

August 2, 2006

L54(2380)
GRTE/General

Memorandum

To: Superintendent, Grand Teton National Park

Through: William L. Jackson, Chief, Water Resources Division (WRD)
Gary Rosenlieb, Chief, Water Operations Branch, WRD

From: Larry Martin, Hydrogeologist, Water Operations Branch, WRD

Subject: Trip Report for travel to Teton Science School, July 27, 2006

Summary: There are three alternatives for a water supply at the Teton Science School:

1. Continue to use the existing spring, or redevelop the spring to improve the collection system.
2. Construct a new well at the school.
3. Extend a pipeline and electrical supply to the Moulton Well, about a mile southwest of the school.

A well constructed at the Teton Science School to a depth of 300-500 feet deep has a very good chance of providing sufficient water for the school. Several private domestic wells and one irrigation well are located within a mile of the school. All of these wells produce good-quality water from the Teewinot Formation. The Teewinot Formation underlies the school campus and is continuous from adjacent areas with wells. The location of the well on or near the campus is relatively unimportant as the target aquifer(s) will be dipping beds within the Teewinot Formation at depths of several hundred feet below ground surface.

Discussion: The current water supply for the Teton Science School is a poorly-developed spring in the middle of the campus. The “spring” is essentially a wetland area that has a small building housing the chlorinator, pumps, and storage tanks. Water is pumped from the “basement” of the building. This is a surface water source and water is treated by filtration and chlorination. The park is investigating the feasibility of constructing a well and obtaining a groundwater source as part of the rehabilitation of the water system at the school.

The Teton Science School is located adjacent to Ditch Creek where the creek flows out of Shadow Mountain into the valley in an area known as Antelope Flats. The site is called Elbo Ranch on older maps. (See Figure 1.)

