

#02-129

**Groundwater Feasibility Assessment
Delta Land property: NW-21-39-02-W5M**

Submitted to:

Delta Land Co. Inc.

Prepared by:

Groundwater Exploration & Research Ltd
October 2002

October 7, 2002
File No: 02-129

Delta Land Co. Inc.
#16 Industrial Drive
Sylvan Lake, AB.
T4S 1P4

Attention: Robert Bilowus

**RE: Proposed Subdivision of the Delta Land property at
NW-21-39-02-W5M; Lacombe County**

In accordance with the Water Act that came into effect January 1, 1999; there is a requirement to submit technical data to the subdivision authority as part of the application for subdivision. Enclosed find our letter report which addresses a groundwater supply feasibility of the Delta Land property at NW-21-39-02-W5M in Lacombe County.

Background Information

The subject property is located along the northwest shore of Sylvan Lake near the intersection of West End Road and Township Road 39-4. The parent parcel is an existing +/-12.14 hectares [30 acres] in size, with the intent to create a maximum of 24 lots. At present, the quarter section contains 10 parcels. Most of the lot density is associated with the Yuill subdivision [8 lots] located in the northwest corner of the quarter section. If subdivision is approved, the maximum number of lots in the quarter section would be 34 lots.

This report addresses an assessment of the groundwater feasibility of finding sufficient volumes of groundwater to sustain the proposed 24-lot subdivision. The Phase 1 assessment, outlined in the AEP June 27, 1994 guideline document, should evaluate the following five criteria:

- [1] the potential of one or more aquifers to provide a sufficient supply of groundwater to meet the needs of any existing development and proposed unserviced residential subdivision within a quarter section during peak demand periods and over the long term;
- [2] the extent to which each aquifer is continuous beneath the proposed development area;
- [3] the potability of each aquifer's water in its current state considering its natural quality and possible existing anthropogenic contamination;
- [4] the feasibility of treating groundwater if needed;
- [5] the susceptibility of each aquifer to potential contamination (particularly from private sewage disposal systems).

Criteria [3] and [4] are more adequately addressed once a well has been drilled and a flow test completed.

Geomorphic/Geologic Setting

The land in the vicinity of the NW-21 quarter section occupies a northeast sloping position toward Sylvan Lake. The elevation change across the NW-21 quarter section is up to 15 meters [Sylvan Lake 83 B/8; 1:50,000 topographic map sheet] based on a large contour interval spacing. Across a block of nine quarter sections the elevation change is up to 30 meters.

The bedrock in the area [Hamilton, Price & Langenberg, 1999: Geologic Map of Alberta; 1:1,000,000] is mapped as the Paskapoo Formation of non-marine origin. The Paskapoo Formation consists of grey to greenish-grey, thick-bedded, calcareous, cherty sandstone; grey and green siltstone and mudstone; with minor conglomerate, thin limestone, coal and tuff beds.

Tokarsky [1971: Hydrogeology of the Rocky Mountain House area, Alberta; Alberta Research Council, ESR 71-3] maps the area as having a groundwater potential of 655 to 3273 m³/day [100 to 500 Cgpm]. The regional groundwater flow direction is toward the northeast. The proposed development site lies to the northeast of a surface and groundwater divide. The mean annual precipitation in the area is less than 51 cm.

Pertinent Regulations

Country residential subdivision and groundwater supply is regulated by Section 21(2) and Section 23(3) of the Water Act and stated as follows:

Section 21(2):

Subject to subsection (3) and section 23 and any exemptions specified in the regulations, a person who owns or occupies land under which groundwater exists

- (a) has the right to commence and continue the diversion of the groundwater for household purposes, and**
- (b) may not obtain a licence for the diversion of the groundwater for household purposes.**

[note: As defined in the Water Act, “household purposes” means the use of a maximum of 1250 cubic meters of water per year per household for the purposes of human consumption, sanitation, fire prevention and watering animals, gardens, lawns and trees].

Section 23(3):

“If, after this Act comes into force, a subdivision of land of a type or class of subdivision specified in the regulations is approved under the Municipal Government Act, a person residing within that subdivision on a parcel of land that adjoins or is above a source of water described in section 21 has the right to commence and continue the diversion of water under section 21 only if

- (a) a report certified by a professional engineer, professional geologist or professional geophysicist, as defined in the Engineering, Geological and Geophysical Professions Act, was submitted to the subdivision authority as part of the application for the subdivision under the Municipal Government Act, and the report states that the diversion of 1250 cubic meters of water per year for household purposes under section 21 for each of the households within the subdivision will not interfere with any household users, licensees or traditional agriculture users who exist when the subdivision is approved, and**
- (b) the diversion of water for each of the households within the subdivision under section 21 is not inconsistent with an applicable approved water management plan.**

Water Regulation [AR 205/98]

9(1) Subject to subsection (2), a type of subdivision of land for the purposes of section 23(3) of the Act is a subdivision that results in 6 or more parcels in a quarter section or in a river lot.

