Paul Monroe
CICWCD General Manager
88 East Fiddlers Canyon Road, Suite A
Cedar City, Utah 84721

21 August 2015

Dear Paul,

This cover letter is for 3 submissions in response to the CICWCD recently circulated form to document additional water supply sources to alleviate the water deficit in the Cedar Basin, which Basin is defined by the UGS on Attachment 1. We have additional suggestions. However, these are logical first steps:

1. Reentry and completion of the Cedar City Quichapa Creek #1 well, 3,200 acre feet of water per year at $50/acre foot;
2. Sheepherder Cabin Well (near Woods Ranch), 800 acre feet of water per well per 182 days at $250/acre foot; and
3. Reentry of the ARCo Three Peaks No. Exploratory Oil Well, 3,200 acre feet of water per well at $250/acre foot.

We want to state up front our support for the West Desert water initiative. Attachment 2 was provided to the CICWCD in 2006 by Roice, suggesting MX aquifer water (West Desert water) as a viable alternative to the Lake Powell Pipeline. The wisdom of the community vote on Lake Powell is shown by the recent pollution of the Colorado River by the EPA into the Animas River. Based on our experience in the oil industry, we are concerned the cost of the proposed pipeline will greatly increase. We strongly believe the West Desert water should be proven (as presented in your meeting on the 18th of June of this year there should be geophysical and geological studies to better define the resource before drilling the first test wells), and permits for wells and the pipeline should still be obtained expeditiously.

We strongly support the CICWCD request for submissions, for putting all projects in a compatible format, and for making this information available for public scrutiny and comment. Our 3 submissions are ranked based on a dollars per acre-foot, and we believe each of these submissions should have priority over drilling test wells or the actual building of the West Desert Pipeline.

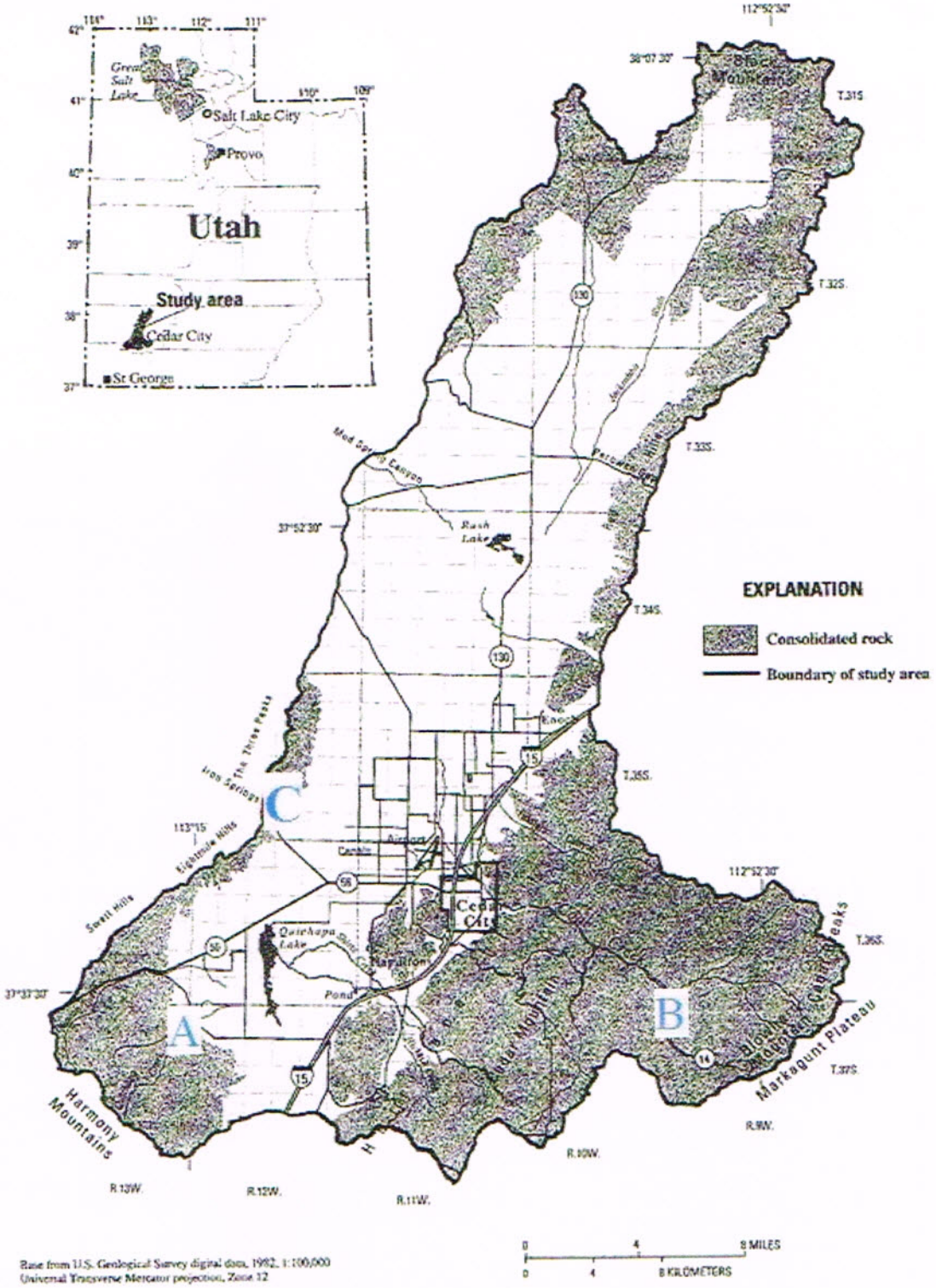
Gary has been working on water issues in Cedar Valley for 25 years. Attachment 3 shows a map and model explaining why the southern Great Basin is under normal hydrostatic pressure. Attachments 4-7 are reports prepared for Cedar City Corporation, which provide background for our three submissions.

Gary F. Player
1671 W 546 S
Cedar City, Utah 84720
Utah Professional Geologist No. 5280804-2250
Idaho Professional Geologist No. 1050
Certified Petroleum Geologist No. 3097
gfplayer@kennylakeventures.us

H. Roice Nelson, Jr.
2155 W 700 S, No. 31
Cedar City, Utah 84720
Texas Professional Geoscientist No. 5128
Louisiana Professional Geoscientist No. 879
Enterprise Award Society of Exploration Geophysicists
rnelson@walden3d.com

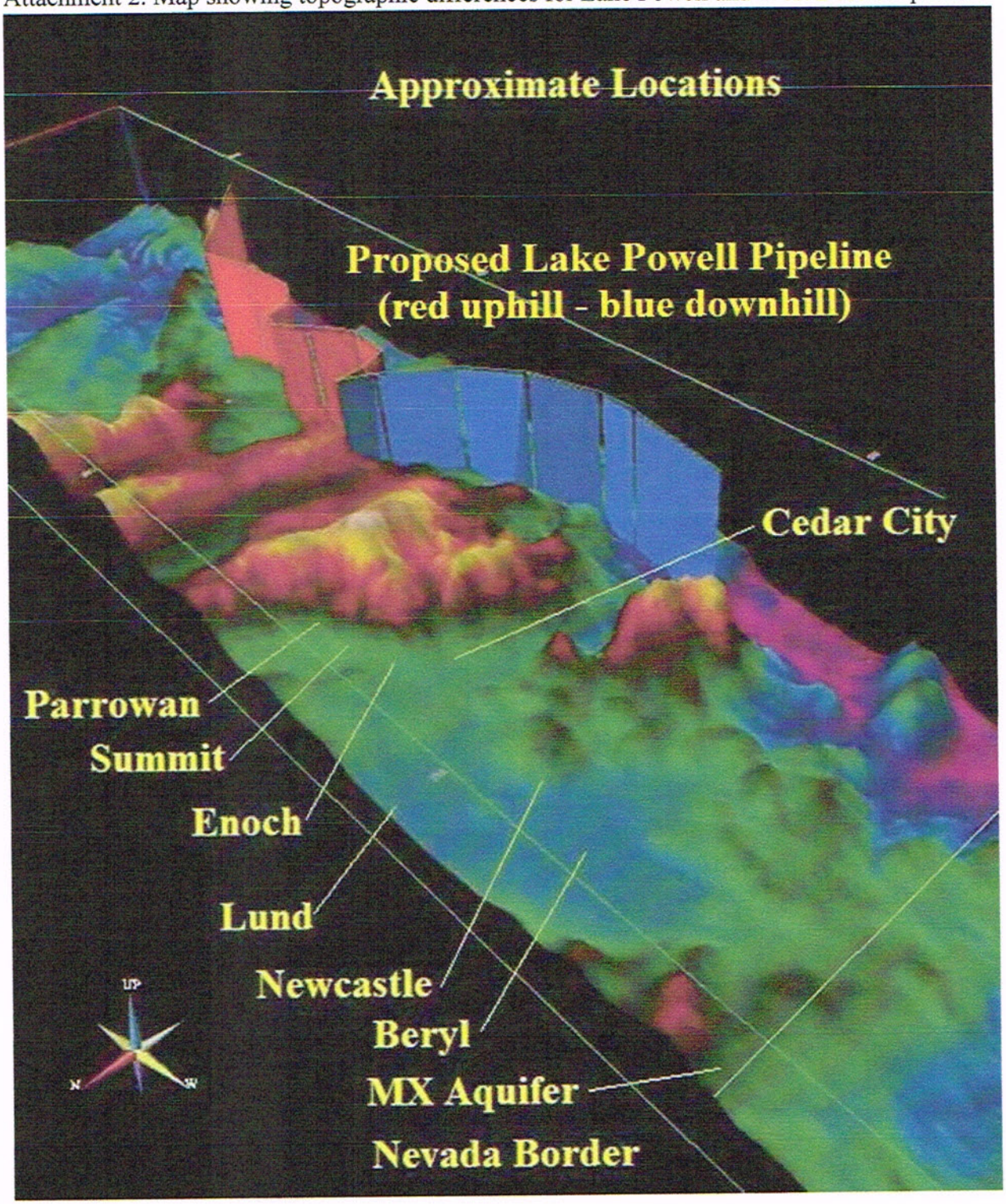
Attachment 1. Map of the Cedar Basin, as defined by the USGS with locations A, B, C
Attachment 2. Map showing topographic differences for Lake Powell and West Desert Pipelines
Attachment 3. Regional Map and 3-D Model showing Leakage Paths Causing the Southern Great Basin to be Under Normal Hydrostatic Pressure
Attachment 4. Abstract for Cretaceous Aquifers - 2010
Attachment 5. Water Stored in Mountains west of Cedar Breaks
Attachment 6. Morgan Letter Confirming Water Transfer from Parowan to Brian Head
Attachment 7. Possible Re-entry of the ARCo Three Peaks No. 1 Well

