

Prepared for the  
Municipal District of Foothills

By  
Walker Newby and Partners Inc.  
Cardel Custom Homes



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## **INTRODUCTION**

### **Vision**

Our vision for the proposed subdivision, is to provide the Municipal District of Foothills with a Country Residential Subdivision consisting of 5 acre parcel sizes on a portion of land located on the balance of a quarter section already zoned (CR) - Country Residential District. This plan reflects the intent to create a viable community, which not only meets the zoning and subdivision design guidelines, but also meets the demands of future homeowners for this area. This plan has been achieved through a comprehensive planning process, with serious attention being given to detailed design by incorporating green space, natural features and pre determined building sites into the overall plan.

As a result of the proposed plan, the developer of this site has initiated the development of an Area Structure Plan to be approved by the Municipal District of Foothills for the purpose of providing a framework for future development.

## **1.0 BACKGROUND**

The Foxboro subdivision is located within the quarter section 'SE ¼ Sec 12 Township 22 Range 29 W4M', adjacent to the existing subdivision of Bow View Estates. The subject lands are located on 80<sup>th</sup> Street 1.3 km north of Dunbow Road as shown on Figure 4.

The lands are currently designated AG (Agricultural District) under the Municipal District of Foothills Land Use Bylaw.

The owner wishes to facilitate the comprehensive development of a planned residential community and is seeking to redesignate the subject lands to a country residential land use.

This plan will provide Council with supporting planning rationale for redesignation of the subject lands from Agricultural District (AG) to Country Residential (CR) district for the purpose of accommodating the proposed subdivision.

Furthermore, this plan will provide Council with a statutory mechanism to guide and control subdivision through the establishment of policies that provide specific direction for subdivision and development issues as identified in the Plan.

Preparation of this document has been guided by the Municipal District of Foothills Land Use Bylaw Section 5.0 and Section 633 (1) of the Municipal Government Act respecting the content of Area Structure Plans, and the MD of Foothills Municipal Development Plan.

### ***1.1 Approval Process***

The purpose of an Area Structure Plan is to provide an outline of how a specified area of the Municipality will be developed. It is a statutory plan, adopted by bylaw by Council and as such provides a land use strategy for subsequent redesignation, subdivision and development of a specific area of land in the Municipality.

After circulation and processing by the Municipality, the ASP is adopted by Council with the inclusion of land owner involvement, pursuant to section 633(1) of the Municipal Government Act. A subsequent redesignation to Country Residential land uses will facilitate recognition of the future uses identified in the Plan.

### ***1.2 Plan Implementation***

The Area Structure Plan contains policy statements that guide specific directions with regard to future subdivision. These policies will be implemented through conditions of subdivision approval pursuant to section 633(2) of the Municipal Government Act.

### ***1.3 Plan Review and Amendment***

There may be a need to review and amend the ASP in the future subject to further input from existing and future residents.

This Plan may only be amended by bylaw in accordance with the provisions of the Municipal Government Act and the M.D. of Foothills Municipal Development Plan.

## **2.0 PLAN POLICIES**

### ***2.1 Plan Goals and Objectives.***

However, a successful community must also meet certain goals that not only benefit future residents of the area, but the community surrounding the subject lands as well. These goals are summed up and outlined in Section 5.0 of the MD of Foothills Municipal Development Plan with the following objectives:

- Ensure that Country Residential Development proceeds in conformance with the Goals and Policies contained within this plan.
- Direct Country Residential Development to lands where there is minimal impact on the Environment, Agriculture and Water.
- Advocate a variety of Country Residential Developments.
- Minimize the impacts of Country Residential Development on adjoining land uses.
- Encourage Country Residential Development in locations that take advantage of existing

