000-01	606.08	6.05	146	221					1.51	
2001-02	606.83	7.21	148	265					1.79	
2002-03	585.69	5.54	142	203					1.43	
2003-04	564.55	5.33	137	196					1.42	
2004-05	562.14	8.25	133	295	152	11	144	247	2.22	1.63
Annual										
1992	2147.30		214							
1993	2213.21		217							
1994	2516.15		245							
1995	2235.65		217							
1996	2374.09		226							
1997	2079.32		202							
1998	2142.09		210							
1999	2181.53		214							
2000	2395.03		236							
2001	2321.73		232							
2002	2285.98		230							
2003	1956.24		196							
2004	1897.54		190							
2005	1906.44		187		216	17	212			

Notes: Water production totals based on electronic archive data from City. The totals do not exactly correspond to other production data provided by the City.
Per Capita demand estimated calculated using the service area population values in the following table.

Year	Service Area Population Estimate from
1992	27,378
1993	27,895
1994	28,098
1995	28,229
1996	28,716
1997	28,136
1998	28,009
1999	27,966
2000	27,761
2001	27,416
2002	27,179
2003	27,302
2004	27,228
2005	27,927

- 5 night / week
- End March → Oct.
- 9 pm → to 5 or 6 AM.
- USE RAIN DEMAND.

Based on Design Info.

10 Year Average 1996-2005 Irrigation Water Utilization Report

CEMETERY SYSTEM	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	Total Min	AVE MIN	AVE GPM	ZONES	AVE MG/YR
Cemetery Phase 1	2,240	2,549	2,862	3,257	2,580	2,883	2,430	2,368	2,108	2,222	25,499	2,550	63.70	23	3.736
Cemetery Phase 2	2,240	2,445	2,690	3,265	2,550	2,898	2,376	2,350	2,212	2,402	25,428	2,543	63.20	22	3.536
Cemetery Phase 3	2,240	4,026	2,412	3,235	2,580	2,923	2,520	2,332	1,880	2,222	26,370	2,637	102.60	24	6.493
Cemetery Phase 4	2,240	3,556	2,402	3,380	2,473	2,943	2,448	2,433	2,742	4,969	29,586	2,959	104.10	24	7.392
Cemetery Phase 5	2,180	2,083	2,392	3,273	2,580	2,531	2,412	2,305	1,510	1,566	22,832	2,283	86.20	16	3.149
Cemetery Phase 6	1,950	1,565	2,544	3,245	2,580	2,383					14,267	2,378	86.80	11	2.244
Total Min. Per Year	15,095	18,228	17,305	21,657	17,344	18,561	14,185	13,786	12,449	15,377	130,664	16,333			
Total Cemetery Average Millions of Gallons Per Year															26.550

PARK SYSTEM	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	Total Min	AVE MIN	AVE GPM	ZONES	AVE MG/YR
Kiwanis	1,841	2,023	3,006	2,409	2,075	2,613	3,268	2,616	1,692	2,958	24,501	2,450	111.30	18	4.909
130/230Y	1,830	1,305	1,820	1,838	1,703	1,760	1,892	1,950	1,212	2,516	17,825	1,783	10.80	6	0.116
Optimist	1,905	1,670	2,786	2,303	2,203	2,195	3,516	2,538	2,149	6,642	27,907	2,791	80.90	16	3.612
Depot	2,119	2,205	1,639	2,174	1,757	1,764	1,836	2,616	1,918	6,795	24,823	2,482	88.40	11	2.414
City Hall	2,032	727	2,451	1,268	1,170	1,070	1,606	1,664	1,076	1,293	14,357	1,436	8.20	4	0.047
Annex/Annex Parking	2,254	2,300	2,298	2,341	2,679	2,533	1,392	2,739	2,128	4,479	25,143	2,514	8.10	12	0.244
Undine	2,328	1,980	2,884	2,622	2,061	2,075	2,134	2,748	1,968	5,159	25,959	2,596	117.70	24	7.333
LaPrele	2,382	1,927	2,259	2,441	1,377	1,200	2,426	2,732	1,722	5,360	23,826	2,383	123.30	15	4.407
Washington West	2,320	2,160	3,111	2,285	2,237	2,315	2,166	2,580	1,828	4,068	25,070	2,507	123.50	18	5.573
Washington East	2,140	2,180	1,958	2,301	2,162	3,959	2,124	2,646	1,888	5,286	26,644	2,664	121.20	10	3.229
Aragon-Soccer	2,431	1,590	2,842	2,801	2,821	2,383	2,348	2,568	2,235	3,261	25,280	2,528	116.30	26	7.644
Aragon-Softball	incl above	-	-	-	-	-	-	-	-	-	-	-	116.30	18	-
Kiowa	2,098	2,152	1,157	2,225	2,631	3,080	2,160	2,858	2,298	4,965	25,624	2,562	29.30	7	0.526
DP #1 Delaware Pond on Pepper	1,764	1,970	1,024	2,433	1,740	1,764	1,980	2,624	2,124	1,975	19,398	1,940	30.30	8	0.470
Harbor	1,850	2,200	1,130	2,249	1,684	2,345	2,210	2,855	1,971	2,724	21,218	2,122	92.00	6	1.171
Mini Park	1,320	567	1,730	1,688	1,647	1,720	1,875	1,818	1,709	1,600	15,674	1,567	35.60	3	0.167
LaBonte Ball Fields	2,061	2,072	2,322	2,215	1,759	2,307	2,075	2,130	1,572	4,161	22,674	2,267	105.50	13	3.110
LaBonte Opt. Field	2,154	2,014	2,661	2,288	1,645	2,071	1,980	2,682	1,866	2,910	22,271	2,227	105.30	15	3.518
LaBonte Warming Hut	2,067	1,955	2,511	2,285	1,923	2,010	2,080	2,622	1,796	3,132	22,381	2,238	82.80	14	2.594
LaBonte Ft. Sanders	2,079	1,915	2,761	2,306	2,114	2,047	1,980	1,896	1,898	3,850	22,846	2,285	112.40	17	4.365
Park Shop	1,521	1,864	1,260	2,249	1,654	3,496	1,976	2,139	1,497	2,015	19,671	1,967	28.10	8	0.442
Children's Museum	1,466	755	2,610	2,361	2,112	2,024	1,736	1,896	1,446	3,364	19,770	1,977	15.50	5	0.153
Scout #1	1,757	1,560	3,478	1,861	1,809	1,850					12,315	2,053	104.50	23	4.933
Cowboy Field	2,580	1,820	2,561	2,058							9,019	2,255	158.40	10	3.572
Little League A West	2,583	1,648	4,476	1,380							10,087	2,522	58.20	21	3.082
Little League B East	2,584	1,670	4,924	1,140							10,318	2,580	37.20	19	1.823
Total Min. Per Year	51,466	46,233	63,662	55,523	44,963	50,581	46,759	50,917	37,993	78,512	514,600	53,614	365.8		
Jacobs Golf Course															
Total Parks Average Millions of Gallons Per Year															69.454
Total Parks and Cemetery MG's and Cemetery MG															96.004

→ Mike Zook 721-5264

Paul Harrison 721-5269

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5A
COST ESTIMATES

TABLE 5A-1 - Additional Cost Estimates Brought Forward From Previous Studies

Cost Index October 2003[1]: 6,771

Cost Index June 2006[2]: 7,700

Dowlin Ditch Water Rights Maintenance	
2003 Capital Cost Estimate[3]:	$205,000
2003 Annual Cost Estimate[3]:	$10,000
2006 Capital Cost Estimate[4]:	$233,200
2006 Annual Cost Estimate[4]:	$11,400
Goforth Reservoir Rehabilitation	
2003 Capital Cost Estimate[3]:	$441,000
2003 Annual Cost Estimate[3]:	$0
2006 Capital Cost Estimate[4]:	$501,500
2006 Annual Cost Estimate[4]:	$0
Harney Creek Irrigation Rehabilitation	
2003 Capital Cost Estimate[3]:	$231,000
2003 Annual Cost Estimate[3]:	$0
2006 Capital Cost Estimate[4]:	$262,700
2006 Annual Cost Estimate[4]:	$0
Simpson Springs Groundwater Development	
2003 Capital Cost Estimate[3]:	$4,200,000
2003 Annual Cost Estimate[3]:	$0
2006 Capital Cost Estimate[4]:	$4,776,000
2006 Annual Cost Estimate[4]:	$0

[1]Used in the Monolith Ranch Water Rights Management Plan (Fassett, 2004).
[2]From ENR website: http://enr.construction.com/features/coneco/subs/recentindexes.asp
[3]Estimated in the Monolith Ranch Water Rights Management Plan (Fassett, 2004).
[4]Calculated using the June 2006 cost index.

6A
SUMMARY OF SDWA REGULATIONS

SUMMARY OF SDWA REGULATIONS

Following is information on relevant current and recently promulgated Safe Drinking Water Act regulations that are applicable to the City of Laramie. The regulations of primary concern are the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR), the Interim Enhanced Surface Water Treatment Rule (IESWTR), Surface Water Treatment Rule (SWTR), the Ground Water Rule (GWR), the Disinfectants/Disinfection By-Products Rule (D/DBPR) Stage 1 and 2, and the Filter Backwash Recycle Rule (FBRR). All these regulations are enforceable for City of Laramie WTP since the plant treats surface water, with the exception of the GWR which is expected to be promulgated in the near future. It is important to note that the Wyoming Department of Environmental Quality (WYDEQ) does not have primacy in the State of Wyoming and therefore, it is not the state but the federal government, the US Environmental Protection Agency (EPA) that retains oversight and final jurisdiction of any WYDEQ programs that implement federal requirements.

6A.1 Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) was originally authorized by Congress in 1974. The SDWA made all previous water standards legally binding, such as the Interstate Quarantine Act and previous Coliform rules. The act also set Primary Standards for the protection of public health, which are enforceable standards. The SDWA was revised in 1976, 1979, and 1980; and was amended in 1986 and 1996. In 1979, the United States Environmental Protection Agency (EPA) also set secondary standards. Secondary standards set desirable levels for contaminants that may adversely affect the aesthetic value of drinking water. The secondary standards were revised in 1986 and 1989.

In 1986 and 1996, major amendments to the SDWA were approved. The 1986 amendments set maximum contaminant level goals (MCLGs). MCLGs are set at a level at which "no known adverse effects on the health of persons occur and which allows an adequate margin of safety". Maximum contaminant levels (MCLs) are enforceable standards that are set as close to the MCLGs as feasible. "Feasible" means the best use of technology, treatment techniques and other means that the EPA administrator finds are available, after examination for efficacy under field conditions and not solely under laboratory conditions, while taking cost into consideration. The 1986 amendments also set filtration and disinfection requirement standards, which are covered in the Surface Water Treatment Rule (SWTR). In 1996, Congress amended the Safe Drinking Water Act to emphasize sound science and risk-based standard setting, small water supply system flexibility and technical assistance, community-empowered source water assessment and protection, public right-to-know, and water system infrastructure assistance through a multi-billion-dollar state revolving loan fund. The 1986 and 1996 amendments include

requirements for volatile organic compounds, the surface water treatment rule, lead and copper, radionuclides, the information collection rule, synthetic organic and inorganic chemicals, arsenic, total coliform rule, disinfectants and disinfection by-products rule, the enhanced surface water treatment rule, the groundwater disinfection rule, secondary standards, the drinking water candidate contaminant list, and the filter backwash water recycle rule.

6A.2 Long Term 2 Enhanced Surface Water Treatment Rule

The purpose of The Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) is to reduce illness linked with the contaminant *Cryptosporidium* and other disease-causing microorganisms in drinking water. The rule was promulgated in January 2006 and has a compliance deadline of approximately 2009. The rule is intended to supplement existing regulations by targeting additional *Cryptosporidium* treatment requirements to higher risk systems. Descriptions of these preceding regulations are provided later in this Appendix. LT2ESWTR has the following major components:

- Source water characterization of *Cryptosporidium* concentrations based on a two-year long, monthly source water monitoring program for *Cryptosporidium*, E. Coli, and turbidity. The highest running annual average of the monitoring data will determine the bin classification for compliance.
- Initial bin classification for treatment requirements three years after rule promulgation. Bin classifications for filtered systems are shown in Table 6A.1
- Requirements presume conventional treatment obtains 3.0-log removal and direct filtration obtains 2.0-log removal/inactivation of *Cryptosporidium*.
- Treatment requirements range from 0 to 2.5-log additional removal/inactivation of *Cryptosporidium* for systems utilizing conventional treatment. Resulting in 3.0 to 5.5-log total removal/inactivation of *Cryptosporidium*.
- Additional log removal credits may be achieved by utilizing multiple tools. The following list summarizes alternatives that may be implemented:
  - Watershed Control
  - Alternative Source
  - Pretreatment
  - Improved treatment
  - Improved disinfection: Chlorine dioxide, ozone, UV
  - Peer review validation of system performance

Table 6A.1
Bin Classifications for Filtered Systems

Bin Classification	*Cryptosporidium* Concentration (oocysts/L)	Additional Treatment Requirements for Systems with Conventional Treatment
1	< 0.075	No Additional Treatment
2	0.075 - < 1.0	1-log of Additional Treatment
3	1.0 - < 3.0	2-log of Additional Treatment
4	> 3.0	2.5-log of Additional Treatment

-- Recalculate after second round of source water monitoring.

6A.3 Interim Enhanced Surface Water Treatment Rule

The Interim Enhanced Surface Water Treatment Rule (IESWTR) is intended to strengthen protection against *Cryptosporidium* and other pathogens. The following items summarize the IESWTR:

- Applies only to systems serving > 10,000 people.
- Requires 2-log removal of *Cryptosporidium.*
- Requires additional monitoring/reporting of filter operations.
- Plant filtered turbidity (conventional, direct and membrane filtration) must be 0.3 NTU or lower in 95% of collected samples, and the filtered water turbidity can not exceed 1.0 NTU.
- Individual filter turbidity must also be monitored. Effluent turbidity from individual filters must be 0.5 NTU or lower in 95% of collected samples, and at no time can filtered water turbidity exceed 2.0 NTU.
- Slightly higher filtered water turbidity requirements for diatomaceous earth and slow sand filtration plants.
- Includes provisions for disinfection profiling and benchmarking.
- Requires covers on new finished water reservoirs.

6A.3.1 Ground Water Under the Direct Influence of Surface Water

In many hydrogeologic situations, ground water and surface water are very closely linked. Where ground water is pumped for water supply sources, infiltration is often induced from nearby surface water. In these situations, the surface water can have a direct impact on the quality of the groundwater. The degree of influence exerted by the surface water on the ground water can dictate the level of treatment required of the ground water. The EPA first addressed

this in a guidance document issued in October, 1992 titled 'Consensus Method for Determining Ground Waters under the Direct Influence of Surface Water Using Microscopic Particulate Analysis (MPA)'.

The IESWTR contains the following definition of 'ground water under the direct influence of surface water' (GWUDI) – *any water beneath the surface of the ground with significant occurrence of insects or other macroorganisms, algae, or large-diameter pathogens such as Giardia lamblia or Cryptosporidium, or significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions. Direct influence must be determined for individual sources in accordance with criteria established by the State. The State determination of direct influence may be based on site-specific measurements of water quality and/or documentation of well construction characteristics and geology with field evaluation'.*

In practice the degree of influence surface water has over ground water is quantified via the EPA's Consensus Method. This method is used to score the results of a Microscopic Particulates Analysis (MPA) test. The numerical score correlates the MPA findings to a degree of risk of surface water influence. Ground water sources exhibiting high scores, or high degree of risk, are then classified as GWUDI and become subject to all of the treatment requirements of surface water sources.

6A.4 Surface Water Treatment Rule

The Surface Water Treatment Rule (SWTR) seeks to prevent waterborne diseases caused by viruses, *Legionella*, and *Giardia lamblia*. These disease-causing microbes are present at varying concentrations in most surface waters. SWTR requires that water systems filter and disinfect water from surface water sources to reduce the occurrence of unsafe levels of these microbes. The SWTR requires all water system utilizing surface water sources to meet the following criteria:

- Filtration of all surface waters, but can be waived for sources that meet pristine criteria.
- 3-log removal/inactivation of *Giardia* cysts and 4-log removal/inactivation of viruses through the Contact Time (CT) concept.
- Maintenance of at least 0.2 mg/L disinfectant residual in the distribution system. Residual disinfectant must be free chlorine, chloramines, or chlorine dioxide.

6A.5 Ground Water Rule

The EPA proposed the Ground Water Rule (GWR) on May 10, 2000 and expects to issue the final GWR in October 2006. The purpose of the GWR is to provide for increased protection

against microbial pathogens in public water systems that use ground water sources. The primary pathogens of concern in ground water systems are fecal coliforms. Fecal contamination can reach ground water sources from failed septic systems, leaking sewer lines, and by passing through the soil. Disease causing microbes such as *Cryptosporidium* and *Giardia lamblia* are not found in ground water. They only occur in surface water and ground water under the direct influence of surface water.

The proposed requirements minimize the risks of ground water contamination by using a multiple barrier approach that relies on five major components:

1. Periodic Sanitary Surveys – These surveys will require the evaluation of the following eight elements:
   - Water supply source
   - Water treatment
   - Distribution system
   - Finished water storage
   - Pumps/Pump Facilities and Controls
   - Monitoring/Reporting Data Verification
   - Water system management/operations
   - Operator compliance with State Health Department requirements

   As well as the identification of significant deficiencies within the system. According to the EPA, a significant deficiency includes: a defect in design, operation, or maintenance, or a failure to the water treatment system. Some examples include:
   - Unsafe source
   - Improper well construction
   - Presence of fecal indicators
   - Lack of cross connection control for treatment chemicals
   - Lack of redundant components for chlorination
   - Improper venting of storage tank
   - Lack of screening of overflow pipe and drain (storage tanks)
   - Inadequate roofing (storage tanks)
   - Inadequate cleaning (storage tanks)
   - Unprotected cross connections
   - System leakage that could introduce contaminants
   - Inadequate monitoring of disinfectant residual
2. Hydrogeologic Sensitivity Assessments – These assessments will identify wells sensitive to microbial fecal contamination.

3. Source Water Monitoring – This monitoring will test for the presence of *E. Coli*, enterococci, or coliphage.
   - *Routine Monitoring* will be required for systems that do not provide 4-log treatment/inactivation or removal of viruses and draw water from sensitive wells.
   - *Triggered Monitoring* will be required for systems that do not provide 4-log treatment and have a total coliform positive sample under the Total Coliform Rule.
4. Corrective Action – Action will be required for any system with a significant deficiency or source water fecal contamination. The system must implement one or more of the following corrective action options:
   - correct the significant deficiency,
   - eliminate the source of contamination
   - provide an alternate source of water, or
   - provide treatment which achieves a 4-log inactivation or removal of viruses.
5. Compliance Monitoring – Continued monitoring will be required to ensure that the treatment technology reliably achieves 4-log inactivation or removal of viruses.

6A.6 Disinfectants/Disinfection By-Products Rule (Stages 1 & 2)

The Disinfectants/Disinfection By-Products Rule (D/DBPR) became effective in two stages. The purpose of the D/DBPR is to minimize customer exposure to disinfection by-products (DBPs) and disinfectants in drinking water. The rule sets limits for disinfectant residual levels and mandates a Total Organic Carbon (TOC) reduction percentage, unless variance criteria are met. The rule also sets MCLs for total trihalomethanes (TTHM) and haloacetic acids (HAA5), which are both disinfection byproducts.

Maximum Disinfectant Residual Levels (MDRLs) are presented in Table 6A.2. The MDRLs are set by Stage 1 of the D/DBPR and are not changed by the Stage 2 rule.

Table 6A.1
Maximum Disinfectant Residual Levels

Disinfectant	MDRL
Chlorine	4.0 mg/L (as Cl_2)
Chloramine	4.0 mg/L (as Cl_2)
Chlorine Dioxide	0.8 mg/L (as ClO_2)

The Stage 2 D/DBPR applies to the distribution system. This rule was promulgated in January 2006 and has a compliance deadline of approximately 2009. It involves monitoring for

the disinfection by-products, total trihalomethanes (TTHM), and haloacetic acid (HAA5) at selected sites throughout the distribution system. Locations in the system likely to have high DBP concentrations are selected for sampling sites. Monitoring at each location is conducted, with MCL compliance based on locational running annual averages (LRAA). In other words, the annual average of all data at any single location must not exceed the MCL. DBP MCLs are presented in Table 6A.3.

Table 6A.2
Disinfection By-Product MCLs

DBP	Stage 1	Stage 2
TTHM	0.080 mg/L	0.080 mg/L
HAA5	0.060 mg/L	0.060 mg/L

Features of the D/DBPR include:

- Data must be collected from four monitoring locations in the distribution system and LRAA calculated and reported for Stage 1 compliance.
- Site selection for Stage 2 monitoring must be based on an intensive distribution system evaluation (IDSE) conducted every two months for one year to determine the system DBP "hot spots". Compliance will be based on the LRAA from one existing sampling site, one site being a high HAA5 site identified by the IDSE, and two sites being high TTHM sites identified by the IDSE.

The D/DBPR also requires TOC reduction through enhanced coagulation unless one of the following variance criteria is met:

- Source water TOC < 2.0 mg/L (running annual average).
- Source water TOC < 4.0 mg/L, alkalinity > 60 mg/L, TTHM < 0.040 mg/L, and HAA5 < 0.030 mg/L (running annual average).
- Treated water TOC < 2.0 mg/L (running annual average).
- Source water specific ultraviolet absorbance (SUVA) <2.0 L/mg-m (running annual average).
- Treated water SUVA < 2.0 L/mg-m (running annual average).
- The system has committed to use technologies that will meet Stage 2 MCLs for TTHMs and HAA5, and will implement such technologies in a timely manner.

If the water system does not meet any of the above criteria, it must remove a set percentage of TOC through enhanced coagulation according to Table 6A.4.

Table 6A.3
D/DBPR Enhanced Coagulation Requirements

Raw Water TOC (mg/L)	Raw Water Alkalinity (mg/L) and Required TOC removal		
	0 – 60	**60 – 120**	**> 120**
2 – 4	35%	25%	15%
4 – 8	45%	35%	25%
> 8	50%	40%	30%

6A.7 Filter Backwash Recycle Rule

The Filter Backwash Recycle Rule (FBRR) was issued by EPA June 8, 2001. This rule is valid for all Public Water Supplies/Systems (PWS/S) that backwash filters. It requires surface water systems using conventional treatment to recycle spent filter backwash water, thickener supernatant, or liquids from dewatering processes. These flows must go through the processes of the system's existing conventional filtration system, or to an alternate recycle location approved by the EPA and WYDEQ. The rule is summarized below:

- Requires all plants to return recycle flows prior to the rapid mix to remove pathogens (e.g. *Cryptosporidium, Giardia*, viruses), and includes provisions for state-allowed variances to return recycle elsewhere.
- Direct filtration plants are to report recycle practices to the State. Plants must assess whether practice exceeds design criteria and must submit to the State for review.
- Requires equalization of filter backwash.
- Requires treatment of backwash with a specific technology or to a specific quality before recycle.
- Limits the quantity of backwash to a specific percentage of plant flow.

6B
COST ESTIMATES

TABLE 6B-1 Option A - 10-MGD Conventional Treatment with Enhanced Coagulation (Figure 6-2)
Laramie Water System Master Plan - Conceptual Cost Opinion

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			5%	$486,880
2	Sitework				
	Earthwork	LS		$440,000	$440,000
	Site Piping/Miscellaneous	LS		$284,000	$284,000
3	Concrete	LS		$1,713,800	$1,713,800
4	Masonry	LS		$543,800	$543,800
5	Metals	LS		$188,750	$188,750
6	Wood/Plastics	LS		$23,000	$23,000
7	Roofing/Weather Protection	LS		$240,808	$240,808
8	Doors and Windows	LS		$136,100	$136,100
9	Finishes	LS		$267,850	$267,850
10	Specialties (accessories/fire protection/signage)	LS		$43,500	$43,500
11	Equipment				
	Rapid Mix	LS		$60,000	$60,000
	Flocculation/Sedimentation	LS		$808,000	$808,000
	Filtration	LS		$349,000	$349,000
	Ozone Generator/Contactor	LS		$1,600,000	$1,600,000
	Chemical Storage/Feed	LS		$409,000	$409,000
	UV Disinfection	LS		$550,000	$550,000
12	Furnishings	LS		$115,000	$115,000
13	Special Construction				
	1.0 MG Clearwell	LS		$1,500,000	$1,500,000
14	Monorail Chain Hoist	EA	1	$15,000	$15,000
15	Mechanical	LS		$450,000	$450,000
16	Electrical/I&C	LS		$1,460,641	$1,460,641
17	Unlisted Items (% of 2-16)	LS		10%	$1,119,825
A	Construction Cost Subtotal				$12,804,955
B	Engineering Costs (% of A)			10%	$1,280,495
C	Subtotal (A+B)				$14,085,450
D	Contingency (% of C)			15%	$2,112,817
E	CONSTRUCTION COST TOTAL (C+D)				$16,198,267
F	Prepare Final Design and Specs (% of E)			10%	$1,619,827
G	Permitting and Mitigation				$0
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$0
	PROJECT TOTAL COST				$17,868,094
	ROUNDED TOTAL COST				**$18,000,000**

Notes: 1. Does not include decommissioning or demolition of existing facilities

TABLE 6B-2 Option B - 10-MGD Low Pressure Membranes with Enhanced Coagulation (Figure 6-3)
Laramie Water System Master Plan - Conceptual Cost Opinion

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			5%	$679,238
2	Sitework				
	Earthwork	LS		$440,000	$440,000
	Site Piping/Miscellaneous	LS		$284,000	$284,000
3	Concrete	LS		$1,638,800	$1,638,800
4	Masonry	LS		$543,800	$543,800
5	Metals	LS		$233,300	$233,300
6	Wood/Plastics	LS		$23,000	$23,000
7	Roofing/Weather Protection	LS		$240,808	$240,808
8	Doors and Windows	LS		$136,100	$136,100
9	Finishes	LS		$289,450	$289,450
10	Specialties (accessories/fire protection/signage)	LS		$43,500	$43,500
11	Equipment				
	Rapid Mix	LS		$60,000	$60,000
	Flocculation/Sedimentation	LS		$808,000	$808,000
	Membrane System/Ancillary Equipment	LS		$4,600,000	$4,600,000
	Ozone Generator/Contactor	LS		$1,600,000	$1,600,000
	Chemical Storage/Feed	LS		$414,000	$414,000
12	Furnishings	LS		$115,000	$115,000
13	Special Construction				
	1.0 MG Clearwell	LS		$1,500,000	$1,500,000
14	Bridge Crane & Monorail Chain Hoist	LS		$65,000	$65,000
15	Mechanical	LS		$550,000	$550,000
16	Electrical/I&C	LS		$2,037,714	$2,037,714
17	Unlisted Items (% of 2-16)	LS		10%	$1,562,247
A	Construction Cost Subtotal				$17,863,957
B	Engineering Costs (% of A)			10%	$1,786,396
C	Subtotal (A+B)				$19,650,352
D	Contingency (% of C)			15%	$2,947,553
E	CONSTRUCTION COST TOTAL (C+D)				$22,597,905
F	Prepare Final Design and Specs (% of E)			10%	$2,259,791
G	Permitting and Mitigation				$0
H	Legal Fees				$0
I	Acquisition of Access and ROW				$0
	PROJECT TOTAL COST				$24,857,696
	ROUNDED TOTAL COST				**$25,000,000**

Notes: 1. Does not include decommissioning or demolition of existing facilities

TABLE 6B-3 Option C - 10-MGD Conventional with Nano/RO Treatment (Figure 6-4)
Laramie Water System Master Plan - Conceptual Cost Opinion

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			5%	$479,980
2	Sitework				
	Earthwork	LS		$517,000	$517,000
	Site Piping/Miscellaneous	LS		$399,000	$399,000
3	Concrete	LS		$2,293,750	$2,293,750
4	Masonry	LS		$662,600	$662,600
5	Metals	LS		$191,000	$191,000
6	Wood/Plastics	LS		$23,000	$23,000
7	Roofing/Weather Protection	LS		$377,808	$377,808
8	Doors and Windows	LS		$179,100	$179,100
9	Finishes	LS		$267,850	$267,850
10	Specialties (accessories/fire protection/signage)	LS		$43,500	$43,500
11	Equipment				
	Rapid Mix	LS		$60,000	$60,000
	Flocculation/Sedimentation	LS		$888,000	$888,000
	Filtration	LS		$384,000	$384,000
	RO Equipment/CIP System	LS		$5,100,000	$5,100,000
	Chemical Storage/Feed	LS		$409,000	$409,000
	UV Disinfection	LS		$550,000	$550,000
12	Furnishings	LS		$115,000	$115,000
13	Special Construction				
	1.0 MG Clearwell	LS		$1,500,000	$1,500,000
	Raw Water Pumping Facilities/Intake	LS		$2,400,000	$2,400,000
14	Monorail Chain Hoist	EA	1	$15,000	$15,000
15	Mechanical	LS		$615,000	$615,000
16	Electrical/I&C	LS		$1,439,941	$1,439,941
17	Unlisted Items (% of 2-16)	LS		10%	$1,843,055
A	Construction Cost Subtotal				$20,753,585
B	Engineering Costs (% of A)			10%	$2,075,358
C	Subtotal (A+B)				$22,828,943
D	Contingency (% of C)			15%	$3,424,341
E	CONSTRUCTION COST TOTAL (C+D)				$26,253,284
F	Prepare Final Design and Specs (% of E)			10%	$2,625,328
G	Permitting and Mitigation				$50,000
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$0
	PROJECT TOTAL COST				$28,978,613
	ROUNDED TOTAL COST				**$29,000,000**

Notes: 1. Does not include decommissioning or demolition of existing facilities
2. Assumes 50% sidestream with 80% recovery (11.25 MGD raw water feed)

TABLE 6B-4 Option D - 13-MGD Conventional with Nano/RO Treatment (Figure 6-5)
Laramie Water System Master Plan - Conceptual Cost Opinion

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			5%	$1,210,798
2	Sitework				
	Earthwork	LS		$607,900	$607,900
	Site Piping/Miscellaneous	LS		$129,000	$129,000
3	Concrete	LS		$3,085,925	$3,085,925
4	Masonry	LS		$861,380	$861,380
5	Metals	LS		$239,400	$239,400
6	Wood/Plastics	LS		$23,000	$23,000
7	Roofing/Weather Protection	LS		$340,700	$340,700
8	Doors and Windows	LS		$172,200	$172,200
9	Finishes	LS		$264,450	$264,450
10	Specialties (accessories/fire protection/signage)	LS		$43,500	$43,500
11	Equipment				
	Rapid Mix	LS		$60,000	$60,000
	Flocculation/Sedimentation	LS		$1,115,000	$1,115,000
	Membrane System/Ancillary Equipment	LS		$4,800,000	$4,800,000
	RO Equipment/CIP System	LS		$6,600,000	$6,600,000
	Chemical Storage/Feed	LS		$443,500	$443,500
12	Furnishings	LS		$115,000	$115,000
13	Special Construction				
	1.0 MG Clearwell	LS		$1,500,000	$1,500,000
	Raw Water Pumping Facilities/Intake	LS		$2,900,000	$2,900,000
14	Bridge Crane and Monorail Chain Hoist	LS		$90,000	$90,000
15	Mechanical	LS		$825,000	$825,000
16	Electrical/I&C	LS		$3,632,393	$3,632,393
17	Unlisted Items (% of 2-16)	LS		10%	$2,784,835
A	Construction Cost Subtotal				$31,843,981
B	Engineering Costs (% of A)			10%	$3,184,398
C	Subtotal (A+B)				$35,028,379
D	Contingency (% of C)			15%	$5,254,257
E	CONSTRUCTION COST TOTAL (C+D)				$40,282,636
F	Prepare Final Design and Specs (% of E)			10%	$4,028,264
G	Permitting and Mitigation				$150,000
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$0
	PROJECT TOTAL COST				$44,510,899
	ROUNDED TOTAL COST				**$45,000,000**

Notes: 1. Does not include decommissioning or demolition of existing facilities
2. Assumes 50% sidestream with 80% recovery (14.5 MGD raw water feed)

TABLE 6B-5 Option E - 7.5-MGD Low-Pressure Membrane Treatment for Groundwater (Figure 6-5)
Laramie Water System Master Plan - Conceptual Cost Opinion

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			7%	$466,340
2	Sitework	LS		$610,000	$610,000
3	Concrete	LS		$680,000	$680,000
4	Masonry	LS		$286,000	$286,000
5	Metals	LS		$105,000	$105,000
6	Wood/Plastics	LS		$16,000	$16,000
7	Roofing/Weather Protection	LS		$125,000	$125,000
8	Doors and Windows	LS		$43,000	$43,000
9	Finishes	LS		$85,000	$85,000
10	Specialties (accessories/fire protection/signage)	LS		$19,000	$19,000
11	Equipment				
	Rapid Mix	LS		$48,000	$48,000
	Membrane System/Ancillary Equipment/Process Piping	LS		$3,150,000	$3,150,000
	Chemical Storage/Feed	LS		$240,000	$240,000
12	Furnishings	LS		$20,000	$20,000
13	Special Construction	LS		$0	$0
14	Bridge Crane	EA	1	$55,000	$55,000
15	Mechanical	LS		$210,000	$210,000
16	Electrical/I&C	LS		$970,000	$970,000
17	Unlisted Items (% of 2-16)	LS		10%	$605,200
A	Construction Cost Subtotal				$7,733,540
B	Engineering Costs (% of A)			10%	$773,354
C	Subtotal (A+B)				$8,506,894
D	Contingency (% of C)			15%	$1,276,034
E	CONSTRUCTION COST TOTAL (C+D)				$9,782,928
F	Prepare Final Design and Specs (% of E)			10%	$978,293
G	Permitting and Mitigation				$150,000
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$0
	PROJECT TOTAL COST				$10,961,221
	ROUNDED TOTAL COST				**$11,000,000**

TABLE 6B-6 Option F - 5.6-MGD Low-Pressure Membrane Treatment for Groundwater (Figure 6-5)
Laramie Water System Master Plan - Conceptual Cost Opinion

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			7%	$418,635
2	Sitework	LS		$575,000	$575,000
3	Concrete	LS		$580,000	$580,000
4	Masonry	LS		$275,000	$275,000
5	Metals	LS		$100,000	$100,000
6	Wood/Plastics	LS		$14,500	$14,500
7	Roofing/Weather Protection	LS		$115,000	$115,000
8	Doors and Windows	LS		$43,000	$43,000
9	Finishes	LS		$78,000	$78,000
10	Specialties (accessories/fire protection/signage)	LS		$19,000	$19,000
11	Equipment				
	Rapid Mix	LS		$48,000	$48,000
	Membrane System/Ancillary Equipment/Process Piping	LS		$2,750,000	$2,750,000
	Chemical Storage/Feed	LS		$210,000	$210,000
12	Furnishings	LS		$20,000	$20,000
13	Special Construction	LS		$0	$0
14	Bridge Crane	EA	1	$55,000	$55,000
15	Mechanical	LS		$178,000	$178,000
16	Electrical/I&C	LS		$920,000	$920,000
17	Unlisted Items (% of 2-16)	LS		10%	$540,550
A	Construction Cost Subtotal				$6,939,685
B	Engineering Costs (% of A)			10%	$693,969
C	Subtotal (A+B)				$7,633,654
D	Contingency (% of C)			15%	$1,145,048
E	CONSTRUCTION COST TOTAL (C+D)				$8,778,702
F	Prepare Final Design and Specs (% of E)			10%	$877,870
G	Permitting and Mitigation				$150,000
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$0
	PROJECT TOTAL COST				$9,856,572
	ROUNDED TOTAL COST				**$9,900,000**

TABLE 6B-7 Option G - 4.0-MGD Low-Pressure Membrane Treatment for Groundwater (Figure 6-5)
Laramie Water System Master Plan - Conceptual Cost Opinion

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			7%	$318,430
2	Sitework	LS		$420,000	$420,000
3	Concrete	LS		$435,000	$435,000
4	Masonry	LS		$195,000	$195,000
5	Metals	LS		$75,000	$75,000
6	Wood/Plastics	LS		$11,000	$11,000
7	Roofing/Weather Protection	LS		$85,000	$85,000
8	Doors and Windows	LS		$29,000	$29,000
9	Finishes	LS		$55,000	$55,000
10	Specialties (accessories/fire protection/signage)	LS		$16,000	$16,000
11	Equipment				
	Rapid Mix	LS		$48,000	$48,000
	Membrane System/Ancillary Equipment/Process Piping	LS		$2,100,000	$2,100,000
	Chemical Storage/Feed	LS		$175,000	$175,000
12	Furnishings	LS		$20,000	$20,000
13	Special Construction	LS		$0	$0
14	Bridge Crane	EA	1	$55,000	$55,000
15	Mechanical	LS		$140,000	$140,000
16	Electrical/I&C	LS		$690,000	$690,000
17	Unlisted Items (% of 2-16)	LS		10%	$412,900
A	Construction Cost Subtotal				$5,280,330
B	Engineering Costs (% of A)			10%	$528,033
C	Subtotal (A+B)				$5,808,363
D	Contingency (% of C)			15%	$871,254
E	CONSTRUCTION COST TOTAL (C+D)				$6,679,617
F	Prepare Final Design and Specs (% of E)			10%	$667,962
G	Permitting and Mitigation				$150,000
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$0
	PROJECT TOTAL COST				$7,547,579
	ROUNDED TOTAL COST				**$7,600,000**

No

7A
CATHODIC PROTECTION 20/24 INCH TRANSMISSION

CONTRACT CONCERNING GAS LINE PROTECTION

This Agreement is entered into effective March 1, 1995, by and between the City of Laramie, Wyoming (Laramie); the City of Cheyenne, Wyoming, acting by and through its Board of Public Utilities (Cheyenne); Walden Capital Leasing Corporation and its potential successor the Town of Walden, Colorado (collectively Walden); witnesseth:

Premises:

A. Walden intends to install an aluminum natural gas line in Albany County, Wyoming, which will cross Cheyenne's water pipeline right of way at one location, will cross Laramie's water pipeline right of way at several locations, and will run parallel to Laramie's water pipelines for approximately 18 miles.

B. Both Laramie and Cheyenne have steel water pipelines with cathodic protection.

C. The best engineering advice given to all parties by qualified consultants is that there is a risk of external corrosion if an aluminum pipeline is installed in close proximity to cathodically protected pipelines or in areas influenced by cathodic protection groundbeds.

D. Laramie and Cheyenne need to preserve their present right to make changes in and additions to their cathodic protection systems, to lay other cathodically protected water lines in the future, and to avoid liability for and resulting from damage to Walden's gas line from corrosion caused in whole or in part by the presence of Laramie and Cheyenne's steel pipelines and associated cathodic protection.

E. Walden is willing to assume all responsibility for protection of its gas line and for any damage to the gas line or caused by failure of the gas line due to corrosion.

NOW, THEREFORE, in consideration of the granting of an easement to Walden by Laramie, and Walden's acceptance of Cheyenne's conditions for crossing Cheyenne's water pipeline right of way, and of the promises hereinafter exchanged, the receipt of which is hereby acknowledged, the parties agree as follows:

1. Laramie agrees to execute and deliver an easement to Walden to allow the installation of Walden's natural gas pipeline through two parcels of land which belong to Laramie, as approved by the Laramie City Council on February 2, 1995. Laramie agrees to allow Walden to install its natural gas pipeline across Laramie's water lines which run from Sodergreen Lake to the City of Laramie, at locations shown upon the map attached hereto as Exhibit A. All crossings shall be at right angles to the water pipelines. Laramie specifically reserves the right to install additional lines between

the Pioneer Canal Headgate and Sodergreen Lake and Sodergreen Lake and the City of Laramie.

2. Cheyenne agrees to the conditions stipulated herein under which Walden will install a natural gas pipeline across Cheyenne's Stage I and Stage II water pipelines. The crossing shall be at a right angle.

3. Laramie's and Cheyenne's agreements extend to one 2.875-inch O.D. coated aluminum pipeline to carry natural gas at a pressure of approximately 500 p.s.i.g., and a 2.375-inch or smaller polyethylene pipeline for natural gas at 60 p.s.i.g. or less. Any additional metallic pipeline must be the subject of a separate future agreement. Provided, however, that Walden reserves the right to replace its aluminum line with a steel gas transmission line.

4. Laramie and Cheyenne may at their discretion from time to time, without liability to Walden,

A. Install additional lines in their current pipeline rights of way or in other rights of way which are parallel to or which cross Walden's gas line, using such materials as they see fit.

B. Operate and modify their present cathodic protection as they see fit.

C. Install additional cathodic protection on their present lines and future lines, modify it, and operate it as they determine is appropriate to protect their lines.

D. If possible, using reasonable diligence, to install any future impressed current cathodic protection stations no closer than 500 feet to the gas line and maintain the maximum current at future stations below 20 amps for each installation.

E. Install test leads and joint bonds to their own structures.

F. Operate and modify their water pipelines including repairs, replacement, and rehabilitation as they see fit.

5. All parties are responsible for physical damage caused to another party's structures by excavation or crossing activities. Any damage to another structure shall be repaired by the party which caused the damage, to a condition equal to the original condition, to the satisfaction of the owner. No crossings and no physical excavations shall be conducted within ten (10) feet of any pipeline covered by this Agreement without previous notice to the other party. The parties agree that they will give 24 hours' notice, oral or written, when they intend to do underground work

falling within the scope of this paragraph. The notice period may be less if a line ruptures creating an emergency. All work at line crossings shall be done in compliance with Wyoming Public Works standards as then in effect.

6. Walden agrees:

A. That it shall install, operate, and maintain all corrosion mitigation and protection which it determines is necessary or convenient to protect its gas line, at Walden's expense.

B. That it shall make no claim against Laramie or Cheyenne or their consultants on account of corrosion of Walden's gas line due in whole or in part to interference from cathodic protection systems, whenever and wherever it occurs.

C. To defend, indemnify, and hold harmless Laramie and Cheyenne and their consultants from all third party claims made on account of all incidents where damage occurs because of ruptures in Walden's gas line caused or contributed to by corrosion due in whole or in part to interference from cathodic protection systems.

D. To use steel pipe for the section of gas line in the immediate area of Laramie's existing Albany County Road 33 Rectifier. The steel gas line may be bonded to Laramie's water line system for coordination of the cathodic protection systems.

E. To place the aluminum gas line in plastic casing for a minimum of ten (10) feet in each direction measured from the side of the treated water lines at all locations where the gas line crosses Laramie's treated water lines, and the full easement width for Cheyenne's water lines.

F. To install the gas line under Laramie's and Cheyenne's water transmission lines, unless installation over the water transmission lines is approved by the appropriate city official. Two-foot minimum physical separation is required between external surfaces of the gas and water lines. Abovegrade pipeline markers shall be placed at the end of each plastic casing. Crossings shall be made when Laramie or Cheyenne personnel are present, unless previous written approval has been given to proceed without city personnel present.

G. To install a test station at each water main crossing, and to install a test station on the gas line at a location typically 100 to 200 feet on either side of each water main crossing. Test stations shall consist of a minimum of two wires to each pipeline.

H. To install grounding cells for interference mitigation at each crossing of a protected steel main. Crossing of

two parallel mains will require two separate grounding cell installations. A standard grounding cell consists of two 1.4" x 60" zinc anodes packaged together in a container with standard anode backfill material. Each grounding cell shall be connected to a 7-terminal test box (Testox, MC Miller, or equal) mounted on a 4" square treated wood post, with suitable shorting straps and shunts to connect the pipelines and grounding cells together. Connections to water lines will be made by the respective water system operator.

I. To install test stations and grounding cells at locations where the pipeline systems parallel each other. For ease of testing, these installations should be placed opposite existing water line test stations, and at sufficient intervals to monitor and mitigate interference if found. Exact location, equipment, and installation specifications shall be as agreed upon by the affected parties' respective corrosion consultants.

J. If cathodic protection is installed/constructed on Laramie's raw water lines, Walden agrees to excavate and install test leads to the gas line at each location where it crosses the raw water pipeline. Walden agrees to conduct testing with Laramie's corrosion consultant at test stations on each of the raw water pipeline crossings to determine the degree of interference at each crossing, if any. If a possibility of interference is detected, to provide and install interference mitigation. Possibility of interference is defined as a positive or negative pipe-to-soil potential change equal to or greater than 25 to 50 millivolts on the gas line, or a pipe-to-soil potential on the aluminum gas line more negative than -1.25 volts to a copper/copper sulfate reference electrode. Where interference is detected, to excavate the water line to allow installation of test leads to the water line by the City, to install a grounding cell at each crossing, to install a test station on the gas line at a location 100 to 200 feet on either side of the raw water line crossing, and to encase the gas line in plastic conduit for 10 feet on either side of the crossing. Walden has the option of either encasing the gas line in plastic conduit or providing a non-conductive electrical barrier between the gas line and the water line. Non-conductive barrier shall be a minimum of ½ inch thick, 8 feet wide, and long enough to extend for 10 feet on either side of the crossing. If while installing protection Laramie exposes the raw water line where Walden's pipeline crosses, the test leads shall be installed while the trench is open and Walden is relieved of its obligation under this subparagraph to expose Laramie's raw water line at that location.

K. To excavate the water and gas lines and install a test station at each metallic water service line crossing. To conduct testing with Laramie's corrosion consultant at test stations on each of the metallic service line crossings to determine the degree of interference, if any. If a possibility of interference is

detected (see 6 J above for definition), to provide and install the interference mitigation consisting of either:

(i) Install a grounding cell at each crossing, test stations on the gas line at 100 to 200 feet location on either side of the metallic service line crossing, and to encase the gas line in plastic conduit or to provide an electrical barrier as provided in 6 J above; or

(ii) Reimburse the City of Laramie for labor and materials to install an electrical insulator in the water service line at the meter or at a buried location and for a test station at any buried insulators.

L. All commitments to install monitoring or mitigation equipment at Walden's expense are equally effective for future lines and cathodic protection systems to be installed by Laramie or Cheyenne.

7. The parties agree that they will conduct joint interference testing when the gas line is substantially completed, at least once each five (5) years thereafter, and when any new impressed current cathodic protection system is installed within two (2) miles of the gas line.

8. Walden has received a copy of CH2M Hill's report dated February 24, 1994, in which William S. Spickelmire of Rustnot Corrosion Control Services, Inc. and Roger Bissell of CH2M Hill provide details concerning Laramie's and Cheyenne's systems and make suggestions as to mitigation. Walden has had an opportunity to consult with engineers of its choice and is satisfied that it understands the facts and possible consequences to its gas line.

9. Laramie, Cheyenne (for itself and its Board of Public Utilities), and Walden reserve all governmental and sovereign immunities as provided by law and shall not be deemed to have waived any governmental or sovereign immunities by entering into this Agreement.

10. This Agreement is in effect until Walden's gas line has been abandoned or until Laramie and Cheyenne abandon their lines, whichever first occurs. Abandonment does not include replacement of an existing line with a line which is cathodically protected and which would reasonably be expected to be within the scope of this Agreement if it were in place (or was being installed) as of the date of execution of this Agreement.

11. The waiver by any party of any term, condition or covenant, or of a breach of any term, condition or covenant, shall not constitute a waiver of any other term, condition or covenant, or breach thereof.

12. This Agreement shall be governed in all respects by the laws of the State of Wyoming. The parties agree that exclusive jurisdiction to hear and resolve disputes arising out of this Agreement shall be in the state courts in the State of Wyoming.

13. The parties agree to comply with all applicable federal, state and local laws, rules and regulations in the performance of this Agreement, except where this Agreement creates lawful contractual rights or duties which are at variance with, but are permitted by, applicable law.

14. If any provision, section, subsection, sentence, clause, or phrase of this Agreement is invalidated by any court of competent jurisdiction, such holding shall not affect the validity of the remainder of this Agreement, which shall continue in full force and effect.

15. All terms, conditions, and provisions of this Agreement shall inure to the benefit of and be binding upon the parties hereto and their respective successors and assigns.

16. No party may assign any rights or duties under this Agreement without the prior written consent of the other parties. Any delegation or attempted assignment shall not operate to relieve any party of its responsibilities hereunder.

17. This Agreement contains the entire understanding of the parties. There are no other terms or conditions, written or oral, concerning or controlling this matter. No modification shall be binding unless agreed to in writing by all parties.

In witness whereof, the parties have caused this Agreement to be executed by their respective duly authorized officers, effective the date and year first written above.

The City of Laramie, Wyoming

By: _____
J. O. Rose, Mayor and
President of the City Council

Attest: _____
R. Susan Vosseller,
City Clerk

The City of Cheyenne, Wyoming

By: _____
Jerry Mark, Director, Board
of Public Utilities

Attest: _____
Timothy E. Wilson

The Town of Walden, Colorado

By: Naida Crowner Mayor
Naida Crowner, Mayor

Attest: Margie Wyatt
Margie Wyatt, Town Clerk

Walden Capital Leasing Corporation

By: Naida Crowner President
Naida Crowner, President

Attest: Margie Wyatt
Margie Wyatt, Secretary

Cathodic Prot.

RUSTNOT Corrosion Control Services, Inc.

"Remember Rust Never Sleeps"

May 25, 2005

Mr. Steve Shute
Pinedale Natural Gas
Operator for Walden Gas

Via e-mail pipeline@rof.net

Dear Steve,

Subject: Walden Gas Interference Mitigation

This letter is to confirm our discussion in which you agreed to mitigate the interference found at the Laramie Raw Water Crossing with the Walden Gas Pipeline. Low potentials were found on the Walden Gas Pipeline during our mutual interference testing completed with the Cities of Cheyenne and Laramie, Sinclair Pipeline, and Walden Gas. This mutual interference testing was conducted the last part of April, 2005.

As you suggested, one method that may effectively mitigate the interference on your pipeline may be installation of ribbon anodes that parallel the raw waterline in this area. The ribbon anodes could then be connected to the Walden Gas Pipeline to act as a drain anode in order to raise the potential on the gas line to protected levels. The drain anodes would not be connected to the water pipeline, but would be installed parallel to the water pipeline in the existing water pipeline easement.

I have discussed this mitigation option with the City of Laramie and they have agreed that Walden Gas can install the ribbon drain anodes in the raw water pipeline right-of-way. The City investigated and reports that the raw water line has a 100-foot wide permanent easement in this area with the pipeline centered in the easement.

This approval by the City of Laramie is based on Walden Gas meeting the following requirements:

- That Walden Gas coordinates location of the waterline with the City prior to any construction and is responsible for any damage caused to the waterline.

- That Walden Gas contact and coordinate your installation with the property owner and meet any of the property owner's requirements for the installed interference mitigation methods.

- That Walden Gas completes the interference mitigation early this summer, so that the final interference testing can be finished during the summer and our contract completed.

We appreciate your assistance during the interference testing and installation of the required interference mitigation methods on your pipeline. Please notify us of your proposed schedule and when you have successfully completed the interference mitigation, so that we can conduct the final mutual interference testing and complete our project requirements.

If you have any questions concerning this letter, please do not hesitate to contact me at my office or on my mobile (208-867-5814), or by e-mail at bspickelmire@rustnotconsulting.com. We look forward to working with you on completion of this project.

Sincerely,

RUSTNOT Corrosion Control Services, Inc.

William S. Spickelmire

William S. Spickelmire
Corrosion Control Consultant
NACE Cathodic Protection Specialist 2678

c: Jim Cavalli/Aspen-Banner
Bruce Jones/City of Laramie
John Trefren/City of Cheyenne

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Aspen-BANNER ENGINEERING

CIVIL ENGINEERING
STRUCTURAL ENGINEERING
SURVEYING
CONSTRUCTION MANAGEMENT
CONTRACT ADMINISTRATION

P.O. Box 550 ▪ 2020 Grand Avenue, Suite 530 ▪ Laramie, WY 82070 ▪ Phone 307-745-7366 ▪ Fax 307-721-2152

October 14, 2004

Town of Walden, Colorado
Gas Utility
513 Harrison
Walden, CO 80480

RE: City of Laramie
20 & 24-inch pipelines
Cathodic protection energization

To Whom It May Concern:

Approximately one year ago someone representing the Walden Gas Pipeline regarding the schedule of energization of the City of Laramie's additional cathodic protection ground beds on its pipelines that run from the Laramie Water Treatment Plant to the City contacted our office. This letter is to confirm our discussion in which you requested that we inform you when we were going to energize the new cathodic protection installations on the Laramie waterlines. Presently, the joint bond testing and repairs are scheduled to be completed during one of the last two weeks in October. The three groundbeds on the treated waterlines will be energized shortly thereafter during November by Bill Spickelmire of RUSTNOT Corrosion Control Services, Inc.

There are now five cathodic protection installations along your gas line, four on the Laramie waterlines and one on the Cheyenne waterlines. The three new groundbeds installed on the Laramie treated waterlines were completed in accordance with the March 1, 1995 agreement between the Cities of Laramie and Cheyenne and the Town of Walden concerning the gas line and the waterline cathodic protection systems. The new groundbeds were located a minimum of 500 feet from the gas line and the rectifier size was limited to approximately 20 amps dc current output. A copy of this agreement (Contract Concerning Gas Line Protection) is attached for your reference. One of the new groundbeds was a replacement for the original groundbed on the Laramie parallel 20- and 24-inch treated water lines.

The three new cathodic protection installations were at:

1. CPS No. 1, County Road 33, Highway Mile Marker 6.7, Replacement Groundbed
2. CPS No. 2, Mears Morgan Ranch Road, Highway Mile Marker 9.3, New Groundbed
3. CPS No. 3, Highway Mile Marker 17.3, New Ground bed

As you are aware in accordance with this agreement, it is the responsibility of Walden to conduct interference testing and perform any mitigation required on your gas lines from the Cities of Laramie's or Cheyenne's cathodic protection systems. Interference is defined by the agreement as a positive or negative shift of 0.25 to 0.50 volts or more on the gasline when the rectifiers are interrupted (cycled on and off) or a negative potential of more than -1.25 volts to a copper/copper sulfate reference electrode on the gasline with the rectifiers on.

Mr. Spickelmire will notify you when the new cathodic protection systems are energized and adjusted. After you have conducted your initial static (native) potentials on the gasline while the rectifiers are still off and then again after they are energized and you have installed any required mitigation items, we will be available to conduct specific interference testing with your corrosion consultant. We will need a minimum two-week notice to schedule our corrosion consultant (Bill Spickelmire) and the City of Laramie and City of Cheyenne personnel to complete the joint interference testing with you to confirm your successful mitigation.

Please feel free to contact Bill Spickelmire directly on his mobile at 206-867-5814 or by e-mail at bspickelmire@rustnotconsulting.com. to schedule this interference testing, after you have completed your initial interference testing and mitigation. He will notify the appropriate City personnel from both Laramie and Cheyenne on the scheduled interference mitigation testing. We would like to thank you for your cooperation during the interference testing and mitigation and look forward to working with you on successful completion of this project.

Sincerely,
Aspen-Banner Engineering

Jim I. Cavalli, P.E.
Project Manager

Attachments: Contract Concerning Gas Line Protection

cc: Bruce Jones, City of Laramie
John Treffren, City of Cheyenne
Bill Spickelmire, RUSTNOT Corrosion Control Services, Inc.

7B
WATER MAIN FAILURE INFORMATION

FROM CAL VANZEE
AT WATER DEPT.

Water Main Line Failure Concerns

January 8, 2004

The water distribution system in Laramie has deteriorated significantly in the past 15 years, which is reflected in the increase of failures, primarily because of the pipe's age, the corrosiveness of the soils, and the lack of a consistent replacement program. The practice of deferring maintenance has contributed to this issue and the price of this deferred maintenance now exceeds $40 million.

The water distribution system has seen a significant increase in main line failures from the time records were kept in 1987 to the present. The first five-year period starting in 1987-88 showed an average failure rate of 45.6 failures annually. The last five years beginning in fiscal year 1998-99 to the present shows a failure rate of 79.2 failures annually. The attached memo, dated 8/23/03, shows a projected increase of main line failures from 79.2 annually today to 198 in ten years. In addition, 39% of the failures over the past five years occurred from November to February. In ten years, there will be 77.2 failures during these four months, which is approximately the current annual failure rate of 79.2. Under the current manpower and equipment levels, extended service outages will occur at an increasing frequency.

The cost of maintaining the water system today for operation and maintenance, based on the proposed fiscal year 2005 budget, is $611,123, which is the 2004 budget with an additional $65,000 for road materials. This amount does not include any capital equipment or projects. When the failure rate reaches 198, in approximately ten years, the cost for maintenance will be $1,527,807 in today's dollars. The difference between the number of failures today and the projected number is 250%. Taking the current budget and multiplying it by 250% determined the projected budget. This does not allow for inflation, wage increases, capital projects, or additional equipment; this is simply the cost of maintaining the system.

The current consumptive water rate is $1.48 per thousand gallons and the rule of thumb used in Laramie is that for every penny increase in rates, approximately $20,000 dollars is raised annually. The difference in the maintenance costs of today and the projected cost in ten years is $916,684. Rates will have to be increased 45.8 cents to meet this which when added to the current rate is a total of $1.938 or $1.94 per thousand gallons at today's dollars. In addition, the rates will have to support capital equipment and projects, unfunded regulatory requirements, and inflationary costs, which will significantly add additional increases to the rates.

The American Water Works Association recommends water line replacement at a minimum of 1.5% of the existing system per year. For the City of Laramie, this would entail 2.25 miles of pipe replacement in the distribution system annually and ¾ of a mile of transmission line to be replaced annually. This level of replacement will replace a system in 67 years and the design life of water systems in the past was based on 50 years. This design life has increased in the past 15-20 years because of the introduction of

different pipe materials such as polyvinyl chloride (PVC) and high-density polyethylene (HDPE).

A replacement rate of 1.5 miles per year for the first ten years with the replacement rate increasing by a half mile every five years for the next two five year periods until the replacement rate reaches 2.5 miles per year would replace the system in 69 years assuming that there are 15 miles of pipe that will not need to be replaced because of the improved pipe materials. This also assumes that the replacement schedule will eliminate catastrophic failure of large sections of the system and the new pipe materials will exceed the life of the existing pipe.

The cost of this replacement program is substantial but necessary to maintain service. The current cost of water line replacement in a paved street is approximately $215/foot based on the cost of the last project. The cost of replacement in an alley is approximately $125/foot. Assuming that the 1.5 miles of replacement is evenly divided between paved streets and alleys, the annual cost of this program will be $1,346,400. This equates to a 67.3-cent per thousand gallons increase in rates. To replace 2.5 miles a year under the same criteria will cost $2,244,000 annually which equates to $1.12 per thousand gallons rate increase.

The reality of the situation is that the City cannot afford to start replacing 1.5 miles of water line next fiscal year. If the initial rate increase for this program were 15 cents per thousand gallons and started in fiscal year 2005, this would raise $300,000 the first year which would allow the program to start. The meter replacement project will be paid off in fiscal year 2009 and the annual payment of $572,000 could be used to pay for water line replacement. If the rates were increased slowly with the intent of reaching the 1.5 mile goal by 2010, only $774,400 would need to be raised with rate increases, which equates to a total 38.7-cent per thousand gallons rate increase. Assuming $300,000 of this amount is raised FY 2005, the remaining $474,000 could be raised over the next 5 years. Not factoring in for inflation, a 5 cent per year increase for the next 5 years would provide the funds to replace 1.5 miles per year by 2010.

Main line failures will continue to increase even with the initiation of a replacement program but as the program continues the number of failures should level off and eventually diminish to a manageable level. Without a main line replacement program, the number of breaks per year will continue to escalate exponentially and the cost to repair the system will follow suit.

To: Wes
Fr: Cal

Re: Mainline Failures

January 17, 2003

Wes
Listed below are the number of failures recorded at the Water Department since 1987. Records kept from 1994 and earlier were recorded by my predecessor and may or may not be accurate.

Water Mainline Failures 1987-2002

Fiscal Year	Dist Failures	Trans Failures	Total
1987-88	40	0	40
1988-89	38	1	39
1989-90	45	1	46
1990-91	44	4	48
1991-92	53	2	55
1992-93	57	1	58
1993-94	44	2	46
1994-95	38	2	40
1995-96	61	2	63
1996-97	70	1	71
1997-98	57	4	61
1998-99	61	7	68
1999-00	93	3	96
2000-01	77	2	79
2001-02	77	6	83
2002-03	68	2	70
2003-04	99	0	99
2004-05	74	0	74

From: Wes Bressler
Sent: Thursday, August 28, 2003 2:11 PM
To: Terry Haugen
Cc: Cal Van Zee
Subject: Mainline Failures

The statistics have been compiled for the past 16 years on mainline failures and the results indicate that we appear to be headed toward a "train wreck". In these times of cutback and downsizing discussions, it is imperative that you have a sense of what is happening to the water distribution system. There has been no sustained support for a mainline rehabilitation program and the Council and former manager/director of public works have seen fit to ignore the division requests to address the problem. With the enclosed information, I hope that you will see fit to raise this issue with the new city manager.

The data listing of mainline failures was averaged in five year increments starting 16 years ago and also averaged in five year increments to include the present, and going back 15 years. Failure average per year for these increments, starting with 1987-88 data was 45.6, 55.6 and 77.4 breaks. Failure average per year including the most recent year's data are 49.2, 56.2 and 79.2 breaks. Considering that each break will demand at least one full work day for the distribution crew, nearly one third of the crew time is currently committed to repair of water breaks. An additional one half crew day is committed to equipment cleanup and maintenance. It is obvious that during the last five year period main break increase has more than doubled from the previous five year average. This would indicate that mainline break occurrence is increasing exponentially. If this is true and we believe that it is, by 2008 we will experience about 118 breaks and by 2013 we would see 198 breaks per year.

This would commit the distribution crew to nothing but mainline repairs and equipment cleanup and maintenance. All the other tasks, fire hydrant , curb stop, meter, and valve maintenance would go unattended or we would have to develop another maintenance crew. The problem will continue to increase until the system deteriorates sufficiently to require massive replacement. I do not believe that there will ever be sufficient grant monies on the horizon to address this common utility problem. Regional and national average mainline failures per 1000 feet of pipe is 0.04. Laramie average failure is 0.12. My recommendation to address this problem is to develop a committed set aside each year funded by the rate structure to replace about 1.5 miles of the system each year.

7C
COST ESTIMATES

TABLE 7C-1 INFRASTRUCTURE TO ADDRESS FUTURE PEAK HOUR (W/O FIRE) DEFICIENCIES (F1)

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			10%	$983,893
2	100' Elevated Storage Tank				
	1 MG	EA	1	$2,000,000	$2,000,000
3	Pumping Stations				
	2,000 gpm	EA	1	$425,000	$425,000
4	Pipe - Total Cost Installed				
	6" Class 200, S.D.R. 21	LF	57,000	$70	$3,993,648
	12" Class 200 S.D.R. 21	LF	495	$108	$53,659
	16" Class 200 S.D.R. 21	LF	13,111	$143	$1,879,499
5	Fittings, Valves, and Fire Hydrants (% of pipe cost)	LS		10%	$592,681
6	Unlisted Items (% of Items 2-5)	LS		10%	$894,449
A	Construction Cost Subtotal				$10,822,828
B	Engineering Costs (% of A)			10%	$1,082,283
C	Subtotal (A+B)				$11,905,111
D	Contingency (% of C)			15%	$1,785,767
E	CONSTRUCTION COST TOTAL (C+D)				$13,690,878
F	Prepare Final Design and Specs (% of E)			10%	$1,369,088
G	Permitting and Mitigation				$25,000
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$50,000
	PROJECT TOTAL COST				$15,184,965
	ROUNDED TOTAL COST				**$15,200,000**

8/23/2006

TABLE 7C-2 SOLUTION NO. 1 TO ADDRESS FUTURE FIRE FLOW ON MAXIMUM DAY DEMAND (F2A)

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			10%	$1,572,407
2	100' Elevated Storage Tank				
	1 MG	EA	1	$2,000,000	$2,000,000
3	Pumping Stations				
	2,000 gpm	EA	1	$425,000	$425,000
4	Pipe - Total Cost Installed				
	6" Class 200, S.D.R. 21	LF	57,000	$70	$3,993,648
	10" Class 200 S.D.R. 21	LF	1,227	$92	$112,798
	12" Class 200 S.D.R. 21	LF	5,669	$108	$614,531
	16" Class 200 S.D.R. 21	LF	21,826	$143	$3,128,818
	24" Class 200 S.D.R. 21	LF	11,767	$224	$2,631,666
5	Fittings, Valves, and Fire Hydrants (% of pipe cost)	LS		10%	$1,048,146
6	PRV Stations	EA	2	$170,000	$340,000
7	Unlisted Items (% of Items 2-6)	LS		10%	$1,429,461
A	Construction Cost Subtotal				$17,296,475
B	Engineering Costs (% of A)			10%	$1,729,647
C	Subtotal (A+B)				$19,026,122
D	Contingency (% of C)			15%	$2,853,918
E	CONSTRUCTION COST TOTAL (C+D)				$21,880,041
F	Prepare Final Design and Specs (% of E)			10%	$2,188,004
G	Permitting and Mitigation				$25,000
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$50,000
	PROJECT TOTAL COST				$24,193,045
	ROUNDED TOTAL COST				**$24,200,000**

8/23/2006

TABLE 7C-3 SOLUTION NO. 2 TO ADDRESS FUTURE FIRE FLOW ON MAXIMUM DAY DEMAND (F2B)

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			10%	$3,425,772
2	100' Elevated Storage Tank				
	1 MG	EA	1	$2,000,000	$2,000,000
3	Pumping Stations				
	2,000 gpm	EA	1	$425,000	$425,000
4	Pipe - Total Cost Installed				
	10" Class 200 S.D.R. 21	LF	1,227	$92	$112,798
	12" Class 200 S.D.R. 21	LF	222,462	$108	$24,115,326
	16" Class 200 S.D.R. 21	LF	13,111	$143	$1,879,499
5	Fittings, Valves, and Fire Hydrants (% of pipe cost)	LS		10%	$2,610,762
6	Unlisted Items (% of Items 2-5)	LS		10%	$3,114,338
A	Construction Cost Subtotal				$37,683,495
B	Engineering Costs (% of A)			10%	$3,768,350
C	Subtotal (A+B)				$41,451,845
D	Contingency (% of C)			15%	$6,217,777
E	CONSTRUCTION COST TOTAL (C+D)				$47,669,622
F	Prepare Final Design and Specs (% of E)			10%	$4,766,962
G	Permitting and Mitigation				$25,000
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$50,000
	PROJECT TOTAL COST				$52,561,584
	ROUNDED TOTAL COST				**$52,600,000**

8/23/2006

TABLE 7C-4 SOLUTION NO. 3 TO ADDRESS FUTURE FIRE FLOW ON MAXIMUM DAY DEMAND

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			10%	$3,252,201
2	32' Elevated Storage Tank				
	2.5 MG	EA	1	$5,000,000	$5,000,000
3	Pipe - Total Cost Installed				
	6" Class 200, S.D.R. 21	LF	155,550	$70	$10,898,455
	8" Class 200, S.D.R. 21	LF	23,609	$80	$1,885,556
	10" Class 200, S.D.R. 21	LF	36,680	$92	$3,371,992
	12" Class 200, S.D.R. 21	LF	10,339	$108	$1,120,768
	14" Class 200, S.D.R. 21	LF	2,837	$128	$363,548
	16" Class 200, S.D.R. 21	LF	11,163	$143	$1,600,247
	18" Class 200, S.D.R. 21	LF	7,326	$160	$1,174,701
	20" Class 200, S.D.R. 21	LF	4,033	$180	$724,245
4	Fittings, Valves, and Fire Hydrants (% of pipe cost)	LS		10%	$2,113,951
5	Air release stations	EA	10	$5,000	$50,000
6	Drain/flushing stations	EA	10	$5,000	$50,000
7	Cased Borings through RR ROW	LF	800	$390	$312,000
8	Booster Station at the WTP				
	5,900 gpm	EA	1	$850,000	$850,000
9	Pump Modifications at Turner, Pope, and Soldier	LS	1	$50,000	$50,000
10	Unlisted Items (% of 2-9)	LS		10%	$2,956,546
A	Construction Cost Subtotal				$35,774,211
B	Engineering Costs (% of A)			10%	$3,577,421
C	Subtotal (A+B)				$39,351,633
D	Contingency (% of C)			15%	$5,902,745
E	CONSTRUCTION COST TOTAL (C+D)				$45,254,377
F	Prepare Final Design and Specs (% of E)			10%	$4,525,438
G	Permitting and Mitigation				$50,000
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$50,000
	PROJECT TOTAL COST				$49,929,815
	ROUNDED TOTAL COST				**$50,000,000**

8/23/2006

TABLE 7C-5 INFRASTRUCTURE TO ADDRESS ALL PRIORITY #1 LINE BREAKS

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			10%	$325,507
2	Pipe - Total Cost Installed				
	6" Class 200, S.D.R. 21	LF	25,416	$70	$1,780,747
	8" Class 200, S.D.R. 21	LF	6,399	$80	$511,063
	10" Class 200 S.D.R. 21	LF	1,124	$92	$103,329
	12" Class 200 S.D.R. 21	LF	1,048	$108	$113,605
	14" Class 200 S.D.R. 21	LF	25	$128	$3,204
	16" Class 200 S.D.R. 21	LF	20	$143	$2,867
	18" Class 200 S.D.R. 21	LF	102	$160	$16,355
	20" Class 200 S.D.R. 21	LF	681	$180	$122,294
	24" Class 200 S.D.R. 21	LF	164	$224	$36,678
3	Fittings, Valves, and Fire Hydrants (% of pipe cost)	LS		10%	$269,014
4	Unlisted Items (% of Items 2+3)	LS		10%	$295,916
A	Construction Cost Subtotal				$3,580,579
B	Engineering Costs (% of A)			10%	$358,058
C	Subtotal (A+B)				$3,938,637
D	Contingency (% of C)			15%	$590,795
E	CONSTRUCTION COST TOTAL (C+D)				$4,529,432
F	Prepare Final Design and Specs (% of E)			10%	$452,943
G	Permitting and Mitigation				$25,000
H	Legal Fees				$25,000
I	Acquisition of Access and ROW				$25,000
	PROJECT TOTAL COST				$5,057,375
	ROUNDED TOTAL COST				**$5,060,000**

8/23/2006

TABLE 7C-6 INFRASTRUCTURE TO ADDRESS ALL PRIORITY #2 LINE BREAKS

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			10%	$701,527
2	Pipe - Total Cost Installed				
	6" Class 200, S.D.R. 21	LF	48,515	$70	$3,399,155
	8" Class 200, S.D.R. 21	LF	12,208	$80	$975,004
	10" Class 200 S.D.R. 21	LF	4,712	$92	$433,174
	12" Class 200 S.D.R. 21	LF	2,166	$108	$234,799
	14" Class 200 S.D.R. 21	LF	636	$128	$81,500
	16" Class 200 S.D.R. 21	LF	1,678	$143	$240,546
	18" Class 200 S.D.R. 21	LF	1,132	$160	$181,513
	24" Class 200 S.D.R. 21	LF	1,127	$224	$252,051
3	Fittings, Valves, and Fire Hydrants (% of pipe cost)	LS		10%	$579,774
4	Unlisted Items (% of 2+3)	LS		10%	$637,752
A	Construction Cost Subtotal				$7,716,795
B	Engineering Costs (% of A)			10%	$771,679
C	Subtotal (A+B)				$8,488,474
D	Contingency (% of C)			15%	$1,273,271
E	CONSTRUCTION COST TOTAL (C+D)				$9,761,746
F	Prepare Final Design and Specs (% of E)			10%	$976,175
G	Permitting and Mitigation				$25,000
H	Legal Fees				$25,000
I	Acquisition of Access and ROW				$25,000
	PROJECT TOTAL COST				$10,812,920
	ROUNDED TOTAL COST				**$10,900,000**

8/23/2006

TABLE 7C-7 INFRASTRUCTURE TO ADDRESS PRIORITY #3 LINE BREAKS

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			10%	$893,715
2	Pipe - Total Cost Installed				
	6" Class 200, S.D.R. 21	LF	61,967	$70	$4,341,656
	8" Class 200, S.D.R. 21	LF	16,088	$80	$1,284,884
	10" Class 200 S.D.R. 21	LF	8,071	$92	$741,967
	12" Class 200 S.D.R. 21	LF	4,047	$108	$438,703
	16" Class 200 S.D.R. 21	LF	2,804	$143	$401,961
	24" Class 200 S.D.R. 21	LF	791	$224	$176,906
3	Fittings, Valves, and Fire Hydrants (% of pipe cost)	LS		10%	$738,608
4	Unlisted Items (% of 2+3)	LS		10%	$812,468
A	Construction Cost Subtotal				$9,830,868
B	Engineering Costs (% of A)			10%	$983,087
C	Subtotal (A+B)				$10,813,955
D	Contingency (% of C)			15%	$1,622,093
E	CONSTRUCTION COST TOTAL (C+D)				$12,436,048
F	Prepare Final Design and Specs (% of E)			10%	$1,243,605
G	Permitting and Mitigation				$25,000
H	Legal Fees				$25,000
I	Acquisition of Access and ROW				$25,000
	PROJECT TOTAL COST				$13,754,653
	ROUNDED TOTAL COST				**$13,800,000**

8/23/2006

7D
METER REPLACEMENT DESIGNS AND COSTS

CITY OF LARAMIE

COST ESTIMATE
INSTALL NEW 14-INCH MAGNETIC METER AT SOLDIER SPRINGS

August 26, 2005

Cost Element		**Amount**
Final Design (Estimated at 10% of Construction Cost Subtotal #1)	$	1,650.00
Permitting & Mitigation	$	-
Legal Fees	$	-
Acquisition of Access and Rights of Way	$	-

Construction Costs

Item No.	Item	Quantity	Unit	Unit Price	Total Item Cost
1	14-inch Meter	1	LS	$ 9,500.00	$ 9,500.00
2	Meter Installation	1	LS	$ 2,000.00	$ 2,000.00
3	Pipe Modifications	1	LS	$ 3,000.00	$ 3,000.00
4	Electrical	1	LS	$ 2,000.00	$ 2,000.00

Construction Cost Subtotal #1 (CCS #1)	$	16,500.00		
Engineering (CCS #1 X 10%)	$	1,650.00		
Subtotal #2	$	18,150.00		
Contingency (Subtotal #2 X 15%)	$	2,722.50		
Construction Cost Total	$	20,872.50	$	20,872.50
	Total Cost		**$**	**22,522.50**

CITY OF LARAMIE

METER REPLACEMENT COST ESTIMATE SUMMARY

August 26, 2005

Location	**Diameter** (inch)	**Cost Estimate**
City Springs	16	$ 31,400
Wye	16	$ 31,400
Water Treatment Plant	24	$ 28,100
Pope Springs	12	$ 20,500
Soldier Springs	14	$ 22,500
	TOTAL	$ **133,900**

CITY OF LARAMIE

COST ESTIMATE
INSTALL NEW 16-INCH MAGNETIC METER AT CITY SPRINGS

August 26, 2005

Cost Element		**Amount**
Final Design (Estimated at 10% of Construction Cost Subtotal #1)	$	2,300.00
Permitting & Mitigation	$	-
Legal Fees	$	-
Acquisition of Access and Rights of Way	$	-

Construction Costs

Item No.	Item	Quantity	Unit	Unit Price	Total Item Cost
1	16-inch Meter	1	LS	$ 10,500.00	$ 10,500.00
2	Meter Installation	1	LS	$ 2,000.00	$ 2,000.00
3	Pipe Modifications and Paint	1	LS	$ 9,000.00	$ 9,000.00
4	Electrical	1	LS	$ 1,500.00	$ 1,500.00

Construction Cost Subtotal #1 (CCS #1)	$	23,000.00		
Engineering (CCS #1 X 10%)	$	2,300.00		
Subtotal #2	$	25,300.00		
Contingency (Subtotal #2 X 15%)	$	3,795.00		
Construction Cost Total	$	29,095.00	$	29,095.00
		Total Cost	**$**	**31,395.00**

CITY OF LARAMIE

COST ESTIMATE
INSTALL NEW 16-INCH MAGNETIC METER AT THE WYE

August 26, 2005

Cost Element		**Amount**
Final Design (Estimated at 10% of Construction Cost Subtotal #1)	$	2,300.00
Permitting & Mitigation	$	-
Legal Fees	$	-
Acquisition of Access and Rights of Way	$	-

Construction Costs

Item No.	Item	Quantity	Unit	Unit Price	Total Item Cost
1	16-inch Meter	1	LS	$ 10,500.00	$ 10,500.00
2	Meter Installation	1	LS	$ 2,000.00	$ 2,000.00
3	Pipe Modifications and Paint	1	LS	$ 9,000.00	$ 9,000.00
4	Electrical	1	LS	$ 1,500.00	$ 1,500.00

Construction Cost Subtotal #1 (CCS #1)	$	23,000.00		
Engineering (CCS #1 X 10%)	$	2,300.00		
Subtotal #2	$	25,300.00		
Contingency (Subtotal #2 X 15%)	$	3,795.00		
Construction Cost Total	$	29,095.00	$	29,095.00
	Total Cost		**$**	**31,395.00**

CITY OF LARAMIE

COST ESTIMATE
INSTALL NEW 24-INCH MAGNETIC METER AT THE WATER TREATMENT PLANT

August 26, 2005

Cost Element		**Amount**
Final Design (Estimated at 10% of Construction Cost Subtotal #1)	$	2,060.00
Permitting & Mitigation	$	-
Legal Fees	$	-
Acquisition of Access and Rights of Way	$	-

Construction Costs

Item No.	Item	Quantity	Unit	Unit Price	Total Item Cost
1	24-inch Meter	1	LS	$ 12,600.00	$ 12,600.00
2	Meter Installation	1	LS	$ 5,000.00	$ 5,000.00
3	Pipe Modifications	1	LS	$ 1,000.00	$ 1,000.00
4	Electrical	1	LS	$ 2,000.00	$ 2,000.00

Construction Cost Subtotal #1 (CCS #1)	$	20,600.00		
Engineering (CCS #1 X 10%)	$	2,060.00		
Subtotal #2	$	22,660.00		
Contingency (Subtotal #2 X 15%)	$	3,399.00		
Construction Cost Total	$	26,059.00	$	26,059.00
	Total Cost		**$**	**28,119.00**

CITY OF LARAMIE

COST ESTIMATE
INSTALL NEW 12-INCH MAGNETIC METER IN POPE WELL FIELD PIPELINE

August 26, 2005

Cost Element		**Amount**
Final Design (Estimated at 10% of Construction Cost Subtotal #1)	$	1,500.00
Permitting & Mitigation	$	-
Legal Fees	$	-
Acquisition of Access and Rights of Way	$	-

Construction Costs

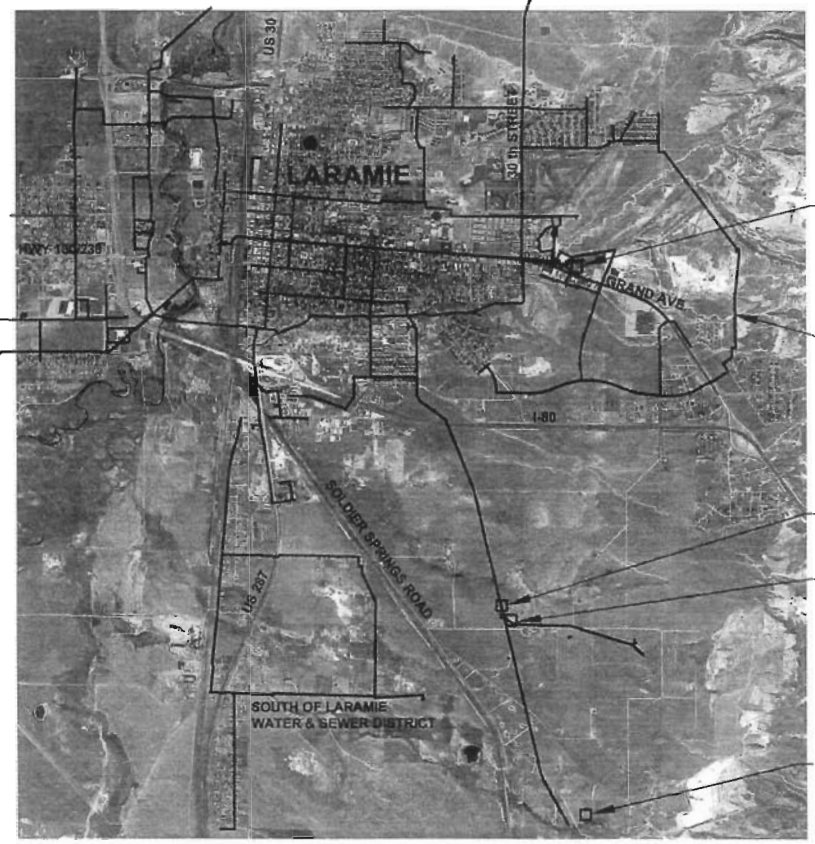
Item No.	Item	Quantity	Unit	Unit Price	Total Item Cost
1	12-inch Meter	1	LS	$ 6,000.00	$ 6,000.00
2	Meter Installation	1	LS	$ 2,000.00	$ 2,000.00
3	Pipe Modifications	1	LS	$ 4,000.00	$ 4,000.00
4	Electrical & Surge Suppression	1	LS	$ 3,000.00	$ 3,000.00

Construction Cost Subtotal #1 (CCS #1)	$	15,000.00		
Engineering (CCS #1 X 10%)	$	1,500.00		
Subtotal #2	$	16,500.00		
Contingency (Subtotal #2 X 15%)	$	2,475.00		
Construction Cost Total	$	18,975.00	$	18,975.00
		Total Cost	**$**	**20,475.00**

7D-6

NO SCALE

NORTH



16" METER AT CITY SPRINGS

WATER PIPELINES, 10" AND LARGER (TYPICAL)

16" METER AT THE WYE

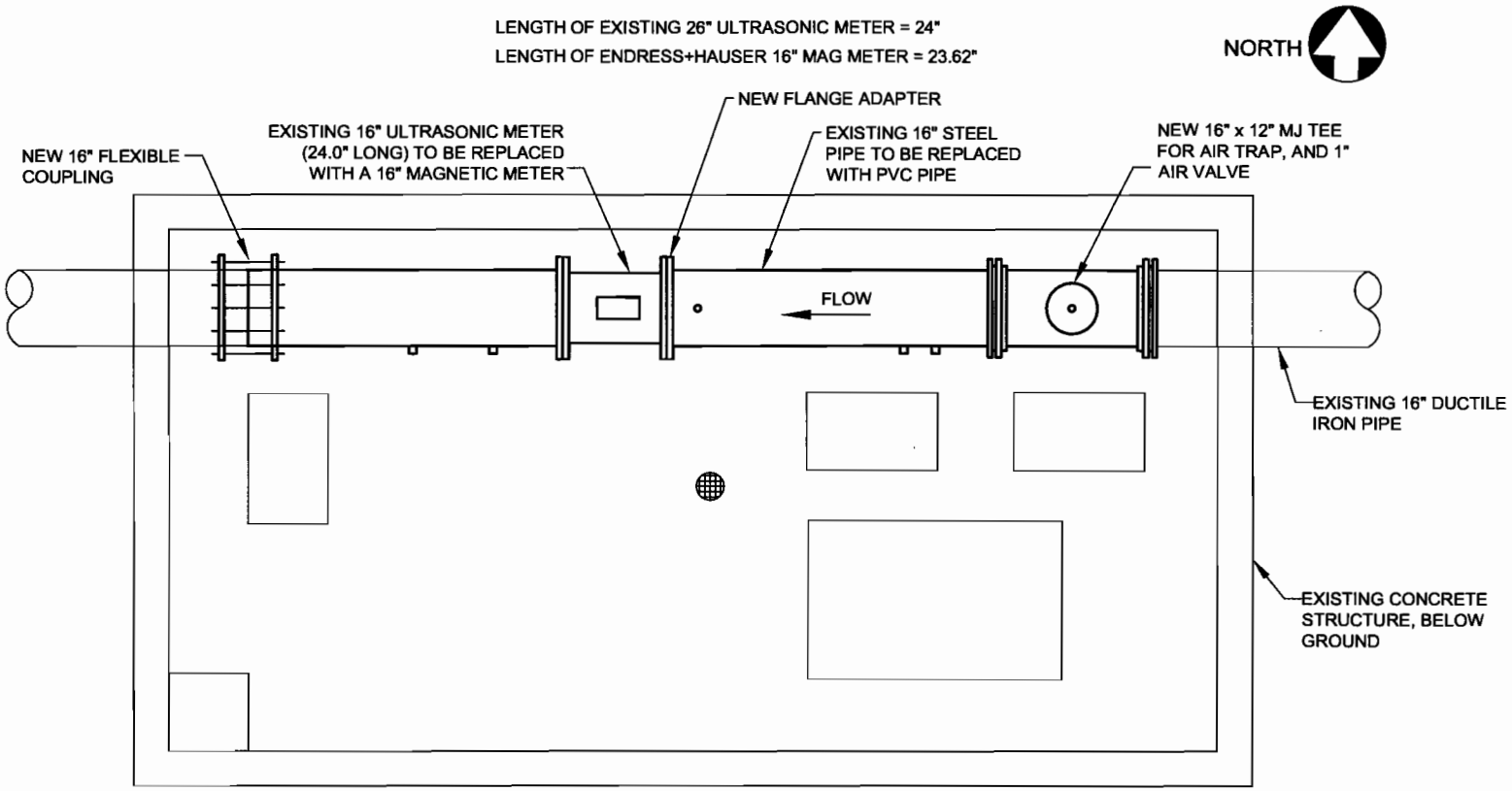
12" METER IN POPE WELL FIELD PIPELINE

14" METER AT SOLDIER SPRINGS

24" METER AT LARAMIE WATER TREATMENT PLANT (18 MILES SOUTHWEST)

