7. Future Groundwater Conditions

7.1. No Action Alternative

No significant changes to regional and local groundwater levels and aquifer systems are expected under the No Action Alternative if the dams and reservoirs are operated as they have been historically. If existing conditions change significantly – such as greatly lowered reservoir levels due to an extended drought period, or changes in the operational parameters of the dams and reservoirs, then significant changes to some of the local wells may occur. Any such changes to the local water levels and the potential impacts on nearby wells cannot be anticipated nor predicted.

7.2. Dam Removal Alternative

Based upon the characterization of the groundwater and well location, the impact to each well was estimated. The Table 7-1, Table 7-2, and Table 7-3 summarize an estimation of which wells are likely to be impacted and how much that impact might be. Additionally, the third table provides some estimate as to how much a well would have to be lowered if it is affected and the preferred mitigation action is to deepen, rehabilitate, or replace the well.

It does not appear that a significant number of private wells will be adversely impacted to any major degree. In most cases, the anticipated impacts will be negligible in the case of wells more than a ½ mile or more from the reservoir, or will only have minor lowering of the SWL in the wells to a new baseline elevation. It is not anticipated that the new baseline will be significantly below the old river channel bed – which is likely to be the new baseline once the reservoirs are drained.

In cases where a well is anticipated to experience significant drops in SWLs and the associated increased pumping heads (and costs associated with those increased pumping heads), one mitigation action would be to deepen an existing well, or replace it if deepening is not an option.

Table 7-1. Estimation of likelihood of impact to wells from removal of dams. Listing of all wells with reliable location data within 2.5 miles of a reservoir. Listing is grouped by reservoir and arranged from closest to furthest from the reservoir. Reason for the estimation is given under 'Comments'.

WELL ID	RESERVOIR				WELL				COMMENTS
	Reservoir	Distance to (ft)	Elevation (ft)	Bottom Elev. (ft) – ORC*	Bottom Elev. (ft)	1st Water Elev. (ft)	W.B. Zone Elev. (ft)	SWL Elev. (ft)	
311084	Iron Gate	544.6	2328.0	2165.0	2442.9	2544.9	2462.9	> 2442	Unlikely to be impacted: W.B. Zone, 1st water, and bottom of well all above reservoir's influence zone.
14918	Iron Gate	554.5	2328.0	2165.0	2169.4	2309.4	2309.4	2334.4	Likely to be impacted: W.B. Zone is near the top of the reservoir elevation; SWL is above reservoir elevation.
78652	Iron Gate	620.1	2328.0	2165.0	2269.0	2384.0	2384.0	2384.0	Unlikely to be significantly impacted: SWL and W.B. Zone are both above reservoir elevation, and well is upgradient to the reservoir.
4335	Iron Gate	712.0	2328.0	2165.0	2397.7	2437.7	2417.7	2417.7	Unlikely to be impacted: 1st water, SWL and W.B. Zone are all above the reservoir elevation.
334387	Iron Gate	866.2	2328.0	2165.0	2088.8			2218.8	Insufficient information: likely to be impacted due to proximity to reservoir
184187	Iron Gate	987.6	2328.0	2165.0	2421.9	2662.9	2432.9		Unlikely to be significantly impacted: bottom of well, 1st water, and SWL are all above the reservoir elevation
311078	Iron Gate	1095.9	2328.0	2165.0	2219.9	2337.9	2337.9		Likely to be impacted due to proximity to reservoir: 1st water and W.B. Zone are both just above reservoir elevation, well is upgradient to the reservoir.
333890	Iron Gate	1683.2	2328.0	2165.0	2100.7	2325.7	2161.7		Likely to be impacted due to proximity to reservoir: 1st water is below reservoir elevation, W.B. Zone is about the same as the ORC, well is upgradient to the reservoir.

