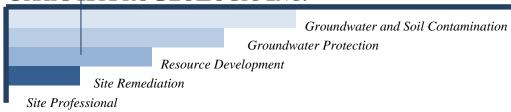
#### CRAIG HYDROGEOLOGIC INC.



#### **CHATHAM WELLFIELD**

#### TH3-2016 GROUNDWATER EXPLORATION

#### **2016**

## **EIA REGISTRATION DOCUMENT SEPTEMBER 19, 2016**

Prepared for: Miramichi Department of Public Works

Mr. Jay Shanahan 141 Henry Street, Miramichi, NB, E1V 2N5

September 19, 2016

#### Craig HydroGeoLogic Inc.

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# CHATHAM WELLFIELD TH3-2016 GROUNDWATER EXPLORATION 2016

### **EIA REGISTRATION DOCUMENT SEPTEMBER 19, 2016**

**Proponent:** City of Miramichi, NB, Mr. Jay Shanahan, Director of Public Works, 141 Henry Street, Miramichi, NB, E1V 2N5. Phone 506-623-2020.

Overview: The City of Miramichi has a number of municipal groundwater wells in the former Municipality of Chatham which provide the Chatham area municipal groundwater supply. Some of these wells are older, located in developed areas, and may be nearing the end of their usefulness. The long term plan for the City is to develop a groundwater treatment plant in the general area of the Springvale, Napan Road and Industrial Park (also known as the NB Power) Wells (see attached Figure 1. In order to facilitate this development plan, the City intends to further develop this wellfield, potentially in the areas to the south or east, which, in general are undeveloped woodlands. This would allow the wells in this area to feed water to the future treatment plant prior to going into the distribution system. Groundwater exploration and development in these areas would also be consistent with minimizing impacts potentially arising from the Ground Water Protection Zone designation.

**Purpose/Rational/Need for the undertaking**: To provide for future groundwater supply needs in the former Municipality of Chatham area

**Project Location:** The potential general exploration area and two potential drill targets are indicated in Figure 1. The actual locations will be determined based on accessibility and land availability. This is complicated somewhat by the plans for the future construction of a highway bypass through the general area. We are aware of the current proposed route and will avoid potentially locating wells near it.

**Siting Considerations**: The exploration area is generally undeveloped forest area. Extending the wellfield into these areas should minimize potential land use conflicts.

**Physical Components and Dimensions of the Project:** The immediate plan is to drill a single new exploration borehole at the location shown in Figure 1, pump testing the well and submitting a specific plan for development as part of the wellfield. It is proposed that TH1-2016 and TH2-2016 be used as observation wells. The physical components include the well, future well house and waterman piping to connect to the future treatment plant and distribution system.

**Zoning:** The project is compliant with the site zoning.

**Public Consultations:** The public consultations will be comprised of sending out an information package to all property owners within a 500 meters' radius of the new production well and accepting comments via mail, telephone and/or email. Copies of the information package will also be sent to the local MLA and MP. The information package will focus on the WSSA process and the use of the well and potential impacts. Any comments received from the public will be compiled and submitted to NBDEG.

**Groundwater Testing**: The groundwater testing is described in the Step One Application. The Step One Application is enclosed with this document.



Project:

Chatham Wellfield
Scale:
Date: September 18, 2016

Proposed TH3-2016 Location
Figure:
1

Craig HydroGeoLogic Inc.

#### CRAIG HYDROGEOLOGIC INC.



## Water Supply Source Assessment Step One Application

#### **TH3-2016**

#### **Chatham Wellfield Groundwater Exploration**

Prepared for: Miramichi Department of Public Works

Mr. Jay Shanahan 141 Henry Street, Miramichi, NB, E1V 2N5

September 19, 2016

#### Craig HydroGeoLogic Inc.

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Telephone 506-**659-3064** Email dcraig@craighydrogeologic.ca/

