

Hydro Logic, Inc.

1002 W. Franklin Street, Boise, ID 83702 (208) 342-8369, (Fax) 342-3100, hydrologic@qwest.net

RECEIVED

June 10, 2004

JUN 11 2004

DEPARTMENT OF
WATER RESOURCES

Mr. Gary Spackman, Bureau Chief
Water Allocation Bureau
Idaho Department of Water Resources
1301 North Orchard Street
Boise, Idaho 83720

Subject: City of Meridian Permit No. 63-12378 Beneficial Use Field Report

Dear Gary:

Under cover of this letter, I submit the Beneficial Use Field Licensing Report for the City of Meridian's water right Permit No. 63-12378. The following documents are attached and should be considered part of the report:

- 1) Location map of the point of diversion (USGS topographic series base map).
- 2) Map of the City of Meridian water supply service area with well locations.
- 3) Five page field report form.
- 4) Photographs of the water distribution plumbing and pump house.
- 5) Installed pump performance curve.
- 6) Photographs of flow and pressure measurement instruments.
- 7) Hydrograph of the Meridian Well #19 discharge rate during July 2003.
- 8) Hydrograph of a constant-discharge flow test of the #19 well on May 3rd, 1998.
- 9) Flow-meter installation specifications.
- 10) The approved Permit No. 63-12378.
- 11) This cover letter.

In addition to the recommendations of the field report, several of the Permit's conditions are in need of revision. These are discussed individually below:

- 1) Condition No. 7.
 - a. This condition was originally implemented as a consequence of the 1993 statewide moratorium of new water right appropriations.
 - b. In recent years, similar conditions, and the underlying reasons for their being placed as conditions of approval on the City's water right Permits, have been resolved and in all prior cases, removed during the licensing process so as to not be a condition on the resultant water right license.
 - c. It is recommended that Condition No. 7 be eliminated from the License.
- 2) Condition No. 8.
 - a. Refer to the narrative under Condition No. 7 above.
 - b. It is recommended that Condition No. 8 be eliminated from the License.

3) Condition No. 10.

- a. It is recognized by the evolving thought on municipal water rights, that municipalities often are required to serve outside of their incorporated "City Limits".
- b. A changing and growing water service area is now generally accepted as part of a municipal water right and recent License approvals by IDWR reflect this.
- c. It is recommended that the place of use be described as "the Municipal Water Service Area of the City of Meridian, Idaho".

4) Condition No. 11.

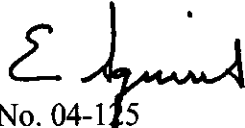
- a. Refer to the narrative under Condition No. 7 above.
- b. The City enforces its ordinances requiring surface water pressurized irrigation of subdivision lots. On certain times of the year and during drought periods, surface water is not always available. In these instances, water users, including residences with irrigated acreage exceeding ½ acre, may want to irrigate with water from the municipal water supply system. municipal
- c. It is recommended that Condition No. 11 be eliminated from the License.

5) Condition No. 12.

- a. Condition No. 12 lists the water bearing zone to be appropriated as 600-to-800 feet.
- b. The water-bearing aquifer zone into which the Meridian Well #19 is sealed and completed includes the depth range of 500-to-732 feet below ground level (See Attachments).
- c. The completion interval of the Well #19 does not co-mingle aquifer units of differing head or chemistry.
- d. It is recommended that Condition No. 12 either be eliminated from the License or that the Condition No. 12 be amended to read "The water-bearing aquifer zone to be appropriated is the depth interval from 500-to-732 feet below ground level".

Please call me directly at (208) 342-8369 with any questions that you, or your staff, may have concerning this submittal. Thank-you.

Respectfully,


Ed Squires CWRE No. 04-115

c: Gary D. Smith, P.E., City of Meridian Public Works Director
Rick A. Clinton, City of Meridian Water Department Superintendent

[illegible]

3. **Delivery System Diagram:** Indicate all major components and distances between components. Indicate weir size / ditch size / pipe I.D. as applicable.

See attached sheets, appendices, and figures:

XX Copy of USGS Quadrangle Attached showing location(s) of point(s) of diversion and place(s) of use (Figures 1 & 2).

___ Aerial Photo Attached (required for irrigation of 10+ acres).

XX Photos of Diversion and System Attached (Figures 3 and 4)

4.

Well or Diversion Identification No.*	Motor Make	Hp	Motor Serial No.	Pump Make	Pump Serial No. or Discharge Size
City Well #19	U.S. Electrical Motors	125	B09-1015783-002R-1	National Pump Company M14HC ? stages – full trim impellers	SN = 3-0067 10-inch discharge
	1785 rpm		High Thrust		
	3 phase				

**Code to correspond with No. on map and aerial photo*

D. FLOW MEASUREMENTS

1.

Measurement Equipment	Type	Make	Model No.	Serial No.	Size	Calibration Date
McCrometer	Propeller	OT110	7000-001	98-00979	10-inch	10/19/98
	w/ veins		Meter # 98-7687-10			(at 690 rpm fs)
			0-3,000 gpm scale			
			779,259,000 gallons			

2. **Measurements:** Discharge measurements for this examination were made using the impeller flow-meter listed above (Figure 3). The minimum piping installation recommendations of the manufacturer (Appendix A) were met because more than 5 pipe diameters of straight-run pipe, without obstructions, are available upstream of the meter. The Model E7000 meter does have integral straightening vanes which greatly compensate for any irregularities that could cause turbulent flow. According to the Engineering Department at McCrometer, if turbulent flow (which could cause meter inaccuracy) was present within the flow stream, the instantaneous flow rate needle would fluctuate erratically. This was not observed to be the case, and because measured drawdown and specific capacity data agree with the readings and previous data, there are no reasons to suspect the instrument's accuracy. Water level measurements were obtained using a recently calibrated (to a steel tape) and disinfected "Powers" electric sounder and pressure readings were checked using a brace of high-quality Ashcroft gages (Figure 4).

E. NARRATIVE/REMARKS/COMMENTS

The field examination for this permit was carried out on June 9, 2004 by Ed Squires, accompanied by Mr. Jamie Allen and Bill Valley of the City of Meridian Water Department. The Meridian #19 well is housed inside of a 32-foot by 16-foot wood-frame pump house (Figure 5). The 18-inch diameter well is equipped with a National Pump Company, Model M14HC deep well, water-lubricated, line-shaft turbine pump (Figure 6) set on 50-feet of 10-inch column with a 10-foot long pump/ intake assembly. The design point of the pump is 1550 gallons per minute (gpm) at 250-feet of total dynamic head (Figure 6) at its highest efficiency of 83%. The motor is coupled to a Toshiba variable frequency drive that can overspeed the motor by about 30 rpm. The pump is driven by a 125 hp, 480 volt, 1785 rpm, U.S. Electrical Motors – High Thrust motor (Figure 7). The 10-inch diameter discharge- piping is comprised of a series of 10-inch plumbing fittings and fixtures, including a swing-check valve, tees, couplings, flow-meter, and control valve (Figures 3 and 8) prior to exiting through the pump-house floor.