In essence, Sections 21(2) and 23(3) of the Water Act ask two basic questions:

- [a] Is there sufficient water to satisfy the maximum requirement of 1250 m³/year for existing plus proposed lots within a given quarter section?
- [b] Will the allocated volume of water for each proposed lot result in well interference and a significant adverse effect on neighbouring wells and licensed users existing at the time of subdivision application?

Groundwater Well Data

A survey of groundwater well data in NW-21 and the surrounding 8 quarter sections of land was undertaken utilizing available information from Alberta Environment's groundwater database file. A total of 47 well records were available for review, including 7 well records in the NW-21 quarter section.

The water well data has been analyzed on the assumption that the water well driller completed wells in the bedrock at the first occurrence of sustainable flow. This concept is applicable notwithstanding changes in topographic relief. A summary of available water well information is summarized in Table 1, appended to this report.

- [1] Well depths vary significantly from 21.3 to 73.2 meters over the block of nine quarter sections; and 27.4 to 34.1 meters for the NW-21 quarter section. The variability in well depth in the immediate area of the NW-21 quarter section exceeds the localized topographic relief of up to 30 meters, indicating that the water-bearing zones are not continuous across the immediate area. A conceptual aquifer model which entails a discontinuous “layer-cake” of hydrostratigraphic units is applicable.
- [2] Preliminary flow estimates vary from 39.3 to 589.1 m³/day over the regional nine block section with a geometric mean of 157.2 m³/day. Within the NW-21 quarter section, preliminary flow rates vary from 78.5 to 392.7 m³/day. The presence of high capacity wells suggests fracture-flow control with induced recharge from Sylvan Lake.
- [3] The variability in well depth implies that water-bearing zones are multi-story through-out the geologic section. The “layer-cake” hydrostratigraphic geology can be summarized based on 15 meter depth increments using either the bottom of the perforated zone or the total depth of the well. The relationship between depth of completion and flow estimates are tabulated as follows:

Depth Increment (m)	Number of Wells	Flow Estimate (m³/day)
0-15	16	116.8
15-30	28	177.7
60-75	1	589.1

- [4] The above data indicates that the vast majority of water wells are completed over a rather confined depth interval of 21 to 30 meters. Based on layer-cake hydrostratigraphic geology, the block of nine-quarter sections has a cumulative production potential of 294.6 m³/day per quarter section, over this depth interval.
- [5] It was indicated that there were 10 existing parcels in the NW-21 quarter section with the intent to create up to 24 additional parcels. The Water Act, under section 21(2) allocates a maximum of 3.42 m³/day [753 Cgpd/lot] to each existing and proposed parcel of land, for household use. The total groundwater requirement is therefore 116.3 m³/day [34 parcels x 3.42 m³/day] which is less than the total cumulative production potential of 294.6 m³/day per quarter section within the upper 30 meters of the geologic profile. Theoretically, there are sufficient water reserves to service the 24-lot subdivision.

Another option for the subdivision would be to service the 24 lots with one or more licensed communal wells. Alberta Environment's in-house guideline for communal wells is 1.818 m³/day per lot, or a water requirement of 43.6 m³/day.

It is recognized that the short term tests given on the water well records may not be indicative of longer term pump tests and sustainable flow rates. However, site-specific wells and flow testing will be required in order to substantiate adequate groundwater reserves.

[6] The water well data was also reviewed to determine if a drop in regional groundwater table was evident with increased country residential subdivision. The geometric mean non-pumping water level data, for the block of nine quarter sections, are tabulated as follows:

Decade	Number of Wells	Non-Pumping Water Level (m)	gm Well Depth (m)
1960's	2	10.4	32.0
1970's	19	16.3	33.7
1980's	10	15.6	34.3
1990's	14	15.4	36.2

There is no evidence for a decline in regional water level over the 30+ year period since the 1970's. The consistency in geometric mean non-pumping water level suggests that the water wells may have an hydraulic connection with Sylvan Lake. Water well depths have remained very consistent over the various decades of drilling.

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Based on the evaluation criteria [AEP: June 27, 1994], there exists more than one water-bearing zone; and the zones may not be continuous beneath the quarter section. This conclusion is based on the variability in well depth, completion interval and preliminary flow estimates.

Water well records within the immediate area of the NW-21 quarter section indicate overburden deposits that vary from 7.3 to 13.7 meters in thickness. When the overburden thickness exceeds 3 meters, this depth of overburden is generally sufficient to accommodate septic fields. In accordance with subdivision regulations, site-specific percolation tests should be undertaken to confirm the suitability of the overburden material for septic field disposal.

Summary of Findings

Based on a feasibility assessment of existing water well information, the following conclusions have been drawn:

- [1] There are currently 10 parcels in the NW-21 quarter section. The proposed 24-lot subdivision would bring the total number of parcels to 34 and a total water requirement to 116.3 m³/day for individual wells; or 77.8 m³/day [10 lots x 3.42 m³/day per lot + 24 lots x 1.818 m³/day per lot] for a licensed communal well system. A third option is the use of cisterns with a hauled water contract assuming that the lot use would be only part time or seasonal.
- [2] Based on existing water well flow test information within a block of nine quarter sections, there is a cumulative groundwater potential of 294.6 m³/day per quarter section within the upper 30 meter depth interval. The additional water requirement for the proposed 24-lots, plus existing lots, is less than the cumulative groundwater potential per quarter section. Theoretically, there exists sufficient groundwater reserves to serve the existing and proposed parcels of land in the NW-21 quarter section with individual wells, based on existing information.
- [3] The groundwater supply for the proposed 24-lot country residential subdivision can be obtained from wells completed within varying depth intervals up to 30 meters.

