

File No. 101 31N 02W 21 EDCB

WELL NO. 2

101 31 N 2 W Cbcb

TRIPLICATE

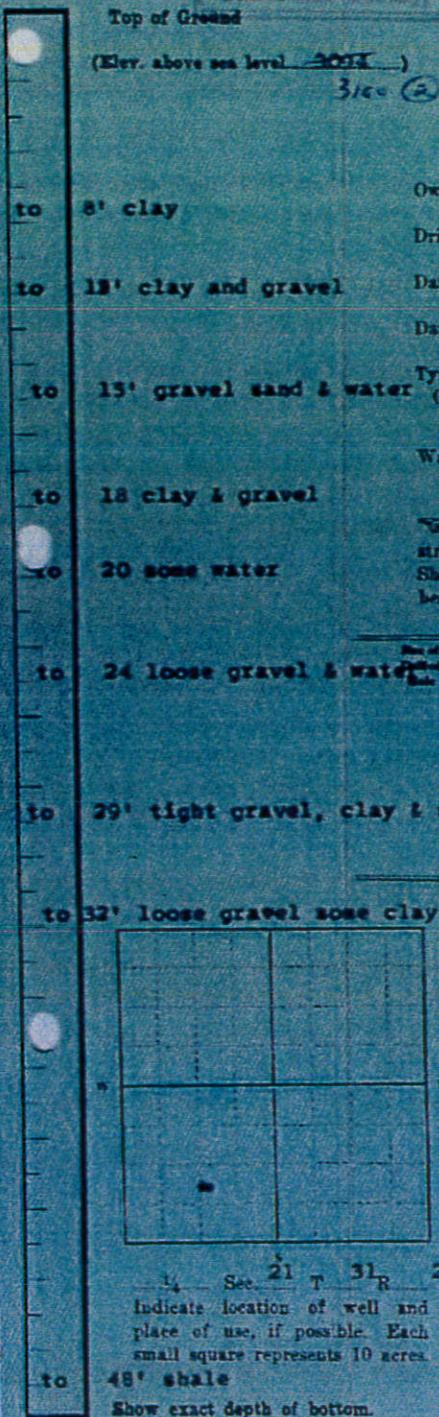
*True*

County Toole

STATE OF MONTANA  
ADMINISTRATOR OF GROUNDWATER CODE  
OFFICE OF STATE ENGINEER

Notice of Completion of Groundwater  
Appropriation by Means of Well

(Under Chapter 237, Montana Session Laws, 1961)



Owner City of Shelby #2 Address Box 743, Shelby, MONTANA  
 Driller J. M. Ulrich Address Unknown  
 Date of Notice of Appropriation of Groundwater \_\_\_\_\_  
 Date well started 9/11/46 Date Completed 10/1/46  
 Type of well Drilled Equipment Used Drill Rig  
 (Aug. driven, bored or drilled) (Carn. drill, rotary or other)  
 Water Use: Domestic  Municipal  Other  Irrigation   
 Industrial  Drainage  Stock

Indicate on the diagram the character and thickness of the different strata met with in drilling, such as soil, clay, shale, gravel, rock or sand, etc. Show depth at which water is encountered, thickness and character of water-bearing strata and height to which water rises in the well.

No. of Percut Casing	Size and Weight of Casing	From (Feet)	To (Feet)	PERFORATIONS		
				Kind and Size	From (Feet)	To (Feet)
	15 1/2 I. D.	0	34	5/8 x 1 1/2 slots	5/8	13'
	12 1/2 I. D.	32'	46		19'	32'

Static Water Level for non-flowing Well 15 feet.  
 Shut-in Pressure for Flowing Well \_\_\_\_\_  
 Pumping Water Level 30 feet at 300 gal. per minute.  
 Discharge in gal. per min. of flowing well Not known  
 How Tested Gauge Length of Test Not known

Remarks: (Gravel packing, cementing, packers, type of shutoff, location of place of use of groundwater if not at well, and any other similar pertinent information, including number of acres irrigated, if used for irrigation)

1/4 Sec. 21 T. 31 R. 2  
 Indicate location of well and place of use, if possible. Each small square represents 10 acres.  
 Show exact depth of bottom.

Not known  
 Driller's License Number  
J. M. Ulrich  
 Driller's Signature

This form to be prepared by driller, and three copies to be filed by the owner with the County Clerk and Recorder in the county in which the well is located.

Please answer all questions. If not applicable, so state, otherwise the form will be returned.

Original to the County Clerk and Recorder; duplicate to the State Engineer; Triplicate to the Montana Bureau of Mines and Geology and Quadruplicate for the Appropriator.

M: 87577

TRIPPLICATE

101 31N 02W 21 CDB  
*Toole*

WELL NO. 3

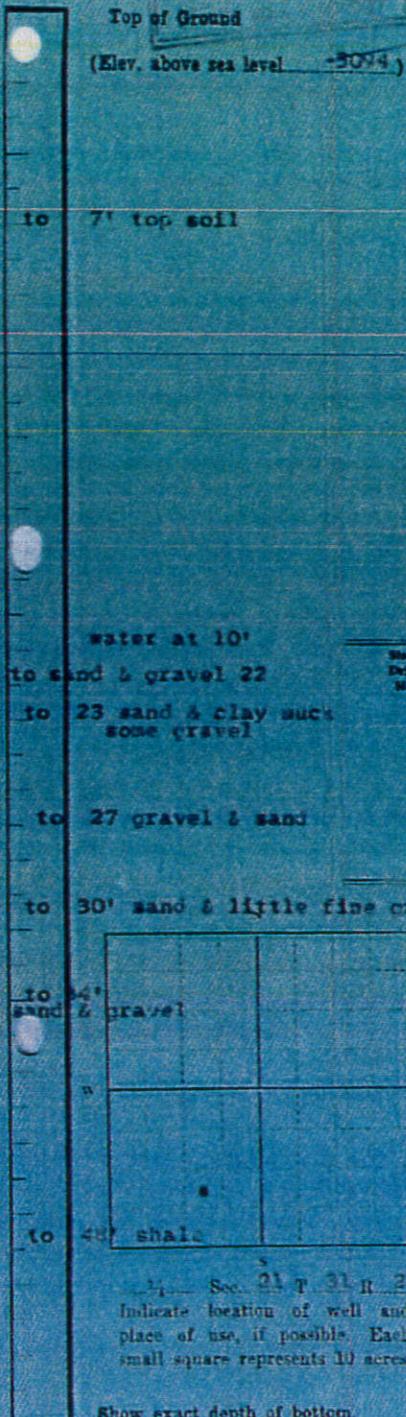
101 31 N 2 R 2 CDB

County Toole

STATE OF MONTANA  
ADMINISTRATOR OF GROUNDWATER CODE  
OFFICE OF STATE ENGINEER

Notice of Completion of Groundwater  
Appropriation by Means of Well

(Under Chapter 207, Montana Session Laws, 1961)



Owner City of Shelby #3 Box 743  
Address Shelby, Montana

Driller J. M. Ulrich Address Unknown

Date of Notice of Appropriation of Groundwater Unknown

Date well started 6/27/39 Date Completed 7/7/39

Type of well Drilled Equipment Used Spudder  
(aug, driven, bored or drilled) (Charn, drill, rotary or other)

Water Use: Domestic  Municipal  Other  Irrigation   
Industrial  Drainage  Stock

Indicate on the diagram the character and thickness of the different strata met with in drilling, such as soil, clay, shale, gravel, rock or sand, etc. Show depth at which water is encountered, thickness and character of water-bearing strata and height to which water rises in the well.

Size of Drill Bit	Size and Weight of Casing	From (Feet)	To (Feet)	PERFORATIONS		
				Kind Size	From (Feet)	To (Feet)
	R 15" x 90 lb steel casing	0	24	screen 24'		34'

Static Water Level for non-flowing Well Not known feet

Shut-in Pressure for Flowing Well Not known

Pumping Water Level Not known feet at Not known gal. per minute

Discharge in gal. per min. of flowing well Not known

How Tested Not known Length of Test Not known

Remarks: (Gravel packing, cementing, packers, type of shutoff, location of place of use of groundwater if not at well, and any other similar pertinent information, including number of acres irrigated, if used for irrigation.)

Sec. 21 T. 31 R. 2  
Indicate location of well and place of use, if possible. Each small square represents 10 acres.

Show exact depth of bottom.

Not known  
Driller's License Number

J. M. Ulrich  
Driller's Signature

ELEV: 3100 (2)

This form to be prepared by driller, and three copies to be filed by the owner with the County Clerk and Recorder in the county in which the well is located.

Please answer all questions. If not applicable, so state, otherwise the form will be returned.