## **2.2 Plan Objectives**

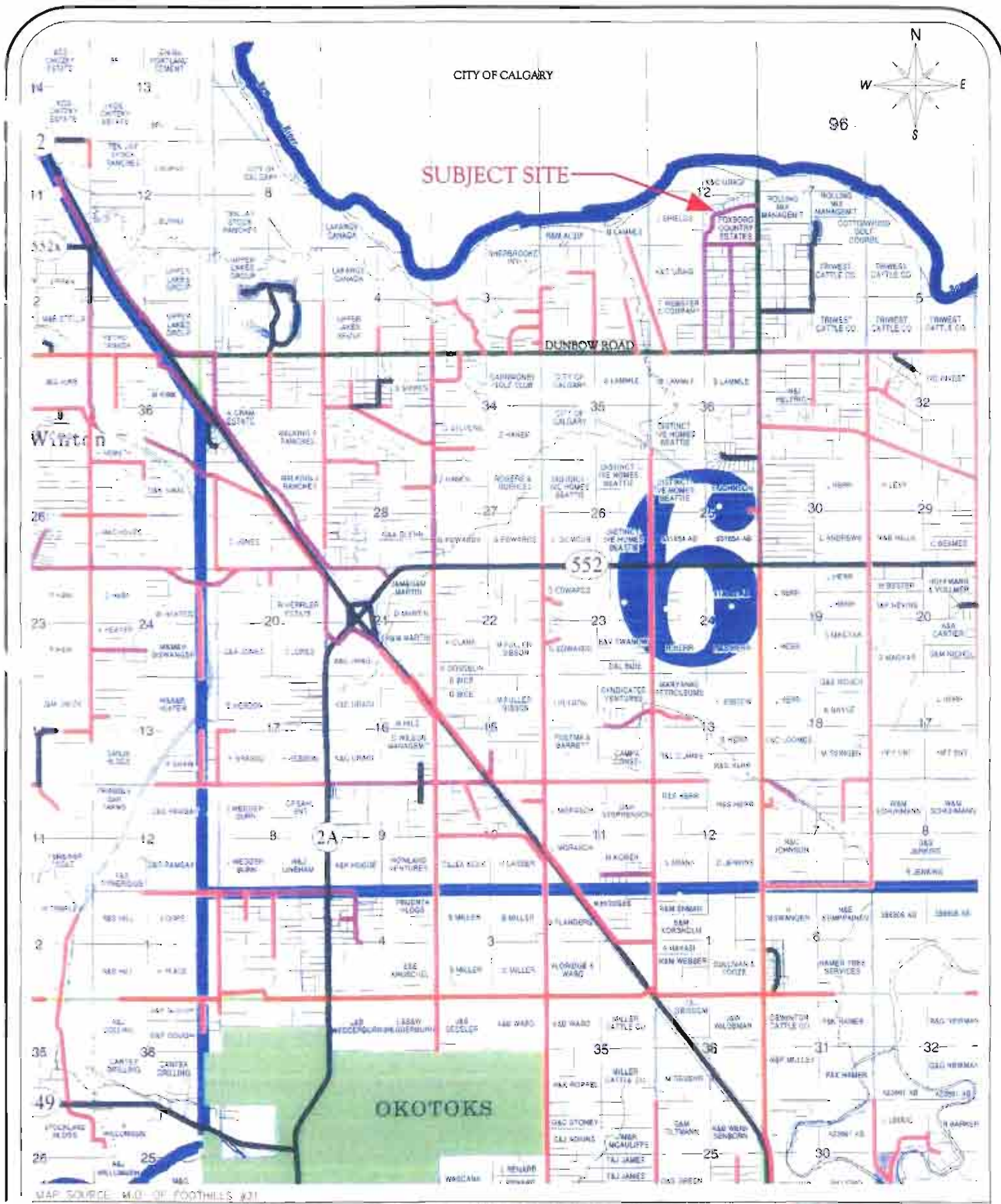
Plan objectives are designed to implement goals established by the M.D. of Foothills for new country residential subdivision.