#### **Water Supply Source Assessment**

#### **Step One Application**

#### **Chatham Wellfield Groundwater Exploration**

- 1) Name of proponent: City of Miramichi, NB, Mr. Jay Shanahan, Director of Public Works, 141 Henry Street, Miramichi, NB, E1V 2N5. Phone 506-623-2020.
- 2) Location of drill targets and the purpose of the proposed water supply: A single new drill target is proposed and the location is shown in Figure 1 as Proposed TH3-2016. Proposed TH3-2016 is located on PID 40052755. The proposed well is intended to form part of the municipal groundwater supply for Miramichi (former Chatham Area).
- 3) Required water quantity (in m<sup>3</sup>/day): The quantity of water is unknown at this time. Test hole TH1-2016 (Figure 1) was originally pump tested for 72 hours at 250 igpm in 2016. It is anticipated that the new well would produce somewhere between 150 and 250 igpm. The long term plan is to construct a central water treatment plant to treat water from the Chatham Wellfield.
- 4) List alternate water supply sources in area (including municipal systems): The proposed target location is shown in Figure 1. There are alternative areas that could be developed, particularly in the relatively undeveloped area east of these location along Black Brook. The City of Miramichi's long term plan is to examine the groundwater resource in the general area shown in Figure 1 to provide future water supplies for the Chatham area. The proposed target areas have limited potential land use conflicts compared to other current locations in the more built up Chatham area.

5) Discuss area hydrogeology as it relates to the project requirements. A well log search was conducted around PID 40052755 in September, 2016. The search provided eight well logs.

The surficial overburden at the site is red clay till of approximately 1.2 to 10.4 meters (4 to 34 feet) in thickness. Significant accumulations of sand or gravel are not known to be present and during the site visit no indications of such materials were observed. The overburden is not used for ground water supplies in the area.

The bedrock in the area is mapped as Pennsylvanian age sedimentary rocks composed of red and grey conglomerate, sandstone, siltstone, and shale, which also forms the local bedrock aquifer. The bedrock is known to be relatively transmissive (readily conducts the flow of ground water). The bedrock units or layers tend to be lenticular (i.e. of variable lateral extent and thickness) and are thought to have formed as a result of sedimentary particles deposited from flowing water (alluvial deposition). The individual beds average less than 1 meter in thickness; however, the total bedrock unit can be several hundred meters thick. This bedrock aquifer covers a large portion of New Brunswick, stretching from the Fredericton area northeast to Shippigan and southeast to the Shediac area.

Based on common knowledge of the area, the bedrock aquifer has been successfully developed for both municipal and private residential wells by a number of individuals over the general area. The general conditions found in the aquifer are suitable for water supply development. Local well drillers with knowledge of the area confirmed the potential for water supply development. Recently, the City of Miramichi has drilled exploration wells in this general area with safe yields in the 200 igpm to 250 igpm range. In addition, the presence of an upper and a deeper, confined to semi confined aquifer is known to be present in the local target area.

**Proposed Drill Target TH3-2016:** A search of the NBDELG well log database for records located within a 750 meter radius around the proposed test well was carried out September 2016 and the search yielded eight usable well logs. A summary of the information contained in the well logs is provided in Table 1, immediately below.

**Table 1**: Summary of hydrogeologic information derived from search of NBDELG well log database for Proposed Drill Target TH3-2016.

#### 750-meter radius search

Well Depth (feet)	Estimated Yield (igpm)	Depth to Bedrock (feet)	Casing Length (feet)
Average: 81.6	Average: 15.1	Average: 20.4	Average: 56.8
Median: 77.5	Median: 16	Median: 22.5	Median: 55
Minimum: 51	Minimum: 5	Minimum: 4	Minimum: 37
Maximum: 125	Maximum: 25	Maximum: 34	Maximum: 85

From the information contained in the well logs it appears that they are all domestic private wells and none of the municipal wells are included in the data set. As can be seen from the above information the average private well in the area is approximately 82 feet deep with an estimated average yield of approximate 15.1 igpm. As expected in any rock unit the yields are variable with a minimum yield of 5 igpm being estimated in a 125 foot deep well. In general, the area has relatively shallow wells with relatively high yields for private wells.

A search of the NBDELG well chemistry database for locations in a 750 radius around the proposed new exploration well property PID was carried out in September, 2016 and the search yielded five chemistry records. The precise locations of the wells from which the ground water chemistry was obtained are not available due to right to privacy considerations for the property owners. These well chemistry analytical results are provided in Table 2, which follows. The average value of the measured result and the Canadian Drinking Water Quality Guideline