Original to the County Clerk and Recorder; duplicate to the State Engineer; Triplicate to the Montana Bureau of Mines and Geology and Quadruplicate for the Appropriator.

M: 87576



File No. 101.31N.02W.21E.DBC  
WELL NO. 4

31 R 2  
County Toole DBBC

TRIPPLICATE Toole

STATE OF MONTANA  
ADMINISTRATOR OF GROUNDWATER CODE  
OFFICE OF STATE ENGINEER

Notice of Completion of Groundwater  
Appropriation by Means of Well

(Under Chapter 237, Montana Session Laws, 1961)

Owner City of Shelby #4 Box 743  
Address Shelby, Montana

Driller J. M. Ulrich Address Not known

Date of Notice of Appropriation of Groundwater \_\_\_\_\_

Date well started 10/3/45 Date Completed 10/12/45

Type of well Drilled Equipment Used spudder  
(dug, driven, bored or drilled) (Churn, drill, rotary or other)

- Top of Ground (Elev. above sea level \_\_\_\_\_)
- to 8' clay
- to 10' clay & sand
- to 15' clay, sand & seepage
- to 20' gravel and water
- to 25' coarse sand & fine gravel & water
- to 30' coarse sand & gravel  
clay mixed with water
- to 50' shale  
Show exact depth of bottom.

Water Use: Domestic  Municipal  Other  Irrigation   
Industrial  Drainage  Stock

Indicate on the diagram the character and thickness of the different strata met with in drilling, such as silt, clay, shale, gravel, rock or sand, etc. Show depth at which water is encountered, thickness and character of water-bearing strata and height to which water rises in the well.

Size of Drilled Hole	Size and Weight of Casing	From (Feet)	To (Feet)	PERFORATIONS		
				Kind Size	From (Feet)	To (Feet)
	15 1/2" ID	0	33'	5/8x3/8	15'	30'
	12 1/2" ID	31'	49' 6"			

Static Water Level for non-flowing Well 19' 6" feet

Shut-in Pressure for Flowing Well Not known

Pumping Water Level 29' feet at 300 gal. per minute

Discharge in gal. per min. of flowing well Not known

How Tested Not known Length of Test Not known

Remarks: (Gravel packing, cementing, packers, type of shutoff, location of place of use of groundwater if not at well, and any other similar pertinent information, including number of acres irrigated, if used for irrigation)

Sec. 21 T. 31 R. 2  
Indicate location of well and place of use, if possible. Each small square represents 10 acres.

50' shale  
Show exact depth of bottom.

Not known  
Driller's License Number

J. M. Ulrich  
Driller's Signature

Elev. 3745

This form to be prepared by driller, and three copies to be filed by the owner with the County Clerk and Recorder in the county in which the well is located.

Please answer all questions. If not applicable, so state, otherwise the form will be returned.

Original to the County Clerk and Recorder; duplicate to the State Engineer; Triplicate to the Montana Bureau of Mines and Geology and Quadruplicate for the Appropriator.

M: 87573

File N 101 31N 02W 2100B0  
**TRIPLICATE** Toole

WELL NO. 5 101 31 N 2 W  
 County Toole COB8D

STATE OF MONTANA  
 ADMINISTRATOR OF GROUNDWATER CODE  
 OFFICE OF STATE ENGINEER

**Notice of Completion of Groundwater  
 Appropriation by Means of Well**

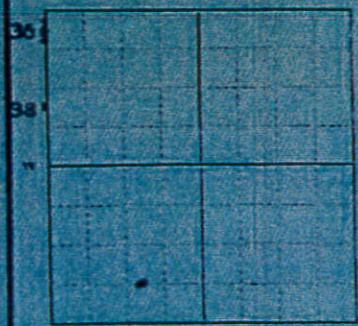
(Under Chapter 237, Montana Session Laws, 1951)

0' Top of Ground  
 (Elev. above sea level -3094)  
 Fill Rock & Gravel 31'  
 8"  
 Coarse gravel  
 16'  
 Sand, gravel, rock  
 23'  
 Sand, gravel, rock & hard clay  
 27'  
 Fine sand, rock, clay  
 30' rock and gravel  
 32'  
 Sand, gravel, rock & Shale

Owner City of Shelby #5 Address Shelby, Montana  
 Box 743  
 Driller Layne-Minnesota Address Minneapolis, Minn.  
 Date of Notice of Appropriation of Groundwater \_\_\_\_\_  
 Date well started 1962 Date Completed 1962  
 Type of well Gravel Well Equipment Used Caisson  
 (dug, driven, bored or drilled) (Crown, drill, rotary or other)  
 Water Use: Domestic  Municipal  Other  Irrigation   
 Industrial  Drainage  Stock

Indicate on the diagram the character and thickness of the different strata met with in drilling, such as soil, clay, shale, gravel, rock or sand, etc. Show depth at which water is encountered, thickness and character of water-bearing strata and height to which water rises in the well.

Depth (Feet)	Size of Drilled Hole	Size and Weight of Casing	From (Feet)		PERFORATIONS		
			To (Feet)	Kind	From (Feet)	To (Feet)	
60"	38"	6"	4'0"				
38"		"	21'				
24"		"	34'28"	5	34'2"	44'28"	
24"	34'2"		44'28"				



1/4 Sec. 21 T31 R 2  
 Indicate location of well and place of use, if possible. Each small square represents 10 acres.

Show exact depth of bottom.

Static Water Level for non-flowing Well 19' 11" feet.  
 Shut-in Pressure for Flowing Well Not known  
 Pumping Water Level 34' feet at 350 gal per minute.  
 Discharge in gal. per min. of flowing well Not known  
 How Tested Turbine Pump Length of Test 8 hrs

Remarks: (Gravel packing, cementing, packers, type of shutoff, location of place of use of groundwater if not at well, and any other similar pertinent information, including number of acres irrigated, if used for irrigation)  
Double gravel wall - 52" dia. to 24" screen, 38" casing cemented in 60" hole. 1 1/2" PVC treatment coil around screen

208  
 Driller's License Number  
Layne-Minnesota Company  
 Driller's Signature

This form to be prepared by driller, and three copies to be filed by the owner with the County Clerk and Recorder in the county in which the well is located.

Please answer all questions. If not applicable, so state, otherwise the form will be returned.

Original to the County Clerk and Recorder; duplicate to the State Engineer; Triplicate to the Montana Bureau of Mines and Geology and Quasuplicate for the Appropriator.

M: 8\*7579

File No. 101 31 N 02 W 11 E 0 BC

WELL NO. 6

101-31 N 02 W

TRIPLICATE

Toole

County Toole

BC

STATE OF MONTANA  
ADMINISTRATOR OF GROUNDWATER CODE  
OFFICE OF STATE ENGINEER

Notice of Completion of Groundwater  
Appropriation by Means of Well

(Under Chapter 237, Montana Session Laws, 1961)

0'  
Top of Ground  
(Elev. above sea level 3094)  
Sandy clay 3.75(2)

4 1/2'  
Sand - fine to coarse

11'  
Date of Notice of Appropriation of Groundwater

Sand & Gravel

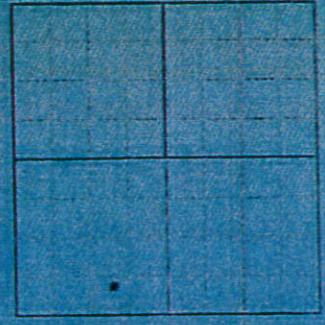
17 1/2'  
Soft clay

21'

Sand, gravel & Rock

34 1/2'

Shale



Sec. 21 T. 31 R. 2  
Indicate location of well and place of use, if possible. Each small square represents 10 acres.

Show exact depth of bottom.

Owner City of Shelby #6 Address Shelby, Montana

Driller Layne-Minnesota Address Minneapolis, Minn.

Date well started 6/22/62 Date Completed 6/4/62

Type of well Gravel wall Equipment Used Caisson  
(dug, driven, bored or drilled) (Churn, drill, rotary or other)

Water Use: Domestic  Municipal  Other  Irrigation   
Industrial  Drainage  Stock

Indicate on the diagram the character and thickness of the different strata met with in drilling, such as soil, clay, shale, gravel, rock or sand, etc. Show depth at which water is encountered, thickness and character of water-bearing strata and height to which water rises in the well.

