

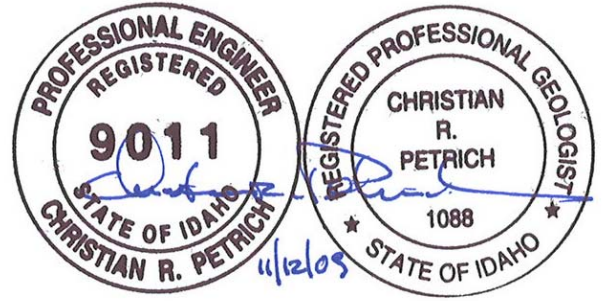
MEMORANDUM

DATE: November 12, 2009

TO: Ned Williamson, Esq., City of Hailey
Tom Hellen, P.E., City of Hailey

FROM: Christian Petrich, Ph.D., P.E., P.G.
Roxanne Brown

RE: *Response to questions regarding Quigley Green water issues*



The purpose of this memo is to respond to your questions of September 24, 2009 regarding Quigley Canyon Ranch water supply and Quigley Green water rights. The following paragraphs list general conclusions from our review of the City's questions, followed by more detailed responses beginning on page 3.

General Conclusions

1. Quigley Green appears to have sufficient water rights and available water supply to meet the projected demand under current Idaho Department of Water Resources (IDWR) management guidelines.
2. Quigley Creek flows above Quigley Reservoir were less than 2.28 cfs (the maximum diversion under water right 37-19736) during about 1/2 of the 2008 irrigation season and about 2/3 of the 2009 irrigation season. The lowest measured flow in Quigley Creek during the last 2 years was 1.4 cfs (measured on August 19, 2009). Based on the 2008-2009 irrigation-season flow data, low flows (e.g., 1.5 cfs or less) are likely during at least some years in the future. However, with supplemental ground water use this flow level is sufficient to meet Quigley Canyon Ranch irrigation needs.
3. To help compensate for low Quigley Creek flows, water can be drawn from storage in Quigley Reservoir during short-duration low-flow periods. The 30 acre feet of storage authorized under water rights 37-2784A and 37-7693¹ could provide a flow of 0.5 cfs for approximately 30 days or 0.25 cfs for approximately 60 days.²
4. It is unclear how conjunctive management will affect diversions under junior-priority surface and ground water rights held by Quigley Green (or junior-priority ground water rights held by the City of Hailey). It is highly unlikely that potable uses would be

¹ 35 acre feet of storage authorized under water right 37-8283 is limited to non-irrigation uses.

subject to curtailment under conjunctive management because potable uses generally are non-consumptive. However, it is conceivable that Quigley Green junior-priority surface and ground water irrigation rights could be subject to full or partial curtailment under conjunctive management *if* diversions under these rights are found to reduce flows in the Big Wood River during water-short periods. In this case, we believe that it is likely that regional mitigation plans, or mitigation plans for individual rights, could effectively protect junior-priority rights from actual curtailment. *If* irrigation diversions under junior-priority Quigley Green rights are found to be subject to curtailment, mitigation would be required for about 90 acres of irrigated land in Quigley Canyon Ranch.

5. Use of reclaimed City of Hailey municipal water would provide Quigley Canyon Ranch greater certainty of adequate supply in the event that mitigation is required. Reclaimed water would reduce Quigley Green surface and/or ground water use. Reclaimed water could be used as mitigation under conjunctive management (if mitigation is required) for junior-priority Quigley Green ground water rights. Reclaimed water could be used for winter snow-making when irrigation systems have been winterized.
6. The City also could use reclaimed water to irrigate existing City parks, common areas, or school grounds. If reclaimed water is used for City irrigation instead of the irrigation of Quigley Canyon Ranch land, the avoided cost to the City is the difference in cost between transmission to Quigley Canyon Ranch versus conveyance to other locations (i.e., the avoided cost is not the cost of a tertiary treatment facility).
7. We believe it is likely that water right 37-19736 will be decreed with an 1879 priority date.
8. The City and Quigley Green have discussed the possibility of using water right 37-19736 for mitigation of junior-priority City ground water rights. Because of the overlapping nature of Quigley Green surface and ground water rights, use of water right 37-19736 by the City for City mitigation would require non-use of a similar acreage of Quigley Green ground water rights. As such, use of water right 37-19736 for the mitigation of junior-priority City rights could result in insufficient irrigation water for Quigley Canyon Ranch (if Quigley Green ground water rights were also subject to curtailment under conjunctive management and if no other form of mitigation were available).
9. Reclaimed municipal water in a non-potable water system can be mixed with surface water (i.e., Quigley Creek) and ground water for irrigation purposes under certain conditions.

² This flow estimate neglects any pond evaporation and seepage, both of which would serve to lower the available rate and/or duration of flow in Quigley Creek.

Detailed Responses to City of Hailey Questions

1. What is the water budget/balance for the property?
2. What is the water budget/balance with a reclaimed water line providing up to 600,000 gallons per day?

SPF Water Engineering, LLC (SPF) prepared the following on-site water budgets to evaluate the (1) sufficiency of authorized diversion rates under existing water rights, (2) sufficiency of available surface water³, and (3) possible uses of City of Hailey reclaimed municipal water. The following pages (1) summarize projected water demand and water sources under existing Quigley Green water rights, (2) describe three water-budget scenarios with three water-availability conditions within each scenario, and (4) present a discussion of results.

Water for the proposed Quigley Canyon Ranch development will come from the City of Hailey municipal water system (for domestic and commercial potable uses), ground and surface water under existing Quigley Green water rights (for irrigation), and possibly reclaimed water from the City of Hailey water treatment system (for the irrigation of golf course land and common areas).

Projected Quigley Canyon Ranch water demands, based on information provided by ERO, are summarized in Table 1. ERO presented irrigation demands (Attachment A) based on maximum water right diversions (0.02 cfs/acre, or 1 miner's inch per acre), but has also indicated that a maximum diversion of 0.016 cfs/acre (0.8 miner's inches per acre) would be sufficient for Quigley Canyon Ranch irrigation needs.

The reasonably-anticipated irrigation demand can be evaluated using precipitation deficit⁴ data. The 20th-percentile exceedance precipitation deficits in June, July, and August for Picabo, Idaho (the closest weather station to Hailey) are 0.28, 0.27, and 0.25 linear inches per day, respectively (Table 2; Attachment B). The irrigation delivery rates needed to meet these deficits are 0.0167, 0.0162, and 0.0152 cfs/acre, respectively (assuming a 70-percent irrigation efficiency). ERO's projected irrigation demand of 0.016 cfs/acre is consistent with these precipitation deficit values.

³ Sufficiency of aquifers underlying the Quigley Canyon Ranch was not evaluated as part of this analysis; it was assumed that the ground water supply is sufficient for the intended needs.

⁴ *Precipitation deficit* is the difference between evapotranspiration and average precipitation; in other words, the precipitation deficit represents the average amount of water needed for irrigation.

Domestic, Commercial, and Snowmaking Demand	Annual Volume (af/yr)	Maximum-Day Demand (cfs)	Maximum-Day Demand (gpm)		
Domestic use (356 units @ 200gpd/unit)	79.75	0.32	144		
Commercial use	9.44	0.03	14		
Snowmaking	2	0.13	58		
Irrigation Demand	Annual Volume (af/yr)	Maximum-Day Demand (cfs)	Maximum-Day Demand (gpm)	Maximum-Day Demand (cfs)	Maximum-Day Demand (gpm)
Delivery rate →		(0.02 cfs/acre 1 miner's inch per acre)		(0.016 cfs/acre 0.8 miner's inch per acre)	
Golf course irrigation (120 acres)	420.00	2.40	1,077	1.92	862
Common space irrigation (18.7 acres)	65.45	0.37	166	0.30	134
Residential irrigation (45.3 acres)	158.55	0.91	408	0.72	325

Table 1: Summary of projected Quigley Canyon Ranch water demand.

