MEMORANDUM

FOR THE

THIRD PARTY REVIEW OF THE KEYSTONE RANCH WATER SYSTEM ANALYSIS AND RATE STUDY

AT

KEYSTONE RANCH

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JVA Project No. 2281c

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JVA 9-11-2014

SECTION 1 – EXECUTIVE SUMMARY

The following key comments follow JVA's review of the reports:

- The report included conflicting information on the number of EQRs in the Keystone Ranch. JVA recommends each lot be assigned an EQR of 1.0 (108 residential). The KRWS could review the EQRs assigned for the Ranch main building (currently 16), and maintenance building (currently 2) against criteria established by the Snake River Water District to confirm appropriateness of the ultimate number used. Establishing the proper EQR's for the KRWS is important for ensuring an appropriate rates paid for by the users of the system.
- The report uses an average use of 350 gal/day per EQR, whereas the well logs reviewed indicate a lower average use of 186 gal/day. Based on discussions with Tetra Tech, the higher value was taken as a conservative number to represent highest usage during summer months. It may be possible to reduce the 350 gal/day/EQR for well capacity design requirements, which may allow the Water System to postpone recommended improvements for well capacity upgrades, and improve modeled performance for system pressure under fire-flow scenarios. However, the 350 gal/day/EQR is a good basis for sizing water storage requirements (to provide additional storage capacity to make up for any deficit in production to peak consumption).
- The KRWS needs to operate both of the existing wells to meet peak daily flows (no backup). A new well would be required to ensure security of supply of peak daily flows with one unit out of service. Alternatively, it may be possible to increase capacity in existing wells to ensure either well can supply the peak daily flow demand with one unit out of service. As discussed in the previous bullet, a reduction in the assumed average daily use may allow the KRWS to defer well improvement costs. Any increase in well production should be confirmed to meet the requirements of the water rights.
- JVA believes low system pressures and fire flow availability to be a key issue for the HOA. Where homes are receiving water at nominal pressures of 20 psi or less, they are not getting adequate supply or fire flow. JVA agrees with the recommendation of looping between Clover Ln and Gentian Rd as well as from the supply wells to the storage tank (last paragraph, pg. 19) to increase system pressures and fire flows.
- An alternative to installing a permanent diesel genset would be the KRWS procuring a portable diesel mounted genset to run plant within 24 hours of outage on an as-needed basis. This approach could allow the plant to get up and running again while waiting for power restoration, and might save/defer estimated $40,000 - $70,000 in capital expenditure.

One item not addressed in the report is the potential for contamination from cross connections with irrigation systems, and the security of supply (adequate backflow prevention and shutoff valves within the distribution system should contamination occur). The KRWS and HOA may consider undertaking a cross-connection survey of the system to ensure adequate backflow prevention and

* ASSUME 100 GAL/PERSON/DAY = 3.5 PEOPLE PER HOUSEHOLD

shutoff valves are installed on the system. The distribution system model developed by Tetra Tech may provide a good starting point for developing a system schematic of the system.

The prioritization and timing of recommended improvements depends somewhat on the ultimate goal for the KRWS. If the WTP continues to be operated, the improvements recommended in the report may follow as presented by Tetra Tech or slightly modified by JVA. However, if the goal is to prepare the water system for inclusion into another district, the priorities on improvements may change. This is a key issue for the KRWS and the HOA to decide how the water system may continue serving the Ranch and commercial facilities.

SECTION 2 – REVIEW OF MEMORANDUM

INTRODUCTION

The purpose of this report is to perform an independent engineering review of the Keystone Ranch Water System (KRWS) master plan and rate analysis performed by Tetra Tech, Inc. for the Vail Corporation and the Keystone Ranch Homeowner's Association (HOA). Tetra Tech, Inc at the request of Vail Resorts performed a water system analysis of the KRWS and prepared a report outlining system deficiencies and improvement recommendations. The report was submitted in draft form in July of 2011 and is included with Appendix A. Subsequently, Tetra Tech prepared a draft rate analysis memorandum to identify adequate revenue to fund recommended improvements and ongoing operation and maintenance costs for the KRWS, which is also included with Appendix A.

The KRWS provides water for the 109 single family home sites, the Keystone Ranch restaurant and clubhouse, the subdivision's swimming center and the golf course maintenance facility The KRWS is owned and operated by the Vail Corp. Fees are paid by the HOA and Vail Corp based on the proportion of flows used between the residences and the commercial facilities.

The KR was initially built as part of the Keystone Ranch development in the mid to late 1970's by Keystone Resort In the late 1990's, the East Ranch was developed and additional lots and improvements were made. The water distribution system consists of approximately 24,000 feet of pipe ranging from 1 to 12 inch diameter sized pipe, one 300,000 gallon tank, and two water production wells. The wells were constructed in the mid 1970's with steel well casing and torch cut slotting. Based on problems with the wells, both from a quantity issue and the inclusion of sand into the wells, they were retrofitted to incorporated well screens and redeveloped in 1979.

Based on a review of District Court, Water Division No. 5, Case No. 88 CW 244, Item 18, the KRWS water rights for domestic use are as follows: *"When augmented pursuant to this plan for Augmentation, the wells shall be operated with priority as of the priority date of the water right used for augmentation, June 1, 1901, otherwise, with priority as of October 31, 1977 for 25 gallons per minute (W-3548) (Well Nos. 1-3) and with priority as of September 30, 1988, for 5.83 gallons per minute (Well No. 4)".* Based upon this information, the KRWS can operate Well No.s 1-3 at 25 gpm (40.4 acre-feet annually) and Well No. 4 at 5.83 gpm (9.4 acre-feet annually) for a total water right of 49.8 acre-feet per year (30.83 gpm or 16.2 million gallons per year). Further review of the water rights indicates a maximum of 2 acres for residential irrigation.

Based on discussions with the HOA and information in the Tetra Tech reports, it is understood that the KRWS is currently only operating Well No. 1 and Well No. 3. Well No. 2 was abandoned. Two new wells were recently drilled (presumably for Well No. 4), which did not yield any water. Subsequently, Well No. 1 was refurbished to yield additional flow. It is unclear whether the KRWS would be allowed to produce the total water right of 49.8 acre-feet per year from the existing two wells in operation, or whether an additional well is required to obtain full usage of the right. Any increase in well production should be confirmed to meet the requirements of the water rights.

INDEPENDENT REVIEW OF MASTER PLAN AND RATE ANALYSIS

JVA undertook a detailed review of the DRAFT Water System Analysis, July 31, 2011 with Appendices A-D, and the DRAFT Memorandum on the Keystone Ranch Water System – Rate Analysis, February 29, 2012. These documents are included with Appendix A. JVA and the HOA are not aware of any additional revisions to these documents. JVA's review assumes that the Draft documents were not subsequently up-revved and reissued.

A number of key issues were identified during our review, and a number of minor issues were also noted, which are discussed below. All references to report discussions, tables, or figures below relate to the water system analysis unless noted otherwise for the rate analysis memorandum.

KEY ISSUES

EQUIVALENT RESIDENTIAL UNITS (EQR)

The report includes differing information on the number of EQRs for the Keystone Ranch. Table 2.1 states 158 EQRs, Table 2.2 states 160 EQRs, and Section 3.2 – Water Rights states 127 single family equivalents (assumed synonymous with EQRs) which matches Table 5.2's 127 EQRs. Furthermore, the Rate Analysis Memo (Feb 29, 2012) states 126 EQRs. We assume the 127 EQRs is the correct number to base calculations on for continued use of the KRWS. Subsequent discussions with Tetra Tech indicated that the higher EQR's presented in Tables 2.1 and 2.2 reflect the anticipated EQRs for the KRWS should they be incorporated into a nearby water District (possibly impacting tap fees or reassessment of annual fees).

An Equivalent Residential Unit (EQR) is a number related to the volume of water consumptively used by a single-family residential unit housing a statistical average of three and five-tenths (3.5) persons having not more than two thousand five hundred (2,500) square feet of irrigated lawn or garden; that water consumption being two-tenths (0.2) acre feet per year (179 gal/day). Based on discussions with the HOA, the Ranch is completely built-out with 108 lots, with many of the homes only occupied seasonally. JVA recommends each lot be assigned an EQR of 1.0, and suggests the EQR for the restaurant (currently at 16) and maintenance building (currently at 2) be checked against criteria used in nearby districts. As an example, the Snake River Water District assigns 0.15 EQR per seat to a full service restaurant, or 0.04 EQR per seat for banquet rooms.

JVA understands that maintenance and repair costs are borne by the HOA and Vail Corporation based on the respective percentages of EQRs for private homes and commercial facilities. Establishing the proper EQR's for the KRWS is important for ensuring an appropriate rates paid for by the users of the system.

Daily Flow Estimates

Table 4.2 calculates average and peak daily flows based on an assumed average use of 350 gal/day per EQR. The report states the flows are based on Well Log records from 2007 – 2010. Following review of Well Log Sheets in Appendix B, data is only provided from May 2009 – December 2011. A review of 2010 log records in Appendix B indicates the following:

- Peak summer day usage was 434 gpd (July 2010)
- Peak winter day usage was 174 gpd (January 2009)
- Average annual gpd usage per EQR is 186 (all available records from May 2009 – December 2011)

The average value is much lower than the average 350 gpd used in the report and reported in Table 4.2. Based on subsequent discussions with Tetra Tech, the 350 gpd value was based on the higher usages noted during the summer time.

It may be possible to reduce the 350 gal/day/EQR for well capacity design requirements, which may in turn allow the KRWS to postpone recommended improvements for well capacity upgrades, as well as improve modeled performance for system pressure under fire-flow scenarios. As an example, the total figures presented in Table 4.2 could be reduced by approximately 50% if a value of 186 gal/day were used for average daily use per EQR. However, careful consideration needs to be given to the required storage capacity should a lower value be used for well capacity design purposes. The 350 gal/day/EQR is a conservative basis for sizing water storage requirements to ensure adequate storage capacity to cover any deficit in production to peak consumption.

Well Capacity and Future Augmentation Requirements

As discussed above in Section 2, we believe the KRWS is permitted to operate Well No.s 1-3 at 25 gpm (40.4 acre-feet annually) and Well No. 4 at 5.83 gpm (9.4 acre-feet annually) for a total water right of 49.8 acre-feet per year (30.83 gpm or 16.2 million gallons per year). Based on review of data in Appendix B, the total water usage from Wells 1 and 3 in 2010 was 9.2 MG, which was less than the water right of 49.8 acre-feet (16.24 MG/year).

The report lists conflicting information on existing well capacity. Section 1.1 indicates an approximate existing capacity of 60 gpm, whereas Table 3.1 indicates an approximate well capacity of 34 gpm from Well No. 1 and Well No. 3. Following on discussion on the assumed average daily water usage per EQR, if a lower value of 186 gal/day were used, the existing wells would have adequate capacity to supply peak daily flows of 33 gpm with both wells in service (no redundancy). As the KRWS does not currently have a backup well, a new well would be required to ensure security of supply of peak daily flows with one unit out of service. Alternatively, capacity in existing wells could be increased to ensure either well can supply the peak daily flow demand with one unit out of service. This may reduce the estimated costs for three new wells each with a 30 gpm capacity as proposed in Table 5.1.

Discussions with the HOA indicated that two new wells were drilled in the summer of 2013 and both came up dry. We recommend further investigation into these two wells to determine whether additional capacity from existing or new wells is even possible.

It should also be noted that the wells could be installed with higher capacities to put greater reliance on the System's water storage tank. The KRWS would need to ensure that total annual water usage does not exceed the water rights through flow totalizer monitoring and reporting. A review of Well Permit Applications for Wells 1 – 4 in Appendix A of the Water System Analysis indicates the following capacities requested on initial applications:

- Well 1 proposed maximum pumping rate = 90 gpm with a combined maximum residential irrigation of 2 acres (all wells)
- Well 2 proposed maximum pumping rate = 45 gpm with a combined maximum residential irrigation of 2 acres (all wells)
- Well 3 proposed maximum pumping rate = 45 gpm with a combined maximum residential irrigation of 2 acres (all wells)
- Well 4 proposed maximum pumping rate = 100 gpm with a combined maximum residential irrigation of 2 acres (all wells)
- The Conditions of Approval in these permit applications state "4) The combined average annual amount of ground water to be appropriated by all wells 1 – 4 shall not exceed 49.8 acre-feet" which matches the total anticipated water right for the KRWS.