Attachment 1. Map of the Cedar Basin, as defined by the USGS with locations A,B, and C

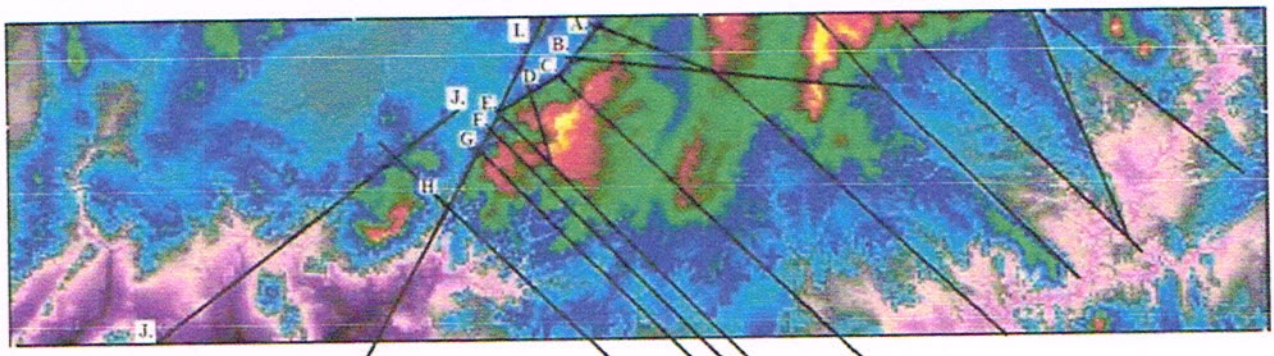


Location of Cedar Valley study area, Iron County, Utah.

Attachment 2. Map showing topographic differences for Lake Powell and West Desert Pipelines



Attachment 3. Regional Map and 3-D Model showing
Leakage Paths Causing the Southern Great Basin to be Under Normal Hydrostatic Pressure

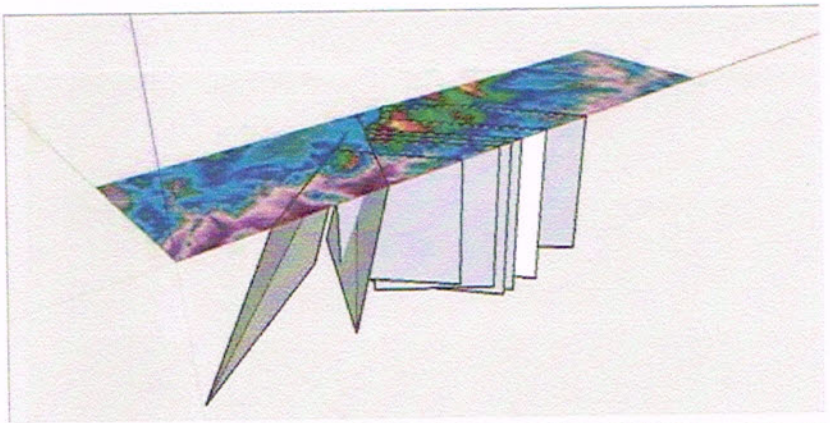


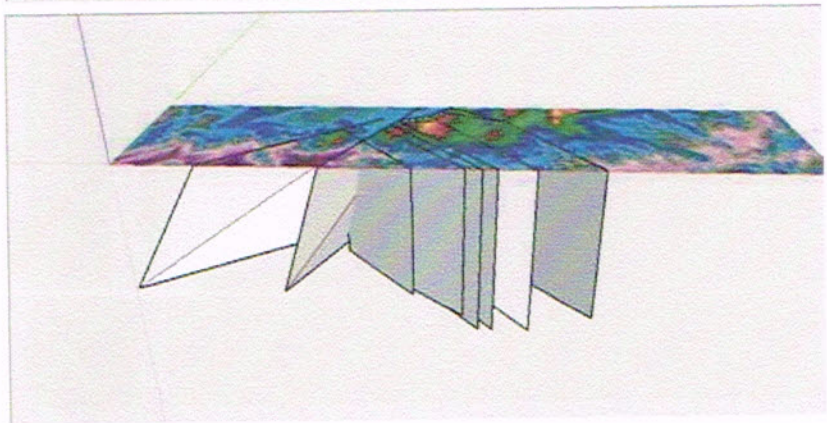
A. Paragonah Canyon
B. Parowan Canyon
C. Summit Canyon
D. Fiddlers Canyon
E. Cedar Canyon
F. Kararaville Canyon

I.

G. Five Fingers
H. New Harmony
I. Hurricane Fault
J. Pinevalley

Possible Fault Geopressure Leak Pathways from Cedar Valley to the Colorado River





Attachment 4. Abstract for Cretaceous Aquifers - 2010

This is the Final Report for completed work on Phase Two of the engineering services agreement between Cedar City Corporation and Gary F. Player for a geological and hydrological study of potential groundwater sources in bedrock aquifers near Cedar City. Field and laboratory studies reported in this document were completed during July and August of 2010. Player completed reconnaissance of springs in Shirts Canyon and north of the Coal Creek-Crow Creek drainage system. Samples of bedrock formations were collected along Coal Creek and north of Crow Creek for description and determination of matrix porosity. The best matrix porosity values (greater than 30 percent) were obtained from samples of Cretaceous rocks that occur east of Right Hand Canyon along Highway 14. Rocks of the same age and physical properties are the sources of springs developed by the City in Right Hand Canyon.

Spring flow reported in Shirts Canyon ranged from about 430 to 600 acre-feet from 1998 to 2001. Likely infiltration of precipitation each year in the same area ranges from about 900 to 1800 acre-feet. Therefore, at least 470 acre-feet, and as much as 1,200 acre-feet of high quality ground water remains to be produced each year from new wells drilled into Cretaceous rocks in Shirts Canyon without depleting the aquifer system.

Similar rocks north of Coal Creek and Crow Creek also contain prolific aquifers that are now virtually untapped. The amount of water in those rocks available for development is much greater than the ground water resources in Shirts Canyon. Revised estimates of the water resource north of Cedar Canyon suggest that about 80,000 acre-feet of ground water are present within 1,000 feet of ground level within each 640 acre section. More than 10,000,000 acre-feet of ground water are available for future development in the mountains north of Coal Creek and Crow Creek. Recharge into these rocks near Cedar Canyon may exceed 10,000 acre-feet each year.

Inflow to properly constructed wells in the Cretaceous aquifer north of Cedar Canyon would be virtually unlimited by physical constraints. The amount of water available for development in wells will be limited only by water rights, access, and costs to drill wells into the relatively soft bedrock.

THE ABOVE ABSTRACT IS FROM THE REPORT ON BEDROCK AQUIFERS EAST OF CEDAR CITY, PREPARED IN 2010. THE CONCLUSIONS APPLY DIRECTLY TO THE WELL PROPOSED AT SHEEPHERDERS CABIN ROAD ON SUU LANDS WEST OF WOODS RANCH. (Note USGS hydrology group defines Bedrock as a general term for the consolidated (solid) rock that underlies soils or other unconsolidated surficial material.)

Attachment 5. Water Stored in Mountains west of Cedar Breaks

WATER STORED IN MOUNTAINS WEST OF CEDAR BREAKS					
AND EAST OF CEDAR VALLEY , IRON COUNTY, UTAH					
AREA	4	TOWNSHIPS			
AREA	144.00	SQ. MILES			
AREA	92,160.00	ACRES			
AREA	4,014,489,600.00	SQ. FEET			
GROSS THICK.	1,000.00	FEET	MINIMUM		
GROSS THICK.	3,000.00	FEET	LIKELY		
GROSS THICK.	5,000.00	FEET	MAXIMUM		
SANDSTONE PROPORTION	0.40	VOL/VOL	MINIMUM		
SANDSTONE PROPORTION	0.50	VOL/VOL	LIKELY		
SANDSTONE PROPORTION	0.60	VOL/VOL	MAXIMUM		
POROSITY	0.15	VOL/VOL	MINIMUM		
POROSITY	0.20	VOL/VOL	LIKELY		
POROSITY	0.25	VOL/VOL	MAXIMUM		
VOLUME OF WATER = AREA * THICKNESS * SANDSTONE PROPORTION * POROSITY					
	MINIMUM	5,529,600.00	ACRE-FEET		
	LIKELY	27,648,000.00	ACRE-FEET		
	MAXIMUM	69,120,000.00	ACRE-FEET		
LIKELY VOLUME OF GROUND WATER IN PLACE UNDER 4 TOWNSHIPS:					
		27,648,000.00	ACRE-FEET		
ANNUAL INFILTRATION:					
PRECIPITATION	15	INCHES PER YEAR	MINIMUM	*1.25*	*FEET*
PRECIPITATION	20	INCHES PER YEAR	LIKELY	*1.67*	*FEET*
PRECIPITATION	30	INCHES PER YEAR	MAXIMUM	*2.50*	*FEET*
AREA	4	TOWNSHIPS			
AREA	144.00	SQ. MILES			
AREA	92,160.00	ACRES			
AREA	4,014,489,600.00	SQ. FEET			
INFILTRATION	0.05	VOL/VOL	MINIMUM		
INFILTRATION	0.1	VOL/VOL	LIKELY		
INFILTRATION	0.15	VOL/VOL	MAXIMUM		
ANNUAL INFILTRATION = AREA * PRECIPITATION * INFILTRATION					
	MINIMUM	5,760.00	ACRE-FEET		
	AVERAGE	15,360.00	ACRE-FEET		
	MAXIMUM	34,560.00	ACRE-FEET		
LIKELY VOLUME OF INFILTRATION UNDER 4 TOWNSHIPS EACH YEAR:					
		15,360.00	ACRE-FEET		
	GARY F. PLAYER				
	8/26/2011				

Attachment 6. Morgan Letter Confirming Water Transfer from Parowan to Brian Head

State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RIGHTS

Michael O. Leavitt
Governor
Kathleen Clarke
Executive Director
Robert L. Morgan
State Engineer

1594 West North Temple, Suite 220
PO Box 146300
Salt Lake City, Utah 84114-6300
801-538-7240
801-538-7467 (Fax)

July 13, 1999

Mr. Gary F. Player, Vice President
Tahoma Companies, Incorporated
PO Box 486; Mile 5 Hwy 14
Cedar City UT 84721

Re: Letter dated July 2, 1999

Dear Mr. Player:

I have read your letter and reviewed it with several members of my staff. It is my opinion that what you propose is possible if several conditions are met. They are as follows:

1. A change application would need to be filed to convert irrigation water to domestic water to be used in the cabins. The application would change the place of use, nature of use and points of diversion. Depending upon when the cabins are used, the period of use may also need to be changed. This application would need to be filed by the Parowan Reservoir Company as the water right owner.