- To identify development issues within the Plan Area and establish appropriate and comprehensive policies for addressing these issues.
- To establish the appropriateness of the subject lands for the land uses proposed by the Development Proposal
- To establish Servicing Scenarios appropriate to the Development Proposal and a policy framework for implementation.
- To facilitate subdivision design that demonstrates optimal lotting configuration and servicing efficiencies.
- To address compatibility with adjacent land uses and the surrounding community.
- To gather input from residents and incorporate this information into the planning process.

The purpose of an Area Structure Plan is to provide the Municipality with a statutory plan, adopted by bylaw, which provides a land use strategy and Policy for subsequent redesignation, subdivision and development of a specific area of land in the Municipality.

## **3.0 PLAN CONTEXT**

The subject land context with respect to the surrounding community is depicted in Figure 2.



**WALKER  
NEWBY**

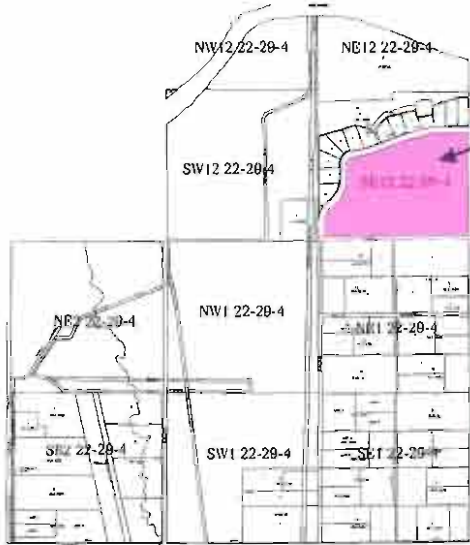
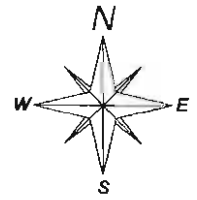
CONCEPTS INTO COMMUNITIES