JVA recommends the KRWS confirm the permitted capacity of all existing wells and consider capacity augmentation along with new wells to provide the recommended redundancy and backup. Any increase in well production should be confirmed to meet the requirements of the water rights.

Fire Flow Availability and System Pressure

As stated in Section 4.3 of the report, there are a few homes in the Ranch that have nominal pressures of 20 psi and with increased demands or fire demands may not have adequate pressures to function properly without individual booster pumps. CDPHE Design Criteria for Potable Water Systems recommends that normal working distribution system pressure must be at least 35 psi and should be approximately 60 psi to 80 psi.

For fire flows, Section 4.5indicates that fire flow requirements are generally estimated at 1,000 gpm for single family residences. Subsequent discussion on Section 5.3 states that 1,500 gpm fire flows over two hours were assumed in the model. This would indicate the model is conservative, and may be revised with a 1,000 gpm fire flow over two hours, which is expected to reduce the number of properties at risk (either below 20 psi or 1,000 gpm fire flows). Furthermore, a letter from Cort D. Nickel of The Sear Brown Group (December 4, 1977) to David A. Morris of East Dillon Water District (included with Appendix D) indicates a design fire flow of 1000 gpm at 20 psi.

For the commercial facilities, Section 4.5 indicates typical fire flows can be in the 2,500 – 3,500 gpm range. Section 5.3 indicates a 1,500 gpm fire flow over 2 hours was also assumed for commercial facilities. This reduction accounts for the facilities also protected by sprinklers. JVA believes this is an acceptable assumption.

Section 5.3 under the "Current System Analysis" indicates that *"Fire flow availability ranges from approximately 725 gpm to 4700 gpm at the water main. Low fire flow availability within the system was seen primarily on the East side of the system located at the end of long dead end lines."* JVA

recommends confirming which homes are currently modeled to receive less than 1,000 gpm fire flow. These homes are at the highest risk, and would benefit most from looping in the distribution system.

JVA believes low system pressures and fire flow availability to be a key issue for the HOA. Where homes are receiving water at nominal pressures of 20 psi or less, they are not getting adequate supply or fire flow. JVA agrees with the recommendation of looping between Clover Ln and Gentian Rd, as well as looping between the supply wells and the storage tank (last paragraph, pg. 19) to increase system pressures and fire flows.

Minor Issues

During review of the report and memorandum, a few minor issues were identified and are discussed below. JVA does not believe these issues require immediate resolution, but has listed them to capture all review comments on the report reviewed.

Water System Age

The model outputs showing water system age are generally well presented. However, Figure 7 shows multiple areas in distribution system where water age skips, as follows:

- Lots 24 – 26 along Keystone Ranch Road skip from 120 -240 hours to 360-480 hours. JVA would expect a portion of this pipe to show 240-360 hours
- Line servicing Clover Ln properties jumps from less than120 hours to greater than 480 hours (servicing lots 15-16). This line would be expected to show all times from 0 to 480 hours.
- Properties along Tract B (Penstemon Rd and Yarrow Ln) show age jumping from less than 120 hours to greater than 480 hours with no times in between. This is a dead-end line, so it is not clear why the water age jumps so dramatically.
- Line from tank running south of Saxifrage Road shows similar jump in system age, but this is understandable showing a demarcation where properties are generally serviced by the tank or by the well pumps.

Chlorination System

Section 5.4,0 second paragraph states that *"The system's chlorine contact time is inadequate."* Furthermore, Section 6.2 states that the installation of a simple chlorinator and mixer will improve the water age at 38 days. Subsequent discussion with Tetra Tech indicate that the KRWS does not currently have a clearwell for chlorine contact time, and as a result, users closest to the chlorination dose point may not receive the full benefit of the disinfection process. Additionally, the long water age in the storage tank can result in aesthetic issues with older water feeding to the homes closest to the water tank. A clearwell and storage tank mixer would help to address these deficiencies.

SCADA System

Section 5.4 - Second bullet states that a *"New SCADA system to be added in 2011"*. Based on discussions with the HOA, the SCADA system has not yet been added. Furthermore, Section 5.4

– Third paragraph. States *"A new SCADA system and control system needs to be installed. Presently operation requires a lot of system knowledge to function as well as requires much more time from the operators. The SCADA and control system will provide safer and more automated controls."* Additionally, the final sentence of Section 6.2 states *"Better controls for security and the operations of the tank need to be done as part of the improvements."*

Although there is limited information to back up these recommendations, a SCADA system can generally improve the security of system and reduce operational aspects of the System. JVA suggests the KRWS and the HOA review anticipated O&M savings and benefits associated with a new SCADA system to assist with the decision to undertake the improvements. We note that SCADA system modifications are required for inclusion into other Districts.

METERING IMPROVEMENTS

The majority of homes in the KRWS do not currently have meters installed. Similar to the SCADA system improvements, metering of all residences would be required for inclusion into another District. Consideration for alternative meters may provide some savings to the KRWS and the HOA.

EMERGENCY GENERATOR

Section 5.4 – Fourth Paragraph, recommends backup power generation by incorporating a small generator onto the existing building. As an alternative to installing a permanent diesel genset, the KRWS could procure a diesel mounted genset to run plant within 24 hours of outage to get plant up and running again while waiting for power restoration. The report indicates the existing storage tank has adequate storage for over 24 hours of peak demand. This approach might save or defer the estimated $40,000 - $70,000 in capital expenditure.

OTHER COMMENTS

The following section outlines some minor comments observed by JVA during the review:

- Figures 2 through 11 were not labelled correctly in Draft Document (all had "1" in the title block).
- Section 3.4 – Water Storage indicates a tank inspection was scheduled for August 2011. If this inspection was undertaken, JVA recommends the KRWS and HOA obtain and review the results of this report, as it may impact the recommendations for repairs to the storage tank. Based on subsequent discussions with the HOA, it is unknown whether this inspection took place.
- Section 6.3 – Distribution System. The second paragraph discusses water age with looped pipe and refers to Figure 11. Figure 11 does not actually show looped pipes, but does indicate different water ages. JVA assumes this is this simply an omission in the figure. Also, similar to comments above, some areas of the distribution system are shown with water ages skipping from less than 240 hours to greater than 360 hours with no apparent section with ages from 240-360 hours.

- Section 6.4 – Metering. The second sentence mentions a "restriction" on system by Augmentation plan. JVA is not aware of what this restriction is or how it may impact the recommended improvements.
- Draft Keystone Ranch Water System - Rate Analysis, February 29, 2012. JVA recommends KRWS and the HOA review the two recommended Alternative Rate Models in greater detail, and request this information as an Appendix or Attachment to the memorandum for information only.

Cost Estimate

This report has not undertaken an in-depth review of the cost estimates for the recommended improvements. Section 8.2 of the Water System Analysis includes opinions of probably costs developed by Tetra Tech. The majority of these estimates include summary OPCs without detailed breakdowns of costing. Detailed cost breakdown was included for the Fire Flow and Distribution System Improvements, and appears to be developed in a manner consistent with normal expectations. JVA noted some discrepancies between the costs presented in the Water System Analysis versus the Rate Analysis Memorandum. JVA has assumed that the OPC's provided in the Rate Analysis Memorandum are correct, as the document is more current. The recommended improvements and priorities from the Tetra Tech document are summarized in Table 1 below.

Table 1. Summary of Tetra Tech Improvement Costs and Priorities

Year	Improvement Description	Cost
2013-2014	Phase I Tank Protection	$10,000
	SCADA Improvements	$67,000
	Standby Generator	$40,000 - $70,000
	Well #3	$35,000
	SUBTOTAL	**$152,000 - 182,000**
2015-2017	Metering Program	$75,000
	Hydro pneumatic Tank	$70,000
	Water Main Replace and Looping, Phase 1	$230,000
	SUBTOTAL	**$375,000**
2022-2024	New Wells	$70,000
	Storage Tank Repairs	$100,000
	SUBTOTAL	**$170,000**
2027-2030	Water Main Additions and Looping, Phase 2	$230,000
	SUBTOTAL	**$230,000**

Discussion and Recommendations

Additional Comments

One item not addressed in the report is the potential for contamination from cross connections with irrigation systems, and the security of supply (adequate backflow prevention and shutoff valves within the distribution system should contamination occur). The KRWS and HOA may consider undertaking a cross-connection survey of the system to ensure adequate backflow prevention and

shutoff valves are installed on the system. The distribution system model developed by Tetra Tech may provide a good starting point for developing a system schematic of the system.

Prioritization of Improvements

The HOA has requested JVA provide an opinion on the priorities of the recommended improvements and prioritization from the Tetra Tech. Depending on the KRWS and HOA's goals for the long term operation of the system, the priorities of repairs may differ. Two possible viewpoints are considered to comment on the prioritization of improvements as follows:

- Assuming the Vail Corporation continues operation of the KRWS for the next planning horizon.
- Assuming the Vail Corporation transfers/sells the KRWS for inclusion into either the East Dillon Water District or the Snake Water District.

Continued Operation of the KRWS by the Vail Corporation

For this scenario, the priorities on improvements may vary somewhat from those presented in Table 1. The improvements and anticipated costs are summarized in Table 2.

Table 2. Summary of Improvement Costs and Priorities for Continued Operation by the Vail Corporation

Year	Improvement Description	Cost
2013-2014	Well #3[1]	$35,000[1]
	Water Main Replace and Looping, Phase 1	$230,000
	SUBTOTAL	**$265,000**
2015-2017	SCADA Improvements	$67,000
	Metering Program	$75,000
	Hydro pneumatic Tank	$70,000
	Standby Generator[2]	$40,000 - $70,000[2]
	SUBTOTAL	**$252,000 - $282,000**
2022-2024	Water Main Additions and Looping, Phase 2	$230,000
	Phase 1 Tank Protection	$10,000
	SUBTOTAL	**$240,000**
2027-2030	Storage Tank Repairs	$100,000
	SUBTOTAL	**$100,000**

Note 1. Augmentation of existing wells or drilling single new well with 30 gpm capacity may reduce costs by up to $70,000 by eliminating the need to drill three new wells. This assumes the average daily and peak daily flows can be reduced from 350 gpd/EQR and 700 gpd/EQR to 200 gpd/EQR and 400 gpd/EQR respectively.

Note 2. Cost may be deferred indefinitely if portable generator rented during outages.

INCLUSION INTO ANOTHER DISTRICT

Table 3 presents a summary of recommended improvements with the objective of inclusion into another District.