Size of Drilled Hole	Size and Weight of Casing	From (Feet)	To (Feet)	PERFORATIONS		
				Kind Size	From (Feet)	To (Feet)
52"	Steel	5 1/2'	18'			
24"	Steel	"	30 1/2'			
24"	Stainless	30 1/2'	40 1/2'	#5	30 1/2'	40 1/2'

Static Water Level for non-flowing Well 19' 11" feet

Shut-in Pressure for Flowing Well Not known

Pumping Water Level 30' feet at 250 gal. per minute

Discharge in gal. per min. of flowing well Not known

Turbine pump  Length of Test 8 hrs  
Haw Tested Griffice

Remarks: (Gravel packing, cementing packers, type of shutoff, location of place of use of groundwater if not at well, and any other similar pertinent information, including number of acres irrigated, if used for irrigation)

Double gravel wall - 52" dia. to 24" screen, outer casing cemented in 60" dia. hole. 1 1/2" PVC treatment coil around screen

208

Driller's License Number  
Layne-Minnesota Company  
Driller's Signature

This form to be prepared by driller, and three copies to be filed by the owner with the County Clerk and Recorder in the county in which the well is located.

Please answer all questions. If not applicable, so state, otherwise this form will be returned.

Original to the County Clerk and Recorder; duplicate to the State Engineer; Triplicate to the Montana Bureau of Mines and Geology and Quadruplicate for the Appropriator.

M: 87550



*Do not add*

WELL LOG REPORT

GOLDENROD - DRILLER

State law requires that this form be filed by the water well driller on any water well completed by him on and after July 3, 1973 within sixty (60) days after completion of the well.

1. WELL OWNER: Name <u>#8</u> Address _____															
2. WELL LOCATION: County _____; _____, Sec. _____, Twp. _____ N-S, Rg. _____ E-W															
3. PROPOSED USE: Domestic _____ Stock _____ Municipal _____ Industrial _____ Lawn and Garden _____ Irrigation _____ Other (if other, specify) _____															
4. METHOD DRILLED: Cable _____ Bored _____ Forward Rotary _____ Reverse Rotary _____ Jetted _____ Other (if other, specify) _____	8. WELL LOG: <table border="1" style="width:100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Depth (ft.)</th> <th rowspan="2">Formation</th> </tr> <tr> <th>From</th> <th>To</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>30</td> <td>STAYED &amp; SAND</td> </tr> <tr> <td></td> <td></td> <td>WATER @ 17 FT.</td> </tr> <tr> <td>30</td> <td>31</td> <td>DARK SHALE</td> </tr> </tbody> </table>	Depth (ft.)		Formation	From	To	0	30	STAYED & SAND			WATER @ 17 FT.	30	31	DARK SHALE
Depth (ft.)		Formation													
From	To														
0	30	STAYED & SAND													
		WATER @ 17 FT.													
30	31	DARK SHALE													
5. WELL CONSTRUCTION: Diameter of hole _____ inches. Depth _____ ft. Casing: Steel _____ Plastic _____ Concrete _____ Threaded _____ Welded _____ Other (if other, specify) _____ Pipe Weight: Dia. _____ From: _____ To: _____ lb/ft. _____ inches _____ feet _____ feet lb/ft. _____ inches _____ feet _____ feet lb/ft. _____ inches _____ feet _____ feet Was perforated pipe used? _____ Yes _____ No Length of pipe perforated _____ feet Was casing left open end? _____ Yes _____ No Was a well screen installed? _____ Yes _____ No Material _____ stainless steel Dia. _____ inches (stainless steel, bronze, etc.) Perforation type: _____ slots _____ holes Size _____ set from _____ feet to _____ feet Size _____ set from _____ feet to _____ feet Size _____ set from _____ feet to _____ feet Was a packer or seal used? _____ Yes _____ No If so, what material _____ Well type: _____ Straight screen _____ Graveled _____ Was the well grouted? _____ Yes _____ No To what depth? _____ feet Material used in grouting _____ Well head completion: Pitless adapter _____ 12" above grade _____ Other _____ (If other, specify) _____ Was the well disinfected? _____ Yes _____ No															
6. WATER LEVEL: Static water level _____ ft. below land surface If flowing: closed-in pressure _____ psi GPM flow _____ through _____ inch pipe Controlled by: _____ Valve _____ Reducers _____ Other, specify _____															
7. WELL TEST DATA: _____ Pump _____ Bailer _____ Other _____ (if other, specify) _____ Pumping level below land surface: _____ ft. after _____ hrs. pumping _____ gpm _____ ft. after _____ hrs. pumping _____ gpm															
9. DATE STARTED: <u>Jan. 15 1973</u>															
10. DATE COMPLETED: _____															
11. WAS WELL PLUGGED OR ABANDONED? _____ Yes _____ No If so, how _____															
12. DRILLER'S CERTIFICATION: This well was drilled under my jurisdiction and this report is true to the best of my knowledge. _____ Driller's or Firm Name _____ License No. _____ _____ Address _____ _____ Signed by _____ Date _____															

M: 87573

3006

101 31N 02W 24 CDBA  
Department of Natural Resources and Conservation

CODED

White Department  
Yellow Department  
Pink-Well Owner  
Gold-Driller

WELL LOG REPORT

State law requires that this form be filed by the water well driller within 60 days after completion of the well, and of Completion of Groundwater Development, be filed by the well owner within 60 days after the water has been

009481

1. WELL OWNER Name Selby City Water Well #9

2. CURRENT MAILING ADDRESS City Hall  
15710 Ave N, Selby, MT 59474

3. PROPOSED USE domestic (includes lawn and garden) stock X municipal industrial  
irrigation other (specify)

4. WELL LOCATION

	NW		NE
	SW		SE

1/4 1/4 1/4 1/4 Section 21  
T 31N R 2W  
N or S E or W  
OR Lot #9 Block  
Subdivision  
City TOOLE County TOOLE  
Elevation Accuracy -10' +50' ±100'

5. DRILLING METHOD X cable, bored, reverse rotary, jettied, other (specify)

6. WELL CONSTRUCTION AND COMPLETION

Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations and/or Screen	Kind	From (feet)	To (feet)
8	2 1/2" 3000	0	24		Screen		
						40	29

Was casing left open end? X Yes No  
Was a packer or seal used? X Yes No  
If so, what material polyurethane  
Was the well gravel packed? X Yes No  
Was the well grouted? X Yes No  
To what depth? 24 ft  
Material used in grouting Portland Cement  
Well head completion: Pitless adapter X 12 in. above grade other  
(if other, specify)  
Pump horsepower \_\_\_\_\_ pump type \_\_\_\_\_  
Pump intake level \_\_\_\_\_ feet below land surface  
Power (electric, diesel, etc.) \_\_\_\_\_

7. WATER LEVEL  
Static water level 10 feet below land surface  
If flowing, closed-in pressure \_\_\_\_\_ psi  
\_\_\_\_\_ gpm flow through \_\_\_\_\_ inch pipe  
Controlled by \_\_\_\_\_ valve \_\_\_\_\_ reducers \_\_\_\_\_ other  
(if other, specify)

8. WELL TEST DATA X pump \_\_\_\_\_ barrel \_\_\_\_\_ other  
(if other, specify)  
Pumping level below land surface:  
10 ft. after 8 hrs. pumping 235 gpm  
\_\_\_\_\_ ft. after \_\_\_\_\_ hrs. pumping \_\_\_\_\_ gpm

9. WAS WELL PLUGGED OR ABANDONED? Yes X No  
If yes, how?

10. DATE STARTED Aug 15 84  
DATE COMPLETED March 13 85

11. WELL LOG  
Depth (ft.)  
From To Formation  
0 15 sand & silt  
15 16 gravel water  
16 26 gravel  
26 29 water colored gravel  
29 40 gravel  
40 \_\_\_\_\_ hard shale

12. DRILLER'S CERTIFICATION  
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.  
Signature David Fisher Date 4-5-85  
Firm name William Selby Co  
Address 15710 Ave N, Selby, MT 59474

M 875 74

STATE OF MONTANA  
Department of Natural Resources and Conservation

101 31N 02W 21 CDBD  
TOOLE  
White-Department  
Yellow-Department  
Pink-Well Owner  
Gold-Driller

WELL LOG REPORT

CODED

009482

State law requires that this form be filed by the water well driller within 60 days after completion of the well, and of Completion of Groundwater Development, be filed by the well owner within 60 days after the water has been

1. WELL OWNER Name Shelby City Hall #10

2. CURRENT MAILING ADDRESS City Hall Shelby MT 59703

3. PROPOSED USE domestic (includes lawn and garden)  stock  municipal  industrial  irrigation  other (specify) \_\_\_\_\_

4. WELL LOCATION

	NW	NE
	SW	SE

T. 31N R. 2W Section 21

OR Lot #10 N or S \_\_\_\_\_ E or W \_\_\_\_\_

Subdivision \_\_\_\_\_

City \_\_\_\_\_ County Toole

Elevation \_\_\_\_\_ Accuracy: -10' +50' +100'

8. WELL TEST DATA  pump  bailer  other (if other, specify) \_\_\_\_\_

Pumping level below land surface:

14.5 ft. after 1 hrs. pumping 320 gpm

ft. after \_\_\_\_\_ hrs. pumping \_\_\_\_\_ gpm

9. WAS WELL PLUGGED OR ABANDONED? Yes  No

If yes, how? \_\_\_\_\_

10. DATE STARTED Oct 20 1984

DATE COMPLETED March 13 1985

11. WELL LOG

Depth (ft.)