WELL ID	RESERVOIR				WELL				COMMENTS
	Reservoir	Distance to (ft)	Elevation (ft)	Bottom Elev. (ft) – ORC*	Bottom Elev. (ft)	1st Water Elev. (ft)	W.B. Zone Elev. (ft)	SWL Elev. (ft)	
99852	Iron Gate	1735.6	2328.0	2165.0	2212.9	2512.9		2562.9	Insufficient information: likely to be impacted due to proximity of reservoir and well 311084
1087529	Iron Gate	2073.6	2328.0	2165.0	2512.8	2532.8			Insufficient information: unlikely to be significantly impacted due to 1st water and bottom of well both well above reservoir elevation.
781723	Iron Gate	3025.1	2328.0	2165.0	2081.0	2109.0	2136.0	2141.0	Unlikely to be impacted: SWL below ORC, over 1/2 mile downstream of dam, and adjacent to the river.
369526	Iron Gate	3376.1	2328.0	2165.0	2371.2	2466.2	2466.2	2541.2	Unlikely to be significantly impacted: SWL and W.B. Zone are both above reservoir elevation, well is over ½ mile from reservoir, and is upgradient to the reservoir.
414209	Iron Gate	3507.4	2328.0	2165.0	2624.8				Insufficient information: Unlikely to be significantly impacted due to proximity to 369526
99834	Iron Gate	3776.4	2328.0	2165.0	2123.7	2298.7	2167.7	2313.7	Unlikely to be significantly impacted: W.B. Zone is near the ORC; SWL is well above ORC and just below the reservoir elevation, and well is nearly ¾ mile from the reservoir. Reservoir is unlikely to be the major source of water for the well.
1075044	Iron Gate	5049.5	2328.0	2165.0	2555.2	2630.2	2630.2	2785.2	Unlikely to be impacted: SWL and W.B. Zone are both well about the reservoir elevation, and well is nearly 1 mile from the reservoir.
781725	Iron Gate	5262.7	2328.0	2165.0	2431.6	2576.6	2576.6	2644.6	Unlikely to be impacted: over 1 mile downstream of dam
781726	Iron Gate	5331.6	2328.0	2165.0	1930.8	2280.8	2280.8	2330.8	Unlikely to be impacted: over 1 mile downstream of dam

WELL ID	RESERVOIR				WELL				COMMENTS
	Reservoir	Distance to (ft)	Elevation (ft)	Bottom Elev. (ft) – ORC*	Bottom Elev. (ft)	1st Water Elev. (ft)	W.B. Zone Elev. (ft)	SWL Elev. (ft)	
1075458	Iron Gate	5479.3	2328.0	2165.0	2547.5	2607.5	2607.5	2637.5	Unlikely to be impacted: SWL and W.B. Zone are both well about the reservoir elevation, and well is over 1 mile from the reservoir.
1087565	Iron Gate	6942.6	2328.0	2165.0	2396.1	2576.1	2556.1	2576.1	Unlikely to be impacted: SWL and W.B. Zone are both well about the reservoir elevation, and well is over 1 mile from the reservoir.
134222	Iron Gate	7585.7	2328.0	2165.0	2321.5	2381.5	2381.5	2431.5	Unlikely to be impacted: over 1 mile downstream of dam
134223	Iron Gate	8199.2	2328.0	2165.0	1951.5			2421.5	Unlikely to be impacted: over 1 mile downstream of dam
134224	Iron Gate	8271.4	2328.0	2165.0	2361.5	2401.5	2401.5	2451.5	Unlikely to be impacted: over 1 mile downstream of dam
14912	Iron Gate	8904.6	2328.0	2165.0	2329.6	2364.6	2364.6	2379.6	Unlikely to be impacted: over 1 mile downstream of dam
14911	Iron Gate	9649.4	2328.0	2165.0	2269.6	2329.6	2329.6	2361.6	Unlikely to be impacted: over 1 mile downstream of dam
958105	Iron Gate	10499.2	2328.0	2165.0	2520.5	2627.5	2627.5	2772.5	Unlikely to be impacted: SWL and W.B. Zone are both well about the reservoir elevation, and well is over 2 miles from the reservoir.
70943	Copco	39.4	2602.0	2493.0	2539.5	2591.5		2608.5	Likely to be impacted: 1st water, SWL, and bottom of well are likely within the reservoir influence zone.
555722	Copco	55.8	2602.0	2493.0	2440.8			2584.8	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.
406066	Copco	85.3	2602.0	2493.0	2386.4	2506.4			Likely to be impacted: 1st water is likely within reservoir's influence zone and bottom of well is below ORC

