

MEMORANDUM

TO: Water Right File 61-7731

FROM: Daniel Nelson – Analyst 3

DATE: September 8, 2017

SUBJECT: Licensing Review of Water Right 61-7731

These field exams were performed by Certified Field Examiner Scott King of SPF Water Engineering. Mr. King reported that 49.20 cfs and 4,455 af from Canyon Creek for ground water recharge. This permit lapsed on June 1, 2008. Mr. King supplied information based on current conditions and current diversion structures. There are several issues that need to be addressed. Each will be addressed below:

History:

A history of this permit is needed to create a better understanding of what has happened at this recharge site. In an average water year, all of the water in Canyon Creek is diverted through a feeder canal to the Mountain Home Reservoir. During high water years, the Mountain Home Irrigation Company tries to prevent the reservoir from spilling by releasing water down Canyon Creek when the reservoir gets to a certain water level. The Mountain Home Ground Water Advisory Committee (Committee) sought to use this excess water for recharge in the late 1990's.

This application for permit was filed in March of 1997 in response to recharge study completed in 1997. The Committee may have diverted water for what they claimed to be recharge in 1997, but this permit was not approved until May of 1998. From the Committee files available at our Western Region office, the 1997 recharge study only monitored the water diverted down the Canyon Creek channel below the feeder canal to determine if the area beside Canyon Creek had adequate infiltration rates to create a reasonable recharge site. The 1997 study did suggest that the area proposed in the permit could be a good area to recharge water for the Mountain Home Aquifers for basin recharge if combination of injection wells and basin recharge was used to provide water to the different aquifers.

After the permit was approved in 1998, a second recharge event occurred in 1999. Department staff were asked to assist with the development of the recharge site and monitor the recharge that occurred. The committee with the assistance of the Department developed three recharge basins and secured water level monitoring of 8 local wells. During this recharge event the Department of Environmental Quality (DEQ) required the Committee to monitor the water quality being discharged and monitor the water quality in a number of wells in the local area. DEQ agreed to perform the monitoring for this recharge event.

During this 33 day recharge event the flow rates diverted just for recharge ranged from 9.26 cfs to 22.67 cfs and the potential volume ranged from 606 af to 1,484 af. In the 1999 recharge report it was determined that an average of 14.69 cfs and 962 af was diverted for recharge. An estimated average flow rate in Canyon Creek during the recharge event below the Feeder Canal was estimated at 19.36 cfs and 1267 af, with a maximum measured flow rate of 20.01 cfs. The 1999 report also estimates that a 102 af of water bypassed the recharge site, and 203 af of water was estimated as stream loss. No injection wells were developed for this event.

On April 15, 2003, the Department received a request for extension of time to provide proof of beneficial use. In this form the committee states that no recharge had occurred between 1999 and 2003. The date to submit proof was extended to June 1, 2008.

In 2006, the Mountain Home Management Plan (Plan) was approved. The Plan discussed recharge on page 84, and describes the 1999 recharge event. The Plan doesn't include any other recharge events. The following is an excerpt from the Plan:

“Water budgets for the Mountain Home aquifer indicate an approximately 31,000 acre-foot deficit. This water budget includes water in Big Canyon Creek that is not used for irrigation water. The bulk of that water is recharged naturally through the bed and banks of Big Canyon Creek. Only in very infrequent wet years does any water escape the Mountain Home System to the Snake River. The only way for recharge to be a viable option is if water can economically be imported into the basin within the constraints of existing water rights....”

The above discussion in the Plan suggests that there was no intent by the Committee to officially proceed with recharge from this point forward. There is no record in the file that Committee has met since December of 2006. The Committee has not officially been disbanded, but it appears as though the Mountain Home Ground Water Management Committee is currently considered to have been inactive since December of 2006. It can be reactivated at any time if the need arises.

In the Western Region office file for the Committee, I did find a Draft Memorandum from James Bledsoe and Michael Clark of Keller Associates to Elmore County dated February 11, 2013. This draft memo is titled “Canyon Creek Spring Runoff Infiltration Study, Phase 1”. On page 6 of the memorandum, they claim that there are no flow records available for the water that bypasses the feeder canal. Also on Page 6, they state that the head gates to the recharge site are always left open, so a portion of any water flowing past the Feeder Canal diversion could find its way into the gravel pits. On page 7, there is a picture showing the gravel pit full of water in 2012 and an overview of a meeting discussing recharge concerns with the Mountain Home Highway District. In the conclusion of the letter, they state that the recharge is dependent of non-use of water from senior water users, and that they couldn't find any definite records that document the frequency, duration, or volume of water currently diverted into Canyon Creek. The conclusions also discusses concerns about liability issues with the Mountain Home Highway District and the cost of creating and maintaining a water quality monitoring plan with DEQ for a recharge event.

A review of Arcmap aerial photos show that there is some water in the gravel pits in 2009 and 2013, but I cannot determine how that water got into the gravel pits. There are numerous possibilities from rainfall, irrigation seepage, carryover from previous years, and many more. Therefore, aerial photography cannot be used to confirm recharge. It should also be noted that any recharge would take place early in the year, and most of the aerial imagery available to the Department were taken during the middle of the irrigation season. Without proof of diversion, water measurements, and a DEQ water quality measurement plan, we cannot confirm recharge delivery.

In 2016, another recharge event took place, and was monitored by Department Staff. According to staff, the only measurements taken were done right below the Feeder Canal Bypass. No measurements were taken downstream or from the diversions to the recharge sites. In a conversation with the staff, I was informed that the head gates from the creek to the recharge sites are no longer in place, and a portion of any water flowing down the Canyon Creek could be allowed to go into the gravel pits without any control or measurement structure. Measurements show that a maximum of 38.2 cfs and an estimated volume of 1,450 af was diverted down Canyon Creek in 2016. There is no record that a DEQ water quality monitoring plan was in place during this recharge event, and Department staff didn't know if the recharge event met DEQ requirements.

The last recharge event took place in the spring of 2017. Once again, flows into the gravel pits were not measured and the head gates into the pits were no longer in place. The creek flows were measured after the Feeder Canal Bypass and downstream of the recharge sites. The maximum flow rate measured upstream was 265 cfs, but there were no downstream measurements on that day. On the days that they had measured above and below the recharge sites, they measured 137 cfs upstream and 105 cfs downstream on 3/29/2017, 185 cfs upstream and 131 cfs downstream on 4/6/2017, and 69.4 cfs upstream and 52 cfs downstream on 4/12/2017. These measurements show a difference in in upstream to downstream flow rates between 17.4 cfs to 54 cfs, but they don't define the amount of water actually being diverted into the gravel pits. The 2017 report has calculate a volume of 4,460 af difference between the upper diversion and the lower diversion. The 4,460 af is the amount of water the report estimated to be diverted into the gravel pits or infiltrated into the subsurface. There is no record that a DEQ water quality monitoring plan was in place during this recharge event.

Scott King of SPF Engineering did provide measurements of the water being diverted into the gravel pits during the 2017 recharge event in his field report. Mr. King measured 49.2 cfs and 4,455 af being diverted into the gravel pits in 2017. These measurements seem reasonable, and the overall measurements that Mr. King supplied were very similar to the measurements supplied in the 2017 report prepared by Department staff. You can assume that the 5 af difference between the Department's measurements and Mr. Kings measurements are probably attributed to stream loss.

None of the above recharge events included any injection wells. No injection wells were developed for this recharge site or any other along Canyon Creek.

A condition of the permit required that this use of this permit must meet DEQ water quality standards. According to DEQ "Wastewater Rules" (IDAPA 58.01016.600) allows DEQ to require and approve a program to monitor ground water quality when surface waters are land applied. Monitoring was required in 1999, and I can find no information that the monitoring requirement has been waived. I could find no record of any water quality monitoring of the recharge site except for the 1999 recharge event. Therefore, there is a concern that any ground water recharge that has occurred after 1999 did not meet with the conditions of the permit.

Proof of Beneficial Use, Ownership, and Beneficial Use:

Proof of Beneficial Use was due on June 1, 2008, and this permit was allowed to lapse. Elmore County filed "Late" proof along with a certified field examination on June 12, 2017. The proof of Beneficial Use was questioned, since Elmore County was not the permit holder of record.

Elmore County then submitted an assignment of permit from the Committee to Elmore County. On face value, this assignment form doesn't appear to be acceptable, since the assignment was signed by the Elmore County Commissioners. The Committee has been inactive since December of 2006. However, along with several individuals representing various interest groups the committee also included several entities as members such as Elmore County, City of Mountain Home, and Mountain Home Airforce Base. Elmore County was listed as member of the Committee and all of the Elmore County commissioners signed the assignment of permit form, so they appear to have the authority to assign the permit for the Committee. It was decided that we shouldn't move forward until something was done to show Elmore County had some type of ownership of the water right permit, since they did not own the property or were not the designated representative for the committee.

On December 3, 2017, the Department received a copy of the assignment of the permit into the name of Elmore County. In the same documentation, the Department received an agreement by the Mountain Home Highway District to allow the County to pursue the recharge projects. Mountain Home Highway District doesn't own the property associated with the recharge project, but they do hold a lease agreements with BLM and Simplot to use those properties for gravel extraction. Therefore, Mountain Home Highway District needed to provide some approval to use the gravel pits for gravel extraction.

The assignment of permit also assigns the BLM's Temporary Use Permit to the County. I am unsure whether or not this permit can be transferred, or if it is still viable. It appears from the attached Temporary Use Permit for BLM, that the permit was only valid for a 5 year term. However, the County's attorney, Scott Campbell provided an email where provides a legal opinion on the legality of assignment of the BLM Temporary Use Permit. Regardless of the ownership of the BLM Temporary Use Permit, the attached permit clearly shows that the original recharge projects was done with the BLM Temporary Use Permit in place, so this water right was not developed in trespass on the BLM ground.

The ownership appears to have remained the same as it was in 1999. The following supplies the actual ownership of the property at the time of the 1999 recharge event:

Upper Recharge Site (Site 1) – BLM owned this site and issued the attached Temporary Use permit found in the attachments - Dated March 23, 1998.

Lower Recharge Site (Site 2) – JR Simplot owned this site and gave a verbal approval to Fred Perez per the January 7, 1999 Mountain Home Ground Water Management Area Advisory Committee. Mr. Perez worked for the Mountain Home Highway District, who had authorization to use the gravel pits.

Snake Pit (Site 3) – This site was also on the JR Simplot property, and Mr. Perez also acquired verbal approval for this site according to the January 7, 1999 minutes.

Whereas the permit holder was required to submit Proof of Beneficial use in 2008, Idaho Code §42-218a (2a) requires that the Department only license the amount of water use developed during the time authorized by the permit or from 1998 to 2008. The extension of time form submitted by the Committee on May 21, 2003, confirmed that the only time that water was available for recharge from 1998 to 2003 was the 1999 recharge event. The Mountain Home Ground Water Management Plan also suggests that no water was diverted for recharge from 2003 to 2006. According to the attached BLM Temporary Use Permit, the Temporary Use Permit would terminate 5 years after it was issued in 1998. I couldn't find any records that show the Temporary Use Permit was re-instated or re-issued under a different filing.

A review of the Water District Records show that 2006 was an extremely good water year, and 2008 was reasonably good year. The Water District records show that 2003, 2004, 2005, and 2007 were poor water years, and they didn't expect the reservoirs to fill. The Water District records have not recorded any water use below the feeder canal, so there are no records in the water district records to suggest that recharge ever occurred. Without any record from the Water District of diversions to the recharge sites, and no records other than the 1999 recharge report discussing an official recharge event from 1998 to 2008, it appears as though we must depend on the 1999 recharge report for the licensing of this permit.

According to the records, it appears as though the 1999 recharge event was the only recharge event that measured the water actually being diverted for recharge and that followed DEQ requirements for water quality monitoring. A conversation with Idaho Water Resource Board staff confirmed that they are required to follow DEQ monitoring requirements for their various recharge sites. It should be noted that Scott King did provide reasonably accurate measurements of the water being diverted for recharge in his certified field report, but those measurements were based on the 2017 recharge event, and cannot be considered in the licensing of this permit. There is also no evidence of DEQ's participation or approval of a monitoring plan for the recharge events in 2016 or 2017. Any recharge event that occurred after the 1999 recharge event should not be considered unless the permit holder can provide proof of the amount of water actually diverted from Canyon Creek and that the recharge event complied with DEQ requirements. We also cannot consider any event that happened after the time proof of beneficial use was due or June 1, 2008.

Therefore, the only information that we can use to license this permit is the information collected during the 1999 recharge event. Mr. King's report relies only on the 2017 recharge event, so those numbers cannot be used. It would be inefficient to require Mr. King to resubmit his field report based on the 1999 recharge report, since the Department has a copy of the report in our office. I will move forward with the licensing of this permit using the 1999 report.

Proof of Beneficial Use and the field exam were received by the Department on June 12, 2017. Therefore the priority date will be advanced to June 12, 2017. The field exam date will be March 17, 2017, since that is the date that Mr. King performed the field exam for the permit. A reinstatement order is required to reinstate the permit.

Reinstatement of Permit and Temporary Permit Discussion:

This permit is limited to only the amount of water that can be diverted after all users on the Canyon Creek are satisfied. It is further limited to all hydropower uses on the Snake River developed prior to October 25, 1984. The application for this permit was protested by Idaho Power, so I am assuming the subordination to pre-1984 hydropower uses was part of the settlement of the protest. Therefore, it is a bit nuclear why Elmore County is interested in reinstating this permit when they can file a temporary permit to cover any recharge event they may have in the future. However, there is a clear record that they did divert water for recharge in 1999, and we can use that information to move forward with licensing. It appears as though the Department will accept the assigning of the permit to Elmore County by the Elmore County Commissioners, so there does not appear to be any obstacles preventing us from re-instating the permit.

Separate Systems and Splitting of the Water Right Permit:

This permit was filed as a single system, and Mr. King regarded all of the water diverted down Little Canyon Creek as a single system. However, the Little Canyon Creek is the source of water, and each diversion point is the start of its own unique system. Therefore, at licensing this permit will be split to reflect each of those systems. An amendment is needed on this permit, so we will amend the permit as a single use and then split the permit at licensing. This will allow us to only charge one amendment of permit fee.

Points of Diversion:

Mr King GPS'ed the two points of diversion and properly located them on the map. According to the 1999 report there were actually three points of diversion. The diversion not located in Mr. King's report diverted into a ditch that meandered north from the creek to a location known as the snake pit. That ditch was dirt channel created specifically for the 1999 recharge event and appears to no longer exist. Regardless of what is being done at the present time, we will need to list all three points of diversion on the permit. This will allow us to properly split the permit at licensing.

The permit did allow 3 injection wells for this recharge site. No injection wells were developed for this recharge site, so no points of injection will be allowed on the license. The Department's injection well coordinator informed me that a new injection well permit would be required, but the water right license would need to show a point of injection for the permit to be approved. Therefore, they would need to file a water right transfer to get a new injection well permit approved.

The lower diversion in the SENW of Section 10, Township 3 South, Range 6 East, was not included on the permit. Therefore, an amendment of permit will be required before this permit can be licensed.

Place of Use:

Mr. King provided an excellent map of the place of use for the two gravel pit recharge sites. However, Mr. King didn't provide a map of the third recharge site on the north side of the creek. Therefore, this place of use will be added to the permit. Site 3 wasn't included on the permit either, so this site will need to be added to the amendment. I have attached a map to the memo to show the place of use and points of diversion for each of the sites. Site 3 is located in the NESW and SESW of Section 3, Township 3 South, Range 6 East.

Diversion Rate and Diversion Volume:

As discussed above, Mr. King measured and recommended a diversion rate based on the 2017 recharge event. His measurements seem fairly reasonable, but they cannot be used. The 1999 Recharge Report provides measurements into the 3 recharge sites at a maximum of 22.67 cfs. Mr. King's report does suggest that the two points of diversion are more than capable of diverting more water than the amount measured in 1999. Therefore, we should recommend the entire amount diverted of 22.68 cfs (please note that the in order to follow the rounding requirements, the diversion rate for site 3 needs to be rounded up to 12.70 cfs, which increases the overall rate to 22.68 cfs). Once the permit is split, the each point of diversion and place of use will have its own portion of the 22.68 cfs. In 1999, the maximum diversion rates for each site was as follows:

Upper Recharge Diversion (Site 1) =	5.33 cfs
Lower Recharge Diversion (Site 2) =	4.65 cfs
<u>Snake Pit Diversion (Site 3) =</u>	<u>12.70 cfs</u>
Total Diversion to Recharge =	22.68 cfs

Diversion Volume:

Mr. King estimated a volume of 4,455 af, which is very close to the 4,460 af estimated in the 2017 recharge event. We cannot use the 2017 data, so we must go with the information supplied in the 1999 data. The estimated volume diverted to the three recharge sites in the 1999 recharge report was 962 af. An estimate of 1,000 af was discussed in the report, but this amount was rounded up for presentation purposes. The 1999 event does state that 1,267 af was measured at the feeder diversion, but a portion of that water flowed past the recharge sites or was lost to stream infiltration. The only volume amount we can actually attribute to recharge is the amount that was actually diverted away from Canyon Creek. We cannot include water flowing in the stream past the recharge site or stream losses as part of a recharge water right.

The ground water recharge storage use was included on this permit to allow long term storage of water in Frazer Reservoir. Ground water recharge in Frazer reservoir has never been established, therefore, the ground water storage component should be removed at licensing. The water recharged into the gravel pits is generally gone within a few weeks of the recharge event, so no storage is needed for the gravel pits.

I am recommending an annual volume of 962 af for this permit. In order to split the 3 permits out separately, a volume per diversion is required. An average diversion rate per site per the number of days diverted was used to gather the average diversion rate per site for 33 days. The following calculations were used to determine the volume of water per sight:

Upper Recharge Diversion (Site 1) =	2.45 ave. cfs X 33 days X 1.9835 = 160 af
Lower Recharge Diversion (Site 2) =	4.61 ave. cfs X 33 days X 1.9835 = 303 af
Snake Pit Diversion (Site 3) =	7.63 ave. cfs X 33 days X 1.9835 = 499 af
Total Diversion to Recharge =	14.69 ave. cfs X 33 days X 1.9835 = 962 af

Overlap:

There are numerous water rights on Canyon Creek, but this permit is the only water right that uses the snake pit, gravel pits, and these points of diversion for ground water recharge. There is no direct overlap for the points of diversion.

Mountain Home Irrigation District and ground water irrigation water right 61-7037 for Clear Springs Ranch LLC, overlaps the Place of Use in the NESW of Section 10, and Mountain Home Highway District has a ground water stockwater right in the SENE of Section 10. Both of the places of use for the permit have been gravel pits prior to the permit being issued, so there does not appear to be any issues with overlapping water rights at this time. The gravel pit in the SENE was fully developed in 1980 and the gravel pit in the NESW was partially developed in 1980 and fully developed in the 1998 aerial photography. The stockwater right doesn't appear to have been used prior to 1980 and the two irrigation rights don't appear to have been used after 1998. Therefore, it doesn't appear as though any of these rights would affect this ground water recharge right.

Conditions:

Conditions 1(052), 3 (053), 5 (26A) and 10 (18B) should be removed at licensing. Condition 2 (081) should be changed to condition 106 and carried forward to licensing. The reason for carrying forward 106 is due to the lack of records for the possible recharge events that happened in 2012, 2016, and 2017. Condition 4 (051) should be changed to 933 and 934 as is standard. Condition 6 (R04) should be changed to R05, and corrected to include the water district number of 61A. Conditions 7 (004) and 9 (020) should be carried forward to licensing, but the updated versions should be used. Most of condition 8 should be deleted and replaced with standard conditions except for the portion of the condition that reads as follows:

This right is subject to all prior water rights, including those water rights for power purposes that may otherwise be subordinated by contract entered into by the governor and Idaho Power Company on October 25, 1984, and ratified by the legislature pursuant to section 42-203B, Idaho Code.

The above portion of condition 8 was placed on the permit as part of a stipulated agreement between the Committee and Idaho Power signed October 31, 1997. Conditions 921, 929, and 01M should be added to the license to address some of the other conditions that were removed and the portions of condition 8 that was removed. The well injection permit requirement was removed from condition 8, since no well injection well was developed. There are no standard conditions preventing an injection well, and I don't believe any condition is necessary. I spoke with the injection well coordinator with the Department, and he informed me that their original injection well permit had expired due to non-development. The injection well coordinator also told me that any new injection well application would require a water right review resulting in a water right transfer to include a point of injection on the water right.

Another condition should be added that states:

Seepage from Canyon Creek incidental to or coincident with delivery of water to the recharge sites shall not be considered ground water recharge under this right.

The reason for the above condition is to ensure that the permit holder is aware that water released into Canyon Creek is not considered ground water recharge until it enters the gravel pits. The 2016 and 2017 report did not differentiate the amounts of water infiltrated in the stream bed to the amount of water actually diverted into the gravel pits. The above condition is similar to condition 924 that limits incidental recharge for canal pursuant to Idaho Code § 42-234(5). This condition should help the permit holder understand that we cannot count any water not recorded as being diverted into the recharge pits.

Conclusion:

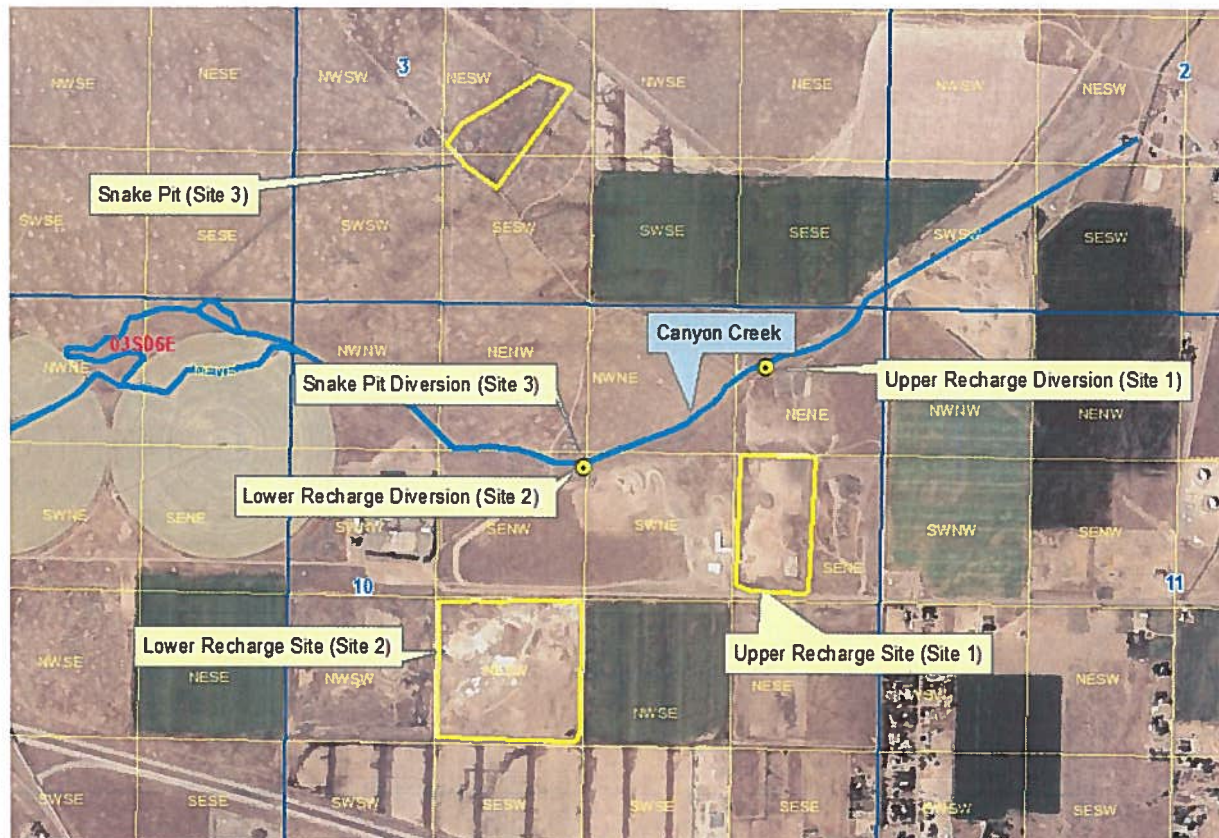
For the Department to move forward with the licensing of this permit, the conditions should be clear that DEQ monitoring is required. I believe this is necessary to assist the permit holder in avoiding liability issues later on if one of the nearby wells becomes contaminated and is blamed on the recharge effort. The permit holder should also be made aware that only the amount of water actually diverted to the recharge sites can be counted as recharge.

The monitoring of these sites and discharge into the recharge sites has been haphazard in the past. To avoid issues later on, the permit holder needs to be more diligent in the monitoring of these recharge events to ensure the public safety, and to determine the viability of recharging this water.

From what can be seen in the records, there is still some ambiguity concerning the County's authority to divert water for recharge onto the lands associated with this permit. A water right doesn't grant an easement or the authority for the County to enter the lands of another. Therefore, it would be in the County's best interest to ensure those agreements are in place prior to diverting water for recharge in the future.

The only other concern is that this proposed license wouldn't allow future development of injection wells. Originally, I was concerned that a condition would be needed to ensure that an injection well wouldn't be added to the system in the future. The process for approving an injection well includes licensing review, so there should be no need to include additional conditions preventing the use of injection wells without an approved transfer. The process in place for injection well group should be sufficient to prevent the drilling of future injection wells without an approved permit.

This map shows the point of diversion and place of use of the Snake Pit (Site 3) which was not included in Mr. King's field report. However, since it was in the 1999 recharge event, it needs to be included in this permit.





United States Department of the Interior

BUREAU OF LAND MANAGEMENT

Lower Snake River District
Boise Field Office
3948 Development Avenue
Boise, Idaho 83705-5389

In Reply Refer To:

IDI-32357
2800

MAR 23 1998

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Ron Hiddleston, Chairman
Mountain Home Ground Water Advisory Committee
Route 3, Box 610 W.
Mountain Home, ID 83647

Dear Mr. Hiddleston:

Subject: Authorization Offered, Timely Response Required

Right-of-Way Application IDI-32347 for injection wells, spreading basin and access road, will be approved subject to the attached stipulations for five years. The right-of-way will carry with it the right to renew upon expiration. If you agree with the stipulations, both copies should be signed and returned within 30 days of receipt.

Please notice that stipulation number fourteen requires that you file Proof of Construction within 90 days of completion. Completion of construction should be no later than one year from grant issuance. A form for your use in filing the Proof is enclosed. Also, stipulation number nineteen requires you to provide us with as-built development maps.

If the signed grant forms are not returned to our office within the time allowed, the application may be rejected.

Sincerely,

Signe Sather-Blair
Bruneau Area Manager

Enclosures

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
RIGHT-OF-WAY GRANT/TEMPORARY USE PERMIT

SERIAL NUMBER IDI-32357

1. A right-of-way is hereby granted pursuant to Title V of the Federal Land Policy and Management Act of October 21, 1976 (90 Stat. 2776; 43 U.S.C. 1761).

2. Nature of Interest:

a. By this instrument, the holder:

Mountain Home Ground Water Advisory Council
Route 3, Box 610W
Mountain Home, ID 83647

receives a right to construct, operate, maintain, and terminate injection wells, spreading basin and access road on public lands described as follows:

Boise Meridian, Idaho

T. 3 S., R. 6 E., section 10: S $\frac{1}{2}$ NE $\frac{1}{4}$ NE $\frac{1}{4}$, E $\frac{1}{2}$ SE $\frac{1}{4}$ NE $\frac{1}{4}$.

(as shown on the attached Exhibit A)

- b. The right-of-way or permit area granted herein for the access road is 20 feet wide, 2508 feet long and contains 1.152 acres, more or less. The spreading basin facility contains 7.0 acres.
- c. This instrument shall terminate five years from its effective date unless, prior thereto, it is relinquished, abandoned, terminated, or modified pursuant to the terms and conditions of this instrument or of any applicable Federal law or regulation.
- d. At the discretion of the authorized officer this instrument may be renewed. If renewed, the right-of-way or permit shall be subject to the regulations existing at the time of renewal and any other terms and conditions that the authorized officer deems necessary to protect the public interest.

- e. Notwithstanding the expiration of this instrument or any renewal thereof, early relinquishment, abandonment, or termination, the provisions of this instrument, to the extent applicable, shall continue in effect and shall be binding on the holder, its successors, or assigns, until they have fully satisfied the obligations and/or liabilities accruing herein before or on account of the expiration, or prior termination, of the grant.

3. Rental:

For and in consideration of the rights granted, the holder agrees to pay the Bureau of Land Management fair market value rental as determined by the authorized officer unless specifically exempted from such payment by regulation. Provided, however, that the rental may be adjusted by the authorized officer, whenever necessary, to reflect changes in the fair market rental value as determined by the application of sound business management principles, and so far as practicable and feasible, in accordance with comparable commercial practices.

4. Terms and Conditions:

- a. This grant or permit is issued subject to the holder's compliance with all applicable regulations contained in Title 43 Code of Federal Regulations part 2800.
- b. Upon grant termination by the authorized officer, all improvements shall be removed from the public lands within 60 days, or otherwise disposed of as provided in paragraph (4)(d) or as directed by the authorized officer.
- c. Each grant issued for a term of 20 years or more shall, at a minimum, be reviewed by the authorized officer at the end of the 20th year and at regular intervals thereafter not to exceed 10 years. Provided, however, that a right-of-way or permit granted herein may be reviewed at any time deemed necessary by the authorized officer.
- d. The stipulations, plans, maps, or designs set forth in Exhibit(s) A & B, dated March 13, 1998 attached hereto, are incorporated into and made a part of this grant instrument as fully and effectively as if they were set forth herein in their entirety.
- e. Failure of the holder to comply with applicable law or any provision of this right-of-way grant or permit shall constitute grounds for suspension or termination thereof.
- f. The holder shall perform all operations in a good and workmanlike manner so

as to ensure protection of the environment and the health and safety of the public.

IN WITNESS WHEREOF, The undersigned agrees to the terms and conditions of this right-of-way grant or permit.

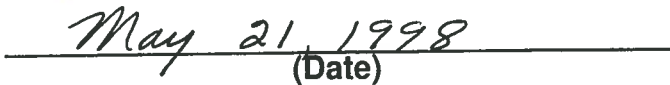
MTN. HOME AREA GROUNDWATER ADV. COMM.