Table 2
NBDOE Groundwater Chemistry Database

Parameter	ALK_T (mg/L)	Al (mg/L)	As (μg/L)	B (mg/L)	Ba (mg/L)	Br (mg/L)	COND (µSIE/cm)	Ca (mg/L)	Cd (µg/L)
	97.7	0.025	1.5	0.038	0.09	0.1	217	25.5	0.5
	119	0.025	1.5	0.075	0.262	0.1	967	30.6	0.5
	13.4	0.025	1.5	0.01	0.115	0.1	306	16.2	0.5
	84.8	0.025	1.55	0.2	0.195	0.1	179	22.4	0.5
	110	0.025	4.14	0.032	0.324	0.1	229	27.6	0.5
Mean	85.0	0.025	2.0	0.071	0.197	0.1	380	24.5	0.5
CDWQG			<10	<5.0	<1.0				<5.0

Parameter	CI (mg/L)	Cr (µg/L)	Cu (µg/L)	E_coli P/A (P/A)	F (mg/L)	Fe (mg/L)	HARD (mg/L)	K (mg/L)	Mg (mg/L)
	4.54	12	10	Ab	0.141	0.872	83.7	1.23	4.83
	231	10	17	Ab	0.213	0.192	99.1	1.7	5.5
	78.1	10	40	Ab	0.1	0.01	77.6	2.4	9.01
	2.4	10	10	Ab	0.13	0.07	79.5	2.52	5.73
	2.47	14	10	Ab	0.148	0.176	92.6	2.85	5.76
Mean	63.7	11	17		0.15	0.264	86.5	2.14	6.17
CDWQG	<250	<50	<1000		<1.5	<0.3			

Brook Ridge Estates

CDWQG = Canadian Drinking Water Quality Guideline

Table 2

NBDOE Groundwater Chemistry Database

Parameter	Mn (mg/L)	NO2 (mg/L)	NO3 (mg/L)	NOX (mg/L)	Na (mg/L)	PH (pH)	Pb (μg/L)	SO4 (mg/L)	Sb (μg/L)
	0.398	0.05	0.05	0.05	8.3	7.17	1	6.22	1
	0.086	0.05	0.05	0.05	25.9	8.53	1	5.66	1
	0.01	0.05	1.8	1.9	21.7	6.61	1	5.48	1
	0.289	0.05	0.05	0.05	6.63	8.21	1	7.48	1
	0.652	0.05	0.05	0.05	11.9	7.95	1	5.43	1
Mean	0.287	0.05	0.40	0.42	14.89	7.69	1.0	6.05	1.00
CDWQG	<0.05	<10	<10	<10	<200	6.5-8.5	<10	<500	6

Parameter	Se (µg/L)	TC-P/A (P/A)	TURB (NTU)	TI (μg/L)	U (µg/L)	Zn (µg/L)	TDS (mg/L)
	1.5	Ab	1.75	1	0.5	5	111
	1.5	Ab	14	1	0.5	8	373
	1.5	Ab	0.2	1	0.5	57	150
	1.5	Ab	0.1	1		6	99
	1.5	Pr	0.4	1	0.5	19	123
Mean	1.5		3.3	1	0.5	19	171
CDWQG			<1.0		<20	<5000	<500

(CDWQG) are included in the table for the purpose of comparison. Any parameter which exceeds the Canadian Drinking Water Quality Guideline concentration is bolded and shaded for ease of recognition in the data table.

Out of the five chemistry records available, one well had an exceedance of the CDWQG for iron of 0.3 mg/L and four wells exceeded the CDWQG concentration for manganese of 0.05 mg/L. The guidelines for iron and/or manganese are based on esthetic considerations, not health. Iron and/or manganese can cause staining of plumbing fixtures and laundry. Iron and/or manganese can usually be readily removed by commercial water softeners at the hardness observed in this water or by filters. The presence of Iron and/or manganese in the groundwater from this aquifer is not uncommon and is commonly the result of natural conditions. In the Miramichi area elevated concentrations of iron and manganese in groundwater are quite common.

A single well exceeded the pH range upper limit of 8.5 with a measured value of 8.53. This is felt to be insignificant.

A total of two out of the five chemistry records available had elevated turbidity present in the samples. The elevated levels of turbidity may be related to the relative newness of the wells and they may not have had sufficient time, or use, to clear naturally. Most new wells clear naturally with time and use. At levels in excess of 5 NTUs turbidity may become noticeable to consumers and therefore, objectionable. The turbidity may be the result of elevated concentrations of iron and or manganese or the presence of particulate in the water. In either case, turbidity can be treated by water softeners and/or particulate filters.