WELL ID	RESERVOIR				WELL				COMMENTS
	Reservoir	Distance to (ft)	Elevation (ft)	Bottom Elev. (ft) – ORC*	Bottom Elev. (ft)	1st Water Elev. (ft)	W.B. Zone Elev. (ft)	SWL Elev. (ft)	
512954	Copco	98.4	2602.0	2493.0	2388.4			2563.4	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.
555712	Copco	154.2	2602.0	2493.0	2522.7			2562.7	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.
113378	Copco	160.8	2602.0	2493.0	2562.3	2588.3		2597.3	Likely to be impacted: 1st water, SWL, and bottom of well are likely within the reservoir influence zone.
93347	Copco	183.7	2602.0	2493.0	2545.4			2640.4	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.
406065	Copco	196.9	2602.0	2493.0	2457.6	2507.6		2597.6	Likely to be impacted: 1st water, SWL, and bottom of well are likely within the reservoir influence zone.
713255	Copco	196.9	2602.0	2493.0	2500.9			2564.9	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.
1075453	Copco	239.5	2602.0	2493.0	2490.4	2610.4		2655.4	Likely to be impacted: 1st water is likely within the reservoir influence zone and bottom of well is coincident with ORC.
750784	Copco	242.8	2602.0	2493.0	2176.3			2616.3	Likely to be impacted: bottom of well is below ORC and SWL is likely within reservoir's influence zone.
406993	Copco	259.2	2602.0	2493.0	2485.6			2507.6	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.
126312	Copco	272.3	2602.0	2493.0	2553.1			2596.1	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.

WELL ID	RESERVOIR				WELL				COMMENTS
	Reservoir	Distance to (ft)	Elevation (ft)	Bottom Elev. (ft) – ORC*	Bottom Elev. (ft)	1st Water Elev. (ft)	W.B. Zone Elev. (ft)	SWL Elev. (ft)	
1075456	Copco	420.0	2602.0	2493.0	2232.6	2532.6		2607.6	Likely to be impacted: 1st water and SWL are likely within reservoir's influence zone, and bottom of well is below ORC.
781717	Copco	429.8	2602.0	2493.0	2188.1	2582.1		2439.1	Unlikely to be significantly impacted: SWL is already below the ORC.
1089469	Copco	547.9	2602.0	2493.0	2377.8	2477.8		2637.8	Likely to be impacted: 1st water and bottom of well are likely within the reservoir influence zone.
824871	Copco	1148.4	2602.0	2493.0	2571.5	2635.5		2730.5	Unlikely to be significantly impacted: 1st water and SWL are above the reservoir elevation, well is located near a tributary drainage channel.
50076	Copco	1335.4	2602.0	2493.0	2607.5	2615.5	2625.5	2635.5	Unlikely to be significantly impacted: 1st water, SWL, and W.B. Zone are all above the reservoir elevation, well is located near a tributary drainage channel.
784332	Copco	2004.7	2602.0	2493.0	2522.6	2526.6		2659.6	Likely to be slightly impacted: 1st water and bottom of well are both below the reservoir elevation, well is located in a tributary drainage channel.
784331	Copco	2142.5	2602.0	2493.0	2578.0	2666.0		2678.0	Unlikely to be significantly impacted: 1st water and SWL are both above the reservoir elevation, well is located in a tributary drainage channel.
783919	Copco	5327.1	2602.0	2493.0	2686.8			2846.8	Unlikely to be impacted: bottom of well and SWL are both well above the reservoir elevation, and well is over 1 mile away.
1075033	Copco	6276.6	2602.0	2493.0	2867.9	2945.9		2977.9	Unlikely to be impacted: bottom of well and SWL are both well above the reservoir elevation, and well is over 1 mile away.