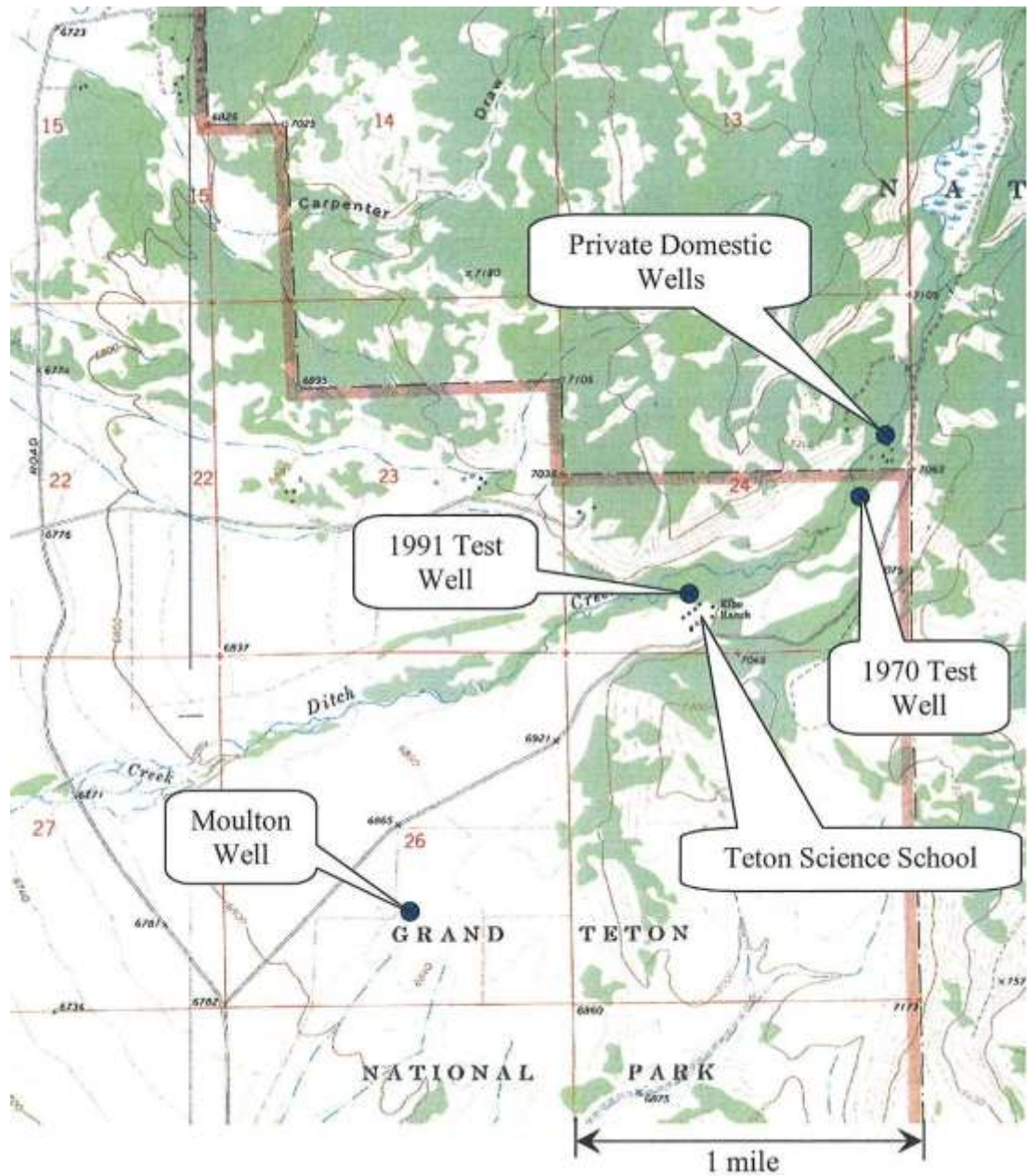


Figure 1. Location of wells in the vicinity of the Teton Science School.

The site is underlain by alluvial sediments deposited by Ditch Creek (Love, 2001). The alluvium is a poorly-sorted mixture of sand, gravel, silt, and clay that have been placed by normal stream processes. The thickness of the alluvium in the immediate vicinity of the campus is no more than a few tens of feet, making it a poor prospect as a source of groundwater. Underlying the alluvium is the Teewinot Formation, a series of limestone, claystone, and pumice beds. Several nearby wells reportedly obtain water from sandstone layers at various depths within the Teewinot Formation.

Table 1 contains a summary of well construction within a mile of the Teton Science School. All of the wells, except the Moulton Well, are located on private property about ½ mile northeast of the school. Wells in this subdivision range from 60-300 feet deep and produce 5-25 gallons per minute of good quality water, mostly from the Teewinot Formation. The Moulton Well is located on NPS property on Antelope Flats, about a mile southwest of the school. The Moulton Well also obtains water from the Teewinot Formation.

Table 1. Wells within 1 mile of the Teton Science School

Permit No. (State Engr.)	Location Twn-Rng-Sec-Qtr	Well Name	Permit Applicant	Well Depth	Static Water Depth	Yield Gpm
P109682W	43N 115W 24 SENE	BINGER #1	ANDREW BINGER	242	130	25
P15663W	43N 115W 24 SENE	CLARKE #1	L. FLOYD CLARKE	100	---	3-4
P161464W	43N 115W 24 SENE	HESKETT #1	ROBERT HESKETT	285	148	25
P28458W	43N 115W 24 SENE	WINGER #2	RICHARD N. WINGER JACK YEATES	193	114	5
P47531W	43N 115W 24 SENE	FROME #1	TED C. FROME	300	50	8
P73919W	43N 115W 24 SENE	MUDD #1	VICTORIA MUDD	126	artesian	20
P77589W	43N 115W 24 SENE	MCKEE #2	PAUL & ELLEN MCKEE	60	40	12
P89227W	43N 115W 24 SENE	CAESAR #1	ROBERT CAESAR	65	16	15
P4320P	43N 115W 26 NWSE	MOULTON #1	CLARK A. MOULTON VEDA L. MOULTON	353	197	20

NPS drilled a test well along Ditch Creek, upstream of the school in 1970. The well was 35 feet deep and was constructed with 1-inch diameter casing. The well was completed in the Teewinot Formation. Little is known about the well, but given its small diameter and shallow depth, it's likely it was constructed by the USGS to provide basic hydrogeologic information regarding groundwater in the area. A second test well was constructed on the north side of the campus, adjacent to Ditch Creek, in 1991. This well encountered Teewinot Formation at a depth of 20 feet below ground surface. Drilling continued to a depth of 124 feet, but little water was encountered and the well was abandoned because of construction problems, including a cave in of the well, which would have necessitated installing casing to continue drilling deeper.