	DESIGNED BY: NOWAK DRAWN BY: NOWAK	DATE: SEPT., 2005 PROJECT NO. 11.01	Camp Creek Engineering, Inc. 410 E. GRAND AVE, SUITE 213 LARAMIE, WY 82070 (307) 742-2019	WYOMING WATER DEVELOPMENT COMMISSION LARAMIE WATER MANAGEMENT PLAN WATER METER REPLACEMENT - SITE PLAN	SHEET G-1

L-01



PLAN
CITY SPRINGS CHLORINE/FLUORIDE BUILDING

NO SCALE

	DESIGNED BY: NOWAK DRAWN BY: NOWAK	DATE: SEPT., 2005 PROJECT NO. 11.01	Camp Creek Engineering, Inc. 410 E. GRAND AVE, SUITE 213 LARAMIE, WY 82070 (307) 742-2019	WYOMING WATER DEVELOPMENT COMMISSION LARAMIE WATER MANAGEMENT PLAN CITY SPRINGS CHLORINE/FLUORIDE BUILDING	SHEET 1

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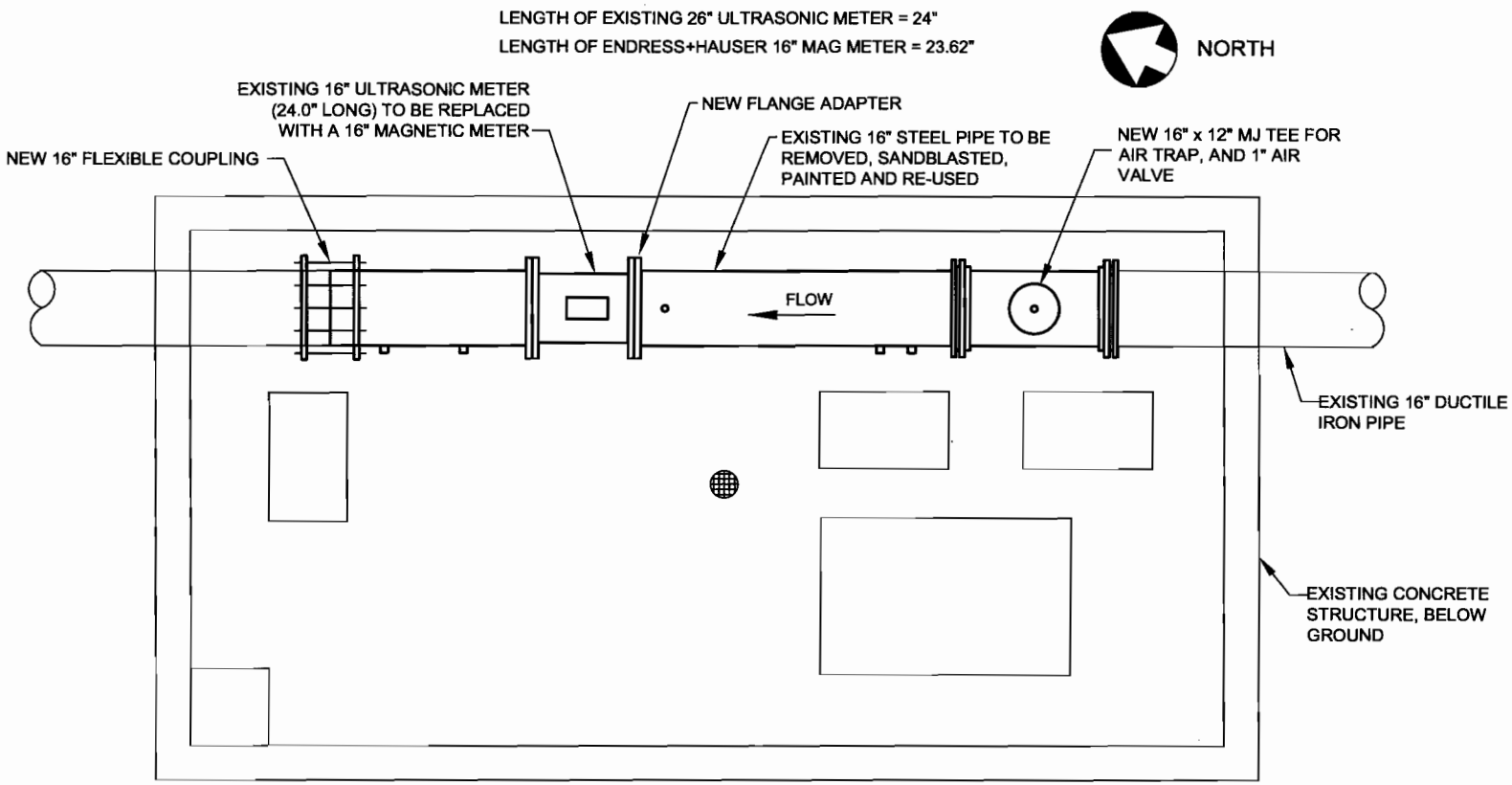

PLAN
WYE CHLORINE/FLUORIDE BUILDING

NO SCALE

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7D-9

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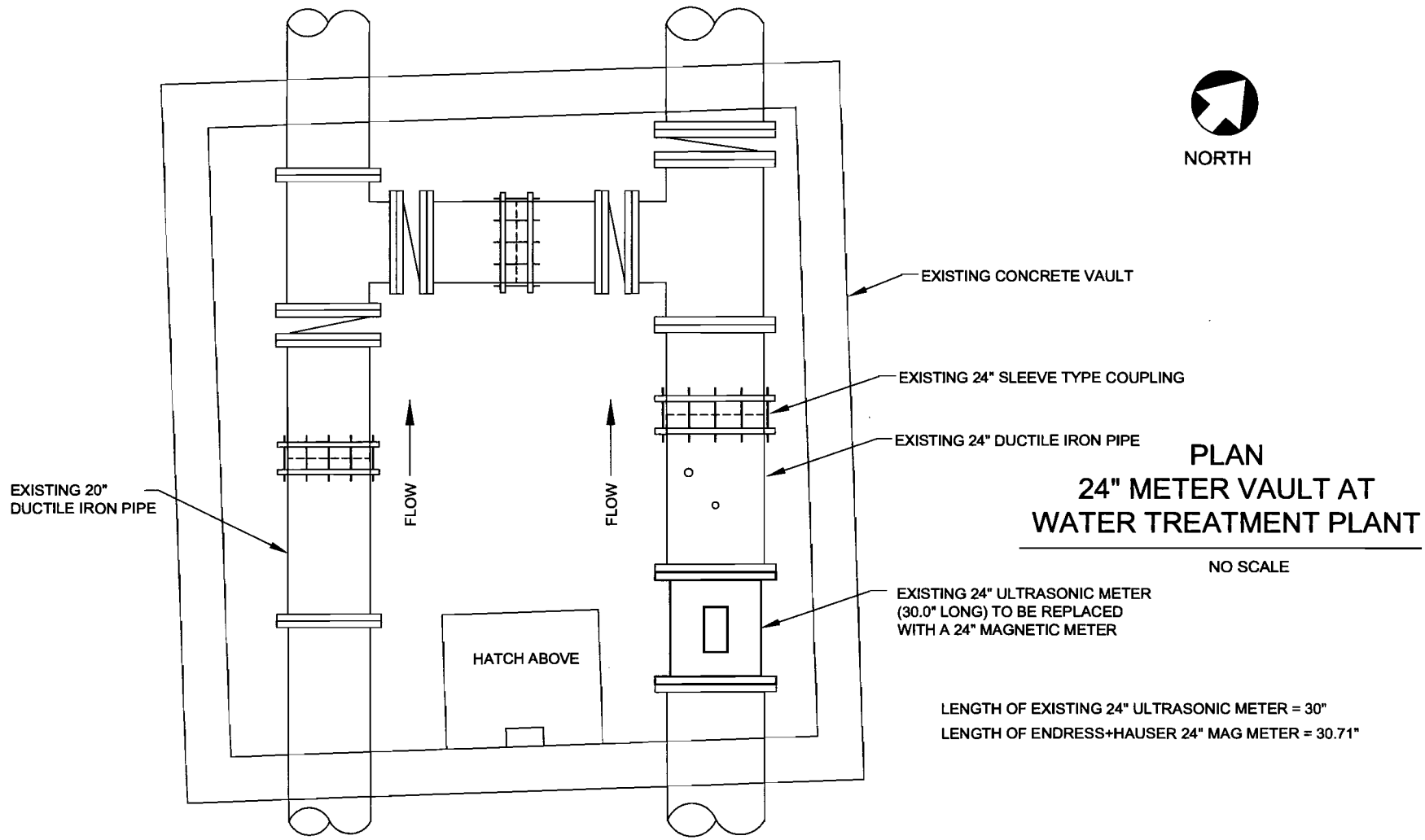

PLAN
24" METER VAULT AT WATER TREATMENT PLANT

NO SCALE

	DESIGNED BY: NOWAK DRAWN BY: NOWAK	DATE: SEPT., 2005 PROJECT NO. 11.01	Camp Creek Engineering, Inc. 410 E. GRAND AVE, SUITE 213 LARAMIE, WY 82070 (307) 742-2019	WYOMING WATER DEVELOPMENT COMMISSION LARAMIE WATER MANAGEMENT PLAN 24" METER VAULT AT WATER TREATMENT PLANT	SHEET 3

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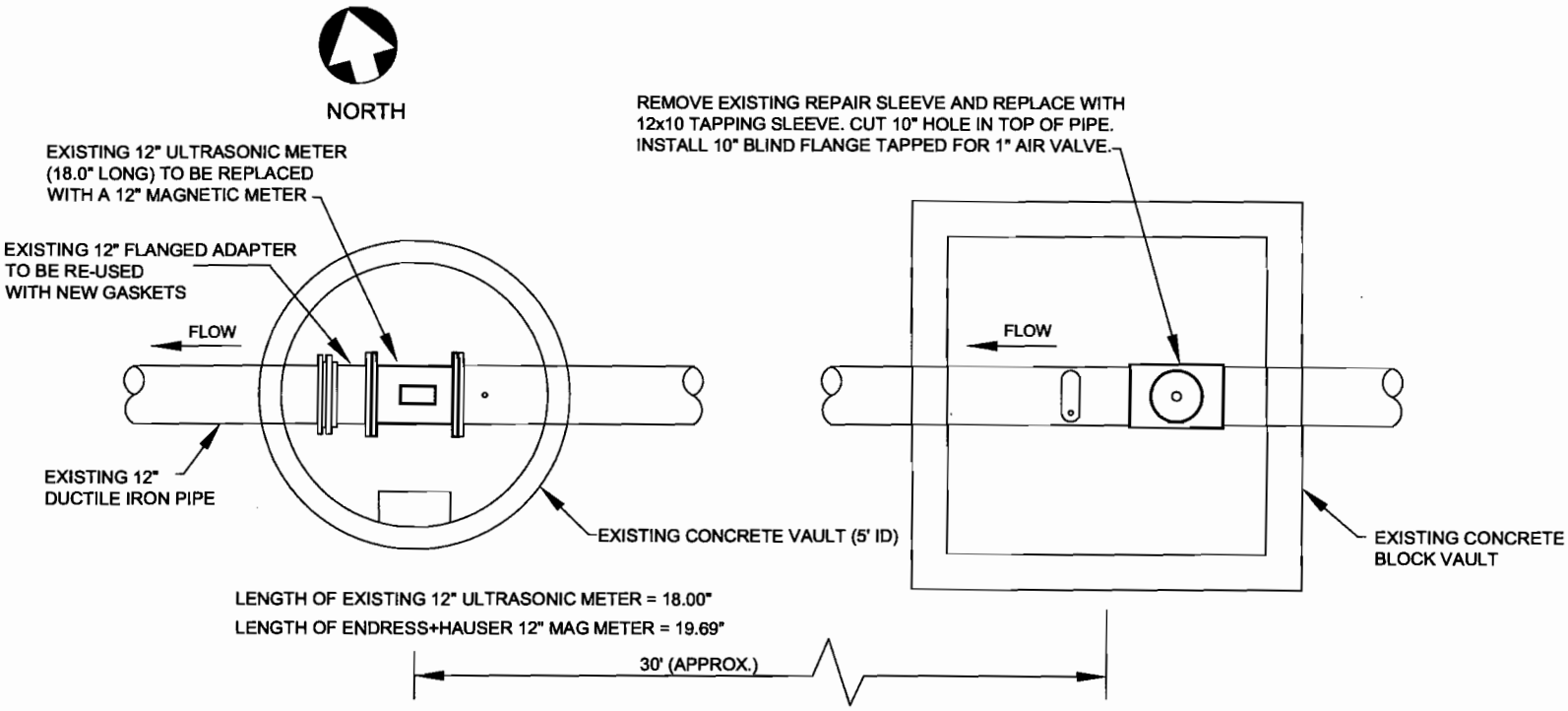
10-01



PLAN
POPE WELL FIELD METER

PLAN
POPE PIPELINE AIR VALVE

NOTE: ADD SURGE SUPPRESSION TO ELECTRICAL SYSTEM

NO SCALE

	DESIGNED BY: NOWAK DRAWN BY: NOWAK	DATE: SEPT., 2005 PROJECT NO. 11.01	Camp Creek Engineering, Inc. 410 E. GRAND AVE, SUITE 213 LARAMIE, WY 82070 (307) 742-2019	WYOMING WATER DEVELOPMENT COMMISSION LARAMIE WATER MANAGEMENT PLAN POPE WELLS METER	SHEET 4

7D-11

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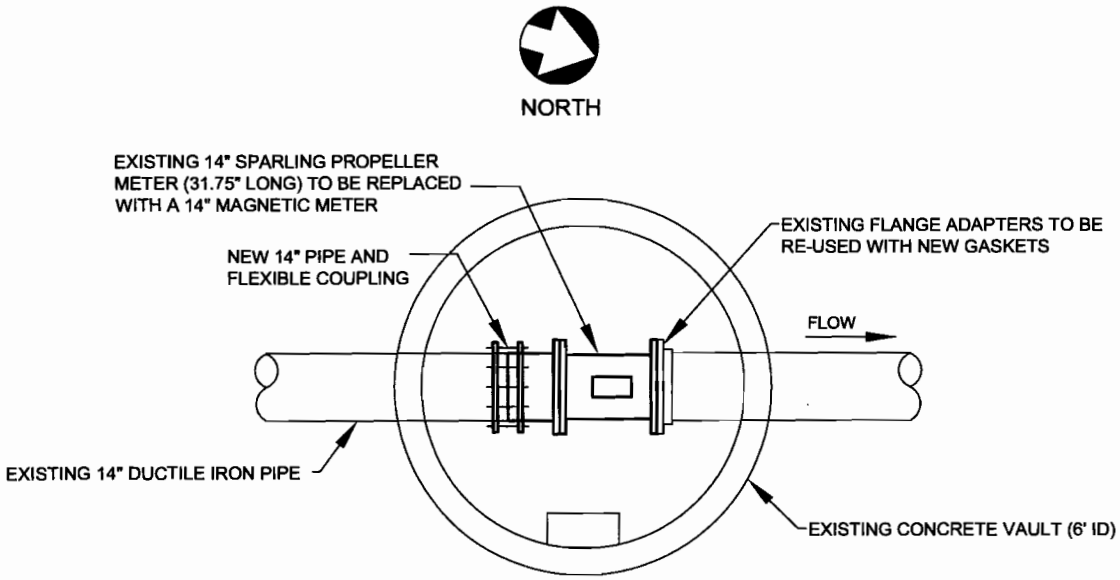

LENGTH OF EXISTING 14" SPARLING PROPELLER METER = 31.75"

LENGTH OF ENDRESS+HAUSER 14" MAG METER = 21.65"

PLAN
SOLDIER SPRINGS METER

NO SCALE

	DESIGNED BY: NOWAK DRAWN BY: NOWAK	DATE: SEPT., 2005 PROJECT NO. 11.01	Camp Creek Engineering, Inc. 410 E. GRAND AVE, SUITE 213 LARAMIE, WY 82070 (307) 742-2019	WYOMING WATER DEVELOPMENT COMMISSION LARAMIE WATER MANAGEMENT PLAN SOLDIER SPRINGS METER	SHEET 5

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70-12

7E
DISTRIBUTION SYSTEM HYDRAULIC EVALUATION

Memo

DATE : DRAFT April 2006 [Finalized 08-23-06]

To: WWC File No. 2005-172 Task 4
Laramie Water Management Study, Level II

By: Ray Alexander RA
Murray Schroeder

RE: Hydraulic Evaluation of Existing Water Transmission, Distribution and Storage System

1.0 Introduction

This memo presents the approach, assumptions and results for a hydraulic evaluation of the City's existing water transmission, distribution and storage system. Figure 1.1 provides a schematic of the system facilities and pressure zones. A hydraulic profile of the Laramie distribution at a static state is provided in Figure 1.2. The evaluation includes and examination of capacity and water quality. For a complete understanding of this evaluation, the reader may find it necessary to consult the narrative, tables and figures presented in the Final report.

2.0 AVwater Model

AVwater provides functionality to define the geometric configuration, establish the materials inventory of a water distribution network, introduce supply and demand loads, perform analyses and display pertinent results in graphic and/or tabular format. Storage tanks, pressure regulating, sustaining and open/close valves, pumps, meters, etc. can be included in the water distribution model. Extended period simulations which adjust liquid levels in tanks over a user-specified simulation period may be modeled. AVwater provides a semi-automated approach for fire flow analyses with node and pipe summary tables being created facilitating the system adequacy determination, as well as, Dynamic Water Quality modeling which tracks the fate of a dissolved substance flowing through the network over time. AVwater uses an ArcView GIS and ArcGIS interface to (a) KYPIPE modeler and (b) EPANET Version 1 and Version 2 modelers, thereby integrating modeling and GIS technology.

3.0 Model Parameters

3.1 Water Main C value Assignmnets

C-values were assigned based on the material data provided by the City. These C-values are as follows:

PVC = 140
Steel = 135
DIP = 125
CIP-Post 1927 = 120
CIP-Pre 1937 = 90
WIP = 90

3.2 Node Elevation Assignments

Nodal elevations were assigned using sanitary sewer manhole elevation data provided by the City. A six foot deduction was taken off the data assuming that all piping has a six foot bury depth. The transmission line data was taken from a City provided file and applied directly to the nodes assuming that there is already a bury depth associated with the elevations.

3.3 Pump Stations, Tanks, PRVs

A summary of the pumps, tanks, and PRVs are located in Tables 3.1 and 3.2, respectively. Table 3.1 provides pump curve data with the name and associated node number. The pump curve used in the model used three points from the curve. The three points used were the cutoff head and low discharge, intermediate head and discharge, high head and discharge. Table 3.2 provides the tank name and the associated node number. The tank characteristics shown in the table are the low elevations, high elevations, tank diameters, and initial elevations. Table 3.2 provides the name of the PRV, associated node number, and setting. Figure 1.1 shows the location of these pumps, tanks, and PRVs. The 8 MG Reservoir is not circular it is shaped like a rectangle with sloping side walls. An effective diameter of 280-feet was used to model this tank.

4.0 Calibration

4.1 Pipelines from WTP to City

The city provided flow data at the highway 230 vault and the vault on the 20" line (Figure 1.1). This data was used to calibrate the transmission lines from the WTP. This calibration was performed by adjusting the C-values until the flow in these lines was modeled within a few percent of the actual measured flows.

4.2 Fire Hydrant Test Data

The Laramie Fire Department (LFD) provided pressure data at various hydrants within the city. A calibration was performed, which compared the modeled results to LFD hydrants tests (Table 4.1). The modeled results approximated actual results within 20 psi.

5.0 Evaluation Criteria

5.1 Maximum Velocity

All pipes with maximum velocity of 6 fps during a fire flow analyses. This is a criteria to consider, but was not in this study.

5.2 Minimum Residual Pressure – Non Fire Flow

All nodes with a minimum residual pressure of 42 psi during a 24 Extended Period Scenario (EPS) with a peaking factor of 1.81.

5.3 Minimum Residual Pressure – Fire Flow

All nodes with a minimum residual pressure of 20 psi during a fire flow analyses. The nodes observed were at the junction of the lead and the main.

5.4 Residence Time – Water Quality

All nodes with a residence time greater than 57 hours during a 3 day EPS analyses.

5.5 Tank Recovery

Tank elevations are at or within a foot of initial elevation during a extreme peaking factor EPS.

6.0 Water Demand Loading

The City of Laramie Utility billing provided water consumption rates for 2005 but lacked geographical data. The City provided a table with latitudes and longitudes associated with a meter number and a street address. That data was combined with the water consumption table by meter number. The combined table was separated by month and monthly use statistics were calculated.

6.1 Peak Use Months

The peak use month of July 2005 was imported into AVwater as a shapefile. The node table was spatially joined to the July data hence

assigning demands to the nodes. The peak use month was used to run the peak day analysis, peak hour analysis and fire flow analyses.

6.2 Low Use Months

The low use month of November 2005 was imported into AVwater to perform a residence time analysis.

6.3 Park Irrigation Demands

The city provided an irrigation report from 1996-2005 (Table 6.1). The average gpm for each park was inserted into the model. A time pattern was used to only turn the irrigation demands on from 9 PM to 6 AM.

6.4 Diurnal Demand – Summer

Diurnal curves were created using city data from the transmission lines on Grand Avenue, Lewis Street, and Reynolds Street. The peak day for each year from 2002 to 2005 was selected and the data was presented on an hourly basis. A statistical analysis was done on each year and transmission line. They were compared and the worst case scenario was selected. The worst case was in 2004 in the Grand Avenue transmission line. The selected case is presented in Figure 6.1 and Table 6.2. This diurnal curve was applied to the EPS's, spreading the meter use data over the 24 hour period for the peak use scenarios.

6.5 Diurnal Demand – Winter

A flat line diurnal curve for the winter months was applied to the low demand scenario.

6.6 Fire Flows by Zone

Fire demands were applied to nodes using a 2005 city zoning map (Figure 6.2). The demands applied to each zone are as follows:

Fire Flow Rate	**Building Zone**
1,500 gpm	R1, R2, R2M, LR, RR
3,000 gpm	B1, B1R, O, R3, LM,
4,000 gpm	I1, I2, IP, C2, B2

7.0 Scenarios

7.1 No. 1 Peak Hour Demand - Average Peaking Factor

An extended period (24-hour) simulation was made to evaluate the adequacy of the Transmission, Distribution, and Storage (TDS) system (TDS) under peak hour conditions on the maximum demand day of the year. Initial elevations of tanks were started at their maximum elevations.

The water demand load was the combined effect of :

a. The July 2005 actual water use data from each meter (8,263 meters) distributed over the distribution system and assigned to the nearest system node using a spatial join function,
b. Item a. above multiplied by the Summer Period Peak Day peaking factor from Table 7.1, of 1.52. This peaking factor represents the average peaking factor (peak day to peak summer ratio) observed in the water use records from year 1992 to 2005.
c. Product a. times b. above distributed over the 24 –hour simulation period using the summer diurnal demand curve presented in Section 6.
d. Item c. above plus the irrigation demands assigned according to the distribution schedule discussed in section 6.3.

7.2 No. 2 Peak Hour Demand – Extreme Peaking Factor

This extended period simulation was the same as No.1, except that the peak day to average summer day peaking factor was 1.81, the most extreme value from Table 7.1.

7.3 No. 3 Peak Day Demand with Fire

Multiple fire flow condition models were run using the following conditions. The fire flow scenarios were run using a static scenario on a maximum July 2005 day. The initial tank elevations were determined by taking the lowest elevations in the tanks from the Extreme Peaking Factor EPS (Scenario No. 2) and subtracting 480,000 gallons from each tank 480,000 gallons is equivalent to a 4,000 gpm fire lasting 2 hours. Table 7.2 provides the initial tank elevations.

These fire flow scenarios were run using only one node to provide the fire flow. The nodes selected were nodes located at the junction of the main and the fire hydrant lead not at the actual fire hydrant. In reality two or more fire hydrants may be used. The modeling program does not provide an efficicient process to select one or more nodes to split the fire flow when running a single analysis for one fire demand. If this process was done for the entire City the results would be more accurate.

7.4 No. 4 Water Quality – Residence Time

An extended period (24-hour) simulation was made to evaluate the residence time of the TDS system during low demands.

a. The November 2005 actual water use data from each meter (8,263 meters) distributed over the distribution system and assigned to the nearest system node using a spatial join function,
b. Item a. above multiplied by the Winter Period Peak Day peaking factor from Table 7.1, of 1.52. This peaking factor represents the average peaking factor (peak day to peak summer ratio) observed in the water use records from year 1992 to 2005.

7.5 No. 5 Future Development

Future developments were considered, the locations of these demands are shown in Figure 7.1 and the quantity is shown in Table 7.3. An iterative approach was taken to identify solutions that would correct identified system problems.

7.5.1 Solution to Address Future Peak hour demands

The purpose of this scenario was to provide the City with a minimum pressure of 42 psi.

7.5.2 Address Future Fire Flow on Maximum Day Demand.

There were two scenarios that were modeled to address deficient pressures during a fire. These scenarios provided a solution to provide the city with a minimum pressure of 20 psi during a fire event.

8.0 Results

8.1 No. 2 Peak Hour Demand – Extreme Peaking Factor

Figure 8.1 presents the residual pressure mapping for this scenario. Detailed model input and out put for this run is included as Attachment A.

The modeling scenario results indicate that there are areas in the City that violate residual pressure evaluation criteria, including the area on Zone 1 south of the university, area out on north 9th street, and south of town in the area of WYDOT.

The modeling results also show that adequate replenishment of water storage is available.

8.2 No. 3 Peak Day Demand plus Fire

Figure 8.2 presents the residual pressure mapping for this scenario. Detailed model input and out put for this run is included in as Attachment A.

The modeling scenario results indicate that there are areas in the City that violate residual pressure evaluation criteria, including the majority of Zone 1, southern portion of Zone 3, and the south east portion of Zone 6.

Table 8.1 provides a coarse explanation of the deficiencies in the infrastructure resulting in low fire flows.

There were areas of concern that were requested to have a fire flow analysis run using multiple nodes. Table 8.2 reflects these results and Figure 8.2 provides the general location of these analyses.

8.3 No. 4 Water Quality – Residence Time

Figure 8.3 presents the residence mapping for this scenario. Detailed model input and out put for this run is included as Attachment A.

9.0 Future Development Scenarios

9.1 Solution to Address Solution to Address Future Peak hour demands Detailed model input and output for this run is included as Attachment A. Figure 9.1 presents a solution to the current/future peak hour deficiency.

- Replace all pipe in Zone 1 and Zone 2 that are smaller than 6-inch diameter with 6-inch diameter PVC
- Construct an elevated water storage tank south of I-80 near the location shown on Figure 9.1. Two pumps on the pipeline between the tank and the trunk main from Pope and Soldier well fields will be required to replenish the tank. The pump and tank characteristics are shown in Table 9.1
- Install large diameter water mains to connect this tank to south 287, then end of 18th street, and the Corthell hill area.
- Rezone the northern and southern areas of Zone 1 to be serviced by Zone 2.

9.2 Address Future Fire Flow on Maximum Day Demand.

- Use infrastructure from solution addressing future peak hour demands (Section 9.1).
- Replacement of the Zone 1 line in Grand Avenue with a 24-inch main.
- Replacement of the 9th Street water main with a large diameter feeder main.
- Re-Zoning of the north and south ends of the present Zone 1 service area and installing two PRV stations to serve a fire demand in Zone 1 with water from Zone 1 and Zone 2. The PRV characteristics are found in Table 9.1
- Replacement of two mains in west Laramie

9.2.2 Solution No. 2

Detailed model input and output for this run is included as Attachment A. Figure 9.3 presents a solution to the current/future fire flow deficiency.

- Use infrastructure from solution addressing future peak hour demands (Section 9.1).
- Replacing all of the pipe in Zone 1 and Zone 2 that is 8-inch or less with 12-inch piping.

Table 3.1: Pump curve data

Node #	Cufoff Head	Low Discharge	Mid Head	Mid Discharge	High Head	High Discharge	Node Name
4695	87.3400	0.0000	82.6700	196.7500	57.9800	361.6700	UW_Pump_No_1
4696	87.3400	0.0000	82.6700	196.7500	57.9800	361.6700	UW_Pump_No_2
4698	108.0000	0.0000	85.0000	475.0000	33.0000	700.0000	Grant_Street_Pump_No_1
4699	108.0000	0.0000	85.0000	475.0000	33.0000	700.0000	Grant_Street_Pump_No_2
4707	352.0000	0.0000	238.0000	1150.0000	152.0000	5900.0000	Wister_Drive_Pump_No_8
4706	352.0000	0.0000	238.0000	1150.0000	152.0000	5900.0000	Wister_Drive_Pump_No_7
4704	352.0000	0.0000	238.0000	1150.0000	152.0000	5900.0000	Wister_Drive_Pump_No_6
4710	168.0000	0.0000	101.0000	2100.0000	24.0000	6560.0000	Wister_Drive_Pump_No_2
4709	168.0000	0.0000	101.0000	2100.0000	24.0000	6560.0000	Wister_Drive_Pump_No_3
4708	168.0000	0.0000	101.0000	2100.0000	24.0000	6560.0000	Wister_Drive_Pump_No_4
4718	83.0000	200.0000	62.0000	440.0000	36.0000	600.0000	Pope_Well_No_2
4719	222.0000	600.0000	157.0000	1500.0000	87.0000	2000.0000	Pope_Well_No_4
4720	89.0000	320.0000	76.0000	800.0000	46.0000	1000.0000	Pope_Well_No_3
4721	84.0000	160.0000	58.0000	350.0000	36.0000	440.0000	Pope_Well_No_1
4784	80.0000	625.0000	70.9000	1750.0000	55.0000	2250.0000	Turner_No_1
4785	104.0000	500.0000	84.4000	1250.0000	55.0000	1600.0000	Turner_No_2
4786	187.0000	200.0000	113.0000	2000.0000	77.0000	2400.0000	Soldier
4788	266.0000	300.0000	201.0000	1400.0000	116.0000	1850.0000	Spur_No_1
4787	266.0000	300.0000	201.0000	1400.0000	116.0000	1850.0000	Spur_No_2
4816	125.0000	0.0000	114.0000	2100.0000	72.0000	3800.0000	Airport_Pump_No_2
4815	125.0000	0.0000	114.0000	2100.0000	72.0000	3800.0000	Airport_Pump_No_3
4814	104.0000	0.0000	90.0000	80.0000	23.0000	155.0000	Airport_Pump_No_4
4813	104.0000	0.0000	90.0000	80.0000	23.0000	155.0000	Airport_Pump_No_5
4812	104.0000	0.0000	90.0000	80.0000	23.0000	155.0000	Airport_Pump_No_6
4821	240.0000	0.0000	195.0000	800.0000	166.0000	960.0000	Imperial_Heights_Pump_No_3
4820	240.0000	0.0000	195.0000	800.0000	166.0000	960.0000	Imperial_Heights_Pump_No_2
4819	117.0000	0.0000	100.0000	379.0000	20.0000	785.0000	Imperial_Heights_Pump_No_1

Table 3.2: Tank and PRV Characteristics for Peak Day Scenario

Tank Characteristics for Peak Day Scenario

Node #	Intial Elevation	Low Elevation	High Elevation	Tank Diameter	Node Name
4713	7552.0000	7520.0000	7553.0000	75.0000	East_Side_Tank
4717	7325.0000	7271.0000	7326.0000	56.0000	Airport_Tank
3026	7353.0000	7327.0000	7355.0000	115.0000	2.1_MG_Tank
4783	7267.0000	7255.0000	7267.0000	280.0000	8_MG_RES
3030	7353.0000	7327.0000	7354.0000	90.0000	1.5_MG_Tank

PRV Settings		
Node #	Pressure Setting	Node Name
4701	44.000	Pierce_Street_PRV
4826	38.000	Motel_6_PRV
4827	125.000	Imperial_Heights_Valve
4859	60.000	Indian_Hills_PCS_Valve
4861	55.000	Indian_Hills_PCS
4882	35.000	Alta_Vista_PRV
4959	80.000	Hillside_PRV
4970	50.000	Turner_Tract_PCS
4971	55.000	Turner_Tract_PCS
4984	55.000	Corthell
4985	60.000	Corthell_PCS
4989	40.000	Alta_Vista_PCS

Table 4.1: Fire Flow Calibration

Model Calibration using Laramie Fire Department hydrant flow data

Location of Fire Demand								Location of Observed Pressure near Fire Demand			
Address	Calculated Discharge (gpm)	Date	Total consumption (mgd)	Total consumption in July 2005 (mgd)	Actual Residual Pressure (psi)	Modeled Residual Pressure (psi)	Ratio	Address	Actual Residual Pressure (psi)	Modeled Residual Pressure (psi)	Pressure Zone #
11th & Spring Creek	839	7/24/02	8.897	9.14	25	38.46	0.650	10th & Ord	42	43.37	1
Whitman between Park and Overland	856	8/17/00	6.699	9.14	26	24.43	1.064	Whitman between Park and Overland	34	27.91	2
Prarie's Edge SW Corner of Park	628	8/8/00	12.293	9.14	14	37.32	0.375	Prarie's Edge	37	33.6	1
Airport NW Terminal	1244	10/22/01	4.223	9.14	55	79.07	0.696	Airport W private hangers	56	76.69	7
Colorado and Franklin	967	4/14/05	4.24	9.14	42	62.37	0.673	Colorado and Harrison	54	64.18	6
NE 5th & Ivinson	557	3/11/03	4.359	9.14	11	65.84	0.167	NE AC Detention Center	51	72.92	1
Pierce & Westview	839	12/9/04	3.233	9.14	25	66.97	0.373	Pierce & Van Buren	60	67.29	6
15th & Grafton	750	3/11/03	4.359	9.14	20	65.720	0.304	15th & Beaufort	55	69.1	2

11-37

For Mike Cook 3/20/06

- 5 night/week
- End March → Oct.
- 9 pm → to 5 or 6 AM.
- USE Rain Demand.

~~TABLE 6.1~~

Based on Dargin Info.

10 Year Average 1996-2005 Irrigation Water Utilization Report

CEMETERY SYSTEM	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	Total Min	AVE MIN	AVE GPM	ZONES	AVE MG/YR
Cemetery Phase 1	2,240	2,549	2,862	3,257	2,580	2,883	2,430	2,368	2,108	2,222	25,499	2,550	63.70	23	3.736
Cemetery Phase 2	2,240	2,445	2,690	3,265	2,550	2,898	2,376	2,350	2,212	2,402	25,428	2,543	63.20	22	3.536
Cemetery Phase 3	2,240	4,026	2,412	3,235	2,580	2,923	2,520	2,332	1,880	2,222	26,370	2,637	102.60	24	6.493
Cemetery Phase 4	2,240	3,556	2,402	3,380	2,473	2,943	2,448	2,433	2,742	4,969	29,586	2,959	104.10	24	7.392
Cemetery Phase 5	2,180	2,083	2,392	3,273	2,580	2,531	2,412	2,305	1,510	1,566	22,832	2,283	86.20	16	3.149
Cemetery Phase 6	1,950	1,565	2,544	3,245	2,580	2,383					14,267	2,378	85.80	11	2.244
Total Min. Per Year	15,095	18,228	17,305	21,657	17,344	18,561	14,185	13,786	12,449	15,377	130,664	16,333			
Total Cemetery Average Millions of Gallons Per Year															26.550

PARK SYSTEM	2005	2004	2003	2002	2001	2000	1999	1998	1997	1996	Total Min	AVE MIN	AVE GPM	ZONES	AVE MG/YR
Kiwanis	1,841	2,023	3,006	2,409	2,075	2,613	3,268	2,616	1,692	2,958	24,501	2,450	111.30	18	4.909
130/230Y	1,830	1,305	1,820	1,838	1,703	1,760	1,892	1,950	1,212	2,515	17,825	1,783	10.80	6	0.116
Optimist	1,905	1,670	2,786	2,303	2,203	2,195	3,516	2,538	2,149	6,642	27,907	2,791	80.90	16	3.612
Depot	2,119	2,205	1,639	2,174	1,757	1,764	1,836	2,616	1,918	6,795	24,823	2,482	88.40	11	2.414
City Hall	2,032	727	2,451	1,268	1,170	1,070	1,606	1,664	1,076	1,293	14,357	1,436	8.20	4	0.047
Annex/Annex Parking	2,254	2,300	2,298	2,341	2,679	2,533	1,392	2,739	2,128	4,479	25,143	2,514	8.10	12	0.244
Undine	2,328	1,980	2,884	2,622	2,061	2,075	2,134	2,748	1,968	5,159	25,959	2,596	117.70	24	7.333
LaPrele	2,382	1,927	2,259	2,441	1,377	1,200	2,426	2,732	1,722	5,360	23,826	2,383	123.30	15	4.407
Washington West	2,320	2,160	3,111	2,285	2,237	2,315	2,166	2,580	1,828	4,068	25,070	2,507	123.50	18	5.573
Washington East	2,140	2,180	1,958	2,301	2,162	3,959	2,124	2,646	1,888	5,286	26,644	2,664	121.20	10	3.229
Aragon-Soccer	2,431	1,590	2,842	2,801	2,821	2,383	2,348	2,568	2,235	3,261	25,280	2,528	116.30	26	7.644
Aragon-Softball	incl above	-	-	-	-	-	-	-	-	-	-	-	116.30	18	-
Kiowa	2,098	2,152	1,157	2,225	2,631	3,080	2,160	2,858	2,298	4,965	25,624	2,562	29.30	7	0.526
DP #1 Delete from Pour on Paper	1,764	1,970	1,024	2,433	1,740	1,764	1,980	2,624	2,124	1,975	19,398	1,940	30.30	8	0.470
Harbon	1,850	2,200	1,130	2,249	1,684	2,345	2,210	2,855	1,971	2,724	21,218	2,122	92.00	6	1.171
Mini Park	1,320	567	1,730	1,688	1,647	1,720	1,875	1,818	1,709	1,600	15,674	1,567	35.60	3	0.167
LaBonte Ball Fields	2,061	2,072	2,322	2,215	1,759	2,307	2,075	2,130	1,572	4,161	22,674	2,267	105.50	13	3.110
LaBonte Opt. Field	2,154	2,014	2,661	2,288	1,645	2,071	1,980	2,682	1,866	2,910	22,271	2,227	105.30	15	3.518
LaBonte Warming Hut	2,067	1,955	2,511	2,285	1,923	2,010	2,080	2,622	1,796	3,132	22,381	2,238	82.80	14	2.594
LaBonte Ft. Sanders	2,079	1,915	2,761	2,306	2,114	2,047	1,980	1,896	1,898	3,850	22,846	2,285	112.40	17	4.365
Park Shop	1,521	1,864	1,260	2,249	1,654	3,496	1,976	2,139	1,497	2,015	19,671	1,967	26.10	8	0.442
Children's Museum	1,466	755	2,610	2,361	2,112	2,024	1,736	1,896	1,446	3,364	19,770	1,977	15.50	5	0.153
Scout #1	1,757	1,560	3,478	1,861	1,809	1,850					12,315	2,053	104.50	23	4.933
Cowboy Field	2,580	1,820	2,561	2,058							9,019	2,255	158.40	10	3.572
Little League A West	2,583	1,648	4,476	1,380							10,087	2,522	58.20	21	3.082
Little League B East	2,584	1,670	4,924	1,140							10,318	2,580	37.20	19	1.823
Total Min. Per Year	51,466	46,233	63,662	55,523	44,963	50,581	46,759	50,917	37,993	78,512	514,600	53,614	365.8		
Jacobs Golf Course															
Total Parks Average Millions of Gallons Per Year															69.454
Total Parks and Cemetery MG's and Cemetery MG															96.004

→ Mike Cook
721-5264 ~~721-5265~~

Paul Harrison
721-5269

TABLE 6.1

03/15/2006 14:30 3077420825 NOWAK PAGE 02/03

Table 6.2: Diurnal Curve Data

Time	Baseflow	Avg Grand Ave Flow	Multiplier	Avg Lewis St. Flow	Multiplier	Avg Reynolds St. Flow	Multiplier
0:00	2029	1594	0.785	1881	1.087	2018	0.950
1:00	2029	1639	0.808	1726	0.997	2243	1.056
2:00	2029	1793	0.883	1795	1.037	2364	1.113
3:00	2029	1798	0.886	1805	1.043	2403	1.132
4:00	2029	1835	0.904	1878	1.085	2297	1.082
5:00	2029	1948	0.960	1891	1.092	2310	1.088
6:00	2029	2119	1.044	1708	0.987	2082	0.981
7:00	2029	2284	1.125	1697	0.980	2073	0.976
8:00	2029	2244	1.106	1924	1.111	2341	1.103
9:00	2029	2114	1.042	1892	1.093	2220	1.046
10:00	2029	1858	0.916	1634	0.944	1726	0.813
11:00	2029	1733	0.854	1391	0.804	1341	0.632
12:00	2029	1562	0.770	1155	0.667	1234	0.581
13:00	2029	1723	0.849	1194	0.690	1339	0.631
14:00	2029	1454	0.716	1062	0.613	1220	0.575
15:00	2029	1451	0.715	1034	0.597	1386	0.653
16:00	2029	1420	0.700	1022	0.590	1387	0.653
17:00	2029	1768	0.871	1181	0.682	1440	0.678
18:00	2029	2490	1.227	1646	0.951	2207	1.040
19:00	2029	2913	1.435	1920	1.109	2567	1.209
20:00	2029	3163	1.559	2506	1.448	3355	1.580
21:00	2029	3209	1.581	2603	1.504	3428	1.615
22:00	2029	2566	1.264	2609	1.507	3277	1.543
23:00	2029	2029	1.000	2392	1.382	2697	1.270

Per Capita Demand Estimates

	Raw Data		GPCD, Calc.		AVERAGE DAY			PEAK DAY		
					92-05	92-05	00-05	92-05	92-05	92-05
Season	Production Total (mg)	Peak Day (mg)	Ave Day	Peak Day	GPCD Ave.	GPCD Std. Dev.	GPCD Ave.	GPCD Ave.	Ratio Peak day to Average Day	Ave. PD/AD
May and Sept										
1992	452.55	10.26	271	375					1.38	
1993	380.04	11.75	223	421					1.89	
1994	466.12	10.82	272	385					1.42	
1995	351.99	10.54	204	373					1.83	
1996	449.65	11.34	257	395					1.54	
1997	393.02	9.57	229	340					1.49	
1998	475.00	12.40	278	443					1.59	
1999	361.03	9.34	212	334					1.58	
2000	446.69	10.28	264	370					1.40	
2001	436.56	11.77	261	429					1.64	
2002	437.12	12.00	264	441					1.67	
2003	320.39	8.04	192	294					1.53	
2004	376.21	8.66	227	318					1.40	
2005	387.72	8.26	228	296	241	27	239	372	1.30	1.55
April and Oct										
1992	338.08	9.36	202	342					1.69	
1993	299.28	8.06	176	289					1.64	
1994	320.52	7.55	187	269					1.44	
1995	290.80	6.32	169	224					1.33	
1996	303.52	7.42	173	258					1.49	
1997	283.12	6.88	165	245					1.48	
1998	277.55	6.72	162	240					1.48	
1999	284.84	6.39	167	228					1.37	
2000	317.21	8.12	187	292					1.56	
2001	295.70	8.88	177	324					1.83	
2002	264.71	7.05	160	259					1.62	
2003	249.39	6.24	150	228					1.53	
2004	269.50	7.72	162	284					1.75	
2005	252.61	7.70	148	276	170	14	164	268	1.86	1.58
Summer										
June,July, Aug										
1992	716.89	12.25	285	448					1.57	
1993	840.98	14.25	328	511					1.56	
1994	1008.44	14.59	390	519					1.33	
1995	874.72	14.36	337	509					1.51	
1996	977.04	15.28	370	532					1.44	
1997	763.41	14.98	295	532					1.81	
1998	789.22	13.54	306	484					1.58	
1999	845.41	14.41	329	515					1.57	
2000	969.33	14.40	380	519					1.37	
2001	983.39	15.24	390	556					1.43	
2002	977.32	16.96	391	624					1.60	
2003	800.77	12.37	319	453					1.42	
2004	687.28	11.05	274	406					1.48	
2005	703.97	12.65	274	453	333	42	338	504	1.65	1.52
Winter										
Nov., Dec., Jan., Feb., March										
1991-92	639.79	6.98	155	255					1.65	
1992-93	692.91	7.52	165	270					1.64	
1993-94	721.08	7.65	170	272					1.60	
1994-95	718.15	6.94	168	246					1.46	
1995-96	643.86	7.31	148	254					1.71	
1996-97	639.77	6.26	151	222					1.48	
1997-98	600.32	6.28	142	224					1.58	
1998-99	690.25	6.92	163	247					1.51	
1999-2000	661.81	8.01	158	288					1.83	
2000-01	606.08	6.05	146	221					1.51	
2001-02	606.83	7.21	148	265					1.79	
2002-03	585.69	5.54	142	203					1.43	
2003-04	564.55	5.33	137	196					1.42	
2004-05	562.14	6.25	133	295	152	11	144	247	2.22	1.63
Annual										
1992	2147.30		214							
1993	2213.21		217							
1994	2516.15		245							
1995	2235.65		217							
1996	2374.09		226							
1997	2079.32		202							
1998	2142.09		210							
1999	2181.53		214							
2000	2395.03		236							
2001	2321.73		232							
2002	2285.98		230							
2003	1956.24		196							
2004	1897.54		190							
2005	1906.44		187		216	17	212			

Notes: Water production totals based on electronic archive data from City. The totals do not exactly correspond to other production data provided by the City.
Per Capita demand estimated calculated using the service area population values in the following table.

Year	Service Area Population Estimate from
1992	27,378
1993	27,895
1994	28,098
1995	28,229
1996	28,716
1997	28,136
1998	28,009
1999	27,966
2000	27,761
2001	27,416
2002	27,179
2003	27,302
2004	27,228
2005	27,927

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Table 7.2: Tank Characteristics for Fire Flow Scenarios

Node #	Intial Elevation	High Elevation	Tank Diameter	Node Name
4713	7533.5000	7553.0000	75.0000	East_Side_Tank
4717	7291.0000	7326.0000	56.0000	Airport_Tank
3026	7344.0800	7355.0000	115.0000	2.1_MG_Tank
4783	7259.0000	7267.0000	280.0000	8_MG_RES
3030	7338.6500	7354.0000	90.0000	1.5_MG_Tank

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7.3

Table ~~7.5~~ Water Demand Allocation for Future Growth Scenario

		Assumed Use and Size							
		Single Family Units	Twin Home Units	Multi Family Units	Total Est. Occupants	Commercial Business Acres	Ave. July Day gpm	Adjusted For 2025 Projection
	Development	3	6	9				
1	Coughlin-Pole Mountain 3rd Addition	253			759		121	85
2	UW Conference Center/Plaza					15.5	14	10
3	Montevue Estates	13			39		6	4
4	Grand View Heights	88	178	5	1,377		220	154
5	CPL Addition	190			570		91	64
6	Snowy Range Addition	56			168		27	19
7	Westfield Village	24			72		12	8
8	Wyoming 12th Addition	18			54		9	6
9	Laramie Ridge Estates	19			57		9	6
10	Wyoming Person			12	108		17	12
11	Turner Tract					24	22	15
12	Coughlin-Pole Mountain 2nd Addition	60			180		29	20
13	Fall Creek	145			435		69	49
14	Bob Blake Trailer Court	101			303		48	34
15	Prairie's Edge	249			747		119	83
16	Jacoby Golf Course	750			2,250		359	252
17	Laramie Country Club	300			900		144	101
18	WyoTech Dorms			71	639		102	71
19	Skyline Plaza					18	16	11
20	Greasers - 60 Unit Condo		60		360		58	40
21	UW Housing			50	450		72	50
22	Boysen North 3rd					60	54	38
23	South Gate					80	72	51
	Park A						100	100
	Park B						50	50
	Park C						100	100
	Park D						50	50
	Park E						50	50
	Park F						50	50
	Park G						100	100
	Park H						100	100
	Total				9,468		1,512	1,783
	Per Capita Water Consumption, Ave July Day 230 gpcd							
	Commercial/Business Water Consumption 1300 gpac							
	2003 Comp Plan 2025 Progected Pop Increase 6626							

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8.1

Table ~~23~~ Fire Flow Scenario Summary - Existing Condition

Pressure Zone	Area	Demand	Number of hydrants	Classification of Results				
				Insufficient Pressure	Small Mains	Long dead end runs	Model specifics unknown or connectivity issue	Works in EPANET not Avwater
		gpm						
Zone #1								
	Cottonwood Dr.	1,500	3		X	X		
	3rd St. and surrounding areas	4,000	80	X	X			
	North 9th St.	1,500/3,000/4,000	16	X				
	12th and Sheridan	1,500/3,000	20	X	X			
	Petro	4,000	4	X	X			
	Trailer Park on Mc Cue St.	3,000	5	X	X	X		
	Banner Rd. and Carrol Ave	3,000	5	X				
Zone #2								
	North Quarter of Zone	1,500/4,000	6			X		
	Remaining Hydrants in Zone			X	X			
Zone #3								
	Alta Vista	1,500	4				X	X
	Laramie Rec Center	3,000	4				X	X
Zone #4								
	Sherman Hills	1,500	1				X	X
	Indian Hills	1,500/3,000	2				X	X
Zone #6								
	West Laramie - Snowy Range Road	4,000	8		X			
	Wyo Tech	4,000	27	X	X			

Note: This table describes areas in the City that appear to have serious fire flow deficiencies when viewing the results shown on Figure 7-5A and 7-5B. Under Classification of Results, we identified what we believed to be the cause for this condition. The Wyo Tech Zone 6 issue may be a non issue, because there is apparently a water main in the system that the current model does not have.

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8-2

Table ~~7-4~~ Requested Fire Flow Results

		No. of Hydrants Sufficiently Removed from Each Other		
Location ID	NFF	1	2	3
	gpm			
1	1,500	No	No	No
2	4,000	No	No	No
3	3,000	No	No	No
4	1,500	No	No	No
5	4,000	Yes	Yes	Yes
6	4,000	No	No	Yes
7	1,500	No	Yes	Yes
8	3,000	Yes	Yes	Yes
9	3,000	Yes	Yes	Yes
10	1,500	Yes	Yes	Yes
11	3,000	No	No	No
12	1,500	No	Yes	Yes
13	1,500	Yes	Yes	Yes
14	1,500	Yes	Yes	Yes
15	1,500	Yes	Yes	Yes
16	1,500	Yes	Yes	Yes
17	4,000	Yes	Yes	Yes
18	1,500	Yes	Yes	Yes

Location ID is in reference to Figure 7-7.

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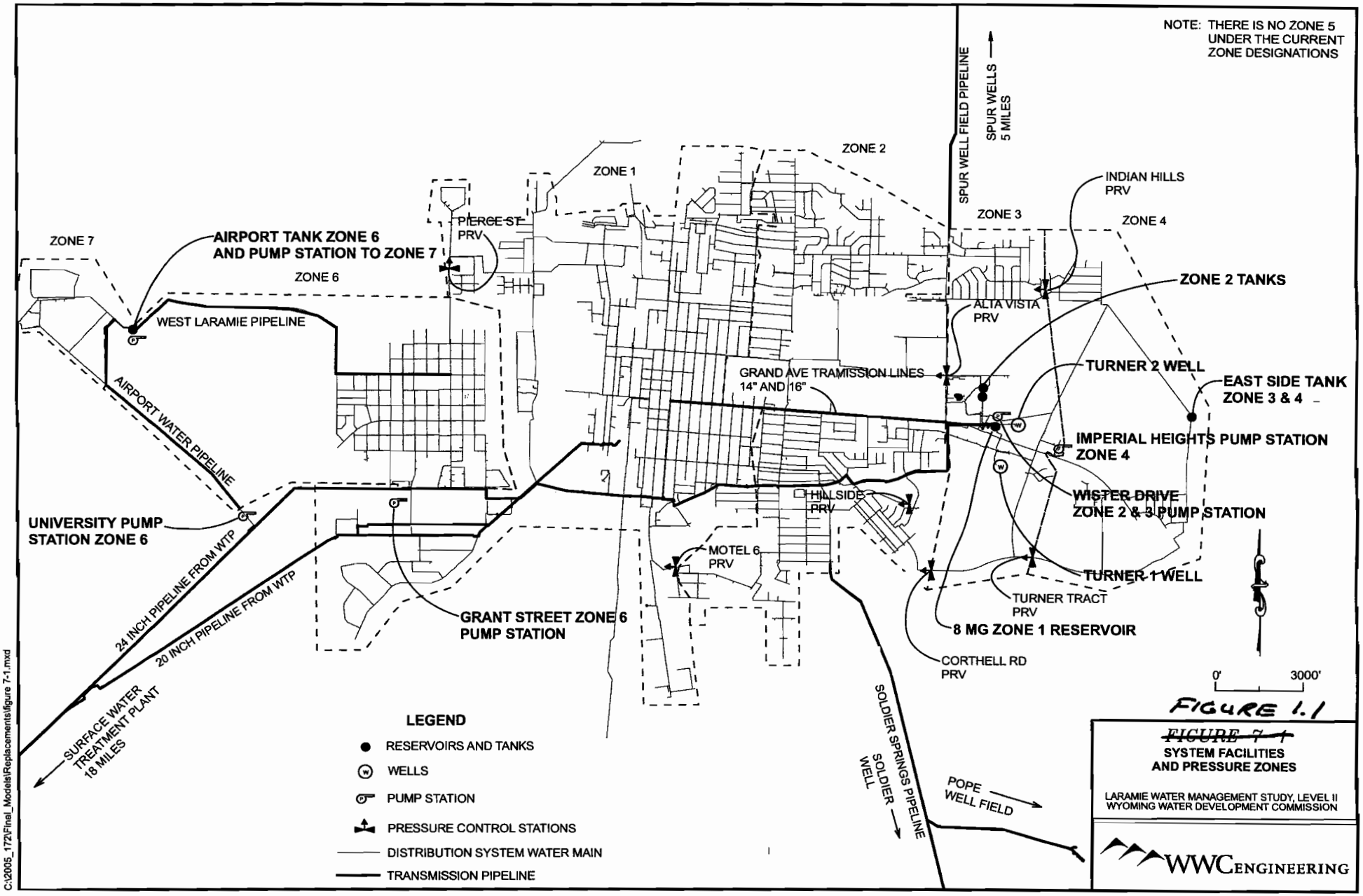
Table 9.1: Future tank, PRVs, and Pumps

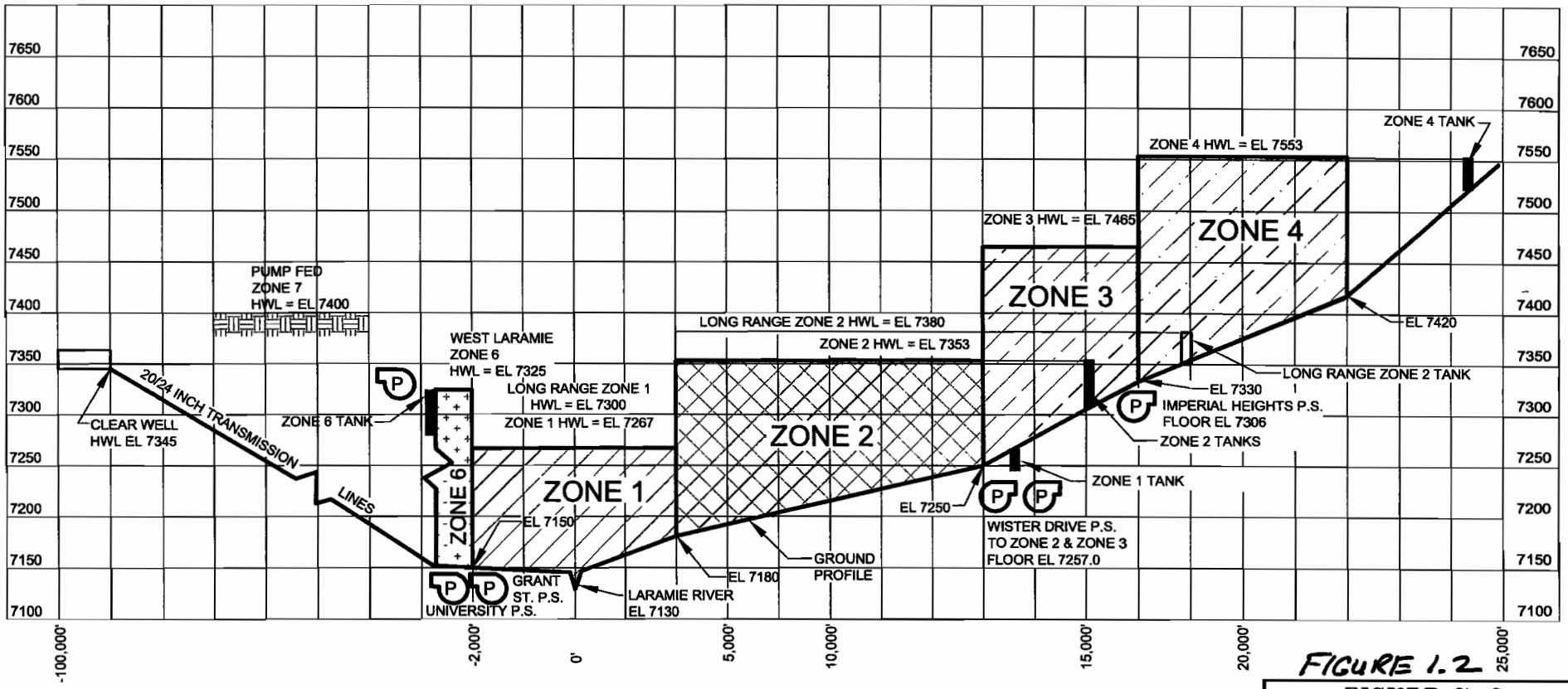
Pumps							
Node Name	Node #	Cufoff Head	Low Discharge	Mid Head	Mid Discharge	High Head	High Discharge
Future_Booster_Pump	5004	168	0	101	2100	24	6560
Future_Booster_Pump	5009	168	0	101	2100	24	6560

Tanks					
Node Name	Node #	Intial Elevation	Low Elevation	High Elevation	Tank Diameter
Future_Zone_2_Tank	4998	7353	7321	7353	75

PRVs		
Node Name	Node #	Pressure Setting
Future_PRV	4683	42
Future_PRV	4671	42


NOTE: THERE IS NO ZONE 5 UNDER THE CURRENT ZONE DESIGNATIONS
ZONE 7
ZONE 6
ZONE 1
ZONE 2
ZONE 3
ZONE 4
AIRPORT TANK ZONE 6 AND PUMP STATION TO ZONE 7
PIERCE ST PRV
WEST LARAMIE PIPELINE
AIRPORT WATER PIPELINE
UNIVERSITY PUMP STATION ZONE 6
24 INCH PIPELINE FROM WTP
20 INCH PIPELINE FROM WTP
SURFACE WATER TREATMENT PLANT 18 MILES
GRANT STREET ZONE 6 PUMP STATION
MOTEL 6 PRV
HILLSIDE PRV
GRAND AVE TRAMISSION LINES 14" AND 16"
SPUR WELL FIELD PIPELINE
SPUR WELLS 5 MILES
INDIAN HILLS PRV
ALTA VISTA PRV
ZONE 2 TANKS
TURNER 2 WELL
EAST SIDE TANK ZONE 3 & 4
IMPERIAL HEIGHTS PUMP STATION ZONE 4
WISTER DRIVE ZONE 2 & 3 PUMP STATION
TURNER 1 WELL
TURNER TRACT PRV
8 MG ZONE 1 RESERVOIR
CORTHELL RD PRV
SOLDIER SPRINGS PIPELINE
SOLDIER WELL
POPE WELL FIELD
0' 3000'
LEGEND
RESERVOIRS AND TANKS
WELLS
PUMP STATION
PRESSURE CONTROL STATIONS
DISTRIBUTION SYSTEM WATER MAIN
TRANSMISSION PIPELINE
FIGURE 1.1
~~FIGURE 7-1~~
SYSTEM FACILITIES AND PRESSURE ZONES
LARAMIE WATER MANAGEMENT STUDY, LEVEL II
WYOMING WATER DEVELOPMENT COMMISSION
WWC ENGINEERING
C:\2005_172\Final_Models\Replacements\figure 7-1.mxd

7E-20



HORIZONTAL SCALE = NOT TO SCALE

FIGURE 1.2

~~FIGURE 7-2~~

LARAMIE HYDRAULIC PROFILE
STATIC CONDITION

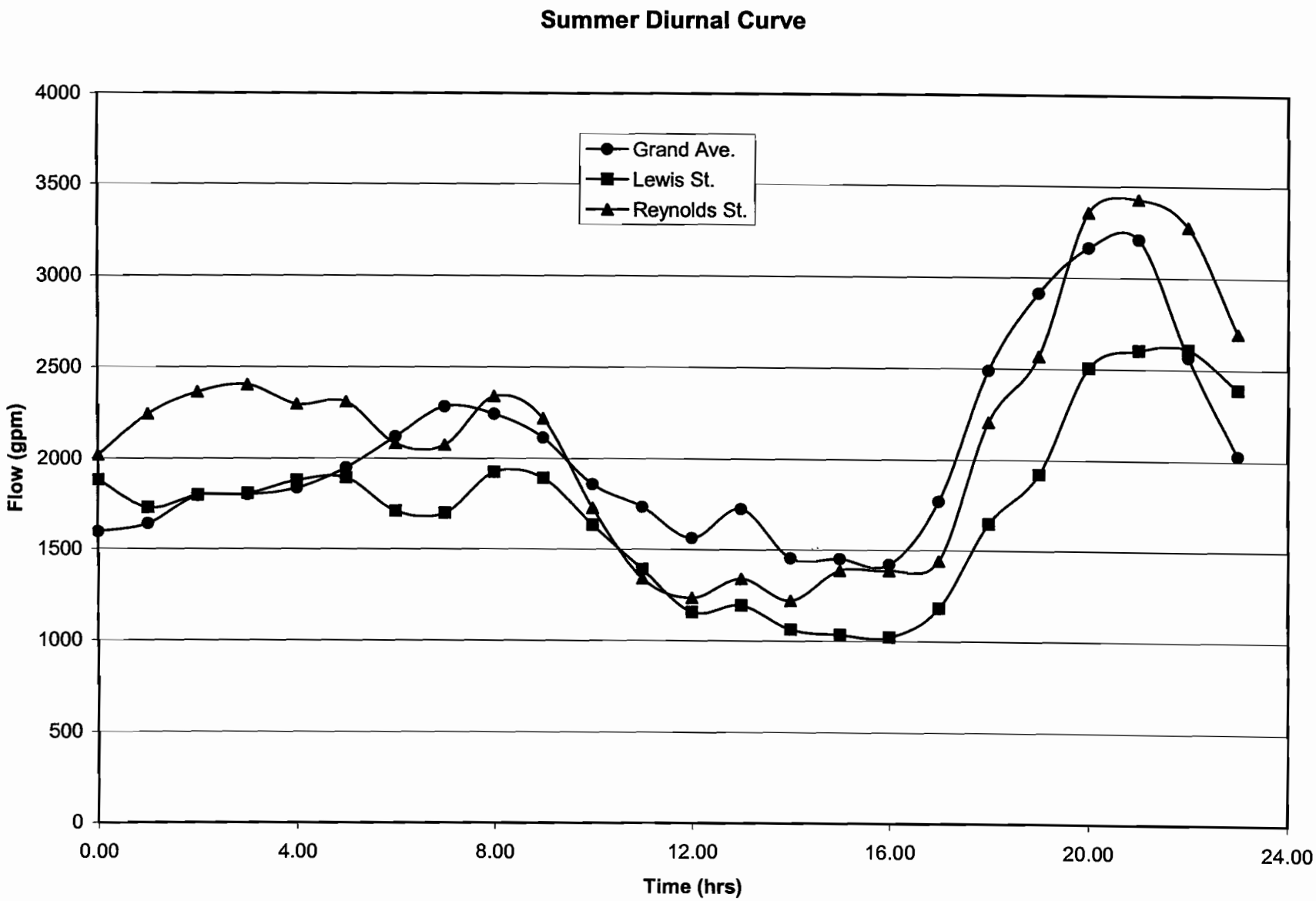
LARAMIE WATER MANAGEMENT STUDY, LEVEL II
WYOMING WATER DEVELOPMENT COMMISSION

WWC ENGINEERING

7E-21

K:\WWDC\005-172 Laramie\cad\hydraulic schematic\FIGURE_6-3.DWG, PHASE I - C-2, 9/11/2006 12:33:37 PM

Figure 6.1



K:\WWDC\2005-172 Laramie\tech_memos\Tech_memo_tables\Table 4 & Graph 1.xls

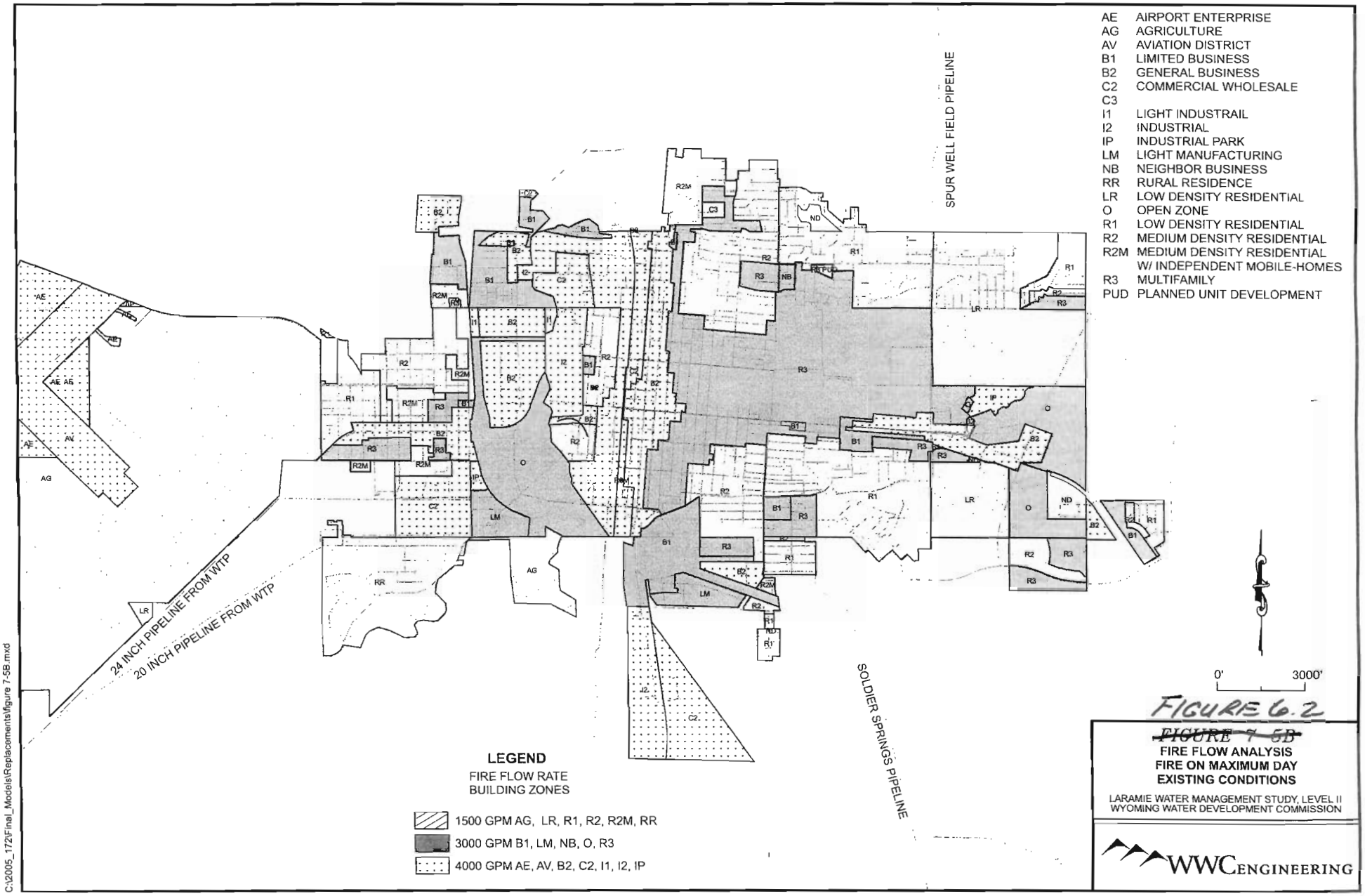


FIGURE 6.2

~~FIGURE 7-5B~~

FIRE FLOW ANALYSIS
FIRE ON MAXIMUM DAY
EXISTING CONDITIONS

LARAMIE WATER MANAGEMENT STUDY, LEVEL II
WYOMING WATER DEVELOPMENT COMMISSION

WWC ENGINEERING

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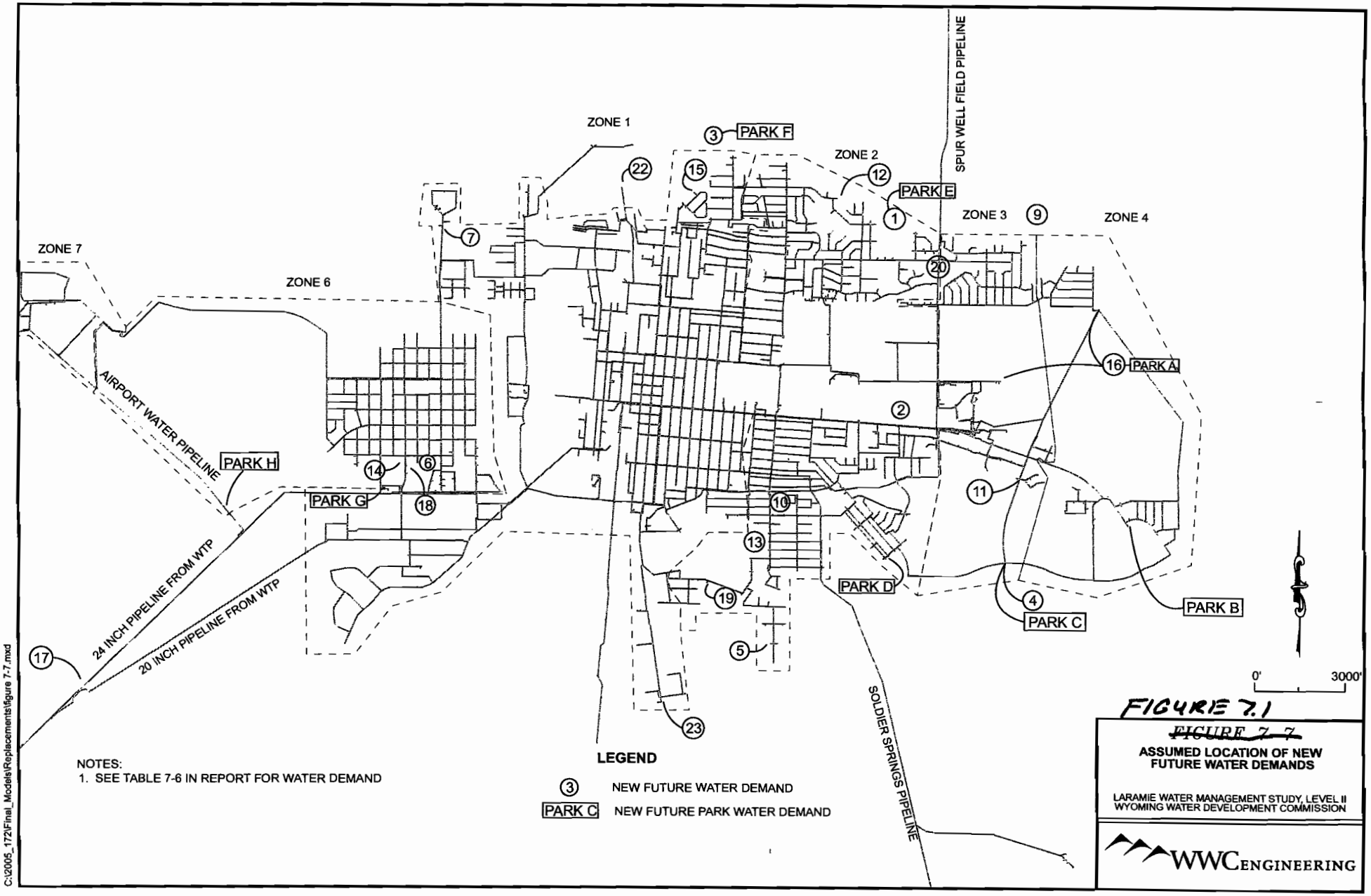


FIGURE 7.1

~~FIGURE 7-7~~

ASSUMED LOCATION OF NEW FUTURE WATER DEMANDS

LARAMIE WATER MANAGEMENT STUDY, LEVEL II
WYOMING WATER DEVELOPMENT COMMISSION

WWC ENGINEERING

7E-24

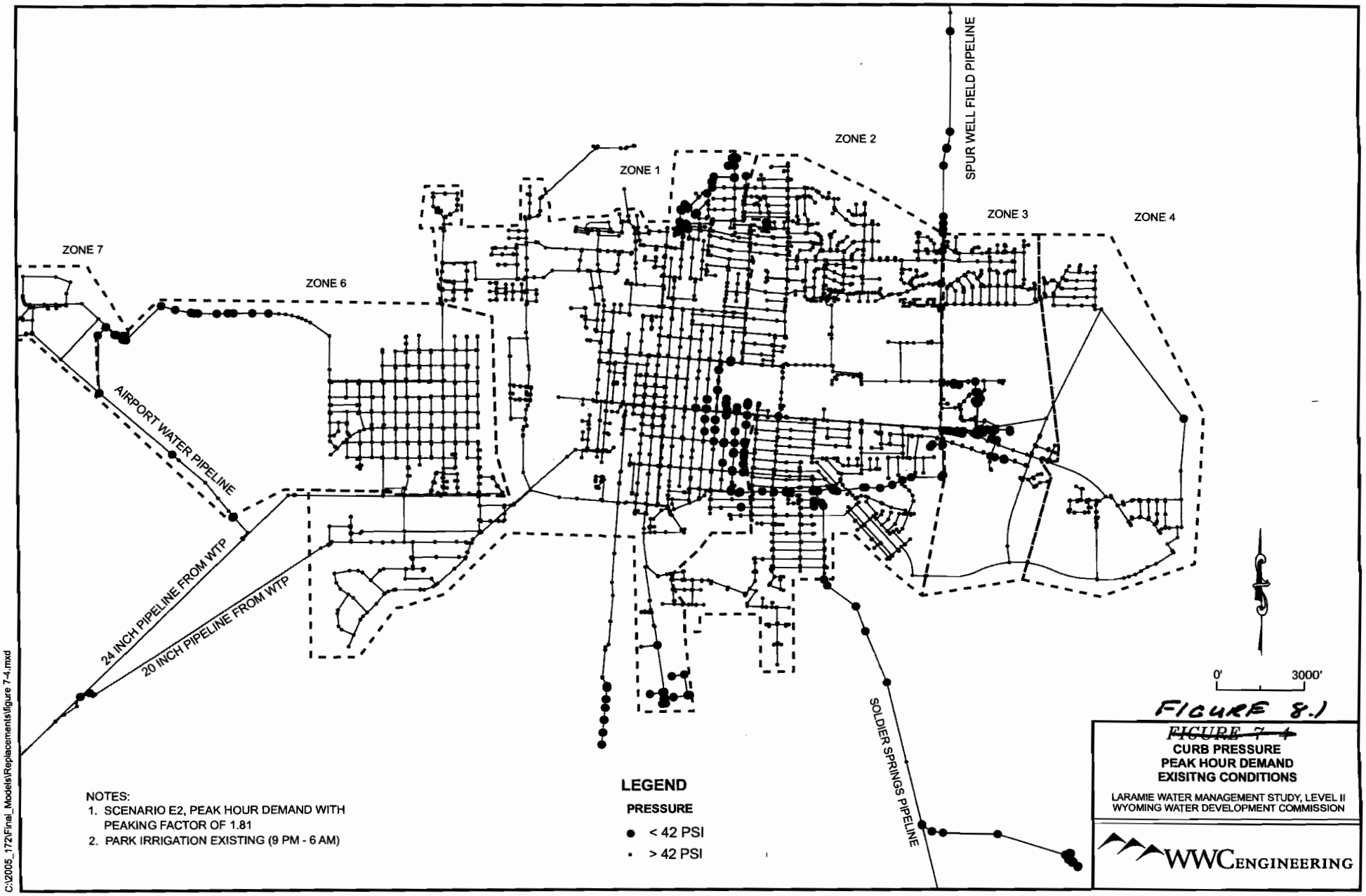


FIGURE 8.1

~~FIGURE 7-4~~

CURB PRESSURE
PEAK HOUR DEMAND
EXISITNG CONDITIONS

LARAMIE WATER MANAGEMENT STUDY, LEVEL II
WYOMING WATER DEVELOPMENT COMMISSION

7E-26

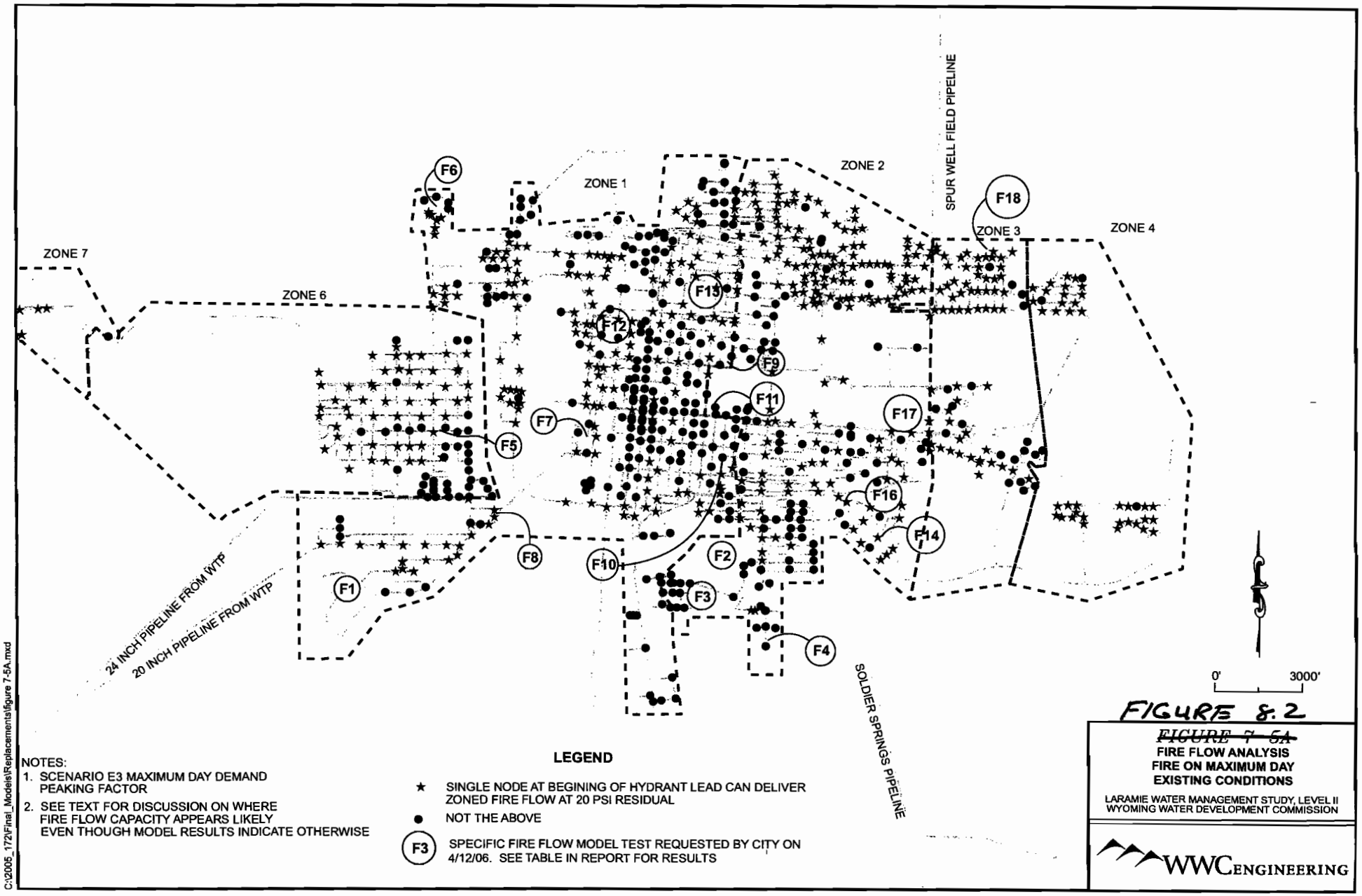
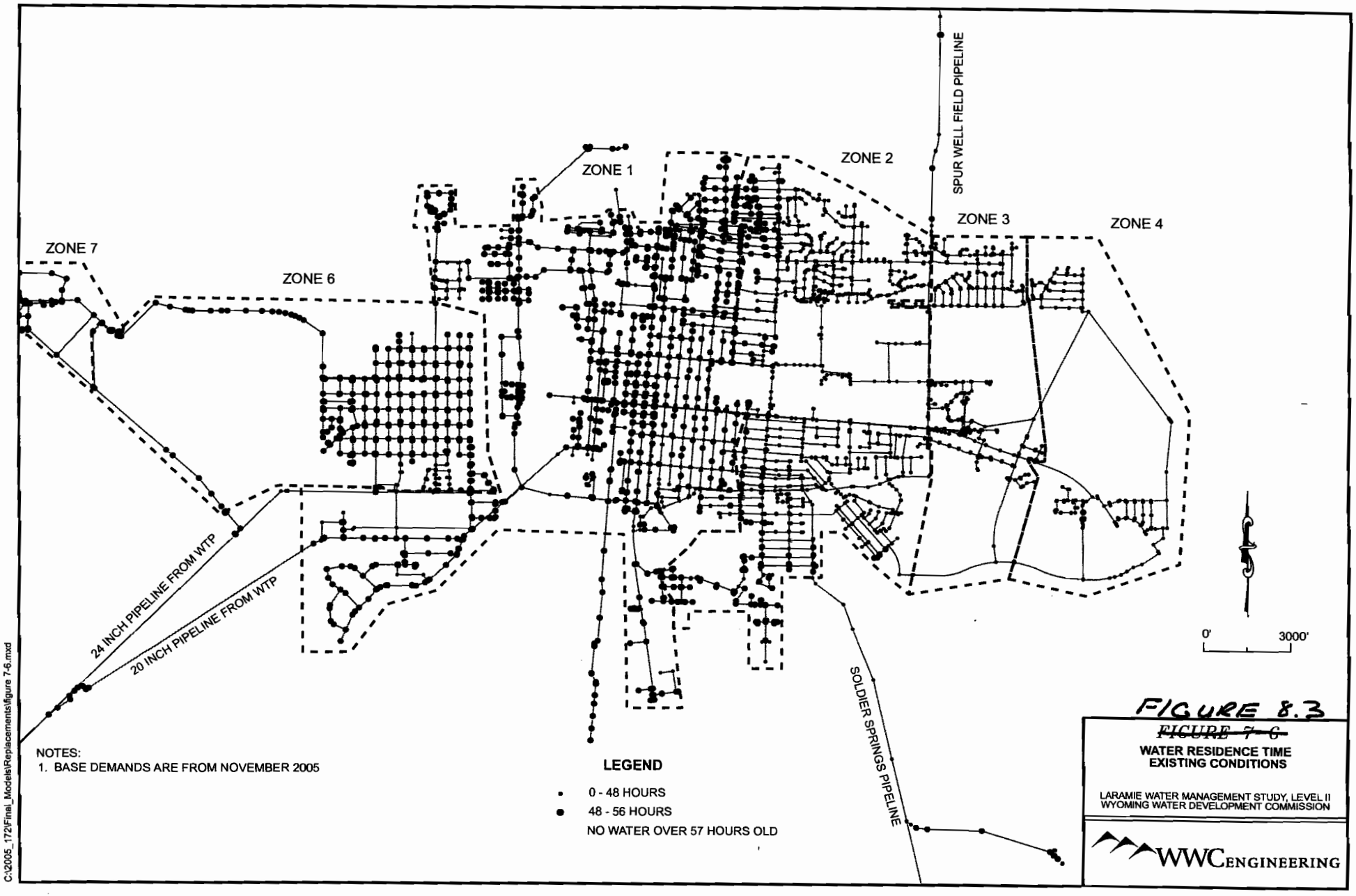