When we arrived on-site, the well pump was not operating. The day was overcast and unseasonally cold and windy. According to Mr. Allen, the well was not in use because of the cool weather and because other system wells (Well #24) were able to supply the current water demand. He mentioned that the system pressure could increase to unacceptable levels if too many well pumps were to be running at the current (low) level of water demand. Jamie offered to take the time to manipulate the system and to turn off Well #24 so that Well #19 could run at its maximum capacity but I indicated that that would not be necessary. This well is a flowing artesian well with an above-ground pressure head. The installed pressure gage on the well head was reading 12 psi when we arrived. Using a brace of calibrated gages (Figure 4) I measured 6.5 psi on the well head measuring point (Figure 8) which is equal to a non-pumping water level in the well of 17.3 feet above pump house floor. Water-level measurements are facilitated through a 2-inch diameter vent pipe measuring port protruding from the concrete thrust block (Figure 8). An oil-filled pressure gage in the mainline was reading 76 psi system line pressure; a reading that was substantiated by an in-line digital pressure read-out on the variable frequency drive unit (Figure 9) of 76 psi. The operators activated the well pump and turned the well into the distribution system. Owing to the low demand situation and elevated system pressures, Mr. Allen did not want to run the well at more than 1,900 gpm (Figure 10). According to water-level information measured by the City during summer 2003, the Well #19 discharged at 2,000 gpm on a daily basis (Figure 11). Using the pump performance curve (Figure 6), the specific capacity data (from pumping water level measurements), and assuming operating system pressures in the mid 70's psi range, the well and pump are certainly capable of producing the water right amount. The on-site measurements taken as a course of this examination demonstrate that the installed pumping plant is operating according to its design specifications and the pump curve.

RECOMMENDATIONS:

With the installed pumping plant and well head plumbing configuration, the well appears to produce at a variable range between 300-to-2,100 gpm depending on the line pressure in the water mains and demand placed upon the water system. Therefore, I recommend that the City of Meridian municipal water right No. 63-12378 be licensed for its requested diversion rate of 4.5 cfs (2020 gpm).

Have conditions of permit approval been met? X yes no

F. FLOW CALCULATIONS

_____ Additional Computation Sheets Attached

Measured Method:

Instantaneous flow rates are based on field-observed readings of high-quality, relatively new (1st in service summer 1999), propeller-type flow-meter installed as recommended by the manufacturer. These readings are supported by: 1) discussions with the pump operators responsible for upkeep of the well, 2) by measured (this exam) operating conditions and pump performance curve, and 3) by the well-documented capacity of the City's #18 groundwater well during previous pumping tests. Using measurements I obtained during a six-hour, 1,200 gpm, constant-discharge pumping test (Figure 12), I calculated a specific capacity for the well of 71 gallons per minute per foot of drawdown using only the natural artesian pressure head of the aquifer (no installed pump) in May of 1998. Using the measured specific capacity of this examination, it is apparent that the capacity of the well has not diminished in the 7 years since the well was first tested. Using the calculated specific capacity of 71 gpm/ft, the pumping lift at 2020 gpm should be about 13.5 feet below measuring point (total drawdown of 27 feet minus the above discharge artesian pressure of 15 feet). Using a reasonable system operating pressure range of 60-to-70 psi, the total dynamic head the Well #19 pump must operate against would be 154-to-177 feet. Dividing the TDH between the 3-stage pump yields about 59 feet per stage which equates to 2020 gpm on the pump performance curve (Figure 6). Given the tremendously high specific capacity of this well (71 gpm/ft) only 1.7 feet of additional drawdown would be required, or about ½ psi less of system pressure, would be needed to produce the additional 120 gpm over the observed discharge rate of the field exam. Therefore, the observed, calculated, and recommended maximum flow rates for the well appear to be justified.

Specific capacity = discharge/drawdown = 1,900 gpm/27 feet = **70 gpm/ft**

Drawdown (at flow rate) = flow rate/ specific capacity = 2,020 gpm/ 70 feet = **29 feet**

Total lift = drawdown + static water level = 27 feet – (+ 15 feet) = **12 feet**

System head = line pressure X 2.31 feet/psi = 76 psi X 2.31 psi/ft = **176 feet**

Total dynamic head = pump lift + system pressure + column/pipe/fitting losses = 12 + 176 + 5 = **~193 feet**

Total head per pump stage = total dynamic head / number of stages = 193 / 3 = **~64 feet**

From pump performance curve (Figure 6), flows would range between 1,920-to-2,020 gpm at system pressures between 68-to-76 psi at the rated constant speed of the installed pump. Over-speeding of the pump using the variable frequency drive could theoretically allows flows somewhat higher than 2,020 gpm in this well.

G. VOLUME CALCULATIONS

1. Volume Calculations for Irrigation:

$V_{I.R.} = (\text{Acres Irrigated}) \times (\text{Irrigation Requirement}) =$

$V_{D.R.} = [\text{Diversion Rate (cfs)}] \times (\text{Days in Irrigation Season}) \times 1.9835 =$

$V = \text{Smaller of } V_{I.R.} \text{ and } V_{D.R.} =$

B

2. Volume Calculations for Other Uses:

Not applicable to a municipal water right.

H. RECOMMENDATIONS

1. Recommended Amounts

Beneficial Use	Period of Use From	To	Rate of Diversion Q (cfs)	Annual Volume (afa)
<u>Municipal</u>	<u>Jan 1.</u>	<u>Dec. 31</u>	<u>4.50 cfs</u>	<u>N/A</u>
Totals:			<u>4.50 cfs</u>	<u>N/A</u>

2. Recommended Amendments

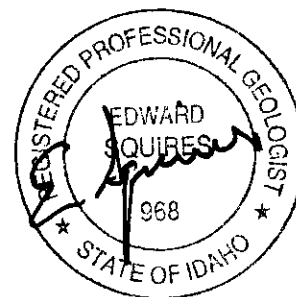
☐ Change P.D. as reflected above ☐ Add P.D. as reflected above ☐ None
☐ Change P.U. as reflected above ☐ Add P.U. as reflected above ☒ Other (see attached cover letter)