The Teewinot Formation in this area dips toward the west at about 14°, or about 25 feet vertically per 100 horizontal feet. Figure 2 shows a schematic southwest-northeast cross-section through the area. Private water-supply wells northeast of the school obtain sufficient water from sandstone and limestone layers about 100-300 feet below ground surface. Following the dip of the formation, these water-bearing zones would lie about 1500 feet below ground surface at the Moulton Well. However, the Moulton Well obtains water from the Teewinot Formation at 200-240 feet below ground surface. Clearly there are additional water-bearing zones within the Teewinot Formation other than those encountered by the private wells northwest of the school. It is impossible to predict at what depth a well at the school will encounter enough water-bearing zones to provide the needed water, but it's likely that a 500-foot deep well would have a good

chance of intersecting several water-bearing zones. As a worst-case scenario, the same water-bearing zones supplying water to private wells ½ mile northeast of the school should be expected to occur at a depth of about 750 feet below ground surface at the school.

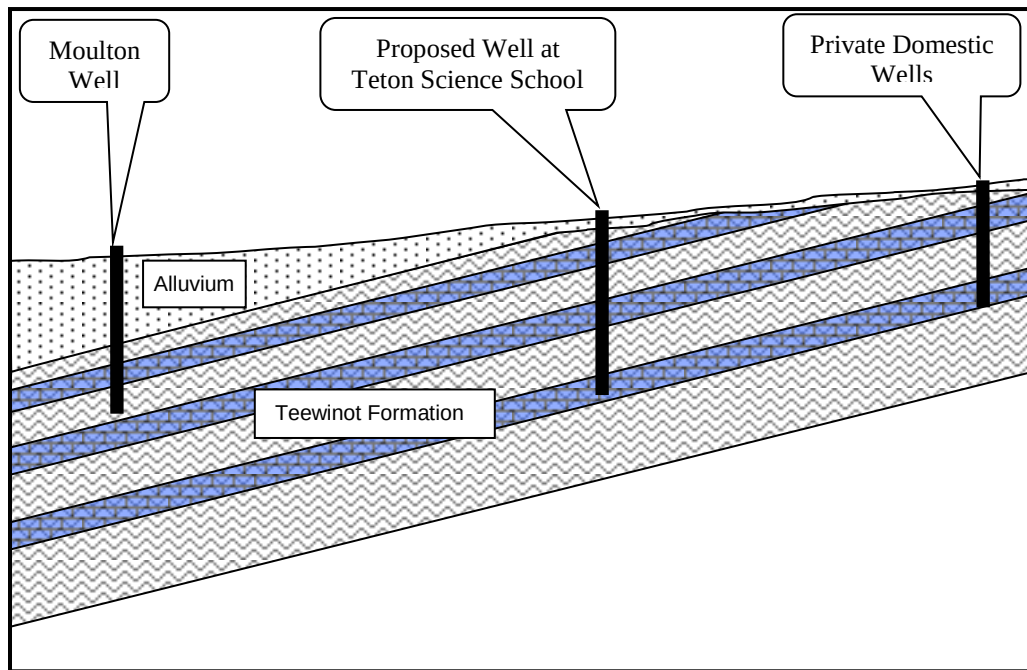


Figure 2. Southwest-northeast cross-section showing anticipated hydrogeologic conditions for a well at the Teton Science School. It is impossible to predict at what depth water-bearing zones will be encountered, or how much water will be available from each water-bearing zone. All of the wells that have been constructed in the area have encountered water-bearing zones within 300 feet of land surface.