2. An appropriate amount of acreage would then be taken out of irrigation and the depletion would be moved to the cabin sites. The amount of depletion eliminated in the valley would need to equal or exceed the depletion that would occur at the cabin sites.

3. The wells at the cabins would need to be in the same hydrologic system as the historic water source.

4. Careful consideration should be given in locating the wells as there are county and state requirements as to how close a well can be to a sewer drain field.

5. The amount of water taken from the wells and the corresponding depletion eliminated within the irrigated area would need to be closely monitored.

Please let me know if you have any other questions. Kerry would be your contact, and he should be kept informed.

Sincerely,

Robert L. Morgan

Robert L. Morgan, P.E.
State Engineer

/gm
cc: Kerry Carpenter

Attachment 7. Possible Re-entry of the ARCo Three Peaks No. 1 Well

Kenny Lake Ventures, LLC

Gary F. Player Cell: (435) 590 8705
dirtdoctor43@gmail.com

Mr. Brent Hunter, Chairman
Central Iron County Water Conservancy District
88 E. Fiddler's Canyon Drive
Cedar City, Utah 84721

Subject: Reentry of the ARCo Three Peaks No. 1 Wildcat Well

Dear Brent:

ARCo drilled the Three Peaks well at the east end of Iron Springs Gap in the SW quarter of the SW quarter of Section 17, T. 35 S., R. 12 W. in 1984 and 1985. The well reached a total depth of 15,590 feet without detecting any showings of oil and gas. However, the well did penetrate a potential ground water aquifer–the "fractured quartz monzonite," from 2,322 feet below ground level (BGL) to 6,286 feet BGL.

My review of the "sonic" log run in open hole (before casing was set) disclosed a very porous interval at the depths proposed for perforating. The porous zone is most likely to be a highly fractured portion of the quartz monzonite aquifer.

The well was plugged and abandoned by ARCo on March 15, 1985. Several cement plugs were placed in the 9 and 5/8" casing below 11, 590 feet BGL, from 7,050 feet to 6,920 feet BGL, and from 2,350 feet to 2,225 feet BGL. One last plug was set from the surface to 25 feet BGL.

Most important, the 9 and 5/8" casing is open for potential future aquifer testing below 2,350 feet BGL. In order to test the quartz monzonite (Qm) aquifer, a workover rig similar to one available from Grimshaw Drilling in Enoch, would set up over the hole and drill out the surface plug and the next shallow plug present from approximately 2,225 feet to 2,350 feet BGL.

Once the plugs have been drilled out, the well should be pressure tested by filling it with water and applying about 200 psi pressure at the surface. Once the casing is proven to be intact, the next step will be to enter the casing with a perforating gun and fire 24 to 48 shots through the casing in the interval from 2,480 feet to 2,610 feet BGL.

Wells drilled into the same Qm zone at Quichapa Creek and at the base of the Pine Valley Mountains southwest of New Harmony are very productive of high quality water. The closest well (Quichapa) penetrated only the first two hundred feet of the Qm, but was producing at a rate of about 150 gallons per minute by air lift while the well was being drilled. Wells at New Harmony have been pump tested at rates on the order of 2,500 gallons per minute with little drawdown.

If the initial flow of water from the perforated intervals appears to be indicative of high porosity and permeability in the zone tested, then it would be appropriate to fire additional shots, and then set a 5" diameter, gravel packed slotted liner inside of the 9 5/8" casing in order to control possible entry of loose silt and sand during long term production. Exact details of the completion should be settled upon by consulting with your engineering staff and the drilling company chosen to test and then complete the well.

I believe that Grimshaw Drilling could quickly provide the District with a reasonable estimate of the price to reenter and hopefully complete the well. I have retained all available well records, and could provide them as needed.

Sincerely,

Gary F. Player

Gary F. Player
Consulting Geologist
Utah Professional Geologist No. 5280804-2250

C:\Users\Gary\Google Drive\Gary's Folders\ARCO THREE PEAKS\REENTRY LETTER TO CICWCD 101714.wpd

730 S Cove Dr STE B, Cedar City, UT 84720 T. (435) 327-1096 F. (435) 867-6383
www.KennyLakeVentures.us

STANDARD FORM 2015-1 (06/2015)

SUBMISSION OF WATER DEVELOPMENT PROJECTS

FOR AGENCY USE ONLY
Application Number
Date Filed

Through the development of scientific studies defining the aquifer within the Cedar Basin it has been documented that additional water resources will be necessary to sustain the growth and further development of the area. Without water the future economic development will be impacted by the availability and cost of existing water supplies to accommodate only the growth capable within our current water budget. This form is being circulated to document additional water supply sources that could be utilized to further alleviate the water deficit in the aquifer, as well as provide water for the future residents of the valley. This form will be evaluated for completeness of content. Please ensure that the proposed project is fully defined and information to substantiate the claim is submitted for a complete evaluation.

Name and address of applicant *(include zip code)*	Name, title, and address of authorized agent if different from item 1 *(include zip code)*	Telephone (area code)
Gary F. Player 1671 W 546 S Cedar City, Utah 84720 gfplayer@kennylakeventures.us	H. Roice Nelson, Jr. 2155 W 700 S #31 Cedar City, Utah 84720 rnelson@walden3d.com	Applicant Authorized Agent

A. Provide names, addresses, phone numbers and email addresses of those who filled out this form.

Gary F. Player
1671 W 546 S
Cedar City, Utah 84720
gfplayer@kennylakeventures.us

H. Roice Nelson, Jr.
2155 W 700 S, No. 31
Cedar City, Utah 84720
rnelson@walden3d.com

B. Project Description (Details are Vital)

1. Scope of Work and Project Description
2. Type of System or Facility
3. Quantity of Water Anticipated
4. Scientific Analysis of Water Resource
5. Uses (irrigation, culinary, industrial etc.)
6. Years Resource is Available
7. Constructability
8. Additional information to describe resource and availability (utilize additional sheets as necessary)

Quichapa Creek Well Re-Entry

B.1. This project is an opportunity to develop ground water from the fractured quartz monzonite bedrock aquifer within the western portion of the Cedar Valley basin as defined by the Utah Division of Water Rights (UDWR). The availability of large quantities of water would be proven initially with the deepening of one 702 feet deep, suspended water well near the convergence of the left and right-hand canyon branches of Quichapa Creek. That Cedar City well was drilled on SITLA lands. The well should be re-entered and deepened to approximately 1,200 feet below ground level, with projected sustainable productivity of up to 2,000 gallons per minute. Produced water could initially be pumped into an existing Cedar City culinary water pipeline now carrying waters from two Quichapa Creek springs. Produced water could also be injected into one or more existing Quichipa Lake wells, and allowed to percolate into the Cedar Valley alluvial basin. A recent well west of Ash Creek, south of New Harmony, has produced 4,000 gallons per minute (18 acre feet per day) from the fractured quartz monzonite aquifer.

B.2. This well would be one of an eventual larger set of wells utilized to reduce over drafting of the Cedar Valley Basin alluvial aquifer system. Water could be utilized for industrial, agricultural, and culinary purposes. The well location is near to existing power lines, pipelines, and roads so that only minimal new development would be necessary to test the concept.

B.3. A well capable of 2,000 gallons per minute would produce 4.456 cubic feet per second, or 8.836 acre-feet per day. Therefore, one well pumped for 365 days each year would provide more than 3,200 acre-feet. The ARCo well drilled in Iron Springs Gap disclosed about 4,000 feet of intrusive quartz monzonite, while at least 3,000 feet are revealed at the outcrops (surface exposures) in the Pine Valley Mountains. Recharge estimates for the fractured bedrock aquifers prepared by Player in 2010 range from 12,800 to 16,000 acre-feet per year, showing that continuous production of 12,000 acre-feet per year would not draw down the bedrock aquifer: THE AREA UNDERLAIN BY THE FRACTURED QUARTZ MONZONITE AQUIFER WEST OF CEDAR VALLEY IS APPROXIMATELY 200 SQUARE MILES. THE FOLLOWING ESTIMATE OF RECHARGE IS BASED ON 15 INCHES OF PRECIPITATION PER YEAR AND 10% INFILTRATION:

Precipitation = 1.25 feet per year
Infiltration at 10% = .125 feet per year
Area = 200*640 = 128,000 acres
Annual infiltration = .125*128, 000 = 16,000 acre-feet per year

Alternatively, recharge would not be less than 12,800 acre-feet with one foot (12 inches) of precipitation and 0.1 foot of infiltration per year.

B.4. The likelihood of a sustainable bedrock aquifer resource in the Harmony Hills west of Cedar Valley was shown by Player in geohydrologic reports prepared for the Cedar City Water Utility. Scientific studies included estimation of bedrock thickness, and review of published and unpublished chemical analyses of spring waters issuing from the bedrock aquifers. Summaries of those studies are attached to the cover letter accompanying this Submission. One water sample was obtained from the Quichapa Creek No. 1 well, drilled in 2012. Water from the quartz monzonite aquifer (encountered below 500 feet) was mixed with water from a thin sandstone layer in the Quichapa Volcanics at about 225 feet below ground level. Total dissolved solids (TDS) in the mixed sample were 205 mG/L (milligrams per liter of water). Water from the Quichapa Creek Left-hand Canyon spring was sampled on the same day. That water had a lower TDS of 165 mG/L. It is interesting to note that water from the test well was found to be significantly younger (approximately 510 years before present) than water issuing from the surface spring in Quichapa Left-hand Canyon (approximately 1,660 years before present). The age difference suggests that recharge water occurring in the fractured quartz monzonite aquifer is younger than water that is the source of the springs in the shallower but less permeable Quichapa Volcanic

rocks.

B.5. Water pumped into a pipeline along Quichapa Creek would be usable by for culinary water of irrigation in the western portion of Cedar Valley. Alternatively, the "new" water could be used to recharge the Cedar Valley aquifer system through drawn down Quichapa Lake wells.