A water budget was prepared for three scenarios that match irrigation demands with available surface water, ground water, and reclaimed City of Hailey municipal water sources. The scenarios illustrate the effects of different assumptions regarding the availability and use of reclaimed water and/or surface water. Domestic and commercial potable uses were excluded from the water budget because water for these uses will not come from on-site resources (domestic water will be provided by the City of Hailey municipal water system).

Month	Average Precipitation Deficit*		Estimated continuous diversion rate required to meet precipitation deficit (assuming 70% irrigation system efficiency)	
	(mm/day)	(in/day)	cfs/acre	Miner's inches per acre
Jun	7.05	0.28	0.017	0.83
July	6.84	0.27	0.016	0.81
August	6.45	0.25	0.015	0.76
* For irrigated turf, 20% exceedance, 7-day rolling average using 1971-2004 Picabo NWS NOAA weather data				

Table 2: Precipitation deficit and estimated diversion requirements for turf.

The water budget analysis focuses on maximum-day diversion rates. This is the only way of evaluating irrigation scenarios under late-season, low-flow conditions. The effect of low-flow conditions cannot be evaluated with a comparison of anticipated annual irrigation volumes with annual volume limits authorized under Quigley Green water rights.

The three water-budget scenarios consist of the following:

1. *No reclaimed water.* The first scenario is based on the use of on-site surface and ground water only; no use of reclaimed City of Hailey municipal water was assumed.
2. *Primary use of reclaimed water.* In this scenario it was assumed that 600,000 gallons per day (gpd) of reclaimed water is available to the Quigley Canyon Ranch development for irrigation purposes, and that the reclaimed water is used as a primary source of water for irrigation of the proposed golf course. Surface would also be used at the golf course for the area not irrigated with reclaimed water. Surface water with supplemental ground water would also be used to irrigate common space and residential areas.
3. *Use of water right 37-19736 for mitigation of City of Hailey irrigation use.* The City has discussed the possibility of using water right 37-19736 for possible mitigation of ground water use under City of Hailey junior-priority water rights. In this scenario, it was assumed that (a) both City of Hailey and Quigley Green junior-priority water rights require mitigation (or face curtailment if suitable mitigation is not provided), and (b) water from Quigley Creek would remain undiverted as mitigation for the use of City of Hailey junior-priority water rights.

Water use under existing water rights in the Quigley Canyon Ranch will depend, in part, on annual and seasonal water availability in Quigley Creek. Water use in Quigley Canyon Ranch may also be influenced by future conjunctive management. Consequently, we have defined three different, generalized conditions for each of the water-budget scenarios:

1. *Normal conditions.* These conditions are described by abundant flow in Quigley Creek and no constraints on the use of ground water. Abundant flow in Quigley Creek is defined for this analysis as a flow at or greater than 2.28 cfs.

Quigley Green water rights authorize surface water diversions up to 5.27 cfs when available (Table 3). However, updated 2008-2009 irrigation-season flow data⁵ indicate that Quigley Creek had flow in excess of 2.28 cfs only about half of the irrigation season in 2008 and in only the month of June in 2009.

⁵ Please see the response to Question 3, page 13.

Water Right No.	Source	Tributary to	Priority Date	Authorized Diversion Rate (cfs) ¹	Authorized Diversion Volume (af/y) ^{2,3}	Irrigated Area (acres) ⁴
37-2784A	Quigley Creek	Sinks	1/3/1967		16 (storage)	154.0
37-7693	Quigley Creek	Big Wood River	12/16/1977	5.27	30.0 (storage) 888.3 (irrigation)	300.0
37-8283	Quigley Creek	Big Wood River	9/23/1986	0.12	35.0 (storage) 6.7 (instream stockwater)	no irrigation
37-19736	Quigley Creek	Sinks	10/11/1889	2.28		253.8
Assumed surface water flow available under normal conditions⁵				2.28	Sufficient to irrigate 143 acres at 0.016 cfs/acre	
Assumed surface water flow available under constrained conditions⁵				1.5	Sufficient to irrigate 94 acres at 0.016 cfs/acre	
Assumed surface water flow available under conjunctive management conditions⁵				1.5		
37-20902	ground water		7/21/1966	2.01	340.2	113.4
37-21348 ⁶	ground water		4/15/1985		52.5	15.0
37-21349 ⁷	ground water		10/28/1969	Recommended for disallowal		
Assumed ground water available under normal conditions⁸				2.01	Sufficient to irrigate 126 acres at 0.016 cfs/acre	
Assumed ground water available under constrained conditions⁸				2.01		
Assumed ground water available under conjunctive management conditions⁸				0		
Notes:						
1. Rights 37-7693 and 37-19736 are limited to a combined diversion rate of 5.27 cfs.						
2. Rights 37-2784A and 37-7693 are limited to a total annual storage volume of 30 acre-feet.						
3. Rights 37-2784A, 37-7693, 37-19736 and 37-20902 are limited to a total annual diversion volume of 888.3 acre-feet at the field headgate. (Water right 37-20902 lists a combined limit for these rights of 881.3 acre-feet.)						
4. Rights 37-2784A, 37-7693, 37-19736 and 37-20902 are limited to the irrigation of a combined total of 253.8 acres in a single irrigation season. (Water right 37-20902 lists a combined irrigated area of 251.8 acres.)						
5. See text.						
6. Rights 37-20902 and 37-21348 are limited to a combined diversion rate of 2.01 cfs						
7. Currently recommended to be disallowed in the SRBA.						
8. See text.						

See text for explanation of assumed *normal*, *constrained*, and *curtailment* conditons.

Table 3: Quigley Green water rights and assumed water availability under normal, constrained, and curtailment conditions.

2. *Constrained conditions.* Constrained conditions are described by low-flow conditions in Quigley Creek. Quigley Creek experienced a 1.4-cfs flow rate in August, 2009. Low Quigley Creek flows limit the amount of surface water available for irrigation. For the purpose of this analysis, a Quigley Creek flow of 1.5 cfs was assumed to define “constrained” conditions.
3. *Conjunctive management conditions.* It is not yet clear if (or how) conjunctive management in the Big Wood River basin will impact water availability in Quigley Canyon Ranch development. However, it is possible that ground water use under junior-priority water rights held by Quigley Green (and the City of Hailey) could be partially or fully curtailed (and thus require mitigation) under a conjunctive management scenario. It is also possible that lag times in pumping impacts (a function, in part, of the distance from Quigley Canyon Ranch wells to the Big Wood River) would make such curtailment futile, which would preclude the curtailment of ground water use in Quigley Canyon. While actual curtailment may be unlikely, the purpose of this condition was to explore potential impacts to the Quigley Canyon Ranch water budget *if* junior-priority Quigley Green rights required mitigation (or, lacking effective mitigation, were to be curtailed).

Several additional assumptions were made for these water budget scenarios:

1. Water for in-home domestic and commercial uses would be available from the City of Hailey and would not be subject to curtailment or mitigation requirements under conjunctive management.
2. Per City preferences, the golf course, as a community resource, would be given irrigation preference over common areas or residential areas.
3. Common space irrigation would be cut prior to residential irrigation.
4. All of the measured flow from Quigley Creek (as represented in the measurements taken at Transect 2) enters the Quigley Reservoir, and all of this water would be available for irrigation use. Losses to reservoir seepage and evaporation would decrease the amount of water available from Quigley Creek.
5. Peak demand periods could require reservoir drawdown and/or reductions (or elimination) of Quigley Creek flows below Quigley Reservoir.
6. The amount of available reclaimed water assumed to be available for irrigation was 600,000 gpd. The actual amount of reclaimed water available for Quigley Canyon Ranch irrigation may be less than 600,000 gpd.
7. Reclaimed municipal water would only be used on golf course land and common areas. It was further assumed that common areas would be

at least 100 feet from occupied dwellings (per Idaho Department of Environmental Quality requirements).