The observed water chemistries are of acceptable drinking water quality and can be considered to be typical of this bedrock unit. The elevated turbidity observed in a number of the well in the sample sets may be related to the newness of the wells and the fact that they have not been pumped sufficiently to clear the water Elevated turbidity values may also impact analytical results leading to overestimates of iron and manganese concentrations. Overall, the review of the inorganic ground water chemistry provided in the NBDELG water quality database for the area did not reveal or indicate significant problems with other water quality parameters.

Location of proposed drill targets relative to existing wells. There are questions as to how closely should new wells be located within the area of the existing Chatham area wellfield. That is, how close they should be located to each other without undue interference occurring. The existing documentation for pump tests on wells in the immediate area was reviewed and found that the report for the pump test on TH2-92 (JWEL 3380-9, 1992) contained some distance drawdown data. Although the data is limited it does provide us with an estimate of the zero drawdown distance based on that pump test.

The pump test on TH2-92 was at 200 igpm (15L/s) for 24 hours. A graph of the distance-drawdown data is attached. It is clear from the graph that the zero drawdown radius around TH2-92 is about 750 meters. It is common; however, to allow some limited interference between pumping wells in a wellfield, say about 1.0 meters. The 1.0 meters interference radius for the test is approximately 200 meters. As interference is additive (if we had two identical wells located 200 meters apart then the total interference would be 2.0 meters) in order to limit the interference between the wells to 1.0 meters the two wells should be approximately 400 meters apart.

- 6) Outline the proposed hydrogeological testing and work schedule: TH1-2016, TH2-2016 and TH2-92 are existing wells which we propose to use as observation wells. We propose to drill the new test well (TH3-2016) as soon as approval to proceed is granted. It is proposed that the new potential production well will be pump tested for a 72-hour period during the fall season, 2016, dependent on acceptable weather conditions.
- 7) Identify any existing pollution or contamination hazards within a minimum 500 m radius of the proposed drill targets. If groundwater use problems (quantity or quality) have occurred in the past, then these should be identified. Historical land use that might pose a contamination hazard (i.e. tannery, industrial, disposal, etc.) should also be discussed. The sites are located in an area of undeveloped woodland. No existing developments are present within the 500-meter radius. A historical NB Power Ash Dump is located approximately 300 meters east-northeast of Proposed Drill Target TH3-2016 as shown in Figure 1. The ash dump operated from

1986 until 2001 when it was closed. The site was a clay lined facility with 600 mm of nominal 10-8 clay with a perimeter collection ditch. The site was capped when it was closed.

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In order to assess the potential significance of this dump the former monitoring information from NB Power and NB Environment for groundwater monitoring wells and the lagoon was obtained and analyzed. The data consisted of several 10's of thousands of data points which have been reduced to the following Table 3 to simplify interpretation. The first 11 stations in the table represent monitoring wells with the number designation and the following letter I = intermediate, D = deep and S = shallow depths. The final station (ADSL) represents the lagoon. The CDWQG are presented in the bottom line of the table for the purpose of comparison and data that exceeds these criteria are colour shaded for ease of recognition. The significant fact of this information is that none of the trace metal concentrations exceed the CDWQG criteria, with the exception of a single Barium concentration in well 2D. The systematic exceedances are for iron, manganese and turbidity for which the CDWQG criteria are not health related.

Another factor to consider would be the proportion of water that the former ash dump would contribute to the recharge sustaining any production well. This would be based on the land area of the dump compared to the total land area contributing recharge to the production well. Based on the size of the existing groundwater capture areas for the existing production wells, the ash dump area would comprise no more than approximately 5% of the recharge land area. In addition, the clay liner and cap would greatly reduce the recharge to the groundwater aquifer from the ash dump site.

Based on the above information, that the potential contamination at the ash dump appear to be relatively innocuous, and that the site should not significantly provide recharge to any production well, it appears that groundwater development in the area of Proposed TH3-2016 can proceed.

8) Identify any watercourse(s) (stream, brook, river, wetland, etc.) within 60 m of the proposed drill targets. There are no watercourses within 60 m of the proposed drill target.