B.6. The bedrock aquifer resource is sustainable due to annual infiltration from precipitation (see above). In the unlikely event of long term drought, the production of 3,200 acre-feet per year could be sustained for more than 3,600 years without any recharge into the fractured quartz monzonite bedrock aquifer system (at least 3,000 feet thick, with 3 percent fracture porosity) beneath the westernmost portion of the Cedar Valley Basin. That aquifer is estimated to contain more than 11,500,000 acre-feet of water in place.

B.7. This well could be deepened and completed by local drilling contractors. Power lines and a road are in place for easy access to the drill site.

B.8. Summaries of bedrock aquifer studies completed in 2010 are attached to the cover letter. More detailed reports can be provided when requested.

C. Attach a map covering the area of development and location of proposed project.

1. Identify Property Ownership
2. Identify Potential Conflicts
3. Provide Details of the Area and Necessary Changes to the Area

C. A map showing the location of the Quichapa Creek No. 1 well and the well log of deeper portion are attached.

C.1. The Quichapa Creek well was drilled on SITLA lands.

C.2. Agreements with nearby surface owners at Quichapa Creek is likely. Power lines and water lines already cross the Bumble Bee Road right of way.

C.3. Roads and pipelines are already constructed. The well head (casing) is in place.

D. Identify any Federal, State or Local Government Issues

1. Federal
   a. Army Corp of Engineers
   b. Bureau of Land Management
   c. Fish and Wildlife
   d. Forest Service
   e. Other

Federal issues, such as wetlands, are minimal on state property. The entire proposed area is outside of designated Sage Grouse Habitat.

2. State
   a. Department of Environmental Quality
   b. Division of Water Rights
   c. Other

State issues are few. Cedar Basin water rights will be transferred by the Utah Division of Water Rights into the Quichapa well prior to beginning full scale production. The sources of those water rights would be farmers, ranchers, Cedar City Municipal Water Utility, and Southern Utah University. It is at least possible that the well would discover "new water" that could be appropriated to the District. Permits to reenter the well must be obtained from the Utah Division of Water Rights.

3. Local
   a. County
   b. Municipal
   c. Other

There are no local issues.

E. Provide cost estimates of project

Costs to reenter the well will be on the order of $150,000 to complete and equip with pumps and a short pipeline (less than 100 feet).

F. Describe additional evaluated alternatives, if any

Separate Submissions of Water Development Projects from Player and Nelson include the following: (2) Construction of a Cretaceous aquifer test well at the Sheepherders Cabin Road, about one mile west of Woods Ranch; and (3) Reentry of the ARCo Three Peaks No. 1 Exploratory Oil Well.

G. Describe any environmental effects the proposed project would have on wildlife and/or plant species

Injection of water into Quichapa Lake wells would aid in the recharge of Cedar Valley Basin aquifer(s)

H. Provide cultural resource evaluations of proposed area

No cultural or archeological resources are present at the site. The site was inspected and cleared prior to commencement of drilling in 2012. For your information, Player served as an environmental inspector during construction of the Kern River Pipeline, and supervised SUU archeologist Barbara Frank as she prepared clearances across a 100-mile segment of the line from Milford to eastern Nevada.

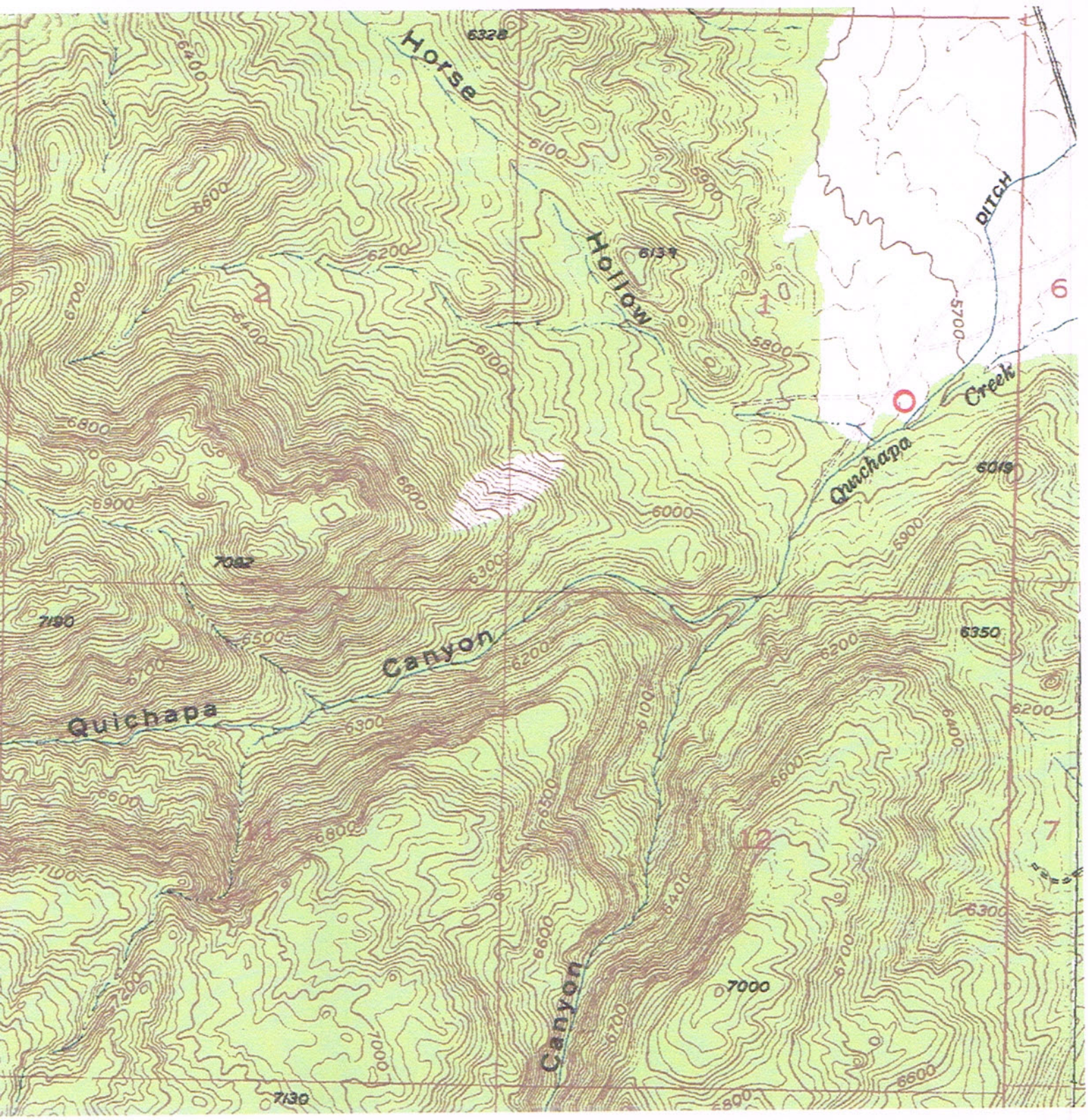
I. Provide any additional information deemed necessary in the evaluation of this project to provide future sustainable water resources to the Cedar Basin

Player reviewed the fractured quartz monzonite bedrock aquifer system for Cedar City in 2010. All of his work will be available for review with the permission of City Engineer's office. For example, additional data includes meteorological studies, summaries of geology, water analyses, aquifer rock properties (matrix porosity and fracture systems), old well records, etc. Summaries of the aquifer study are attached to the cover letter that accompanies this Submission.

Respectfully Submitted,

Gary Farnsworth Player
Utah Professional Geologist No. 5280804-2250
Idaho Professional Geologist No. 1050
Certified Petroleum Geologist No. 3097

H. Roice Nelson, Jr.
Texas Professional Geoscientist No. 5120
Louisiana Professional Geoscientist No. 879



LOCATION MAP:
PROPOSED CEDAR CITY QUICHAPA CREEK NO. 1 WELL RE-ENTRY, Iron County ○
Basemap from Stoddard Mountain USGS 1:24,000 Topographic Map

Submitted by H. Roice Nelson, Jr. and Gary F. Player

QUICHAPA CREEK TEST WELL NUMBER 1

LOGGED BY WATSON ENGINEERING FROM SURFACE TO 450 FEET.
LOGGED BY GARY F. PLAYER BELOW 450 FEET.

DATE	FROM	TO	THICK	RATE FT/HOUR	WATER GPM	LITHOLOGY
05/08/12	450	460	10	30	30 GPM	QUICHAPA VOLCANICS--REDDISH BROWN ASH FLOW TUFFS. WATER ENTRY FROM ABOVE ONLY.
	460	470	10	60	30 GPM	SAME
	470	475	5	40	30 GPM	SAME
	475	485	10	20	30 GPM	CUTTINGS SIZE INCREASING TO GRANULES AND FINE PEBBLE SIZE, FRACTURED
	485	490	5	20	30+ GPM	BASALT INTERBBEDED WITH ASH FLOW TUFF. DRILL BIT BOUNCING, WATER INCREASING SLIGHTLY
	490	495	5	20	30+ GPM	AS ABOVE
	495	500	5	20	30+ GPM	**DEEPLY WEATHERED QUARTZ MONZONITE, WHITE, CLAYEY, WITH TRACES OF RED-BROWN ANDESITE** LAST FOOT OF CUTTINGS ARE FULL OF WHITE CLAY, DRILLED SLOWLY BUT SMOOTHLY. WATER INCREASING. TOP GRANITE MAY BE WEATHERED EROSION SURFACE COVERED BY BASALT EXTRUSION AT BASE OF QUICHAPA GROU STOPPED TO REAM OUT HOLE TO 8" AND GET PERMISSION TO CONTINUE TO 700 FEET.
05/11/12	501	507	6	60	50+ GPM	CIRCULATED OUT FILL. COARSE FRACTURED MATERIALS--MIX OF VOLCANICS AND QUARTZ MONZONITE. WHITE CL
	507	512	5	60		GRANITIC QUARTZ MONZONITE CUTTINGS INCREASED TO 50%.
	512	517	5	48		GRANITIC CUTTINGS TO 75%
	517	522	5	25		GRANITIC CUTTINGS TO 80%. NO INDICATIONS OF ANY ROUNDING--ANGULAR CHUNKS
	522	527	5	37	60+	SLIGHT PINK TINGE TO QUARTZ MONZONITE. QUARTZ XTALS TO 4 MM. WATER INCREASING GRADUALLY
	527	532	5	37		PLAGIOCLASE PHENOCRYSTS TO 4 MM IN PINKISH GROUND MASS
	532	537	5	33		AS ABOVE
	537	542	5	33	75+	AS ABOVE, SLIGHTLY MORE FRACTURES; 20% DARK MINERALS IN PINKISH TO WHITE QM. BIOTITE AND PYROXENES
	542	547	5	30		QM FRESH AND HARD, A FEW WHITE, MOSTLY PINKISH GRAINS OF QM, AS AT PINE VALLEY MTNS.
	547	552	5	30	80+	AS ABOVE, FRACTURED AT 549. DRILLING AIR PRESSURE UP TO 130 PSI--STARTED TODAY AT 120 PSI.
	552	557	5	37		AS ABOVE
	557	562	5	30		FRACTURES 561-562
	562	567	5	60		FRACTURES 562-567+ IN QM
	567	572	5	30		FRACTURES CONTINUING IN QM. WATER INCREASING. MICROCRYSTALLINE WHITE QUARTZ LINES FRACTURES.
	572	577	5	30	90+	FRACTURES CONTINUING IN QM. WATER INCREASING. PINKISH QM MICROCRYSTALLINE WHITE QUARTZ LINES FRA
	577	582	5	35		FRACTURES CONTINUING IN QM. WATER INCREASING. MICROCRYSTALLINE WHITE QUARTZ LINES FRACTURES.
	582	702	120	10-60	120+GPM	QUARTZ MONZONITE, AS ABOVE, VARYING FROM LIGHT GRAY TO REDDISH BROWN (WHERE WEATHERED) TO PINK LOCALLY FRACTURED. WATER BEARING.

