SUNSET RIDGE
AREA STRUCTURE PLAN

Prepared for:
The Municipal District of Foothills No. 31

Landowner / Developer
CinNet Developments Ltd.
(923594 Alberta Ltd.)

Prepared By:
Torus Engineering Consultants Ltd.

September 2004

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1.0 INTRODUCTION

1.1 Purpose of the Plan

The Sunset Ridge Area Structure Plan (ASP) has been prepared pursuant to provincial legislation and the M.D. of Foothills Municipal Development Plan. The purpose of the Area Structure Plan is to provide for the orderly development of a country residential subdivision within the Plan Area. An Area Structure Plan is more detailed than the Municipal Development Plan (MDP) and is intended to provide a more specific municipal policy framework to guide subsequent land use redesignation, subdivision, and development approvals within the Plan Area.

1.2 Background to the Area Structure Plan

The Plan Area contains the major parcel (27.26 hectares/ 67.37 acres as measured from Certificates of Title) of the SouthEast quarter of Section 32, Township 21, Range 28, West of the 4th Meridian. This parcel of land was owned until recently by Maxine (Mickey) Groeneveld,a longtime and active resident of the Davisburg area. The Plan Area is located on the north side of 256th Avenue Southeast (formally known as Bow River Bottom Trail) and east of 112th Street Southeast . The general area is approximately 2.0 kilometres south of the Bow River, 10 kilometres east of the Highway #2 / Dunbow Road intersection and 1.6 kilometres north of Secondary Highway #552.

The property is located in the Davisburg area of the Foothills east of Highway #2. In the last 5 years, this area that has been experiencing significant demand for country residential development. The majority of this development in the Davisburg area has been in the single lot parcel or small sized subdivisions consisting of 4 to 10 lots. The exception to this small development of acreage lots will be the coulee Estates development to the east of the subject land and to the north of Secondary Highway #552 on 274th Avenue S.E. which will contain 14 lots in the 3.0 acre to 4.0 acre size and 1 MR parcel. The majority of the Davisburg area is a rolling topography with limited elevation differential. Unrestricted and long range views toward the Rocky Mountain foothills are the exception in this area but with certain ridges and hills offering majestic views of the Okotoks valley and the foothills mountains. The proximity of the southern limits of the City of Calgary offers superb viewing of the City of Calgary, especially at night. In addition to the areas proximity to the City of Calgary, a number of first rate golf course have been constructed in the area offering an additional attraction for the area lifestyle. While close to the City of Calgary, the Sunset Ridge property is not located in a planned future growth corridor of the City of Calgary. In this respect, future use of the property should provide an appropriate transition between traditional rural land uses and expanding urban fringe uses closer to the edge of the City of Calgary. Topographical features need to be incorporated sensitively into the design of any development for the site in accordance with M.D. of Foothills MDP policies while

recognizing the surrounding development and roadway context. Ideally, the key natural features being the elevation and mountain views of the site can be incorporated into an environmentally appropriate site development that will complement and enhance existing and future uses in the general vicinity.

1.3 The Approval Process

The M.D. of Foothills requires Municipal Council approval of an Area Structure Plan (ASP) as part of a country residential proposal. Preparation of the Sunset Ridge Area Structure Plan commenced with a thorough review of existing technical studies and previous applications. The conceptual plan was reviewed to ensure the best possible blend of current development practices and concepts for the site. Finally a revised Draft ASP (November 2003) was prepared for circulation and discussion with all local stakeholders and the M.D. of Foothills.

A public open house meeting was held on March 12th, 2004 to discuss the Draft Area Structure Plan with residents of the local community. Approximately 18 people attended the Open House at the Davisburg Community Hall with 14 residents signing our sign –in sheet. A comment sheet and information package was provided to all attendees with three of these residents forwarding their comments to Torus Engineering Consultants of which copies are attached in the additional Information section of the report. All input from key stakeholders and the general public was considered and incorporated into this Proposed Sunset Ridge Area Structure Plan wherever appropriate.

The Proposed Sunset Ridge Area Structure Plan (November 2003) was formally submitted to the M.D. of Foothills in April 2004. The Plan in its final statutory bylaw form is the result of a statutory Public Hearing of Foothills Council, and subsequent adoption by Council as an Area Structure Plan bylaw.

1.4 Plan Implementation

The Sunset Ridge Area Structure Plan, adopted by bylaw in accordance with Part 633 of the Municipal Government Act, will become a statutory document of the Municipal District of Foothills No. 31. The ASP does not supercede, repeal, replace, regulate, or otherwise diminish the M.D. of Foothills Municipal Development Plan or other statutory plans in effect in the Plan Area.

To be fully implemented, the Area Structure Plan may have to be incorporated into other municipal planning documents. These documents include the M.D. of Foothills Municipal Development Plan, and the M.D. of Foothills Land Use Bylaw. In practice, this ASP will be implemented through commitments to public and

private improvements that are embodied in the Area Structure Plan policies contained herein.

1.5 Plan Review and Amendment

Changing considerations may necessitate periodic review and occasional amendment of the ASP. Council, through monitoring of subdivision and development approvals, may initiate amendment or the ASP in accordance with the Municipal Government Act. In addition, the landowner or the landowner's agents may request amendment of the ASP in accordance with application requirements and procedures of the same Act.

1.6 Legislative Framework

Municipal Government Act

Pursuant to Part 633 of the Municipal Government Act (MGA), the Council of a municipality is permitted via by-law to adopt an ASP as a statutory document. Section 633 of the MGA states that:

1. ***For the purpose of providing a framework for subsequent subdivision and development of an area of land, a council may, by bylaw, adopt an area structure plan.***

2. ***An area structure plan***

    a) ***must describe***

        i. ***the sequence of development proposed for the area,***

        ii. ***the land uses proposed for the area, either generally or with respect to specific pads of the area,***

        iii. ***the density of population proposed for the area either generally or with respect to specific parts of the area, and***

        iv. ***the general location of major transportation routes and public utilities,***

    b) ***may contain any other matters the council considers necessary.***

The Municipal Development Plan

The M.D. of Foothills adopted a new Municipal Development Plan (MDP) in 1998 to guide future growth throughout the municipality. The MDP establishes long range goals, objectives, and policies that summarize the M.D.'s intentions respecting this growth and development. The Sunset Ridge Area Structure Plan has been prepared to be consistent with, and conform to the policies of the Municipal Development Plan.

The MDP defines an Area Structure Plan as a *"statutory plan, adopted by bylaw, which provides a land use strategy for subsequent redesignation, subdivision and development of a specific area of land in the municipality".* Pursuant to Part 5.3.5 of the Municipal Development Plan:

> *"An Area Structure Plan drafted in accordance with the Guidelines adopted by the Municipality shall be required as part of a Country Residential proposal that would create 8 new lots or more and for proposals of less than 8 new lots an Area Structure plan may be required if in the opinion of Council one is necessary due to*
>
> *a) the impact the proposal may have on adjoining lands;*
> *b) the need to review, in greater detail, the infrastructure requirements* of *this proposal;*
> *c) the proposal being a continuation of an existing subdivision and leads to a density greater than 8 lots per quarter section;*
> *d) the proposal, in the opinion of Council, being phase I of a development that will create 8 new lots or* more."

1.7 Interpretation

In this Area Structure Plan, the following interpretations shall apply:

"**General Agriculture**" and "**Intensive Agriculture**" means those agricultural uses as defined in Section 10.13.1 of the M.D. of Foothills Land Use Bylaw.

"**ASP**" or "**Plan**" means the Sunset Ridge Area Structure Plan.

"**Council**" means the Council of the Municipal District of Foothills No. 31.

"**Developer**" means the registered owner of lands within the Area Structure Plan boundary.

"**Landowner**" means the registered owner of lands within the Area Structure Plan boundary.

"**M.D.**" means the Municipal District of Foothills No. 31.

"**MDP**" means the Municipal District of Foothills No. 31 Municipal Development Plan.

"**MGA**" means the Municipal Government Act.

"**Qualified Professional**" means a professional engineer, geologist, or geophysicist licensed to practice in the Province of Alberta.

"**Subdivision Approving Authority**" means the Council of the Municipal District of Foothills No. 31.

"**Tentative Plan Preparation Stage**" means that stage of the land development process in which detailed site analysis is undertaken, local planning needs and development philosophy are identified, and site specific subdivision design is prepared.

"**Tentative Plan**" means a detailed proposal for development of the lands or of any portion thereof, which may form the basis for an application for subdivision.

2.0 THE PLAN AREA

2.1 Regional / Municipal Location

Figure 5: Municipal Setting, illustrates the Plan Area within the broader context of Highway 2, Secondary Highway 552 between the southern boundary of the City of Calgary and lands to the west. This area has been the location of a significant amount of country residential development during the past decade. The rolling topography and provide an ideal setting for rural residential lifestyles while Highway 2 provides convenient access to locations throughout the region including the City of Calgary to the north, Okotoks and Kananaskis Country to the west. The completion of the Deerfoot Trail in November 2003 from Highway 22x to the Highway 2 interchange into Okotoks will provide an alternate access to the City of Calgary from access points at Secondary Highway #552 and Dunbow Road.

Figure 5 also illustrates the boundary of the City of Calgary/M.D. of Foothills Intermunicipal Development Plan (IDP). The Sunset Ridge ASP is not located within the IDP boundary. Therefore development of the Sunset Ridge Land is not subject to IDP policies and future growth of the City of Calgary is not expected to directly affect planning for development of the site. Planning for the site will be indirectly affected by the proximity to the City of Calgary, for example where the Deerfoot Trail extension is constructed to accommodate traffic flows to/from the City of Calgary.

2.2 Boundaries of the Plan Area

The Sunset Ridge Area Structure Plan incorporates 27.26 hectares (67.37 acres) of land comprising the majority of the SouthEast Quarter of Section 32, Township 21, Range 28, West of the 4th Meridian and a portion of the NorthEast Quarter of Section 29 . The south half of Section 32 and the northeast quarter of Section 29 north of 256th Avenue has been subdivided on four previous occasions.

1. In 1975 a 5.0 acre (1.93 ha) parcel was created adjacent to the east side of the Sunset Ridge original parcel to accommodate a single-family dwelling (see Block 1, Plan 7510860). This "Country Residential District parcel is in separate ownership and has direct access to a municipal roadway. Therefore, it is not contained within the ASP boundary.

2. In 2003 a 14.5 acre (5.8 ha) small holding parcel west of 112th Street S.E. was subdivided into 3 smaller parcels with the original residence being retained and the remaining 2 parcels for single family dwelling use.

3. In 1974 a number of parcels in the range of 20 acres each were subdivided from the original parcel into 4 lots accessing directly onto 256th Avenue S.E. with a recent resubdivision (in 1998) of one of the parcels into a smaller lot.

4. In 1975 a large parcel to the northwest of the Sunset Ridge lands and accessing from 96th Street was subdivided into a 7 lot subdivision containing an internal road with later resubdivisions and boundary adjustments taking place in 1977,1979, 1991 and 1998 eventually providing 13 lots in total.
5. The most recent subdivision was in 2004 when a 5.0 acre parcel out of the original Groeneveld land holding taken on the southeast corner of the A.S.P.

The above noted subdivision history is for information only in the context of the past development in the section of land containing the Sunset Ridge ASP. None of these noted subdivisions or part thereof will form part of the Sunset Ridge Area Structure Plan as per the detailed boundary of the Area Structure Plan as illustrated in Figure 1. The boundaries and immediately adjacent land uses can be generally described as follows:

- The 256th Avenue S.E. (Bow River Bottom Trail) municipal road on the south;
- To the north the remainder of the southeast quarter section of 32.
- To the east and west, the country residential lands described above.
- Land contained within the Plan Area includes the following areas and titles. : Parcel A , Plan 4299 containing 67.37 ha.

2.3 General Physical Description

Existing Land Use and Access

The Plan Area is currently designated Agricultural District (A) under the M.D. of Foothills Land Use Bylaw. The purpose of the Agricultural District is to allow for a broad range of agricultural uses on the property. Existing and historical agricultural use of the property has been limited to grazing of cattle and marginal cultivation of feed grasses.

256th Avenue S.E. is a all weather surfaced 20-metre municipal roadway. Portions of 256th Avenue S.E. have been widened by 5-metres where adjacent subdivision has occurred in recent years. Where subdivision has occurred on both sides of the road, the road allowance is currently 30-metres in width.

Access to the Plan Area is available via 256th Avenue S.E.
Access to the Sunset Ridge development will be constructed at the west boundary of the site as per the proposed subdivision plan.

Soil Capability for Agriculture

The majority of the Plan Area is classified as marginal agricultural land and classified as Class 3T under the Alberta Soils Advisory Committee. Under this classification, the lands are to have moderate limitations that restrict the range of crops or require special management practices with a subclass of steep or /and long uniform slopes.

A soil type analysis has been undertaken for the site by Curtis Engineering Associates Ltd. and the results included under page 2 in the report in the Appendix. The report concludes that:

> *The parcel is dominated (91.2%,) by Land Capability Class 3T land, with mostly well-drained topsoil in the range of 0 to 0.31m of depth. The subsurface soils to the 0.91m range consist of silty sand . Limiting factors for agriculture are climate and sometimes topography. Land on steeper slopes (15 to 20%) is rated as Land Capability Class 5 and comprises 3.3% of the total site.*

Topography and Vegetation

The majority of the site consists of brome and Kentucky bluegrass grasslands that are grazed by cattle and have replaced the original fescue grasslands. The portion of site having the original house and barn contains a number of large poplar and spruce trees and a variety of hedges planted a number of years ago by the original owner. Included in this site are also a variety of smaller trees and shrubs for landscaping purposes.

The plan area is comprised of mixed topography ranging from relatively flat area in the central portion of the site to sloping conditions to the northeast and south. The upper flat area contains a slight ridge of high land at the central west location in the property and falls approximately 5 metres in elevation to the northeast. The land also falls to the south from this high point to the edge of a prominent ridge adjacent to 256th Avenue S.E. The fall in elevation from the flat central area to the top of the ridge is approximately 5 metres. The elevation differential from the top of the prominent ridge to the roadway is approximately 10 metres.

Figure 3 illustrates the contours of the property as well as the slope gradients within the Plan Area for three major categories of slope;

1) Less than 10%. These slopes are generally considered to be easily developable for country residential purposes. MD of Foothills policies require a minimum area of tiers on each lot with slopes in this category. The area of land within the maximum 10% slope is 26.40 ha. (65.3 acres) with the vast majority of this area being in the 0% to 5% slope.

2) Slopes of 10% to 15%. These slopes will be incorporated into the 4 lots backing onto 256th Avenue S.E.. All 4 lots will have provision for a 1 acre development area having slopes of less than 15% with the limits of the developable area being a minimum of 30m from the top limit of the 15% slope. The area contained within the 10% to 15% slopes is 1.90 ha. (4.7 acres) and comprises 6.5% of the total site area.

3) Slopes of 15% to 20%. These steep slopes are located in the area adjacent to 256th Avenue S.E. and have been incorporated into the southerly portion of 4 lots backing onto 256th Avenue S.E. The area contained within the slopes in excess of 15% but less than 20% is 0.98 ha. (2.4 acres) and comprises 3.3% of the total site.

3.0 PLAN GOALS AND PRINCIPLES

3.1 Plan Goal and Vision Statement

The goal of the Sunset Ridge ASP is to provide a framework for orderly and efficient development of a country residential subdivision that is consistent with the topographical features of the site and compatible with the land uses and lifestyles of the adjacent residential and agricultural Property owners.

3.2 Principles of Development

Pattern of Development

All development shall be in accordance with statutory policy and municipal standards in effect at the time development is approved.

Patterns of development should reflect the natural form and character of the land and, in particular the sloping topography providing mountain views.

Natural Environment

The natural landform of the site should be retained wherever possible and reasonable. Site grading should be limited to that which is required for roadways, home building sites and utility services.

Distinctive natural features on the site of the site should be retained and incorporated into the site plan where feasible.

Site design should maintain and enhance the visual prominence of the foothill mountains.

Character of Development

Comprehensive design of local roads, open space and homes should provide a uniform high quality character that will give the Sunset Ridge subdivision a distinctive identity within the broader area.

Site development should create a positive image and identity for the Municipal District of Foothills at this visually prominent location adjacent to 256th Avenue S.E.

All country residential lots should have equal potential for usage. Keeping of livestock in excess of the M.D. of Foothills Bylaws will not be permitted regardless of lot size.

Community Integration

Landscaping with indigenous natural shrubs, trees, and grasses will be encouraged throughout the subdivision with specific regards to the lots backing onto 256th Avenue S.E. Natural landscaping will encourage the conservation of the ground water supply in the subdivision .

Public pedestrian access should be provided to municipal reserve land on the site. A centrally located reserve site offering access through the municipal road allowance will provide appropriate pedestrian access to and through the site.

Infrastructure

Infrastructure shall be provided in accordance with municipal standards to ensure adequate capacity for all proposed country residential lots.

Infrastructure should be designed to minimize impacts to the environment and to surrounding residential properties.

Phasing

Development will be undertaken in two (2) building phases . The initial phase of development will incorporate the south portion of the Plan adjacent to 256th Avenue and contain 7 of the proposed 13 residential lots and the M.R. lot. Phase 2 will be the northerly portion of the plan and will contain the remaining lots . Development of the Phase 2 through the subdivision process will not proceed until such time as the initial phase of development is 66% sold and 50% of the Phase 1 housing units occupied and a Q20 test report provided for the Lot 10 monitoring well.

4.0 PLAN POLICIES

4.1 The Plan Concept

Sunset Ridge is proposed to be a country residential subdivision that is comprehensively designed to be compatible with the surrounding residential and agricultural uses and retain the topographical prominence of the site with regards to the mountain views.

Figure 2 illustrates the Sunset Ridge Land Use Plan. The Concept identifies two major land use components.

a) Country Residential area consisting of 13 new lots ranging in size from 3.5 acres to 5.0 acres
b) A reserve parcel of 7.18 acres

Key considerations that have been built into the plan include the following:

- Dedication of a 5.0m wide parcel of land on the north side of the existing roadway for a future widening of 256th Avenue S.E. across the entire frontage of the property. This road widening has been taken on the subject land as part of the subdivision of the 5 acre parcel in the southeast corner of the original 72.4 acre parcel.

- Architectural controls to be placed on each individual title as noted in the Appendix and to contain the following items :
  - identification of building sites on each individual lot to provide maximum visual protection as noted in Section 4.3.8
  - control of the house designs for the lots backing onto 256th Avenue
  - geotechnical testing with regards to building setbacks from the slope for the lots backing onto 256th Avenue as noted in Section 4.3.9
  - a water conservation plan for the development

- Dedication of a 2.91 ha (7.18 acre) Municipal Reserve parcel at the center of the property. This parcel is ideally located in the subdivision to provide pedestrian access for all lots within the subdivision as well as enhancing the mountain sightlines for the lots in the northeast corner of the subdivision.. Specific facilities for this public land have not been identified at this time. However it is anticipated the property will be maintained primarily as natural open space providing for a passive appreciation of the mountain views.

- All new country residential lots will be registered with architectural controls as part of a Sunset Ridge Homeowners Association. This will ensure that all property owners in the area share a common interest in the ownership and maintenance of their private as well as common areas within the subdivision.

A breakdown of land use areas illustrated in Figure 2, Land Use Plan is provided in the following table.

LAND USE	HECTARES	ACRES
Total County Residential Areas	21.43	52.96
Road Widening	0 20	0.49
Local Roads	2.74	6.74
Municipal Reserve : 10% dedication	2.71	6.69
Municipal Reserve : deferral from Plan 0410183	0.20	0.49
Total Plan Area	27.26	67.37

PLAN CONCEPT POLICIES

4.1.1 When considering applications for redesignation, subdivision, or development applications within the Plan Area, the Municipality shall confirm that such applications conform to the land use concept shown in Figure 2 and is compatible with the policies of this Plan.

4.1.2 Any application in the Plan Area that is contrary to the land use concept and policies contained within this Plan shall require a formal amendment to this Plan.

4.2 Environmentally Sensitive Areas

The MD of Foothills Municipal Development Plan contains policies that encourage the preservation of unique or significant natural environments, water supplies and wildlife habitat and corridors. In particular, the MDP defines Environmentally

Significant Areas to include "areas that provide an important linking function and permit the movement of wildlife over considerable distances, including migration corridors and migratory stopover points". **The Sunset Ridge Plan Area does not contain lands that are suitable for permanent protection as natural areas**.

4.3 Country Residential Areas

A parcel of approximately 5 acres containing the original house and shop has recently been subdivided from the original land holding. The remainder of the property, being the land under this ASP consists of the subdivision of a proposed residential development consisting of a maximum of 13 residential lots and a municipal reserve lot on a "cul-de-sac" road system that provides access to 256th Avenue S.E. at the west boundary of the site. The cul-de-sac road system has been carefully designed to follow existing grades, conform to MD of Foothills standards for gradient on municipal roads, and minimize the need for grading. Likewise, the proposed design of new lots will ensure that all new dwellings have driveways with a moderate slope to allow for safe access all year-round. Lot sizes are intended to be as small as possible while respecting MD density policy, topographical constraints and servicing requirements.

When fully built out, maximum development of thirteen (13) country residential lots and one (1) reserve lot are anticipated within the Plan Area. This represents an ultimate total of 13 new dwelling units and a population of approximately 39-45 residents. The ultimate Development Concept is illustrated in Figure 1.
The development is to be constructed in 2 phases consisting of 7 lots in Phase 1 and the remaining 6 lots in Phase 2.

In accordance with Alberta Environment guidelines and MD of Foothills policies, each lot shown in Figure 8 has been designed to include a minimum contiguous area of 1 acre of developable land where the slope does not exceed 15%.

COUNTRY RESIDENTIAL POLICIES

4.3.1 The minimum residential lot size shall be 3.58 acres with the maximum residential lot size should not exceed 5.07 acres, except to the extent reasonably necessary to accommodate topographic conditions, meet MD guidelines for developable area, and / or meet utility servicing requirements.

4.3.2 Country residential lots shall support single family dwellings only. No agricultural uses shall be permitted within designated residential areas beyond the limitations of the M.D. of Foothills Bylaws regardless of lot size.

4.3.3 Development on country residential lots shall comply with the terms of a

4.3.3 Development on country residential lots shall comply with the terms of a Restrictive Covenant to be registered against the Title of each lot. Terms of the Restrictive Covenant are subject to finalization at the Land Use Redesignation and Subdivision stage of the approval process.

4.3.4 Country residential lots shall have direct access to a surfaced road in accordance with the Municipal Internal Subdivision road policies

4.3.5 No direct residential driveway access shall be allowed onto 256th Avenue S.E. All residential lots will front onto an internal residential subdivision road.

4.3.6 Site grading should be strictly minimized to retain the existing slopes. Wherever possible site grading should be limited to roadways, driveways, and other grading that is required to meet municipal servicing and development standards.

4.3.7 The need for additional requirements for visual integrity of the rear of the lots backing onto 256th Avenue S.E. to provide for an attractive entrance to the subdivision to be reviewed at subdivision stage of the approval process.

4.3.8 Development of the country residential lots in Sunset Ridge will provide building site parameters for each individual lot to retain visual access to the available mountain views for all homes regardless of their location in the subdivision. Architectural controls to be implemented to determine building locations.

4.3.9 As Council so requests, a geotechnical report proving the suitability of building sites in accordance with municipal policies shall be prepared and submitted to the Municipality by the developer, as a prerequisite to third reading of a Land Use Bylaw amendment allowing the creation of any new country residential lots. In particular such geotechnical study shall address policies related to development of any land that falls within 30-metres of slopes of 15% or greater as a prerequisite to development.

4.4 Environmental and Municipal Reserve Lands

Pursuant to the Municipal Government Act (MGA), a subdivision authority may require the provision of Environmental Reserve land at the time of subdivision. At the discretion of the subdivision authority, land that consists of a natural drainage course, or that is subject to flooding, or is unstable in its natural state may be required to be dedicated to the municipality as public Environmental Reserve land. The sloped lands adjacent to 256th Avenue S.E. at the south end of the Plan Area have been surveyed with respect to the area of the slope in excess of 15% . The area of sloped land in excess of 15% is relatively small in size at 0.98 ha.(2.42

acres) and does not form part of a ravine or treed area or any environmentally sensitive area. Therefore these sloped lands should not qualify for dedication as public Environmental Reserve land under the terms of the MGA.