FIGURE 8.2

~~FIGURE 7-5A~~

FIRE FLOW ANALYSIS
FIRE ON MAXIMUM DAY
EXISTING CONDITIONS

LARAMIE WATER MANAGEMENT STUDY, LEVEL II
WYOMING WATER DEVELOPMENT COMMISSION



NOTES:
1. BASE DEMANDS ARE FROM NOVEMBER 2005

FIGURE 8.3
~~FIGURE 7-6~~
WATER RESIDENCE TIME
EXISTING CONDITIONS

LARAMIE WATER MANAGEMENT STUDY, LEVEL II
WYOMING WATER DEVELOPMENT COMMISSION

WWC ENGINEERING

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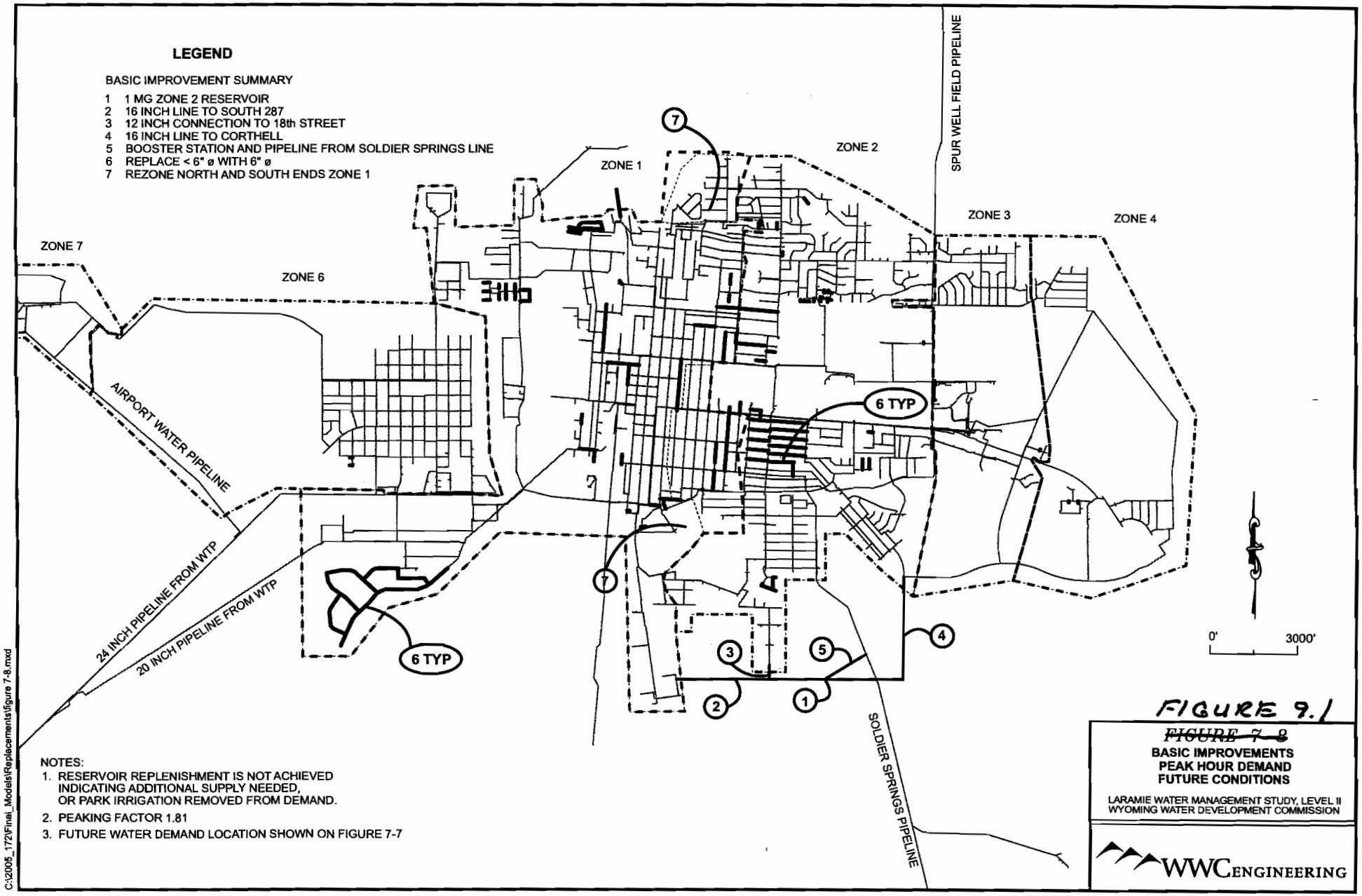
7E-27


LEGEND
BASIC IMPROVEMENT SUMMARY
1 1 MG ZONE 2 RESERVOIR
2 16 INCH LINE TO SOUTH 287
3 12 INCH CONNECTION TO 18th STREET
4 16 INCH LINE TO CORTHELL
5 BOOSTER STATION AND PIPELINE FROM SOLDIER SPRINGS LINE
6 REPLACE < 6" ø WITH 6" ø
7 REZONE NORTH AND SOUTH ENDS ZONE 1
ZONE 1
ZONE 2
ZONE 3
ZONE 4
ZONE 6
ZONE 7
SPUR WELL FIELD PIPELINE
AIRPORT WATER PIPELINE
24 INCH PIPELINE FROM WTP
20 INCH PIPELINE FROM WTP
SOLDIER SPRINGS PIPELINE
6 TYP
6 TYP
0'
3000'
NOTES:
1. RESERVOIR REPLENISHMENT IS NOT ACHIEVED INDICATING ADDITIONAL SUPPLY NEEDED, OR PARK IRRIGATION REMOVED FROM DEMAND.
2. PEAKING FACTOR 1.81
3. FUTURE WATER DEMAND LOCATION SHOWN ON FIGURE 7-7
FIGURE 9.1
~~FIGURE 7-8~~
BASIC IMPROVEMENTS
PEAK HOUR DEMAND
FUTURE CONDITIONS
LARAMIE WATER MANAGEMENT STUDY, LEVEL II
WYOMING WATER DEVELOPMENT COMMISSION
WWC ENGINEERING
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7E-28

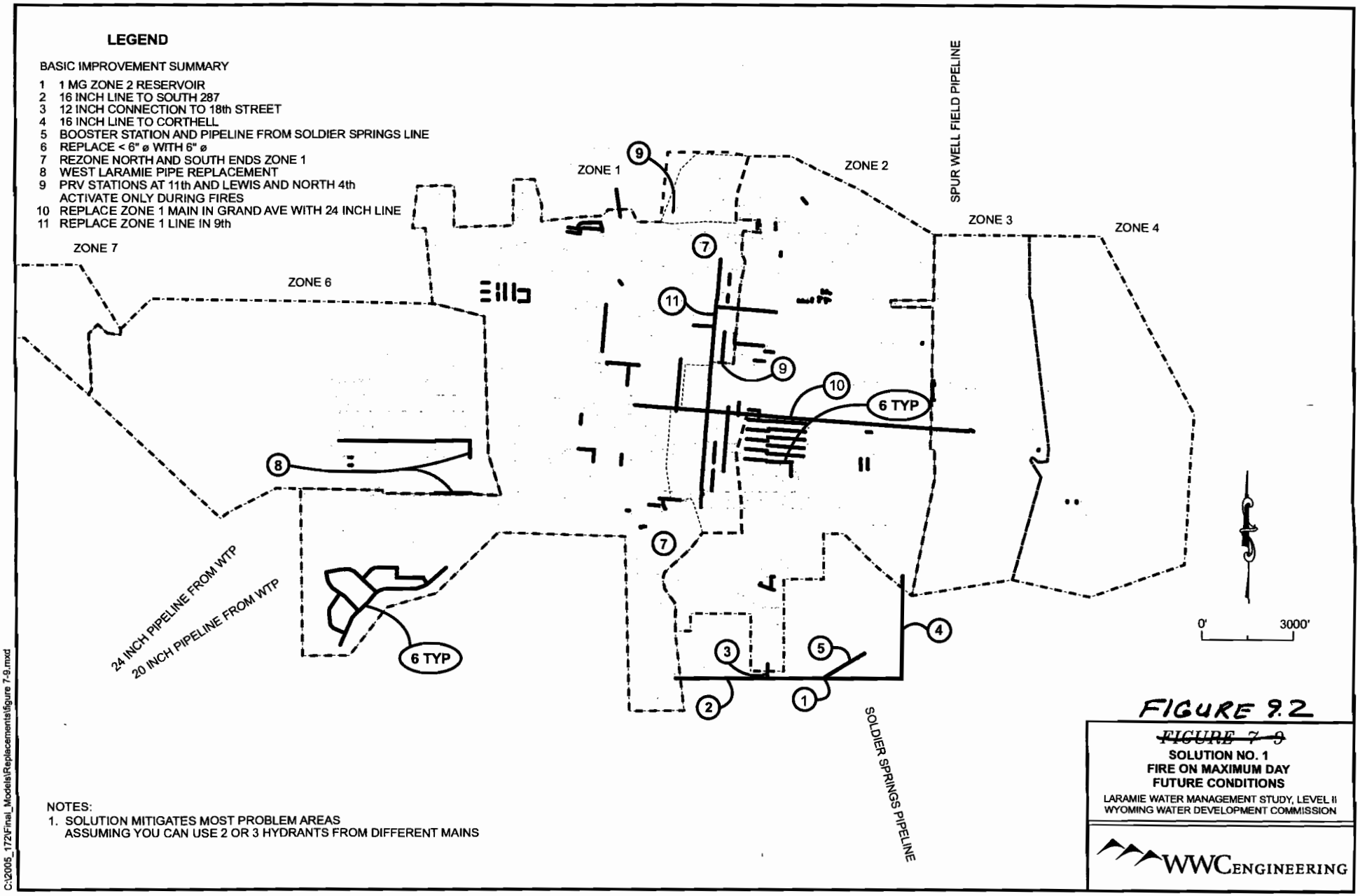


FIGURE 9.2

~~FIGURE 7-9~~

SOLUTION NO. 1
FIRE ON MAXIMUM DAY
FUTURE CONDITIONS

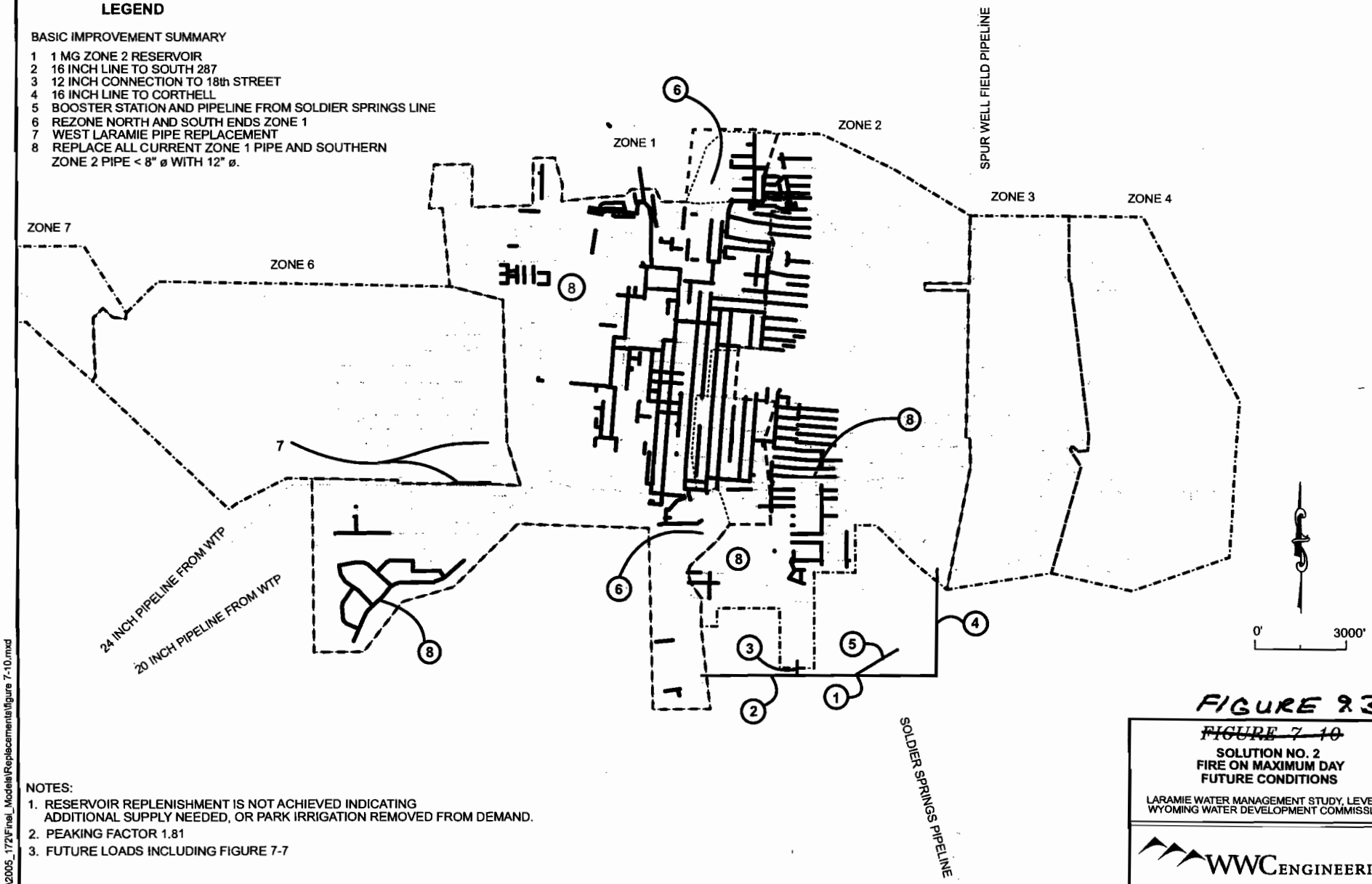
LARAMIE WATER MANAGEMENT STUDY, LEVEL II
WYOMING WATER DEVELOPMENT COMMISSION

7E-30

LEGEND

BASIC IMPROVEMENT SUMMARY

1 1 MG ZONE 2 RESERVOIR
2 16 INCH LINE TO SOUTH 287
3 12 INCH CONNECTION TO 18th STREET
4 16 INCH LINE TO CORTHELL
5 BOOSTER STATION AND PIPELINE FROM SOLDIER SPRINGS LINE
6 REZONE NORTH AND SOUTH ENDS ZONE 1
7 WEST LARAMIE PIPE REPLACEMENT
8 REPLACE ALL CURRENT ZONE 1 PIPE AND SOUTHERN ZONE 2 PIPE < 8" ø WITH 12" ø.



NOTES:
1. RESERVOIR REPLENISHMENT IS NOT ACHIEVED INDICATING ADDITIONAL SUPPLY NEEDED, OR PARK IRRIGATION REMOVED FROM DEMAND.
2. PEAKING FACTOR 1.81
3. FUTURE LOADS INCLUDING FIGURE 7-7

FIGURE 7.3

~~FIGURE 7-10~~

SOLUTION NO. 2
FIRE ON MAXIMUM DAY
FUTURE CONDITIONS

LARAMIE WATER MANAGEMENT STUDY, LEVEL II
WYOMING WATER DEVELOPMENT COMMISSION

WWC ENGINEERING

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8A
COST ESTIMATES

TABLE 8A-1 - LARAMIE RIVER PIPELINE

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)	LS		8%	$429,205
2	Pipe (Installed) - Assumes no rock excavation				
	36" ø C905	LF	22,527	$130.00	$2,928,500
	Excavation	LF	22,527	$55.00	$1,238,980
3	Fittings and Valves (% of pipe)	LS		10%	$292,850
4	Air Valves (includes vault)	EA	8	$25,000	$200,000
5	Blowoff Valve	EA	3	$10,000	$30,000
6	Control Valve	EA	1	$100,000	$100,000
7	Revegetation (Assume 100' corridor)	AC	58	$1,500	$87,000
8	Unlisted Items (% of Items 2-7)	LS		10%	$487,733
A	Construction Cost Subtotal				$5,365,063
B	Engineering Costs (% of A)			10%	$536,506
C	Subtotal (A+B)				$5,901,569
D	Contingency (% of C)			15%	$885,235
E	CONSTRUCTION COST TOTAL (C+D)				$6,786,805
F	Prepare Final Design and Specs (% of E)			10%	$678,680
G	Permitting and Mitigation			1%	$67,868
H	Legal Fees			1%	$67,868
I	Acquisition of Access and ROW				
	Construction Easement (100' Wide Corridor)	LF	23,000	$2	$46,000
	Permanent Easement (50' Wide Corridor)	LF	23,000	$4	$92,000
	PROJECT TOTAL COST				$7,739,221
	ROUNDED TOTAL COST				**$7,700,000**

TABLE 8A-2 - LARAMIE RIVER PIPELINE - NEW POINT OF DIVERSION

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)	LS		8%	$545,631
2	Pipe (Installed) - Assumes no rock excavation				
	36" ø C905	LF	26,527	$130.00	$3,448,510
	Excavation	LF	26,527	$55.00	$1,458,990
3	Fittings and Valves (% of pipe)	LS		10%	$344,851
4	Air Valves (includes vault)	EA	8	$10,000	$80,000
5	Blowoff Valve	EA	3	$5,000	$15,000
6	Control Valve	EA	1	$100,000	$100,000
7	Revegetation (Assume 100' corridor)	AC	68	$1,000	$68,000
8	River Diversion Dam (low)	LS	1	$385,000	$385,000
9	Bank/wet well structures				
	Pipes	LS	1	$50,000	$50,000
	Concrete Wet Well	LS	1	$50,000	$50,000
	Traveling Water Screen	LS	1	$100,000	$100,000
	Intake Headwall Gates, Sediment Chamber	LS	1	$100,000	$100,000
10	Unlisted Items (% of Items 2-9)	LS		10%	$620,035
A	Construction Cost Subtotal				$6,820,386
B	Engineering Costs (% of A)			10%	$682,039
C	Subtotal (A+B)				$7,502,425
D	Contingency (% of C)			15%	$1,125,364
E	CONSTRUCTION COST TOTAL (C+D)				$8,627,788
F	Prepare Final Design and Specs (% of E)			10%	$862,779
G	Permitting and Mitigation			1%	$86,278
H	Legal Fees			1%	$86,278
I	Acquisition of Access and ROW				
	Construction Easement (100' Wide Corridor)	LF	26,500	$2	$53,000
	Permanent Easement (50' Wide Corridor)	LF	26,500	$4	$106,000
	PROJECT TOTAL COST				$9,822,123
	ROUNDED TOTAL COST				**$9,820,000**

9A
IRRIGATION AUDITS

City of Laramie, Wyoming Parks Irrigation "Audit"

Prepared by:
Wyss Associates, Inc.
Rapid City, South Dakota

Introduction

Americans have always valued the beauty and functions of our landscapes. Billions of dollars are invested annually on the enhancement and maintenance of our landscapes. With water consumption becoming a serious issue in western states, the need for water conservation is paramount. Cities need to save and extend their water supplies and protect water quality while enabling citizens to maintain healthy, functional and appealing landscapes. The City of Laramie has the opportunity to be a leader in demonstrating sound irrigation practices and educating the public about water conserving irrigation methods. Turf and landscape irrigation is one of the most visible uses of water in an urban setting and the City must demonstrate their understanding and value of the resource and the technology that delivers it.

This appendix presents the findings of a brief study of irrigation practices within several Laramie parks and makes recommendations to the improvement of irrigation practices, water conservation opportunities, and overall operation of the irrigation systems within the parks studied. The city parks that were reviewed for the study were Optimist Park, Scout Park, Undine Park and Washington Park. While not reviewed, the University of Wyoming has several large open green spaces where the recommendations within this report can be implemented to help conserve water resources on the campus. Also, while the golf courses were not reviewed, Best Management Practices (BMPs) for golf courses are included with this report. These Irrigation BMPs can be applied as applicable to the golf courses located in Laramie.

Approach

In the fall of 2005, Wyss Associates, Inc. conducted a site study of the previously mentioned city parks to review the existing irrigation systems and their operation. While not a comprehensive or formal irrigation audit, the site study reviewed several irrigation issues such as irrigation head types, irrigation head placement, types of irrigated zones (i.e. turf, shaded areas, sports areas, planting beds, etc.), controllers, water supply and distribution, and overall operation of the systems.

After all the sites were reviewed, overall Best Management Practices (BMPs) for the irrigation systems were developed for implementation by the City of Laramie when prudent and practical for the City. These Irrigation BMPs will help conserve water, reduce long-term annual operating costs, reduce irrigation runoff, and help reduce soil erosion.

General Findings

During the review of the park sites, very similar issues were encountered in most of the parks. Some of the more common issues were:

1. Improper placement of irrigation heads.
2. Overspray onto surrounding pavements or over walkways.

3. Improper setting height of irrigation heads.
4. No separation of irrigation zones for different irrigation requirements within the parks.
5. Aging irrigation equipment including controllers, heads, and backflow devices.
6. Some of the parks, at the time of the study, did not have metering devices on the irrigation systems.
7. Pressure regulation was not observed on any of the systems reviewed.
8. Low head drainage (Scout Park)

With the implementation of sound irrigation design, operation, maintenance practices, and the resolution of the above issues, the City of Laramie will be able to dramatically reduce water use for irrigation while still providing well maintained and visually attractive park settings throughout the city.

Irrigation Review of Specific Laramie Parks

Kiwanis Park

A review of the irrigation system was held at Kiwanis Park and the following irrigation issues were noted:

1. A rain sensor was present on the system for Kiwanis Park.
2. No water regulating devices were installed on the system.
3. The types of heads present in the park are pop-up impact rotors. No separate watering zones were noted throughout the park. All areas in the park receive the same type of irrigation watering.
4. A large number of the heads are set too low in the turf and the turf is interfering with their spray pattern.
5. The park contains 18 irrigation stations with a 4 day per week programming with run time of 23 minutes per station.
6. According to the Irrigation Utilization Reports for the past 10 years, the average annual water usage for irrigation in Kiwanis Park is 5.044 MG per year.

Washington Park West/East

The following observations were made at Washington Park East/West:

1. This park has some very distinctly different irrigation needs. One the west side of the park a mature tree canopy shades much of the park. On the east side of the park, there are sports fields in full sun with very different watering needs.
2. No water regulating devices were installed on the system.
3. The heads present were pop-up impact heads. It does not appear that watering zones are differentiated between sunny areas vs. shady areas or lawn areas vs. landscaped areas.
4. The irrigation head placement allows irrigation to cross paved walking areas.
5. Again a number of the heads are set too low and the grass is affecting the spray patterns.
6. The west side of the park contains 18 irrigation stations with run time set at 30 mins per zone. The east side of the park contains 10 irrigation stations with run time set at 27 mins per zone.
7. The park uses approximately 9.0 MG per year total.

Scout Park

The following observations were made at Scout Park:

1. Scout Park is a fairly new park and is primarily wide open. The park is mostly sports turf for soccer fields with some lower lying areas used for storm water detention purposes.
2. No water regulating devices were installed on the system.
3. The heads present were a newer style gear driven rotor.
4. It was noted that the system layout did not account for grade changes from the road down to the field levels. Because of this, there is water loss due to head seepage from high areas to the lower areas.
5. Again a number of the heads are set too low and the grass is affecting the spray patterns.
6. Scout Park (#1) contains 23 irrigation stations with run time set at 30 mins per zone.
7. According to the Irrigation Water Utilization Reports for the last 5 years, the park uses on average approximately 5.075 MG per year.

Turf and Landscape Irrigation Best Management Practices (T&L BMPs)

Recently, the Irrigation Association has developed a set of turf and landscape irrigation BMPs for use in a wide range of activities from policy making to implementation of sound irrigation practices. The definition of a turf and landscape irrigation BMP is "a voluntary irrigation practice that is designed to reduce water usage and protect water quality. A turf and landscape irrigation BMP is economical, practical, and sustainable and maintains a healthy, functional landscape without exceeding the water requirements of the landscape."

The five Turf and Landscape Irrigation Best Management Practices include:

1. **Assure Overall Quality** of the Irrigation System;
2. **Design** the Irrigation System for the Efficient and Uniform Distribution of Water;
3. **Install** the Irrigation System to Meet the Design Criteria;
4. **Maintain** the Irrigation System for Optimum Performance; and\
5. **Manage** the Irrigation System to Respond to the Changing Requirement for Water in the Landscape.

T&L BMP 1 - Assure Overall Quality of the Irrigation System

The purpose of an irrigation system is to provide supplemental water when rainfall is not sufficient to maintain the turf and landscape for its intended purpose. A quality irrigation system and its proper management are required to distribute supplemental water in a way that adequately maintains plant health while conserving and protecting water resources and the environment. Assuring the overall quality of the system requires attention to system design, installation, maintenance and management, in particular:

1. The irrigation system shall be designed to be efficient and to uniformly distribute the water.
2. The irrigation system shall be installed according to the irrigation design specifications.
3. The irrigation system shall be regularly maintained to preserve the integrity of the design and to sustain efficient operation.
4. The irrigation schedule shall be managed to maintain a healthy and functional landscape with the minimum required amount of water.

Recommendations

1. Encourage the use of qualified irrigation designers when designing new or renovating existing irrigation systems in the City's parks and open spaces.

2. Perform routine inspections and maintenance of existing irrigation systems.

3. Implement technologies that allow for controller programming to respond to changing need for water in the landscape such as rain sensors, soil moisture probes, weather stations (for larger systems), central control systems, etc.

4. Encourage the requirement of using qualified irrigation contractors for the installation and maintenance of new and existing irrigation systems.

T&L BMP 2 - Design the Irrigation System for the Efficient and Uniform Distribution of Water

The irrigation system shall be designed to be efficient and to uniformly distribute the water. Specific criteria that shall be considered in the design include soil type, slope, root depth, plant materials, microclimates, weather conditions and water source (e.g., quantity, quality and pressure). To conserve and protect water resources, the irrigation designer shall select appropriate equipment components that meet state and local code requirements and site requirements.

Recommendations

1. Design irrigation systems to consider the direct conditions of the site such as soil types, sun exposure, wind conditions, topography, and specific vegetation requirements.

2. Meet all applicable state and local codes including plumbing and electrical codes.

3. Specify manufacturer, model, type, and size of all components to eliminate ambiguity at construction and to facilitate management of the system. The selection of pipe, electrical wire and other materials shall be based on design parameters, environmental conditions and code requirements.

4. Apply the following rules of maximum safe flow rate for municipal water suppliers with the lowest safe flow rate prevailing as the design guideline:

    a. The maximum allowable pressure loss through the meter should be less than 10% of the static pressure at the meter.
    b. The maximum flow rate through the meter should not exceed 75% of the maximum safe flow rate through the meter.
    c. The velocity of water through the service line supplying the meter should not exceed 7.5 feet per second (fps).
    d. Select main and lateral pipe sizes so that the velocity of water moving through the irrigation pipe does not exceed state and local requirements, or the industry standard of 5 fps.

5. Specify protection of the water source in accordance with state and local requirements. Where no requirements exist, assess the degree of hazard and specify the appropriate backflow prevention device.

6. For commercial installations, specify a metering device that measures the total landscape water use separate from other use. For residential installations, a separate metering device is recommended.

7. For systems on a municipal supply, allow for a reduction in static pressure of up to 10 psi to accommodate possible expansion in the supply network.

8. Specify pressure regulation where variable or excessive static pressure exists.

9. Specify the recommended operating (working) pressure at the maximum design flow rate of the system.

10. Design the layout of heads and other emission devices for zero overspray across or onto a street, public driveway or sidewalk, parking area, building, fence, or adjoining property. Overspray may occur during operation of the irrigation system due to actual wind conditions that differ from the design criteria.

11. Design sprinkler head spacing with a minimum of "head-to-head" coverage (minimum 50% of diameter) unless the coverage is designed for wind de-rating. Wind derating should be based on wind criteria for the time period that the system is normally run, typically nighttime.

12. Use separate station/zones (hydrozones) for areas with dissimilar water or scheduling requirements.

13. When selecting system components, place a high priority on avoiding surface runoff. Select components to keep the sprinkler precipitation rate below the infiltration rate of the soil and/or use repeat cycles to allow the water to soak into the root zone. Separate station/zones for sprinklers at the top and toe of sloped areas.

14. Locate sprinkler heads based on a thorough evaluation of physical, environmental, and hydraulic site conditions, including typical wind conditions during the normal irrigation period.

T&L BMP 3 - Install the Irrigation System to Meet the Design Criteria

The irrigation system shall be installed according to the irrigation design specifications. To conserve and protect water resources, the installed components shall meet the irrigation design specifications, manufacturer's specifications, and state and local code requirements. The installation shall result in an efficient and uniform distribution of the water. The irrigation contractor or installer shall be licensed (and certified where applicable) and insured.

T&L BMP 4 - Maintain the Irrigation System for Optimum Performance

The irrigation system shall be regularly serviced to maintain the performance of the system as designed. To conserve and protect water resources and the environment, the serviced components shall meet the irrigation design specifications, manufacturer's specifications, and state and local code requirements. The maintenance shall result in sustaining an efficient and uniform distribution of the water. The maintenance contractor, owner, manager, or irrigation contractor shall be licensed (and/or certified where applicable) and insured.

Recommendations

1. Establish a periodic maintenance schedule for inspection and reporting performance conditions to the end-user (or owner) of the irrigation system. Report any deviations from the original design. Create a station/zone map for ease of system inspection and controller programming.

2. Periodically review the system components to verify that the components meet the original design criteria for efficient operation and uniform distribution of water:

    a. Verify that the backflow prevention device is working correctly.
    b. Verify that the water supply and pressure are as stated in the design.
    c. Verify that pressure regulators are adjusted for desired operating pressure.
    d. Examine filters and clean filtration elements as required.
    e. Verify proper operation of the controller. Confirm correct date/time input and functional back-up battery.
    f. Verify that sensors used in the irrigation system are working properly and are within their calibration specifications.
    g. Adjust valves for proper flow and operation. Adjust valve flow regulators for desired closing speed.
    h. Verify that heads are properly adjusted – nozzle size, arc, radius, level and attitude with respect to slope.
    i. Repair or replace broken hardware and pipe; restore the system to its design specifications.
    j. Complete repairs in a timely manner to support the integrity of the irrigation design and to minimize the waste of water.
    k. Record any deviations from the original design.
    l. Test all repairs.

3. Ensure that the replacement hardware used for system repairs matches the existing hardware, and is in accordance with the design. Aftermarket replacement nozzles may not match original parts well enough to preserve distribution uniformity and the precipitation rate. Conduct a performance audit every three to five years to assure that the system is working efficiently and with the desired DULQ and precipitation rate specifications.

4. As plant material matures, trim or remove vegetation as required to preserve system performance. Add additional sprinklers or other hardware as required to compensate for blocked spray patterns or changes in the irrigation needs of the landscape. Ensure that system modifications are in keeping with design specifications and do not cause landscape water demand to exceed the hydraulic capacity of the system.

5. Establish a "winterization" protocol (if required) and a corresponding process for system activation in the spring.

T&L BMP 5 - Manage the Irrigation System to Respond to the Changing Requirement for Water in the Landscape

To conserve and protect water resources and the environment, the irrigation schedule shall be changed as required to provide supplemental water to maintain a functional and healthy turf and landscape with the minimum required amount of water.

Recommendations

1. Create a site map showing, at a minimum, the location of each point of connection water meter, backflow prevention device, controller, station/zone valves, and landscape area served by each valve.

2. Ensure that a dedicated irrigation water meter has been installed for measuring both the irrigation water flow rate and the volume applied to the landscape. To facilitate managing irrigation water use, the water meter should have an electronic flow rate output signal for interfacing with a remote display or to controllers that can perform leak detection and water management.

3. Periodically, verify that sensors and other components in the irrigation system are working properly. Inspect the irrigation system during operation.

4. Periodically, visually verify that the plant material is healthy and that soil moisture is adequate. Use a soil probe to evaluate root depth, soil structure and moisture.

5. Adjust the watering times (number of minutes) and the frequency of watering (daily, twice a week, etc.) based on weather conditions.

6. Change your settings to adjust for seasonal differences and reset the timer when needed.

7. Make sure spray and sprinkler heads are properly adjusted to avoid watering pavements and other non-landscape areas.

8. Develop a separate drip watering schedule for trees, shrubs and flower beds.

9. Aerate in the spring and fall to loosen soil and reduce runoff

Considerations for Golf Course Irrigation Systems

Due to their high visibility and unique water needs, golf courses often become targets of criticism when discussing water conservation and water usage. For many years, the golf industry has been researching ways to reduce water use and become less reliant on potable water use for the irrigation of golf courses. The golf industry has taken a multi-faceted approach to the issue, including the development of 1) new grass varieties that use less water and are able to withstand poor water quality; 2) new technologies that improve the efficiency of the irrigation system; 3) "best management

practices" in golf course maintenance that result in less water use; 4) alternative water sources that reduce or eliminate the use of potable water; 5) design concepts that minimize the area maintained with grasses that require considerable use of water; and 6) programs that educate golf course superintendents and other water users about water conservation opportunities.

Improved Grasses That Require Less Water

Several improved cultivars of buffalograss (Buchloe dactyloides), a native of the American Great Plains, have been developed by turfgrass breeders at the University of Nebraska. Buffalograss can replace high water use grasses on fairways and roughs in a large geographic area of the Mid-West, resulting in water savings of 50% or more.

The use of alternative grasses in fairways and roughs should be encouraged wherever possible to help reduce the water demand of golf courses in Laramie.

Best Management Practices for Golf Course Irrigation

Best Management Practices for water conservation could be described as the combination of proper plant selection and cultural maintenance practices that provide adequate turf quality while minimizing water use. These could include:

1. Selecting low-water-use turfgrasses, groundcovers, shrubs and trees for use on the course.

2. Providing adequate levels of nutrients to the turf, including a balance of potassium and nitrogen, while avoiding excessive levels of nitrogen.

3. Using mulches in shrub and perennial beds to reduce water evaporation losses.

4. Adjusting mowing heights to the ideal levels, depending on the species and seasonal water use characteristics.

5. Using soil cultivation techniques such as spiking, slicing and core aerification to improve water infiltration and minimize runoff during irrigation and rain events.

6. Improving drainage where needed to improve turf quality and health.

7. Limiting cart traffic to paths to minimize turf wear and limit soil compaction.

8. Cycling irrigation sessions to ensure good infiltration and minimize runoff.

Golf Course Design Concepts that Save Water

There are many innovative golf design concepts being implemented today to help save water.

1. Careful earth shaping and good drainage design is used to collect runoff and sub-surface drainage water in on-site storage lakes.

2. Turfed areas and water-demanding landscape areas are kept to a minimum, resulting in water savings off 50% or more.

3. The use of native grasses in golf course rough areas are becoming more prevalent helping to reduce the overall water budget of the golf course.

With the implementation of the above golf course BMPs, significant water savings can be realized on the golf courses in Laramie.

Review of Potential Irrigation Saving Practices

This review will focus on a few of the Laramie parks studied during the site visits in the Fall of 2005. Costs of each water savings measure will be presented along with a potential water savings volume for each measure and a total estimated water savings for each park reviewed here. These figures can easily translate to the other major open spaces within Laramie.

Several water savings measures were investigated and they include: water pressure regulators, irrigation controller updates, rain shut off sensors, soil moisture sensors, creation of "hydrozones" within the parks, and routine maintenance & system adjustment.

Water Pressure Regulators

Irrigation systems are typically designed to run most efficiently at a certain water pressure. For example spray heads are most efficient at around 30 psi of water pressure, rotor heads are most efficient with 60-80 psi. There are two ways to regulate pressure on an irrigation system, one is control the entire system with a water pressure regulating valve at the point of connection and the other is by using pressure regulating valves on each zone. If the system has a combination of spray heads and rotor heads, both types of pressure regulation may be needed to ensure optimum performance of the system.

For every 5 psi reduction in pressure, the water usage can be reduced by 6-8%. For example if a system is running at 85 psi and is reduced to an optimum 70 psi, the potential water saving is 18-24%. The costs and savings for specific parks are listed below:

Park	Cost of Measure	Total Avg. MG/yr	Potential % Saved	Total Saved MG
Kiwanis	$1300	5.044 MG	18%	.90 MG/yr
Undine	$1000	5.097 MG	18%	.92 MG/yr
LaPrele	$1000	5.101 MG	18%	.92 MG/yr
Washington East	$750	3.312 MG	18%	.60 MG/yr
Washington West	$1300	5.619 MG	18%	1.01 MG/yr

Irrigation Controller Updates

The installation of newer technology controller with built-in water saving measures is an excellent way to control the amount of water applied for irrigation purposes. The following water saving features should be considered when selecting a new controller:

1. Multiple start times – allows several shorter and more precise run times to reduce run-off.

2. Multiple independent programs – allows the watering schedule to be divided into smaller, more precise watering schedules for different "hydro zones" depending on sun exposure, plant materials, etc.
3. Water Budget features – allows the adjustment of the watering schedules.
4. Rain Delay – allows the schedule to be paused during rain events/periods and allows the program to resume when appropriate. This can also be controlled by a Rain Sensor.
5. Cycle/Soak capability – applies water at a rate according to the soils ability to absorb and retain it. This helps reduce runoff and over watering.

The costs and savings for specific parks are listed below:

Park	Cost of Measure	Total Avg. MG/yr	Potential % Saved	Total Saved MG
Washington East	$1500	5.044 MG	10%	.50 MG/yr
Washington West	$3500	5.097 MG	15%	.76 MG/yr

Rain Shut-off and Soil Moisture Sensors

Adding an automatic shut-off device can result in a 15-20% in water savings over the course of a watering season. Every irrigation system within the City of Laramie should have a rain shut-off or soil moisture sensor installed on the system. Rain shut-off sensors are fairly inexpensive and should be able to be installed for around $300 to $400 per system. Soil moisture sensors and controls are more expensive to install and probably only make sense on larger irrigation systems for the larger Laramie Parks. Systems with soil moisture sensors can expect to save around 30-50% of an irrigation budget. These systems range from $2,500 to $6,000 to install on an existing system. The costs and water savings for specific parks are listed below:

Rain Shut-off Sensors

Kiwanis	Existing	5.044 MG	0%	0 MG/yr
Optimist	$400	3.750 MG	15%	.56 MG/yr
Undine	$400	5.097 MG	15%	.76 MG/yr
LaPrele	$400	5.101 MG	15%	.77 MG/yr
Scout #1	$400	5.075 MG	15%	.76 MG/yr
Washington East	$400	3.312 MG	15%	.50 MG/yr
Washington West	$400	5.619 MG	15%	.84 MG/yr

Soil Moisture Sensors

Park	Cost of Measure	Total Avg. MG/yr	Potential % Saved	Total Saved MG
Kiwanis	$4000	5.044 MG	30%	2.02 MG/yr
Optimist	$2500	3.750 MG	40%	1.50 MG/yr
Undine	$2500	5.097 MG	50%	2.55 MG/yr
LaPrele	$5500	5.101 MG	40%	2.04 MG/yr
Scout #1	$3000	5.075 MG	30%	1.52 MG/yr
Washington East	$3000	3.312 MG	30%	.99 MG/yr
Washington West	$4000	5.619 MG	50%	2.81 MG/yr

Hydro-zone Creation

The separation of irrigation zones into areas of different irrigation requirements makes a lot of sense in a number of parks reviewed in Laramie. For example, Washington Park has very different irrigation needs from the area of the park that has mature trees versus the wide open lawn areas. The separation of the irrigation programs to accommodate these different water requirements can save up to 30% water usage. Generally speaking, the irrigation system should be able to be run 30% less were there is mature tree cover. Currently, the zones within the park are all set to run at 30 mins per zone regardless of where the zones are within the park. Changing to a "hydro-zone" concept should be able to be implemented at little to no cost. Other parks where this concept could be used are in LaPrele Park, Undine Park, Kiwanis Park, and Optimist Park. Other parks may also be able to incorporate this measure with little or no cost while providing the desired appearance for the park.

Routine Maintenance & Adjustment

The continued maintenance and adjustment of the irrigation systems should be already incorporated into the workload of maintaining Laramie's parks. However, this may need to be formalized into specific tasks, items to review, and formalized schedules for reviewing the irrigation systems. The following items should be reviewed during these irrigation reviews for each specific park:

1. Adjustment of Delivery Angle – make sure the heads aren't spraying onto adjacent paved surfaces to reduce runoff and wasted water.
2. Adjustment to Vertical – Make sure the heads are set to vertical. The irrigation head's distribution patterns change when the head tilts off vertical alignment.
3. Adjust Head Height – A common problem noticed was heads being set too low in the turf and the turf affecting the irrigation pattern and throw.
4. Replace Worn Nozzles/Heads – A worn nozzle can have a dramatic effect on the distribution pattern and quantity of water used. These should be reviewed periodically to make sure every head is performing optimally.
5. Maintain Proper Pressure – setting the system and/or zones to run at their optimum pressure reduces misting, the "donut effect" and other inefficient water delivery. The use of a pressure regulating valve at the point of connection and/or pressure regulating control valves will help ensure efficient water use.
6. Replace Leaky Valves – Over time, valves become worn and lose their sealing capability and may need maintenance to reduce leaking when they are shut down.

Summary

Through the review of the existing irrigation systems and the implementation of the Turf and Landscape Best Management Practices (T&G BMPs) and the Golf Course Irrigation BMPs, the City of Laramie can realize significant reduction of water usage for irrigation within its city parks. As funding becomes available, it is strongly encouraged that the City of Laramie makes a dedicated effort to upgrade its public irrigation systems to implement the water conservation principals outlined in this report. As water resources become increasingly scrutinized, the City of Laramie needs to be a proactive leader in water conservation and in educating its citizens on sound turf and landscape irrigation practices.

9B
COST ESTIMATES AND CONCEPTUAL DESIGN INFORMATION

TABLE B-9-1 - RAW WATER IRRIGATION - SURFACE WATER - CITY RECOMMENDED GREEN SPACES - ALTERNATIVE D

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			10%	$860,583
2	Steel Storage Tank				
	1.6 MG	EA	1	$1,600,000	$1,600,000
3	Pipe - Total Cost Installed				
	6" Class 200, S.D.R. 21	LF	19,405	$70	$1,359,592
	8" Class 200, S.D.R. 21	LF	2,400	$80	$191,678
	12" Class 200 S.D.R. 21	LF	9,800	$108	$1,062,340
	14" Class 200 S.D.R. 21	LF	2,203	$128	$282,304
	16" Class 200 S.D.R. 21	LF	1,609	$143	$230,655
	18" Class 200 S.D.R. 21	LF	7,445	$160	$1,193,782
4	Fittings, Valves, and Fire Hydrants (% of pipe cost)	LS		10%	$432,035
5	Air release stations	EA	10	$5,000	$50,000
6	Drain/flushing stations	EA	10	$5,000	$50,000
7	Cased Borings through RR ROW	LF	800	$390	$312,000
8	Pumping Station at the Laramie River				
	1,800 gpm	EA	1	$374,100	$374,100
9	River Diversion Dam (low)	LS	1	$385,000	$385,000
10	Bank/wet well structures				
	Pipes	LS	1	$50,000	$50,000
	Concrete Wet Well	LS	1	$50,000	$50,000
	Traveling Water Screen	LS	1	$100,000	$100,000
	Intake Headwall Gates, Sediment Chamber	LS	1	$100,000	$100,000
11	Unlisted Items (% of 2-9)	LS		10%	$782,349
A	Construction Cost Subtotal				$9,466,417
B	Engineering Costs (% of A)			10%	$946,642
C	Subtotal (A+B)				$10,413,059
D	Contingency (% of C)			15%	$1,561,959
E	CONSTRUCTION COST TOTAL (C+D)				$11,975,018
F	Prepare Final Design and Specs (% of E)			10%	$1,197,502
G	Permitting and Mitigation				$50,000
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$50,000
	PROJECT TOTAL COST				$13,322,520
	ROUNDED TOTAL COST				**$14,000,000**

TABLE B-9-2 - CITY RECOMMENDED - ON-SITE STORAGE - TANKS AT EVERY PARK

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			10%	$1,256,656
2	Underground Fiberglass Storage Tank				
	10,000 gallons	EA	2	$23,400	$46,800
	15,000	EA	4	$35,800	$143,200
	20,000	EA	3	$45,400	$136,200
	25,000	EA	4	$58,200	$232,800
	30,000	EA	2	$69,600	$139,200
	40,000	EA	8	$100,000	$800,000
	48,000	EA	38	$116,000	$4,408,000
3	Pumping Stations				
	20-75 gpm	EA	4	$32,250	$129,000
	78-125 gpm	EA	9	$45,150	$406,350
	126-225 gpm	EA	1	$77,400	$77,400
	226-350 gpm	EA	4	$103,200	$412,800
	351-500 gpm	EA	1	$129,000	$129,000
	501-800 gpm	EA	1	$193,500	$193,500
	801-1000 gpm	EA	2	$232,200	$464,400
	1001-1400 gpm	EA	1	$296,700	$296,700
4	Pipe - Total Cost Installed				
	6" Class 200, S.D.R. 21	LF	6,426	$70	$450,231
	8" Class 200, S.D.R. 21	LF	2,203	$80	$175,945
	10" Class 200 S.D.R. 21	LF	1,200	$92	$110,316
	12" Class 200 S.D.R. 21	LF	3,900	$108	$422,768
	14" Class 200 S.D.R. 21	LF	4,700	$128	$602,282
5	Fittings, Valves, and Fire Hydrants (% of pipe cost)	LS		10%	$176,154
6	Air release stations	EA	10	$5,000	$50,000
7	Drain/flushing stations	EA	10	$5,000	$50,000
8	Cased Borings through RR ROW	LF	800	$390	$312,000
9	Pumping Station at the Laramie River				
	1,800 gpm	EA	1	$374,100	$374,100
10	River Diversion Dam (low)	LS	1	$385,000	$385,000
11	Bank/wet well structures				
	Pipes	LS	1	$50,000	$50,000
	Concrete Wet Well	LS	1	$50,000	$50,000
	Traveling Water Screen	LS	1	$100,000	$100,000
	Intake Headwall Gates, Sediment Chamber	LS	1	$100,000	$100,000
12	Unlisted Items (% of 2-10)	LS		10%	$1,142,415
A	Construction Cost Subtotal				$13,823,217
B	Engineering Costs (% of A)			10%	$1,382,322
C	Subtotal (A+B)				$15,205,539
D	Contingency (% of C)			15%	$2,280,631
E	CONSTRUCTION COST TOTAL (C+D)				$17,486,370
F	Prepare Final Design and Specs (% of E)			10%	$1,748,637
G	Permitting and Mitigation				$50,000
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$50,000
	PROJECT TOTAL COST				$19,385,007
	ROUNDED TOTAL COST				**$20,000,000**

TABLE B-9-3 - RAW WATER IRRIGATION - GROUNDWATER ALTERNATIVE

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of Items)			10%	$480,898
2	Wyoming Groundwater: Installation of 19 wells	LS	1	$3,028,000	$3,028,000
3	Power to Pumps in Parks	EA	19	$20,000	$380,000
4	Underground Fiberglass Storage Tank				
	250,000 gallons	EA	1	$383,800	$383,800
	300,000 gallons	EA	1	$580,000	$580,000
6	Unlisted Items (% of Items 2-4)	LS		10%	$437,180
A	Construction Cost Subtotal				$5,289,878
B	Engineering Costs (% of A)			10%	$528,988
C	Subtotal (A+B)				$5,818,866
D	Contingency (% of C)			15%	$872,830
E	CONSTRUCTION COST TOTAL (C+D)				$6,691,696
F	Prepare Final Design and Specs (% of E)			10%	$669,170
G	Permitting and Mitigation				$50,000
H	Legal Fees				$50,000
I	Acquisition of Access and ROW				$50,000
	PROJECT TOTAL COST				$7,510,865
	ROUNDED TOTAL COST				**$7,600,000**

City of Laramie Raw Water Distribution System - Recommended City Facilities

Network Table - Nodes at 5:00 Hrs

Alternative

Primary 8/2

Node ID	Elevation ft	Demand GPM	Pressure psi
Junc Tee1	7135	0.00	99.24
Junc Optimist	7140	81.00	87.69
Junc Depot	7155	88.00	77.23
Junc Undine	7165	118.00	72.10
Junc Tee3	7140	0.00	97.12
Junc Amoco	7135	250.00	95.50
Junc Tee4	7150	0.00	93.90
Junc Labonte	7150	406.00	91.97
Junc Harbon	7180	92.00	82.45
Junc Tee5	7220	0.00	67.70
Junc Greenhill	7220	506.00	65.29
Junc Tee6	7240	0.00	61.66
Junc Scout	7230	105.00	64.53
Junc Aragon	7250	116.00	57.42
Junc LittleLeague	7260	114.00	52.83
Junc North40	7255	237.00	60.28
Junc Cowboy	7255	158.00	59.09
Junc Tee7	7245	0.00	61.18
Junc Tee8	7225	0.00	71.22
Junc Washington	7205	245.00	58.42
Junc LaPrele	7210	242.00	54.83
Junc HighSchool	7212	133.00	64.24
Junc JuniorHigh	7208	92.00	73.90
Junc Tee13	7180	0.00	78.55
Junc Tee10	7275	0.00	52.19
Junc Tee12	7135	0.00	97.18
Resvr River	7120	0.00	0.00
Tank PropTank	7406	-2983.00	1.44

City of Laramie Raw Water Distribution System - Recommended City Facilities

Alternative L

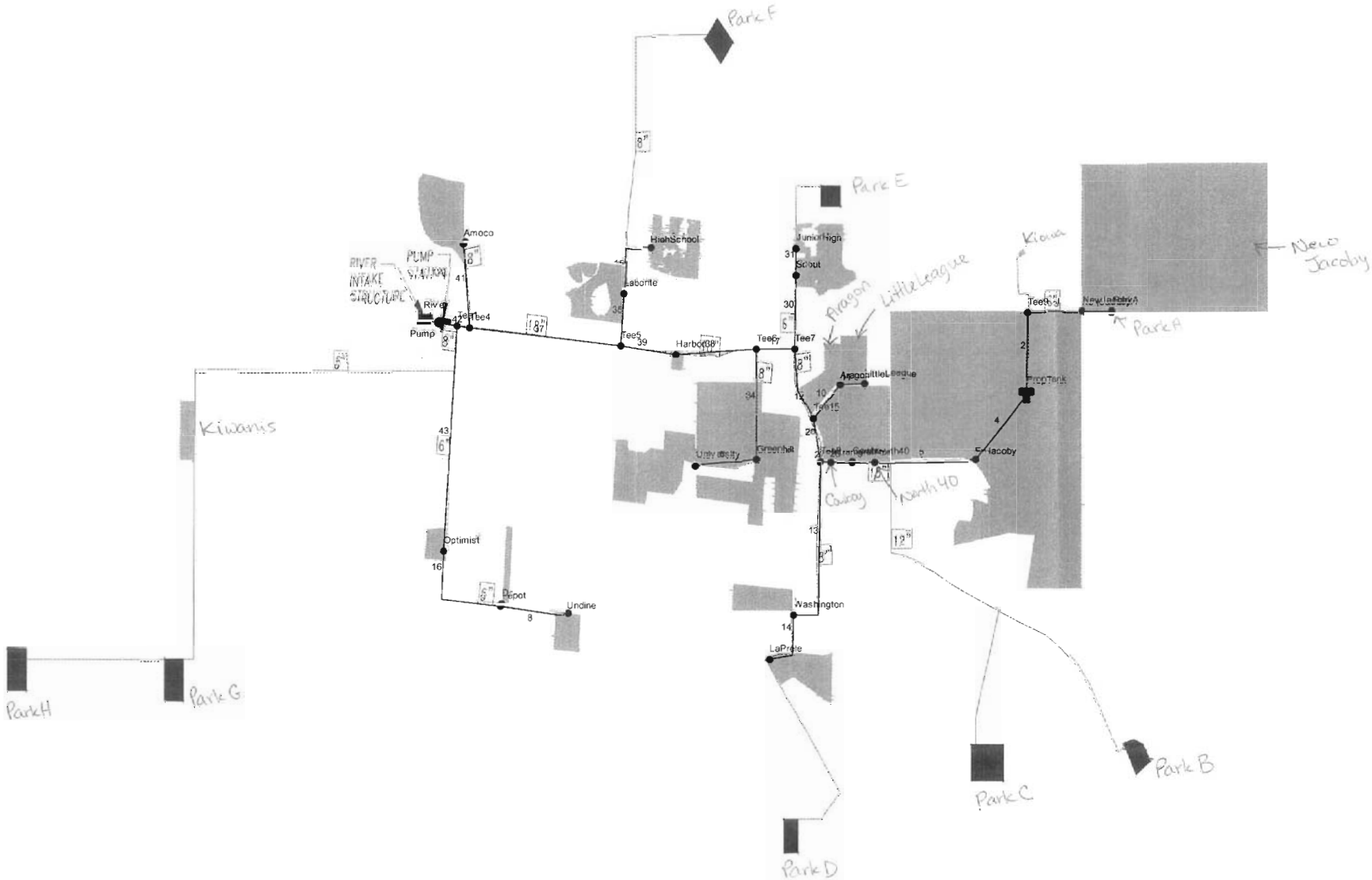
Network Table - Nodes at 21:00 Hrs

Printed 8/2?/0?
JC

Node ID	Elevation ft	Demand GPM	Pressure psi
Junc Tee1	7135	0.00	107.84
Junc Optimist	7140	81.00	96.29
Junc Depot	7155	88.00	85.83
Junc Undine	7165	118.00	80.70
Junc Tee3	7140	0.00	105.72
Junc Amoco	7135	250.00	104.10
Junc Tee4	7150	0.00	102.50
Junc Labonte	7150	406.00	100.57
Junc Harbon	7180	92.00	91.05
Junc Tee5	7220	0.00	76.30
Junc Greenhill	7220	506.00	73.89
Junc Tee6	7240	0.00	70.26
Junc Scout	7230	105.00	73.13
Junc Aragon	7250	116.00	66.02
Junc LittleLeague	7260	114.00	61.43
Junc North40	7255	237.00	68.89
Junc Cowboy	7255	158.00	67.70
Junc Tee7	7245	0.00	69.78
Junc Tee8	7225	0.00	79.82
Junc Washington	7205	245.00	67.02
Junc LaPrele	7210	242.00	63.43
Junc HighSchool	7212	133.00	72.84
Junc JuniorHigh	7208	92.00	82.50
Junc Tee13	7180	0.00	87.15
Junc Tee10	7275	0.00	60.79
Junc Tee12	7135	0.00	105.78
Resvr River	7120	0.00	0.00
Tank PropTank	7406	-2983.00	10.05

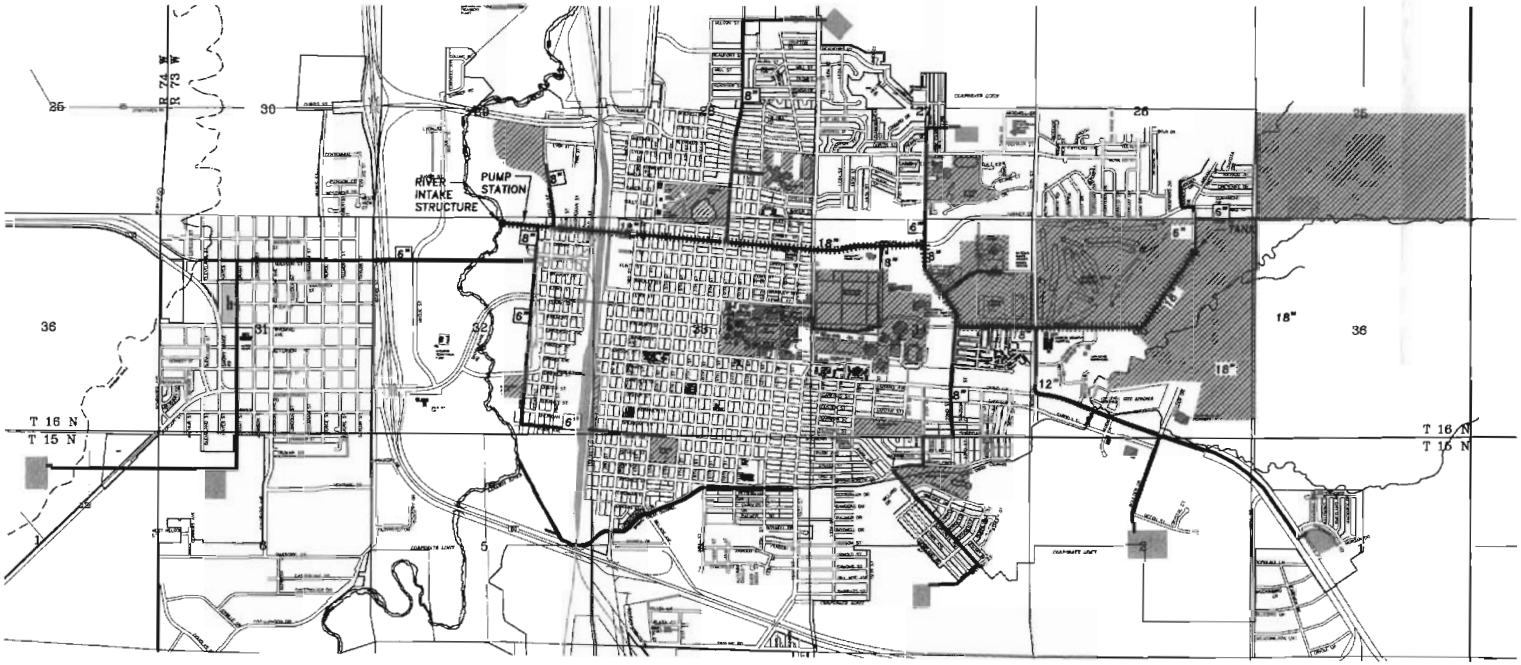
City of Laramie Raw Water Distribution System - Recommended Facilities

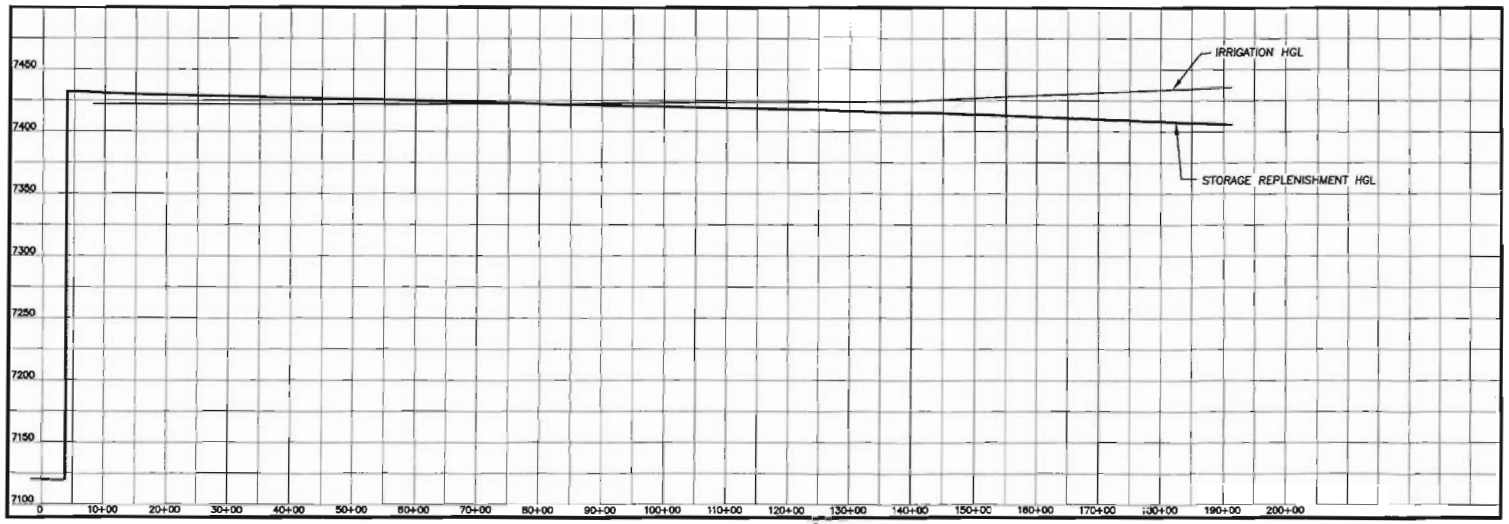
Alternative D
Printed 8/22/04 JS



EPANET 2

98-6





LEGEND

PARKS AND GOLF COURSE

NON-POTABLE WATER PUMPING AND DISTRIBUTION SYSTEM

HYDRAULIC GRADE LINES – ALTERNATE D
CONCEPTUAL DESIGN
NON-POTABLE IRRIGATION WATER SYSTEM
LARAMIE WATER MANAGEMENT STUDY, LEVEL II
WYOMING WATER DEVELOPMENT COMMISSION

WWC ENGINEERING

K:\WWPDC\2005-172 Laramie\Model\HGL for new water.dwg, FILN, 9/27/2006 1:03:12 PM

9C
DEMAND MANAGEMENT

Water Supply Shortage Response Plan

March 20, 2003

	Response Level 1	Response Level 2	Response Level 3	Response Level 4
Water Supply				
Projected water supply shortage as determined by the City Manager	1-10%	11-20%	21-30%	Greater than 30%
Regulated Water Use Activities				
1. Lawn & turf watering				
a. Non-watering hours	No lawn watering between 10 a.m. to 6 p.m.	No lawn watering between 10 a.m. to 6 p.m.	No lawn watering between 10 a.m. to 6 p.m.	No lawn watering between 10 a.m. to 6 p.m.
b. Number of watering days per week (Note: even and odd refers to the street address)	Residential (even) - Th & Sun Residential (odd) - Wed & Sat Multi-family & Commercial - Tue & Fri No watering on Monday.	Residential (even) - Sun Residential (odd) - Sat Multi-family & Commercial - Fri No watering Monday thru Thursday.	Residential (even) - Sun Residential (odd) - Sat Multi-family & Commercial - Fri No watering Monday thru Thursday.	No watering from 6/1 thru 8/31. Use Level 3 restrictions from 9/1 thru 5/31.
c. Time limit per day	Unrestricted during watering hours	Unrestricted during watering hours	2 hours during designated watering day	No watering from 6/1 thru 8/31. Use Level 3 restrictions from 9/1 thru 5/31.
d. Sprinkler system maintenance	Allowed any time. Minimize water used.	Allowed any time. Minimize water used.	Allowed any time. Minimize water used.	Allowed only from 9/1 thru 5/31. Minimize water used.
2. Lawn & turf watering exceptions by permit	(Note: All permits must be displayed so they are visible from the street or sidewalk.)			
a. Sod and seed for new lawns	Permit required to water other than normal watering days for a period not to exceed 3 weeks for sod and 4 weeks for seed.	Permit required to water other than normal watering day for a period not to exceed 3 weeks for sod and 4 weeks for seed.	No exceptions from 5/15 thru 8/15. Permit required to water other than normal watering day for a period not to exceed 3 weeks for sod and 4 weeks for seed that is installed from 8/16 thru 5/14.	No exceptions
b. Medical hardship	Permit required for a special watering schedule to accommodate medical hardship. No watering on Monday and between the hours of 10 a.m. and 6 p.m.	Permit required for a special watering schedule to accommodate medical hardship. No watering on Monday thru Thursday and between the hours of 10 a.m. and 6 p.m.	Permit required for a special watering schedule to accommodate medical hardship. No watering on Monday thru Thursday and between the hours of 10 a.m. and 6 p.m. Must comply with 2 hr/week restriction.	No exceptions
c. Religious objection	Permit required to accommodate a different two-day schedule. No watering on Monday and between the hours of 10 a.m. and 6 p.m.	Permit required to accommodate a different watering day. No watering Monday thru Thursday and between the hours of 10 a.m. and 6 p.m.	Permit required to accommodate a different watering day. No watering Monday thru Thursday and between the hours of 10 a.m. and 6 p.m. Must comply with 2 hr/week restriction.	No exceptions

Source: Water Supply & Demand Management Policy Report
City of Fort Collins, Utilities

May 2004

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	Response Level 1	Response Level 2	Response Level 3	Response Level 4
d. 4 acres or more	Permit required for a special watering schedule to accommodate areas of 4 acres or more. Max of 1.00" per week. No watering on Monday and between the hours of 10 a.m. and 6 p.m.	Permit required for a special watering schedule to accommodate areas of 4 acres or more. Max of 0.75" per week. No watering Monday thru Thursday and between the hours of 10 a.m. and 6 p.m.	No exceptions	No exceptions
e. City parks & public athletic/playing fields using treated water	Permit required for a special watering schedule. Max of 1.25" per week. No watering on Monday and between the hours of 10 a.m. and 6 p.m.	Permit required for a special watering schedule. Max of 1.00" per week. No watering Monday thru Thursday and between the hours of 10 a.m. and 6 p.m.	Permit required for a special watering schedule for only select fields. Max of 0.75" per week. No watering Monday thru Thursday and between the hours of 10 a.m. and 6 p.m.	No exceptions
f. Golf courses using treated water	Permit required for special watering schedule- No watering rough. No watering between the hours of 10 a.m. and 6 p.m.	Permit required for special watering schedule- No watering rough. No watering between the hours of 10 a.m. and 6 p.m.	Permit required for special watering schedule. Max of 0.75" per week for tees, greens & designated landing areas. No watering between the hours of 10 a.m. and 6 p.m.	Permit required for special watering schedule. Max of 0.75" per week for tees and greens. No watering between the hours of 10 a.m. and 6 p.m.
g. Well or raw water	Registration recommended - unrestricted use	Registration recommended - unrestricted use	Registration recommended - unrestricted use	Registration recommended - unrestricted use
3. Landscape watering (trees, shrubs, gardens)	Unrestricted	Water by hose with shutoff nozzle or low-volume efficient irrigation.	Water by hose with shutoff nozzle or low-volume efficient irrigation.	Water by hose with shutoff nozzle or low-volume efficient irrigation.
4. Non-automated car washing	Shutoff nozzle and bucket required.	Shutoff nozzle and bucket required.	Not allowed from 6/1 thru 8/31. Shutoff nozzle and bucket required 9/1 thru 5/31.	Not allowed
5. Washing City fleet vehicles	Once per week or as approved by the City Manager for health or safety reasons.	Once per month or as approved by the City Manager for health or safety reasons.	Not allowed unless approved by the City Manager for health or safety reasons.	Not allowed unless approved by the City Manager for health or safety reasons.
6. Dealership vehicle washing	Once per week	Once per week	Upon sale	Upon sale
7. Spraying impervious surfaces (siding, garages, sidewalks, driveways, patios) except as necessary for health and safety reasons	Not allowed	Not allowed	Not allowed	Not allowed

	Response Level 1	Response Level 2	Response Level 3	Response Level 4
8. Hydrant flushing & testing	Unrestricted	Limited to critical situations as approved by the Utilities General Manager.	Limited to critical situations as approved by the Utilities General Manager.	Limited to critical situations as approved by the Utilities General Manager.
9. Water Fountains Public Display Private	No use allowed Unrestricted	No use allowed No use allowed	No use allowed No use allowed	No use allowed No use allowed
Enforcement				
1. Residential fines per violation	$50 to $1,000	$50 to $1,000	$100 to $1,000	$100 to $1,000
2. Business fines per violation	$250 to $1,000	$250 to $1,000	$500 to $1,000	$500 to $1,000
Water Rate Adjustments				
Adjust water rates to encourage additional conservation	No adjustment	Recommend adjustment that reflects a 15% reduction in water demand.	Recommend adjustment that reflects a 25% reduction in water demand.	Recommend adjustment that reflects a 35% reduction in water demand.

CITY OF LARAMIE
DROUGHT STRATEGY
APRIL 16, 2003

STAGE	CONSERVATION GOAL	ELEMENTS	PRIVATE FOCUS	PUBLIC ENTITY FOCUS	TRIGGER
1	10%	Education Conservation Landscaping	Dissemination of info on drought conditions Voluntary Conservation Measures Encourage Xeriscaping (i.e. water wise landscaping)	1. Provide Conservation Information 2. Xeriscaping	Declaration of drought by reputable governmental agency and the City Manager determines that a 10% reduction is necessary
2	20%	Education Conservation Landscaping	1. Irrigation from private wells must be posted at a point visible from the street 2. Restaurants can only serve water on request & must post signage to that effect 1. Prohibit watering between 9 AM and 7 PM 2. Car washing only with shut off nozzles 3. No washing of concrete or other hard surfaces allowed 4. Lodging establishments to restrict laundry services 1. Irrigation only as necessary to keep landscape turf vegetation alive	1. Prohibit watering between 9 AM and 7 PM 2. Maintain adequate water on the following park and recreation facilities: All turf and woody vegetation 3. No golf course watering of rough allowed	Watersheds and / or stream flow forecasts are predicting levels below 80% of the 30 year average, water supplies are predicted to provide less water than the anticipated demand and the City Manager determines that a 20% reduction is necessary
3	30%	Landscaping	1. Keep the following existing vegetation growing actively: woody vegetation, flower and vegetable gardens 2. Turf irrigation limited to that quantity necessary to maintain dormancy 3. Outdoor watering limited to two days per week, two hours per day,	1. Limit irrigation to the following park and recreation facilities: Athletic field turf and woody vegetation 2. Golf course watering limited to greens, tee boxes, and woody vegetation	Daily demand is exceeding the available water supply, the City is unable to meet the demand for two consecutive days, and the City Manager determines that a 30% reduction is necessary

STAGE	CONSERVATION GOAL	ELEMENTS	PRIVATE FOCUS	PUBLIC ENTITY FOCUS	TRIGGER
4	50%	Landscaping	Watering of trees, shrubs, and container plants only, no turf or garden irrigation allowed	Limit irrigation to the following park and recreation facilities: watering of trees and shrubs only * Golf course watering limited to greens, trees and shrubs	The City water plant is shut down due to no available water in the Laramie River, the City wells are producing 6 mgd or less, and the City Manager determines that a 50% reduction is necessary
5	MAXIMUM POSSIBLE	Essential indoor water use only	No outdoor use of water allowed	No outdoor use of water allowed	The City wells are producing 4.5 mg or less and the City Manager determines that maximum reduction in water usage is necessary

Each stage includes the elements of all previous stages.

* The Parks and Recreation Division has noted that if irrigation on athletic field facilities is terminated, either, use of those facilities will be banned or prohibited, or there will be significant cost to the City and the University of Wyoming to re-establish the turf at those facilities.

Board of Public Utilities

Wise Water Use Plan

Cheyenne, Wyoming

(Revised 12/20/04)

Executive Summary

Cheyenne has an excellent water system. The system provides sufficient water to serve the current and future needs of the city. However, southeast Wyoming is a high altitude desert and is subject to periods of decreasing or little precipitation known as drought. The purpose of this plan is to promote beneficial water use, eliminate wasteful water use, reduce consumption to minimize peak demands, delay water supply capital improvements, keep Cheyenne's water prices low and to protect Cheyenne's water resources in drought conditions.

To accomplish the above purpose, this plan implements common sense water use objectives to be followed at all times. In addition, the BOPU will evaluate Cheyenne's water supply throughout the year and implement water conservation measures appropriate to meet long-term and short-term conservation requirements. This document contains trigger points that identify if Cheyenne's water resources are drought impacted. If water resources are impacted, this document identifies the severity of the impact and the water conservation measures necessary to ensure adequate water supply.

Recognizing Impacts to Reservoir Storage

We can identify when Cheyenne's water resources are being impacted by diminishing reservoir levels and preliminary analyses of snow pack conditions. It is, however, impossible to define exactly when a drought begins or ends, except through hindsight. As such, this plan incorporates trigger points that identify when the water supply is being impacted and the severity of the impact. Conservation levels are determined based on the amount of water remaining in the reservoirs and how long this water will last based on anticipated consumption and available snow pack data.

Cheyenne is in a snow-melt hydrology, meaning that most of the water in this area comes from snow accumulated in the mountains over the winter. Outdoor water use can begin in the early spring (mid-April). However, the wettest and most water producing snows occur as late as mid-May.

For water conservation measures to be effective, they must be published with adequate time to inform BOPU water users prior to spring water use. It is therefore necessary to evaluate and re-evaluate Cheyenne's water supply throughout the year. The first evaluation, conducted in March, estimates what the lowest reservoir storage will be for the year. This typically occurs around May 1. May 1 is also the general time of year when spring runoff is just beginning. The reservoir storage capacity at this time of the year represents how much water Cheyenne will have in the event that little or no precipitation is received, as occurred in 2002.

The reservoir management strategy of BOPU is to maintain an adequate supply of water to carry Cheyenne through years where there may be little or no snow pack or precipitation. Based on a service population of 66,550 people, an average daily rate of 150 gallons per capita day (gpcd), average commercial and industrial uses of

approximately 5.1 million gallons per day (mgd), and operational and evaporation losses of 2,000 acre-ft per year, Cheyenne can consume approximately 19,000 acre-ft of water per year.

Actual water consumption depends on weather conditions. In 1998, a wet year climatologically, Cheyenne consumed approximately 15,000 acre-ft including operational losses and evaporation. In 2002, a dry year climatologically, Cheyenne consumed approximately 20,000 acre-ft including operational losses and evaporation.

This strategy incorporates five levels of conservation measures, based on the amount of water available for consumption. The five levels increase in severity from 2 years of water supply and wise water use measures to less than 6 months of water supply and a complete ban on all outside water uses.

	Reservoir Storage for May 1st			
Reservoir Storage Status	Projected Storage Capacity acre-ft	Percent of Storage	Conservation Goal Percent	Conservation Goal Acre-ft (mg)
Normal	25,000 or greater	63% or greater	5 to 10	900 – 1,800 (294 - 587)
Mild	19,000 to 24,999	48% to 63%	10 to 15	1,800 – 2,700 (587 - 880)
Moderate	13,000 to 19,000	33% to 48%	20 to 25	3,600 – 4,500 (1,173 - 1,466)
Severe	7,000 to 13,000	18% to 33%	30 to 40	5,400 – 7,200 (1,759 - 2,346)
Extreme	less than 7,000	Less than 18%	50 to 60	9,000 – 10,800 (2,933 - 3,519)

The BOPU will conduct further evaluations during and after spring runoff. BOPU staff will use available data from snow pack, runoff data, anticipated consumption, current water storage and reservoir operation/evaporation losses to estimate reservoir storage for the next spring. The BOPU will implement the conservation measures necessary to maintain adequate storage in the reservoirs.

Changes in water supply policy, minimum and maximum flows for reservoir discharges, well field production and/or increased storage at Seminoe Reservoir may change these trigger points. If Cheyenne can collect more water during spring runoff or from the well fields, reservoir storage can be lowered because Cheyenne will have a greater capacity to refill the reservoirs, thereby, lessening impacts on Cheyenne's water supply system. This document may require updating as conditions change.

Reduce Consumption

Associated with each status level are conservation measures designed to reduce consumption by the amount designated in the above table. The following tables and sections indicate which conservation measures apply during normal conditions and during mild, moderate, severe and extreme reservoir storage status.

Watering Schedule for Normal, Mild, Moderate and Severe Reservoir Storage Status

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Single Family Addresses Ending in 1, 2, or 3		Normal Mild		Normal Mild Moderate Severe			Normal Mild Moderate Severe
Single Family Addresses Ending in 4, 5, 6 or 7	Normal Mild Moderate Severe		Normal Mild		Normal Mild Moderate Severe		
Single Family Addresses Ending in 8, 9 or 0	Normal Mild		Normal Mild Moderate Severe			Normal Mild Moderate Severe	
Business and Multifamily		Normal Mild Moderate Severe			Normal Mild Moderate Severe		Normal Mild

Properties without a specific or numeric address may irrigate the same days as addresses ending in 4.
Note: If moderate or severe conditions exist for more than one year, then designated water days may be rotated for single family residences.

6-3b

Turf and Lawn Water Conservation Measures

Reservoir Storage Status		Normal 5 to 10%	Mild 10 to 15%	Moderate 20 to 25%	Severe 30 to 40%	Extreme 50 to 60%
1. Turf/Lawn Irrigation:						
	Spring: April 16 Through June	3 Days/Week No Watering 10-6	3 Days/Week No Watering 10-6 3 Hrs./Day Or 20 Min./Zone	2 Days/Week No Watering 10-6 3 Hrs./Day Or 20 Min./Zone	2 Days/Week No Watering 10-6 2 Hrs./Day Or 15 Min./Zone	No Outdoor Water Use
	Summer: July			No Watering*	No Watering*	
	Summer: August			2 Days/Week No Watering 10-6 3 Hrs./Day Or 20 Min./Zone	No Watering*	
	Fall: September Through October 15				2 Days/Week No Watering 10-6 2 Hrs./Day Or 15 Min./Zone	
	Winter: October 16 Through April 15	3 Days/Week	No Watering			
2. Require Permits For Watering New Lawns/Sod/Seed Other Than Designated Watering Day		----------Yes----------				

*Exception for warm season/alternative turf-type grasses that have been proven to use at least 30 percent less water than bluegrass, but needs to be watered once during the month of July. For lawns and turf areas planted with warm season/alternative turf-type grasses, applicants may apply for a variance. Variances for watering during the month of July limited to 1 day for 2 hours during the second week of July. No watering between 10 a.m. and 6 p.m.

9C-10

Gardens And Flowers Conservation Measures

Reservoir Storage Status	Normal 5 to 10%	Mild 10 to 15%	Moderate 20 to 25%	Severe 30 to 40%	Extreme 50 to 60%
1. Watering Of Gardens And Flowers					
Summer: April 16 Through October 15	Limited To Hand-Held Hose Or Drip Irrigation And Prohibited Between 10 a.m. and 6 p.m				No Outdoor Water Use
Winter: October 16 Through April 15	Limited To Hand-Held Hose Or Drip Irrigation		No Watering		

Trees, Bushes, And Shrubs Water Conservation Measures

Reservoir Storage Status	Normal 5 to 10%	Mild 10 to 15%	Moderate 20 to 25%	Severe 30 to 40%	Extreme 50 to 60%
1. Watering Trees, Bushes, And Shrubs					
Summer: April 16 Through October 15	Limited To Designated Watering Days and Prohibited Between 10 a.m. and 6 p.m.	Limited To Hand-Held Hose And/Or Drip Irrigation On Designated Watering Days And Prohibited Between 10 a.m. and 6 p.m.			No Outdoor Water Use
Winter: October 16 Through April 15	Limited To Once Per Month	Limited To Hand-Held Hose With Shut Off Nozzle Or Drip Irrigation Once Per Month.			
2. Watering Requirements for Trees, Bushes And Shrubs - Apply 10 Gallons For Every One-Inch Diameter Of the Tree Trunk Measured At The Base Of The Trunk					

Watering Frequency For Trees, Bushes and Shrubs

Trunk size	Watering Frequency
Less Than Or Equal To 1 Inch	Two Times Per Week On Designated Days
Greater Than One Inch But Less Than Or Equal To Five Inches	Once Per Week On Designated Days
Greater Than Five Inches	Once Per Month On Designated Days

Washing Conservation Measures

Reservoir Storage Status	Normal 5 to 10%	Mild 10 to 15%	Moderate 20 to 25%	Severe 30 to 40%	Extreme 50 to 60%
1. Washing Hard Surfaces (Sidewalks, Parking Lots, Driveways, Etc.)	Prohibited Except For Health, Safety Or Construction Reasons.				Prohibited Except For Health Or Safety Reasons.
2. Washing Personal Vehicles					
Summer: April 16 Through October 15	Limited To Hose Equipped With a Spray Nozzle, And/Or Bucket.		Limited To Hose Equipped With a Spray Nozzle, And/Or Bucket On Designated Watering Days And Prohibited Between 10 a.m. And 6 p.m.		No Outdoor Water Use.
Winter: October 16 Through April 15			Limited To Hose Equipped With a Spray Nozzle, And/Or Bucket.		
3. Washing Fleet Vehicles	Must Use BMP's* to Conserve Water.		Limited To Twice Per Month Except For Health Or Safety Reasons.		Prohibited Except For Health Or Safety Reasons.

Other Conservation Measures

Reservoir Storage Status	Normal 5 to 10%	Mild 10 to 15%	Moderate 20 to 25%	Severe 30 to 40%	Extreme 50 to 60%
1. Ponds, Fountains and Waterfalls	Wasting Water Prohibited		Prohibited Unless Operation Is Essential To Support Fish Or Aquatic Life		No Outdoor Water Use
2. Must Post Sign If Irrigating Or Watering By Private Well	Yes	Yes	Yes	Yes	Yes
3. Impose Drought Surcharge To Water Rates If Necessary	No	No	Yes	Yes	Yes
4. Events That Use Significant Water For Setup Or Operation – Such As Car Washes	Must Use BMP's* to Conserve Water	---------- Prohibited ----------			

**BMP = Best Management Practices, Such As Automatic Shut-Off Spray Nozzles For Car Washes.*

9C-12

Watering New Sod or Seed for Lawns

- Watering new sod or seed for lawns outside of established lawn designated days allowed only by permit.
- Permits
  - Applicants for permits must show proof in the form of a receipt for amendments and sod or seed.
  - Site subject to inspection and permits may be revoked if site not prepared properly.
  - New sod and seed:
    - Soil must be amended with a minimum of 3.5 cubic yards of organic material per 1,000 square feet of sod.
    - Organic material must be worked into a depth of 6 inches by tilling, disking or other suitable method.
    - Inorganic substitutes will not be accepted.
    - Recommend 6 cubic yards of organic material per 1,000 square feet of sod for high clay soils.
    - Acceptable examples of organic material: compost, aged and composted manure, sphagnum peat moss.
    - Amendments not accepted: sand, mountain peat moss, fresh manure, gypsum or lime.
  - Overseeding:
    - Requires site preparation through aeration and hard raking or power raking.
  - Must post BOPU issued sign in yard indicating watering with new sod/seed permit and address and containing dates of permit.
  - See New Sod Permits table and New Seed And Overseeding Permits table for length of permitted watering days for each drought status level.
- Watering new sod or seed prohibited during drought status level 5.
- Watering new sod or seed prohibited between 10 a.m. and 6 p.m. from April 16 through October 15.
- Excessive watering surcharge at the rate of the highest single-family residential block may be applied to permit holders for consumption exceeding 1,250 gal/1,000 square feet per permitted day.
  - 1,250 gal over 1,000 square feet is 2 inches of water per day
  - Permits allow for ½ inch per permitted watering day

New Sod Permits Reservoir Storage Status	Normal 5 to 10%	Mild 10 to 15%	Moderate 20 to 25%	Severe 30 to 40%	Extreme 50 to 60%
1. Require Soil Amendments Prior To Installing Sod	Yes	Yes	Yes	Yes	No Outdoor Water Use
2. Require Sign Be Displayed On Property For New Sod	Yes	Yes	Yes	Yes	
3. Allow Watering 1/2 Inch For ____ Consecutive Days	14	12	11	9	
4. Allow Water ¼ Inch Every Other Day For ____ Days	7	6	5	4	
5. Allow Watering Sod Other Than Designated Day					
March Through May	Yes	Yes	Yes	Yes	
June	Yes	Yes	Yes	Yes	
July	Yes	Yes	No*	No	
August	Yes	Yes	Yes	No	
September Through October 15	Yes	Yes	Yes	Yes	
October 16 Through November	Yes	Yes	Yes	Yes	
December Through February	Yes^	Yes^	No	No	

*Applicants who established a lawn or turf area by sod permit during the 45-day period before July 1st may water on the regularly scheduled day for a period not to exceed one hour during July. No watering will be allowed between 10 a.m. and 6 p.m.

^Applicants who lay sod during December through February may apply for a winter watering permit that will allow watering ¼ inch every other day as listed under item 4.

New Seed And Overseed Permits

Reservoir Storage Status	Normal 5 to 10%	Mild 10 to 15%	Moderate 20 to 25%	Severe 30 to 40%	Extreme 50 to 60%
1. Require Soil Amendments Prior To Seeding	Yes	Yes	Yes	Yes	No Outdoor Water Use
2. Require Sign Be Displayed On Property For New Seed	Yes	Yes	Yes	Yes	
3. Allow Watering Seed For ____ Consecutive Days	21	14	11	9	
4. Allow Watering Seed Every Other Day For ____ Days	7	6	5	4	
5. Allow Watering Overseed For ____ Consecutive Days	14	12	11	9	
6. Allow Watering Overseed Every Other Day For ____ Days	7	6	5	4	
7. Allow Watering Seed And Overseed Other Than Designated Day					
March Through May	Yes	Yes	Yes	Yes	
June	Yes	Yes	Yes	Yes	
July	Yes	Yes	No*	No	
August	Yes	Yes	Yes	No	
September Through October 15	Yes	Yes	Yes	Yes	
October 16 Through November	Yes	Yes	Yes	Yes	
December Through February					
8. Excessive watering charge equal to highest single-family residential tier assessed for consumption over 1250 gal/1000 square feet/day	Yes	Yes	Yes	Yes	

*Applicants who established a lawn or turf area by seed during the 45-day period before July 1st may water on the regularly scheduled day for a period not to exceed 1 hour during July. No watering will be allowed between 10 a.m. and 6 p.m.

9C-15

Watering Large-Community Areas – Water Budgets

- Available to customers with community used irrigated areas exceeding 1 acre in size.
- Application for water budget program:
    - During normal conditions, the water budget allotment is based on landscape irrigation requirement.
    - During mild, moderate, severe and extreme drought conditions, the water budget allotment is based on the landscape irrigation requirement less the conservation goal plus 5 percent.
    - Must complete application and sign agreement to reduce water consumption by the conservation goal + 5 percent.
    - Application not valid unless signed by BOPU water conservation specialist or administration manager.
    - Must submit water conservation plan.
    - Must have irrigation audit performed by licensed irrigation auditor.
- Allotment based on landscape irrigation requirement:
    - Calculated using reference ET multiplied by an approved landscape coefficient based on species, density and microclimate estimates and by irrigated area.
- No watering between 10 a.m. and 6 p.m.
- No watering outside of restricted dates that apply to residential consumers unless specified and approved in water budget application.
- Water consumption will be monitored monthly. Exceeding water budget allotment will result in a surcharge equivalent to the highest single-family residential tier.

City Maintained Areas

- Annual water budget program.
- Group community areas with similar features and water use:
    - Community Parks
    - Athletic Fields
    - Golf Courses
    - Greenways and Parkways
    - Gardens

Industrial and Commercial

All commercial and industrial water users must implement best management practices to conserve water. A best management practice for water conservation utilizing the best policies or technology reasonably available to achieve water conservation. Commercial and industrial consumers must present a water conservation plan if requesting to participate in water budget program.