For each of the above-described scenarios, the irrigated Quigley Canyon Ranch acreages supplied by surface water, ground water, and reclaimed City of Hailey municipal water under normal, constrained, and conjunctive management conditions are listed in Table 4 through Table 6. These irrigated acreages are shown graphically in Figure 1 through Figure 3.

Scenario 1: Irrigated acreage assuming no reclaimed municipal water									
	Golf Course (120 acres)			Common Area (18.7 acres)			Residential (45.3 acres)		
Irrigation source	Normal	Constrained	Conj. Mgt.	Normal	Constrained	Conj. Mgt.	Normal	Constrained	Conj. Mgt.
Surface water	120.0	94.0	94.0	18.7	0.0	0.0	4.3	0.0	0.0
Ground water	0.0	26.0	0.0	0.0	18.7	0.0	41.0	45.3	0.0
Reclaimed water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Dry or requiring mitigation	0.0	0.0	26.0	0.0	0.0	18.7	0.0	0.0	45.3
Total	120.0	120.0	120.0	18.7	18.7	18.7	45.3	45.3	45.3

Table 4: Scenario 1 irrigated acreage.

Scenario 2: Irrigated acreage assuming that reclaimed water is used as a primary source									
	Golf Course (120 acres)			Common Area (18.7 acres)			Residential (45.3 acres)		
Irrigation source	Normal	Constrained	Conj. Mgt.	Normal	Constrained	Conj. Mgt.	Normal	Constrained	Conj. Mgt.
Reclaimed water	54.0	54.0	54.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface water	66.0	66.0	66.0	18.7	18.7	18.7	45.3	9.3	9.3
Ground water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	0.0
Dry or requiring mitigation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0
Total	120.0	120.0	120.0	18.7	18.7	18.7	45.3	45.3	45.3

Table 5: Scenario 2 irrigated acreage.

Scenario 3: Irrigated acreage assuming that reclaimed water is used as a primary source <i>and</i> water right 37-19376 is used for mitigation of other City junior-priority water rights in under curtailment conditions									
	Golf Course (120 acres)			Common Area (18.7 acres)			Residential (45.3 acres)		
Irrigation source	Normal	Constrained	Conj. Mgt.	Normal	Constrained	Conj. Mgt.	Normal	Constrained	Conj. Mgt.
Reclaimed water	54.0	54.0	54.0	0.0	0.0	0.0	0.0	0.0	0.0
Surface water	66.0	66.0	0.0	18.7	18.7	0.0	45.3	9.3	0.0
Ground water	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.0	0.0
Dry or requiring mitigation	0.0	0.0	66.0	0.0	0.0	18.7	0.0	0.0	45.3
Total	120.0	120.0	120.0	18.7	18.7	18.7	45.3	45.3	45.3

Table 6: Scenario 3 irrigated acreage.

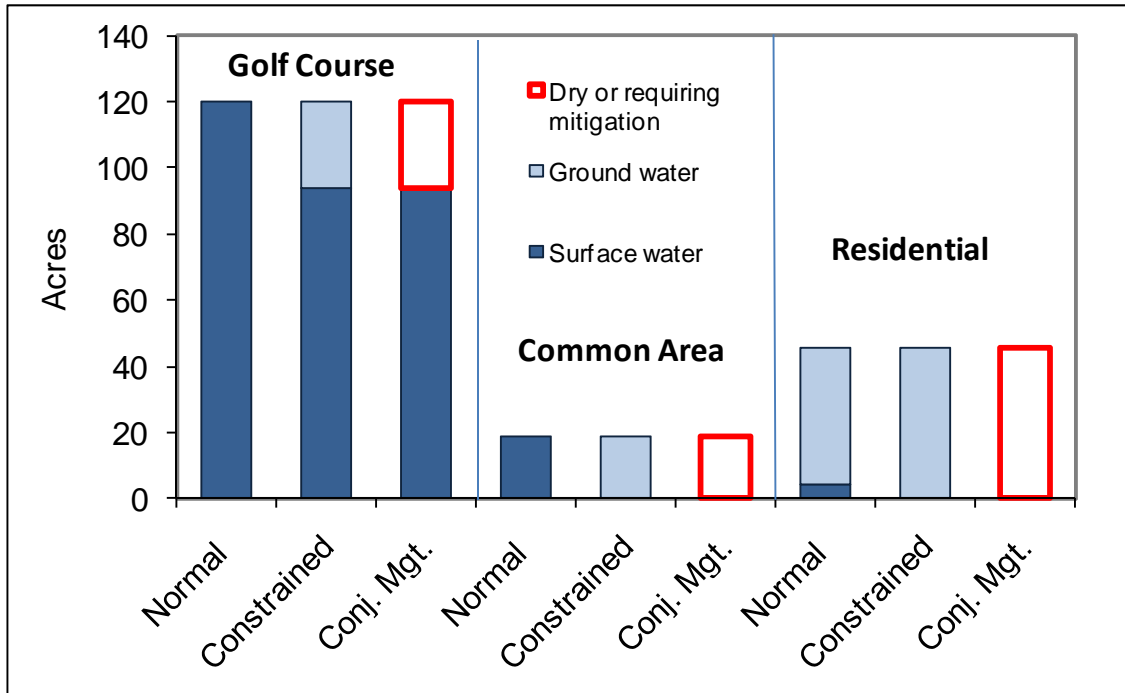


Figure 1. Scenario 1 irrigated acreage (no reclaimed water).

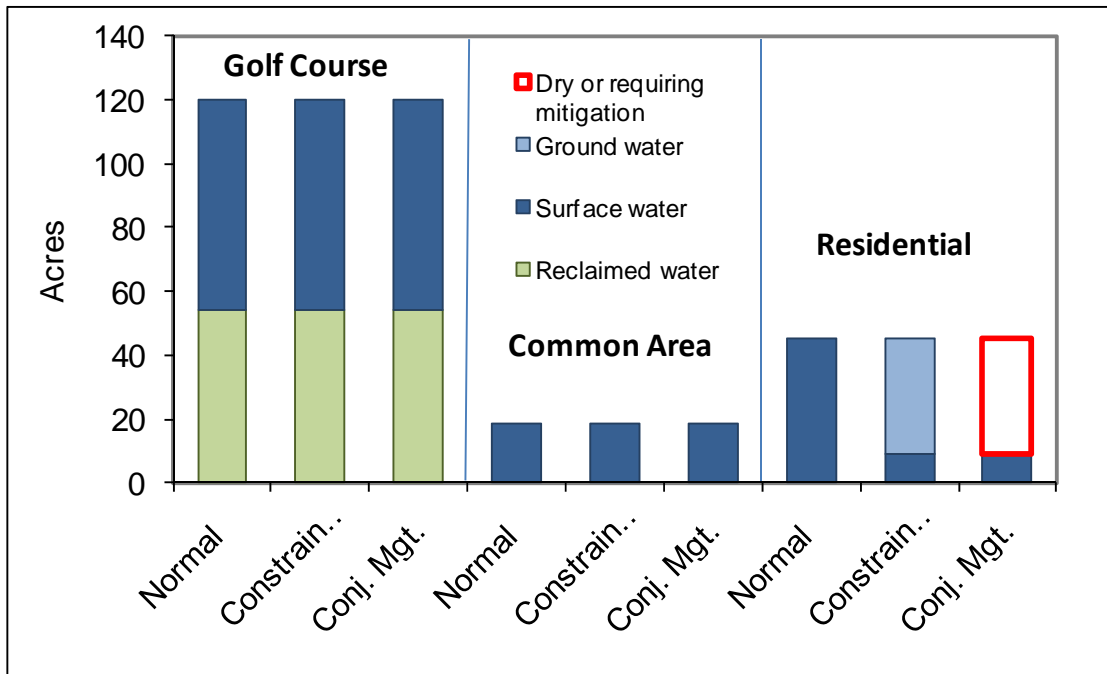


Figure 2. Scenario 2 irrigated acreage (with reclaimed water).