The Municipal Government Act provides for the dedication of Municipal and School Reserve land at the time of subdivision. Up to 10% of the gross area of the land to be subdivided, after dedication of any Environmental Reserve land is deducted, may be required as land for public parks and schools, or as cash-in-lien of municipal reserve land.
The Concept Plan proposes dedication of 2.91 ha. (7.18 acres) of developable land as Municipal Reserve. The proposed Municipal Reserve parcel is well situated within the central area of the subdivision to provide for convenient access to the reserve parcel by all residents as well as providing for a sight line for a number of lots in the northeast quarter of the subdivision. Mountain views are available from the reserve site and will enhance the use of this parcel for passive activities.

At the discretion of Council as Subdivision Approval Authority, the MD may choose to take 'cash-in-lieu" of municipal reserve instead of taking the municipal reserve land shown in this plan. Where cash-in-lieu of municipal reserve land is provided, the lands shown in this plan as proposed municipal reserve will be subject to relevant country residential development policies. It is anticipated that the 2.91 ha (7.18 acre) parcel at the central location in the Plan Area would ultimately be subdivided as 2 country residential lots accessed from the cul-de-sac road proposed for the subdivision if adequate servicing is available.

Proposed Municipal Reserve lands total 2.91 ha (7.18 acres) representing 10% of the land contained within the Plan Area as well as a deferral of reserve from the 5.02 acre parcel subdivided from the original parcel in 2003 under Plan 0410183.

RESERVE LAND POLICIES

4.4.1 The MD of Foothills will require Municipal Reserve land or cash-in-lieu of municipal reserve land to be provided on 10% of the total residential lands to be subdivided less the amount of land dedicated for road widening. The preferred location for municipal reserve land will be at the central area of the Plan Area adjacent to the adjacent to the internal road .

4.5 Transportation

The two major access roads to the Sunset Ridge development are the Secondary Highway #552 to the south of the site and Dunbow Road to the north as per Figure #7a . Both of these roads are all weather surfaced roads . In the area of Sunset Ridge, at grade controlled intersections are built at the 112th Street, 96 Street S.E. and at 80th Street S.E. intersections with 256th Avenue S.E.
Access to the plan area will then be from the municipal road designated as 256th Avenue S.E. road running parallel to the south side of the site and connecting to 112th Street S.E. to the east and 96th Street and / or 80th Street to the west. Access is available from all 3 streets to Dunbow Road and Secondary Highway 552.

Internal Roadways and Driveways

As illustrated in Figure 1, the Country Residential lands will be served by a local cul-de-sac road connecting from 256th Avenue through the development area. All residential lots will be provided access to the new internal subdivision roadway. Intersection of the cul-de-sac road with the municipal road system at 256th Avenue has been designed to provide required turning radii for safe access and egress to 256th Avenue S.E. As the municipal road has a fairly flat grade with no high or low points within the viewing distance from the proposed subdivision intersection point, sightlines for access and/or egress are considered excellent for safe turning movements. A temporary cul de sac will be provided at the north limits of Phase 1 until such time as the Phase 2 roadway is constructed.

A 5.0m widening right of way on the north side of 256th Avenue has been provided at the time of subdivision of the adjacent 5 acre parcel to allow for a future 30.0m roadway.

New roads will not exceed the maximum grade approved by the M.D. of Foothills at the time of engineering design approval. All new roads will be designed and constructed to M.D. of Foothills standards by the developer, complete with an approach and culvert to each lot. Figure 10 Illustrates road grades associated with the Phase 2 cul-de-sac road alignment. The steepest road grade is associated with the internal road at the ridge location. The remainder of the internal road grades are moderate to provide for a safe year-round access.

The lotting design has been prepared to ensure that all residential lots can be served by a gently sloping driveway that allows for safe all-weather access. Conceptual studies show that all lots can be served by driveways with slopes in the range of 2% maximum slope.

External Roadways

The limited number of residential and agricultural living units in the area bounded by Dunbow Road to the north, Secondary Highway #552 to the south, 112th Street to the east and 80th Street to the west and the excellent all weather condition of Secondary highway #552 with its direct access to Highway #2 and the City of Calgary has attracted the majority of traffic from the area. The graveled condition of 112th Street and the eastern portion of Dunbow Road (80th Street to 112th Street) has assisted in creating the preference for Secondary Highway #552. The recent Deerfoot Trail extension to Highway #2 with access to Dunbow Road and the upgrading of the portion of Dunbow Road from Deerfoot Trail to 80th Street will most likely result in a change in the driving patterns for residents of the area accessing the south end of the City of Calgary.

TRANSPORTATION POLICIES

4.5.1 A road widening on the north side of 256th Avenue and for the full length of the site plan has been dedicated as "road widening" as per the MD of Foothills requirements.

4.5.2 No direct vehicular access shall be allowed to 256th Avenue S.E. from the lots backing onto 256th Avenue S.E. with the exception of the original homestead lot retaining the existing driveway to 256th Avenue.

4.5.3 All roadways required to give access to the development shall be designed and built to M.D. of Foothills standards and to the satisfaction of Council. The M.D. of Foothills may require the preparation of a traffic impact study for the adjacent roadways. Where local roadways are to be dedicated as public roads, the Municipality will assume long-term maintenance of the roadway upon issuance of a Final Acceptance Certificate to the developer.

4.5.4 The developer will be required to make a contribution toward maintenance and upkeep of external roads through payment of an infrastructure levy fee at the time of land use bylaw redesignation for each new lot. Infrastructure levy fees shall be paid in accordance with the standard fee schedule in effect at the time of redesignation.

4.6 Utility Servicing

Water supply and sewage disposal for country residential development will be established without creating adverse impacts on the natural environment or the groundwater aquifer in the vicinity of the Plan Area. All utilities necessary to service each lot will be provided to Provincial and Municipal standards at the expense of the developer or builder.

Water Supply

Groundwater testing was undertaken by "Groundwater Exploration and Research" to locate and evaluate the groundwater supply for domestic subdivision purposes at Sunset Ridge. Groundwater Exploration and Research together with Neimans Drilling conducted 24-hour pumping tests and recovery tests on four (4) wells on the property, evaluated aquifer properties and quantity, and analyzed water characteristics.

In accordance with the Alberta Water Act, a household is allowed to withdraw up to 1250 m^3/year without requiring a license to divert water.

Four flow tests have been conducted on the property. Wells on Lots 5, 8 and 10 as well as the stock well were flow tested as follows;
Lot 5 flow tested at 9.8 cm/day with a Q20 of 15.1 cm/day and recovery @ 90.1%
Lot 8 flow tested at 18.0cm/day withy a Q20 of 13.8cm/day and recovery @ 97.5%
Lot 10 flow tested at 9.8cm/day with a Q20 of 20.31cm/day and recovery @ 89.1%
Stock well flow tested at 39.3cm/day with a Q20 of 26.8cm/day and recovery @ 90.1%.
A survey of the groundwater well data in SE-32 and the surrounding 8 quarter sections of land was undertaken noting a total of 60 well records, including 4 well records from the SE quarter section. Summary of data is available in the Appendix

Groundwater Exploration and Research summary of findings:

1) The 3 parcels in the SE-32 plus the proposed 14 lot subdivision would require a total of 54.7 cm/day for individual wells or 32.3 cm/day for a combination of existing individual wells and a communal well
2) Summary of groundwater well data within the nine quarter sections indicates a cumulative groundwater potential of 157.7 cm/day. Theoretically, there exists sufficient groundwater reserves to serve the existing and proposed parcels of land in the SE-32.
3) Given the variability in transmissive capacity and well depth, it is possible that individual wells could be used to service the subdivision without too much interference. This approach would require the drilling of an individual

well per lot at the subdivision planning stage.

4) Flow test data from the stock well indicates that this well is capable of supporting up to 14 lots based on a communal well scheme.
5) Recommendation to provide a monitoring well (future Lot 10 – Phase 2) To provide Q20 results prior to redesignation of Phase 2 of the project.

Geotechnical Evaluation

A Geotechnical review of soils within the Plan Area was undertaken by Curtis Engineering Associates Ltd. to assess the ability of soils to meet percolation and near-surface water table requirements for sewage disposal systems[8]. Two (2) boreholes were drilled to 3.0 metres to identify geotechnical parameters for development. PVC standpipes were installed in all boreholes to assess groundwater levels. The four (4) test holes were drilled to 1.0 metre to evaluate near surface groundwater and bedrock that might affect construction of conventional septic fields. Results of the testing are contained in the Appendix.

The study found that:

- The Plan Area typically contains 300mm (12 inches) of topsoil over 2.7 metres of subsoil. Depth of bedrock was not encountered in the 3.0 metre range of the borehole

- 2 standpipes did not encounter free water during drilling or upon inspection 96 hours later.

- Groundwater levels and surface drainage conditions are not expected to be a concern for the development; however some common control measures may be required.

- Slopes on the site are naturally stable.

- No evidence of any significant erosion was found on the site, Grading and landscaping should be designed to prevent erosion of slopes by concentrated water runoff. Alternatively, surface drainage features such as swales could be constructed along slopes to collect and control surface water.

- Cut and fill slopes of no greater than 3H: 1V are suitable for permanent cuts or fills in the native clay till.

- All standpipes indicated depth to groundwater table conditions which meet AEP Guidelines and Standard of Practice requirements for sewage disposal.

well per lot at the subdivision planning stage.

5) Flow test data from the stock well indicates that this well is capable of supporting up to 14 lots based on a communal well scheme.

In order to determine the ground water capacity for Phase 2, a well (future Lot 10 – Phase 2) will be monitored to provide Q20 results prior to redesignation of Phase 2 of the project.

Geotechnical Evaluation

A Geotechnical review of soils within the Plan Area was undertaken by Curtis Engineering Associates Ltd. to assess the ability of soils to meet percolation and near-surface water table requirements for sewage disposal systems[8]. Two (2) boreholes were drilled to 3.0 metres to identify geotechnical parameters for development. PVC standpipes were installed in all boreholes to assess groundwater levels. The four (4) test holes were drilled to 1.0 metre to evaluate near surface groundwater and bedrock that might affect construction of conventional septic fields. Results of the testing are contained in the Appendix.

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- Groundwater levels and surface drainage conditions are not expected to be a concern for the development; however some common control measures may be required.

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- No evidence of any significant erosion was found on the site, Grading and landscaping should be designed to prevent erosion of slopes by concentrated water runoff. Alternatively, surface drainage features such as swales could be constructed along slopes to collect and control surface water.

- Cut and fill slopes of no greater than 3H: 1V are suitable for permanent cuts or fills in the native clay till.

- All standpipes indicated depth to groundwater table conditions which meet AEP Guidelines and Standard of Practice requirements for sewage disposal.

- The site soils have moderate percolation rates and comply with the Alberta Environment Protection recommended standards for installation of normal subsurface sewage disposal fields.

SERVICING AND UTILITIES POLICIES

4.6.1 Development of country residential lots will require proof of a suitable groundwater supply in conformity with the Provincial Water Act. The developer intends to provide individual wells on each individual lot. Redesignation of Phase 2 of the development will be subject to the results of a monitoring well on the proposed Lot 10 in Phase 2. The proposed water supply shall be to the satisfaction of MD of Foothills Council and in accordance with the requirements of the approved Area Structure Plan with respect to the phasing of the development.

4.6.2 All necessary Alberta Environment approvals, permits, and licenses will be obtained for water supply wells .

4.6.3 A Restrictive Covenant, administered by a Condominum or Homeowners Association shall be registered against all country lots to provide, among other things

a) For the encouragement of specific water conservation methods;

b) For the prohibition of chemical or salt-based water softeners or similar additives that could be harmful if released back to the soils:

c) For the prohibition of methods of open discharge from a septic tank and/or non-evaporative Lagoons;

d) For solid waste from the Sunset Ridge development to be to be the responsibility of individual landowners. Solid waste should be hauled by individual landowners or by an association of local landowners, to an appropriate transfer site.

4.6.4 To maintain water quality in local aquifers, consideration must be given to proper disposal of sanitary and sewer waste from all country residential dwellings. An Engineered Tank and Field system will be the minimum requirement for septic treatment. On-site sewage disposal systems shall meet the standards of the Municipality and the Alberta Private Sewage Systems Standard of Practice and these shall be considered the minimum required.

4.6.5 The Municipality may support the use of alternative technological systems of sewage disposal, particularly where the use of traditional septic tile fields would be impractical or marginal relative to regulatory standards. Alternate systems, including but not necessarily limited to slow sand "trickle" filters, septic mounds or modified tile field designs, a centralized wastewater treatment plant, and individual "package" wastewater treatment plants may be considered at the discretion of the Municipality and Alberta Labour.

4.6.6 Storm water runoff from developed areas shall be contained within the developable portions of the Plan Area wherever possible. Storm water will be retained primarily in open ditches within the rights-of-way of local subdivision roads.

4.6.7 In order maintain the natural character of the landscape, flows from country residential lots that are not intercepted by a roadway will be permitted to irrigate the intervening natural area as they flow toward the natural drainage course. These flows will not be significantly greater than existing pre-development flow rates.

4.6.8 Erosion prevention measures, including site grading, ditch checks and landscaping, shall be employed as required and appropriate throughout the Plan Area.

4.6.9 The MD of Foothills may request a Stormwater Management Plan (SMP) be prepared at the time of redesignation or subdivision. The SMP shall be prepared by a qualified engineer, at the sole expense of the applicant.

4.6.10 The impact of the proposed subdivision and/or development on the existing transportation network.

4.6.11 Electrical and telephone services shall be provided underground as per the Architectural Control Guidelines in the Appendix.

4.6.12 The provision of shallow utilities shall be at the sole expense of the developer to the extent required in the Municipal Standard Development Agreement.

4.7 Protective Services

Country residential development within the Plan Area will be covered by a 911 Emergency Service. Fire fighting response will be provided from the Okotoks Station with back up from The City of Calgary. The Royal Canadian Mounted Police, Okotoks detachment, and the M.D. of Foothills Special Constables will

provide police services to the Plan Area.

PROTECTIVE SERVICES POLICIES

4.7.1 Applications for redesignation, subdivision, and development shall demonstrate that proper emergency vehicle access is provided to MD of Foothills standards and the satisfaction of Council.

4.7.2 New country residential subdivisions shall meet MD of Foothills standards for on-site fire fighting measures.

5.0 PLAN IMPLEMENTATION

5.1 Approval Process

Adoption of the Sunset Ridge Area Structure Plan (ASP) as a Council approved bylaw is the first step toward implementation of development within the Plan Area. The ASP provides a framework of land use policies that must be met prior to approval of subsequent land use redesignation (zoning) bylaws and subdivision plans for specific lots with the Plan Area. The Sunset Ridge ASP is adopted only after endorsement by the provincial Minister of Transportation, a statutory Public Hearing of MD of Foothills Council, and appropriate consultation with key stakeholders including nearby landowners and municipal staff. All development within the plan area must be consistent with the policies of the approved area structure plan.

At the time of land use redesignation, additional technical information may be required in order to confirm the technical feasibility and design of the proposed land uses. Details of water supply and septic tank and field design for specific lots would be provided in accordance with MD policies and requirements, including the policies and requirements of this ASP. Following a statutory Public Hearing of Council, the MD of Foothills Land Use Bylaw #01-99 would be amended to reflect the land uses as proposed, and generally as illustrated in this Area Structure Plan. Redesignation will be undertaken in 2 applications to reflect the construction phasing of the project and the conditions attached to Phase 2.
A Development Agreement between the MD of Foothills and the landowner/developer will be a condition of land use redesignation approval to ensure the provision of roadway and utility infrastructure in accordance with municipal standards.

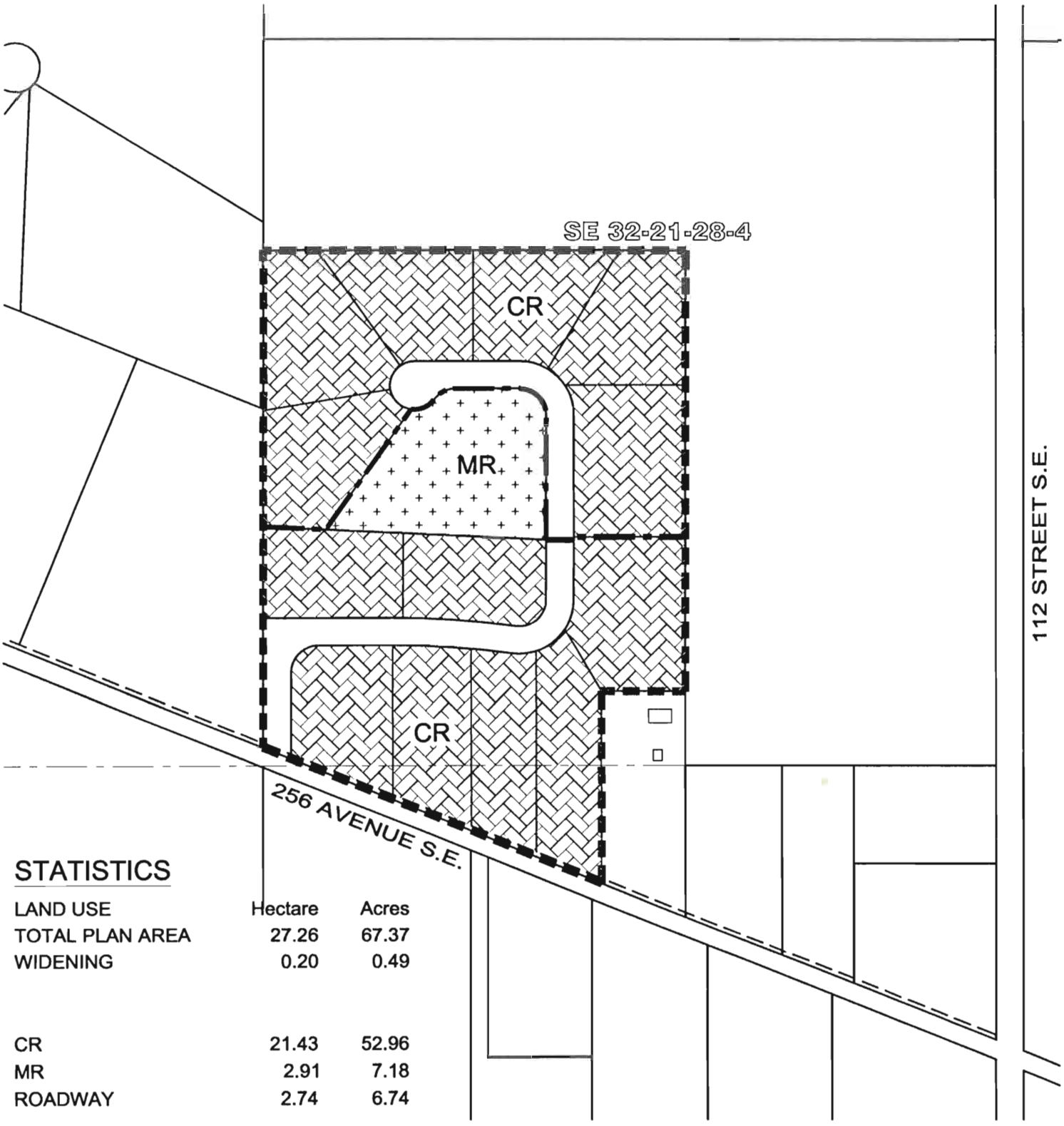
A legal subdivision application will be submitted to the MD of Foothills Council after appropriate land use bylaw amendments are in place to accommodate the planned land uses. Subdivision approval to be phased over time as per the conditions of Section (3.2 - Phasing) relating to the determination of a stable ground water supply .

A.S.P BOUNDARY
EXISTING ROADS
PROPOSED ROADS

FIGURE 1:
DEVELOPMENT CONCEPT / PHASING PLAN

TORUS ENGINEERING CONSULTANTS LTD.

N.T.S.



STATISTICS

LAND USE	Hectare	Acres
TOTAL PLAN AREA	27.26	67.37
WIDENING	0.20	0.49
CR	21.43	52.96
MR	2.91	7.18
ROADWAY	2.74	6.74

A.S.P. BOUNDARY
COUNTRY RESIDENTIAL
MUNICIPAL RESERVE

FIGURE 2:
LAND USE PLAN

TORUS ENGINEERING CONSULTANTS LTD.

N.T.S.

A.S.P. BOUNDARY

10% - 15% (1.90 Ha.)

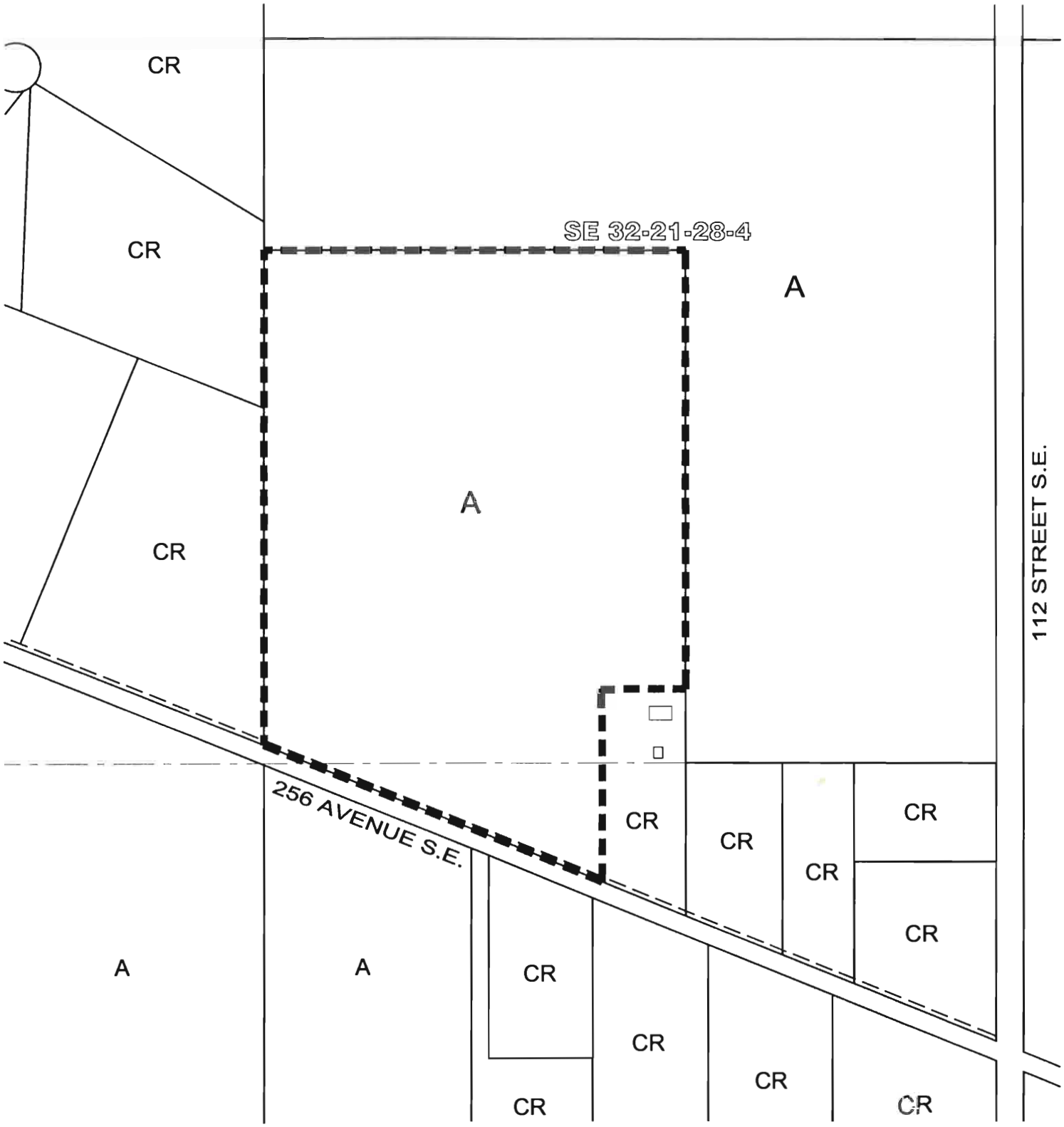
15% - 20% (0.98 Ha.)