I. AUTHENTICATION

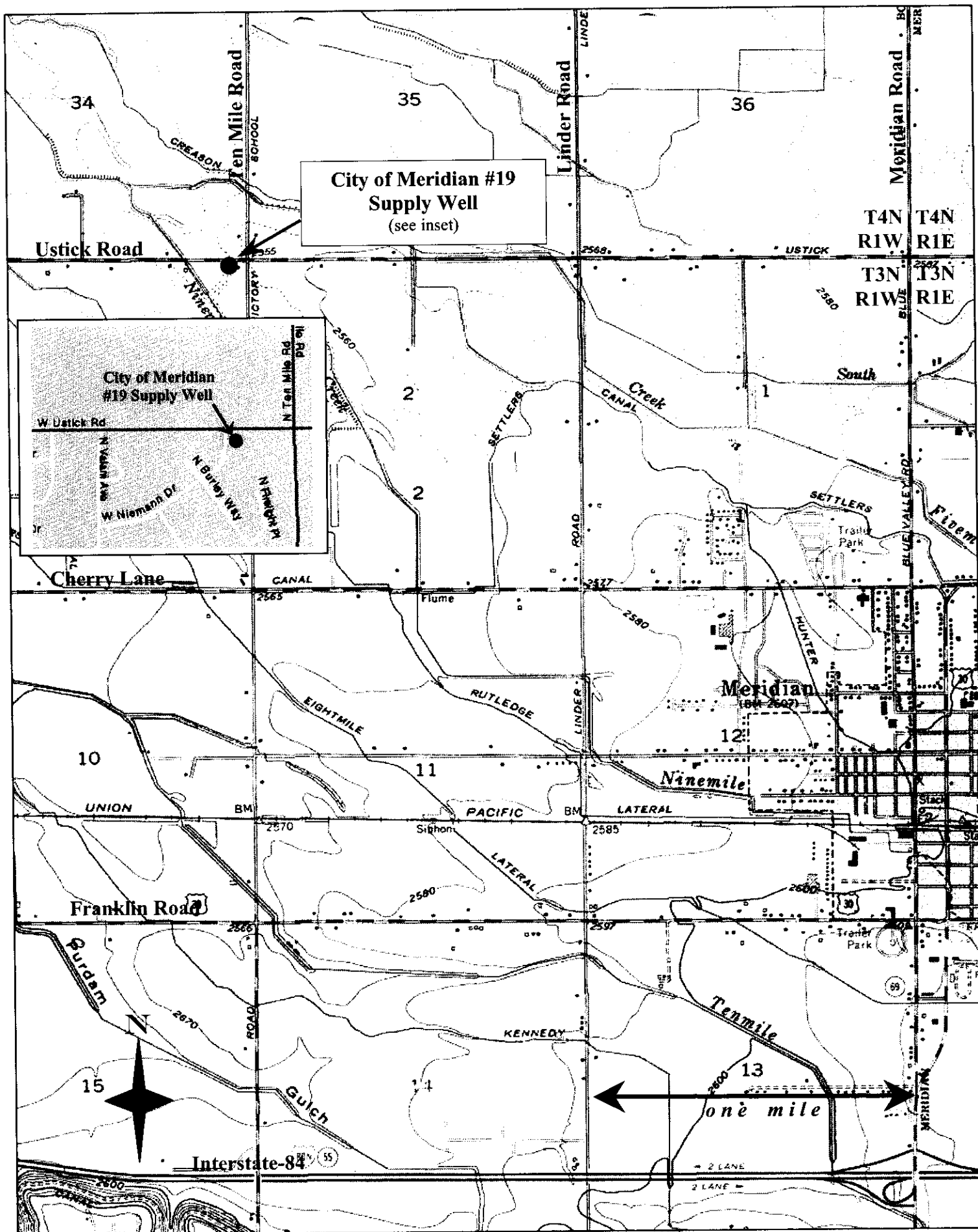
Field Examiner's Name Edward Squires CWRE No. 04-125 Date June 10, 2004

Reviewer _____ Date _____

SEAL



FIGURES



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Boise, Idaho

Figure 1.

Meridian Area of Impact 2004

Figure 2.

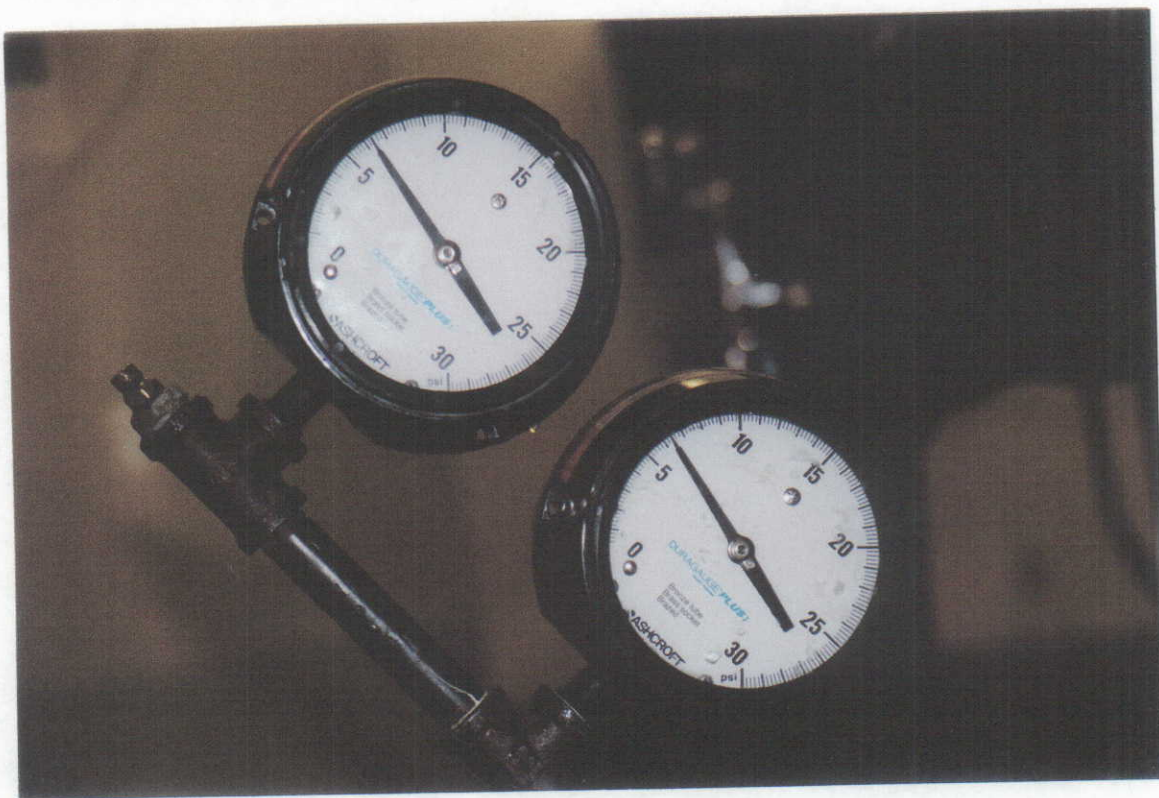
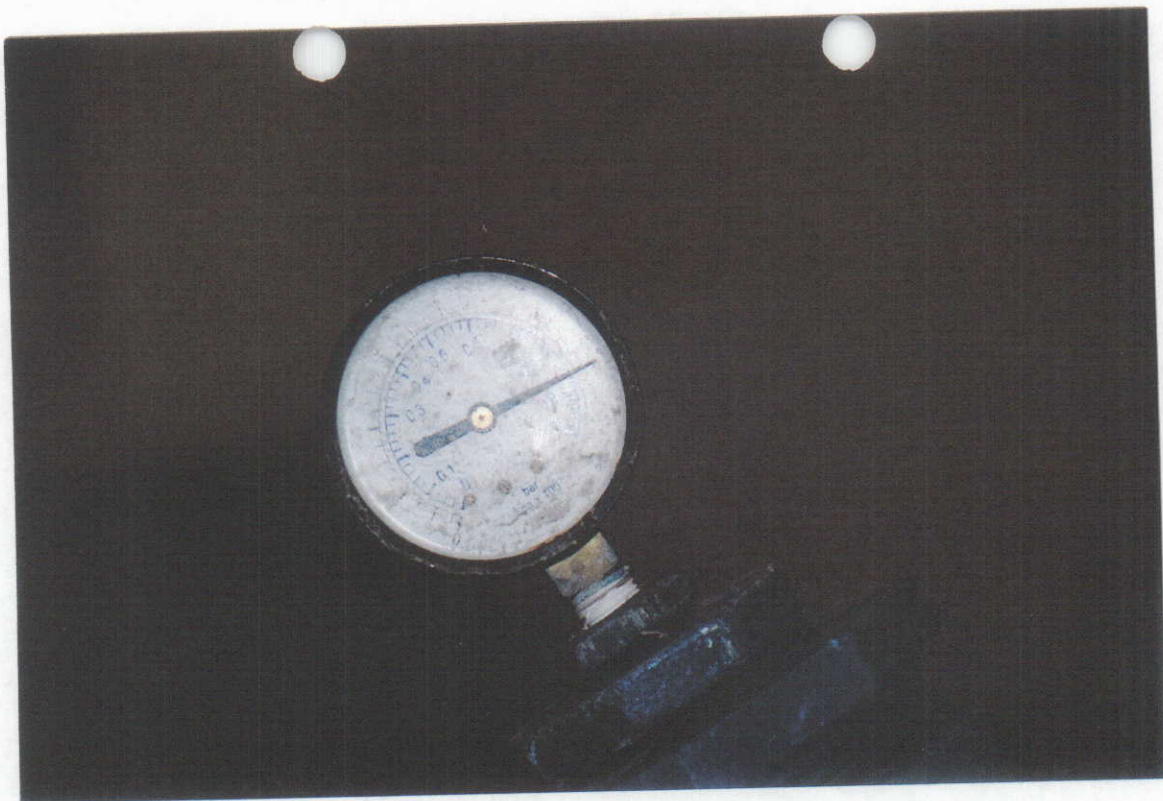