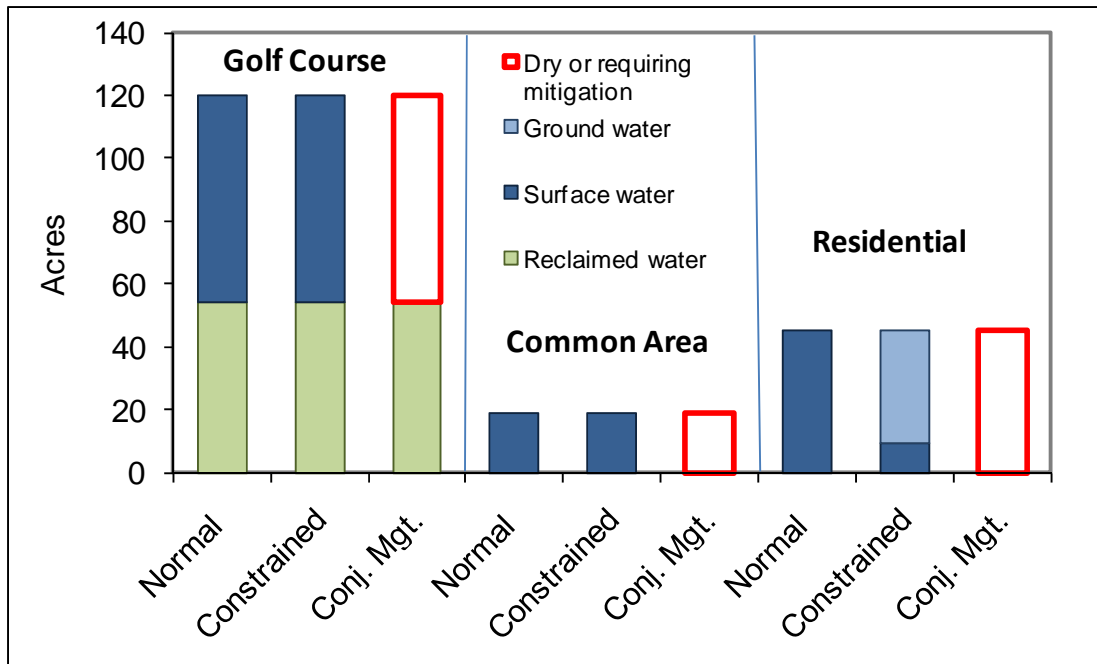


Figure 3. Scenario 3 irrigated acreage (with reclaimed water and the dedication of water right 37-19736 for City mitigation).

The following observations can be made from this analysis:

1. Quigley Green has sufficient surface and ground water rights (and sufficient water in Quigley Creek) to irrigate the desired acreage under current IDWR management guidelines (see normal and constrained conditions, Table 4, Figure 1).
2. We believe that IDWR will eventually manage surface and ground water in the Big Wood River Valley on a conjunctive basis. It is not clear what conjunctive management would mean for Quigley Canyon Ranch or City of Hailey water use. We believe that local and regional mitigation options will be available to avoid widespread curtailment. However, *if* conjunctive management results in full or partial curtailment of junior-priority surface and/or ground water rights⁶, the senior Quigley Green water right (37-19736) would be insufficient to irrigate the golf course, common areas, and residential areas within the Quigley Canyon Ranch area (see “Conjunctive Management” conditions in Figure 1).

Curtailment of Quigley Green ground water rights for irrigation – if imposed, and absent acceptable mitigation – would affect approximately 26 golf course acres, 18.7 acres of common space, and 45.3 acres of residential irrigation (Table 4). If Quigley Canyon Ranch ground water pumping were to be curtailed, the only remaining water source would be diversions from Quigley Creek under water right 37-19736. The amount of land that could be irrigated from this source alone (at a rate of 0.016 cfs/acre) would be between 75 and 114 acres (assuming a low Quigley Creek diversion rate of 1.5 cfs and a higher-flow diversion rate of 2.28 cfs, respectively). Thus, at low Quigley Creek flows mitigation might be required for the irrigation of about 90 Quigley Canyon Ranch acres if conjunctive management limits the use of Quigley Green junior-priority ground water rights.

ERO has noted that concerns about the effect of possible conjunctive management “must be tempered with an understanding that conjunctive management does not equate to automatic curtailment of use under all ground water rights.” We agree with this statement, but we believe it is important to consider the possible impacts (such as potential mitigation requirements) under conjunctive management.

Curtailment has been avoided in many areas through the implementation of mitigation plans. Thus, even if conjunctive management leads to potential full or partial curtailment of junior-priority water rights, regional mitigation options may evolve to prevent full curtailment of Quigley Green (or City of Hailey) rights.

⁶ Mitigation of water use under junior-priority rights would preclude curtailment.

3. The use of reclaimed municipal water would provide Quigley Canyon Ranch with greater certainty of supply in times of low Quigley Creek flows. The use of reclaimed municipal water also could augment the Quigley Canyon Ranch water supply under conjunctive management conditions.
4. Quigley Canyon Ranch's demand for ground water would be reduced by the use of reclaimed City of Hailey municipal water. The cost of Quigley pumping Quigley Canyon Ranch wells would be less as a result (assuming that the City bears the cost of pumping reclaimed water to Quigley Canyon Ranch).
5. Reclaimed water could be used for winter snow-making when irrigation systems have been winterized.
6. Under curtailment conditions, surface water under water right 37-19736 could be considered for mitigation of junior-priority ground water rights within the City limits. However, this would require the non-irrigation of at least portions of the golf course, common areas, and/or residential areas in Quigley Canyon Ranch (even with the use of reclaimed municipal water).
7. The City wishes to use reclaimed waste water as a way of reducing current discharges to the Big Wood River. Reclaimed water could be used for the irrigation of Quigley Canyon Ranch lands or existing City parks, common areas, or school grounds. If reclaimed water is used for Quigley Canyon Ranch irrigation, the avoided cost to the City is the difference between the conveyance cost to Quigley Canyon Ranch versus other City locations (i.e., the avoided cost of using reclaimed water for the irrigation of Quigley Canyon Ranch lands is not the cost of a tertiary treatment facility).
8. These scenarios are presented for illustrative purposes. Other scenarios or conditions (or combinations of scenarios and conditions) are possible.