FIGURE 3:

SLOPE ANALYSIS

TORUS ENGINEERING CONSULTANTS LTD.

N.T.S.



A.S.P. BOUNDARY

A AGRICULTURAL DISTRICT

CR COUNTRY RESIDENTIAL DISTRICT

FIGURE 4:

PLAN AREA

TORUS ENGINEERING CONSULTANTS LTD.

N.T.S.

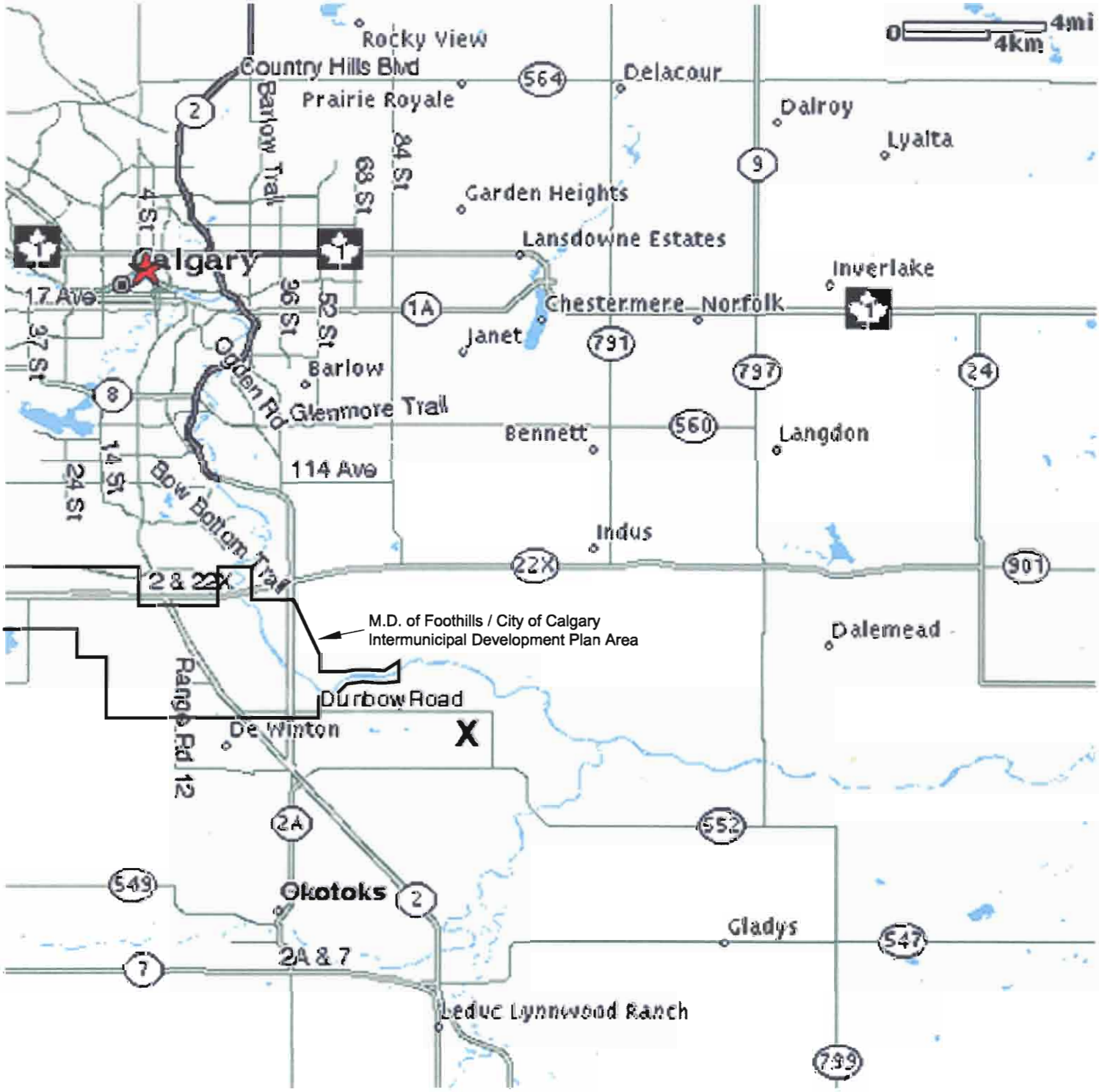


FIGURE 5:

MUNICIPAL SETTING

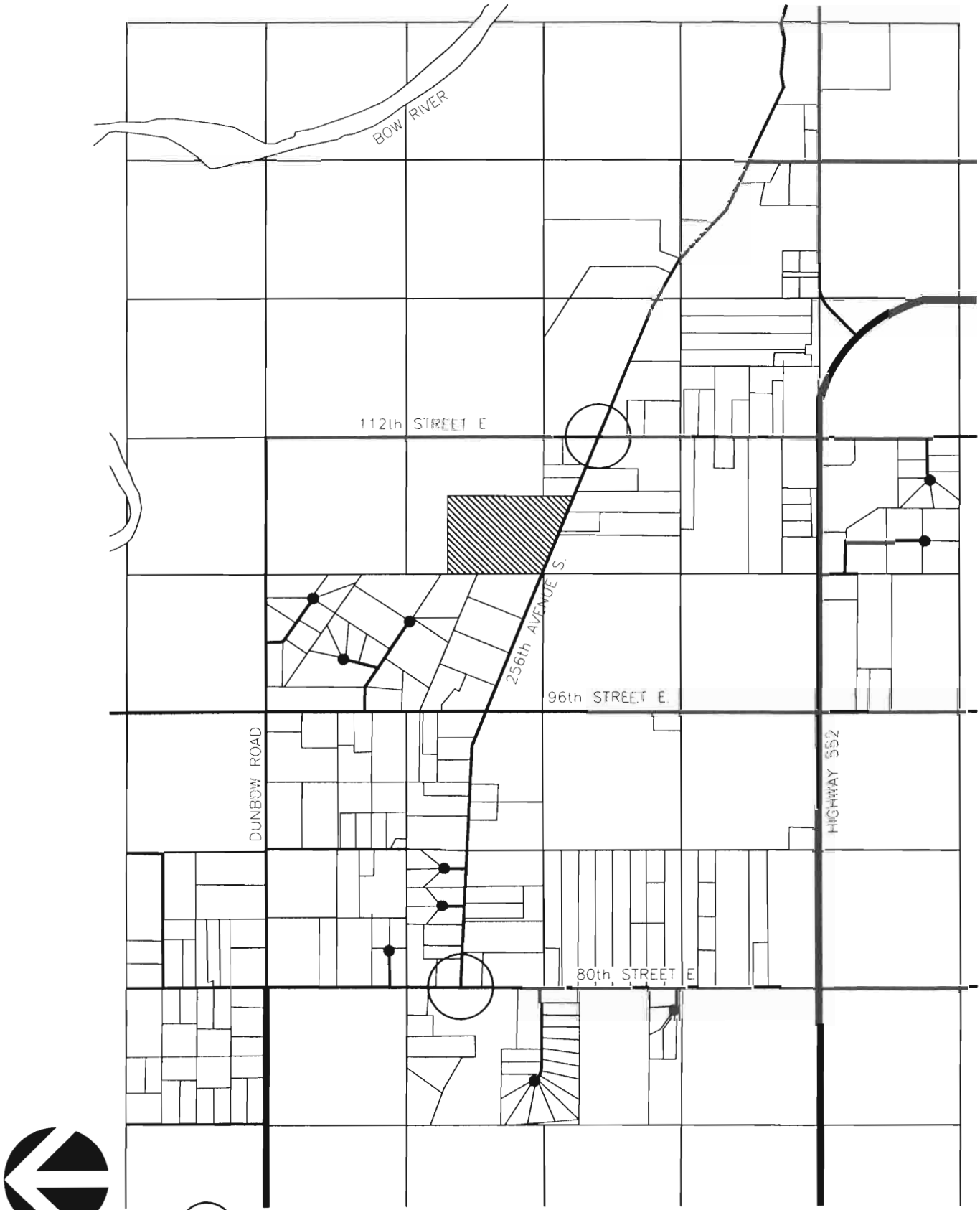
⊠ EXISTING WELL

FIGURE 6:

WELL LOCATIONS

TORUS ENGINEERING CONSULTANTS LTD.

N.T.S.



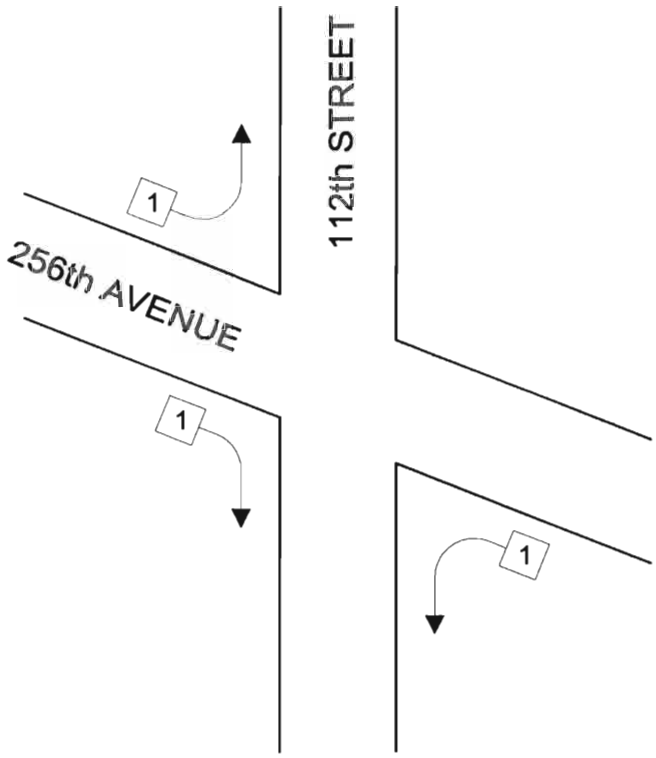
STUDIED INTERSECTION

MAJOR ROUTES - FIGURE 7a:

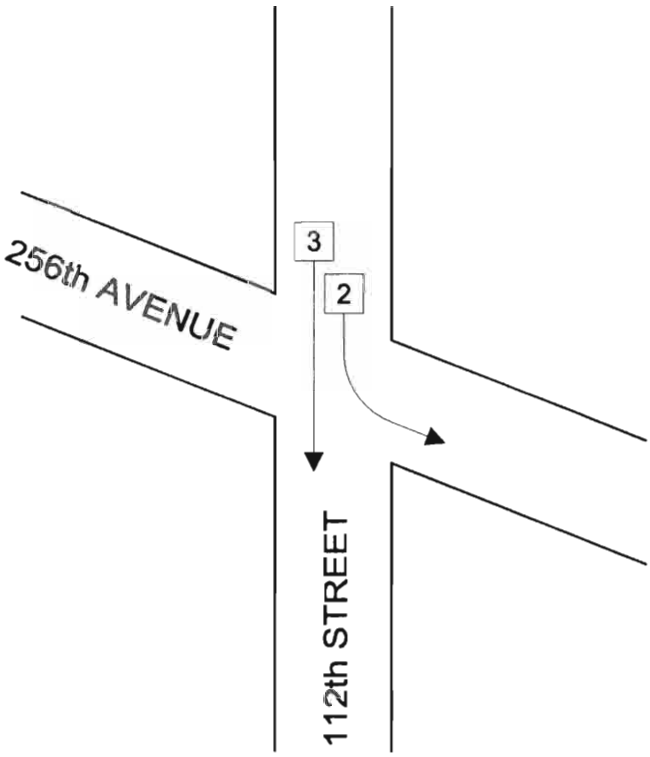
TRANSPORTATION

TORUS ENGINEERING CONSULTANTS LTD.

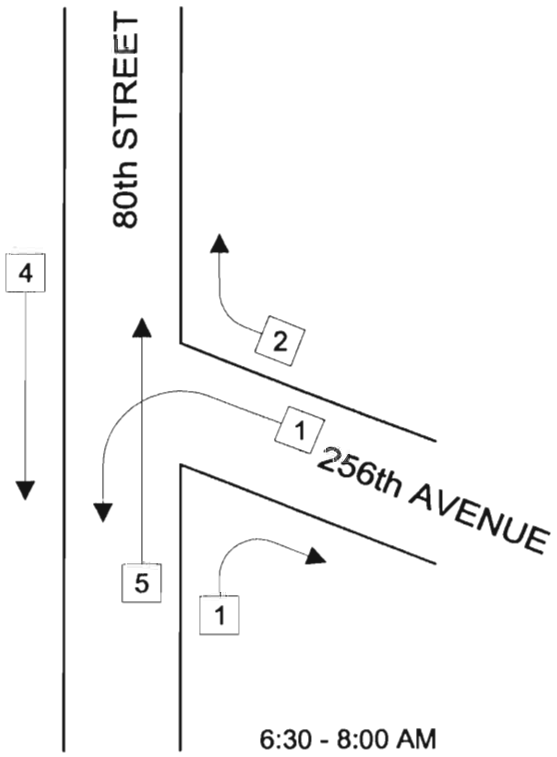
N.T.S.



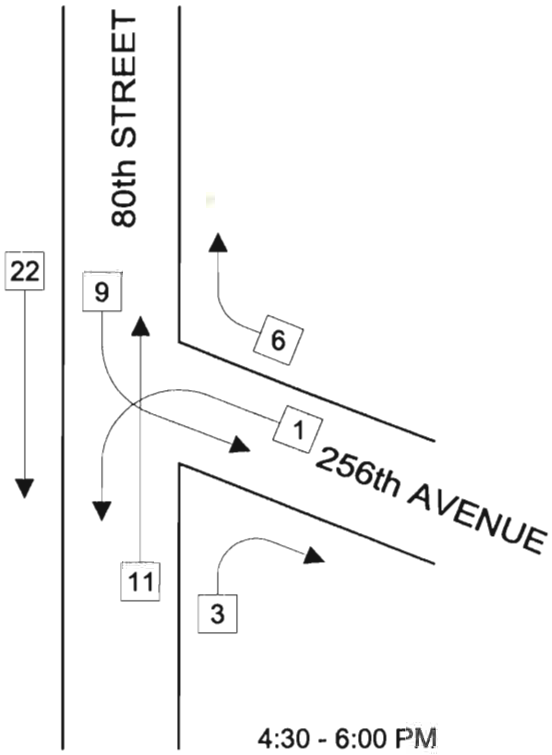
6:30 - 8:00 AM



4:30 - 6:00 PM



6:30 - 8:00 AM



4:30 - 6:00 PM

5 NUMBER OF VEHICLES
DIRECTION OF TRAFFIC

TRAFFIC FLOWS - FIGURE 7b:

TRANSPORTATION

BUILDING ENVELOPE

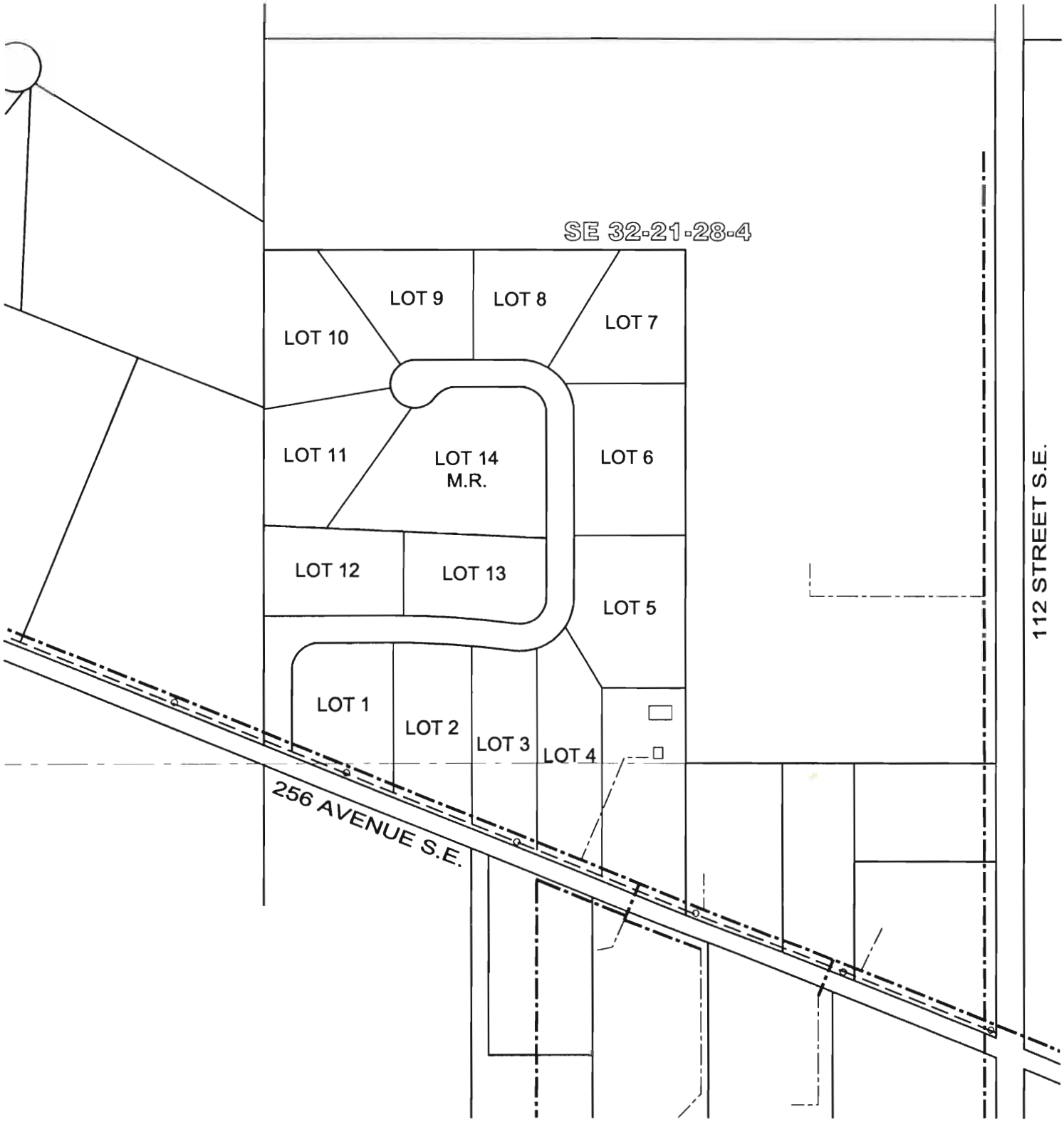
VIEWLINE

FIGURE 8:

LOT SITTINGS / VIEWLINES

TORUS ENGINEERING CONSULTANTS LTD.

N.T.S.



EXISTING GAS MAIN

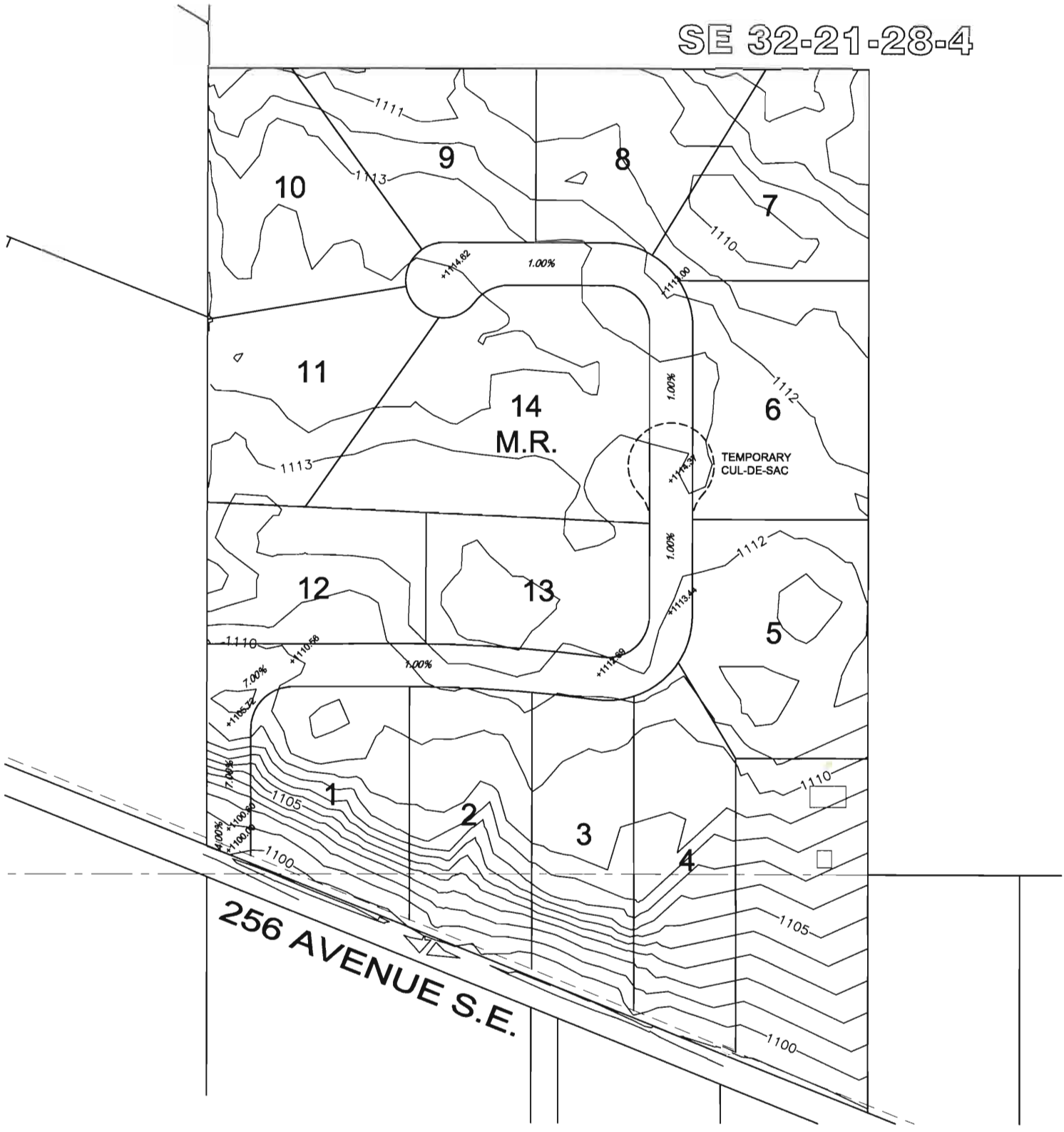
EXISTING POWER POLE

FIGURE 9:

ELECTRIC / GAS SERVICES

TORUS ENGINEERING CONSULTANTS LTD.

N.T.S.



+1100.00 ROAD ELEVATION

1.00% ROAD GRADE

FIGURE 10:

ROAD GRADING

TORUS ENGINEERING CONSULTANTS LTD. N.T.S.

APPENDIX

Architectural Controls

Summary of Ground Water Well Data

Geotechnical Investigation & Percolation Testing

Open House Summary

Architectural Controls

SUNSET RIDGE SUBDIVISION
ARCHITECTURAL CONTROL GUIDELINES
(herein referred to as the "Guidelines")

For the purposes of these Guidelines 923594 Alberta Ltd. is the developer of the Development and is herein referred to as the "Developer". The purchaser of a Lot within the Development is herein referred to as an "Owner" and all Owner's of the Lots within the Development are herein together referred to as the "Owner's".

General

The lands within and comprising the Development (the "Lands") shall only be used for the purpose of a single family country residential development in accordance with the M.D. of Foothills No. 31 by-laws and guidelines for such development (the "Development"). Notwithstanding the M.D. of Foothills No. 31 by-laws and guidelines for the Development no dwelling, separate from the single family country residence (the "Residence") erected, or to be erected, on the Lands, or any duplex, mobile home, apartment or move on home/residence, whether attached, semi-detached or detached from the Residence, shall be installed or erected on the Lands or be allowed as part of the Development.

Formal standards for the Development and the construction of a Residence on the lands will be those as established by the Municipal District of Foothills No. 31 Land Use Bylaw (the "By-Law") and conformity with the By-Law does not supersede the required approval of the Municipal District of Foothills No. 31.

No portion of the Lands, which includes any lot (the Lot") within the Development created by the subdivision of the Lands, and no building erected or constructed, or to be erected or constructed, on the Lands or any Lot shall, at any time, be used for the purpose of any profession, trade or business of any description whatsoever unless it is permitted under the "Minor Home Based Business" provisions of the By-Law.