(Signature of Holder)

CHAIRPERSON

(Title)



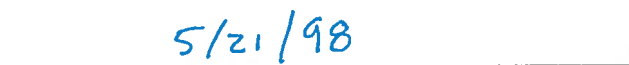
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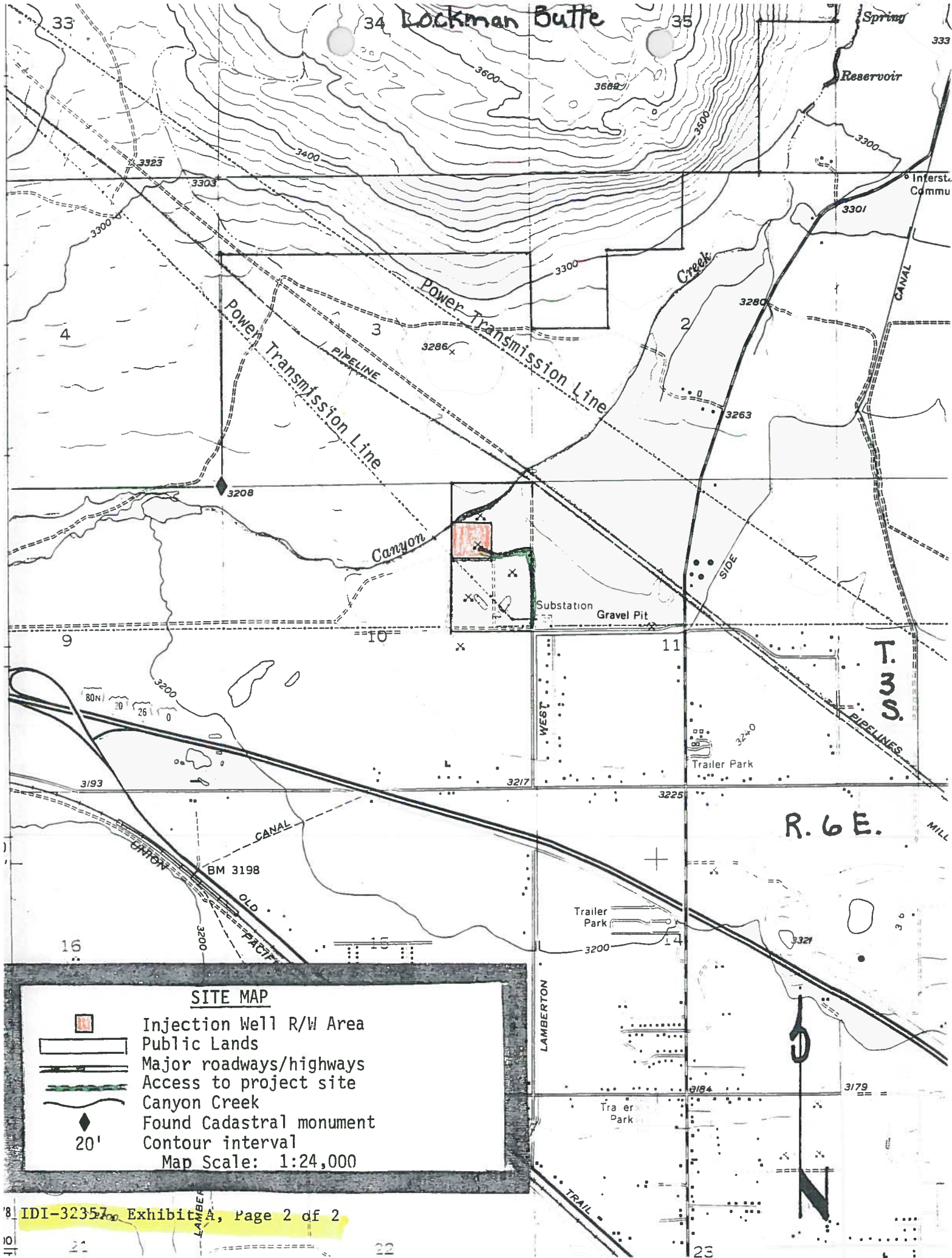
Signe Sather-Blair

Bruneau Area Manager

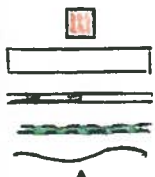
(Title)



(Effective Date of Grant)



SITE MAP



- Injection Well R/W Area
- Public Lands
- Major roadways/highways
- Access to project site
- Canyon Creek
- Found Cadastral monument
- Contour interval
- Map Scale: 1:24,000

SPECIAL STIPULATIONS

Mtn. Home Ground Water Advisory Committee
Injection Wells and Spreading Basin R/W
Right-of-Way IDI-32357

1. The Holder's use herein is subject to all valid existing rights and shall not excuse the Holder from obtaining any additional approvals lawfully required by other Federal, state, and local agencies.
2. There is reserved to the Secretary of the Interior, or his lawful delegate, the right to grant additional rights-of-way or permits for compatible uses on, over, under or adjacent to the lands involved in this grant. The Holder is being granted non-exclusive use of the land.
3. This grant shall be subject to cancellation upon failure by the Holder to observe any conditions or terms of the grant. The cancellation shall become effective as provided by 43 CFR §2803.4 and the Holder shall quietly and peaceably deliver to the United States possession of the premises.
4. Unless otherwise authorized, the Holder shall be allowed sixty (60) days after the termination of this grant to remove all authorized and any unauthorized improvements placed on the premises by the Holder.
5. All waste caused by the Holder or his activities shall be promptly removed and disposed of in an authorized disposal area. The term "waste" as used herein means all discarded matter including, but not limited to, trash, garbage, refuse, petroleum products, ashes, and equipment.
6. The Holder shall conduct all operation and use activities in a manner that will avoid or minimize degradation of air, land, and water quality. Toxic or hazardous materials shall not be released polluting either air, land, or water resources. All operation or use shall be consistent with applicable Federal, state and local laws and regulations relating to safety, water quality, and public health.
7. The Holder hereby agrees to indemnify and hold harmless the United States, its successors and assigns, its officers, agents, and employees, from any and all damages and claims for damages of every description or kind whatsoever which may result from the exercise of privileges granted by this permit or which may result from the exercise of any of the rights reserved herein.
8. Access to the site shall be by existing roads or trails and no new ones are to be constructed. No site clearing is permitted under any circumstances outside the area authorized without prior approval from the authorized officer.

9. The Holder shall rehabilitate all disturbed areas as a result of his use by first smoothing to the original contour and then broadcast seeding and chaining a seed mixture as approved by the authorized officer. This seeding shall be completed to the satisfaction of the authorized officer as prescribed at the time of grant allowance or cancellation, termination or when the grant expires.

10. All disturbed areas shall be broadcast seeded with 90% pure live seed to a mixture of Siberian wheatgrass (7.0 lbs/acre), ladak alfalfa (2.0 lbs/acre), and bozoiski Russian wildrye (2.0 lbs/acre). This 11 lbs/acre seeding shall immediately be lightly harrowed or hand raked to cover the seed. This work shall be completed from October 15 to December 15 in the year of the seeding. If, after the second growing season, it is determined the seeding is not successful the Holder shall repeat the seeding, using the same requirements as the original seeding, until it is determined by the authorized officer a viable seeding has been established.

11. Care and reasonable precaution shall be taken to protect and not disturb existing users and right-of-way holders in the area during your construction or use granted herein.

12. The Holder shall comply with the applicable Federal and state laws and regulations concerning the use of pesticides (i.e., insecticides, herbicides, fungicides, rodenticides, and other similar substances) in all activities/ operations under this grant. The permittee shall obtain from the authorized officer approval of a written plan prior to the use of such substances. The plan must provide the type and quantity of material to be use; the pest, insect, fungus, etc., to be controlled; the method of application; the location of or storage and disposal of containers; and other information that the authorized officer may require. The plan should be submitted no later than December 1 of any calendar year that covers the proposed activities for the next fiscal year. If need for emergency use of pesticides is identified, the use must be approved by the authorized officer. The use of substances on or near the permit shall be in accordance with the approved plan. A pesticides shall not be used if the Secretary of the Interior has prohibited its use. A pesticide shall be used only in accordance with its registered uses and within other limitations if the Secretary has imposed limitations. Pesticides shall not be stored on public lands authorized for use under this grant.

13. Title to water associated with this grant shall continue to be legally authorized by the Idaho Department of Water Resources (IDWR). Failure of the permittee to remain in compliance with IDWR requirements regarding the use of water to the satisfaction of the Bureau of Land Management Authorized Officer will result in the automatic termination of this permit in accordance with 43 CFR §2800. No rights to the public lands accrue due to their description as the place of use or place of crossing in conjunction with a water right, beyond those described specifically by this permit nor beyond the term of this permit.

14. The Holder shall file proof of construction within 90 days of completion of construction but no later than one year of the date of the grant.

15. The Holder shall furnish the authorized officer with all drilling logs, on wells drilled on public lands, within 60 days of the drilling event. Each log shall include the following information: 1) date well was drilled; 2) who drilled the well; 3) well permit number; 4) location by legal description of well; 5) how well was drilled; 6) size of well and whether it was cased and screened and at what depth; 7) water levels; and 8) lithographic encountered.

16. Any cultural and/or paleontological resource (fossil(s) or historic or prehistoric site or object) discovered by the Holder, or any person working on his behalf, on public or Federal land shall be immediately reported to the authorized officer. Holder shall suspend all operations in the immediate area of such discovery until written authorization to proceed is issued by the authorized officer. An evaluation of the discovery will be made by the authorized officer to determine appropriate values. The Holder will be responsible for the cost of evaluation and any decision as to proper mitigation measures will be made by the authorized officer after consulting with the Holder.

17. The Holder shall notify the authorized officer of any change of address within 30 days of such event.

18. The Holder shall comply with the construction practices and mitigating measures established by Title 33 CFR §323.4, which sets forth the parameters of the "national permit" required by Section 404 of the Clean Water Act. If the proposed action exceeds the parameters of the nationwide permit, the Holder shall obtain an individual permit from the appropriate office of the Army Corps of Engineers and provide the authorized officer with a copy of same. Failure to comply with this requirement shall be cause for suspension or termination of this grant.

19. The Holder shall provide the authorized officer with an as-built development map specifically showing a Plan View of the location of all site development, road access, and their orientation with Canyon Creek on public lands.



State of Idaho

DEPARTMENT OF WATER RESOURCES

Western Region, 2735 Airport Way, Boise, Idaho 83705-5082 - (208) 334-2190

FAX (208) 334-2348

PHILIP E. BATT
GOVERNOR

KARL J. DREHER
DIRECTOR

May 20, 1998

To: Mountain Home Groundwater Advisory Committee

Re: BLM Right-of-Way Agreement

Ladies & Gentlemen:

I called Mike Austin of the Bureau of Land Management (BLM) who worked on the right-of way application filed by the Committee. I asked him questions raised by the Committee at its last meeting. This letter attempts to state Mr. Austin's responses. I am sending him a copy of this letter for his review and correction if I misrepresent anything.

The Committee expressed concern that the delivery ditch and associated diversion works were not specifically described by the draft permit. Mr. Austin recognized that water would have to be diverted from Canyon Creek to the settling basin and injection wells, and that construction of a ditch or pipeline to the site would be permitted.

The Committee expressed concern that construction would not be complete within one year, primarily because of funding. Mr. Austin stated that BLM typically grants one year for completion of construction, but will entertain a request for an extension of time if the Committee demonstrates good cause for the delayed construction.

The Committee was also concerned about whether it would be required to pay rent for the property. Because the Committee is a quasi-governmental entity, Mr. Austin felt that the rent might be waived but did not commit to me during our conversation. Mr. Austin stated that the rent would be approximately \$18 per acre annually.

Ron Hiddleston and I spoke after I visited with Mike Austin, and we agreed that Ron should sign the permit. Because of the 30 day deadline, Ron will sign the permit on May 21, 1998.

Sincerely,

A handwritten signature in cursive script that reads "Gary Spackman".

Gary Spackman

c. Mike Austin, BLM

**MOUNTAIN HOME GROUND WATER MANAGEMENT AREA
ADVISORY COMMITTEE
MINUTES OF MEETING JANUARY 7, 1999**

ATTENDANCE

COMMITTEE MEMBERS:

Ron Leydet, David Olson, Forrest Freer, Jerry Peterman, Paul Raymond and Gary Burton

VISITORS/INTERESTED PARTIES:

Bill Young, John Schleicher, Gary Spackman, Joe Twitchell, Dan Nelson, Charles Olson, Jonathan Oakes, Fred Perez and Sue Taylor

The meeting was brought to order at 8:10 a.m. by Paul Raymond. The role was called by Sue Taylor and the minutes for December were reviewed and approved. The next meeting was scheduled for February 4, 1999, at the Mountain Home City Hall.

Dan Nelson with the Idaho Department of Water Resources was introduced. He will be assisting on the recharge committee.

John Schleicher gave an update on the management plan. It was suggested that the City of Mountain Home be responsible for the entity plan for the city domestic users, Elmore County for the county domestic users and the Soil Conservation District for the irrigators.

Paul Raymond suggested that someone from the subcommittee meet with the City of Mountain Home, Elmore County, and the Soil Conservation District to ask them to submit a plan. John Schleicher said that the subcommittee would draft an entity plan to present to them.

If anyone has any suggestions for the management plan subcommittee, John Schleicher asked that they get them to the subcommittee as soon as possible. He suggested a representative from each entity be on the subcommittee. He would also check with Mountain Home Air Force Base to see what the plan for the base was like.

Gary Spackman complimented Charles Olson and John Schleicher on their progress. He also suggested they establish time lines for the entities to finish their plans.

It was suggested that the entities be contacted for their input and possibly be put on the agenda for the next meeting on February 4.

Gary Spackman suggested submitting the management plan to the Director of Water Resources without the entities plans attached, then add their plans later.

Charles Olson said the subcommittee would need everyones suggestions by February. They would get everyone a copy of the plan by January 20, 1999.

John Schleicher thought that appendices needed to be included but that would mean continual updating.

The advisory committee made some suggestions for other changes in the management plan. The subcommittee will revise the plan.

Gary Spackman reported that there was approximately \$5,000 left from the grant. There is some flexibility in using the money and it could possibility be used for recharge monitoring.

Forrest Freer reported on the water outlook.

Mountain Home Reservoir	1,450 a.f.	Capacity	5,000 a.f.
Long Tom Reservoir	510 a.f.	Capacity	3,780 a.f.
Camas Reservoir	14,510	Capacity	23,500 a.f.

Next the recharge subcommittee gave its report. The subcommittee consists of Forrest Freer, Fred Perez, Dan Nelson, Calvin Ireland, Clayton Colthorp and Ron Leydet.

The subcommittee has two sites in mind for recharge. Fred Perez has worked on site one and is starting on site two. Site one is on BLM land. Site two belongs to the highway district and Simplot. Fred Perez has obtained verbal permission from Simplot personnel to work on the site.

Forrest Freer thinks that water quanlity tests are necessary. IDWR can monitor some wells and Ron Leydet's well can be used for monitoring.

The main expenses of the project are water quality testing and boards and culverts at site two. Water quality testing should be done within the next month.

Bill Young will put together a short proposal for water quality monitoring. He estimates the testing well will cost \$1,600 total for all the tests.

Bill Young showed a recharge video.

Dan Nelson went over the recharge plan. The subcommittee needs volunteers to help with backup.

The meeting was adjourned at 10:40 a.m.

DAN'S

Initial Water Level Testing For Mountain Home Groundwater Advisory Committee 1999 Recharge Project

*Submitted by Daniel A. Nelson
Water Right Agent
Idaho Dept of Water Resources*

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Leydet South Well

Hiddleston Grandmothers Well

Hiddleston Back Well

George Jones Well

REVIEW OF DATA

BY DANIEL A. NELSON

Gary Spackman of the Idaho Department of Water Resource requested that I oversee the 1999 recharge event and perform flow measurements and water level test in 8 wells for the Mountain Home Recharge Project in 1999. This review contains a review of the data that has been collected up to May 5, 1999. Monitoring of the 8 wells will continue through 1999 to determine tendencies in the 8 wells. Shane Bendixsen and Helen Harrington of the State Office of the Idaho Department of Water Resources have assisted in the measurements and have interpreted the data that has been collected.

I have estimated that approximately 1000 acre feet of water was diverted from Canyon Creek for the Mountain Home Recharge Project in 1999. The acre foot amount comes from an average of three measurements taken during the 1999 recharge event. However, the flow of Canyon Creek decreased throughout the recharge event and these measurements were taken during the last three weeks of the five week event. Even though the first two weeks were not measured, I feel that this estimate is reasonable.

The Mountain Home Recharge Committee did an excellent job of monitoring and working with the water available to ensure that there were no problems and that the used the water available as efficiently as possible. An estimated 8 % of the water flowing down Canyon Creek was not utilized by the Recharge Committee. Special recognition should be given to both Fred Perez and Ron Leydet for their work on the system.

The water level tests performed on 8 monitoring wells was disappointing. The results of these tests were inconclusive and no discernable changes in the water levels could be seen. There did seem to some rise in the Mountain Home Highway District Stock Well, the Mountain Home Highway District Shop Well, and the Leydet North Well. However, these water level changes were probably attributable to piling or build up around the recharge sites. According to the review of the measurements by Shane Bendixsen and Helen Harrington, it seems that the amount of water that was recharged only amounted to approximately 4 % of the water in the local aquifer. In order to see dramatic change in water levels the percentage of water added to the local aquifer would have to be much higher. In speaking with local area residents and water users, it is believed that there could be a system of fissures or lava tubes within the recharge area. There is no evidence to substantiate these claims, but it could give a possible reason why water level were significantly changed in the monitoring wells.

In conclusion, it is safe to say that the recharge project was a success, even though measurable results could not be shown. A 1000 acre feet of water was recharged into the aquifer and the Mountain Home Recharge Committee did an outstanding job of controlling the water for the recharge event. I believe that the 1999 recharge event was an excellent beginning to future recharge. Through time a better understanding of the underground flow patterns should be attained allowing recharge water to be better monitored.

ESTIMATED ANNUAL VOLUME FOR MOUNTAIN HOME RECHARGE PROJECT FOR 1999
SUBMITTED BY DANIEL A NELSON - WATER RIGHT AGENT

Two recharge events have happened in 1999. The first event began on 3/9/1999 and lasted for 3-24 hour days. The second event began on 3/19/1999 and ended 4/17/1999 for 30-24 hour days. The Mountain Home Recharge Projected recharged water for a total of 33 days in 1999. Three measurements were made on all three recharge sites and 2 measurements were made on Canyon Creek at the feeder canal diversion and after the recharge sites.

DATE MEASURED	CANYON CREEK AT FEEDER CANAL DIVERSION	SITE #1	NORTHSIDE SITE #2	SOUTHSIDE SITE #2	CANYON CREEK AFTER RECHARGE SITES
3/31/99		5.33 CFS	12.69 CFS	4.65 CFS	
4/07/99	18.70 CFS	.75 CFS	6.18 CFS	2.33 CFS	2.35 CFS
4/14/99	20.01 CFS	1.26 CFS	4.01 CFS	6.84 CFS	0.76 CFS

Below are the calculations for high flow (3/31/1999), low flow (4/07/1999), and the average flow from all three sites. To calculate the estimated volume of water recharged I multiplied the total cfs rate X 86400 seconds per day X 33 days and divided by 43560 to determine the total volume in acre feet diverted for recharge.

HIGH FLOWS (3/31/1999):

SITE # 1 =	5.33 CFS
SITE # 2 NORTHSIDE =	12.69 CFS
SITE # 2 SOUTHSIDE =	4.65 CFS
TOTAL RECHARGE DIVERSION RATE =	22.67 CFS

$(22.67 \text{ CFS}) (86400 \text{ SEC./DAY}) (33 \text{ DAYS}) / 43560 = 1484 \text{ AF OF RECHARGE AT HIGH FLOWS}$

LOW FLOWS (4/07/1999):

SITE # 1 =	.75 CFS
SITE # 2 NORTHSIDE =	6.18 CFS
<u>SITE # 2 SOUTHSIDE =</u>	<u>2.33 CFS</u>
TOTAL RECHARGE DIVERSION RATE =	9.26 CFS

$$(9.26 \text{ CFS}) (86400 \text{ SEC./DAY}) (33 \text{ DAYS}) / 43560 = 606 \text{ AF OF RECHARGE AT LOW FLOWS.}$$

AVERAGE VOLUME (COMBINATION OF ALL THREE MEASUREMENTS):

SITE # 1 =	5.33 CFS (3/31) + .75 CFS (4/7) + 1.26 CFS (4/14) / 3 =	2.45 AVE CFS
SITE # 2 NORTHSIDE =	12.69 CFS (3/31) + 6.18 CFS (4/7) + 4.01 CFS (4/14) / 3 =	7.63 AVE CFS
<u>SITE # 2 SOUTHSIDE =</u>	<u>4.65 CFS (3/31) + 2.33 CFS (4/7) + 6.84 CFS (4/14) / 3 =</u>	<u>4.61 AVE CFS</u>
TOTAL AVERAGE RECHARGE DIVERSION RATE		= 14.69 AVE CFS

$$(14.69 \text{ CFS}) (86400 \text{ SEC/DAY}) (33 \text{ DAYS}) / 43560 = 962 \text{ AF AVERAGE VOLUME}$$

CONCLUSION:

It is estimated that recharge from the Mountain Home Recharge Project is between 606 af to 1484 af of water. The average volume of water is 962 af of water. I estimate the actual amount of water that was recharged was fairly close to 1000 af of water.

ESTIMATED AMOUNT OF WATER DIVERTED INTO CANYON CREEK:

Two measurements were made on Canyon Creek at the feeder canal diversion to Mountain Home Reservoir. On 4/7/999 the measurement was 18.70 cfs and on 4/14/999 it was 20.01 cfs, for an average of 19.36 cfs ($18.70 \text{ cfs} + 20.01 \text{ cfs} / 2 = 19.36 \text{ cfs}$). Below I have estimated the average volume of water diverted into Canyon Creek during the recharge effort.

AVERAGE VOLUME = (19.36 CFS) (86400 SEC/DAY) (33 DAYS) / 43560 = 1267 AF AVERAGE VOLUME

PERCENT OF WATER USED FOR RECHARGE:

(962 AF AVE. RECHARGE VOLUME) / (1267 AVE. CANYON CREEK VOLUME) (100) = 75.9 % OF CANYON CREEK WATER USED FOR RECHARGE.

PERCENT OF WATER PASSING BY RECHARGE SITE:

Two measurements were made on Canyon Creek Below the Site # 2 point of diversion. These measurements were 2.35 cfs and 0.76 cfs for an average of 1.56 cfs ($2.35 + 0.76 / 2 = 1.56$). Below I have estimated the average volume of water not used in the recharge effort.

AVERAGE VOLUME = (1.56 CFS) (86400 SEC/DAY) (33 DAYS) / 43560 = 102 AF AVERAGE VOLUME

PERCENT OF WATER PASSING BY RECHARGE SITE:

(102 AF AVE. UNUSED WATER) / (1267 AVE. CANYON CREEK VOLUME) (100) = 8.1 % OF CANYON CREEK WATER PASSING BY SITE # 2.

ESTIMATED STREAM LOSS:

An estimated 75.9 % of Canyon Creek water was used for recharge and another estimated 8.1 % of Canyon Creek water was allowed to pass by Site # 2 for a total of 84 % of Canyon Creek's volume is accounted for. It is assumed that the remaining 16 % or 203 af ($1267 \text{ af Canyon Creek volume} \times .16 = 203 \text{ af stream loss}$) of water was a result of stream loss. This area has a very porous soil and stream losses and local canal losses are extremely high. This amount does not seem unreasonable.

1598.00 CANYON CREEK AT OREGON TRAIL CROSSING NR MOUNTAIN HOME

[KAF]

W-YR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANN
85	0.4	0.3	0.4	0.3	0.3	1.7	4.4	4.2	3.1	2.9	2.7	1.3	22.0
86	0.2	0.5	0.6	1.8	14.5	11.7	4.0	4.3	4.4	3.5	3.0	1.9	50.4
87	0.2	0.2	0.1	0.1	0.4	1.5	3.9	3.0	2.2	1.9	0.9	0.1	14.5
88	0.1	0.1	0.1	0.2	0.9	1.6	1.4	3.0	2.1	1.9	0.1	0.0	11.5
89	0.1	0.3	0.7	0.6	1.4	12.1	7.3	4.3	4.7	4.4	3.7	2.1	41.7
90	0.2	0.2	0.2	0.2	0.3	1.4	1.6	2.2	2.7	3.5	1.9	0.1	14.5
91	0.1	0.1	0.1	0.1	0.2	0.4	0.4	0.7	1.4	0.4	0.0	0.0	3.9
92	0.0	0.1	0.1	0.1	0.2	0.3	0.2	0.4	0.3	0.1	0.0	0.0	1.8
93	0.0	0.0	0.1	0.3	0.9	7.9	7.2	4.2	3.5	4.2	3.6	2.2	34.1
94	0.3	0.1	0.2	0.1	0.2	1.0	1.5	2.5	3.4	2.5	0.4	0.0	12.2
95	0.0	0.1	0.5	1.6	4.0	3.5	2.8	4.8	3.6	3.6	3.3	2.5	30.3
AVE 1985-95:	0.1	0.2	0.3	0.5	2.1	3.9	3.2	3.1	2.9	2.6	1.8	0.9	21.5

CANYON CREEK'S HISTORIC FLOWS.

MEMORANDUM

TO: Gary Spackman

FROM: Shane Bendixsen and Helen Harrington

RE: Mountain Home Managed Recharge Project
Summary of Spring 1999 Data

DATE: May 3, 1999

Recharge Activity

Managed recharge occurred in two episodes in early 1999. Surface water from Canyon Creek was diverted into gravel pits for three days beginning on March 9, 1999, at a continuous rate. Water was again diverted into gravel pits beginning on March 19 and continued until April 17, 1999. Total volume of water diverted into the gravel pits is estimated to be 1000 acre feet (Dan Nelson, IDWR).

Monitoring

Water levels in eight nearby wells were monitored. Prior to managed recharge, the wells were monitored monthly for three months. Beginning on March 3, water levels were monitored weekly. A continuous recorder was installed on Well 03S06E-10DBC1 (Leydet South) well. One additional well (Larrea) was monitored as a part of the larger Mountain Home regional monitoring network. The well is located approximately one and one-half miles south-southwest of the main recharge pit. Attachment 1 shows the locations of the gravel pits and monitoring sites.

Attachment 2 shows ground water elevations prior to and following managed recharge. The contour lines reflect the generalized flow direction of the ground water (from higher elevations to lower elevations). The general direction of ground water flow is southwest and is generally the same in both illustrations.

Attachment 3 shows the hydrographs spanning the time period December 15, 1998 to April 28, 1999. The data shows the period prior to recharge through the active recharge diversions. Two wells are upgradient (Jones and MHHD Stock), while the other wells are downgradient at varying distances from the recharge sites. Only two wells (MHHD Stock and MHHD Shop) show any significant increases in ground water levels during the managed recharge. The Hiddleston-Back well showed an increase following the cessation of recharge. This increase may be a result of recharge from a ditch near the well (per Dan Nelson).

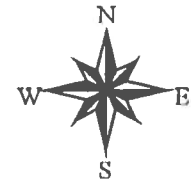
Three wells nearest downgradient from the main recharge pit (MHHD Shop, Leydet North and Leydet South) show minor short term increases ranging from one to two feet. These increases occurred approximately two to three weeks after the beginning of the longer recharge event. The upgradient Jones well, however, also shows a minor increase around the same time.

Ground water levels may have also been influenced by a number of other factors unrelated to the managed recharge. MHHD Shop and the Hiddleston Domestic wells were pumping or had been recently pumped prior to measurement on two occasions. Therefore, measurements do not reflect static levels. Additionally, seepage from Canyon Creek would also recharge the ground water. It is not possible with the existing information to determine the amount of influence the seepage loss compared to the managed recharge influence.

Summary

Overall, water levels did not significantly increase. Some wells even showed an overall downward trend. This can be explained several ways. Some of the recharge must have been delayed in the unsaturated zone overlying the water table. A 'lag effect' is also possible and therefore ground water levels still might increase. Underflow leaving the area would also significantly diminish the effects. Also, assuming a 20 percent specific yield, the top 200 feet of the aquifer in the one square mile around the recharge sites, contains approximately 25,000 acre feet of water already in storage. Therefore the 1,000 acre feet of recharge only amounts to approximately four percent of what was already in storage. Note that if the total thickness and extend of the aquifer are taken into consideration, the amount of recharge becomes an immeasurable amount.