3. What is the quantity of actual Quigley Creek water available?

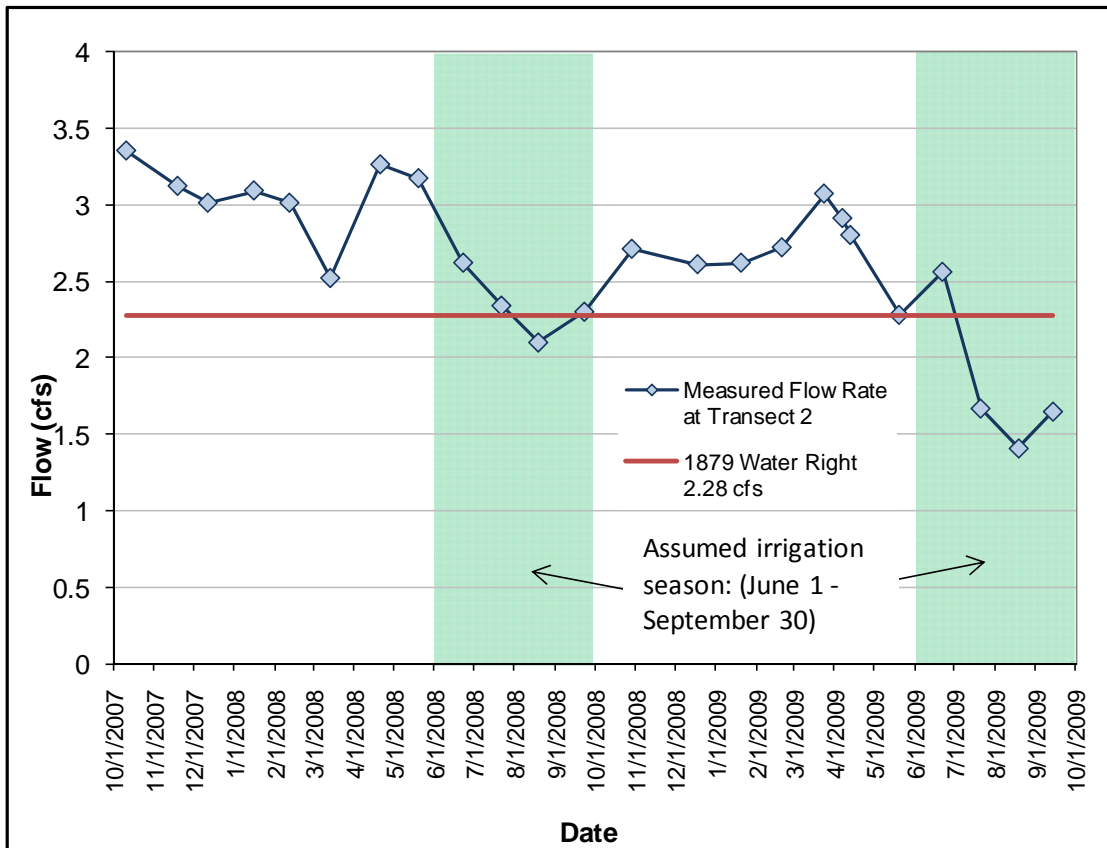
ERO has described Quigley Creek flows as follows⁷:

Quigley Creek is a spring-fed stream with a stable base flow that does not exhibit the large variation in flow of mountain streams only fed directly by snow melt and precipitation events. Quigley Green Owners LLC has had monthly measurements taken of the inflow of Quigley Creek to the reservoir since October 2007. The attached hydrograph demonstrates that the base flow is stable and usually satisfies the 2.28 cfs flow rate authorized by QCR's oldest

⁷ Memo to SPF dated October 2, 2009.

priority right throughout the irrigation season. The hydrograph also shows that significant flow is also available for diversion under QCR's 1976 right from Quigley Creek.

Quigley Creek flow data collected in 2007 – 2009 show that Quigley Creek had an irrigation-season flow in excess of 2.5 cfs only during the month of June in 2008 and for a few days in 2009 (Figure 4). Flows in Quigley Creek above Quigley Reservoir were less than 2.28 cfs (the maximum diversion under water right 37-19736) during about 1/2 of the 2008 irrigation season and about 2/3 of the 2009 irrigation season. Low Quigley Creek flows limit the amount of surface water available for irrigation.



Source: ERO Resources; Transect 2 is upstream of the Quigley Canyon Ranch Reservoir.

Figure 4. Updated Quigley Creek flow data.

The decrease in flow between fall 2007 and fall 2009 does not appear to correspond with precipitation. October Quigley Creek stream flow was less in 2008 than in 2007, and less in 2009 than in 2008. However, annual water-year⁸ precipitation in Picabo, Idaho⁹ suggests that Hailey-area precipitation was likely

⁸ A “water year” represents the period between October 1 through September 30.

⁹ Picabo is the closest National Weather Service station to Hailey with recent precipitation data.

greater in 2008 than in 2007, and that 2009 precipitation was likely greater than in 2008 (Figure 5). Precipitation in 2009 was greater than the 40-year average.

For comparison, recent data from various Big Wood River basin SNOTEL sites (Table 7 and Figure 6)¹⁰ were plotted for comparison with the 2007-2009 Quigley Creek hydrograph. The SNOTEL site precipitation data show precipitation patterns that are generally consistent with the Picabo precipitation data. Two sites show moderately greater precipitation in the winter of 2008 than in 2007, and all sites show greater precipitation in the winter of 2009 than in 2008. These data do not correspond with decreasing Quigley Creek flows between fall 2007 through fall 2009 (Figure 4).

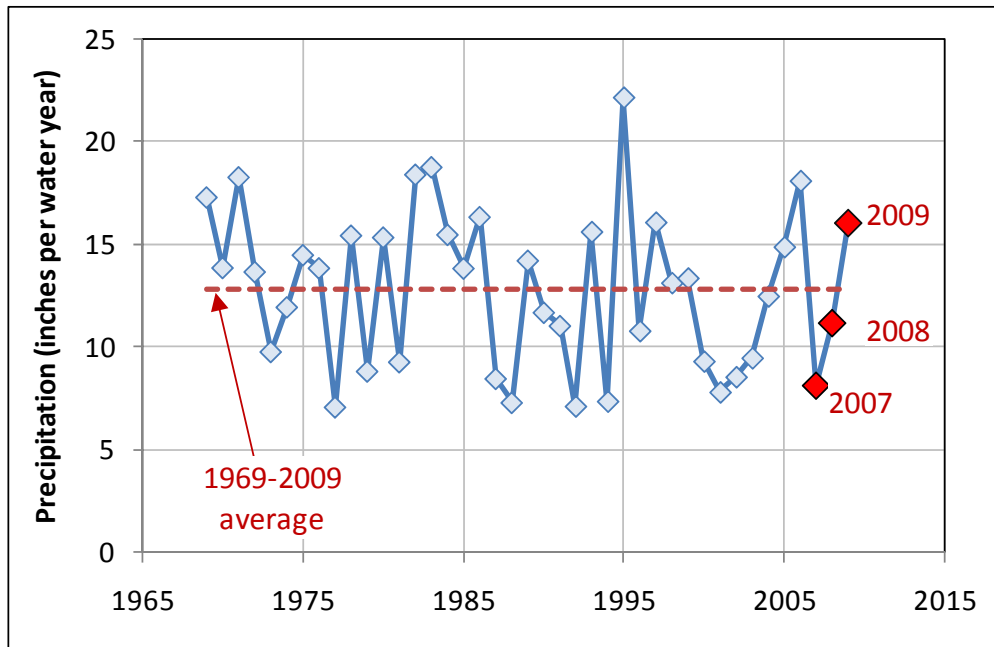


Figure 5. Water-year precipitation, Picabo, Idaho.

¹⁰ We are unaware of recent (2007-2008) precipitation data for the Hailey area. These SNOTEL data (despite being collected at a higher elevation than the Quigley Creek basin) were used as an indication of relative local precipitation.

SNOTEL Site Precipitation (inches)				
Site	2007	2008	2009	Elev
Hyndman	20.0	19.7	30.1	7,440
Galena	21.5	24.4	27.6	7,470
Galena Summit	42.0	27.3	32.5	8,780
Dollarhide Summit	26.1	34.5	39.4	8,420

Source: <http://www.wcc.nrcs.usda.gov/cgi-bin/state-site.pl?state=ID&report=precipitablehist>

Table 7: SNOTEL precipitation at selected Big Wood River basin sites.