Table 3. Summary of Improvement Costs and Priorities for Inclusion to Another District

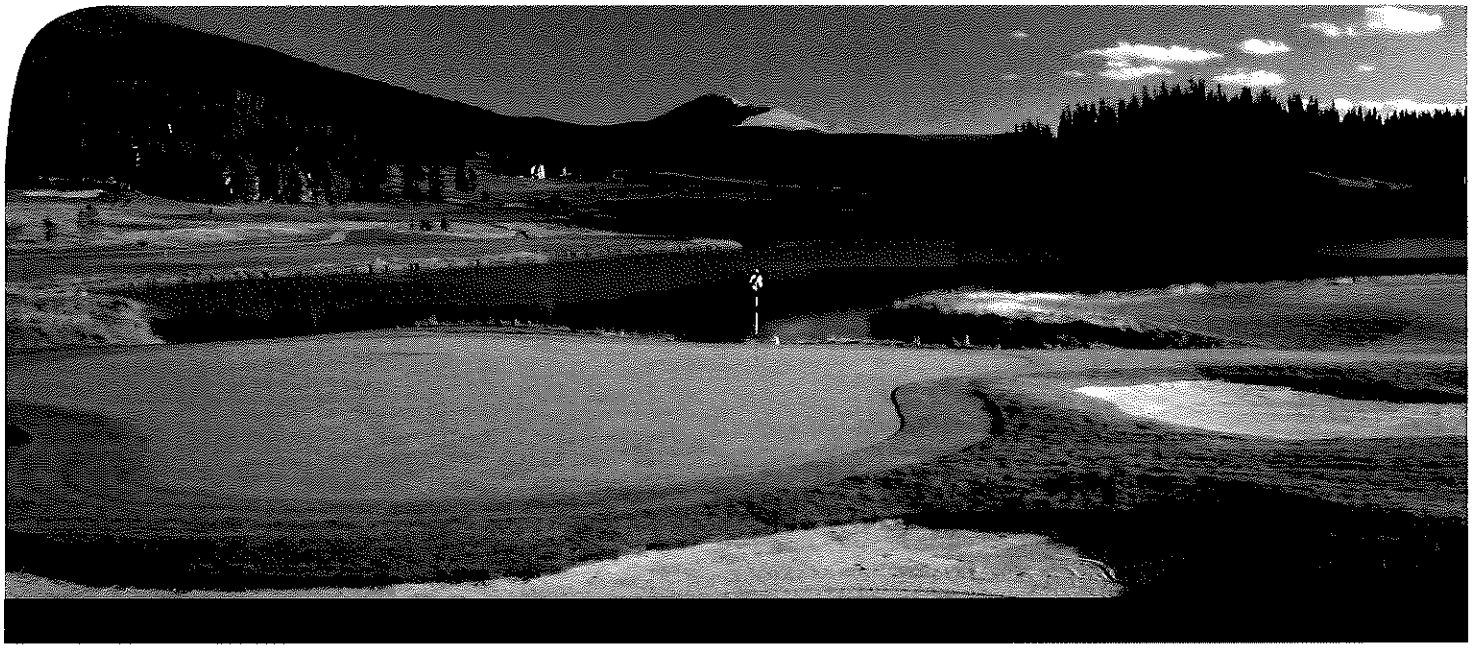
Year	Improvement Description	Cost
2013-2014	Water main interconnect pipeline	Note 1
	Proof of System Easements	Note 1
	Booster Pump Station	Note 1
	SCADA Improvements	$67,000
	Metering Program	$75,000
	SUBTOTAL	**$265,000[2]**
2015-2017	Addition of Tank Chlorination	Note 1
	Water Main Replace and Looping, Phase 1	$230,000
	Water rights transfer	Note 1
	Tank Chlorination[3]	$10,000
	Evaluation of Existing System	Note 1
	SUBTOTAL	**$230,000[2]**
2022-2024	Decommissioning of Existing WTP	Note 1
	SUBTOTAL	-

Note 1. Improvement not costed.
Note 2. Does not include costs for all recommended improvements.
Note 3. Assumed same cost as Phase I Tank Protection in original report.

Many of the priorities in Table 3 are related to the items identified by the Districts as important. It should be noted that a number of improvements were identified by East Dillon Water District and the Snake Water District which were not costed in the Tetra Tech report or in JVA's review of this report. These items are listed without costs. Also, improvements such as new wells or well augmentation were deleted from this scenario assuming the incorporating District would have adequate water supply to meet the KRWS current average and peak demands.

APPENDIX A – WATER SYSTEM AND RATE ANALYSIS

JULY 31, 2011 [redacted]



DRAFT WATER SYSTEM ANALYSIS

KEYSTONE RANCH

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KEYSTONE RANCH
WATER SYSTEM ANALYSIS

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Tetra Tech Job No. 133-67474-11001

July 31, 2011

TETRA TECH

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1.0 INTRODUCTION

1.1 General

The Keystone Ranch Water system (KR) provides water to properties in eastern portion of the Keystone Ranch subdivision. The water system provides water for the 109 single family home sites, the Keystone Ranch restaurant and clubhouse, the subdivision's swimming center and the golf course maintenance facility. The subdivision is located approximately one half mile south of Highway 6. Access to the subdivision is off of Highway 6 approximately 3 miles along Soda Ridge Road and Keystone ranch road. The service area includes approximately 182 acres of land excluding the golf course. See Figure 1, Vicinity Map.

The water system consists of two groundwater wells with treatment buildings and vaults that produce approximately 60 gpm, a 300,000 gallon concrete storage tank and approximately 23,000 linear feet (lf) of twelve, eight and six inch cast or ductile iron pipe. Approximately 5,000 lf of service line ranging from 3 inch ductile to ¾ inch copper service lines exist throughout the system.

1.2 History of the Water System

The Keystone Ranch Water System was initially built as part of the Keystone Ranch development in the mid to late 1970's by Keystone Resort. In the late 1990's, the East Ranch was developed and additional lots and improvements were made. The system is still owned and operated by the Keystone Resort.

1.3 Purpose

The purpose of this master plan is to analyze the existing water system and formulate recommendations that will provide a safe and reliable water system for the residents and guests of the Keystone Ranch now and in the future. In performing the analysis:

- Existing system data was collected and reviewed
- The supply treatment was evaluated
- The storage system was evaluated
- The distribution system was modeled and evaluated
- Flow data was reviewed
- Water quality data was reviewed

Recommendations for system improvements were made and Opinions of Probable cost for those improvements prepared. Options for funding the improvements were created. Finally, preliminary opportunities to connect to the adjacent water systems were reviewed.

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THE VAIL CORPORATION

KEYSTONE RANCH WATER SYSTEM ANALYSIS

VICINITY MAP

Project No.:	133-67474-11001
Date:	07-22-2011
Designed By:	KYS

FIG. 1

2.0 POPULATION PROJECTIONS

2.1 Existing Population

The Keystone Ranch subdivision being part of a mountain resort and on the golf course has both a permanent and transient population with many of the home s being second homes. Populations vary during the times of year with peak population inhabiting the subdivision during the ski season and in the summer months with minimal population in the spring and fall seasons. This is very typical of mountain resorts. The golf course however increases the peak population toward the summer months. Table 2.1 below summarizes the existing equivalent residential units (EQR) and population for the Keystone Ranch subdivision.

TABLE 2.1
EXISTING EQRs AND POPULATION
Keystone Ranch Water System

AREA	RESIDENTIAL	COMMERICAL	EQRs[1,2,3,5]	POPULATION[4]
Single Family Large	108		140	378
Keystone Ranch Main Building		1	16	50
Maintenance Facility		1	2	20
Total	108	2	158	448

(1) EQR Factor for Single Family Large (1.30) - Per Unit (1.00) Additional Bedroom (0.15) Additional Kitchenette (0.15)
(2) EQR Factor for Main Building (19.6) - 100 Seat Rest. (15) 30 Seat Bar/Lounge (3.6) Retail Space (0.50) Restroom (0.50)
(3) EQR Factor for Maintenance Facility (1.86) - 8,600 SF Garages, Machine Shops, Fire Station (1.46) 500 SF Office (0.40)
(4) Assumes 3.5 People/Unit
(5) EQR calculations for comparison with adjacent District tap schedules

2.2 Ultimate Population

With the subdivision being almost built-out and only a handful of lots not built upon, it is expected that the ultimate population and its usage patterns will not change for the remaining development, from expansion of commercial facilities or from the expansion of existing homes.

Table 2.2 outlines the ultimate population of the Ranch and East Ranch.

TABLE 2.2
ULTIMATE EQRs AND POPULATION
Keystone Ranch Water System

AREA	RESIDENTIAL	COMMERICAL	EQRs[1,2,3,5]	POPULATION [4]
Single Family Large	109		142	382
Keystone Ranch Main Building		1	16	50
Maintenance Facility		1	2	20
Total	109	2	160	452

(1) EQR Factor for Single Family Large (1.30) - Per Unit (1.00) Additional Bedroom (0.15) Additional Kitchenette (0.15)
(2) EQR Factor for Main Building (19.6) - 100 Seat Restaurant (15) 30 Seat Bar/Lounge (3.6) Retail Space (0.50) F Restroom (0.50)
(3) Maintenance Facility (1.86) - 8,600 SF Garages, Machine Shops, Fire Station (1.46) 500 SF Office Space (0.40)
(4) Assumes 3.5 People/Unit
(5) EQR calculations for comparison with adjacent District tap schedules

3.0 EXISTING SYSTEM

The existing water system is served with one pressure zone. Service elevations range from 9170 to 9370 feet with system pressures ranging from 25-125 pounds per square inch (psi). Individual sections will outline the existing system's Water Supply, Water Rights, Water Transmission and Distribution Lines and Water Storage. A brief description of each follows.

3.1 Water Supply and Treatment

3.1.1 General

The water supply for the subdivision consists of two groundwater wells. The wells were constructed in the mid 1970's with steel well casing and torch cut slotting. Based on problems with the wells, both form a quantity issue and the inclusion of sand in to the wells, they were retrofitted to incorporate well screens and redeveloped in 1979.

Well #1 was permitted under Permit Number 035819-F. The well is permitted at a maximum pumping rate of 27 gallons per minute (gpm). Existing capacity of the well is around 18 gpm. The well was drilled originally to 55 feet in 1978. The well was cased with 8 5/8 inch steel casing with torch cut slots made from elevations 36 feet to 53 feet. It was rehabilitated in 1979 by placing a 7 inch diameter steel casing from an approximate elevation of 23-43 feet and a 60 slot Johnson well screen from elevation 43-53 feet.

Well #2 was drilled and has been abandoned in place.

Well #3 was originally drilled in 1978. The well was drilled to a total depth of 45 feet. It was found to have numerous problems. In 1979, Blatchley Associates reviewed the well conditions and made recommendations to retrofit. Ten feet of well screen was placed inside of the 8- 5/8 inch steel casing. A 5 inch diameter galvanized 30 slot steel wrapped well screen was also installed.

A new pump was installed in 2009

The Keystone Ranch well data is summarized below:

TABLE 3.1
EXISTING WELL CAPACITY
Keystone Ranch Water System

	APPROXIMATE CAPACITY (GPM)
Well #1	20
Well #2	Abandoned
Well #3	14
Well #4	Not drilled
Total	34

Specific permit and drawings of the wells can be found in Appendix A.

3.1.2 Water Quality

Based on evaluation of the water quality data submitted to Tetra Tech, the source water from Wells 1 and 3 does not exceed the primary and secondary containment levels established by the Colorado Department of Public Health and Environment (CDPHE). Wells 1 and 3 are currently blended and chlorinated within the existing booster pump station located on the golf course. Since the existing wells are the Keystone Ranch's primary water source and the wells are within close proximity of the golf course lake with respect to horizontal and vertical separation as well as the golf course fairways, Tetra Tech evaluated four (4) alternatives for the Keystone Ranch to consider since this is the primary water source for the Keystone Ranch subdivision. The four (4) alternatives are; no action, enhanced annual monitoring, Snake River Water District or East Dillon Water District connection, and District water treatment.

No Action Plan:
The "No Action" plan would be for Keystone Ranch to continue operating the water system as it has been by blending and chlorinating prior to distribution. Continue the required sampling requirements set forth in the Colorado Primary Drinking Water Regulations.

Enhanced Annual Monitoring:
This option would involve the implementation of an enhanced annual water quality program that would include Microscopic Particulate Analysis (MPA) of the ground water source to monitor and confirm that there is no direct hydraulic connection between surface and ground waters and record any significant shifts in conductivity, temperature, pH, etc. Annual MPA and other testing will create a historical database. Trending can be developed to determine if there is an increase in contamination susceptibility.

Snake River Connection:
This alternative would provide a connection from either the Snake River Water District or East Dillon Water District's system to the Keystone Ranch water distribution system. The Keystone Ranch Well system could then be used as a back-up system if necessary. In addition, either of the Districts would benefit from the existing water storage capacity within Keystone Ranch.

Water Treatment:
Currently, the existing ground water source does not need to be treated to comply with the Colorado Primary Drinking Water regulations. However, the Source Water Assessment Report completed in 2004 does rank the Keystone Ranch ground water sources from "moderately high" to "high" for susceptibility to potential contamination. CDPHE could require water treatment if results of the above mentioned enhanced annual monitoring program were to indicate potential contamination.

3.1.3 Treatment

Treatment for the wells is by hypo chlorination as they come into the treatment buildings. There is no chorine contact or detention storage with the exception of the storage found in the lines ahead of the first customer service line. Calculated detention time ranges from 15 minutes to 45 minutes for wells 1

and 3 respectively. Times when both wells are working chlorine contact times are reduced to 8 minutes.