From	To	Formation
0	15	silt + sand
15	17	gravel water
17	40	sand + gravel
40	41	dash shale

Received state water test 3/19/85

5. DRILLING METHOD  cable,  bored, forward rotary,  reverse rotary,  jetted, other (specify) \_\_\_\_\_

6. WELL CONSTRUCTION AND COMPLETION

Size of drilled hole	Size and weight of casing	From (feet)	To (feet)	Perforations and/or Screen	Kind Spec	From (feet)	To (feet)
8	3 3/8 galv 0	0	29	X	Johnson	41	29

Was casing left open end?  Yes  No

Was a packer or seal used?  Yes  No

If so, what material \_\_\_\_\_

Was the well gravel packed?  Yes  No

Was the well grouted?  Yes  No

To what depth? 0-40

Material used in grouting cement

Well head completion: Pileless adapter \_\_\_\_\_

12 in. above grade  other \_\_\_\_\_

(if other, specify) \_\_\_\_\_

Pump horsepower \_\_\_\_\_ pump type \_\_\_\_\_

Pump intake level \_\_\_\_\_ feet below land surface

Power (electric, diesel, etc.) \_\_\_\_\_

7. WATER LEVEL

Static water level 9 feet below land surface

If flowing, closed-in pressure \_\_\_\_\_ psi

\_\_\_\_\_ gpm flow through \_\_\_\_\_ inch pipe

Controlled by: \_\_\_\_\_ valve, \_\_\_\_\_ reducers, \_\_\_\_\_ other (if other, specify) \_\_\_\_\_

12. DRILLER'S CERTIFICATION

This well was drilled under my jurisdiction and this report is true to the best of my knowledge.

3/13/85  
Date

Shelby City Hall  
Signature

98  
License No.

Shelby's Drilling Co  
Firm Name

151-10 2nd Ave N Shelby MT 59703  
Address

M. 87575

# WELL LOG REPORT

File No. 41P-1058/29

State law requires that the Bureau's copy be filed by the water well driller within 60 days after completion of the well.

<p><b>1. WELL OWNER</b> Name <u>City of Shelby</u></p> <p><b>2. CURRENT MAILING ADDRESS</b> <u>P.O. Box 743</u> <u>Shelby, MT 59474</u></p> <p><b>3. WELL LOCATION</b> <u>NE</u> 1/4 <u>SE</u> 1/4 <u>SW</u> 1/4 Section <u>21</u> Township <u>31</u> Range <u>2</u> County <u>Toole</u> Gov't Lot _____ or Lot _____ Block _____ Subdivision Name _____ Tract Number _____</p> <p><b>4. PROPOSED USE:</b> Domestic <input checked="" type="checkbox"/> Stock <input type="checkbox"/> Irrigation <input type="checkbox"/> Other <input type="checkbox"/> specify <u>PWS</u></p> <p><b>5. TYPE OF WORK:</b> New well <input checked="" type="checkbox"/> Method: Dug <input type="checkbox"/> Bored <input type="checkbox"/> Deepened <input type="checkbox"/> Cable <input type="checkbox"/> Driven <input checked="" type="checkbox"/> Reconditioned <input type="checkbox"/> Rotary <input type="checkbox"/> Jetted <input type="checkbox"/></p> <p><b>6. DIMENSIONS: Diameter of Hole</b> Dia. <u>8"</u> in. from _____ ft. to <u>20</u> ft. Dia. <u>8</u> in. from <u>20</u> ft. to <u>38</u> ft. Dia. _____ in. from _____ ft. to _____ ft.</p> <p><b>7. CONSTRUCTION DETAILS:</b> Casing: Steel <input type="checkbox"/> Dia. <u>8"</u> from <u>10</u> ft. to <u>26</u> ft. Threaded <input type="checkbox"/> Welded <input checked="" type="checkbox"/> Dia. _____ from _____ ft. to _____ ft. Type <u>38.55 lbs</u> Wall Thickness <u>.322</u> Casing: Plastic <input type="checkbox"/> Dia. _____ from _____ ft. to _____ ft. Weight _____ Dia. _____ from _____ ft. to _____ ft. PERFORATIONS: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Type of perforator used _____ Size of perforations _____ in. by _____ in. _____ perforations from _____ ft. to _____ ft. _____ perforations from _____ ft. to _____ ft. _____ perforations from _____ ft. to _____ ft.</p> <p><b>SCREENS:</b> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Manufacturer's Name <u>Huston Well Screen</u> Type <u>Stainless Steel</u> Model No. <u>304-85</u> Dia. <u>8"</u> Slot size <u>.060</u> from <u>26</u> ft. to <u>36</u> ft. Dia. _____ Slot size _____ from _____ ft. to _____ ft.</p> <p><b>GRAVEL PACKED:</b> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Size of gravel _____ Gravel placed from _____ ft. to _____ ft.</p> <p><b>GRAOUTED:</b> To what depth? <u>20</u> ft. Material used in grouting: <u>Cement</u></p> <p><b>8. WELL HEAD COMPLETION:</b> Pitless Adapter <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p><b>9. PUMP (if installed)</b> Manufacturer's name _____ Type _____ Model No. _____ HP _____</p> <p><b>10. WELL TEST DATA</b> The information requested in this section is required for all wells. All depth measurements shall be from the top of the well casing. All wells under 100 gpm must be tested for a minimum of one hour and provide the following information: a) Air _____ Pump <input checked="" type="checkbox"/> _____ Bailer _____ b) Static water level immediately before testing _____ ft. if flowing; closed-in pressure _____ psi. _____ gpm. Flow controlled by _____ valve, _____ reducers, _____ other (specify) _____ c) Depth at which pump is set for test _____ 36 d) The pumping rate _____ 440 e) Pumping water level _____ 22 ft. at _____ 1/2 hrs after pumping began</p>	<p>i) Duration of test: Pumping time <u>24</u> hrs ii) Recovery time <u>2</u> hrs iii) Recovery water level _____ 9 ft. at <u>1/2</u> hrs after pumping stopped.</p> <p>Wells intended to yield 100 gpm or more shall be tested for a period of 8 hours or more. The test shall follow the development of the well, and shall be conducted continuously at a constant discharge at least as great as the intended appropriation. In addition to the above information, water level data shall be collected and recorded on the Department's "Aquifer Test Data" form. NOTE: All wells shall be equipped with an access port 1/2 inch minimum or a pressure gauge that will indicate the shut-in pressure of a flowing well. Removable caps are acceptable as access ports.</p> <p><b>11. WAS WELL PLUGGED OR ABANDONED?</b> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, how? _____</p> <p><b>12. WELL LOG</b> Depth (ft.) From To Formation</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>0</td><td>4 1/2</td><td>Brown Sand - Medium Grain</td></tr> <tr><td>4 1/2</td><td>9</td><td>Brown Sand - Small Gravel</td></tr> <tr><td>9</td><td>12</td><td>Brown Sand - Medium Grain</td></tr> <tr><td>12</td><td>23</td><td>Brown Sand - 1/2" - 1" Gravel</td></tr> <tr><td>23</td><td>26</td><td>Gravel Sand - Medium Grain</td></tr> <tr><td>26</td><td>36</td><td>Gravel Sand - 3/4" - 1 1/2" Gravel</td></tr> <tr><td>36</td><td>38</td><td>Gravel Shale (Clay)</td></tr> </table> <p style="text-align: center; font-weight: bold; font-size: 24px;">RECEIVED</p> <p style="text-align: center;">OCT 22 1993</p> <p style="text-align: center;">MONTANA D.N.R.C. HAVRE FIELD OFFICE</p> <p style="text-align: center; font-weight: bold; font-size: 24px;">RECEIVED</p> <p style="text-align: center;">M.B.A.G.</p> <p style="text-align: right;">ATTACH ADDITIONAL SHEETS IF NECESSARY</p> <p><b>13. DATE COMPLETED</b> <u>5-31-93</u></p> <p><b>14. DRILLER/CONTRACTOR'S CERTIFICATION</b> This well was drilled under my jurisdiction and this report is true to the best of my knowledge. <u>152-1888</u> _____ Date <u>7-24-93</u> <u>Bohnd Drilling Co.</u> Firm Name <u>4601 7th Ave. N Great Falls,</u> Address <u>MT 59405</u> <u>Chris Bohnd</u> _____ Signature License No. <u>482</u></p>	0	4 1/2	Brown Sand - Medium Grain	4 1/2	9	Brown Sand - Small Gravel	9	12	Brown Sand - Medium Grain	12	23	Brown Sand - 1/2" - 1" Gravel	23	26	Gravel Sand - Medium Grain	26	36	Gravel Sand - 3/4" - 1 1/2" Gravel	36	38	Gravel Shale (Clay)
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MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION  
1520 EAST SIXTH AVENUE      HELENA, MONTANA 59620-2301      444-6610