PLANNERS  
ENGINEERS  
LEGAL SURVEY  
STRATEGISTS

# **FOXBORO COUNTRY ESTATES LOCATION PLAN N.T.S.**



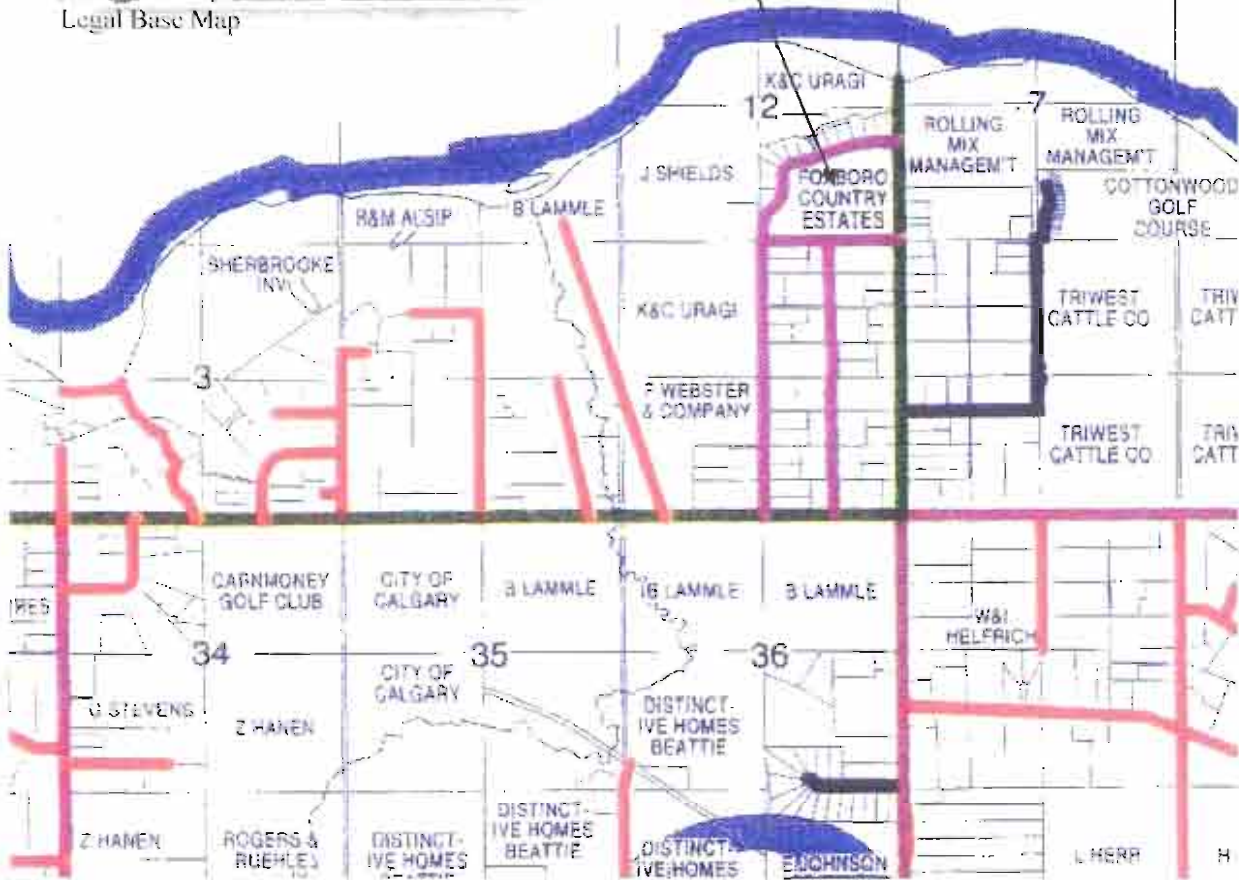
Figure  
1



Subject Site

Legal Base Map

96 ST. E



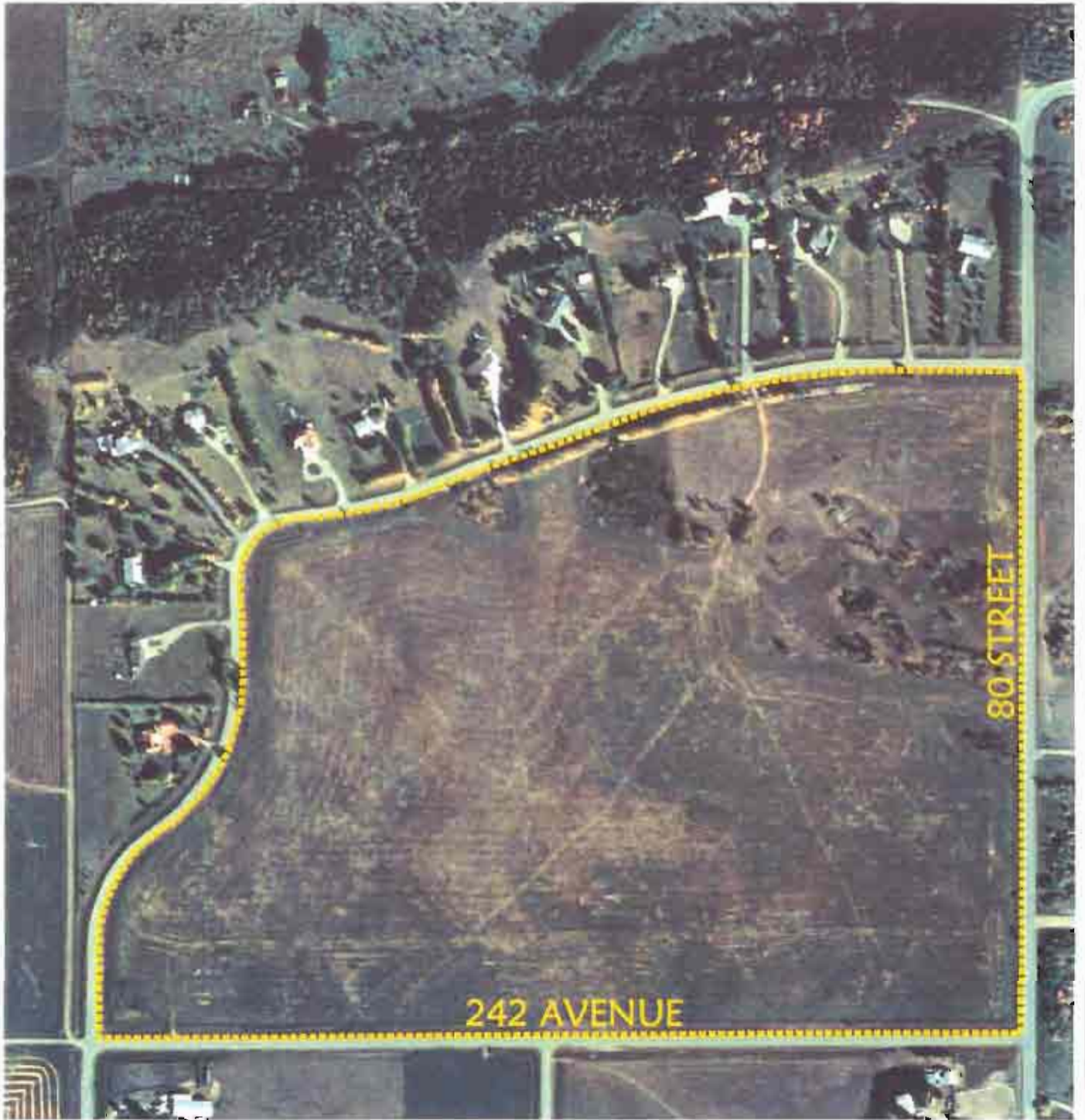
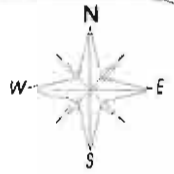
Map Source: M.D of Foothills #31

**WILKIN**  
**NEWBY**  
PLANNERS  
ENGINEERS  
LAND SURVEY  
CONSULTANTS

## FOXBORO COUNTRY ESTATES SITE CONTEXT MAP



Figure  
2



### **3.1 Existing Area Land Use**

The plan area is located in an area of the MD of Foothills that has experienced significant Country Residential growth over the past few years. Subdivision has occurred in this area, both as comprehensive subdivision projects initiated on previously undeveloped ¼ sections, and through the re-subdivision of existing parcels, see Figure 4.

There has been recent residential subdivision to the south, east and west of the subject site ranging from 2 acre parcels to 20 acre parcel sizes. Located on the balance of the ¼ section is the existing development of Bow View Estates with fourteen two acre parcels.

The establishment of residential uses on the subject lands represents a logical extension of existing surrounding residential development