No equipment, material or supplies will be stored or stockpiled on the Lands or any Lot other than as normally and regularly used in conjunction with a single family residence. These Guidelines permit the landscaped and constructed screening of a portion of a Lot in accordance with the provisions hereof and the provisions of the By-Law for the storage of one (and only one) recreational vehicle, machinery or equipment, of any nature whatsoever, owned by the occupants of the Lot and used for their personal residential use. No commercial trucks and related use trailers exceeding one-ton capacity shall be parked or placed on the Lands at any time or at any location.

No portion of the Lands shall be used for depositing, dumping, burning or storing of any refuse, trash or garbage or discarded building materials of any nature whatsoever. All rubbish, trash, garbage or discarded building materials shall be removed from the Lands

and shall not be allowed to accumulate thereon. The burning of garbage or any other refuse or discarded building materials is strictly prohibited.

No excavation of the Lands or any Lot shall be made except for the purpose of constructing or improving any buildings, gardens or grounds located on, or to be located on, the Lands or any Lot. No person shall alter the existing drainage of the Development or the Lands in any manner whatsoever, and all open areas of the Lots shall be maintained in a dust free condition by the landscaping thereof with trees, shrubs, suitable ground cover or undisturbed natural growth. All Lots and the buildings erected, or to be erected, thereon shall, at all times, be maintained in a clean and tidy manner and in good and substantial repair. Garbage containers and receptacles shall, at all times, be enclosed and/or screened from view.

At all times during the construction of a Residence precautions must be taken avoid damage to the natural environment of the Lot upon which the Residence is being built. Construction water must be handled with care to avoid damage to the area and must not be released into the natural drainage system. A suitably sized garbage container must be located at the site during construction to avoid debris and garbage blowing into other areas of the Development or into neighboring fields. Excess fill arising from any excavation on a Lot (whether from the basement excavation or otherwise) must be immediately removed from the site unless it can be incorporated into the landscaping of the subject Lot.

The building commitment to construct a Residence on a Lot shall be occupancy of the Residence within thirty-six (36) months of the purchase of the Lot by the initial purchaser thereof. This commitment also includes the completion of the exterior of the Residence (including, but not necessarily limited to, all trim, siding and other finishing details) within eight (8) months of commencement of the site excavation of the Lot for construction of the Residence thereon. In furtherance thereof the Owner's, and each of them, acknowledge and support the Developer's policy of controlling the design and expediting the diligent construction of the Residence on the Lot in order to enhance the appearance of the Development and therefore the value of all Lots forming a part of the Development.

Each Owner understands that the Developer may pursue and continue, in addition to the Development, a further subdivision of the property known as Sunset Ridge (Parcel A, Plan 4299 JK) and agrees not to restrict the Developer in the pursuit of such further subdivision and development. In pursuing such further subdivision the Developer shall conform to all M.D. of Foothills No. 31 by-laws and guidelines applicable thereto.

Setbacks, Side Yards, Building Heights and Building Commitments

The location of the Residence and all outbuildings on the Lot is the prerogative of the Developer subject to all buildings being located within the legal building envelope applicable to the Development. All architectural plans and related information pertaining to a Lot and the development thereof including, but not necessarily limited to, the

construction of a Residence and all outbuildings thereon (which plans and information are collectively herein referred to as the "Plans") must be submitted to the Developer for approval, and approved by the Developer, prior to the commencement of any construction on the Lot, of any nature whatsoever. The location chosen for the construction of a Residence and all outbuildings on a Lot should be complimentary to the adjacent Lots and properties. It is the intention of the Developer and the Owners that all Residences erected on the Lots within the Development shall, as far as possible, have a desirable view of the surrounding countryside.

The setbacks, side yards and building heights must adhere to the requirements By-Law and as set forth by the M.D. of Foothills No. 31. All Residences constructed on the Lots must comply with the Bylaw and these Guidelines. In some cases siting requirements for a Residence may be authorized by the Developer, with the appropriate approval and consent of the M.D. of Foothills No. 31 having been obtained, to exceed the minimum front, side or rear yard setbacks in order to vary the streetscape and enhance the appearance of the overall Development. No outbuilding shall be positioned in front of the primary Residence. Front elevation of the Residence must face the cul-de-sac roadway within the Development.

The Owner is responsible for conforming to the By-Laws, which may be updated from time to time by the M.D. of Foothills No. 31.

House Sizes and House Types

The Development and the Residences shall be built with a western country theme. Each design should be in harmony with the residential neighborhood and community comprising the Development. Certain Lots are more conducive to certain types or styles of Residences due to slope, topography, view and vegetation. Residences should be plotted to take advantage of the characteristics of the particular Lot upon which they are to be constructed. Special consideration must be given to Lots 1, 2, 3, 4, 10, 11, 12 and 13 of the Development, all of which Lots must be bungalows with maximum building heights of 23 feet from existing grade to peak.

Minimum House Sizes

All Residences within the Development must meet the following size requirements:

Bungalows -	1400 square feet area on the main (ground) floor
Split and Bi-Levels -	1400 square feet area on the main floor
Two Stories -	2000 square feet of total area on the main (ground) floor and upper level with a minimum of 1200 square feet on the main (ground) floor excluding the area of the garage

Garages - All Residences must include an attached double car garage. The garage must conform to the same architectural guidelines and styling of the Residence. Attached garages should be positioned to the side of the Residence to increase the visual mass of the building.

Outbuildings- All outbuildings to be constructed on a Lot shall be constructed with the same attention to detail as the main Residence on the Lot. Outbuildings for each Lot shall be limited to one building being a detached garage, workshop or barn together with one small animal shelter. Garden sheds, gazebos and other landscaping features shall conform to the western theme of the Development and where possible shall be located away from the direct view of public spaces within the Development. No outbuilding shall be permitted on a Lot if the outbuilding is greater than the square footage of the footprint of the Residence constructed, or to be constructed, on the Lot and provided that no outbuilding, under any circumstance, shall exceed 3000 square feet in total area. No outbuilding shall be greater that eighteen (18) feet in height at its peak and the same should be aesthetically pleasing and conform in style, design and exterior finish to the Residence constructed, or to be constructed on the same Lot. Under no circumstance shall any structure on a Lot, whether a Residence or any outbuilding, be erected or constructed except from new materials.

Design Criteria and Guidelines

One material shall predominate the exterior finish of each building located on a Lot, with the maximum of three materials being used on any one building. All buildings on a Lot shall be finished uniformly with the same theme and attention to detail as the Residence constructed, or to be constructed, on the Lot.

Roof pitch shall be a minimum of 5/12. Steeper, interesting accent rooflines will be encouraged.

Soffit overhangs are to be a minimum of 18" on roof pitches under 8:12 and 12" on roof pitches over 8:12. A 6" aluminum fascia is the minimum requirement. All fascia, rainwater leaders and eaves trough are to match the trim color and be consistent with each other.

Chimneys and furnace flue's in prominent locations (visible from public spaces of the Development) must be boxed and covered with the appropriate predominate siding material of the Residence. Accent detailing will be encouraged.

All windows must have applicable window treatments (i.e. shutters, grills, battens, etc.) on the front and side elevations and any other elevation directly facing a public space of the Development. These details should be of a maintenance free material.

Garage doors shall be finished to match the overall style of the Residence.

Front entrances should be a feature of the Residence. Strong detailing will be encouraged with elements such as verandas, wide stairs, railings, sidelights, transoms, or columns.

All electrical, telephone or other utility services must be installed underground. Septic tank and fields will be the responsibility of the Owner and must conform to all applicable requirements and code of the M.D. of Foothills No. 31 and all departments of the Alberta Government having jurisdiction.

Prior to occupancy of the Residence contractor signage on the Lot will be permitted to a maximum size of 24" X 36". No contractor signage will be allowed on any Lot after occupancy of the Residence. Personal name signage and For Sale signage are permitted but such signage shall not exceed 24" X 36".

The use of barbed wire for fencing on or around a Lot is strictly prohibited and will not be permitted under any circumstance.

All trees to be planted on a Lot shall be planted in small groupings. No lines of trees will be allowed except on Lots adjacent to 256 Avenue where lines of trees parallel to 256 Avenue can act as a barrier for sight and sound.

Personal motorized vehicles will not be allowed on any Municipal or Public Reserve or any public green spaces at any time except for the purpose of maintenance.

Summary of Ground Water Well Data

#04-10a

Groundwater Supply Evaluation
CinNet Developments Lot 5 well:
SE-32-21-28-W4M

Submitted to:

Torus Engineering Consultants Ltd and
CinNet Developments

Prepared by:

Groundwater Exploration & Research Ltd.
April 2004

Groundwater Exploration & Research LTD

Box 15
Balzac, AB. CANADA T0M 0E0
Phone (403) 226-0330: Fax (403) 226-6593: Email: gerl@telus.net

April 6, 2004
File No: 04-10a

CinNet Developments
c/o Torus Engineering Consultants Ltd.
#125, 1711 10 Avenue SW
Calgary, AB.
T3C 0K1

Attention: Gary Wise

RE: Proposed subdivision of the CinNet Developments property at SE-32-21-28-W4M: Municipal District of Foothills

Enclosed find our letter report which summarizes well completion details; includes a table of pump test data; a graph of the drawdown and recovery data from a field test conducted on the well; and makes a recommendation with respect to the calculated Q_{20} for a well at the above captioned location.

1.0 Background Information

The subject property is located northeast of the Town of Okotoks, approximately 1.6 km north of Secondary Road SR 552 on 112 Street East. The parent parcel is a +/-27.28 hectare [67.4 acre] parcel from which a proposed 13 lot subdivision is to be created with parcel sizes varying from +/-1.45 to 2.06 hectares [3.58 to 5.08 acre]; with municipal reserve of 2.91 hectares [7.18 acres]. A well test was conducted on a new well drilled on Lot 5, a +/-1.98 hectare [4.90 acre] parcel.

2.0 Well Completion Details

Total Depth:		42.68 meters
Non-Pumping Water Level:		15.27 meters below top of casing
Surface Casing:		168 mm steel; depth unknown
Liner:		114 mm PVC set depths unknown perforated from 30.49 to 36.59 meters
Drilling Contractor:		Niemans Drilling (1980) Ltd.
Pump Test Contractor:		Niemans Drilling (1980) Ltd
Date Drilled:		February 23, 2004
Lithology:	0.00 - 0.61	topsoil
	0.61 - 14.63	clay and rocks
	14.63 - 21.34	sandy clay & rocks
	21.34 - 24.09	brown sandstone
	24.09 - 30.49	grey shale
	30.49 - 36.59	grey sandstone
	36.59 - 42.68	grey shale/sandstone

3.0 Well Test Results

The Lot 5 well was flow tested by Niemans Drilling on February 28-29, 2004. The well was pumped at a rate of 9.82 m^3/day [1.5 Cgpm] for 720 minutes followed by 720 minutes of recovery. Water level measurements were recorded automatically using a pressure transducer and data logger supplied and installed by Niemans Drilling.

The maximum drawdown was observed to be 1.42 meters during the 720 minute test at a pumping rate of 9.82 m^3/day [1.5 Cgpm]. After 720 minutes of termination of pumping, the water level in the well had recovered 90.1 percent.

The maximum available drawdown, measured from the non-pumping water level of 15.27 meters, and the top of the perforated interval at 30.47 meters is 15.20 meters.

Transmissive capacity has been determined graphically using the Cooper and Jacob semilog plot method, with transmissive capacity based usually on the final limb of the curve according to:

$$T = 2.3Q/4*pi*delta\ s$$

where: T = transmissive capacity, in m^2/day
Q = pump rate, in m^3/day
s = drawdown over one log cycle

and by the non-graphical Sheahan Z(u) and Kasenow SAM methods.

Transmissive capacity, determined from the above methods is summarized as follows:

Stage	Delta s	Transmissivity
drawdown	0.86	2.09
residual drawdown	0.87	2.07
Sheahan Z(u)		2.16
Kasenow SAM		2.54

Based on the above methods of analysis, the geometric mean transmissive capacity is 2.21 m^2/day. It should be noted that the calculated transmissive capacity value is time dependent, flow rate dependent [particularly for fractured or stratified heterogeneous media] and reflects the response of an aquifer for the particular time of the year during which the test was conducted. Transmissive capacity is not a constant everywhere in an aquifer and is generally characterized by a log-normal distribution.

The 20 year, long term safe yield index (Q_{20}), neglecting well loss, is determined from the equation:

$$Q_{20} = 0.683TH$$

where: Q20 = 20 year, long term safe yield, in m^3/day

T = effective transmissive capacity, in m^2/day

H = available drawdown, in meters

The calculation of the 20 year safe yield index for an aquifer, assuming isotropic, homogeneous conditions is derived by extrapolating a downward trend so that the available drawdown lasts for 20 years. This approach neglects the effects of recharge, and is, therefore, a conservative approach.

It is common practice to adjust the Q_{20} by a safety factor to account for unknown boundary conditions due to test duration, well deterioration, well inefficiency, seasonal variability in non-pumping water level and errors associated with assuming isotropic, homogeneous aquifer conditions.

Based on a factor of safety of 1.5 the calculated Q_{20} is 15.30 m^3/day (2.3 Cgpm). When the calculated Q_{20} exceeds the pump test rate, it is common practice to consider the Q_{20} as the pump test rate. The Q_{20} is, therefore, conservatively taken as 9.82 m^3/day (1.5 Cgpm).

In accordance with the Water Act, every household user is entitled to divert up to a maximum of 1250 cubic meters per year or 3.42 m^3/day. Based on well test data, the Lot 5 production well is capable of providing the allotted 1250 m^3/year.

4.0 Licenced Users

A review of existing Alberta Environmental Protection groundwater licences indicates no licenced users within an 800 meter radius of the new production well. Operation of the domestic well will not, therefore, interfere with any licenced user existing at the time of subdivision application.

5.0 Well Interference

Country residential subdivision is subject to the following sections of the Water Act and the Water Regulation:

Section 23(3) of the Water Act states:

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 subdivision is approved, and

(b) the diversion of water for each household within the subdivision under section 21 is not inconsistent with an applicable approved water management plan

Section 23(3) of the Water Act requires that an APEGGA member sign-off on whether or not a newly created subdivision lot well would interfere with any household users, licensees or traditional agricultural users existing at the time of subdivision application. Unfortunately, this section of 23(3) has an inherent weakness because well interference for domestic wells is not a relevant issue. In general, planners are more concerned with the cumulative effect of country residential subdivision on the availability of groundwater supplies.

Well interference calculations do not address this issue. While well interference is not a significant issue, long term aquifer depletion and cumulative effects could be.

On a weighing of plausibility, well interference is not deemed to be a relevant issue for the following reasons:

[1] Well interference can be thought of as an artificial boundary condition resulting from the overlapping of cones of depression created by wells pumping on a continuous basis [Driscoll (1986) Groundwater And Wells, page 242-243].

[2] Household wells do not operate on a continuous basis, and as a result a cone of depression is not developed. Household wells operate on a cyclic basis, with very short periods of pumping followed by longer periods of recovery. In essence, only the water held in storage in the well is pumped to the pressure tank system and then the pump shuts down. A cone of depression is not generated under such a pumping condition.

[3] Transmissive capacity values are not constant within a given aquifer; and in fact are log-normally distributed. Well interference assumes a constant transmissive capacity between wells in order that the calculation have any realistic meaning. Bibby [1979: Estimating sustainable yield to a well in heterogeneous strata; Alberta Research Council, Bulletin 37] has indicated that in Alberta there exists no practical methods for determining the spatial variations of transmissivity of heterogeneous aquifers.

[4] The well interference concept assumes no recharge over a 20 year period and is, therefore, conservative.

[5] The actual water consumption for household purposes, based on historical use, is less than 50% of the volume of 1250 m^3/year allocated under the Water Act.

[6] Groundwater is a common reservoir on which anyone may draw. In accordance with Section 27 of the Water Act no one using groundwater under Section 21 has any priority over any other Section 21 user.

[7] Because of the complexity of natural heterogeneous groundwater flow systems, any cause and effect with regard to well interference, can not be brought together with any reasonable degree of certainty.

One approach to determining if increased country residential development has impacted the regional non-pumping water level is to review water well records on a decade basis. Historical, geometric mean, non-pumping water level data has been summarized for the SE-32 quarter section and the surrounding 8 quarter sections. The data are tabulated as follows:

Decade	No of Well Records	Npwl (m)	gm Well Depth (m)
1960s	2	17.4	31.8
1970s	18	19.2	67.0
1980s	9	17.3	43.8
1990s	28	26.3	79.0
2000s	6	23.7	75.9

There is some evidence to suggest a minor decline in regional water level based on existing water well information. Well depths in the 1990s and 2000s are only slightly deeper than those in the 1970s. Two of the wells drilled for the recent CinNet Developments project had well depths in excess of 120 meters, but one of the wells [Lot 5] was completed at a depth of 42.7 meters, suggesting that a regional drop in water level is not evident. The wells within the block of 9-quarter sections appear to be completed in a recharge zone as there is a relationship between increased non-pumping water level and well depth.

6.0 Summary of Findings

Based on the results of the flow test and drill log, the following conclusions have been drawn:

[1] The groundwater production well is capable of providing a maximum of 1250 m^3/year in accordance with Section 23(3) of the Water Act for the proposed +/-1.98 hectare [4.90 acre] Lot 5 parcel.

[2] Pumping of the new well, for household purposes, will not interfere with any household users, licensees or traditional agricultural users who exist at the time of subdivision application.

[3] Historical non-pumping water levels do not yield a concern for any significant decline in regional water level.

[4] It would be prudent to equip the well with a flow restrictor [approximately 2.5 US gpm Dole value] to prevent overpumping and stressing of the aquifer. For most household situations [reference: Water Wells That Last For Generations - 1998], wells with a production rate of less than 5 gpm do not supply enough water for a one hour peak use period. Therefore, it is usually necessary to create additional water storage using a cistern.

7.0 Closure

The well owner should be aware, in accordance with Alberta Environment document Draft Environmental Guidelines for the Review of Subdivisions in Alberta; Chapter 2: Guidelines For The Evaluation of Groundwater Supply For Unserviced Residential Subdivision (September 1998) that additional information may be required with this report, particularly chemical and bacteriological analysis of the well water to ensure that the water quality meets drinking water quality guidelines

If you have any questions or comments regarding the conclusions drawn in this groundwater supply evaluation, contact the undersigned at your convenience.

Respectfully yours,
Groundwater Exploration & Research Ltd.

Bob Nowak

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

PERMIT TO PRACTICE
Groundwater Exploration & Research Ltd.
Signature B. Nowak
Date Apr 7 '04
PERMIT NUMBER: P 3471
The Association of Professional Engineers, Geologists and Geophysicists of Alberta

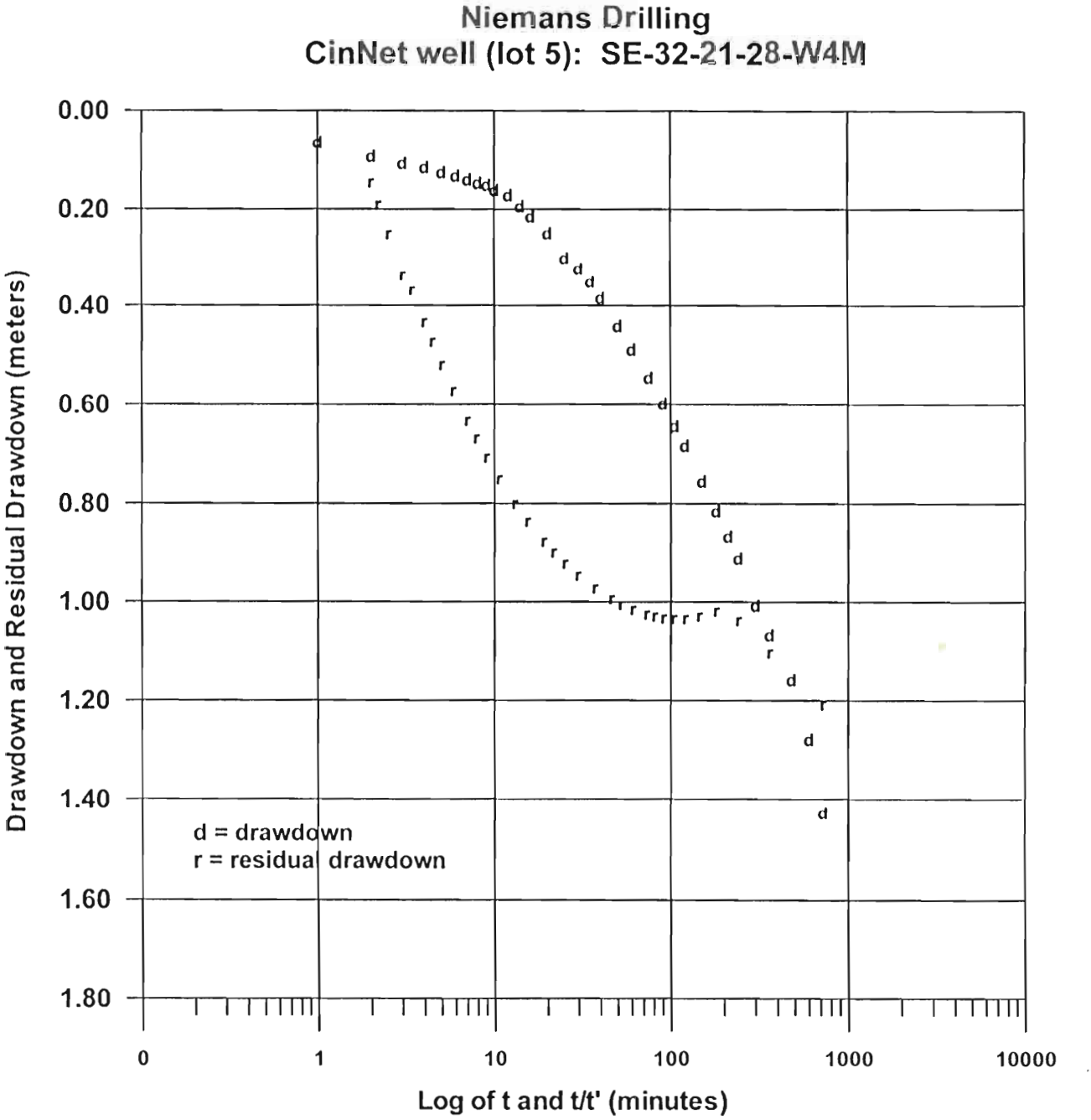
Pump Test Data
SE-32-21-28-W4M

Project: CinNet Developments Lot 5
Date: February 28-29, 2004
Non-Pumping Water Level: 15.27 meters, below top of casing
Pump Test Rate: 9.82 m^3/day (1.5 Cgpm)
Test Duration: 720 + 720 minutes

Elapsed Time t (min)	Drawdown (m)	Elapsed Time t/t' (min)	Residual Drawdown (m)
1	0.06	721	1.20
2	0.09	361	1.09
3	0.10	241	1.03
4	0.11	181	1.01
5	0.12	145	1.02
6	0.13	121	1.03
7	0.13	103.86	1.03
8	0.14	91	1.02
9	0.14	81	1.02
10	0.15	73	1.02
12	0.17	61	1.01
14	0.19	52.43	1.00
16	0.21	46	0.99
20	0.24	37	0.96
25	0.29	29.8	0.94
30	0.32	25	0.91
35	0.34	21.57	0.89
40	0.38	19	0.87
50	0.43	15.4	0.83
60	0.48	13	0.79
75	0.54	10.6	0.74
90	0.59	9	0.70
105	0.64	7.86	0.66
120	0.68	7	0.63
150	0.75	5.8	0.56
180	0.81	5	0.51
210	0.86	4.42	0.46
240	0.91	4	0.43

Pump Test Data (continued)
Lot 5: SE-32-21-28-W4M

Elapsed Time t (min)	Drawdown (m)	Elapsed Time t/t' (min)	Residual Drawdown (m)
300	1.00	3.4	0.36
360	1.06	3	0.33
480	1.15	2.5	0.24
600	1.27	2.2	0.18
720	1.42	2	0.14


Niemans Drilling
CinNet well (lot 5): SE-32-21-28-W4M
Drawdown and Residual Drawdown (meters)
0.00
0.20
0.40
0.60
0.80
1.00
1.20
1.40
1.60
1.80
d = drawdown
r = residual drawdown
0
1
10
100
1000
10000
Log of t and t/t' (minutes)

Bill Niemans Water well Drilling

Static: 15.27 Test start GPM: 1 5
DATE: 2/28/2004 Legal:
NAME: Johnson NP TEMP. 5.88
WELL ID: Lot # 5 Perf: 30.47-36 5 m
Top of casing.