Station	As	В	Ba	Ca	Cd	Cl	Cond	Cr	Cu	Fe	Fl	Hard
10I	< 0.05	< 0.1	0.2	17.00	< 0.005	3.77	117.00	< 0.01	< 0.01	0.530	0.130	57
11I	< 0.05	< 0.1	0.2	22.25	< 0.005	3.38	150.45	< 0.01	< 0.01	0.272	0.139	74
13I	< 0.05	< 0.1	0.2	12.95	< 0.005	3.69	90.41	< 0.01	< 0.01	0.377	< 0.009	45
1D	< 0.05	< 0.1	0.1	18.22	< 0.005	13.31	136.04	< 0.01	< 0.01	0.432	0.200	55
2D	< 0.05	< 0.1	3.0	39.39	< 0.005	6.42		< 0.01	< 0.01	20.582	0.030	122
3S	< 0.05	< 0.1	0.0	66.39	< 0.005	13.20	193.61	< 0.01	< 0.01	0.289	0.124	193
4S	< 0.05	< 0.1	< 0.2	17.19	< 0.005	6.11	151.61	< 0.01	< 0.01	0.141	0.012	37
5S	< 0.05	< 0.1	< 0.2	5.50	< 0.005	3.39	54.27	< 0.01	< 0.01	0.224	0.015	34
6S	< 0.05	< 0.1	< 0.2	17.16	< 0.005	5.42	150.23	< 0.01	< 0.01	0.743	0.014	49
7S	< 0.05	< 0.1	< 0.2	8.16	< 0.005	3.03	99.27	< 0.01	< 0.01	1.638	0.014	44
9S	< 0.05	< 0.1	< 0.1	4.13	< 0.005	3.99	37.56	< 0.01	< 0.01	0.092	0.000	28
ADSL	< 0.05	0.03	< 0.1	72.69	< 0.005			< 0.01	< 0.01	0.088		
CDWQG	0.025	5	1	200	0.005	250		0.01	0.01	0.3	1.5	200

Station	Hg	Mn	Na	Ni	NO3	Pb	рН	SS	Sul	TDS	Turb	Zn
10I	< 0.001	0.010	2.90	< 0.01	0.210	< 0.02	8.1	32	6.7	65.2	7.0	< 0.01
11I	< 0.001	0.024	3.62	< 0.01	0.604	< 0.02	8.0	32	3.6	79.0	11.9	< 0.01
13I	< 0.001	0.026	2.54	< 0.01	0.191	< 0.02	7.1	68	5.1	51.7	22.4	< 0.01
1D	< 0.001	0.044	4.28	< 0.01	0.358	< 0.02	6.6	91	17.9	76.4	6.9	< 0.01
2D	< 0.001	0.426	4.99	< 0.01	0.318	< 0.02	7.5	28	5.8	128.5	3.6	< 0.01
3S	< 0.001	0.187	6.49	< 0.01	0.800	< 0.02	5.8	19	147.6	195.4	7.1	< 0.01
4S	< 0.001	0.088	2.80	< 0.01	0.444	< 0.02	6.0	18	33.3	46.0	13.3	< 0.01
5S	< 0.001	0.065	2.93	< 0.01	0.175	< 0.02	5.9	38	12.3	33.3	41.9	< 0.01
6S	< 0.001	0.263	3.68	< 0.01	0.420	< 0.02	6.0	72	35.8	56.1	86.8	< 0.01
7S	< 0.001	0.228	2.99	< 0.01	0.885	< 0.02	6.1	133	15.0	41.2	93.5	< 0.01
9S	< 0.001	0.076	2.57	< 0.01	0.082	< 0.02	6.2	54	5.9	36.0	12.3	< 0.01
ADSL	< 0.001			< 0.01		< 0.02	9.5	7	101.1	203.7	15.6	< 0.01
<b>CDWQG</b>		0.05	200		10	0.01	6.5-8.5		500		1	5

- 9) Identify site supervisory personnel involved in the source development (municipal officials, consultants and drillers: Mr. Jay Shanahan (City of Miramichi, 506-623-2020) Mr. Doug Craig (Craig Hydrogeologic Inc., 506-659-3064) and Mr. Donald Green, (Green's Well Drilling, 506 369-2603).
- 10) Figure 1 (site plan): Please See Attached.
- 11) Figure 2 (land use/zoning map): Please See Attached

**Prepared By** 

**Doug Craig** 

Craig Hydrogeologic



Project:

Chatham Wellfield
Scale:
Date: September 18, 2016

Proposed TH3-2016 Location
Figure:
1

Craig HydroGeoLogic Inc.