NOTE: WELL REMAINED IN FRACTURED QUARTZ MONZONITE TO 702 FEET BELOW GROUND. MEASURED AIR PRESURE INCREASED TO OVER 200 PSI WATER PRODUCTION RATE MEASURED (ESTIMATED WITH A 5 GALLON BUCKET DIPPED INTO STREAM) AT ABOUT 120 GALLONS PER MINUTE BELOW 650 F SCANNED FIELD NOTES INTO A .PDF FILE.

STANDARD FORM 2015-1 (06/2015)

(2)

SUBMISSION OF WATER DEVELOPMENT PROJECTS

	FOR AGENCY USE ONLY
Through the development of scientific studies defining the aquifer within the Cedar Basin it has been documented that additional water resources will be necessary to sustain the growth and further development of the area. Without water the future economic development will be impacted by the availability and cost of existing water supplies to accommodate only the growth capable within our current water budget. This form is being circulated to document additional water supply sources that could be utilized to further alleviate the water deficit in the aquifer, as well as provide water for the future residents of the valley. This form will be evaluated for completeness of content. Please ensure that the proposed project is fully defined and information to substantiate the claim is submitted for a complete evaluation.	Application Number Date Filed

Name and address of applicant (*include zip code*)	Name, title, and address of authorized agent if different from item 1 (*include zip code*)	Telephone (area code) Applicant Authorized Agent
Gary F. Player 1671 W 546 S Cedar City, Utah 84720 gfplayer@kennylakeventures.us	H. Roice Nelson, Jr. 2155 W 700 S #31 Cedar City, Utah 84720 rnelson@walden3d.com	

A. Provide names, addresses, phone numbers and email addresses of those who filled out this form.

Gary F. Player
1671 W 546 S
Cedar City, Utah 84720
gfplayer@kennylakeventures.us

H. Roice Nelson, Jr.
2155 W 700 S, No. 31
Cedar City, Utah 84720
rnelson@walden3d.com

B. Project Description (Details are Vital)

1. Scope of Work and Project Description
2. Type of System or Facility
3. Quantity of Water Anticipated
4. Scientific Analysis of Water Resource
5. Uses (irrigation, culinary, industrial etc.)
6. Years Resource is Available
7. Constructability
8. Additional information to describe resource and availability (utilize additional sheets as necessary)

(2) Cretaceous Well #1 at Sheepherders Cabin Road

B.1. This project is an opportunity to develop ground water from porous bedrock aquifers within the eastern portion of the Cedar Valley basin as defined by the Utah Division of Water Rights (UDWR). The availability of water would be proven initially with the completion of one well south of Utah Highway 14. The first well would be drilled along Sheepherders Cabin Road on lands owned by Southern Utah University. The well would be drilled to a depth of 500 to 1,000 feet, with projected sustainable productivity of 1,000 to 1,500 gallons per minute. Produced water would be pumped into a tributary of Crow Creek, and allowed to flow down Crow Creek to its intersection with Ashdown Creek (where it becomes Coal Creek). Water could then be directed to a proposed off stream storage facility along Rock Creek, or be allowed to flow into Cedar Valley via existing stream channels and newly constructed canals.

B.2. This well would be one of an eventual larger set of wells utilized to stabilize flow in the Coal Creek drainage system throughout the spring and summer months. Water could be utilized for both agricultural and culinary purposes. The well location is near to existing power lines and Crow Creek so that only minimal new development would be necessary to test the concept.

B.3. Each well capable of 1,000 gallons per minute would produce 2.228 cubic feet per second, or 4.418 acre-feet per day. Therefore, one well pumped for 182 days each year would provide slightly more than 800 acre-feet. Eventual development of only five wells could provide about 4,000 acre-feet over 182 days. A development of 15 wells, each producing 1,000 gallons per minute, would provide approximately 12,000 acre-feet in six months, allowing wells in the valley floor to be shut-in, so that all over-drafting of the valley aquifers could be eliminated. Recharge estimates for the bedrock aquifers prepared by Player in 2010 range from 10,000 to 15,000 acre-feet per year, showing that continuous production of 12,000 acre-feet per year would not draw down the bedrock aquifer.

B.4. The likelihood of a sustainable bedrock aquifer resource in the western portion of the Markagunt Plateau was shown by Player in geohydrologic reports prepared for the Cedar City Water Utility. Scientific studies included estimation of bedrock thickness, laboratory measurements of aquifer porosity, and review of published and unpublished chemical analyses of spring waters issuing from the bedrock aquifers. Summaries of those studies are attached to a cover letter delivered with this Submission. Water samples from Cedar City springs developed in Right Hand Canyon, south of Coal Creek, averaged 230 -250 mG/L of Total Dissolved Solids (TDS), comparable to water developed in Cedar Valley. One sample collected by Player from the "piped spring" exiting Cretaceous Straight Cliffs Sandstones due east of the major landslide along Highway 14 was analyzed at the SUU water laboratory in December of 2014. That sample had at a TDS of 230 mG/L, the same as the waters issuing from springs in Cretaceous bedrock at Right Hand Canyon.

B.5. Water pumped into Coal Creek would be usable by for irrigation in Cedar Valley, allowing farmers and ranchers to switch from expensive pumped wells to virtually free canal water. Water stored at Rock Creek (to be described in a future Submission) or other CICWCD facilities along Coal Creek would be suitable for domestic and industrial use after suspended solids settled out during residency in reservoirs.

B.6. The bedrock aquifer resource is sustainable due to annual infiltration from precipitation. In the unlikely event of long term drought, the production of 4,000 acre-feet per year could be sustained for more than 6,900 years without recharge to that portion of the bedrock aquifer system within the Cedar Valley Basin estimated to contain more than 27,648,000 acre-feet of water in place.

B.7. This well could be drilled by local drilling contractors. Power lines are in place near the Sheepherders Cabin Road for easy access to the drill site. Produced water could be piped to a Crow Creek tributary within an economical and short (less than 500 feet) PVC pipeline.

B.8. Summaries of bedrock aquifer studies completed in 2010 are attached to the cover letter referenced above. More detailed reports can be provided when requested.

C. Attach a map covering the area of development and location of proposed project.

1. Identify Property Ownership
2. Identify Potential Conflicts
3. Provide Details of the Area and Necessary Changes to the Area

A map showing the proposed location for the first well at Sheepherders Cabin road is attached. Also attached is a well log from a well drilled by Brian Head City into rocks overlying the Cretaceous Rocks.

C.1. The first test well would be drilled on lands owned by Southern Utah University.

C.2. Rapid agreement with surface owners at SUU is likely. Power lines and water lines will cross an SUU right of way, requiring negotiated access.

C.3. The proposed test well location is on private, developed lands. A well at Sheepherders Cabin Road would require a power line to be constructed across an SUU road. Produced water could be directed to Crow Creek through a tributary channel, less than 500 feet away from the proposed drill site.

D. Identify any Federal, State or Local Government Issues

1. Federal
   a. Army Corp of Engineers
   b. Bureau of Land Management
   c. Fish and Wildlife
   d. Forest Service
   e. Other

Federal issues, such as wetlands, are minimal on private property. Crow Creek and Coal Creek are both certified as having no fishery. The entire proposed area is outside of designated Sage Grouse Habitat.

2. State
   a. Department of Environmental Quality
   b. Division of Water Rights
   c. Other

There are no known State issues. Proposed stream flow maintenance could be done at rates that do not exceed 35 cubic feet per second, rates routinely exceeded naturally during spring run off. Cedar Basin water rights will be transferred by the Utah Division of Water Rights into each well prior to beginning full scale production. The sources of those water rights would be farmers, ranchers, Cedar City Municipal Water Utility, and Southern Utah University. It is at least possible that the wells would discover "new water" that could be appropriated to the District.

3. Local
   a. County
   b. Municipal
   c. Other

Approvals were already obtained 1 mile away at Woods Ranch, and so no local issues are anticipated.

E. Provide cost estimates of project

An exploratory well will cost on the order of $200,000 to complete and equip with pumps and short pipelines to streams. A full scale development of 15 wells would cost approximately $3,000,000 to produce 12,000 acre-feet per year. The CAPEX for full development of the aquifer would be on the order of $250 per acre-foot.

F. Describe additional evaluated alternatives, if any

Separate Submissions of Water Development Projects from Player and Nelson include the following: (1) Deepening of the Cedar City Quichapa Creek Number 1 well into the fractured quartz monzonite aquifer; and (3) A re-entry of the ARCo Three Peaks well to test the fractured quartz monzonite aquifer at Iron Springs.

G. Describe any environmental effects the proposed project would have on wildlife and/or plant species

Continuous summertime flow of Coal Creek could possibly allow the establishment of a trout fishery. Eventual construction of off-stream storage at Rock Creek would allow development of both trout and bass fisheries.