WELL ID	RESERVOIR				WELL				COMMENTS
	Reservoir	Distance to (ft)	Elevation (ft)	Bottom Elev. (ft) – ORC*	Bottom Elev. (ft)	1st Water Elev. (ft)	W.B. Zone Elev. (ft)	SWL Elev. (ft)	
54713	J.C. Boyle	29.5	3787.0	3720.0	3712.6			3776.8	Likely to be impacted: proximity to reservoir, and similarity between SWL and reservoir elevation; SWL unlikely to decline below ORC.
54714	J.C. Boyle	62.3	3787.0	3720.0	3725.9				Insufficient information: Likely to be impacted due to proximity to 54713
54615	J.C. Boyle	65.6	3787.0	3720.0	3656.4				Insufficient information: Likely to be impacted due to proximity to 54713
13668	J.C. Boyle	183.7	3787.0	3720.0	3630.0	3655.0	3655.0	3690.0	Unlikely to be significantly impacted; SWL below ORC
51633	J.C. Boyle	203.4	3787.0	3720.0	3512.0	3701.0	3701.0	3701.0	Unlikely to be significantly impacted; SWL below ORC
54618	J.C. Boyle	278.9	3787.0	3720.0	3707.8				Insufficient information: Likely to be impacted due to proximity to 54713
14002	J.C. Boyle	2706.8	3787.0	3720.0	3638.0	3695.0	3695.0	3698.0	Unlikely to be impacted: 1st water, water bearing zone, and SWL are all below the lowest ORC; and the well is downstream of the dam.
13628	J.C. Boyle	2884.0	3787.0	3720.0	3644.0	3675.0	3675.0	3681.0	Unlikely to be impacted: 1st water, water bearing zone, and SWL are all below the lowest ORC; and the well is downstream of the dam.
10514	J.C. Boyle	4721.4	3787.0	3720.0	3561.0	3634.0	3646.0	3687.0	Unlikely to be impacted: SWL is below the lowest ORC, and the well is just under 1 mile away from the reservoir.
10059	J.C. Boyle	5518.6	3787.0	3720.0	3627.0	3831.0	3705.0	3686.0	Unlikely to be impacted: SWL is below the lowest ORC, and the well is over 1 mile away from the reservoir.

ORC – Elevation of **O**riginal **R**iver **C**hannel bed at the location of the dam

Table 7-2. Estimation of the amount of impact to wells within 2.5 miles of a reservoir, and an estimation of the amount of additional depth each well would have to be extended to in order to reasonably reach a reliable water supply. Wells estimated unlikely to be estimated in Table 7-1are not carried through to Table 7-2.

WELL ID	RESERVOIR			WELL			COMMENTS	IMPACT CATEGORY[1]
	Reservoir	Distance to (ft)	Bottom Elev. (ft) – ORC*	Bottom Elev. (ft)	Additional Drilling (ft)*	Replacement Drilling (ft)		
14918	Iron Gate	554.5	2165.0	2169.4	75	235	Likely to be impacted: W.B. Zone is near the top of the reservoir elevation; SWL is above reservoir elevation. Gradient is towards the reservoir.	IC-1
78652	Iron Gate	620.1	2165.0	2269.0	N/C	140	Unlikely to be significantly impacted: SWL and W.B. Zone are both above reservoir elevation, and well is upgradient to the reservoir	IC-2
334387	Iron Gate	866.2	2165.0	2088.8	N/A	420	Insufficient information: likely to be impacted due to proximity to reservoir. Gradient is away from the reservoir.	IC-3
184187	Iron Gate	987.6	2165.0	2421.9	N/C	291	Unlikely to be significantly impacted: bottom of well, 1st water, and SWL are all above the reservoir elevation. Gradient is towards the reservoir.	IC-2
311078	Iron Gate	1095.9	2165.0	2219.9	130	376	Likely to be impacted due to proximity to reservoir: 1st water and W.B. Zone are both just above reservoir elevation, well is upgradient to the reservoir. Gradient is towards the reservoir.	IC-4
333890	Iron Gate	1683.2	2165.0	2100.7	10	281	Likely to be impacted due to proximity to reservoir: 1st water is below reservoir elevation, W.B. Zone is about the same as the ORC, well is upgradient to the reservoir. SWL N/R.	IC-4
99852	Iron Gate	1735.6	2165.0	2212.9	125	625	Insufficient information: likely to be impacted due to proximity of reservoir. SWL N/R.	IC-3