750 meter radius around PID 40052755

	gth t) 60 85
Depth (Feet) Vield (Feet) Bedrock (Feet) (Feet) (Feet) 125 12 22 66	gth t) 60 85
(Feet) (igpm) (Feet) (Feet) (125 12 22 6	60 85
125 12 22 6	60 85
	35
	35
	35
125   5   22   8	
	4.0
60 7 27 4	40
80 20 4	52
75 20 6 4	40
82 25 23 8	30
55 20 25 5	50
51 12 34 3	37
Well Estimated Depth to Casi	ing
Depth Yield Bedrock Leng	
(Feet) (igpm) (Feet) (Fee	

Median	77.5	16	22.5	55 Median
average	81.6	15.1	20.4	56.8 AVERAG
max	125	25	34	85 max
min	51	5	4	37 min
count	8			





Date printed 2016/09/18

Drilled by

Well Use Work Type **Drill Method** Work Completed New Well 10/04/2003 Drinking Water, Domestic

Casing Information	Casing ab	ove ground 0ft	Drive Shoe Used? No		
Well Log Casing Type	Diameter	From	End	Slotted?	
8527 Steel	6 inch	Oft	60ft		

Aquifer Test	t/Yield				Estimated		
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Safe Yield	Flowing Well?	Rate
	35ft	12 igpm	1hr	74ft	0 igpm	No	0 igpm
	(BTC - Below to	p of casina)					

Well Grouting Disinfectant Pump Installed Drilling Fluids Used N/A None N/A There is no Grout information. Intake Setting (BTC) Qty 0 ig 75ft

Driller's Log Overall Well Depth Well Log From End Colour Rock Type 125ft 8527 0ft Slate and Granite 22ft Brown 8527 22ft 52ft **Brown** Sandstone and Shale 8527 52ft 88ft Grey Sandstone

Bedrock Level 22ft

8527	88ft	12 igpm	
Well Log	Depth	Rate	
Water Be	earing Frac	ture Zone	

Setbacks		
Well Log	Distance	Setback From
8527	230ft	Right of any Public Way Road





#### Report Number 16364

#### Well Driller's Report

Date printed 2016/09/18

Drilled by

Well Use Work Type **Drill Method** Work Completed Deepened 07/07/2007 Drinking Water, Domestic Rotary

Casing	Information	Casing above ground 1ft 6in			Drive Shoe Used? No
Well Log	Casing Type	Diameter	From	End	Slotted?
16364	Steel	6 inch	Oft	85ft	

Aquifer Test	t/Yield				Estimated		
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Safe Yield	Flowing Well?	Rate
Air	35ft (BTC - Below to	15 igpm o of casina)	1hr	70ft	5 igpm	No	0 igpm

Well Grouting Disinfectant Pump Installed Drilling Fluids Used None N/A N/A There is no Grout information. Intake Setting (BTC) Qty 0 ig

85ft

Driller's	Log				Overall Well Depth
Well Log	From	End	Colour	Rock Type	125ft
16364	88ft	125ft	Grey	Sandstone	Bedrock Level
					22ft

Water Be	earing Frac	cture Zone	
Well Log	Depth	Rate	
16364	100ft	5 igpm	
16364	120ft	15 igpm	

Setbacks	
	There is no Setback information.





Date printed 2016/09/18

Drilled by

Well Use Work Type **Drill Method** Work Completed New Well 05/27/2008 Non-Drinking Water, Industrial Rotary

17803	Steel	6 inch	Oft	40ft	
Well Log	Casing Type	Diameter	From	End	Slotted?
Casing	Information	on Casing above ground 1ft 6in			Drive Shoe Used? No

Aquifer Test/	Yield				Estimated		
	Initial Water	Pumping		Final Water	Safe Yield	Flowing	
Method	Level (BTC)	Rate	Duration	Level (BTC)		Well?	Rate
Bailer	24ft	14 igpm	1hr	24ft	7 igpm	No	0 igpm
	(BTC - Below to	p of casina)			-		-

Well Grouting Disinfectant Pump Installed Drilling Fluids Used Foam N/A N/A There is no Grout information. Intake Setting (BTC)

Qty 0 ig 40ft

Driller'	s Log			
Well Lo	g From	End	Colour	Rock Type
17803	0ft	3ft	Brown	Fill Shale
17803	3ft	27ft	Red	Clay
17803	27ft	33ft	Grey	Sandstone
17803	33ft	34ft	Grey	Clay
17803	34ft	38ft	Grey	Sandstone
17803	38ft	39ft	Red	Clay
17803	39ft	60ft	Grey	Sandstone