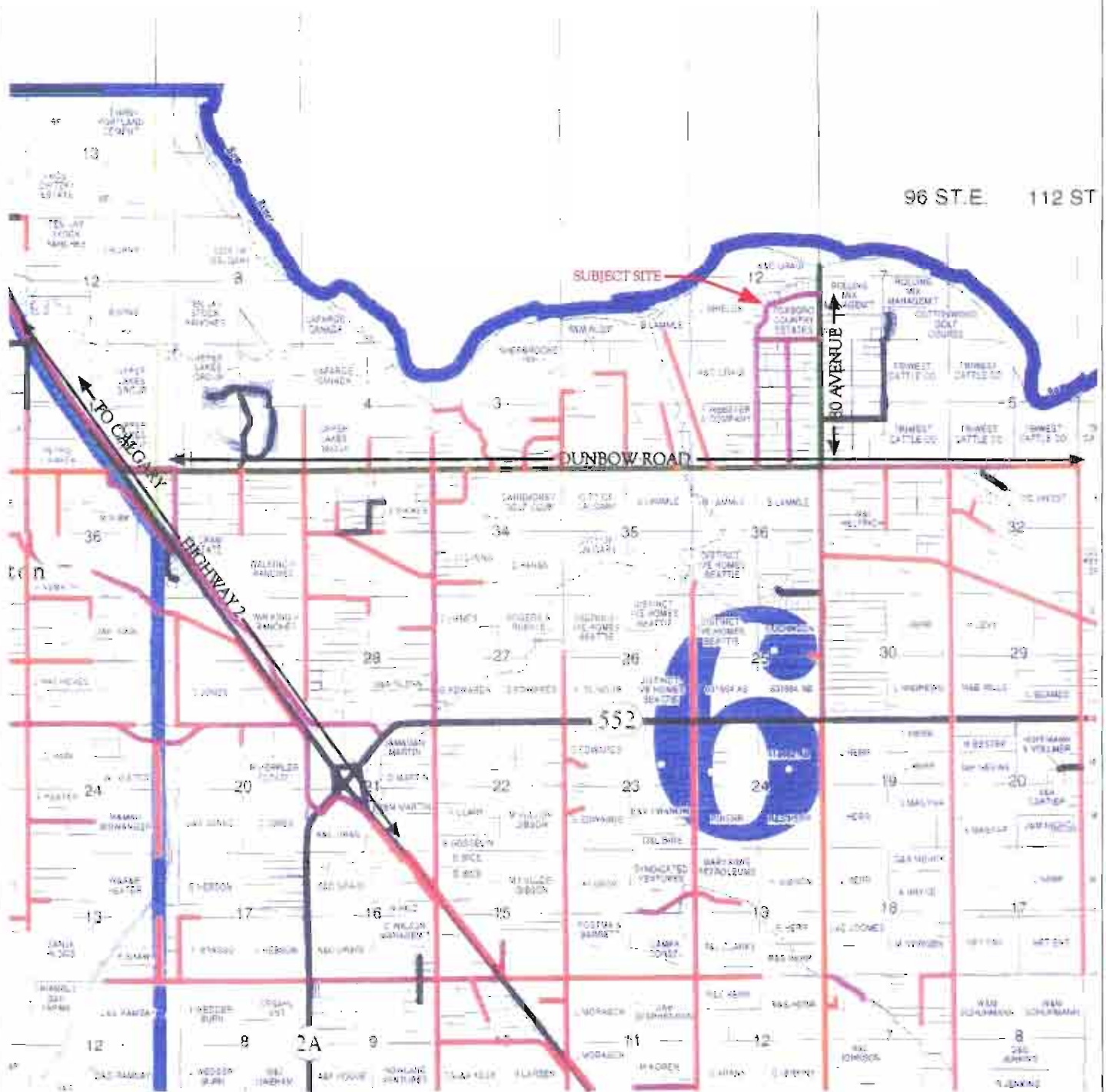
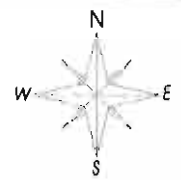
Consequently, redesignation of these lands is appropriate from a land use planning perspective primarily by virtue of their context within the greater area which has evolved from an agricultural community to predominantly residential uses.

*Policy: 3.1.1: Proposed land uses shall be compatible with the surrounding residential community.*

### **3.2 Access**

The surrounding municipal road network is illustrated in Figure 6. Direct access to the subject lands is available from Highway 2 (Macleod Trail S.) to 242 Ave and 80<sup>th</sup> Street, via Dunbow Road.

Figure  
4



MAP SOURCE: M.D. OF FOOTBALL #1

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## FOXBORO COUNTRY ESTATES SITE ACCESS N.T.S.