## DNRC

## RECEIVED

SEP 8 2005

MT DEPT PUBLIC WATER  
& SUBDIVISIONS BUREAU

Well No 11

WWS# 0328012

# WELL LOG REPORT

File No. 4.P- 2058129

State law requires that the Bureau's copy be filed by the water well driller within 50 days after completion of the well

<p><b>1. WELL OWNER</b> Name <u>City of Shelby</u></p> <p><b>2. CURRENT MAILING ADDRESS</b> <u>P.O. Box 743</u> <u>Shelby, MT 59474</u></p> <p><b>3. WELL LOCATION</b> <u>NE 1/4 SE 1/4 SW 1/4</u> Section <u>21</u> Township <u>31 N</u> Range <u>2 E</u> County <u>Deer</u> Gov't Lot _____ or Lot _____ Block _____ Subdivision Name _____ Tract Number _____</p> <p><b>4. PROPOSED USE:</b> Domestic <input checked="" type="checkbox"/> Stock <input type="checkbox"/> Irrigation <input type="checkbox"/> Other <input checked="" type="checkbox"/> specify <u>PWS</u></p> <p><b>5. TYPE OF WORK:</b> New well <input checked="" type="checkbox"/> Method: Dug <input type="checkbox"/> Bored <input type="checkbox"/> Deepened <input type="checkbox"/> Cable <input type="checkbox"/> Driven <input checked="" type="checkbox"/> Reconditioned <input type="checkbox"/> Rotary <input type="checkbox"/> Jetted <input type="checkbox"/></p> <p><b>6. DIMENSIONS: Diameter of Hole</b> Dia. <u>12"</u> in. from <u>0</u> ft. to <u>20</u> ft. Dia. <u>8"</u> in. from <u>20</u> ft. to <u>38</u> ft. Dia. _____ in. from _____ ft. to _____ ft.</p> <p><b>7. CONSTRUCTION DETAILS:</b> Casing: Steel Dia. <u>8"</u> from <u>10</u> ft. to <u>24</u> ft. Threaded <input type="checkbox"/> Welded <input checked="" type="checkbox"/> Dia. _____ from _____ ft. to _____ ft. Type <u>28.556</u> Wall Thickness <u>.332</u> Casing: Plastic Dia. _____ from _____ ft. to _____ ft. Weight _____ Dia. _____ from _____ ft. to _____ ft. PERFORATIONS: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Type of perforator used _____ Size of perforations _____ in. by _____ in. _____ perforations from _____ ft. to _____ ft. _____ perforations from _____ ft. to _____ ft. _____ perforations from _____ ft. to _____ ft. SCREENS: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Manufacturer's Name <u>Houston Well Screen</u> Type <u>Stainless Steel</u> Model No. <u>304SS</u> Dia. <u>8"</u> Slot size <u>.100</u> from <u>24</u> ft. to <u>36</u> ft. Dia. _____ Slot size _____ from _____ ft. to _____ ft. GRAVEL PACKED: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Size of gravel _____ Gravel placed from _____ ft. to _____ ft. GROUTED: To what depth? <u>20</u> ft. Material used in grouting <u>Cement</u></p> <p><b>8. WELL HEAD COMPLETION:</b> Fits Adapter <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No</p> <p><b>9. PUMP (if installed)</b> Manufacturer's name _____ Type _____ Model No. _____ HP _____</p> <p><b>10. WELL TEST DATA</b> The information requested in this section is required for all wells. All depth measurements shall be from the top of the well casing. All wells under 100 gpm must be tested for a minimum of one hour and provide the following information: a) A.P. _____ Pump <input checked="" type="checkbox"/> Bailor _____ b) Static water level immediately before testing _____ ft. if flowing, closed in pressure _____ psi. Flow controlled by: _____ valve, _____ reducers, _____ other, (specify): _____ c) Depth at which pump is set for test _____ <u>36</u> d) The pumping rate: <u>440</u> gpm. e) Pumping water level _____ ft. at _____ hrs. after pumping began</p>	<p>f) Duration of test: Pumping time <u>24</u> hrs. g) Recovery time <u>2</u> hrs. h) Recovery water level _____ ft. at <u>1/2</u> hrs. after pumping stopped.</p> <p>Wells intended to yield 100 gpm or more shall be tested for a period of 8 hours or more. The test shall follow the development of the well, and shall be conducted continuously at a constant discharge at least as great as the intended appropriation. In addition to the above information, water level data shall be collected and recorded on the Department's "Aquifer Test Data" form. NOTE: All wells shall be equipped with an access port 1/2 inch minimum or a pressure gauge that will indicate the shut-in pressure of a flowing well. Removable caps are acceptable as access ports.</p> <p><b>11. WAS WELL PLUGGED OR ABANDONED?</b> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If yes, how? _____</p> <p><b>12. WELL LOG</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2">Depth (ft.)</th> <th rowspan="2">Formation</th> </tr> <tr> <th>From</th> <th>To</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>4</td> <td>Brown Sand - Medium Gravel</td> </tr> <tr> <td>4</td> <td>12</td> <td>Brown Sand - 1/2" - 1" Gravel</td> </tr> <tr> <td>12</td> <td>20</td> <td>Brown Sand - 3/4" - 1 1/2" Gravel</td> </tr> <tr> <td>20</td> <td>24</td> <td>Gray Sand - Coarse Gravel</td> </tr> <tr> <td>24</td> <td>36</td> <td>Gray Sand - 3/4" - 1 1/2" Gravel</td> </tr> <tr> <td>36</td> <td>38</td> <td>Gray Shaly Clay</td> </tr> </tbody> </table>	Depth (ft.)		Formation	From	To	0	4	Brown Sand - Medium Gravel	4	12	Brown Sand - 1/2" - 1" Gravel	12	20	Brown Sand - 3/4" - 1 1/2" Gravel	20	24	Gray Sand - Coarse Gravel	24	36	Gray Sand - 3/4" - 1 1/2" Gravel	36	38	Gray Shaly Clay
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**RECEIVED**  
OCT 22 1993  
MONTANA D.N.R.C.  
HAVRE FIELD OFFICE

ATTACH ADDITIONAL SHEETS IF NECESSARY

**13. DATE COMPLETED** 5-31-93

**14. DRILLER/CONTRACTOR'S CERTIFICATION**  
This well was drilled under my jurisdiction and this report is true to the best of my knowledge.  
7-24-93  
Boiland Drilling Co.  
Firm Name  
4601 7th Ave. So. Great Falls,  
Address  
Ch. Boiland 482  
Signature License No.

MONTANA DEPARTMENT OF NATURAL RESOURCES & CONSERVATION  
1520 EAST SIXTH AVENUE HELENA, MONTANA 59620-2301 444-6610

DNRC

Well No 12

205 # 00328013

RECEIVED

SEP 08 2005

MT DEQ PUBL. C WATER & SUBDIVISIONS BUREAU



**KLJ WELL FIELD PUMPING TEST REPORT**

2909 Airport Road Suite 105  
PO Box 1507  
Helena, MT 59624-1507  
406 449 7764  
kljeng.com



## Shelby Well Field Pump Test

**Date:** 10/2/2013 - 10/3/2013

**To:** Larry Bonderud (Shelby, NCMRWA)

**Copy to:** Julie Titchbourne (Missoula-KLJ)  
Brad Koon (Helena-KLJ)  
Mark Peterson (Helena-AE2S)

**From:** Jason Crawford (Helena-KLJ)

**RE:** NCMRWA Cut Bank to Shelby



### PURPOSE

On October 2<sup>nd</sup> and 3<sup>rd</sup> 2013, the City of Shelby Public Works Department and KLJ conducted pump tests on Shelby's well field. The purpose of the tests was to determine the quantity of water that could be pumped from the wells to the 100,000 gallon tank situated near Williamson Park.