Figure 4. Photographs of pressure gages use to indicate the artesian (above ground) pressure head of the aquifer unit into which the Meridian Well #19 is completed and sealed. The installed gage was reading 12 psi with the well pump not operating (upper photo). The lower view depicts the brace of Ashcroft calibration gages used to measure the actual piezometric head prior to activating the pump. The gages were installed to the same measuring point on the well head (2.3 feet above the pump house floor). The two gages indicate 6.5 psi or 15 feet of head above the measuring point (17.3 feet above the floor). The installed gage was found to be defective and it was replaced.

Figure 4.



Figure 3. Photographs of the well head plumbing inside of the Meridian Well #19 pump house showing the configuration and specifications of the installed totalizing flow-meter.

Figure 3.



Figure 5. Photographs of the exterior of the Meridian Well #19 pump house. The upper view looks generally east at the west and south walls and the lower photo is to the southeast showing the north and west walls of the structure. Visible in the lower picture are: 1) the artesian bypass/pump-to-waste flushing discharge pipe, the roof-access hatch positioned over the well, and the well lot located on the southeast corner of the intersection of West Neimann Drive and Ustick Road.

Figure 5.

PERFORMANCE BASED ON
PUMPING CLEAR, FRESH
NON-AERATED WATER AT
85° F. MAXIMUM.