Figure  
5

## **4.0 SITE FEATURES**

### ***4.1 Existing Land Use***

The subject lands have been primarily used for grazing and pasturing of livestock, with country residential uses on the balance of the ¼ section.

### ***4.2 Topography***

Figure 6, provides a topographical overview of existing natural features found on the subject site. The land generally slopes from the centre of the site, being the high point, to the southwest and northeast portions of the site.

The gentle rolling topography presents no constraints or hindrances to the development of this land, and allows for the development of residential building sites.

A small low lying area in the north-east corner of the lands where marshy areas are intermixed with small clusters of trees.

### ***4.4 Vegetation***

Vegetation over the subject lands consists primarily of grasses typical of non-native pasture. However, small clusters of poplar trees can be found in the low lying portion of the site, as depicted in Figure 6.

### ***4.5 Existing Drainage and Stormwater Management***

Overall, the subject lands are well drained with soils that exhibit good infiltration rates. There are no existing drainage courses on the site, however a small pond and marsh area captures surface water runoff in the north east portion of the site. This is a significant natural feature that provides both stormwater retention and an aquatic habitat for birds and should be protected.

All post-development runoff will be contained on each individual lot and will not exceed pre-development runoff. In addition, natural drainage courses will be maintained, although road runoff will be captured and conveyed in roadside ditches, thereby not affecting neighbouring areas.

*Policy 4.5.1 The subject lands natural drainage patterns shall be preserved where possible.*



## **5.0 DEVELOPMENT SCHEME**

### ***5.1 Proposed Land Uses***

An examination of site features indicates that there are few natural features that would present a constraint or hazard to development. The only portion of the site that is unsuitable for development is the existing pond and wet land area in the north east portion of the site.

A Country Residential (CR) Land Use Designation is proposed for the subject lands to facilitate subdivision and development for residential purposes.

### ***5.2 Subdivision Concept***

Figure 8 provides a proposed tentative plan of subdivision for the balance of the ¼ section. Thirteen 5 acre parcels, on a total of 34.48ha (85.2ac), are proposed for residential development in combination with an MR and ER parcel. The subdivision is designed around the current municipal road servicing the existing Bow View Estates Subdivision, as well as an internal access road.

Design of the site has been guided by a careful analysis of the subject land natural features to maximize the aesthetics of future building sites while preserving and enhancing the most significant natural attributes of the land. Building envelopes are to be located as close to the internal subdivision road as possible to minimize impact on adjacent development. A separate restrictive covenant outlining building site locations will be registered on a lot per lot basis at redesignation of subdivision. As seen in Appendix 3, the architectural controls include the same restrictions as Bow View Estates in regards architecture out-buildings and animals.

*Policy 5.2.1: Proposals for subdivision shall generally conform to the concept shown on Figure 8.*

### ***5.3 Municipal Reserves (MR)***

Pursuant to the Municipal Government Act, Council as Subdivision Approving authority, has the opportunity to acquire up to 10% of the gross area of the subject lands as Municipal or School Reserve. The proposed MR parcel is 3.30ha (8.15ac) and thereby satisfies the minimum 10% MR dedication. The rectangular MR parcel is situated in the northeast corner of the site, with a walkway connection to the

intersection of 80<sup>th</sup> Street and 242<sup>nd</sup> Avenue. The MR parcel is located in a logical place within the subject site boundary, due to its access and connectivity with natural features found within the ER boundary.