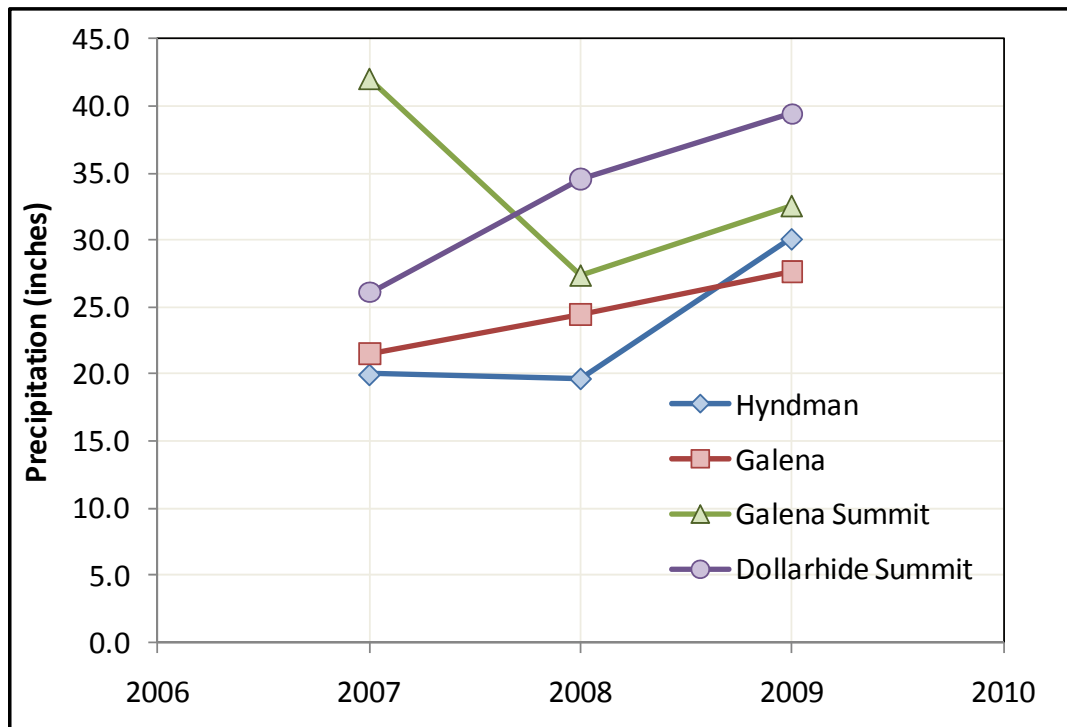


Figure 6. SNOTEL precipitation at selected Big Wood River basin sites.

ERO has suggested that the Quigley Creek low flows in 2009 may be the result of increasing beaver activity in upper reaches of Quigley Creek. ERO states the following¹¹:

The uncharacteristically low flows noted during July, August and September of this year and the somewhat less impacted flows measured last summer are attributed to an increase in evapotranspiration from wetlands and meadows upstream of Quigley Reservoir. Traditionally, the operators of QCR's irrigated

¹¹ Memo to SPF dated October 2, 2009.

field have controlled beavers, but this has not been the case in recent years. A field visit on September 14, 2009 identified significant beaver activity in the drainage from the spring sources of the creek downstream about three miles to just above the reservoir. Several older dams were found to be completely closing off the creek, creating open water ponds and keeping the adjacent meadows and wetlands saturated. A number of newer dams were also observed. The stream bottom occupies about 85 acres in this reach.

Other possible explanations for the lower Quigley Creek flows in 2009 may be that (1) the spring flow component of Quigley Creek flow lags precipitation by more than a year, (2) increased seepage occurs from newly-ponded areas, or (3) Quigley Creek flow measurement error. If the lower Quigley Creek flows reflect recent increases in beaver activity (resulting in increased evapotranspiration and/or increased pond seepage), then absent beaver eradication we would expect continued low-flow patterns in future years. Based on recent data, it appears that flows of less than 1.5 cfs in Quigley Creek are likely in the future, especially in dry years.

4. Agree on the likelihood of the water right (37-19736) getting the 1879 priority?

Based on the information that ERO has provided, we agree that water right 37-19736 will likely receive a partial decree with an 1879 priority date.

5. Could the developer retain the rights and transfer them off-site at a later date?

Quigley Green could retain existing water rights and transfer them off-site at a later date. However, the Quigley Green ground water rights are supplemental to surface water rights (IDWR refers to such rights as “stacked rights”). This means that all rights to irrigate a certain acreage would probably need to be transferred as a package (i.e., Quigley Green could not easily transfer away senior surface water rights or junior ground water rights alone).

We recommend that Quigley Green or the City retain water right 37-19736 for irrigation of Quigley Canyon Ranch lands or potential mitigation of junior-priority City irrigation use. As such, overlapping Quigley Green ground water irrigation rights would remain tied to water right 37-19736.

6. What is the value of the water as mitigation (both now and in the future with conjunctive management)?

Regional mitigation

It is difficult to determine the value of water right 37-19736 (which presumably will be adjudicated with an 1879 priority date) because we do not know (1) if

conjunctive management will lead to curtailment of junior-priority ground water rights in the City or Quigley Canyon Ranch, (2) if curtailment of some rights (such as junior-priority rights appurtenant to Quigley Canyon Ranch land) would be deemed futile, or (3) Quigley Creek flows in dry years (e.g., flows might be less than 1.5 cfs in dry years when curtailment would be most likely). Furthermore, if ground water rights become subject curtailment, a regional mitigation solution may prevent actual curtailment of individual rights.

However, based on our water budget scenarios, all of the available water under right 37-19736 would likely be required for irrigation of the Quigley Canyon Ranch golf course if Quigley Canyon Ranch ground water were subject to curtailment (assuming that golf course irrigation takes precedence over the irrigation of residential or common areas. Reclaimed City municipal water would not replace the irrigation benefit of water right 37-19736 to Quigley Canyon Ranch, because the assumed reclaimed water flow (0.86 cfs based on a daily rate of 600,000 gallons) is less than the low flow of Quigley Creek (about 1.5 cfs, based on 2008-2009 irrigation season data).

There may be value to the City of using water right 37-19736 for mitigation *if* City irrigation under junior-priority rights is subject to curtailment but pumping under junior-priority Quigley Green rights is not subject to curtailment. At this point, however, we do not know whether this outcome is likely (or unlikely), and can therefore not evaluate the value of water right 37-19736 if used in this way. Again, use of water right 37-19736 for mitigation would require the non-irrigation of a portion of Quigley Canyon Ranch area.

7. What is the City's avoided cost with a reclaimed water line?

Our understanding from City staff is that the avoided cost of a tertiary treatment facility is approximately \$7 million, although it would cost approximately \$1.5 million to construct a transmission system for conveying treated water to Quigley Canyon Ranch. The City could use reclaimed municipal water on existing parks within City limits or land within Quigley Canyon Ranch: 600,000 gpd would be sufficient to irrigate about 43 acres at 0.02 cfs/acre (1 miner's inch per acre) or 54 acres at 0.016 cfs/acre (0.6 miner's inch per acre).

We see an avoided cost of about \$5.5 million associated with the use of reclaimed municipal water as an alternative to tertiary treatment. However, the avoided (or additional) cost associated with Quigley Green's use of the treated wastewater is the difference between what it would cost to pipe the reclaimed water to Quigley Canyon Ranch versus other City areas.

8. Assuming reclaimed water use, how can it mix with the Quigley Creek water or can't it?

Reclaimed Class B wastewater can be mixed with water diverted from Quigley Creek (or Quigley Canyon Ranch well water) in a non-potable irrigation system. However, the Idaho Department of Environmental Quality has restrictions on the use of such water (Attachment C). Class B water could be used for sprinkler-irrigated common space and golf course irrigation (with a minimum setback of 100 feet from inhabited dwellings).