### WELL FIELD

All of the water for the City of Shelby is supplied from eleven wells located in Williamson Park near the Marias River. The wells vary in depth from 31 to 50 feet. Seven of the eleven wells are shut down during the winter months. Six (Wells No. 7-12) of the seven wells that are shut down in the winter months are removed from service to prevent them from freezing and the other well (Well No. 5, which is capable of operating during the winter months) is shut down because the additional water is not needed during the winter months. Following is a summary of the operations of the eleven wells:

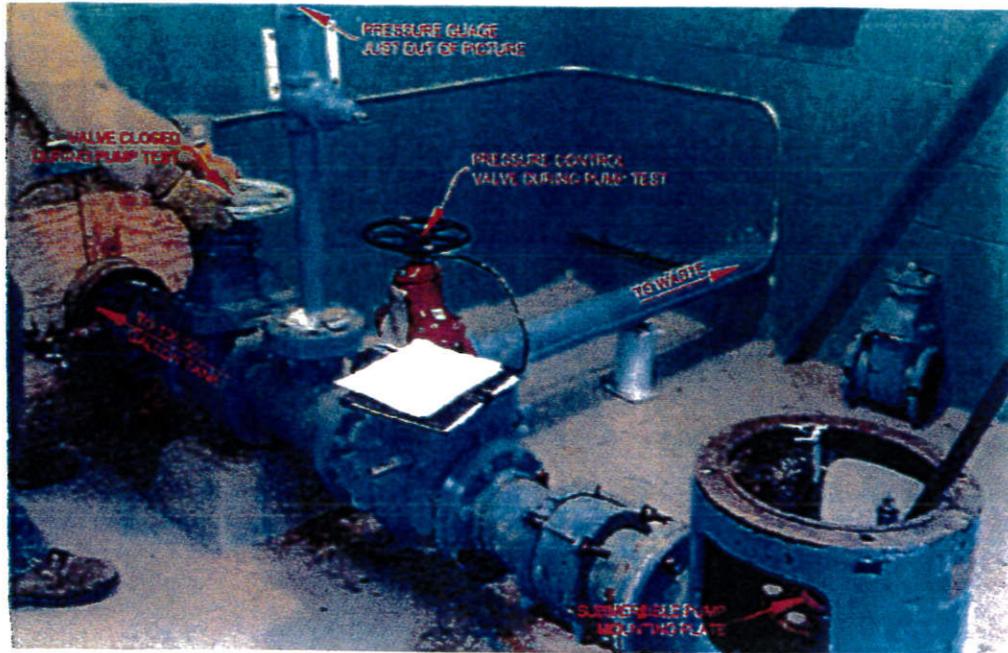


Well No.	Well Operation	Well Status
1	Pumps into the 100,000 gallon tank	Is used all year.
2	Pumps into the 100,000 gallon tank	Is used all year.
3	Pumps into the 100,000 gallon tank	Is used all year.
4	5 Pumps into the 100,000 gallon tank	Is shut down during winter months
6	7 Pumps into the 100,000 gallon tank	Must be shut down during winter months
	8 Pumps into the 100,000 gallon tank	Must be shut down during winter months
	9 Pumps into the casing of Well No. 1	Must be shut down during winter months
	10 Pumps into the casing of Well No. 3	Must be shut down during winter months
	11 Pumps into the casing of Well No. 5	Must be shut down during winter months
	12 Pumps into the casing of Well No. 7	Must be shut down during winter months
	13 Pumps into the 100,000 gallon tank	Is used all year.

#### PUMP TESTING

The tests were conducted by pumping those wells that directly supply water to the 100,000 gallon tank. The wells were pumped at a known flow rate and pressure. The rate and pressures were incrementally adjusted until a maximum pumping rate was achieved. The testing setup for the wells generally consisted of the well, pump, pressure gauge, meter, and the plumbing.

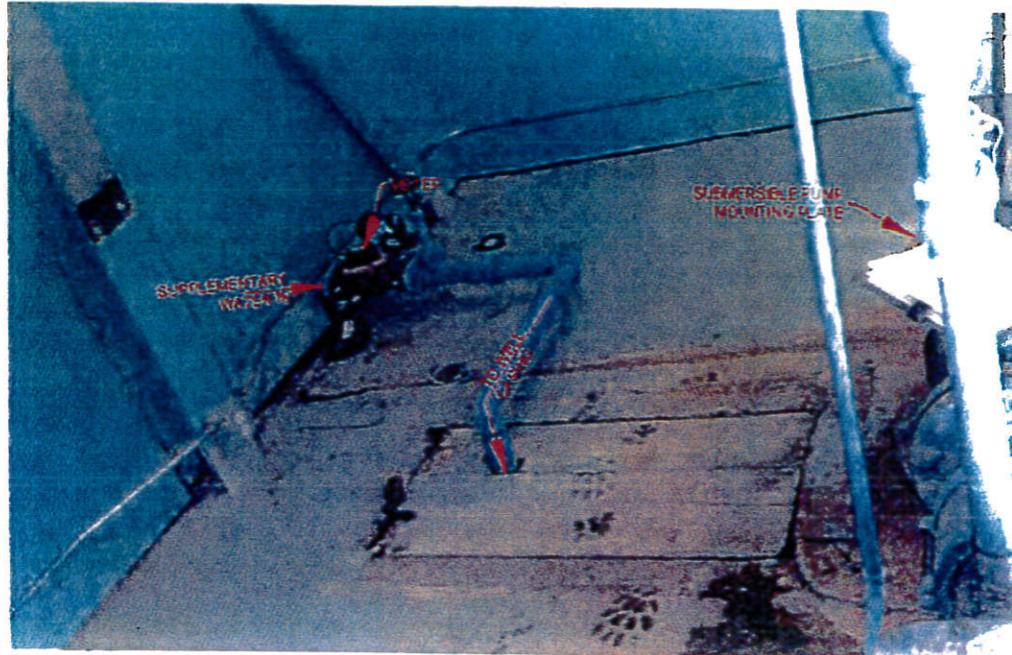
The following picture represents the typical well house plumbing:



Wells 1-8 were pumped to waste.



Wells 1,3,5, and 7 receive supplementary water from wells 9-12. The supplementary water is pumped from the supplementary well to its corresponding receiving well casing.



The specifics of each test are as follows:

#### Well No. 1

Well No. 1 was pumped to waste. Well No. 9 pumps supplementary water into the casing of well No. 1. Prior to starting the pump test, well no. 9 was turned on and the pumping rate was recorded to be 160 gpm by review of the meter. Once the supplementary rate was recorded, well no. 1 was turned on. The pressure and pumping rate were incrementally adjusted and recorded. The following table provides a summary of the pump test results for well no. 1.



WELL # 1 - WITH WELL NO. 9 PUMPING TO IT AT 160 GPM	PRESSURE (PSI)	PUMPING RATE (GPM)	TIME (10/2/13)	COMMENT
	30	191	13:40	
	28	231		
	26	250		
	24	271		
	22	293		
	20	307		
	18	330		
	16	357		
	14	370		
	12	389		
	10	401		
	8	415		
	6	428		
5.5	437	14:13	VALVE WIDE OPEN	

Well No. 2

Well No. 2 was pumped to waste. Well No. 2 does not have supplementary water pumping to it. Well no. 2 was turned on and the pressure and pumping rate were incrementally adjusted and recorded. The following table provides a summary of the pump test results for well no. 2.

WELL # 2	PRESSURE (PSI)	PUMPING RATE (GPM)	TIME (10/3/13)	COMMENT
	40	35	9:28	
	35	70		
	32	73	9:45	MAXIMUM RATE

Well No. 3

Well No. 3 was pumped to waste. Well No. 10 pumps supplementary water into the casing of well No. 3. Prior to starting the pump test, well no. 10 was turned on and the

KLJ  
 CONSULTING  
 ENGINEERS  
 10000  
 10000



pumping rate was recorded to be 140 gpm by review of the meter. Once the supplementary rate was recorded, well no. 3 was turned on. The pressure and pumping rate were incrementally adjusted and recorded. The following table provides a summary of the pump test results for well no. 3.

WELL # 3 - WITH WELL NO. 10 PUMPING TO IT AT 140 GPM	PRESSURE (PSI)	PUMPING RATE (GPM)	TIME (10/2/13)	COMMENT
	30	87	15:07	
	25	163		
	20	235		
	15	271		
	10	298		
6	370	15:30	VALVE WIDE OPEN	

Well No. 5

Well No. 5 was pumped to waste. Well No. 11 pumps supplementary water into the casing of well No. 5. Prior to starting the pump test, well no. 11 was turned on and the pumping rate was recorded to be 175 gpm by review of the meter. Once the supplementary rate was recorded, well no. 5 was turned on. The pressure and pumping rate were incrementally adjusted and recorded. The following table provides a summary of the pump test results for well no. 5.