Cc: Wayne Haas
Norm Young
Hal Anderson
Bob Sutter
Dan Nelson

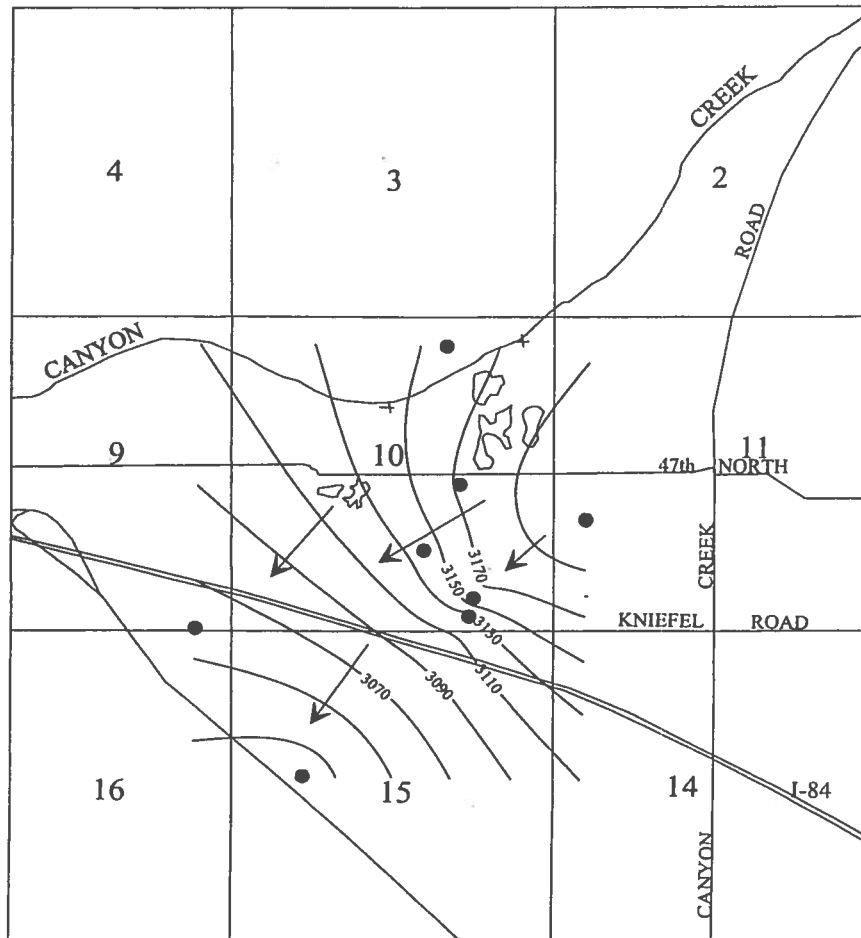
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- **Monitoring Well Location**

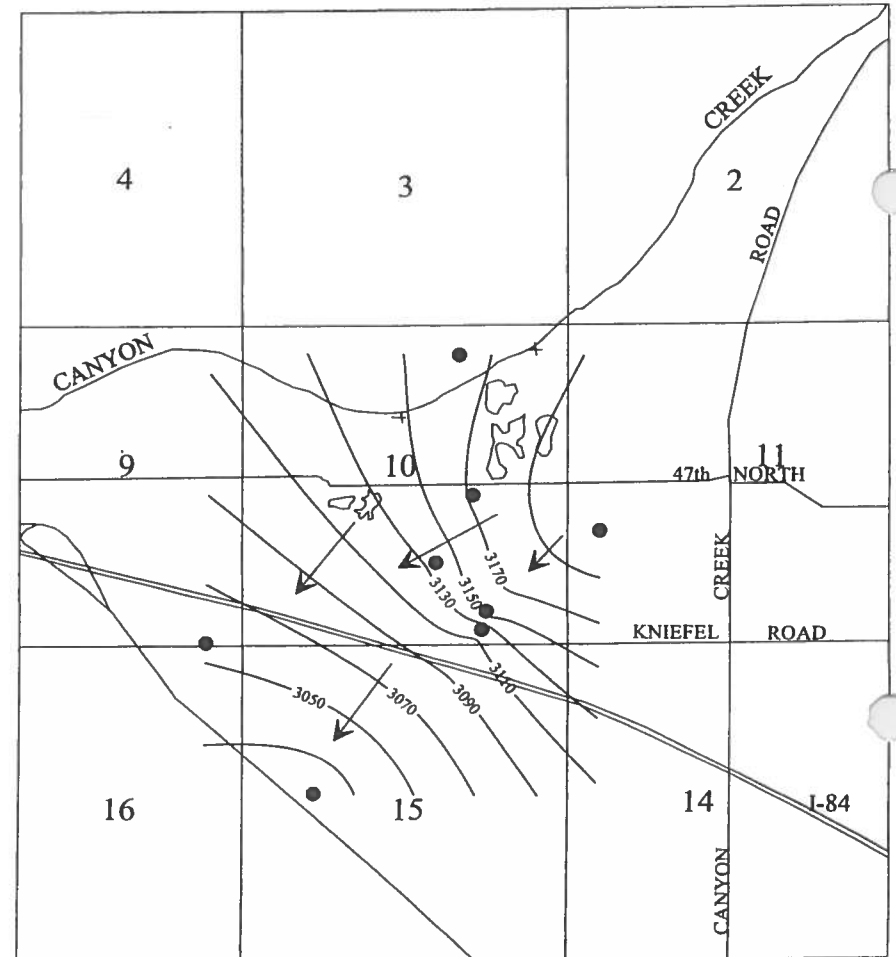
MOUNTAIN HOME RECHARGE PROJECT

GROUND WATER ELEVATIONS

Pre Recharge Event (2/99)



Post Recharge (4/19-22)



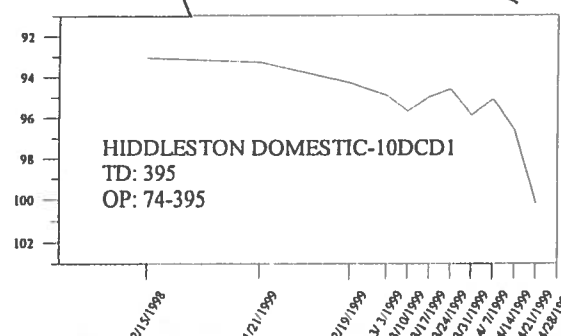
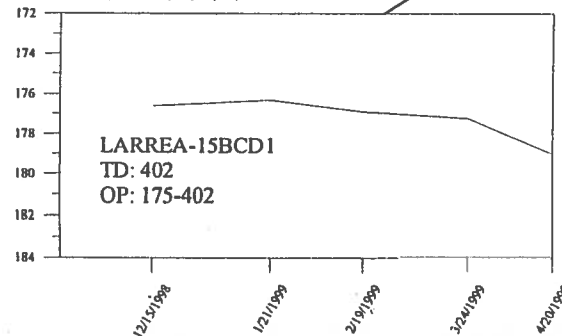
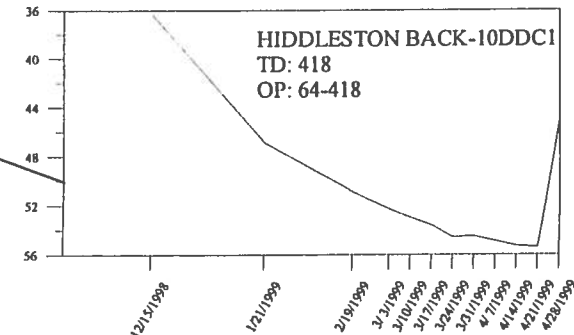
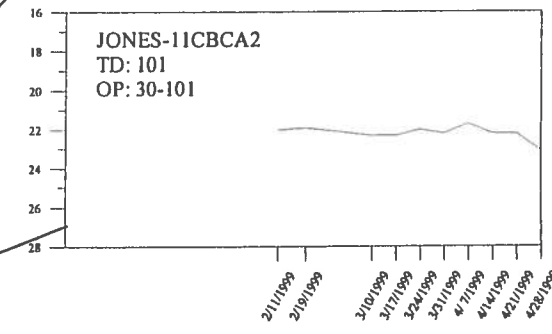
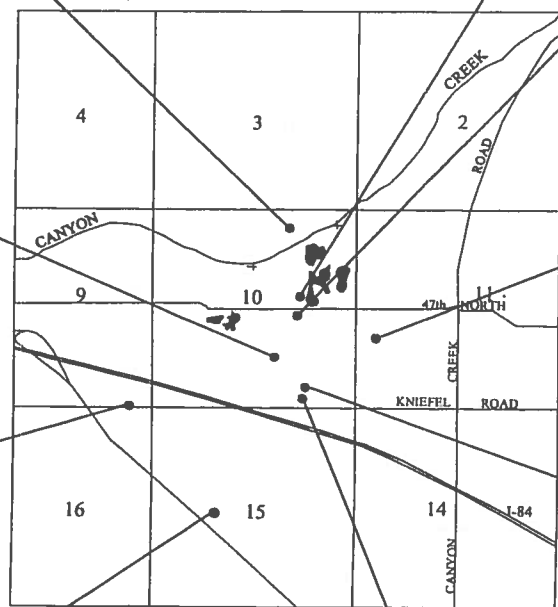
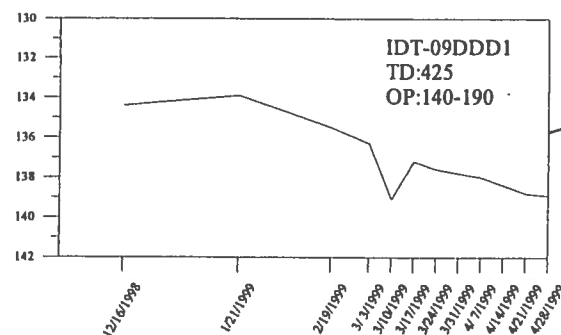
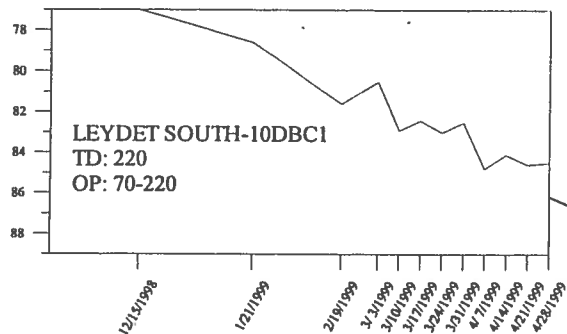
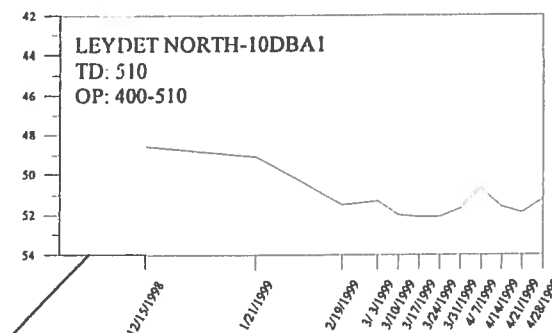
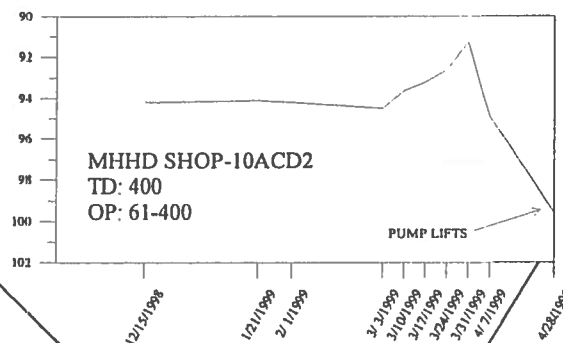
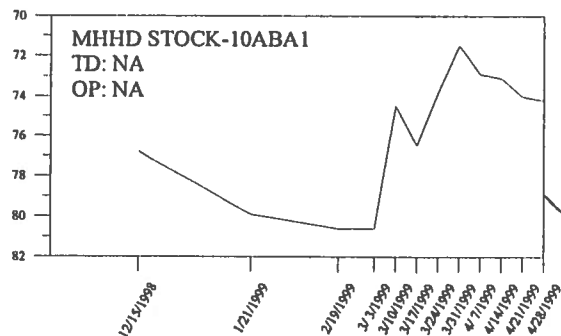
● MONITORING WELL LOCATION

← GENERALIZED FLOW DIRECTION

□ GRAVEL PITS

MOUNTAIN HOME RECHARGE PROJECT

IDWR MONITORING SITES



Legend

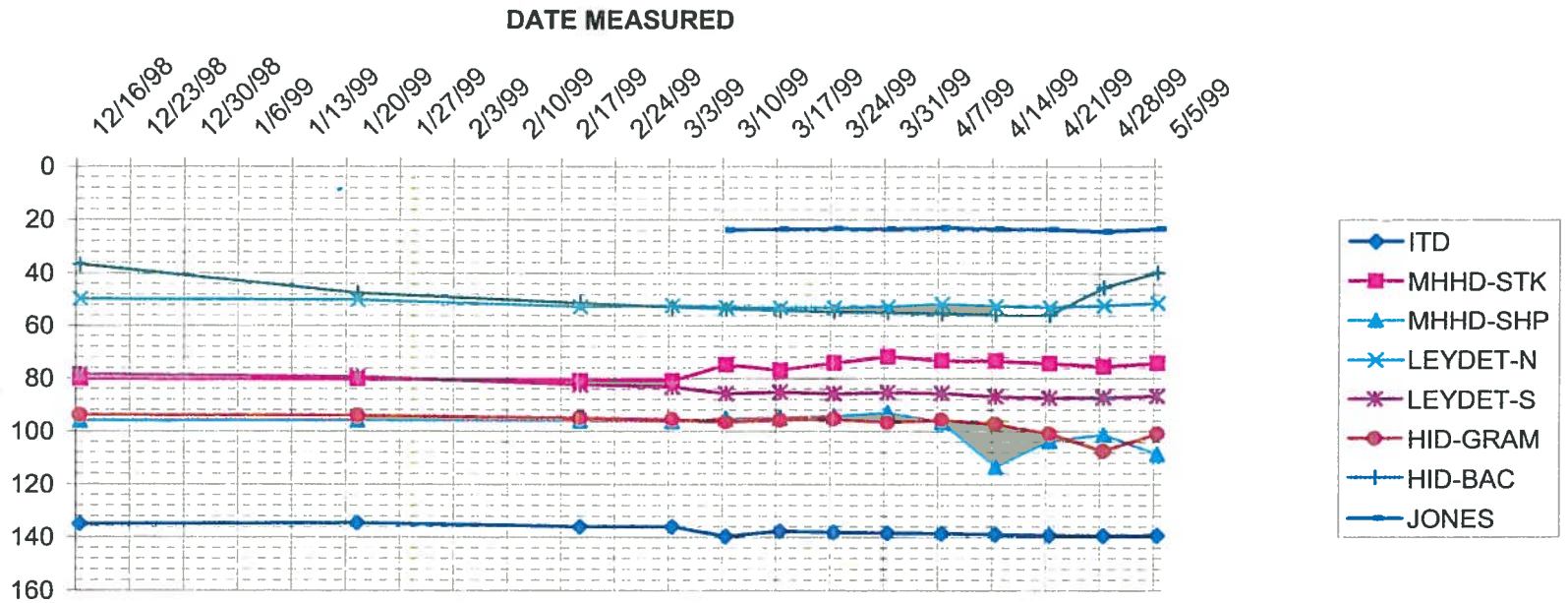
TD: Total Depth
OP: Interval at which well is perforated or open to the aquifer
Left Side: Depth to water
Base: Date measurement taken



Gravel Pit

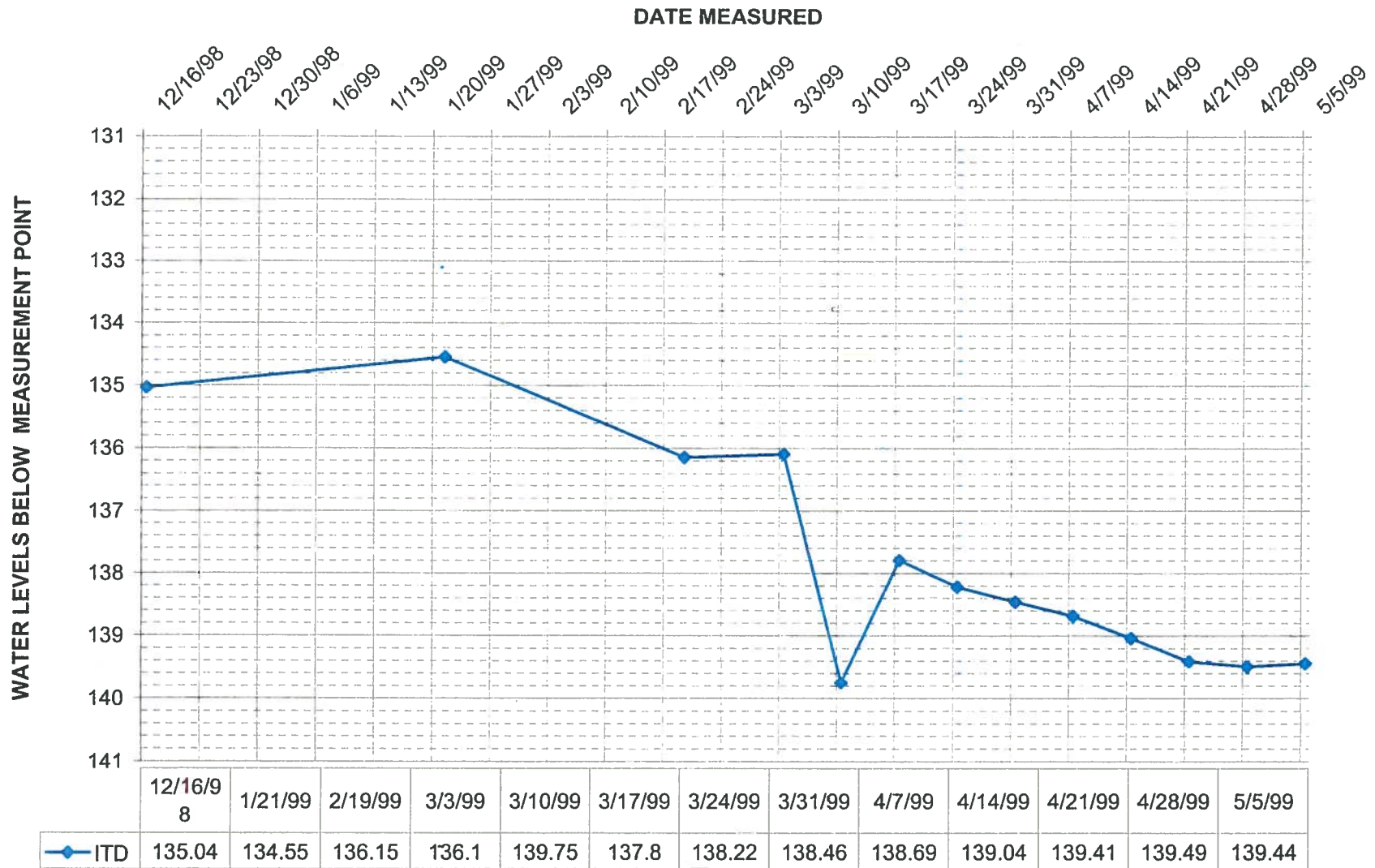
MOUNTAIN HOME WATER LEVELS

FEET BELOW MEASUREMENT POINT

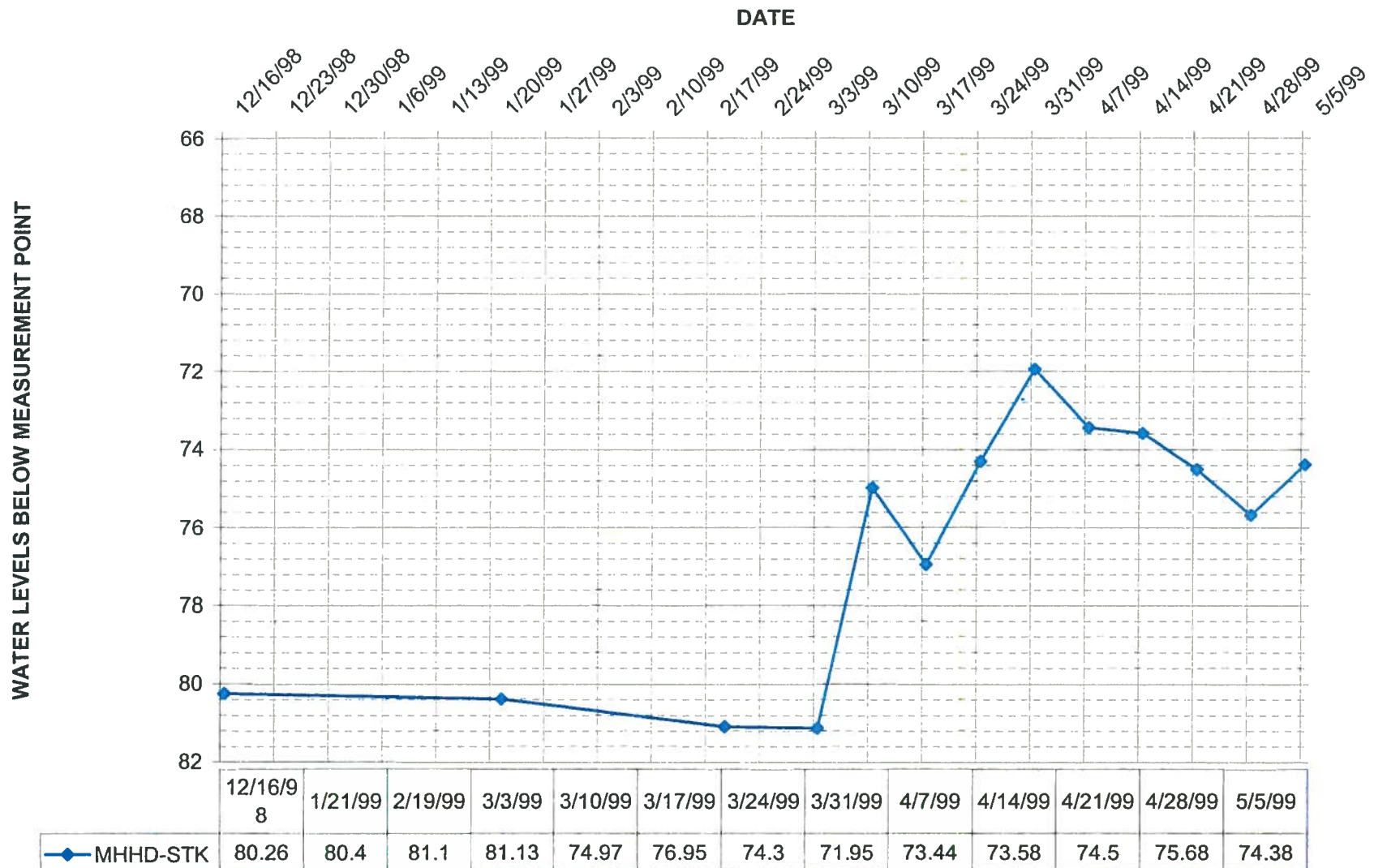


	12/16/98	1/21/99	2/19/99	3/3/99	3/10/99	3/17/99	3/24/99	3/31/99	4/7/99	4/14/99	4/21/99	4/28/99	5/5/99
ITD	135	134.6	136.2	136.1	139.8	137.8	138.2	138.5	138.7	139	139.4	139.5	139.4
MHHD-STK	80.26	80.4	81.1	81.13	74.97	76.95	74.3	71.95	73.44	73.58	74.5	75.68	74.38
MHHD-SHP	95.94	95.76	95.9	96.24	95.26	94.85	94.33	93.03	96.51	113.5	103.8	101.3	108.7
LEYDET-N	49.75	50.07	52.69	52.3	53	53.1	53.13	52.7	51.7	52.55	52.93	52.24	51.39
LEYDET-S	78.67	79.5	82.52	83.39	85.78	85.25	85.86	85.41	85.7	86.99	87.51	87.36	86.78
HID-GRAM	94.02	94.13	95.1	95.67	96.5	95.76	95.39	96.66	95.89	97.36	101	107.6	101
HID-BAC	36.77	47.39	51.37	52.82	53.53	54.1	54.63	55.03	55.38	55.76	55.87	45.37	39.76
JONES					23.75	23.51	23.28	23.44	22.98	23.45	23.49	24.38	23.35

IDAHO TRANSPORTION DEPARTMENT WATER LEVEL TEST



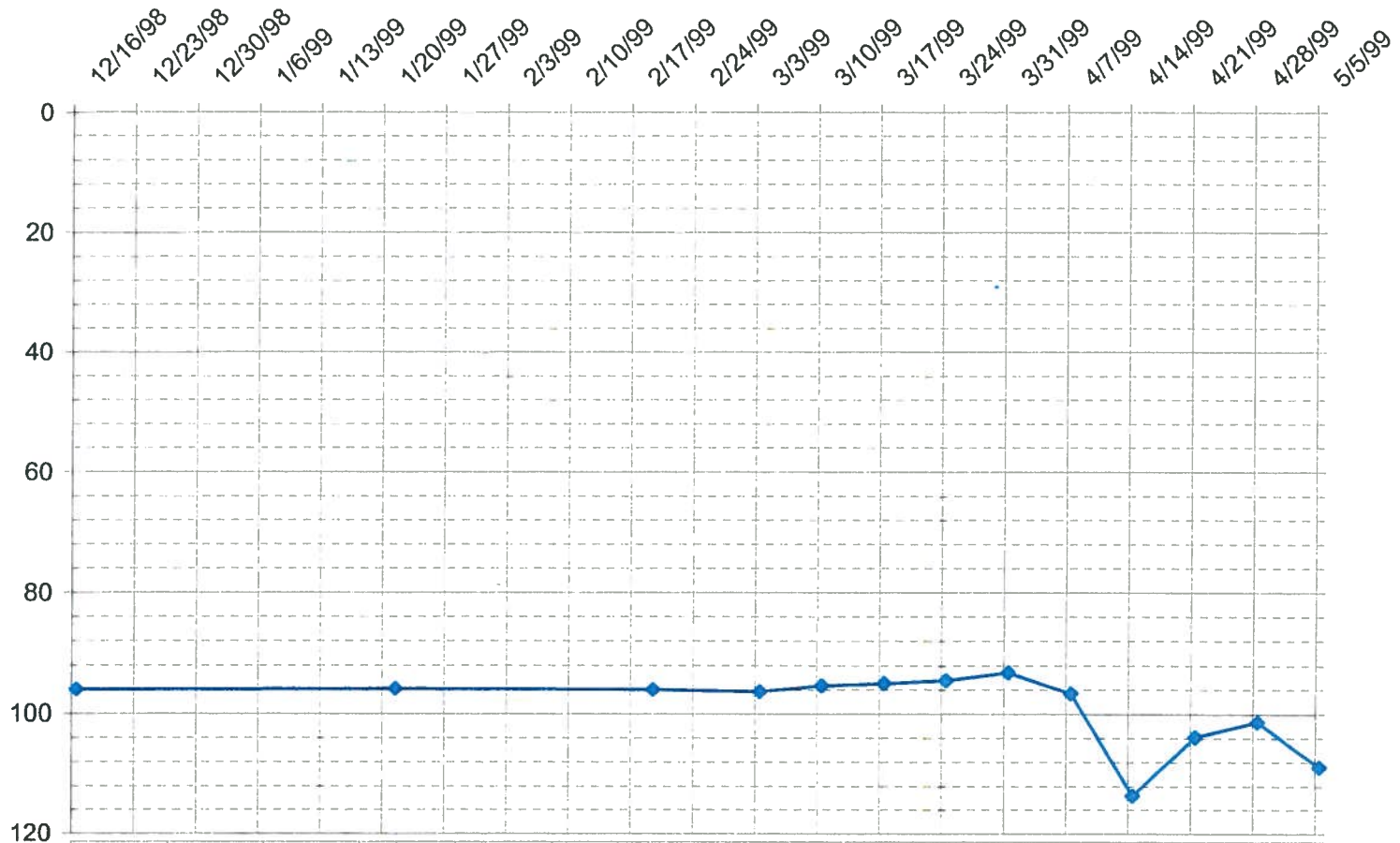
MOUNTAIN HOME HIGHWAY DISTRICT STOCKWATER WELL WATER LEVEL TEST



MOUNTAIN HOME HIGHWAY DISTRICT SHOP WELL WATER LEVELS

WATER LEVEL BELOW MEASUREMENT POINT

DATE MEASURED

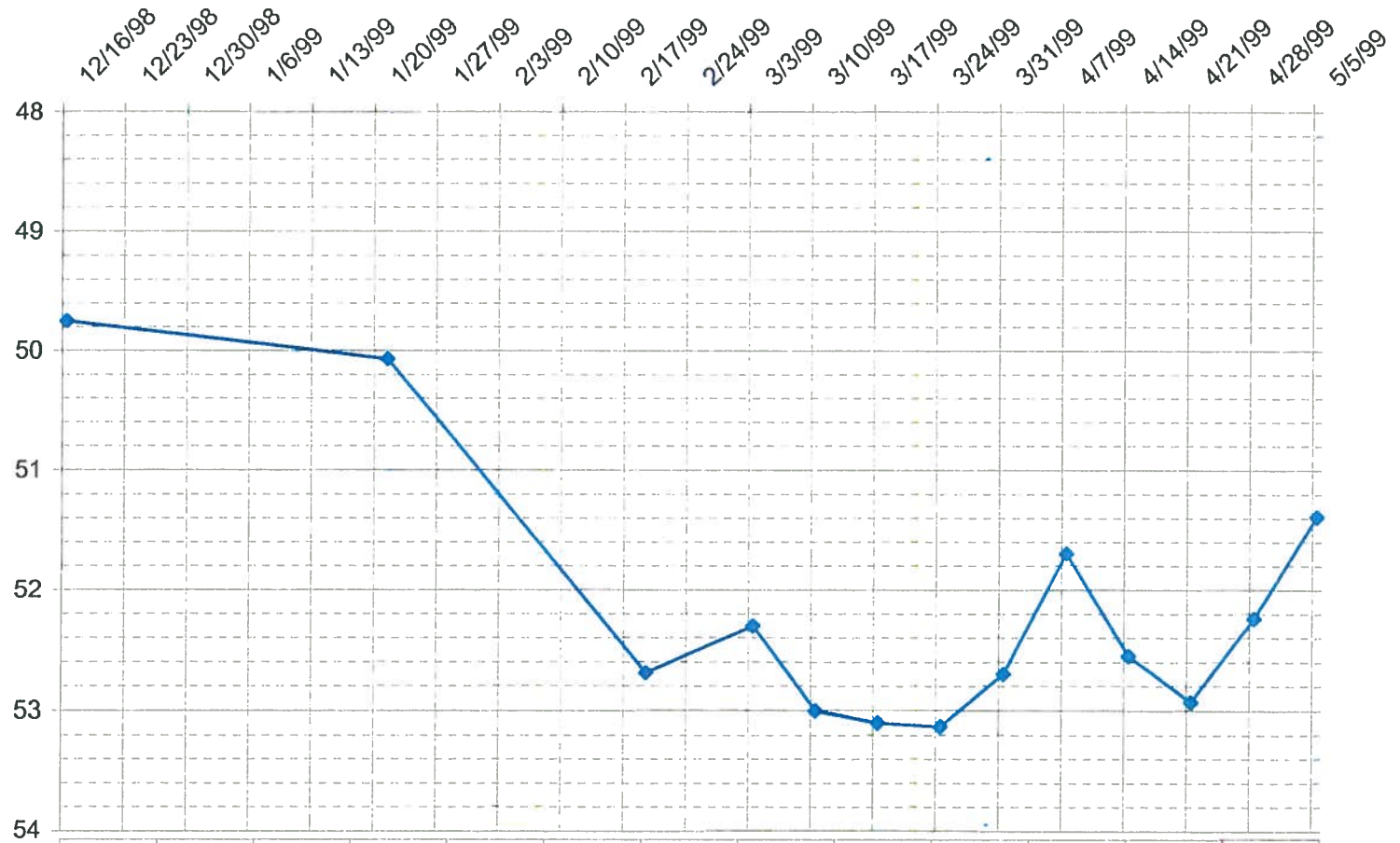


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—◆— MHHD-SHP	95.94	95.76	95.9	96.24	95.26	94.85	94.33	93.03	96.51	113.52	103.78	101.29	108.71