Mins	temp	drawdown	mins	temp	recovery
1	5.86	15.457	721	6.16	19.205
2	5 85	15 552	722	6 12	18.859
3	5 85	15.598	723	6.11	18 647
4	5.9	15 625	724	6 38.	18.582
5	6	15.659	725	6.64	18 617
6	6.06	15.683	726	6 78	18.634
7	6.11	15.707	727	6.88	18.634
8	6.16	15.731	728	6.96	18.628
9	6.22	15.743	729	7.01	18.617
10	6.28	15.777	730	7.03	18.604
12	6.34	15.812	732	7.07	18 572
14	6.45	15.885	734	7.06	18.54
16	6.51	15.951	736	7 03	18.503
20	6.5	16.063	740	7.01	18.432
25	6.41	16.231	745	6.97	18.347
30	6.33	16 304	750	6.92	18.268
35	6.29	16.395	755	6.84	18.193
40	6.28	16.508	760	6.75	18.121
50	6.26	16.695	770	6.65	17.987
60	6.24	16.851	780	6.55	17.869
75	6.21	17.036	795	6.43	17.707
90	6.2	17 211	810	6.34	17.584
105	6 19	17 363	825	6.29	17.438
120	6.17	17.493	840	6.22	17 32
150	6.15	17.727	870	6.16	17.119
180	6.14	17.922	900	6.1	16.946
210	6 15	18 092	930	6.06	16.794
240	6.16	18.239	960	6.01	16 666
300	6 16	18 55	1020	5.95	16 449
360	6.15	18 745	1080	5.92	16 344
480	6 14	19.048	1200	5.9	16.064
600	6.11	19.439	1320	5 87	15 867
720	6.16	19.93	1440	5 87	15.722

Alberta ENVIRONMENT

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy. All information on this report will be retained in a public database.

Well I.D.
Map verified
Date report received:

Contractor & Well Owner Information

Company Name: NIEMANS [illegible]
Approval No.: 0820
Mailing Address: Box 5564 High River, AB.
City or Town:
Postal Code:
Well Owner's Name: NEIL TOWNSEND
Well Owner has a copy of this report: ☑ Yes ☐ No
Mailing Address:
City or Town: HIGH RIVER AB.
Postal Code:

❷ Well Location

¼ or LSD	Sec	Twp	Rge	West of Mer.
S.E.	32	21	28	4

m/ft from ☐ N ☐ S
m/ft from ☐ E ☐ W

❸ Drilling Information

Type of Work: ☐ Testhole ☑ New Well ☐ Reconditioned ☐ Deepened
☐ Reclaimed well Date reclaimed Yr Mo Day
Materials Used: ☐ Cement ☐ Bentonite Product ☐ Other.
Proposed well use: ☑ Household (up to 1250 m³ per year with a residence on the property) ☐ Other Specify
Method of Drilling: ☐ Auger ☑ Rotary ☐ Boring ☐ Combination ☐ Cable tool ☐ Backhoe ☐ Other

❹ Formation Log

Depth from ground level	Lithology Description
0'-2'	Top Soil
2'-88'	Clay & Rocks
88'-90'	Soft Clay, Rocks, Sand
90'-99'	Brown SS
99'-100'	Grey SH.
100'-135'	Grey SS.
135'-140'	Gray SH. SS.

AIR TESTED.
5-6 G.P.M.

❺ Well Completion

Date Started: 04/2/20 (Yr Mo Day)
Date Completed: 04/2/22 (Yr Mo Day)
Are measurements in metric or imperial?
Well Depth: 140 FT.
Borehole diameter: [illegible]
Casing type: STEEL
Liner type: P.V.C.
Size OD: 6 5/8"
Size OD: 4 ½"
Wall thickness: .188
Wall thickness: .219
Bottom at:
Top: Bottom:
Perforations: from 100 to 120
from: to:
Perforation size: 1/8" x 6"
Perforated by: ☑ Saw ☐ Machine ☐ Torch ☐ Other
Seal: ☑ Bentonite product ☑ Driven ☐ Cement / Grout ☐ Other:
Sealed interval: from 6 FT. to
Screen type: Size OD:
Intervals: from to slot size
from to slot size
Installation: ☐ Attached to casing ☐ Telescoped
Fittings: Top ☐ Packer ☐ Coupler Bottom ☐ Wash-down ☐ Bail ☐ Plug
Pack: ☐ Artificial Mechanical ☐ Natural
Grain size: Amount

❻ Well Yield

Test Date: 04/2/28 (Yr Mo Day) Start Time
Test method: Air
☐ Pump ☐ Bailer ☐ Air
Are measurements in metric or imperial?
Non pumping static water level: 15.22 M.
Rate of water removal: 1½ I.G.P.M.
Depth of pump intake if pump tested: 120 FT.
Depth bailed or air tested from: 140 FT.
Distance from top of casing to ground level:

Depth to water level Pumping	Elapsed Time minutes	Recovery
15.22 M.	0	
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	12	
	14	
	16	
	20	
	25	
	30	
	35	
	40	
	50	
	60	
	75	
	90	
	105	
82.33 M.	120	[illegible]

Total Drawdown: [illegible]
If water removal was less than 2 hr duration, reason:
Recommended pumping rate
Recommended pump intake
Pump installed ☐ Yes ☐ No
Type:
Any further comments / information? ☑ Yes ☐

Geophysical Log taken: ☐ Electric ☐ Gamma
Did you encounter: ☐ Mineralized water more than 4000 ppm TDS ☐ Gas
At what depth
Remedial action taken.

❼ Contractor Certification

Driller's Name: CHAD NIEMANS.
Certification No.: 46340 A
This well was constructed in accordance with the Water (Ministerial) Regulation of the Water Act. All information in this report is true.
Signature: [signature] 04 3 1 (Yr Mo Day)

White copy: Alberta Environment Yellow copy: Well Owner Pink copy: Contractor

#04-10b

Groundwater Supply Evaluation
CinNet Developments Lot 8 well:
SE-32-21-28-W4M

Submitted to:

Torus Engineering Consultants Ltd and
CinNet Developments

Prepared by:

Groundwater Exploration & Research Ltd.
April 2004

Groundwater Exploration & Research LTD

Box 15
Balzac, AB. CANADA T0M 0E0
Phone (403) 226-0330: Fax (403) 226-6593: Email: gerl@telus.net

April 6, 2004
File No: 04-10b

CinNet Developments
c/o Torus Engineering Consultants Ltd.
#125, 1711 10 Avenue SW
Calgary, AB.
T3C 0K1

Attention: Gary Wise

RE: **Proposed subdivision of the CinNet Developments property at SE-32-21-28-W4M: Municipal District of Foothills**

Enclosed find our letter report which summarizes well completion details; includes a table of pump test data; a graph of the drawdown and recovery data from a field test conducted on the well; and makes a recommendation with respect to the calculated Q_{20} for a well at the above captioned location.

1.0 Background Information

The subject property is located northeast of the Town of Okotoks, approximately 1.6 km north of Secondary Road SR 552 on 112 Street East. The parent parcel is a +/-27.28 hectare [67.4 acre] parcel from which a proposed 13 lot subdivision is to be created with parcel sizes varying from +/-1.45 to 2.06 hectares [3.58 to 5.08 acres]; with a municipal reserve of 2.91 hectares [7.18 acres]. A well test was conducted on a new well drilled on Lot 8, a +/-1.51 hectare [3.74 acre] parcel.

2.0 Well Completion Details

Total Depth:		121.95 meters
Non-Pumping Water Level:		28.12 meters below top of casing
Surface Casing:		168 mm set to 17.99 meters
Liner:		114 mm PVC set from 12.20 to 121.95 meters; perforated from 48.78 to 57.93; 97.56 to 105.18; and 109.76 to 115.85 meters
Drilling Contractor:		Niemans Drilling (1980) Ltd
Pump Test Contractor:		Niemans Drilling (19800 Ltd.
Date Drilled:		March 10, 2004
Lithology:	0.00 - 2.44	clay & rocks
	2.44 -16.77	sandy clay
	16.77 - 33.84	shale
	33.84 - 37.20	shale/sandstone
	37.20 - 47.56	shale
	47.56 - 55.48	sandstone
	55.48 - 57.92	grey shale
	57.92 - 63.11	grey shale & sandstone ledges
	63.11 - 65.24	grey sandstone
	65.24 - 94.51	grey shale & sandstone ledges
	94.51 - 98.17	grey sandstone
	98.17 - 102.74	grey shale/sandstone
	102.74 -105.18	grey shale & sandstone ledges
	105.18 -112.80	grey sandstone
	112.80 - 121.95	grey shale & sandstone ledges

3.0 Well Test Results

The Lot 8 well was flow tested by Niemans Drilling on March 9-10, 2004. The well was pumped at a rate of 18.00 m^3/day [2.75 Cgpm] for 720 minutes followed by 720 minutes of recovery. Water level measurements were recorded automatically using a pressure transducer and data logger supplied and installed by Niemans Drilling.

The maximum drawdown was observed to be 9.69 meters during the 720 minute test at a pumping rate of 18.00 m^3/day [2.75 Cgpm]. After 720 minutes of termination of pumping, the water level in the well had recovered 97.5 percent.

The maximum available drawdown, measured from the non-pumping water level of 28.12 meters, and the top of the perforated interval at 48.78 meters is 20.66 meters.

Transmissive capacity has been determined graphically using the Cooper and Jacob semilog plot method, with transmissive capacity based usually on the final limb of the curve according to:

$$T = 2.3Q/4*pi*delta\ s$$

where: T = transmissive capacity, in m^2/day
Q = pump rate, in m^3/day
s = drawdown over one log cycle

and by the non-graphical Sheahan Z(u) and Kasenow SAM methods.

Transmissive capacity, determined from the above methods is summarized as follows:

Stage	Delta s	Transmissivity
drawdown	1.96	1.68
residual drawdown	1.67	1.97
Sheahan Z(u)		0.95
Kasenow SAM		1.46

Based on the above methods of analysis, the geometric mean transmissive capacity is 1.46 m^2/day. It should be noted that the calculated transmissive capacity value is time dependent, flow rate dependent [particularly for fractured or stratified heterogeneous media] and reflects the response of an aquifer for the particular time of the year during which the test was conducted. Transmissive capacity is not a constant everywhere in an aquifer and is generally characterized by a log-normal distribution.

The 20 year, long term safe yield index (Q_{20}), neglecting well loss, is determined from the equation:

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The calculation of the 20 year safe yield index for an aquifer, assuming isotropic, homogeneous conditions is derived by extrapolating a downward trend so that the available drawdown lasts for 20 years. This approach neglects the effects of recharge, and is, therefore, a conservative approach.

It is common practice to adjust the Q_{20} by a safety factor to account for unknown boundary conditions due to test duration, well deterioration, well inefficiency, seasonal variability in non-pumping water level and errors associated with assuming isotropic, homogeneous aquifer conditions.

Based on a factor of safety of 1.5 the calculated Q_{20} is 13.73 m^3/day (2.1 Cgpm).

In accordance with the Water Act, every household user is entitled to divert up to a maximum of 1250 cubic meters per year or 3.42 m^3/day. Based on well test data, the Lot 8 production well is capable of providing the allotted 1250 m^3/year.

4.0 Licenced Users

A review of existing Alberta Environmental Protection groundwater licences indicates no licenced users within an 800 meter radius of the new production well. Operation of the domestic well will not, therefore, interfere with any licenced user existing at the time of subdivision application.

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Country residential subdivision is subject to the following sections of the Water Act and the Water Regulation:

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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 subdivision is approved, and

(b) the diversion of water for each household within the subdivision under section 21 is not inconsistent with an applicable approved water management plan

Section 23(3) of the Water Act requires that an APEGGA member sign-off on whether or not a newly created subdivision lot well would interfere with any household users, licensees or traditional agricultural users existing at the time of subdivision application. Unfortunately, this section of 23(3) has an inherent weakness because well interference for domestic wells is not a relevant issue. In general, planners are more concerned with the cumulative effect of country residential subdivision on the availability of groundwater supplies.

Well interference calculations do not address this issue. While well interference is not a significant issue, long term aquifer depletion and cumulative effects could be.

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[2] Household wells do not operate on a continuous basis, and as a result a cone of depression is not developed. Household wells operate on a cyclic basis, with very short periods of pumping followed by longer periods of recovery. In essence, only the water held in storage in the well is pumped to the pressure tank system and then the pump shuts down. A cone of depression is not generated under such a pumping condition.

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[6] Groundwater is a common reservoir on which anyone may draw. In accordance with Section 27 of the Water Act no one using groundwater under Section 21 has any priority over any other Section 21 user.

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1990s	28	26.3	79.0
2000s	6	23.7	75.9

There is some evidence to suggest a minor decline in regional water level based on existing water well information. Well depths in the 1990s and 2000s are only slightly deeper than those in the 1970s. Two of the wells drilled for the recent CinNet Developments project had well depths in excess of 120 meters, but one of the wells [Lot 5] was completed at a depth of 42.7 meters, suggesting that a regional drop in water level is not evident. The wells within the block of 9-quarter sections appear to be completed in a recharge zone as there is a relationship between increased non-pumping water level and well depth.

6.0 Summary of Findings

Based on the results of the flow test and drill log, the following conclusions have been drawn:

[1] The groundwater production well is capable of providing a maximum of 1250 m^3/year in accordance with Section 23(3) of the Water Act for the proposed +/-1.51 hectare [3.74 acre] Lot 8 parcel.

[2] Pumping of the new well, for household purposes, will not interfere with any household users, licensees or traditional agricultural users who exist at the time of subdivision application.

[3] Historical non-pumping water levels do not yield a concern for any significant decline in regional water level.

[4] It would be prudent to equip the well with a flow restrictor [approximately 3.0 US gpm Dole value] to prevent overpumping and stressing of the aquifer. For most household situations [reference: Water Wells That Last For Generations - 1998], wells with a production rate of less than 5 gpm do not supply enough water for a one hour peak use period. Therefore, it is usually necessary to create additional water storage using a cistern.

7.0 Closure

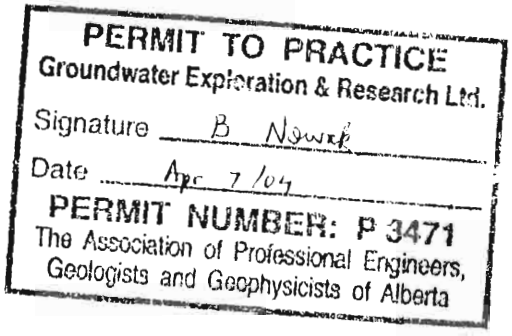
The well owner should be aware, in accordance with Alberta Environment document Draft Environmental Guidelines for the Review of Subdivisions in Alberta; Chapter 2: Guidelines For The Evaluation of Groundwater Supply For Unserviced Residential Subdivision (September 1998) that additional information may be required with this report, particularly chemical and bacteriological analysis of the well water to ensure that the water quality meets drinking water quality guidelines

If you have any questions or comments regarding the conclusions drawn in this groundwater supply evaluation, contact the undersigned at your convenience.

Respectfully yours,
Groundwater Exploration & Research Ltd.

Bob Nowak

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



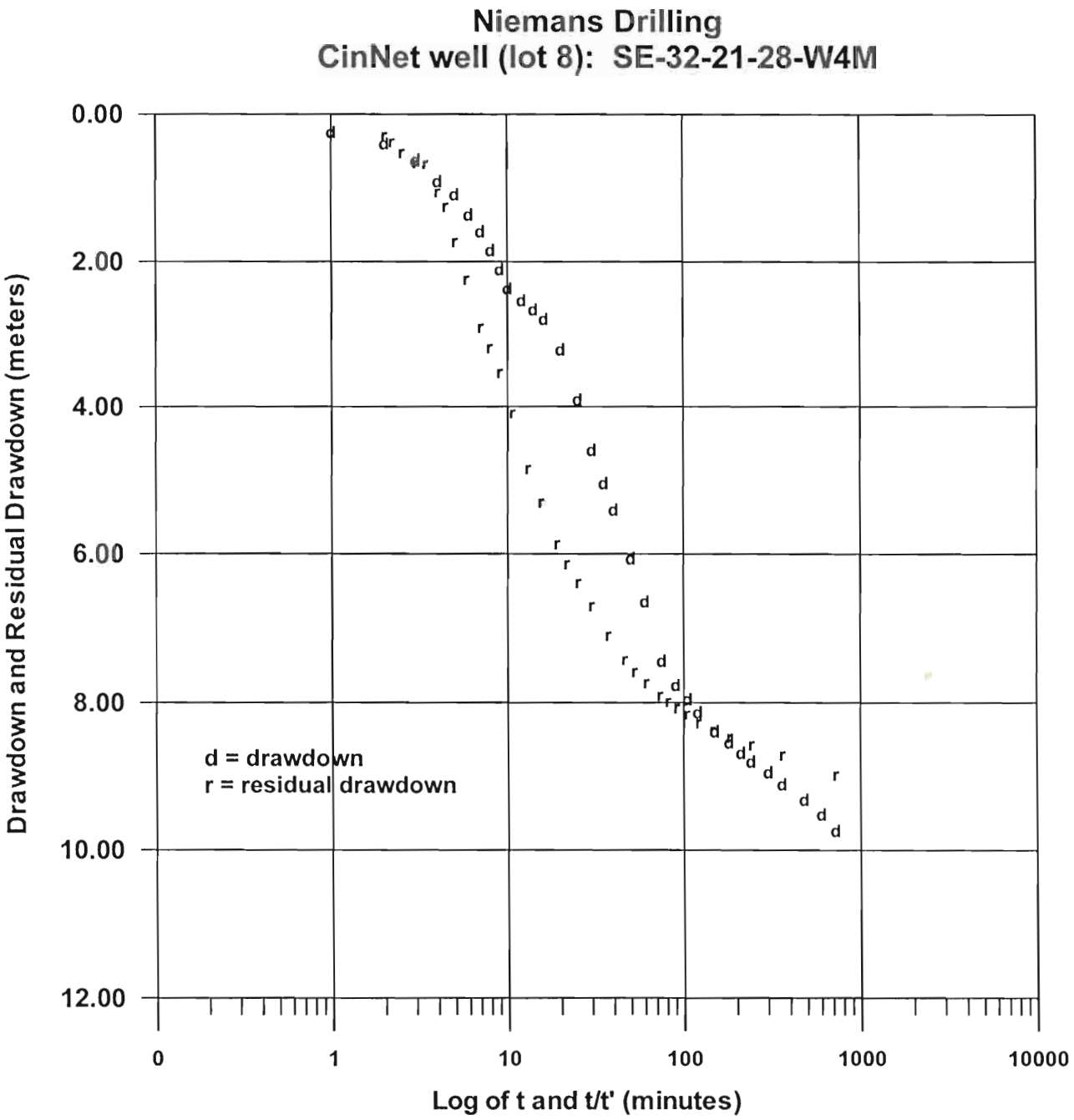
Pump Test Data
SE-32-21-28-W4M

Project: CinNet Developments Lot 8
Date: March 9-10, 2004
Non-Pumping Water Level: 28.12 meters, below top of casing
Pump Test Rate: 18.00 m^3/day (2.75 Cgpm)
Test Duration: 720 + 720 minutes

Elapsed Time t (min)	Drawdown (m)	Elapsed Time t/t' (min)	Residual Drawdown (m)
1	0.20	721	8.92
2	0.36	361	8.65
3	0.58	241	8.51
4	0.88	181	8.42
5	1.06	145	8.32
6	1.33	121	8.22
7	1.55	103.86	8.11
8	1.80	91	8.02
9	2.07	81	7.94
10	2.34	73	7.85
12	2.51	61	7.68
14	2.63	52.43	7.52
16	2.77	46	7.36
20	3.18	37	7.03
25	3.86	29.8	6.64
30	4.56	25	6.33
35	5.00	21.57	6.08
40	5.35	19	5.82
50	6.01	15.4	5.25
60	6.58	13	4.80
75	7.38	10.6	4.04
90	7.71	9	3.48
105	7.91	7.86	3.14
120	8.09	7	2.87
150	8.34	5.8	2.20
180	8.49	5	1.68
210	8.63	4.42	1.21
240	8.75	4	1.02

Pump Test Data (continued)
Lot 8: SE-32-21-28-W4M

Elapsed Time t (min)	Drawdown (m)	Elapsed Time t/t' (min)	Residual Drawdown (m)
300	8.89	3.4	0.62
360	9.06	3	0.62
480	9.27	2.5	0.47
600	9.47	2.2	0.33
720	9.69	2	0.24


Niemans Drilling
CinNet well (lot 8): SE-32-21-28-W4M
Drawdown and Residual Drawdown (meters)
0.00
2.00
4.00
6.00
8.00
10.00
12.00
d = drawdown
r = residual drawdown
0
1
10
100
1000
10000
Log of t and t/t' (minutes)

Bill Niemans Water well Drilling

Static:	28.12	Test start	13:50	GPM:	2.75
DATE:	3/9/2004			Legal:	
NAME:	johnson			NP TEMP:	7.41
WELL ID:	Lot [redacted] 8			Perf:	drill report
				Top of casing:	16 inches

Mins	temp	drawdown	mins	temp	recovery
1	7 37	28.774	721	7.51	57.388
2	7.32	29.293	722	7.52	56.502
3	7.3	30.019	723	7.51	56.048
4	7 28	30.986	724	7.51	55.735
5	7.26	31.536	725	7.51	55.421
6	7 25	32.471	726	7.5	55.087
7	7.23	33.202	727	7.47	54 71
8	7 22	34.032	728	7.42	54.425
9	7.22	34.901	729	7.38	54.147
10	7.21	35.786	730	7.35	53.874
12	7.21	36 348	732	7.32	53.3
14	7.21	36.758	734	7.31	52.798
16	7 21	37.206	736	7.32	52.259
20	7.26	38.535	740	7.32	51.178
25	7.26	40.766	745	7.33	49.891
30	7.26	43.062	750	7.27	48.886
35	7.27	44.521	755	7.21	48 052
40	7.26	45.684	760	7.23	47.198
50	7.17	47.845	770	7.38	45.331
60	7.06	49.718	780	7.35	43.858
75	6.98	52.337	795	7.26	41.361
90	6.94	53.425	810	7.21	39.535
105	6.96	54.071	825	7 17	38.428
120	6.98	54.653	840	7.14	37 537
150	6.98	55.487	870	7.13	35.334
180	6.89	55.975	900	7.01	33.627
210	6 83	56.434	930	6 99	32.078
240	6 92	56.814	960	7.06	31.463
300	6 88	57 286	1020	7.07	30.161
360	6 89	57 831	1080	7.04	30 142
480	7.06	58.533	1200	6 83	29.667
600	7.42	59.182	1320	6.56	29 192
720	7.45	59.901	1440	6.51	28.912

Alberta ENVIRONMENT

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy. All information on this report will be retained in a public database.