All best management practices include repairing leaks promptly and educating employees on water conservation practices. Other industry specific best management practices include:

For normal conditions:

- Restaurants:
    - Serve water upon customer request.
- Hotel/Motel:
    - Must offer guests staying more than one night the option of not changing linen, towels, etc.
    - Inspect for leaky faucets, showers or recreation equipment regularly.
- Construction sites:
    - BOPU water used for construction must be used in the city.
    - Hoses must be equipped with shut-off nozzles.
    - Use a broom or brush instead of a hose to clean surfaces.
    - Water used at construction sites must be metered.

For mild, moderate, severe or extreme drought impacts, include all the best management practices outlined under normal conditions and the following:

- Car Washes:
    - Check equipment and facilities routinely to identify leaks or faulty equipment.
    - Modify wash procedures to conserve water – for example, no pre-wash or adjust pressure settings.
- Swimming Pools:
    - Check pool regularly for cracks and leaks, make repairs promptly.
    - Lower water in pool to reduce splashing water outside of pool.
    - No filling private and residential pools during drought status level 5.
- Other types of best management practices:
    - Optimization and recycling of cooling and process water.
    - Modify processes to reduce water waste.

Authority

Authority for implementation and enforcement of water conservation measures comes from:

1. BOPU Resolution No. 2004-03
2. City of Cheyenne Resolution No. 4564
3. Water supply status and conservation level declaration

Enforcement

Water enforcement personnel, as approved by BOPU management, may issue violations for water use prohibited under the declared drought status level. These enforcement personnel must wear identification and a BOPU safety vest when issuing violations.

When possible, the enforcement personnel will notify the person(s) responsible for a violation that a violation has occurred. This may be accomplished through one-on-one communication or by leaving a copy of the violation notice at the location. A second copy will be mailed to the property owner within a few days following the violation.

In all cases, the enforcement personnel are instructed to be courteous.

Penalties

Penalties for violating the water conservation measures for the declared conservation level will be added to the customer's water bill. First offenses result in an official warning and entry into the computer system. Violation and fine history accumulates between Jan. 1 and Dec. 31, refreshing each year. Hence, previous years violations do not apply to the following year. The following outlines the fine associated with each violation:

- First violation = warning.
- Second violation = $300 fine.
- Third and subsequent violations = $500 fine.
- After five violations, water services may be shut-off or a trickle device installed.

Appeal Process

Appeals for violations resulting in fines may be requested pursuant to the "Rules Of Practice And Procedure For Cases Before The Board Of Public Utilities" approved and adopted January 19, 1999. To appeal a violation resulting in a fine, contact the water conservation specialist or customer service at the Board of Public utilities, ph. 637-6463, or

Water Conservation
P.O. Box 1469
Cheyenne, WY 82003.

Wells

Well water is exempt from these water conservation measures. However, because ground water is also affected by drought, BOPU strongly encourages people with wells to follow the conservation measures included in this document. Residents using wells for irrigation purposes must post a sign indicating that irrigated water comes from a well. The BOPU administration office, at 2100 Pioneer Ave. will issue "Well Irrigation Signs" at no charge. The sign must be visible from public roads.

Properties displaying a well irrigation sign(s) are subject to chlorine tests and verification of ground water permit from the State Engineering Office to assure irrigation water does not originate from the public water works. Properties displaying a "Well Irrigation Sign" waive their first warning and may be issued a fine if irrigation water, after testing, is determined to originate from the public water works, not from the private well, and is in violation of established conservation measures.

Water Efficient Forms of Irrigation

Efficient water practices, such as low pressure sub-surface irrigation, may not be able to water within the designated times and days according to the water conservation level. These watering practices must implement best management practices in order to achieve water conservation goals. For example, extend the watering frequency of the system to meet the conservation goal.

Variances

The water conservation specialist, administration manager or customer service supervisor may grant, in writing, temporary variances for water uses otherwise prohibited under the declared water conservation level. Variances may be granted under the following conditions:

1. Compliance with the conservation measures established for the declared drought status level can not be technically accomplished.
2. Alternative methods can be implemented that will achieve the same level of reduction in water use.

To request a variance, submit the request in writing to:

Water Conservation
P.O. Box 1469
Cheyenne, WY 82003.

Recommended BOPU Conservation Strategies

Upon determination that Cheyenne's water resources are drought impacted, the following steps are recommended for mitigating the drought

1. Determine water conservation goals .
2. Notify Board and City Governing Body of change in water supply status.
3. Coordinate efforts with city departments, South Cheyenne Water and Sewer and with Laramie County Conservation District.
4. Notify water consumers of drought status change and effective dates via releases to local media and billing inserts.
5. Hire, assign and/or train staff for increased customer service needs .
6. Designate water conservation enforcement team and establish appeals committee.
7. Implement public education and information campaign.
8. Implement and enforce conservation measures .
9. Continually monitor and inform Board, Governing Body and Cheyenne water users of changes to water supply status and/or conservation progress.
10. If necessary, establish drought surcharge to stabilize revenue.
11. Evaluate drought conservation measures upon return to normal conditions or change in water supply status.
12. Review comments and suggestions of water consumers.
13. Compare water savings to goals.
14. Modify plan and make suggestions for future water conservation measures.

10A
MISC. DOCUMENTS

Appendix 10-Misc. Documents

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TW-1 Well Log
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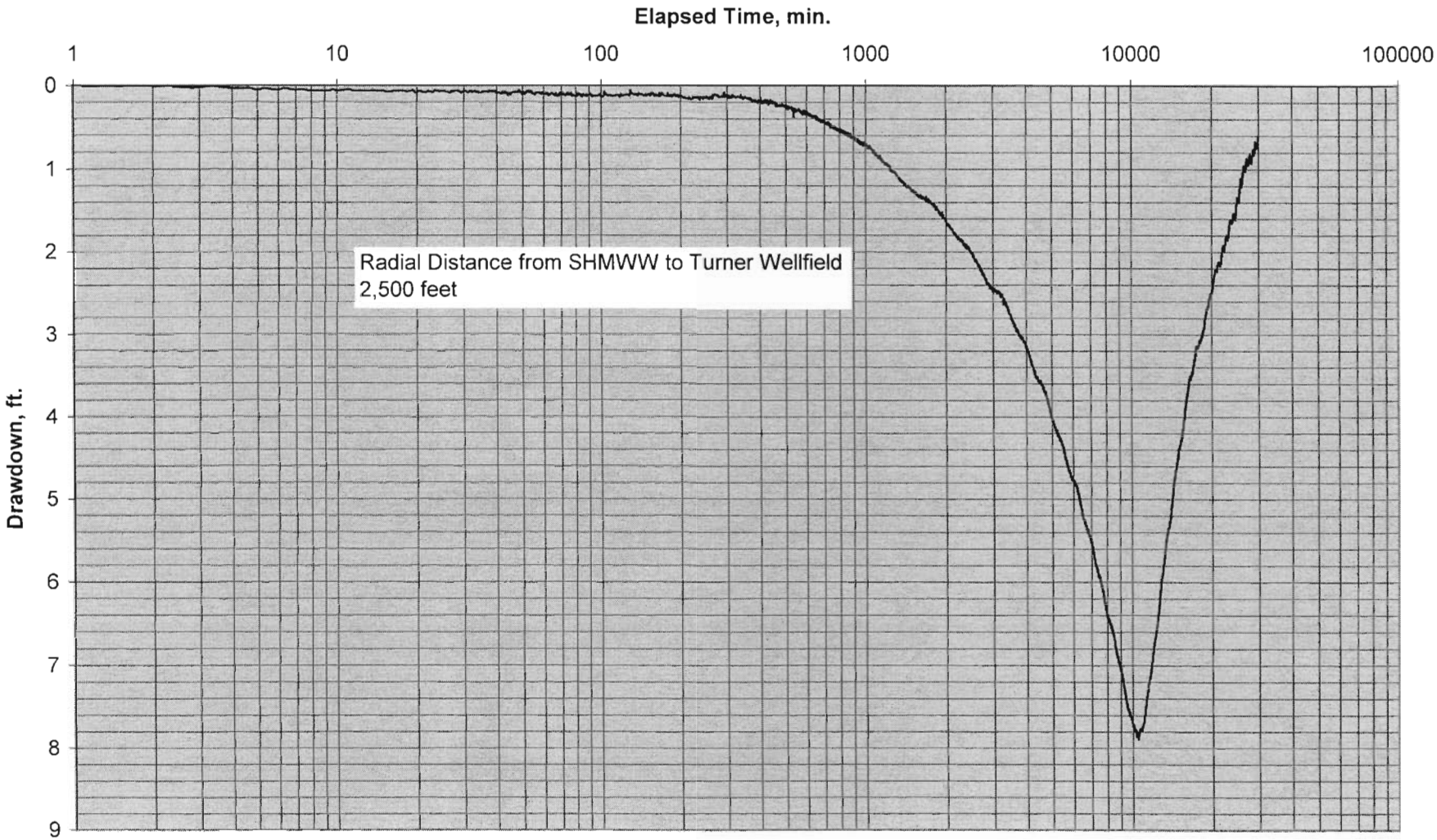
Wyoming Groundwater, LLC., April 2004, Downhole Camera Inspection of the Turner No. 2 Well, Report Memorandum to the City of Laramie

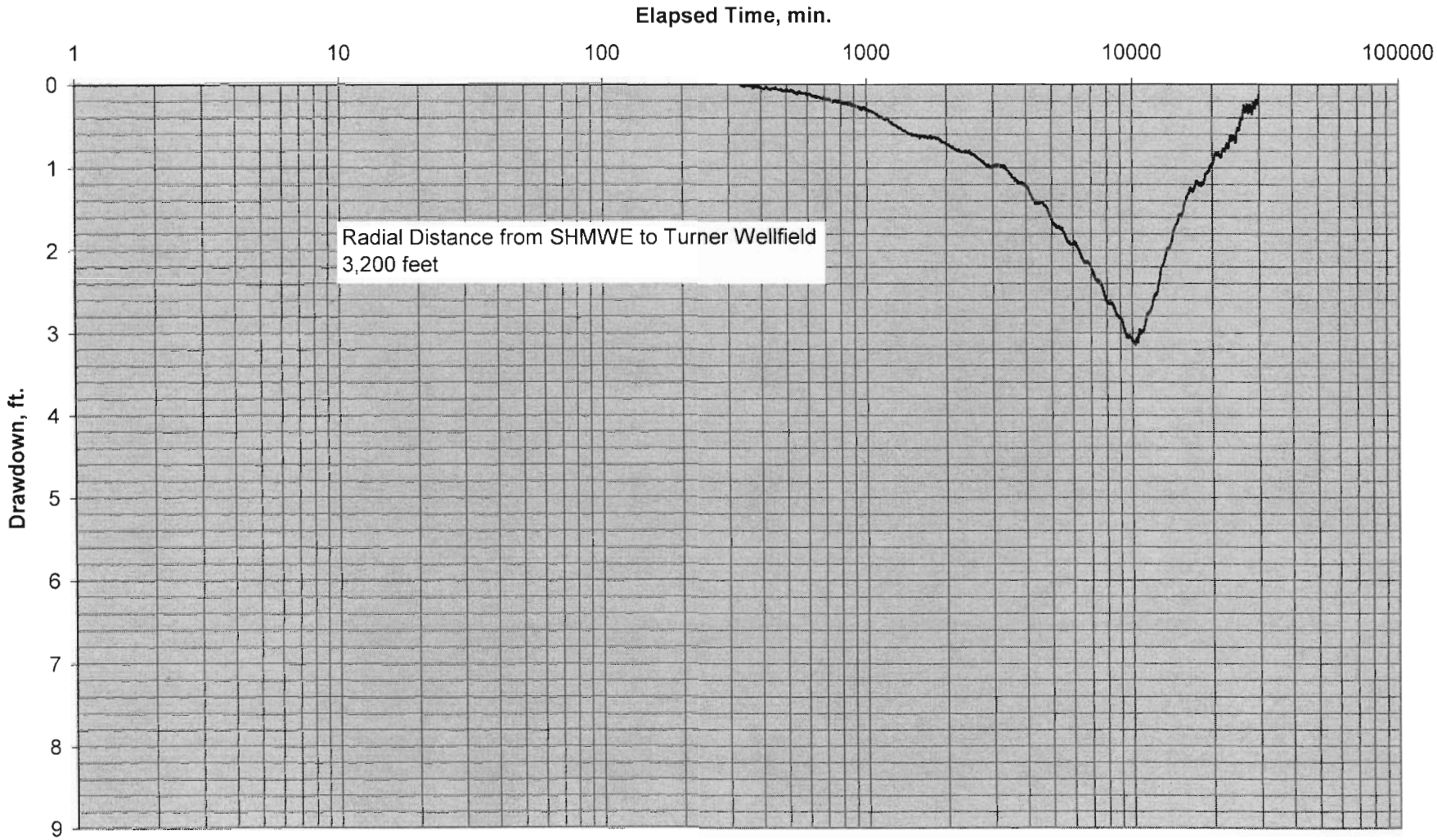
Younus, Mohammad, July 1992, Ground Water Circulation and Vertical Mixing in the Principal Aquifers in the Southern Part of the Laramie Basin, Albany County, Wyoming, Univ. of Wyo. Dept. of Geology M.S. Thesis, 71pp.

Observation Well SHMWW: Time-Drawdown and Recovery Plot
September 27 to October 4, 2005, Pump Test at Turner No. 1 & No. 2



DA-5

Observation Well SHMWE: Time-Drawdown and Recovery
September 27 to October 4, 2005, Pump Test at Turner No. 1 & No. 2



104-6

MISCELLANEOUS NOTICE
Permit No. U.W. 106548
STIPULATION & AGREEMENT

COPY

BEFORE THE STATE ENGINEER

STATE OF WYOMING

IN RE PETITION FOR CHANGE IN LOCATION OF SPUR NO. 2 WELL, PERMIT NO. U.W. 106548; UNADJUDICATED PRIORITY DECEMBER 1, 1994; LARAMIE UNDERGROUND WATER DISTRICT	)
GEORGE HOOD, JUDY HOOD, STEPHEN JACKSON, ANNE M. BOWEN, K. KIM KELLOGG, CINDY KELLOGG, HOWARD (CASH) CARROLL, DIANA KOCORNIK WAYNE SUTHERLAND, PAUL FLESHER, WILLIAM BAKER, DEBORA PAULSON,	)
Contestants.	)
vs.	)
CITY OF LARAMIE,	)
Contestee.	)

MAR 2 7 1998

State Engineer Docket No. 97-4

STIPULATION AND AGREEMENT--CITY OF LARAMIE AND VARIOUS CONTESTANTS

The City of Laramie filed a request to relocate its Spur No. 2 Well, Permit No. UW 106548. Some persons filed timely protests to the relocation. The Spur No. 1 Well and Spur No. 2 Well (Permit Nos. U.W. 106547 and U.W. 106548 respectively) now comprise the City's Spur Well Field. Through negotiation, the City and the parties have arrived at a method of operation of the Spur Well Field, which is intended to permit the City to use the water resource, while affording protection to current and future domestic and stock wells which might be affected by the City's operation of the Spur Well Field. In settlement of the controversy, the parties stipulate and agree as follows:

1. The parties intend that this stipulation be made a part of the record in this contested case.

2. The parties intend that the State Engineer shall incorporate the terms of this stipulation as operating conditions upon the Spur No. 1 Well and Spur No. 2 Well as relocated. Any expansion (new wells or permit enlargements) of the well field will also become subject to the collective acre feet per year limit.

3. The City will monitor its monitoring wells MW-7, MW-8, MW-10, MW-11, and MW-12, shown upon the map attached hereto as Exhibit A. Interested domestic and stock well owners will be allowed to accompany City personnel while they are collecting aquifer data. These five monitoring wells were strategically located to assess aquifer drawdown characteristics in neighboring subdivisions to the east of the City's Spur Well field.

4. The City will monitor the new Warren well C 121 (Warren No. 1 Well, SE¼SE¼ Section 33, T. 17 N., R. 73 W.) which is located west of the Spur Wells field.

5. It is the City's intent to provide monitoring equipment in MW-7, MW-8, MW-10, MW-11, and MW-12 that will measure and record drawdown depths on a daily basis. A copy of all drawdown measurements will be provided within a reasonable time after collection to the State Engineer's Office and will be made available for review in the office of the City of Laramie Director of Public Works.

6. Private domestic wells in the vicinity of each of the five monitoring wells have been analyzed with regards to depth of well and depth of pump setting below the static water level. The private wells were grouped around the respective monitoring wells that most closely reflect their conditions. Then the private well with the smallest distance between its pump setting and static water elevation was selected as the control situation. The full tabulation of well data is attached and is summarized below:

MW-7 Control Well (Bury)

Depth of well	200 feet
Depth of pump	188 feet
Depth to static water level	120 feet
Water column height above pump	68 feet

MW-8 Control Well (Meacham) (Attebery well judged to be inadequate)

Depth of well	175 feet
Depth to pump	165 feet
Depth to static water level	105 feet
Water column height above pump	60 feet

MW-10 Control Well (Fluty)

Depth of well	175 feet

10A-8

Depth to pump	170 feet
Depth to static water level	105 feet
Water column height above pump	65 feet

MW-11 Control Well (Schlosser)

Depth of well	280 feet
Depth to pump	265 feet
Depth to static water level	160 feet
Water column height above pump	105 feet

MW-12 Control Well (Borgialli)

Depth of well	380 feet
Depth to pump	320 feet
Depth to static water level	218 feet
Water column height above pump	102 feet

7. Drawdown is defined as the distance between measured water surface in a monitoring well and the initial water level measured in that well prior to initiation of the Spur Well No. 1 pump test on August 22, 1997. The following values represent initial water level elevations that will be used to establish drawdown:

Monitoring Well	Top of Well Casing Elevation	Water Surface Elevation Measured Just Prior to the August 22, 1997 Pump Test
MW-7	7365.7	7259.7
MW-8	7371.7	7262.3
MW-10	7368.3	7262.3
MW-11	7380.4	7260.0
MW-12	7425.8	7283.5

8. The City will place the following constraints upon its collective operation of its Spur Well field:

10A-9

Drawdown in MW-7 MW-8, MW-10, MW-11, or MW-12	Maximum Annual Withdrawal Rate (acre-feet per year)	Maximum Daily Withdrawal Rate (MGD)
0-20 feet	1200	4.0
20-25 feet	900	3.0
25-30 feet	600	2.0
30-35 feet	300	1.0
Greater than 35 feet	0	0

9. Additionally, the City agrees to further restrict annual withdrawal rates in the first two years of operation as follows:

A. First year of operation - annual withdrawal shall not exceed 400 acre-feet.
B. Second year of operation - annual withdrawal shall not exceed 800 acre-feet.

10. The drawdown measurements on May 15th of each year will be used to determine maximum annual withdrawal rates for the next twelve months. The drawdown measurements taken on the 1st and 15th of each month will be used to determine the maximum daily withdrawals for the upcoming 15 to 16 day period in June through September. The drawdown measurements taken on the 1st of each month will be used to determine daily withdrawals for the upcoming 28 to 31 day period in October through May. The greatest drawdown in the five sampled monitoring wells will be the drawdown used to set the control program.

11. Water levels in the Warren will be monitored but will not be used as a control mechanism for this program. This well and others which penetrate the Casper formation in the Aliquot Subdivision have static water levels 600 plus feet above the Casper formation which allows much more operational flexibility than private wells located near MW-7, 8, 10, 11, and 12.

12. Twenty years after beginning production, the City may elect to petition the State Engineer's Office to modify the monitoring program and other appropriate conditions of the permit, based upon the twenty years of data related thereto. The State Engineer will provide an adequate public notice and comment period as required by Wyoming statutes and regulations in place at that time. The City will provide notice to the signatories to this stipulation or their successors in interest, who shall have the full right to appear and be heard regarding any request to modify these permit conditions.

13. A. The City of Laramie will perform all necessary water quality analyses to assure full compliance with federal Safe Drinking Water Act requirements for water produced from its Spur Wells. Additionally, the City will monitor total dissolved solids, major cations, and major anions in the production water.

10A-10

B. The City will evaluate these water quality results over time so as to detect possible aquifer contamination. One example of potential contamination is the leachate from private on-site wastewater disposal systems. If aquifer contamination is detected, the City will seek voluntary cooperation from the affected landowners to identify and correct the problem. It is the City's intent to negotiate individual agreements with adjacent property owners that will establish the framework to jointly resolve aquifer contamination problems.

C. If TDS equals or exceeds 700 ppm in Spur Well water, the City will take water samples from each of the monitoring wells and analyze the samples for TDS. If TDS in any of the monitoring wells equals or exceeds 700 ppm, the City will notify domestic well owners within the scope of the monitoring well network, and will take reasonable steps to remedy the situation. "Reasonable steps" may include, but are not limited to, reduction in Spur Well Field withdrawals irrespective of drawdown, providing alternate domestic water to well owners whose individual wells test >700 ppm TDS, or cessation of withdrawals from the Spur Well Field until sampling shows reductions in TDS to <700 ppm.

14. A. If the City is unable to meet municipal water demand due to an emergency situation in the first two years of operation, the City may exceed the agreed annual withdrawal limitation during those years. Upon declaration of emergency, the City will notify the State Engineer's Office and adjacent landowners of said emergency and its intent to exceed the year 1 and 2 withdrawal limit, subject to the constraints described in Table 2.

B. If the City operates above the volume limitations during the first two years, the City will extend the period of restricted withdrawals under paragraphs 9 A and B for an equal amount of time.

C. An emergency may include, but is not limited to: mechanical or electrical failure which adversely affects the City's ability to deliver water from surface or other underground water sources; temporary increased demand due to conditions beyond the City's control (not caused by unforeseen increases in customer base); casualty to the water treatment plant which reduces or eliminates its ability to deliver treated water; and failure of part of the delivery system which prevents or substantially reduces the City's ability to deliver water from a surface or another underground source.

15. The City will abandon the existing originally permitted location of the Spur No. 2 Well.

16. All contestants who have signed below shall withdraw their protests to the relocation of the Spur No. 2 Well.

17. This stipulation will be null and void if the conditions contained herein are not incorporated as permanent conditions in permit numbers 106547 and 106548 for the Spur No. 1 and Spur No. 2 wells.

18. This stipulation is entered into by the City based upon the City's conclusion that the execution of this stipulation will definitely and discernibly benefit the City of Laramie and its residents by assuring the development and maintenance of the groundwater supply associated with the operation of the Spur well field. The extended temporal term of this stipulation is necessary to protect the public interest by defining the operation of the Spur well field in a manner which assures certainty of water supply for the residents of the City while minimizing the possibility of interruption in the operation of the well field.

19. Each party executing this agreement warrants and represents that they have all necessary power and authority to execute the agreement and that, where necessary, they are acting pursuant to duly authorized and adopted resolutions of the governing bodies.

20. This stipulation may be executed in any number of counterparts, each of which shall operate as an original instrument, and all of which together shall constitute one and the same instrument.

In witness whereof, the undersigned City of Laramie and protestants have signed this stipulation at Laramie, Wyoming, on the dates shown below.

The City of Laramie

By: _____ Date: 3/26/98
Authorized Signature

Signatures of Contestants:

Wayne M. Sutherland
Date: March 23, 1998

Robert D. Paul
Date: 3/24/98

Diane J. Koronis 3/24/98
Date:

William L. Baker by Robert D. Paul
Date: 3/24/98

Cindy Kellogg
Date: 3/24/98

L. Ann Kello
Date: 3-24-98

Paul M. Fehlz
Date: 3/24/98

Date:

Steph T. Jacobs
Date: 24 III 98

X Ann M. Bowen by Steph T. Jacobs
Date: 24 III 98

Warrie J. Means 3-25-98

Gregory A. Hagmann 26 March '98

10A-12

Date:

Date:

Date:

Date:

10A-13

2005
Monthly Report
Aquifer Impacts

Resulting from the use of
Spur Well #1 & #2

January 1, 2006

Submitted by

City of Laramie
Utilities Division

10A-14

City withdrawal year to date

195.0 Acre Feet

Water Surface Elevation in Feet

MW #	7	8	10	11	12
*8/97	7259.7	7262.3	7262.3	7260.0	7283.5
Current	7249.5	7252.2	7252.8	7249.6	7278.4
Change	-10.2	-10.1	-9.5	-10.5	-5.1

*Water surface elevation measured prior to August 22, 1997 pump test

TDS

MW#	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Spur #1	300	290	280	310	320					
Spur #2	300	290	280	320	320					

Cations, Anions, & Metals

	2001				2002				2003			
	Spur #1*(mg/L)*		Spur #2*(mg/L)*		Spur #1*(mg/L)*		Spur #2*(mg/L)*		Spur #1*(mg/L)*		Spur#2*(mg/L)*	
Cations	Current	Max Δ	Current	Max Δ	Current	Max Δ	Current	Max Δ	Current	Max Δ	Current	Max Δ
Calcium	46		46		46	0	51	5	49	3	48	2
Magnesium	16		16		16	0	16	0	16	0	16	0
Sodium	1.6		1.0		2.8	1.2	2.3	1.3	2.5	0.9	2.2	1.2
Potassium	<1		<1		0.7	~0.3	0.7	~0.3	0.7	~0.3	0.6	~0.4
Anions												
Carbonate	6		6		0	6	0	6	0	6	0	6
Bicarbonate	200		200		200	0	210	10	210	10	210	10
Chloride	2.0		1.7		2.0	0	1.8	0.1	1.9	0.1	1.7	0
Fluoride	0.1		0.1		0.2	0.1	0.2	0.1	0.1	0	0.1	0
Nitrate as N	1.5		1.4		1.5	0	1.5	0.1	1.6	0.1	1.6	0.2
Nitrite as N	<0.1		<0.1		<0.1	0	<0.1	0	<0.1	0	<0.1	0
Sulfate	6.6		5.5		6.7	0.1	5.4	0.1	6.0	0.6	5.3	0.2
Metals												
Copper	<0.05		<0.05		0.006	~.044	0.005	~0.045	0.010	~0.04	0.002	~0.048
Iron	<0.05		<0.05		<0.050	0	0.055	~0.005	0.063	~0.013	<0.050	0
Lead	<0.002		<0.002		<0.001	~0.001	<0.001	~0.001	0.001	~0.001	<0.001	~0.001
Manganese	<0.05		<0.05		<0.001	~0.049	<0.001	~0.049	<0.001	~0.049	<0.001	~0.049
Zinc	<0.05		<0.05		0.002	~0.048	0.001	~0.049	0.006	~0.044	0.002	~0.048

Cations, Anions, & Metals

	2004				2005				2006			
	Spur #1*(mg/L)*		Spur #2*(mg/L)*		Spur #1*(mg/L)*		Spur #2*(mg/L)*		Spur #1*(mg/L)*		Spur#2*(mg/L)*	
Cations	Current	Max Δ	Current	Max Δ	Current	Max Δ	Current	Max Δ	Current	Max Δ	Current	Max Δ
Calcium	45	1	46	0	46	0	45	1				
Magnesium	15	1	16	0	15	1	15	1				
Sodium	2.8	1.2	2.8	1.8	3.0	1.4	2.4	1.4				
Potassium	0.9	0.1	0.6	0.4	0.8	0.2	0.7	0.3				
Anions												
Carbonate	0	6	0	6	0	6	0	6				
Bicarbonate	210	10	210	10	210	10	210	10				
Chloride	1.8	0.2	1.7	0	1.9	0.1	1.7	0				
Fluoride	0.2	0.1	0.2	0.1	0.3	0.2	0.3	0.2				
Nitrate as N	1.5	0	1.4	0	1.5	0	1.4	0				
Nitrite as N	<0.05	0	<0.05	0	<0.05	0	<0.05	0				
Sulfate	6.4	0.2	5.4	0.1	7.2	0.6	5.9	0.4				
Metals												
Copper	0.010	0.04	0.003	0.047	0.006	--	0.017	0.043				
Iron	0.038	0.012	<0.020	0	<0.020	--	<0.020	--				
Lead	<0.001	0	<0.001	0	<0.001	--	<0.001	--				
Manganese	<0.001	0	<0.001	0	<0.001	--	<0.001	--				
Zinc	0.102	0.052	0.142	0.092	0.127	0.077	0.048	0.002				

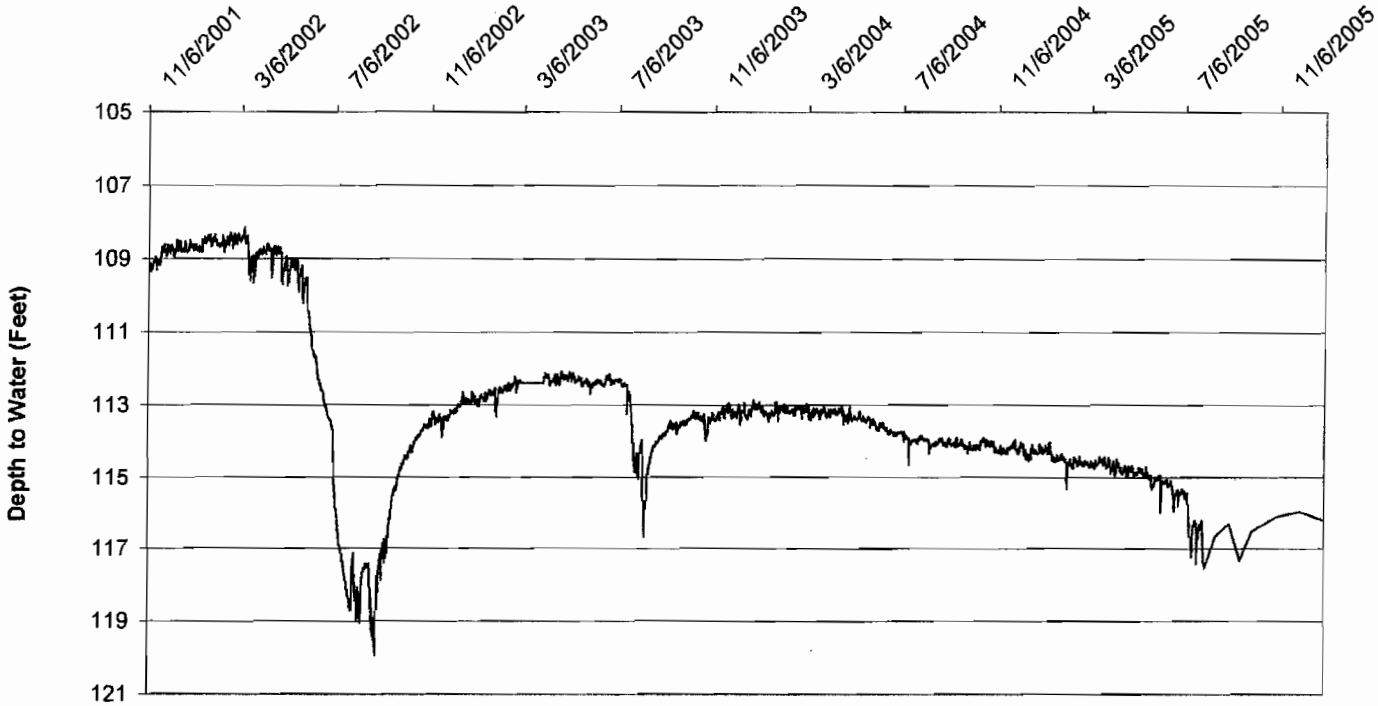
Cations, Anions, & Metals

	2007				2008				2009			
	Spur #1*(mg/L)*		Spur #2*(mg/L)*		Spur #1*(mg/L)*		Spur #2*(mg/L)*		Spur #1*(mg/L)*		Spur#2*(mg/L)*	
Cations	Current	Max Δ	Current	Max Δ	Current	Max Δ	Current	Max Δ	Current	Max Δ	Current	Max Δ
Calcium												
Magnesium												
Sodium												
Potassium												
Anions												
Carbonate												
Bicarbonate												
Chloride												
Fluoride												
Nitrate as N												
Nitrite as N												
Sulfate												
Metals												
Copper												
Iron												
Lead												
Manganese												
Zinc												

Monitoring Well Average Daily Depth to Water in Feet									
	01/01/05	02/01/05	03/01/05	04/01/05	05/01/05	05/15/05	06/01/05	06/15/05	07/01/05
MW 7	114.18	114.48	114.59	114.87	114.90	114.97	115.03	115.21	115.43
MW 8	117.56	117.88	117.91	118.26	118.24	118.30	118.33	118.52	118.73
MW 10	113.50	113.79	113.84	114.19	114.16	114.14	114.27	114.97	114.69
MW 11	128.80	129.11	129.20	129.53	129.54	129.60	129.64	129.85	130.05
MW 12	146.00	146.24	146.30	146.58	146.59	146.62	146.64	146.75	146.87
	07/15/05	08/01/05	08/15/05	09/01/05	09/15/05	10/01/05	11/01/05	12/01/05	01/01/06
MW 7	117.06	117.57	116.66	116.31	117.35	116.51	116.11	115.96	116.22
MW 8	119.45	119.82	119.63	119.52	119.57	119.67	119.33	119.27	119.54
MW 10	115.02	115.38	115.43	115.42	115.63	115.42	115.25	115.21	115.48
MW 11	131.46	131.91	131.26	130.88	131.16	131.22	130.90	130.62	130.85
MW 12	147.08	147.21	147.28	147.28	147.26	147.32	147.38	147.20	147.41

Monitoring Well Depth to Water in Feet													
		1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
MW 7	*Max*			106.68	108.63	113.25	119.94	116.67	114.66	117.57	116.22		
	Min			105.90	105.72	106.76	108.15	112.07	112.91	114.04	116.22		
	Avg			106.28	106.23	108.87	112.42	113.04	113.72	115.00	116.22		
MW 8	*Max*		111.03	111.14	111.38	114.45	119.22	118.04	117.98	120.51	119.54		
	Min		110.27	110.08	109.90	110.69	112.27	115.71	116.51	117.35	119.54		
	Avg		110.66	110.64	110.45	112.41	115.20	116.61	117.24	118.62	119.54		
MW 10	*Max*	107.43	107.57	107.56	107.91	110.62	114.33	113.51	113.94	115.63	115.48		
	Min	107.43	106.88	106.70	106.59	107.56	108.96	111.71	112.42	113.29	115.48		
	Avg	107.43	107.23	107.29	107.44	109.07	110.98	112.47	113.24	113.99	115.48		
MW 11	*Max*	121.88	122.10	122.08	123.57	127.94	134.59	129.54	129.20	132.19	130.85		
	Min	121.88	121.43	121.22	121.02	122.10	123.48	127.43	127.49	128.61	130.85		
	Avg	121.88	121.76	121.64	121.60	124.13	127.65	127.95	128.35	130.14	130.85		
MW 12	*Max*	143.64	143.73	143.56	142.38	144.16	146.11	145.52	146.28	147.48	147.41		
	Min	143.64	143.23	142.17	141.60	141.99	142.41	144.49	144.96	145.87	147.41		
	Avg	143.64	143.47	142.67	141.97	142.99	144.14	144.98	145.63	146.77	147.41		

MW #7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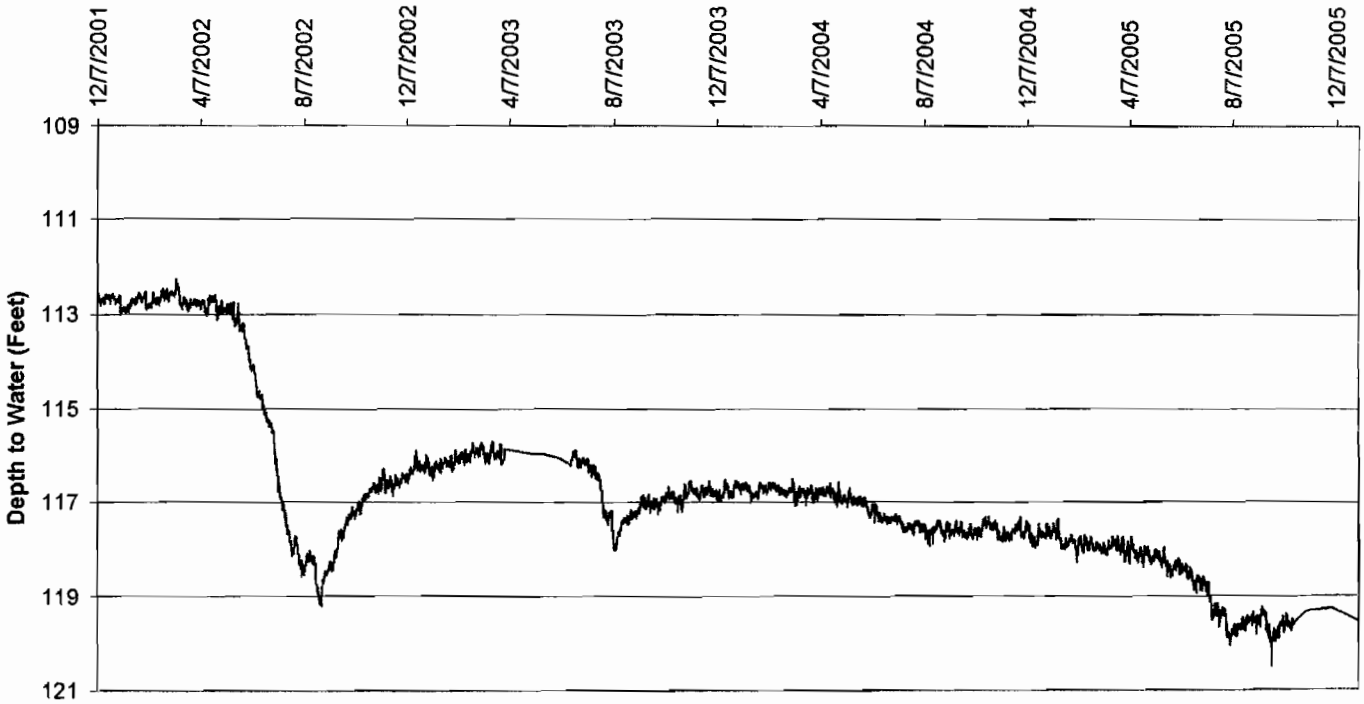
11/6/2004
3/6/2005
7/6/2005
11/6/2005
105
107
109
111
113
115
117
119
121
Depth to Water (Feet)

MW #8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111
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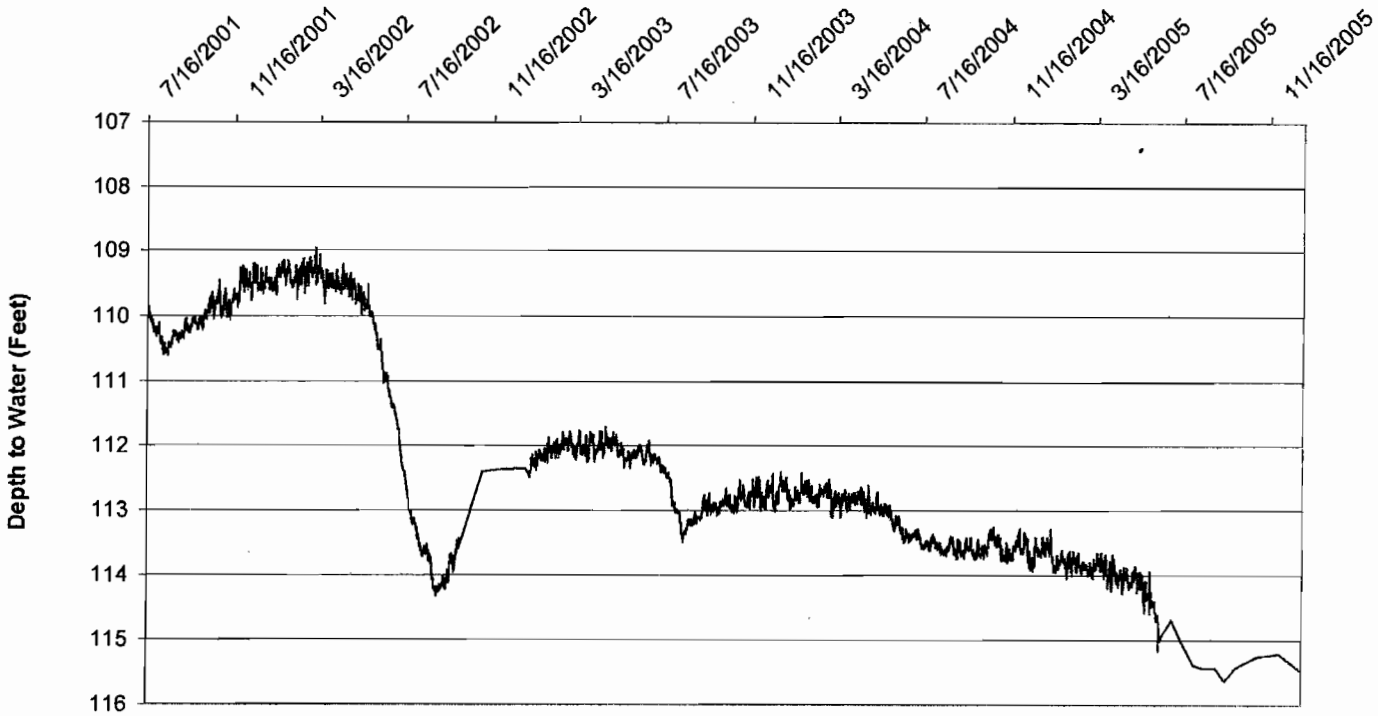
117
119
121
Depth to Water (Feet)

MW #10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3/16/2005
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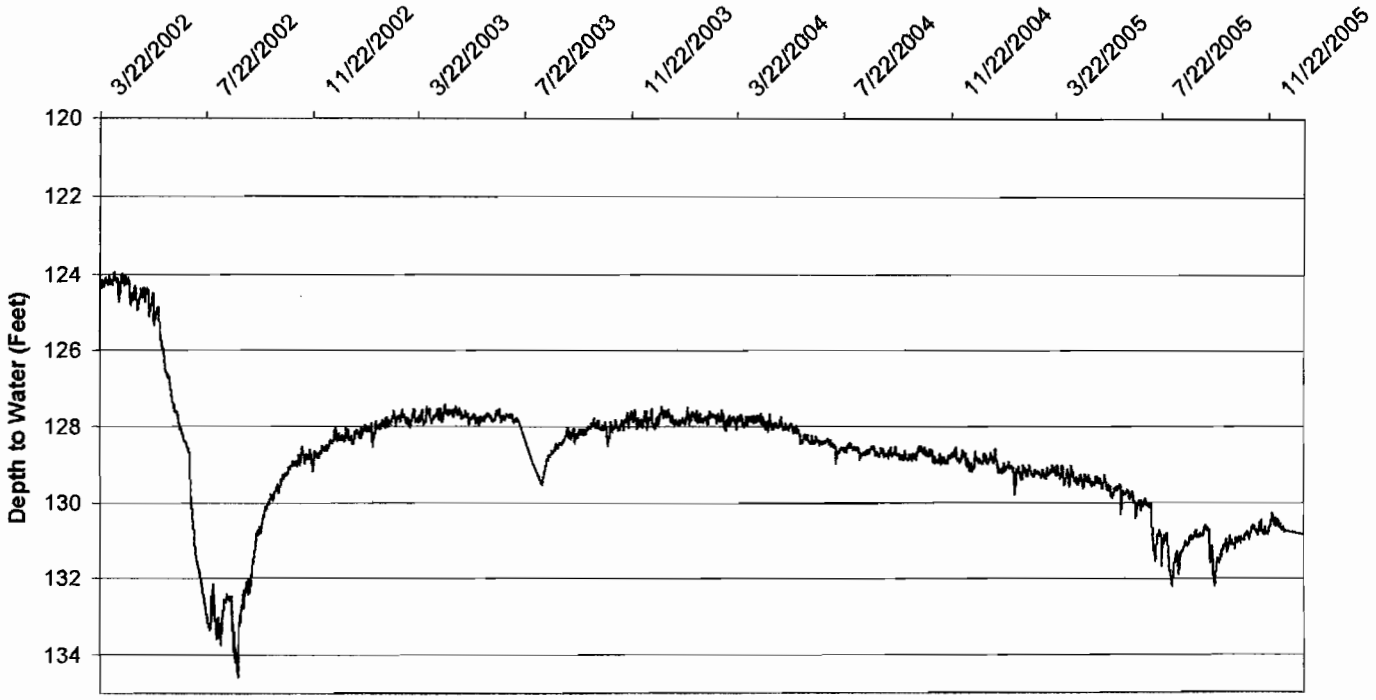
112
113
114
115
116
Depth to Water (Feet)

MW #11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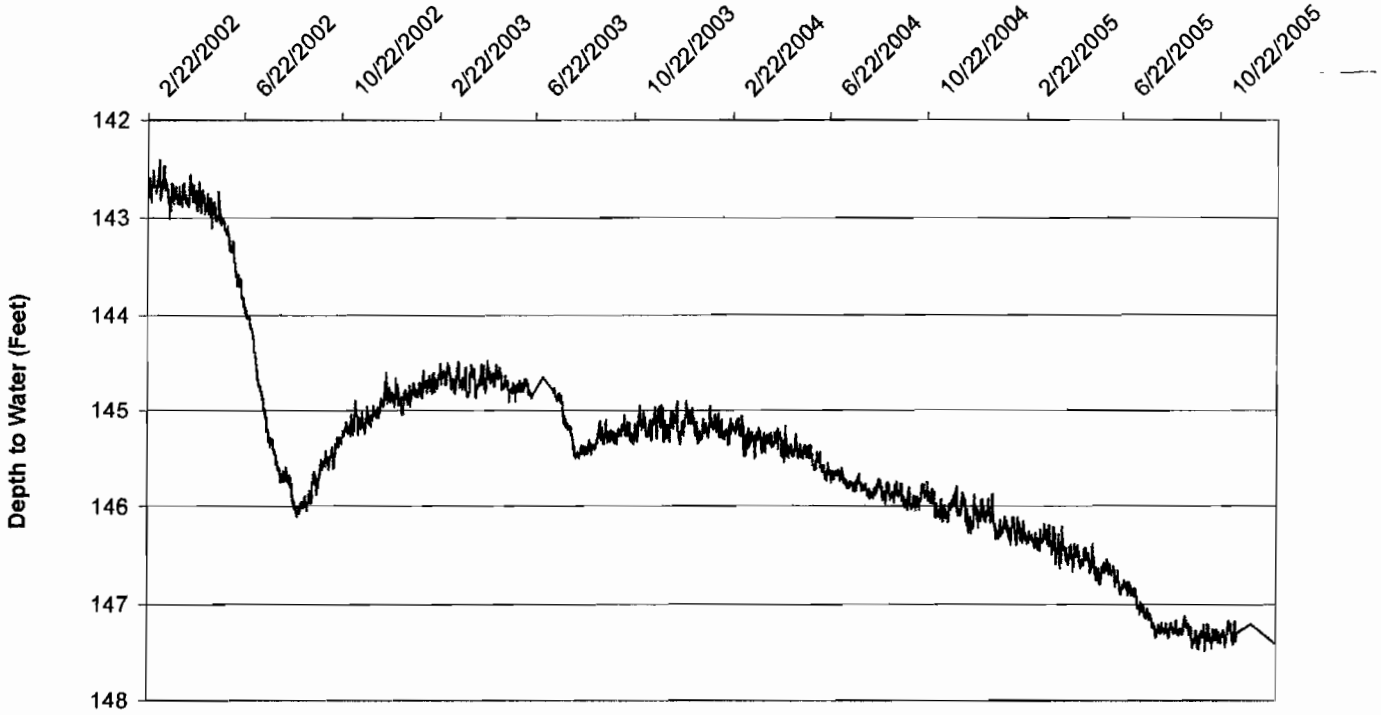
132
134
Depth to Water (Feet)

MW #12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6/22/2004
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2/22/2005
6/22/2005
10/22/2005
142
143
144
145
146
147
148
Depth to Water (Feet)

WYOMING DEPARTMENT OF AGRICULTURE
ANALYTICAL SERVICES
1174 Snowy Range Road
Laramie, WY 82070 Phone: (307)-742-2984
Internet: http://wyagric.state.wy.us/aslab/aslab.htm E-mail: aslab@state.wy.us

OFFICIAL ANALYTICAL REPORT

City of Laramie
Water and Sewer Dept.
P. O. Box C
Laramie, WY 82073

Phone No: High School, Zone 2

Sample ID: ARS Dist.

Lab Number:	**61028**
Date Collected:	10-Jul-06
Date Received:	10-Jul-06
Date Completed:	02-Aug-06

Analyte	Units	Result
Turbidity	NTU	<0.1
Bicarbonate	mg/L	140
Carbonate	mg/L	0
Alkalinity- Total	mg/L	110
Ammonia - N	mg/L	<0.1
Antimony	mg/L	<0.001
Arsenic	mg/L	<0.001
Barium	mg/L	0.128
Beryllium	mg/L	<0.001
Boron	mg/L	<0.020
Cadmium	mg/L	<0.001
Calcium	mg/L	39
Chloride	mg/L	3.3
Chromium	mg/L	<0.001
Copper	mg/L	0.029
Cyanide	mg/L	<0.1
Fluoride	mg/L	0.7
Hardness	mg/L	140

Analyte	Units	Result
Iron	mg/L	0.026
Lead	mg/L	<0.001
Magnesium	mg/L	11
Manganese	mg/L	<0.001
Mercury	mg/L	<0.000020
Nickel	mg/L	0.002
Nitrate + Nitrite - N	mg/L	0.82
Potassium	mg/L	0.9
Selenium	mg/L	<0.001
Silica	mg/L	4.5
Silver	mg/L	<0.001
Sodium	mg/L	8.2
Sulfate	mg/L	37
TDS - ROE	mg/L	180
Zinc	mg/L	0.005
pH	pH	7.8
Conductivity	uS / cm	320

Prepared By: mkw RWH

I hereby certify that the above sample was analyzed by myself or my assistant.

Section Supervisor

Kenneth L. McMillam, State Chemist/Lab Manager

10A-21

CHUCK CORLEY
WESTERN WATER CONSULTANTS
611 SKYLINE DRIVE
LARAMIE, WY 82070

DATE: APRIL 25, 1997

REQUEST NO.: 13133

WESTERN WATER CONSULTANTS, INC
RECEIVED
APR 29 1997
LARAMIE, WY 82070

SAMPLE ID: E8901 / TW-1 4-7-97

REPORT OF ANALYSIS

	E8901
pH	7.4
Bicarbonate, as $CaCO_3$, mg/L	175
Carbonate, as $CaCO_3$, mg/L	< 1
Chloride, mg/L	3
Sulfate, mg/L	< 1
Nitrate+Nitrite, as N, mg/L	1.0
Total Dissolved Solids, mg/L	190
Calcium, mg/L	50
Magnesium, mg/L	13
Potassium, mg/L	< 1
Sodium, mg/L	2
Hardness, grns/gal	10.4
Hardness, mg/L	178
Conductivity, μmhos/cm @ 25°C	323

DAVE K. OLSON
LABORATORY MANAGER

DKO:adb

WYOMING ANALYTICAL LABORATORIES, INC.
1660 Harrison St. (307) 742-7995 • FAX: (307) 721-8956 LARAMIE, WYOMING 82070

MEMBER ACIL

10A-22

K:\172040\97-013L\CADD\97\WELL-LOG\TW-1.DWG 12/15/97 08:05

TW-1 / PH-2

LOCATION: SW1/4, NW1/4, NE1/4, NE1/4, SEC 2, T 16 N, R 73 W, ALBANY COUNTY, WYOMING

LOG: WESTERN WATER CONSULTANTS, CHRIS MOODY

DRILLER: WATSON WELL SERVICE, ROBB WATSON

INSTALLATION DATE: JUNE 20, 1994

STATE ENGINEER PERMIT NO: U.W. 95558

DRILLING METHOD: AIR ROTARY

HOLE DIAMETER: 11" (0-72'); 7 7/8" (72-300')

GROUND SURFACE ELEV: 7289.04

MEASURING POINT ELEV: 7291.04 FT. AMSL (TOP OF STEEL CASING)

DEPTH TO WATER: 28.73 (8/23/94)

CASPER HEAD ELEV: 7262.31 FT. AMSL (8/23/94)

ELEV. (FT)	DEPTH (FT)
7289	0
7239	50
7189	100
7139	150
7089	200
7039	250
6989	300

TD=300 FT.

CH = CASPER HEAD WATER LEVEL IN TEST WELL.

DESCRIPTION

SATANKA SHALE

0-20' RED SHALE AND INTERBEDDED YELLOW FINE GRAINED SANDSTONE, DRILLS EASY, DRY.

20-37' RED SHALE WITH HARD SANDSTONE LAYERS, DRY.

37-38' WHITE FINE GRAINED SANDSTONE, DRY.

38-57' RED SANDY SHALE AND RED, YELLOW, AND WHITE FINE GRAINED SANDSTONES. AIR-LIFT 2 GPM AT 54 FT.

CASPER FM.

57-95' WHITE FINE GRAINED SANDSTONE, SATURATED, CUTTINGS ARE LOOSE SAND, EASY TO MODERATE DRILLING. AIR-LIFT 21 GPM AT 90 FT.

95-116' DRILLING ROUGH AND JUMPY THROUGH FRACTURES IN WHITE SANDSTONE. AIR-LIFT 60 GPM AT 100 FT. 140 GPM AT 113 FT.

116-127' DRILL BIT FALLS THROUGH SMALL CAVITIES OR INTENSELY FRACTURED ZONES IN THE WHITE SANDSTONE, FINGER-SIZED SANDSTONE FRAGMENTS IN CUTTINGS. AIR-LIFT 284+ GPM (MAXIMUM AIR-LIFT DISCHARGE) AT 125 FT.

—FIRST SANDSTONE (EPSILON) HIGHLY PRODUCTIVE

127-140' LIMESTONE WITH RED SILTSTONE.

140-234' YELLOW FINE GRAINED SANDSTONE, OCCASIONAL YELLOW SILTSTONE AND RED SANDSTONE, VERY EASY DRILLING, SANDSTONE POORLY CEMENTED AND SOFT, APPARENT FRACTURE ZONE AT 225 TO 229 FT. AS INDICATED BY JUMPY BIT AND VERY RAPID DRILLING RATE.

234-280' LIMESTONE, GREY, VERY HARD, SLOW DRILLING, APPARENT FRACTURE ZONE IN LIMESTONE AT 240 TO 242 FT.

280-300' TAN AND RED FINE TO MEDIUM GRAINED SANDSTONE, POORLY CEMENTED, VERY RAPID DRILLING RATE, POSSIBLE FRACTURE ZONE AT 280 TO 283 FT., EXCELLENT POTENTIAL FOR WATER PRODUCTION. AIR-LIFT 284+ GPM AT 300 FT.

WELL COMPLETION

DEPTH (FT)	ELEV. (FT)
0	7289
50	7239
100	7189
150	7139
200	7089
250	7039
300	6989

10A-23

JOINT RESOLUTION NO. 2002-01 No. 2002-28

RESOLUTION SUPPORTING THE ENVIRONMENTAL ADVISORY COMMITTEE'S LARAMIE REGIONAL DRINKING WATER PROTECTION PROGRAM FOR THE CASPER AQUIFER PROTECTION PLAN

WHEREAS, the Environmental Advisory Committee is composed of qualified professionals with expertise in areas related to groundwater supply and protection and concerned citizens; and

WHEREAS, the EAC has prepared a Laramie Regional Drinking Water Protection Plan for the Casper Aquifer which includes a delineation report, contaminant source inventory, contaminant management plan, and contingency plan; and

WHEREAS, protection of the City's sole source aquifer is of the highest importance to the community;

NOW, THEREFORE, BE IT RESOLVED by the Laramie City Council and the Albany County Board of County Commissioners that the City of Laramie and Albany County accept the Laramie Regional Drinking Water Protection Plan for the Casper Aquifer;

FURTHER RESOLVED, that the City shall submit the Plan to the Wyoming Department of Environmental Quality with the request that the Plan be accepted by the DEQ for appropriate action.

Dated June 18th, 2002.

Fred Homer for
Joe Shumway, Mayor and President
of the Laramie City Council

Pat Gabriel
Pat Gabriel, Chairman
Albany County Board of County
Commissioners

Attest: Sue Morris-Jones
Sue Morris-Jones, CMC
City Clerk

Attest: Jackie R. Gonzales
Jackie Gonzales
Albany County Clerk

10A-24

ORIGINAL ORDINANCE NO. 1608 INTRODUCED BY: Reisenburg

ENROLLED ORDINANCE NO. 1404

AN ORDINANCE TO CREATE AN AQUIFER PROTECTION OVERLAY ZONE

Section 1. Legislative Findings. Approximately 60% of the City's municipal water supply comes from wells and springs in the Casper Formation aquifer. The Casper Formation is exposed along the west side of the Laramie Range and is vulnerable to contamination for these reasons:

A. Points of withdrawal (municipal and domestic wells) are in close proximity to the recharge area;

B. The aquifer is fractured and has extensive exposures of porous sandstones; and

C. Interstate Highway 80 cuts through the entire thickness of the Casper Formation. Numerous hazardous substances are transported each day over I-80.

D. The Casper Formation is exposed at the ground surface on the west flank of the Laramie Range.

The City of Laramie/Albany County Environmental Advisory Committee (EAC) has members with expertise in groundwater science. The Environmental Advisory Committee has developed the Casper Aquifer Protection Plan. One of the EAC's priority recommendations is the establishment of an overlay zone which defines setbacks from recharge features and prohibition of inappropriate land uses.

The Casper Formation is overlain by the Satanka Formation. The bottom fifty feet of the Satanka Formation are fractured and are probably in hydraulic communication with the Casper Formation. Generally the Satanka Formation serves as a confining layer above the Casper aquifer, retarding the flow of water upward out of the Casper Formation and the flow of water downward to the Casper Formation. The EAC recommends a safety factor of seventy-five feet of Satanka Formation above the Casper Formation as adequate to reduce the risk of contamination to acceptable levels.

To safeguard the Casper aquifer wells and springs which provide 60% of the City's municipal water, the City Council adopts this ordinance.

Section 2. Aquifer Protection Overlay Zone Established.

A. There is established within the City of Laramie an aquifer protection overlay zone (APO zone). The APO zone is effective within the city corporate limits at all

1. Activities involving any equipment for the underground storage or transmission of oil or petroleum to the extent that it is not pre-empted by federal law; or hazardous material.	Any business or facility. Some examples include automotive service station, gasoline station, fleet garage
2. The discharge to ground water of any waste product.	Any business or facility.
3. Car or truck washing, unless all waste waters from the activity are lawfully disposed of through a connection to a Publicly Owned Treatment Works.	Car or truck washes.
4. Production or refining of chemicals, including without limitation hazardous materials or asphalt.	Chemical, petroleum, asphalt, or pesticide manufacturer.
5. Clothes or cloth cleaning service which involves the use, storage, or disposal of hazardous materials including without limitation dry-cleaning solvents.	Dry cleaner.
6. Generation of electrical power by means of fossil fuels except generation by means of natural gas or propane	Fossil-fueled electric power producer.
7. Production of electronic boards, electrical components, or other electrical equipment involving the use, storage, or disposal of any hazardous material or involving metal plating, degreasing of parts or equipment, or etching operations.	Electronic circuit board, electrical components or other electrical equipment manufacturer.
8. On-site storage of oil or petroleum for the purpose of wholesale or retail sale.	Bulk plant.
9. Embalming or crematory services which involve the use, storage or disposal of hazardous material, unless all waste waters from the activity are lawfully disposed of through a connection to a Publicly Owned Treatment Works.	Funeral home or crematory.
10. Furniture stripping operations which involve the use, storage, or disposal of hazardous materials.	Furniture stripper.
11. Furniture finishing operations which involve the use, storage, or disposal of hazardous materials, unless all waste waters from the activity are lawfully disposed of through a connection to a Publicly Owned Treatment Works.	Furniture repair.
12. Storage, treatment, or disposal of hazardous waste permitted under Wyoming law.	Hazardous waste treatment, storage, or disposal facility.
13. Clothes or cloth cleaning service for any industrial activity that involves the cleaning of clothes or cloth contaminated by hazardous material, unless all waste waters from the activity are lawfully disposed of through a connection to a Publicly Owned Treatment Works.	Industrial laundry.
14. Any biological or chemical testing, analysis or research which involves the use, storage, or disposal of hazardous material.	Laboratory: biological, chemical, clinical, educational, product testing, or research.
15. Pest control services which involve storage, mixing, or loading of pesticides or other hazardous materials.	Lawn care or pest control service
16. Salvage operations of metal or vehicle parts.	Metal salvage yards, vehicle parts, salvage yards, or junk yards.
17. Photographic finishing which involves the use, storage, or disposal of hazardous materials.	Photographic finishing laboratory.
18. Production, fabrication of metal products which involves the use, storage, or disposal of hazardous materials including (A) metal cleaning or degreasing with industrial solvents; (B) metal plating; (C) metal etching.	Metal foundry, metal finisher, metal machinist, metal fabricator, or metal plating.
19. Printing, plate making, lithography, photoengraving, or gravure, which involves the use, storage, or disposal of hazardous materials.	Printer or publisher.
20. Pulp production, which involves the use, storage or disposal of any hazardous materials.	Pulp, paper, or cardboard manufacturer.
21. Accumulation or storage of waste oil, anti-freeze or spent lead-acid batteries.	Recycling facility which accepts waste oil, spent anti-freeze, or spent lead-acid batteries.

2. Folds which extend to the ground surface.

3. Exposed bedrock.

4. Bedrock not overlain by a sufficient thickness of low-permeability materials to prevent the effective downward migration of contaminants into the aquifer.

5. Defined drainages.

6. Shallow depth to ground water, defined as any location where no effective confining layer is present over the water-bearing strata within the Casper Formation and the depth to water is less than 70 feet.

B. No person shall install, maintain, or use any on-site wastewater treatment system or wastewater storage system or any private sewer system not connected to a public wastewater system within 100 feet of a vulnerable feature in the Casper Formation.

C. Within the APO, no building permit shall be issued for any wastewater system until the applicant demonstrates to the Building Official that there are no vulnerable features in the Casper Formation within 100 feet of any point of the proposed system. Proof shall be at least the signed and stamped written opinion of a Wyoming licensed professional engineer or Wyoming licensed professional geologist. The Building Official may review independently obtained evidence and records in arriving at a decision under this subsection. If material not supplied by the applicant is used in the decision, the applicant shall be given notice of the material used and an opportunity to comment on it before a final decision is reached. Aggrieved parties may appeal the Building Official's decision to the Zoning Board of Adjustment.

Section 5. Design standards for on-site wastewater treatment systems.

A. Installation, design, repair, and removal of septic systems located within the APO zone must be in accordance with plans and specifications certified by a professional engineer registered to practice in the State of Wyoming. This ordinance does not grant the right to install a septic system or small wastewater treatment system otherwise forbidden by the Laramie Municipal code. A septic system on property annexed to the City after the effective date of this ordinance must be replaced by a connection to the Publicly Owned Treatment Works or, if no connection is available at the time of annexation, brought into compliance with subsection B below within one year of annexation and must comply with Section 6 of this ordinance.

B. Each septic system and leach field within the APO shall be inspected by a person qualified by education or training to inspect small wastewater systems

1. During installation before and during backfilling;
2. Any time the ownership of the property is transferred; and

control technology shall be in place to prevent contact between hazardous materials and the surface of the ground.

C. A pre-existing nonconforming use may be expanded under these conditions:

1. The expansion does not increase the hazard to the aquifer; or

2. Control technology built in to the expansion will prevent any increased risk to the aquifer because

a) Substitution is made of one hazardous material for another provided the substituted material is used for the same function and in equal or lesser amounts as the original material;

b) Substitution of equipment or process for equipment or process provided that the substituted equipment or process performs the same function as the original equipment or process, without increasing the storage volume of hazardous materials stored at the subject business or facility;

c) Expansion of wholesale or retail sales volume which increases the use of hazardous materials but which does not increase the storage capacity for hazardous material;

d) Initiation at the subject facility or business of an activity that is not a prohibited activity; or

3. As a result of the expansion the risk to the aquifer will be reduced.

D. Every pre-existing nonconforming use shall:

1. Store hazardous material in an enclosed structure or under a roof which minimizes storm water entry to the containment area.

2. Provide floors within a structure where hazardous material is stored, coated to protect the surface of the floor from deterioration due to spillage of any such material. A structure which may be used for storage or transfer of hazardous material shall be protected from storm water run-on and ground water intrusion.

3. Store hazardous material within an impermeable containment area which is capable of containing at least the volume of the largest container of such hazardous material present in the area, or 10% of the total volume of all such containers in the area, whichever is larger, without overflow of released hazardous material from the containment area.

4. Store hazardous material in a manner that will prevent the contact of chemicals with any materials so as to create a hazard of fire, explosion, or generation of toxic substances.

Joe Shumway, Mayor and President
of the City Council

Attest:
Sue Morris-Jones, CMC
City Clerk

Duly published in the Laramie Daily Boomerang on the 22th day of October, 2002.

First Reading: 9/03/2002
Public Hearing: 9/24/2002
Second Reading: 10/01/2002
Third/Final Reading: 10/15/2002

JOINT RESOLUTION NO. 2000-02 OF SUPPORT

RESOLUTION SUPPORTING THE ENVIRONMENTAL ADVISORY COMMITTEE'S (EAC) DEVELOPMENT OF THE LARAMIE REGIONAL DRINKING WATER PROTECTION PROGRAM

WHEREAS, the EAC has prepared a Delineation Report and Delineation Map which identify land areas that contribute water to public drinking water supplies for the Laramie Regional Drinking Water Protection Area; and

WHEREAS, the EAC has prepared a Contingency Plan which addresses problems that the City of Laramie's public water supply system may need to overcome in the event of water supply shortages or a contamination incident that impacts the system's ability to supply an adequate quantity of safe drinking water to the public; and

WHEREAS, the Laramie City Council and the Albany County Board of County Commissioners request the EAC to proceed with developing an Aquifer Area Management Plan that will make recommendations on how to manage the existing potential sources of contamination identified within the aquifer protection area and to ensure that future land-use activities do not pose a threat to the water quality of the most permeable parts of the Casper aquifer in the Laramie Regional Drinking Water Protection area; and

WHEREAS, the Laramie City Council and the Albany County Board of County Commissioners wish to thank the EAC members for all their hard work and effort in developing the comprehensive Delineation Report, Delineation Map, and the Contingency Plan.

NOW THERFORE, BE IT RESOLVED, by the Laramie City Council and the Albany County Board of County Commissioners that the City of Laramie and Albany County accept the Delineation Report, Delineation Map, and the Contingency Plan of the Laramie Regional Drinking Water Protection Program as written.

PASSED AND APPROVED this 4th day of January, 2000.

David F. Williams, Mayor and
President of the Laramie City
Council, Laramie, Wyoming

Pat Gabriel, Chairman
Albany County Board of County
Commissioners

ATTEST:

Sue Morris-Jones, CMC
City Clerk

ATTEST:

Jackie Gonzales
Albany County Clerk

03/07/06 **106**

10A-30

Aquifer Protection Plan approved by the Albany County Board of County Commissioners on June 18, 2002

Section 9. Aquifer Protection Overlay Zone.

A. Legislative Findings. Approximately 60% of the City of Laramie's municipal water supply and 100% of the water to approximately 450 rural residences comes from wells and springs in the Casper Formation aquifer. The Casper Formation is exposed along the west side of the Laramie Range and is vulnerable to contamination for these reasons:

1. Points of withdrawal (municipal and domestic wells) are in close proximity to the recharge area;

2. The aquifer is fractured and has extensive exposures of porous sandstones; and

3. Interstate Highway 80 cuts through the entire thickness of the Casper Formation. Numerous hazardous substances are transported each day over I-80.

4. The Casper Formation is exposed at the ground surface on the west flank of the Laramie Range.

The City of Laramie/Albany County Environmental Advisory Committee (EAC) has members with expertise in groundwater science. The Environmental Advisory Committee has developed the Casper Aquifer Protection Plan. One of the EAC's priority recommendations is the establishment of an overlay zone which defines setbacks from recharge features and prohibition of inappropriate land uses.

The Casper Formation is overlain by the Satanka Formation. The bottom fifty feet of the Satanka Formation are fractured and are probably in hydraulic communication with the Casper Formation. Generally the Satanka Formation serves as a confining layer above the Casper aquifer, retarding the flow of water upward out of the Casper Formation and the flow of water downward to the Casper Formation. The EAC recommends a safety factor of seventy-five feet of Satanka Formation above the Casper Formation as adequate to reduce the risk of contamination to acceptable levels.

To safeguard the Casper aquifer wells and springs which provide 60% of the City of Laramie's municipal water and 100% of the water to approximately 450 rural residences, the Board of County Commissioners adopts this resolution.

B. Aquifer Protection Overlay Zone Established.

1. There is established within the unincorporated area of Albany County an aquifer protection overlay zone (APO zone). The APO zone is effective outside of the

City of Laramie corporate limits at all locations where the upper boundary of the Casper Formation is not covered by at least 75 feet of the overlying Satanka Formation naturally in place,

whether the reduction in thickness of the Satanka Formation is due to natural causes or is man-made.

2. Initial delineation of the APO zone shall be as described by the Aquifer Protection Plan approved by the Board of County Commissioners on June 18, 2002. Copies of the illustrations which accompany the Aquifer Protection Plan shall be kept in appropriate County offices. All property within zones 2 and 3 are zoned APO by default. Property west of the western boundary of Zone 2 shall be included in the APO zone if in the opinion of the Planner or designee based upon geologic evidence, there is less than 75 feet of Satanka Formation overlying the Casper Formation at that location. If such determination is made, the APO zone area shall be amended accordingly.

3. Any aggrieved person who believes that all or part of a parcel of property included in the APO should not be included may request that the Planner or designee redetermine whether the property is correctly included. Redetermination shall not be made except upon clear and convincing evidence that at least 75 feet of undisturbed Satanka Formation overlies the Casper Formation at the location in dispute. Evidence based upon opinion alone without sound geologic field control is unacceptable. Before making a decision, the County may submit the evidence to qualified professionals for analysis, and may obtain independent evidence bearing upon the question. Costs of professional consultation to the County shall be reimbursed to the County by the aggrieved person.

4. Any person aggrieved in fact by an administrative decision under this section may appeal the decision to the Planning and Zoning Commission for review and recommendation to the Board of County Commissioners for determination.

C. Allowed and Prohibited Uses.

1. Within APO zone, the underlying zoning classification shall control all aspects of the property's zoning except that no property may be used for any use prohibited in subsection 3.C. below.

2. For the purposes of this regulation, "hazardous material" means (i) any hazardous substance as defined in 40 CFR 302.4 and listed therein at Table 302.4; (ii) any hazardous waste as defined in Wyoming law including, but not limited to, the Wyoming Department of Environmental Quality hazardous waste rules and regulations as may be amended from time to time; (iii) any pesticide as defined in Wyoming law; or (iv) any oil or petroleum.

3. Each prohibited activity listed in Column 1 of the table below in this section is prohibited in the APO zone.

Table of Prohibited Activities

Column 1 Prohibited Activity	Column 2 Examples
The following activities are prohibited in the APO zone:	**The following are examples of business or activity which conduct the prohibited activity.**
1. Activities involving any equipment for the underground storage or transmission of oil or petroleum to the extent that it is not pre-empted by federal law; or hazardous material.	Any business or facility. Some examples include automotive service station, gasoline station, fleet garage
2. The discharge to ground water of any waste product.	Any business or facility.
3. Car or truck washing, unless all waste waters from the activity are lawfully disposed of through a connection to a Publicly Owned Treatment Works.	Car or truck washes.
4. Production or refining of chemicals, including without limitation hazardous materials or asphalt.	Chemical, petroleum, asphalt, or pesticide manufacturer.
5. Clothes or cloth cleaning service which involves the use, storage, or disposal of hazardous materials including without limitation dry-cleaning solvents.	Dry cleaner.
6. Generation of electrical power by means of fossil fuels except generation by means of natural gas or propane	Fossil-fueled electric power producer.
7. Production of electronic boards, electrical components, or other electrical equipment involving the use, storage, or disposal of any hazardous material or involving metal plating, degreasing of parts or equipment, or etching operations.	Electronic circuit board, electrical components or other electrical equipment manufacturer.
8. On-site storage of oil or petroleum for the purpose of wholesale or retail sale.	Bulk plant.
9. Embalming or crematory services which involve the use, storage or disposal of hazardous material, unless all waste waters from the activity are lawfully disposed of through a connection to a Publicly Owned Treatment Works.	Funeral home or crematory.
10. Furniture stripping operations which involve the use, storage, or disposal of hazardous materials.	Furniture stripper.
11. Furniture finishing operations which involve the use, storage, or disposal of hazardous materials, unless all waste waters from the activity are lawfully disposed of through a connection to a Publicly Owned Treatment Works.	Furniture repair.
12. Storage, treatment, or disposal of hazardous waste permitted under Wyoming law.	Hazardous waste treatment, storage, or disposal facility.
13. Clothes or cloth cleaning service for any industrial activity that involves the cleaning of clothes or cloth contaminated by hazardous material, unless all waste waters from the activity are lawfully disposed of through a connection to a Publicly Owned Treatment Works.	Industrial laundry.
14. Any biological or chemical testing, analysis or research which involves the use, storage, or disposal of hazardous material.	Laboratory: biological, chemical, clinical, educational, product testing, or research.

15. Pest control services which involve storage, mixing, or loading of pesticides or other hazardous materials.	Lawn care or pest control service
16. Salvage operations of metal or vehicle parts.	Metal salvage yards, vehicle parts, salvage yards, or junk yards.
17. Photographic finishing which involves the use, storage, or disposal of hazardous materials.	Photographic finishing laboratory.
18. Production, fabrication of metal products which involves the use, storage, or disposal of hazardous materials including (A) metal cleaning or degreasing with industrial solvents; (B) metal plating; (C) metal etching.	Metal foundry, metal finisher, metal machinist, metal fabricator, or metal plating.
19. Printing, plate making, lithography, photoengraving, or gravure, which involves the use, storage, or disposal of hazardous materials.	Printer or publisher.
20. Pulp production, which involves the use, storage or disposal of any hazardous materials.	Pulp, paper, or cardboard manufacturer.
21. Accumulation or storage of waste oil, anti-freeze or spent lead-acid batteries.	Recycling facility which accepts waste oil, spent anti-freeze, or spent lead-acid batteries.
22. Production or processing of rubber, resin cements, elastomers, or plastic, which involves the use, storage or disposal of hazardous materials.	Rubber, plastic, fabric coating, elastomer, or resin cement manufacturer.
23. Any activity listed in this column that is conducted at a residence for compensation.	Residential occupations.
24. Storage of pavement de-icing chemicals unless storage takes place within a weather-tight waterproof structure for the purpose of retail sale, or for the purpose of de-icing parking areas or access roads to parking areas.	Salt storage facilities.
25. The accumulation, storage, handling, recycling, disposal, reduction, processing, burning, transfer, or composting of solid waste except for a potable water treatment sludge disposal area.	Solid waste facility or intermediate processing center.
26. Finishing or etching of stone, clay, concrete or glass products, or painting of clay products which involves the use, storage, or disposal of hazardous materials.	Stone, clay or glass products manufacturer.
27. Dying, coating or printing of textiles, or tanning or finishing of leather, which involves the use, storage, or disposal of hazardous materials.	Textile mill, tannery.
28. Repair or maintenance of automotive or marine vehicles or internal combustion engines of vehicles, involving the use, storage, or disposal of hazardous materials, including solvents, lubricants, paints, brake or transmission fluids, or the generation of hazardous wastes.	Vehicle service facilities which may include: new or used car dealership, automobile body repair or paint shop, aircraft repair shop, automobile radiator, or transmission repair; boat dealer; recreational vehicle dealer; motorcycle dealer; truck dealer; truck stop; diesel service station; automotive service station, municipal garage, employee fleet maintenance garage, or construction equipment repair or rental.
29. On-site storage of hazardous materials for the purpose of wholesale or retail sale.	Wholesale trade, storage or warehousing of hazardous substances, hazardous wastes, pesticides or oil or petroleum.
30. Production or treatment of wood, veneer, plywood, or	Manufacturer of wood veneer, plywood, or reconstituted wood

reconstituted wood, which involves the use, storage or disposal of any hazardous material.	products.
31. Injection wells All UIC except Class V subclasses 5B1, 5B2, 5B4, 5B5, 5B6, and 5B7, as defined in WDEQ Chapter 16 as beneficial use UIC wells, should be prohibited in the Casper Aquifer protection area.	
32. Water wells which are not cased at least to the top of the production zone with the annular space sealed from the top of the production zone to the surface, or in accordance with the state engineer's requirements or recommendations, whichever is stricter.	Residential uses.
33. Application of pesticides and herbicides which do not become non-hazardous within 48 hours of application or which are not applied according to the manufacturer's instructions..	
34. Application of fertilizer at greater than the agronomic uptake rate of the vegetation fertilized.	
35. Quarrying and sand and gravel mining to the extent that such prohibition is not violative of state law, particularly Wyoming statutes, S. 18-5-201.	

D. Setbacks from vulnerable features.

1. *Vulnerable features* in the Casper Formation are:

a. Faults and fracture zones which intercept the ground surface and have apertures of greater than one centimeter. Fractures may extend as far as 150 feet from the fault trace.

b. Folds which extend to the ground surface.

c. Exposed bedrock.

d. Bedrock not overlain by a sufficient thickness of low-permeability materials to prevent the effective downward migration of contaminants into the aquifer.

e. Defined drainages.

f. Shallow depth to ground water, defined as any location where no effective confining layer is present over the water-bearing strata within the Casper Formation and the depth to water is less than 70 feet.

2. No person shall install, maintain, or use any on-site wastewater treatment system or wastewater storage system or any private connection to a public wastewater system within 100 feet of a vulnerable feature in the Casper Formation.

3. Within the APO, no permit shall be issued for any wastewater system until the applicant demonstrates to the Planner or designee that there are no vulnerable features in the Casper Formation within 100 feet of any point of the proposed system. Proof shall be at least the signed

and stamped written opinion of a Wyoming licensed professional engineer or Wyoming licensed professional geologist. The Planner or designee may review independently obtained evidence and records in arriving at a decision under this subsection. If material not supplied by the applicant is used in the decision, the applicant shall be given notice of the material used and an opportunity to comment on it before a final decision is reached. Aggrieved parties may appeal the decision to the Board of County Commissioners.

E. Design standards for on-site wastewater treatment systems.

1. Installation, design, repair, and removal of septic systems located within the APO zone must be in accordance with plans and specifications certified by a professional engineer registered to practice in the State of Wyoming. This resolution does not grant the right to install a septic system or small wastewater treatment system otherwise forbidden by County resolutions.

2. Each septic system and leach field within the APO shall be inspected by a person qualified by education or training to inspect small wastewater systems

a. During installation before backfilling;

b. At least once each three years.

If upon inspection a septic system is found not to be adequately designed or constructed to serve the use to which it is connected without undue risk to the aquifer it shall not be used for the disposal of wastewater until it is cleaned, repaired, or otherwise made to operate adequately, so as not to present an undue risk to the aquifer.

F. Pre-existing nonconforming uses.

Pre-existing nonconforming uses within the APO zone are subject to the terms of this resolution and not to other general resolution provisions on pre-existing nonconforming uses.

1. A pre-existing nonconforming use is a use prohibited by this regulation but which is in place upon property included in the APO zone as of the date the property was included in the APO zone. That date may be the effective date of this resolution, or the date a use becomes nonconforming because of an amendment to this resolution. Septic systems and other privately–owned wastewater treatment systems are controlled exclusively under Sections 4 and 5 above and are not subject to these provisions on pre-existing nonconforming uses.

2. Pre-existing nonconforming uses may continue in the same location they were in when they became nonconforming uses, but shall not be expanded in size or scope. Pre-existing nonconforming uses which are damaged may be repaired and resumed at the same location, size, and scope, provided that after repairs are complete, best available control technology shall be in place to prevent contact between hazardous materials and the surface of the ground.

3. A pre-existing nonconforming use may be expanded under these conditions:

a. The expansion does not increase the hazard to the aquifer; or

b. Control technology built in to the expansion will prevent any increased risk to the aquifer because

1) Substitution is made of one hazardous material for another provided the substituted material is used for the same function and in equal or lesser amounts as the original material;

2) Substitution of equipment or process for equipment or process provided that the substituted equipment or process performs the same function as the original equipment or process, without increasing the storage volume of hazardous materials stored at the subject business or facility;

3) Expansion of wholesale or retail sales volume which increases the use of hazardous materials but which does not increase the storage capacity for hazardous material;

4) Initiation at the subject facility or business of an activity that is not a prohibited activity; or

4. Every pre-existing nonconforming use shall:

a. Store hazardous material in an enclosed structure or under a roof which minimizes storm water entry to the containment area.

b. Provide floors within a structure where hazardous material is stored, coated to protect the surface of the floor from deterioration due to spillage of any such material. A structure which may be used for storage or transfer of hazardous material shall be protected from storm water run-on and ground water intrusion.

c. Store hazardous material within an impermeable containment area which is capable of containing at least the volume of the largest container of such hazardous material present in the area, or 10% of the total volume of all such containers in the area, whichever is larger, without overflow of released hazardous material from the containment area.

d. Store hazardous material in a manner that will prevent the contact of chemicals with any materials so as to create a hazard of fire, explosion, or generation of toxic substances.

e. Store hazardous materials only in a container that has been certified by a state or federal agency or the American Society of Testing Materials as suitable for the transport or storage of the material.

f. Store all hazardous material in an area secured against entry by the public, except items offered for retail sale in their original unopened containers.

g. Not use, maintain, or install floor drains, dry wells, or other infiltration devices or appurtenances which allow the release of wastewater to the ground water.

h. Not discharge any substance or material to the ground in the APO zone unless the discharge is permitted by law.

These requirements are intended to supplement, and not to supersede, any other applicable requirements of federal, state, or local law.

The Planner or designee is authorized to promulgate rules and regulations under the Wyoming Administrative Procedure Act concerning the kind and amount of information which the owner of a pre-existing nonconforming use must provide to enable the Planner or designee to make an informed decision under this section. Appeals from the decision under this section shall be taken to the Board of County Commissioners.

G. Existing law on aquifer contamination unaffected.

The establishment of the APO zone, and the use of APO-zoned properties in accord with this resolution, does not relieve any person from liability provided by law for contamination of the

aquifer. This resolution does not supersede or modify the requirements of any federal, state or local law which makes stricter requirements.

H. Severability.

The provisions of this resolution are severable. If any provision is declared to be invalid or unenforceable by any court of competent jurisdiction, those provisions not so declared shall remain in effect.

Environmental Protection Agency, Region VIII
999 18th Street, Suite 300 (8P-W-MS)
Denver, Colorado 80202-2466

Assessment of Ground Water Under the Direct Influence of Surface Water (GWUDISW)

(GWUDISW is subject to the Surface Water Treatment Rule)

Public Water System Name: PWS#:

Well/Spring/Infiltration Gallery Name: County:

State Engineer's Office Ground Water Permit #:

Department of Environmental Quality Construction Permit #:

Date of Assessment: Analyst:

	Index Points	Score
A. TYPE OF SUBSURFACE WATER SOURCE (score one)		
Well, equal to or greater than 50 ft. deep *	0	
Well, less than 50 ft. deep*	5	
Spring	10	
Infiltration gallery, more than 2 ft. deep	10	
Infiltration gallery, ≤ 2 ft. deep	25	
*depth to first screen or perforation for groundwater entry		
B. HISTORICAL MICROBIOLOGICAL CONTAMINATION (score one)		
History or suspected outbreak of Giardia or other pathogenic organisms associated with surface water with current system configuration	50	
Record of total coliform acute MCL violations over last 3 years	30	
Record of total coliform monthly MCL violations over last 3 years		
One month	5	
Two months	10	
Three months	20	
Regulatory agency verifies complaints about turbidity or suspected waterborne disease	10	

10A-39

GWUDISW ASSESSMENT, CONTINUED (PG. 2)

PWS ID#: DATE:

	Index Points	Score
C. HYDROLOGICAL FEATURES		
Distance between a surface water source and the groundwater collector (vertical well, spring box, or infiltration gallery)		
Over 200 ft.	0	
100-200 ft.	5	
Less than 100 ft.	10	
Well, spring, or infiltration gallery located on floodplain at approximate altitude of stream	20	
Surface runoff drains toward well, spring, or infiltration gallery	15	
Source aquifer that is alluvial material, cavernous, or fractured	15	
C. STRUCTURAL FEATURES		
WELLS (includes well collecting water from infiltration galleries)		
Uncased well	40	
Casing not properly sealed	15	
No watertight sanitary seal on well casing cap	15	
SPRING COLLECTION BOX (includes collection vaults collecting water from infiltration galleries)		
Deep-rooted vegetation (e.g. trees, shrubs) around springbox, providing conduit for surface water into spring water	15	
Springbox is not watertight, with watertight overlapping lid or cover	15	
Overflows or drains open to atmosphere or allow entrance of animals (unscreened)	15	
Marshy (standing water) around spring collection area	30	

TOTAL SCORE **:

** total score of ≥ 40 indicates further assessment is needed

COMMENTS:

10B
KARL TABOGA RESEARCH SUMMARY

Structural Controls on Recharge Mechanisms in a Mountain Block/ Mountain Front Aquifer System, Casper Aquifer in the Vicinity of Laramie, Albany County, Wyoming.