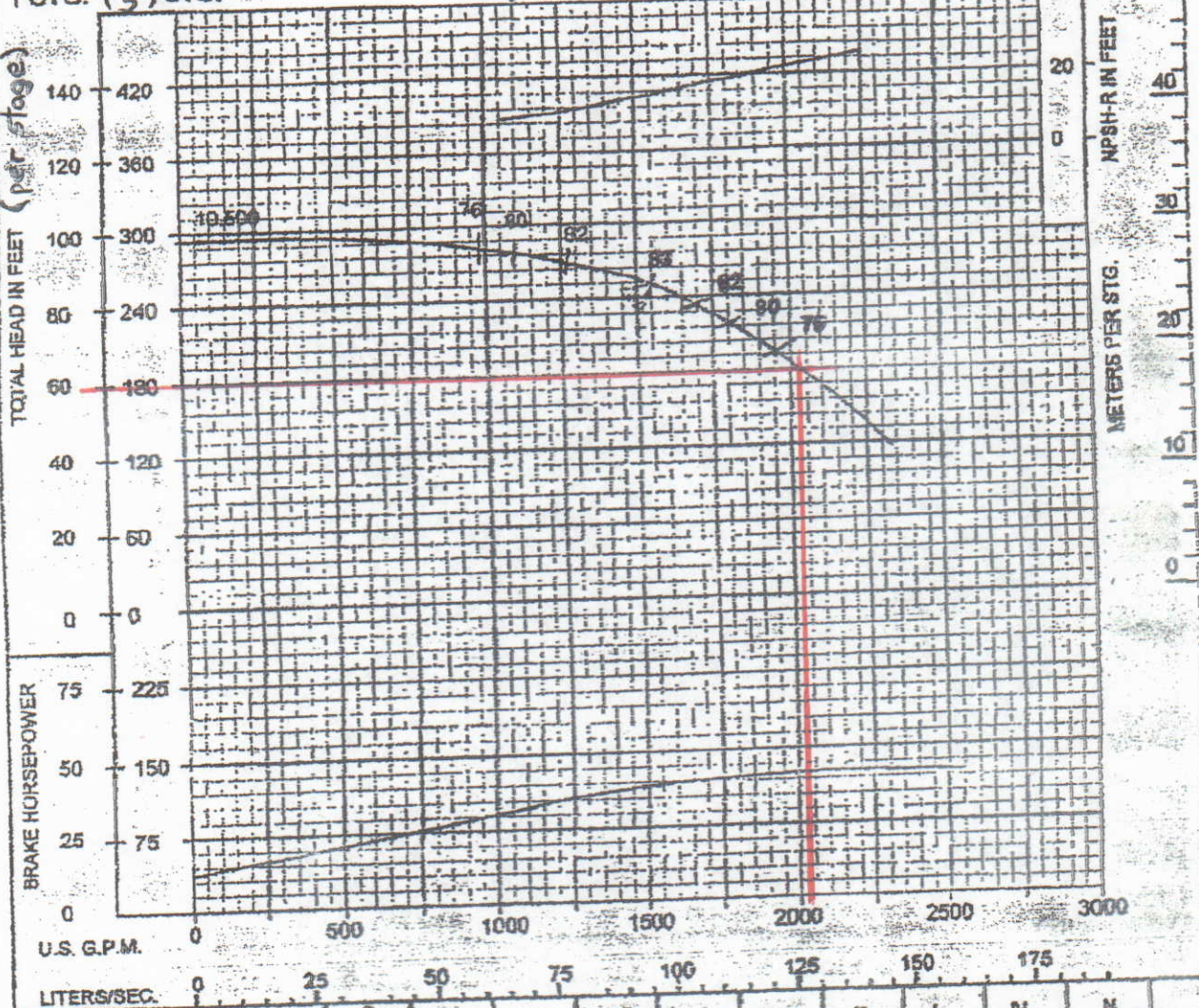
**NATIONAL PUMP
COMPANY**

M14HC
1770 RPM

CHANGE EFFICIENCY AS FOLLOWS	NUMBER OF STAGES	1	2	3
	NUMBER OF POINTS	-2	-1	0

DESIGN G.P.M. 1550 TDH 250 BPH 118 EFF. 83
PUMP TECH.
CERTIFIED CURVE BY: *[Signature]* 10/9/96

1 STG. (3) STG.



DIMENSIONS IN INCHES	A	B	C ADD. STG.	E	F	G	H	J	K	L	M	N
	14.25	5.44	13.25	10.0	11.25	0.56	22.5	7.25	12.06	6.88	2.75	28.69

PUMP DATA

EMPELLER: ENCLOSED	BOWL CONNECTION FLANGED
NO. OF VANES: 7	DISCHARGE SIZE: 10", 12"
THRUST CONSTANT 12.5	SUCTION SIZE: 10"
LATERAL: 1.12	STD. TUBE: 3"
EYE AREA IN: 25.32	WR: 3.62 LB. FT ²
SHAFT DIA: 1.9375	ONE STG. WT. LB. 420
	ADD STG. WT. / LB. 170

* THIS DIMENSION TO BE USED WITH NPSH-R PUMP INSTALLATION
AND SYSTEM MUST SATISFY BOTH VALUES. PERFORMANCE BASED
ON CAST IRON ENAMELED BOWLS AND BRONZE IMPELLERS.

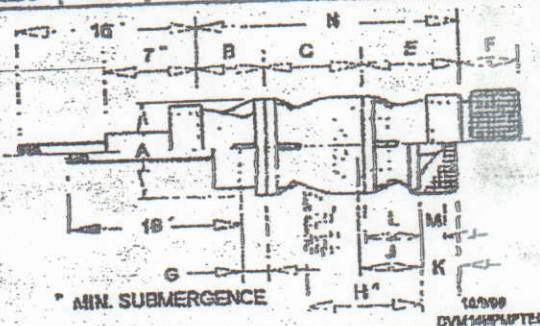


Figure 6. Pump performance curve for the installed pump in the Meridian Well #19. The pumping plant is coupled to Toshiba variable frequency drive that can regulate to discharge by varying the speed of the pump above and below the design point of this pump (1550 gpm). According to the pump supplier, the 3-stage pump (10.6-inch impeller trim) was installed on 50 feet of 10-inch diameter column by Irminger Construction in 1996.

Figure 6.

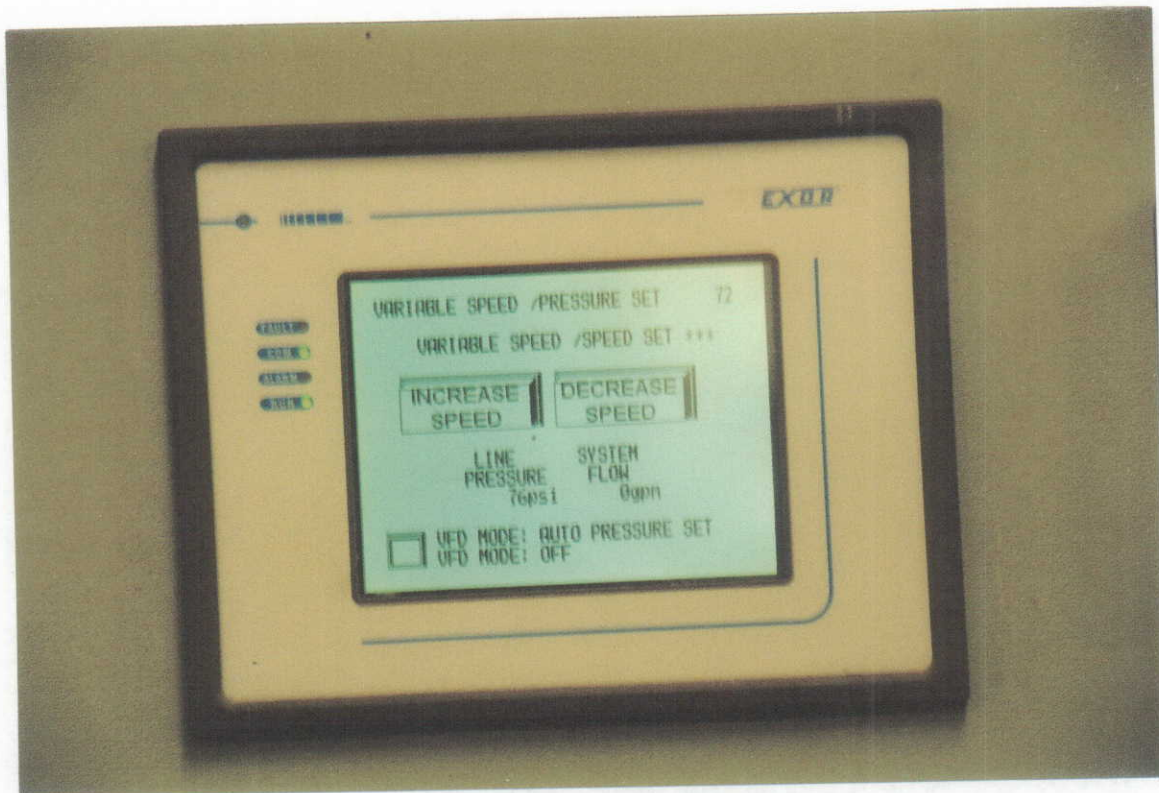


Figure 9. Photograph of the digital readout of the Toshiba variable frequency drive installed on the City of Meridian's #19 municipal water supply well. Shown is the non-pumping line pressure in the distribution system prior to activating the well pump. The 76 psi pressure indicated agreed exactly with an installed 3-inch oil-filled pressure gage on the main line (not shown).

Figure 9.