Overall Well Depth 60ft Bedrock Level Oft

Water Bearing Fracture Zone					
Well Log	Depth	Rate			
17803	50ft	10 igpm			
17803	60ft	14 igpm			

Setbacks	3		
Well Log	Distance	Setback From	
17803	30ft	Right of any Public Way Road	





Date printed 2016/09/18

Drilled by

Well Use Work Type Drill Method Work Completed Non-Drinking Water, Heat Pump New Well Rotary 07/29/2010

25762	Steel	6 inch	Oft	62ft			
Well Log	Casing Type	Diameter	From	End	Slotted?		
Casing	Information	Casing above ground 2ft			Drive Shoe Used? No		

Aquifer Tes	t/Yield				Estimated				
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Safe Yield	Flowing Well?	Rate		
Air	24ft	60 igpm	1hr	24ft	20 igpm	No	0 igpm		
	(BTC - Below top of casina)								

Well Grouting

There is no Grout information.

Drilling Fluids Used
Foam

Disinfectant
N/A
N/A
Intake Setting (BTC)

Qty 0 ig Oft

Driller's	s Log			
Well Log	From	End	Colour	Rock Type
25762	Oft	1ft	Brown	Shale
25762	1ft	2ft	Brown	Soil
25762	2ft	4ft	Brown	Soils and Sand and Clay
25762	4ft	21ft	Brown	Sandstone
25762	21ft	26ft	Dark brown	Sandstone
25762	26ft	41ft	Brown	Sandstone
25762	41ft	42ft	Grey	Clay
25762	42ft	46ft	Grey	Sandstone
25762	46ft	58ft	Brown	Sandstone
25762	58ft	61ft	Dark brown	Soft Sandstone
25762	61ft	80ft	Brown	Sandstone

Overall Well Depth 80ft Bedrock Level 0ft

Water Bearing Fracture Zone						
Well Log	Depth	Rate				
25762	40ft	55 igpm				
25762	60ft	75 igpm				

Setbacks	i	
Well Log	Distance	Setback From
25762	66ft	Right of any Public Way Road
25762	170ft	Right of any Public Way Road





Date printed 2016/09/18

Drilled by

Well Use Work Type **Drill Method** Work Completed 07/29/2010 New Well Drinking Water, Domestic Rotary

Casing Information  Well Log Casing Type	Casing ab Diameter	Casing above ground 1ft 10in  Diameter From End		
25763 Steel	Biamotor	Oft	40ft	Slotted?

Aquifer Test/	Yield				Estimated			
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Safe Yield	Flowing Well?	Rate	
Air	24ft	35 igpm	1hr	24ft	20 igpm	Yes	0 igpm	
(BTC - Below top of casina)								

Well Grouting Disinfectant Pump Installed Drilling Fluids Used Foam N/A N/A There is no Grout information. Intake Setting (BTC) Qty 0 ig

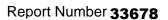
60ft

Driller'	s Log			
Well Lo	g From	End	Colour	Rock Type
25763	Oft	6ft	Brown	Fill Shale
25763	6ft	26ft	Brown	Sandstone
25763	26ft	32ft	Dark brown	Sandstone
25763	32ft	36ft	Brown	Sandstone
25763	36ft	39ft	Dark brown	Soft Sandstone
25763	39ft	75ft	Brown	Sandstone

Overall Well Depth 75ft Bedrock Level Oft

Water Bearing Fracture Zone					
Well Log	Depth	Rate			
25763	75ft	35 igpm			
25763	60ft	20 igpm			

Setbacks		
Well Log	Distance	Setback From
25763	115ft	Right of any Public Way Road
25763	115ft	Right of any Public Way Road





Date printed 2016/09/18

Drilled by

Well Use Work Type Drill Method Work Completed Drinking Water, Domestic New Well Rotary 11/11/2011

33678	Steel	6 inch	Oft	80ft			
Well Log	Casing Type	Diameter	From	End	Slotted?		
Casing	Information	Casing above ground 0ft			Drive Shoe Used? No		

Aquifer Tes	t/Yield				Estimated				
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Safe Yield	Flowing Well?	Rate		
Air	27ft	35 igpm	1hr	27ft	25 igpm	No	0 igpm		
	(BTC - Below top of casina)								

Well Grouting

There is no Grout information.