Prepared by: Karl G. Taboga
University of Wyoming
Department of Geology and Geophysics
August 21, 2006

Prepared for: Wyoming Groundwater, LLC
710 Garfield, Suite 211
Laramie WY 82070

As part of Laramie Water Management Study, Level II
Wyoming Water Development Commission
Appendix 10-B

Forward

In partial fulfillment of a PhD in Geology and Geophysics at the University of Wyoming, Mr. Karl Taboga has conducted detailed research on the hydrodynamics and recharge characteristics of the Casper Aquifer in the vicinity of Laramie, Wyoming. His field work includes the monthly measurement of approximately 50 wells on the west flank of the Laramie Range from September 2003 through 2006. This extensive field effort represents a huge step forward in the acquisition of physical and chemical data needed to understand the hydrodynamics of the Casper Aquifer.

The information and analysis presented by Mr. Taboga in this Appendix report is preliminary in the sense that his PhD dissertation and field work are not yet finished. However, it was deemed important that the preliminary results and interpretations of his research are relevant to the management/development of the Casper Aquifer and should be incorporated into the Level II Laramie Water Management Plan. The City of Laramie should always be aware of, and participate to the degree possible, with ongoing research efforts involving the Casper Aquifer by the faculty and students at the University of Wyoming.

Wyoming Groundwater, LLC

Abstract

In many of the earth's arid and semi-arid high plateau regions, a significant component of recharge to basin aquifers originates as snow pack in high elevation mountain catchments, along the flank of the mountain block, and in the corresponding mountain front (Williams, 2004). Traditionally, the mountain block has been treated by hydrogeologists as a boundary condition and the groundwater recharge contribution from the mountain block has been considered to be negligible. In contrast to the traditional view, faults and fractures, which originate in the brittle crystalline basement of the mountain block and propagate upward into the overlying clastic stratigraphy, may transport substantial amounts of subcharge from the mountain block into the corresponding mountain front aquifer. These structures may influence the distribution of mountain front recharge by: 1) intercepting and redirecting groundwater flow along fault strike, and 2) creating areas of increased recharge infiltration proximate to the outcrops of faults and the associated fracture zones.

The Casper Formation, located on the west slope of the Laramie Mountains in southeastern Wyoming, is a stratigraphically complex Paleozoic sedimentary aquifer that extends from the west flank of the mountain block across the mountain front and into the Laramie Basin. The lithological units of the Casper Formation exhibit low to high granular storage capacities. The underlying crystalline Precambrian basement rock has negligible matrix permeability and is dominated by fault/fracture permeability. Discrete near-vertical fault

and fracture zones, able to transport large amounts of water, occur in the Casper and probably originate in the Precambrian. This report describes a current PhD level project that seeks to characterize the mechanisms by which geologic structures impact the distribution and transport of groundwater within the Casper Aquifer. A combined approach using hydrometric and isotopic data and flow modeling is being used to quantify and conceptualize the influence that faults and their associated fracture zones have on recharge mechanics.

The PhD research attempts to answer three questions:

1. What are the amounts, sources, and timing of recharge in the Casper Aquifer;

2. Do faults transport recharge into the Casper Aquifer upward from the Precambrian basement and/or downward from the surface exposures during snowmelt; and,

3. What is the nature of the conduit structures responsible for the high order transmissivities observed in the large production fault/fold associated City of Laramie municipal wells?

Although the data are preliminary and further analyses must be completed, the evidence collected to date strongly suggests that:

1. The Casper Aquifer is a highly dynamic system. Recharge apparently enters the saturated zone days to weeks after the occurrence of snowmelt in March and April as evidenced by large, rapid head increases in upland wells located high on the flank of the Laramie Range and in wells sited on the Red Buttes fault. Similar head increases are not observed in response to summer rainfall events.

2. A general decline in head resulting from the current drought has been observed in Casper Aquifer wells. However, this observed decline could be reversed by one season of above average snow pack. There is no apparent evidence that the aquifer is being depleted by over pumping.

3. The conduit structure associated with the high production municipal wells appears to be extensive and highly transmissive.

4. The City of Laramie can track the relative amount of recharge entering the aquifer annually by continuing and expanding their Casper Aquifer Monitoring Program. Snow pack data for the Laramie Range is easily obtained for the Crow Creek Snotel Site at: http://www.wcc.nrcs.usda.gov/cgibin/site-wygraph-swe-only.pl?state=WY

Description Of Casper Aquifer Research

Geologic Setting

The Laramie Basin of southeastern Wyoming is a large intermontane basin bounded by the Laramie Mountains on the north, east and south, the Snowy Range to the west and southwest and the Shirley Mountains to the northwest. The study area encompasses ~ 270 km^2 on the southeastern edge of the basin. The area extends from the eastern side of the City of Laramie from exposures of the Paleozoic Casper Formation, and upward into the Precambrian Horse Creek Anorthosite Complex (1.76 Ga.) and Sherman Batholith (1.43 Ga.), shown in Figure 10-B.1. This area comprises the foothills and highlands of the west slope of the Laramie Mountains. Surface elevations range from 2175 meters (7134 ft) in Laramie to 2675 meters (8774 ft) at the range summit. Surface topography is characterized by westward dipping slopes of 2 to 8 degrees marked by alternating drainage-cuesta terrain. Drainage morphology ranges from shallow valleys to deeply incised canyons.

The climate is semi-arid. Mean annual precipitation ranges from 28 cm/year (11 in/yr) in the basin to 51cm/year (20 in/yr) at the summit. Natural vegetation consists of short-grass prairie dominated by sage and grass species in the lower elevations and scattered pine-aspen forests mixed with grass and sage parks in the highlands. Streams, ponds, and small lakes are common where the Precambrian units are exposed. Surface waters that discharge at higher elevations on the Casper Formation (Figure 10-B.2) are limited to less than a dozen fault associated perennial and intermittent springs that flow at rates < 0.1 cfs (0.748 gpm). Streamflow in these losing reaches infiltrates into the alluvium of the streambed within 800 meters from the point of spring discharge. Approximately six perennial springs discharge at the basinward contact of the Casper Formation with the less permeable Satanka Formation with streamflows averaging from 0.4 to 2.5cfs.

The two primary aquifers of interest in the study area are the Paleozoic Casper Aquifer and the underlying Precambrian crystalline aquifer (formed from the two units noted above). The contact between the two aquifers generally forms a hydrologic divide for the Laramie Mountains with surface waters on Precambrian outcrops flowing predominately toward Cheyenne to the east and surface waters on the Casper Formation flowing to the west toward the Laramie Basin.

The Casper Aquifer is approximately 700 feet thick and is composed of thick beds of finely sorted eolian sandstones, (Steidtmann, J. R., 1974) interbedded with thin marine carbonates. Detrital quartz grains and lesser amounts of feldspar crystals dominate the framework of the sandstones. The sandstones are cemented in decreasing order by calcite, dolomite, micrite, and silica (Kirn, 1972). Matrix hydraulic conductivities in the sandstones are typically on the order of 0.10 to 2.6 ft/day (0.03 to 0.80 m/day) (Huntoon and Lundy, 1979). The carbonates are 10 to 35 feet thick and have estimated intergranular conductivities two to three orders of magnitude lower than the sandstones (Lundy, 1978). Benniran (1969) identified 10 carbonate

strata in the formation. Lundy (1978) considered five of the carbonate layers to be continuous confining layers for the sandstones.

The Precambrian Aquifer underlies the Casper Aquifer on the western slope of the Laramie Mountains but has been exposed by erosion only at the summit. The Precambrian Aquifer has been considered to be a basal confining unit for the Casper Aquifer in previous studies (Lundy, 1978). Granular permeabilities are negligible and wells produce sufficient amounts of water for domestic use only from permeable fracture complexes (Lundy, 1978; Huntoon and Lundy, 1979).

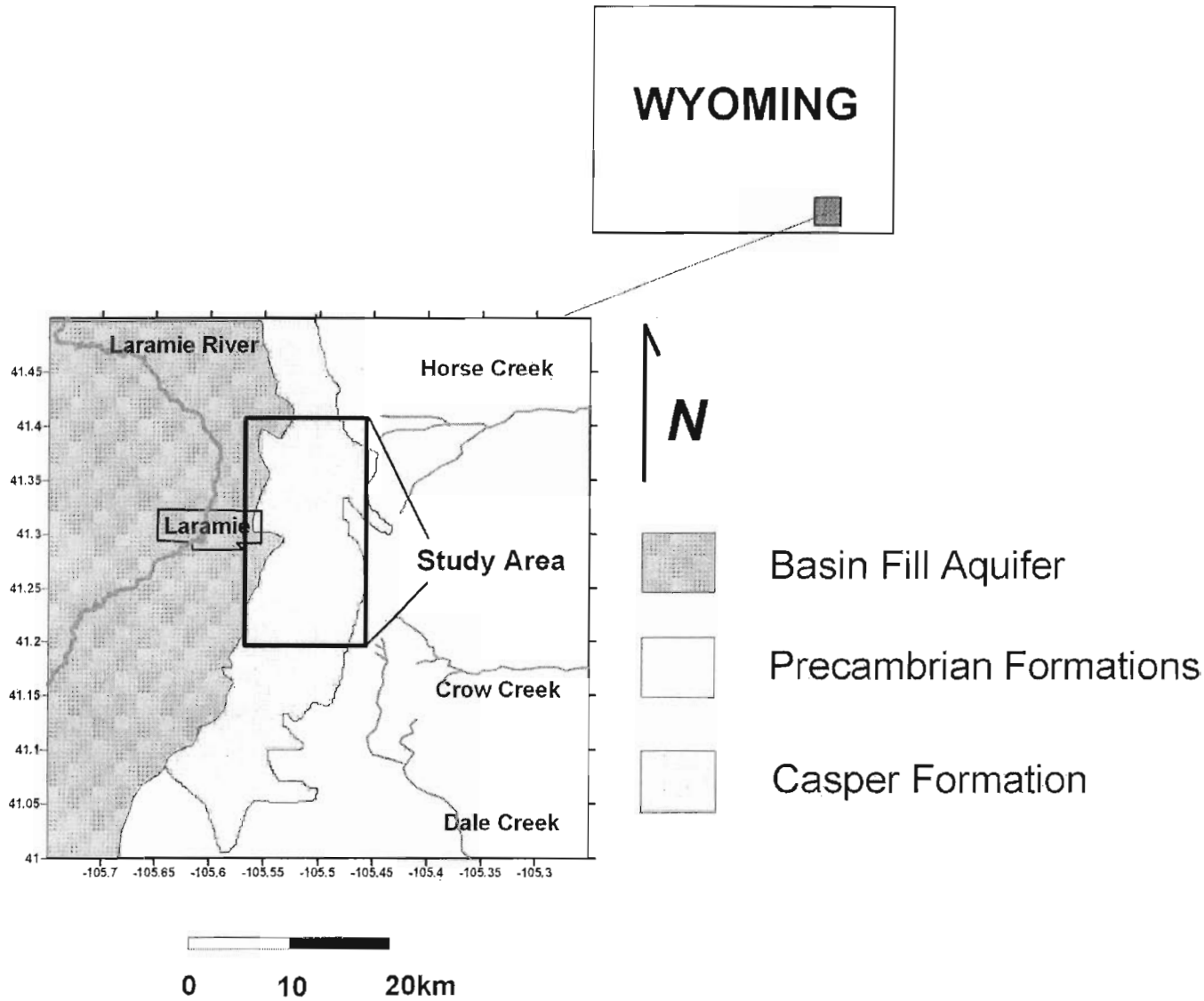

Figure 10-B.1: Site map of the southeastern Laramie Basin showing outcropping bedrock units, study area and prominent surface hydrology.

The Casper and Precambrian Aquifers exhibit signs of substantial past tectonic activity in areas where faults, folds and fractures are exposed (Plate 10-1). Structure is characterized by high angle reverse Laramide-age faults which originate in the Precambrian basement. As these faults propagated upward into

the Casper Formation, the brittle carbonates fractured whereas the thicker clastic sandstones responded with a combination of fractures and folds. Thus, folds with large structural offsets such as the Spur Monocline and Pilot Hill are usually cored by reverse faults in the brittle crystalline basement rocks (Huntoon and Lundy, 1979). Reverse faults are usually offset or terminated by normal faults that extend from the Precambrian outcrops into the Casper Formation. Jackrabbit, Red Buttes, and Telephone Canyon Faults originate as normal faults in the Sherman Batholith. Hydraulic transmissivities in areas proximate to faults and folds in the Casper Formation are two to three orders of magnitude larger than the transmissivities observed in undisturbed matrix (Huntoon and Lundy, 1979). The concept that faults provide pathways for vertical circulation within the Casper Formation was first proposed by Huntoon and Lundy (1979) and proven by Western Water Consultants (WWC, 1996; 1997).

Traditionally, hydrologists who model recharge dynamics in mountain front aquifers have considered recharge from the mountain block as a "boundary condition". Mountain block inputs into basin aquifers were limited to surface flows from streams. Recharge amounts for mountain front aquifers were calculated using mass balance methods based on precipitation measurements (Lundy, 1978) or meteoric chloride concentrations (Scanlon and Healy, 2002). The complex relationships between permeable mountain front aquifers and the mountain block units dominated by fracture permeability were recognized conceptually (Snow, 1972) but could not be well constrained using available field hydrological methods. Recent advancements in hydrologic modeling, isotope geology (Toner, 2000; Frost and Toner, 2004) and geophysical methods have made it possible to characterize these systems and the mechanisms that drive them.

The actual impact of faults on groundwater flow in semi-arid mountain front aquifers is not well quantified. What spatial and temporal effects do faults in these aquifers have on recharge mechanisms? Do these faults create recognizable patterns of groundwater flow within the aquifer? Are the fault zones vertical conduits for recharge infiltration or the transport of subcharge from the crystalline basement? Do wells in fault/fracture zones react differently to aquifer stressors such as drought and well production and can the timeframes of these responses be constrained? Can numerical flow models be constructed to forecast faulted aquifer behavior?

The Rocky Mountain West continues to experience rapid population growth and many cities such as Laramie, Albuquerque, and Salt Lake City rely on recharge from mountain block aquifers in order to meet municipal water demands. An understanding of fault influence on the recharge mechanisms of mountain front/block aquifers will be instrumental in defining public policies for water production and aquifer protection in these communities.

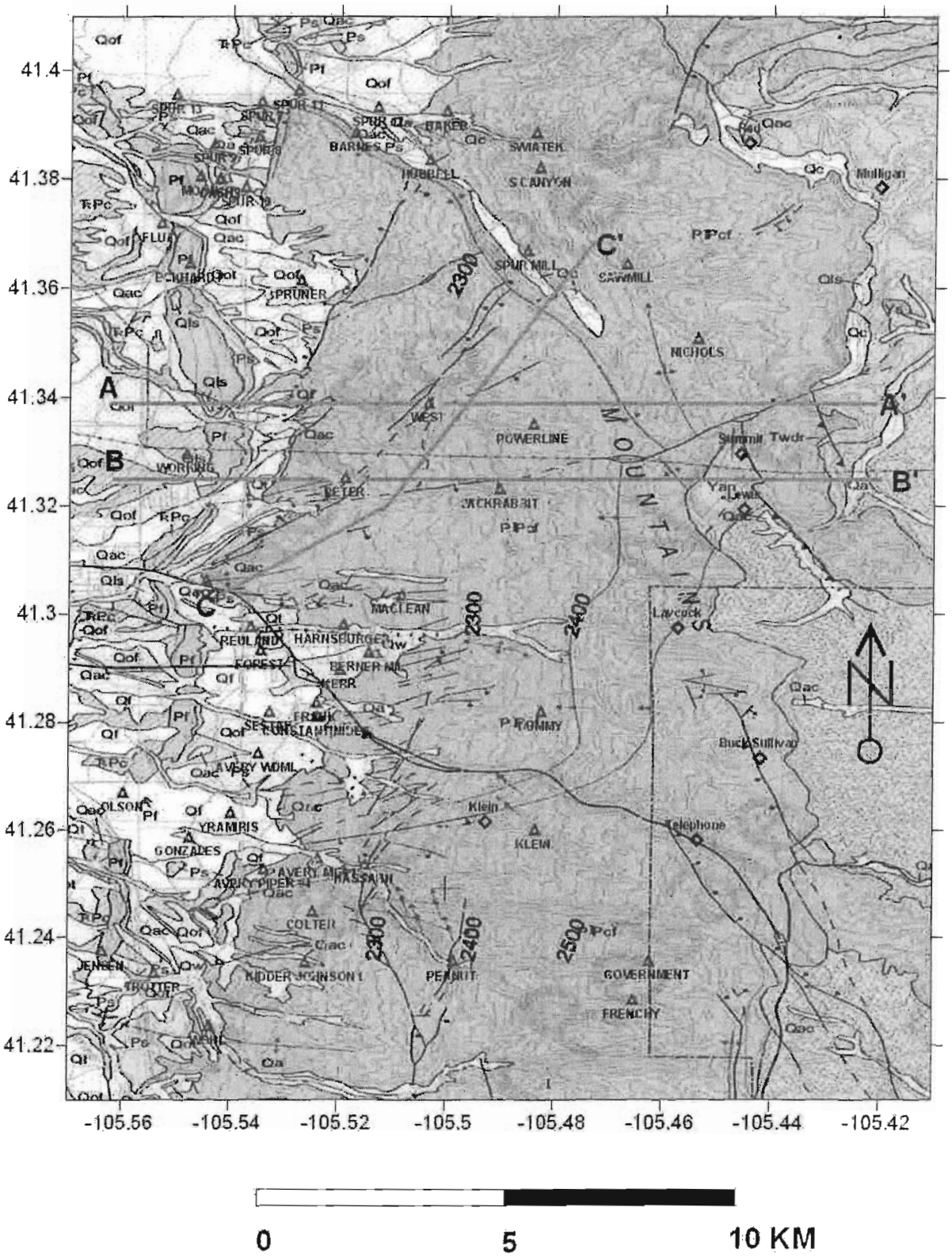

Figure 10-B.2; Study area map shows geological structure, the general potentiometric surface, surface exposures [basin fill (yellow), Casper (grey) and Precambrian (orange/brown)], sampling sites: [wells, red triangles; springs, blue diamonds] and transects for cross sections. Transect C-C' actually lies on City Springs Fault but has been offset approximately 1 km to the south (Map from Ver Ploeg and Boyd, 1999). A more detailed version of this map is attached as Plate 10-1.

Objectives

This study proposes to address three hypotheses related to the effects of fault/fracture zones on recharge mechanisms in mountain front and mountain block aquifers:

1. What are the amounts, sources, and timing of recharge in the Casper Aquifer?

2. If faults act as vertical conduits that transport recharge upward from the Precambrian mountain block and/or downward from their surface exposures during snowmelt, we should observe water level variations in wells and changes in isotopic groundwater chemistry.

3. If we pump a large volume of water from a well located in a fault complex, we should observe a rapid response in connecting faults that reflects the role of fractures as flow conduits.

Project Design

Hypothesis 1: What are the amounts, sources and timing of recharge in the Casper Aquifer?

Depth to groundwater was initially measured in January 2003 in ninety wells completed in the Casper Aquifer and a potentiometric surface was constructed using Surfer contouring software. Fifty of these wells were identified for regular long term static depth monitoring based on spatial distribution and proximity to mapped geological structure. Eight wells are completed in proximity to faults and exhibit characteristic fracture permeability, and the remaining wells are not proximate to mapped structure. Monthly monitoring of depth to water in these wells was started in September 2003 and will continue until September 2007.

Individual hydrographs of head variation have been constructed for the monitored wells and preliminary correlations made to proximate geological structure. Preliminary data show that annual hydrograph behavior is strongly dependent on the spatial relationship of a well to dominant geological structure. Preliminary analyses of the data strongly suggest that faults intercept and redirect groundwater flow and influence the seasonal distribution and timing of recharge within the mountain front/mountain block aquifers. Preliminary data has been analyzed for time series correlations between specific recharge events and well level responses. Methods used by other researchers (Crosbie et al, 2005; Healy and Cook, 2002) using temporal variations in groundwater levels to estimate recharge rates are being evaluated for application in the Casper Aquifer.

Hypothesis 2: If faults act as vertical conduits that transport recharge upward from the Precambrian mountain block and/or downward from their surface exposures during snowmelt, we should see water level variations in wells and changes in isotopic groundwater chemistry.

In order to identify if recharge is transported by faults from the Precambrian into the Casper Aquifer, this study will examine variations in ratios of strontium-87/strontium-86 and the stable meteoric isotopes in groundwater samples. Frost and Toner (2004) confirmed that strontium isotope ratios could be used to identify Precambrian groundwater inputs into the Casper Aquifer and that significant mixing does occur in northern parts of the study area. However, the hydrometric data was unavailable to correlate this mixing to

specific geological structure and seasonal recharge inputs. This study will sample and analyze groundwater from twenty of the monitored wells using the procedures outlined in Frost and Toner (2004). Ten of the wells are sited in the vicinity of mapped faults. The balance will consist of wells not sited in proximity (>500 m) to mapped structure. The data will be examined for correlations between strontium isotope concentrations and known hydraulic, spatial and structural parameters of the sampled wells. A contour map will be constructed for strontium isotope ratios in the study area and a range of mean volumes for the Precambrian component of recharge will be calculated. This work has not yet been performed.

The stable meteoric isotopes, ^{18}O and ^{2}H, have been used to identify recharge sources and mixing in fractured (Bradbury, et al. 2001) and mountain front aquifers previously (Thiros, 1995). Stable meteoric isotope concentrations in Casper Aquifer water will be used to identify the source and mean altitude of recharge and correlate its delivery into the aquifer to a specific significant recharge event. An initial sampling will be made for ^{18}O and ^{2}H concentrations for the same 20 monitored wells used in the strontium study. Samples of accumulated snowfall will be collected (Earman. et al, 2004) along an east-west transect of the study area at 50 meter intervals of elevation. Sample isotope concentrations will be analyzed by the Stable Isotope Laboratory in the University of Wyoming's College of Agriculture. An initial study would be conducted to evaluate the efficacy of using stable isotope concentrations to characterize recharge source, temperature and altitude.

If an altitude signature is discernable in the precipitation samples, the well samples will be analyzed relative to their altitudes to evaluate the value of using ^{18}O and ^{2}H levels in determining recharge elevations. Derived recharge elevations can then be plotted using contouring software and correlated to existing potentiometric and topographical contours to determine probable recharge areas. The data from the meteoric isotope and the strontium isotope analyses will be examined relative to well proximity to mapped structure. This work has not yet been performed.

The stable meteoric isotopes can also be used to identify a sudden downward influx of recharge into a faulted/fractured aquifer resulting from a specific snowmelt event (Bradbury, et al. 2001). If such an event occurs in the study area, subsequent well sampling for ^{18}O and ^{2}H levels will be conducted in conjunction with the first observable increase in head in an effort to identify an isotopic recharge signal and constrain recharge timing.

Hypothesis 3: If we pump a large volume of water from a well located in a fault complex, we should see a rapid response in connecting faults that reflects the role of fractures as flow conduits.

Faults in fractured aquifers have been observed to act as conduits, barriers or both (Caine et al., 1996). Although, fault hydraulic parameters such as conductivity and storage coefficient are critical for constructing groundwater flow models on local and regional scales, these properties are rarely quantified using actual hydraulic tests. Additionally, few studies have attempted to characterize fault hydraulics and architecture in a complex system composed of several interconnected faults (Allen and Michel, 1998). An examination of fault system hydraulics will be useful to explain the observed temporal and spatial variations in the well hydrographs, to define how a fault distributes recharge within a mountain front aquifer and to determine if it transports recharge from the mountain block.

Several large mapped faults in the Casper Aquifer converge at the Turner Wellfield on the eastern edge of the City of Laramie. There are numerous wells located in the area on the converging faults. This situation presents an opportunity to conduct a series of multi-well high volume pump tests to evaluate the hydraulic behavior of faults at a scale of hundreds of meters to kilometers.

In conjunction with the City Utilities Department, a series of high volume multi-well pump and recovery tests were conducted in 2005. For each test, a set of wells proximate to the City's Turner municipal wellfield was identified and instrumented with data loggers programmed to measure head changes and temperature. City utilities personnel pumped municipal supply wells at a constant discharge rate of 1500 gpm for a period of time (~1500 minutes) sufficient to cause head declines at the instrumented wells. Pumping was terminated for a similar period of time and the wells allowed to recover.

Preliminary data indicate that the pumping and monitoring wells exhibit extensively developed hydraulic connectivity that is observable on a scale of hundreds to thousands of feet. Well responses to the initiation of both the pumping and recovery phases of the test were observed to occur in far field monitoring wells (0.2 to 1.0 mile distant) in less than an hour. A similar test was conducted at the Brow #2 well 6 miles south of Laramie in November 2005. Monitoring well responses similar in timing and magnitude to the Turner Wellfield test were observed.

An initial conceptual model of aquifer and fault architecture will be developed by comparing the Turner Wellfield test data to numerical flow models that simulate vertical fractures (Gringarten and Witherspoon, 1972), vertical dykes (Boonstra and Boehmer, 1987) and unfaulted matrix (Theis, 1938). The fault hydraulic parameters of storativity and transmissivity will be calculated and evaluated. Finally, groundwater isotopic and temperature data collected during the pump test would be examined for correlations to the fault architecture and flow models. This work has not yet been performed.

Preliminary Work and Results

Analysis of the Potentiometric Surface and Well Hydrograph Time Series:

Groundwater levels were measured in ~75 wells in November 2005 and a potentiometric surface was contoured for comparison to the surface drawn by Lundy in 1978 (Lundy, 1978). Substantial differences exist between the 2005 data and Lundy's measurements, (Table 10-2). At this point in time, the observed differences cannot be adequately explained but can only be acknowledged. It should be noted that the wells used in the 2005 water level data have been measured repeatedly over a 3 year period while the earlier study collected groundwater level data once or twice for each well.

The potentiometric surface is shown in Plate 10-2 for the study area. The equipotential contours indicate that groundwater flows generally from east to west. The most obvious exception is the area around the Spur Anticline, the largest, most dominant geologic structure in this portion of the Casper Aquifer. The alpha member of the Casper Formation is exposed along Spur Ridge. Along the Spur Ridge, the Casper Formation is no more than 350 feet thick. An analysis of data for this area strongly suggests that groundwater levels are located below the elevation of the top of the underlying Precambrian basement rock on Spur Ridge and that the Casper Formation is probably unsaturated.

Preliminary data indicate that head response to recharge events is a function of the spatial relationship of the well to dominant geological structure. A secondary determinant appears to be altitude. The occurrence and timing of recharge events for this area of the Laramie Range is represented by Snow Water Equivalent (SWE) data obtained at the Crow Creek Snotel Site. The data are available at the National Resources Conservation Service (NRCS) website http://www.wcc.nrcs.usda.gov/snotel/Wyoming/wyoming.html. Generally, wells sited in similar structural regimes and at similar altitudes exhibit the same general seasonal

response to recharge and can be grouped together by the patterns of response and location. Hydrographs for all monitored wells are shown in Appendix 10-C.

Upland Wells

Upland wells are located on the west slope of the Laramie Range upslope of major faults at altitudes greater than 7800 feet. Generally, these wells are low production stockwells that draw down 10-100 feet when pumped at 2-5 gpm. The large drawdowns are typical of the low porosities and specific storages characteristic of the alpha and beta members of the Casper Aquifer within which the wells are completed. Upland wells exhibit highly variable changes in head in rapid response to snowmelt. For example, the head in Government Well (Figure 10-B.3), located near the summit crest of the Laramie Range, responded to four recharge events (snowmelt in March, 2004; late September, 2004; April, 2005 and April, 2006). During the April 2005 event, head in Government Well began to increase within days of the start of snowmelt. Head in the well peaked on July 4, 2005 at 17.80 feet above pre-event elevation and then began to decline. Groundwater levels declined until March 26, 2006 when head in the well began to respond to the March 2006 snowmelt event. The increased head persisted through the year; the lowest head observed in the well prior to the latter snowmelt event (March 2006) was 0.87 feet higher than the level observed prior to the 2005 snowmelt. Similar responses have been seen in upland wells, Nichols, Powerline, Klein and Frenchy. The degree and frequency of head variability observed in the upgradient wells are significantly larger than those observed in the wells located downgradient of faults.

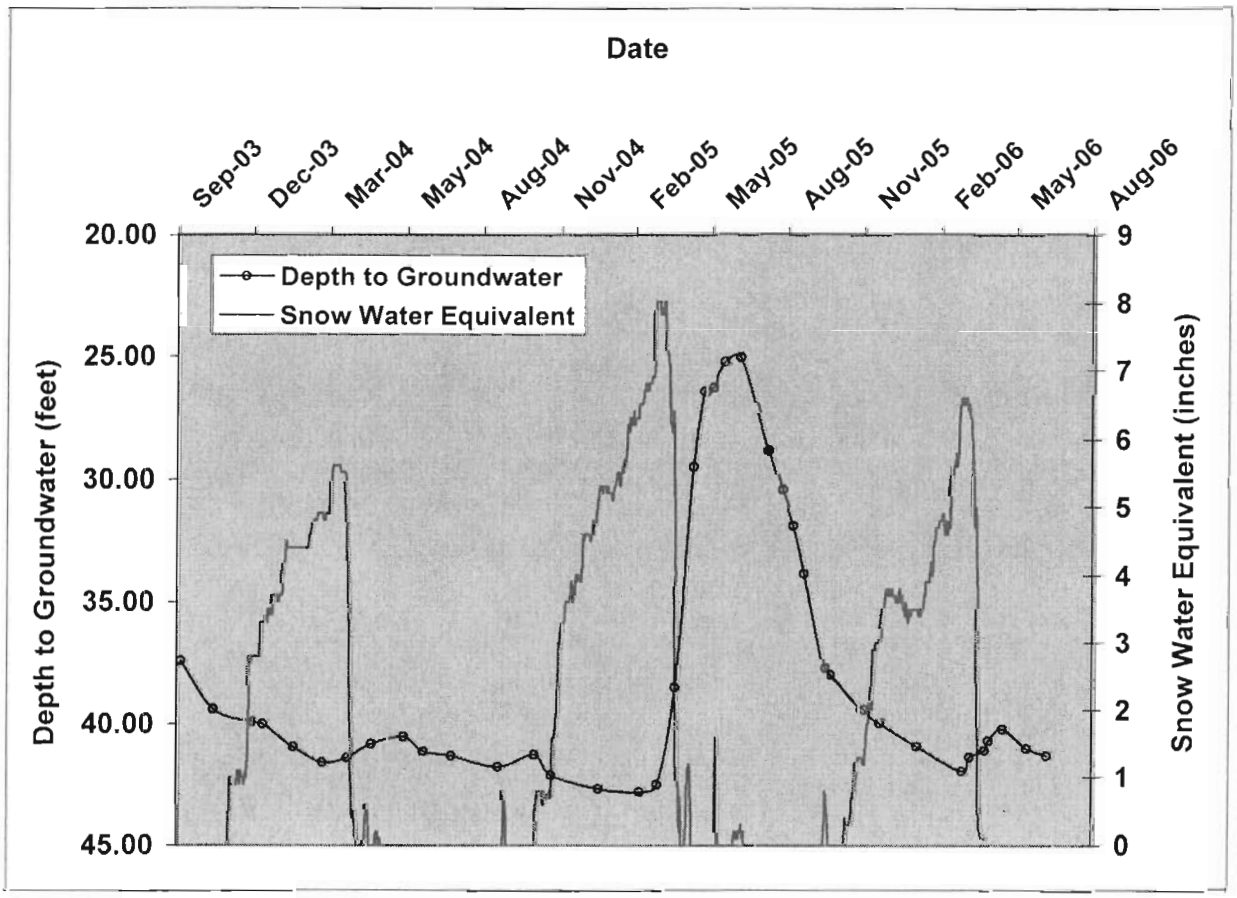

Figure 10-B.3: Response of an upland well, Government, to recharge events as indicated by snow water equivalent recorded at the Crow Creek, WY Snotel Site.

Fault Associated Wells

A number of the wells that are monitored monthly are sited in close proximity to mapped faults and/or folds (Table 10-B.1). Fault associated wells generally exhibit low magnitude head responses to specific recharge events. For example, Peanut Well is located on the Red Hills Fault, a mountain block bounding normal fault that strikes north-south parallel to the ridge of the Laramie Range. Peanut does not appear to be impacted by pumping because, unlike many of the other faults in the study area, there are no high production wells or large subdivisions sited in the vicinity of the fault. Head in Peanut Well declined at a relatively constant rate during 2004 when snow pack was low. Rapid, low magnitude head increases were observed in 2005 apparently in response to two snowmelt events in April (0.27 ft) and June (1.10 feet). After the June recharge event, head "reset" at a persistently higher level than observed prior to the 2005 snowmelt events. This suggests that the fault intercepts groundwater flow from the upgradient mountain slopes. Head then declined at approximately the same rate seen prior to snowmelt. The rapid response "spikes" observed during the snowmelt events are seen only at the Peanut, Kassahn, Jackrabbit and Harris wells. The West, Peter and MacLean wells do not exhibit these responses.

Well Name	Associated Fault
Jackrabbit	Jackrabbit
West, Peter	City Springs
Peanut, Kassahn, XX#8	Red Buttes
Harris #1	Spur
MacLean	Quarry

Table 10-B.1: Fault associated wells

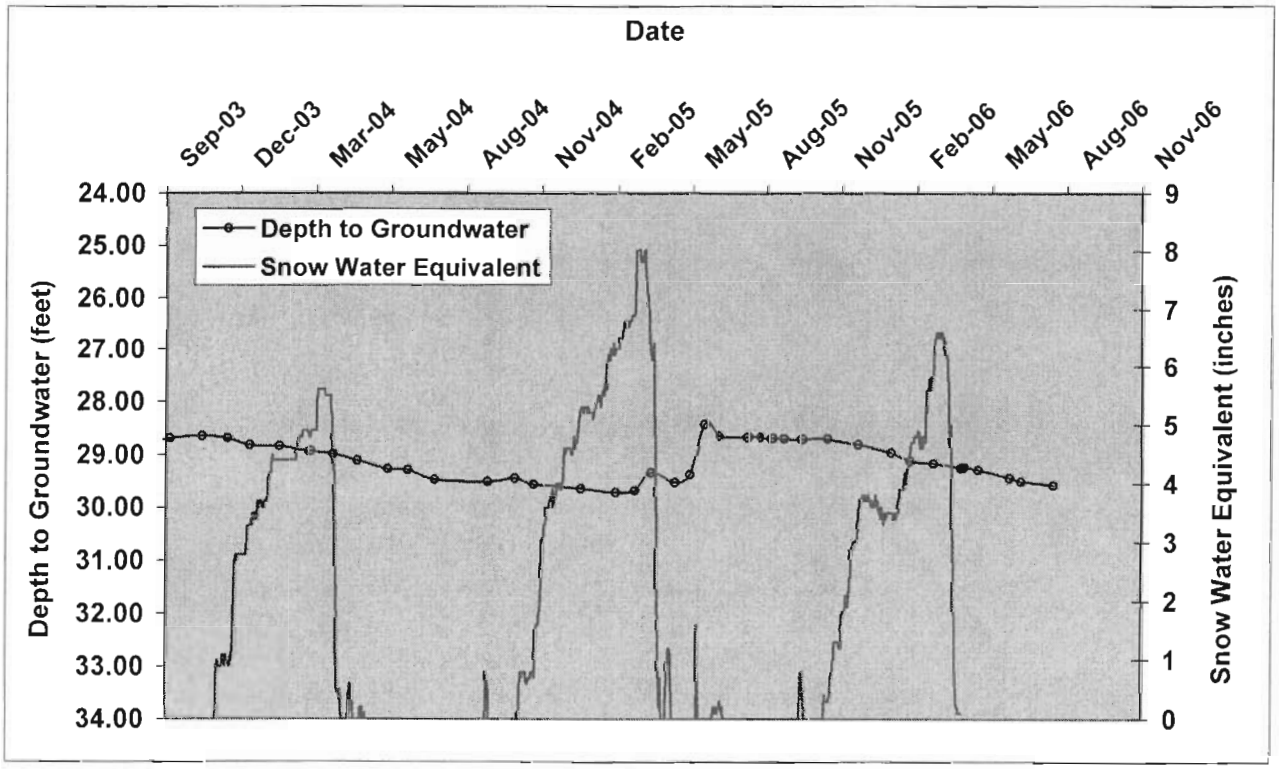

Figure 10-B.4: Response of a fault associated well, Peanut, to recharge events as indicated by snow water equivalent recorded at the Crow Creek, WY Snotel site.

Peanut exhibited no or limited response to the recharge events of March 2004, September 2004, and April 2006. This is probably due to the lack of snow at lower elevations where the well is sited. The applicability

of the Crow Creek Snotel data is limited for lower altitude wells. The Snotel site is located 5 miles to the east of Peanut at an altitude that is 550 feet higher. Field observations confirm that the accumulated snowpack was melting at Peanut concurrently with the Snotel site during the events of April and June 2005. There was no snowpack present at Peanut after March 15, 2006 while snowmelt did not begin at the Snotel site until March 31.

The low magnitude of the responses seen during the 2005 events suggests that the specific storage of the aquifer in the area around the Peanut Well is higher than the upland wells. It is possible that that higher specific storage makes it difficult to discern well response to low volume recharge events, such as the September 2004 event.

It is worthwhile to note the similarities of the hydrographs for wells located on the same fault. Compare the hydrographs of Peter Well to West Well (City Springs Fault) and Kassahn Well to Peanut Well (Red Hills Fault). Although these wells are separated by several miles, the configurations of their respective hydrographs show close correlations suggesting that the hydraulic character of the faults is relatively similar at the respective well sites.

Fault associated wells exhibited a marked, steady decline during 2004. The observed head declines may be a general response to low snowpack The rate of decline (slope of best fit line) for each well appears to depend on the angle of the fault to the direction of downgradient flow (Figure 10-B.5). Static water levels declined at lower rates in faults that strike perpendicular to the direction of groundwater flow than those that strike parallel to flow direction. This suggests that orientation may have a direct effect on the quantity of flow captured by a fault.

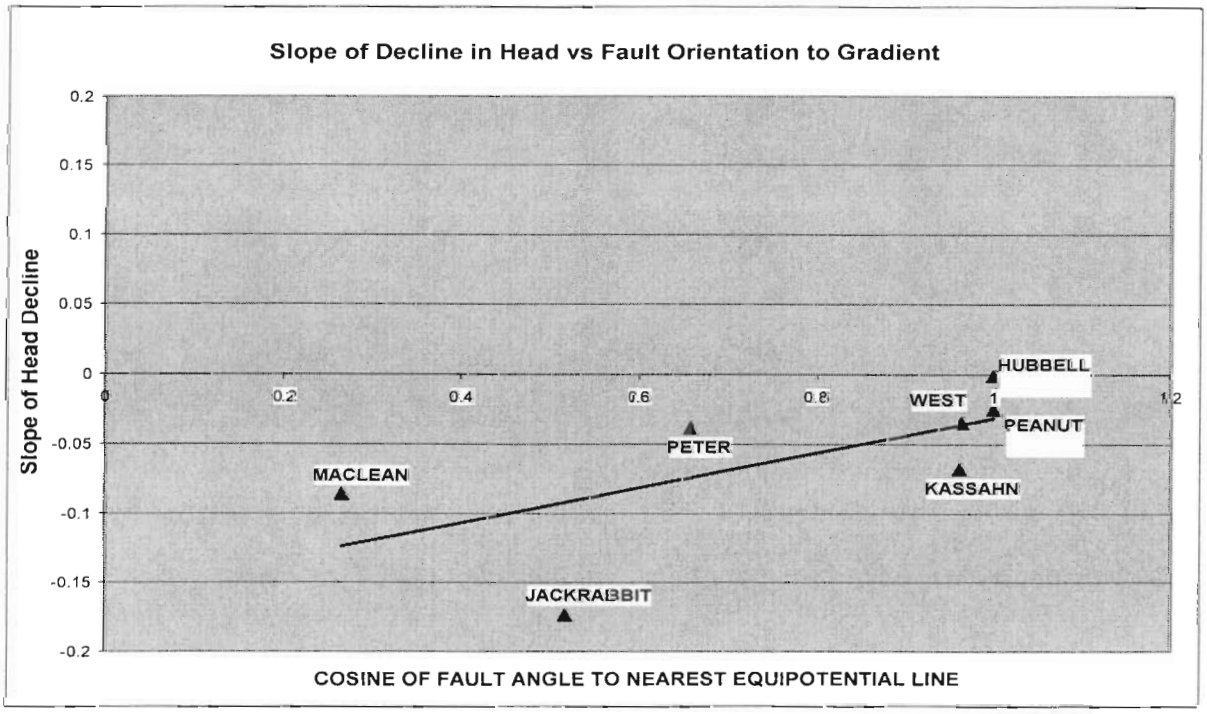

Figure 10-B.5: Head decline in fault associated wells versus fault orientation. Best fit line is shown in black

A simple analysis was conducted to examine the local influence of faults on head. Since the direction of groundwater flow is from east to west, a plot was constructed relating accumulated distance eastward from the meridian at -105.59 to the elevation of the potentiometric surface in fault associated wells and wells that are not proximate to mapped structure. Figure 10-B.6 shows the relationships. Generally, water elevations are depressed in wells associated with faults connected to the City Springs Fault. The depression is largest upgradient (east) and decreases to the west.

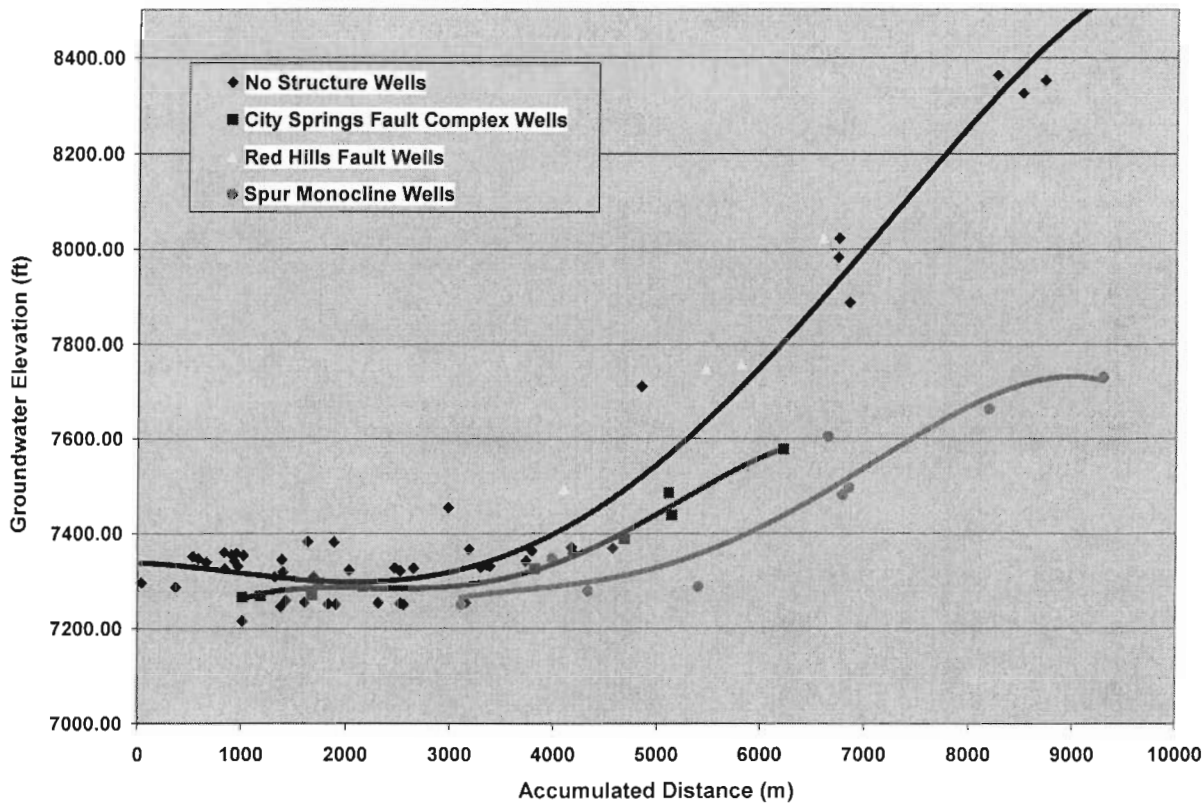

Figure 10-B.6: Relationships of accumulated distance to groundwater elevation in wells not located proximate to mapped structure, fault associated wells on the City Springs Fault Complex (Quarry, Spur, City Springs and Jackrabbit Faults), fault associated wells on Red Hills Fault, and wells located below the Spur Anticline. Best fit curves shown are fourth order polynomial lines.

An analysis of the potentiometric surface model in the vicinity of the City Springs Fault supports the observation that water levels are depressed in the fault associated wells. Cross-sections of the aquifer were constructed through the West and Peter Wells and along the City Springs Fault (see the Figure 10-B.2 for transect locations). The cross-sections show the relationship between the modeled potentiometric and topographical surfaces (Figure 10-B.7). Note the depression of the potentiometric surface in the vicinity of the fault in the two east-west transects. The magnitude and length of the plotted depression may indicate a large volume of groundwater redirected and transported by the City Springs Fault. The depression is especially pronounced on the northernmost transect through the West Well and is less apparent on the section through the Peter Well. This suggests that the fault transports groundwater that originates in high altitude recharge areas. In contrast, the rate of decrease in the elevation of the potentiometric surface along the strike of the City Springs Fault is markedly lower than the decrease in elevation of the topographical surface. This analysis strongly suggests that City Springs Fault is highly transmissive throughout its length and not just at its southwest end in the vicinity of the Turner Wellfield.

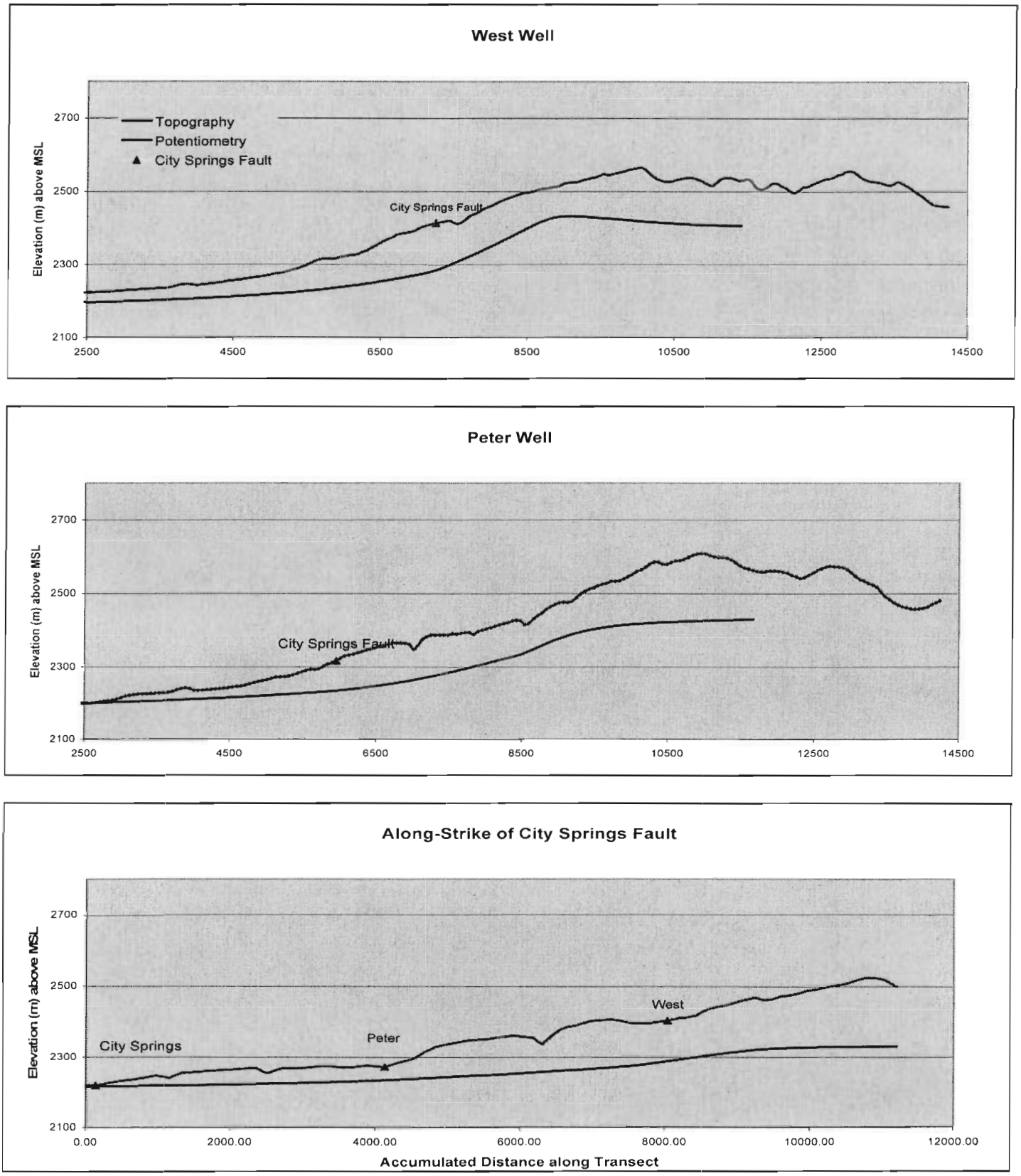

Figure 10-B.7: Sections through Transects A-C showing the relation of potentiometric surface (blue) to topographic surface (brown).

Downgradient Wells

Wells sited in areas downgradient of the faults in the Casper Aquifer exhibit similar hydrographs but are affected by the spatial relationships of the wells to large subdivisions and City of Laramie municipal wellfields. For example, many of the wells located in the Sherman Hills Subdivision drawdown simultaneously with pumping at the Turner Wellfield. It is important to keep these effects in mind when examining the data from downgradient wells. One way to address this is to look at the hydrographs of downgradient wells that are located several miles away from any large subdivisions and wellfields. The Trotter and Wohl Wells are located 4.2 miles south of the Pope Wellfield on the west end of Gilmore Gulch, a thinly populated area. The Wohl Well is sited 0.9 miles upgradient of the Trotter Well. Hydrographs for the two wells are shown below (Figures 10-B.8, 10-B.9).

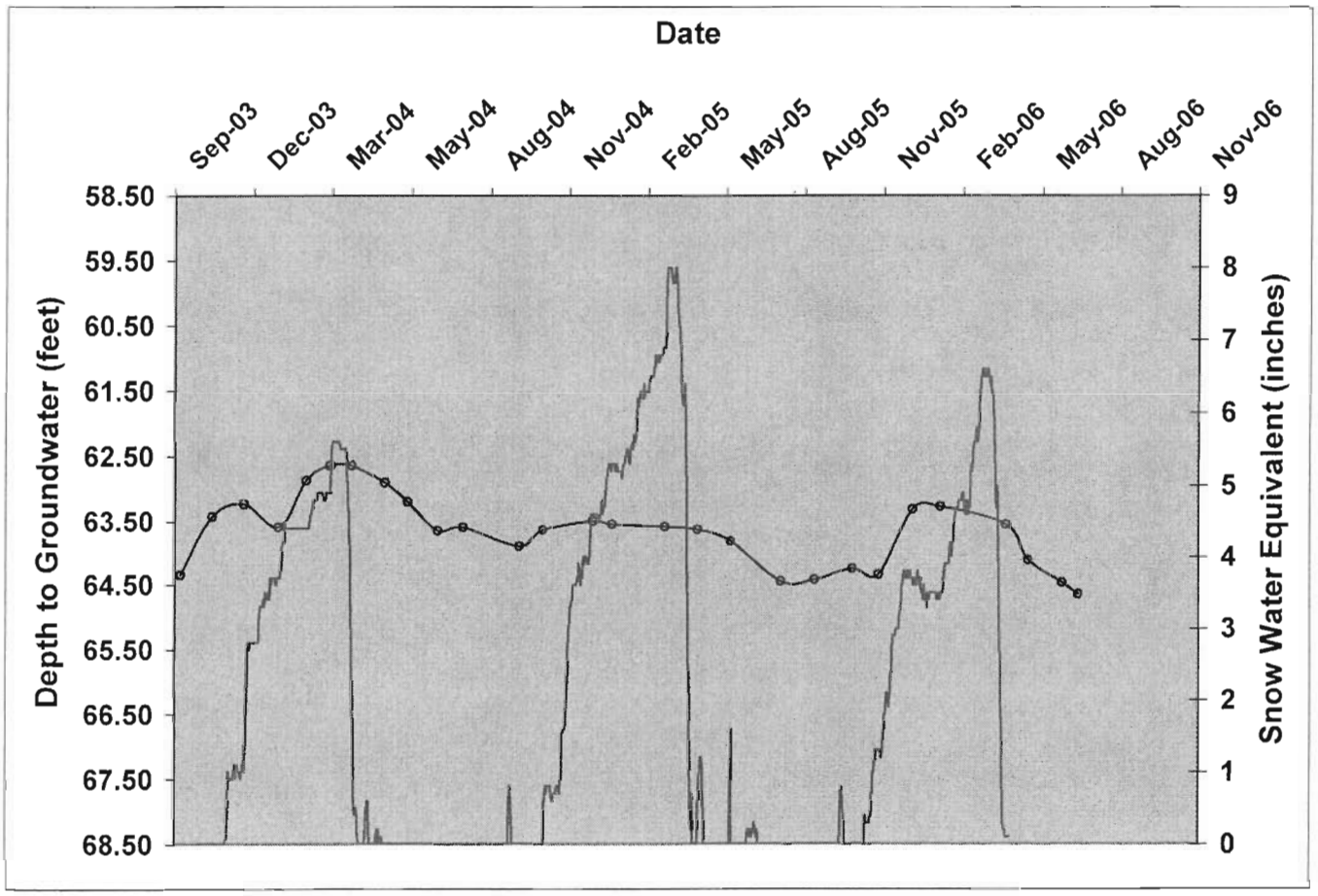

Figure 10-B.8: Response of a downgradient well, Trotter, to recharge events as indicated by snow water equivalent recorded at the Crow Creek, WY Snotel site.

The time series hydrograph suggests that responses of the Trotter and Wohl Wells to the spring snowmelt events of 2004 and 2005 are delayed by 6 and 4 months respectively. The magnitudes of the observed head increases in the wells correlate best with the quantities of snow water equivalent observed in the snowpack just prior to the spring snowmelts. Although similar patterns are observed in other downgradient wells (Appendix 10-C), the magnitude and timing are probably compromised by coincident pumping of nearby

city wells during the period from the late spring through early fall. The difference in apparent response times between the two wells suggests that a recharge pulse may move through Gilmore Gulch during the course of the year. A further analysis is required to determine if this effect is seen elsewhere in the Casper Aquifer.

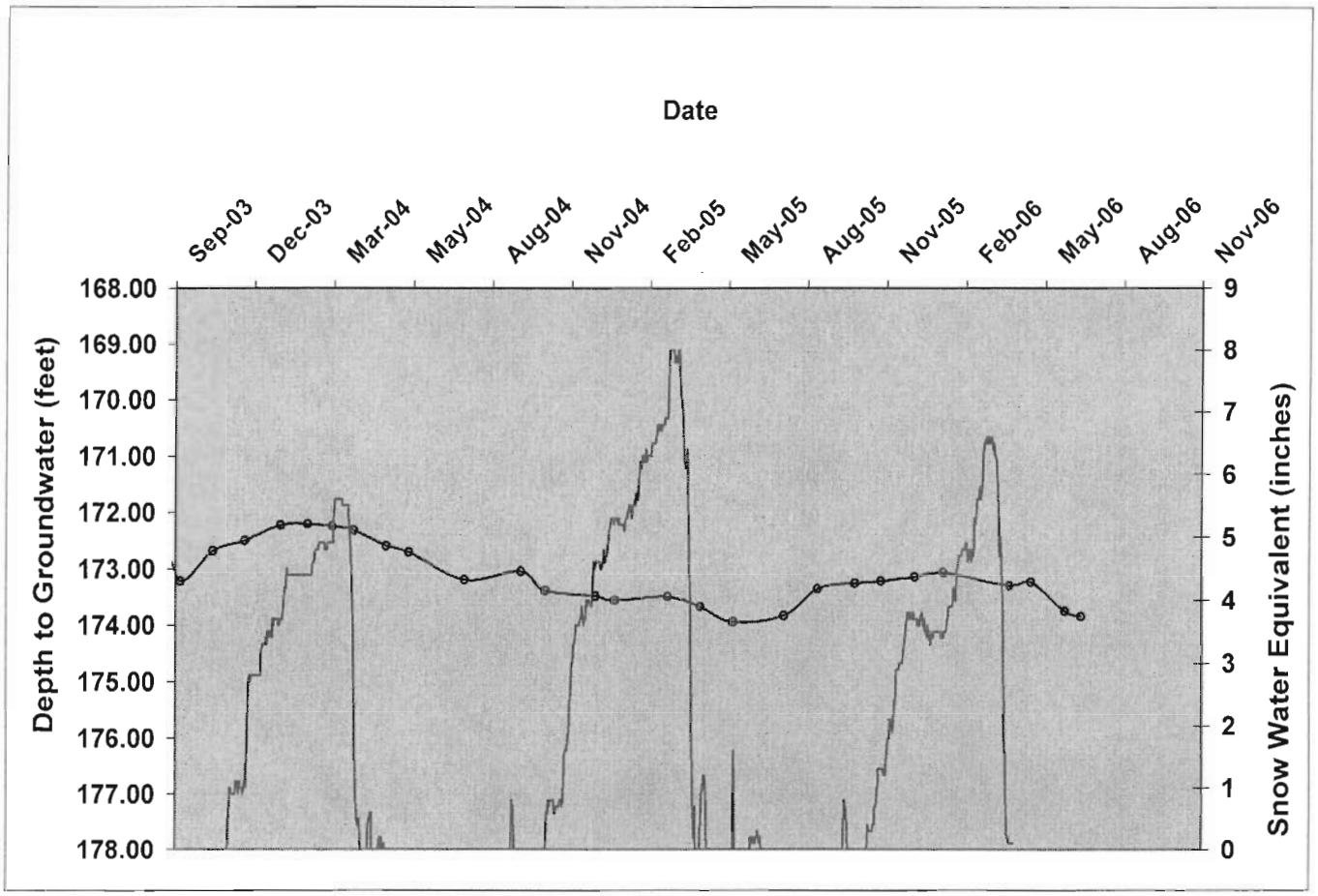

Figure 10-B.9: Response of a downgradient well, Wohl, to recharge events as indicated by snow water equivalent recorded at the Crow Creek, WY Snotel site.

Further Analyses of Temporal and Spatial Potentiometric Surface Differencing

In order to characterize the movement of recharge in the Casper Aquifer, a seven well transect was established along the entire length of Gilmore Gulch from the hydrologic divide at the Casper/Precambrian contact down to the Jensen Well on the east edge of the Laramie Basin (see Plate 10-2). Monthly well measurements began in the transect wells in September 2005. Some of the wells were instrumented this summer with pressure transducer/datalogger units; the rest will be fitted with dataloggers in October 2006.

Regular monthly water level measurements in all monitoring wells will be continued until September, 2007. Well hydrographs will continually be updated and first order analyses will include:

- Continued correlations of changes in aquifer head with proximate structure, fault orientation to downgradient flow, and recharge history;

- A time series examination of aquifer head changes in response to recharge events; and,
- Calculations of study area aquifer volumetrics using previously published data of aquifer member porosities (Lundy, 1978).

Second order analyses would include:

- Calculations of the spatial and temporal variations of groundwater volumes;
- Calculations of study site recharge volumes based on variations in aquifer volumetrics; and,
- An examination of the relationships between aquifer volumetrics and fault behavior.

Influence of Faults on Recharge Sources

Attempts by previous researchers to define recharge sources in the Casper Formation were well designed. Lundy (1978) and Mazor et al. (1993) examined the major ion chemistry of the Precambrian, Casper and Redbed aquifers. These studies concluded that differences in the chemical composition were unique and could be used to show mixing of Casper and Redbed ground waters. The major ion chemistries of the Casper and Precambrian aquifers, however, show considerable overlap and cannot be used to calculate mixing between the two end members. Toner (2000) and Frost and Toner (2004) concluded in thorough studies that strontium isotope data can be used identify and calculate mixing between Casper and Precambrian groundwater end members.

Preliminary Work: Characterizing Subcharge Input in Springs with Strontium Isotope Concentrations

In the spring of 2004, water samples were collected at several high altitude springs for strontium isotope analysis. The Heavy Isotope Laboratory at the University of Wyoming's Department of Geology and Geophysics conducted the tests. A three part mixing diagram using previously published end members for Casper Aquifer groundwater and precipitation (Toner, 2000) and a Precambrian end member (Lewis Springs) was constructed (Figure 8). Toner (2000) noted a wide range of strontium ratios for Precambrian waters in her research; Lewis Springs was chosen in this case because it is a fault associated spring located within 10 km and sampled contemporaneously with the other springs. Strontium ratios for all springs sampled in 2004 fell within the ranges of the chosen end members. The data

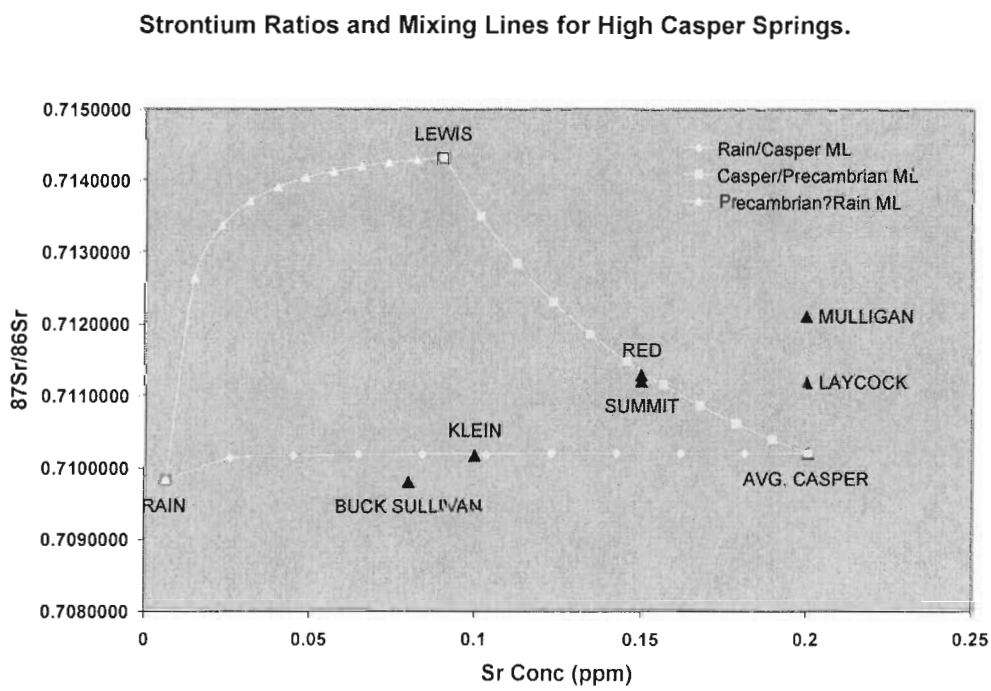

Figure 10-B.10: Strontium Ratios for Casper Springs

suggest that proximity to the Casper-Precambrian contact and altitude are not the primary controls on the origin of spring discharge.

Planned Work: Characterizing Subcharge Input in Faults with Strontium Isotope Concentrations

Twenty wells will be sampled in February, June and October, 2007 and analyzed for strontium isotope ratios and concentrations using the procedures outlined in Frost and Toner (2004). The target wells will include all the identified fault associated wells. The balance will consist of wells not sited in proximity (>500 m) to mapped faults. The data will be analyzed for correlations between strontium isotope concentrations and the known spatial, structural and recharge hydrograph parameters of the sampled wells. A contour map will be constructed for strontium isotope ratios in the study area and a range of mean volumes for the Precambrian component of recharge will be calculated. This work has not yet been performed.

Planned Work: Characterizing Recharge Inputs with Stable Meteoric Isotope Concentrations

The stable meteoric isotopes, ^{18}O and ^{2}H, have been used to identify recharge sources and mixing in fractured (Bradbury, et al. 2001) and mountain front aquifers (Thiros, 1995; Greene, 1997,). One limitation noted by previous studies (Manning and Solomon, 2003) is that stable isotope ratios cannot differentiate subsurface inflow from streambed seepage since both sources carry a depleted high altitude signal. Theoretically, stable isotope levels can be used to characterize subsurface inflow only in aquifers where streamflow is known to be negligible. For this reason, their use to characterize recharge sources may be especially applicable in the Casper Aquifer. Streamflow, measured in 2003/2004, in the recharge area is limited to a total volume of less than 200 gpm. Additionally, stream flow that originates in the Casper Formation is discharged from faults associated springs and is usually re-absorbed back into the aquifer within 400 meters of the discharge point. Stable meteoric isotope concentrations in Casper Aquifer water may potentially be used to characterize:

- The source (meteoric?), and type (snowmelt or rain infiltration) of recharge.
- Areas contributing recharge to a specific well or fault.

An initial sampling of approximately 5 springs and 20 wells will be made for ^{18}O and ^{2}H isotope analysis concurrently with strontium isotope sampling. Additionally, samples of rainfall, snowfall and accumulated snowfall will be collected (Earman. et al, 2004) along two east-west transects at 50 meter intervals of elevation to determine stable isotope concentrations in different forms of precipitation at varying elevations. Sample isotope concentrations will be analyzed by the University of Wyoming's Light Isotope Lab in the College of Agriculture. An analysis will then be conducted to correlate the stable isotope concentrations of the groundwater samples to recharge source and the known spatial, structural and recharge hydrograph parameters of the sampled wells,.

If a significant snowmelt event occurs in the recharge area, a subsequent sampling and ^{18}O analyses would be conducted in conjunction with the first observable increase in potentiometric surface in an effort to identify an isotopic recharge signal and constrain recharge timing.

Large Scale Evaluation of Hydraulic Behavior of a Complex Fault System.

Faults in fractured aquifers have been observed to act as conduits, barriers or both (Huntoon and Lundy, 1979; Rojcstaczer, 1987; Caine et al., 1996). Fractured aquifers typically display complex behavior in response to hydraulic tests which may be due to fault/fracture architecture, size, orientation and density, undisturbed matrix permeabilities, secondary mineralization, and non-Darcian flow (Caine et al., 1996; Allen and Michel 1998, 1999). Although, fault hydraulic parameters such as conductivity and storage coefficient are critical for constructing groundwater flow models on local and regional scales, these properties are rarely quantified using actual hydraulic tests due to a lack of sufficient data. Additionally, few studies have attempted to characterize fault hydraulics and architecture in a complex system composed of several interconnected faults. An examination of fault system hydraulics would be useful to explain observed temporal and spatial variations in well hydrographs, to define fault impact within the aquifer and, in the broad scientific sense, to characterize this type of fault.

Several large mapped faults in the study area converge at the Turner Well Field on the eastern edge of the City of Laramie. Jackrabbit Fault connects with the City Springs Fault ~ 2.5 km northeast of the juncture of City Springs, Spur and Quarry Faults. Although the Sherman Hills Fault does not show a direct mapped structural connection to the City Springs Fault, it passes within 800 meters of the municipal well field and has been observed to drawdown when the municipal wells are pumping (Chris Moody, personal communication, July 2004). There are numerous wells located in the area of this fault complex. This situation presents an opportunity to conduct a series of multi-well high volume pump tests to evaluate the hydraulic behavior of faults at a scale of hundreds of meters to kilometers. This approach has been used to model linear flow along faults and radial flow between fault blocks at Carleton University in Ottawa, Canada (Allen and Michel, 1998, 1999). The primary objectives of the modeling exercises are to:

1) Provide insight into the architecture of individual faults and the fault complex;
2) Define the hydraulic dynamics of the fault complex; and,
3) Further constrain the hydraulic parameters of the faults;

Physical analysis

In conjunction with the City Utilities Department, a series of high volume multi-well pump and recovery tests were conducted in 2005. For each test, a set of wells proximate to the City's Turner Municipal Well Field were identified and instrumented with data loggers programmed to measure static water depth and temperature. City utilities personnel pumped Turner No. 2 in July 2005 and both Turner No. 1 and No. 2 in October 2005 at a constant discharge rate for a several days. In both cases, the pumping phases of the tests were sufficient to draw down the instrumented wells. Pumping was terminated and data were collected during the recovery phases.

The hydrographs for the pumping wells (Turner No. 1 and No. 2) and the observation wells are shown for the October 2005 test (Figure10-B.11). Thorough analyses of either test has not yet been completed but the preliminary data strongly suggest that draw downs occurred in response to pumping within short time frames (>1 hour) in observation wells located hundreds of yards away. Observation well 41T2, sited 400 yards from the pumping wells on the Quarry Fault, began to draw down approximately 15 minutes after the test began. Head levels in observation well, 41T3, sited 1500 yards away on the Spur Fault, began to decrease in response to the pump test after 50 minutes. Similar response times were noted in the two observation wells after the pumping phase of the test was terminated and the recovery phase began. The two Sherman Hills Monitoring Wells, SHMWE and SHMWW, are located closer to the pumping wells than

41T3. The onset of draw down began after and the magnitude of head decline was less than the responses observed in the 41T3 well. The rapid response and magnitude of drawdown and recovery in the 41T3 well indicate the high degree of anisotropy in the system. Hydraulic connectivity is especially well developed along the faults north of the Turner Wellfield.

A complete analysis of the pump tests remains to be done. The hydraulic nature of the conduit structure will be evaluated by comparing drawdown data to vertical fracture (Gringarten and Witherspoon, 1972), vertical dyke (Boonstra and Boehmer, 1987) and radial flow models (Theis, 1935, 1938). The curves will be evaluated for fit and the appropriate model chosen based on the type of flow regime exhibited by the data. The initial development of a conceptual model of fault behavior and architecture would begin by examining the fit of the modeled curves and the hydrometric data. Storativity and transmissivity estimates could be calculated from model curve fit and evaluated.

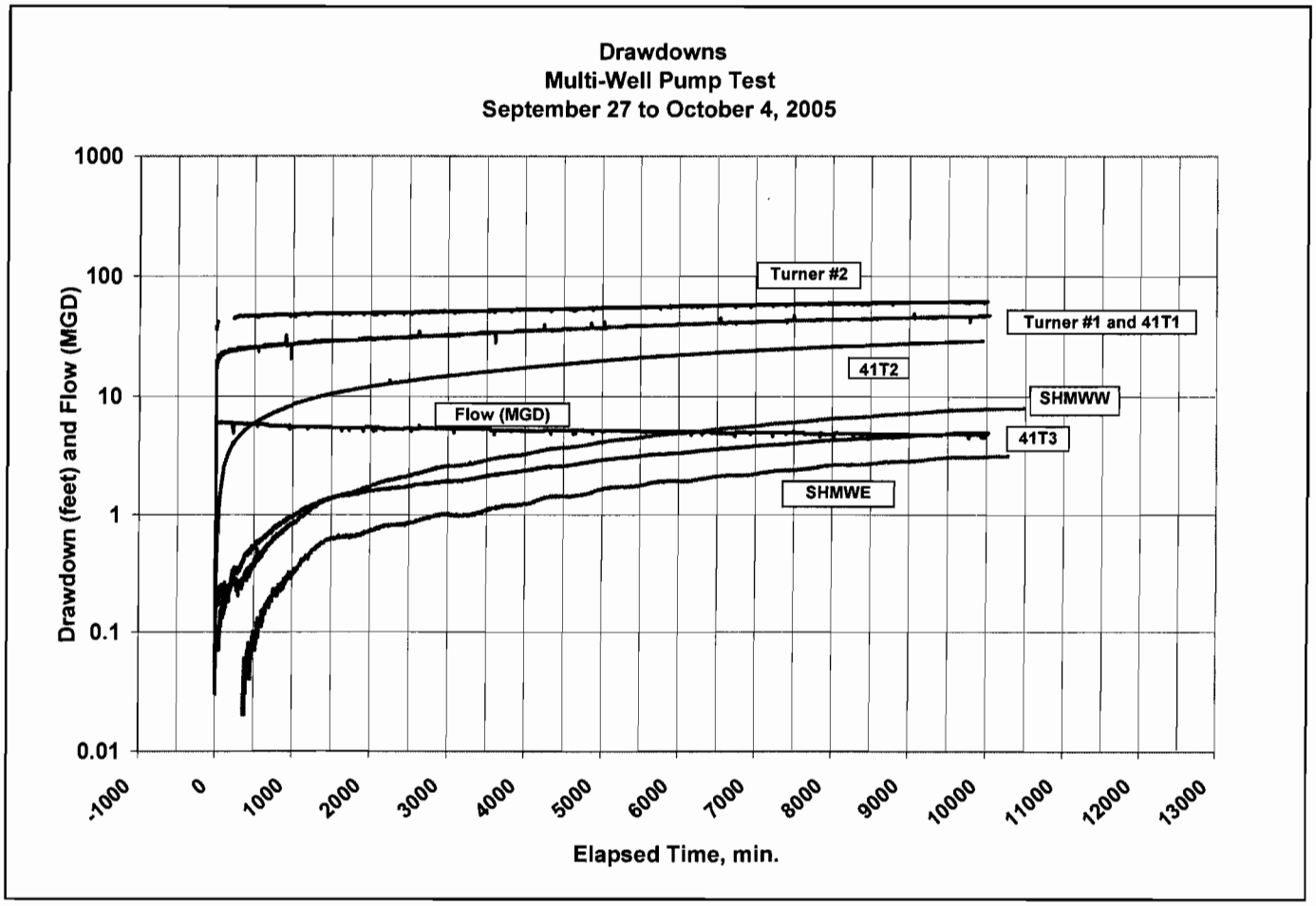

Figure 10-B.11: Preliminary drawdown data for the Turner Wellfield pump and recovery test, October, 2005

Preliminary Conclusions

The data collected during this research are preliminary, but strongly suggest the following:

1. The Casper Aquifer is a highly reponsive system. Recharge (and potentially contaminants) can enter the saturated zone days to weeks after the occurrence of snowmelt in March and April as evidenced by large, rapid head increases in upland wells located high on the flank of the Laramie Range and in wells sited on the Red Buttes fault. Similar head increases are not observed in response to summer rainfall events.

2. A general decline in head resulting from the current drought has been observed in Casper Aquifer wells. However, this observed decline could be reversed by one season of above average snow pack. There is no apparent evidence that the aquifer is being depleted by over pumping.

3. The conduit structure associated with the high production municipal wells appears to be extensive and highly transmissive. Water and contaminants can be transported from distances on the scale of miles in very short time periods by pumping at the Turner Wellfield and potentially at other wellfields also.