Attachment A:
Updated Quigley Canyon Ranch Water Requirements
ERO Resources Corporation
(Received) October 2, 2000

Table 2. Quigley Canyon Ranch Water Requirements Based on Revised Annexation Area and Reduction in Units

PURPOSE OF USE	AVERAGE ANNUAL VOLUME	MAXIMUM DAY DEMAND	PEAK HOUR DEMAND	ACRES OF IRRIGATION UNDER QCR WATER RIGHTS
POTABLE WATER - CITY OF HAILEY MUNICIPAL SYSTEM; NO IRRIGATION OF LOTS				
Residential Domestic without irrigation of lots	356 units ¹ 200 gpd/unit ² 79.75 af/yr	207,851 gpd 144.34 gpm 0.32 cfs³	502,202 gpd 348.75 gpm 0.78 cfs⁴	-----
Commercial use (Restaurant and Clubhouse) ⁵	9.44 af/yr	8430 gpd 14 gpm for 10 hrs 0.03 cfs	peaking factor of 4.0 56 gpm 0.12 cfs	-----
Fire Flow	No additional storage required	No additional storage required	No additional storage required	-----
Total supplied through City of Hailey Municipal System	89.19 af/yr	0.35 cfs	0.90 cfs	89.19 af/yr equates to 25.5 acres @ 3.5 afa. ⁶ 0.35 cfs equates to 17.5 acres @ 0.02 cfs/acre

¹ Table F, Updated Quigley Canyon Ranch Cost / Benefit Study Update, Richard Caplan & Associates, August 28, 2009.

² Average daily in-home domestic water use. Reference: SPF Water Engineering Memo to Tom Hellen, Hailey City Engineer, May 28, 2009.

³ Based on IDEQ Design File Note "Design Flows – Public Water Systems, July 9, 2007" See Exhibit 3 for spreadsheet calculation of maximum daily demand.

⁴ Based on IDEQ Design File Note "Design Flows – Public Water Systems, July 9, 2007" See Exhibit 3 for spreadsheet calculation of peak hourly demand.

⁵ Live/work units are included under the residential domestic estimate. Water requirements for restaurant and clubhouse are based on State of Utah R309-510 "Minimum Sizing Requirements." Assume 150 seat restaurant, 30 seat lounge, 2 public restrooms, 1 washer laundry and 2 locker rooms w/o showers.

⁶This assumes that the rights used to offset the increased demand on the municipal system continue to be used for irrigation. IDWR will recognize only the historic consumptive use under a change in use to municipal purposes (i.e. alfalfa consumptive use is about 2.5 afa) which would proportionately change the acreage requirement.

PURPOSE OF USE	AVERAGE ANNUAL VOLUME	MAXIMUM DAY DEMAND	PEAK HOUR DEMAND	ACRES OF IRRIGATION UNDER QCR WATER RIGHTS
NON-POTABLE WATER SUPPLIED THROUGH QCR SYSTEMS				
Irrigation of Golf Course Turf ⁷	120 acres @ 3.5 afa 420 af/yr ⁸	120 acres @ 0.02 cfs/acre 2.4 cfs ⁹		120 acres per IDWR's acre-for-acre irrigation transfer policy. ¹⁰
Irrigation of Common Areas	18.7 acres ¹¹ @ 3.5 afa 65.45 af/yr	18.7 acres @ 0.02 cfs/acre 0.37 cfs		18.7 acres per IDWR's acre-for-acre irrigation transfer policy.
Irrigation of Residential Lots	45.3 acres ¹² @ 3.5 afa 158.55 af/yr	45.3 acres @ 0.02 cfs/acre 0.91 cfs		45.3 acres per IDWR's acre-for-acre irrigation transfer policy.
Nordic Trail Snowmaking ¹³		59.5 gpm @ 50% eff. for 14 days 0.13 cfs		Not a factor if treated waste flows are used
In-stream flow for Quigley Creek through golf course.	Until design information is available, assume no additional commitment of water is needed if irrigation system incorporates the stream.			
Fill and maintenance of ponds	Until design information is available, assume no net increase in pond size or water use for ponds.			

⁷ An additional area of 60.5 acres of native vegetation will require irrigation until growth is established. The water supply for this temporary need is not included in this analysis of continuing water requirements.

⁸ IDWR guidelines for irrigation water rights in the Hailey area. Average annual consumptive irrigation requirement for fully irrigated turf grass will be less than this amount; i.e., 120 acres @ 24.4 in CIR @ 70% irrigation efficiency requires approximately 348.6 afa (Ref. <http://www.kimberly.uidaho.edu/ETIdaho>)

⁹ Based on a standard miner's inch/acre (0.02 cfs/acre) recognized in Idaho.

¹⁰ "Transfer Processing Policies & Procedures" IDWR Administrative Memo No. 24 Revised January 21, 2009, p. 26.

¹¹ Based on an email from Jen Chadd, DTJ Design Consultants, dated July 10, 2008.

¹² Assume irrigated area is 50% of gross lot area, up to a maximum irrigated area of 1/2 acre per lot.

¹³ Equivalent to a Nordic trail, 10,000 feet long by 20 feet wide with a 2 foot of snow depth having a 20% water equivalent.

PURPOSE OF USE	AVERAGE ANNUAL VOLUME	MAXIMUM DAY DEMAND	PEAK HOUR DEMAND	ACRES OF IRRIGATION UNDER QCR WATER RIGHTS
Adjustment for use of treated waste water. ¹⁴	630,000 gpd Volume during 200-day irrigation season 386.7 af/yr	average treated waste flow 437.5 gpm (-) 0.98 cfs		Equivalent to a reduction in diversion from other sources 110.5 acres @ 3.5afa 49 acres @ .02 cfs/acre
Total Supplied through QCR systems from natural sources (reduced by use of treated waste water)	Irrigation: 645.84 af/yr minus 386.7 af/yr 259.14 af/yr	Irrigation: 3.81 cfs minus 0.98 cfs 2.83 cfs		Irrigation: 184 - 110.5 acres = 73.5 acres 184 - 49 acres = 135 acres
HAILEY MUNICIPAL SYSTEM AND QCR IRRIGATION SYSTEM				
Total diversions from natural sources for Municipal and QCR irrigation systems	89.19 + 259.14 348.33 af/yr	0.35 + 2.83 3.18 cfs		25.5 + 135 160.5 acres
WATER DIVERSION AUTHORIZED BY QCR WATER RIGHTS				
QCR claims	N.A.	9.56 ¹⁵	N.A.	305 acres ¹⁶
IDWR Recommendation	940.8 af/yr	7.28 cfs	N.A.	268.8 acres

¹⁴ Available treated wastewater flow from the City per email from David Hennessy dated June 3, 2009. Year round flow may be stored in surface ponds or disposed in rapid infiltration beds.

¹⁵ The claimed diversion rates were not adjusted to address duplication among the rights claimed.

¹⁶ QCR claimed about 305 acres, adjusted for the sale of a parcel to the Blaine County School District, of full irrigation from Quigley Creek and ground water. IDWR has recommended 268.8 acres. QCR has objected to the recommendation. The matter is pending before the SRBA court.

Attachment B:
Precipitation Deficit Data

Source: <http://www.kimberly.uidaho.edu/ETIdaho/stcvrstats.php?station=107040&cover=17&stats=Deficit>

ET_{Idaho} --- Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho

Please send suggestions for improving this site to robison at kimberly dot uidaho dot edu Copyright 2007, University of Idaho.

Picabo (NWS NOAA--107040)

Statistics based on 30 years between 1971 to 2004

For a different land cover or crop click on the above link.

You can highlight this table and copy via the clipboard to a Microsoft Excel or OpenOffice spreadsheet to plot or otherwise work with this data.