Drilling Fluids Used
Foam

Disinfectant
N/A
N/A
Intake Setting (BTC)

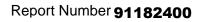
Qty 0 ig 60ft

Well Log	From	End	Colour	Rock Type	
33678	0ft	2ft	Brown	Fill Shale	
33678	2ft	10ft	Brown	Soil	
33678	10ft	11ft	Mix	Gravel	
33678	11ft	14ft	Brown	Clay	
33678	14ft	15ft	Mix	Gravel	
33678	15ft	23ft	Brown	Clay	
33678	23ft	31ft	Brown	Sandstone	
33678	31ft	33ft	Brown	Clay	
33678	33ft	42ft	Brown	Sandstone	
33678	42ft	44ft	Dark brown	Soil	
33678	44ft	52ft	Brown	Sandstone	
33678	52ft	53ft	Brown	Sandstone	
33678	53ft	56ft	Brown	Sandstone	
33678	56ft	58ft	Brown	Clay	
33678	58ft	72ft	Brown	Sandstone	
33678	72ft	82ft	Grey	Sandstone	

Overall Well Depth 82ft Bedrock Level 0ft

Water Bearing Fracture Zone					
Well Log	Depth	Rate			
33678	72ft	25 igpm			
33678	81ft	35 igpm			

Setbacks	}	
Well Log	Distance	Setback From
33678	79ft	Septic Tank
33678	76ft	Leach Field
33678	293ft	Right of any Public Way Road





2016/09/18 Date printed

Drilled by

Well Use Work Type **Drill Method** Work Completed New Well (NEW WELL) 08/06/1998 Drinking Water, Domestic

Casing Information	Casing abo	ove ground 0ft	Drive Shoe Used? No	
Well Log Casing Type	Diameter	From	End	Slotted?
91182400 Steel	5 inch	0ft	50ft	

Aquifer Test/	Yield				Estimated		
	Initial Water	Pumping		Final Water	Safe Yield	Flowing	
Method	Level (BTC)	Rate	Duration	Level (BTC)		Well?	Rate
	27ft	20 igpm	1hr	46ft	0 igpm	No	0 igpm
(BTC - Below top of casing)							

Well Grouting	Drilling Fluids Used	Disinfectant	Pump Installed	
There is no Grout information.	None	N/A	N/A Intake Setting (BTC)	
		Oty Oig	40ft	

0 ig 49ft

Driller's Log			
Well Log From	End	Colour	Rock Type
91182400 Oft	25ft	Brown	Clay
91182400 25ft	29ft	Soft grey and red	Mud and Stone and Shale
91182400 29ft	47ft	Red	Soft Rock
91182400 47ft	47ft	White and red	Coal
91182400 47ft	55ft	Grey	Sandstone

Overall Well Depth 55ft Bedrock Level 25ft

Water Bearing Fracture Zone			Setbacks
Well Log	Depth	Rate	There is no Setback information.
91182400	55ft	20 igpm	





Date printed 2016/09/18

Drilled by

Well Use Work Type Drill Method Work Completed Drinking Water, Domestic New Well Cable Tool 05/30/2001

Casing Information	Casing ab	ove ground 2ft	Drive Shoe Used? No	
Well Log Casing Type	Diameter	From	End	Slotted?
92035300 Steel	5 inch	Oft	37ft	

Aquifer Test	t/Yield				Estimated		
Method	Initial Water Level (BTC)	Pumping Rate	Duration	Final Water Level (BTC)	Safe Yield	Flowing Well?	Rate
Bailer	24ft (BTC - Below to	12 igpm	1hr	24ft	12 igpm	No	0 igpm
	IBIC - Below to	o or casinar					

Well Grouting

There is no Grout information.

Drilling Fluids Used

None

Disinfectant

Bleach (Javex)

N/A

Intake Setting (BTC)

Qty 0.5 ig 44ft

Driller's Log			
Well Log From	End	Colour	Rock Type
92035300 Oft	4ft	Brown	Fill
92035300 4ft	18ft	Brown	Clay
92035300 18ft	34ft	Grey	Clay
92035300 34ft	51ft	Grey	Sandstone

Overall Well Depth 51ft Bedrock Level Oft

Water Bearing Fracture Zone					
Well Log	Depth	Rate			
92035300	42ft	2 igpm			
92035300	50ft	12 igpm			

Setbacks	
	There is no Setback information.