WELL ID	RESERVOIR			WELL			COMMENTS	IMPACT CATEGORY[1]
	Reservoir	Distance to (ft)	Bottom Elev. (ft) – ORC*	Bottom Elev. (ft)	Additional Drilling (ft)*	Replacement Drilling (ft)		
1087529	Iron Gate	2073.6	2165.0	2512.8	N/C	200	Insufficient information: unlikely to be significantly impacted due to 1st water and bottom of well both well above reservoir elevation. SWL N/R, gradient likely towards the reservoir or similar to the local/regional gradient.	IC-1
70943	Copco	39.4	2493.0	2539.5	120***	210	Likely to be impacted: 1st water, SWL, and bottom of well are likely within the reservoir influence zone.	IC-4
555722	Copco	55.8	2493.0	2440.8	25	209	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone. Gradient is towards reservoir	IC-4
406066	Copco	85.3	2493.0	2386.4	N/A	300	Likely to be impacted: 1st water is likely within reservoir's influence zone and bottom of well is below ORC. SWL N/R. Gradient likely away from reservoir.	IC-4
512954	Copco	98.4	2493.0	2388.4	N/A	384	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.	IC-4
555712	Copco	154.2	2493.0	2522.7	80***	300	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.	IC-4
113378	Copco	160.8	2493.0	2562.3	145***	220	Likely to be impacted: 1st water, SWL, and bottom of well are likely within the reservoir influence zone.	IC-4
93347	Copco	183.7	2493.0	2545.4	100	210	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.	IC-4
406065	Copco	196.9	2493.0	2457.6	40	240	Likely to be impacted: 1st water, SWL, and bottom of well are likely within the reservoir influence zone.	IC-4
713255	Copco	196.9	2493.0	2500.9	75	199	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.	IC-4

WELL ID	RESERVOIR			WELL			COMMENTS	IMPACT CATEGORY[1]
	Reservoir	Distance to (ft)	Bottom Elev. (ft) – ORC*	Bottom Elev. (ft)	Additional Drilling (ft)*	Replacement Drilling (ft)		
1075453	Copco	239.5	2493.0	2490.4	70***	270	Likely to be impacted: 1st water is likely within the reservoir influence zone and bottom of well is coincident with ORC.	IC-4
750784	Copco	242.8	2493.0	2176.3	N/A	510	Likely to be impacted: bottom of well is below ORC and SWL is likely within reservoir's influence zone.	IC-4
406993	Copco	259.2	2493.0	2485.6	65***	237	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.	IC-4
126312	Copco	272.3	2493.0	2553.1	135	218	Likely to be impacted: bottom of well and SWL are likely within reservoir's influence zone.	IC-4
1075456	Copco	420.0	2493.0	2232.6	N/A	425	Likely to be impacted: 1st water and SWL are likely within reservoir's influence zone, and bottom of well is below ORC.	IC-4
1089469	Copco	547.9	2493.0	2377.8	N/A	350	Likely to be impacted: 1st water and bottom of well are likely within the reservoir influence zone.	IC-4
784332	Copco	2004.7	2493.0	2522.6	100***	250	Likely to be slightly impacted: 1st water and bottom of well are both below the reservoir elevation, well is located in a tributary drainage channel.	IC-5
54713	J.C. Boyle	29.5	3720.0	3712.6	ABN	N/A	Likely to be impacted: proximity to reservoir, and similarity between SWL and reservoir elevation. Gradient is away from reservoir	IC-3
54714	J.C. Boyle	62.3	3720.0	3725.9	ABN	N/A	Insufficient information: Likely to be impacted due to proximity to 54713. SWL N/R.	IC-3
54615	J.C. Boyle	65.6	3720.0	3656.4	ABN	N/A	Insufficient information: Likely to be impacted due to proximity to 54713. SWL N/R	IC-3
13668	J.C. Boyle	183.7	3720.0	3630.0	N/A	180	Unlikely to be significantly impacted; SWL below ORC. Gradient is away from reservoir.	IC-5
51633	J.C. Boyle	203.4	3720.0	3512.0	ABN	N/A	Unlikely to be significantly impacted; SWL below ORC.	IC-5

WELL ID	RESERVOIR			WELL			COMMENTS	IMPACT CATEGORY[1]
	Reservoir	Distance to (ft)	Bottom Elev. (ft) – ORC*	Bottom Elev. (ft)	Additional Drilling (ft)*	Replacement Drilling (ft)		
54618	J.C. Boyle	278.9	3720.0	3707.8	ABN	N/A	Insufficient information: Likely to be impacted due to proximity to 54713	IC-3

* - Estimated by subtracting recorded drawdowns for wells with water bearing units at about the same elevation as the ORC from the ORC, and taking the difference between that value and the recorded bottom of the well, then adding 10 ft for a sump and rounding up to the next 10 ft increment. When no recorded drawdowns exist for wells with water bearing units at or about the elevation of the ORC, then a standard 70 feet was used [only one well remaining on the list for Iron Gate had a recorded drawdown – which was well 4335 @ 60 ft.]