LEYDET NORTH WELL WATER LEVEL TEST

DATE MEASURED

WATER LEVELS BELOW MEASUREMENT POINT

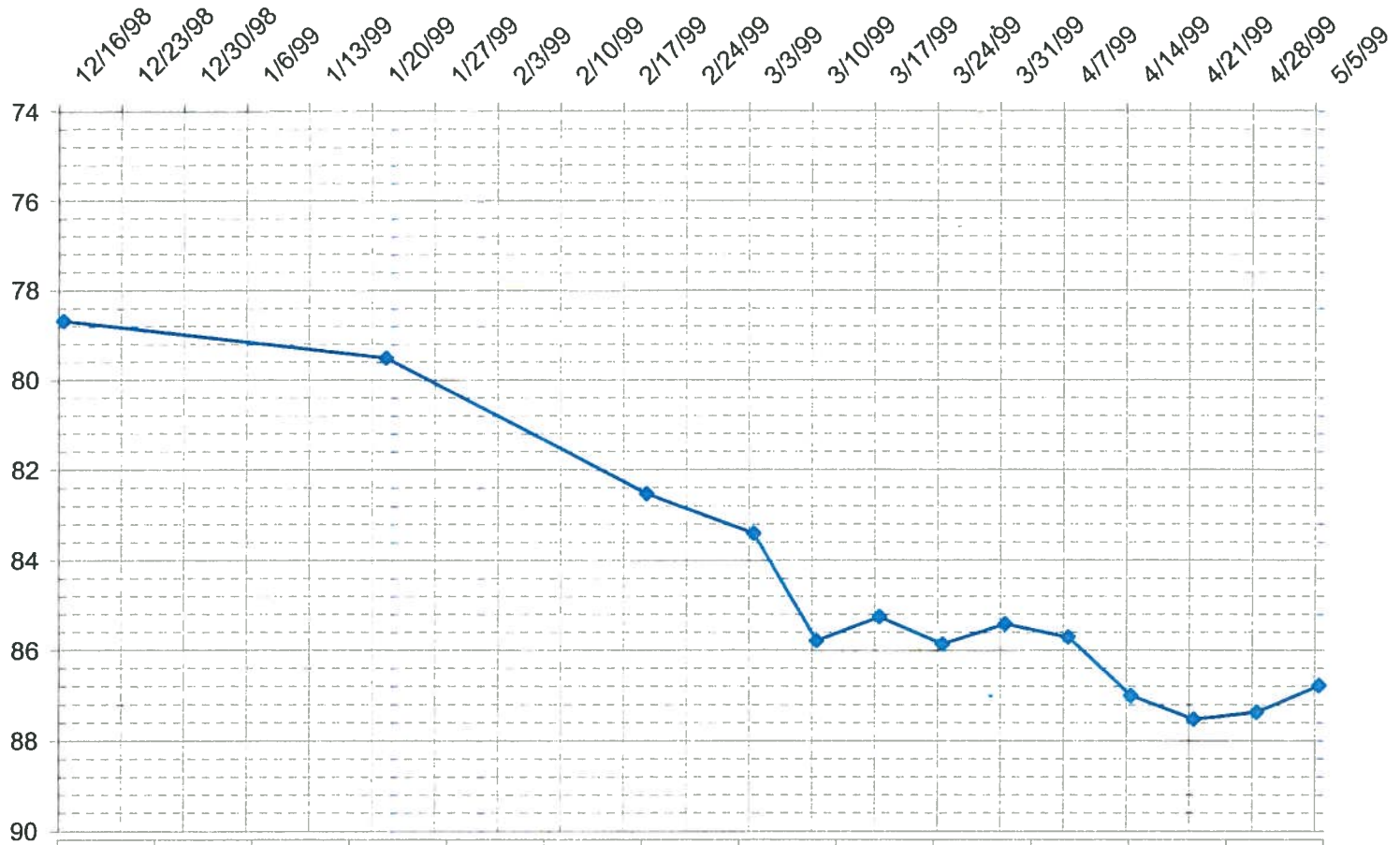


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LEYDET-N	49.75	50.07	52.69	52.3	53	53.1	53.13	52.7	51.7	52.55	52.93	52.24	51.39

LEYDET SOUTH WELL WATER LEVEL TEST

DATE MEASURED

WATER LEVELS BELOW MEASUREMENT POINT

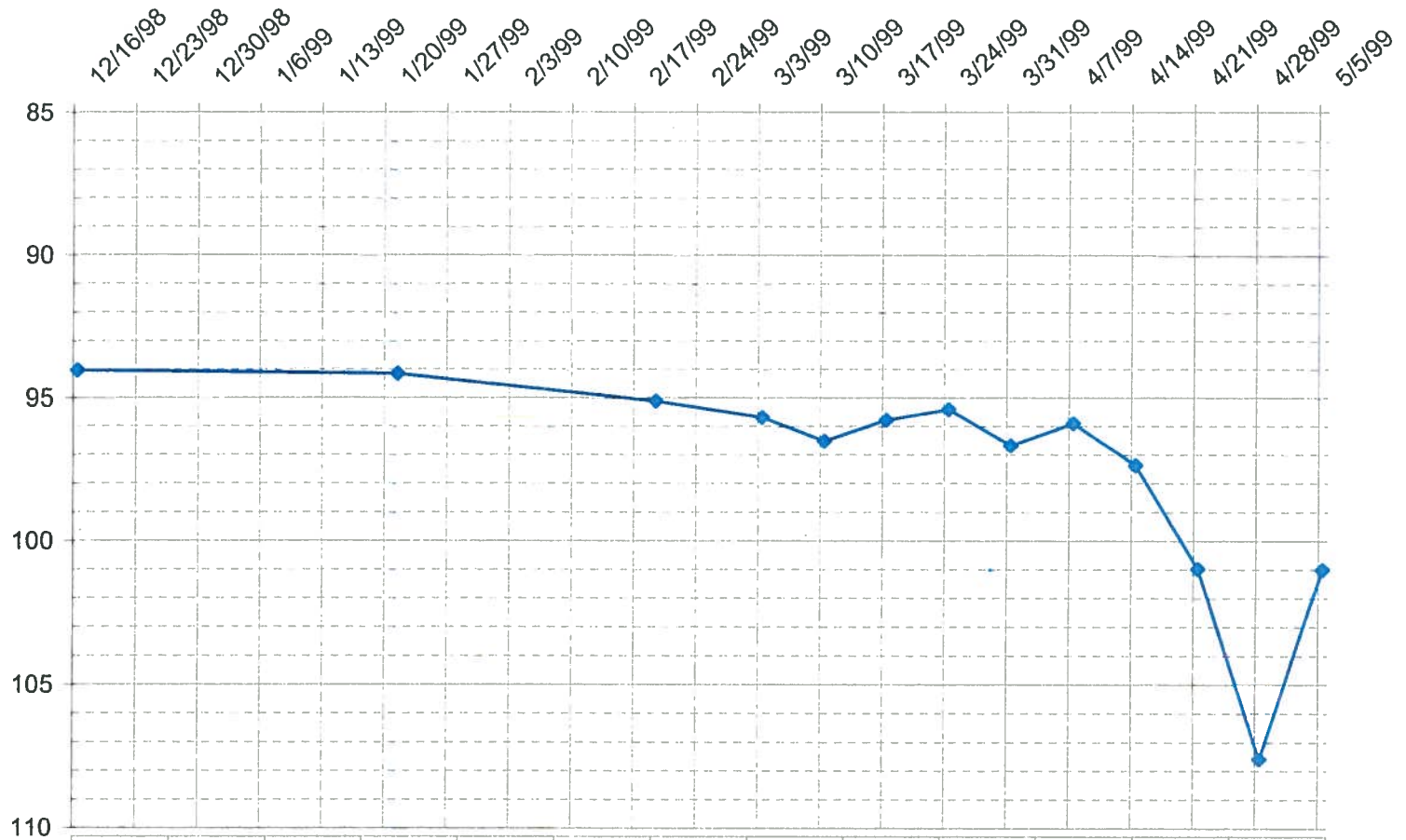


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LEYDET-S	78.67	79.5	82.52	83.39	85.78	85.25	85.86	85.41	85.7	86.99	87.51	87.36	86.78

HIDDLESTON GRAMOTHER'S WELL WATER LEVEL TEST

DATE MEASURED

WATER LEVELS BELOW MEASUREMENT POINT

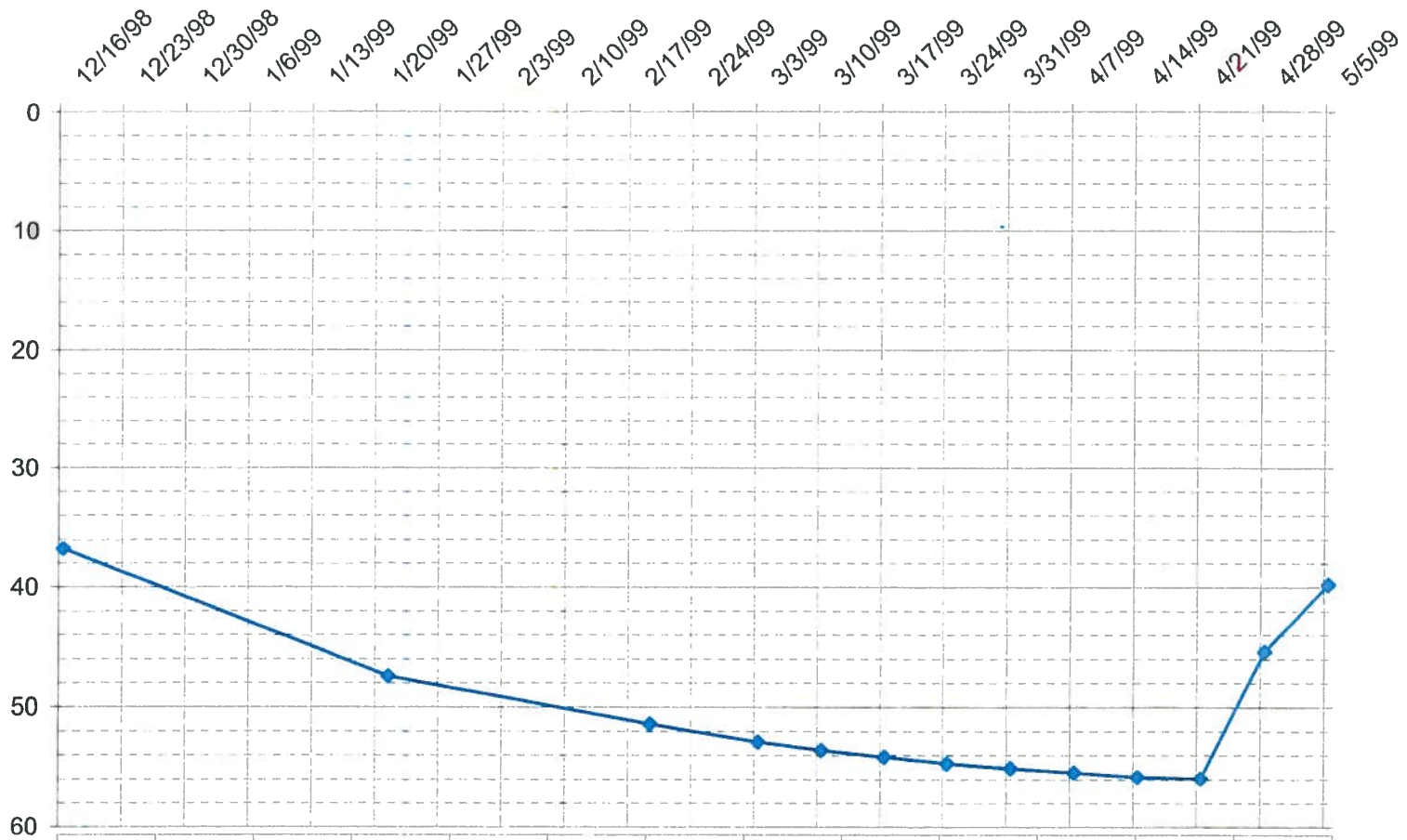


	12/16/98	1/21/99	2/19/99	3/3/99	3/10/99	3/17/99	3/24/99	3/31/99	4/7/99	4/14/99	4/21/99	4/28/99	5/5/99
—◆— HID-GRAM	94.02	94.13	95.1	95.67	96.5	95.76	95.39	96.66	95.89	97.36	100.97	107.59	100.99

HIDDLESTON BACK WELL WATER LEVEL TEST

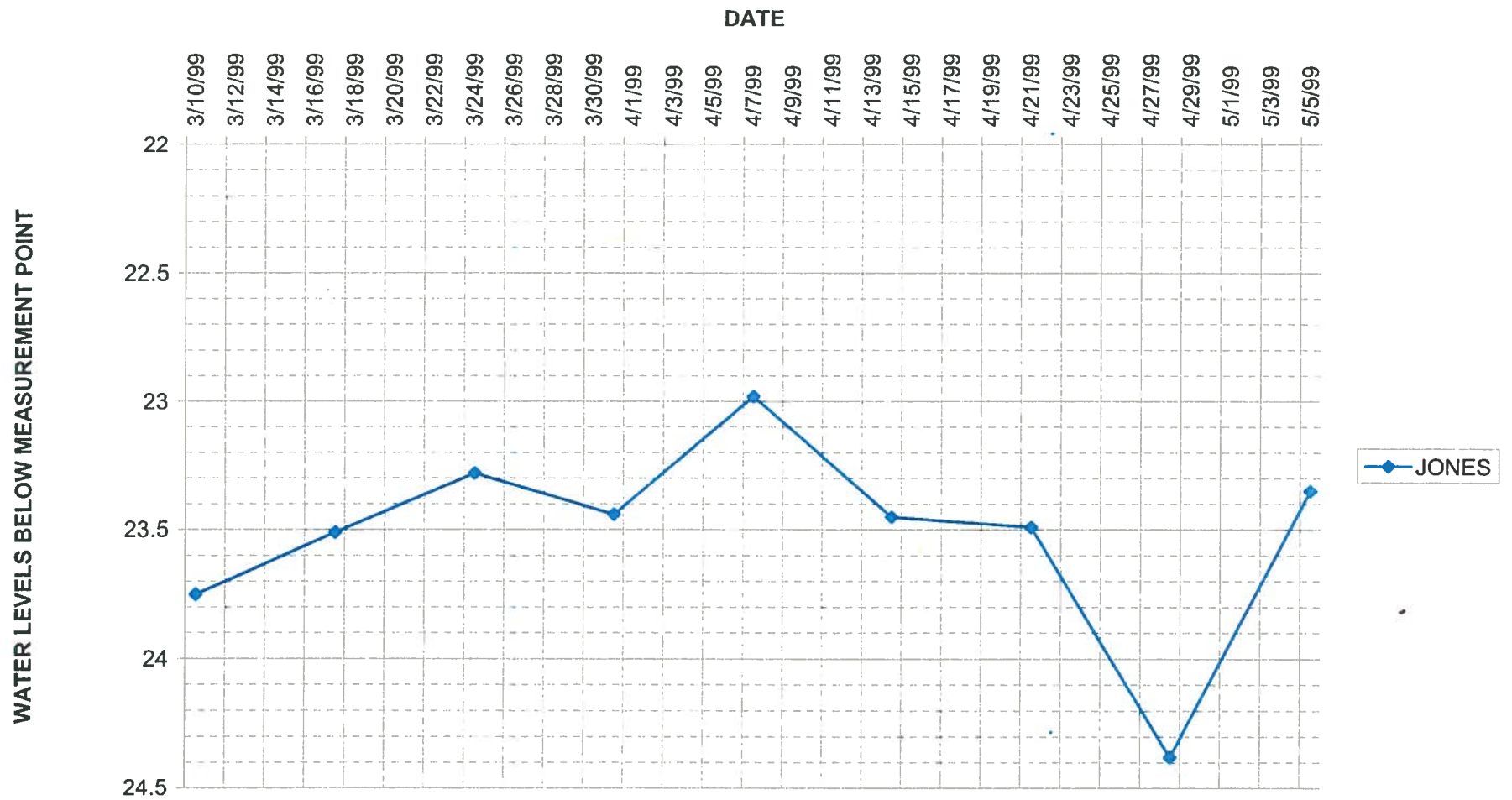
WATER LEVELS BELOW MEASUREMENT POINT

DATE



	12/16/98	1/21/99	2/19/99	3/3/99	3/10/99	3/17/99	3/24/99	3/31/99	4/7/99	4/14/99	4/21/99	4/28/99	5/5/99
—●— HID-BAC	36.77	47.39	51.37	52.82	53.53	54.1	54.63	55.03	55.38	55.76	55.87	45.37	39.76

GEORGE JONES WELL WATER LEVEL TEST

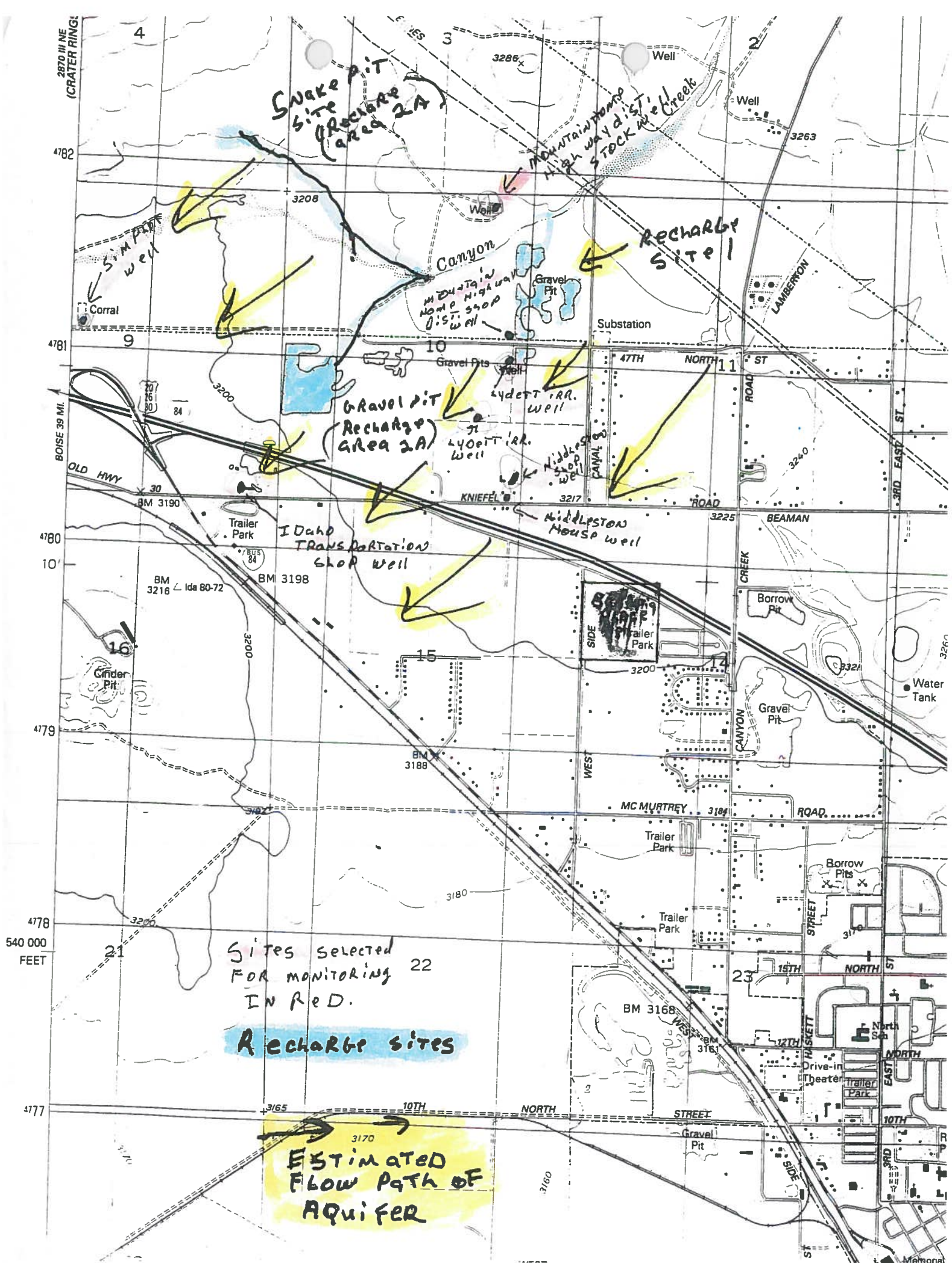


	3/10/99	3/17/99	3/24/99	3/31/99	4/7/99	4/14/99	4/21/99	4/28/99	5/5/99
JONES	23.75	23.51	23.28	23.44	22.98	23.45	23.49	24.38	23.35

LICENSING REVIEW MEMO ATTACHMENT

PERMIT 61-7731

FIELD NOTES MAP FROM 1999 RECHARGE PROJECT FILE



LICENSING REVIEW MEMO ATTACHMENT

PERMIT 61-7731

PAGE 84 OF

MOUNTAIN HOME GROUNDWATER ADVISORY COMMITTEE

GROUNDWATER MANAGEMENT PLAN

The measuring devices would be automated to provide for continuous recording of flows. Financial assistance would also be required to contract with a reputable entity to carry out research phase of the project and to purchase the required PAM products. Table X

Table X: Estimated cost for determining the effectiveness of PAM for conserving water in the Little Camas Canal.

Item	Cost
Parshall Flume	\$10,000
Additional Measuring Devices	\$5,000
Funding for PAM Evaluation	\$50,000
Total	\$65,000

provides a cost estimate for the project.

4.0 Managed Aquifer Recharge

Managed aquifer recharge can be used in some situations to enhance ground water supplies within a basin. A preliminary review of the Mountain Home basin indicates that aquifer recharge may not be a viable alternative. A small recharge test was conducted in 1999 at a gravel pit north of the City of Mountain Home. Total volume diverted was estimated at 1,000 acre-feet. Monitoring in eight nearby wells prior to and after the recharge occurred showed no response to the recharge.

Water budgets for the Mountain Home aquifer indicate an approximately 31,000 acre-foot deficit. This water budget includes water in Big Canyon Creek that is not used for irrigation water. The bulk of that water is recharged naturally through the bed and banks of Big Canyon Creek. Only in very infrequent wet years does any water escape the Mountain Home system to the Snake River. The only way for recharge to be a viable option is if water can economically be imported into the basin within the constraints of existing water rights. If water can be imported to the basin an economic analysis should be conducted to determine if the water should be delivered directly to the water user instead of recharge. As recharge does not appear to be a viable option for the Mountain Home basin, no cost estimates were developed.

***Idaho Department of Water Resources
Open-File Report***



Summary of Canyon Creek Recharge Project – Spring 2017

**By
Dennis Owsley**

July 2017

Overview

The winter of 2016/2017 and the spring of 2017 provided above average amounts of precipitation in southern Idaho. Mountain Home Reservoir, near Mountain Home, Idaho, receives runoff water from the Canyon Creek watershed by way of the Feeder Canal (Figure 1). In the spring of 2017, water was also allowed to flow down the Canyon Creek channel because water in the watershed system was in excess of the reservoir capacity. The water flowing into the Canyon Creek channel was allowed to infiltrate into the subsurface through the porous media of the channel bottom and was diverted into two gravel pits in an attempt to provide recharge to the aquifer system near the Mountain Home area.

Water flowed down Canyon Creek from February 9, 2017 until April 20, 2017, controlled by the head gate structures located approximately four miles north of the town of Mountain Home (Figure 1, Appendix A). The water flowed down the natural channel of Canyon Creek to the south/southwest, towards the Snake River. Prior to the crossing of the Canyon Creek channel and I-84, two diversions into gravel pits were utilized to divert additional water out of the Canyon Creek channel as an aquifer recharge mechanism. Several field observations noted that a significant amount of the water flowing under the I-84 crossing was returning to the Snake River.



Figure 1. Map of Canyon Creek recharge area.

Surface Water Measurements

The Idaho Department of Water Resources (IDWR) measured flow rates in Canyon Creek with a handheld SonTek Flow Tracker or StreamPro Acoustic Doppler Current Profiler (ADCP) ten times on a weekly basis from February through April 2017. A suitable location for measuring flow was found approximately 50 yards downstream from the diversion structures (Appendix A). This same cross section was used for all upstream flow measurements (Table 1).

Table 1. Measured flow rates from Canyon Creek during spring 2017.

Date	Measured Flow Upstream (CFS)	Measured Flow Downstream (CFS)	Calculated Diversion (CFS)	Calculated Diversion (AF)	Comments
2/9/2017	200	N/A	56.1	556	Estimated Flow
2/16/2017	4	N/A	0.0	0	pulled remaining boards
2/22/2017	185	N/A	51.4	816	
3/1/2017	47	N/A	8.3	115	
3/8/2017	36	N/A	4.9	68	
3/15/2017	116	N/A	29.9	415	
3/22/2017	265	N/A	76.4	1061	
3/29/2017	137	105	36.4	506	
4/6/2017	185	131	51.4	714	
4/12/2017	69.4	52	15.2	211	boards back in place
4/20/2017	1	N/A	0.0	0	boards back in place
				4460	

A suitable location for measuring flow on the downstream portion of the study area was found approximately 200 yards downstream of the crossing of I-84 and the Canyon Creek channel. Three measurements were collected at the downstream location to help estimate the total amount of water being diverted or lost to the aquifer system upstream of the I-84 crossing. A suitable measurement location was not located near the mouth of Canyon Creek and the Snake River, although several visual observations of flow were conducted to estimate the amount of water returning to the Snake River. Based on these estimates, the majority of the water that was seen flowing under the I-84 crossing was discharging into the Snake River as it appeared very little infiltration was occurring between the I-84 crossing and the Snake River.

Although physical measurements were only conducted on a weekly basis, a comparison to the hydrograph from the USGS gage site on Canyon Creek approximately 5 miles upstream from the diversion structure indicates that the hand measurements generally agree (minus the diversion to Mountain Home Reservoir) with the hydrograph from USGS site 13159800 (Figure 2).

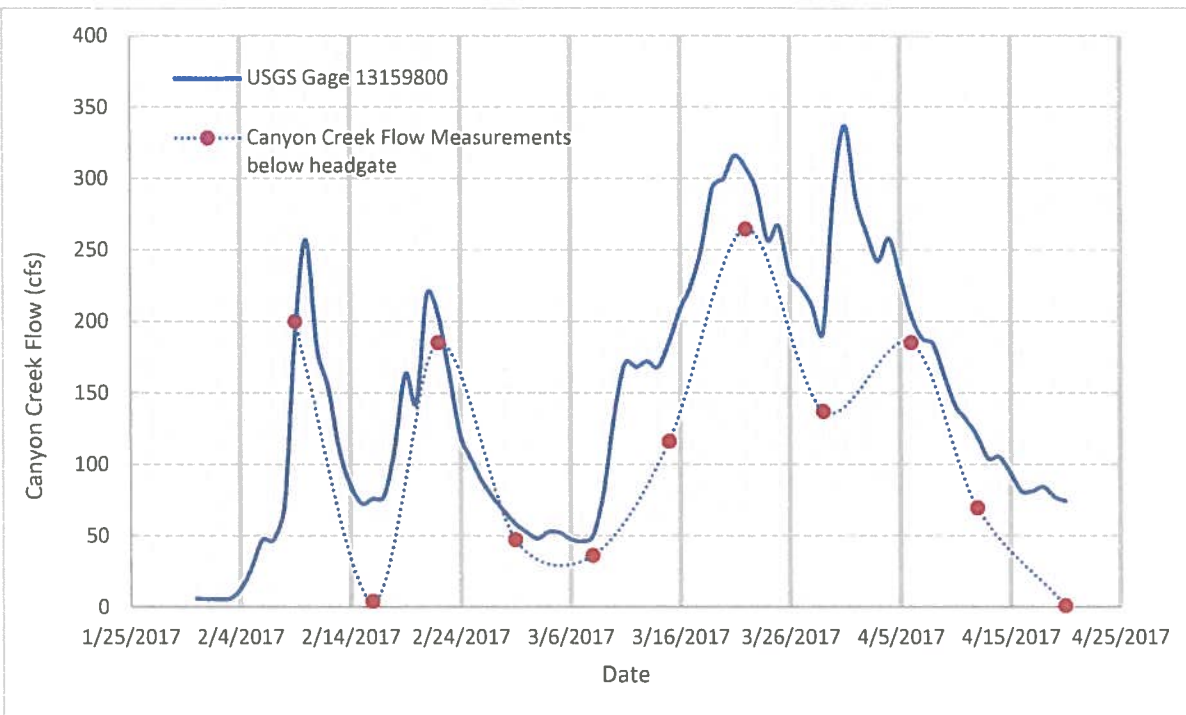


Figure 2. Hydrograph from USGS Gage #13159800 and measurements on Canyon Creek.

The total amount of water that was diverted or infiltrated into the subsurface is estimated based on the differences of three sets of measurements that were collected on the upstream and downstream sections of Canyon Creek. The three sets of measurements on the creek varied significantly in flow rates and provided a good coverage of the flows measured throughout the duration of runoff. The three sets of flow measurements were plotted to determine if any relationship existed between the upstream and downstream flow rates (Figure 3). Based on the plot of the limited data, a linear trend was observed with an R^2 of 0.96, indicating a strong correlation of the data points. Using the equation derived from the linear trend line of the three data sets, the total amount to water diverted above the I-84 crossing was estimated. Based on the duration of the flows, the measurements taken, and the assumptions based on the relationship between the upstream and downstream measurements, an estimated total volume of water that was diverted into the gravel pits or infiltrated into the subsurface was approximately 4,460 acre-feet (AF).

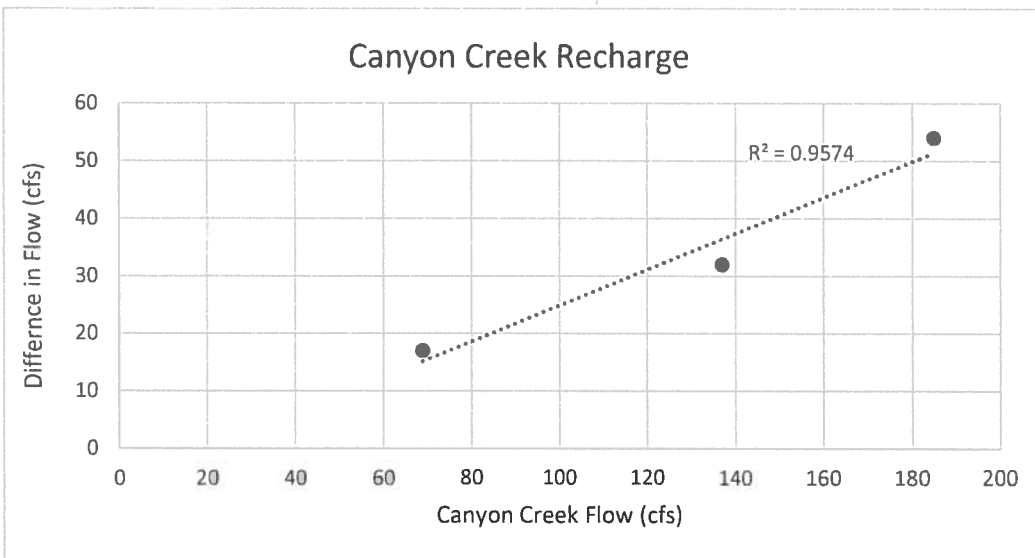


Figure 3. Plot of downstream Canyon Creek measurements versus difference in flows.