3.2 Water Rights

The ranch water system is owned and operated by Vail-Arapahoe Limited Partnership. The system has water rights through the Keystone-Arapahoe Limited partnership. The Keystone –Arapahoe limited partnership has decreed water augmentation plans found in Water Court Cases W-3548 and 88 CW 244.

The decrees allow for 109 single family equivalent units (SFE's), an additional 18 SFE's for the restaurant, stable and clubhouse associated with the golf course and two acres of irrigation according to a memo dated July 26, 1994 from Bishop Brodgen Associates Inc.

3.3 Water Transmission and Distribution Lines

Water transmission and distribution lines are primarily ductile iron pipe with the possibly of some cast iron pipe installed. A few common copper service lines exist within the water system along Keystone Ranch and Gentian Roads. They are located at the south end of the system and on the west side of the system and serve 2-3 units each maximum. The system has many lines that are dead end lines, many of which looping is somewhat prohibitive but other areas where looping would lend to the reliability and better quantity and quality of flows. Only the lines done in conjunction with the East Ranch Subdivision have easements and ROW's where the water distribution system is located where as the original construction have waterline easements that were dedicated by separate instrument. We have not had a lot of luck locating these individual easements.

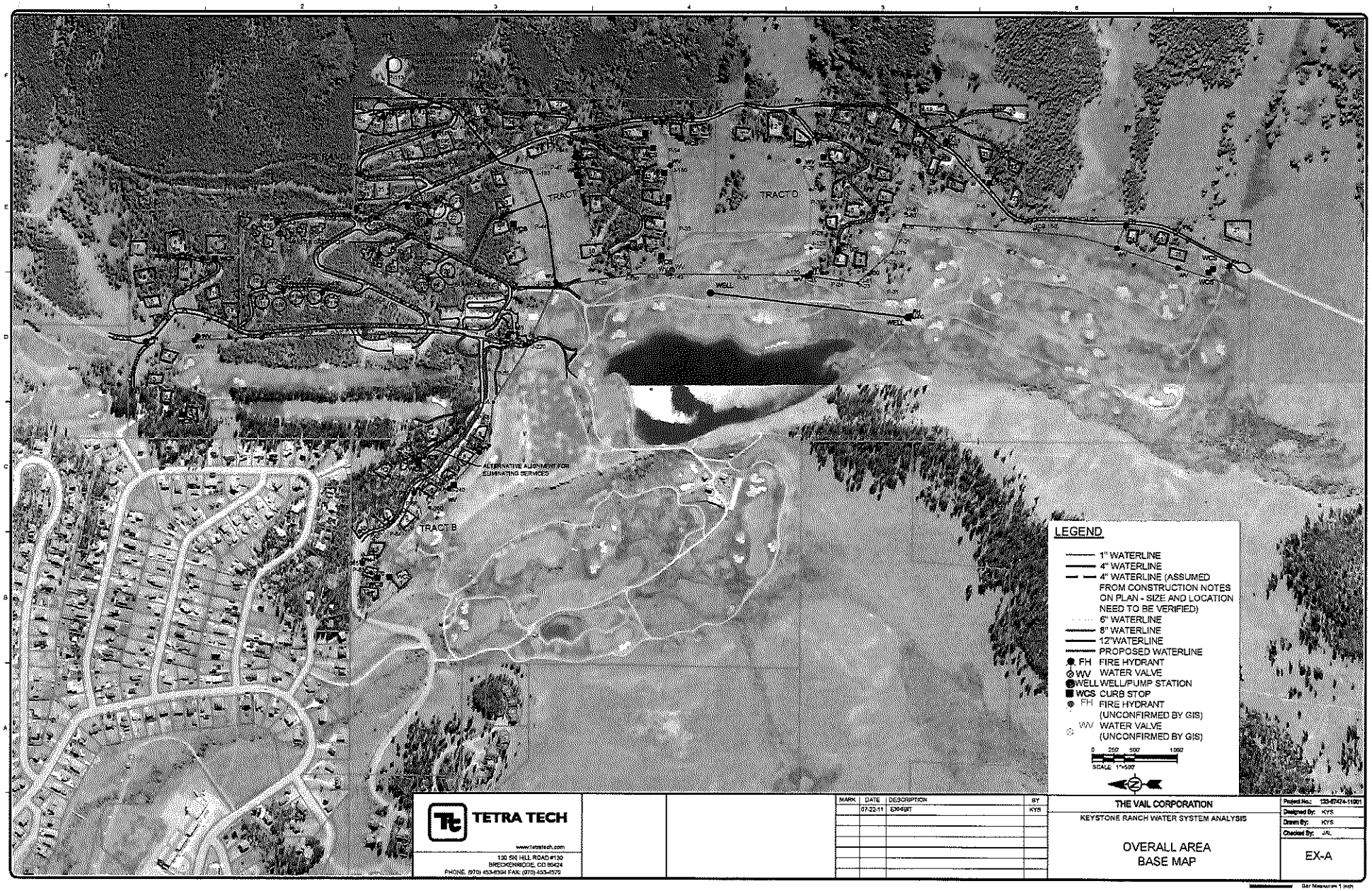
3.4 Water Storage

Water storage consists of a 300,000 gallon partially buried concrete tank. The concrete tank was built in 1978. An access gate located at the bottom of the transmission line serves as the main security to the tank. A tamper alarm is located on the locked access hatch which is connected to an auto dialer.

The tank is located on United States Forest Service Lands under a Special Use Permit. The permit is held under Keystone Resorts, Inc. and expires in 2028.The easement area includes a 10 foot easement for the water pipeline and an approximate area of 250 feet by 250 feet for the tank and appurtenances. Annual permit fees area around $5,000.

Slight cracks are evident on the lid of the tank. From discussions with Water Solutions Inc., the operator of water system, they understood that the tank lid was previously repaired by pouring a new lid over the existing lid. From the site visit, it appears that the surface cracks may have been routed out and sealed with an epoxy sealer. The repairs were believed to be done around 1992-1993 from correspondence found in the files. No records for the repairs were available at the time of this report. Water Solutions Inc. has a diving company specializing in water tank inspections and is slated to inspect the tank in late August 2011. Results of the inspection once available can be incorporated into the final masterplan report.

The existing system drawings can be found on Exhibits A through E.



TETRA TECH
www.tetratech.com
130 SKI HILL ROAD #130
BRECKENRIDGE, CO 80424
PHONE: (970) 453-6394 FAX: (970) 453-4570

MARK	DATE	DESCRIPTION	BY
	07-22-11	EXHIBIT	KYS

THE VAIL CORPORATION

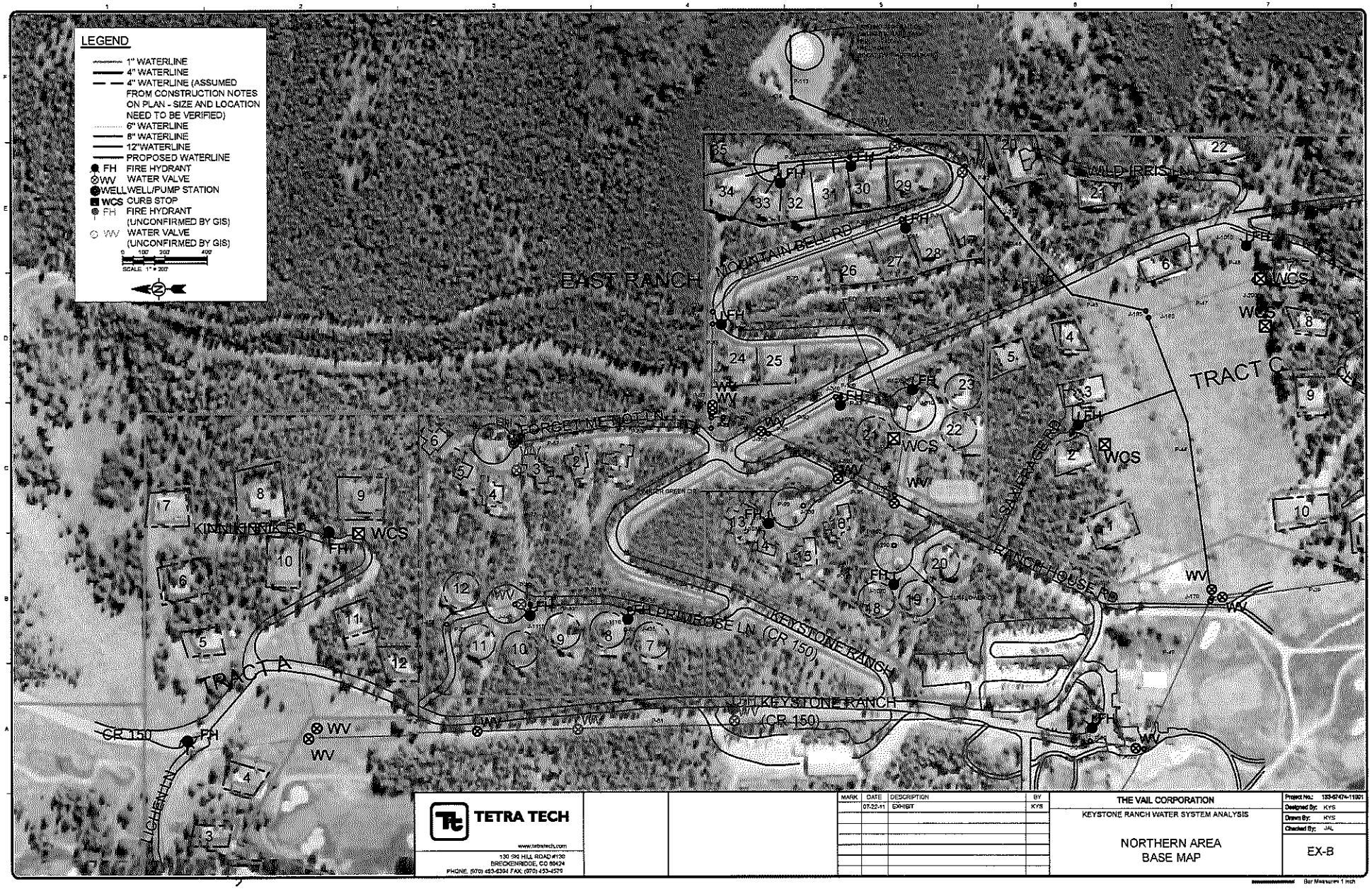
KEYSTONE RANCH WATER SYSTEM ANALYSIS

OVERALL AREA
BASE MAP

Project No.:	133-67474-11001
Designed By:	KYS
Drawn By:	KYS
Checked By:	JAL

EX-A

Bar Measures 1 inch


LEGEND
1" WATERLINE
4" WATERLINE
4" WATERLINE (ASSUMED FROM CONSTRUCTION NOTES ON PLAN - SIZE AND LOCATION NEED TO BE VERIFIED)
6" WATERLINE
8" WATERLINE
12"WATERLINE
PROPOSED WATERLINE
FH FIRE HYDRANT
WV WATER VALVE
WELL WELL/PUMP STATION
WCS CURB STOP
FH FIRE HYDRANT (UNCONFIRMED BY GIS)
WV WATER VALVE (UNCONFIRMED BY GIS)
SCALE 1" = 200'
EAST RANCH
TRACT C
TRACT A
MOUNTAIN BELL RD
WILD IRIS LN
FORGET-ME-NOT LN
KINNIKINNICK RD
SAWTOOTH RD
FELDSPAR CLOSE LN
KEYSTONE RANCH
RANCH HOUSE RD
KEYSTONE RANCH (CR 150)
CR 150
HIGHLINE
TETRA TECH
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130 SKI HILL ROAD #130
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PHONE: (970) 453-8394 FAX: (970) 453-4579
MARK DATE DESCRIPTION BY
07-22-11 EXHIBIT KYS
THE VAIL CORPORATION
KEYSTONE RANCH WATER SYSTEM ANALYSIS
NORTHERN AREA BASE MAP
Project No.: 133-62474-11001
Designed By: KYS
Drawn By: KYS
Checked By: JAL
EX-B
Bar Measures 1 Inch