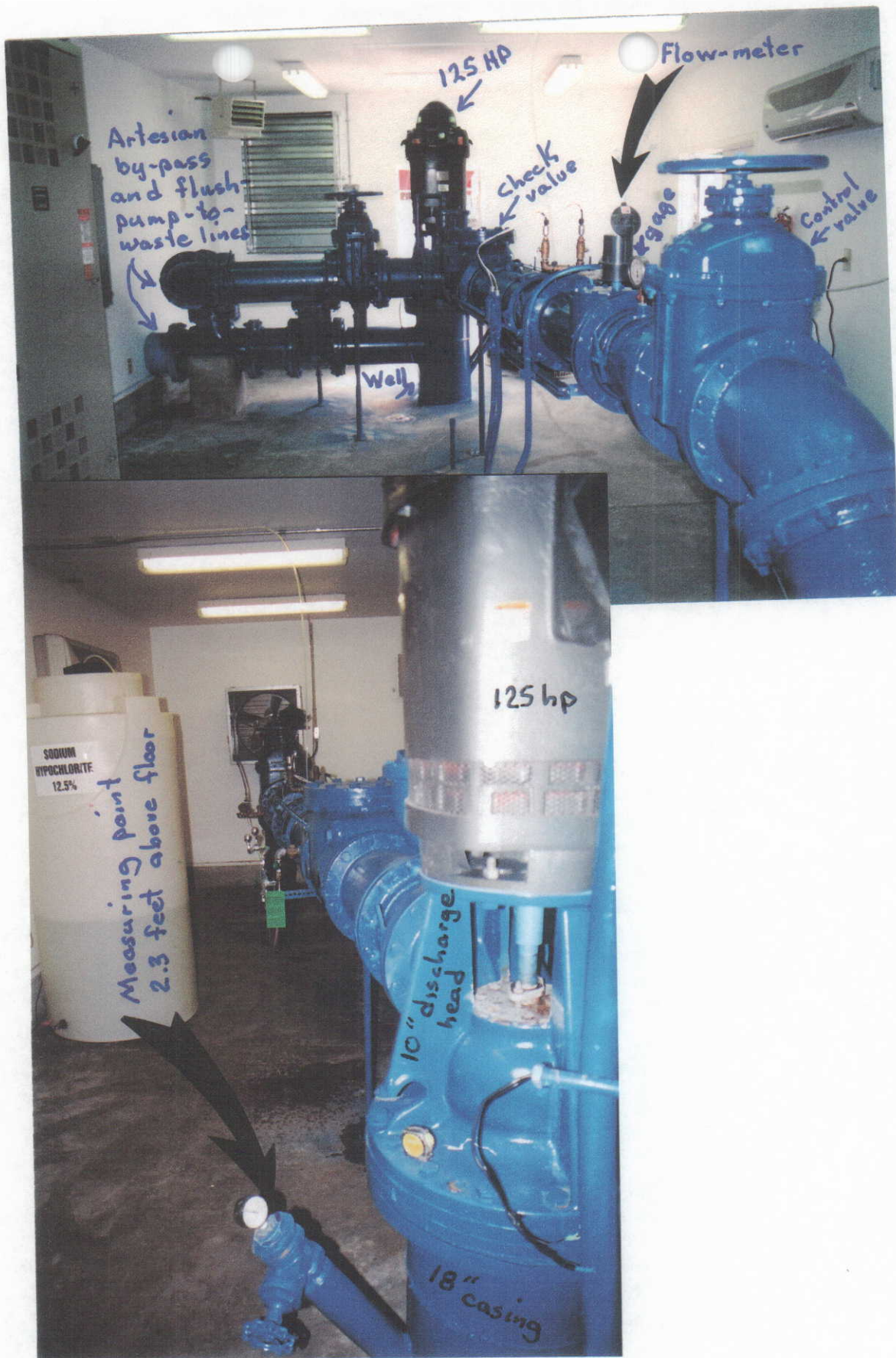


Figure 8. Photographs of the well head and pump house plumbing of the City of Meridian's #19 municipal water supply well. Upper view looks west, from the 18-inch diameter well head casing and 10-inch diameter discharge head, to where the mainline exits the pump house through the concrete floor of the pump house. Lower view is to the east with various components labeled.

Figure 8.

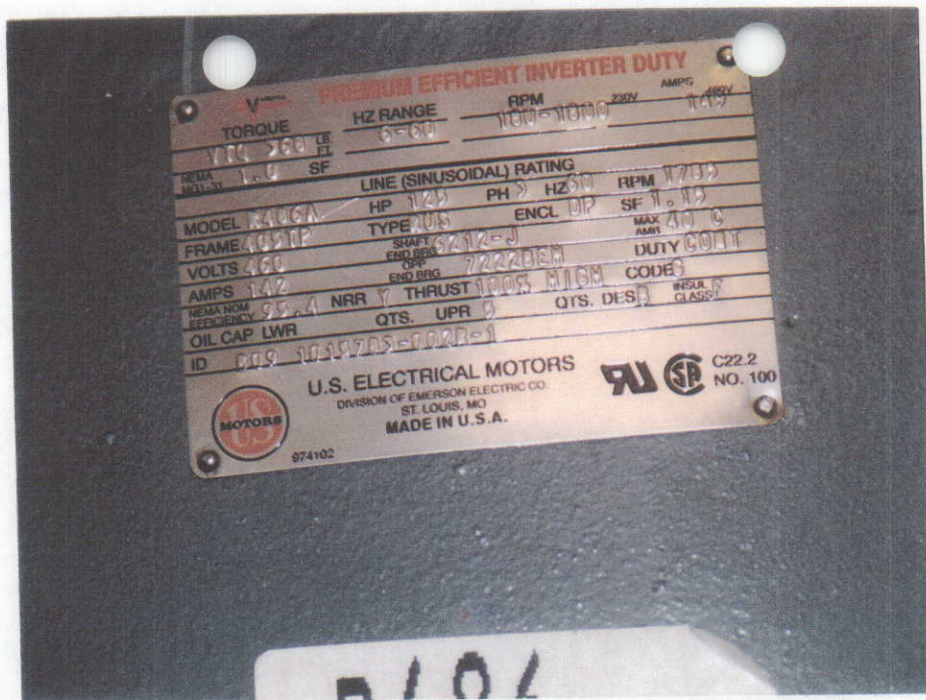


Figure 7. Photographs of the 125 HP drive motor for the line-shaft deep well turbine pump installed in the City of Meridian's 18-inch diameter #19 municipal water supply well. Upper view is a close up photo of the motor specification plate fastened to the motor.

Figure 7.



Figure 10. Photograph of the McCrometer totalizing flow-meter installed on the City of Meridian's #19 municipal water supply wellhead plumbing. Upper view is of the flow-meter prior to activating the well pump. The lower picture shows a discharge of about 1875 gpm after a few minutes of pumping. The discharge was held to a maximum of 1900 gpm for the 30-minute pumping test of this examination.