In an attempt to verify the assumptions made to estimate the total volume of water diverted into the gravel pits, or infiltrated into the subsurface, a comparison of the estimated flow rates were compared to physical measurements collected by a private consulting firm conducted within the same timeframe as the IDWR measurements. The SPF Water Engineering consulting firm collected two sets of measurements into the gravel pits on March 20 and 29, 2017. Based on these measurements and the timeframe of the flow conditions, SPF estimated a total diversion of approximately 4,455 AF, similar to the 4,460 AF IDWR estimate.

Ground Water Monitoring

IDWR monitored the aquifer responses to the runoff event by equipping two nearby ground water wells (03S 06E 10ABA1 and 03S 06E 10DBC1) with pressure transducers (Figure 1). Both wells are less than 0.5 miles from Canyon Creek and are open to the aquifer less than 100 feet below land surface. The wells are about 2.5 miles downstream from the diversion structure.

Only one year of historic pressure transducer data are available from the wells which limits the amount of analysis that can be conducted. A normalization of the data to evaluate aquifer response from Canyon Creek seepage could not be conducted because data is lacking. Therefore, all conclusions and inferences regarding aquifer responses in the two wells monitored are based on the relatively short record of pressure transducer data collected for this project.

Aquifer responses to the Canyon Creek seepage are apparent in the hydrographs from both wells monitored during the runoff event. The well closest to Canyon Creek, 03S 06E 10ABA1, is approximately 600 feet from the Canyon Creek channel. This well is 622 feet deep, with an open interval extending from 42 feet to 622 feet below land surface (Appendix B).

The hydrograph from well 03S 06E 10ABA1 exhibited a similar trend to that of the Canyon Creek flows and showed a water level rise of approximately 22 feet at the peak of the runoff flows (Figure 4). To

account for the rising water level trend prior to the runoff, a trend was established for the three month period prior to the runoff and was forecasted to show the predicted water level at a later time. Based on this prediction, the water level in 03S 06E 10ABA1 was approximately 12 feet higher nearly two months after the runoff event concluded.

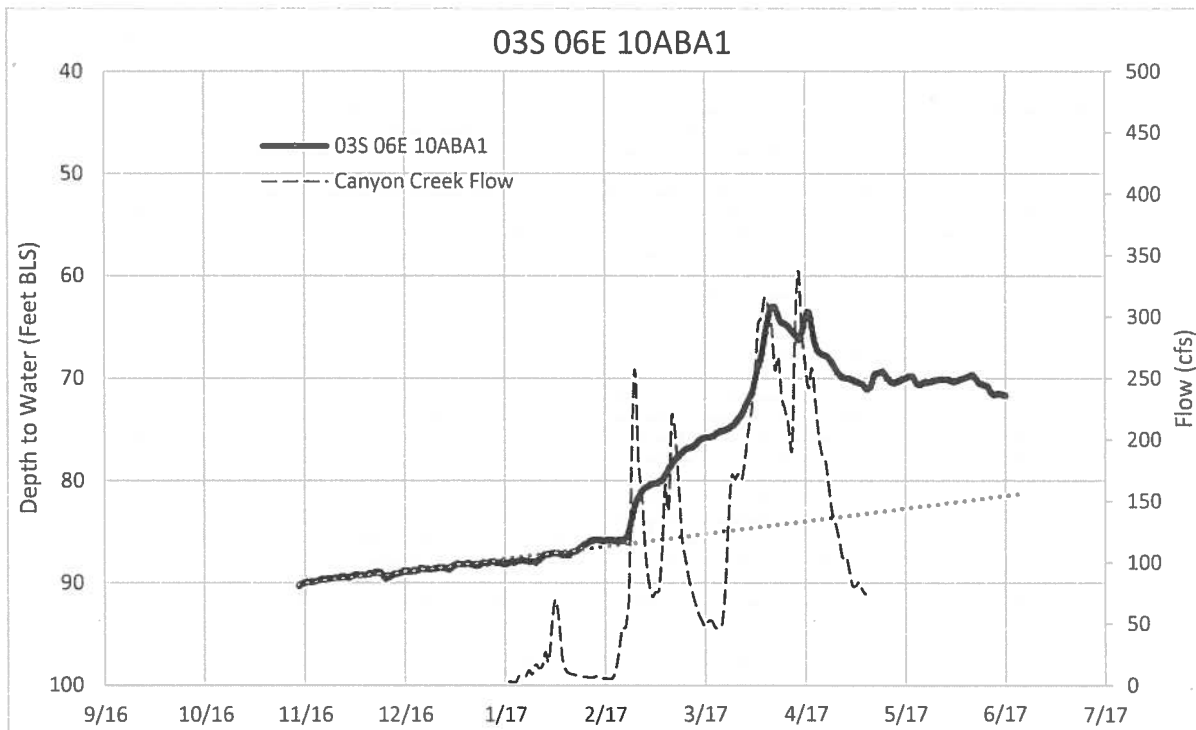


Figure 4. Hydrograph of well 03S 06E 10ABA1 and Canyon Creek flow data during the spring of 2017.

Monitoring well 03S 06E 10DBC1 is approximately 0.5 miles south of Canyon Creek, 220 feet deep, and open to the aquifer system from 70 feet to 220 feet below ground surface (Appendix B). This well is less than 0.25 miles from several irrigation wells, and the influence of the pumping of these irrigation wells can be seen in the corresponding hydrograph (Figure 5).

An analysis of the hydrograph of well 03S 06E 10DBC1 also indicated an apparent aquifer response to the Canyon Creek flows. To account for the rising water level observed prior to the runoff event, a linear trend based on the three months prior to the runoff event was extended into the future. Using this assumed trend line as a baseline for comparison, the water level in well 03S 06E 10 DBC1 was approximately 22 feet higher at the conclusion of the runoff event and 15 feet higher approximately two months later. It should be noted that water levels in this well were impacted by the pumping of nearby irrigation wells, which limits the analysis and resulting conclusions drawn from the dataset.

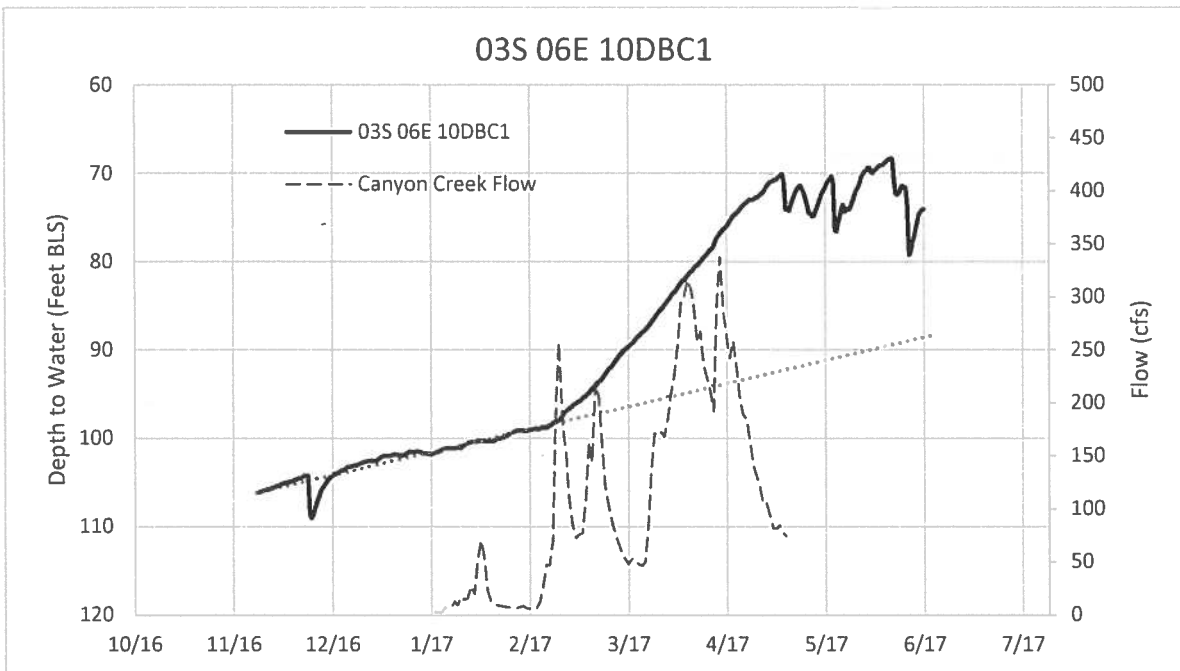


Figure 5. Hydrograph of well 03S 06E 10DBC1 and Canyon Creek flow data during the spring of 2017.

Conclusions

In the spring of 2017, approximately 16,874 AF of water flowed down the Canyon Creek channel below the diversion structure for the Feeder Canal to the Mountain Home Reservoir. Approximately 4,460 acre-feet of water was recharged either thru the seepage in the Canyon Creek channel or into gravel pits. The aquifer response was monitored and hydrographs were created for the two nearby ground water wells. An increase in water levels is apparent in both hydrographs that correlate to the duration and volume of water diverted. Both wells indicated an increase of approximately 22 feet from baseline conditions during peak flow. Additional data and monitoring are required to make any further determinations regarding the benefits to the aquifer associated with these events.

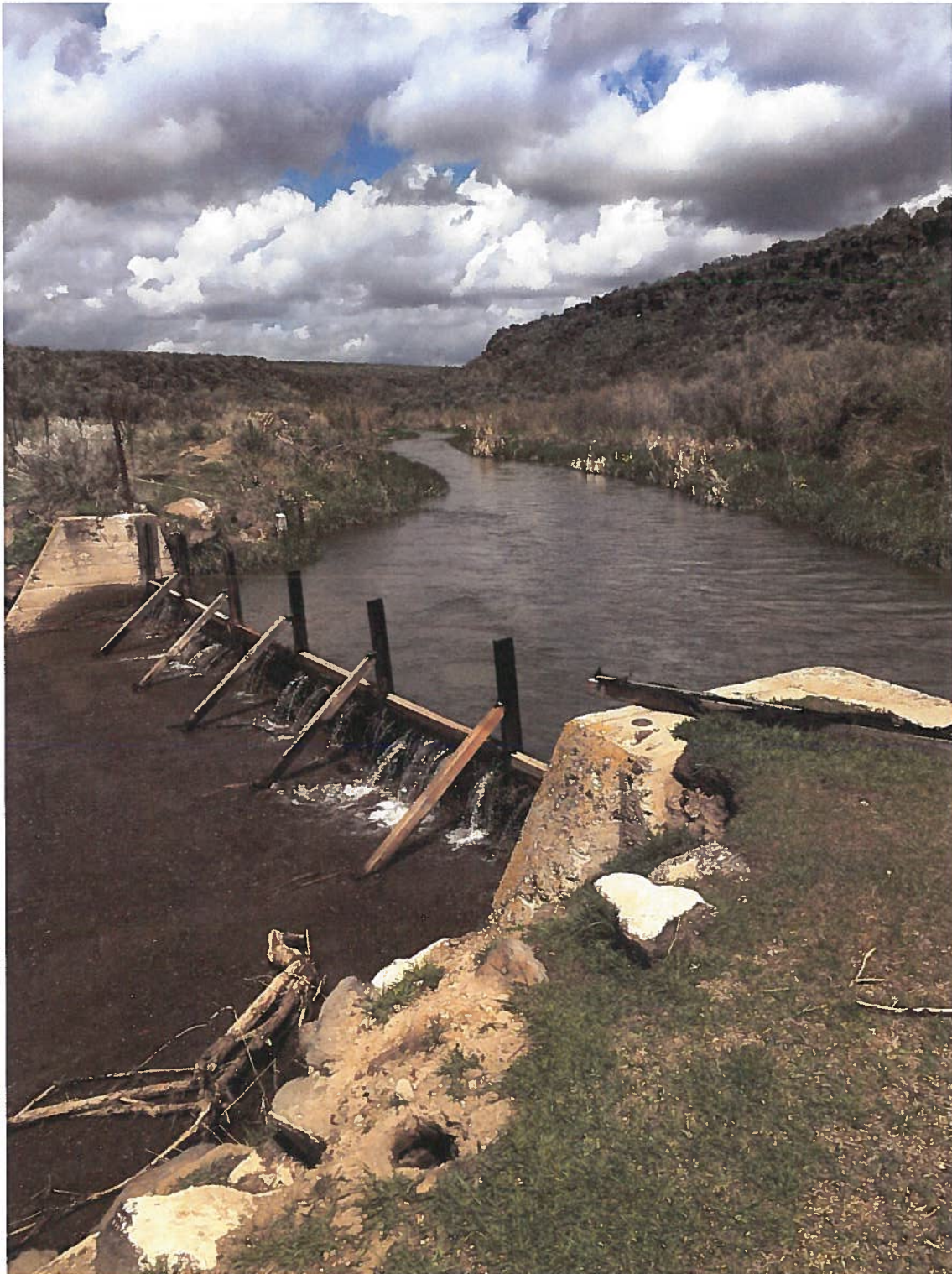


Photo 1. Diversion structure at the confluence of Canyon Creek and the Mountain Home Canal. Photo taken on 4/20/2017.



Photo 2. Head gate structure on the Mountain Home Canal. Photo taken on 2/9/2017.



Photo 3. Measurement cross section on Canyon Creek. Photo taken on 2/22/2017.



Photo 4. Diversion into gravel pit. Photo taken on 4/20/2017.



Photo 5. Check dam at Canyon Creek diversion. Photo taken on 3/1/2017.



Photo 6. Check dam at Canyon Creek diversion structure. Photo taken on 4/20/2017



Photo 7. Canyon Creek channel near the downstream measurement location. Photo taken on 4/20/17.

Appendix B – Driller's reports

USE TYPEWRITER OR
BALL POINT PENState of Idaho
Department of Water Resources

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water
days after the completion or abandonment of the well.

Location Corrected by IDWR To:

T03S R06E Sec. 10 NENWNE

By: mciscell 2012-08-28

1. WELL OWNER Name <u>DOMINGO AGUIRRE</u> Address <u>MTN HOME, ID</u> Owner's Permit No. _____		7. WATER LEVEL Static water level <u>87</u> feet below land surface Flowing? ☐ Yes ☒ No G.P.M. flow _____ Temperature _____ ° F. Quality _____ Artesian closed-in pressure _____ p.s.i. Controlled by ☐ Valve ☐ Cap ☐ Plug																																																																																																																																																																							
2. NATURE OF WORK ☒ New well ☐ Deepened ☐ Replacement ☐ Abandoned (describe method of abandoning) _____		8. WELL TEST DATA ☒ Pump ☐ Bailer ☐ Other <table border="1"> <thead> <tr> <th>Discharge G.P.M.</th> <th>Draw Down</th> <th>Hours Pumped</th> </tr> </thead> <tbody> <tr> <td><u>540</u></td> <td><u>3.4</u></td> <td><u>1.5</u></td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>		Discharge G.P.M.	Draw Down	Hours Pumped	<u>540</u>	<u>3.4</u>	<u>1.5</u>																																																																																																																																																																
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Department of Water Resources
Washington Regional Office

Well Log Form 1
1/15 F.M.

099024

WELL LOG AND REPORT OF THE
STATE RECLAMATION ENGINEER OF IDAHO

Permit No. 86 Well No. 1 County Elmore
 Owner Henry L. Laydett
 Address RFD Box 20 Mt Home Idaho
 Driller Richard Brigg - C.B. Eaton & Sons
 Address Wendell, Idaho
 Well location N 1/4 Sec 10, T 35 N, R 6 E
 Size of drilled hole 18 inch

Locate well in section

NW 1/4	NE 1/4
SW 1/4	SE 1/4

Total depth of well 220'Give depth to standing water from the ground 100' Water temp. 60° Fahr.On "Pumping Test" delivery was — g.p.m. or — c.f.s. Drawdown was — feet.Size of pump and motor used to make test Baker tested 30 g.p.m.Length of time of test 2 hours — minutes.If flowing well, give flow — c.f.s. or — g.p.m. and of shut off pressure —If flowing well, described control works —

(TYPE AND SIZE OF VALVE, ETC.)

Water will be used for domestic Weight of casing per lineal foot —Thickness of casing 3.25 Casing material pipe (STEEL, CONCRETE, WOOD, ETC.)Diameter, length and location of casing 18" O.D. 20' 5" at top of well
(CASING 12" IN DIAMETER OR LESS, GIVE INSIDE DIAMETER)
(CASING OVER 12" IN DIAMETER, GIVE OUTSIDE DIAMETER)

CASING RECORD

Diam. Casing	From Feet	To Feet	Length	Remarks—seals, grouting, etc.
18" O.D.	0	70' 5"	70' 5"	

Number and size of perforations — located — feet to — feet from groundDate of commencement of well Aug 15 - 1959 Date of completion of well Sept 5, 1959

NW 8 E 5, 10 35 4 E

WELL LOG

From Foot	To Foot	Type of Material	Water-bearing Formation Ann. Year or No.	Gravel Produced Ann. Year or No.
0	3	Topsoil		
3	49	gravel - coarse		
49	52	Sand - water		
52	56	clay & gravel mixed		
56	65	gravel		
65	70	clay & gravel		
70	124	Solid Lava		
124	139	porous Lava		
139	150	Lava		
150	152	Sandstone		
152	168	Lava - impregnated with clay		
168	175	Lava		
175	180	Lava impregnated with clay		
180	182	Hard Sand		
182	187	Lava - clay		
187	195	porous Lava - clay		
195	200	~~Lava~~ Solid porous Lava		
200	210	Lava solid		
210	220	Lava + clay		

WELL DRILLER'S STATEMENT

This well was drilled under my supervision and the above information is true and correct to the best of my knowledge and belief.

Signature Charles Briggs
By _____

Dated Sept 5, 1952

License No. 26

***Idaho Department of Water Resources
Open-File Report***



Summary of Canyon Creek Recharge Project – Spring 2016

By
Dennis Owsley

July 2016

Overview

The Mountain Home Reservoir, near Mountain Home, Idaho, (Figure 1) receives runoff water from the Canyon Creek watershed via a canal system. In the spring of 2016, water was diverted from the Mountain Home Canal into Canyon Creek channel and allowed to infiltrate into the subsurface. Water released from the canal system was in excess of the reservoir capacity and provided an opportunity to monitor a potential ground water recharge mechanism for the Mountain Home area.

Water was diverted into Canyon Creek from March 9, 2016 until April 3, 2016 through a pre-existing head gate structure located approximately four miles north of the town of Mountain Home (Figure 1, Appendix A). The diverted water flowed down the natural channel of Canyon Creek to the south/southwest, towards the Snake River. This channel of permeable sand and gravel is typically dry as years of excess water are limited. Throughout the duration of the release, water was observed flowing at least as far as the crossing of Interstate 84 and the Canyon Creek channel. No attempts were made to track the furthest downstream point to which the water traveled.



Figure 1. Map of Canyon Creek diversion.

Surface Water Monitoring

Flow rates in Canyon Creek were measured with a handheld SonTek Flow Tracker on a weekly basis. A suitable location for measuring flow was found approximately 50 yards downstream from the diversion structure (Appendix A). This same cross section was used for all four flow measurements (Table 1). Based on the duration of the release and the measurements taken, an estimated total volume of water released was approximately 1,450 acre-feet. Estimates range from 1,372 to 1,530 acre-feet depending on the interpretation between measurements during the volume calculations.

Table 1. Measured flow rates from Canyon Creek during March 2016.

Date	Flow Rate (cfs)	Uncertainty (+/- %)
3/8/2016	0	NA
3/9/2016	30.6	2.8
3/16/2016	38.2	2.8
3/24/2016	24	4.3
3/31/2016	18.7	2.9
4/4/2016	0	NA

Ground Water Monitoring

Two nearby existing ground water wells (03S 06E 10ABA1 and 03S 06E 10DBC1) were equipped with pressure transducers to monitor the aquifer responses to the recharge efforts (Figure 1). Both wells are less than 0.5 miles from Canyon Creek and are open to the aquifer less than 100 feet below land surface. The wells are about 2.5 miles from the diversion structure. Historic pressure transducer data are not available in either of the wells to allow a normalization of the data collected. A normalization of the data is the most appropriate approach to evaluate any potential aquifer response from the seepage of the diverted water. Therefore, all conclusions and inferences regarding aquifer responses in the two wells monitored are based on the relatively short record of pressure transducer data collected for this project.

Aquifer responses to the Canyon Creek seepage are apparent in the hydrographs from both wells monitored during the recharge event. The well closest to Canyon Creek, 03S 06E 10ABA1, is approximately 600 feet from the Canyon Creek channel. This well is 622 feet deep, with an open interval extending from 42 feet to 622 feet below land surface (Appendix B).

The hydrograph from well 03S 06E 10ABA1 exhibited a similar trend to that of the Canyon Creek flows and showed a water level rise of approximately 27 feet during the first four days of the release (Figure 2). Available data for this well from two weeks prior to the release indicate the water level was rising prior to the release date. To account for the pre-release rising water level trend, the trend established for the pre-release period of record was forecasted to show the predicted water level at a later time. Based on this prediction, the water level in 03S 06E 10ABA1 was approximately 12 feet higher following the end of the release and approximately three feet higher nearly two months after the release (Figure 3).

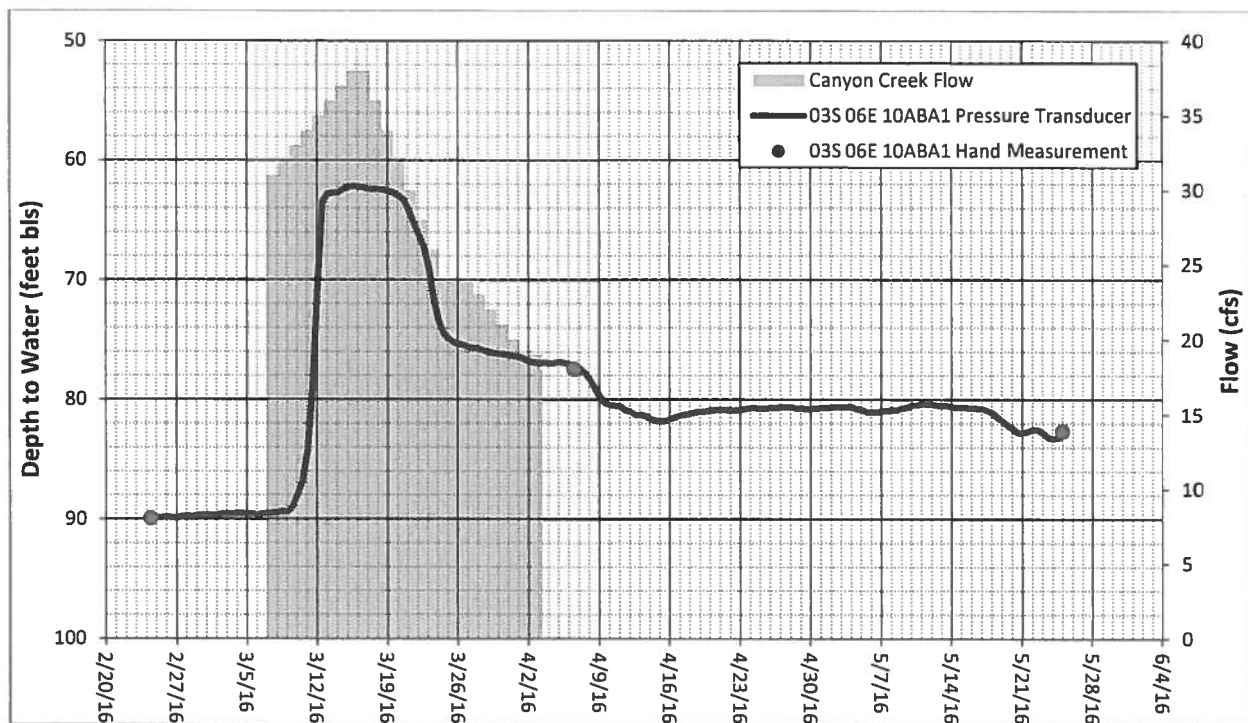


Figure 2. Hydrograph of well 03S 06E 10ABA1 and Canyon Creek flow data during the spring of 2016.

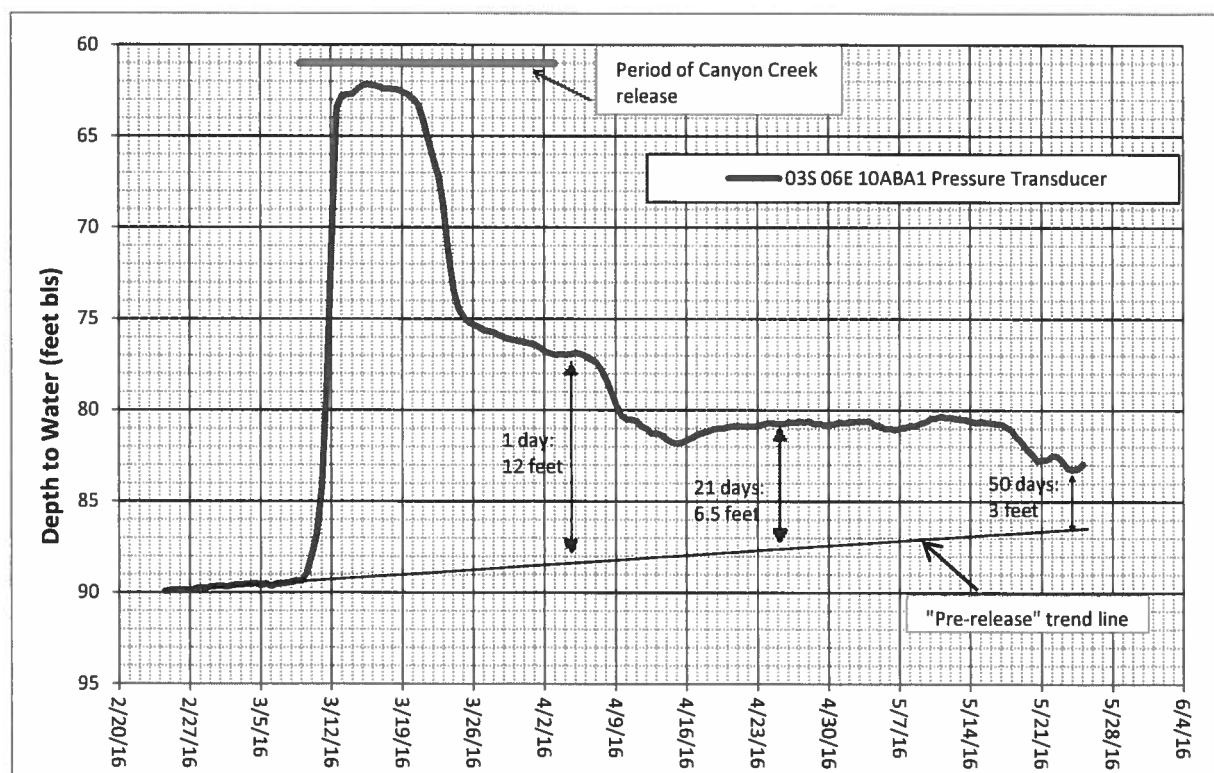


Figure 3. Hydrograph of well 03S 06E 10ABA1 with "pre-release" trend line included to evaluate residual effects of Canyon Creek seepage.

Monitoring well 03S 06E 10DBC1 is approximately 0.5 miles south of Canyon Creek, 220 feet deep, and open to the aquifer system from 70 feet to 220 feet below ground surface (Appendix B). This well is less than 0.25 miles from several irrigation wells, and the influence of the pumping of these irrigation wells can be seen in the corresponding hydrograph (Figure 4).

An analysis of the hydrograph of well 03S 06E 10DBC1 also indicated an apparent aquifer response to the Canyon Creek release. The “pre-release” timeframe of the hydrograph showed an upward trend in water levels, with an increase in slope occurring days after the start of the Canyon Creek release (Figure 4). To account for the pre-existing trend in the hydrograph analysis, the linear trend determined from the pre-release timeframe was extended into the future. Using this assumed linear trend as a baseline for comparison, the water level in well 03S 06E 10 DBC1 was approximately 3.5 feet higher at the conclusion of the release and approximately 4.5 feet higher 43 days following the release (Figure 5). Water levels in this well were impacted by the pumping of nearby irrigation wells, which limits the analysis and resulting conclusions drawn from the dataset.