The USGS proposed drilling a water-supply well at Elbo Ranch in a letter to NPS dated April 24, 1972. This letter identified the Teewinot Formation as the target aquifer and speculated that a well at this location might need to be 250 feet deep. Apparently no well was constructed at that time. Cox (1974) identified the Teewinot Formation as being a potential source of up to 100 gpm from fractures and solution channels in limestone beds in the formation.

An alternative to drilling a new well at the school is to utilize the Moulton Well located about a mile to the southwest. That well was drilled in 1963 as a source for stock and domestic use by Clark Moulton. The well is reportedly 353 feet deep and produced 20 gpm. The well was drilled through alluvium from 0-111 feet, and Teewinot Formation from 111-353 feet. The water bearing zone was from 200-240 feet below ground surface. Below 240 feet, the formation was mostly clay and bentonite. If there is further interest in using this well as the water source for the school it should be redeveloped, tested for drawdown and yield characteristics, and sampled for water quality.

If there are any questions regarding this trip report, please call me at (970)-225-3515.

References

Cox, Edward R., 1974, *Water Resources of Grand Teton National Park, Wyoming*, USGS Open-File Report 74-1019, 114 pp.

Love, J. David, 2001, *Geologic Map of the Shadow Mountain Quadrangle, Teton County, Wyoming*, Wyoming State Geological Survey, Map LMS-7

Wyoming State Engineer's Office, 2006, records of water well construction accessed at <http://seo.state.wy.us/wrdb/index.aspx>

cc:

GRTE – Bob Wemple, Chris Finley, Rodney Booth, Ed Trigg, Tom Bail, Sue O'Ney
1211– Janet Wise, John Reber

A new well was constructed at the school in 2007. The well is at the southeast part of the developed area.



STATE OF WYOMING
OFFICE OF THE STATE ENGINEER
HERSCHLER BLDG., 4-E
CHEYENNE, WYOMING 82002

(307) 777-6163

STATEMENT OF COMPLETION AND DESCRIPTION OF WELL OR SPRING

NOTE: Do not fold this form. Use typewriter
or print neatly with black pen.

PERMIT NO. U.W. 180903 NAME OF WELL/SPRING TSS-2, TETON SCIENCE SCHOOL

1. NAME OF OWNER GRAND TETON NATIONAL PARK

2. ADDRESS PO BOX 170

☐ Please check if address has changed from that shown on permit

City MOOSE State Wyoming Zip Code 83012 Phone No. 307-739-3350

3. USE OF WATER ☐ Domestic ☐ Stock Watering ☐ Irrigation ☐ Municipal ☐ Industrial ☒ Miscellaneous
☐ Monitor or Test ☐ Coal Bed Methane Explain proposed use (Example: One single family dwelling)

4. LOCATION OF WELL/SPRING SE 1/4 SW 1/4 of Section 24 T, 043N R, 115W, of the 6th P.M. (or W.R.M.)

GPS Coordinates UTM Zone Easting Northing

Subdivision Name Lot Block

If surveyed, bearing, distance and reference point

Longitude (degrees, minutes, seconds) 110° 35' 44.94" Latitude (degrees, minutes, seconds) 43° 40' 12.66"

Datum ☐ 1927 ☒ 1983 Source: ☐ GPS ☐ Map ☐ Survey

5. TYPE OF CONSTRUCTION ☒ Drilled Air Rotary ☐ Dug ☐ Driven ☐ Other

(Type of rig, and fluid used, if any)

Describe

6. CONSTRUCTION Total depth of well/spring 200.00 ft.

Depth of static water level 30.13 ft. (below land surface) Casing height 2.00 ft. above ground

a. Diameter of borehole (bit size) 7.88 inches

b. Casing schedule ☒ New ☐ Used Joint type ☐ Threaded ☐ Glued ☐ Welded

8.00 diameter from 0 ft. to 80.000 ft. Material Steel - Other Gage .250

6.00 diameter from 0 ft. to 187.000 ft. Material Steel - Other Gage .250

c. Cemented/grouted interval, from 0 ft. to 30.00 ft.

Amount of cement/grout used 10 SX/8 SX type Cement/Bentonite

(example: 10 sacks) (example: bentonite pellets)

d. Type of completion ☒ Factory screen ☐ Open hole ☐ Customized perforations

Type of perforator used

Size of perforations inches by inches.