WELL # 5 - WITH WELL NO. 11 PUMPING TO IT AT 175 GPM	PRESSURE (PSI)	PUMPING RATE (GPM)	TIME (10/3/13)	COMMENT
	30	350	9:53	
	28	365		
	26	386		
	24	406		
	22	425		
	20	431		
	18	455		
	16	476		
	14	484		
12	508	10:10	MAXIMUM RATE	



Well No. 13

Well No. 13 was pumped to the tank because is it equipped with a meter inside the pump house unlike all of the other wells. Well No. 13 does not have supplementary water pumping to it. Well no. 13 was turned on and the pressure and pumping rate were incrementally adjusted and recorded. The following table provides a summary of the pump test results for well no. 13.

WELL # 13	PRESSURE (PSI)	PUMPING RATE (GPM)	TIME (10/3/13)	COMMENT
	54	40	10:30	
	40	190		
	35	265		
	32	320		
	24	340	10:45	VALVE WIDE OPEN

While well No. 13 was being test pumped to the tank, wells 1,2,3, and 5 were also pumping to the tank. Wells No. 3 and 13 both pump to the same 12" PVC water main that leads to the 100,000 gallon tank; therefore, resulting in a higher pressure reading when the valve was wide open than if pumped to waste or pumped to the tank on its own. Wells 1,2, & 5 all pump to a different 12" water main that leads to the 100,000 gallon tank.



**SUMMARY**

Well No.	Pumping Rate (GPM)	Volumes		Comments
		GPD	ACRE- FEET/YEAR	
1	437	629,280	704.9	Well No. 9 pumps to Well No. 1 at 160 gpm
2	73	105,120	117.8	
3	370	532,800	596.9	Well No. 10 pumps to Well No. 3 at 140 gpm
5	508	731,520	819.5	Well No. 11 pumps to Well No. 5 at 175 gpm
7	240	345,600	387.1	Well No. 12 pumps to Well No. 7 at 130 gpm
8	111	159,840	179.1	
9	160	230,400	258.1	These wells pump to the other wells as indicated above.
10	140	201,600	225.8	
11	175	252,000	282.3	
12	130	187,200	209.7	
13	340	489,600	548.5	
<b>Totals</b>	<b>2,079</b>	<b>2,993,760</b>	<b>3,353.7</b>	The rates from wells 9-12 have been included in the rates for 1,3,5, & 7.

## KLJ WATER SYSTEM MODELING REPORT



## Shelby Water System Model

**Date:** 1/22/2014

**To:** File

**Copy to:** Julie Titchbourne (Missoula-KLJ)  
Brad Koon (Helena-KLJ)  
Tyrel Clark (Billings-KLJ)  
Doug Whitney (Billings-KLJ)  
Mark Peterson (Helena-AE2S)

**From:** Jason Crawford (Helena-KLJ)

**RE:** NCMRWA Cut Bank to Shelby

---



### PURPOSE

A WaterCAD model was prepared for the City of Shelby's water system. The model will be used to analyze the operations of the components of the City's system during the various demands that the system experiences and to determine if the system can handle additional demands at various locations. The purpose of this report is to document the strategies used to model the different components of the system.

### MODELED OPERATIONS

The critical components of the system were included for modelling purposes. Those critical components include the well pumps, clear well, clear well booster station, south tank, shop tank, airport tank, prison tank booster station, prison tank, and water mains connecting the critical components. A schematic of the modeled operations is included in Exhibit A. The critical components are all placed at surveyed elevations. The pipe sizes, types, and lengths included in the model are all representative of actual conditions. Specific components of the system (i.e individual hydrants, services, and distribution pipes, etc.) have been excluded from this model.

#### Well Pumps

Pump testing was recently completed on the well field indicating that during the summer months the well field is capable of producing a maximum of 2,079 gpm. Instead of



modeling each of the wells and well pumps separately the well field was modeled as a reservoir with the water elevation set to the average static water elevation of the wells (3,055.00'). A single pump with a maximum operating point of 2,079 gpm was used in place of the 11 separate well pumps. The pump was set at the same elevation as the reservoir water level (3,055.00'). The well pumps are controlled by the water level of the clear well.

### **Clear Well**

The 11 wells pump to a central 12" pvc water main. The 12" water main is approximately 400' long and delivers water to the 100,000 gallon clear well. The clear well is 34' in diameter which equates to 6,791 gallons per foot. The clear well has the ability to operate between 3,112.81' and 3,125.81'. The well field pump has been modeled to turn on when the clear well reaches a water level of 3,122.81' and off at 3,124.81'.

### **Clear Well Booster Station**

The clear well booster station (CWBS) is situated adjacent to the clear well at an elevation of 3,106.31'. The CWBS pumps water from the clear well to the south tank, the shop tank, and the airport tank through approximately 7 miles of 16" asbestos concrete pipe. The CWBS consists of 4 constant speed pumps. The pumps have each been included in the model along with the corresponding constant speed pump curves. The booster station pump curves are included in Exhibit B. The CWBS pumps are controlled by the water level of the south tank, shop tank, and airport tank.

### **South Tank, Shop Tank, and Airport Tank(Low Pressure Zone)**

The 1,000,000 gallon south tank is 67' in diameter which equates to 26,372 gallons per foot. The south tank has the ability to operate between 3,452.03' and 3,478.96'.

The 100,000 gallon airport tank is 28' in diameter which equates to 4,606 gallons per foot. The airport tank has the ability to operate between 3,450.41' and 3,478.96'.

The 1,500,000 gallon shop tank shop tank is 80.5' in diameter which equates to 38,070 gallons per foot. The shop tank has the ability to operate between 3,439.96' and 3,478.96'.

The total storage for the Low Pressure Zone is 2,600,000 gallons, based on the above mentioned tank diameters a fluctuation of 1' equates to 69,048 gallons.



CWBS Pump 1 is set to turn on when the water level of the tanks drops to 3,475.96', CWBS Pump 2 is set to turn on only if CWBS Pump 1 is on and the water level of the tanks drops to 3,475.46', CWBS Pump 3 is set to turn on only if CWBS Pumps 1 & 2 are on and the water level of the tanks drops to 3,474.96', CWBS Pump 4 is set to turn on only if CWBS Pumps 1, 2, & 3 are on and the water level of the tanks drops to 3,474.46'. CWBS Pumps 1, 2, 3, and 4 all turn off when the water level of the tanks reaches 3,477.96'.

### **Prison Tank Booster Station**

The prison tank booster station (PTBS) is situated adjacent to the south tank at an elevation of 3,456.79'. The PTBS draws water from the south tank and pumps water into the 500,000 gallon prison tank through approximately 2 miles of 12" PVC pipe. The PTBS is made up of 3 constant speed pumps. The pumps have each been included in the model along with corresponding constant speed pump curves. The pumps were pump tested in September of 2013. The pump tests results were as follows:

- 1 Pump = 365 gpm, 91 psi

The pump curve used to define each of the pumps was created based on the pump test information. The PTBS pumps are controlled by the water level of the Prison Tank.

### **Prison Tank(High and Middle Pressure Zones)**

The 500,000 gallon prison tank is 49.5' in diameter which equates to 14,395 gallons per foot. The prison tank has the ability to operate between 3,637.53' and 3,663.38'. PTBS Pump 1 is set to turn on when the water level drops to 3,660.38, PTBS Pump 2 is set to turn on only if PTBS Pump 1 is on and the water level drops to 3,659.88', and PTBS Pump 3 is set to turn on only if PTBS Pumps 1 & 2 are on and the water level drops to 3,659.38'.

PTBS Pumps 1, 2, and 3 all turn off at a water level of 3,662.38.

### **MODELED DEMANDS**

The demands that have been modeled are the annual peak day demands for Shelby and Cut Bank. The Shelby demands have been calculated based on 2012 meter information from various metered locations throughout Shelby's system. The meter results and demand calculations are included in Exhibit C. The modeled Cut Bank demands include a peak day demand of 1 MGD. The demands were applied at appropriate locations and elevations throughout the model. The daily pattern applied to the demands was determined based on the Prison Tank Level monitoring equipment for 8/5/2013 - 8/12/2013. The output from the Prison Tank Level monitoring equipment has been included in Exhibit D. Model results of the system at peak day demands with Cut Bank



have been included in Exhibit E. It is important to note that when reviewing the “System Pressures @ Peak Day Demand Plus Cut Bank” reports that the following junctions are situated near the base of the various tanks around town: J21, J385, J551, J572, J577, J580-J585, J594, J597, J599.