Well I.D.
Map verified
Date report received:

Contractor & Well Owner Information

Company Name: WIEMANS DRLG (1980) LTD. Approval No.: 0820.
Mailing Address: BOX 5564, City or Town: HIGH RIVER, AB. Postal Code: T1V 1M6.
Well Owner's Name: NEIL JOHNSEN.
Well Owner has a copy of this report: [x] Yes [ ] No
Mailing Address: City or Town: HIGH RIVER, AB. Postal Code:

❷ Well Location

1/4 or LSD	Sec	Twp	Rge	West of Meridian
SE	32	21	28	4

Location in Quarter: m/ft from [ ] N [ ] S; 8 m/ft from [ ] E [ ] W
Lot Block Plan

❸ Drilling Information

Type of Work: [ ] Testhole [x] New Well [ ] Reconditioned [ ] Deepened [ ] Reclaimed well — Date reclaimed: Yr Mo Day
Materials Used: [ ] Cement [ ] Bentonite Product [ ] Other:
Proposed well use: [x] Household (up to 1250 m^3 per year with a residence on the property) [ ] Other Specify:
Method of Drilling: [ ] Auger [ ] Boring [ ] Cable tool [x] Rotary [ ] Combination [ ] Backhoe [ ] Other

❹ Formation Log

Depth from ground level [ ] metres [x] feet

Depth	Lithology Description
0'-8'	CL. Agg. ROCKS.
8'-55'	SILTY CLAY
55'-111'	SH.
111'-122'	SH. SS.
122'-156'	SH.
156'-182'	Grey SS.
182'-190'	SH. (GREY).
190'-267'	Grey. SH. +SS.L.
267'-314'	Grey. SS.
314'-318'	Grey. SH.+SS.L.
318'-322'	Grey. SS.
322'-337'	Grey. BLUE SS.
337'-345'	Grey SH.+SS.L.
345'-380'	Grey. SS.
380'-480'	Grey. SH.+SS.L.

AIR TESTED
5 G.P.M.

Geophysical Log taken [ ] Electric [ ] Gamma
Did you encounter: [ ] Mineralized water more than 4000 ppm TDS [ ] Gas
At what depth:
Remedial action taken:

❺ Well Completion

Date Started: 04 3 10 (Yr Mo Day). Date Completed: 04 3 12.
Are measurements in metric or imperial?
Well Depth: 480 FT. Borehole diameter: 6
Casing type: STEEL. Liner type: P.V.C.
Size OD: 6 5/8" Size OD: 4 1/2"
Wall thickness: .188 Wall thickness: .219
Bottom at: 59 FT. Top: 460FT. Bottom: 480FT.
Perforations from: 160 FT. to 190FT.
from: 324FT. to 345FT.
from: 360FT. to 380FT.
Perforation size: 1/8" x 6"
Perforated by: [x] Saw [ ] Torch [ ] Machine [ ] Other:
Seal: [x] Bentonite product [x] Driven [ ] Cement / Grout [ ] Other
Sealed Interval: from 0FT. to 59FT.
Screen type: Size OD:
Intervals: from to slot size
from to slot size
Installation [ ] Attached to casing [ ] Telescoped
Fittings: Top [ ] Packer [ ] Coupler Bottom [ ] Wash-down [x] Bail [ ] Plug
Pack: [ ] Artificial/Mechanical [ ] Natural
Grain size: Amount:

❻ Well Yield

Test Date: 04 3 12 (Yr Mo Day). Start Time:
Test method: [x] Pump [ ] Bailer [ ] Air
Are measurements in metric or imperial?
Non pumping static water level: 58 12.91
Rate of water removal: 23/4 I.G.P.M.
Depth of pump intake if pump tested: 390FT.
Depth bailed or air tested from: 480FT.
Distance from top of casing to ground level: 1 1/2 FT.

Depth to water level

Pumping	Elapsed Time minutes	Recovery
	0	
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	12	
	14	
	16	
	20	
	25	
	30	
	35	
	40	
	50	
	60	
	75	
	90	
	105	
	120	

Total Drawdown:
If water removal was less than 2 hr duration, reason:
Recommended pumping rate:
Recommended pump intake:
Pump installed [ ] Yes Depth:
Type
Any further pumptest information? [ ] Yes [ ] No

❼ Contractor Certification

Driller's Name: CHAD WIEMANS
Certification No: 06340A.
This well was constructed in accordance with the Water (Ministerial) Regulation of the Water Act. All information in this report is true.
Signature: [signature] 04 3 12 (Yr Mo Day)

#04-10c

Groundwater Supply Evaluation
CinNet Developments Lot 10 well:
SE-32-21-28-W4M

Submitted to:

Torus Engineering Consultants Ltd and
CinNet Developments

Prepared by:

Groundwater Exploration & Research Ltd.
April 2004

Groundwater Exploration & Research LTD

Box 15
Balzac, AB. CANADA T0M 0E0
Phone (403) 226-0330: Fax (403) 226-6593: Email: gerl@telus.net

April 6, 2004
File No: 04-10c

CinNet Developments
c/o Torus Engineering Consultants Ltd.
#125, 1711 10 Avenue SW
Calgary, AB.
T3C 0K1

Attention: Gary Wise

RE: Proposed subdivision of the CinNet Developments property at SE-32-21-28-W4M: Municipal District of Foothills

Enclosed find our letter report which summarizes well completion details; includes a table of pump test data; a graph of the drawdown and recovery data from a field test conducted on the well; and makes a recommendation with respect to the calculated Q_{20} for a well at the above captioned location.

1.0 Background Information

The subject property is located northeast of the Town of Okotoks, approximately 1.6 km north of Secondary Road SR 552 on 112 Street East. The parent parcel is a +/-27.28 hectare [67.4 acre] parcel from which a proposed 13 lot subdivision is to be created with parcel sizes varying from +/-1.45 to 2.06 hectares [3.58 to 5.08 acres]; with a municipal reserve of 2.91 hectares [7.18 acres]. A well test was conducted on a new well drilled on Lot 10, a +/-1.62 hectare [4.00 acre] parcel.

2.0 Well Completion Details

Total Depth:		122.87 meters
Non-Pumping Water Level:		32.97 meters below top of casing
Surface Casing:		168 mm set to 21.19 meters
Liner:		114 mm PVC set from 13.11 to 122.87 meters; perforated from 102.74 to 110.67 meters
Drilling Contractor:		Niemans Drilling (1980) Ltd.
Pump Test Contractor:		Niemans Drilling (1980) Ltd
Date Drilled:		February 24, 2004
Lithology:	0.00 - 14.63	clay & rocks
	14.63 - 17.38	light grey sand
	17.38 - 20.73	clay & rocks
	20.73 - 22.87	grey shale & sandstone ledges
	22.87 - 36.59	grey shale
	36.59 - 44.21	grey shale & sandstone ledges
	44.21 - 47.26	grey shale
	47.26 - 49.09	grey shale & sandstone ledges
	49.09 - 67.07	grey shale
	67.07 - 73.17	grey shale & sandstone
	73.17 - 83.83	grey shale
	83.83 - 85.67	grey sandstone
	85.67 - 87.80	grey shale
	87.80 - 109.76	grey sandstone
	109.76 - 122.87	grey shale & thin sandstone ledges

3.0 Well Test Results

The Lot 8 well was flow tested by Niemans Drilling on March 10-11, 2004. The well was pumped at a rate of 9.82 m^3/day [1.5 Cgpm] for 720 minutes followed by 720 minutes of recovery. Water level measurements were recorded automatically using a pressure transducer and data logger supplied and installed by Niemans Drilling.

The maximum drawdown was observed to be 7.07 meters during the 720 minute test at a pumping rate of 9.82 m^3/day [1.5 Cgpm]. After 720 minutes of termination of pumping, the water level in the well had recovered 89.1 percent.

The maximum available drawdown, measured from the non-pumping water level of 32.97 meters, and the top of the perforated interval at 102.74 meters is 69.77 meters.

Transmissive capacity has been determined graphically using the Cooper and Jacob semilog plot method, with transmissive capacity based usually on the final limb of the curve according to:

T = 2.3Q/4*pi*delta s

where: T = transmissive capacity, in m^2/day
Q = pump rate, in m^3/day
s = drawdown over one log cycle

and by the non-graphical Sheahan Z(u) and Kasenow SAM methods.

Transmissive capacity, determined from the above methods is summarized as follows:

Stage	Delta s	Transmissivity
drawdown	2.73	0.66
residual drawdown	2.81	0.64
Sheahan Z(u)		0.63
Kasenow SAM		2.53

Based on the above methods of analysis [three lowest values], the geometric mean transmissive capacity is 0.64 m^2/day. It should be noted that the calculated transmissive capacity value is time dependent, flow rate dependent [particularly for fractured or stratified heterogeneous media] and reflects the response of an aquifer for the particular time of the year during which the test was conducted. Transmissive capacity is not a constant everywhere in an aquifer and is generally characterized by a log-normal distribution.

The 20 year, long term safe yield index (Q_{20}), neglecting well loss, is determined from the equation:

$$\mathbf{Q_{20} = 0.683TH}$$

where: Q20 = 20 year, long term safe yield, in m^3/day

T = effective transmissive capacity, in m^2/day

H = available drawdown, in meters

The calculation of the 20 year safe yield index for an aquifer, assuming isotropic, homogeneous conditions is derived by extrapolating a downward trend so that the available drawdown lasts for 20 years. This approach neglects the effects of recharge, and is, therefore, a conservative approach.

It is common practice to adjust the Q_{20} by a safety factor to account for unknown boundary conditions due to test duration, well deterioration, well inefficiency, seasonal variability in non-pumping water level and errors associated with assuming isotropic, homogeneous aquifer conditions.

Based on a factor of safety of 1.5 the calculated Q_{20} is 20.33 m^3/day (3.1 Cgpm). When the calculated Q_{20} exceeds the flow test rate, it is common practice to consider the Q_{20} equal to the flow test rate, in this case 9.82 m^3/day (1.5 gpm).

In accordance with the Water Act, every household user is entitled to divert up to a maximum of 1250 cubic meters per year or 3.42 m^3/day. Based on well test data, the Lot 10 production well is capable of providing the allotted 1250 m^3/year.

4.0 Licenced Users

A review of existing Alberta Environmental Protection groundwater licences indicates no licenced users within an 800 meter radius of the new production well. Operation of the domestic well will not, therefore, interfere with any licenced user existing at the time of subdivision application.

5.0 Well Interference

Country residential subdivision is subject to the following sections of the Water Act and the Water Regulation:

Section 23(3) of the Water Act states:

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 subdivision is approved, and

(b) the diversion of water for each household within the subdivision under section 21 is not inconsistent with an applicable approved water management plan

Section 23(3) of the Water Act requires that an APEGGA member sign-off on whether or not a newly created subdivision lot well would interfere with any household users, licensees or traditional agricultural users existing at the time of subdivision application. Unfortunately, this section of 23(3) has an inherent weakness because well interference for domestic wells is not a relevant issue. In general, planners are more concerned with the cumulative effect of country residential subdivision on the availability of groundwater supplies.

Well interference calculations do not address this issue. While well interference is not a significant issue, long term aquifer depletion and cumulative effects could be.

On a weighing of plausibility, well interference is not deemed to be a relevant issue for the following reasons:

[1] Well interference can be thought of as an artificial boundary condition resulting from the overlapping of cones of depression created by wells pumping on a continuous basis [Driscoll (1986) Groundwater And Wells, page 242-243].

[2] Household wells do not operate on a continuous basis, and as a result a cone of depression is not developed. Household wells operate on a cyclic basis, with very short periods of pumping followed by longer periods of recovery. In essence, only the water held in storage in the well is pumped to the pressure tank system and then the pump shuts down. A cone of depression is not generated under such a pumping condition.

[3] Transmissive capacity values are not constant within a given aquifer; and in fact are log-normally distributed. Well interference assumes a constant transmissive capacity between wells in order that the calculation have any realistic meaning. Bibby [1979: Estimating sustainable yield to a well in heterogeneous strata; Alberta Research Council, Bulletin 37] has indicated that in Alberta there exists no practical methods for determining the spatial variations of transmissivity of heterogeneous aquifers.

[4] The well interference concept assumes no recharge over a 20 year period and is, therefore, conservative.

[5] The actual water consumption for household purposes, based on historical use, is less than 50% of the volume of 1250 m^3/year allocated under the Water Act.

[6] Groundwater is a common reservoir on which anyone may draw. In accordance with Section 27 of the Water Act no one using groundwater under Section 21 has any priority over any other Section 21 user.

[7] Because of the complexity of natural heterogeneous groundwater flow systems, any cause and effect with regard to well interference, can not be brought together with any reasonable degree of certainty.

One approach to determining if increased country residential development has impacted the regional non-pumping water level is to review water well records on a decade basis. Historical, geometric mean, non-pumping water level data has been summarized for the SE-32 quarter section and the surrounding 8 quarter sections. The data are tabulated as follows:

Decade	No of Well Records	Npwl (m)	gm Well Depth (m)
1960s	2	17.4	31.8
1970s	18	19.2	67.0
1980s	9	17.3	43.8
1990s	28	26.3	79.0
2000s	6	23.7	75.9

There is some evidence to suggest a minor decline in regional water level based on existing water well information. Well depths in the 1990s and 2000s are only slightly deeper than those in the 1970s. Two of the wells drilled for the recent CinNet Developments project had well depths in excess of 120 meters, but one of the wells [Lot 5] was completed at a depth of 42.7 meters, suggesting that a regional drop in water level is not evident. The wells within the block of 9-quarter sections appear to be completed in a recharge zone as there is a relationship between increased non-pumping water level and well depth.

6.0 Summary of Findings

Based on the results of the flow test and drill log, the following conclusions have been drawn:

[1] The groundwater production well is capable of providing a maximum of 1250 m^3/year in accordance with Section 23(3) of the Water Act for the proposed +/-1.62 hectare [4.00 acre] Lot 10 parcel.

[2] Pumping of the new well, for household purposes, will not interfere with any household users, licensees or traditional agricultural users who exist at the time of subdivision application.

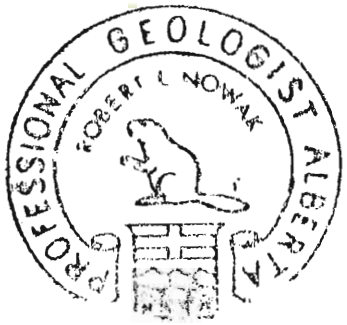
[3] Historical non-pumping water levels do not yield a concern for any significant decline in regional water level.

[4] It would be prudent to equip the well with a flow restrictor [approximately 2.0 US gpm Dole value] to prevent overpumping and stressing of the aquifer. For most household situations [reference: Water Wells That Last For Generations - 1998], wells with a production rate of less than 5 gpm do not supply enough water for a one hour peak use period. Therefore, it is usually necessary to create additional water storage using a cistern.

7.0 Closure

The well owner should be aware, in accordance with Alberta Environment document Draft Environmental Guidelines for the Review of Subdivisions in Alberta; Chapter 2: Guidelines For The Evaluation of Groundwater Supply For Unserviced Residential Subdivision (September 1998) that additional information may be required with this report, particularly chemical and bacteriological analysis of the well water to ensure that the water quality meets drinking water quality guidelines

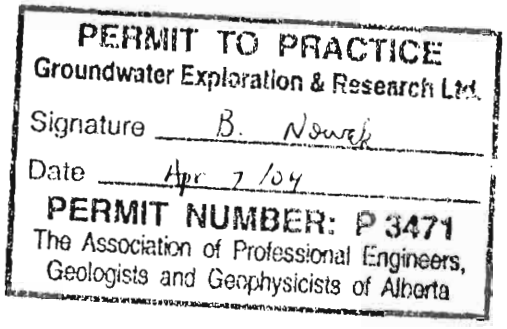
If you have any questions or comments regarding the conclusions drawn in this groundwater supply evaluation, contact the undersigned at your convenience.



Respectfully yours,
Groundwater Exploration & Research Ltd.

Bob Nowak

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



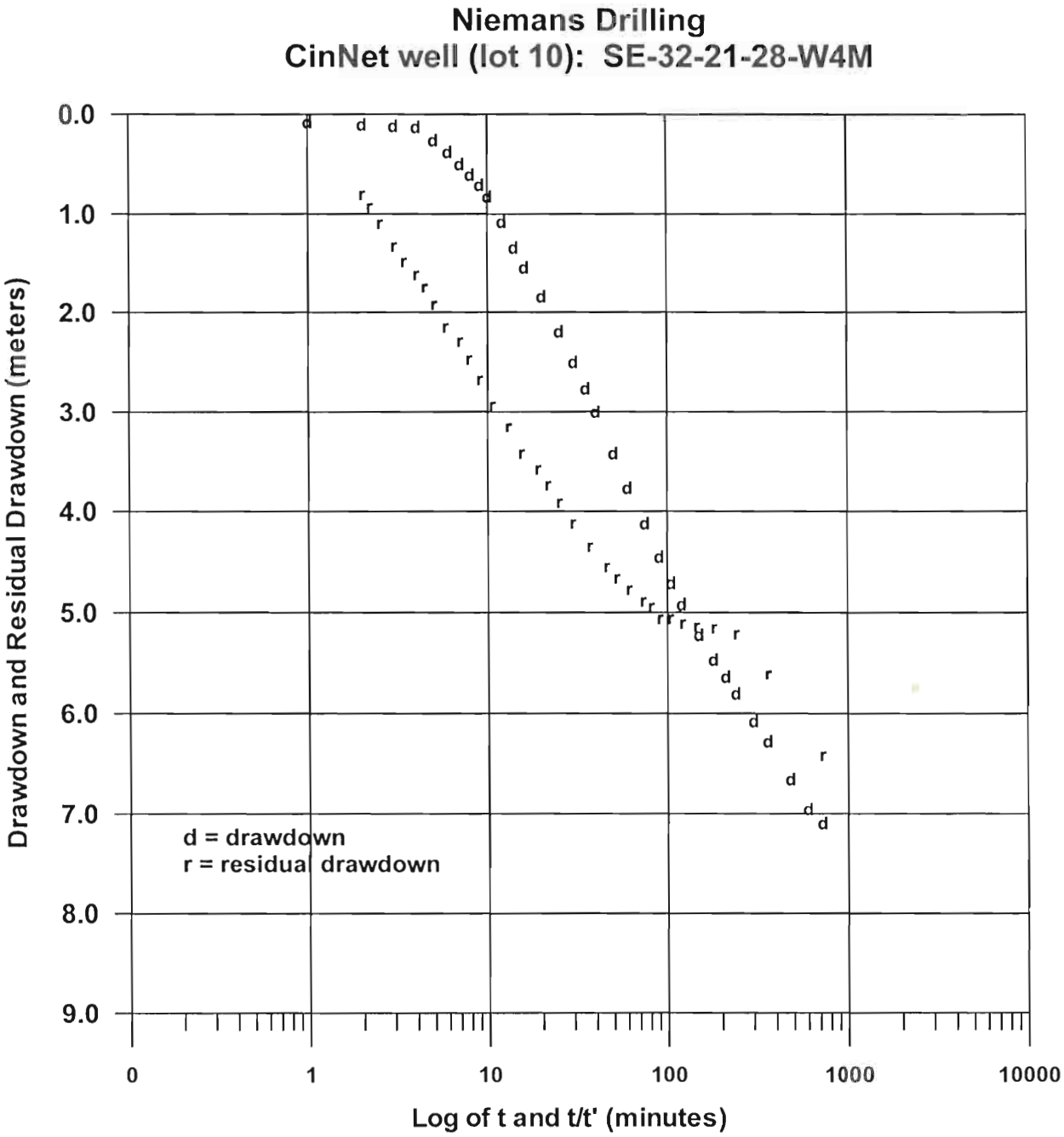
Pump Test Data
SE-32-21-28-W4M

Project: CinNet Developments Lot 10
Date: March 10-11, 2004
Non-Pumping Water Level: 32.97 meters, below top of casing
Pump Test Rate: 9.82 m^3/day (1.5 Cgpm)
Test Duration: 720 + 720 minutes

Elapsed Time t (min)	Drawdown (m)	Elapsed Time t/t' (min)	Residual Drawdown (m)
1	0.05	721	6.37
2	0.07	361	5.57
3	0.08	241	5.16
4	0.09	181	5.11
5	0.23	145	5.10
6	0.34	121	5.06
7	0.47	103.86	5.02
8	0.57	91	5.02
9	0.68	81	4.90
10	0.79	73	4.85
12	1.04	61	4.74
14	1.30	52.43	4.62
16	1.50	46	4.51
20	1.81	37	4.31
25	2.16	29.8	4.08
30	2.46	25	3.87
35	2.73	21.57	3.70
40	2.97	19	3.54
50	3.39	15.4	3.39
60	3.74	13	3.12
75	4.09	10.6	2.89
90	4.42	9	2.63
105	4.68	7.86	2.43
120	4.89	7	2.25
150	5.18	5.8	2.11
180	5.43	5	1.88
210	5.60	4.42	1.70
240	5.77	4	1.56

Pump Test Data (continued)
Lot 10: SE-32-21-28-W4M

Elapsed Time t (min)	Drawdown (m)	Elapsed Time t/t' (min)	Residual Drawdown (m)
300	6.04	3.4	1.43
360	6.25	3	1.28
480	6.61	2.5	1.05
600	6.92	2.2	0.89
720	7.07	2	0.77


Niemans Drilling
CinNet well (lot 10): SE-32-21-28-W4M
Drawdown and Residual Drawdown (meters)
0.0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
d = drawdown
r = residual drawdown
0
1
10
100
1000
10000
Log of t and t/t' (minutes)

Bill Niemans Water well Drilling

Static: 32.87 Test start 13:09 GPM: 15
DATE: 3/10/2004 Legal:
NAME: Johnson NP TEMP:
WELL ID: Lot 10 Perf: drill report
Top of casing 24 inches

Mins	temp	drawdown	mins	temp	recovery
1	6.79	33.118	721	7.79	53.871
2	6.73	33.196	722	7.62	51.228
3	6.77	33.241	723	8.17	49.91
4	6.79	33.28	724	8.67	49.728
5	6.8	33.711	725	8.77	49.688
6	6.83	34.095	726	8.79	49.581
7	6.83	34.499	727	8.82	49.427
8	6.84	34.846	728	8.82	49.227
9	6.84	35.189	729	8.81	49.052
10	6.85	35.572	730	8.77	48.874
12	6.85	36.394	732	8.74	48.501
14	6.84	37.236	734	8.72	48.125
16	6.84	37.892	736	8.68	47.759
20	6.83	38.898	740	8.62	47.108
25	6.84	40.054	745	8.51	46.35
30	6.88	41.048	750	8.44	45.675
35	6.85	41.92	755	8.37	45.108
40	6.82	42.705	760	8.3	44.593
50	6.83	44.093	770	8.11	44.077
60	6.88	45.226	780	7.71	43.191
75	6.91	46.378	795	7.47	42.462
90	7.01	47.462	810	7.36	41.605
105	7.13	48.307	825	7.31	40.933
120	7.37	48.993	840	7.27	40.359
150	7.59	49.972	870	7.25	39.691
180	7.64	50.774	900	7.2	39.145
210	7.66	51.337	930	7.16	38.55
240	7.67	51.888	960	7.12	38.102
300	7.96	52.786	1020	7.08	37.674
360	7.9	53.456	1080	7.06	37.161
480	8	54.663	1200	6.99	36.417
600	8	55.668	1320	6.97	35.88
720	7.98	56.145	1440	6.93	35.486

Note: well had reached full recovery 14 hrs after drawdown was shut off- water level 32.95 m

Alberta ENVIRONMENT

Water Well Drilling Report

The data contained in this report is supplied by the Driller. The province disclaims responsibility for its accuracy. All information on this report will be retained in a public database.

Well I.D.
Map verified
Date report received:

1 Contractor & Well Owner Information

Company Name: ALLEMANS DRLG. (1950) LTD. Approval No.: 2520

Mailing Address: 307 5 ST. E, City or Town: HIGH RIVER, AB. Postal Code: T1V 1M6

Well Owner's Name: NEIL JOHNSON — Well Owner has a copy of this report: ☑ Yes ☐ No

Mailing Address: City or Town: HIGH RIVER, AB. Postal Code:

2 Well Location

1/4 or LSD	Sec	Twp	Rge	West of Meridian
S.E.	32	21	28	4

m/ft from ☐ N ☐ S
m/ft from ☐ E ☐ W
Lot: 10 Block: Plan:

3 Drilling Information

Type of Work: ☐ Testhole ☑ New Well ☐ Reconditioned ☐ Deepened
☐ Reclaimed well Date reclaimed: Yr Mo Day
Materials Used: ☐ Cement ☐ Bentonite Product ☐ Other

Proposed well use: ☑ Household (up to 1250 m³ per year with a residence on the property) ☐ Other Specify:

Method of Drilling: ☐ Auger ☑ Rotary ☐ Boring ☐ Combination ☐ Cable tool ☐ Backhoe ☐ Other

4 Formation Log

☐ metres ☑ feet

Depth from ground level	Lithology Description
1 – 49'	Clay & Rock
49' – 57'	Gr. SD.
57' – 68'	Clay & Rock
68' – 75'	Gr. SH. + SS. L.
75' – 120'	Gr. SH.
120' – 145	Gr. SH. + SS. L.
145' – 153	Gr. SH.
153' – 161'	Gr. SH. + SS. L.
161' – 210	Gr. SH.
210' – 240	Gr. SH. + SS.
240' – 275	Gr. SH.
275' – 281'	Gr. SS.
281' – 335	Gr. SH.
335' – 360	Gr. SS.
360' – 403	Gr. SH. + THIN SS. L.