Number of perforations and depths where perforated

perforations from ft. to ft.

perforations from ft. to ft.

Open hole from ft. to ft.

Well screen details

Diameter 6.000 slot size 0.060 set from 185.000 ft. to 195.000 ft.

Diameter slot size set from ft. to ft.

e. Well development method How long was well developed?

f. Was a filter/gravel pack installed? ☒ Yes ☐ No Size of sand/gravel 6-9 Sand

Filter/gravel pack installed from 80.00 ft. to 200.00 ft.

g. Was surface casing used? ☒ Yes ☐ No Was it cemented in place? ☐ Yes ☒ No

Surface casing installed from 0 ft. to 30.00 ft.

7. NAME AND ADDRESS OF DRILLING COMPANY THOMAS DRILLING LLC 131 ROCKY ROAD

8. DATE OF COMPLETION OF WELL (including pump installation) OR SPRING (first used) 09/10/07

9. PUMP INFORMATION Manufacturer AQUA DUTY Type Submersible

Source of power Electricity Horsepower 1 Depth of pump setting or intake 160 ft.

Amount of water being pumped 90 gal./min. (For springs or flowing wells, see item 10)

Total volumetric quantity used per calendar year. 5 acre-feet

10. FLOWING WELL OR SPRING (Owner is responsible for control of flowing well)

If artesian flow or spring, yield is 0 gal./min. Surface pressure is lb./sq.inch, or feet of water.

The flow is controlled by: ☐ Valve ☐ Cap ☐ Plug

Does well leak around casing? ☐ Yes ☒ No

Permit No. U.W. 180903 Book No. Page No.

SEE REVERSE SIDE

11. IF SPRING, HOW WAS IT CONSTRUCTED? (Some method of artificial diversion, i.e., spring box, cribbing, etc., is necessary to quality for a water right)

12. PUMP TEST Was a pump test conducted? ☒ Yes ☐ No

If so, by whom **THOMAS DRILLING**

Yield 90 gal./min. with 7.87 ft. drawdown after 24 hours

Yield _____ gal./min. with _____ ft. drawdown after _____ hours

13. LOG OF WELL Total depth drilled 200.00 ft.

Depth of completed well 200.00 ft. Diameter of well 6.00 inches

Depth to first water bearing formation 90.00 ft.

Depth to principal water bearing formation Top 190.00 ft. to Bottom 200.00 ft.

Land surface elevation (ft. above mean sea level)

Datum ☐ 1929 ☐ 1988

How determined ☐ Map

☐ Altimeter☐ Survey ☐ Other

DRILL CUTTINGS DESCRIPTION

[illegible]

14. DOES A GEOPHYSICAL LOG ACCOMPANY THIS FORM? ☐ Yes ☒ No

- ## 15. QUALITY OF WATER INFORMATION

Does a chemical and/or bacteriological water quality analysis accompany this form?

☐ Yes ☒ No

It is recommended that chemical and bacteriologic water quality analyses be performed and that the report(s) be filed with the records of this well (contact Department of Agriculture, Analytical Lab Services, Laramie, 742-2984).

If not, do you consider the water as ☒ Good ☐ Acceptable ☐ Poor ☐ Unusable

REMARKS

Water will be distributed to 20 cabins on the Teton Science School campus and a main lodge. Water will be used for typical domestic use such as bathrooms and kitchen. The main lodge has showers and bigger kitchen facility. Surface casing is installed and seal installed.

Under penalties of perjury, I declare that I have examined this form and to the best of my knowledge and belief it is true, correct, and complete.

GRAND TETON NATIONAL PARK

Signature of Owner or Authorized Agent

Date _____

FOR STATE ENGINEER'S USE ONLY

Permit No. U.W. 180903

Date of Receipt **December 16** , 20 **10**Date of Approval **February 29**, 20 **12**

Date of Priority **April 4** 20**07**

Patrick T. Tyrrell, State Engineer

**Teton Science School
90 GPM, 24 Hours**