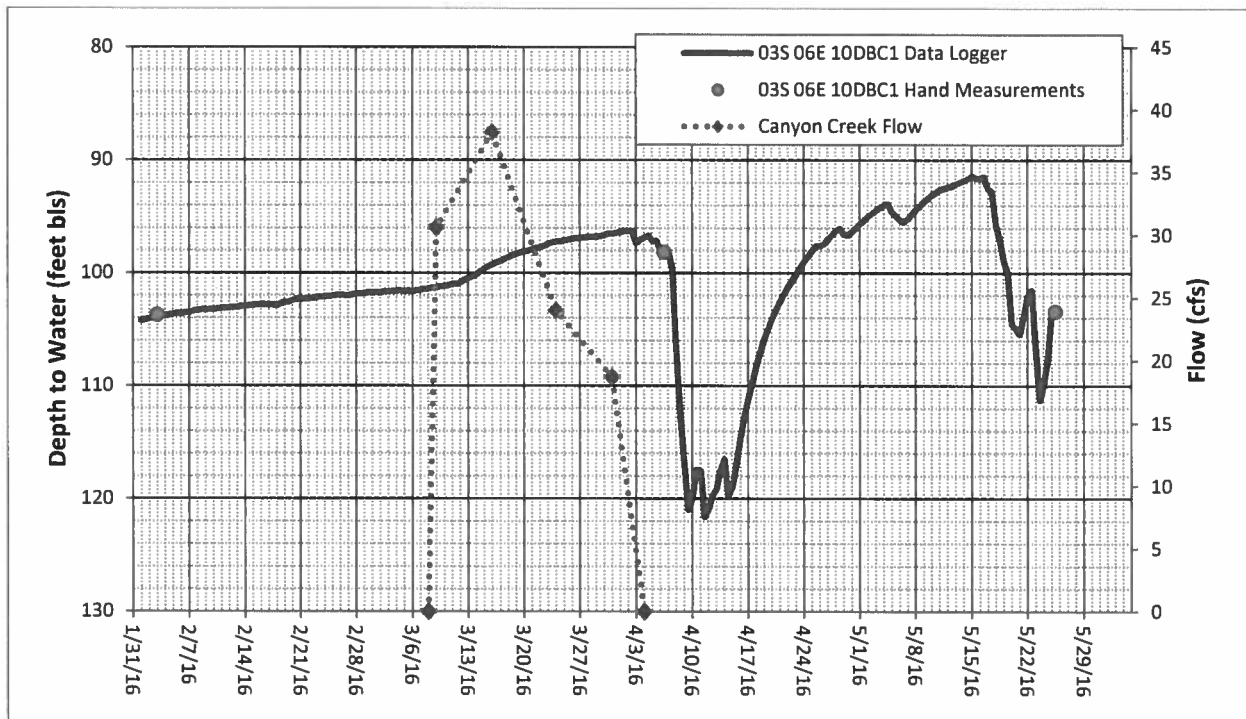


Figure 4. Hydrograph of well 03S 06E 10DBC1 and Canyon Creek flow data during the spring of 2016.

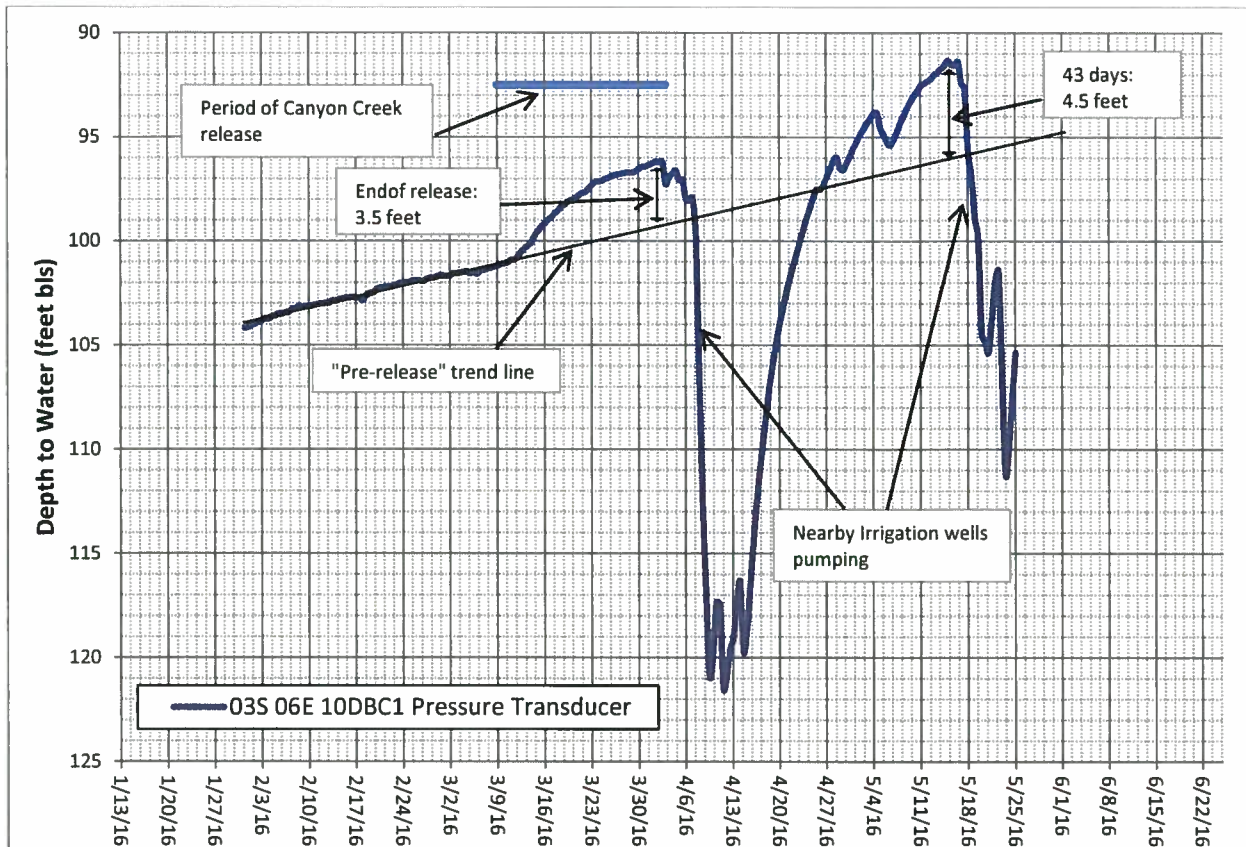


Figure 5. Hydrograph of well 03S 06E 10DBC1 with "pre-release" trend line included to evaluate residual effects of Canyon Creek seepage.

Conclusions

Approximately 1,450 acre-feet of water was diverted into the Canyon Creek channel and allowed to naturally seep into the subsurface as a potential ground water recharge mechanism for the Mountain Home area. The aquifer response to this recharge water was monitored and hydrographs were created for the two nearby existing ground water wells. Although the historic daily data required to do a full analysis of recharge benefits are unavailable, the data collected indicates that the Canyon Creek recharge water did create a positive response in the local aquifer system. The duration of the positive response is not well constrained due to the lack of historic data, the presence of natural aquifer trends, and the impact to the water levels created by the pumping of nearby irrigation wells. Additional data and monitoring are required to make any further determinations regarding the benefits of such releases.

Appendix A -- Field photos



Photo 1. Diversion structure at the confluence of Canyon Creek and the Mountain Home Canal.



Photo 2. Headgate structure on the Mountain Home Canal.

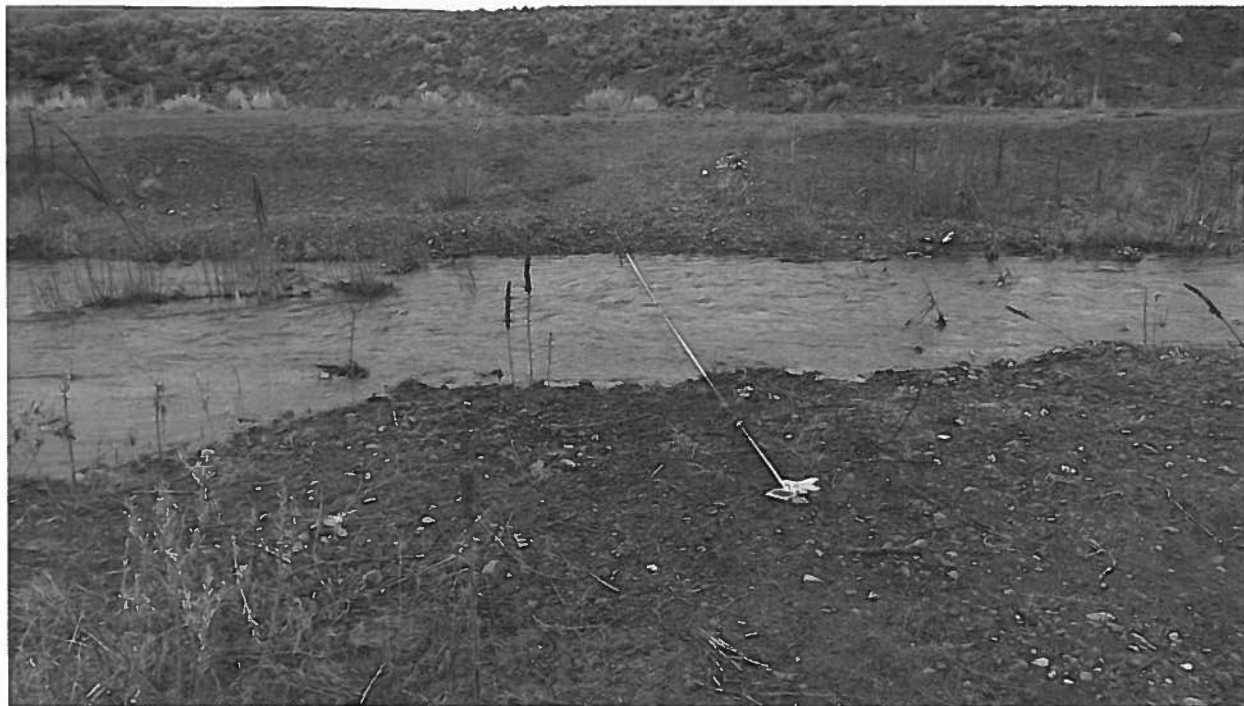


Photo 3. Measurement cross section on Canyon Creek.



Photo 4. Looking upstream in Canyon Creek from measurement cross section.



Photo 5. Looking downstream Canyon Creek from diversion structure.



Photo 6. Overview of Canyon Creek and Mountain Home Canal.

Appendix B – Driller's reports

03S 06E 10ABA1

USE TYPEWRITER OR
BALL POINT PEN

State of Idaho
Department of Water Resources

WELL DRILLER'S REPORT

State law requires that this report be filed with the Director, Department of Water
days after the completion or abandonment of the well.

Location Corrected by IDWR To:

T03S R06E Sec. 10 NENWNE

By: mclscell 2012-08-28

1. WELL OWNER Name <u>DOMINGO AGUIRRE</u> Address <u>INTN HOME, ID</u> Owner's Permit No. _____	7. WATER LEVEL Static water level <u>87</u> feet below land surface Flowing? ☐ Yes ☒ No G.P.M. flow _____ Temperature _____ ° F. Quality _____ Artesian closed-in pressure _____ p.s.i. Controlled by ☐ Valve ☐ Cap ☐ Plug																																																																																																																																																																						
2. NATURE OF WORK ☒ New well ☐ Deepened ☐ Replacement ☐ Abandoned (describe method of abandoning)	8. WELL TEST DATA ☒ Pump ☐ Bailer ☐ Other <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Discharge G.P.M.</th> <th>Draw Down</th> <th>Hours Pumped</th> </tr> </thead> <tbody> <tr> <td><u>540</u></td> <td><u>284</u></td> <td><u>10.00</u></td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Discharge G.P.M.	Draw Down	Hours Pumped	<u>540</u>	<u>284</u>	<u>10.00</u>																																																																																																																																																																
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4. METHOD DRILLED ☒ Cable ☐ Rotary ☐ Dug ☐ Other	5. WELL CONSTRUCTION Diameter of hole <u>16"</u> inches Total depth <u>622'</u> feet Casing schedule: ☒ Steel ☐ Concrete <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Thickness</th> <th>Diameter</th> <th>From</th> <th>To</th> </tr> </thead> <tbody> <tr> <td><u>250</u> inches</td> <td><u>16"</u> inches</td> <td><u>0</u> feet</td> <td><u>43</u> feet</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> Was casing drive shoe used? ☐ Yes ☒ No Was a packer or seal used? ☐ Yes ☒ No Perforated? ☐ Yes ☒ No How perforated? ☐ Factory ☐ Knife ☐ Torch Size of perforation _____ inches by _____ inches <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Number</th> <th>From</th> <th>To</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> <tr> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> Well screen installed? ☐ Yes ☒ No Manufacturer's name _____ Type _____ Model No. _____ Diameter _____ Slot size _____ Set from _____ feet to _____ feet Diameter _____ Slot size _____ Set from _____ feet to _____ feet Gravel packed? ☐ Yes ☒ No Size of gravel _____ Placed from _____ feet to _____ feet Surface seal depth <u>43</u> Material used in seal ☐ Cement grout ☐ Pudding clay ☒ Well cuttings Sealing procedure used ☐ Shrink pit ☒ Temporary surface seal	Thickness	Diameter	From	To	<u>250</u> inches	<u>16"</u> inches	<u>0</u> feet	<u>43</u> feet																					Number	From	To																																																																																																																																							
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Well Log Form 1
1/75

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RECEIVED
607
IrrigationWELL LOG AND REPORT OF THE
STATE RECLAMATION ENGINEER OF IDAHO

Permit No. 86 Well No. 1 County Edmon
 Owner Henry L. Laydet
 Address RFD Box 20 Mt Home Idaho
 Driller Richard Biggs - C.B. Bates & Son
 Address Wendell, Idaho
 Well location NW 1/4 SE 1/4 Sec 10, T. 35 N., R. 6 E. 1/4
 Size of drilled hole 18 inch

Locate well in section

NW 1/4	NE 1/4
SW 1/4	SE 1/4

Total depth of well 220'Give depth to standing water from the ground 100' Water temp. 60° Fahr.On "Pumping Test" delivery was 30 g.p.m. at — f.s. Drawdown was — feet.Size of pump and motor used to make test Baker tested 30 g.p.m.Length of time of test 2 hours — minutes.If flowing well, give flow — f.s. or — g.p.m. and of shut off pressure —If flowing well, described control works —

(TYPE AND SIZE OF VALVE, ETC.)

Water will be used for domestic Weight of casing per lineal foot —Thickness of casing 20" Casing material Pipe (STEEL, CONCRETE, WOOD, ETC.)
 Diameter, length and location of casing 18" O.D. 20'-5" at top of well
(CASING 18" IN DIAMETER OR LESS, GIVE INSIDE DIAMETER;
CASING OVER 18" IN DIAMETER, GIVE OUTSIDE DIAMETER)

CASING RECORD

Diam. Casing	From Foot	To Foot	Length	Remarks—seals, grouting, etc.
18" O.D.	0	70' 5"	70' 5"	

Number and size of perforations — located — feet to — feet from groundDate of commencement of well Aug 15 - 1959 Date of completion of well Sept 5, 1959

NW 8 E 5, 10 35 4 E

WELL LOG

From Foot	To Foot	Type of Material	Water Level Feet or Fathoms	Depth Feet or Fathoms
0	3	Topsoil		
3	49	gravel - coarse		
49	52	sand - water		
52	56	clay & gravel mixed		
56	65	gravel		
65	70	clay + gravel		
70	124	Salted Lava		
124	139	porous Lava		
139	150	Lava		
150	152	Sandstone		
152	168	Lava - impregnated with clay		
168	175	Lava		
175	180	Lava impregnated with clay		
180	182	fine sand		
182	187	Lava - clay		
187	195	porous Lava - clay		
195	200	fine sand porous Lava		
200	210	Lava - salt		
210	220	Lava - clay		

WELL DRILLER'S STATEMENT

This well was drilled under my supervision and the above information is true and correct to the best of my knowledge and belief.

Signed Richard Briggs

By _____

Dated Sept 5, 1952

License No. 26

TECHNICAL MEMORANDUM

TO: Elmore County

FROM: James Bledsoe, P.E., Michael Clark, E.I.

DATE: February 11, 2013

RE: Canyon Creek Spring Runoff Infiltration Study, Phase 1

INTRODUCTION

Portions of Elmore County have documented declines in groundwater levels exceeding two feet per year. Elmore County has expressed an interest in capturing unappropriated water from Canyon Creek and recharging this water into the Mountain Home aquifer

The purpose of this technical memorandum is to summarize Keller Associates' findings concerning what work has been completed previously and summarize the current operational practices, available reports, water rights, and collective knowledge of key stakeholders.

SUMMARY OF PREVIOUS WORK

The Mountain Home Ground Water Advisory Committee was established on June 6th, 1996 (see IDWR order in Appendix A). The Committee was established to find possible solutions to the declining aquifer levels. The Committee met regularly to develop alternatives to solve the declining aquifer problem. In 2006, a final draft of a groundwater management plan was developed and provides a fairly comprehensive summary of the work done in the area. It outlines the historical studies performed in the area, general basin characteristics, previous work completed, a groundwater management plan, entity recommendations/objectives and plans, reference information about the study area, and other miscellaneous documents. A copy of the 2006 management plan can be found in Appendix A.

An Expanded Natural Resources Interim Committee titled the Mountain Home Working Group began meeting in April 2004 to hear local concerns, discuss ground water conditions, and analyze strategies to address the issues and concerns specific to the Mountain Home area. The Mountain Home Working Group adopted a final report on December 6, 2004 that outlined their findings and recommendations. This report can be found in Appendix A.

CANYON CREEK WATER RIGHTS

According to IDWR, there are 44 water rights that list Canyon Creek as their source. Keller Associates completed a cursory review of these rights to identify general ownership and points of diversion, diversion rates, and periods of use. The scope of this investigation was not intended to be exhaustive or attempt to determine validity of rights or potential of forfeiture. A owner summary table for all listed water rights on Canyon Creek is shown in Table 1.1. A more detailed list of Canyon Creek water rights is located in Appendix D. According to Table 1.1, the two largest owners of water rights are the Elmore County Irrigated Farms Association with 408.5

CFS (approximately 47 % of total) and the Mountain Home Irrigation District with 434.1 CFS (approximately 50% of total). Based on our discussions with the IDWR and the Mountain Home Irrigation District, it is unclear as to whether the Elmore County Irrigated Farms Association actually has any right or if this right may actually be part of the Mountain Home Irrigation District's right. All other owners have a combined 28.9 CFS (approximately 3% of total).

TABLE 1.1
 Summary of Canyon Creek Water Rights by Owner

Owner	Diversion Rate (CFS)
AKE, FRANK P	1.00
AKE, LAURA	1.60
BENNETT, RICHARD	3.20
ELMORE COUNTY IRRIGATED FARMS ASSN	408.5
FICKLE, ANITA L	0.31
FREER, FORREST	2.40
GREAT WESTERN BEET SUGAR CORP	3.20
HANSEN, DEBORA M; HANSEN, LLOYD M	0.38
HOFFMAN, THEODORE W	1.29
HORGAN, MARY J	0.31
IRELAND RANCHES	5.67
J R SIMPLOT CO	1.70
LOCKMAN, A W	1.00
LOCKMAN, SUSAN A	1.20
MACK, HEATHER KATHERINE	1.50
MOUNTAIN HOME IRRIGATION DIST	434.1
NORSTEBON, JAMES S	0.31
NORSTEBON, JOY A; NORSTEBON, ROBERT A	0.31
STATE OF IDAHO	0.09
TINDALL, CHESTER J	0.13
USA ACTING THROUGH	0.10
WATTS, J G	0.00
WILLIAMS, B L	3.20
Total	871.5

In 1997, the Mountain Home Groundwater Advisory Committee (MHGAC) obtained a water right permit for the purpose of groundwater recharge. This permit was for a diversion rate of 200 cfs and a total volume of 1000 acre-feet. Since the demonstration project that was completed in the late 1990s, the MHGAC has since disbanded and the water right was never perfected.

CORRESPONDANCE WITH IDAHO DEPARTMENT OF WATER RESOURCES

Keller Associates met with John Westra (January 7, 2013) with the Idaho Department of Water Resources (IDWR) and had subsequent follow up conversations in an effort to find out what work had been previously completed that was directly related to Canyon Creek and the potential to use Canyon Creek spring runoff for recharge. Discussions centered on available runoff data, recharge studies, the status of existing water rights, and the availability and feasibility of acquiring new water rights. The following findings were made:

1. Fraser Reservoir used to have a dam and was utilized for storage/recharge until 20± years ago when the dam failed. The dam blew out from high water flow and has not been rebuilt since that time. An option could be to rebuild the dam, however this option would be costly and is not a guaranteed solution.

2. Mountain Home Reservoir has many large fissures within its banks and surrounding area. Standpipes were erected many years ago as an overflow precautionary measure. The standpipes are positioned directly over large fissures so that once the reservoir reaches a certain level, the water can be conveyed directly from the reservoir into the fissures. Mr. Westra assumes these fissures connect directly into the aquifer. When asked about potentially using the standpipes to mitigate the aquifer depletion problem, Mr. Westra commented that the standpipes may be considered "grandfathered" and any modification to the standpipes could trigger regulatory review and potentially additional water treatment requirements – especially if the purpose of the use were to change (e.g. recharge rather than overflow protection) such that there would be an increased discharge to the aquifer than existed previously.
3. Gravel pits located near the Mountain Home Highway District were utilized in an attempt to recharge the aquifer by diverting excess runoff from Canyon Creek. The Mountain Home Groundwater Advisory Committee's (MHGAC) water permit for the gravel pit lapsed and was never renewed. He also believes that any new permit in the area may trigger additional water monitoring and potentially treatment requirements from DEQ. He recommended checking with DEQ before proceeding with any option having to do with applying for new water rights aimed at groundwater injection.
4. Mr. Westra provided Keller Associates with a document titled Mountain Home Area Groundwater Management Plan (MHGMP). He said that the 2006 plan is the most comprehensive and complete summary of the work done in the area. The document was written by the Mountain Home Groundwater Advisory Committee. It outlines the historical studies performed in the area, general basin characteristics, a groundwater management plan, entity recommendations/objectives and plans, reference information about the study area, and other miscellaneous and documents. According to Mr. Westra, the plan was never formally approved by the state director of the Idaho Department of Environmental Quality.
5. Mr. Westra also provided two boxes of documents pertaining to the Mountain Home Groundwater Advisory Committee. These documents included meeting minutes, memos, pictures, drafts of reports, letters to government agencies, etc. Most of the pertinent information was summarized into the 2006 MHGMP. The IDWR documents were reviewed by Keller Associates and information believed to be particularly relevant are included in the appendices of this document.
6. Mr. Westra recommended contacting the United States Geological Survey (USGS) to discuss available resources applicable to the project including studies and flow data.
7. IDWR could issue a new permit to Elmore County for the purpose of recharge. This permit would be subject to an approved DEQ recharge permit. Additionally, IDWR would want to see some kind of agreement underway between the County and the underlying land owner (in this case BLM). The County would likely be required to have fully secured DEQ regulatory approval before the water right could become licensed.

MEETING WITH THE MOUNTAIN HOME IRRIGATION DISTRICT

On January 23rd, Keller Associates met with Calvin Ireland and Terry Seegrist with the Mountain Home Irrigation District. The purpose of this meeting was to ask for additional information about district water rights, status of Fraser Reservoir, operational and

management practices, flow data, and District concern with recharge project. After the meeting, Mr. Ireland and Mr. Seegrist provided a tour of the district's facilities, canals, and diversions. Pictures of significant sites were taken and can be found below.

1. Water Rights

Information from the Idaho Department of Water Resources suggests that water rights exist on Canyon Creek of approximately 871 CFS, 408.5 CFS of which belong to Elmore County Irrigation Farm's Association and 434.1 CFS that belong to the Mountain Home Irrigation District. Calvin was certain that the Elmore County Irrigation Farm's Association does not divert water from Canyon Creek, rather they divert water from the Snake River. He believes that the rights were sold by Elmore County Irrigation Farm's Association prior to the 1920s.

2. Fraser Reservoir

Rebuilding Fraser Reservoir was mentioned previously as a potential solution to the aquifer recharge problem. Calvin mentioned that he repaired the reservoir in the late 70s or early 80s after it washed out the first time. However, in 1986 the reservoir washed out again and has not been repaired since.

3. Operational and Management Practices

Mountain Home Irrigation District manages flows into Canyon Creek. A diversion structure controls water that flows into the Feeder Canal which ultimately leads to the Mountain Home Reservoir. Under normal operations, flow is diverted to the Mountain Home reservoir with water being diverted to Canyon Creek only in the event that Feeder Canal and Mountain Home Reservoir could not accommodate the flows.

FIGURE 1
Feeder Canal Diversion (Feeder Canal)

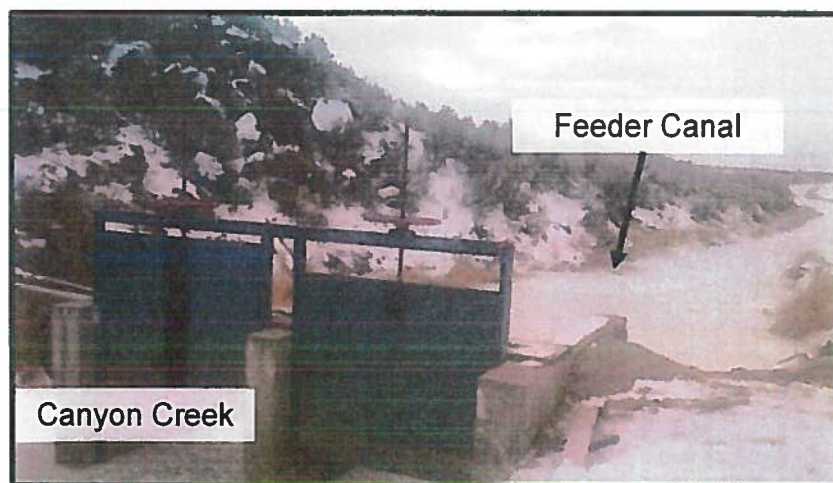
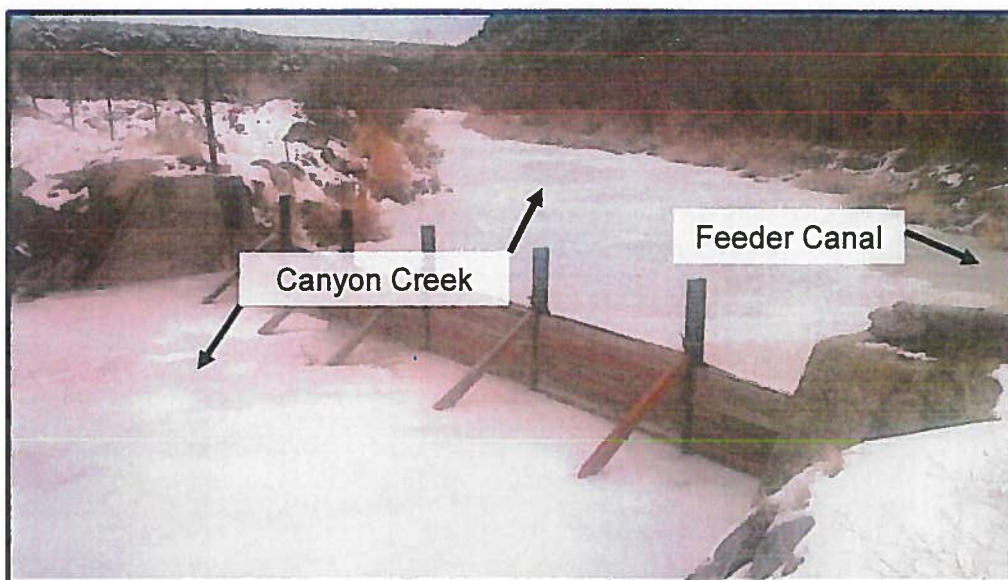
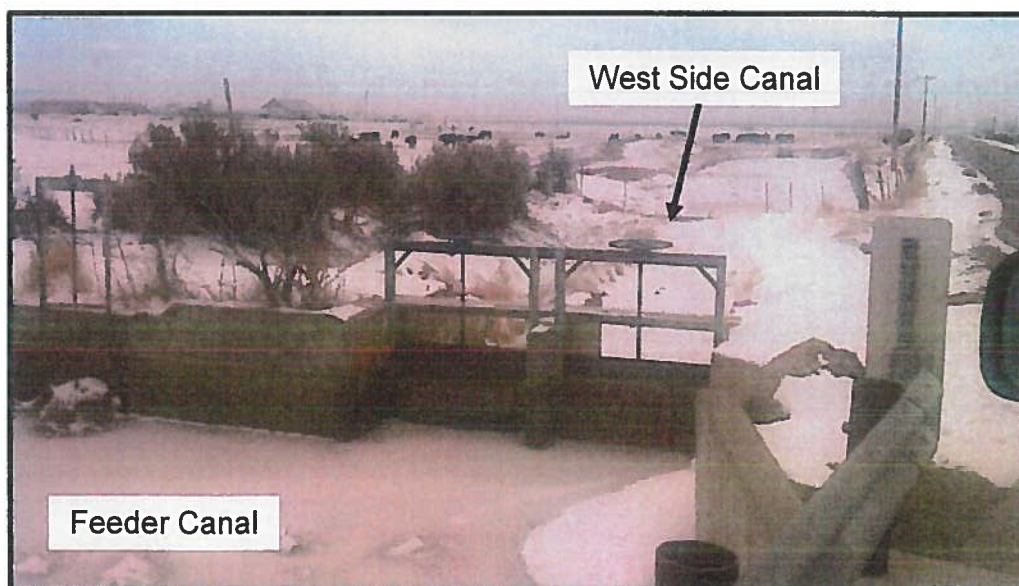


FIGURE 2
Feeder Canal Diversion (Canyon Creek)



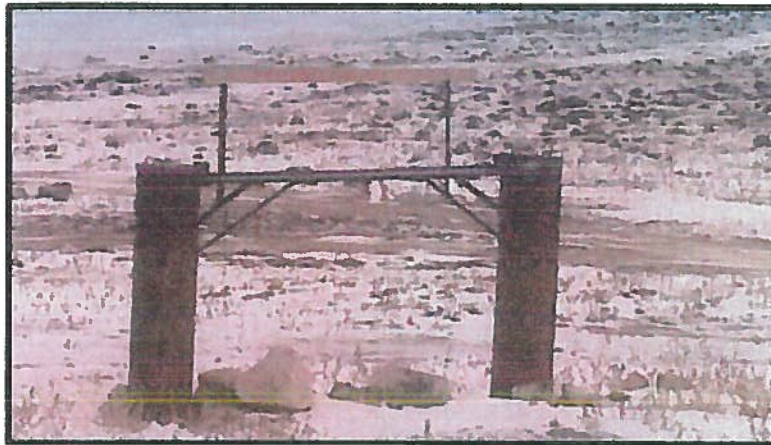
The District mentioned that they have no existing customers on Canyon Creek downstream of the Feeder Canal diversion. All customers receive their water either directly from Feeder Canal or from the West Side Canal from a downstream diversion off of the Feeder Canal. All excess water flows down Canyon Creek towards the freeway, the old Fraser Reservoir, and eventually the Snake River. When there are periods of excess water, Calvin reports that this usually lasts only a few weeks, but during some years it has been known to last multiple months.

FIGURE 3
West Canal Diversion (Feeder Canal)



Mountain Home Reservoir has several deep fissures within its banks that would drain the reservoir constantly. The District attempted to concrete the fissures shut, but the leaking continued. In 1995 the District installed two 22-inch diameter standpipes (see Figure 4). The standpipes reportedly are positioned several inches below the spillway elevation and allow the District to prevent excess water to flow into the fissures rather than overtop the reservoir, through the City of Mountain Home, eventually resulting in flooding of farmers' fields. Generally, the District tries to keep at least three feet of freeboard in the reservoir to accommodate uncontrolled runoff that flows directly into the Mountain Home reservoir from Rattlesnake Creek and other small streams. To accommodate this, when the reservoir levels get within about 3-feet of the spillway, the district typically limits (or eliminates) flow in the Feeder Canal and begins spilling to Canyon Creek at the Feeder Canal diversion.