TETRA TECH

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BRECKENRIDGE, CO 80424
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MARK	DATE	DESCRIPTION	BY
	07-22-11	EXHIBIT	KYS

THE VAIL CORPORATION

KEYSTONE RANCH WATER SYSTEM ANALYSIS

NORTHWESTERN
AREA BASE MAP

Project No.: 133-67474-11001
Designed By: KYS
Drawn By: KYS
Checked By: JAL

EX-C

Bar Measures 1 inch

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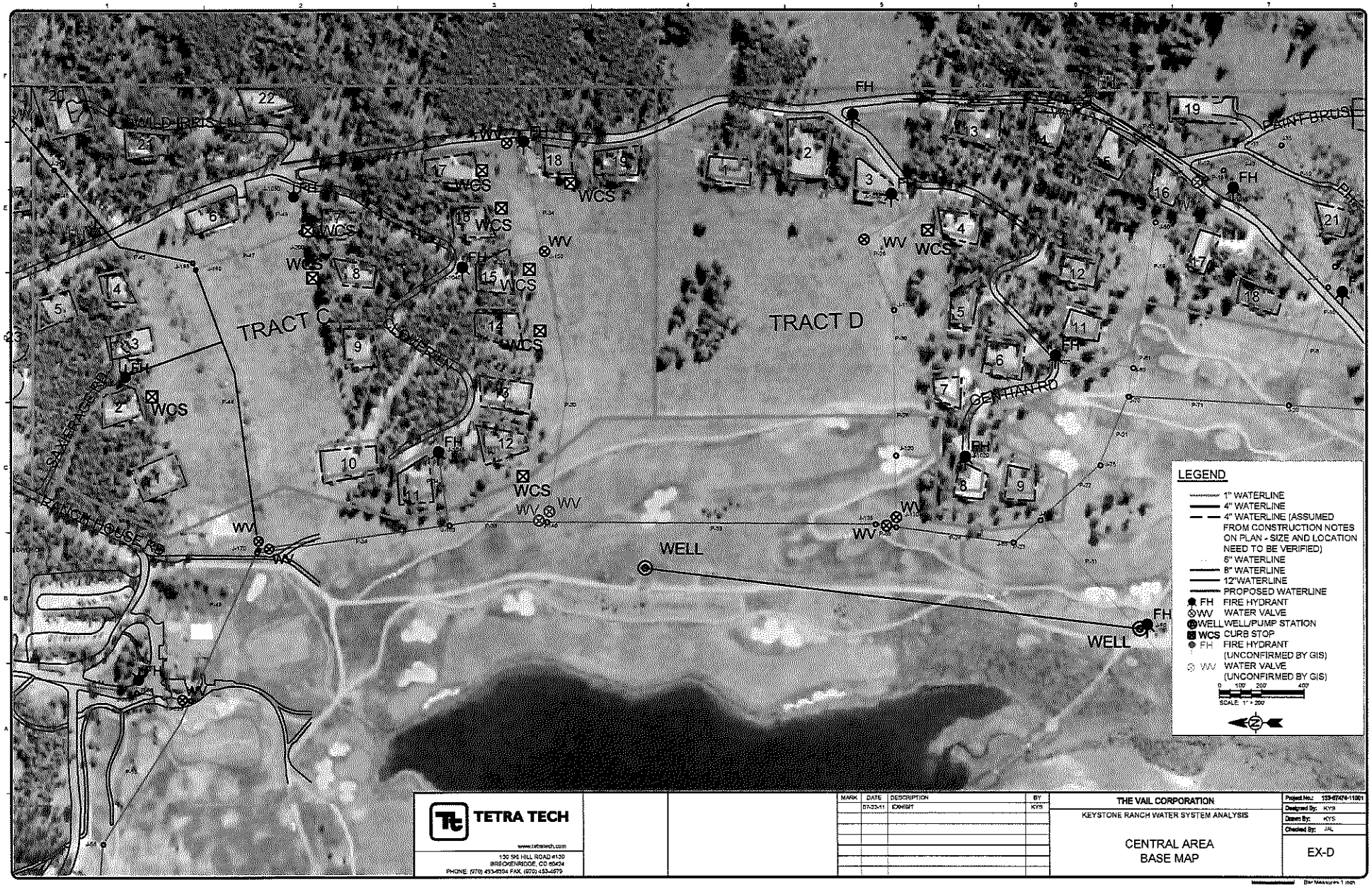

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MARK	DATE	DESCRIPTION	BY
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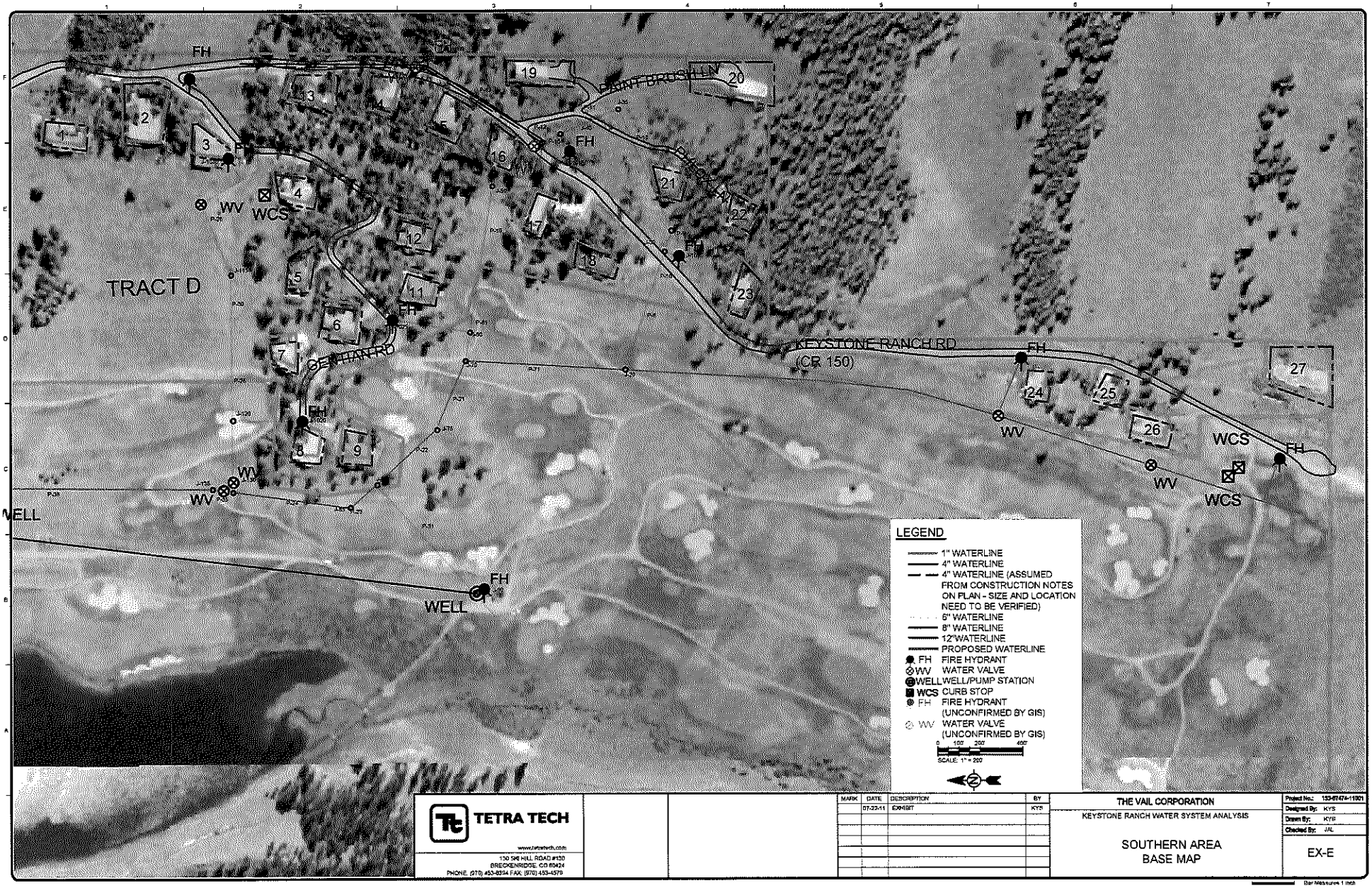
THE VAIL CORPORATION
KEYSTONE RANCH WATER SYSTEM ANALYSIS

CENTRAL AREA
BASE MAP

Project No.:	133-07474-11001
Designed By:	KYS
Drawn By:	KYS
Checked By:	JAL

EX-D

9/6/2011 1:39:58 PM - P:\07474\133-07474-11001\CAD\SHEETFILES\KEYSTONE RANCH WATER\LIVE BASE MAP.DWG - SCHAEL, KARL



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THE VAIL CORPORATION

KEYSTONE RANCH WATER SYSTEM ANALYSIS

SOUTHERN AREA
BASE MAP

Project No.:	153-87474-11001
Designed By:	KYS
Drawn By:	KYS
Checked By:	JAL

EX-E

Bar Measures 1 inch

8/10/11 4:42:43 PM - P:\87474\153874741100\CAD\SHEETFILES\KEYSTONE RANCH WATERLINES BASE MAP.DWG - JSCHWAB, KGEL

4.0 WATER DEMANDS

Water demands for the Keystone Ranch are somewhat typical of the mountain towns and resorts. Typical water demands can't be used based on the vacancy rates associated with second homes, high occupancy rates during the holidays, ski season and summer season. In addition, summer irrigation typically increases the demand. Occupancy rates have not been correlated with the main water supply meters and individual meters are not installed for all taps, so water demand estimates have been made to allow a comparison to calculated demands.

4.1 Water Production

Water production is the only means of accounting of water for the system. Readings are made by the operators every 2-3 days which provides a good basis for demands during the peak winter and summer seasons. Typical full occupancy rates will be estimated based on the Christmas/ New Years' time period for winter demands and the time around the fourth of July for summer demands. Usage for these periods of time along with an understanding of full time occupancies in the area will provide a rough idea of present usage.

Table 4.1 delineates the peak day usage from the logs form the period of 2007-2010. Individual logs can be found in Appendix B of the report.

Table 4.1
PEAK DAY USAGE
Keystone Ranch Water System

SUMMER PEAK DAY, gpm	SUMMER PEAK DAY, per unit	WINTER PEAK DAY, gpm	WINTER PEAK DAY, gpd
50	567	30	340

4.2 Water System Peaking Factors

Peak day demands have been correlated with the production records for both the single family and commercial usages. Table 4.2 outlines these demands.

TABLE 4.2
FUTURE WATER REQUIREMENTS- PUMPING & TREATMENT FACILITY
Keystone Ranch Water System

AREA	EQUIVALENT RESIDENTIAL UNITS EQRs	AVERAGE DAILY FLOW GPD	PEAK DAILY FLOW GPD	PEAK DAILY FLOW GPM	PEAK INSTANT FLOW GPM
Single Family Large	109	38,150	76,300	53	132
Keystone Ranch Main Building	16	5,600	11,200	8	19
Maintenance Facility	2	700	1,400	1	2
Total	127	44,450	88,900	62	154

(1) Peak Daily Flow = 2 Times Average Daily Flow
(2) Peak Instant Flow = 5 Times Peak Daily Flow

4.3 System Pressures

Water Distribution system pressures range from 25 psi to 125 psi. There are a few homes that have nominal pressures of 20 psi and with increased demands or fire demands may not have adequate pressures to function properly without individual booster pumps.

4.4 Irrigation Requirements

Irrigation appears to contribute to the major source of usage for the system. It coincides with the peak summer season for the commercial aspects of the Ranch which includes the golf course, ranch restaurant, recreation center and maintenance facility.

4.5 Fire Flow Requirements

The Keystone Ranch water system generally serves single family homes with the exception of the Keystone Ranch golf club house and restaurant, recreation building and golf course maintenance building. Previous correspondence and studies have affirmed the concerns of the Snake River Fire Protection chief (now the Lake Dillon Fire Protection District) along with his recommendations for both increased flows and hydrant spacing. Generally, single family fire flow requirements have been estimated to be around 1,000 gpm for single family residences. The commercial facilities are sprinkled which will allow a substantial reduction from normal fire flow requirements that can be in the 2500-3500 gpm range.