Grass - Turf (lawns) - Irrigated														
Precipitation Deficit (Click here for a graph)														
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Growing Season ^a	Annual
Mean	mm/day												mm	
Monthly ^b	-0.01	0.13	0.26	0.65	2.61	5.00	5.75	5.20	3.28	0.70	-0.28	-0.07	693	710
15-Day Moving Average ^c	0.03	0.09	0.25	0.61	2.62	5.04	5.76	5.18	3.32	0.68	-0.30	-0.05		
7-Day Moving Average ^d	0.01	0.11	0.25	0.61	2.64	5.00	5.74	5.21	3.29	0.69	-0.30	-0.06		
3-Day Moving Average ^e	-0.01	0.12	0.25	0.64	2.62	4.99	5.74	5.20	3.28	0.70	-0.29	-0.07		
Standard Deviation	mm/day												mm	
Monthly	0.29	0.13	0.30	0.64	1.52	0.97	0.82	0.76	0.87	1.03	0.35	0.26	101	94
15-Day Moving Average	0.24	0.21	0.32	0.66	1.40	1.20	0.75	0.76	1.00	1.07	0.55	0.26		
7-Day Moving Average	0.43	0.34	0.49	0.89	1.84	1.63	1.03	0.95	1.42	1.54	0.86	0.39		
3-Day Moving Average	0.72	0.52	0.80	1.21	2.45	2.12	1.58	1.30	1.96	2.03	1.29	0.62		
20% Exceedance	mm/day												mm	
Monthly	0.10	0.25	0.39	0.97	3.30	5.86	6.24	5.65	4.02	1.26	0.05	0.04	761	776
15-Day Moving Average	0.25	0.39	0.71	1.19	4.50	6.50	6.65	5.99	4.52	2.69	0.37	0.20		
7-Day Moving Average	0.34	0.58	0.93	1.51	5.88	7.05	6.84	6.45	5.11	3.50	0.56	0.27		
3-Day Moving Average	0.42	0.65	1.21	2.45	7.28	8.19	8.01	7.71	6.00	3.95	0.71	0.33		
80% Exceedance	mm/day												mm	
Monthly	-0.09	0.02	0.08	0.19	1.59	4.11	5.01	4.71	2.63	0.10	-0.60	-0.24	581	632
15-Day Moving Average	-0.28	-0.21	-0.36	-0.33	0.37	3.31	4.31	3.99	1.39	-0.88	-1.49	-0.77		
7-Day Moving Average	-0.88	-0.61	-1.03	-1.35	-0.99	1.71	2.57	2.98	-0.54	-2.63	-2.50	-1.30		
3-Day Moving Average	-1.85	-1.46	-2.26	-3.21	-4.42	-1.27	-0.49	1.52	-3.45	-6.28	-4.73	-2.79		
Ave Highest ET	mm/day												--	
15-Day Moving Average ^f	0.19	0.29	0.57	1.03	3.78	5.88	6.29	5.74	4.05	1.65	0.21	0.13		
7-Day Moving Average ^g	0.31	0.48	0.82	1.45	4.81	6.50	6.63	6.18	4.72	2.33	0.43	0.22		
3-Day Moving Average ^h	0.38	0.60	1.09	2.07	6.04	7.63	7.64	7.16	5.61	2.88	0.57	0.28		
Ave Lowest ET	mm/day												--	
15-Day Moving Average ^f	-0.20	-0.05	-0.06	0.20	1.45	4.13	5.24	4.58	2.47	-0.17	-0.77	-0.28		
7-Day Moving Average ^g	-0.56	-0.36	-0.54	-0.48	0.26	2.83	4.32	3.89	1.28	-1.29	-1.55	-0.64		
3-Day Moving Average ^h	-1.34	-1.03	-1.70	-1.70	-2.14	0.91	2.64	2.63	-0.66	-3.53	-3.33	-1.56		

Special normal distribution parameters for monthly, seasonal, and annual intervals													--	
Skew	-0.77	-1.19	0.11	3.12	0.23	-0.75	-0.16	-0.08	-1.24	0.47	-0.42	-0.25	0.48	0.56
Kurtosis	1.89	5.77	0.94	15.01	1.20	3.51	0.56	0.59	3.74	1.30	2.88	0.55	3.14	3.29

^a Growing Season: This is usually the time from green up or planting in the spring to a killing frost or harvest in the fall. It is not applicable for entries without a growing season and will be blank.

^b Mean of the average daily value for month

^c Mean of the fourteen 15-day period averages contained in the month

^d Mean of the twenty three 7-day period averages contained in the month

^e Mean of the twenty seven 3-day period averages contained in the month

^f Mean of the highest/lowest 15-day period average in month

^g Mean of the highest/lowest 7-day period average in month

^h Mean of the highest/lowest 3-day period average in month

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The citation for the evapotranspiration data used from this site should be: *Allen, Richard G. and Clarence W. Robison, 2006 (Revised 2007). Evapotranspiration and Consumptive Irrigation Water Requirements for Idaho, Research Technical Completion Report, Kimberly Research and Extension Center, University of Idaho, Moscow, ID.*

Questions regarding the data should be addressed to [Clarence W. Robison](#) or [Richard G. Allen](#), University of Idaho, Kimberly Research and Extension Center, 3793 North 3600 East, Kimberly, ID 83341. Telephone (208)-423-6610

Attachment C:
**Guidelines for Reclamation and Reuse of
Municipal and Industrial Wastewater**
IDEQ
September 2007

Source: http://www.deq.state.id.us/water/permits_forms/permitting/guidance_reuse_0907.pdf

Table 6-4. Buffer Zone Guidance for Municipal Wastewater Treatment Sites

Site Condition	Scenarios															
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	Wastewater Class and Degree of Treatment															
Class E: Primary, not disinfected, with organisms too numerous to count (TNTC) (1)	X				X				X				X			
Class D: Primary Disinfected to < 230 CFU/100 ml (1)		X				X				X				X		
Class C: Secondary Disinfected to <23 CFU/100 ml (1)			X				X				X				X	
Class B: Advanced Secondary Disinfected to <2.2 CFU/g/100 ml (1)				X				X				X				X
	Location															
Suburban or Residential Area	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Rural or Industrial Area					X	X	X	X					X	X	X	X
	Mode of Irrigation															
Sprinkler Irrigated	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Furrow/Flood Irrigated																
	Resulting Buffer Zone Recommendations															
Buffer Zone Between:																
Site and Inhabited Dwellings (in feet)	1000	500	300	100	1000	500	300	100	300	300	300	50	50	300	50	50
Site and Areas																
Accessible to Public (in feet)	1000	300	50	0	1000	300	0	0	100	100	100	0	0	50	50	0
Fencing Type																
Cyclone w/Barbed Wire									X	X	X					
Woven Pasture Fence	X	X	X	X	X	X	X	X			X	X	X	X	X	X
Three-Wire Pasture Fence						X	X	X								
None Required				X				X					X			X
	Posting Recommendations															
Required (2)	X			X	X	X	X	X	X	X	X	X	X	X	X	X
Required (3)		X	X	X	X	X	X	X			X	X	X	X	X	X

(1) Organisms here are total coliform in concentrations of colony forming units per 100 milliliter (CFU/100 ml.). Bacteria count represents the total coliform bacteria as a median of the last 7 days of bacteriological sampling for which analysis have been completed

(2) Signs should read 'Sewage Effluent Application - Keep Out' or equivalent to be posted every 250 feet and at each corner of the outer perimeter of the buffer zone(s) of the site

(3) Signs should read 'Irrigated with Reclaimed Wastewater - Do Not Drink' or equivalent to be posted every 500 feet and at each corner of the outer perimeter of the buffer zone(s) of the site