The City is divided into three different pressure zones: high, middle and low. The high and middle pressure zones are controlled by the prison tank and are separated by a PRV. The low pressure zone is controlled by the south tank, the airport tank, and the shop tank.

#### **High & Middle Pressure Zone (Prison Tank)**

The high pressure zone is made up of Ethridge and the Prison, both of which are metered and the middle pressure zone is made up of Shelby Heights. To determine the demands of Shelby Heights, the Ethridge demands plus the Prison demands were subtracted from the total number of gallons pumped to the prison tank. Following are the high and middle pressure zone 2012 calculated demands:

- Ethridge (High Press. Zone)
  - o Avg Day - 13,345 gallons (9.27 gpm)
  - o Peak Day - 35,304 gallons (24.52 gpm)
- Prison (High Press Zone)
  - o Avg Day - 65,682 gallons (45.61 gpm)
  - o Peak Day - 173,755 gallons (120.66 gpm)
- Shelby Heights (Middle Press. Zone)
  - o Avg Day - 83,710 gallons (58.13 gpm)
  - o Peak Day - 221,446 gallons (153.78 gpm)

#### **Low Pressure Zone (South Tank, Airport Tank, and Shop Tank)**

The low pressure zone is made up of the remainder of the town. To determine the demands of the low pressure zone the total number of gallons pumped to the prison tank were subtracted from the total number of gallons pumped to town. Following are the low pressure zone 2012 calculated demands:

- Remainder of Shelby (Low Press. Zone)
  - o Avg Day - 472,326 gallons (328.00 gpm)
  - o Peak Day - 1,249,494 gallons (867.70 gpm)



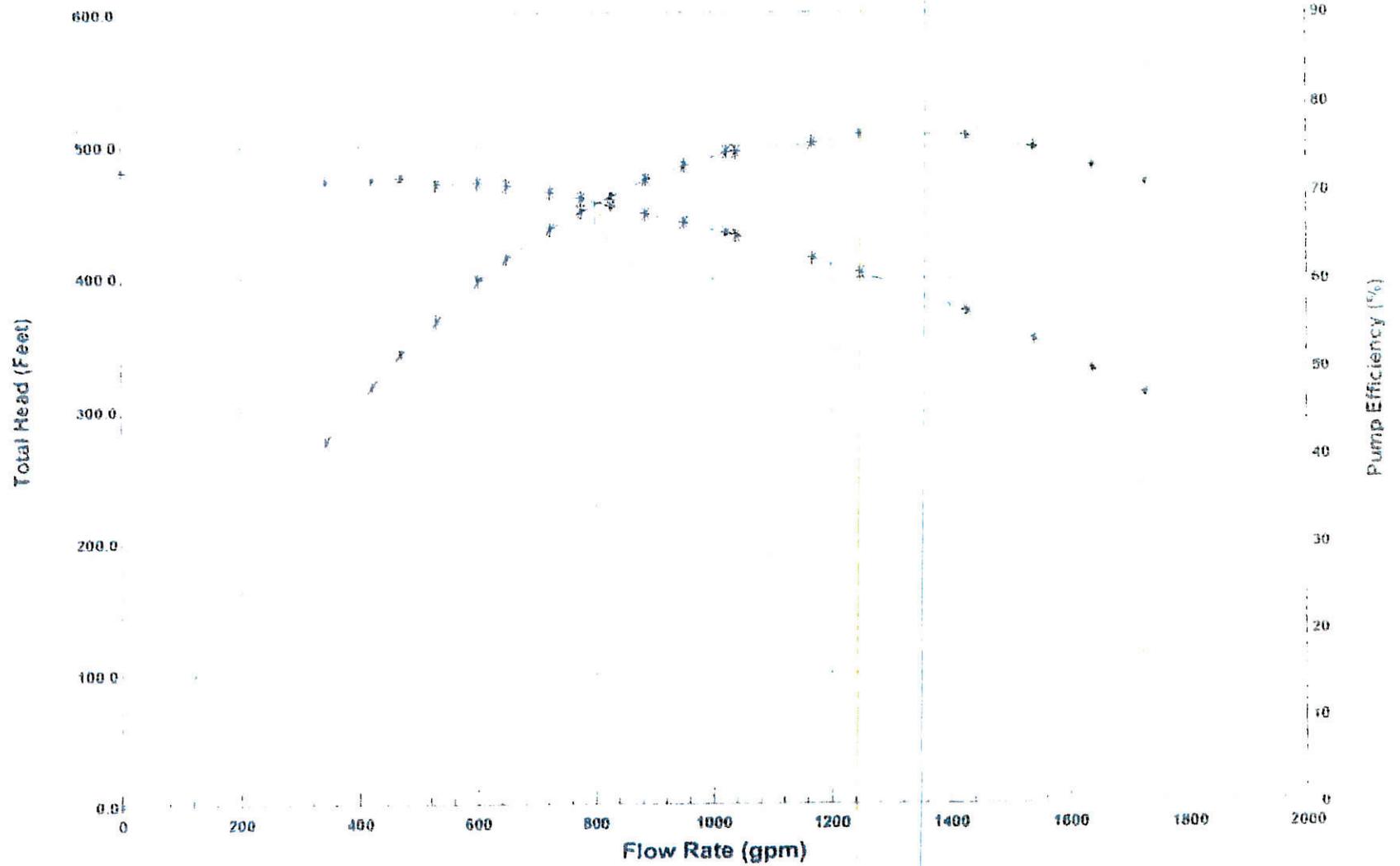
**EXHIBIT A**





**EXHIBIT B**

# 5AE12 S/N: RH-9927017069A



Date: 11/30/10

International Center for Water Technology



## EXHIBIT C

PRISON TANK	HIGH PRESSURE ZONE	<b>Ethridge - 2012</b>	
		Month	Usage (gal)
		January	198,900
		February	128,800
		March	165,800
		April	204,200
		May	654,800
		June	470,000
		July	906,400
		August	731,100
		September	883,500
		October	246,900
	November	120,600	
	December	160,100	
	<b>Prison - 2012</b>		
	Month	Usage (gal)	
	January	2,082,400	
	February	1,827,600	
	March	1,887,800	
	April	2,208,700	
	May	2,142,000	
	June	2,057,700	
	July	1,779,800	
	August	2,011,900	
September	1,995,800		
October	2,059,300		
November	1,882,800		
December	2,038,100		
<b>Shelby Heights - 2012</b>			
Month	Usage (gal)		
January	788,700		
February	950,600		
March	1,058,400		
April	1,879,100		
May	2,933,200		
June	2,305,300		
July	6,423,800		
August	6,696,000		
September	3,178,700		
October	1,473,800		
November	1,498,600		
December	1,367,800		

Avg Day - 13,345 gallons  
9.27 gpm  
Peak Day - 35,304 gallons  
24.517 gpm

Avg Day - 65,682 gallons  
45.61 gpm  
Peak Day - 173,755 gallons  
120.66 gpm

Avg Day - 83,710 gallons  
58.13 gpm  
Peak Day - 221,446 gallons  
153.78 gpm

LOW PRESSURE ZONE - ALL OTHER TANKS	<b>Remainder of Town - 2012</b>	
	Month	Usage (gal)
	January	10,251,000
	February	7,194,000
	March	7,552,000
	April	12,490,000
	May	17,728,000
	June	16,357,000
	July	28,493,000
	August	27,344,000
	September	18,644,000
	October	11,679,000
November	7,230,000	
December	7,437,000	

Avg Day - 472,326 gallons  
328.00 gpm  
Peak Day - 1,249,494 gallons  
867.70 gpm

TOTAL PUMPED TO TOWN - 2012	<b>Total to Town - 2012</b>		
	Month	Usage (gal)	Max Day (gal)
	January	13,321,000	457,000
	February	10,101,000	793,000
	March	10,664,000	638,000
	April	16,782,000	872,000
	May	23,458,000	1,303,000
	June	21,190,000	817,000
	July	37,603,000	1,680,000
	August	36,783,000	1,659,000
	September	24,702,000	903,000
	October	15,459,000	889,000
November	10,732,000	519,000	
December	11,003,000	662,000	

Avg Day - 635,063 gallons  
441.02 gpm  
Peak Day - 1,680,000 gallons  
1166.67 gpm

TOTAL PUMPED TO PRISON TANK - 2012	<b>Total to Prison Tank - 2012</b>	
	Month	Usage (gal)
	January	3,070,000
	February	2,907,000
	March	3,112,000
	April	4,292,000
	May	5,730,000
	June	4,833,000
	July	9,110,000
	August	9,439,000
	September	6,058,000
	October	3,780,000
November	3,502,000	
December	3,566,000	

**WATER SERVICE AREA DESIGN AND RECORD DRAWINGS**