** - N/A indicates that the bottom of the well is already more than 70 feet below the ORC, SWLs are not expected to drop significantly below the ORC so adequate saturated thickness will remain in the well. Pumping heads, and associated costs, will likely increase with a drop in SWLs. Insufficient information is available to estimate the actual drops in SWLs and associated pumping costs. N/C indicates that the impact will likely not be significant, only relatively minor drops in SWL are expected in the well along with associated minor increase in pumping heads (and costs).

[1/] Description of each 'impact category' is included in Table 3-16 at the end of the chapter.

*** - Indicates that these wells are currently screened and will likely have to be screened when deepened. The remaining wells either are open (unscreened) wells or are unlikely to need to be deepened.

Table 7-3. Estimated drilling lengths and screen lengths and associated estimated costs (drilling costs do not include mobilization and demobilization costs, material costs, or development and testing costs). Wells estimated to be unlikely to need deepening or replacement on Table 7-1are not carried through to Table 7-3.

WELL ID	RESERVOIR	ADDITIONAL DRILLING (LF)	ADDITIONAL SCREEN (LF)	ESTIMATED DRILLING ASSUMPTIONS*	ESTIMATED DRILLING COSTS*
14918	Iron Gate	75	0	2 days @ 50 ft/day @ $3,600.00/day	$7,200
311078	Iron Gate	130	0	3 days @ 50 ft/day @ $3,600.00/day	$10,800
333890	Iron Gate	10	0	1 day @ 50 ft/day @ $3,600.00/day	$3,600
99852	Iron Gate	125	0	3 days @ 50 ft/day @ $3,600.00/day	$10,800
70943	Copco	90 + 120	15 + 120	5 days @ 50 ft/day @ $3,600.00/day**	$18,000
555722	Copco	25	0	1day @ 50 ft/day @ $3,600.00/day	$3,600
555712	Copco	220 + 80	120 + 80	4 days @ 50 ft/day @ $3,600.00/day**	$14,400
113378	Copco	75 + 145	60 + 145	5 days @ 50 ft/day @ $3,600.00/day**	$18,000
93347	Copco	100	0	2 days @ 50 ft/day @ $3,600.00/day	$7,200
406065	Copco	40	0	1 day @ 50 ft/day @ $3,600.00/day	$3,600
713255	Copco	75	0	2 days @ 50 ft/day @ $3,600.00/day	$7,200
1075453	Copco	200 + 70	150 + 70	4 days @ 50 ft/day @ $3,600.00/day**	$14,400
406993	Copco	172 + 65	20 + 65	4 days @ 50 ft/day @ $3,600.00/day**	$14,400
126312	Copco	135	0	3 days @ 50 ft/day @ $3,600.00/day	$10,800
784332	Copco	100	100	4 days @ 50 ft/day @ $3,600.00/day	$14,400
All Wells	- - -	- - -	- - -	15 days @ 1/2 day/well to pull pump + ½ day/well to reset pump	$54,000
TOTALS		**2052**	**945**	**59 days @ 50 ft/day**	**$212,400**

* - Assumptions: Actual costs will vary and will be greater once all un-included services are factored in

- Drill Rig: down-hole hammer, conservatively estimated at 50 ft/day for 'hard rock' such as competent basalt and lava, and un-decomposed granite.
- Material type: basalt and/or granite
- Drill hole diameter: 6 inch to 8 inch
- Existing well conditions: uncased, open hole
- Rig Time: $3,600.00/day includes rig and crew charges (under current economic conditions)
- Mobilization and demobilization: not included
- Casing and Screen costs: not included

Site Prep and Clean-up (as necessary): not included

Drilling durations are rounded up to next whole 'day'.