H. Provide cultural resource evaluations of proposed area

No cultural or archeological resources are present at the site. For your information, Player served as an environmental inspector during construction of the Kern River Pipeline, and supervised SUU archeologist Barbara Frank as she prepared clearances across a 100-mile segment of the line from Milford to eastern Nevada.

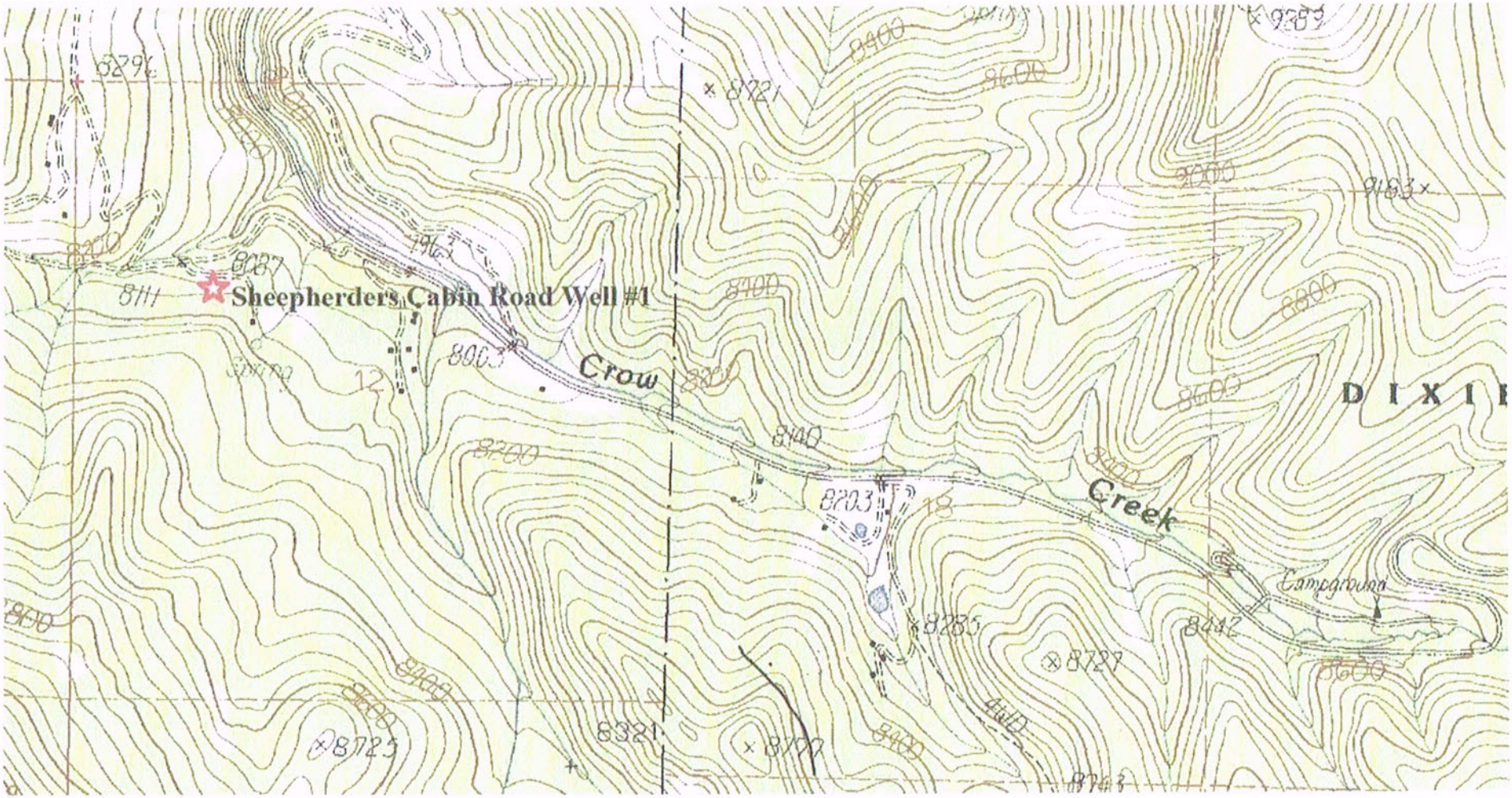
I. Provide any additional information deemed necessary in the evaluation of this project to provide future sustainable water resources to the Cedar Basin

Player reviewed the Markagunt Plateau bedrock aquifer system for Cedar City in 2010. All of his work will be available for review with the permission of the City Engineer's office. For example, additional data includes meteorological studies, summaries of geology, water analyses, aquifer rock properties (matrix porosity and fracture systems), old well records, etc. Summaries of the aquifer study are attached to the cover letter accompanying this Submission.

Respectfully Submitted,

Gary Farnsworth Player
Utah Professional Geologist No. 5280804-2250
Idaho Professional Geologist No. 1050
Certified Petroleum Geologist No. 3097

H. Roice Nelson, Jr.
Texas Professional Geoscientist No. 5120
Louisiana Professional Geoscientist No. 879



LOCATION MAP:
PROPOSED SHEEPHERDERS CABIN ROAD EXPLORATORY WELL #1

Basemap is Webster's Flat Topographic Map

Submitted by G.F. Player and H. Roice Nelson, Jr.

WELL DRILLER'S REPORT
State of Utah
Division of Water Rights

For additional space, use "Additional Well Data Form" and attach

Well Identification

Change Application: a37313 (75-661) WIN: 434816

Owner *Note any changes*

Town of Brian Head
P.O. Box 65
Brian Head UT 84719

Contact Person/Engineer: ADVANCED ENVIRONMENTAL ENGINEERING
DAVE LORE 801-200-2528
801-773-3155

Well Location *Note any changes*

S 568 E 2182 from the W4 corner of section 02, Township 36S, Range 9W, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation, local well #)

Drillers Activity Start Date: MAY 12 - 2011 Completion Date: NOV. 01 - 12

Check all that apply: ☒ New ☐ Repair ☐ Deepen ☐ Clean ☐ Replace ☐ Public Nature of Use:

If a replacement well, provide location of new well. _____ feet north/south and _____ feet east/west of the existing well.

DEPTH (feet) FROM	TO	BOREHOLE DIAMETER (in)	DRILLING METHOD	DRILLING FLUID
0	6'	34"	ROTARY	
0	115	28"	MUD ROTARY	BENTONITE / POLYMER
115	750	23"	MUD ROTARY	BENTONITE / POLYMER
750	1502	14 3/4"	MUD ROTARY	BENTONITE / POLYMER

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture, degree of weathering, hardness, water quality, etc.)
0	5												BLACK	
5	15	x		x			x			x		LAVA ROCK	BLACK	YELLOW SAND
15	30	x		x						x	x			
30	65	x		x					x	x	x			
65	93	x		x							x	LAVA		VARY HARD FRACTURED
93	96	x		x					x	x			BLACK & WHITE	
96	112	x		x							x	LAVA	BLACK	HARD
112	129	x		x							x	LAVA	RED BROWN	VARY HARD
129	135				x						x		"	CLAY IS TAN ORANGE
135	146				x						x		"	" ORANGE

NOV 7 2012

Static Water Level

Date 11-28-11 Water Level 137 feet Flowing? ☐ Yes ☒ No - PSI

Method of Water Level Measurement GAUGE If Flowing, Capped Pressure _____

Point to Which Water Level Measurement was Referenced TOP OF CASING Elevation -

Height of Water Level reference point above ground surface 2' feet Temperature 41 ° degrees ☐ C ☒ F

Well Log

Construction Information

DEPTH (feet) FROM	TO	CASING: CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)
0	6'	A53 GRADE B	.375	30
0	115	A53 GRADE B	.312	24"
+2	520	A53 GRADE B	.312	16"
600	705	A53 GRADE B	.312	16"
0	175	A53 GRADE B	.250	4½"
0	518	A53 GRADE B	.250	5⁹/₁₆"

DEPTH (feet) FROM	TO	☒SCREEN ☐PERFORATIONS ☐OPEN BOTTOM: SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
520	600	.050	16"	304 STAINLESS STEEL
705	745	.050	16"	304 STAINLESS STEEL
735	745	BLANK	8⁵/₈"	304 STAINLESS STEEL SCREEN
745	805	.030	8⁵/₈"	
805	1200	BLANK	8⁵/₈"	304 STAINLESS STEEL
1200	1470	.050	8⁵/₈"	
1470	1480	BLANK	8⁵/₈"	
GRAVEL OR ACCESS TUBES				

Well Head Configuration: STEEL PLATE — Access Port Provided? ☒Yes ☐No

Casing Joint Type: BUTT WELD — Perforator Used: STAINLESS STEEL 304

Was a Surface Seal Installed? ☒Yes ☐No — Depth of Surface Seal: 115 feet — Drive Shoe? ☐Yes ☒No

Surface Seal Material Placement Method: PUMPED 50/50 TO BOTTOM BACK TO SURFACE

Was a temporary surface casing used? ☒Yes ☐No If yes, depth of casing: 6" feet diameter: 30 inches

THIS CASING WAS REMOVED 2012

SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION

DEPTH (feet) FROM	TO	SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	Quantity of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)
0	6	CEMENT & BENTONITE HOLE PLUG	36 CUBIC FEET	
0	115	50/50 SAND CEMENT	11 CUBIC YARDS	18.40 lbs
560	750	3/8 ROUND PEA GRAVEL	45 CUBIC YARDS	
740	1476	12 - 20 SILICA SAND	16 CUBIC YARDS	
95	113	3/8 BENTONITE HOLE PLUG	13 CUBIC FEET	
PLACED IN 100% HEAVY BENTONITE DRILLING FLUID - OUT SIDE UP INTO 24" CASING				

Well Development and Well Yield Test Information

DATE	METHOD	YIELD	Units Check One GPM	Units Check One CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)
Sept. Oct. 11	AIR DEVELOPMENT	600	x		380	46 Hrs
10-14 to 10-22-11	TEST PUMP	1163	x		326	184 Hrs
10-18 to 20-12	WELL DEVELOPMENT	825	x		304.40	45.25

Pump (Permanent)

Pump Description: _____ Horsepower: _____ Pump Intake Depth: _____ feet

Approximate Maximum Pumping Rate: _____ Well Disinfected upon Completion? ☐Yes ☐No

Comments

Description of construction activity, additional materials used, problems encountered, extraordinary Circumstances, abandonment procedures. *Use additional well data form for more space.*

PEA GRAVEL WAS EXTRACTED FROM SURFACE TO 560 FEET. THE SCREEN WAS COLLAPSED FROM 524' TO 540' SCREEN SIZE DISTORTED OR UNDERSIZED FROM 540' TO 560' SCREEN WAS SWAGGED FROM 522' TO 542' AND 304 STEEL PATCHES WERE PLACED FROM 518.7' TO 527.5 THE SWAGGING TOOL WAS UNABLE TO GO BELOW 541'6¾". INSTALLED TEST PUMP TO 495' TEST RESULTS WERE SAME AS TEST PUMP 2011

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations, and this report is complete and correct to the best of my knowledge and belief.