AIR TESTED
6 I.G.P.M.

Geophysical Log taken ☐ Electric ☐ Gamma
Did you encounter ☐ Mineralized water more than 4000 ppm TDS ☐ Gas
At what depth
Remedial action taken:

5 Well Completion

Date Started: 04 12 23 — Date Completed: 04 12 24
Are measurements in metric or imperial?

Well Depth: 403 FT. — Borehole diameter: 9" 6"
Casing type: STEEL — Liner type: P.V.C.
Size OD: 6 5/8" — Size OD: 4 1/2"
Wall thickness: .188 — Wall thickness: .219
Bottom at: 69 1/2 FT. — Top: 43 FT. Bottom: 403
Perforations: from: 337 FT. to: 363 FT.
from: to:
Perforation size: 1/8" x 6"
Perforated by: ☑ Saw ☐ Machine ☐ Torch ☐ Other
Seal: ☑ Bentonite product ☐ Cement / Grout ☑ Driven ☐ Other
Sealed Interval: from: 0 FT. to: 69 1/2 FT.
Screen type: Size OD:
Intervals: from: to slot size
from: to slot size
Installation: ☐ Attached to casing ☑ Telescoped
Fittings: Top ☐ Packer ☐ Coupler — Bottom ☐ Wash-down ☐ Bail ☐ Plug
Pack: ☐ Artificial Mechanical ☐ Natural
Grain size: Amount:

7 Contractor Certification

Driller's Name: CHAD ALLEMAN
Certification No.: 46340 A.

This well was constructed in accordance with the Water (Ministerial) Regulation of the Water Act. All information in this report is true.

Signature: [signature] 04 12 31 (Yr Mo Day)

6 Well Yield

Test Date (Yr Mo Day): 04 12 24 — Start Time:
Test method: ☑ Pump ☐ Bailer ☐ Air
Are measurements in metric or imperial?
Non pumping static water level: 33.97 FT.
Rate of water removal: 15 I.G.P.M.
Depth of pump intake if pump tested: 390 FT.
Depth bailed or air tested from: 400 FT.
Distance from top of casing to ground level: 2 FT.

Depth to water level

Pumping	Elapsed Time minutes	Recovery
33.97 ft.	0	
	1	
	2	
	3	
	4	
	5	
	6	
	7	
	8	
	9	
	10	
	12	
	14	
	16	
	20	
	25	
	30	
	35	
	40	
	50	
	60	
	75	
	90	
	105	
54.66 ft.	120	35.35 ft.

Total Drawdown: 20.69 ft.
If water removal was less than 2 hr duration, reason why:
Recommended pumping rate: 7 I.G.P.M.
Recommended pump intake: 390 FT.
Pump installed ☐ Yes Depth
Type
Any further pumptest information? ☐ Yes ☐ No

Geotechnical Investigation & Percolation Testing

CURTIS ENGINEERING ASSOCIATES LTD

GEOTECHNICAL INVESTIGATION AND PERCOLATION TESTING
SE-32-21-28-W4M
MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERTA

Submitted to:

Cinnet Development
P.O. Box 916
Okotoks, Alberta

Prepared by:

CURTIS ENGINEERING ASSOCIATES LTD.
1, 820 – 28 Street NE, Calgary, AB
Telephone: 273-5868 Fax: 273-5957

Date: September , 2003
File: 203-1561-001

GEOTECHNICAL INVESTIGATION AND PERCOLATION TESTING
SE-32-21-28-W4M
MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERTA

TABLE OF CONTENTS

1.0 INTRODUCTION

Under authorization from Gary Wise of Torus Engineering, Curtis Engineering Associates Ltd. carried out percolation testing at the site of the proposed residential development at SE-32-21-28-W4M, Municipal District of Foothills No. 31, Alberta.

The purpose of our investigation was to determine the suitability of the existent soils for installation of a sanitary field.

Four (4) percolation holes were drilled at the suitable locations on the site to determine the percolation rate of site soils and to provide recommendations for suitability of site for subsurface septic field. Locations of the percolation holes are shown on the Drawing I-2, Appendix I.

2.0 SOIL TYPES

Two (2) test holes were drilled to a depth of 3.05 metres (10.0 feet) on the subject lots to determine soil types and the near surface ground water table conditions, (see Drawing I-2, Appendix I). Ground water levels were monitored twenty-four (24) hours after completion of drilling. Results, as detailed below, were obtained.

TEST HOLE NO.1 (TH-1) SE-32-21-28-W4M MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERT	
DEPTH	**MATERIAL**
0-0.31 METRES (0-1.0 FEET)	TOPSOIL ▪ Organics ▪ Black ▪ Moist
0.31 to 3.05 METRES (1.0 TO 10.0 FEET)	SAND ▪ Silty ▪ Dense ▪ Brown ▪ Moist
END OF TEST HOLE AT 3.05 METRES (10.0 FEET) NO FREE WATER ENCOUNTERED DURING DRILLING NO FREE WATER FOUND NINETY-SIX (96) HOURS AFTER DRILLING	

TEST HOLE NO.2 (TH-2) SE-32-21-28-W4M MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERT	
DEPTH	**MATERIAL**
0-0.31 METRES (0-1.0 FEET)	TOPSOIL ▪ Organics ▪ Black ▪ Moist
0.31 to 3.05 METRES (1.0 TO 10.0 FEET)	SAND ▪ Silty ▪ Dense ▪ Brown ▪ Moist
END OF TEST HOLE AT 3.05 METRES (10.0 FEET) NO FREE WATER ENCOUNTERED DURING DRILLING NO FREE WATER FOUND NINETY-SIX (96) HOURS AFTER DRILLING	

3.0 PERCOLATION TESTS AND RESULTS

Standard field percolation tests were carried out on September 12, 2003, using procedures in accordance with Interim Guidelines for the Evaluation of Water Table Conditions and Percolation Testing provided by Alberta Environmental Protection (AEP). Four (4) percolation tests were drilled to a depth of 0.91 metres (3.0 feet). The locations of the percolation test holes are shown on the site plan, Drawing I-2, Appendix I.

The percolation test holes were filled with water to a level of 45 cm (18 inches) and the level was maintained for six (6) hours. The percolation tests were carried out in the test holes twenty-four (24) hours after the beginning of the soaking period.

The water was added to the percolation test hole until the 45.0 cm (18.0 inch) refill mark was reached. The rate in drop after a minimal period of ten (10) minutes was observed. The test hole was filled to the 45.0 cm refill mark and the test procedure was repeated until the percolation rates of three (3) consecutive readings were relatively the same. The details of the percolation test observations and soil texture at each percolation hole location are summarized as follows.

PERCOLATION TEST DATA
PERCOLATION TEST HOLE NO. 1 (PH-1)
SE-32-21-28-W4M
MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERT

TRIAL NO.	TIME INCREMENT (MINUTES)	DROP (cm)	PERCOLATION RATE (min/cm)	REMARKS
1	11	5.4	2.04	Average of last three (3) readings: 2.15 min/cm
2	25	12.1	2.07	
3	10	4.3	2.33	

SOIL TEXTURE PERCOLATION TEST HOLE NO. 1 (PH-1) SE-32-21-28-W4M MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERT		
DEPTH	**DESCRIPTION OF SOIL**	**PERCOLATION RATE**
0 to 0.31 METRES (0 to 1.0 FEET)	TOPSOIL: ▪ Organics ▪ Black ▪ Moist	2.14 min/cm
0.31 to 0.91 METRES (1.0 to 3.0 FEET)	SAND: ▪ Silty ▪ Dense ▪ Brown ▪ Moist	

PERCOLATION TEST DATA PERCOLATION TEST HOLE NO. 2 (PH-2) SE-32-21-28-W4M MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERT				
TRIAL NO.	**TIME INCREMENT (MINUTES)**	**DROP (cm)**	**PERCOLATION RATE (min/cm)**	**REMARKS**
1	13	7.7	2.13	Average of last three (3) readings: 2.15 min/cm
2	26	9.4	2.77	
3	10	4.8	2.08	

SOIL TEXTURE PERCOLATION TEST HOLE NO. 2 (PH-2) SE-32-21-28-W4M MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERT		
DEPTH	**DESCRIPTION OF SOIL**	**PERCOLATION RATE**
0 to 0.31 METRES (0 to 1.0 FEET)	TOPSOIL: ▪ Organics ▪ Black ▪ Moist	2.33 min/cm
0.31 to 0.91 METRES (1.0 to 3.0 FEET)	SAND: ▪ Silty ▪ Dense ▪ Brown ▪ Moist	

PERCOLATION TEST DATA PERCOLATION TEST HOLE NO. 3 (PH-3) SE-32-21-28-W4M MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERT				
TRIAL NO.	**TIME INCREMENT (MINUTES)**	**DROP (cm)**	**PERCOLATION RATE (min/cm)**	**REMARKS**
1	32	13.5	2.37	Average of last three (3) readings: 2.45 min/cm
2	13	5.9	2.20	
3	32	11.5	2.78	

SOIL TEXTURE PERCOLATION TEST HOLE NO. 3 (PH-3) SE-32-21-28-W4M MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERT		
DEPTH	**DESCRIPTION OF SOIL**	**PERCOLATION RATE**
0 to 0.31 METRES (0 to 1.0 FEET)	TOPSOIL: ▪ Organics ▪ Black ▪ Moist	2.45 min/cm
0.31 to 0.91 METRES (1.0 to 3.0 FEET)	SAND: ▪ Silty ▪ Dense ▪ Brown ▪ Moist	

PERCOLATION TEST DATA PERCOLATION TEST HOLE NO. 4 (PH-4) SE-32-21-28-W4M MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERT				
TRIAL NO.	**TIME INCREMENT (MINUTES)**	**DROP (cm)**	**PERCOLATION RATE (min/cm)**	**REMARKS**
1	36	10.7	3.36	Average of last three (3) readings: 3.25 min/cm
2	13	4.3	3.02	
3	32	9.5	3.37	

SOIL TEXTURE PERCOLATION TEST HOLE NO. 4 (PH-4) SE-32-21-28-W4M MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERT		
DEPTH	**DESCRIPTION OF SOIL**	**PERCOLATION RATE**
0 to 0.31 METRES (0 to 1.0 FEET)	TOPSOIL: ▪ Organics ▪ Black ▪ Moist	3.25 min/cm
0.31 to 0.91 METRES (1.0 to 3.0 FEET)	SAND: ▪ Silty ▪ Dense ▪ Brown ▪ Moist	

4.0 GRAINSIZE ANALYSIS – AGRICULTURAL LAND

Grainsize analysis was carried out on the soil samples collected at depths of 0 to 0.31 metres (o to 1.0 feet) from test hole Nos. 1 and 2 (TH-1 and TH-2). The results of grain size analysis on the soil samples are detailed on Drawing I-3 and I-4 and are tabulated below:

GRAINSIZE ANALYSIS OF SOIL SAMPLES SE-32-21-28-W4M MUNICIPAL DISTRICT OF FOOTHILLS NO. 31, ALBERT				
TEST HOLE NO.	**SAND**	**SILT**	**CLAY**	**TEXTURAL CLASSIFICATION**
TH-1	28	57	15	Silt Loam
TH-2	38	55	7	Silt Loam

The test results show that the textural classification of the site soils is silty clay loam. The soils of this classification are not suitable for installation of subsurface sewage disposal fields (Reference Alberta Private Sewage System Standard of Practice, 1999). Based on the results of grain size analysis, it is concluded that site soils are suitable for installation of subsurface septic fields.

According to the Municipal District of Foothills No. 31, the classicisation of the soils is 3T. Soils of this class have moderately severe limitation that restrict the range of crops or require special conservation practices, with a sub-class designation of topography.

Based on the Sodium Absorption Ratio (SAR) test results, SAR of the water supply for the residential buildings is within the allowable value of 8.0 recommended by Alberta Environmental Protection for development lots.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on results of investigation and testing, the following conclusions and recommendations are made:

1. The near surface groundwater levels monitored at these lots are below the depth of 3.05 metres (10.0 feet) and are within the allowable depth recommended by Alberta Environmental Protection guidelines for development lots.

2. The site soils have moderate percolation rates varying from 2.15 to 3.25 minutes per centimetre and comply with Alberta Environment Protection recommended standards for instillation of normal subsurface sewage disposal fields.

3. Soil class as given by the Municipal District of Foothills NO. 31 is Class 3T.

4. It is recommended that each lot of the proposed development be individually tested during development of the subdivision.

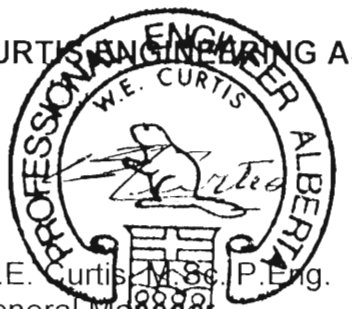
5. All design and installation of sewage disposal systems should be carried out by a qualified plumber in accordance with specifications and Alberta Labour Plumbing and Gas Safety Standards.

The recommendations presented in this report were based on interpreted surface conditions found in two (2) test holes and four (4) percolation holes.

It should be noted that natural conditions can be variable individual recommendations in this report should not be used out of context with the entire report and the interpretation of any part of this report should be made in consultation with out office to avoid any misinterpretation. Should subsurface conditions other than those presented in this report be encountered during construction, the client should notify out office so that our recommendations presented herein can be reviewed and revised, if necessary.

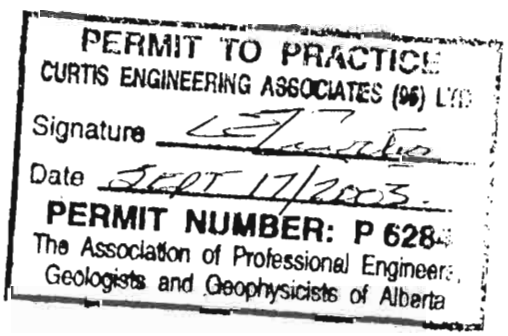
Respectfully Submitted,

CURTIS ENGINEERING ASSOCIATES LTD.



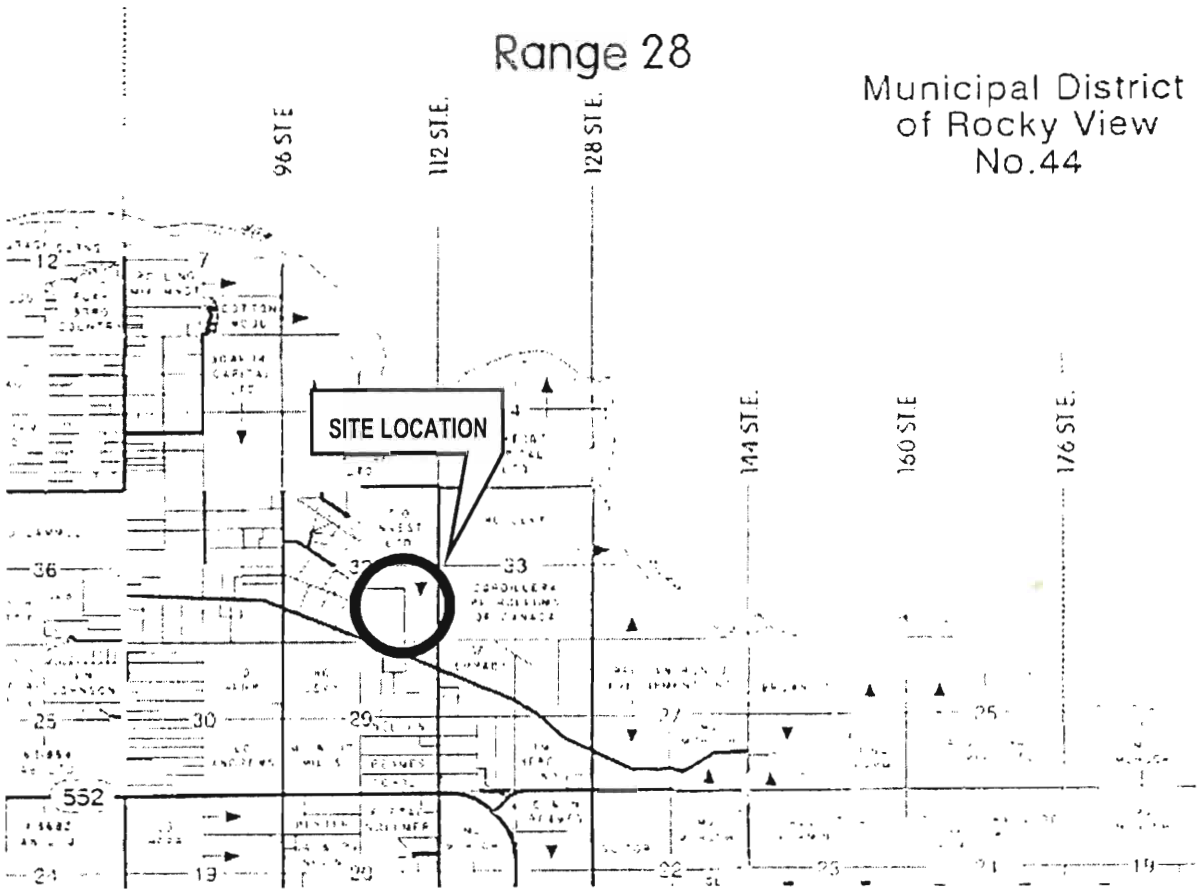
W.E. Curtis, M.Sc. P.Eng.
General Manager

MS/dm



APPENDIX 1

N

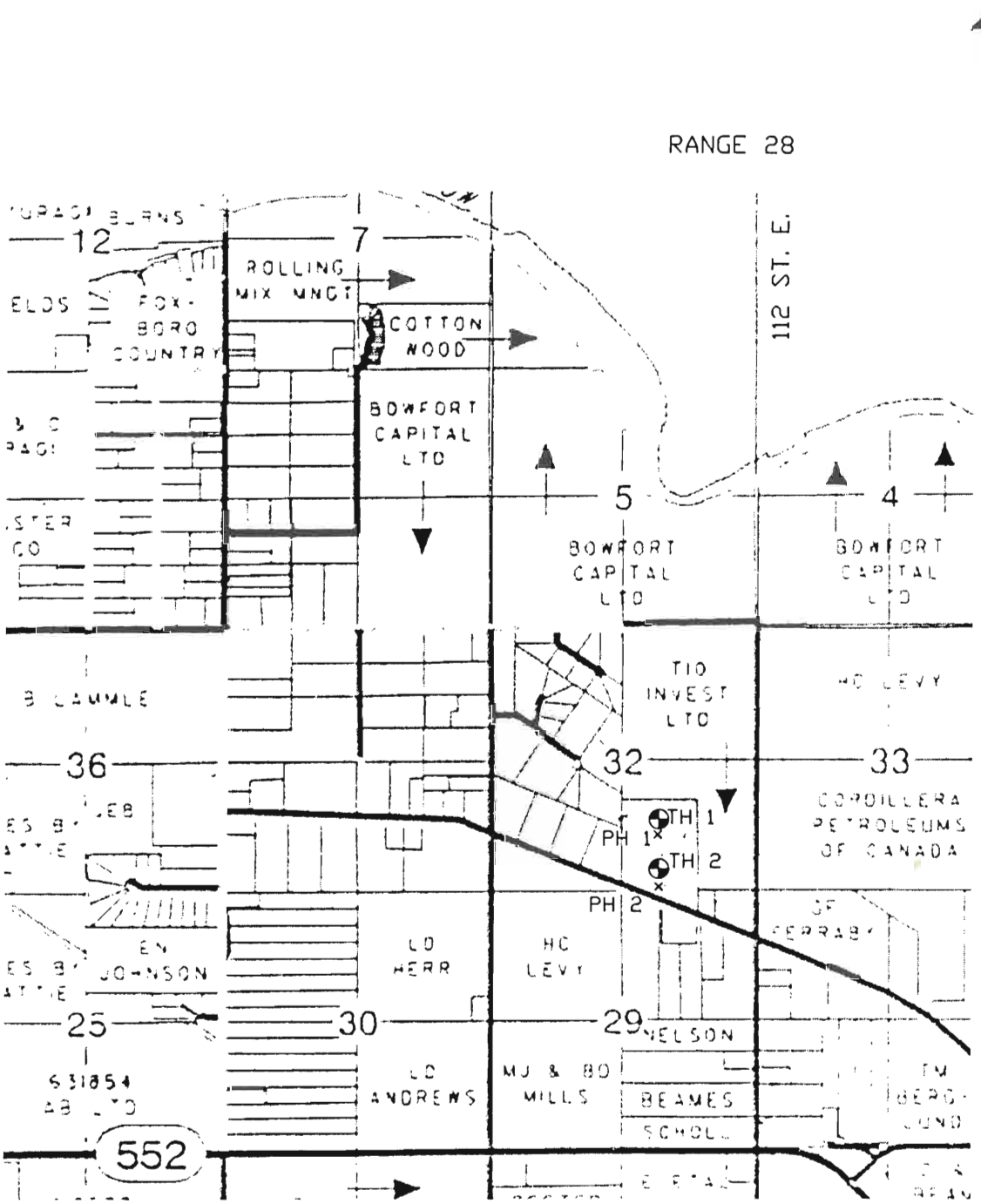


CURTIS ENGINEERING ASSOCIATES LTD.

SITE LOCATION PLAN

CINNET DEVELOPMENTS
SE-32-21-28-W4M
M.D. OF FOOTHILLS NO.31, ALBERTA

DRAWN BY	KLN	DATE	03-09-17
CHK'D BY	WEC	DRAWING NO	
SCALE	N.T.S.		I-1
FILE NO	203-1561-001		



LEGEND
● TEST HOLE
× PERCOLATION HOLE

CURTIS ENGINEERING ASSOCIATES LTD.