4. The City of Laramie can track the relative amount of recharge entering the aquifer annually by continuing and expanding their Casper Aquifer Monitoring Program. Snow pack data for the Laramie Range is easily obtained for the Crow Creek Snotel Site at: http://www.wcc.nrcs.usda.gov/cgibin/site-wygraph-swe-only.pl?state=WY

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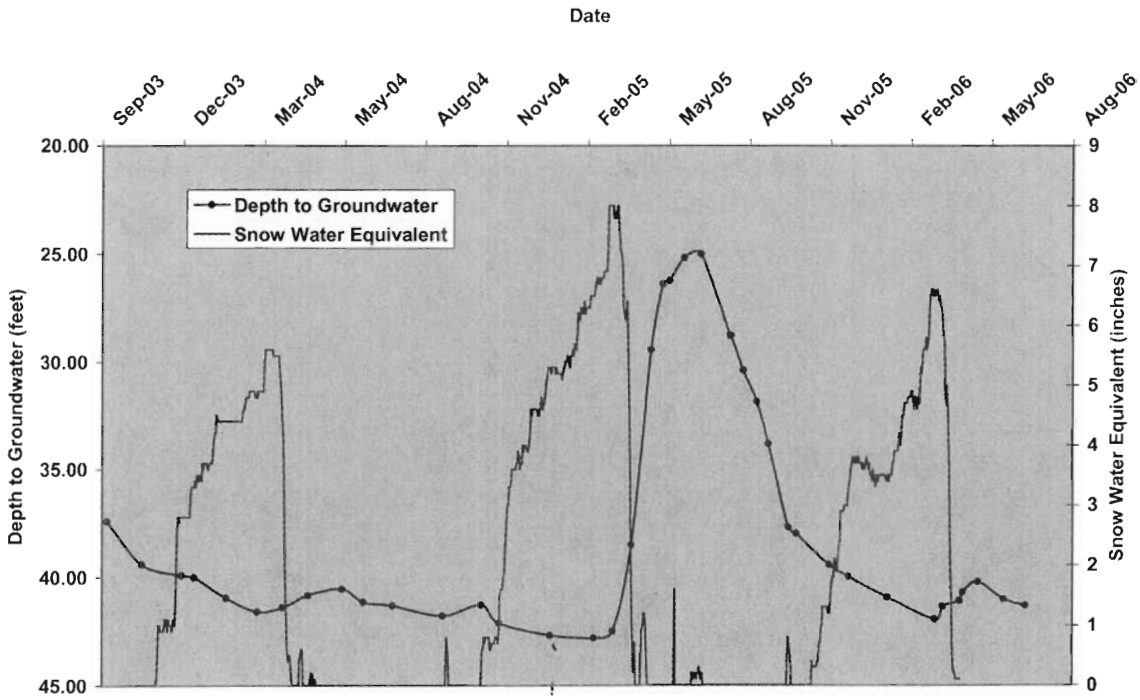
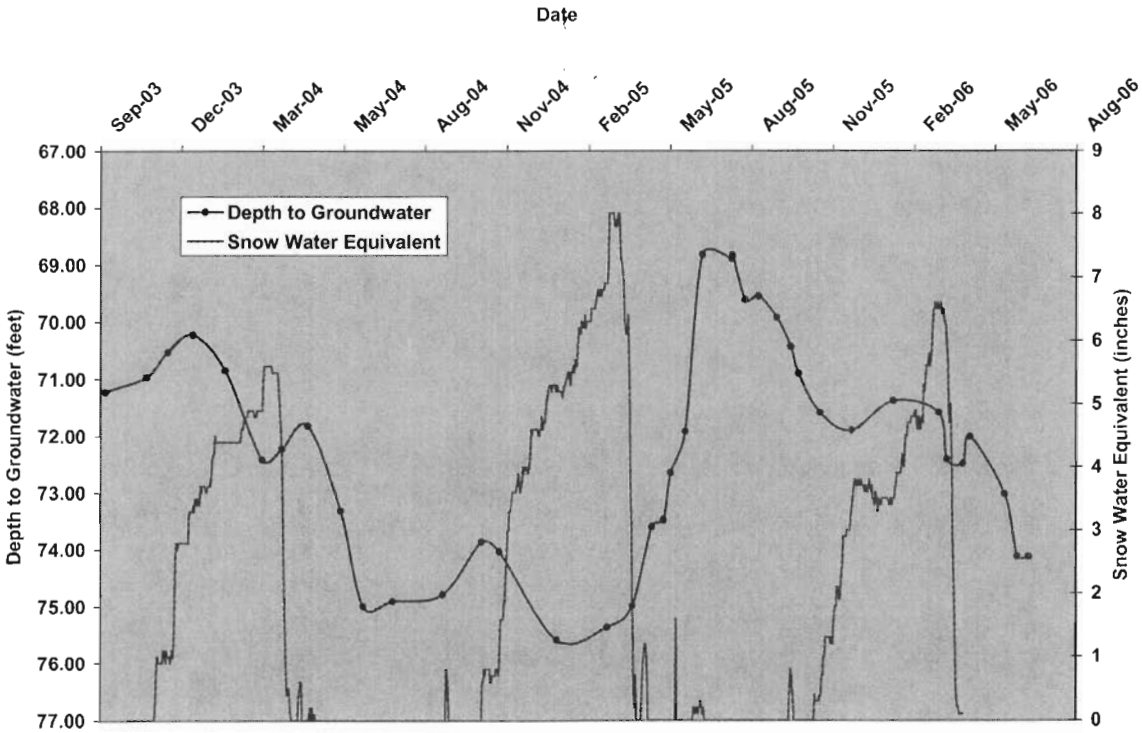
10C
MONITORING WELL HYDROGRAPHS

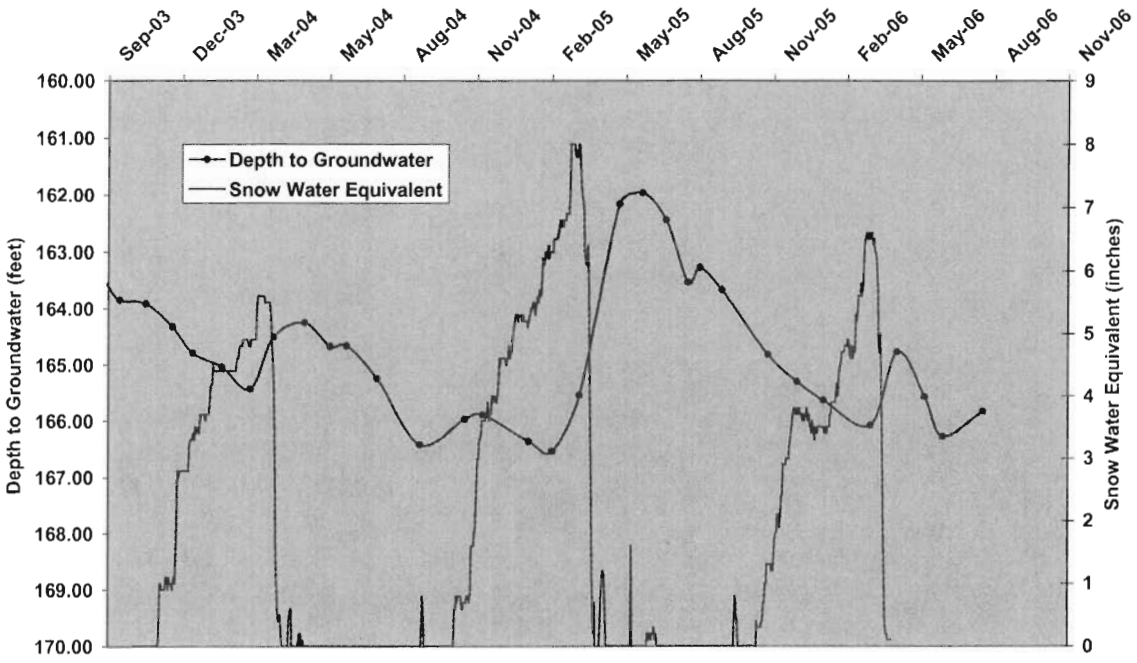
Government Well Hydrograph



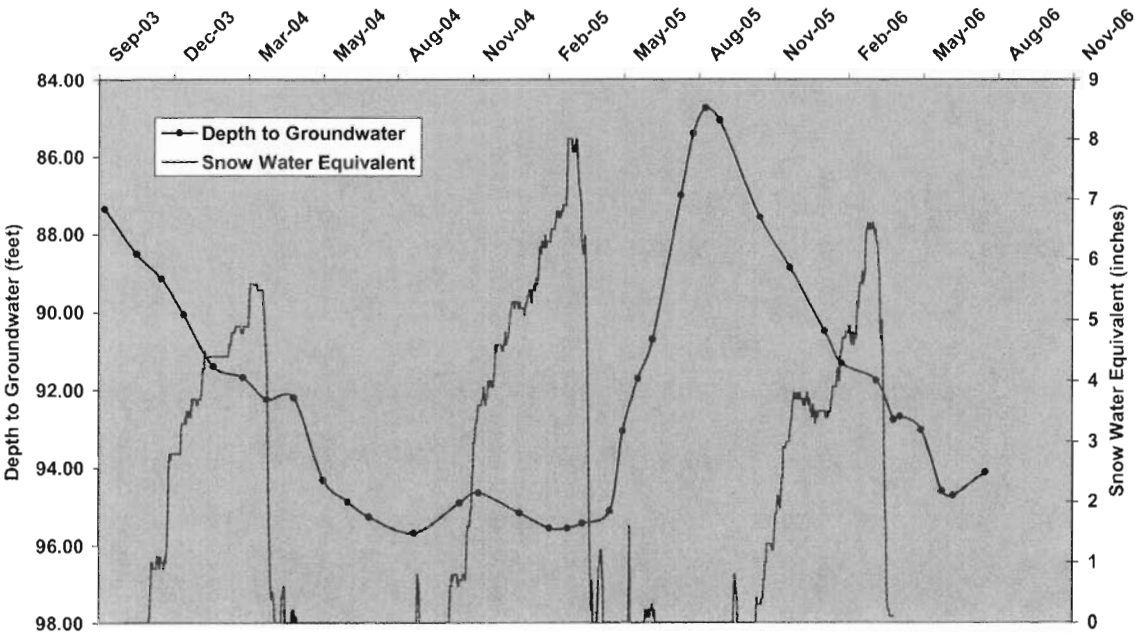
Frenchy Well Hydrograph

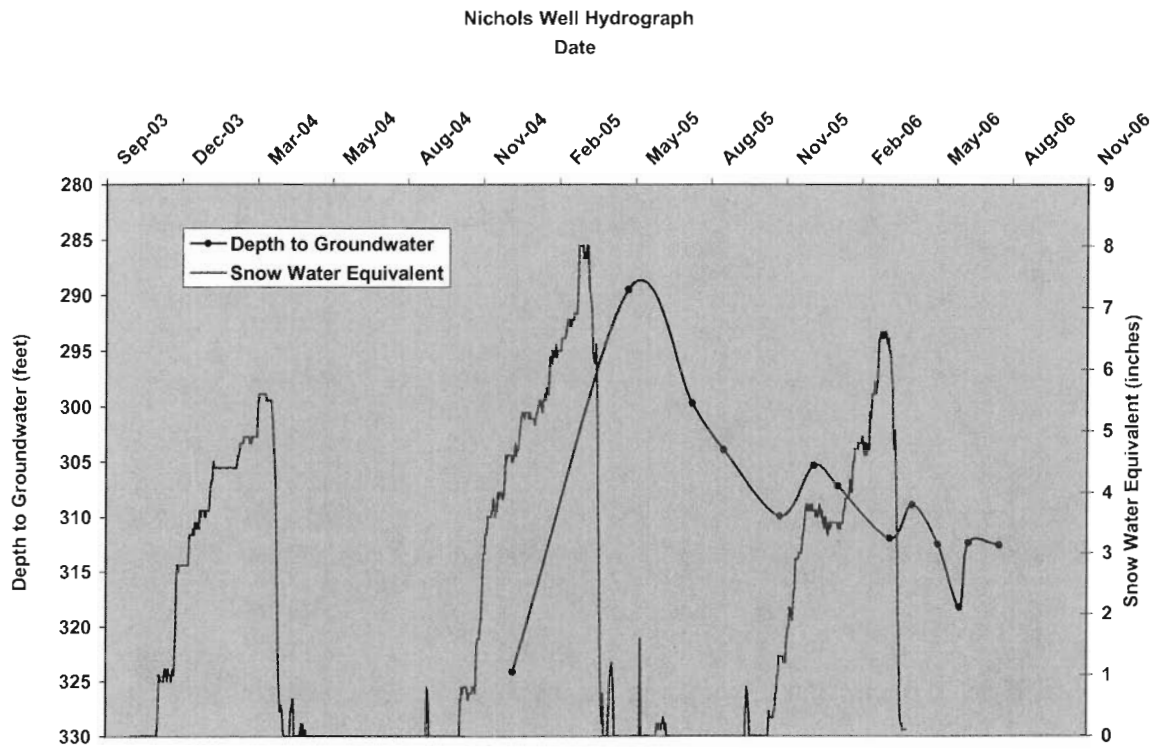


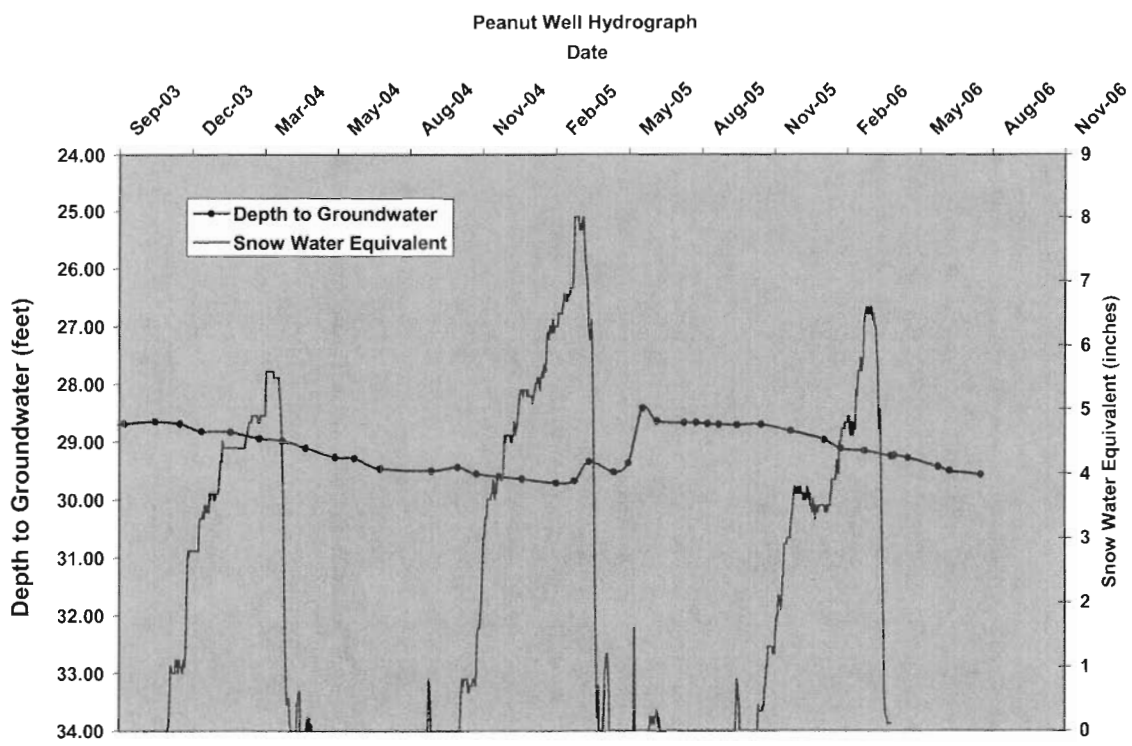
Powerline Well Hydrograph



Klein Well Hydrograph




Nichols Well Hydrograph
Date
Sep-03
Dec-03
Mar-04
May-04
Aug-04
Nov-04
Feb-05
May-05
Aug-05
Nov-05
Feb-06
May-06
Aug-06
Nov-06
Depth to Groundwater
Snow Water Equivalent
Depth to Groundwater (feet)
280
285
290
295
300
305
310
315
320
325
330
Snow Water Equivalent (inches)
9
8
7
6
5
4
3
2
1
0


Peanut Well Hydrograph
Date
Sep-03
Dec-03
Mar-04
May-04
Aug-04
Nov-04
Feb-05
May-05
Aug-05
Nov-05
Feb-06
May-06
Aug-06
Nov-06
Depth to Groundwater
Snow Water Equivalent
Depth to Groundwater (feet)
24.00
25.00
26.00
27.00
28.00
29.00
30.00
31.00
32.00
33.00
34.00
Snow Water Equivalent (inches)
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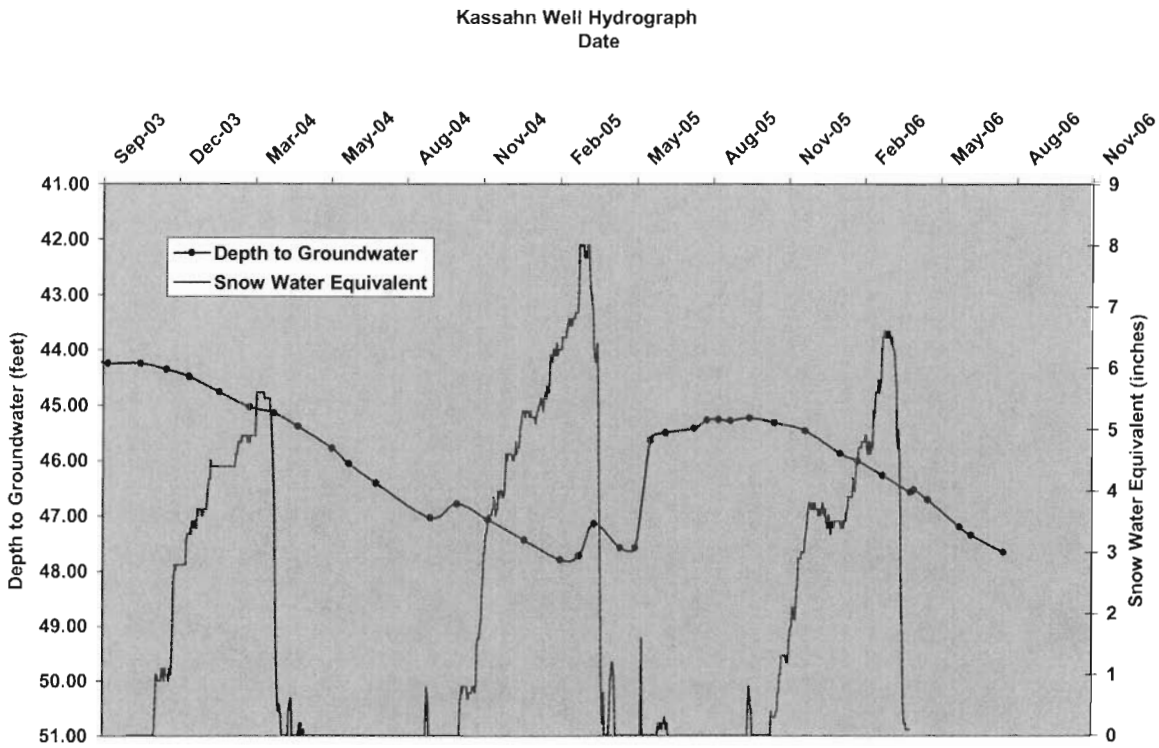
8
7
6
5
4
3
2
1
0


Kassahn Well Hydrograph
Date
Sep-03
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Mar-04
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Aug-04
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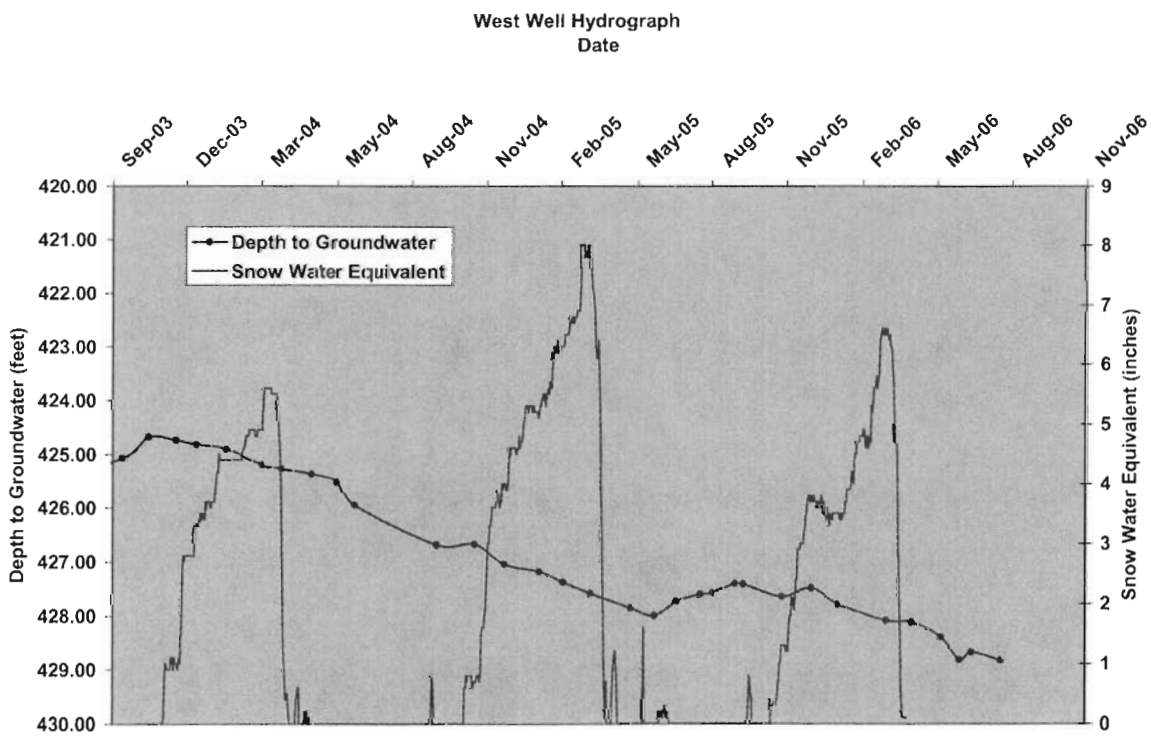
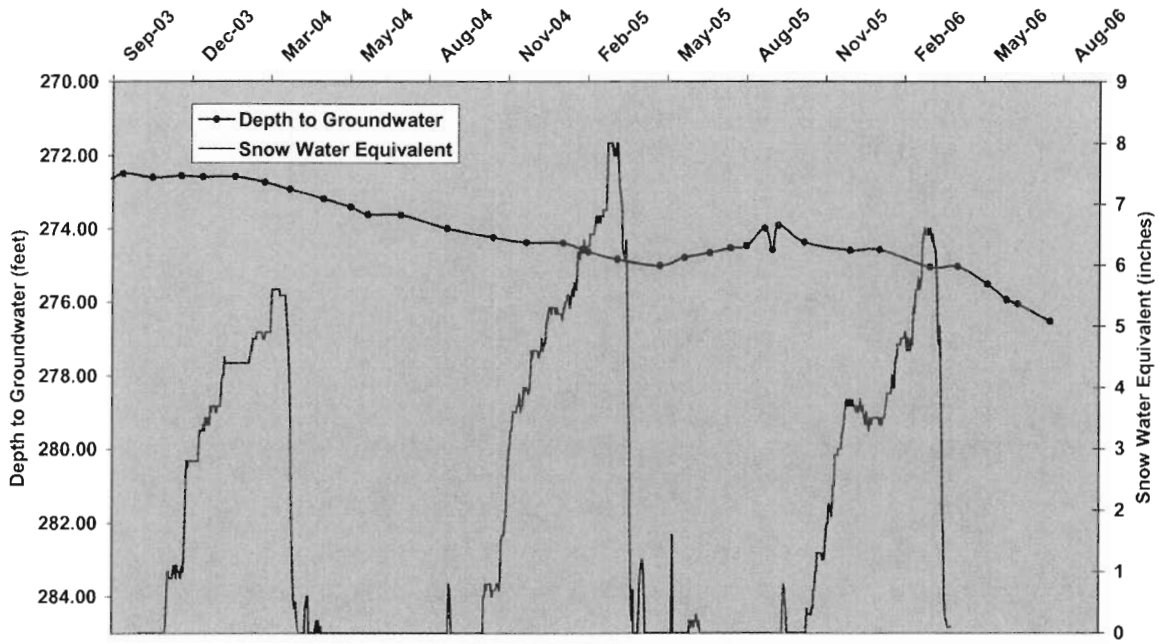
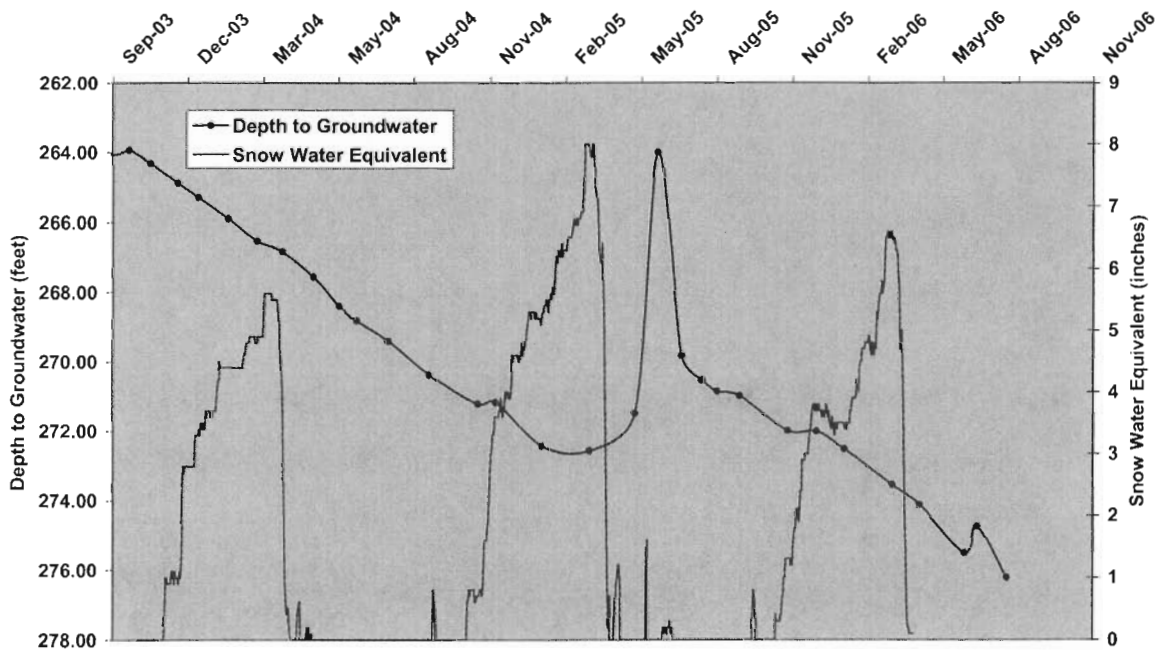
Feb-05
May-05
Aug-05
Nov-05
Feb-06
May-06
Aug-06
Nov-06
Depth to Groundwater
Snow Water Equivalent
Depth to Groundwater (feet)
Snow Water Equivalent (inches)
41.00
42.00
43.00
44.00
45.00
46.00
47.00
48.00
49.00
50.00
51.00
9
8
7
6
5
4
3
2
1
0

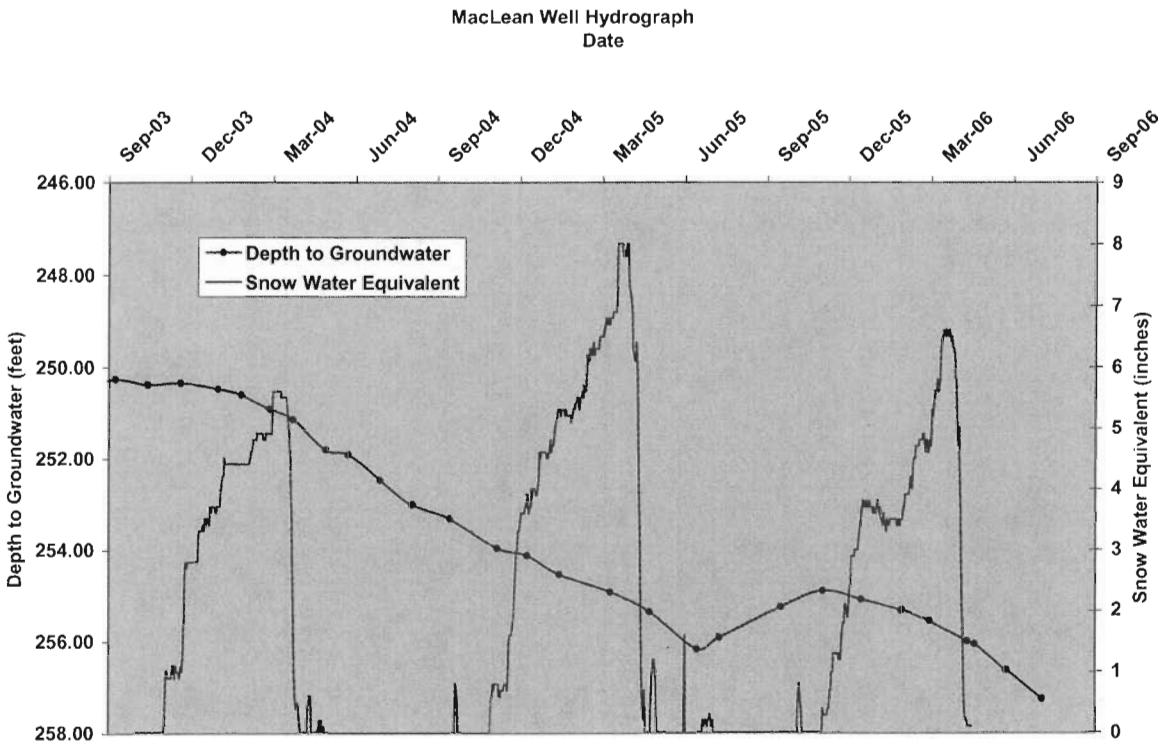

West Well Hydrograph
Date
Sep-03
Dec-03
Mar-04
May-04
Aug-04
Nov-04
Feb-05
May-05
Aug-05
Nov-05
Feb-06
May-06
Aug-06
Nov-06
Depth to Groundwater
Snow Water Equivalent
Depth to Groundwater (feet)
Snow Water Equivalent (inches)
420.00
421.00
422.00
423.00
424.00
425.00
426.00
427.00
428.00
429.00
430.00
9
8
7
6
5
4
3
2
1
0

Peter Well Hydrograph
Date



Jackrabbit Well Hydrograph
Date




MacLean Well Hydrograph
Date
Sep-03
Dec-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
Jun-06
Sep-06
Depth to Groundwater
Snow Water Equivalent
Depth to Groundwater (feet)
Snow Water Equivalent (inches)
246.00
248.00
250.00
252.00
254.00
256.00
258.00
9
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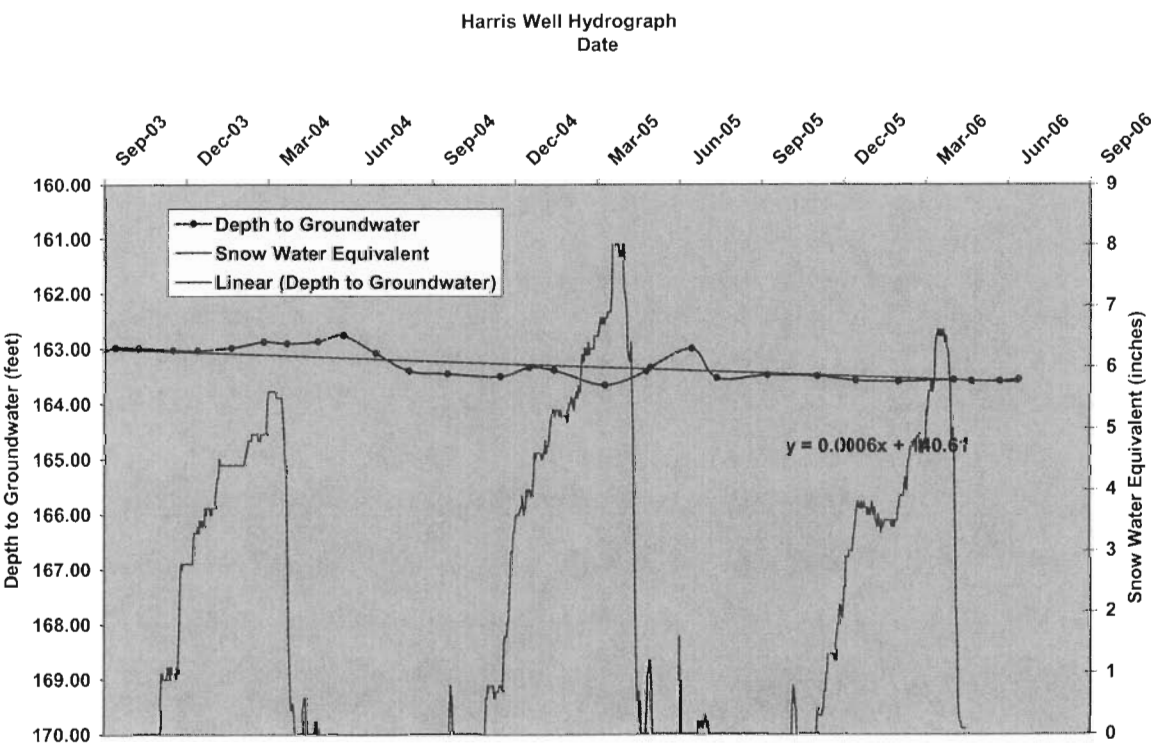
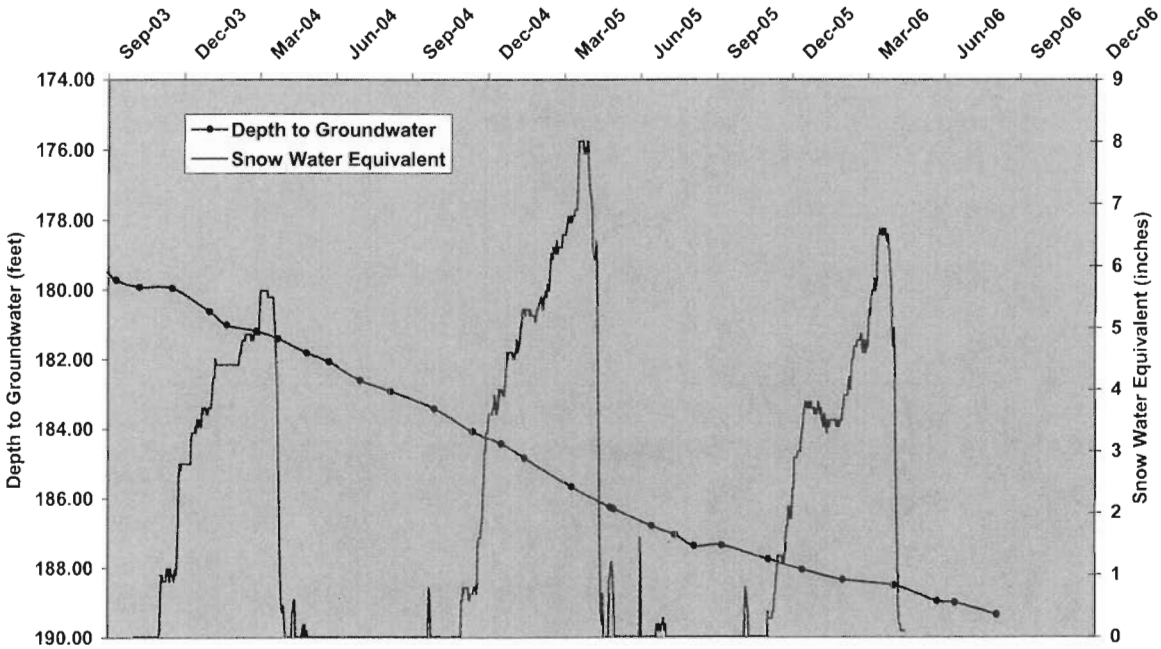
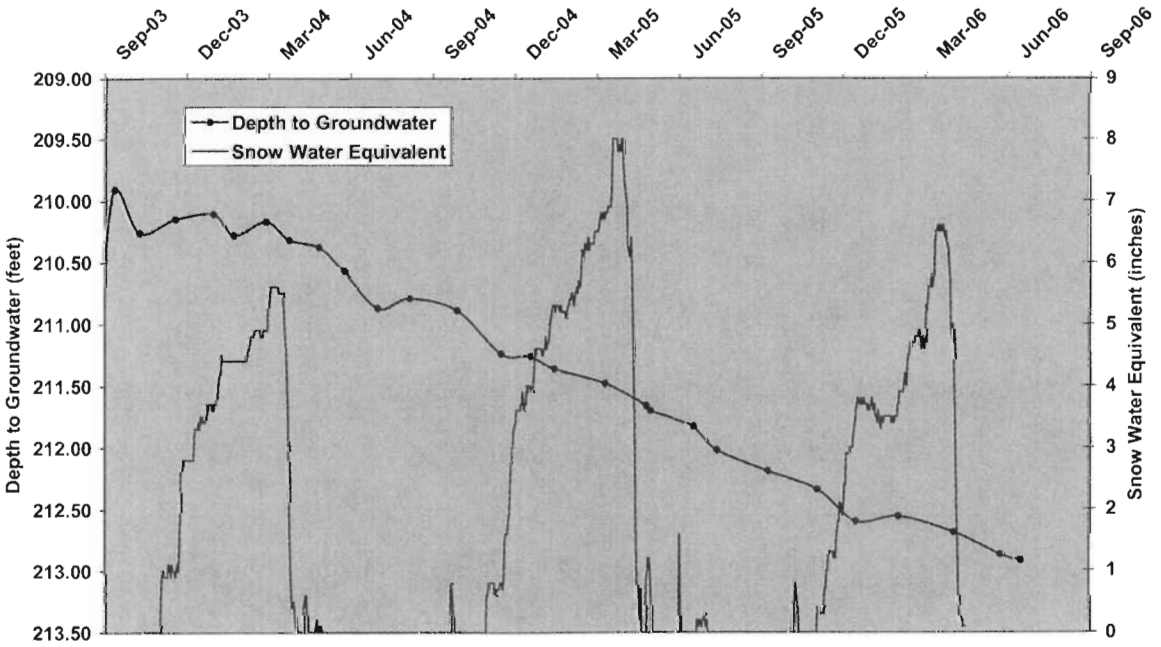
7
6
5
4
3
2
1
0


Harris Well Hydrograph
Date
Sep-03
Dec-03
Mar-04
Jun-04
Sep-04
Dec-04
Mar-05
Jun-05
Sep-05
Dec-05
Mar-06
Jun-06
Sep-06
Depth to Groundwater
Snow Water Equivalent
Linear (Depth to Groundwater)
y = 0.0006x + 140.61
Depth to Groundwater (feet)
Snow Water Equivalent (inches)
160.00
161.00
162.00
163.00
164.00
165.00
166.00
167.00
168.00
169.00
170.00
9
8
7
6
5
4
3
2
1
0

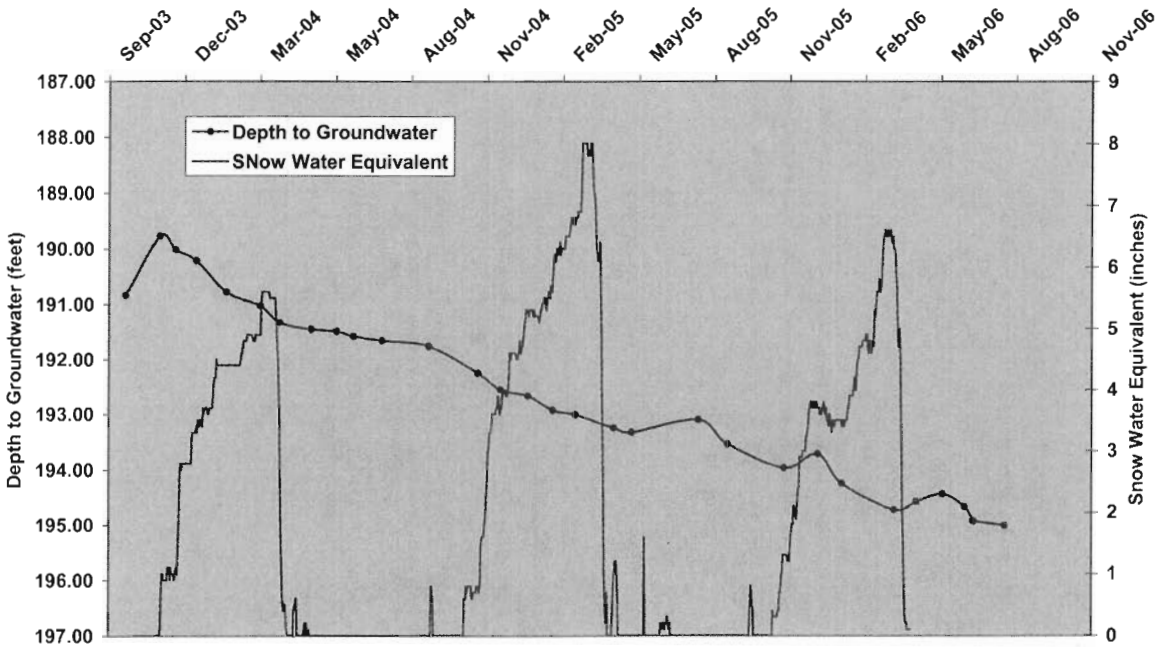
Swiatek Well Hydrograph
Date



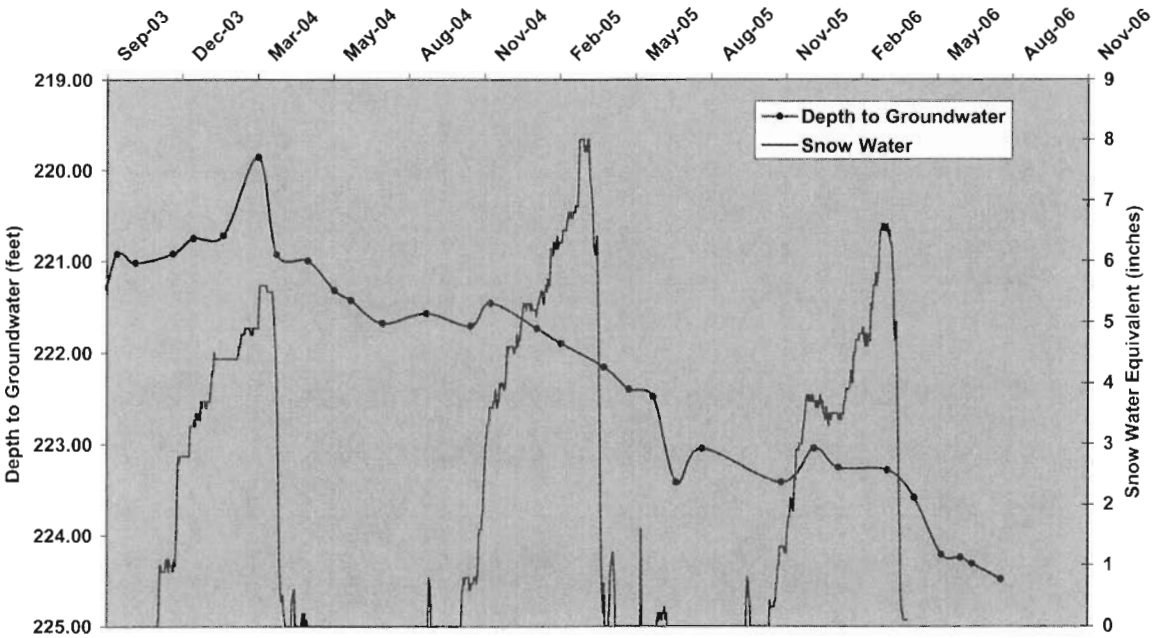
Mathis Well Hydrograph
Date



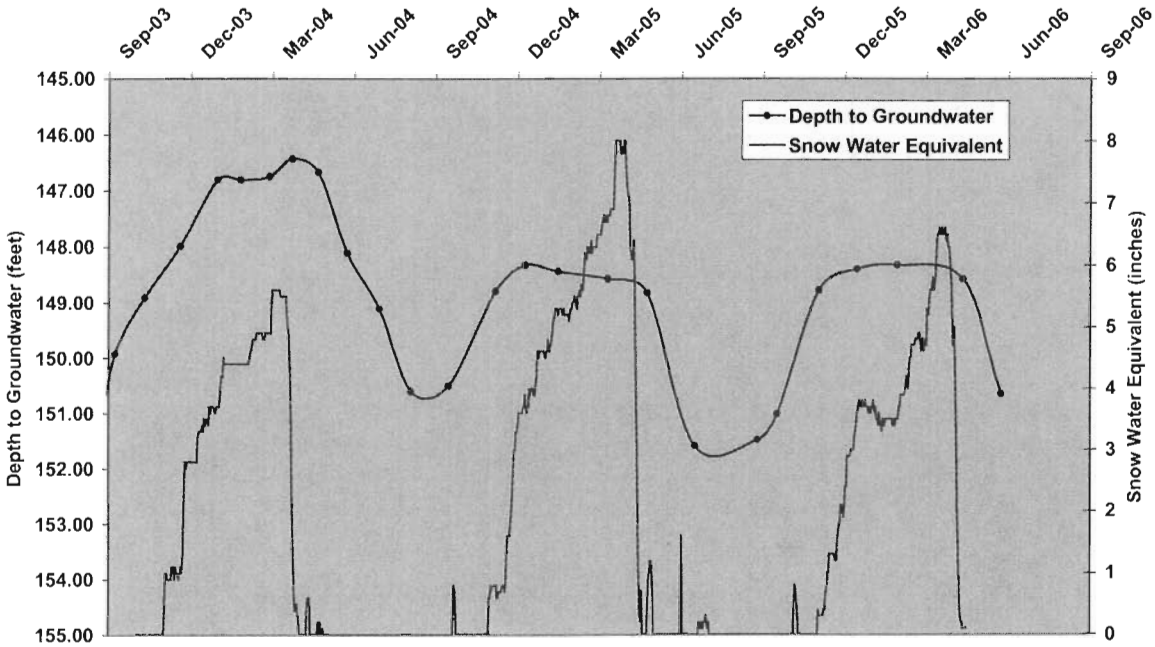
Spur Mill Well Hydrograph
Date



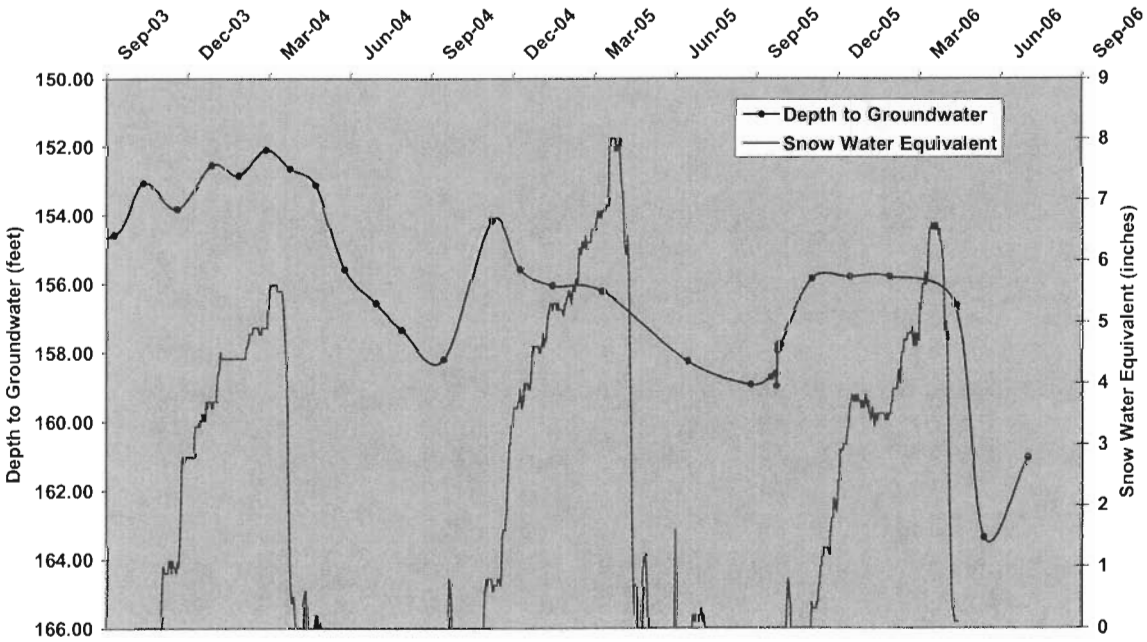
Pruner Well Hydrograph
Date



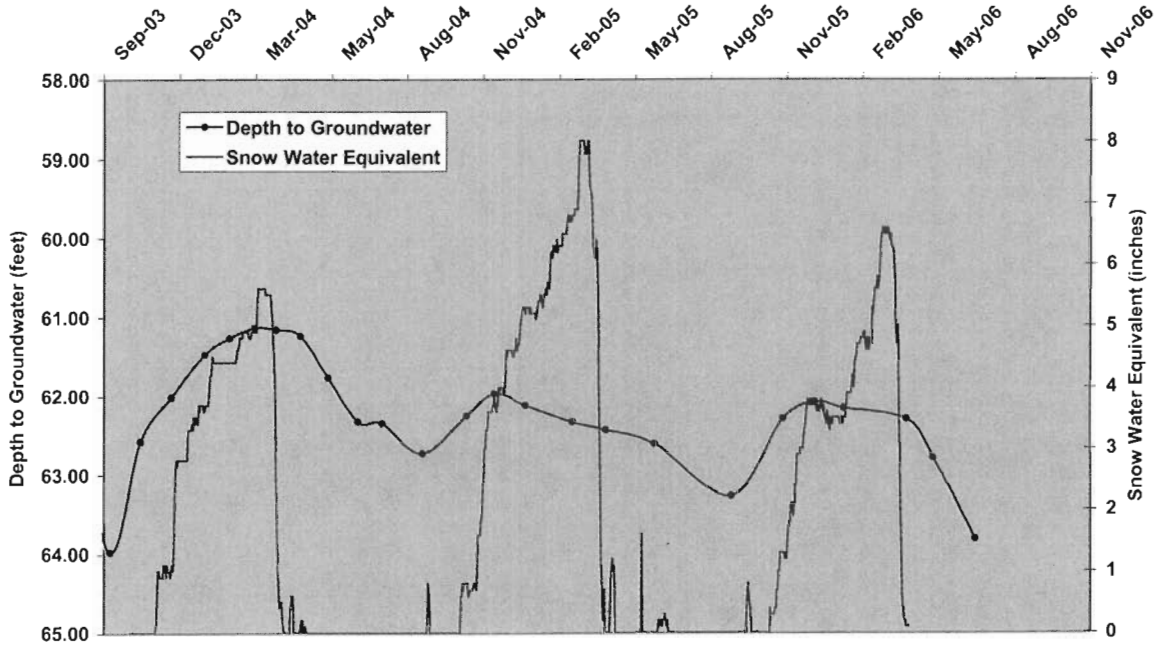
Kerr Well Hydrograph
Date



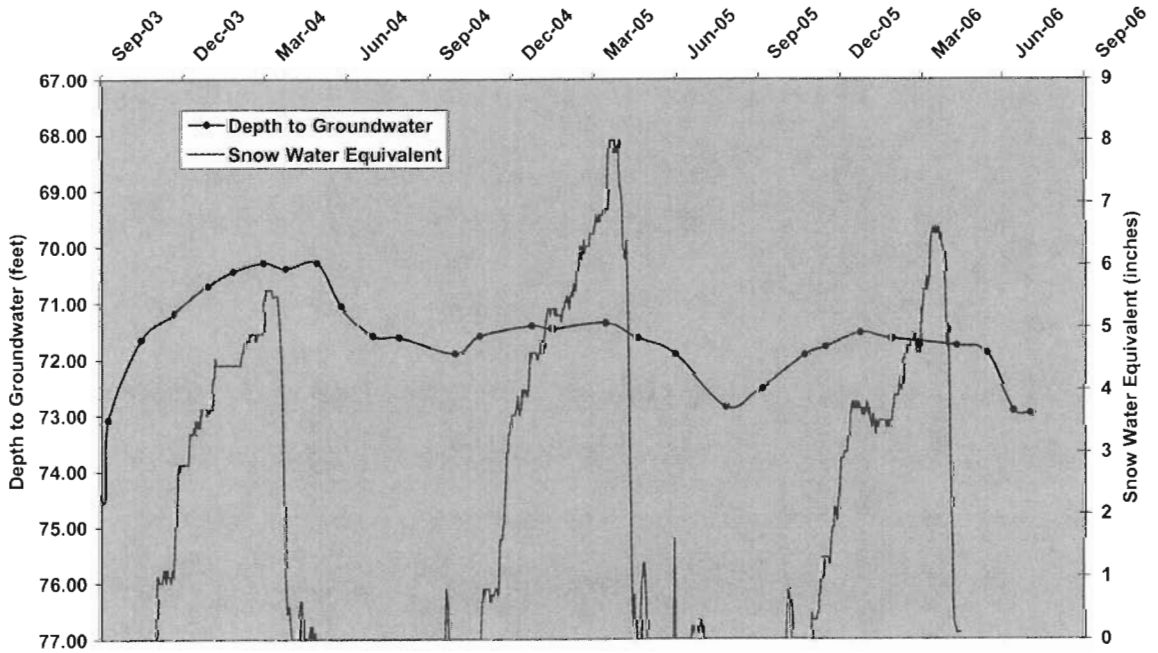
Berner Mill Well Hydrograph
Date



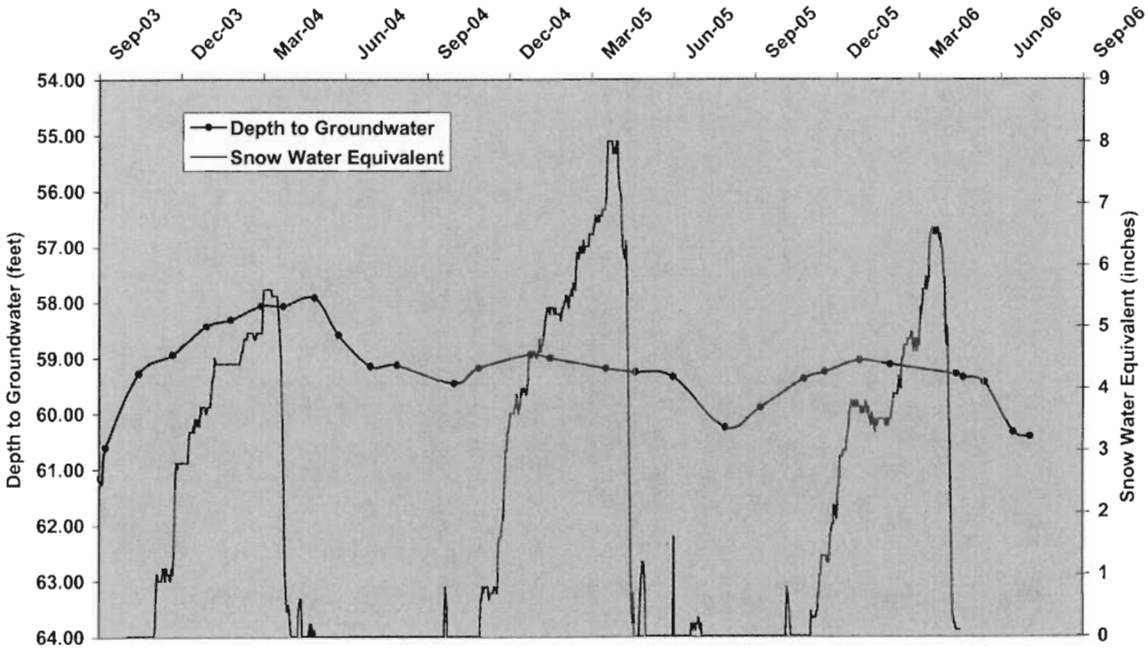
Sestak Well Hydrograph
Date



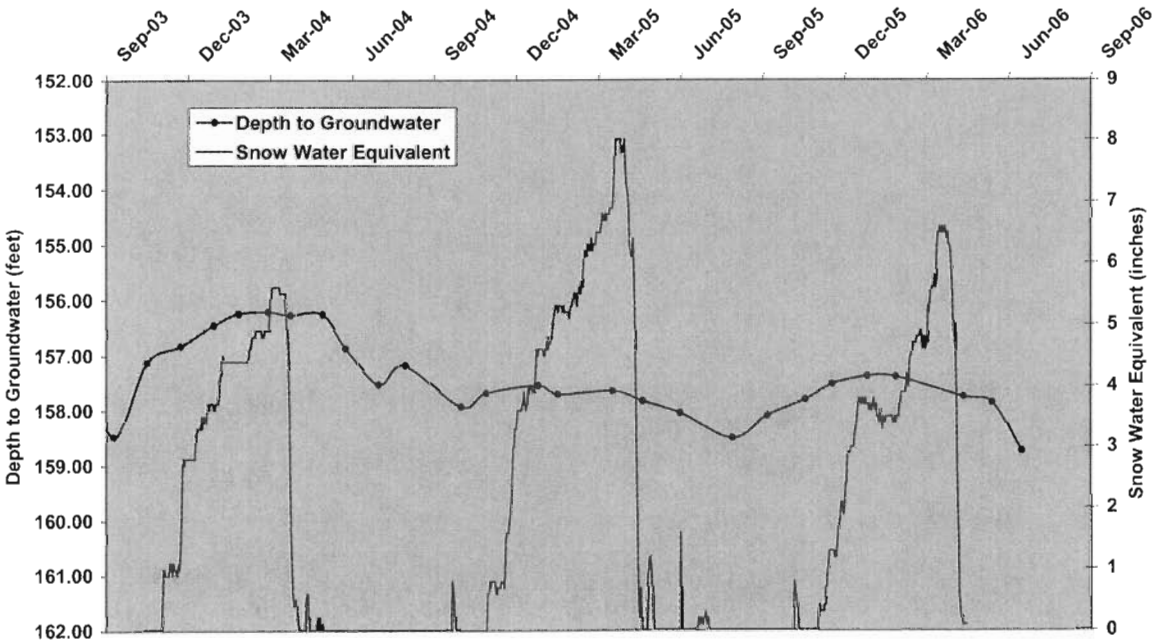
Piper #6 Well Hydrograph
Date



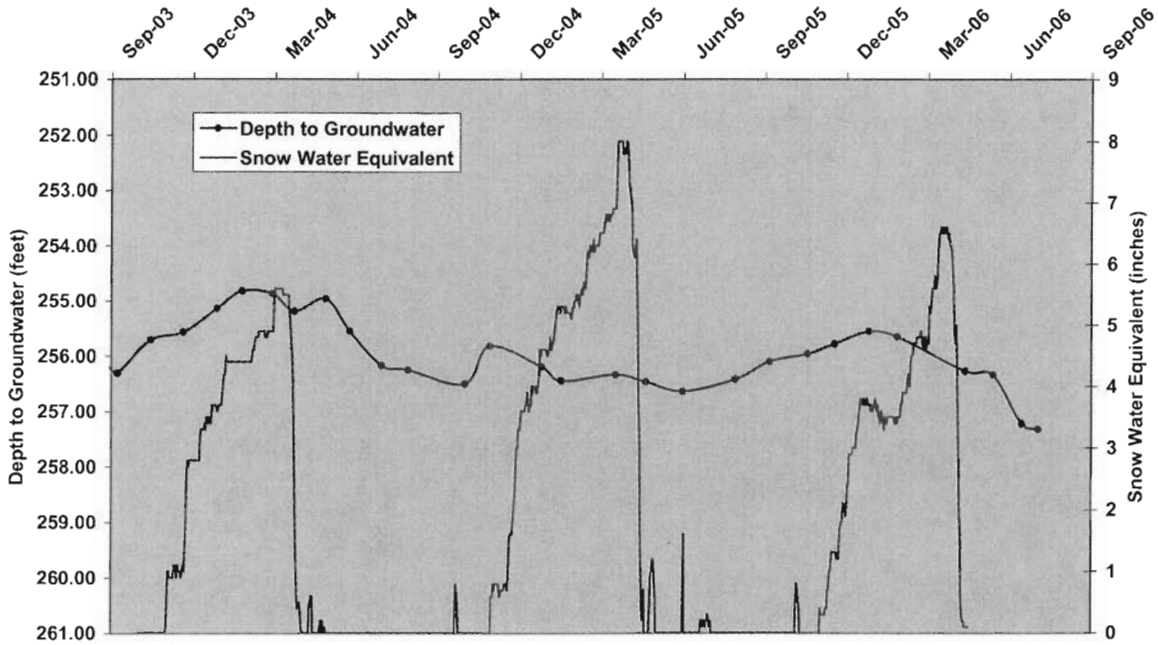
Yramiris #1 Well Hydrograph
Date



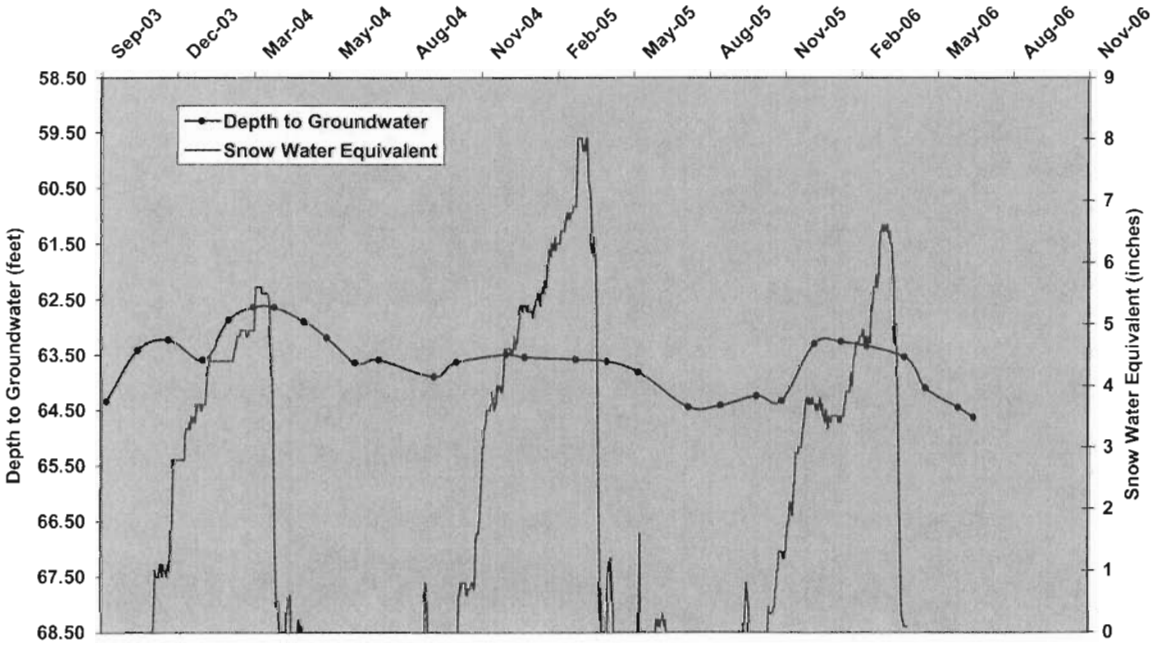
Unreg Piper Well Hydrograph
Date



Colter Well Hydrograph
Date



Trotter Well Hydrograph
Date



10D
COST ESTIMATES

TABLE 10D-1 - TURNER MODIFICATIONS AND ASR PROJECT

	Item	Unit	Quantity	Cost/Unit	Total Cost
1	Mobilization and Bonds (% of items)			10%	$232,606
2	VFD on Turner No. 2	LS	1	$50,000	$50,000
3	Monitoring well near City Spring	EA	2	$10,000	$20,000
4	Install pumping wells, pumps, pitless units, power and pump tests	EA	3	$100,000	$300,000
5	Piping and manifold to 8 MG reservoir	LF	1	$50,000	$50,000
6	Treatment				
	Building	LS	1	$75,000	$75,000
	Interior Pipe, fittings, valves, meter	LS	1	$50,000	$50,000
	Softening, Chlorination, Floridation	LS	1	$80,000	$80,000
	Electrical and Controls	LS	1	$175,000	$175,000
7	Pumping Stations				
	1,300 gpm	EA	1	$296,700	$296,700
8	Pipe - Total Cost Installed				
	12" Class 200 S.D.R. 21	LF	8,225	$108	$891,606
9	Street Reconstruction				
	Sub-base 15" in depth	SQ YD	4,200	$5.29	$22,218
	Type 1 base 12" in depth	SQ YD	4,200	$9.37	$39,354
	Asphalt 2 $^1/_2$" in depth	SQ YD	4,200	$8.12	$34,104
	Geotextile (includes overlap)	SQ YD	5,012	$1.12	$5,613
10	Monitoring at Spur Wells: meter, air line, telemetry	LS	1	$25,000	$25,000
11	Unlisted Items (% of 2-10)			10%	$211,460
A	Construction Cost Subtotal				$2,558,661
B	Engineering Costs (% of A)			10%	$255,866
C	Subtotal (A+B)				$2,814,527
D	Contingency (% of C)			15%	$422,179
E	CONSTRUCTION COST TOTAL (C+D)				$3,236,706
F	Prepare Final Design and Specs (% of E)			10%	$323,671
G	Permitting and Mitigation				$50,000
H	Legal Fees				$20,000
I	Acquisition of Access and ROW				$0
	PROJECT TOTAL COST				$3,630,377
	ROUNDED TOTAL COST				**$3,630,000**

11A
ENVIRONMENTAL REPORT

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

August 1, 2006

Brian Mark, SRF Program Principal
WDEQ Water Quality Division
Herschler Building, 4W
Cheyenne, WY 82002

Re: Environmental Assessment Documentation for City of Laramie Water Projects

Dear Mr. Mark;

As we discussed during our phone conversation yesterday, here is a copy of the current draft of the environmental assessment, including the supporting letters and memos from the agencies. At this time, the City is considering a funding application for the "River intake pipeline—which is listed as item 2 on the contact letters".

You will note that we have not registered a response from the State Engineer's office regarding Surface or Groundwater issues, however, we do have several experts involved who are familiar with Surface and Groundwater rights and permitting issues. The proposed pipeline does not involve a change in the Surface water usage from the Laramie River, though it does involve a significant reduction in losses between the intake and the treatment plant.

It would appear that we need the following studies to be eligible for funding:

1. Wetlands evaluation/delineation
2. SHPO Cultural Resource Study
3. Biologist Study
4. Consumptive Use analysis

Based on the studies and on the other comments from the correspondence, plans and specifications shall be adjusted to have BMPs and construction restrictions based on the findings.

Please examine the attached report and correspondence and indicate whether we have missed any aspects from our analysis.

If you need further information or wish to discuss the projects, please contact either myself or Murray Schroeder at 307-742-0031, or Bruce Jones at 307-761-1569.

Sincerely,

Stan Miller EIT
WWC Engineering

cc. Bruce Jones – City of Laramie

K:\WWDC\2005-172 Laramie\Task11_Environ\Brian Mark EA letter.doc
8/1/2006

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

TECHNICAL MEMORANDUM

TO: FILE 2005-072L.12 Laramie Water Management Study – Level II

FROM: Stan Miller, EIT

DATE: May 29, 2006

SUBJECT: Environmental Report

Purpose and Need for Project:

The Level II Water Management Study for the City of Laramie has identified a number of projects which would be necessary to help the City meet current and future needs for supplying water to the City customers. Since the City will need to seek funding from Federal and State agencies for these improvements, an investigation was made to assess the potential environmental impacts in accordance with the National Environmental Policy Act (NEPA). This report should aid the State and Federal Agencies in preparing their environmental documentation as required.

The following have been identified as improvements which have potential environmental impacts within the proposed scope of system improvements identified in the Level II Water Management Study:

1. Implementation of a Raw Water Irrigation system for large city green spaces. This project would include extensive pipelines and controls primarily within the improved areas of the City of Laramie, providing a parallel raw water delivery system to green spaces throughout the City.
2. Connection of a pipeline between the Water Treatment Plant and the Laramie River, replacing the existing open canal. The pipeline would run along the Laramie River a distance of approximately 19,650 feet.
3. Upgrades and improvements to the Turner Well Field, including removal and reinstallation of wellhead appurtenances.

In addition, the report points out the need for upgrades within the current system, such as replacement of existing aged water mains and appurtenances. Since these replacements and upgrades are within active City Streets and Alleys, and are part of ongoing operation for the City of Laramie Water system, such improvements should not generate environmental impacts beyond normal construction requirements as mentioned below.

WWC is also engaged in updating the Laramie Water Supply Master Plan which may result in recommendations for operational, training, staffing, and billing changes. Such changes should not generate environmental concerns on their own.

These projects are the direct result of the planning, design, and construction process that the City has undertaken previously, including the recommendations of the "Management Plan for Water Rights on the Monolith Ranch", Fassett Consulting, 2004.

Attachments include letters to each of the environmental agencies affected by the potential improvements as well as their responses. The maps depict the proposed project areas of potential effect for all construction activities.

Alternatives to the Proposed Action:

The proposed projects are a result of an analysis which includes a study of the present water system for the City of Laramie, as well as a projection of future growth and water needs. Some of the projects address deficiencies in the current supply system and some address projected demands based on growth according to the Laramie Comprehensive plan.

There are no good alternatives to fixing the deficiencies of the current system. First priorities must be given to life safety issues such as fire protection and water quality. For the growth demands, however, some efforts should also

be given to water conservation and reuse alternatives. The raw water irrigation system for green areas is one such alternative.

For pipe routings, such as enclosing the water treatment intake or replacing the current water mains because of age, alternative routings can be considered if a particular area is designated as environmentally sensitive.

Affected Environment/Environmental Consequences:

The following is a compilation of the responses received from the various jurisdictional agencies.

Land Use: For the water treatment intake, some grazing land would be impacted, but the use for grazing would not be permanently affected. The State Conservation Office (for USDA-NRCS) indicated that they have "few concerns", but would request that an erosion control plan and revegetation plan be part of any project where land is being disturbed. Most of the improvements being contemplated involve replacement or upgrades to existing pipe infrastructure located in public Rights of Way and do not change the permitted land use.

Flood Plain Impacts: The only area near the river where new construction is contemplated is for the water treatment plant intake. The Wyoming and Federal Emergency Management agencies indicated that permits would come from the local county (in this case Albany), or the City. The engineer for any project would be responsible to determine the flood plain impacts using the FEMA maps, and the local authority would determine if a floodplain impact study would be required.

Wetlands: Any wetland impacts would be a U.S. Army Corps of Engineers section 404 issue. The Corps of Engineers indicated that there are possible permits under NWP 12 (utilities) or NWP 33 (temporary construction). At this time there are no identified wetland areas to be impacted by the proposed projects. Some pipe replacements within the City of Laramie could possibly occur in wetlands areas and would have to be permitted.

Cultural Resources: The Wyoming State Historic Preservation Office indicated that most of the activities contemplated are for previously disturbed areas not requiring further study. An exception would be for the new proposed pipeline at the treatment plant intake which should have a study. Also, the Turner Well field improvements are near the 48AB6 site which should be evaluated for eligibility for listing on the NRHP if affected by the project.

Biological Resources: The U.S. Fish and Wildlife Services listed several possible species of concern, including Bald Eagle, Black-footed Ferret, Wyoming Toad, Preble's Meadow Jumping Mouse and their habitat (normally East of the Laramie Mountains, but has been identified in Albany county), and Ute ladies'-tresses (generally for areas below 7,000 feet in elevation, which does not include any of the proposed project areas). For these species, a qualified biologist should evaluate the project to assure that none of these species is adversely impacted.

In addition, since the projects will produce a net withdrawal of water from the Laramie River, which is a tributary to the North Platte River, the U.S. Fish and Wildlife Service requested a detailed report of the timing and net effects of withdrawals from the River, including historic as well as new uses. The report should detail the locations affected, the methods for calculation of withdrawal and return flows, and an analysis of consumptive uses.

The Wyoming Game and Fish Department expressed concern about the crucial Pronghorn winter range near Sodergreen Lake, which should be mitigated by having construction occur after May 1 and before November 30. In addition, seed and plantings should be native and locally adapted species appropriate for the wildlife. Finally, the river intake structure should be designed to prevent fish uptake.

Water Quality issues: The Wyoming Department of Environmental Quality indicated that the proposed construction activities would require a temporary discharge permit, a Wyoming Pollutant Discharge, Erosion and Sediment Control permit, a DEQ permit to construct, and a section 404 permit from the Corps for any wetlands impacted.

Surface and Groundwater: There have not been any responses from the State Engineer's Office to date.

Coastal Resources: Not applicable.

Socio-economic Issues and Environmental Justice: The Wyoming State Lands and Investment office has not indicated any concerns about the projects as described. At this time, all of the necessary easements and Rights of Way are projected to be voluntary with no condemnations or involuntary takings.

Miscellaneous issues: Impacts to air quality should be minimal, limited to dust concerns during construction. The specifications for these construction projects will require dust suppression. For projects within the City, the City

noise ordinances shall apply. For projects in the County, noise is generally not a concern as the project locations are far from any residential areas. If the biologist recommended by Fish and Wildlife imposes any noise restrictions or timing restrictions on construction, these will be added to the project specifications and enforced by the construction supervision. Transportation issues are generally the concern of the City of Laramie Traffic Department or WYDOT, depending on the roadways involved. All plans will be reviewed and approved by the appropriate authority.

Mitigation Summary for Each Resource:

Land Use: No mitigation expected.

Flood Plain Impacts: No mitigation expected.

Wetlands: No mitigation expected. Any wetlands encountered should be returned to wetlands state after construction. Wetlands evaluation required.

Cultural Resources: No mitigation expected. More study required.

Biological Resources: No mitigation expected. Adjustment of schedule, plans, and procedures may be necessary, based on study by Biologist.

Water Quality issues: Normal construction BMPs.

Surface and Groundwater: Responses from the State Engineer's Office are Pending... Study for consumptive water use impacts may be required.

Coastal Resources: Not applicable.

Socio-economic Issues and Environmental Justice: No mitigation expected.

Miscellanous issues: No mitigation expected. Construction BMPs.

Correspondence and Coordination: Attached.

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

Matt Bilodeau
Cheyenne Regulatory Office
U.S. Army Corps of Engineers
2232 Dell Range Blvd., Suite 210
Cheyenne, WY 82009

307-772-2300

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II study

Applicant: The City of Laramie
Public Works Department
405 Grand Avenue
Laramie, WY 82070

The Wyoming Water Development Commission (WWDC) is funding a study which will, in part perform an environmental review pursuant to the National Environmental Policy Act for the Drinking Water State Revolving Fund (SRF) in order to assess the environmental impacts of the following projected improvements:

1. Implementation of a Raw Water Irrigation system for large city green spaces. This project would include extensive pipelines and controls primarily within the improved areas of the City of Laramie, providing a parallel raw water delivery system to green spaces throughout the City.
2. Connection of a pipeline between the Water Treatment Plant and the Laramie River, replacing the existing open canal. The pipeline would run along the Laramie River a distance of approximately 19,650 feet.
3. Upgrades and improvements to the Turner Well Field, including removal and reinstallation of wellhead appurtenances.

These projects are the direct result of the planning, design, and construction process that the City has undertaken previously, including the recommendations of the "Management Plan for Water Rights on the Monolith Ranch", Fassett Consulting, 2004.

We are also engaged in updating the Laramie Water Supply Master Plan and would invite any related feedback or input related to this venture. Enclosed are maps that depict the proposed project areas of potential effect for all construction activities and a description of the work involved.

Enclosed are maps that depict the proposed project areas of potential effect for all construction activities and a description of the work involved.

The WWDC requests that your office review the proposed project for any activities that may occur in the project area, which fall under the jurisdiction of the Corps. Please provide any permit requirements that your agency may have regarding the outlined project activities, as well as any recommendations you may have to mitigate or avoid these impacts.

We would appreciate a response within 30 days. If you need further information or wish to discuss the projects, please contact Stan Miller or Murray Schroeder at 307-742-0031.

Sincerely,

Stan Miller EIT
WWC Engineering

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5/30/2006

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

Dan Carlson
Federal Emergency Management Agency
Denver Federal Center, Bldg. 710
Denver, CO 80255-0267

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II study

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Laramie, WY 82070

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The WWDC requests that your office review the proposed projects and determine if any part of the proposed activities will occur within a local floodplain. If floodplain impacts are expected, please advise this office of any floodplain permits that may be necessary, as well as any recommendations you may have to mitigate or avoid these impacts.

We would appreciate a response within 30 days. If you need further information or wish to discuss the projects, please contact Stan Miller or Murray Schroeder at 307-742-0031.

Sincerely,

Stan Miller EIT
WWC Engineering

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5/30/2006

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

Wyoming Flood Plain Coordinator
Wyoming Emergency Management Agency
5500 Bishop Blvd.
Cheyenne, WY 82009-3320

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II study

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Public Works Department
405 Grand Avenue
Laramie, WY 82070

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Stan Miller EIT
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5/30/2006

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

Tom Collins
Habitat Protection Program
Wyoming Game and Fish Dept.
5400 Bishop Blvd.
Cheyenne, WY 82006

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II study

Applicant: The City of Laramie
Public Works Department
405 Grand Avenue
Laramie, WY 82070

The Wyoming Water Development Commission (WWDC) is funding a study which will, in part perform an environmental review pursuant to the National Environmental Policy Act for the Drinking Water State Revolving Fund (SRF) in order to assess the environmental impacts of the following projected improvements:

1. Implementation of a Raw Water Irrigation system for large city green spaces. This project would include extensive pipelines and controls primarily within the improved areas of the City of Laramie, providing a parallel raw water delivery system to green spaces throughout the City.
2. Connection of a pipeline between the Water Treatment Plant and the Laramie River, replacing the existing open canal. The pipeline would run along the Laramie River a distance of approximately 19,650 feet.
3. Upgrades and improvements to the Turner Well Field, including removal and reinstallation of wellhead appurtenances.

These projects are the direct result of the planning, design, and construction process that the City has undertaken previously, including the recommendations of the "Management Plan for Water Rights on the Monolith Ranch", Fassett Consulting, 2004.

We are also engaged in updating the Laramie Water Supply Master Plan and would invite any related feedback or input related to this venture. Enclosed are maps that depict the proposed project areas of potential effect for all construction activities and a description of the work involved.

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The WWDC requests that your agency review the proposed projects for any activities that may occur in the project area which fall under the jurisdiction of your agency. Please list any permit requirements that your agency may have regarding activities related to the proposed project as well as any recommendations you may have to mitigate or avoid these impacts.

We would appreciate a response within 30 days. If you need further information or wish to discuss the projects, please contact Stan Miller or Murray Schroeder at 307-742-0031.

Sincerely,

Stan Miller EIT
WWC Engineering

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5/30/2006

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

Darla Potter
DEQ, Air Quality Division
Herschler Bldg. 4-W, 122 W. 25th St.
Cheyenne, WY 82002

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II study

Applicant: The City of Laramie
Public Works Department
405 Grand Avenue
Laramie, WY 82070

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Sincerely,

Stan Miller EIT
WWC Engineering

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5/30/2006

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

Barbara Sahl
DEQ, Water Quality Division
Herschler Bldg. 4-W, 122 W. 25th St.
Cheyenne, WY 82002

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II study

Applicant: The City of Laramie
Public Works Department
405 Grand Avenue
Laramie, WY 82070

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Sincerely,

Stan Miller EIT
WWC Engineering

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5/30/2006

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

Mike Long, State Supervisor
U.S. Fish and Wildlife Service, Ecological Services
4000 Airport Parkway
Cheyenne, WY 82001

307-772-2374

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II study

Applicant: The City of Laramie
Public Works Department
405 Grand Avenue
Laramie, WY 82070

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Enclosed are maps that depict the proposed project areas of potential effect for all construction activities and a description of the work involved.

The proposed projects do not represent a "major construction activity" as defined in 50 CFR 402.02. We request a list of any federally-listed or proposed threatened or endangered species and designated or proposed critical habitats that may be present in the project areas. In addition, please advise us of any present concerns you may have related to possible effects of the projects described above on such species or critical habitat, as well as any other wildlife concerns.

We would appreciate a response within 30 days. If you need further information or wish to discuss the projects, please contact Stan Miller or Murray Schroeder at 307-742-0031.

Sincerely,

Stan Miller, EIT
WWC Engineering

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5/30/2006

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

Ed Burton, State Conservationist
USDA-NRCS Federal Bldg.
100 East B Street, Room 3124
Casper, WY 82601

307-261-6453

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II study

Applicant: The City of Laramie
Public Works Department
405 Grand Avenue
Laramie, WY 82070

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Enclosed are maps that depict the proposed project areas of potential effect for all construction activities and a description of the work involved.

We are requesting information on the possible effects of the proposed projects on important farmland and prime rangeland and any recommendations you may have to minimize these effects. We also seek your assessment of the compatibility of the proposed project with State and local government or any private programs and policies to protect important farmland.

We would appreciate a response within 30 days. If you need further information or wish to discuss the projects, please contact Stan Miller or Murray Schroeder at 307-742-0031.

Sincerely,

Stan Miller, EIT
WWC Engineering

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5/30/2006

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

Wyoming State Engineer's Office
Lisa Lindeman
Herschler Bldg. 4-E, 122 West 25th St.
Cheyenne, WY 82002

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II study

Applicant: The City of Laramie
Public Works Department
405 Grand Avenue
Laramie, WY 82070

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Enclosed are maps that depict the proposed project areas of potential effect for all construction activities and a description of the work involved.

The WWDC requests that your office review the proposed projects and determine if any part of the proposed activities will impact any ground water rights issues. If water rights issues are expected, please advise this office of any permits that may be necessary.

We would appreciate a response within 30 days. If you need further information or wish to discuss the projects, please contact Stan Miller or Murray Schroeder at 307-742-0031.

Sincerely,

Stan Miller, EIT
WWC Engineering

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5/30/2006

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

Wyoming State Engineer's Office
attn: John Barnes
Herschler Bldg. 4-E, 122 West 25th St.
Cheyenne, WY 82002

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II study

Applicant: The City of Laramie
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The WWDC requests that your office review the proposed projects and determine if any part of the proposed activities will impact any surface water rights issues. If water rights issues are expected, please advise this office of any permits that may be necessary.

We would appreciate a response within 30 days. If you need further information or wish to discuss the projects, please contact Stan Miller or Murray Schroeder at 307-742-0031.

Sincerely,

Stan Miller, EIT
WWC Engineering

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5/30/2006

WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

Richard Currit
Wyoming State Historic Preservation Office
2301 Central Ave, Barrett Building, 3rd Floor
Cheyenne, WY 82002

307-777-5497

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II study

Applicant: The City of Laramie
Public Works Department
405 Grand Avenue
Laramie, WY 82070

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Enclosed are maps that depict the proposed project areas of potential effect for all construction activities and a description of the work involved.

The WWDC requests the assistance of your office in identifying historic properties that are listed or eligible for listing on the National Register of Historic Places that may be affected by the projects. Please provide any recommendations you may have to mitigate or avoid these impacts to properties that may be affected.

We would appreciate a response within 30 days. If you need further information or wish to discuss the projects, please contact Stan Miller or Murray Schroeder at 307-742-0031.

Sincerely,

Stan Miller EIT
WWC Engineering

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WWC ENGINEERING
611 Skyline Road – Laramie, WY 82070 – (307) 742-0031
FAX (307) 721-2913 – E-mail: infolar@wwcengineering.com

Jim Whalen, Assistant Director
Wyoming State Lands & Investments
122 W. 25th Street Herschler Bldg. 3W
Cheyenne, WY 82002
307-777-7331

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II study

Applicant: The City of Laramie
Public Works Department
405 Grand Avenue
Laramie, WY 82070

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The WWDC requests the assistance of your office in identifying economic impacts, concerns, and advice for future funding efforts.

We would appreciate a response within 30 days. If you need further information or wish to discuss the projects, please contact Stan Miller or Murray Schroeder at 307-742-0031.

Sincerely,

Stan Miller EIT
WWC Engineering

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5/30/2006

Dave Freudenthal, Governor

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

John Corra, Director

March 17, 2006

MAR 20 2006

Stan Miller
WWC Engineering
611 Skyline Road
Laramie, WY 82070

re: Agency Review for the Laramie Water Management Level II Study

Dear Mr. Miller:

I received a request for an agency review of the proposed project for activities that may fall under the Department of Environmental Quality Water Quality Division's (WQD) jurisdiction.

There are three WQD permits that may apply to this project. Any or all of them may apply depending on the eventual scope of the project.

- ❑ Temporary Discharge Permit. Any discharges to "waters of the state" must be permitted under the Wyoming Pollutant Discharge Elimination System (WYPDES) program. This program is part of the federal Clean Water Act, but is administered by the WQD. Coverage is required for discharges from cofferdam dewatering, discharges from hydrostatic pipeline testing, or discharge of other waste waters to waters of the state. For clarification waters of the state include rivers, streams, dry draws, wetlands, lakes, reservoirs and even stock ponds. The type of activity proposed can most likely be covered under the general permit for temporary discharges. This permit will require some sampling and will incorporate effluent limits for any constituents of concern. Roland Peterson (307-777-7090) can provide additional information.

- ❑ Storm Water Associated with Construction Activities. This permit is required any time a project results in clearing, grading, or otherwise disturbing one or more acres. The disturbed area does not need to be contiguous. The permit is required for surface disturbances associated with construction of the project, access roads, construction of wetland mitigation sites, borrow and stockpiling areas, equipment staging and maintenance areas and any other disturbed areas associated with construction. A general permit has been established for this purpose and either the project sponsor or general contractor is responsible for

11-A-17

filing a Notice of Intent (NOI) and complying with the provisions of the general permit. The NOI should be filed no later than 30 days prior to the start of construction activity. Please contact Barb Sahl at 307-777-7570.

- ❑ Permit to Construct. Any time a public water or waste water system is constructed, installed, or modified a permit to construct is required. The program is handled out of our Cheyenne office for the Southeast portion of the State. Please contact Lou Harmon at 307-777-7088 for more detailed information.

- ❑ Section 404. While not a state permit, this project may require a section 404 permit from the US Army Corps of Engineers. Any time work occurs within waters of the US a 404 permit may be required. Please contact the Corps (307-772-2300) for specific information regarding jurisdiction and requirements.

These are the permits most likely to affect this project. Also, every effort to prevent erosion of any kind should be taken. Any sediment taken away due to runoff and collection by the storm drainage system can affect the water quality of the receiving water. If you have any questions please contact the persons listed above or me at 307-777-7588.

Sincerely,

Jeremy Lyon
Environmental Senior Analyst
Water Quality Division

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Subject: City of Laramie water project
From: "Charles S. Meyers" <cmeyer3@state.wy.us>
Date: Mon, 13 Mar 2006 15:45:56 -0700
To: smiller@wwcengineering.com

Dear Stan

In review your project and talking with Murray Schroeder in your office, it is determined that the irrigation project for the city parks will impact the floodplain. The project of piping water to the water treatment plant appears to be in the floodplain as well.

Permits for work in the floodplain are handled at the local level. Permits would be needed from the City of Laramie and Albany County. It appears that permits from the Corp of Engineers would be needed. Possible permits from DEQ may also be needed.

The Floodplain Manager for the City of Laramie is Jerry Hankin, 307-721-5274. The Floodplain Manager for Albany County is Barney Bisson, 307-721-5207.

If you have any further questions please contact me at the numbers below.

C. Scott Meyers
NFIP/LEPC Coordinator
Wyoming Office of Homeland Security
Herschler Building 1st Floor East
122 W 25th St
Cheyenne WY 82002
307-777-4910

11A-19

ARTS. PARKS. HISTORY.

Wyoming Department of State Parks and Cultural Resources

WYOMING STATE HISTORIC PRESERVATION OFFICE
BARRETT BUILDING, 2301 CENTRAL AVE, CHEYENNE, WY 82002
(307) 777-7697

March 13, 2006

Stan Miller EIT
WWC Engineering
611 Skyline Road
Laramie, WY 82070

Re: Compliance with Federal Authorities to Obtain a State Revolving Fund for Improvements under the Laramie Water Management Level II Study (SHPO File # 0306SMC006)

Dear Mr. Miller:

Thank you for consulting with the Wyoming State Historic Preservation Office (SHPO) regarding the above referenced project.

Following 36 CFR Part 800, we find that most of the proposed project is in an area of previous disturbance and has a low probability of containing historic properties, as defined in 36 CFR § 800.16(1)(1). No further identification efforts are warranted in these previously disturbed areas. However, for the following areas we recommend that a cultural resource survey be conducted:

- A search of our records shows that a cultural resource survey has not been conducted in the area of potential effect following the pipeline connecting the Water Treatment Plant and the Laramie River. Additionally, two known historic properties, 48AB834 and 48AB835, are within or within the vicinity of the area of potential effect.
- Also, 48AB, which is unevaluated for listing in the National Register of Historic Places (NRHP), is located in the vicinity of the Turner Well Field. We recommend that WWC Engineering hire a consultant to investigate the eligibility of 48AB6 for listing in the NRHP if the proposed project will have an effect on the site.

Following 36 CFR Part 800, and prior to any ground disturbing activities, we recommend WWC Engineering carry out appropriate efforts necessary for identification of historic properties within the two above-mentioned areas of potential effect where a previous survey has not been conducted, which may include a file search, background research, consultation, consideration of visual effects, sample field investigations or field survey. The identification efforts must be conducted by a consultant meeting the Secretary of the Interior's Professional Qualification Standards (48 FR 22716, Sept. 1983). A report detailing the results of these efforts must be provided to SHPO staff for our review and comment.

We have enclosed a copy of a cultural resource consultants list for your use. Please refer to SHPO project control number #0306SMC006 on any future correspondence dealing with this project. If you have any questions, please contact me at 307-777-3424.

Sincerely,

Shanna Cox

Shanna Cox
Archaeologist

11-A-20

WYOMING SHPO
CULTURAL RESOURCE CONSULTANTS LIST
2006

The Wyoming State Historic Preservation Office (SHPO) does not permit or license consultants and makes no endorsement of any particular consultant.

John P. Albanese
P. O. Box 1397
Casper, WY 82602-1397
Phone 307-234-1379
Fax 307-268-4709
E-mail: albanese@bresnan.net

James M. Brechtel
James Enterprises Inc.
P. O. Box 1064
Fort Collins, CO 80522
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E-mail: jbjei@mesanetworks.net

James A. Brunette
Frontier Archaeology
3630 West 46th Street
Casper, WY 82604
Phone 307-234-5166
Fax 307-234-5133
E-mail: frontierarch@wyoming.com

Allan R. Burns
Terra Alta Archaeology
902 14th Street
Cody, WY 82414
Phone/Fax 307-587-8732
E-mail: taa@vcn.com

Wade and Christina Burns
Beaver Creek Archaeology, Inc.
P.O. Box 489
Linton, ND 58552
Phone: 701-367-8993
Email: wadeburns@beavercreekarchaeology.com

John D. Cater
Aztec Archaeological Consultants
210 S. Main Avenue
Aztec, NM 87410
Phone 505-334-6675
Fax 505-334-2558
E-mail: aacaztec@sisna.com

Thomas Lennon
Western Cultural Resource Management
P.O. Box 2326
Boulder, CO 80306
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Fax 303-530-7716
E-mail: wcrm@qwest.net

Patrick F. Light
Lone Wolf Archaeology
2904 Highwood Drive
Missoula, MT 59803-2533
Phone 406-251-8016
Fax 406-251-0618
E-mail: PLight1470@aol.com

Marilyn Martorano
RMC Consultants, Inc.
12345 West Alameda Parkway, Suite 205
Lakewood, CO 80228
Phone: 303-980-4101
Fax: 303-980-4107
Email: dbarclay@rmc-consultants.com

Michael Metcalf
Metcalf Archaeological Consultants
P. O. Box 899
Eagle, CO 81631
Phone 970-328-6244
Fax 970-328-5623
E-mail: mike@metcalfarchaeology.com

Brian L. Molyneaux
Archeology Laboratory
University of South Dakota
414 E. Clark St.
Vermillion, SD 57069
Phone 605-677-5597
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E-mail: moly@usd.edu

Susan M. Chandler
Alpine Archaeological Consultants, Inc.
P. O. Box 2075
Montrose, CO 81402
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Dave Freudenthal, Governor

Department of Environmental Quality

To protect, conserve and enhance the quality of Wyoming's environment for the benefit of current and future generations.

John Corra, Director

March 13, 2006

Mr. Stan Miller, EIT
WWC Engineering
611 Skyline Rd.
Laramie, WY 82070

RE: Air Quality Division Review of Various City of Laramie Waterline Improvement Projects

Dear Mr. Miller:

The Air Quality Division (Division) has reviewed your letter received March 9, 2006 regarding the following projects:

1) Raw Water Irrigation System - Project includes the installation of a raw water delivery system within the City of Laramie for irrigating city green spaces.
2) WTP Pipeline - Project includes the installation of a pipeline between the city water treatment plant (WTP) and the Laramie River to replace an open canal.
3) Turner Well Field Upgrades - Project includes improvements to the Turner Well Field including removal and installation of wellhead appurtenances.

Per your request, the Division has reviewed and evaluated the submitted information with respect to compliance with existing air quality rules and regulations. Based on the Division's review, three sections of the Wyoming Air Quality Standards and Regulations (WAQSR) apply to the proposed projects should they be initiated.

First, WAQSR Chapter 3, Section 8 asbestos regulations require an initial work-site inspection prior to any demolition or renovation activities at a facility. This includes a thorough inspection of the affected facility, part of the facility, or site where the demolition or renovation will occur for the presence of asbestos. This section also contains specific notification requirements and procedures for asbestos emissions control which may be applicable. In the case of the previously described projects, it is possible asbestos containing pipeline or other materials may be encountered during implementation of the above projects. Thus, to ensure all requirements are met, please complete the attached Notification of Demolition and Renovation form and return it to the Cheyenne office at the address listed above. A Division asbestos inspector will contact you in a timely manner to schedule an inspection. If you have any questions, please contact Mr. Robert Rodriguez, Asbestos Inspector, at 777-7584 for further information.

11A-26

It appears based on your letter that earth work and/or earth moving activities will take place during the above described projects. Subsequently, you should be aware that WAQSR Chapter 3, Section 2(f) requires persons engaged in clearing or leveling land, earthmoving, excavation, movement of trucks or construction equipment over access roads or cleared land, and demolition activities to control fugitive dust emissions using frequent watering and/or chemical stabilization of the affected areas. Applications of water should be made as necessary to control fugitive dust from these activities. For land clearing, hauling, and similar activities, water is typically applied hourly. However, should this prove inadequate more frequent applications may be required. For fugitive dust generated by demolition activities, the application of water is required to control fugitive dust. In cases where water cannot be used or is impractical, other control measures shall be used to control fugitive dust. This section also requires prompt removal of earth or other materials from paved streets. As long as such control measures are taken during completion of a project, the Division expects the impact on ambient air quality from fugitive dust emissions to be minimal.

Finally, Chapter 10, Section 2 prohibits the disposal of any discarded materials, including wood, construction materials, or other prohibited materials by open burning. All such materials generated by these projects should be disposed of by an alternative means.

If you have any questions regarding this matter, please feel free to contact me at (307) 777-3787 or at the address listed on the previous page.

Sincerely,

Glenn A. Spangler
District 1 Engineer
Air Quality Division

GAS/gas
(attachment)

xc: David A. Finley, Air Quality Division Administrator (w/o attachment)
Robert Rodriguez, Asbestos Inspector (w/o attachment)
Glenn Spangler, SSC District 1 Engineer (w/o attachment)
Laramie County Compliance File (w/o attachment)

Section 29 of The Wyoming Air Quality Standards and Regulations requires written notification of demolition or renovation operations. This form may be used to fulfill this requirement. Only complete notification forms are acceptable. Incomplete notification may result in enforcement action.

The notification should be typewritten and postmarked or delivered no later than ten working days prior to the beginning of the asbestos removal activity (dates specified in Section VI) or demolition (dates specified in Section VII.) Please submit this form to:

Air Quality Division
122 W. 25th Street
Hershler Building
Cheyenne, Wyoming 82002

INSTRUCTIONS

I. Facility Description: Provide detailed information on the areas being renovated or demolished. If applicable, provide the floor numbers and room numbers where renovations are to be conducted.

II. Facility Information: Enter the names, addresses, contact persons and telephone numbers of the following:

Owner: Legal owner of the site at which asbestos is being removed or demolition planned.