Name GRIMSHAW DRILLING (Person, Firm, or Corporation - Please Type) License No. 240

Signature _____ (Licensed Well Driller) Date Nov. 14 - 2012

Construction Information

DEPTH (feet) FROM	TO	CASING TYPE AND MATERIAL/GRADE	WALL THICK (in)	NOMINAL DIAM. (in)
0	6'	A53 GRADE B	.375	30"
0	115	A53 GRADE B	.312	24"
+2	520	A53 GRADE B	.312	16"
600	705	A53 GRADE B	.312	16"
0	175	A53 GRADE B	.250	4½"
0	518	A53 GRADE B	.250	5⁹/₁₀"

DEPTH (feet) FROM	TO	☒SCREEN ☐PERFORATIONS ☐OPEN BOTTOM SCREEN SLOT SIZE OR PERF SIZE (in)	SCREEN DIAM. OR PERF LENGTH (in)	SCREEN TYPE OR NUMBER PERF (per round/interval)
520	600	.050	16"	304 STAINLESS STEEL
705	745	.050	16"	304 STAINLESS STEEL
735	745	BLANK	8⅝"	304 STAINLESS STEEL SCREEN
745	805	.030	8⅝"	
805	1200	BLANK	8⅝"	304 STAINLESS STEEL
1200	1470	.050	8⅝"	
1470	1480	BLANK	8⅝"	
GRAVEL OR ACCESS TUBES				

Well Head Configuration: STEEL PLATE — Access Port Provided? ☒Yes ☐No

Casing Joint Type: BUTT WELD — Perforator Used: STAINLESS STEEL 304

Was a Surface Seal Installed? ☒Yes ☐No — Depth of Surface Seal: 115 feet — Drive Shoe? ☐Yes ☒No

Surface Seal Material Placement Method: PUMPED 50/50 TO BOTTOM BACK TO SURFACE

Was a temporary surface casing used? ☒Yes ☐No If yes, depth of casing: 6" feet diameter: 30 inches

THIS CASING WAS RELOCATED 2012

DEPTH (feet) FROM	TO	SURFACE SEAL / INTERVAL SEAL / FILTER PACK / PACKER INFORMATION SEAL MATERIAL, FILTER PACK and PACKER TYPE and DESCRIPTION	Quantity of Material Used (if applicable)	GROUT DENSITY (lbs./gal., # bag mix, gal./sack etc.)
0	6	CEMENT & BENTONITE HOLE PLUG	36 CUBIC FEET	
0	115	50/50 SAND CEMENT	11 CUBIC YARDS	18.40 lbs
560	750	3/8 ROUND PEA GRAVEL	45 CUBIC YARDS	
740	1476	12 - 20 SILICA SAND	16 CUBIC YARDS	
95	113	3/8 BENTONITE HOLE PLUG	13 CUBIC FEET	
PLACED IN 100% HYDRO BENTONITE DRILLING FLUID - OUT SIDE UP INTO 24" CASING				

Well Development and Well Yield Test Information

DATE	METHOD	YIELD	Units Check One GPM	Units Check One CFS	DRAWDOWN (ft)	TIME PUMPED (hrs & min)
SEPT. OCT. 11	AIR DEVELOPMENT	600	x		380	46 Hrs
10-14=10-22-11	TEST PUMP	1163	x		326	184 Hrs
10-18=20-12	WELL DEVELOPMENT	825	x		304.40	45.25

Pump (Permanent)

Pump Description: _____ Horsepower: _____ Pump Intake Depth: _____ feet

Approximate Maximum Pumping Rate: _____ Well Disinfected upon Completion? ☐Yes ☐No

Comments

Description of construction activity, additional materials used, problems encountered, extraordinary Circumstances, abandonment procedures. *Use additional well data form for more space.*

PEA GRAVEL WAS EXTRACTED FROM SURFACE TO 560 FEET. THE SCREEN WAS COLLAPSED FROM 524' TO 540' SCREEN SIZE DISTORTED OR UNDERSIZED FROM 540' TO 560' SCREEN WAS SWAGGED FROM 522' TO 542' AND 304 STEEL PATCHES WERE PLACED FROM 518.7' TO 527.5 THE SWAGGING TOOL WAS UNABLE TO GO BELOW 541' 6¼". INSTALLED TEST PUMP TO 495' TEST RESULTS WERE SAME AS TEST PUMP 2011

Well Driller Statement

This well was drilled and constructed under my supervision, according to applicable rules and regulations. and this report is complete and correct to the best of my knowledge and belief.

Name GRIMSHAW DRILLING (Person, Firm, or Corporation - Print or Type) License No. 240

Signature _____ (Licensed Well Driller) Date NOV. 14 - 2012

WELL DRILLER'S REPORT ADDTIONAL DATA FORM
State of Utah
Division of Water Rights

Well Identification

Change Application: a37313 (75-661)

Owner *Note any changes*

Town of Brian Head
P.O. Box 65
Brian Head UT 84719

Contact Person/Engineer: _____

Well Location *Note any changes*

S 568 E 2182 from the W4 corner of section 02, Township 36S, Range 9W, SL B&M

Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
146	148				X								ORANGE	
148	174				X						X	LAVA RED BROWN	CLAY ORANGE	ISOM FORMATION
174	179	X		X							X	LAVA	RED BROWN & BLK	
179	193	X		X							X	LAVA	BLACK RED BROWN	VARY HARD
193	227	X		X							X	LAVA & QUARTZ	"	" "
227	393	X		X							X	LAVA	"	" "
393	489	X		X							X	LAVA	BLACK	MED HARD
489	509	X		X							X	LAVA	RED BLACK	VARY HARD
509	547	X		X							X	LAVA	BLACK	" "
547	551	X	X	/							X	LAVA	BLACK	HARD FRACTURED
551	582	X	X								X	LAVA	BLACK	VARY HARD FRACTURED
582	596	X		X							X	LAVA	RED BROWN	HARD
596	609	X		X							X	LAVA	RED	
609	699	X		X							X	LAVA	RED, BROWN & BLACK	HARD
699	788	X		X							X	LAVA	" " "	HARD BRITTLE
788	790	X	X								X	LAVA	RED, BROWN & BLACK SOME WHITE	BIG FRACTURE
790	857										X	MUDSTONE	WHITE, TAN	CLARON FORMATION
857	879										X	MUDSTONE	WHITE	HARDER
879	886										X	MUDSTONE	RED	
886	927										X	MUDSTONE	WHITE	
927	931										X	MUDSTONE	WHITE	HARDER FRACTURED

WELL DRILLER'S REPORT ADDTIONAL DATA FORM
State of Utah
Division of Water Rights

Well Identification

Change Application: a37313 (75-661)

Owner *Note any changes*

Town of Brian Head
P.O. Box 65
Brian Head UT 84719

Contact Person/Engineer: _____

Well Location *Note any changes*

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Location Description: (address, proximity to buildings, landmarks, ground elevation,local well #)

Well Log

DEPTH (feet) FROM	TO	WATER	PERMEABLE High	PERMEABLE Low	UNCONSOLIDATED CLAY	SILT	SAND	GRAVEL	COBBLES	BOULDER	OTHER	CONSOLIDATED ROCK TYPE	COLOR	DESCRIPTION AND REMARKS (e.g., relative %, grain size, sorting, angularity, bedding, grain composition density, plasticity, shape, cementation, consistancy, water bearing, odor, fracturing, minerology, texture,degree of weathering, hardness, water quality, etc.)
931	1206										x	MUDSTONE	WHITE	CLARON FORMATION
1206	1210	x		x							x	MUDSTONE	ORANGE	FRACTURED BROKEN HARD
1210	1246	x		x							x	MUDSTONE	YELLOW, WHITE & GRAY	FRACTURED
1246	1263	x		x							x	MUDSTONE	ORANGE	FRACTURED HARD
1263	1294	x		x							x	MUDSTONE	ORANGE	VARY HARD FRACTURED
1294	1302	x		x							x	MUDSTONE	ORANGE	HARD
1302	1308	x	x								x	MUDSTONE	ORANGE	HARD FRACTURED BIG FLUID LOSE
1308	1314	x		x							x	MUDSTONE	ORANGE	
1314	1322	x	x								x	MUDSTONE	ORANGE	FRACTURED BIG FLUID LOSE
1322	1330	x		x							x	CONGLOMERATE	WHITE TAN	FRACTURED (GRAND CASTLE FORMATION)
1330	1333										x	CONGLOMERATE	"	"
1333	1338	x		x							x	CONGLOMERATE	"	" FRACTURED
1338	1354										x	CONGLOMERATE	"	"
1354	1440	x		x							x	CONGLOMERATE	"	" FRACTURED
1440	1480										x	CONGLOMERATE	"	"
1480	1502										x	MUDSTONE	ORANGE RED	CLARON FORMATION

Well Log

STANDARD FORM 2015-1 (06/2015)

(3)

SUBMISSION OF WATER DEVELOPMENT PROJECTS

	FOR AGENCY USE ONLY
Through the development of scientific studies defining the aquifer within the Cedar Basin it has been documented that additional water resources will be necessary to sustain the growth and further development of the area. Without water the future economic development will be impacted by the availability and cost of existing water supplies to accommodate only the growth capable within our current water budget. This form is being circulated to document additional water supply sources that could be utilized to further alleviate the water deficit in the aquifer, as well as provide water for the future residents of the valley. This form will be evaluated for completeness of content. Please ensure that the proposed project is fully defined and information to substantiate the claim is submitted for a complete evaluation.	Application Number Date Filed

Name and address of applicant *(include zip code)*	Name, title, and address of authorized agent if different from item 1 *(include zip code)*	Telephone (area code) Applicant Authorized Agent
Gary F. Player 1671 W 546 S Cedar City, Utah 84720 gfplayer@kennylakeventures.us	H. Roice Nelson, Jr. 2155 W 700 S #31 Cedar City, Utah 84720 rnelson@walden3d.com	

A. Provide names, addresses, phone numbers and email addresses of those who filled out this form.

Gary F. Player
1671 W 546 S
Cedar City, Utah 84720
gfplayer@kennylakeventures.us

H. Roice Nelson, Jr.
2155 W 700 S, No. 31
Cedar City, Utah 84720
rnelson@walden3d.com

B. Project Description (Details are Vital)

1. Scope of Work and Project Description
2. Type of System or Facility
3. Quantity of Water Anticipated
4. Scientific Analysis of Water Resource
5. Uses (irrigation, culinary, industrial etc.)
6. Years Resource is Available
7. Constructability
8. Additional information to describe resource and availability (utilize additional sheets as necessary)

(3) ARCo Three Peaks Well Re-Entry

B.1. This project is an opportunity to develop ground water from the fractured quartz monzonite bedrock aquifer within the western portion of the Cedar Valley basin as defined by the Utah Division of Water Rights (UDWR). The availability of water would be proven initially with the recompletion of one abandoned exploratory oil well along Iron Springs Road. That ARCo well was drilled on private lands. The well would be re-entered and tested with perforations through existing casing at depths ranging from 2,490 to 2,610 feet below ground level, with projected sustainable productivity of more than 2,000 gallons per minute. Produced water could be pumped into a reservoir constructed in Iron Springs Creek, and allowed to percolate into the Cedar Valley alluvial basin. Water could eventually be conducted approximately 6 miles to the southeast via pipeline to industrial and residential consumers along Utah Highway 56.