SITE PLAN

CINNET DEVELOPMENTS
SE-32-21-28-W4M
M.D. OF FOOTHILLS NO.31, ALBERTA

DRAWN BY KLN	DATE 03.09.17
CHK'D BY WEC	DRAWING NO. I-2
SCALE NTS	
FILE NO. 203-1561-001	

Grain Size Distribution Curve

Client: TORUS

Project:

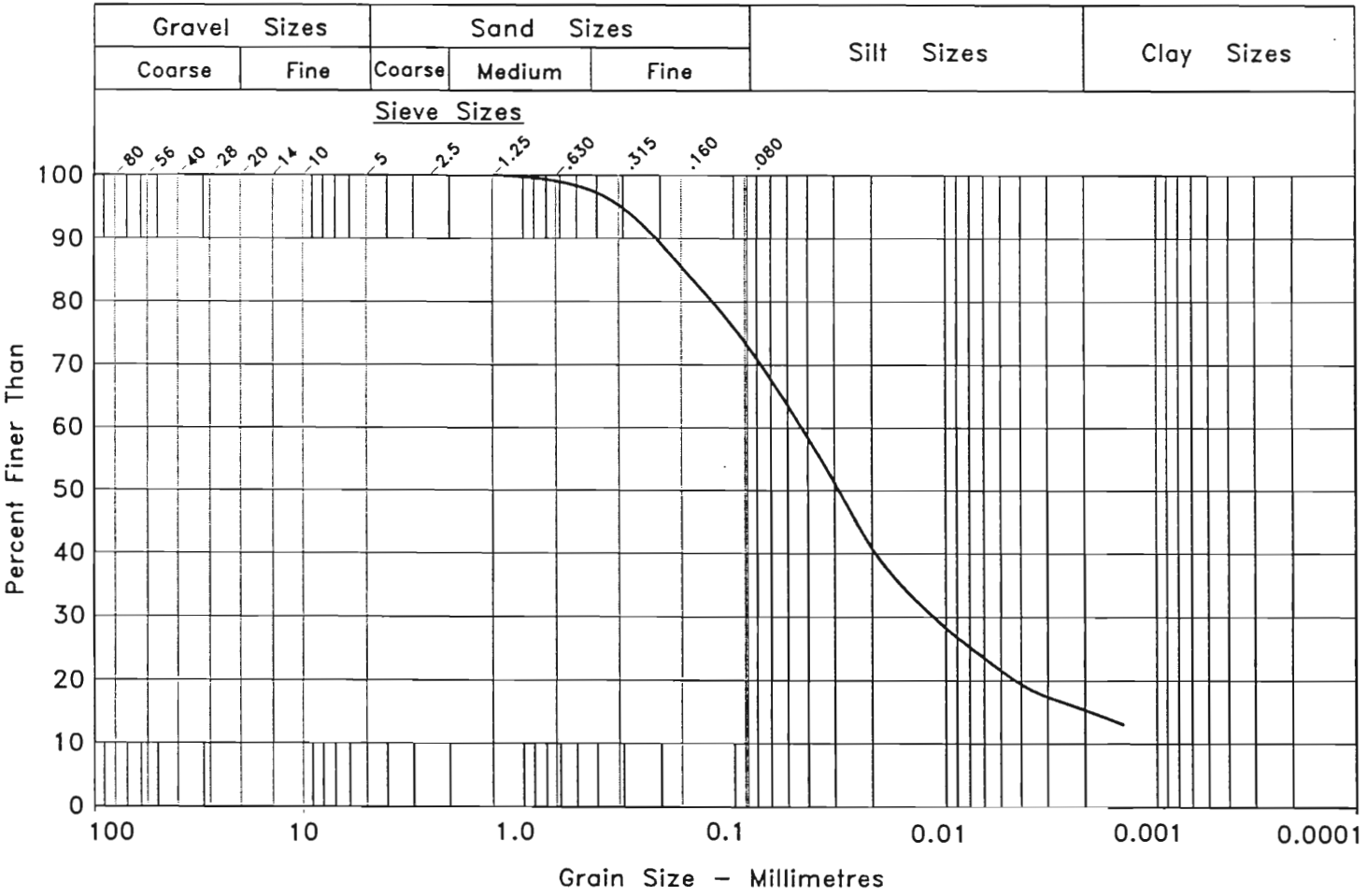
Job No.: 102-493-001-2

Tech: V.K. Chk'd by: S.T.

Date: SEPTEMBER 10, 2003

Sample: TH 1

Location:



Remarks: SAND = 28%
SILT= 57%
CLAY = 15%

D_{10} = ____ mm
D_{60} = ____ mm
C_U = ____

Note: M.I.T. Grain Size Scale

CURTIS

1-3

Grain Size Distribution Curve

Client: TORUS

Project:

Job No.: 102-493-001-2

Sample: TH 2 Tech: V.K. Chk'd by: S.T.

Location: Date: SEPTEMBER 9, 2003

D_{10} = mm

D_{60} = mm

C_U =

Remarks: SAND = 38%

SILT = 55%

CLAY = 7%

Note: M.I.T. Grain Size Scale

CURTIS

1-4

EXPLANATIONS OF SOIL DESCRIPTIONS AND SYMBOLS SHOWN ON TEST HOLE LOGS

I. DEFINITION OF SOIL TYPES

MATERIAL	GRAIN SIZE
Boulder	Larger than 200 mm
Cobbles	80 mm - 200 mm
Gravel - Coarse	20 mm - 80 mm
- Fine	5 mm - 20 mm
Sand - Coarse	2 mm - 5 mm
- Medium	425 μm - 2 mm
- Fine	75 μm - 424 μm
Silt and Clay	Smaller than 75 μm

II. COMPOSITION OF SOIL

2.1 **Principal Component** - Major soil type representing at least 50% by weight of material.

2.2 **Minor Component** - Minor soil types identified by the following terms with respect to their percentages by weight of material:

"Trace": 1% - 10% "Little": 10% - 20%
"Some": 20% - 35% "and": 35% - 50%

III. CONSISTENCY OR STRENGTH OF SOIL

3.1 **Coarse Grained Soils** - (Principal Component larger than 75 μm). The following terms are used relative to the Standard Penetration test (ASTM D1586).

DESCRIPTION	NO. BLOWS PER FOOT
Very Loose	Less than 4
Loose	4 - 10
Compact	10 - 30
Dense	30 - 50
Very Dense	Over 50

3.2 **Fine Grained Soils** - (Principal Component smaller than 75 μm).
The following terms are used relative to the undefined compressive strength.

Description	Unconfined Compressive Strength kPa (tsf)	N
Very Soft	24 (0.25)	N < 2
Soft	24 - 48 (0.25 - 0.50)	2 - 4
Firm	48 - 96 (0.50 - 1.00)	4 - 8
Stiff	96 - 190 (1.00 - 2.00)	8 - 15
Very Stiff	190 - 380 (2.00 - 4.00)	15 - 30
Hard	380 (4.0)	> 30

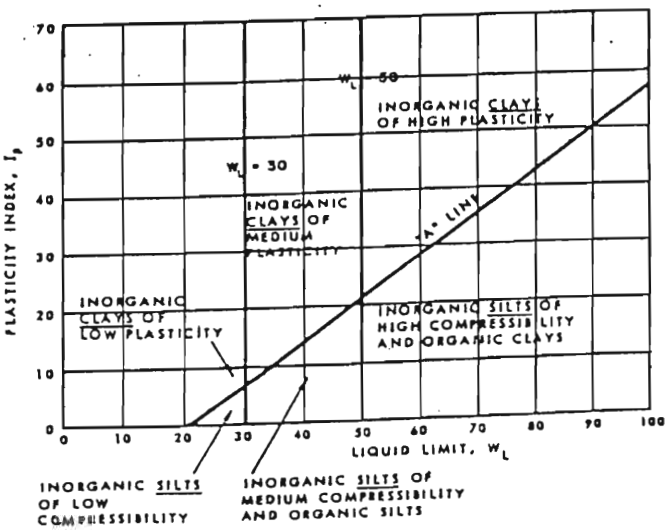
SOIL CLASSIFICATION SYSTEM (MODIFIED U.S.C.)

MAJOR DIVISION			GROUP SYMBOL	GRAPHIC SYMBOL	COLOR CODE	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA	
HIGHLY ORGANIC SOILS			Pt		ORANGE	PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOR OR ODOR, AND OFTEN FIBROUS TEXTURE	
COARSE-GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN NO. 200 SIEVE SIZE)	GRAVELS MORE THAN HALF COARSE FRACTION LARGER THAN NO. 4 SIEVE SIZE	CLEAN GRAVELS	GW		RED	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, < 5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 4 \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
			GP		RED	POORLY-GRADED GRAVELS, AND GRAVEL-SAND MIXTURES, < 5% FINES	NOT MEETING ALL ABOVE REQUIREMENTS	
		DIRTY GRAVELS	GM		YELLOW	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES > 12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $I_p < 4$	
			GC		YELLOW	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES > 12% FINES	ATTERBERG LIMITS ABOVE "A" LINE, $I_p > 7$	
	SANDS MORE THAN HALF COARSE FRACTION SMALLER THAN NO. 4 SIEVE SIZE	CLEAN SANDS	SW		RED	WELL-GRADED SANDS, GRAVELLY SANDS, < 5% FINES	$C_u = \frac{D_{60}}{D_{10}} > 6 \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$	
			SP		RED	POORLY-GRADED SANDS, OR GRAVELLY SANDS, < 5% FINES	NOT MEETING ALL ABOVE REQUIREMENTS	
		DIRTY SANDS	SM		YELLOW	SILTY SANDS, SAND-SILT MIXTURES > 12% FINES	ATTERBERG LIMITS BELOW "A" LINE OR $I_p < 4$	
			SC		YELLOW	CLAYEY SANDS, SAND-CLAY MIXTURES > 12% FINES	ATTERBERG LIMITS ABOVE "A" LINE OR $I_p > 7$	
FINE-GRAINED SOILS (MORE THAN HALF BY WEIGHT PASSES NO. 200 SIEVE SIZE)	SILTS BELOW "A" LINE ON PLASTICITY CHART; NEGLIGIBLE ORGANIC CONTENT		ML		GREEN	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHT PLASTICITY	$W_L < 50$	SEE CHART BELOW
			MH		BLUE	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS	$W_L > 50$	
	CLAYS ABOVE "A" LINE ON PLASTICITY CHART; NEGLIGIBLE ORGANIC CONTENT		CL		GREEN	INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAYS, LEAN CLAYS	$W_L < 30$	
			CI		GREEN-BLUE	INORGANIC CLAYS OF MEDIUM PLASTICITY SILTY CLAYS	$W_L > 30, < 50$	
			CH		BLUE	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS	$W_L > 50$	
	ORGANIC SILTS & ORGANIC CLAYS BELOW "A" LINE ON PLASTICITY CHART		OL		GREEN	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY	$W_L < 50$	
			OH		BLUE	ORGANIC CLAYS OF HIGH PLASTICITY	$W_L > 50$	

1. All sieve sizes mentioned on this chart are U.S. Standard, ASTM E11.
2. Boundary classifications possessing characteristics of two groups are given combined group symbols eg GW-GC is a well-graded gravel-sand mixture with clay binder between 5% and 12%.
3. Soil fractions and limiting textural boundaries are in accordance with the Unified Soil Classification System, except that an inorganic clay of medium plasticity (CI) is recognized.
4. The following adjectives may be employed to define percentage ranges by weight of minor components:

and	50 - 36%
some	35 - 21%
little	20 - 11%
trace	10 - 1%

PLASTICITY CHART



APPENDIX 2

ADDITIONAL RECOMMENDATIONS

The additional recommendations contained in this Appendix should be read in conjunction with the text of this report.

FOOTINGS

Footings should be founded on undisturbed, native, inorganic soil as described in the text of this report. It should be noted that weak or soft foundation soils may exist at the site which are not encountered in the test borings. Over-excavation below footing levels may be required to ensure that footings are founded on competent bearing strata. All footing excavations should be inspected by a qualified geotechnical engineer prior to forming and concreting.

All loose, disturbed, remoulded or sloughed material should be removed from bearing surfaces of footing excavations. Hand cleaning will be required if acceptable bearing surfaces cannot be prepared by mechanical equipment.

Footing excavations should be protected from rain, snow, drying and ingress of free water at all times. Prolonged exposure of the foundation excavations should be avoided.

Foundation soils beneath footings must be protected from frost action during and after construction. Adequate soil cover should be provided to all footings. Footings in heated areas should be founded at a depth of at least 1.37 metres (4.5 feet) below final grade. Footings in unheated areas should have a minimum soil cover of 2.13 metres (7.0 feet). For footings founded at more shallow depths, artificial insulation should be provided. Curtis Engineering Associates Ltd. will supply footings insulation requirements should the Client select this alternative.

To ensure satisfactory performance of the foundation system, footings and foundation walls should be adequately reinforced to withstand a reasonable amount of differential foundation movement to avoid endangering the structural integrity of the proposed building. If grade beams are used, a void space or a layer of compressible material should be placed between grade beams and the ground surface to limit any heaving pressures resulting from soil expansion.

FOOTINGS

(Continued)

Backfill against foundation walls and around grade beams should not be placed until the concrete foundation elements have developed sufficient strength and are laterally supported to resist earth pressures resulting from fill placement and compaction. The use of heavy equipment for compaction should be avoided. Backfill should be compacted in layers not exceeding 150 mm (6.0 inches) in compacted thickness, and should be compacted to a uniform dry density of 95% standard Proctor dry density for cohesive soils or 80% relative density for cohesionless soils. The backfill material should be capped with a minimum 0.60 metres (2.0 feet) compacted thickness of selected fine grained soils to provide a relatively impermeable layer which will minimize surface water infiltration. The final site grading should also direct surface water to areas away from the proposed structure.

CURTIS ENGINEERING ASSOCIATES LTD.

GENERAL RECOMMENDATIONS FOR BORED, CAST-IN-PLACE CONCRETE PILES

1. It is recommended that all piles be installed under full-time inspection by qualified geotechnical personnel.

2. Pile shafts should be a minimum of 410 mm (16.0 inches) in diameter. Should hand cleaning be required, a minimum shaft diameter of 760 mm (30.0 inches) should be provided.

3. A 100 mm (4.0 inch) thickness of compressible material should be placed between grade beams, pile caps and the ground surface to facilitate any soil expansion.

4. The pile excavation should be inspected for depth and freedom from loose soil before the placement of concrete. (Loose, disturbed or sloughed materials should be removed from the pile base. Hand cleaning will be required if acceptable pile bases cannot be prepared using the belling tool).

5. The pile concrete should have slump not less than 130 mm (5.0 inches) to prevent honeycombing and should have a minimum 28-day compressive strength of 21 MPa (3,000 psi). Concrete should be adequately compacted by vibration.

6. The pile should be installed not more than 2% of its length out of plumb for vertical piles and the centre of the pile should not be more than 75 mm (3.0 inches) from its design location.

7. Steel reinforcement should be provided for at least the top 3.05 metres (10.0 feet) of piles in order to resist potential uplift due to frost action and soil moisture variation.

8. Concrete should be poured immediately upon completion and inspection of the pile bases so that seepage and sloughing of soil will be limited.

9. Records should be kept on the volume of concrete poured. Suitable procedures should be adopted to ensure that a continuous pile section has been formed without voids.

10. Bored and cast-in-place concrete piles, should be spaced not closer than three (3) times the shaft diameter. For piles spaced at less than three (3) diameters, the drilling of adjacent piles may affect the previously poured concrete. Therefore, the drilling must not be carried out adjacent to a newly installed pile within a period of 24 hours, to permit the fresh concrete to set.

CURTIS ENGINEERING ASSOCIATES LTD.

FLOOR SLAB SUPPORTED ON GRADE

All topsoil and soils containing significant amounts of organics should be removed from beneath slab areas. In addition, soft or weak areas should be over-excavated to competent material. The excavated surface should be proof-rolled, and the final grade can be restored to its intended level with well compacted backfill materials.

Locally derived inorganic soils or granular soils may be used for backfill. The materials should be compacted in 150 mm (6.0 inch) lifts to a minimum uniform dry density of 98% Standard Proctor maximum dry density for cohesive soils and 85% relative density, for cohesionless soils.

A granular base should be provided directly beneath floor slabs. The use of coarse material should be avoided to limit potential stress concentration under floor slabs. Recommended gradation limits for free draining bedding materials are enclosed in this Appendix.

It is recommended that the floor slabs should contain an adequate number of construction joints to ensure controlled cracking of concrete. Slabs supporting dynamic loadings, such as those resulting from the operation of machinery, should be specially designed.

CURTIS ENGINEERING ASSOCIATES LTD.

PAVEMENTS

All topsoil and soils containing significant amounts of organics should be stripped to native materials. Soft or weak areas should be over-excavated and backfilled with well compacted inorganic cohesive or cohesionless soils.

Prior to backfilling or subbase placement, the excavated surface should be proof-rolled. Where complex surficial soil conditions exist, the subgrade should be scarified, thoroughly blade mixed and uniformly compacted. This procedure may not eliminate any potential heaving and/or settlement, but will provide a more uniform support condition under pavements and will reduce differential soil movements due to abrupt transition between soil types or from drier to wetter materials.

All backfill and base course materials should be compacted in layers not exceeding 150 mm (6.0 inches) in compacted thickness and should be compacted to a uniform dry density of 97% maximum standard Proctor density for cohesionless soils.

Adequate surface drainage of paved areas is essential to performance of the pavement structure. Surface ponding should be avoided; a minimum surface gradient of 1.5 percent is recommended.

CURTIS ENGINEERING ASSOCIATES LTD.

RECOMMENDED GRADATION LIMITS FOR CRUSHED GRANULAR BASE COURSE MATERIALS

(Percent Passing in Weight)

Sieve Size	Nominal Gravel Size			
	Pit Run	100 mm	50 mm	25 mm
200 mm	100*			
150 mm	96 - 100*			
100 mm	-	100		
75 mm	60 - 80*	90 - 100		
50 mm	-	-	100	
40 mm	-	60 - 80	90 - 100	
25 mm	60 - 100**	-	-	100
20 mm	-	40 - 65	50 - 75	95 - 100
10 mm	-	25 - 48	25 - 52	60 - 80
4.75 mm	24 - 45**	15 - 35	20 - 40	40 - 60
2.36 mm	-	10 - 30	12 - 26	28 - 48
1.18 mm	10 - 25**	-	-	-
600 µm	8 - 20**	6 - 18	4 - 13	13 - 29
300 µm	-	-	-	9 - 21
150 µm	4 - 10**	3 - 10	2 - 7	6 - 15
75 µm	2 - 6**	2 - 8	1 - 6	4 - 10

NOTE:

* Percent by weight of total sample

** Percent by weight of sample material passing 75 mm sieve.

CURTIS ENGINEERING ASSOCIATES LTD.

RECOMMENDED GRADATION LIMITS FOR BEDDING AND DRAINAGE MATERIALS

(Percent Passing in Weight)

Sieve Size	Nominal Gravel Size		
	50 mm	40 mm	Sand
50 mm	100		
40 mm	90 - 100	100	
25 mm	-	95 - 100	
20 mm	35 - 70	-	
15 mm	-	25 - 60	
10 mm	10 - 30	-	100
4.75 mm	0 - 5	0 - 10	95 - 100
2.36 mm	-	0 - 5	80 - 100
1.18 mm	-	-	50 - 85
600 µm	-	-	25 - 60
300 µm	-	-	10 - 30
150 µm	-	-	2 - 10

Open House Summary

SUNSET RIDGE

PUBLIC INFORMATION MEETING

CinNet Developments Ltd. would appreciate your comments regarding the proposed Sunset Ridge country residential development. Mail or fax your comments to :

Torus Engineering Consultants Ltd. Attn : Gary Wise
1711 10th Avenue S.W.
Calgary, Ab T3C 0K1
Phone : 244 – 9710
Fax : 228 - 9656

Residents name : Todd Esler / Yvonne Jonk

Residents address : _____

Comments : We have no objections to this ASP and subdivision from proceeding and we have a strong intest in purchasing a lot in this development.

SUNSET RIDGE

PUBLIC INFORMATION MEETING

CinNet Developments Ltd. would appreciate your comments regarding the proposed Sunset Ridge country residential development. Mail or fax your comments to :

Torus Engineering Consultants Ltd. Attn : Gary Wise
1711 10th Avenue S.W.
Calgary, Ab T3C 0K1
Phone : 244 – 9710
Fax : 228 - 9656

Residents name : Jim & Jacqueline Can

Residents address : Box 65, Site 11, R.R.1 DeWinton AB T0L 0K0

Comments : We would like to offer our support to the proposed "Sunset Ridge" Development. There has been a tremendous amount of growth in our area, even since we have moved here, and areas such as the aforementioned add to the appeal of the area in general. We are all for architectural controls and uniformity in size and design - believing that it adds to our community in a positive way. The Deerfoot extention has made travel time and growth in our community more feasable then before. We understand the development plans and feel it would be beneficial for our area & community.

Regards
Jim & Jacqueline Can
995-7009

SUNSET RIDGE

PUBLIC INFORMATION MEETING

CinNet Developments Ltd. would appreciate your comments regarding the proposed Sunset Ridge country residential development. Mail or fax your comments to :

Torus Engineering Consultants Ltd. Attn : Gary Wise
1711 10th Avenue S.W.
Calgary, Ab T3C 0K1
Phone : 244 – 9710
Fax : 228 - 9656

Residents name : Sherry Woychyshyn, Willam Coster

Residents address : SE 1/4 S 32 T21 R28 W4th

Comments : We feel that this development is well thought out and takes into consideration everyone involved presently + in the future. We do not oppose any aspect of this development + look forward to having more neighbours.

SUNSET RIDGE

PUBLIC INFORMATION MEETING

CinNet Developments Ltd. would appreciate your comments regarding the proposed Sunset Ridge country residential development. Mail or fax your comments to :

Torus Engineering Consultants Ltd. Attn : Gary Wise
1711 10th Avenue S.W.
Calgary, Ab T3C 0K1
Phone : 244 – 9710
Fax : 228 - 9656

Residents name : Brian Sigvaldason

Residents address : 56 Chapalina Way. SE Calgary

Comments :

— Very nice location
— Beautifully planned out
— We would be interested in purchasing one of these lots when they become available

SUNSET RIDGE

PUBLIC INFORMATION MEETING

CinNet Developments Ltd. would appreciate your comments regarding the proposed Sunset Ridge country residential development. Mail or fax your comments to :

Torus Engineering Consultants Ltd. Attn : Gary Wise
1711 10th Avenue S.W.
Calgary, Ab T3C 0K1
Phone : 244 – 9710
Fax : 228 - 9656

* CELL - 403-815-5548.

Residents name : MEL & KARNA WOLFE.

Residents address : RR 1 DEWINTON SW 32.
* DIRECTLY WEST OF LOT 10.

Comments :

① I WAS AWAY WHEN YOUR OPEN HOUSE WAS AND KARNA ATTENDED, BUT I DO HAVE SEVERAL CONCERNS AS FOLLOWS.

② WATER WELLS: THIS IS A VERY BAD WATER AREA AND I DO NOT THINK ANOTHER 13 WELLS CAN BE SUPPORTED & THEY ARE AT THE EXACT DEPTH AS MY WELL, WHICH HAS ME VERY CONCERNED THAT MY WELL WILL FOR SURE HAVE PROBLEMS IN THE FUTURE.

③ TRAFFIC: THE LOCAL ROADS WILL BE POUNDED OUT WITH THE AMOUNT OF TRAFFIC THAT IS REQUIRED TO BRING IN SUPPLY'S ECT.

④ YOU SAY MY VALUE WILL GO UP BUT I DO NOT AGREE AS PRIVACY IS SOMETHING YOU CANNOT BUY.

⑤ I WILL ASK FOR NEW FENCES & TREE PLANTING

⑥ I WILL BE SEEKING ADVISE ON THIS ISSUE.

⑦ I WILL BE MEETING WITH THE MD ON THIS.

⑧ I WILL BE ASKING FOR A HOME BUILDING RESTRICTIONS ON THE TYPE OF HOUSE & SIZE AS THIS IS A BEAUTIFUL AREA AND NOT ANY HOUSE WILL DO.

→ NEXT PAGE.

(9) I DO WISH TO MEET WITH A. REP. ON THESE ISSUES AS I AM NOT TOTALLY AGAINST IT BUT WHEN I BUILT 9 YEARS AGO I MET WITH EXTREME RESISTANCE AND IT TOOK ME 2.5 YEARS TO SUB-DIVIDE I LOT FROM MY DAD. SO THAT I COULD LIVE CLOSE TO MY FAMILY AND IF THESE 13 LOTS GO ASAP WITHOUT THE CONCERNS I HAD TO MEET I MAY HAVE TO SEEK OTHER ADVISE.

(10) I WILL EXPECT CERTAIN TYPES OF ASSURANCES, ON BUILDING RESTRICTIONS AND I REALLY FEEL SOME TYPE OF A WATER CO-OP SHOULD BE DONE.

(11) I AM WORKING IN NE. B.C @ THIS BUT WILL BE BACK NEAR THE END OF MAY.

THANK YOU! I REALLY HOPE MY CONCERNS ARE HEARD! DEALT WITH.

MEL WOLFE

	A	B
1	**Project : Sunset Ridge**	
2		
3	**Item : Public Information Meeting / Attendance Record**	
4		
5	**Date : March 12th, 2004**	
6		
7		
8		
9	**Residents Name**	**Address**
10		
11	Lynda Pierzchalski	Box 8 Site 23 RR#1 Dewinton TOL-0X0
12	MAC STIRLING	RR1 DEWINTON AB. TOL0X0
13	Jacqueline Jim Can	Box 63, Site 11 RR1 Dewinton TOL0X0
14	BOB & LUCY THOMAS	SITE 11, BOX 4, RR1 4 4
15	Karna Wolfe	RR#1 DeWinton, AB. TOL-0X0.
16	TODD ESLER / YVONNE TOOK	15 Crystal Shores Crt Okotoks AB T1S1W2
17	[illegible]	
18	GENE CLARK	Box 42, RR1, Site 11 Dewinton, AB.
19	Anita Lowndes	R.R. #1 DeWinton.
20	Willem Goster	Site 23 Box 16 RR1 Dewinton
21	Sherry Woychyshyn	" " " "
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