Figure 10.

City of Meridian Well #19 Flow Rate Data
July, 2003

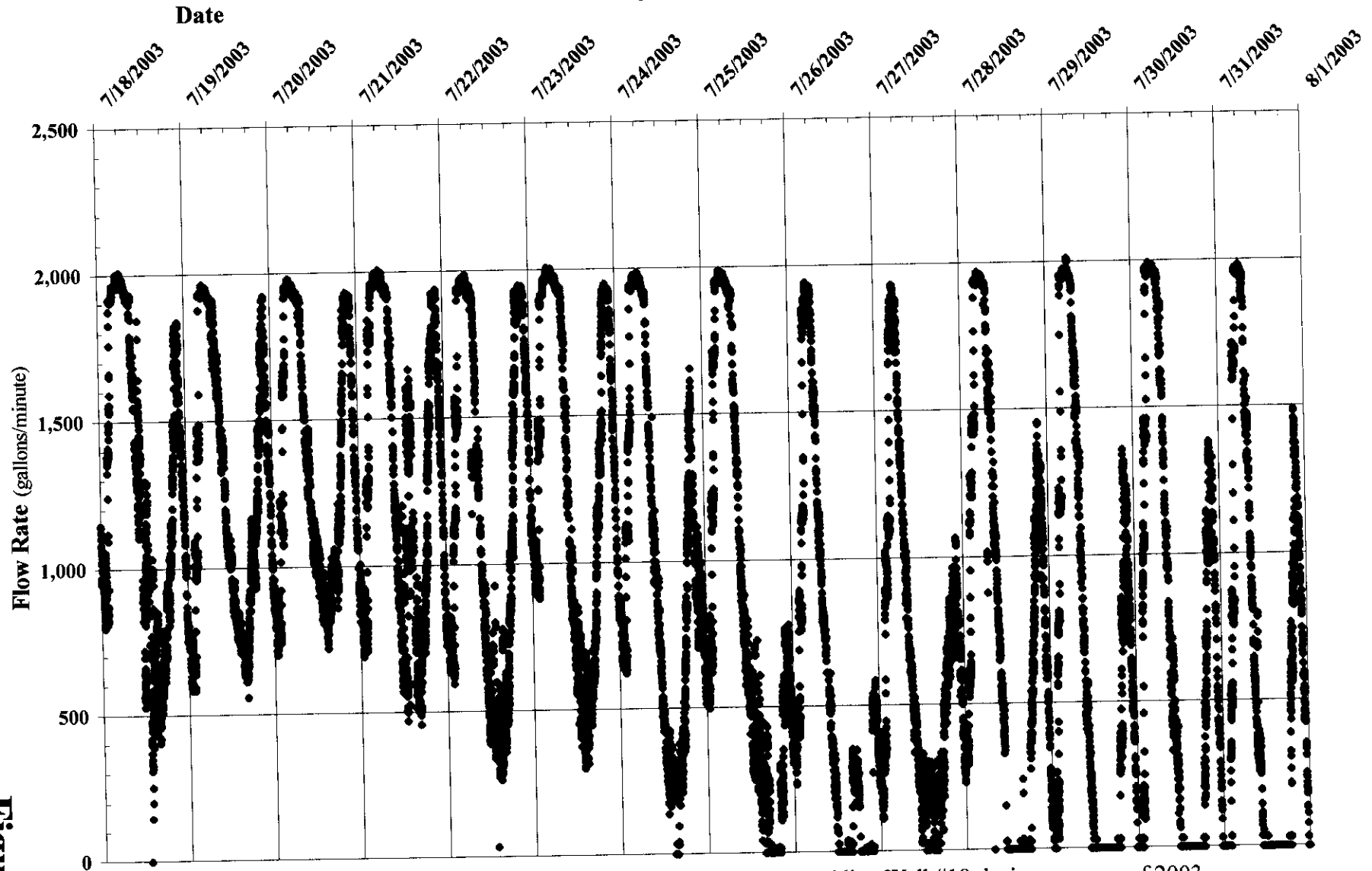


Figure 11. Continuous discharge rate measurements for the City of Meridian Well #19 during summer of 2003. Hydrograph shows regular pumping rates equal to the instantaneous flow rate of water right Permit No. 63-12378.

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Boise, Idaho

Figure 11.

City of Meridian #19 Supply Well **Projected water-levels for various discharge rates**