B.2. This well would be one of an eventual larger set of wells utilized to reduce over drafting of the Cedar Valley Basin alluvial aquifer system. Water could be utilized for both industrial and culinary purposes. The well location is near to existing power lines and roads so that only minimal new development would be necessary to test the concept.

B.3. A well capable of 2,000 gallons per minute would produce 4.456 cubic feet per second, or 8.836 acre-feet per day. Therefore, one well pumped for 365 days each year would provide more than 3,200 acre-feet. Recharge estimates for the bedrock aquifers under Harmony Mountains and Three Peaks prepared by Player in 2010 range from 12,800 to 16,000 acre-feet per year, showing that continuous production of 12,000 acre-feet per year would not draw down the bedrock aquifer. THE AREA UNDERLAIN BY THE FRACTURED QUARTZ MONZONITE AQUIFER WEST OF CEDAR VALLEY IS APPROXIMATELY 200 SQUARE MILES. THE FOLLOWING ESTIMATE OF RECHARGE IS BASED ON 15 INCHES OF PRECIPITATION PER YEAR AND 10% INFILTRATION:

Precipitation = 1.25 feet per year
Infiltration at 10% = .125 feet per year
Area = 200*640 = 128,000 acres
Annual infiltration = .125*128, 000 = 16,000 acre-feet per year

Alternatively, recharge would not be less than 12,800 acre-feet with one foot (12 inches) of precipitation and 0.1 foot of infiltration per year.

B.4. The likelihood of a sustainable bedrock aquifer resource in the Harmony Hills west of Cedar Valley was shown by Player in geohydrologic reports prepared for the Cedar City Water Utility. Scientific studies included estimation of bedrock thickness, and review of published and unpublished chemical analyses of spring waters issuing from the bedrock aquifers. Summaries of those studies are attached to a cover letter for the Player-Nelson submissions. One water sample was obtained from the Quichapa Creek No. 1 well, drilled in 2012. Water from the quartz monzonite aquifer (encountered below 500 feet) was mixed with water from a thin sandstone layer in the Quichapa Volcanics at about 225 feet below ground level. Total dissolved solids (TDS) in the mixed sample were 205 mG/L (milligrams per liter of water). Water from the Quichapa Creek Left-hand Canyon spring was sampled on the same day. That water had a lower TDS of 165 mG/L. It is interesting to note that water from the test well was found to be significantly younger (approximately 510 years before present) than water issuing from the surface spring in Quichapa Left-hand Canyon (approximately 1,660 years before present). The age difference suggests that recharge water occurring in the fractured quartz monzonite aquifer is younger than water that is the source of the springs in the shallower but less permeable Quichapa Volcanic rocks.

B.5. Water pumped into a reservoir along Iron Springs Creek would be usable by for irrigation in the western portion of Cedar Valley, allowing farmers and ranchers to switch from expensive pumped wells to virtually free canal water.

B.6. The bedrock aquifer resource is sustainable due to annual infiltration from precipitation. In the unlikely event of long term drought, the production of 3,200 acre-feet per year could be sustained for almost 3,600 years without recharge into the fractured quartz monzonite bedrock aquifer system within the Cedar Valley Basin. That aquifer is estimated to contain more than 11,500,000 acre-feet of water in place.

B.7. This well could be drilled by local drilling contractors. Power lines are in place along Highway 14 for easy access to the drill site.

B.8. Summaries of bedrock aquifer studies completed in 2010 are attached to the cover letter for the Player-Nelson submissions. More detailed reports can be provided when requested.

C. Attach a map covering the area of development and location of proposed project.

1. Identify Property Ownership
2. Identify Potential Conflicts
3. Provide Details of the Area and Necessary Changes to the Area

C. A map showing the proposed location for the ARCo test and that portion across the sonic log across themost likely interval to test are attached.

C.1. The well site is on private property.

C.2. There are no potential conflicts. Re-entry of the well will require a permit from the Utah Division of Oil, Gas, and Mining.

C.3. The area is flat and will not require grading.

D. Identify any Federal, State or Local Government Issues

1. Federal
   a. Army Corp of Engineers
   b. Bureau of Land Management
   c. Fish and Wildlife
   d. Forest Service
   e. Other

   Federal issues are minimal on developed private property. Iron Springs Creek dried up as the Cedar Basin aquifer was over drawn, and no fishery is present. The proposed area is outside of managed Sage Grouse habitat.

2. State
   a. Department of Environmental Quality
   b. Division of Water Rights
   c. Other

   There are no known State issues. Cedar Basin water rights will be transferred by the Utah Division of Water Rights into the old ARCo well prior to beginning full scale production. The sources of those water rights would be farmers, ranchers, Cedar City Municipal Water Utility, and Southern Utah University. It is at least possible that the well would discover "new water" that could be appropriated to the District.

3. Local
   a. County
   b. Municipal
   c. Other

   No local issues are known exist.

E. Provide cost estimates of project

Each exploratory well will cost on the order of $200,000 to complete and equip with pumps and short pipelines to streams. Full development of 15 wells (described in a separate Submission) would cost approximately $3,000,000 to develop 12,000 acre-feet per year. The CAPEX for full development of the aquifer would be on the order of $250 per acre-foot.

F. Describe additional evaluated alternatives, if any

Separate Submissions of Water Development Projects from Player and Nelson include the following: (1) Deepening of the Cedar City Quichapa Creek Number 1 well into the fractured quartz monzonite aquifer; and (2) Construction of a Cretaceous aquifer test well at the Sheepherders Cabin Road, about one mile west of Woods Ranch,

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G. Describe any environmental effects the proposed project would have on wildlife and/or plant species

Full scale production of water from the fractured quartz monzonite aquifer west of Cedar Valley could lead to the elimination of over drafting from the Cedar Valley aquifer system.

H. Provide cultural resource evaluations of proposed area

Iron Springs Gap has provided access to several industrial and mining operations, and has been "disturbed" for 100 years. No cultural or archeological resources are present at the site. For your information, Player served as an environmental inspector during construction of the Kern River Pipeline, and supervised SUU archeologist Barbara Frank as she prepared clearances across a 100-mile segment of the line from Milford to eastern Nevada.

I. Provide any additional information deemed necessary in the evaluation of this project to provide future sustainable water resources to the Cedar Basin

Player reviewed the Harmony Hills bedrock aquifer system for Cedar City in 2010. All of his work will be available for review with the permission of City Engineer's office. For example, additional data includes meteorological studies, summaries of geology, water analyses, aquifer rock properties, old well records, etc. Summaries of the aquifer study are attached to the cover letter provided with the Player-Nelson Submissions.

Respectfully Submitted,

Gary Farnsworth Player
Utah Professional Geologist No. 5280804-2250
Idaho Professional Geologist No. 1050
Certified Petroleum Geologist No. 3097

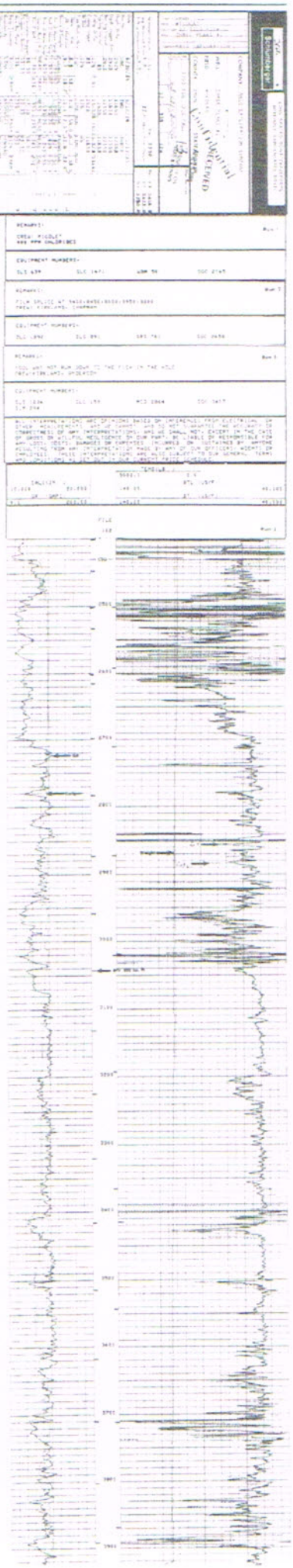
H. Roice Nelson, Jr.
Texas Professional Geoscientist No. 5120
Louisiana Professional Geoscientist No. 879

Utah Oil and Gas Map 2.0.0 (ChangeLog.html)

LOCATION MAP:
PROPOSED ARCo THREE PEAKS EXPLORATORY WELL RE-ENTRY, Iron County
Map provided by Utah Division of Oil, Gas, and Mining, Salt Lake City, Utah

Submitted by G.F. Player and H. Roice Nelson, Jr.

Sonic Log



Top Qm = 2322'

fractured? 2,500' - 2,615'

fractured? 2,960' - 3050'

ARCO Three Peaks #1