5.0 WATER SYSTEM ANALYSIS

5.1 Water Supply

The present water supply does not provide a reliable source of water for the system. Firm capacity of the system if one pump went down would leave a supply of 14 gpm using the lowest producing well. Peak day flow estimates are around 60 gpm. The wells not only need to have increased capacity of at least 30 gpm but also provide redundancy. Table 5.1 outlines the recommended well capacity improvements.

TABLE 5.1
PROPOSED WELL CAPACITY
Keystone Ranch Water System

	APPROXIMATE CAPACITY (GPM)
Well #1	30
Well #2	30
Well #3	30
Well #4	0
Total	90

By providing another well, the Keystone Ranch subdivision can provide the required firm capacity with the largest pump off-line.

5.2 Potable Water Storage

Water storage is based on the combination of Peak day storage plus Fire flow storage. The existing system has a total storage of 300,000 gallons. Based on these requirements, the existing tank will provide enough storage to handle that demand.

TABLE 5.2
FUTURE WATER REQUIREMENTS- FINISHED WATER STORAGE FACILITIES
Keystone Ranch Water System

AREA	EQUIVALENT RESIDENTIAL UNITS EQRs	PEAK DAILY FLOW GAL/DAY	FIRE STORAGE GAL[1,2]	PEAK DAY PLUS FIRE STORAGE GAL[3]
Single Family Large	109	76,300	180,000	268,200
Keystone Ranch Main Building	16	11,200	180,000	268,200
Maintenance Facility	2	1,400		88,200
Total	127	88,900	180,000	268,200

(1) Assumes 1500 GPM Demand for 2-hours for Single Family Large
(2) Assumes 1500 GPM Demand for 2-hours for Keystone Ranch Main Building (Sprinkled)
(3) Total Peak Day Plus Fire Storage Assumes Largest Peak Day Plus Fire Storage

5.3 Distribution System

To evaluate the water distribution system, a hydraulic water model was developed using the H2ONET Version 8.5 modeling software developed by MWH Soft, Inc. in conjunction with AutoCAD Release 9. Existing record drawings and previous model documentation was incorporated into the H2ONET model database for use in developing a steady-state and extended period simulation models for the Keystone Ranch system. Existing fireflow data and system pressures were used to validate the hydraulic model.

The water distribution system model consists of approximately 24,000 feet of pipe ranging from 1-inch diameter to 12-inch diameter sized pipe, one 300,000 gallon tank, and two water production wells. Water system demands were developed and distributed within the model on a gallons per minute (gpm) per lot basis and verified with water production records. Tank water level records were used to develop pump controls that mirror existing operating conditions.

Current System Analysis

The hydraulic model representing the current distribution system was analyzed for system operating pressures, water velocity, fire flow availability and water age within the system.

Operating pressures within the distribution system range from 25 psi to 125 psi. Figure 2 displays pressure contours to represent how pressure varies throughout the system. Higher pressures are generally located on the West and North sides of the system while lower pressures are found on the East and South parts of the system.

Water velocity across the entire system ranges between near 0 feet per second (fps) and 0.7 fps. These velocities are quite low and can lead to increased water age throughout the distribution system, especially if flushing events do not occur regularly.

A fire flow analysis of the system was conducted to determine how much fire flow is available throughout the system as well as to determine the effects of a fire flow event on water pressure throughout the entire distribution system. Fire flow availability ranges from approximately 725 gpm to 4,700 gpm at the water main. Low fire flow availability within the system was seen primarily on the East side of the system located at the end of long dead end lines. In addition to determining flow capacities of the mains, the fire flow scenario was used to evaluate how system pressures were affected by the fire flow demands. Figures 3 through 6 illustrate system wide pressures under a 1,500 gpm fire flow event at different fire hydrant locations throughout the system.

To evaluate the water age throughout the distribution system an extended period model simulation was developed. Using flow versus versus time data from other similar type mountainous subdivisions, a diurnal flow pattern was developed and used for evaluating how the flow of water acts over time through the system of pumps, storage tank, and distribution system piping. The model simulated how water moves through the system over long periods of low water demands and how old the water becomes within the distribution system piping and storage tank. In addition, this type of scenario is used for evaluating water storage tank recovery times and booster pump run times. The analysis showed that with the water demand being so small compared to the size of the tank the water age within the tank is much higher than the rest of the distribution system on average. The high volume of water in the tank causes there to be surges of older water to be put into the system when the tank is being emptied and when the pumps are not operating. The average water age within the tank during periods of low water demand was calculated to be approximately 38 days. Within the distribution system, the locations most affected by the water age surges are those closest to the tank, specifically the North part of the distribution system, while the South section of the distribution system experiences shorter periods of being serviced by the tank. Figure 7 illustrates the water age within the model shortly after the pumps are shut down and not supplying well water to the distribution system.

The analysis shows that Keystone Ranch would benefit from implementing a flushing program to help move water through the distribution system.

The system however has a number of dead end lines that can limit the reliability of the system. Looping where feasible is always preferred. A critical loop for the system is between Gentian Road and Clover Lane. The feeds from the water supply to the tank and the tank to the water supply has a one way feed for approximately 1,800 lf, much of it through the golf course. If a break should occur, these critical sources will be cut off from each other. As a minimum, looping this 1,300 lf section would

eliminate the potential for increased down time while minimizing the need to restrict play on the golf course if a break were to occur.

In addition, there are a number of areas where fire hydrants should be added to provide better coverage based on the comments from the Lake Dillon Fire Protection District. The addition of isolation valves would provide an easier and less restrictive solution to isolating areas of the distribution system for repairs or replacement.


Output @ 01:00 hrs
Pressure (psi)
1. Below 20
2. 20 ~ 40
3. 40 ~ 60
4. 60 ~ 80
5. 80 ~ 100
6. 100 ~ 120
7. 120 ~ 140
8. Above 140
LEGEND
WATER
EDGE OF ROAD
LOTS
TETRA TECH
KEYSTONE RANCH
1
Date: Jun 20, 20**
Designed By: JK
Figure No


FIRE FLOW = 1,500 GPM @ 2-HR DURATION
Output @ 01:00 hrs
Pressure (psi)
1. Below 20
2. 20 ~ 40
3. 40 ~ 60
4. 60 ~ 80
5. 80 ~ 100
6. 100 ~ 120
7. 120 ~ 140
8. Above 140
LEGEND
WATER
EDGE OF ROAD
LOTS
TETRA TECH
KEYSTONE RANCH
Figure No
1


FIRE FLOW = 1,500 GPM @ 2-HR DURATION
Output @ 01:00 hrs
Pressure (psi)
1. Below 20
2. 20 ~ 40
3. 40 ~ 60
4. 60 ~ 80
5. 80 ~ 100
6. 100 ~ 120
7. 120 ~ 140
8. Above 140
LEGEND
WATER
EDGE OF ROAD
LOTS
TETRA TECH
KEYSTONE RANCH
1


FIRE FLOW = 1,500 GPM @ 2-HR DURATION
Output @ 01:00 hrs
Pressure (psi)
1. Below 20
2. 20 ~ 40
3. 40 ~ 60
4. 60 ~ 80
5. 80 ~ 100
6. 100 ~ 120
7. 120 ~ 140
8. Above 140
LEGEND
WATER
EDGE OF ROAD
LOTS
TETRA TECH
KEYSTONE RANCH
1


Output @ 01:00 hrs
Pressure (psi)
1. Below 20
2. 20 ~ 40
3. 40 ~ 60
4. 60 ~ 80
5. 80 ~ 100
6. 100 ~ 120
7. 120 ~
8. Above 140
LEGEND
WATER MAIN
EDGE OF ROAD
LOTS
FIRE FLOW = 1,500 GPM @ 2-HR DURATION
TETRA TECH
KEYSTONE RANCH
1


Pipe Output View
Water Age (hrs)
Below 120.00
120.00 - 240.00
240.00 - 360.00
Above 360.00
LEGEND
WATER
EDGE OF ROAD
LOTS
0
100
200
TETRA TECH
www.tetratech.com
1900 S. Sunset Street, Ste. 1-F
Longmont, Colorado 80501
PHONE (303) 772-5282 FAX (303) 772-7328
KEYSTONE RANCH
Project No.
Date
Designed by
Figure No.
1

5.4 Water Treatment Plant

The water treatment/ booster pump station presently houses Well 1, the hypochlorination treatment and the controls. The older facility needs improvements to bring it up to a higher standard. The following items need to be done to the facility:

- Chlorine contact clearwell
- New SCADA and control system (proposed for 2011)
- Back-up generator
- Better floor drain

The system's chlorine contact time is inadequate. Storage needs to be provided. Based on a 30 minute detention time with peak day flows of 60 gpm, an 1800 gallon clearwell should be constructed.

A new SCADA and control system needs to be installed. Presently operation requires a lot of system knowledge to function as well as requires much more time from the operators. The SCADA and control system will provide safer and more automated controls. Appendix C outlines the proposed improvement s that are anticipated to go in this year.

The present pump house has no backup generation. If a power failure were to occur, the supply would be shut off. Opportunities incorporating a small generator on to the existing building or providing a portable generator are options for providing an alternate power source. With the proximity of the station to the golf course, it appears that a generator inside the building would be a better option.

6.0 MASTER FACILITIES PLAN

6.1 Water Supply and Treatment

The water supply and treatment facility treatment improvements include new wells that are designed to provide an adequate and redundant supply. Three- 30 gallon per minute wells that would be chlorinated and pumped into a 2000 gallon clearwell providing adequate chlorine contact time. New booster pumps would then pump the water to the tanks upon tank level controls. The clearwell could be located on the south side of the exiting building and would be buried. Re-piping and electrical modifications would need to be done as part of the improvements.

6.2 Water Storage

The water storage volume of the existing 300,000 gallon tank is adequate for the ultimate development of the Keystone Ranch Water system. A few improvement s however need to be made to the storage facility. Based on the water modeling and the low flows during the shoulder season, the water age of water stored in the system can reach over 38 days. To rectify this, a simpler chlorinator and mixer needs to be installed at the tank. As an alternative, operations could manually do this but during the winter months when the road is closed, but it would be a difficult task. In

addition recommendations from the tank inspection that is to occur in August 2011 needs to be made. As the tank gets older, ongoing maintenance should be considered. Better controls for security and the operations of the tank need to be done as part of the improvements.

6.3 Distribution System

Following the existing distribution system evaluation, three (3) separate system improvement scenarios were evaluated within the model to improve fire flow availability and water age within the distribution system. The first scenario partially looped the dead end waterlines on the East side of the distribution system. Another scenario completely looped all of the dead end lines on the East site of the system. The third scenario included the complete looping of the East side of the system as well as looping the North end of the distribution system. Finally, along with the three improvement scenarios, a scenario developed to minimize water age within the system by increasing the range of which the water level within the tank is allowed to drop was also evaluated.

Of the three looping scenarios, partial looping of the East side of the distribution system had little effect on the available fire flow in the areas except directly where the looping occurred. Figure 8 shows pressure contours during a fire event located on the eastern side of the distribution system with the partial looping in place. On the other hand the fire flow availability is greatly increased by doing a complete loop of the eastern side of the distribution system, increasing availability in some locations by as much as 1,300 gpm. Figure 9 shows the increased pressure during the fire event depicted in Figure 9 as a result of complete looping of the East side of the distribution system. The last looping scenario evaluated was the looping connection of the North side of the distribution system. Similar to the complete looping of the East side of the system, looping the North end of the system substantially increased the amount of fire flow available in the northern part of the system. Figure 10 displays the pressure contours of a fire flow event occurring in the northern part of the distribution system after looping has been incorporated into the model. In addition to the fire flow availability, water age was also evaluated for each of these looping scenarios. The looping scenarios all showed similar average water age characteristics to the results seen in the model of the existing system. The primary difference with the looping scenarios was the decrease in the variance of the water age at a location over a period of time, though this did not show any change in the average water age at any locations sampled within the distribution system. The scenario of modifying the pump operating controls to allow the tank to empty further than is currently being observed did decrease the average water age within the tank from 38 days to approximately 17 days. This caused water age throughout the distribution system to decrease on a similar scale. Figure 11 illustrates the fully looped system scenario with the alternate operating controls and the water age associated with a time shortly after the pumps are offline.