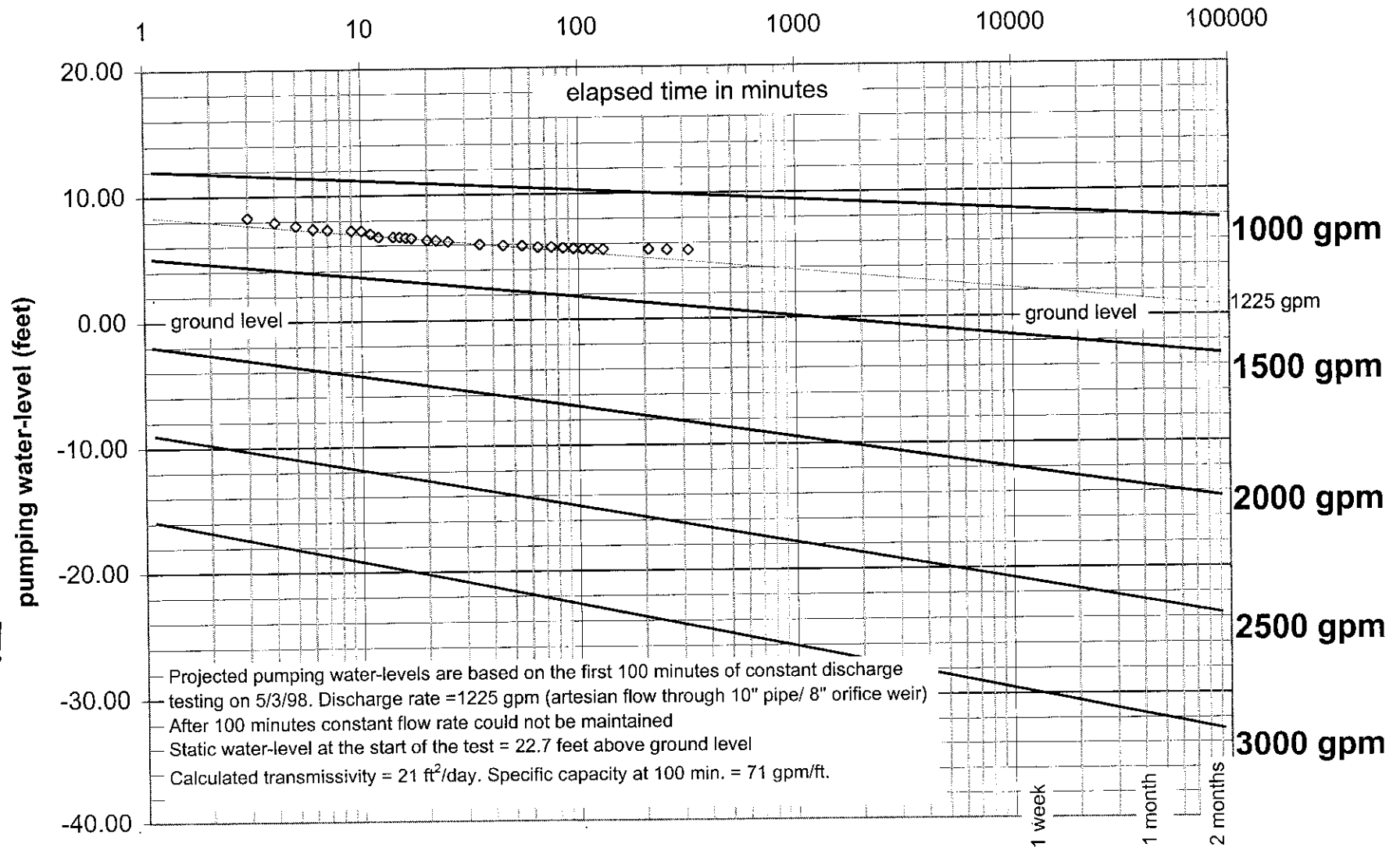


Figure 12.

CITY OF MERIDIAN # 19 SUPPLY WELL
 Constant Discharge Test (1225 gpm) 5/3/98

Time (hours)	E.T. (minutes)	Water- Level (ft. AGL)	
14:53	0	22.67	start of flow test
15:03	3	8.29	1225 gpm
15:04	4	7.90	
15:05	5	7.62	
15:06	6	7.37	
15:07	7	7.28	
15:09	9	7.20	
15:10	10	7.19	
15:11	11	6.94	
15:12	12	6.69	
15:14	14	6.67	
15:15	15	6.67	
15:16	16	6.60	
15:17	17	6.56	
15:20	20	6.39	
15:22	22	6.37	
15:25	25	6.27	
15:35	35	6.03	
15:45	45	5.93	
15:55	55	5.88	
16:05	65	5.77	
16:15	75	5.77	
16:25	85	5.68	
16:35	95	5.63	
16:45	105	5.58	Discharge rate begins to decrease slightly.
16:55	115	5.57	
17:10	130	5.55	1200 gpm
18:00	210	5.50	1190 gpm
18:45	255	5.47	1150 gpm
19:50	320	5.43	

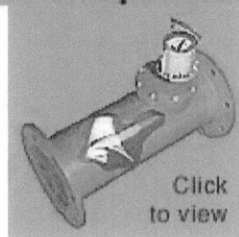
Constant pumping rate drawdown testing using natural artesian head; flow through 10" pipe/ 8" orifice weir. After 100 minutes constant flow rate could not be maintained due to friction loss in piping. Specific capacity at 100 minutes = 71 gpm/ft.

Table 1.

APPENDICES

[Home](#)[Industries](#)[Products](#)[Fluids](#)[Literature](#)

Mc Propeller



Number One in the US

Clean and dirty flows

Accuracy of +/-2%

Repeatability of +/-0.25%

Self-cleaning design

Easy to install

Easy to operate

Specifications

The Mc Propeller is a uniquely-designed propeller meter good for both clean and dirty water flows, and is the top-selling flowmeter in the US for agriculture and turf irrigation applications. Here are the product specifications and design features for the Mc Propeller:

- Accuracy of +/-2%
- Repeatability of +/-0.25%
- Turndown up to 15:1
- Very low permanent headloss
- Mechanical instantaneous flowrate indicator and totalizer standard
- Optional electronic digital register available
- Unique magnetic coupling system, isolates register from flow
- Needs 5 diameters upstream, 1 diameter downstream
- Straightening veins to generate optimum flow profiles
- Epoxy-coated carbon steel body; all stainless available
- Pre-calibrated, corrosion-resistant polymer impeller
- AWWA approved for cold water use
- Register options: forward/reverse flow; test hand/index wheel; anti-reverse totalizer; custom scale; extended digit totalizer
- Impeller options: high temperature resistant; acid and caustic resistant
- Line sizes from 2" to 96"



Now available with the advanced
Electronic Register for remote
Installation. Click here for details.

Mc Propeller

[description](#)[specifications](#)[models](#)[how it works](#)[parameters](#)

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Evaluation*

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State of Idaho
Department of Water Resources
Permit To Appropriate Water

NO. 63-12378

Proposed Priority: February 18, 1997

Maximum Diversion Rate:

4.50 CFS

This is to certify, that CITY OF MERIDIAN
33 E IDAHO AVE
MERIDIAN ID 83642

has applied for a permit to appropriate water from: GROUNDWATER

and a permit is APPROVED for development of water as follows:

BENEFICIAL USE

PERIOD OF USE

RATE OF DIVERSION

MUNICIPAL

01/01 to 12/31

4.50 CFS

LOCATION OF POINT(S) OF DIVERSION: Lot 1 (NENE), Sec. 3, Township 03N, Range 01W
ADA County

PLACE OF USE: See Remarks

CONDITIONS OF APPROVAL AND REMARKS

1. Proof of construction of works and application of water to beneficial use shall be submitted on or before April 1, 1999.
2. Subject to all prior water rights.
3. Project construction shall commence within one year from the date of permit issuance and shall proceed diligently to completion unless it can be shown to the satisfaction of the Director of the Department of Water Resources that delays were due to circumstances over which permit holder had no control.
4. After specific notification by the department, the right holder shall install a suitable measuring device or shall enter into an agreement with the department to determine the amount of water diverted from power records and shall annually report the information to the department.
5. Right holder shall comply with the drilling permit requirements of Section 42-235, Idaho Code.
6. The right holder shall comply with Idaho well construction standards when constructing a well pursuant to this right.
7. The daily diversion volume for non-domestic uses under this municipal right shall not exceed 2,500 gallons per use and the daily diversion volume for domestic uses under this right shall not exceed 13,000 gallons per dwelling in accordance with Section 42-111, Idaho Code.
8. Irrigation of large projects such as parks, golf courses, or sports activities fields is not authorized under this right.
9. Point of diversion is located within Lot 1, Blk. 5, Englewood Creek Estates Subdivision.
10. Place of use is limited to the city limits of Meridian.
11. The irrigation occurring under this municipal use shall not exceed 1/2 acre within each platted subdivision lot upon which a home has been constructed.
12. Water bearing zone to be appropriated is 600 to 800 feet.

State of Idaho
Department of Water Resources

Permit To Appropriate Water

NO. 63-12378

This permit is issued pursuant to the provisions of Section 42-204, Idaho Code.
Witness the signature of the Director, affixed at Boise, this

16th day of April, 1997.

for K. J. Dreher
Karl J. Dreher, Director