Removal Contractor: Contractor hired to remove asbestos.

Other Operator: Demolition contractor, general contractor, or any other person who leases, operates, controls or supervises the site.

If known, the name of the site supervisor should be entered as the contact person for the notification. If additional parties share responsibility for the site, demolition activity, renovations or ACM removal, include complete information (including name, address, contact person and telephone number) on additional sheets submitted with the form.

III. Type of Operation: Enter "D" for facility demolition, "R" for facility renovation, "O" for ordered demolitions, or "E" for emergency renovations.

Site Location: Provide information needed to locate site in the event that the address alone is inadequate.

Building Size: Provide in square meters or square feet.

No. of Floors: Enter the number of floors including basement or ground level floors.

Age in Years: Enter approximate age of the facility.

Present Use/Prior Use: Describe the primary use of the facility or enter the following codes: H – Hospital; S – School; P – Public Building; O – Office; I – Industrial; U – University or College; B – Ship; C – Commercial; or R – Residence.

IV. Is Asbestos Present? Answer "Yes" or "No" regardless of the amount or type of asbestos.

V. Asbestos Detection Procedure: Describe methods and procedures used to determine whether ACM is present at the site, including a description of the analytical methods employed.

VI. Scheduled Dates of Asbestos Removal (MM/DD/YY): Enter scheduled dates (month/day/year) for asbestos removal work. Asbestos removal work includes any activity, including site preparation, which may break up, dislodge or disturb asbestos material.

VII. Scheduled Dates of Demo/Renovation (MM/DD/YY): Enter scheduled dates (month/day/year) for beginning and ending the planned demolition or renovation.

VIII. Scheduled Work Hours: Enter the work hours and the days you will be working.

FOR EXAMPLE:
Regular:
Start: Monday - Friday 8:00 A.M. Complete: 4:30 P.M.
For 4 Ten Hour Days:
Start: Monday - Thursday 7:00 A.M. Complete: 5:30 P.M.
For Weekend Work:
Start: Monday - Saturday or Sunday 8:00 A.M. Complete: 4:30 P.M.

IX. Approximate Amount of Asbestos Including: (1) Regulated ACM to be removed (including nonfriable ACM to be sanded, ground or abraded); (2) Category I ACM not removed; and (3) Category II ACM not removed.

For both removals and demolitions, enter the amount of RACM to be removed by entering a number in the appropriate box and an "X" for the unit. For demolitions only, enter the amount of Category I and II nonfriable asbestos not to be removed in the appropriate boxes.

Category I nonfriable material includes packing, gaskets, resilient floor covering and asphalt roofing materials containing more than one percent asbestos. Category II nonfriable material includes any material, excluding Category I products, containing more than one percent asbestos, that when dry, cannot be crumbled, pulverized or reduced to powder.

X. Description of Planned Demolition or Renovation Work, and Method(s) to be Used: Include in this description the demolition and renovation techniques to be used and a description of the areas and types of facility components which will be affected by this work.

XI. Description of Engineering Controls and Work Practices to be Used to Control Emissions of Asbestos at the Demolition and Renovation Site: Describe the work practices and engineering controls selected to ensure compliance with the requirements of the regulations, including both asbestos removal and waste-handling emission control procedures.

XII. Type of Notification: Enter "0" if the notification is a first time or original notification, "R" if the notification is a revision of a prior notification, or "C" if the activity has been cancelled.

XIII. Waste Transporter(s): Enter the names, addresses, contact persons and telephone numbers of the persons or companies responsible for transporting ACM from the removal site to the waste disposal site. If the removal contractor or owner is the waste transporter, state "same as owner" or "same as removal contractor." If additional parties are responsible include complete information on an additional sheet submitted with the form.

XIV. Waste Disposal Site: Identify the waste disposal site, including the complete name, location and telephone number of the facility. If ACM is to be disposed of at more than one site, provide complete information on an additional sheet submitted with the form.

XV. If Demolition Ordered by a Government Agency, Please Identify the Agency below: Provide the name of the responsible official, title and agency, authority under which the order was issued, the dates of the order and the dates of the ordered demolition.

XVI. Emergency Renovation Information: Provide the date and time of the emergency, a description of the event and a description of unsafe conditions, equipment damage or financial burden resulting from the event. The information should be detailed enough to evaluate whether a renovation falls within the emergency exception.

XVII. Description of Procedures to be Followed in the Event that Unexpected Asbestos is Found or Previously Nonfriable Asbestos Material Becomes Crumbled, Pulverized or Reduced to Powder: Provide adequate information to demonstrate that appropriate actions have been considered and can be implemented to control asbestos emissions adequately, including at a minimum, conformance with applicable work practice standards.

XVIII. Certification of Presence of Trained Supervisor: One year after promulgation of the applicable regulation, the notifier must certify that a person trained in asbestos-removal procedures will supervise the demolition or renovation. The supervisor is responsible for the activity on-site. Evidence that the training has been completed by the supervisor must be available for inspection during normal business hours.

XIX. Verification: Please certify the accuracy and completeness of the information provided by signing and dating the notification form.

STATE OF WYOMING

NOTIFICATION OF DEMOLITION AND RENOVATION

I. FACILITY DESCRIPTION (INCLUDE BUILDING NAME, NUMBER AND FLOOR OR ROOM NUMBER)

BLDG NAME:

ADDRESS:

CITY:	STATE:	CONTACT:

SITE DESCRIPTION (type of material being removed)

II. FACILITY INFORMATION (IDENTIFY OWNER, REMOVAL CONTRACTOR, AND OTHER OPERATOR)

OWNER NAME:

ADDRESS:

CITY:	STATE:	ZIP:
CONTACT:		TEL:

REMOVAL CONTRACTOR:

ADDRESS:

CITY:	STATE:	ZIP:
CONTACT:		TEL:

OTHER OPERATOR:

ADDRESS:

CITY:	STATE:	ZIP:
CONTACT:		TEL:

BUILDING SIZE:	NUM OF FLOORS:	AGE IN YEARS:
PRESENT USE:	PRIOR USE:	

III. TYPE OF OPERATION (D=DEMO O=ORDERED DEMO R=RENOVATION E=EMER. RENOVATION):

IV. IS ASBESTOS PRESENT? (YES/NO)

V. PROCEDURE, INCLUDING ANALYTICAL METHOD, IF APPROPRIATE, USED TO DETECT THE PRESENCE OF ASBESTOS MATERIAL:

VI. SCHEDULED DATES ASBESTOS REMOVAL (MM/DD/YY) START: COMPLETE:

VII. SCHEDULED DATES DEMO/RENOVATION (MM/DD/YY) START: COMPLETE:

VIII. SCHEDULED WORK HOURS: START: COMPLETE:

IX. APPROXIMATE AMOUNT OF ASBESTOS, INCLUDING: 1. REGULATED ACM TO BE REMOVED 2. CATEGORY I ACM NOT REMOVED 3. CATEGORY II ACM NOT REMOVED	RACM TO BE REMOVED	NONFRIABLE ASBESTOS MATERIAL TO BE REMOVED		NONFRIABLE ASBESTOS MATERIAL NOT TO BE REMOVED	
		CAT I	CAT II	CAT I	CAT II
PIPES					
SURFACE AREA					
VOL RACM OFF FACILITY COMPONENT					

X. DESCRIPTION OF PLANNED DEMOLITION OR RENOVATION WORK, AND METHOD(S) TO BE USED:

XI. DESCRIPTION OF WORK PRACTICES AND ENGINEERING CONTROLS TO BE USED TO PREVENT EMISSIONS OF ASBESTOS AT THE DEMOLITION AND RENOVATION SITE:

NOTIFICATION OF DEMOLITION AND RENOVATION (CONTINUED)

XII. TYPE OF NOTIFICATION (O=ORIGINAL R=REVISED C=CANCELLED):		WPR Notice?
XIII. WASTE TRANSPORTER #1		
NAME:		
ADDRESS:		
CITY:	STATE:	ZIP:
CONTACT PERSON:		TELEPHONE:
WASTE TRANSPORTER #2		
NAME:		
ADDRESS:		
CITY:	STATE:	ZIP:
CONTACT PERSON:		TELEPHONE:
XIV. WASTE DISPOSAL SITE		
NAME:		
LOCATION:		
CITY:	STATE:	ZIP:
TELEPHONE:	CONTACT PERSON:	
XV. IF DEMOLITION ORDERED BY A GOVERNMENT AGENCY, PLEASE IDENTIFY THE AGENCY BELOW:		
NAME:	TITLE:	
AUTHORITY:		
DATE OF ORDER (MM/DD/YY):	DATE ORDERED TO BEGIN (MM/DD/YY):	
XVI. FOR EMERGENCY RENOVATIONS		
DATE AND HOUR OF EMERGENCY (MM/DD/YY):		
DESCRIPTION OF THE SUDDEN, UNEXPECTED EVENT:		
EXPLANATION OF HOW THE EVENT CAUSED UNSAFE CONDITIONS OR WOULD CAUSE EQUIPMENT DAMAGE OR AN UNREASONABLE FINANCIAL BURDEN:		
XVII. DESCRIPTION OF PROCEDURES TO BE FOLLOWED IN THE EVENT THAT UNEXPECTED ASBESTOS IS FOUND OR PREVIOUSLY NONFRIABLE ASBESTOS MATERIAL BECOMES CRUMBLED, PULVERIZED, OR REDUCED TO POWDER.		
XVIII. I CERTIFY THAT AN INDIVIDUAL TRAINED IN THE PROVISIONS OF THIS REGULATION (40 CFR PART 61, SUBPART M) WILL BE ON-SITE DURING THE DEMOLITION OR RENOVATION AND EVIDENCE THAT THE REQUIRED TRAINING HAS BEEN ACCOMPLISHED BY THIS PERSON WILL BE AVAILABLE FOR INSPECTION DURING NORMAL BUSINESS HOURS (REQUIRED 1 YEAR AFTER PROMULGATION).		
(SIGNATURE OF OWNER/OPERATOR)		(DATE)
XIX. I CERTIFY THAT THE ABOVE INFORMATION IS CORRECT.		
(SIGNATURE OF OWNER/OPERATOR)		(DATE)

United States Department of Agriculture
NRCS Natural Resources Conservation Service

Natural Resources Conservation Service
Federal Building
100 East B Street, Room 3124
P.O. Box 33124
Casper, WY 82602

Date: March 20, 2006

WWC Engineering
Stan Miller, EIT
611 Skyline Road
Laramie, Wyoming 82070

Dear Mr. Miller,

The Natural Resources Conservation Service has reviewed your letter in regards to Laramie Water Management Level II Study.

In your letter you have listed three different project improvements. The NRCS has no comments on the first project which would be supplying raw water to areas within the city as it appears all of the project will be within the city limits and in public road right of ways. Project 2 was listed as the connection of a pipeline between the Water Treatment Plant and The Laramie River. This appears proposed pipeline appears to be going across rangeland and cropland (Hayland). There is no prime land of concern in the area. We would like to see in place an erosion control plan and a revegetation plan for this area of disturbance prior to any construction being started. Project 3 was upgrades and improvements to the Turner Well Field which we do not have any comments on.

If you have any questions, or need to discuss this comment with us, please contact either myself at 307-233-6750 or please contact Doug Gasseling, Conservation Agronomist, Cheyenne, Wyoming, at 307-772-2320, ext. 101.

Sincerely,

ADOLFO PEREZ
State Conservationist

The Natural Resources Conservation Service works hand-in-hand with the American people to conserve natural resources on privatelands.

USDA IS AN EQUAL OPPORTUNITY PROVIDER AND EMPLOYER

WYOMING GAME AND FISH DEPARTMENT

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Phone: (307) 777-4600 Fax: (307) 777-4610
Web site: http://gf.state.wy.us

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JERRY GALLES
CLIFFORD KIRK
KERRY POWERS

April 3, 2006

WER 11395
WWC Engineering
Environmental Field Review
City of Laramie
Laramie Water Management Level II Study
Albany County

Stan Miller, EIT
WWC Engineering
611 Skyline Road
Laramie, WY 82070

Dear Mr. Miller:

The staff of the Wyoming Game and Fish Department has reviewed the Environmental Field Review for the proposed Laramie Water Management Level II Study in Albany County. We offer the following comments for your consideration.

Terrestrial Considerations:

The proposed pipeline will cross pronghorn crucial winter range near Sodergreen Lake. We recommend trenching activity not occur from November 30 through April 30 to avoid disturbance to pronghorn during the crucial winter period.

Open trenches should be filled in as soon as possible to facilitate wildlife movement and prevent wildlife injury. We recommend topsoil be saved and spread over disturbed areas as soon as possible after disturbance to accelerate re-vegetation. Seed mixtures should include locally adapted, native shrubs and grasses palatable to wildlife.

Aquatic Considerations:

The Laramie River is classified as a Yellow Ribbon trout stream at the river intake structure downstream of Curtis Street, meaning it is of regional importance to anglers. There is a naturally reproducing brown trout population in this portion of the Laramie River, along with numerous nongame species. The report does not indicate what provisions will be taken to prevent the uptake of fish through this structure, and this issue should be addressed.

Thank you for the opportunity to comment.

Sincerely,

Bill Wichers

BILL WICHERS
DEPUTY DIRECTOR

BW:VS:gfb

cc: USFWS

DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS, OMAHA DISTRICT
WYOMING REGULATORY OFFICE
2232 DELL RANGE BOULEVARD, SUITE 210
CHEYENNE WY 82009-4942

Reply to
Attention of:

March 17, 2006

Wyoming Regulatory Office

Terry Haugen, Public Works Director
City of Laramie
P.O. Box C
Laramie, Wyoming 82073

Dear Mr. Haugen:

This is in response to a letter that we received on March 9, 2006, from Mr. Stanley D. Miller with WWC Engineering of Laramie, Wyoming. In his letter, Mr. Miller described various improvements proposed for the City of Laramie municipal water supply system. Mr. Miller stated that the Wyoming Water Development Commission is funding a study of the proposal that will in part perform an environmental review pursuant to the National Environmental Policy Act for the Drinking Water State Revolving Fund (SRF). Mr. Miller asked for Corps comments on the project relative to our authorities.

According to Mr. Miller, the improvement project involves the following activities:

1. Construction of a raw water irrigation system for large city spaces. It appears that the proposed new raw water line would involve an intake on Laramie River and a crossing of the river nearby. According to the map provided, those proposed activities would occur in Section 32, Township 16 North, Range 73 West, Albany County, Wyoming.

2. Replacement of an existing open water supply canal with a pipeline running between a diversion/intake on the Laramie River and the city's water treatment plant. The pipeline would run along the Laramie River for a distance of approximately 19,650 feet. The intake is located in approximately the SW ¼, Section 36, Township 14 North, Range 77 West, Albany County, Wyoming and the water treatment plant is located in approximately the SW ¼, Section 23, Township 14 North, Range 76 West, Albany County, Wyoming.

3. Upgrades and improvements to the Turner Well Field, including removal and reinstallation of wellhead appurtenances. The well field is located in approximately the SW ¼, Section 35, Township 16 North, Range 73 West, Albany County, Wyoming.

The U.S. Army Corps of Engineers regulates the placement of dredged and fill material into wetlands and other waters of the United States as authorized primarily by Section 404 of the Clean Water Act (33 U.S.C. 1344). The term "waters of the United States" has been broadly defined by statute, regulation, and judicial interpretation to include all waters that were, are, or could be used in interstate commerce such as rivers, streams (including ephemeral streams), reservoirs, and lakes as well as wetlands adjacent to those areas. The Corps regulations are set forth at 33 CFR Parts 320 through 331. Information on Section 404 program requirements in Wyoming can be obtained by visiting our web site at https://www.nwo.usace.army.mil/html/od-rwy/Wyoming.htm.

Wetlands are defined as areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are characterized by growth of vegetation such as bulrush, cattails, rushes, sedges, and willows. Wetlands not only provide wildlife habitat but also improve water quality by holding sediment and taking up nutrients. In many cases, wetlands decrease flooding by storing surface water and recharging ground water in flood plains.

Based on the information provided, we have determined that portions of project may require authorization from the Corps of Engineers. Any option and/or activity involving the placement of fill material into waters of the U.S., including wetlands, will require authorization from the Corps. The proposed raw water line intake and crossing of the Laramie River may need authorization if they involve any fills, including temporary fills such as cofferdams, in the Laramie River and or any other waterways. The same is true for the proposed pipeline replacement project between the city's intake and water treatment plant. Finally, it was not clear from Mr. Miller's description whether "...upgrades and improvements..." at the Turner Well Field will also require authorization. It is noted that the well field is located in close proximity to Spring Creek.

Regulated activities involving waterline crossings of area waterways or new intakes may qualify for authorization under Nationwide Permit No. 12 (NWP 12) for "Utility Line Activities" and Nationwide Permit No. 33 (NWP 33) for "Temporary Construction Access and Dewatering". Information on NWP 12 and NWP 33 can be obtained by visiting our web site at the location described above. We recommend this office be contacted and provided with project specific information in the context of a preconstruction notification if or when options are chosen, such as area waterway waterline crossings, which require Corps authorization.

This letter is considered a preliminary jurisdictional determination by this office. It does not eliminate the requirement to obtain any other applicable federal, state, tribal, or local permits that may be required. If you have any questions regarding this determination, please contact me at (307) 772-2300 and reference file No. 200640077.

Sincerely,

Matthew A. Bilodeau

Matthew A. Bilodeau
Program Manager
Wyoming Regulatory Office

11A-36

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
5353 Yellowstone Road, 308A
Cheyenne, Wyoming 82009

In Reply Refer To:
ES/61411/W.99/WY10326

MAR 2 8 2006

Mr. Stan Miller, EIT
WWC Engineering
611 Skyline Road
Laramie, WY 82070

Dear Mr. Miller:

Thank you for your letter received by our office on March 13, 2006 regarding the proposed Laramie Water Management Level II Study that examines the implementation of a raw water irrigation system for the City of Laramie, the connection of a pipeline between the City of Laramie water treatment plant and the Laramie River, and upgrades and improvements to the Turner Well Field. Your letter requested a list of species that may be impacted by the proposed Project and additional comments we may have on potential environmental impacts. In accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 *et seq.*) and the Interagency Cooperation Regulations (50 CFR 402), the U.S. Fish and Wildlife Service (Service) has reviewed the information provided. The following species may be found within the Project area:

SPECIES	STATUS	HABITAT
Bald eagle (*Haliaeetus leucocephalus*)	Threatened	Found throughout state
Black-footed Ferret (*Mustela nigripes*)	Endangered	Prairie dog towns
Wyoming toad (*Bufo baxteri*)	Endangered	Wetlands in Laramie River Valley
Preble's meadow jumping mouse (*Zapus hudsonius preblei*)	Threatened	Riparian habitats east of Laramie Mountains and south of the North Platte River

Critical habitat for Preble's meadow jumping mouse	Designated	Varying widths (360 to 394 feet from stream edge) along portions of Cottonwood, Chugwater, and Lodgepole creeks and some tributaries
Ute ladies'-tresses (*Spiranthes diluvialis*)	Threatened	Seasonally moist soils and wet meadows of drainages below 7000 feet elevation

Platte River Water Depletions and Downstream Species Effects: The proposed action will result in consumptive use of water in the Platte River System. Water depletions to the Platte River system may affect the federally listed whooping crane (*Grus americana*), interior least tern (*Sterna antillarum*), piping plover (*Charadrius melodus*), pallid sturgeon (*Scaphirhynchus albus*), bald eagle (*Haliaeetus leucocephalus*), and western prairie fringed orchid (*Platanthera praeclara*). In addition, depletions may contribute to the destruction or adverse modification of designated critical habitat for the whooping crane and the northern Great Plains breeding population of the piping plover. Depletions include evaporative losses and/or consumptive use, often characterized as diversions from the Platte River or its tributaries less return flows. Project elements that could be associated with depletions to the Platte River system include, but are not limited to, ponds (detention/recreation/irrigation storage/stock watering), lakes (recreation/irrigation storage/municipal storage/power generation), reservoirs (recreation/irrigation storage/municipal storage/power generation), created or enhanced wetlands, hydrostatic testing of pipelines, wells, diversion structures, dust abatement, and water treatment facilities. Future documents regarding Project details should include: an estimate of the amount and timing of average annual water use (both historic and new uses) and methods of arriving at such estimates; location of where water use or diversion occurs as specifically as possible; if and when the water will be returned to the system; and what the water is being used for. Note that if the project has peculiarities or oddities, the Service may have more specific questions regarding the potential consumptive use of water.

Bald Eagle: While habitat loss and human disturbance remains a threat to the bald eagle's full recovery, most experts agree that its recovery to date is encouraging. Adult eagles establish life-long pair bonds and build large nests in the tops of large trees near rivers, lakes, marshes, or other wetland areas. During winter, bald eagles gather along open water to forage and night roost in large mature trees, usually in secluded locations that offer protection from harsh weather. Bald eagles often return to use the same nest and winter roost year after year. Because bald eagles are particularly sensitive to human disturbance at their nests and communal roosts, protective buffers should be implemented around these areas [Buehler et al. 1991, Greater Yellowstone Bald Eagle Working Group (GYBEWG) 1996, Montana Bald Eagle Working Group (MBEWG) 1994, Stalmaster and Newman 1978, U.S. Fish and Wildlife Service (USFWS) 1986].

In Wyoming, bald eagle nest buffer recommendations include avoiding project-related disturbance and habitat alteration within 1 mile of bald eagle. The nesting season occurs from

February 1 to August 15 and bald eagle nest buffers should receive maximum protection during this time period. For some activities (construction, seismic exploration, blasting, and timber harvest), a home range buffer may include potential foraging habitat for 2.5 miles from the nest (GYBEWG 1996). We recommend that you contact the U.S. Fish and Wildlife Service to determine the potential impact of your activity to nesting bald eagles if your project will cause disturbance within one of these nest buffer areas.

A communal roost is defined as an area where six or more eagles spend the night within 100 meters (328 feet) of each other (GYBEWG 1996). For bald eagle communal winter roosts, we recommend that disturbance be restricted within 1 mile of known communal winter roosts during the period of November 1 to April 1. Additionally, we recommend avoiding disturbance and habitat alteration within 0.5 mile of active roost sites year round.

Disturbance sensitivity of roosting and nesting bald eagles may vary between individual eagles, topography, density of vegetation and intensity of activities. The buffers and timing stipulations, as described above, should be implemented unless site-specific information indicates otherwise (Stalmaster and Newman 1978, USFWS 1986). Modification of buffer sizes may be permitted where biologically supported and in coordination with the U.S. Fish and Wildlife Service.

Wyoming Toad: The Wyoming toad historically occupied flood plains, ponds, and seepage lakes associated with shortgrass communities occurring between 7,000 and 7,500 feet in elevation within the Laramie Basin. The toad was associated with both the Big and Little Laramie Rivers. Populations of the Wyoming toad suffered a dramatic decline in the 1970s and the current distribution is limited to Mortenson Lake National Wildlife Refuge (MLNWR) and possibly Hutton Lake National Wildlife Refuge (HLNWR). Western Ecosystems Technology Incorporated conducted in depth toad surveys following U.S. Fish and Wildlife Service protocol in 1994 and 1995. No new populations were discovered.

Current recommendations call for surveys when proposed projects occur within 1-mile of any border of MLNWR or HLNWR during the toad's active season (May through September). These guidelines may change as new sites are established. The Wyoming toad is currently found in the wild only at Mortenson Lake and possibly Lake Hutton National Wildlife Refuges in the Laramie Basin in Albany County. The toad was recently reintroduced to a small research project site in the Laramie Plains (2003) and on private land in Centennial, Wyoming (June 2005) as a result of a Safe Harbor Agreement dated August 2004.

Black-Footed Ferret: Black-footed ferrets may be affected if prairie dog towns are impacted. Please be aware that black-footed ferret surveys are no longer recommended in black-tailed prairie dog towns statewide or white-tailed prairie dog towns <u>except</u> those noted in our enclosed February 2, 2004, letter. However, we encourage the Federal action agency to protect all prairie dog towns for their value to the prairie ecosystem and the myriad of species that rely on them. We further encourage you to analyze potentially disturbed prairie dog towns for their value to future black-footed ferret reintroduction.

If white-tailed prairie dog towns or complexes greater than 200 acres will be disturbed, surveys for ferrets may be recommended in order to determine if the action will result in an adverse effect to the species. Surveys are recommended even if only a portion of the white-tailed prairie dog town or complex, as identified in our enclosed letter, will be disturbed. According to the *Black-Footed Ferret Survey Guidelines* (USFWS 1989), a prairie dog complex consists of two or more neighboring prairie dog towns less than 7 km (4.3 miles) from each other. If a field check indicates that prairie dog towns may be affected, you should contact this office for guidance on ferret surveys.

Preble's Meadow Jumping Mouse: The Preble's meadow jumping mouse (Preble's) is a small rodent in the *Zapodidae* family and is 1 of 12 recognized subspecies of the species *Z. hudsonius*, the meadow jumping mouse. The diet of the Preble's consists of seeds, fruits, fungi and insects. Hibernation occurs from October to May in small underground burrows. Nests are made of grass, leaves or woody material in burrows the mouse excavates several centimeters underground. Preble's are primarily nocturnal or crepuscular, but have been observed during daylight. They occur in low undergrowth consisting of grasses, forbs, or a mix of both, in wet meadows and riparian corridors, or where tall shrubs and low trees provide adequate cover. Additionally, Preble's exhibits a preference for lush vegetation along watercourses or herbaceous understories in wooded areas with close proximity to water. In Wyoming, Preble's has been recently documented in Albany, Laramie, Platte and Converse Counties, and may occur in Goshen County. If a proposed project will result in a disturbance to suitable habitat within any of these five counties, surveys should be conducted prior to any action. Due to the difficulty in identifying the Preble's, surveys should be conducted by knowledgeable biologists trained in conducting these surveys.

Ute Ladies'-Tresses: Ute ladies'-tresses (*Spiranthes diluvialis*) is a perennial, terrestrial orchid, 8 to 20 inches tall, with white or ivory flowers clustered into a spike arrangement at the top of the stem. *Spiranthes* typically blooms from late July through August; however, depending on location and climatic conditions, it may bloom in early July or still be in flower as late as early October. *Spiranthes* is endemic to moist soils near wetland meadows, springs, lakes, and perennial streams where it colonizes early successional point bars or sandy edges. The elevation range of known occurrences is 4,200 to 7,000 feet in alluvial substrates along riparian edges, gravel bars, old oxbows, and moist to wet meadows. Soils where *Spiranthes* have been found typically range from fine silt/sand, to gravels and cobbles, as well as to highly organic and peaty soil types. *Spiranthes* is not found in heavy or tight clay soils or in extremely saline or alkaline soils. *Spiranthes* seems intolerant of shade and small scattered groups are found primarily in areas where vegetation is relatively open. Surveys should be conducted by knowledgeable botanists trained in conducting rare plant surveys. *Spiranthes* is difficult to survey for primarily due to its unpredictability of emergence of flowering parts and subsequent rapid desiccation of specimens. The Service does not maintain a list of "qualified" surveyors but can refer those wishing to become familiar with the orchid to experts who can provide training or services.

Wetlands/Riparian Areas: Wetlands associated with the Laramie River may be impacted by the proposed project. Wetlands perform significant ecological functions which include: (1) providing habitat for numerous aquatic and terrestrial wildlife species, (2) aiding in the dispersal

of floods, (3) improving water quality through retention and assimilation of pollutants from storm water runoff, and (4) recharging the aquifer. Wetlands also possess aesthetic and recreational values. The Service recommends measures be taken to avoid and minimize wetland losses in accordance with Section 404 of the Clean Water Act, and Executive Order 11988 (floodplain management) as well as the goal of "no net loss of wetlands." If wetlands may be destroyed or degraded by the proposed action, those wetlands in the project area should be inventoried and fully described in terms of their functions and values. Acreage of wetlands, by type, should be disclosed and specific actions should be outlined to avoid, minimize, and compensate for all unavoidable wetland impacts.

Riparian or streamside areas are a valuable natural resource and impacts to these areas should be avoided whenever possible. Riparian areas are the single most productive wildlife habitat type in North America. They support a greater variety of wildlife than any other habitat. Riparian vegetation plays an important role in protecting streams, reducing erosion and sedimentation as well as improving water quality, maintaining the water table, controlling flooding, and providing shade and cover. In view of their importance and relative scarcity, impacts to riparian areas should be avoided. Any potential, unavoidable encroachment into these areas should be further avoided and minimized. Unavoidable impacts to streams should be assessed in terms of their functions and values, linear feet and vegetation type lost, potential effects on wildlife, and potential effects on bank stability and water quality. Measures to compensate for unavoidable losses of riparian areas should be developed and implemented as part of the project.

Plans for mitigating unavoidable impacts to wetland and riparian areas should include mitigation goals and objectives, methodologies, time frames for implementation, success criteria, and monitoring to determine if the mitigation is successful. The mitigation plan should also include a contingency plan to be implemented should the mitigation not be successful. In addition, wetland restoration, creation, enhancement, and/or preservation does not compensate for loss of stream habitat; streams and wetlands have different functions and provide different habitat values for fish and wildlife resources.

Best Management Practices (BMPs) should be implemented within the project area wherever possible. BMPs include, but are not limited to, the following: installation of sediment and erosion control devices (e.g., silt fences, hay bales, temporary sediment control basins, erosion control matting); adequate and continued maintenance of sediment and erosion control devices to insure their effectiveness; minimization of the construction disturbance area to further avoid streams, wetlands, and riparian areas; location of equipment staging, fueling, and maintenance areas outside of wetlands, streams, riparian areas, and floodplains; and re-seeding and re-planting of riparian vegetation native to Wyoming in order to stabilize shorelines and streambanks.

We appreciate your efforts to ensure the conservation of endangered, threatened, and candidate species and migratory birds. If you have further questions on this subject, please contact Tyler Abbott of my staff at the letterhead address or phone (307) 772-2374, extension 23.

Sincerely,

Brian T. Kelly
Field Supervisor
Wyoming Field Office

cc: WGFD, Lander, Non-Game Coordinator (B. Oakleaf)
WGFD, Cheyenne, Statewide Habitat Protection Coordinator (V. Stelter)

References

Buehler, D. A., T. J. Mersmann, J. D. Fraser, and J. K. D. Seegar. 1991. Effects of human activity on bald eagle distribution on the Northern Chesapeake Bay. Journal of Wildlife Management 55(2):282-290.

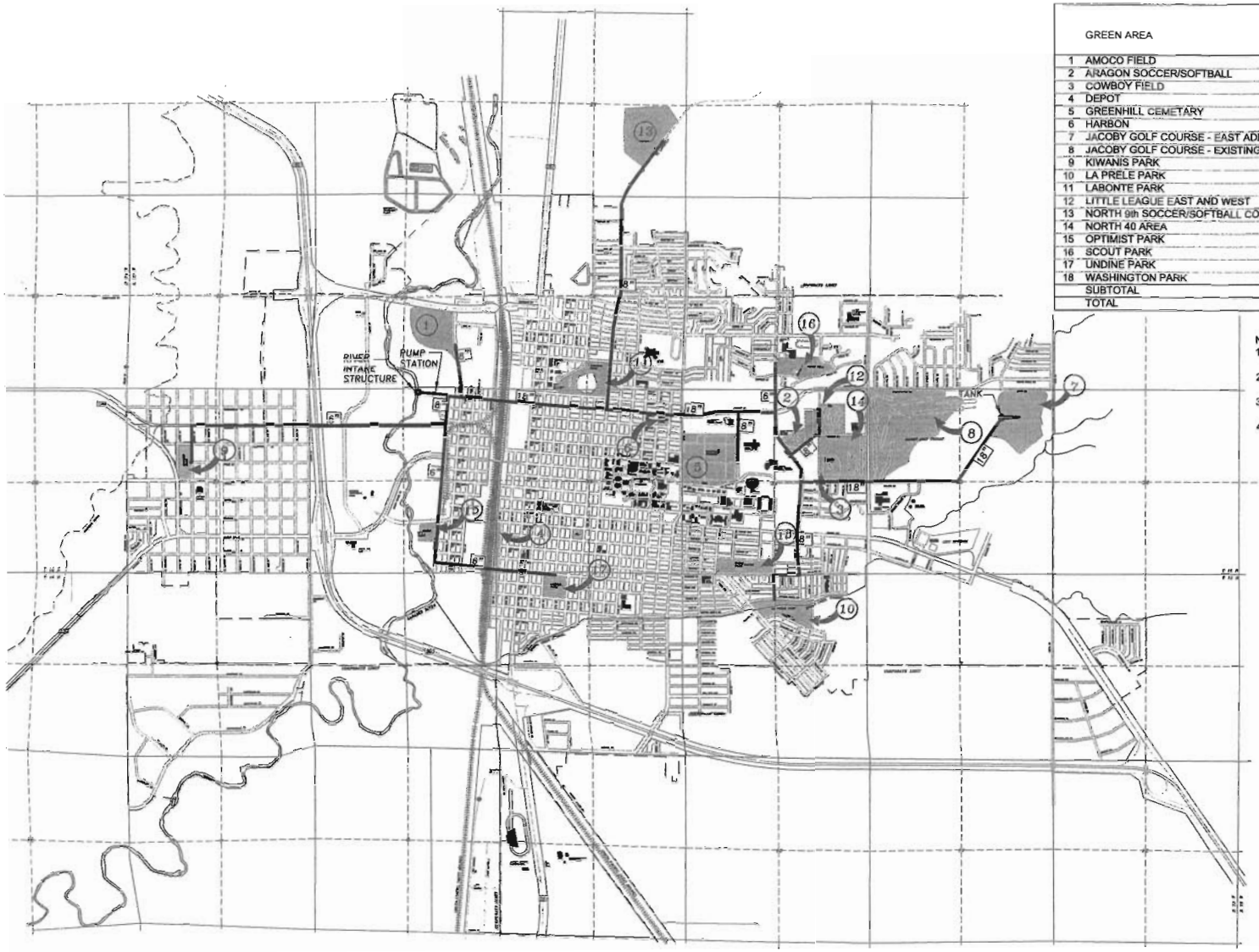
Greater Yellowstone Bald Eagle Working Group. 1996. Greater Yellowstone Bald Eagle Management Plan: 1995 Update. Greater Yellowstone Bald Eagle Working Group, Wyoming Game and Fish Department, Lander, Wyoming. 47 pp.

Montana Bald Eagle Working Group. 1994. Montana Bald Eagle Management Plan. Bureau of Reclamation, Montana Projects Office. Billings, Montana. 104 pp.

Stalmaster, M. V. and J. R. Newman. 1978. Behavioral responses of wintering bald eagles to human activity. Journal of Wildlife Management 42(3):506-513.

U.S. Fish and Wildlife Service. 1986. Recovery Plan for the Pacific Bald Eagle. U.S. Fish and Wildlife Service, Portland, Oregon. 160 pp.

U.S. Fish and Wildlife Service. 1989. Black-footed ferret survey guidelines for compliance with the Endangered Species Act, April 1989. U. S. Fish and Wildlife Service, Denver, Colorado and Albuquerque, New Mexico. 15pp.



GREEN AREA SUMMARY

	GREEN AREA	AREA CITY AC Note 1	AREA MAP AC Note 2	WATER USE DATA MG/YR Note 3	WATER USE EST. MG/YR Note 4	WATER USE TOTAL AC-FT/YR	REMARKS
1	AMOCO FIELD		30		21	64	Conceptual Project
2	ARAGON SOCCER/SOFTBALL	12		9.190		28	
3	COWBOY FIELD		11.4	3.658		11	
4	DEPOT	2.68		2.492		8	
5	GREENHILL CEMETARY	52		26.754		82	
6	HARBON	2		1.185		4	
7	JACOBY GOLF COURSE - EAST ADDITION		50		35	107	Conceptual project
8	JACOBY GOLF COURSE - EXISTING		100	69.000		212	2003 water use only
9	KIWANIS PARK	8.4		5.168		16	
10	LA PRELE PARK	29.1		5.301		16	
11	LABONTE PARK		17.64	13.916		43	
12	LITTLE LEAGUE EAST AND WEST		13.72	5.722		18	
13	NORTH 9th SOCCER/SOFTBALL COMPLEX		40		28	86	Conceptual project
14	NORTH 40 AREA		28.5		20	61	Estimated
15	OPTIMIST PARK	4.8		3.937		12	
16	SCOUT PARK	12		5.407		17	
17	UNDINE PARK		8.93	5.734		18	
18	WASHINGTON PARK		13.44	9.109		28	
	SUBTOTAL	122.98	313.63	166.573	104	830	
	TOTAL	437		271			

NOTES
1. AREA FROM CITY PARK DATABASE, MAY NOT REFLECT ACTUAL IRRIGATED AREAS
2. AREA FROM OFFICE MAPPING ESTIMATE BY WWC, MAY NOT REFLECT ACTUAL IRRIGATED AREAS
3. WATER USE BASED ON 1996-2003 AVERAGE IF AVAILABLE. DATA PROVIDED BY CITY PARK AND REC DEPARTMENT
4. ESTIMATED WATER DEMAND BASED ON 0.7 MG/YR/AC (25 INCHES OF MOISTURE)

LEGEND
PARKS AND GOLF COURSE
NON-POTABLE WATER PUMPING AND DISTRIBUTION SYSTEM

FIGURE III-2
CONCEPTUAL DESIGN
NON-POTABLE
IRRIGATION WATER SYSTEM
MANAGEMENT PLAN FOR WATER RIGHTS ON THE MONOLITH RANCH
CITY OF LARAMIE, WYOMING

WWC ENGINEERING

114-43

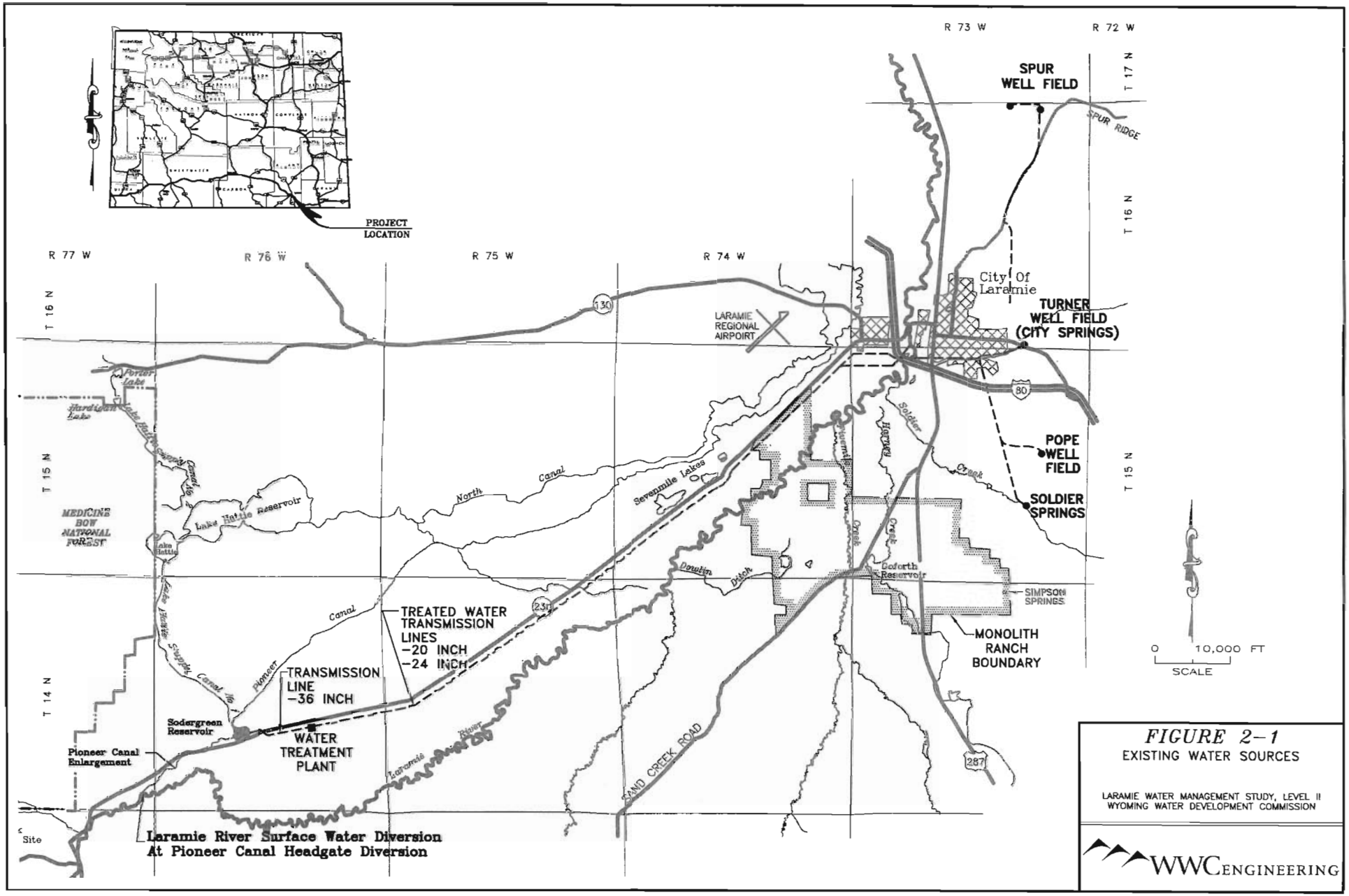
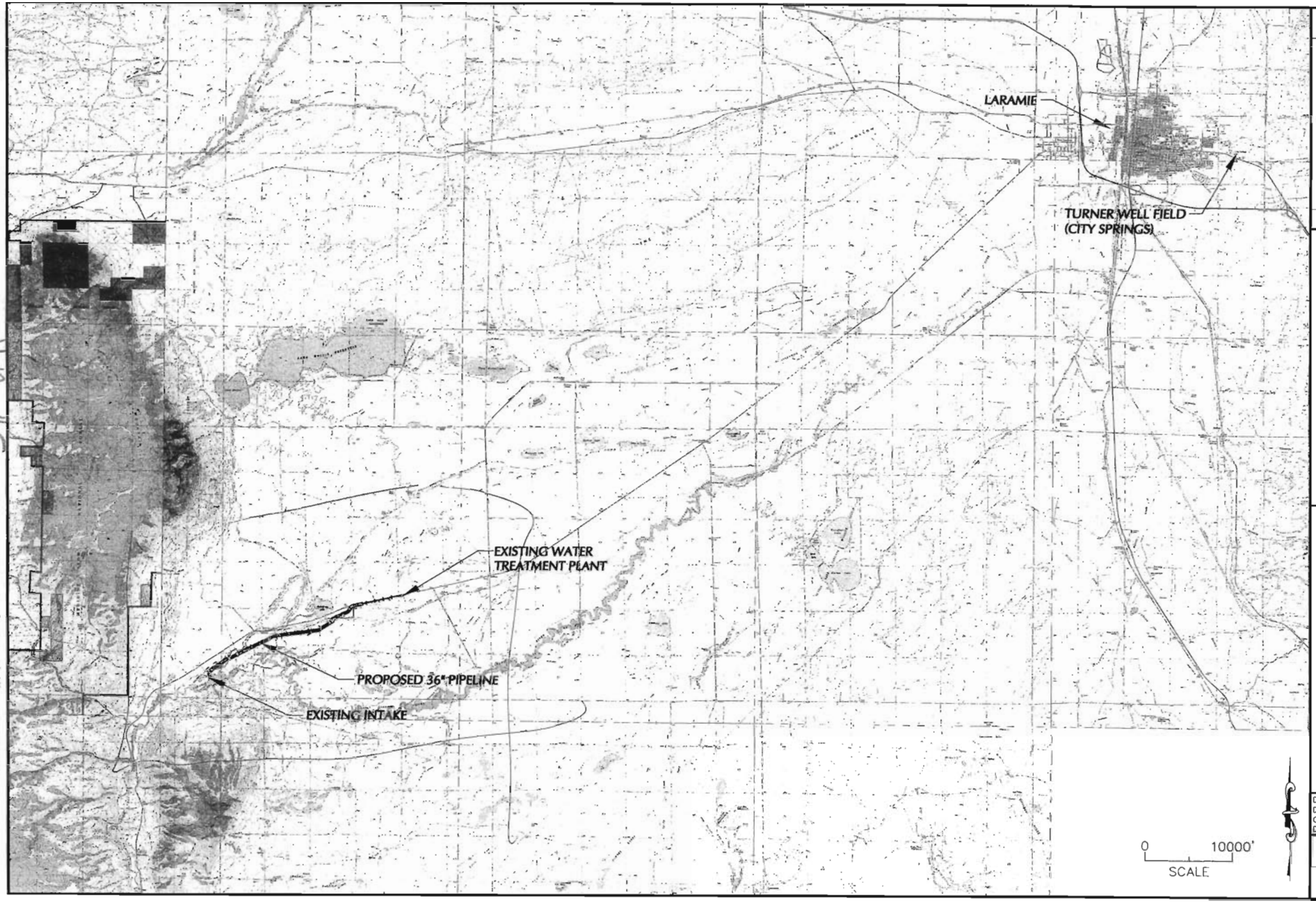


FIGURE 2-1
EXISTING WATER SOURCES

LARAMIE WATER MANAGEMENT STUDY, LEVEL II
WYOMING WATER DEVELOPMENT COMMISSION

WWC ENGINEERING



NO.	REVISIONS	DATE

WWC ENGINEERING

TREATMENT SUPPLY PIPELINE

DESIGNED BY: RRA
DRAWN BY: SDG
CHECKED BY: MTS
DATE: 02/02/06

DRAWING
PLAN

SHEET
1 of 3

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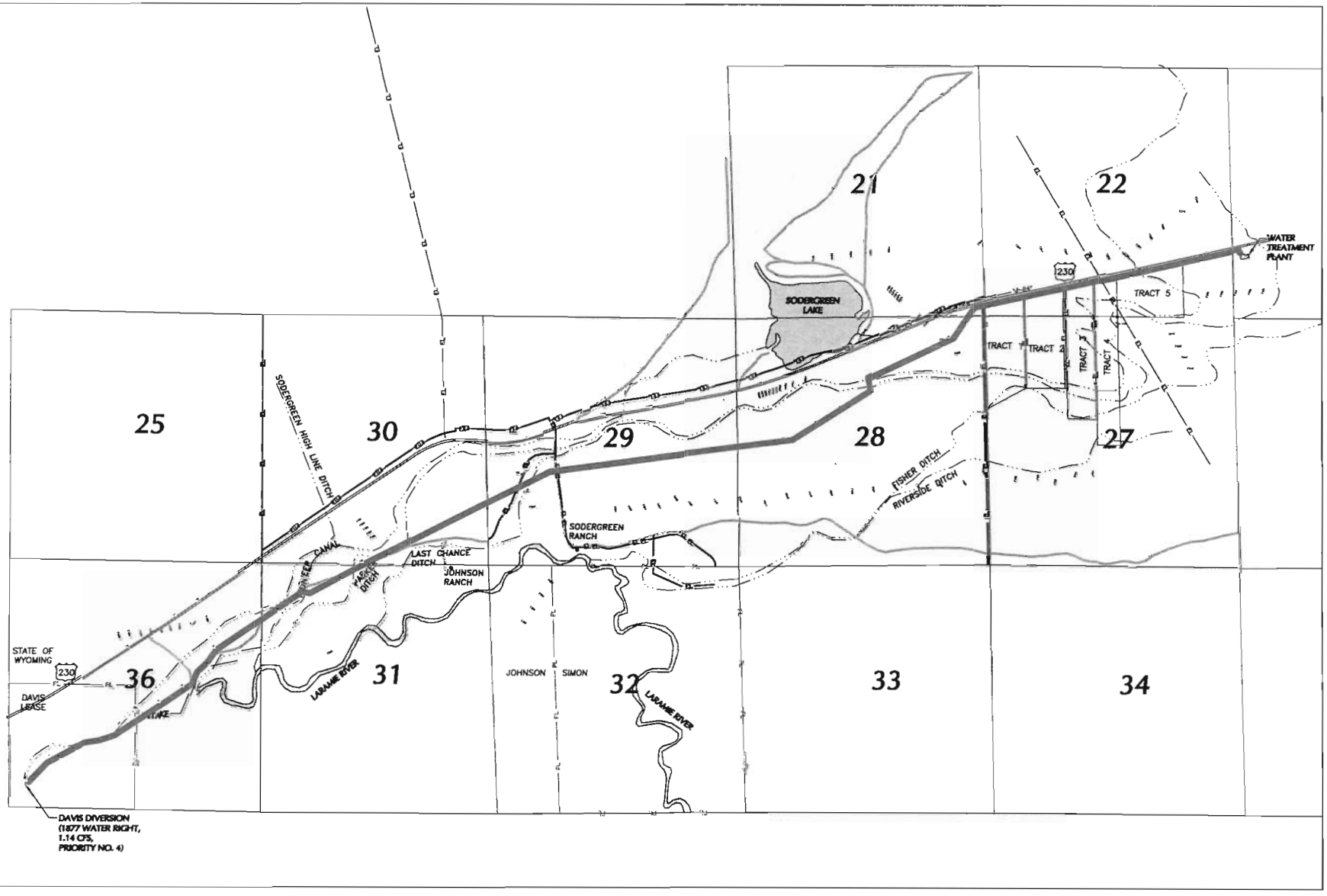
11A-45



NO.	REVISIONS	DATE

WWC ENGINEERING

PIPELINE ALIGNMENT

TREATMENT SUPPLY PIPELINE-TASK 5

DESIGNED BY: RRA
DRAWN BY: RRA
CHECKED BY: MTS
DATE: 11-10-05

DRAWING
PLAN

SHEET
1 OF 1

11A-46

ID	Agency	Agency Address 1	Agency Address 2	Contact	Letter sent	Response	Details	Phone
4	Wyoming Emergency Management A	5500 Bishop Blvd.	Cheyenne, WY 82009-3320	Wyoming Flood Plain Coordinator	3/7/2006	3/14/2006	E-mail from Scott Meyers and follow-up conversation on 6/22/06 indicated that Albany County would be the permitting agency for work in the county and the City of Laramie for work in the City. Mr. Meyers indicated that some concerns would be floodplain modification, discharges and sediment control, and any in-stream structures.	(307) 777-4910 (307) 777-4910
5	Federal Emergency Management A	Denver Federal Center, Bldg. 710	Denver, CO 80255-0267	Dan Carlson	3/7/2006	3/10/2006	FEMA phone response indicates that we are responsible for determining the flood-plain impacts of our proposed projects using the FEMA maps. Wetlands impacts would be a Corps of Engineers issue. Local jurisdiction would decide if a flood plain development permit is required.	(303) 235-4739 (303) 235-4739
6	U.S. Army Corps of Engineers	2232 Dell Range Blvd., Suite 210	Cheyenne, WY 82009	Matt Bilodeau	3/7/2006	3/21/2006	Letter to Public Works (Haugen), from Matt Bilodeau is pretty much standard and indicates that section 404 compliance would be required if wetlands are impacted. Possible activities may be permitted under NWP 12(utilities) and 33(temporary construction). Ref. file #200640077	(307) 772-2300 (307) 772-2300
7	Wyoming State Historic Preservation Office	2301 Central Ave, Barrett Building, 3rd Floor	Cheyenne, WY 82002	Richard Currit	3/7/2006	3/13/2006	Letter from Shanna Cox (archeologist), indicates that most activities contemplated are for previously disturbed areas not requiring further study except the river pipeline area should be have a study, and the Turner Well Field is near site 48AB6 which should be evaluated for eligibility for listing on the NRHP if affected by the project.	(307) 777-5497 (307) 777-5497
8	Wyoming State Engineer's Office-Surface Water Division	Herschler Bldg. 4-E, 122 West 25th St.	Cheyenne, WY 82002	John Barnes	3/7/2006	5/16/2006	Calls not returned.	(307) 777-6150 (307) 777-6150
9	Wyoming State Engineer's Office-Ground Water Division	Herschler Bldg. 4-E, 122 West 25th St.	Cheyenne, WY 82002	Lisa Lindeman	3/7/2006	5/16/2006	Calls not returned.	

114-47

ID	Agency	Agency Address 1	Agency Address 2	Contact	Letter sent	Response	Details	Phone
10	USDA-NRCS Federal Bldg.	100 East B Street, Room 3124	Casper, WY 82601	Ed Burton, State Conservationist	3/7/2006	3/20/2006	Letter from Adolfo Perez, (State Conservationist), indicates that they have few concerns and would only request an erosion control plan and revegetation plan be part of the project where land is being disturbed.	(307) 233-6750 (307) 261-6453
11	U.S. Fish and Wildlife Service, Ecological Services	4000 Airport Parkway	Cheyenne, WY 82001	Mike Long, State Supervisor	3/7/2006	3/28/2006	Letter from Brian T. Kelly (Field Supervisor), listed possible impacted species of concern. Also they request an analysis of water useage impacts to the Platte River Bisin overall. Species-specific concerns and guidance are included in the letter. More studies will be needed.	( ) - (307) 772-2374
12	DEQ, Water Quality Division	Herschler Bldg. 4-W, 122 W. 25th St.	Cheyenne, WY 82002	Jeremy Lyon	3/7/2006	3/20/2006	Letter went to Barb Sahl but she indicated it was given to Jeremy Lyon. Lyon's response letter indicates likely need for a Temporary discharge permit, a construction storm water discharge permit, a DEQ permit to construct, and possibly a section 404 US Army Corps of Engineers permit. Lyons also indicated that erosion control would be a DEQ concern.	(307) 777-7570 (307) 777-7588
13	DEQ, Air Quality Division	Herschler Bldg. 4-W, 122 W. 25th St.	Cheyenne, WY 82002	Darla Potter	3/7/2006	3/13/2006	Letter from Glenn A. Spangler-District 1 Engineer indicated possible concerns with asbestos if renovating existing facilities or removal of exisitng pipelines, dust suppression for construction sites, and prohibition of open burning of construction debris.	( ) - (307) 332-6755
14	Wyoming Game and Fish Dept., Habitat Protection Program	5400 Bishop Blvd.	Cheyenne, WY 82006	Tom Collins	3/7/2006	4/4/2006	FAX received from Bill Wichers (Deputy Director), indicated concerns with Pronghorn winter range near Sodergreen Lake, so no trenching between Nov. 30 and April 30. Use native reseeding mixes. Also need to address fish protection on intake structure.	(307) 777-4600 (307) 777-4558
15	Wyoming State Lands & Investments			Jim Whalen, Assistant Director	3/7/2006	5/16/2006	In follow up phone call on May 16, Mr. Whalen indicated no present concerns but was not personally familiar with the projects.	(307) 777-7331 (307) 777-7331

IIA-48

14A
CITY BUDGET SHEETS

ANNUAL ADOPTED BUDGET

JULY 1, 2004—JUNE 30, 2005

CITY OF
LARAMIE, WYOMING

14A-1

CITY OF LARAMIE 2004 - 2005 BUDGET
FIVE-YEAR CAPITAL REQUEST SUMMARY

WATER FUND

DEPARTMENT: PUBLIC WORKS

DEPARTMENT	[redacted]	[redacted]	[redacted]	2005-2006	2006-2007	2007-2008	2008-2009	Unscheduled
ADMINISTRATION								
East Side Tank	$ 9,600,000	$ 9,600,000						
Sidewalk Repair	$ 7,000	$ 7,000		$ 7,000				
Water Dispensing Stations	$ 145,000	$ 145,000		$ 25,000	$ 75,000		$ 45,000	
TOTAL Administration	**$ 9,752,000**	**$ 9,752,000**		**$ 32,000**	**$ 75,000**		**$ 45,000**	
FILTER TREATMENT PLANT								
Alum Storage Tank	$ 35,000	$ 35,000						
WTP Storage Building	$ 25,000	$ 25,000			$ 25,000			
Backwash Reuse	$ 80,000	$ 80,000			$ 80,000			
Clarifier Effluent Line	$ 195,000	$ 195,000						$ 195,000
Clearwell Storage Expansion	$ 1,200,000	$ 1,200,000						$ 1,200,000
Office Space	$ 40,000	$ 40,000						$ 40,000
Filter Media	$ 1,800,000	$ 1,800,000						$ 1,800,000
Super Pulsator II	$ 600,000	$ 600,000						$ 600,000
Raw Water Pump Station	$ 1,560,000	$ 1,560,000						$ 1,560,000
Ozonation Phase II	$ 1,000,000	$ 1,000,000						$ 1,000,000
TOTAL Filter Treatment Plant	**$ 6,535,000**	**$ 6,535,000**			**$ 105,000**			**$ 6,395,000**
PUMPS & WELLS								
Biofilm Analysis	$ 60,000	$ 60,000		$ 15,000	$ 15,000	$ 15,000	$ 15,000	
Electric Valves on Spur Well Transmission	$ 230,000	$ 230,000		$ 230,000				
City Springs Fence	$ 60,000	$ 60,000		$ 60,000				
Well Site Road Improvements	$ 90,000	$ 90,000			$ 90,000			
Pope I Sanitary Seal	$ 110,000	$ 110,000			$ 110,000			
Chemical Storage Building	$ 30,000	$ 30,000					$ 30,000	
Pope II TV Inspection	$ 23,000	$ 23,000					$ 23,000	
Spring Creek Flume Telemetry	$ 14,500	$ 14,500					$ 14,500	
City Springs Seal Tank	$ 228,000	$ 228,000					$ 228,000	
TOTAL Pumps and Wells	**$ 845,500**	**$ 845,500**		**$ 305,000**	**$ 215,000**	**$ 15,000**	**$ 310,500**	
DISTRIBUTION								
Water Main Line Rehab	$ 1,577,000	$ 1,577,000		$ 250,000	$ 341,000	$ 451,000	$ 535,000	
Leak Audit	$ 31,000	$ 31,000		$ 7,000	$ 6,000	$ 6,000	$ 6,000	
Second Feed to Superior Court	$ 78,000	$ 78,000			$ 78,000			
Addition for Equipment & Inventory Storage	$ 225,000	$ 225,000				$ 225,000		
TOTAL Distribution	**$ 1,911,000**	**$ 1,911,000**		**$ 257,000**	**$ 425,000**	**$ 682,000**	**$ 541,000**	
MONOLITH RANCH								
Ranch Comp Management Plan-Public	$ 10,000	$ 10,000						
South Dowlin Rehabilitation	$ 33,000	$ 33,000		$ 33,000				
Ranch Telemetry	$ 21,275	$ 21,275		$ 21,275				
Simpson Springs Rehab	$ 24,000	$ 24,000			$ 24,000			
Harney Creek Flume	$ 25,000	$ 25,000				$ 25,000		
Go Forth Reservoir	$ 250,000	$ 250,000				$ 250,000		
Simpson Springs Outfall	$ 80,000	$ 80,000				$ 80,000		
Laramie River Bridge	$ 80,000	$ 80,000					$ 80,000	
TOTAL Distribution	**$ 523,275**	**$ 523,275**		**$ 54,275**	**$ 24,000**	**$ 355,000**	**$ 80,000**	
TOTAL Water Fund	**$ 19,566,775**	**$ 19,566,775**		**$ 648,275**	**$ 844,000**	**$ 1,052,000**	**$ 976,500**	**$ 6,395,000**

14A-2

Faesler Farms: Lease: $7,000/yr. 17,000 back to city with 14k/yr.

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WATER FUND

Total FY05 Budget Expenditures
$4,630,132

	FY05 Budget
Water Administration	$ 2,082,012.00
Pumping and Wells	$ 437,279.00
Water Filter Treatment Plant	$ 592,886.00
Transmission and Delivery	$ 875,540.00
Meters	$ 385,041.00
Monolith Ranch	$ 174,237.00
Environmental Advisory	$ 83,137.00

From the adopted budget: July 1, 2004 - June 30, 2005

WATER FUND

CITY OF LARAMIE

2004-2005 Revenues

ACCOUNT NUMBER	ACCOUNT DESCRIPTION	BUDGET FY 2002-2003	ACTUALS FY 2002-2003	BUDGET FY 2003-2004	ACTUALS FY 2003-2004	BUDGET FY 2004-2005
510-0000-322.90-00	WT WY Water Dev Loans	$ -	$ -	$ -		$ -
510-0000-322.90-01	Lar No Eastside Tank	$ -	$ 175,235.00	$ -	$ 87,445.91	$ -
510-0000-322.90-02	Lar No Trans Rehab	$ -	$ 539,229.00	$ 1,627,000.00	$ 798,548.05	$ -
510-0000-322.91-00	State Land & Investment	$ -	$ -	$ -		$ -
510-0000-322.91-10	WT State Land & Inv Grant	$ -	$ 153,455.00	$ 148,000.00		$ -
510-0000-322.92-00	WT State Land & Inv Loans	$ -	$ 292,415.00	$ -		$ -
510-0000-322.94-00	DEQ Pollution	$ -	$ -	$ -		$ -
510-0000-323.50-00	WT WY Water Dev Grants	$ -	$ -	$ -		$ -
510-0000-323.50-01	Lar No Eastside Tank	$ -	$ 175,235.00	$ -	$ 87,445.93	$ 4,800,000.00
510-0000-323.50-02	Lar No Trans Rehab	$ -	$ 539,229.00	$ 1,627,000.00	$ 798,548.07	$ -
510-0000-344.70-00	Hydrant Fees	$ 10,227.00	$ 37,294.00	$ 30,000.00	$ 27,435.21	$ 30,000.00
510-0000-344.71-00	Meter Sales	$ 33,024.00	$ 65,619.00	$ 50,000.00	$ 67,209.38	$ 50,000.00
510-0000-344.71-10	Meter Salvage	$ -	$ 8,512.00	$ 5,000.00	$ 5,018.60	$ -
510-0000-344.72-00	Water Sales	$ -	$ 9,199.00	$ 8,000.00	$ 5,879.49	$ 6,000.00
510-0000-344.73-00	WT Plant Inv Fees	$ 60,000.00	$ 71,870.00	$ 60,000.00	$ 76,020.00	$ 50,000.00
510-0000-344.74-00	WT Construct Relm	$ 14,549.00	$ 21,406.00	$ 20,000.00	$ 30,844.31	$ 24,000.00
510-0000-346.20-00	Water Charges	$ 3,551,612.00	$ 3,470,571.00	$ 3,760,000.00	$ 3,442,032.26	$ 3,137,000.00
510-0000-346.35-00	Water Surcharge	$ -	$ -	$ -		$ -
510-0000-346.36-04	WT Line Replacement	$ -	$ -	$ -		$ -
510-0000-346.60-10	Utility WOC Water	$ -	$ -	$ -		$ -
510-0000-361.10-01	WT Miscellaneous Income	$ 6,244.00	$ 5,121.00	$ -	$ 7,752.69	$ -
510-0000-361.15-00	Monolith Ranch Rentals	$ 50,000.00	$ 16,150.00	$ 18,000.00	$ 19,375.00	$ 20,400.00
510-0000-361.16-00	Monolith Ranch HayContrat	$ -	$ 65,531.00	$ 50,000.00	$ 44,991.13	$ 45,000.00
510-0000-361.17-00	Monolith Ranch Grazing	$ -	$ 17,664.00	$ 13,000.00	$ 3,654.82	$ 10,000.00
510-0000-361.18-00	Monolith Ranch Game/Fish	$ -	$ 1,440.00	$ -		$ -
510-0000-361.30-01	WT Unrealized Gain/Loss	$ -	$ 8,920.00	$ -	$ 30,615.32	$ -
510-0000-361.31-01	Water Gain Security Sale	$ -	$ 3.00	$ -		$ -
510-0000-362.10-04	WT Interest	$ 1,925.00	$ 2,514.00	$ 6,500.00	$ 4,268.46	$ -
510-0000-371.10-00	General Fund	$ -	$ -			$ -
510-0000-372.10-00	Water Service Chgs	$ -	$ -			$ -
510-0000-372.20-00	Wastewater Service Chgs	$ -	$ -			$ -
**Water Fund Revenues		$ 3,727,581.00	$ 5,676,612.00	$ 7,422,500.00	$ 5,537,084.63	$ 8,172,400.00

WATER FUND
Administration

PUBLIC WORKS DEPARTMENT - *UTILITIES DIVISION*

The Public Works Department is comprised of four divisions: Streets, Fleet Maintenance, Solid Waste, and Utilities (Water and Wastewater).

The utilities division of the Public Works Department manages the Water Fund and the Wastewater Fund. For legal and accounting purposes these funds are treated separately, but for management purposes the two funds are handled jointly by the Utilities Manager and Public Works Director. The cooperative administration of the Water and Wastewater Funds insures effective management of financial and operational conditions for the water and wastewater utility, including development of adequate rate structures to support the annual operation budget and capital program.

The utilities division oversees potable water. The Utilities Manager is responsible for administering City policies, developing division policies and procedures, and ensuring effective management of financial and operational conditions for the water utility which includes development of an adequate rate structure to support the annual operating budget and capital program.

The water utility is a municipal enterprise and in many ways operates like a private business. All funds necessary for operations come from user-fees charged to consumers, not from taxes. (Please see the *Government Funds* section of this booklet for more information on government accounting.) Charges for services include base charges (flat monthly rates) and consumption charges (charges for amount consumed that may vary monthly).

Safe drinking water is one of the most important services any municipality provides to residents. Laramie's water quality meets or exceeds all federal standards.

POSITION SUMMARY

TITLE	FY02	FY03	FY04	FY05
Utility Manager	1	1	1	1
Utility Maintenance Supervisor	1	1	1	1
Water Outreach Coordinator	1	1	1	0
Administrative Assistant	1	1	1	1
Total	**4**	**4**	**4**	**3**

WATER FUND

CITY OF LARAMIE

2004-2005 Operating Budget

Water Fund - ADMINISTRATION

ACCOUNT NUMBER	ACCOUNT DESCRIPTION	BUDGET FY 2002-2003	ACTUALS FY 2002-2003	BUDGET FY 2003-2004	ACTUALS FY 2003-2004	BUDGET FY 2004-2005
PERSONNEL						
510-7010-461.10-10	Full Time	$ 163,300.00	$ 122,511.00	$ 129,128.00	$ 110,805.68	$ 102,452.00
510-7010-461.10-20	Part Time	$ 11,150.00	$ 5,287.00	$ 11,150.00	$ 9,175.52	$ 11,150.00
510-7010-461.10-30	Pager Pay	$ 1,121.00	$ -	$ 1,121.00		$ 1,121.00
510-7010-461.11-10	Regular Overtime	$ 4,810.00	$ 558.00	$ 4,218.00	$ 1,114.70	$ 4,218.00
510-7010-461.15-20	Longevity	$ 10,054.00	$ 7,147.00	$ 7,328.00	$ 4,802.49	$ 1,849.00
510-7010-461.15-30	Vehicle Allowance	$ 1,200.00	$ 1,800.00	$ 1,800.00	$ 750.00	$ 1,800.00
510-7010-461.21-00	FICA	$ 14,483.00	$ 10,437.00	$ 11,570.00	$ 9,800.65	$ 9,343.00
510-7010-461.22-10	State Pension	$ 15,959.00	$ 10,977.00	$ 12,003.00	$ 9,192.76	$ 9,394.00
510-7010-461.24-10	BCBS Medical	$ 18,396.00	$ 16,899.00	$ 18,686.00	$ 13,189.24	$ 21,103.00
510-7010-461.24-50	Life Insurance	$ 330.00	$ 241.00	$ 254.00	$ 202.76	$ 254.00
510-7010-461.25-00	Worker's Compensation	$ 6,626.00	$ 4,909.00	$ 5,899.00	$ 11,417.11	$ 15,905.00
510-7010-461.26-00	Unemployment Insurance	$ -	$ 8,383.00	$ 6,000.00	$ 2,523.54	$ 6,000.00
510-7010-461.29-70	Employee Physicals	$ 370.00	$ 120.00	$ 370.00	$ 102.00	$ 370.00
510-7010-461.29-80	Drug Testing	$ 700.00	$ 293.00	$ 700.00	$ 158.00	$ 700.00
**PERSONNEL		$ 248,499.00	$ 189,562.00	$ 210,227.00	$ 173,234.45	$ 185,659.00
CONTRACTUAL						
510-7010-461.30-05	Professional & Consulting	$ 12,000.00	$ 20,672.00	$ 8,000.00	$ 937.50	$ 8,000.00
510-7010-461.30-10	Accounting/Audit	$ 8,200.00	$ 10,104.00	$ 8,200.00	$ 12,611.94	$ 8,200.00
510-7010-461.30-45	Environ Advisory Committe	$ 25,350.00	$ 18,921.00	$ 25,350.00	$ 22,770.70	$ -
510-7010-461.31-10	Janitorial	$ 2,000.00	$ 6,815.00	$ 8,000.00	$ 5,736.85	$ 8,000.00
510-7010-461.31-15	Laundry Services	$ 2,800.00	$ 3,089.00	$ 3,000.00	$ 3,744.69	$ 3,000.00
510-7010-461.31-25	Licensing	$ -	$ 1,303.00	$ -	$ 917.50	$ -
510-7010-461.31-35	Miscellaneous	$ -	$ -	$ -		$ -
510-7010-461.31-50	Towing/Freight Hauling	$ -	$ -	$ -	$ 31.98	$ -
510-7010-461.31-60	Lab or Medical Services	$ -	$ 2,790.00	$ 3,500.00	$ 2,614.40	$ 3,500.00
510-7010-461.31-80	Rentals	$ 1,000.00	$ 17,233.00	$ 17,000.00	$ 17,121.48	$ 17,000.00
510-7010-461.35-10	Local Business	$ -	$ 463.00	$ 500.00	$ 397.08	$ 500.00
510-7010-461.35-20	Non local	$ 9,438.00	$ 4,540.00	$ 8,938.00	$ 5,889.15	$ 8,938.00
510-7010-461.35-30	Registrations/Education	$ 4,920.00	$ 7,580.00	$ 4,920.00	$ 3,926.00	$ 4,920.00
510-7010-461.35-40	Supplies	$ -	$ -	$ -		$ -
510-7010-461.35-50	Testing/Certifications	$ -	$ 31.00	$ -		$ -
510-7010-461.39-10	Postage	$ 9,900.00	$ 7,700.00	$ 9,900.00	$ 6,025.08	$ 9,900.00
510-7010-461.39-20	Printing	$ 5,480.00	$ 1,142.00	$ 5,480.00	$ 720.46	$ 5,480.00
510-7010-461.39-30	Copier & Copies	$ 2,800.00	$ 4,837.00	$ 4,500.00	$ 4,739.13	$ 4,500.00
510-7010-461.39-40	Telephone	$ 21,000.00	$ 18,546.00	$ 20,500.00	$ 15,651.53	$ 20,500.00
510-7010-461.39-41	Pagers	$ -	$ 21.00	$ -	$ 1,418.08	$ -
510-7010-461.39-42	Cell Phones	$ -	$ 440.00	$ 500.00	$ 690.77	$ 500.00
510-7010-461.39-50	Investment Fees	$ -	$ 10.00	$ -	$ 5.00	$ -
510-7010-461.39-51	Credit Cards	$ 500.00	$ 1,208.00	$ 1,200.00	$ 1,432.96	$ 1,200.00
510-7010-461.39-52	Bad Debts	$ -	$ 301.00	$ -	$ 97,946.48	$ -
510-7010-461.39-53	Collection/Bank Fees	$ 300.00	$ -	$ 300.00	$ 9,631.94	$ 300.00
510-7010-461.39-54	Legal & Recording Fees	$ -	$ 23.00	$ -	$ 112.00	$ -
510-7010-461.39-60	Dues/Memberships	$ 7,500.00	$ 8,114.00	$ 8,000.00	$ 5,149.12	$ 8,000.00
510-7010-461.41-10	Electric	$ 12,000.00	$ 3,108.00	$ 3,200.00	$ 3,413.57	$ 3,200.00
510-7010-461.41-11	Gas	$ -	$ 7,735.00	$ 7,000.00	$ 8,786.48	$ 7,000.00
510-7010-461.43-10	Maintenance Agreements	$ 8,700.00	$ 5,676.00	$ 8,200.00	$ 678.78	$ 8,200.00
510-7010-461.43-20	Vehicle Repair	$ -	$ 76.00	$ 900.00	$ 893.98	$ 900.00
510-7010-461.43-30	Equipment Repair	$ 1,000.00	$ 785.00	$ 1,000.00	$ 618.96	$ 1,000.00
510-7010-461.43-40	Building Repair	$ 5,200.00	$ 1,544.00	$ 6,400.00	$ 2,689.26	$ 4,400.00
510-7010-461.43-62	Road Materials	$ -	$ -	$ -		$ -

CITY OF LARAMIE
2004-2005 Operating Budget

Water Fund - ADMINISTRATION

ACCOUNT NUMBER	ACCOUNT DESCRIPTION	BUDGET FY 2002-2003	ACTUALS FY 2002-2003	BUDGET FY 2003-2004	ACTUALS FY 2003-2004	BUDGET FY 2004-2005
510-7010-461.52-20	WARM Liability	$ 14,605.00	$ -	$ 7,600.00		$ 7,550.00
510-7010-461.52-25	WARM Property	$ -	$ 5,201.00	$ 7,000.00		$ 7,000.00
510-7010-461.52-30	Judgements & Claims	$ -	$ 403.00	$ -		$ -
510-7010-461.54-10	Legal	$ 2,500.00	$ 2,764.00	$ 2,500.00	$ 2,801.28	$ 2,500.00
510-7010-461.54-20	Employment	$ -	$ 497.00	$ 500.00	$ 2,280.02	$ 500.00
510-7010-461.54-30	Promotional & Marketing	$ -	$ -	$ -		$ -
510-7010-461.54-90	Other	$ -	$ 2,380.00	$ -		$ -
**CONTRACTUAL		$ 157,193.00	$ 166,052.00	$ 182,088.00	$ 242,384.15	$ 154,688.00
MATERIALS/SUPPLIES						
510-7010-461.60-10	Office Supplies	$ 2,700.00	$ 2,025.00	$ 2,200.00	$ 1,162.61	$ 2,200.00
510-7010-461.60-15	Computer Supplies/Equipme	$ 3,200.00	$ 3,149.00	$ 3,600.00	$ 449.63	$ 3,600.00
510-7010-461.60-20	Furniture & Fixtures	$ 1,600.00	$ 66.00	$ 1,600.00	$ 2,319.64	$ 1,600.00
510-7010-461.60-25	Tools & Shop Supplies	$ 7,000.00	$ 7,676.00	$ 7,000.00	$ 8,910.49	$ 9,000.00
510-7010-461.60-30	Books/Pubs/Subscription	$ 1,500.00	$ 1,107.00	$ 1,500.00	$ 1,123.70	$ 1,500.00
510-7010-461.61-10	Operating Supplies	$ 200.00	$ 1,310.00	$ 1,700.00	$ 1,114.20	$ 1,700.00
510-7010-461.61-20	Vehicle Supplies	$ 900.00	$ 327.00	$ -		$ -
510-7010-461.61-30	Uniforms	$ 4,500.00	$ 4,899.00	$ 4,500.00	$ 4,636.74	$ 4,500.00
510-7010-461.61-35	Safety Supplies	$ 5,000.00	$ 3,731.00	$ 5,000.00	$ 5,339.99	$ 5,000.00
510-7010-461.61-45	Horticultural/Landscaping	$ -	$ 2,780.00	$ 500.00	$ 137.10	$ 500.00
510-7010-461.61-60	Electrical/Electronic Sup	$ -	$ 255.00	$ -	$ 442.46	$ -
510-7010-461.61-65	Maintenance Supplies	$ 1,700.00	$ 1,854.00	$ 1,700.00	$ 1,478.30	$ 1,700.00
510-7010-461-61-70	Chemicals	$ -	$ -	$ -	$ 743.95	$ -
510-7010-461.62-10	Gas,Oil & Lubricants	$ 2,500.00	$ 1,935.00	$ 2,500.00	$ 1,053.99	$ 2,500.00
**MATERIALS/SUPPLIES		$ 30,800.00	$ 31,114.00	$ 31,800.00	$ 28,912.80	$ 33,800.00
EQUIPMENT/CAPITAL						
510-7010-461.73-50	Water Lines	$ -	$ -	$ -		$ -
510-7010-461.74-10	Machinery & Equipment	$ 1,300.00	$ 1,215.00	$ 1,300.00		$ -
510-7010-461.74-20	Vehicles	$ -	$ -	$ -		$ -
510-7010-461.74-30	Office & Fixtures	$ -	$ -	$ -		$ -
510-7010-461.76-10	Machinery & Equipment	$ -	$ -	$ -		$ -
510-7010-461.76-20	Vehicles	$ -	$ -	$ 25,000.00	$ 21,061.53	$ -
510-7010-461.76-30	Office & Fixtures	$ -	$ -	$ -		$ -
510-7010-461.79-00	Capital Projects	$ 3,225,000.00	$ 1,671,174.00	$ 3,254,000.00	$ 1,919,214.38	$ 200,000.00
510-7010-461.79-20	Design	$ -	$ -	$ -		$ -
510-7010-461.79-35	General Construction	$ -	$ -	$ -		$ -
**EQUIPMENT/CAPITAL		$ 3,226,300.00	$ 1,672,389.00	$ 3,280,300.00	$ 1,940,275.91	$ 200,000.00
TRANSFERS						
510-7010-461.80-10	General Fund	$ 152,048.00	$ 152,048.00	$ 152,048.00	$ 152,048.04	$ 152,048.00
510-7010-461.81-10	Depreciation Expense	$ 589,300.00	$ 582,260.00	$ -		$ -
**TRANSFERS		$ 741,348.00	$ 734,308.00	$ 152,048.00	$ 152,048.04	$ 152,048.00
CAPITAL OBLIGATIONS						
510-7010-461.90-10	Principal	$ 328,776.00	$ 264,095.00	$ 704,747.00	$ 712,394.82	$ 838,645.00
510-7010-461.90-20	Interest	$ 327,838.00	$ 329,583.00	$ 409,590.00	$ 451,634.56	$ 517,072.00
**CAPITAL OBLIGATIONS		$ 656,614.00	$ 593,678.00	$ 1,114,337.00	$ 1,164,029.38	$ 1,355,717.00
**WATER ADMINISTRATION		$ 5,060,754.00	$ 3,387,103.00	$ 4,970,800.00	$ 3,700,884.73	$ 2,081,912.00

WATER FUND
Pumping and Wells

PUBLIC WORKS DEPARTMENT - *UTILITIES DIVISION*

The Public Works Department is comprised of four divisions: Streets, Fleet Maintenance, Solid Waste, and Utilities (Water and Wastewater).

The pumping and wells program is responsible for the well-water supply to the system. Duties include: monitoring water chemistry through sampling, maintaining buildings, pumps and well facilities, maintaining pump motors, protecting wellheads to prevent groundwater contamination, ensuring compliance with environmental and safety regulations, and maintaining the three City reservoirs.

Another important function of the pumping and wells program is to ensure there is a reliable fire flow to higher elevation zones in Laramie. Other functions included in this budget are the maintenance of nine wells, the low-level reservoir, eight pumping stations, three chlorinating/fluoridation facilities, three high storage tanks, and related control systems that provide pressure, treatment and storage.

POSITION SUMMARY

TITLE	FY02	FY03	FY04	FY05
Senior Utility Maintenance Operator	1	1	1	1
Treatment Plant Operator	2	2	2	2
Total	**3**	**3**	**3**	**3**

WATER FUND

CITY OF LARAMIE

2004-2005 Operating Budget

Water Fund - PUMPING & WELLS

ACCOUNT NUMBER	ACCOUNT DESCRIPTION	BUDGET FY 2002-2003	ACTUALS FY 2002-2003	BUDGET FY 2003-2004	ACTUALS FY 2003-2004	BUDGET FY 2004-2005
PERSONNEL						
510-7015-461.10-10	Full Time	$ 85,156.00	$ 87,438.00	$ 92,446.00	$ 92,671.22	$ 100,464.00
510-7015-461.10-20	Part Time	$ -	$ -	$ -		$ -
510-7015-461.10-30	Pager Pay	$ 5,046.00	$ 3,900.00	$ 5,046.00	$ 4,068.00	$ 5,046.00
510-7015-461.11-10	Regular Overtime	$ 3,855.00	$ 5,387.00	$ 3,381.00	$ 5,976.21	$ 5,750.00
510-7015-461.15-20	Longevity	$ 6,117.00	$ 6,079.00	$ 6,430.00	$ 6,366.71	$ 7,890.00
510-7015-461.21-00	FICA	$ 7,779.00	$ 7,589.00	$ 7,878.00	$ 8,138.26	$ 8,545.00
510-7015-461.22-10	State Pension	$ 8,147.00	$ 8,666.00	$ 9,085.00	$ 9,195.68	$ 9,416.00
510-7015-461.24-10	BCBS Medical	$ 11,272.00	$ 11,222.00	$ 19,473.00	$ 12,380.42	$ 16,657.00
510-7015-461.24-50	Life Insurance	$ 172.00	$ 182.00	$ 193.00	$ 193.76	$ 193.00
510-7015-461.25-00	Worker's Compensation	$ 3,559.00	$ 3,598.00	$ 4,610.00	$ 9,708.94	$ 14,518.00
**PERSONNEL		$ 131,103.00	$ 134,061.00	$ 148,542.00	$ 148,699.20	$ 168,479.00
CONTRACTUAL						
510-7015-461.30-05	Professional & Consulting	$ 12,000.00	$ 9,824.00	$ 12,000.00	$ 812.50	$ 12,000.00
510-7015-461.30-40	Well Monitoring	$ -	$ 3.00	$ -		$ -
510-7015-461.30-50	Environmental	$ -	$ -	$ -		$ 15,000.00
510-7015-461.31-10	Janitorial	$ -	$ 690.00	$ 900.00	$ 161.38	$ 900.00
510-7015-461.31-60	Lab or Medical Services	$ 2,600.00	$ 2,734.00	$ 3,500.00	$ 3,228.93	$ 3,500.00
510-7015-461.31-80	Rentals	$ 500.00	$ -	$ 400.00		$ 400.00
510-7015-461.35-20	Non local	$ -	$ 109.00	$ -		$ -
510-7015-461.35-30	Registrations/Education	$ -	$ 1,015.00	$ 1,500.00		$ 1,500.00
510-7015-461.39-10	Postage	$ -	$ 56.00	$ 100.00	$ 55.74	$ 100.00
510-7015-461.39-40	Telephone	$ -	$ -	$ -		$ -
510-7015-461.39-41	Pagers	$ -	$ -	$ -	$ 350.00	$ -
510-7015-461.41-10	Electric	$ 1,000.00	$ 85.00	$ 150.00		$ -
510-7015-461.41-11	Gas	$ -	$ 875.00	$ 1,000.00	$ 941.89	$ 2,600.00
510-7015-461.41-13	Power	$ 120,000.00	$ 114,407.00	$ 131,400.00	$ 115,486.55	$ 147,650.00
510-7015-461.43-10	Maintenance Agreements	$ -	$ 2,080.00	$ 3,000.00		$ 3,000.00
510-7015-461.43-20	Vehicle Repair	$ 2,000.00	$ 854.00	$ 1,200.00	$ 2,425.10	$ 1,200.00
510-7015-461.43-30	Equipment Repair	$ 3,500.00	$ 1,551.00	$ 1,500.00	$ 28,269.75	$ 1,500.00
510-7015-461.43-40	Building Repair	$ 3,100.00	$ 1,096.00	$ 1,600.00	$ 5,897.18	$ 1,600.00
510-7015-461-43-99	Other Improvements	$ -	$ -	$ -	$ 1,714.23	$ -
**CONTRACTUAL		$ 144,700.00	$ 135,379.00	$ 158,250.00	$ 159,343.25	$ 190,950.00
MATERIALS/SUPPLIES						
510-7015-461.60-10	Office Supplies	$ -	$ 44.00	$ -		$ -
510-7015-461.60-15	Computer Supplies/Equipme	$ -	$ 470.00	$ 700.00	$ 122.57	$ 700.00
510-7015-461.60-20	Furniture & Fixtures	$ -	$ -	$ -	$ 151.86	$ -
510-7015-461.60-25	Tools & Shop Supplies	$ 450.00	$ 812.00	$ 1,000.00	$ 1,055.99	$ 1,000.00
510-7015-461.61-10	Operating Supplies	$ -	$ 920.00	$ 1,000.00	$ 417.80	$ 1,000.00
510-7015-461.61-20	Vehicle Supplies	$ 500.00	$ 129.00	$ -		$ -
510-7015-461.61-35	Safety Supplies	$ 1,100.00	$ 244.00	$ 300.00	$ 270.00	$ 300.00
510-7015-461.61-60	Electrical/Electronic Sup	$ 900.00	$ 6,032.00	$ 3,900.00	$ 11,802.83	$ 3,900.00
510-7015-461.61-65	Maintenance Supplies	$ 73,650.00	$ 6,977.00	$ 28,650.00	$ 8,813.11	$ 38,650.00
510-7015-461.61-70	Chemicals	$ 4,800.00	$ 15,948.00	$ 13,400.00	$ 6,381.85	$ 17,900.00
510-7015-461.62-10	Gas,Oil & Lubricants	$ 1,875.00	$ 2,668.00	$ 3,000.00	$ 6,833.27	$ 3,000.00
**MATERIALS/SUPPLIES		$ 83,275.00	$ 34,244.00	$ 51,950.00	$ 35,849.28	$ 66,450.00

CITY OF LARAMIE						
2004-2005 Operating Budget						
Water Fund - PUMPING & WELLS						
		BUDGET	ACTUALS	BUDGET	ACTUALS	BUDGET
ACCOUNT NUMBER	ACCOUNT DESCRIPTION	FY 2002-2003	FY 2002-2003	FY 2003-2004	FY 2003-2004	FY 2004-2005
EQUIPMENT/CAPITAL						
510-7015-461.72-00	Buildings	$ -	$ -	$ -	$ -	$ -
510-7015-461.74-10	Machinery & Equipment	$ -	$ 2,546.00	$ 78,100.00	$ -	$ -
510-7015-461.74-20	Vehicles	$ -	$ -	$ -	$ -	$ -
510-7015-461.74-30	Office & Fixtures	$ -	$ -	$ -	$ -	$ -
510-7015-461.76-10	Machinery & Equipment	$ 20,000.00	$ -	$ -	$ -	$ 11,400.00
510-7015-461.76-20	Vehicles	$ 28,000.00	$ 18,000.00	$ -	$ -	$ -
510-7015-461.76-30	Office & Fixtures	$ -	$ -	$ -	$ -	$ -
510-7015-461.79-00	Capital Projects	$ -	$ -	$ -	$ -	$ -
**EQUIPMENT/CAPITAL		$ 48,000.00	$ 20,546.00	$ 78,100.00	$ -	$ 11,400.00
TRANSFERS						
510-7015-461.81-10	Depreciation Expense	$ -	$ -	$ -	$ -	$ -
**TRANSFERS		$ -	$ -	$ -	$ -	$ -
**PUMPING & WELLS		$ 407,078.00	$ 324,230.00	$ 436,842.00	$ 343,891.73	$ 437,279.00

WATER FUND
Water Filter Treatment Plant

PUBLIC WORKS DEPARTMENT - *UTILITIES DIVISION*

The Public Works Department is comprised of four divisions: Streets, Fleet Maintenance, Solid Waste, and Utilities (Water and Wastewater).