FIGURE 4
Mountain Home Reservoir Standpipes



4. Gravel Pits

The water that spills down Canyon Creek currently flows to several gravel pits and drainage basins. Calvin stated that he has a gravel pit on his property that fills with water whenever Canyon Creek runs for more than a few days. He reported that the water enters the pit via subsurface flow of groundwater from Canyon Creek.

At the time of our visit in January 2013, the gates that control the flow of water into the Mountain Home Highway District pits were open. It appeared that at a least a portion of the normal flow within Canyon Creek would be directed to the pits. A summary of our conversations with the Mountain Home Highway District is presented later in this report.

5. Flow Data

No flow data quantifying the amount of water discharged into Canyon Creek at the Diversion Structure is available. Currently, there is no metering structure that could be used to quantify this flow (although some estimation could be made if the level above the weir-like structure were taken). Keller Associates reviewed about 10 years of district meeting minutes with Mountain Home Irrigation District personnel to determine if there

were records of when and how long they spilled into Canyon Creek. Unfortunately, no such records were found. There were, however, monthly reservoir levels reported in the meeting minutes. This information could be utilized to extract and plotted to determine periods when the reservoir levels were high enough that some diversion may have occurred.

6. Concerns with Recharge Project

Calvin and Terry were skeptical that any recharge project would be worth the investment of time and money required. Calvin mentioned that previous recharge project discussions have come and gone without any feasible solution due to two main reasons. The first reason is a lack of consistent excess water that could be used to recharge the aquifer. The second reason is that even if water were to be put back in the ground, it would be difficult to show that the recharge water produces a measurable benefit within the aquifer of concern.

MEETING WITH THE MOUNTAIN HOME HIGHWAY DISTRICT

There are two large gravel pits Street that were utilized for the recharge project. These are located east of the Highway District offices and north of Mashburn Road and are reportedly on BLM land. Keller Associates met briefly with personnel from the Mountain Home Highway District to discuss the operation of the pits and identify any concerns that they might have. According to district staff, they have seen regular flooding of the pits, even in recent years. A picture of the flooded pit during the spring of 2012 is illustrated in Figure 5 below. The Highway District expressed the following concerns:

- They have a fuel tank that holds some 20,000 gallons of fuel that could be damaged in the event that the groundwater level rose to high. This tank is located in fairly close proximity to the gravel pits.
- When the water level is especially high, the flow pools on the north side of Mashburn Road and begins to seep through to the south side into a state owned gravel pit. The Highway District is concerned that there is a potential to eventually wash out the road.
- The District recently reseeded the gravel pits as part of the decommissioning the pit. However, flooding that resulted from water entering the pit effectively annulled the seeding effort.

FIGURE 5
Mountain Home Highway District Ponds During High Runoff



CORRESPONDENCE WITH THE DEPARTMENT OF ENVIRONMENTAL QUALITY

Appendix C contains a letter written by the Department of Environmental Quality (DEQ) addressing concerns and issues relative to the demonstration recharge project completed over a decade ago. Since this letter had been issued, many of the regulatory rules affecting a project of this nature have been updated/developed. Recharge is regulated under two primary rules

- Wastewater Rules (see Section 600 of IDAPA 58.01.15)
- Groundwater Quality Rule (see Sections 350 and 400 of IDAPA 58.01.11)

In 2006, DEQ prepared a document intended to help entities pursue recharge. It is titled *Guidance for Developing a Ground Water Quality Monitoring Program for Managed Recharge Projects by Land Application*. A copy of this guidance document as well as section of the Wastewater and Groundwater Quality Rules are found in Appendix C. It should be noted that additional, and much more stringent regulations would be anticipated should a recharge project be developed that is intended to directly discharge surface water into the groundwater via injection wells (or potentially fractures / fissures).

The process for obtaining DEQ approval of a recharge project would involve the following steps:

1. Pre-project meeting
2. Submit a ground water monitoring program. This project would include a project description, recharge area characterization, evaluation of potential impacts (including 1 year time of travel distance), water quality monitoring project, and a description of management practices. Given the complexities of the underlying basalt, this program could require more than the monitoring network previously developed as part of the recharge project.
3. Public notice and comment period
4. Opportunity for appeal
5. Ongoing reporting and annual regulatory project reviews

INFORMATION FROM THE UNITED STATES GEOLOGIC SURVEY

The United States Geologic Survey (USGS) has one stream gage currently in operation on Canyon Creek that has been collecting data since 1984. There have been two other gages operational for various lengths of time in the past 80+ years but are currently offline. One gage measured flow on Canyon Creek below south of the current station, while the other measured flow on the Feeder Canal which flows to the Mountain Home Reservoir. The southern Canyon Creek gage only collected data for 10 months during 1917 before being taken offline.

Canyon Creek Station #13159800

The Canyon Creek Station is located on Canyon Creek (see Chart 1.1) and is currently in operation. Daily and monthly data for the Canyon Creek Station was provided by USGS and is shown in Figures 1.1-1.2.

CHART 1.1
USGS Stream Gage Locations

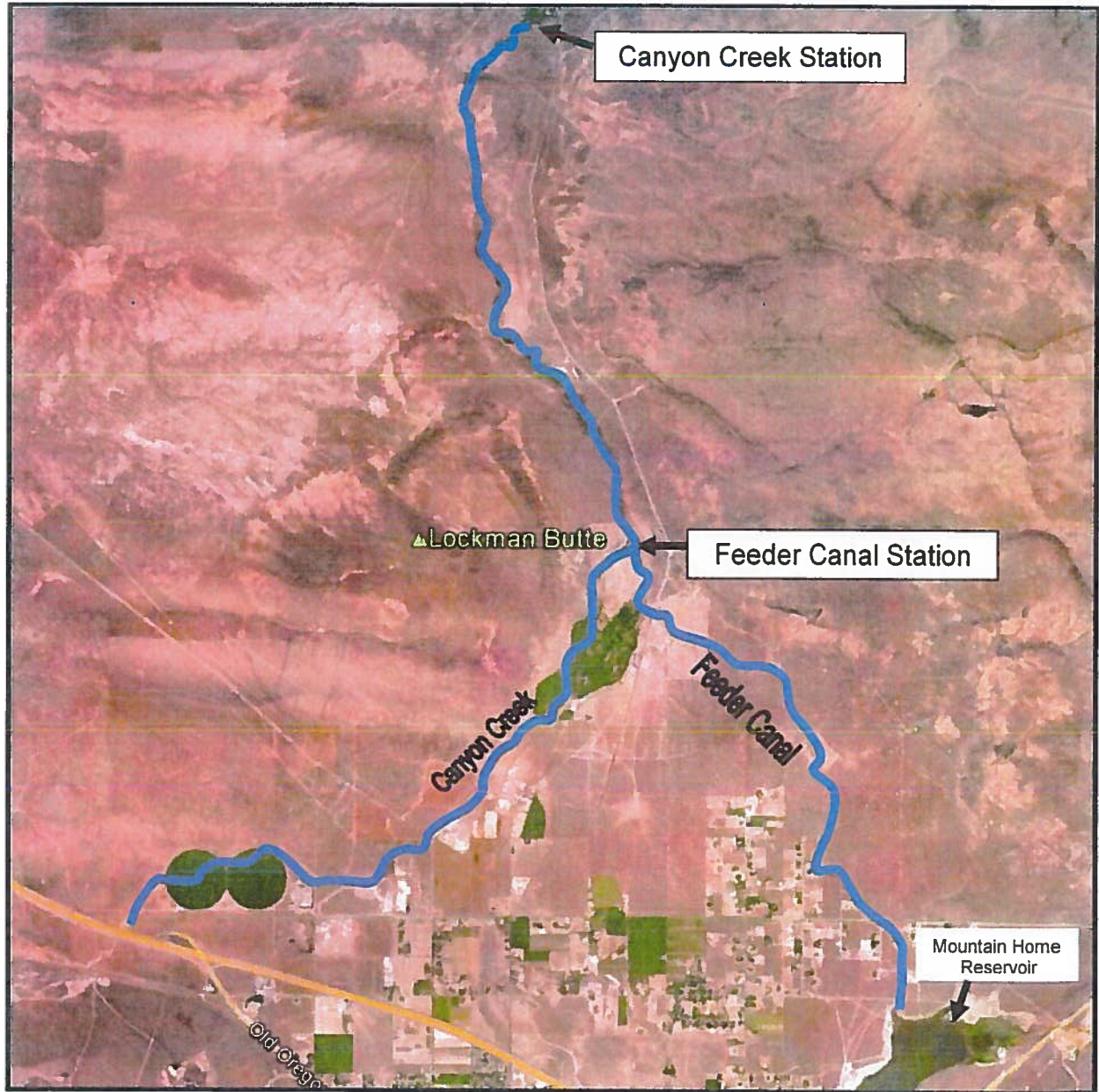


FIGURE 1.1
Canyon Creek Station #13159800 - Monthly Average Flow

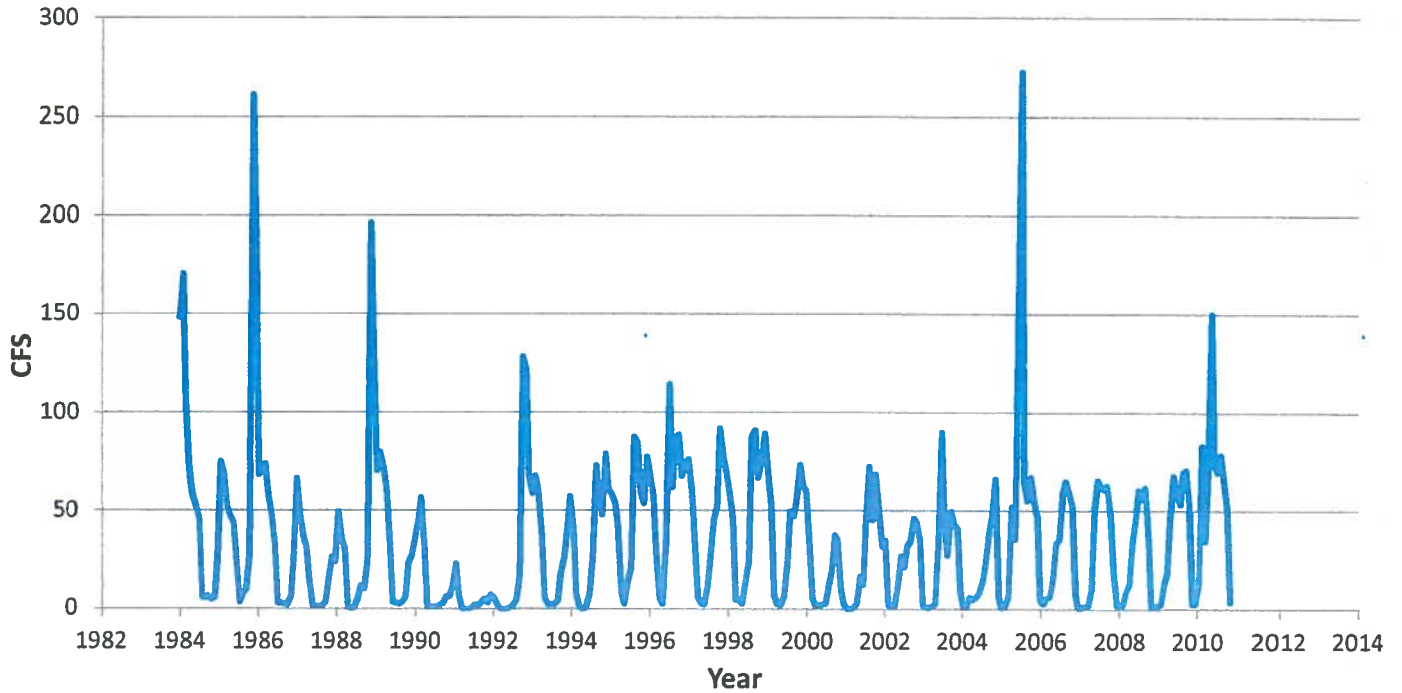
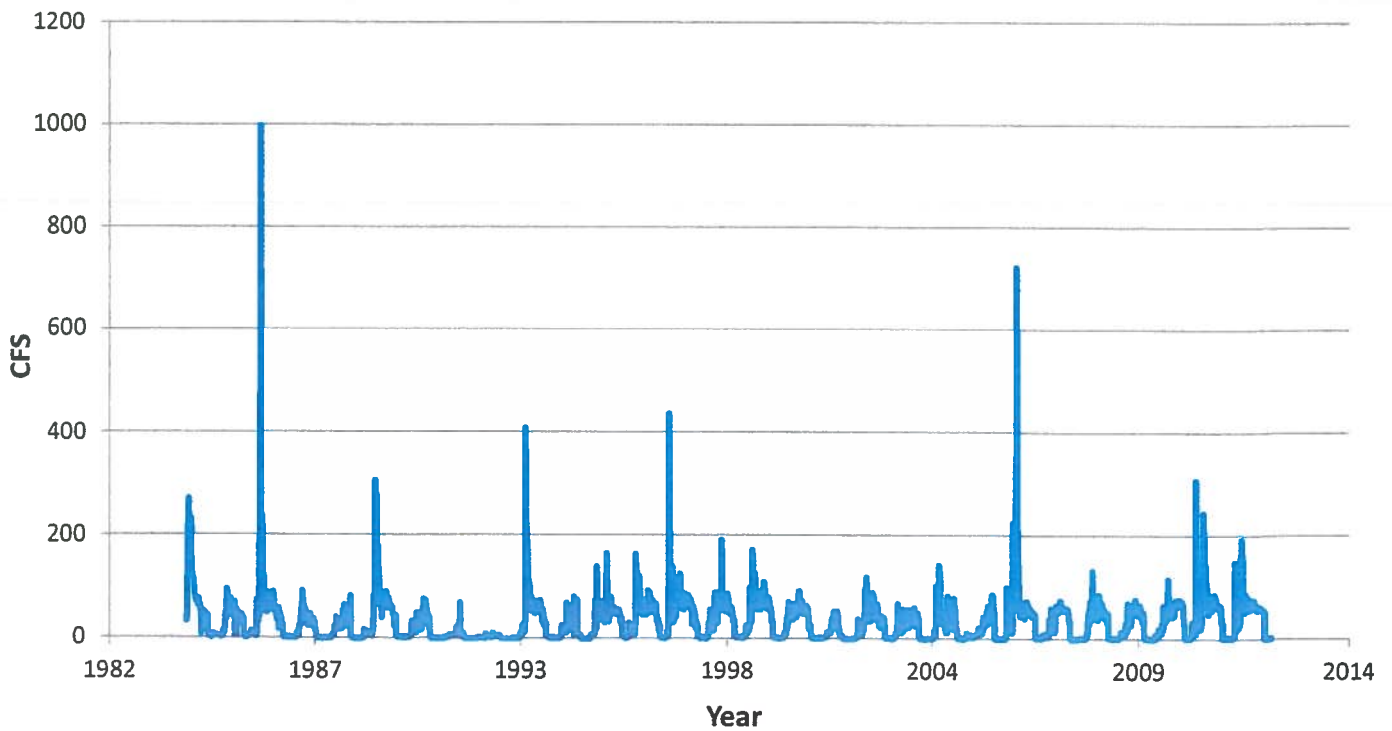


FIGURE 1.2
Canyon Creek Station #13159800 - Daily Flow



Based on Figures 1.1-1.2, the maximum average monthly flow rate is 272.5 CFS while the maximum daily flow rate is 997 CFS. Based on a cursory comparison of the diversion rates of existing rights to historical flows, it would appear that any recharge efforts would depend primarily on the non-use of more senior water rights.

USGS information gathered during the recharge project.

Multiple individuals referred to extensive monitoring and study efforts completed by Bill Young and other hydrologists and scientists with the USGS prior to the Mountain Home recharge demonstration project. Their studies are referenced in the Mountain Home Area Groundwater Management Plan, but the actual studies were not included. Tim Merrick with the USGS provided digital copies of these historical studies which can be found in Appendix B.

The USGS is currently conducting ground water monitoring at the Mountain Home Air Force Base. They have been monitoring 25 wells since 2001 with monthly data being uploaded to their website at http://groundwaterwatch.usgs.gov/countymaps/ID_039.html or at USGS.gov. Based on a cursory look at the ground water level data, levels in the area have been linearly declining an average of approximately 1.5 feet per year.

INFORMATION FROM THE SOIL CONSERVATION SERVICE

The Soil Conservation Service provided a custom soils report for the Mountain Home area which can be found in Appendix D. This report comprises of 10,000 acres that lie between the Canyon Creek – Feeder Canal diversion and American Legion Blvd. The soils data for this area provides a generalized look at what kinds of soils one could expect to find.

INFORMATION FROM THE IDAHO TRANSPORTATION DEPARTMENT

Greg Zitley with the Idaho Department of Transportation (ITD) provided documents relating to the Canyon Creek Bridge construction project and environmental report. The report included a hydraulic and hydrologic report with calculations. Based on the calculations, the flood flows expected for a 10-year and 50-year storm are 957 cfs and 1,723 cfs, respectively. Additional calculations can be found in the report in Appendix B.

INFORMATION FROM THE MOUNTAIN HOME AIR FORCE BASE

In an email from Mike Pope (12/4/12), he shared some insight into the impacts of the Fraser Reservoir on the wells within the base. He stated that when the Fraser Reservoir was in operation, the 343 foot deep Well #4 located within the compound on MHAFB had water in it with a static level of about 200 feet below ground surface. He reported that the level depended on activities at Fraser reservoir. When that dam was breached, he reported that Well 4 went dry in less than a year. When asked if the base had ever completed any kind of study to determine if the well would be considered under the influence of surface water (i.e. MPA test), he said that the well had dried up before these kind of regulations took effect in Idaho.

COST - BENEFIT CONSIDERATIONS

The scope of this study did not include an evaluation of costs. However, we feel it is worth mentioning some costs as the County considers possible actions moving forward.

What is the value of the water right? In 2004, the City of Mountain Home was investigating the purchase of water rights. At the time three water rights were being considered with a cost per acre foot that ranged from \$397/ac*ft to \$600/ac*ft. Assuming a value for water rights of \$500/ac*ft, the 1000 ac*ft water right would be approximately \$500,000. However, given the unreliable nature of the right, the fact that it is a junior surface water right subject in part to the non-use of more senior water rights, and the fact that it is a surface water right, all would suggest that the actual value of the water right would less than \$500,000.

What is the cost to implement? It is hard to estimate the cost of implementation, but it is safe to say that there would be considerable permitting effort, hydrogeologic modeling, and development of an ongoing maintenance of a monitoring program. In our opinion, the cost secure the water right and work through the regulatory requirements could be \$50,000 to \$200,000 or more depending on what DEQ required. The cost to implement the improvements could also range from fairly minimal improvements to a couple hundred thousand, depending on what kind of monitoring efforts would be required. Ongoing monitoring and reporting efforts could also be in the range of a few thousand dollars to \$10,000+ per year depending on the monitoring frequency and testing required.

CONCLUSION

Based on the research completed, Keller Associates provides the following conclusions:

1. The Mountain Home area has an existing water deficit of approximately 30,000 acre-feet. This has resulted in long-term declines in aquifer levels for many areas in Elmore County.
2. Recharge has been identified previously as a desired strategy to improve groundwater levels. Previous studies estimated the potential recharge activities on Canyon Creek would correspond to about 1,000 acre-feet. This value is consistent with the water right permit obtained by the MHGAC.
3. The amount of water available for recharge depends in part on the nonuse of upstream more senior water rights.
4. There does not appear to be definitive records that document the frequency, duration, or volume of water currently diverted into Canyon Creek.
5. It is uncertain the impacts the recharge efforts would have on the regional groundwater. Measurements taken during the demonstration project at the gravel pits reportedly had not noticeable impacts on local ground water levels. While recharge efforts at Fraser Reservoir are likely to have a significant impact on levels at the Air Force Base, it is unlikely that they would have significant impact on other upstream areas within the basin such as the City of Mountain Home.
6. While a water right permit was obtained for recharge, this permit has expired. It should also be noted that recharge water may depend on the inability of senior water right holders to fully utilize their water right resulting primarily from high runoff during wetter years.
7. Previous recharge planning efforts have focused on restoring Fraser Reservoir, directing flows to known fissures, and directing flows to a gravel pit and injection wells. A demonstration project was completed for the gravel pit option. During the course of this

study 1,000 acre-feet was reportedly diverted in one year with no measureable effects in nearby groundwater levels.

8. Since the completion of the recharge project, it appears that flows have periodically been diverted to the pits. This has created some risk / liability concerns among the Mountain Home Highway District staff. Additionally, this may make it more difficult to establish background conditions desired as part of the DEQ required groundwater monitoring plan.
9. Increased awareness of groundwater quality and newer groundwater quality regulations will likely make direct aquifer recharge more difficult and costly to implement.
10. IDWR could issue a new permit to Elmore County for the purpose of recharge. This permit would be subject to an approved DEQ recharge permit. Additionally, IDWR would want to see some kind of agreement underway between the County and the underlying land owner (in this case BLM). To perfect or fully license the water right, the County would be required to demonstrate beneficial use. In other words, the recharge project would need to be implemented to secure the water right. The County would likely also be required to have fully secured DEQ regulatory approval before the water right could become licensed.
11. The cost to implement a recharge project could be costly and involve many stakeholders. However, efforts could be completed in phases.

RECOMMENDATION

Elmore County should continue to support regional efforts to secure groundwater resources within the County. Encouraging recharge of unused water on Canyon Creek may be a part of the long-term strategy for the region. Specific recommendations include:

1. Work with and encourage the Mountain Home Irrigation District in monitoring and recording flows that are diverted to Canyon Creek downstream of the Feeder Canal diversion structure. Documenting the frequency and magnitude of runoff will better define the potential benefit of a recharge project.
2. Should the County desire to move forward with a recharge project, work closely with regulatory agencies (IDWR, DEQ, and BLM) to secure a new water right and complete a recharge project. Keller Associates would suggest that the process proceed in phases, reevaluating the costs-benefits at each step. The first step would include filing a new permit with IDWR and completing a pre-meeting with DEQ.

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APPENDIX A

- 1 – Mountain Home Ground Water Management Advisory Committee Order
- 2 – Mountain Home Aquifer Recharge Demonstration/Study
- 3 – Map of Aquifer Recharge Sites
- 4 – USGS Letter for Recharge Program Proposal
- 5 – 404 Permit
- 6 – Mountain Home Ground water Advisory Committee Water Permit
- 7 – Mountain Home Area Groundwater Management Plan Final Draft
- 8 – Mountain Home Working Group Final Report and Recommendations

APPENDIX B

- 1 – Mountain Home Feeder Canal Discharge, 1938-1939
- 2 – Ground-Water Resources of Camas Prairie, Camas and Elmore Counties, Idaho, 1962
- 3 – Ground-Water Resource of the Mountain Home Area, Elmore County, Idaho, 1968
- 4 – Ground Water Investigation of the Mountain Home Plateau, Idaho, 1982
- 5 – Hydrologic and Chemical Data From Selected Wells and Springs in Southern Elmore County, Including Mountain Home Air Base, Southwestern Idaho, 1989
- 6 – Seasonal Changes in Ground-Water Quality and Ground-Water Levels and Directions of Ground-Water Movement in Southern Elmore County, Southwestern Idaho, Including Mountain Home Air Force Base, 1990-91
- 7 – Hydrology and Geochemistry of Thermal Ground Water in Southwestern Idaho and North-Central Nevada, 1982
- 8 – Hydrographs of Water Levels in Observation Wells in Idaho, 1971-1982
- 9 – Ground-Water-Level Trends in Idaho, 1971-1982
- 10a – Signed Environmental Evaluation for Canyon Creek Bridge, North of Mountain Home, Elmore County, Idaho, 2010
- 10b – ITD-210 Approval
- 10c – Irrigation Board Letter
- 10d – Hydraulics Report and Approval

APPENDIX C

- 1 – Idaho Administrative Code (Sections 301, 400, and 600)
- 2 – Department of Environmental Quality (DEQ) comments via email
- 3 – DEQ letter on Canyon Creek Recharge Project
- 4 – Guidance for Developing a Ground Water Quality Monitoring Program for Managed Recharge Projects by Land Application, June 2010

APPENDIX D

- 1 – Canyon Creek water right owner summary spreadsheet
- 2 – Custom Soil Resource Report for Elmore County Area, Idaho

MOUNTAIN HOME AREA GROUND WATER AQUIFER RECHARGE DEMONSTRATION/STUDY



by
**Mountain Home Area Ground Water
Advisory Committee
1997**

**MOUNTAIN HOME AREA GROUND WATER AQUIFER
RECHARGE DEMONSTRATION/STUDY**

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MOUNTAIN HOME AREA GROUND WATER AQUIFER RECHARGE DEMONSTRATION/STUDY

Background

Past ground-water studies in the Mountain Home Area reveal the depth to water in the regional aquifer is greater than 400 feet, and the aquifer has limited natural recharge. The majority of natural recharge from Canyon Creek near the City of Mountain Home moves into shallow perched aquifer(s), and little migrates downward to the deeper regional aquifer. Development through the 1970's brought about significant regional aquifer level decreases. In 1981 the Cinder Cone Butte Critical Ground Water Area, and in 1982 the Mountain Home Ground Water Management Area were established to restrict ground water use. Unfortunately, with recent years of drought contributing, the regional aquifer water levels continue to decline in certain areas, see hydrographs, page 10).

Future water availability is a concern of the Mountain Home community. Continued development of the Air Force Base and population growth in the area continue to tax the resource. During the spring of 1996 the Mountain Home Area Ground Water Advisory Committee was established, and charged with the task of developing a ground water recharge program for the area. Through a cooperative effort the US Geological Survey, the Elmore Soil Conservation District, local leaders, Mountain Home Air Force Base, and the Advisory Committee have developed a Demonstration/Study Aquifer Recharge Project for the Mountain Home area.

Project Objectives

The objectives of the project are the following:

1. Establish the perched and regional aquifer geohydrologic and water quality conditions in the Mountain Home area prior to artificial recharge.
2. Document/study the effects of artificial recharge on the perched and regional aquifer systems
3. Determine feasibility and benefits for the establishment of a long term artificial recharge program

Project Approach/Funding

It is the goal of the sponsors to make the project a cooperative local community effort. The project is being approached on 2 parallel avenues to expedite the project development; they are the following:

1. Obtain the necessary permits/easements/approvals required for the project. Once the requirements are in place, the Advisory Committee will facilitate a local recharge district to address authority, liability, and legal issues.
2. Procure the funding required for the project. The sponsor's goal is to make the project a cooperative community effort. Local voluntary contributions and grants will be the source of funding.

Recharge Method

"Two major methods of artificial recharge are injection wells and spreading basins. The use of both methods are consistent with the geohydrologic setting of greater Mountain Home area" (Young & Low, USGS). The project will utilize both methods of recharge at sites along Canyon Creek utilizing excess spring stream flow runoff, see site map, page 16. Proposed Site #1 northwest of the City of Mountain Home will utilize injection wells and a spreading basin. A preliminary geohydrology evaluation will determine the suitability of site #1; if not suitable, another site will be selected.

Sites #2A-D downstream will divert excess recharge flows into selected surface fissures and spreading basins along Canyon Creek, see attached map #1. Each site will also be evaluated for long term recharge potential to the regional aquifer.

Project Phases

The duration of the project will span over a 3-1/2 year period. It may be extended if spring runoff flows are not adequate during the recharge effort. The project will be implemented in the following phases:

Phase #1- (1 year +)

- Inventory and select monitoring wells for water level and water quality relating to the recharge sites. Construct injection and monitoring wells if existing wells are not suitable.
- Examine selected wells by camera and complete geophysical logging
- Construct creek diversion structures, settling basins, and measurement structures.
- Monitor ground water levels in selected wells 1 year prior to recharge.

Phase #2- (2 years +)

- Divert recharge water into the selected sites.
- Record/Document monitoring data for recharge rates. and aquifer water level response in established data base, USGS.
- Monitor water quality of recharge water and water in the receiving aquifers.

Phase #3- (1/2 year)

- Final summary report by USGS

↖
*Data to be stored
on USGS database?*

Project Costs

As this is a cooperative community effort, voluntary/donated resources from government agencies, businesses, individuals, etc, will be maximized. The following is the estimated cost breakdown of the project:

Phase #1-

-USGS-Labor, Equipment, O&M, Well Logging, Lab. Services, Travel & Transportation	\$ 270,900.00
-Injection-monitoring well construction well heads, etc. (subject to utilizing existing wells where possible)	\$ 180,000.00
-Measuring weirs, diversion structures, settling basins, excavation, etc.	\$ 70,000.00
-Engineering/technical services	\$ 25,000.00
-Permits/easements/insurance	\$ 10,000.00
Total	\$ 555,900.00

Phase #2-

-USGS- Labor, Equipment, O&M, Lab Services, Travel & Transportation	\$ 355,000.00
--	---------------

Phase #3-

-USGS- Labor, Publications, etc	\$ 133,600.00
10% Contingency	\$ 104,450.00
Total Estimated Cost	\$1,148,950.00*

* Estimated cost is assuming all services/materials are purchased

*Could the MHA&B
Environmental Engr.
group be involved?
USGS sucks off \$7.6M
they're very expensive.*

*I believe the
project should be
bid out. Private
consultants could
do it for a lot less.*

*Mt. Home and
MHA&B could do
a lot for themselves
by just instituting
conservation programs*

Recharge/Aquifer Monitoring

The USGS will be responsible for the collection/recording of recharge flow measurements and aquifer water level data. The following monitoring criteria will be used during the recharge demonstration/ study:

- Monitoring wells will establish perched and regional aquifer water levels before recharge occurs. This will document natural aquifer water level fluctuations, and the aquifer response to recharge. Monitoring will begin one year prior to recharge.
- Flow measurement gages will be located along Canyon Creek at recharge sites along Canyon Creek to record recharge diversions. Each injection well at site #1 will have flow measurement instrumentation.
- Recharge rates, and aquifer water levels will be recorded and data will be entered into the USGS data bases.