The recommended distribution system improvements include area line looping along Keystone Ranch Road from Tract C to Tract D. In addition, additional hydrants along Keystone Ranch Road should be installed. Exhibits A-E show the proposed distribution system improvements.


FIRE FLOW = 1,500 GPM @ 2-HR DURATION
Output @ 01:00 hrs
Pressure (psi)
1. Below 20
2. 20 ~ 40
5. 80 ~ 100
6. 100 ~ 120
7. 120 ~ 140
8. Abov
GEND
WATER
EDGE OF ROAD
LOTS
TETRA TECH
KEYSTONE RANCH
1


FIRE FLOW = 1,500 GPM @ 2-HR DURATION
Output @ 01:00 hrs
Pressure (psi)
1. Below 20
2. 20 ~ 40
3. 40 ~ 60
4. 60 ~ 80
5. 80 ~ 100
6. 100 ~ 120
7. 120 ~ 140
8. Above 140
LEGEND
WATER
EDGE OF ROAD
LOTS
TETRA TECH
KEYSTONE RANCH
1


FIRE FLOW = 1,500 GPM @ 2-HR DURATION
Output @ 01:00 hrs
Pressure (psi)
1. Below 20
2. 20 ~ 40
3. 40 ~ 60
4. 60 ~ 80
5. 80 ~ 100
6. 100 ~ 120
7. 120 ~ 140
8. Above 140
LEGEND
WATER
EDGE OF ROAD
LOTS
TETRA TECH
KEYSTONE RANCH
Figure No
1


Pipe Output View
Water Age (hrs)
Below 120.00
120.00 - 240.00
240.00 - 360.00
360.00 - 480.00
Above 480.00
LEGEND
WATER
EDGE OF ROAD
LOTS
TETRA TECH
KEYSTONE RANCH
1

6.4 Metering

Metering is a major issue with both tracking individual water usage but also providing a cross check for water losses in the system. With the restriction on the system by the Augmentation plan, a metering program will allow the utility to operate the system more efficiently.

7.0 INCLUSION INTO OTHER DISTRICTS

One option for the Keystone and the Ranch water system is Inclusion into existing adjacent districts. The East Dillon Water District (EDWD) and the Snake Water District (SRWD) are adjacent the Keystone Ranch property. The EDWD borders the Ranch property and presently serves the West Ranch. The SRWD is located along Keystone Ranch Road approximately 1 mile from the KR.

The second option would be to have either of the Districts operate and maintain the KR Water system independently from their systems but handle all Operations and Maintenance as well as Administrative billings.
A brief review of requirements of the two Districts follows:

East Dillon Water District Inclusion
Inclusion into the EDWD has been brought up and reviewed for many years starting in the 1990's. The West Ranch Development which includes approximately 60 units is served by the EDWD. The KR water system is higher than the development of the EDWD and the West Ranch and would need the EDWD to establish a new pressure zone or operate the Ranch as a separate system. That would mean a booster pump station would need to be installed to boost the EDWD's system pressure to the KR water system pressure. A letter from Sear-Brown in Dec 1997 outlined the anticipated requirements that would need to be done for "Acquisition". The letter can be found in Appendix D. In the letter the following items were outlined:

- 1000 lf of water main interconnect pipeline
- Booster pump facilities inside of the present Grey Fox Lane Pump Station
- SCADA system modifications
- 0.5 miles of 8" water main and appurtenances along Keystone Ranch road for fire protection
- Metering of al residences
- Water rights transfer to EDWD if water would be supplied from their system
- Potential of decommissioning the present water supply system
- Elimination of joint service lines
- Proof of adequate water line easements
- Existing system evaluation

In addition to these items, there would be fees associated with the "Acquisition" that may be a bit more favorable from a typical Inclusion. It would be anticipated that all improvements to bring the KR water system up to EDWD requirements would be at the cost of KR. In addition, there would be tap fees that would need to be paid. Since the KR water system has some facilities that by rights (water rights and storage), would be considered infrastructure that could benefit the EDWD, those facilities may allow some negotiations from the typical inclusion requirements. In addition, the tax base brought in by the Ranch properties could also be a plus to the EDWD. This would however be totally up to the discretion of the EDWD board. Tap fees for the District are presently are presently at $7500/tap.

Anticipated costs for inclusion to the District can be found under the cost Estimate Section of this report. These are done on a magnitude basis since detailed discussions would need to be made with the District to outline all other issues.

Snake River Water District Inclusion

Inclusion into the SRWD would require a bit more infrastructure to provide service to the KR since the District is farther away. If the KR would connect in to the main SRWD water system for a source, the system would be an independent zone as explained in the East Dillon Water District inclusion section. Improvements and issues surrounding the inclusion could include:

- Construction of a booster pump station
- Construction of 5,100 lf of pipeline up to the Ranch property
- SCADA system modifications
- Metering of all Residences
- Proof of waterline easements, service line locations
- Dedication of Water rights to the SRWD
- Through review of the system including testing
- Looping of water lines where feasible
- Addition of key valves and hydrants
- Addition of tank chlorination

Tap fees for the facilities would need to be paid to the District based on their regulations. Present rates are at $7200/ tap. Tap fee schedules for the Districts will change the number of taps that would be required to purchase as a single family lot since tap fees schedules of ten include the number of bathrooms and bedroom as a basis for additional taps beyond the single EQR.

It should be noted that inclusion is up to the respective District boards. There are no binding regulations that say they would have to include the KR water system properties into their Districts.

8.0 COST ESTIMATES

8.1 General

The master plan has made several recommendations for Capital improvements to the water system. Cost Estimates for the proposed system upgrades can be found in this section. Costs have been broken down to compare system improvements with the system operating as it does now along with costs for inclusion into one of the adjacent Districts. Costs are preliminary in nature and should be used to establish a magnitude number. Costs are based on 2011 numbers. No attempt has been made to sequence the schedule of improvements which will affect future pricing.

8.2 Opinions of Probable Cost

The costs estimates will be broken down into three categories; Keystone Ranch Water system, Acquisition of the water system by the EDWD and inclusion into the Snake River Water District. This will allow Keystone to compare the alternatives for service.

KEYSTONE RANCH
WATER SYSTEM RECOMMENDATIONS
SUMMARY
COST ESTIMATE

Item Description	Cost
CHLORINATION, VAULT & GENERATOR	$328,000.00
FIRE FLOW & DISTRIBUTION SYSTEM IMPROVEMENTS	$479,000.00
STORAGE TANK REPAIRS	$35,000.00
SCADA IMPROVEMENTS	$67,000.00
METERING-REMOTE	$75,000.00
NEW WELLS	$104,000.00
Total (rounded to the nearest $1,000)	**$1,088,000.00**

Notes:

KEYSTONE RANCH
WATER SYSTEM RECOMMENDATIONS
EDWD CONNECTION SUMMARY
COST ESTIMATE

Item Description	Cost
TAP FEES	$952,500.00
FIRE FLOW & DISTRIBUTION SYSTEM IMPROVEMENTS	$479,000.00
STORAGE TANK REPAIRS	$35,000.00
SCADA IMPROVEMENTS	$67,000.00
METERING-REMOTE	$75,000.00
CONNECTION	$393,000.00
MISC	$100,000
Total (rounded to the nearest $1,000)	**$2,101,500.00**

Notes:

KEYSTONE RANCH
WATER SYSTEM RECOMMENDATIONS
SRWD CONNECTION SUMMARY
COST ESTIMATE

Item Description	Cost
TAP FEES (158)	$1,137,600.00
FIRE FLOW & DISTRIBUTION SYSTEM IMPROVEMENTS	$479,000.00
STORAGE TANK REPAIRS	$35,000.00
SCADA IMPROVEMENTS	$67,000.00
METERING-REMOTE	$75,000.00
CONNECTION	$1,238,000.00
MISC	$100,000
Total (rounded to the nearest $1,000)	**$3,131,600.00**

Notes:

KEYSTONE RANCH
WATER SYSTEM RECOMMENDATIONS
FIRE FLOW & DISTRIBUTION SYSTEM IMPROVEMENTS

Item Description	Qty	Units	Unit Cost	Cost
Additional Hydrants To Meet Fire District 300' Radius Rule				
- Knnicknnick Rd				
- Hydrant Assembly	1	EA	$5,000.00	$5,000.00
- Line Extension (6" DIP)	250	LF	$100.00	$25,000.00
- Paint Brush Ln				
- Hydrant Assembly	1	EA	$5,000.00	$5,000.00
- Keystone Ranch Road (300 LF NE of Paint Brush Ln Intersection)				
- Hydrant Assembly	1	EA	$5,000.00	$5,000.00
- Line Extension (8" DIP)	330	LF	$100.00	$33,000.00
- Road Repair (330 LF x 12')*	3,960	SqFt	$3.00	$11,880.00
Water line loop to minimize service outage				
- Keystone Ranch Road from existing line between lots 17 & 18 Tract C to .				
- to Gentian Rd.				
- Line Extension (8" DIP)	850	LF	$75.00	$63,750.00
- Road Repair (850 LF x 12')*	10,200	SqFt	$3.00	$30,600.00
- Keystone Ranch Road from new hydrant NE of Paint Brush Ln.				
- to existing 8" line South of Gentian Rd.				
- Line Extension (8" DIP)	450	LF	$120.00	$54,000.00
- Road Repair (450 LF x 12')*	5,400	SqFt	$3.00	$16,200.00
Water line loop to allow individual services to lots 12, 13, & 14 Tract B				
- Keystone Ranch Road from Penstemon Rd. to Yarrow Ln.				
- Line Extension (8" DIP)	600	LF	$100.00	$60,000.00
- Road Repair (350 LF x 12')*	4,200	SqFt	$3.00	$12,600.00
Water Distribution system locates and mapping for valves and curb stops not yet located, or existence confirmed.				
- Curb Stop locating and mapping **	89	EA	$250.00	$22,250.00
- Gate Valve locating and mapping (10 gate valves on plans not confermed0	10	EA	$300.00	$3,000.00
Capital Cost Sub-Total (Present Worth)				$347,280.00
Contingency (20% of Capital Cost)				$69,456.00
Direct Construction Cost				$416,736.00
Engineering (15% of Direct Construction Cost)				$62,510.40
Operation & Maintenance Cost Sub-Total (Present Worth)				
Total (rounded to the nearest $1,000)				$479,000.00

Notes:

*Assumes that road disturbance can be limited to a 12' width for removal and replacement.