The water filter treatment plant converts Laramie River water into safe, high-quality drinking water for Laramie residents.

The filter treatment plant ensures the standards of the Safe Water Drinking Act are met. Facility staff are also responsible for maintaining and repairing all plant and remote monitoring equipment. Duties include: plant operation, monitoring and testing of water chemistry, disposing of undesirable wastes, maintaining the building and grounds, monitoring water rights, monitoring the watershed, and ensuring compliance with all federal regulations concerning potable water.

POSITION SUMMARY

TITLE	FY02	FY03	FY04	FY05
Water Treatment Plant Supervisor	1	1	1	1
Treatment Plant Operator	2	2	2	2
Total	**3**	**3**	**3**	**3**

WATER FUND

CITY OF LARAMIE

2004-2005 Operating Budget

Water Fund - FILTER TREATMENT PLANT

ACCOUNT NUMBER	ACCOUNT DESCRIPTION	BUDGET FY 2002-2003	ACTUALS FY 2002-2003	BUDGET FY 2003-2004	ACTUALS FY 2003-2004	BUDGET FY 2004-2005
PERSONNEL						
510-7020-461.10-10	Full Time	$ 120,757.00	$ 125,886.00	$ 128,253.00	$ 133,108.23	$ 134,666.00
510-7020-461.10-20	Part Time	$ 9,850.00	$ 9,413.00	$ 9,850.00	$ 10,073.52	$ 9,850.00
510-7020-461.10-30	Pager Pay	$ 5,046.00	$ 2,880.00	$ 5,046.00	$ 3,300.00	$ 5,046.00
510-7020-461.11-10	Regular Overtime	$ 16,910.00	$ 8,443.00	$ 14,827.00	$ 4,826.82	$ 14,827.00
510-7020-461.15-20	Longevity	$ 2,673.00	$ 3,795.00	$ 4,140.00	$ 3,960.00	$ 4,320.00
510-7020-461.21-00	FICA	$ 11,875.00	$ 10,841.00	$ 11,701.00	$ 11,251.73	$ 12,906.00
510-7020-461.22-10	State Pension	$ 11,830.00	$ 11,876.00	$ 13,011.00	$ 11,830.87	$ 13,391.00
510-7020-461.24-10	BCBS Medical	$ 14,423.00	$ 14,333.00	$ 25,986.00	$ 15,814.79	$ 20,998.00
510-7020-461.24-50	Life Insurance	$ 243.00	$ 260.00	$ 265.00	$ 265.20	$ 265.00
510-7020-461.25-00	Worker's Compensation	$ 5,433.00	$ 5,265.00	$ 6,809.00	$ 13,718.01	$ 21,967.00
**PERSONNEL		$ 199,040.00	$ 192,992.00	$ 219,888.00	$ 208,149.17	$ 238,236.00
CONTRACTUAL						
510-7020-461.30-05	Professional & Consulting	$ 4,000.00	$ 8,267.00	$ 12,000.00	$ 4,145.00	$ 12,000.00
510-7020-461.31-10	Janitorial	$ 300.00	$ 2,009.00	$ 2,600.00	$ 2,060.84	$ 2,600.00
510-7020-461.31-60	Lab or Medical Services	$ 11,800.00	$ 11,000.00	$ 6,000.00	$ 4,783.84	$ 6,000.00
510-7020-461.31-80	Rentals	$ 1,000.00	$ 234.00	$ 1,000.00		$ 1,000.00
510-7020-461.35-10	Local Business	$ -	$ 38.00	$ -	$ 13.00	$ -
510-7020-461.35-20	Non local	$ 5,759.00	$ 2,522.00	$ 3,750.00	$ 9.28	$ 3,750.00
510-7020-461.35-30	Registrations/Education	$ 5,875.00	$ 901.00	$ 3,900.00		$ 3,900.00
510-7020-461.35-50	Testing/Certifications	$ -	$ -	$ -		$ -
510-7020-461.39-10	Postage	$ -	$ 853.00	$ 750.00	$ 960.80	$ 750.00
510-7020-461.39-30	Copier & Copies	$ -	$ 36.00	$ 100.00	$ 65.12	$ 100.00
510-7020-461.39-40	Telephone	$ 850.00	$ 443.00	$ 850.00	$ 116.56	$ 850.00
510-7020-461.39-41	Pagers	$ -	$ 89.00	$ 150.00		$ 150.00
510-7020-461.39-42	Cell Phones	$ -	$ 1,047.00	$ 1,300.00	$ 633.75	$ 1,300.00
510-7020-461.39-60	Dues/Memberships	$ -	$ 152.00	$ 200.00	$ 601.00	$ 200.00
510-7020-461.41-10	Electric	$ 17,000.00	$ -	$ 3,800.00		$ -
510-7020-461.41-11	Gas	$ -	$ 2,536.00	$ 3,500.00		$ 6,450.00
510-7020-461.41-13	Power	$ 40,000.00	$ 38,444.00	$ 40,000.00	$ 45,391.95	$ 56,800.00
510-7020-461.43-10	Maintenance Agreements	$ -	$ 5,484.00	$ 6,500.00	$ 4,542.00	$ 6,500.00
510-7020-461.43-20	Vehicle Repair	$ 2,000.00	$ 255.00	$ 4,300.00	$ 1,432.88	$ 4,300.00
510-7020-461.43-30	Equipment Repair	$ 4,000.00	$ 5,534.00	$ 4,000.00	$ 11,086.66	$ 14,000.00
510-7020-461.43-40	Building Repair	$ 6,500.00	$ 2,898.00	$ 4,500.00	$ 11,079.87	$ 4,500.00
510-7020-461.43-99	Other Improvements	$ -	$ -	$ -		$ -
510-7020-461.54-10	Legal	$ -	$ 231.00	$ -		$ -
**CONTRACTUAL		$ 99,084.00	$ 82,973.00	$ 99,200.00	$ 86,922.55	$ 125,150.00
MATERIALS/SUPPLIES						
510-7020-461.60-10	Office Supplies	$ 700.00	$ 713.00	$ 1,000.00	$ 180.48	$ 1,000.00
510-7020-461.60-15	Computer Supplies/Equipme	$ -	$ 977.00	$ 1,300.00	$ 3,462.61	$ 6,800.00
510-7020-461.60-25	Tools & Shop Supplies	$ 700.00	$ 532.00	$ 700.00	$ 2,219.82	$ 700.00
510-7020-461.60-30	Books/Pubs/Subscription	$ 700.00	$ 186.00	$ 700.00	$ 187.45	$ 700.00
510-7020-461.61-10	Operating Supplies	$ 18,075.00	$ 3,382.00	$ 6,100.00	$ 4,692.82	$ 6,100.00
510-7020-461.61-20	Vehicle Supplies	$ 2,300.00	$ 229.00	$ -		$ -
510-7020-461.61-30	Uniforms	$ -	$ 8.00	$ -		$ -
510-7020-461.61-35	Safety Supplies	$ 2,000.00	$ 329.00	$ 1,000.00	$ 1,190.81	$ 1,000.00
510-7020-461.61-45	Horticultural/Landscaping	$ 200.00	$ 1,216.00	$ 1,000.00	$ 1,010.23	$ 1,000.00
510-7020-461.61-60	Electrical/Electronic Sup	$ -	$ 4,756.00	$ 3,500.00	$ 6,734.23	$ 3,500.00
510-7020-461.61-65	Maintenance Supplies	$ 64,700.00	$ 22,027.00	$ 44,700.00	$ 29,461.86	$ 34,700.00
510-7020-461.61-70	Chemicals	$ 116,300.00	$ 55,237.00	$ 122,000.00	$ 81,899.57	$ 129,000.00
510-7020-461.62-10	Gas,Oil & Lubricants	$ 7,000.00	$ 10,822.00	$ 7,000.00	$ 8,098.48	$ 7,000.00
**MATERIALS/SUPPLIES		$ 212,675.00	$ 100,414.00	$ 189,000.00	$ 139,138.36	$ 191,500.00

CITY OF LARAMIE
2004-2005 Operating Budget

Water Fund - FILTER TREATMENT PLANT

ACCOUNT NUMBER	ACCOUNT DESCRIPTION	BUDGET FY 2002-2003	ACTUALS FY 2002-2003	BUDGET FY 2003-2004	ACTUALS FY 2003-2004	BUDGET FY 2004-2005
EQUIPMENT/CAPITAL						
510-7020-461.73-45	Water Other	$ 38,000.00	$ 12,405.00	$ -		$ -
510-7020-461.74-10	Machinery & Equipment	$ 101,300.00	$ 99,950.00	$ 24,000.00	$ 5,156.70	$ -
510-7020-461.74-20	Vehicles	$ -	$ -	$ -		$ -
510-7020-461.74-30	Office & Fixtures	$ -	$ -	$ -		$ -
510-7020-461.76-10	Machinery & Equipment	$ 41,800.00	$ 14,023.00	$ 35,500.00	$ 9,670.33	$ 3,000.00
510-7020-461.76-20	Vehicles	$ 16,500.00	$ 14,030.00	$ -		$ -
510-7020-461.76-30	Office & Fixtures	$ -	$ -	$ -		$ -
510-7020-461.79-00	Capital Projects	$ -	$ 7,000.00	$ -		$ 35,000.00
**EQUIPMENT/CAPITAL		$ 197,600.00	$ 147,408.00	$ 59,500.00	$ 14,827.03	$ 38,000.00
TRANSFERS						
510-7020-461.81-10	Depreciation Expense	$ -	$ -	$ -	$ -	$ -
**TRANSFERS		$ -	$ -	$ -	$ -	$ -
**FILTER TREATMENT PLANT		$ 708,399.00	$ 523,787.00	$ 567,588.00	$ 449,037.11	$ 592,886.00

clear tank

Pump tank

WATER FUND
Transmission and Distribution

PUBLIC WORKS DEPARTMENT - *UTILITIES DIVISION*

The Public Works Department is comprised of four divisions: Streets, Fleet Maintenance, Solid Waste, and Utilities (Water and Wastewater).

Personnel funded through this account are responsible for maintaining the City water distribution lines that carry raw water to the treatment plant and treated water to the customers.

Responsibilities include: repairing leaks in service lines and water main lines, installing and repairing meter pits, performing locate services requested through one-call, maintaining fire hydrants, and other routine maintenance services.

POSITION SUMMARY

TITLE	FY02	FY03	FY04	FY05
Senior Utility Maintenance Operator	1	1	1	1
Utility Maintenance Operator	4	4	4	4
Total	**5**	**5**	**5**	**5**

WATER FUND

CITY OF LARAMIE

2004-2005 Operating Budget

Water Fund - TRANSMISSION & DELIVERY

ACCOUNT NUMBER	ACCOUNT DESCRIPTION	BUDGET FY 2002-2003	ACTUALS FY 2002-2003	BUDGET FY 2003-2004	ACTUALS FY 2003-2004	BUDGET FY 2004-2005
PERSONNEL						
510-7025-461.10-10	Full Time	$ 156,105.00	$ 155,121.00	$ 160,713.00	124,541.33	$ 140,110.00
510-7025-461.10-20	Part Time	$ 4,046.00	$ 7,005.00	$ 10,695.00	14,511.92	$ 10,695.00
510-7025-461.10-30	Pager Pay	$ 5,046.00	$ 3,428.00	$ 5,046.00	2,275.50	$ 5,046.00
510-7025-461.11-10	Regular Overtime	$ 13,115.00	$ 12,578.00	$ 11,500.00	12,978.74	$ 11,500.00
510-7025-461.15-20	Longevity	$ 2,889.00	$ 4,915.00	$ 5,760.00	4,279.04	$ 6,329.00
510-7025-461.21-00	FICA	$ 13,650.00	$ 13,665.00	$ 14,563.00	11,850.61	$ 13,286.00
510-7025-461.22-10	State Pension	$ 14,933.00	$ 14,837.00	$ 15,392.00	11,964.68	$ 13,739.00
510-7025-461.24-10	BCBS Medical	$ 22,371.00	$ 21,091.00	$ 35,392.00	17,980.45	$ 27,159.00
510-7025-461.24-50	Life Insurance	$ 310.00	$ 320.00	$ 328.00	247.69	$ 345.00
510-7025-461.25-00	Worker's Compensation	$ 6,245.00	$ 6,407.00	$ 8,984.00	13,695.31	$ 22,581.00
**PERSONNEL		$ 238,710.00	$ 239,367.00	$ 268,373.00	$ 214,325.27	$ 250,790.00
CONTRACTUAL						
510-7025-461.30-05	Professional & Consulting	$ 11,000.00	$ 14,451.00	$ 15,600.00	2,639.34	$ 21,600.00
510-7025-461.31-15	Laundry Services	$ -	$ 40.00	$ -		$ -
510-7025-461.31-35	Miscellaneous	$ -	$ 413.00	$ -		$ -
510-7025-461.31-50	Towing/Freight Hauling	$ -	$ 98.00	$ 150.00	100	$ 150.00
510-7025-461.31-80	Rentals	$ 5,000.00	$ 2,283.00	$ 3,500.00	1,587.95	$ 3,500.00
510-7025-461.35-10	Local Business	$ -	$ -	$ -	116.34	$ -
510-7025-461.39-10	Postage	$ -	$ 255.00	$ -		$ -
510-7025-461.39-30	Copier & Copies	$ -	$ 584.00	$ -	33	$ -
510-7025-461.39-42	Cell Phones	$ -	$ 28.00	$ -	31.95	$ -
510-7025-461.39-60	Dues/Memberships	$ -	$ 214.00	$ -	213.53	$ -
510-7025-461.43-20	Vehicle Repair	$ 1,400.00	$ 559.00	$ 6,900.00	3,650.73	$ 6,900.00
510-7025-461.43-30	Equipment Repair	$ 7,000.00	$ 8,250.00	$ 7,000.00	8,150.19	$ 7,000.00
510-7025-461.43-40	Building Repair	$ -	$ 143.00	$ -	140.64	$ -
510-7025-461.43-60	Curbs,Gutters,Sidewalks	$ -	$ 1,091.00	$ 2,000.00	7,747.76	$ 5,000.00
510-7025-461.43-62	Road Materials	$ 115,000.00	$ 80,313.00	$ 114,000.00	152,391.11	$ 150,000.00
510-7025-461-4399	Other Improvements	$ -	$ -	$ -	4,820.51	$ -
510-7025-461.54-10	Legal	$ -	$ 561.00	$ -		$ -
**CONTRACTUAL		$ 139,400.00	$ 109,283.00	$ 149,150.00	$ 181,623.05	$ 194,150.00
MATERIALAS/SUPPLIES						
510-7025-461.60-10	Office Supplies	$ -	$ 4.00	$ -		$ -
510-7025-461.60-25	Tools & Shop Supplies	$ -	$ 471.00	$ -	2,142.26	$ -
510-7025-461.61-10	Operating Supplies	$ -	$ 7,011.00	$ 10,000.00	8.99	$ 10,000.00
510-7025-461.61-20	Vehicle Supplies	$ 2,000.00	$ 2,599.00	$ -		$ -
510-7025-461.61-30	Uniforms	$ -	$ -	$ -		$ -
510-7025-461.61-35	Safety Supplies	$ -	$ 2,031.00	$ 2,600.00	305.42	$ 2,600.00
510-7025-461.61-45	Horticultural/Landscaping	$ -	$ 735.00	$ 1,000.00	973.79	$ 1,000.00
510-7025-461.61-60	Electrical/Electronic Sup	$ -	$ 40.00	$ -		$ -
510-7025-461.61-65	Maintenance Supplies	$ 110,000.00	$ 107,341.00	$ 110,000.00	80,415.46	$ 110,000.00
510-7025-461.61-70	Chemicals	$ -	$ 32.00	$ -		$ -
510-7025-461.62-10	Gas,Oil & Lubricants	$ 6,000.00	$ 4,909.00	$ 5,000.00	$ 6,164.92	$ 7,000.00
**MATERIALS/SUPPLIES		$ 118,000.00	$ 125,173.00	$ 128,600.00	$ 90,010.84	$ 130,600.00

CITY OF LARAMIE						
2004-2005 Operating Budget						
Water Fund - TRANSMISSION & DELIVERY						
		BUDGET	ACTUALS	BUDGET	ACTUALS	BUDGET
ACCOUNT NUMBER	ACCOUNT DESCRIPTION	FY 2002-2003	FY 2002-2003	FY 2003-2004	FY 2003-2004	FY 2004-2005
EQUIPMENT/CAPITAL						
510-7025-461.73-50	Water Lines	$ 343,908.00	$ 338,414.00	$ 300,484.00	5,451.86	$ 300,000.00
510-7025-461.74-10	Machinery & Equipment	$ -	$ -	$ -		$ -
510-7025-461.74-20	Vehicles	$ -	$ -	$ -		$ -
510-7025-461.74-30	Office & Fixtures	$ -	$ -	$ -		$ -
510-7025-461.76-10	Machinery & Equipment	$ -	$ -	$ -		$ -
510-7025-461.76-20	Vehicles	$ 124,000.00	$ 87,405.00	$ -	240.24	$ -
510-7025-461.76-30	Office & Fixtures	$ -	$ -	$ -		$ -
510-7025-461.79-00	Capital Projects	$ -	$ -	$ -		$ -
**EQUIPMENT/CAPITAL		$ 467,908.00	$ 425,819.00	$ 300,484.00	$ 5,692.10	$ 300,000.00
TRANSFERS						
510-7025-461.81-10	Depreciation Expense	$ -	$ -	$ -	$ -	$ -
**TRANSFERS		$ -	$ -	$ -	$ -	$ -
**TRANSMISSION & DELIVERY		$ 964,018.00	$ 899,642.00	$ 846,607.00	$ 491,651.26	$ 875,540.00

WATER FUND
Meters

PUBLIC WORKS DEPARTMENT - *UTILITIES DIVISION*

The Public Works Department is comprised of four divisions: Streets, Fleet Maintenance, Solid Waste, and Utilities (Water and Wastewater).

Meter personnel are responsible for maintaining and monitoring water meters in the City. Duties include: installing new meters, repairing and replacing existing meters, reading meters, investigating high consumption inquiries, delivering "shut-off" notices, locating curb valves for connection/disconnection of service lines and meters, investigating back flow devices to ensure cross connection protection and performing locate services requested through one-call.

Meter readers use a computerized meter reading system. They also assist in other water line maintenance operations.

POSITION SUMMARY

TITLE	FY02	FY03	FY04	FY05
Senior Utility Maintenance Operator	1	1	1	1
Utility Maintenance Operator	3	3	3	3
Total	**4**	**4**	**4**	**4**

WATER FUND

CITY OF LARAMIE

2004-2005 Operating Budget

Water Fund - METERS

ACCOUNT NUMBER	ACCOUNT DESCRIPTION	BUDGET FY 2002-2003	ACTUALS FY 2002-2003	BUDGET FY 2003-2004	ACTUALS FY 2003-2004	BUDGET FY 2004-2005
PERSONNEL						
510-7030-461.10-10	Full Time	$ 130,689.00	$ 113,402.00	$ 135,151.00	$ 122,688.90	$ 140,784.00
510-7030-461.10-20	Part Time	$ 4,046.00	$ 281.00	$ 4,046.00	$ 2,772.90	$ 4,046.00
510-7030-461.10-30	Pager Pay	$ 2,018.00	$ 525.00	$ 2,018.00	$ 576.00	$ 2,018.00
510-7030-461.11-10	Regular Overtime	$ 8,341.00	$ 2,552.00	$ 7,223.00	$ 2,729.37	$ 7,223.00
510-7030-461.15-20	Longevity	$ 8,127.00	$ 6,966.00	$ 8,268.00	$ 3,900.00	$ 4,260.00
510-7030-461.21-00	FICA	$ 11,257.00	$ 9,348.00	$ 11,804.00	$ 10,046.77	$ 12,113.00
510-7030-461.22-10	State Pension	$ 12,575.00	$ 10,406.00	$ 12,790.00	$ 10,919.93	$ 13,006.00
510-7030-461.24-10	BCBS Medical	$ 16,729.00	$ 16,456.00	$ 28,152.00	$ 17,903.37	$ 25,900.00
510-7030-461.24-50	Life Insurance	$ 263.00	$ 269.00	$ 277.00	$ 252.28	$ 277.00
510-7030-461.25-00	Worker's Compensation	$ 5,349.00	$ 4,330.00	$ 6,965.00	$ 11,430.84	$ 20,614.00
**PERSONNEL		$ 199,394.00	$ 164,535.00	$ 216,694.00	$ 183,220.36	$ 230,241.00
CONTRACTUAL						
510-7030-461.30-05	Professional & Consult	$ -	$ -	$ -	$ 159.37	$ -
510-7030-461.31-80	Rentals	$ -	$ -	$ -		$ -
510-7030-461.39-10	Postage	$ -	$ 45.00	$ 100.00	$ 38.22	$ 100.00
510-7030-461.39-20	Printing	$ -	$ 353.00	$ 700.00	$ 7.69	$ 700.00
510-7030-461.43-20	Vehicle Repair	$ 1,000.00	$ 229.00	$ 2,500.00	$ 887.17	$ 2,500.00
510-7030-461.43-30	Equipment Repair	$ 1,000.00	$ 616.00	$ 1,000.00	$ 370.96	$ 1,000.00
510-7030-461-43-99	Other Improvements	$ -	$ -	$ -	$ 82.11	$ -
**CONTRACTUAL		$ 2,000.00	$ 1,243.00	$ 4,300.00	$ 1,545.52	$ 4,300.00
MATERIALS/SUPPLIES						
510-7030-461.60-10	Office Supplies	$ -	$ 3.00	$ -		$ -
510-7030-461.60-25	Tools & Shop Supplies	$ -	$ 447.00	$ 500.00	$ 27.35	$ 500.00
510-7030-461.61-10	Operating Supplies	$ -	$ 2.00	$ -	$ 2,630.26	$ -
510-7030-461.61-20	Vehicle Supplies	$ 1,500.00	$ 733.00	$ -		$ -
510-7030-461.61-35	Safety Supplies	$ -	$ 45.00	$ -		$ -
510-7030-461.61-60	Electrical/Electronic Sup	$ -	$ 10.00	$ -		$ -
510-7030-461.61-65	Maintenance Supplies	$ 80,600.00	$ 115,691.00	$ 100,000.00	$ 101,635.20	$ 110,000.00
510-7030-461.61-70	Chemicals	$ -	$ -	$ -		$ -
510-7030-461.62-10	Gas,Oil & Lubricants	$ 3,000.00	$ 2,949.00	$ 3,000.00	$ 3,169.29	$ 3,000.00
**MATERIALS/SUPPLIES		$ 85,100.00	$ 119,880.00	$ 103,500.00	$ 107,462.10	$ 113,500.00
EQUIPMENT/CAPITAL						
510-7030-461.74-10	Machinery & Equipment	$ 2,700.00	$ -	$ -		$ -
510-7030-461.74-20	Vehicles	$ -	$ -	$ -		$ 37,000.00
510-7030-461.74-30	Office & Fixtures	$ -	$ -	$ -		$ -
510-7030-461.76-10	Machinery & Equipment	$ -	$ -	$ -		$ -
510-7030-461.76-20	Vehicles	$ -	$ 26,455.00	$ 33,000.00	$ 27,869.00	$ -
510-7030-461.76-30	Office & Fixtures	$ -	$ -	$ -		$ -
510-7030-461.79-00	Capital Projects	$ -	$ -	$ -		$ -
**EQUIPMENT/CAPITAL		$ 2,700.00	$ 26,455.00	$ 33,000.00	$ 27,869.00	$ 37,000.00
TRANSFERS						
510-7030-461.81-10	Depreciation Expense	$ -	$ -	$ -	$ -	$ -
**TRANSFERS		$ -	$ -	$ -	$ -	$ -
**METERS		$ 289,194.00	$ 312,113.00	$ 357,494.00	$ 320,096.98	$ 385,041.00

37,971 pu
new truck
11 039 replace

WATER FUND
Monolith Ranch

PUBLIC WORKS DEPARTMENT - *UTILITIES DIVISION*

The City of Laramie purchased the Monolith Ranch in 1981 for the Dowlin water right attached thereto. This right includes priority usage of the Laramie River. Acquisition of the water right attached to the Monolith Ranch allows the City to control 20.1 cubic feet of Laramie River water per second. The intention of the purchase was to reserve the agricultural water right for conversion to municipal use at the most opportune time in the future.

The City is managing the property to maximize and protect the potential municipal water supply. The ranch lands are put to the highest beneficial use. A secondary objective is to maximize the short term revenues from the ranch without harming the water transfer potential. The Monolith Ranch, at 11,440 acres, is more than twice the size of the incorporated City of Laramie.

Ranching activity includes management of four irrigated pastures: Big Meadow, Hunziker, Level Ground, and the Pivot for haying operations. Grazing occurs on the irrigated hay pastures after completion of the yearly harvest, and on other irrigated pastures that are not suitable for hay production. Dry land pastures are also used for grazing, provided there is sufficient moisture in the form of precipitation to sustain the vegetative growth required for grazing.

In addition to the aforementioned agricultural uses, Monolith Ranch is utilized for the following ongoing uses:

- Biosolids Disposal
- Rental Housing
- Hunting
- Fishing
- Star Gazing
- Bird Watching
- UW Experiments

Staff required to operate the ranch include a ranch manager and a seasonal ranch hand. Clerical assistance for the ranch is provided by the Public Works Utility Division

POSITION SUMMARY

TITLE	FY02	FY03	FY04	FY05
Ranch Manager	0	.5	.5	.5
Total	**0**	**.5**	**.5**	**.5**

WATER FUND

CITY OF LARAMIE

2004-2005 Operating Budget

Water Fund - MONOLITH RANCH

ACCOUNT NUMBER	ACCOUNT DESCRIPTION	BUDGET FY 2002-2003	ACTUALS FY 2002-2003	BUDGET FY 2003-2004	ACTUALS FY 2003-2004	BUDGET FY 2004-2005
PERSONNEL						
510-7035-461.10-10	Full Time	$ 20,223.00	$ 21,727.00	$ 19,146.00	$ 19,408.82	$ 19,146.00
510-7035-461.10-20	Part Time	$ 10,000.00	$ 21,556.00	$ 10,000.00	$ 20,475.36	$ 10,000.00
510-7035-461.10-30	Pager Pay	$ -	$ 960.00	$ -	$ 588.00	$ 960.00
510-7035-461.11-10	Regular Overtime	$ 3,641.00	$ 6,707.00	$ 3,192.00	$ 10,648.39	$ 7,000.00
510-7035-461.15-20	Longevity	$ 1,243.00	$ 1,220.00	$ 1,200.00	$ 1,082.77	$ 1,380.00
510-7035-461.21-00	FICA	$ 1,805.00	$ 3,991.00	$ 2,558.00	$ 3,973.49	$ 2,580.00
510-7035-461.22-10	State Pension	$ 1,989.00	$ 2,421.00	$ 2,022.00	$ 2,050.93	$ 2,401.00
510-7035-461.24-10	BCBS Medical	$ 2,318.00	$ 2,318.00	$ 4,276.00	$ 2,209.41	$ 3,078.00
510-7035-461.24-50	Life Insurance	$ 40.00	$ 45.00	$ 40.00	$ 38.80	$ 40.00
510-7035-461.25-00	Worker's Compensation	$ 826.00	$ 1,826.00	$ 1,393.00	$ 4,998.52	$ 5,002.00
**PERSONNEL		$ 42,085.00	$ 62,771.00	$ 43,827.00	$ 65,474.49	$ 51,587.00
CONTRACTUAL						
510-7035-461.30-05	Professional & Consulting	$ 26,000.00	$ 90.00	$ -	$ 1,221.25	$ 1,500.00
510-7035-461.30-50	Environmental	$ -	$ -	$ -		$ -
510-7035-461.31-25	Licensing	$ -	$ -	$ -	$ 1,061.41	$ 1,100.00
510-7035-461.31-60	Lab or Medical Services	$ -	$ -	$ -	$ 876.00	$ -
510-7035-461.31-80	Rentals	$ 3,500.00	$ 2,535.00	$ 3,500.00	$ 2,524.99	$ 2,500.00
510-7035-461.35-10	Local Business	$ -	$ 248.00	$ -		$ -
510-7035-461.35-20	Non local	$ -	$ 17.00	$ -		$ 100.00
510-7035-461.35-30	Registrations/Education	$ -	$ 420.00	$ 400.00		$ 400.00
510-7035-461.39-10	Postage	$ -	$ -	$ -	$ 61.42	$ 100.00
510-7035-461.39-20	Printing	$ -	$ 7.00	$ -	$ 403.64	$ -
510-7035-461.39-30	Copier & Copies	$ -	$ 20.00	$ -	$ 5.00	$ -
510-7035-461.39-42	Cell Phones	$ -	$ 932.00	$ 1,000.00	$ 519.56	$ 700.00
510-7035-461.41-10	Electric	$ -	$ 5,922.00	$ 9,500.00	$ 1,241.89	$ 9,500.00
510-7035-461.41-13	Power	$ -	$ 3,739.00	$ 2,300.00	$ 2,920.09	$ 2,300.00
510-7035-461.43-10	Maintenance Agreements	$ -	$ 175.00	$ -	$ 82.31	$ -
510-7035-461.43-20	Vehicle Repair	$ 19,000.00	$ 810.00	$ 12,000.00	$ 854.51	$ 3,000.00
510-7035-461.43-30	Equipment Repair	$ -	$ 1,831.00	$ -	$ 8,405.08	$ 5,000.00
510-7035-461.43-40	Building Repair	$ 4,500.00	$ 13,422.00	$ 4,500.00	$ 7,400.21	$ 4,500.00
510-7035-461.43-64	Sign Installation & Paint	$ -	$ 680.00	$ -		$ -
510-7035-461.43-99	Other Improvements	$ -	$ 9,836.00	$ -	$ 7,223.60	$ 2,000.00
510-7035-461.54-10	Legal	$ -	$ 295.00	$ -	$ 74.28	$ -
510-7035-461.54-90	Other	$ -	$ 90.00	$ -	$ 273.20	$ 500.00
**CONTRACTUAL		$ 53,000.00	$ 41,069.00	$ 33,200.00	$ 35,147.44	$ 33,200.00
MATERIALS/SUPPLIES						
510-7035-461.60-10	Office Supplies	$ -	$ 1.00	$ -	$ 15.48	$ -
510-7035-461.60-25	Tools & Shop Supplies	$ -	$ 289.00	$ -	$ 129.32	$ 200.00
510-7035-461.61-10	Operating Supplies	$ 1,900.00	$ 1,282.00	$ 1,900.00	$ 1,958.02	$ 1,700.00
510-7035-461.61-20	Vehicle Supplies	$ 4,000.00	$ 1,303.00	$ -		$ -
510-7035-461.61-30	Uniforms	$ -	$ 201.00	$ -		$ -
510-7035-461.61-45	Horticultural/Landscaping	$ 20,000.00	$ 17,460.00	$ 20,000.00	$ 17,624.28	$ 23,000.00
510-7035-461.61-60	Electrical/Electronic Sup	$ 2,500.00	$ 3,436.00	$ 2,500.00	$ 3,453.52	$ 2,500.00
510-7035-461.61-65	Maintenance Supplies	$ 5,100.00	$ 5,605.00	$ 5,100.00	$ 4,854.06	$ 5,100.00
510-7035-461.61-70	Chemicals	$ -	$ 71.00	$ -	$ 11.98	$ -
510-7035-461.62-10	Gas,Oil & Lubricants	$ 11,500.00	$ 12,457.00	$ 13,000.00	$ 17,187.90	$ 18,200.00
**MATERIALS/SUPPLIES		$ 45,000.00	$ 42,105.00	$ 42,500.00	$ 45,234.56	$ 50,700.00

CITY OF LARAMIE
2004-2005 Operating Budget

Water Fund - MONOLITH RANCH

ACCOUNT NUMBER	ACCOUNT DESCRIPTION	BUDGET FY 2002-2003	ACTUALS FY 2002-2003	BUDGET FY 2003-2004	ACTUALS FY 2003-2004	BUDGET FY 2004-2005
EQUIPMENT/CAPITAL						
510-7035-461.73-45	Water Other	$ -	$ -	$ 11,000.00		$ -
510-7035-461.73-50	Water Lines	$ -	$ 200.00	$ -		$ -
510-7035-461.74-10	Machinery & Equipment	$ -	$ -	$ -		$ -
510-7035-461.74-20	Vehicles	$ -	$ -	$ -		$ -
510-7035-461.74-30	Office & Fixtures	$ -	$ -	$ -		$ -
510-7035-461.76-10	Machinery & Equipment	$ 18,000.00	$ 650.00	$ 17,350.00		$ 28,750.00
510-7035-461.76-20	Vehicles	$ -	$ -	$ -		$ -
510-7035-461.76-30	Office & Fixtures	$ -	$ -	$ -		$ -
510-7035-461.79-00	Capital Projects	$ -	$ -	$ -	$ (0.23)	$ -
510-7035-461.79-10	Concept/Feasability Study	$ 66,000.00	$ 20,741.00	$ 102,000.00	$ 80,736.68	$ 10,000.00
**EQUIPMENT/CAPITAL		$ 84,000.00	$ 21,591.00	$ 130,350.00	$ 80,736.45	$ 38,750.00
TRANSFERS						
510-7035-461.81-10	Depreciation Expense	$ -	$ -	$ -	$ -	$ -
**TRANSFERS		$ -	$ -	$ -	$ -	$ -
**MONOLITH RANCH		$ 224,085.00	$ 167,536.00	$ 249,877.00	$ 226,592.94	$ 174,237.00

WATER FUND
Environmental Advisory
PUBLIC WORKS DEPARTMENT - *UTILITIES DIVISION*

The Public Works Department is comprised of four divisions: Streets, Fleet Maintenance, Solid Waste, and Utilities (Water and Wastewater).

The environmental advisory section of the Utilities Division includes a Water Outreach Coordinator (WOC) who collects and disseminates information to citizens on the topics of water conservation, aquifer protection, household hazardous waste disposal, water-wise landscaping, and other topics related to the City's Utility Division. The WOC writes newspaper articles, updates the City's website, gives presentations to community groups, and creates brochures to support completion of these tasks.

The WOC is also responsible for writing the City's water system vulnerability assessment and groundwater monitoring plan, managing and implementing the City's aquifer protection and source water protection programs, creating and mailing the annual consumer confidence report, and completing other duties as assigned. The WOC also aids in seeking grant funding for environmental programs and security improvements.

POSITION SUMMARY

TITLE	FY02	FY03	FY04	FY05
Water Outreach Coordinator*	0	0	0	1
Total	**0**	**0**	**0**	**1**

*This position is reflected in the Water Fund *Administration* section of the budget for fiscal years 2002, 2003, and 2004.

WATER FUND

CITY OF LARAMIE

2004-2005 Operating Budget

Water Fund - ENVIRONMENTAL ADVISORY

ACCOUNT NUMBER	ACCOUNT DESCRIPTION	BUDGET FY 2002-2003	ACTUALS FY 2002-2003	BUDGET FY 2003-2004	ACTUALS FY 2003-2004	BUDGET FY 2004-2005
PERSONNEL						
510-7040-461.10-10	Full Time	$ -	$ -	$ -	$ -	$ 39,926.00
510-7040-461.10-20	Part Time	$ -	$ -	$ -	$ -	$ -
510-7040-461.10-30	Pager Pay	$ -	$ -	$ -	$ -	$ -
510-7040-461.11-10	Regular Overtime	$ -	$ -	$ -	$ -	$ -
510-7040-461.15-20	Longevity	$ -	$ -	$ -	$ -	$ -
510-7040-461.15-30	Vehicle Allowance	$ -	$ -	$ -	$ -	$ -
510-7040-461.21-00	FICA	$ -	$ -	$ -	$ -	$ 3,054.00
510-7040-461.22-10	State Pension	$ -	$ -	$ -	$ -	$ 3,366.00
510-7040-461.24-10	BCBS Medical	$ -	$ -	$ -	$ -	$ 6,161.00
510-7040-461.24-50	Life Insurance	$ -	$ -	$ -	$ -	$ 74.00
510-7040-461.25-00	Worker's Compensation	$ -	$ -	$ -	$ -	$ 5,206.00
**PERSONNEL		$ -	$ -	$ -	$ -	$ 57,787.00
CONTRACTUAL						
510-7040-461.30-05	Professional & Consulting	$ -	$ -	$ -	$ -	$ 800.00
510-7040-461.30-10	Accounting/Audit	$ -	$ -	$ -	$ -	$ -
510-7040-461.30-45	Environ Advisory Committee	$ -	$ -	$ 25,350.00	$ -	$ -
510-7040-461.31-10	Janitorial	$ -	$ -	$ -	$ -	$ -
510-7040-461.31-15	Laundry Services	$ -	$ -	$ -	$ -	$ -
510-7040-461.31-25	Licensing	$ -	$ -	$ -	$ -	$ 1,750.00
510-7040-461.31-35	Miscellaneous	$ -	$ -	$ -	$ -	$ -
510-7040-461.31-50	Towing/Freight Hauling	$ -	$ -	$ -	$ -	$ -
510-7040-461.31-60	Lab or Medical Services	$ -	$ -	$ -	$ -	$ 5,300.00
510-7040-461.31-80	Rentals	$ -	$ -	$ -	$ -	$ -
510-7040-461.35-10	Local Business	$ -	$ -	$ -	$ -	$ -
510-7040-461.35-20	Non local	$ -	$ -	$ -	$ -	$ 500.00
510-7040-461.35-30	Registrations/Education	$ -	$ -	$ -	$ -	$ 2,500.00
510-7040-461.35-40	Supplies	$ -	$ -	$ -	$ -	$ -
510-7040-461.35-50	Testing/Certifications	$ -	$ -	$ -	$ -	$ -
510-7040-461.39-10	Postage	$ -	$ -	$ -	$ -	$ 2,200.00
510-7040-461.39-20	Printing	$ -	$ -	$ -	$ -	$ 6,520.00
510-7040-461.39-30	Copier & Copies	$ -	$ -	$ -	$ -	$ -
510-7040-461.39-40	Telephone	$ -	$ -	$ -	$ -	$ -
510-7040-461.39-41	Pagers	$ -	$ -	$ -	$ -	$ -
510-7040-461.39-42	Cell Phones	$ -	$ -	$ -	$ -	$ -
510-7040-461.39-50	Investment Fees	$ -	$ -	$ -	$ -	$ -
510-7040-461.39-51	Credit Cards	$ -	$ -	$ -	$ -	$ -
510-7040-461.39-52	Bad Debts	$ -	$ -	$ -	$ -	$ -
510-7040-461.39-53	Collection/Bank Fees	$ -	$ -	$ -	$ -	$ -
510-7040-461.39-54	Legal & Recording Fees	$ -	$ -	$ -	$ -	$ -
510-7040-461.39-60	Dues/Memberships	$ -	$ -	$ -	$ -	$ 200.00
510-70410-461.41-10	Electric	$ -	$ -	$ -	$ -	$ -
510-7040-461.41-11	Gas	$ -	$ -	$ -	$ -	$ -
510-7040-461.43-10	Maintenance Agreements	$ -	$ -	$ -	$ -	$ -
510-7040-461.43-20	Vehicle Repair	$ -	$ -	$ -	$ -	$ -
510-7040-461.43-30	Equipment Repair	$ -	$ -	$ -	$ -	$ -
510-7040-461.43-40	Building Repair	$ -	$ -	$ -	$ -	$ -
510-7040-461.43-62	Road Materials	$ -	$ -	$ -	$ -	$ -
510-7040-461.52-20	WARM Liability	$ -	$ -	$ -	$ -	$ -
510-7040-461.52-25	WARM Property	$ -	$ -	$ -	$ -	$ -
510-7040-461.52-30	Judgements & Claims	$ -	$ -	$ -	$ -	$ -
510-7040-461.54-10	Legal	$ -	$ -	$ -	$ -	$ -
510-7040-461.54-20	Employment	$ -	$ -	$ -	$ -	$ -
510-7040-461.54-30	Promotional & Marketing	$ -	$ -	$ -	$ -	$ 1,500.00
510-7040-461.54-90	Other	$ -	$ -	$ -	$ -	$ -

CITY OF LARAMIE						
2004-2005 Operating Budget						
Water Fund - ENVIRONMENTAL ADVISORY						
		BUDGET	ACTUALS	BUDGET	ACTUALS	BUDGET
ACCOUNT NUMBER	ACCOUNT DESCRIPTION	FY 2002-2003	FY 2002-2003	FY 2003-2004	FY 2003-2004	FY 2004-2005
**CONTRACTUAL		$ -	$ -	$ 25,350.00	$ -	$ 21,270.00
MATERIALS/SUPPLIES						
510-7040-461.60-10	Office Supplies	$ -	$ -	$ -	$ -	$ 400.00
510-7040-461.60-15	Computer Supplies/Equipme	$ -	$ -	$ -	$ -	$ -
510-7040-461.60-20	Furniture & Fixtures	$ -	$ -	$ -	$ -	$ -
510-7040-461.60-25	Tools & Shop Supplies	$ -	$ -	$ -	$ -	$ -
510-7040-461.60-30	Books/Pubs/Subscription	$ -	$ -	$ -	$ -	$ 200.00
510-7040-461.61-10	Operating Supplies	$ -	$ -	$ -	$ -	$ 2,780.00
510-7040-461.61-20	Vehicle Supplies	$ -	$ -	$ -	$ -	$ -
510-7040-461.61-30	Uniforms	$ -	$ -	$ -	$ -	$ -
510-7040-461.61-35	Safety Supplies	$ -	$ -	$ -	$ -	$ -
510-7040-461.61-45	Horticultural/Landscaping	$ -	$ -	$ -	$ -	$ 500.00
510-7040-461.61-60	Electrical/Electronic Sup	$ -	$ -	$ -	$ -	$ -
510-7040-461.61-65	Maintenance Supplies	$ -	$ -	$ -	$ -	$ 200.00
510-7040-461.62-10	Gas,Oil & Lubricants	$ -	$ -	$ -	$ -	$ -
**MATERIALS/SUPPLIES		$ -	$ -	$ -	$ -	$ 4,080.00
EQUIPMENT/CAPITAL						
510-7040-461.73-50	Water Lines	$ -	$ -	$ -	$ -	$ -
510-7040-461.74-10	Machinery & Equipment	$ -	$ -	$ -	$ -	$ -
510-7040-461.74-20	Vehicles	$ -	$ -	$ -		$ -
510-7040-461.74-30	Office & Fixtures	$ -	$ -	$ -	$ -	$ -
510-7040-461.76-10	Machinery & Equipment	$ -	$ -	$ -	$ -	$ -
510-7040-461.76-20	Vehicles	$ -	$ -	$ -	$ -	$ -
510-7040-461.76-30	Office & Fixtures	$ -	$ -	$ -	$ -	$ -
510-7040-461.79-00	Capital Projects	$ -	$ -	$ -	$ -	$ -
510-7040-461.79-20	Design	$ -	$ -	$ -	$ -	$ -
510-7040-461.79-35	General Construction	$ -	$ -	$ -	$ -	$ -
**EQUIPMENT/CAPITAL		$ -	$ -	$ -	$ -	$ -
**ENVIRONMENTAL ADVISORY		$ -	$ -	$ 25,350.00	$ -	$ 83,137.00

14B
WATER SYSTEM MASTER PLAN WORSHEETS

General Assumptions that will affect the budget sheets...

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Projected Service Area Population	30,032	30,295	30,558	30,822	31,085	31,348	31,579	31,810	32,042	32,273	32,504	32,727	32,951	33,174	33,398	33,621	33,820	34,019	34,219	34,418	34,617
Annual Inflation Rate	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
WY Construction Premium	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%

End of Planning Horizon -->

Basic Sheet Structure:

Supply (a)

List of supply oriented projects including resource protection, future supply development, and miscellaneous projects.
Each project has a start year, financing assumptions, and possible annual cost impact.
Costs for the project are amortized using the financing assumptions, with the financed base cost adjusted for inflation to the year of implementation.
Some projects and portions of payments may extend beyond the planning horizon, resulting in "unscheduled" costs.
Some projects are dropped for Scenario C (drop lower priority projects) and Scenarios B and D (projects not needed for no demand growth).

Distribution (b)

List of distribution oriented projects including Zone1/Zone2 upgrade needs and the water mains replacement program.
Each project has a start year and financing assumptions.
Costs for the project are amortized using the financing assumptions, with the financed base cost adjusted for inflation to the year of implementation.
Some projects and portions of payments may extend beyond the planning horizon, resulting in "unscheduled" costs.
Some of the lower priority projects are excluded from Scenario C.

O & M (c)

The O&M costs are based on the current year budget and broken down in a similar manner.
It is assumed the base costs will simply grow with inflation.
From the current budget, the mains replacement program (300,000 in 2006) is removed and is covered under Distribution.
Current capital obligations are listed and amortized according to the schedule provided by the City.
An on-going capital obligation is included to allow for minor leases, short-term obligations, and unspecified revolving credit obligations.
New capital obligations are estimated based on the sum of new projects listed in Supply and Distribution. The City may choose to postpone some projects and pay cash if concerned a

System Income (d)

Uses the current budget to back-calculate the present income streams from Water sales, Service Fees, Surcharges, and Plant Investment Fees (Impact fees)
Assumes that the water charges, service fees, and Plant investement fees will be increased generally with inflation.
Assumes that the Main Replacement Surcharge will cover the proposed Main Replacement Program.

Scenarios

BASE The current rate structure adjusted for inflation.
A Scenario A is the average rate required to pay for all the planned costs.
B Scenario B is the same as A except the population does not grow (It stays equal to year 1 population).
C Scenario C is the average rate required to pay for all high priority projects only.
D Scenario D is the same as A with conservation.
E Scenario E is the same as A with additional Groundwater Treatment projects.

Master Plan Summary Sheet		0	1	2	3	4	5	6	7	8	9	10	11	12	13
	Supplemental	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	sheet	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
I. Supply improvements	a														
1 Resource Protection			156,580	159,434	162,360	165,359	126,039	129,190	132,420	155,032	158,425	161,903	165,468	169,122	172,868
2 Future Supply Development (no GW treatment)			78,763	78,763	78,763	78,763	78,763	243,017	242,437	241,842	241,233	240,609	239,969	239,313	238,640
3 Misc. City Plans (on 5 year plan)			45,015	91,076	31,882	158,100	96,087	31,882	31,882	130,605	130,605	147,030	147,030	147,030	147,030
			280,358	329,273	273,006	402,222	300,889	404,089	406,739	527,479	530,263	549,542	552,467	555,465	558,538
II. Distribution system	b														
1 Zone 1/Zone 2 Fire suppression upgrades			-	-	-	-	680,625	680,625	680,625	680,625	680,625	680,625	680,625	680,625	680,625
2 Watermain Replacement Program (Maintenance)			300,000	964,575	964,575	964,575	964,575	964,575	964,575	2,374,674	2,374,674	2,374,674	2,374,674	2,374,674	2,374,674
			300,000	964,575	964,575	964,575	1,645,200	1,645,200	1,645,200	3,055,299	3,055,299	3,055,299	3,055,299	3,055,299	3,055,299
III. Operational costs (O&M improvements)	c														
1 Staffing Costs		1,212,575	1,242,889	1,273,962	1,305,811	1,338,456	1,371,917	1,406,215	1,441,371	1,477,405	1,514,340	1,552,199	1,591,003	1,630,779	1,671,548
2 Contractual costs		741,383	759,917	778,915	798,388	818,348	838,806	859,776	881,271	903,303	925,885	949,032	972,758	997,077	1,022,004
3 Materials/supplies		606,800	621,970	637,519	653,457	669,794	686,539	703,702	721,295	739,327	757,810	776,755	796,174	816,079	836,481
4 Equipment/Cap. Replacement		923,054	946,130	969,783	994,028	1,018,878	1,044,350	1,070,459	1,097,221	1,124,651	1,152,767	1,181,587	1,211,126	1,241,404	1,272,439
5 Existing Financial Commitments		1,355,000	1,355,000	1,358,700	1,132,493	595,380	599,364	603,448	607,635	611,925	616,324	620,832	625,453	630,189	635,044
6 Qualserve Efforts		-	25,000	25,625	26,266	26,922	27,595	28,285	28,992	29,717	30,460	31,222	32,002	32,802	33,622
		4,838,811	4,950,906	5,044,504	4,910,442	4,467,778	4,568,572	4,671,886	4,777,783	4,886,328	4,997,586	5,111,626	5,228,517	5,348,329	5,471,138
IV. Rates/Financing/Sequence	d														
1 Income (From sheet d, TOTAL INCOME)			4,202,365	4,343,570	4,487,351	4,636,489	4,756,761	4,909,780	5,068,579	5,230,147	5,397,624	5,560,724	5,738,203	5,918,761	6,107,138
Expenses (total of I, II, and III)			5,531,264	6,338,352	6,148,022	5,834,575	6,514,661	6,721,175	6,829,722	8,469,106	8,583,148	8,716,466	8,836,282	8,959,093	9,084,974
Projected Balance/Deficit			(1,328,900)	(1,994,783)	(1,660,671)	(1,198,086)	(1,757,901)	(1,811,395)	(1,761,144)	(3,238,959)	(3,185,524)	(3,155,742)	(3,098,079)	(3,040,332)	(2,977,836)

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14	15	16	17	18	19	20	unscheduled	
2019	2020	2021	2022	2023	2024	2025		
2020	2021	2022	2023	2024	2025	2026		
								Supply improvements
176,707	201,278	205,312	209,446	213,684	218,027	222,480	236,950	Resource Protection
237,951	237,244	236,520	235,778	235,017	234,237	233,438	23,474,158	Future Supply Development
147,030	147,030	118,055	118,055	118,055	118,055	101,630	101,630	Misc. City Plans (on 5 year plan)
561,688	585,552	559,887	563,279	566,756	570,319	557,548	23,812,738	
								Distribution system
680,625	680,625	680,625	680,625	680,625	680,625	680,625	3,850,324	Zone 1/Zone 2 Fire suppression upgrades
2,934,140	2,934,140	2,934,140	2,934,140	2,934,140	2,934,140	2,934,140	3,760,529	Watermain Replacement Program (Maintenance)
3,614,765	3,614,765	3,614,765	3,614,765	3,614,765	3,614,765	3,614,765	7,610,852	
								Operational costs (O&M improvements) – QUALSERVE
1,713,337	1,756,170	1,800,074	1,845,076	1,891,203	1,938,483	1,986,945		Staffing Costs
1,047,554	1,073,743	1,100,586	1,128,101	1,156,304	1,185,211	1,214,842		Contractual costs
857,393	878,827	900,798	923,318	946,401	970,061	994,312		Materials/supplies
583,020	362,120	367,348	219,707	225,200	230,829	236,600		Existing Financial Commitments
34,463	35,324	36,207	37,113	38,040	38,991	39,966		Qualserve Efforts
5,540,016	5,443,042	5,575,293	5,557,850	5,696,796	5,839,216	5,985,196		
								Rates/Financing/Sequence
6,298,797	6,465,200	6,664,435	6,870,999	7,081,037	7,298,560	7,522,532		Income (From sheet d, TOTAL INCOME)
9,716,469	9,643,359	9,749,944	9,735,893	9,878,317	10,024,300	10,157,509		Expenses (total of I, II, and III)
(3,417,671)	(3,178,159)	(3,085,509)	(2,864,894)	(2,797,279)	(2,725,741)	(2,634,977)		Expected Balance

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Supply Improvements
detail sheet a

								1	2	3	4	5	6	7	8	9
								2006	2007	2008	2009	2010	2011	2012	2013	2014
				financed				2007	2008	2009	2010	2011	2012	2013	2014	2015
1.	Resource Protection		% city	cap	rate	annual	years	start								
	a) Homeland security	200,000	50%	100,000	2.50%	25,000	7	-2	41,375	42,015	42,672	43,345	28,285	28,992	29,717	30,460	31,222
	b) Well-head and aquifer protection	-	100%	-	2.50%	20,000			20,500	21,013	21,538	22,076	22,628	23,194	23,774	24,368	24,977
	c) Watershed protection	-	100%	-	2.50%	10,000			10,250	10,506	10,769	11,038	11,314	11,597	11,887	12,184	12,489
	d) Water rights (Monolith)	-	100%	-	2.50%	45,000			46,125	47,278	48,460	49,672	50,913	52,186	53,491	54,828	56,199
	e) Dowlin Ditch Rights	233,200	100%	233,200	2.50%	11,400	10	-5	38,330	38,622	38,922	39,229	12,898	13,221	13,551	13,890	14,237
	** f) Goforth Reservoir (drop for C)	501,500	50%	300,900	2.50%	-	20	8	-	-	-	-	-	-	-	19,302	19,302
	** g) 5 Mile/Harney Creek Rehab. (drop for C)	262,700	50%	180,606	2.50%	-	10	15	-	-	-	-	-	-	-	-	-
	h) Undefined Project	-	50%	-	2.50%	-	20	21	-	-							
									156,580	159,434	162,360	165,359	126,039	129,190	132,420	155,032	158,425
2.	Future Supply Development																
	* a) City Springs/Turner Wells/ASR	3,630,000	33%	1,227,848	2.50%		20	1	78,763	78,763	78,763	78,763	78,763	78,763	78,763	78,763	78,763
	b) River Pipeline	7,700,000	33%	2,922,150	2.50%	(20,000)	20	6	-	-	-	-	-	164,254	163,674	163,079	162,470
	c) WTP replacement	18,000,000	50%	13,725,000	2.50%		20	21	-	-	-	-	-	-	-	-	-
	* d) WTP Booster Station	3,000,000	33%	1,509,750	2.50%		20	21	-	-	-	-	-	-	-	-	-
	* e) Raw Water Distribution (Parks - Groundwater)	7,600,000	33%	3,824,700	2.50%	2,000	20	21	-	-	-	-	-	-	-	-	-
	* f) Simpson Springs	4,776,000	33%	2,403,522	2.50%		20	21	-	-	-	-	-	-	-	-	-
	*** g) Low Pressure Treatment @ Wye	11,000,000	33%	4,083,750	2.50%	100,000	20	5	-	-	-	-	375,102	377,930	380,829	383,801	386,847
	*** h) Low Pressure Treatment @ Turner	9,900,000	33%	4,083,750	2.50%	41,000	20	10	-	-	-	-	-	-	-	-	-
	*** i) Low Pressure Treatment @ Spur	7,600,000	33%	3,824,700	2.50%	5,000	20	21	-	-	-	-	-	-	-	-	-
	j) Undefined Project	-	33%	-	2.50%	-	20	21	-	-	-	-	-	-	-	-	-
	Scenario E (with f,g, &h)								78,763	78,763	78,763	78,763	453,865	620,947	623,266	625,643	628,080
	Scenario A (without f,g &h)								78,763	78,763	78,763	78,763	78,763	243,017	242,437	241,842	241,233
3.	Miscellaneous City Projects																
	a) WTP Storage Bldg.	25,000	50%	12,813	2.50%		1	1	13,133	-	-	-	-	-	-	-	-
	b) Backwash Reuse	80,000	50%	42,000	2.50%		1	2	-	43,050	-	-	-	-	-	-	-
	c) Chlorine Generators	700,000	50%	358,750	2.50%		15	1	28,975	28,975	28,975	28,975	28,975	28,975	28,975	28,975	28,975
	d) Pope 1 Sanitary Seal	110,000	50%	60,500	2.50%		1	4	-	-	-	62,013	-	-	-	-	-
	e) Chemical Storage Bldg.	30,000	50%	15,750	2.50%		1	2	-	16,144	-	-	-	-	-	-	-
	f) Equipment Addition	225,000	50%	123,750	2.50%		2	4	-	-	-	64,205	64,205	-	-	-	-
	g) Painting of 2 tanks	230,000	50%	143,750	2.50%		10	10	-	-	-	-	-	-	-	-	-
	h) 2007 Large meter replacement	134,000	33%	45,326	2.50%		20	1	2,908	2,908	2,908	2,908	2,908	2,908	2,908	2,908	2,908
	i) Short-term WTP improvements (Burns/Mack)	2,565,000	50%	1,539,000	2.50%		20	8	-	-	-	-	-	-	-	98,722	98,722
	j) Undefined Project	-	50%	-	2.50%		5	21	-	-	-	-	-	-	-	-	-
									45,015	91,076	31,882	158,100	96,087	31,882	31,882	130,605	130,605

* Drop for no supply development (Budget Scenarios B and D)
** Drop for no low priority projects (Budget Scenario C)
*** Added to Budget Scenario E only

Note: the financed capital is increased by the inflation factor to the year of implementation.

Supply Improvements detail sheet a	10 2015 2016	11 2016 2017	12 2017 2018	13 2018 2019	14 2019 2020	15 2020 2021	16 2021 2022	17 2022 2023	18 2023 2024	19 2024 2025	20 2025 2026	unsched.
1. Resource Protection												
a) Homeland security	32,002	32,802	33,622	34,463	35,324	36,207	37,113	38,040	38,991	39,966	40,965	-
b) Well-head and aquifer protection	25,602	26,242	26,898	27,570	28,259	28,966	29,690	30,432	31,193	31,973	32,772	-
c) Watershed protection	12,801	13,121	13,449	13,785	14,130	14,483	14,845	15,216	15,597	15,987	16,386	-
d) Water rights (Monolith)	57,604	59,044	60,520	62,033	63,584	65,173	66,803	68,473	70,185	71,939	73,738	-
e) Dowlin Ditch Rights	14,593	14,958	15,332	15,715	16,108	16,511	16,923	17,346	17,780	18,225	18,680	-
** f) Goforth Reservoir (drop for C)	19,302	19,302	19,302	19,302	19,302	19,302	19,302	19,302	19,302	19,302	19,302	146,647
** g) 5 Mile/Harney Creek Rehab. (drop for C)	-	-	-	-	-	20,636	20,636	20,636	20,636	20,636	20,636	90,303
h) Undefined Project												
	161,903	165,468	169,122	172,868	176,707	201,278	205,312	209,446	213,684	218,027	222,480	236,950
2. Future Supply Development												
* a) City Springs/Turner Wells/ASR	78,763	78,763	78,763	78,763	78,763	78,763	78,763	78,763	78,763	78,763	78,763	61,392
b) River Pipeline	161,846	161,206	160,550	159,877	159,188	158,482	157,757	157,015	156,254	155,475	154,675	876,645
c) WTP replacement	-	-	-	-	-	-	-	-	-	-	-	14,411,250
* d) WTP Booster Station	-	-	-	-	-	-	-	-	-	-	-	1,585,238
* e) Raw Water Distribution (Parks - Groundwater)	-	-	-	-	-	-	-	-	-	-	-	4,015,935
* f) Simpson Springs	-	-	-	-	-	-	-	-	-	-	-	2,523,698
*** g) Low Pressure Treatment @ Wye	389,969	393,170	396,450	399,812	403,258	406,791	410,411	414,123	417,927	421,826	425,822	1,020,938
*** h) Low Pressure Treatment @ Turner	314,444	315,756	317,101	318,480	319,893	321,341	322,826	324,347	325,907	327,505	329,144	2,041,875
*** i) Low Pressure Treatment @ Spur	-	-	-	-	-	-	-	-	-	-	-	4,015,935
j) Undefined Project	-	-	-	-	-	-	-	-	-	-	-	-
Scenario E (with f,g, &h)	945,022	948,895	952,864	956,932	961,102	965,376	969,757	974,248	978,851	983,569	988,405	30,552,905
Scenario A (without f,g &h)	240,609	239,969	239,313	238,640	237,951	237,244	236,520	235,778	235,017	234,237	233,438	23,474,158
3. Miscellaneous City Projects												
a) WTP Storage Bldg.	-	-	-	-	-	-	-	-	-	-	-	-
b) Backwash Reuse	-	-	-	-	-	-	-	-	-	-	-	-
c) Chlorine Generators	28,975	28,975	28,975	28,975	28,975	28,975	-	-	-	-	-	-
d) Pope 1 Sanitary Seal	-	-	-	-	-	-	-	-	-	-	-	-
e) Chemical Storage Bldg.	-	-	-	-	-	-	-	-	-	-	-	-
f) Equipment Addition	-	-	-	-	-	-	-	-	-	-	-	-
g) Painting of 2 tanks	16,425	16,425	16,425	16,425	16,425	16,425	16,425	16,425	16,425	16,425	-	-
h) 2007 Large meter replacement	2,908	2,908	2,908	2,908	2,908	2,908	2,908	2,908	2,908	2,908	2,908	2,908
i) Short-term WTP improvements (Burns/Mack)	98,722	98,722	98,722	98,722	98,722	98,722	98,722	98,722	98,722	98,722	98,722	98,722
j) Undefined Project	-	-	-	-	-	-	-	-	-	-	-	-
	147,030	147,030	147,030	147,030	147,030	147,030	118,055	118,055	118,055	118,055	101,630	101,630

* Drop for no supply development (Budget Scenarios B a
** Drop for no low priority projects (Budget Scenario C)
*** Added to Budget Scenario E only

Note: the financed capital is increased by the inflat

Distribution Improvements
detail sheet b

		financed base cost	term % City	capital	years	start		1 2006 2007	2 2007 2008	3 2008 2009	4 2009 2010	5 2010 2011	6 2011 2012	7 2012 2013	8 2013 2014	9 2014 2015	10 2015 2016	11 2016 2017
1 Capital Improvements needed to meet zone1/zone2 needs																		
a) Peak hour upgrades		15,200,000	50%	8,550,000	20	5	2.50%			0	0	0	0	427,500	427,500	427,500	427,500	427,500
b) Fire suppression upgrades (drop for budget scenario C)	**	9,000,000	50%	5,062,500	20	5	2.50%			0	0	0	0	253,125	253,125	253,125	253,125	253,125
c) Unspecified Project		-	0%	-	20	1	2.50%			0	0	0	0	0	0	0	0	0
Total for Zone1/zone2 Upgrade (Master Plan II-1)		24,200,000		13,612,500						0	0	0	0	680,625	680,625	680,625	680,625	680,625
Total (scenario C only)										0	0	0	0	427,500	427,500	427,500	427,500	427,500
2 Replacement Program					years													
a) Transmission Mains (30 mi) (drop for C)	**	-	33%	-	50	41	2.50%			0	0	0	0	0	0	0	0	0
b) Distribution Lines-high priority (1)		5,060,000	100%	5,313,000	6	2	2.50%			300,000	964,575	964,575	964,575	964,575	964,575	964,575	0	0
c) medium priority (2)		10,900,000	100%	13,080,000	6	8	2.50%			0	0	0	0	0	0	0	2,374,674	2,374,674
d) lower priority (3) (drop for C)	**	13,800,000	100%	18,630,000	7	14	2.50%			0	0	0	0	0	0	0	0	0
e) Tanks (drop for C)	**	-	33%	-	30	31	2.50%			0	0	0	0	0	0	0	0	0
f) Pumps and Equipment (drop for C)	**	-	33%	-	30	21	2.50%			0	0	0	0	0	0	0	0	0
Total for Replacement Program (Master Plan II-2)		29,760,000		37,023,000		300,000	964,575			964,575	964,575	964,575	964,575	964,575	2,374,674	2,374,674	2,374,674	2,374,674
Total Replace (scenario C only)						300,000	964,575			964,575	964,575	964,575	964,575	964,575	2,374,674	2,374,674	2,374,674	2,374,674

** Drop for no low priority projects (Budget Scenario C)

Note: the financed capital is increased by the inflation factor to the year of implementation.

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		continued	continued	continued	continued	continued	continued	continued	continued	continued	continued	12 2017 2018	13 2018 2019	14 2019 2020	15 2020 2021	16 2021 2022	17 2022 2023	18 2023 2024	19 2024 2025	20 2025 2026	unsched.
Capital Improvements needed to meet zone1/zone2 needs																					
Peak hour upgrades												427,500	427,500	427,500	427,500	427,500	427,500	427,500	427,500	427,500	2,418,385
Fire suppression upgrades (drop for C)	**											253,125	253,125	253,125	253,125	253,125	253,125	253,125	253,125	253,125	1,431,939
Unspecified Project												0	0	0	0	0	0	0	0	0	0
Total for Zone1/zone2 Upgrade (Master Plan II-1)												680,625	680,625	680,625	680,625	680,625	680,625	680,625	680,625	680,625	3,850,324
Total (scenario C only)												427,500	427,500	427,500	427,500	427,500	427,500	427,500	427,500	427,500	2,418,385
Replacement Program																					
1 Transmission Mains (30 mi) (drop for C)	**											0	0	0	0	0	0	0	0	0	0
2 Distribution Lines-high priority												0	0	0	0	0	0	0	0	0	0
medium priority												2,374,674	2,374,674	0	0	0	0	0	0	0	0
low priority (drop for C)	**											0	0	2,934,140	2,934,140	2,934,140	2,934,140	2,934,140	2,934,140	2,934,140	3,760,529
3 Tanks (drop for C)	**											0	0	0	0	0	0	0	0	0	0
4 Pumps and Equipment (drop for C)	**											0	0	0	0	0	0	0	0	0	0
Total for Replacement Program (Master Plan II-2)												2,374,674	2,374,674	2,934,140	2,934,140	2,934,140	2,934,140	2,934,140	2,934,140	2,934,140	3,760,529
Total (scenario C only)												2,374,674	2,374,674	0	0	0	0	0	0	0	0

** Drop for no low priority projects (Budget Scenario C)

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Operating and Maintenance Expenses
detail sheet c

				2004 2005	2005 2006	1 2006 2007	2 2007 2008	3 2008 2009	4 2009 2010	5 2010 2011	6 2011 2012	7 2012 2013	8 2013 2014	9 2014 2015
1 Total Personnel (To Master Plan, III-1)				1,183,000	1,212,575	1,242,889	1,273,962	1,305,811	1,338,456	1,371,917	1,406,215	1,441,371	1,477,405	1,514,340
2 Contractual support (To Master Plan, III-2)				723,300	741,383	759,917	778,915	798,388	818,348	838,806	859,776	881,271	903,303	925,885
3 Materials/Supplies (To Master Plan, III-3)				592,000	606,800	621,970	637,519	653,457	669,794	686,539	703,702	721,295	739,327	757,810
4 Equipment/Cap. Replacement (To Master Plan, III-4)				900,540	923,054	946,130	969,783	994,028	1,018,878	1,044,350	1,070,459	1,097,221	1,124,651	1,152,767
Existing Capital Obligations (Interest/Principal)	start	through	$M											
– Refunding water bonds: $3.59M - (230k/yr)	pre-2006	2008	3.59	230,000	230,000	230,000	230,000	-	-	-	-	-	-	-
– WWDC: $1.668M @2.5% (150k/yr)	pre-2006	2020	1.668	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000	150,000
– WWDC: $0.884M @4.0% (76k/yr)	pre-2006	2020	0.884	76,000	76,000	76,000	76,000	76,000	76,000	76,000	76,000	76,000	76,000	76,000
– WWDC: $1.814M @7.5% (153k/yr)	pre-2006	2022	1.814	153,000	153,000	153,000	153,000	153,000	153,000	153,000	153,000	153,000	153,000	153,000
– WWDC: $0.632M @4.0% (57k/yr)	pre-2006	2019	0.632	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000	57,000
– Sun Trust: $2.41M @3.99% (541k/yr)	pre-2006	2009	2.41	541,000	541,000	541,000	541,000	541,000	-	-	-	-	-	-
– Misc. Obligations[1]: $1.84M equiv. @4% (148k/yr)	pre-2006	2100	1.84	148,000	148,000	148,000	151,700	155,493	159,380	163,364	167,448	171,635	175,925	180,324
5 Total Existing Water Debt.			12.838	1,355,000	1,355,000	1,355,000	1,358,700	1,132,493	595,380	599,364	603,448	607,635	611,925	616,324
6 Qualserve Improvements	25000	/year				25,000	25,625	26,266	26,922	27,595	28,285	28,992	29,717	30,460
7 Total O&M (Lines 1 through 6)				4,753,840	4,838,811	4,950,906	5,044,504	4,910,442	4,467,778	4,568,572	4,671,886	4,777,783	4,886,328	4,997,586
– Proposed New Obligations (sum of new financed projects as occurring)						664,683	1,378,174	1,321,906	1,451,123	2,405,516	2,511,544	2,517,094	3,952,182	3,958,012

Proposed new water Debt is handled within the cost distribution for each project.

				10 2015 2016	11 2016 2017	12 2017 2018	13 2018 2019	14 2019 2020	15 2020 2021	16 2021 2022	17 2022 2023	18 2023 2024	19 2024 2025	20 2025 2026
continued	continued	continued	continued	continued	continued	continued	continued							
1 Total Personnel (To Master Plan, III-1)				1,552,199	1,591,003	1,630,779	1,671,548	1,713,337	1,756,170	1,800,074	1,845,076	1,891,203	1,938,483	1,986,945
2 Contractual support (To Master Plan, III-2)				949,032	972,758	997,077	1,022,004	1,047,554	1,073,743	1,100,586	1,128,101	1,156,304	1,185,211	1,214,842
3 Materials/Supplies (To Master Plan, III-3)				776,755	796,174	816,079	836,481	857,393	878,827	900,798	923,318	946,401	970,061	994,312
4 Equipment/Cap. Replacement (To Master Plan, III-4)				1,181,587	1,211,126	1,241,404	1,272,439	1,304,250	1,336,857	1,370,278	1,404,535	1,439,648	1,475,640	1,512,531
Existing Capital Obligations (Interest/Principal)	start	through												
– Refunding water bonds: $3.59M - (230k/yr)	pre-2006	2008		-	-	-	-	-	-	-	-	-	-	-
– WWDC: $1.668M @2.5% (150k/yr)	pre-2006	2020		150,000	150,000	150,000	150,000	150,000	-	-	-	-	-	-
– WWDC: $0.884M @4.0% (76k/yr)	pre-2006	2020		76,000	76,000	76,000	76,000	76,000	-	-	-	-	-	-
– WWDC: $1.814M @7.5% (153k/yr)	pre-2006	2022		153,000	153,000	153,000	153,000	153,000	153,000	153,000	-	-	-	-
– WWDC: $0.632M @4.0% (57k/yr)	pre-2006	2019		57,000	57,000	57,000	57,000	-	-	-	-	-	-	-
– Sun Trust: $2.41M @3.99% (541k/yr)	pre-2006	2009		-	-	-	-	-	-	-	-	-	-	-
– Misc. Obligations[1]: $1.84M equiv. @4% (148k/yr)	pre-2006	2100		184,832	189,453	194,189	199,044	204,020	209,120	214,348	219,707	225,200	230,829	236,600
5 Total Existing Water Debt.				620,832	625,453	630,189	635,044	583,020	362,120	367,348	219,707	225,200	230,829	236,600
6 Qualserve Improvements	25000	/year		31,222	32,002	32,802	33,622	34,463	35,324	36,207	37,113	38,040	38,991	39,966
7 Total O&M (Lines 1 through 6)				5,111,626	5,228,517	5,348,329	5,471,138	5,540,016	5,443,042	5,575,293	5,557,850	5,696,796	5,839,216	5,985,196
– Proposed New Obligations (sum of new financed projects as occurring)				5,016,512	5,023,949	5,031,573	5,039,386	5,606,862	5,635,707	5,615,147	5,623,772	5,632,612	5,641,674	5,634,537

Proposed new water Debt is handled within the cost distribution for each project.

Note 1: Miscellaneous obligations are derived from the difference between the defined obligations and the total reported Capital Obligation payment for 2005. It includes unspecified lease and small loan obligations that are assumed to be of a revolving nature, not expected to change significantly over the planning horizon. This obligation is increased by the inflation factor since it is rotating.

Analysis and Projection of Water System Incomes			1	2	3	4	5	6	7	8	9	10	11	12
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Rate/1000 gal. (infl. adj.)	2.14	2.14	2.21	2.27	2.32	2.38	2.44	2.50	2.56	2.63	2.69	2.76	2.83	2.90
Number of Services[1]	7,938	8,008	8,077	8,147	8,216	8,286	8,347	8,408	8,469	8,530	8,591	8,650	8,710	8,768
1 Sale of Water[2]	2,114,787	2,133,307	2,222,214	2,297,448	2,374,978	2,454,948	2,534,865	2,617,242	2,702,239	2,789,763	2,879,975	2,972,227	3,067,384	3,165,347
2 Monthly Tap Service Fee[3]	1,203,241	1,254,842	1,308,558	1,352,859	1,398,513	1,445,604	1,492,663	1,541,172	1,591,222	1,642,761	1,695,882	1,750,205	1,806,239	1,863,925
3 Water Main Replacement Assessment	364,619	441,374	456,336	471,785	487,706	504,128	520,539	537,456	554,910	572,883	591,408	610,352	629,893	650,010
4 New Service Impact Fees (Plant Investment)[4]	212,000	210,007	215,257	221,477	226,154	231,808	208,693	213,911	220,208	224,740	230,359	227,940	234,686	239,480
5 Extra Income such as gen. tax fund 0		0	0	0	0	0	0	0	0	0	0	0	0	0
6 TOTAL INCOME (Taken to Master Plan IV-1)	3,894,647	4,039,530	4,202,365	4,343,570	4,487,351	4,636,489	4,756,761	4,909,780	5,068,579	5,230,147	5,397,624	5,560,724	5,738,203	5,918,761
6A Income using Scenario A rates			6,173,966	6,227,305	6,437,453	6,654,216	6,870,831	7,094,119	7,324,505	7,561,742	7,806,263	8,056,315	8,314,243	8,579,773
6B Income using Scenario B rates			6,401,818	6,561,864	6,725,910	6,894,058	7,066,410	7,243,070	7,424,147	7,609,750	7,799,994	7,994,994	8,194,869	8,399,740
6C Income using Scenario C rates			5,114,675	5,287,834	5,466,278	5,650,340	5,834,276	6,023,878	6,219,507	6,420,954	6,628,586	6,840,914	7,059,930	7,285,402
6D Income using Scenario D rates			5,966,040	6,168,022	6,376,170	6,590,869	6,805,423	7,026,584	7,254,777	7,489,756	7,731,949	7,979,621	8,235,093	8,498,096
6E Income using Scenario E rates			6,384,510	6,600,659	6,823,406	7,053,165	7,282,768	7,519,442	7,763,641	8,015,101	8,274,283	8,539,326	8,812,718	9,094,168

continued continued continued continued continued	13	14	15	16	17	18	19	20
	2018	2019	2020	2021	2022	2023	2024	2025
	2019	2020	2021	2022	2023	2024	2025	2026
Rate/1000 gal. (infl. adj.)	2.97	3.05	3.12	3.20	3.28	3.36	3.45	3.53
Number of Services[1]	8,828	8,887	8,939	8,992	9,045	9,097	9,150	9,202
1 Sale of Water[2]	3,266,388	3,370,403	3,475,111	3,582,948	3,694,112	3,808,485	3,926,268	4,047,560
2 Monthly Tap Service Fee[3]	1,923,423	1,984,673	2,046,330	2,109,830	2,175,290	2,242,639	2,311,996	2,383,419
3 Water Main Replacement Assessment	670,759	692,118	713,620	735,765	758,593	782,079	806,266	831,174
4 New Service Impact Fees (Plant Investment)[4]	246,568	251,603	230,138	235,892	243,004	247,834	254,029	260,380
5 Extra Income such as gen. tax fund	0	0	0	0	0	0	0	0
6 TOTAL INCOME (Taken to Master Plan IV-1)	6,107,138	6,298,797	6,465,200	6,664,435	6,870,999	7,081,037	7,298,560	7,522,532
6A Income using Scenario A rates	8,853,649	9,135,584	9,419,398	9,711,694	10,013,009	10,323,020	10,642,274	10,971,039
6B Income using Scenario B rates	8,609,734	8,824,977	9,045,602	9,271,742	9,503,535	9,741,124	9,984,652	10,234,268
6C Income using Scenario C rates	7,517,960	7,757,361	7,998,358	8,246,557	8,502,415	8,765,657	9,036,748	9,315,914
6D Income using Scenario D rates	8,769,364	9,048,616	9,329,728	9,619,241	9,917,688	10,224,748	10,540,963	10,866,598
6E Income using Scenario E rates	9,384,464	9,683,303	9,984,133	10,293,952	10,613,333	10,941,931	11,280,326	11,628,801

	proposed monthly/tap	PIF impact	size factor
3/4"	13.14	3,021	
1"	22.09	5,045	1.7
1 1/2"	43.48	10,070	3.3
2"	70.39	16,112	5.3
3"	131.14	30,210	10.0
4"	218.78	50,350	16.7
6"	437.63	75,525	25.0
8"	699.94	134,267	44.4

apparent gal./month/tap average: 10,369

Scenario Calculations:	current		proposed		BASE	Scenario A	Scenario B	Scenario C	Scenario D	Scenario E	
	2005		2006		2.21	2.85	3.02	2.72	3.17	3.08	<--1st year water rate for inflation adjustment
rate/1000 gal.	2.14		2.21		2.83	3.67	3.89	3.50	4.08	3.96	<--average water rate for 20 years
water charge	22.19	58%	22.92	57%	29.33	38.07	40.34	36.26	42.32	41.10	<--average water charge
Tap Service Fees (3/4")	12.71	33%	13.14	33%	16.82	21.83	23.13	20.79	16.82	23.57	<--averageTap Service Fees (3/4")
Water Main Replacement Assessment	3.40	9%	4.08	10%	5.22	19.65	21.09	10.49	19.65	19.65	<--average Water Main Replacement Assessment
average bill (38.30 now)	38.30		40.14		51.38	79.55	84.55	67.55	78.79	84.32	<--average water bill for 20 years
			36.06		40.14	61.76	65.64	52.44	61.17	65.46	<--1st year water bill for inflation adjustment
					5,727,953	5,727,953	5,074,308	5,727,953	5,727,953	5,727,953	average income with current rates
						8,308,520	8,176,613	7,048,677	8,221,967	8,798,672	average income using Scenario Specific Rates
						8,273,632	8,194,869	7,025,446	8,194,869	8,769,672	Scenario average expense
						(2,545,679)	(3,120,561)	(1,297,493)	(2,466,916)	(3,041,720)	average deficit if rates are only increased with inflation.

Notes:

1 Number of services is based on the planned population divided by 3.78 persons per tap on average.
2 Water sale is the projected water use (population adjusted) times the rate (inflation adjusted).
3 Monthly tap service fee is the number of services times the monthly proposed fee.
4 New Service Impact or Plant Investment Fees are the number of calculated new services times the inflation-adjusted 3/4" impact fee.

BASE Scenario has the current rate structure only adjusted for inflation.
A Scenario A is the average rate required to pay for all the planned costs.
B Scenario B is the same as A except the population does not grow (It stays equal to year 1 population).
C Scenario C is the average rate required to pay for all high priority projects only.
D Scenario D is the same as A with conservation.
E Scenario E is the same as A with additional Groundwater Treatment projects.

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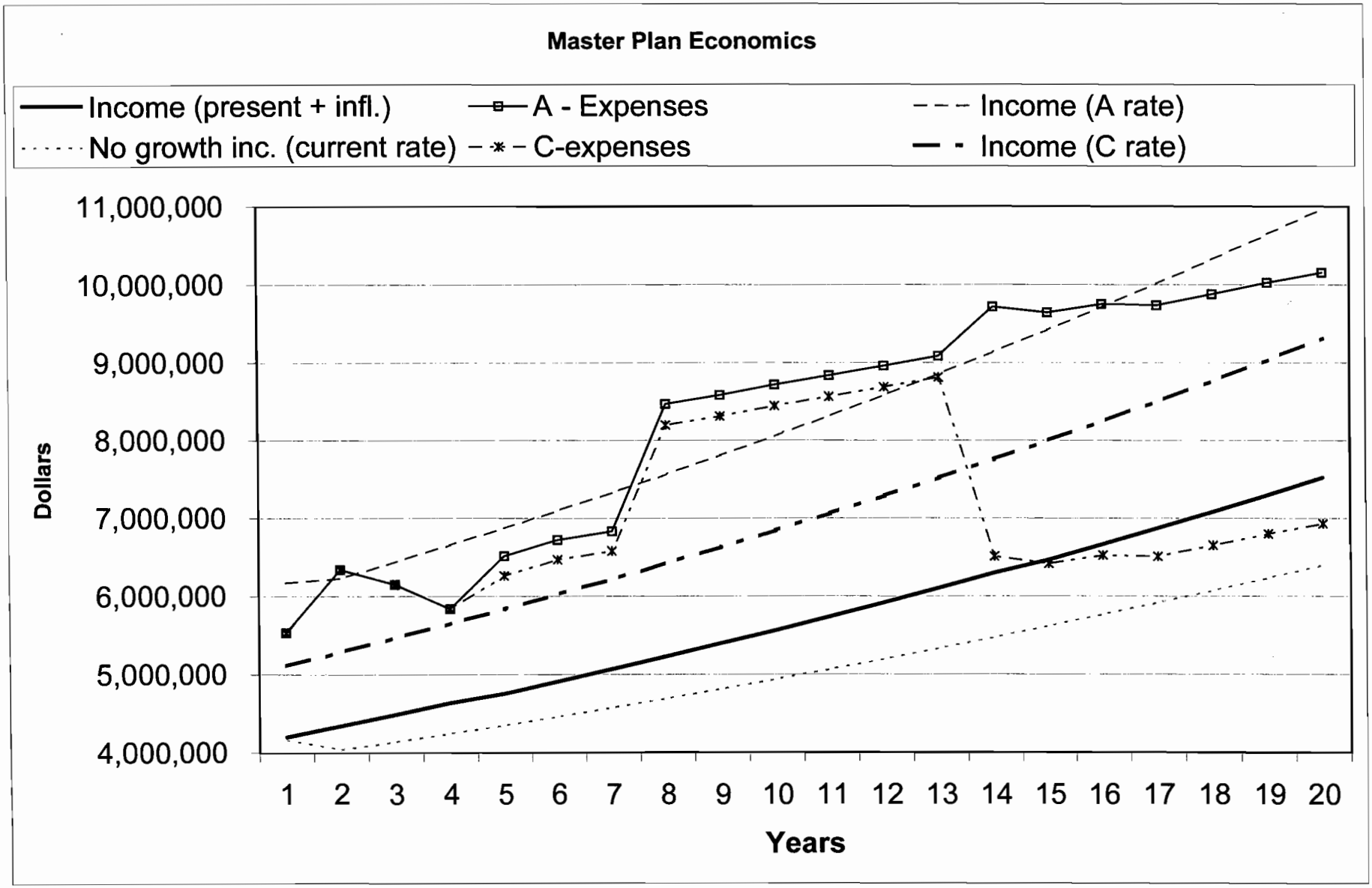
Master Plan Economics
Income (present + infl.)
A - Expenses
Income (A rate)
No growth inc. (current rate)
C-expenses
Income (C rate)
11,000,000
10,000,000
9,000,000
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
Dollars
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
Years

146-8

Master Plan Economics Graph

- Income (solid line) represents the current income along with projected growth and adjustment for inflation. It starts at the current income of slightly above 4 Million dollars per year and grows over 20 years to approximately 7.5 Million dollars per year, assuming all rates are adjusted annually for the 2.5% inflation rate.

- No Growth (small dashes) represents the projected income if there is no population growth during the planning horizon, but the income does increase with inflation. This scenario has a slight drop in income due to not realizing any new tap fees, and the total income after 20 years is projected to be about 6.4 Million dollars annually.

- Master Plan scenario A Expenses (boxed line) represents the projected expenses if all the planned system improvements are carried out. Note that some projects identified in the analysis have been assigned a tentative start date more than 20 years out, effectively removing them from the projected budget as outlined. The expenses projected on this graph are capitalized costs and reflect the estimated payment impact depending on the financing assumptions for the individual projects. The individual project start, financing assumptions, and inflation factors are shown on the detail sheets elsewhere in this Appendix.

- Master Plan scenario C Expenses (line with asterisks) is the projected annual expense level if only the high priority projects are undertaken. It is similar to scenario A except a series of identified lower priority projects are excluded from the expense stream and there is a drop in expenses after approximately 13 years.

- The A rate income (medium dashed line) is the estimated income stream if the rate structure is adjusted to a level where projected income balances the projected Master Plan scenario A expenses during the 20 year planning horizon.

- C rate income (heavy dashed line) is the equivalent projected income based on an estimated rate that balances the projected expenses for the Master Plan scenario C.