Water Quality

The project will adhere to water quality standards set by DEQ and IDWR. Analyses of water samples will be submitted to the Departments on a quarterly basis. The USGS will be responsible for the project water quality monitoring. The following is the water quality monitoring criteria:

- Water quality monitoring will commence 1 year prior to recharge to determine ambient and variability of water quality in the regional and perched aquifers surrounding the recharge sites. Monitoring will continue throughout the project duration.
- Water sampling sites will be established in conjunction with aquifer water level monitoring wells. Existing wells will be utilized where possible. The sampling sites will include:
 - Recharge diversion sites #1 & #2 on Canyon Creek
 - Regional aquifer observation wells upgradient and downgradient of site #1.
 - Perched aquifer observation wells upgradient and downgradient of site #1.
- Sampling frequency will be monthly, with the exception of the beginning and ending of the recharge periods, which will be weekly, phased to biweekly, and finally monthly.
- On-site Analyses of each site will be the following:
 - water temperature
 - specific conductance
 - dissolved oxygen
 - alkalinity
 - pH
 - fecal coliform bacteria
 - fecal streptococcal bacteria
- Monthly Laboratory analyses at site #1 will consist of the following:
 - common ions
 - nitrogen and phosphorus compounds
 - organic compounds
 - volatile organic compounds
 - trace elements

Evaluation of background water quality analyses of the recharge water will insure that the water is suitable for its intended use. Background water quality analyses from the receiving aquifers prior to recharge begins will document water quality changes in the receiving aquifers resulting from recharge.

Fecal coliform bacterial and fecal streptococci analyses and other on-site analyses will be completed on domestic wells located within 1/2 mile of the recharge sites. Samples will be taken at the beginning of each recharge episode and at one and two weeks intervals after the recharge is completed.

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ADDENDUM

Mountain Home Area Ground Water Advisory Committee

Chairman: Ron Hiddleston,

Vice Chairman: Brenda Zehr

Members: Forest Freer-Irrigator
Jerry Peterman-Irrigator
Ron Leydet- Commercial
David Olson-Irrigator, Elmore Soil Conservation District
Clayton Colthorp-Mountain Home Irrigation District
Calvin Ireland- Elmore County Commissioners
Paul Raymond- City of Mountain Home
Mike Pope- Mountain Home Air Force Base

Project Sponsors:

Mountain Home Area Ground Water Advisory Committee
Elmore Soil Conservation District

Participating Agencies:

Natural Resource Conservation Service (NRCS)
NRCS South West Idaho Resource Conservation and Development Council
US Geological Service
Idaho Department of Water Resources
Central District Health-Mtn. Home

AGENCY CONTACTS

EASEMENTS/RIGHT of WAYS

BLM

%Del Bale

Boise District Office

Development Ave

Boise, ID 83705

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%Bob Snapp

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334-3488

USGS

%Bill Young

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387-1341

Water Rights/Injection Wells

Water Rights

IDWR-Western Region

%John Westra

2735 Airport Way

Boise, ID 83705

334-2190

Injection Wells

IDWR-State Office

% Helen Harrington

1301 North Orchard

Boise, ID 83706

327-7950

Water Quality

DEQ

%Rob Howarth

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Boise, ID 83706-2239

373-0404

NRCS-Southwest Idaho Resource Conservation & Development Council

% Bill Moore

PO Box 397

Kuna, ID 83634

922-5140

NRCS

%Ron Blake

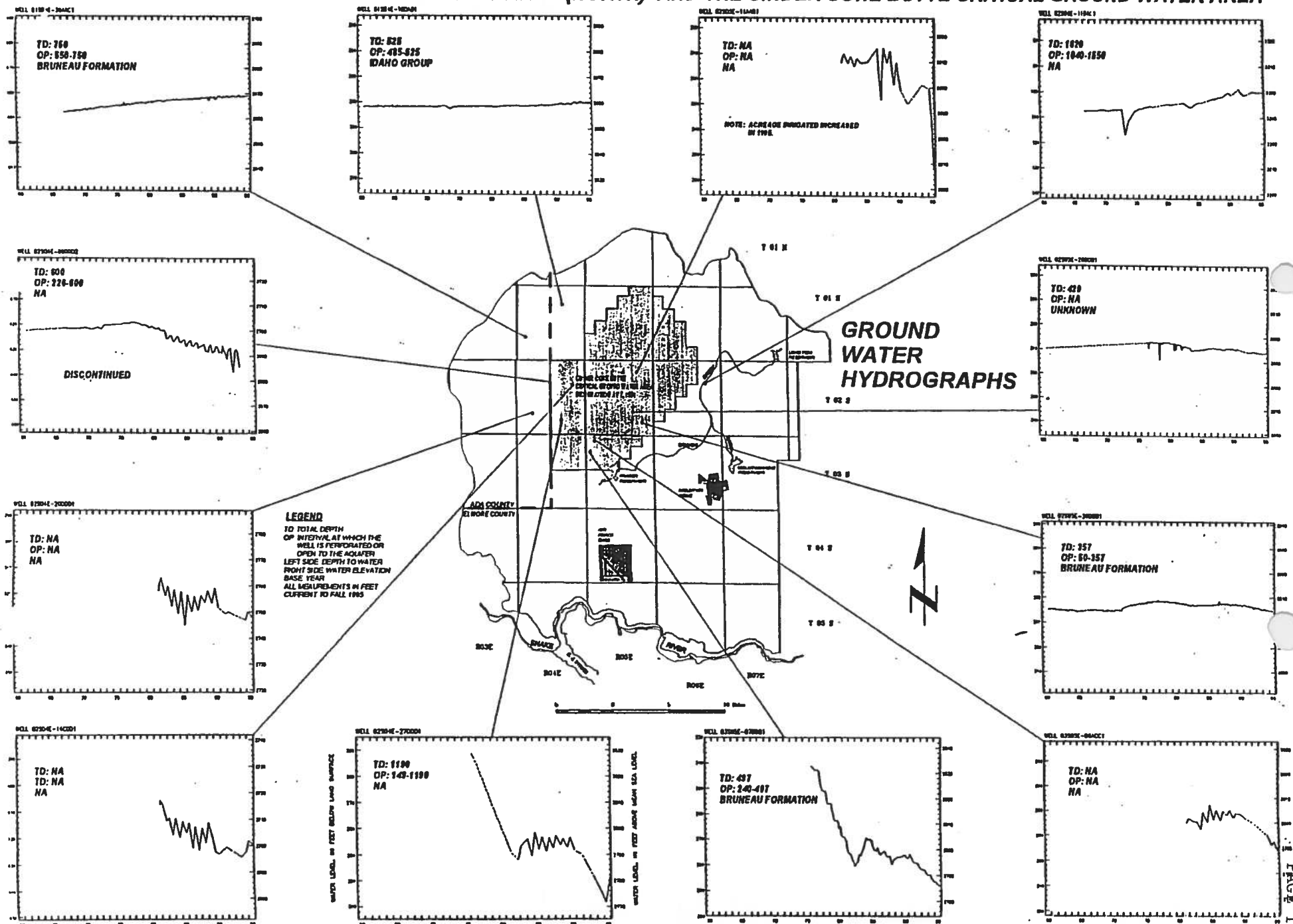
795 S Haskett

Mountain Home, ID 83647

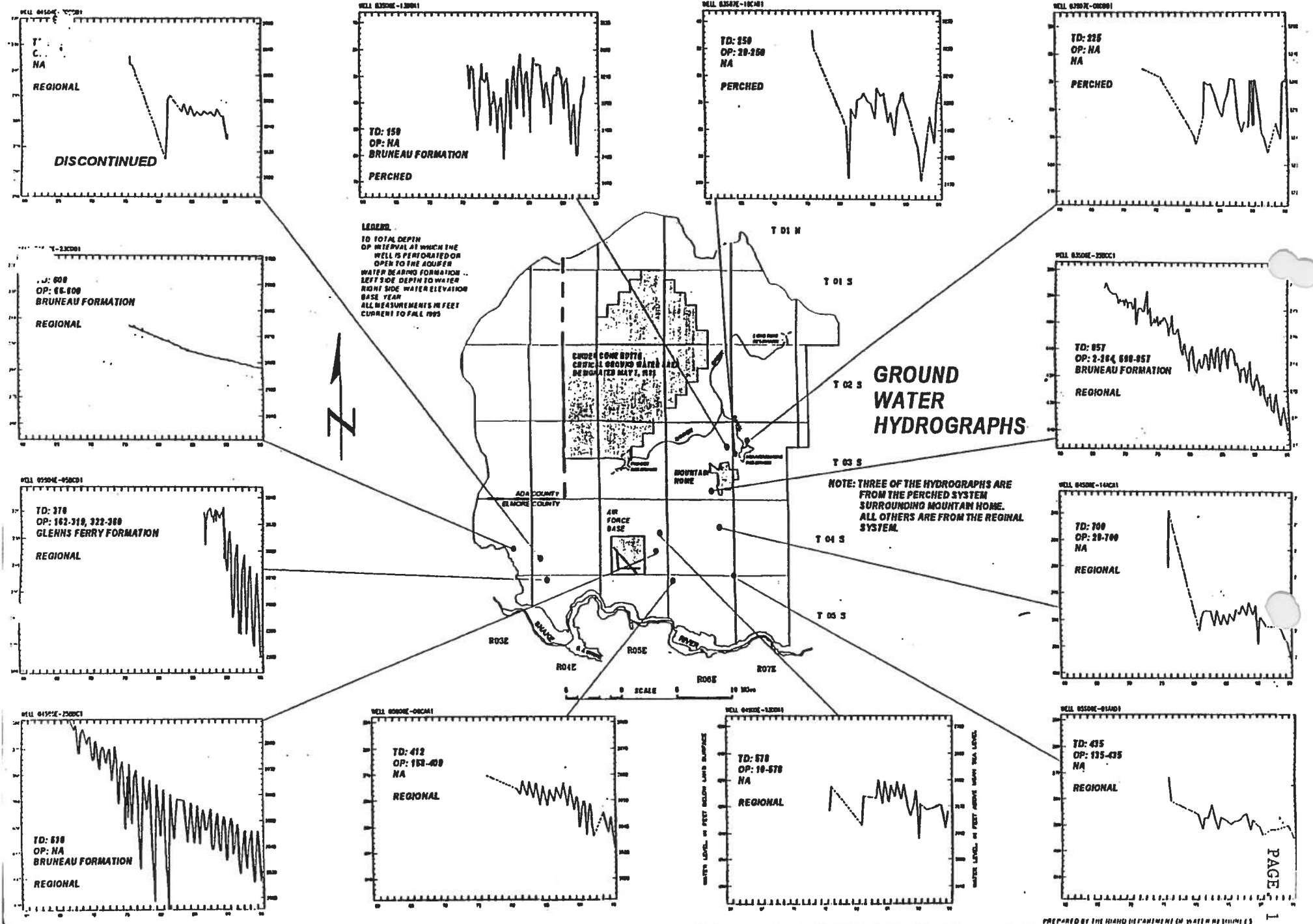
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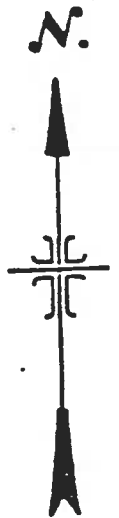
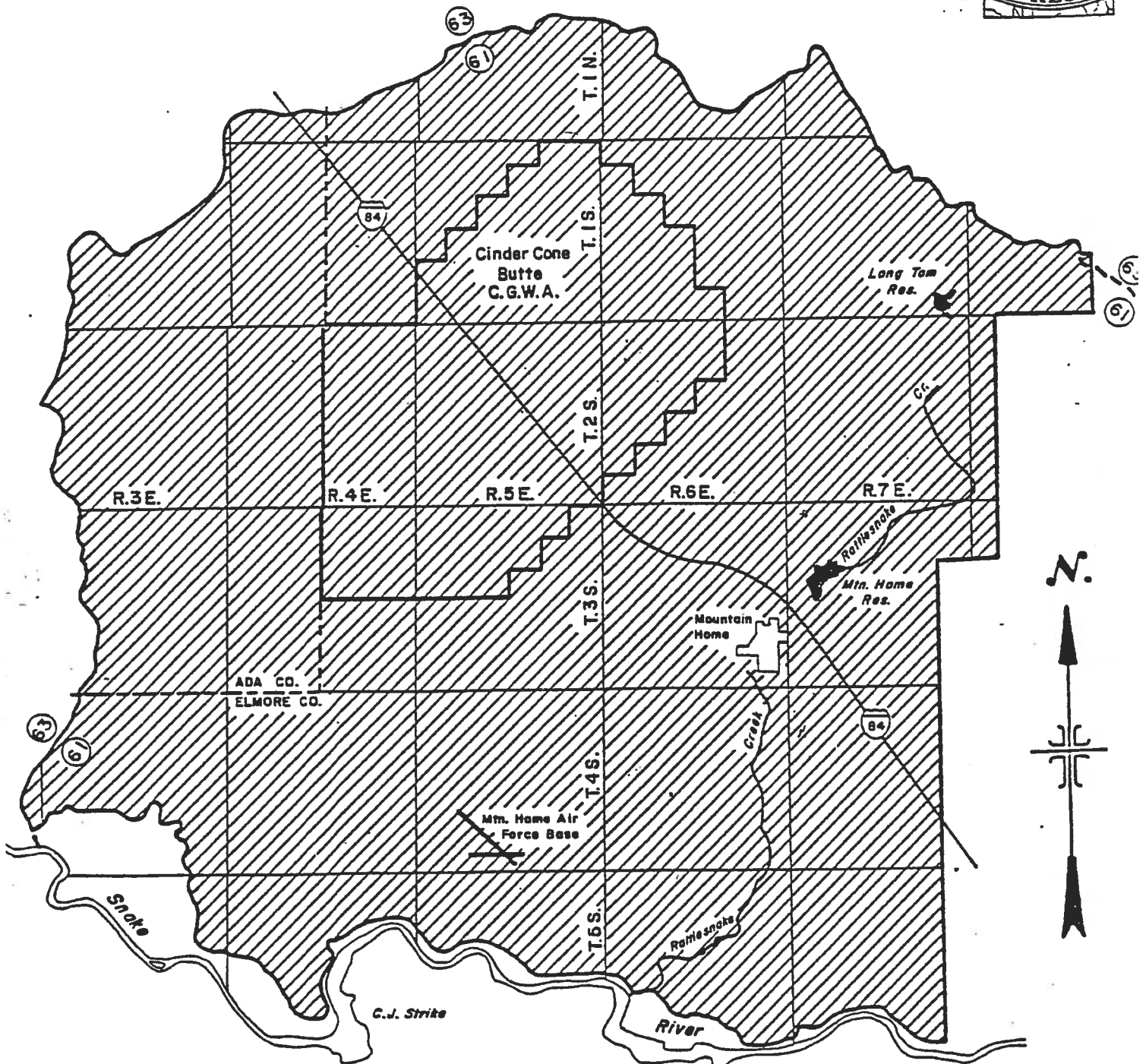
FIGURE 1.

MOUNTAIN HOME GROUND WATER MANAGEMENT AREA (NORTH) AND THE CINDER CONE BUTTE CRITICAL GROUND WATER AREA



MOUNTAIN HOME GROUND WATER MANAGEMENT AREA (SOUTH)





LEGEND

 Groundwater Area

 Hydrologic Basin No.

0 1 2 3 4 5 6
Scale

MOUNTAIN HOME GROUNDWATER MANAGEMENT AREA
(Designated Nov. 9, 1982)

UNITED STATES DEPARTMENT OF THE INTERIOR - GEOLOGICAL SURVEY - BOISE

01/23/97

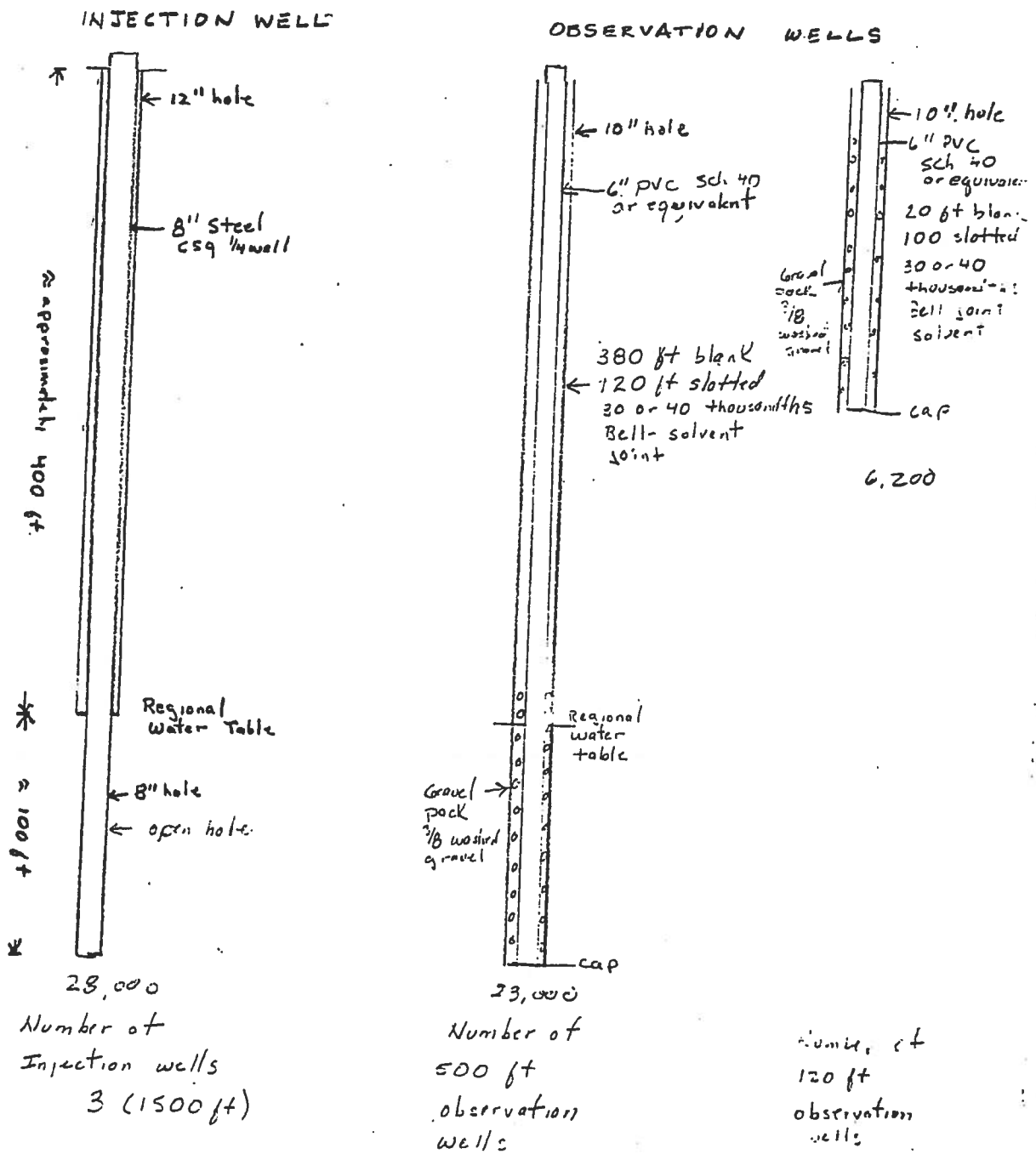
STATION NUMBER 13159800 CANYON CR AT OREGON TRAIL XING NR MOUNTAIN HOME ID STREAM SOURCE AGENCY USGS
 LATITUDE 431539 LONGITUDE 1154206 DRAINAGE AREA 0.00 DATUM STATE 16 COUNTY 039
 PROVISIONAL DATA DISCHARGE, CUBIC FEET PER SECOND, WATER YEAR OCTOBER 1995 TO SEPTEMBER 1996
 DAILY MEAN VALUES SUBJECT TO REVISION

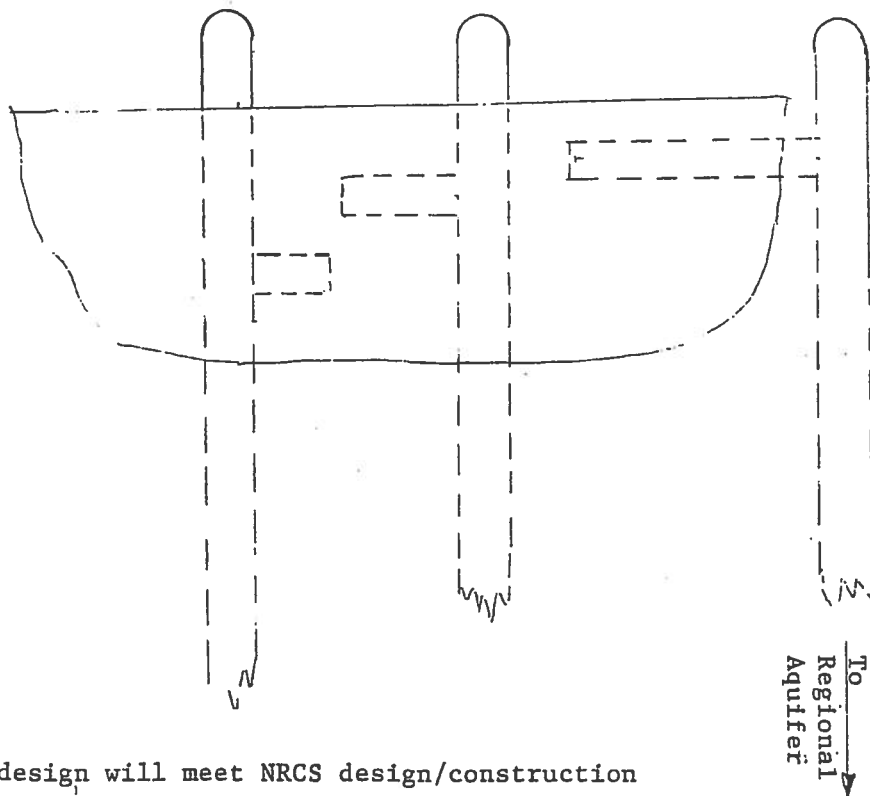
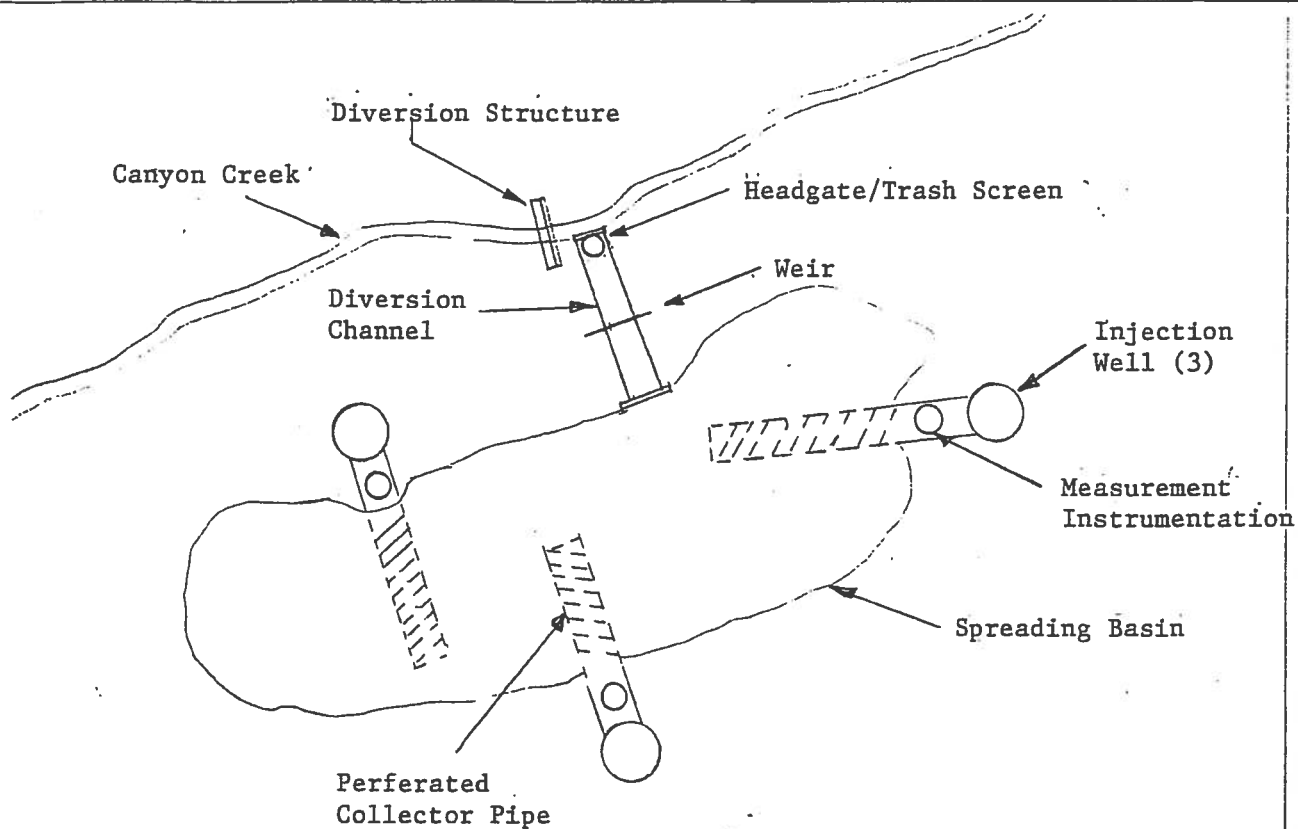
DAY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1	41	2.8	3.4	21	33	61	91	71	80	103	107	76
2	42	2.9	3.6	22	57	57	89	77	80	91	110	76
3	39	2.8	3.6	23	73	61	87	88	80	78	107	74
4	35	2.7	3.9	23	52	63	86	76	79	85	106	72
5	25	2.8	4.1	21	29	70	83	75	79	98	104	73
6	7.8	2.8	4.1	21	28	68	80	73	88	98	88	74
7	7.0	2.9	4.3	20	84	65	78	72	107	99	87	75
8	6.1	2.9	4.3	19	138	66	78	70	120	99	87	75
9	5.7	3.1	4.4	19	179	71	78	69	121	100	89	---
10	5.1	3.0	4.7	20	186	87	75	73	118	97	88	---
11	5.2	3.2	5.4	19	158	98	73	79	140	94	87	---
12	5.2	4.7	17	19	137	112	69	78	140	92	86	---
13	4.6	4.1	33	19	124	111	65	76	144	91	86	---
14	4.6	3.7	31	18	116	104	64	79	143	92	94	---
15	4.6	3.7	29	18	118	106	63	80	141	94	95	---
16	4.5	3.7	26	23	121	128	60	82	141	93	97	---
17	4.3	3.7	23	23	124	139	65	81	128	103	89	---
18	4.3	3.6	22	22	148	141	65	82	121	105	92	---
19	4.1	3.6	20	23	167	136	61	82	120	102	95	---
20	4.0	3.5	18	23	161	126	59	78	120	103	83	---
21	4.2	3.5	17	22	144	122	61	73	118	101	92	---
22	4.2	3.5	15	21	127	118	62	72	120	100	84	---
23	4.2	3.3	14	20	110	117	66	72	122	99	90	---
24	4.3	3.4	13	20	100	111	73	73	123	106	111	---
25	4.2	3.5	12	18	90	104	75	72	134	107	105	---
26	4.9	3.7	12	17	81	100	75	73	136	105	94	---
27	3.7	3.4	11	17	74	90	74	73	133	104	92	---
28	3.0	3.9	11	18	70	103	71	76	132	103	86	---
29	2.9	3.4	10	18	66	101	73	80	122	103	84	---
30	2.8	3.3	14	16	---	97	74	79	107	100	86	---
31	2.8	---	20	20	---	93	---	80	---	100	77	---
TOTAL	300.3	101.1	413.8	623	3095	3026	2173	2364	3537	3045	2878	595
MEAN	9.69	3.37	13.3	20.1	107	97.6	72.4	76.3	118	98.2	92.8	74.4
MAX	42	4.7	33	23	186	141	91	88	144	107	111	76
MIN	2.8	2.7	3.4	16	28	57	59	69	79	78	77	72
AC-FT	596	201	821	1240	6140	6000	4310	4690	7020	6040	5710	1180

CAL YR 1995 TOTAL 15861.9 MEAN 43.5 MAX 166 MIN 2.7 AC-FT 31460
 WTR YR 1996 TOTAL 22151.2 MEAN 64.4 MAX 186 MIN 2.7 AC-FT 43940

1598.00 CANYON CREEK AT OREGON TRAIL CROSSING NR MOUNTAIN HOME (CFS)

W-YR	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ANN
85	7	5	7	5	5	28	74	68	52	47	44	22	363
86	3	8	10	29	261	190	67	70	74	57	49	32	851
87	3	3	2	2	7	24	66	49	37	31	15	2	240
88	2	2	2	3	16	26	24	49	35	31	2	0	190
89	2	5	11	10	25	197	123	70	79	72	60	35	688
90	3	3	3	3	5	23	27	36	45	57	31	2	239
91	2	2	2	2	4	7	7	11	24	7	0	0	65
92	0	2	2	2	3	5	3	7	5	2	0	0	30
93	0	0	2	5	16	128	121	68	59	68	59	37	563
94	5	2	3	2	4	16	25	41	57	41	7	0	201
95	0	2	8	26	72	57	47	78	60	59	54	42	505
AVE 1985-95:	2	3	5	8	38	64	53	50	48	43	29	16	358





* Final design will meet NRCS design/construction requirements.

50 SHEETS RELEASE 5 SQUARE
100 SHEETS RELEASE 5 SQUARE
200 SHEETS RELEASE 5 SQUARE
400 SHEETS RELEASE 5 SQUARE
800 SHEETS RELEASE 5 SQUARE
1600 SHEETS RELEASE 5 SQUARE
3200 SHEETS RELEASE 5 SQUARE
6400 SHEETS RELEASE 5 SQUARE
12800 SHEETS RELEASE 5 SQUARE
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819200 SHEETS RELEASE 5 SQUARE
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3276800 SHEETS RELEASE 5 SQUARE
6553600 SHEETS RELEASE 5 SQUARE
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3450873173395281893717377931138767528400739058944101935637178859200 SHEETS RELEASE 5 SQUARE
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36185027886661311069865932815217642998603333594713706332624283154636800 SHEETS RELEASE 5 SQUARE
723700557733226221397318656304

RECHARGE SITES

SITE #1-Injection Wells and Spreading Basin
(Proposed)

SITE #2A-Fissure

SITE #2B-Fissures/Spreading Basin

SITE #2C-Fissures/Spreading Basin

SITE #2D-Frasier Reservoir