**Assumes that of the 109 total Residential units that approximately 20 curb stops have already been located and mapped.

KEYSTONE RANCH
WATER SYSTEM RECOMMENDATIONS
CHLORINATION, VAULT & GENERATOR

Item Description	Qty	Units	Unit Cost	Cost
A. Site Work	1	LS	$8,000.00	$8,000.00
B. Chlorination Vault (2000 Gal.)	1	EA	$10,000.00	$10,000.00
C. Building modifications	1	LS	$20,000.00	$20,000.00
D. Vault Piping/Pumps/Mechanical	1	LS	$85,000.00	$85,000.00
Portable Generator				
A. Gen. set w/ Fuel Tank and electrical connections	1	LS	$25,000.00	$25,000.00
C. Electrical connection at each pump house & Vault to MCC	2	EA	$10,000.00	$20,000.00
E. Misc.	1	LS	$5,000.00	$5,000.00
G. Electrical	1	LS	$20,000.00	$20,000.00
Capital Cost Sub-Total (Present Worth)				$ 193,000.00
Contingency (20% of Capital Cost)				$ 38,600.00
Direct Construction Cost				$ 231,600.00
Engineering Design and Construction Phases (20% of Direct Construction Cost)				$ 46,320.00
Engineering Pre-Design/Feasibility Study				$ 50,000.00
Operation & Maintenance Cost Sub-Total (Present Worth)				
Total (rounded to the nearest $1,000)				$ 328,000.00

Notes:

KEYSTONE RANCH
WATER SYSTEM RECOMMENDATIONS
NEW WELLS

Item Description	Qty	Units	Unit Cost	Cost
Additional System Capacity				
- New Wells	3	EA	$15,000.00	$45,000.00
-Pumps and Electrical	3	EA	$10,000.00	$30,000.00
Capital Cost Sub-Total (Present Worth)				$75,000.00
Contingency (20% of Capital Cost)				$15,000.00
Direct Construction Cost				$90,000.00
Engineering (15% of Direct Construction Cost)				$13,500.00
Operation & Maintenance Cost Sub-Total (Present Worth)				
Total (rounded to the nearest $1,000)				$104,000.00

Notes:

KEYSTONE RANCH
WATER SYSTEM RECOMMENDATIONS
STORAGE TANK REPAIRS

Item Description	Qty	Units	Unit Cost	Cost
- Keystone Ranch Storage Tank				
- Roof Repair (Cracks in existing roof)	1	LS	$25,000.00	$25,000.00
- Internal Repairs*	1	LS		$0.00
Capital Cost Sub-Total (Present Worth)				$25,000.00
Contingency (20% of Capital Cost)				$5,000.00
Direct Construction Cost				$30,000.00
Engineering (15% of Direct Construction Cost)				$4,500.00
Operation & Maintenance Cost Sub-Total (Present Worth)				
Total (rounded to the nearest $1,000)				$35,000.00

Notes:

* Internal tank inspection scheduled by Water Solutions at the endo fo August 2011. Results of the inspection to be incorporated int oteh report once available.

KEYSTONE RANCH
WATER SYSTEM RECOMMENDATIONS
SCADA IMPROVEMENTS

Item Description	Qty	Units	Unit Cost	Cost
SCADA				
- Plant PLC Automation	1	LS	$15,000.00	$15,000.00
- SCADA System	1	LS	$12,785.00	$12,785.00
-Instrumentation	1	LS	$19,900.00	$19,900.00
-Old system removal	1	LS	$920.00	$920.00
Capital Cost Sub-Total (Present Worth)				$48,605.00
Contingency (20% of Capital Cost)				$9,721.00
Direct Construction Cost				$58,326.00
Engineering (15% of Direct Construction Cost)				$8,748.90
Operation & Maintenance Cost Sub-Total (Present Worth)				
Total (rounded to the nearest $1,000)				$67,000.00

Notes:

KEYSTONE RANCH
WATER SYSTEM RECOMMENDATIONS
WATER METERING

Item Description	Qty	Units	Unit Cost	Cost
Remote Metering				
- Residential (Replace existing meter with remote read meter)	36	EA	$200.00	$7,200.00
- Residential (New remote read meter)	73	EA	$500.00	$36,500.00
- Multi/Commercial	2	EA	$1,500.00	$3,000.00
- Software	1	EA	$5,000.00	$5,000.00
- Computer Hardware	1	EA	$5,000.00	$5,000.00
- Remote Reader	1	LS	$5,000.00	$5,000.00
Capital Cost Sub-Total (Present Worth)				$54,500.00
Contingency (20% of Capital Cost)				$10,900.00
Direct Construction Cost				$65,400.00
Engineering (15% of Direct Construction Cost)				$9,810.00
Operation & Maintenance Cost Sub-Total (Present Worth)				
Total (rounded to the nearest $1,000)				$75,000.00

Notes:

Assumes that of the 109 total Residential units that approximately 36 units are currently metered and can be fitted with remote read meters.

KEYSTONE RANCH
WATER SYSTEM RECOMMENDATIONS
EAST DILLON WATER SYSTEM CONNECTION
MAIN LINE & BOOSTER PUMP STATION

Item Description	Qty	Units	Unit Cost	Cost
System Connection				
- 8" Main Line connection	1000	LF	175	$175,000.00
Booster Pump Station				
- Pumps and Piping in the existing building	1	LS	$75,000.00	$75,000.00
- Electrical & Telemetry	1	LS	$35,000.00	$35,000.00
Capital Cost Sub-Total (Present Worth)				$285,000.00
Contingency (20% of Capital Cost)				$57,000.00
Direct Construction Cost				$342,000.00
Engineering (15% of Direct Construction Cost)				$51,300.00
Operation & Maintenance Cost Sub-Total (Present Worth)				
Total (rounded to the nearest $1,000)				$393,000.00

Notes:

KEYSTONE RANCH
WATER SYSTEM RECOMMENDATIONS
SRWD WATER SYSTEM CONNECTION
MAIN LINE & BOOSTER PUMP STATION

Item Description	Qty	Units	Unit Cost	Cost
System Connection				
- 10" Main Line connection	5150	LF	125	$643,750.00
- Road Repair (5150 LF x 12')	61,800	SqFt	$2.00	$123,600.00
Booster Pump Station				
- Pump Station Building Addition	1	LS	$20,000.00	$20,000.00
- Pumps and Piping	1	LS	$75,000.00	$75,000.00
- Electrical & Telemetry	1	LS	$35,000.00	$35,000.00
Capital Cost Sub-Total (Present Worth)				$897,350.00
Contingency (20% of Capital Cost)				$179,470.00
Direct Construction Cost				$1,076,820.00
Engineering (15% of Direct Construction Cost)				$161,523.00
Operation & Maintenance Cost Sub-Total (Present Worth)				
Total (rounded to the nearest $1,000)				$1,238,000.00

Notes:

A route from Elk Spur Ln. along Keystone Ranch Road was used for cost estimating. An alternate rout may be available pending the acquisition of easements , or U.S.F.S special use agreement to allow for a more direct route at the Keystone Ranch Road switch back that could reduce water line length by approximately 1,800 lineal feet.

9.0 FINANCING

Since the District is mostly built out, there are two options to finance the improvements. With both, a schedule to establish the improvements needs to be made.

The first option is levy a series of lump sum payments that would establish a pay as you go on a project by project basis. Specific project s would be outlined and improvement costs on an EQR basis paid into the fund. The second is to increase the monthly charges to the homeowners and commercial properties to build up a reserve. Once enough money is reserved a certain project can progress.

10.0 ADDITIONAL TASKS

Additional tasks needed to bring the water system up to a higher level but not a capital improvement in nature will be outlined under this section.

- Line locates to insure lines are in easements and can be found in an emergency situation
- Location and excavation of missing valves. A number of valves are shown on the original plans but have not been found in the field
- All service lines should be located and shut-offs surveyed to insure they can be found in an emergency
- Service lies under private structures should be located and leers written to individual homeowners to move the lines.
- Back flow preventers should be made a mandatory install for individual homeowners.

TETRA TECH

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DRAFT WATER SYSTEM ANALYSIS

TETRA TECH

DRAFT

February 29, 2012
133-67474-11001

MEMORANDUM

TO: Randy May, Vail Resorts Development Company

FROM: Jim Lenzotti

SUBJECT: Keystone Ranch Water System – Rate Analysis

The purpose of this memorandum is to outline the rationale behind the Rate Analysis for the Keystone Ranch Water System (KR). The plan has been prepared to provide adequate revenue to fund improvements, operate and maintain the water system for both Vail Corporation and the Keystone Ranch Homeowner's Association

HISTORY

The KR provides water to properties in eastern portion of the Keystone Ranch subdivision. The water system provides water for the 109 single family home sites, the Keystone Ranch restaurant and clubhouse, the subdivision's swimming center and the golf course maintenance facility The KR was initially built as part of the Keystone Ranch development in the mid to late 1970's by Keystone Resort. In the late 1990's, the East Ranch was developed and additional lots and improvements were made.

The water distribution system consists of approximately 24,000 feet of pipe ranging from 1 to 12 inch diameter sized pipe, one 300,000 gallon tank, and two water production wells The wells were constructed in the mid 1970's with steel well casing and torch cut slotting. Based on problems with the wells, both form a quantity issue and the inclusion of sand into the wells, they were retrofitted to incorporated well screens and redeveloped in 1979.

Tetra Tech, Inc at the request of Vail Resorts was directed to perform a water system analysis of the KR and prepare a report which would outline and provide system improvement recommendations This report was submitted in draft form in July of 2011, in which is documented the needed system improvements and deficiencies. In performing the analysis the existing system data was collected and reviewed, supply treatment and storage system were evaluated, the distribution system modeled and evaluated, and flow and water quality data were reviewed.

A hydraulic model representing the KR's distribution system was created to analyze system operating pressures, water velocity, fire flow availability and water age.

RECOMMENDED SYSTEM IMPROVEMENTS

It was determined that system rehabilitation and improvements were necessary to provide safe and reliable water system for the residents and guests of the Keystone Ranch now and in the future. In

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addition some operational improvements for the system have been made. System improvements consist of upgrades, repairs and replacements to the well system, treatment system, distribution system and the storage tank. With that analysis, it was determined that approximately one million dollars of improvements will need to be completed to improve the existing facilities. An outline of general improvements and a proposed timeline for completion are outlined in Table 1.

Table 1

KEYSTONE RANCH
WATER SYSTEM IMPROVEMENT PRIORITIES

2013-2014		
	Phase I Tank Protection	$10,000
	Scada Improvements	$67,000
	Standby Generator	$ 40,000-70,000
	Well #3	$35,000
		$182,000
2015-2017		
	Metering Program	$75,000
	Hydropneumatic Tank	$70,000
	Water Main Replace & Looping PH-I	$230,000
		$375,000
2022-2024		
	New Wells	$70,000
	Storage Tank Repairs	$100,000
		$170,000
2027-2030		
	Water Main Additions and Looping	$230,000

RATE STRUCTURE

The rate structure for the water system will review existing and proposed operational expenses along with capital improvements projected from the Water analysis report.

Current Rate Structure

Presently Vail charges $50/mo. per EQR for water service. The Ranch system has 126 EQR's presently connected with one EQR remaining to be connected to the system Of the 127 total EQR's, 109 are residential units, 16 are commercial units and 2 are for the maintenance/recreation facilities.

Tetra Tech evaluated the existing rate structure and compared it to the existing and proposed expenditures. It was evident that with the additional recommendations, a rate adjustment was in order. The present rate structure will not cover Operations let alone replacement improvements.

Proposed Rate Structure

A revised budget for operations was prepared that outlines present expenditures along with additional projected expenditures for future maintenance and testing of the system. In addition, costs for the improvements delineated in Table 1 have been incorporated into the model.

Alternatives for a proposed rate structure were established to provide options for funding the water system operations and capital improvements. The rate structure Costs have been broken down to compare system improvements with system operations as it does now

Based on these factors, two models have been prepared to reflect the new rates that would be required to fund the annual Operations and Maintenance costs along with the Improvements, Replacement and Repair costs.

Table 2 outlines the two alternatives and their associated rates and proposed special assessments.

Table 2

Alternative rate model	Rates, monthly per unit (EQR)				Assessments per unit (EQR)				
	2013	2018	2023	2028	2013	2020	2028	2030	Total
Alt 1 (Annual Inflation)	$62.50	70.36	81.57	94.56	$5,000	$2,500		$2,500	$10,000
Alt 7 (Constant rate)	$75.00	$82.50	$103.13	$123.75	$4,500		$1,000		$5,500

Alternative 1 increases the present monthly rate by 25% ($62 50/ month) and incorporates an annual increase for inflation which for this model has been set at 2-3%. It provides an initial special assessment of $5,000 in year 2013 with two additional assessments in the years 2020 and 2030 for $2,500 each of the years for a total of $10,000.

Alternate 7 increases the present base rate by 50% to $75/ month and incorporates 10% - 25% rate increases approximately every 5 years. It includes an initial special assessment of $4,500 in 2013 and a subsequent assessment of $1000 in 2030 for a total of $5,500

Recommendations

We would recommend that Vail and the Homeowners' Association review the rate alternatives in detail so a preferred rate can be established. The rate structures try to balance the monthly customer rates with the special assessments that occur throughout the 20-year study period. Assessments and/ or rate increases have been spread throughout the 20-year period to keep dollars close to the improvement schedule

END

JAL/CP