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Closure

If you have any questions or comments regarding the assumptions and conclusions drawn in this groundwater feasibility assessment, contact the undersigned at your convenience. It should be noted that the assessment of potential groundwater availability is not a guarantee, but rather an indication of the probability of securing a sustainable groundwater supply. Site-specific well testing is required to confirm an adequate groundwater supply in accordance with the Water Act. Thanking you for the opportunity to have been of service, we remain,

Respectfully yours,
Groundwater Exploration & Research Ltd

Bob Nowak; Ph.D., P.Geol.
Groundwater Geologist

Appendix

Table 1
Summary of Groundwater Well Data

Location	Landowner	Date Drilled	Td/Npwl (ft)	Flow Estimate	Completion Interval (ft)
TP24, R28					
SE-24	Richert	Jul 00	115/36	4 Cgpm/2 hrs	35 - 55 & 95 - 115
SE-24	Richert	Apr 64	59/10	20 Cgpm/0.3 hrs	40 - 54
SE-24	Ogston	Jun 64	84/9	1.5 Cgpm/10 hrs	na
SE-24	Wingenback	Apr 93	280/18	>12 Cgpm/2 hrs	40 - 80
SE-24	Rosin	Oct 95	295/27.3	1.75 Cgpm/2 hrs	20 - 35 & 115 - 135 & 195 - 215
SE-24	Mohamed	Feb 99	375/26	4 Cgpm/2 hrs	316 - 374
NE-24	Farch	Mar 85	160/26	4 Cgpm/2 hrs	120 - 160
NW-24	Trutina	Jun 87	220/79	1 Cgpm/3 hrs	133 - 146
NW-24	Grant	na	45/8	30 Cgpm/na	40 - 45
NW-24	Gusenger	Apr 69	260/54	1 Cgpm/2 hrs	open hole 234 - 260
NW-24	Gilmore	Apr 69	392/54	1.5 Cgpm/2 hrs	open hole 220 - 392
NW-24	Ashmore	May 67	200/49	1 Cgpm/2.3 hrs	65 - 85 & 180 - 200
NW-24	Lem	Aug 81	480/70	3 Cgpm/10 hrs	460 - 480
NW-24	Scaglioni	Apr 89	211/58	2.5 Cgpm/2 hrs	171 - 211
NW-24	Trutina	Nov 89	184/72	4 Cgpm/3 hrs	80 - 100 & 144 - 184
NW-24	Singh	Dec 90	280/65	3 Cgpm/3 hrs	120 - 160 & 180 - 200 & 260 - 280
NW-24	Lenbach	Oct 78	195/15	4 Cgpm/4.4 hrs	170 - 195
NW-24	Brar	Jul 93	290/27	3.5 Cgpm/3 hrs	190 - 290
NW-24	Brar	Jul 93	310/23	4 Cgpm/3 hrs	100 - 310
NW-24	Brar	Aug 93	290/62	3.5 Cgpm/3 hrs	120 - 290
NW-24	Bellcastro	Jul 92	240/120	>10 Cgpm/3 hrs	160 - 240
NW-24	Bellcastro	May 94	240/42.9	3 Cgpm/2 hrs	140 - 160 & 180 - 200 & 220 - 240
NW-24	Scaglione	Jun 94	160/31	2 Cgpm/2 hrs	20 - 40 & 140 - 160

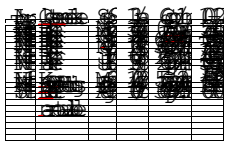


Table 1 (continued)
Summary of Groundwater Well Data

Location	Landowner	Date Drilled	Td/Npwl (ft)	Flow Estimate	Completion Interval (ft)
NW-24	Scaglione	Jul 98	240/106.3	3 Cgpm/24 hrs	180 - 235
NW-24	Scaglione	Jul 98	240/37	4 Cgpm/2 hrs	180 - 235
SW-24	Del Bello	Apr 77	292/70	1 Cgpm/1 hr	190 - 270
SW-24	Esayenko	Sep 78	280/48	1 Cgpm/na	75 - 85 & 205 - 270
SW-24	Saverio	Jun 91	340/97	2.5 Cgpm/2.3 hrs	100 - 338
SW-24	Mann	Nov 92	220/48	2 Cgpm/2 hrs	160 - 180 & 200 - 220
SW-24	Wilson	Sep 97	420/66	1 Cgpm/2 hrs	120 - 140 & 160 - 220 & 280 - 300
SW-24	Lamoureux	May 98	200/68.1	3 Cgpm/2 hrs	180 - 200
SW-24	Del Construction	Jun 00	300/58.1	2 Cgpm/12 hrs	260 - 300
SW-24	Del Construction	Jun 00	240/71.1	3 Cgpm/12 hrs	200 - 240