** - Includes 2 days to set screen.

NOTES:

- Air Rotary, with or without water/foam, would be about the same as the down-hole hammer under the same assumptions.
- Smaller diameter boreholes will decrease the advancement rate, conservatively estimated at 30 ft/day – primarily due to the reduced weight of the drill string reducing the impact of the hammer or the down-hole 'pressure' on the rotary drill bit.
- Cased and/or screened holes will either have to have the casing pulled, or drill a smaller diameter borehole below the casing/screen bottom. The bottom cap will have to be pulled or drilled through.
- Softer materials, such as sandstones, claystones, cinders, ash, clays, broken or decomposed hard rock will allow for higher advancement rates of up to 100+/- ft/day.

Table 7-4. Table of lithology abbreviations used in well logs.

Abbreviations:		
MATERIALS	COLORS	OTHERS
SDST = sandstone	brn = brown	decomp'd = decomposed
CLST = claystone	lt = light	fract'd = fractured
BRNST = brownstone	grn = green	interm't = intermittent
GRST = graystone	dk = dark	crs = coarse
SH = shale	brnsh = brownish	am't = amount
CGLT = conglomerate	grnsh = greenish	med = medium
BDRK = bedrock	blk = black	lgr = large
SPTN = serpentine		sm = small
SLT = silt		comp'd = compacted
MDST = mudstone		N/R = No Recovery, No Log, or illegible log

Table 7-5. Impact Category descriptions.

Impact Category:

Current elevation of reservoir forms a local 'base line'* that impacts the groundwater levels and gradients upgradient of the reservoir and within the immediate vicinity of the reservoir. When the reservoir is drained and the dam removed, the local base line will be re-established at the elevation of the river channel as it was prior to construction of the dam. Initially, gradients will increase sharply between a well upgradient of the existing reservoir and the new base line. Over time, the groundwater system will establish equilibrium with the new (pre-dam) base line. Water levels in the upgradient wells will likely drop by varying amounts depending on a number of conditions, including:

- Distance from the existing reservoir site,
- Elevation of the water bearing zone relative to existing reservoir water levels,
- Degree of hydraulic connectivity between the water bearing unit in the well and the units that daylight in the reservoir walls, and
- Degree of hydraulic connectivity between the reservoir and the units within the reservoir's zone of influence – both horizontally and vertically.

IC-0: *SWL above reservoir elevation; W.B. Zone above reservoir elevation; 1st water is below reservoir elevation; and/or gradient is towards the reservoir*. Water bearing units upgradient of, and higher in elevation than, the reservoir are unlikely currently being significantly influenced by the reservoir, and after the reservoir is removed are unlikely to experience significant changes in existing water levels. Reduction in the well's SWL of several feet might be expected.

IC-1: *SWL above reservoir elevation; W.B. Zone near reservoir elevation; 1st water is above reservoir elevation; and/or gradient is towards the reservoir*. Water bearing units upgradient of, and at about the same elevation as, the reservoir are likely

currently being influenced by the reservoir, and after the reservoir is removed are likely to experience significant changes in existing water levels. SWL in the well can be expected to drop. The SWL would be expected to drop to about the elevation of the nearest reach of the river channel. Regional gradient will likely keep the SWL above the base line.

IC-2: *SWL above reservoir elevation; W.B. Zone above reservoir elevation; 1st water is above reservoir elevation; and/or gradient is towards the reservoir*. Water bearing units upgradient of, and above the reservoir are unlikely currently being influenced by the reservoir, and after the reservoir is removed are unlikely to experience significant changes in existing water levels. SWL in the well can be expected to drop only a few feet at most as the local gradients adjust to the new base line.

IC-3: *SWL between reservoir elevation and ORC elevation.* Insufficient information, likely to be impacted due to elevation of SWL relative to the reservoir elevation, and proximity to the reservoir. SWL can be expected to drop to near or slightly below the ORC elevation.

IC-4: *SWL likely near reservoir elevation; W.B. Zone near reservoir elevation; 1st water near reservoir elevation; and/or gradient is away from the reservoir or flat*. Water bearing units at about the same elevation as the reservoir are likely currently being influenced by the reservoir, and after the reservoir is removed are likely to experience significant changes in existing water levels. SWL in the well can be expected to drop. The SWL would be expected to drop to about the elevation of the nearest reach of the river channel.

IC-5: *SWL below ORC, 1st Water below ORC, W.B. Zone below ORC, and/or gradient is away from reservoir.* SWL in well can be expected to decline slightly as the gradient between the reservoir zone and the well is reduced to the ORC elevation. The overall gradient would remain away from the reservoir.