#### ***5.4 Environmental Reserves (ER)***

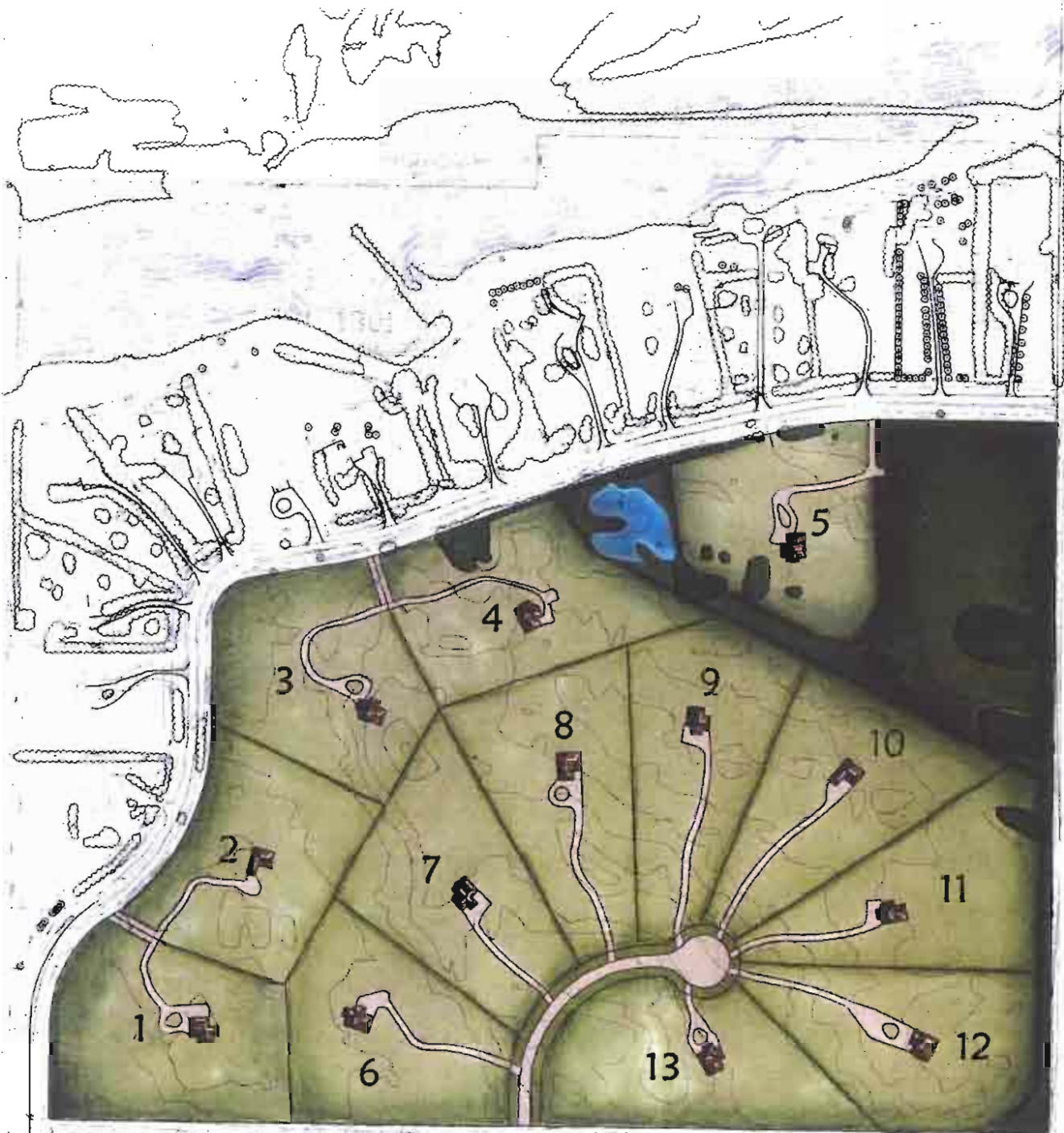
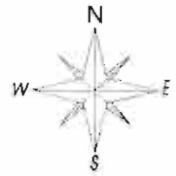
The pond and low lying treed area in the north east portion of the site will be preserved in its natural state by designating it as an Environmental Reserve parcel. This ER parcel will provide an open space recreation amenity that can be used by both the existing residents of Bow View Estates and the future residents of Foxboro Country Estates.

#### ***5.5 Municipal Development Plan Conformity***

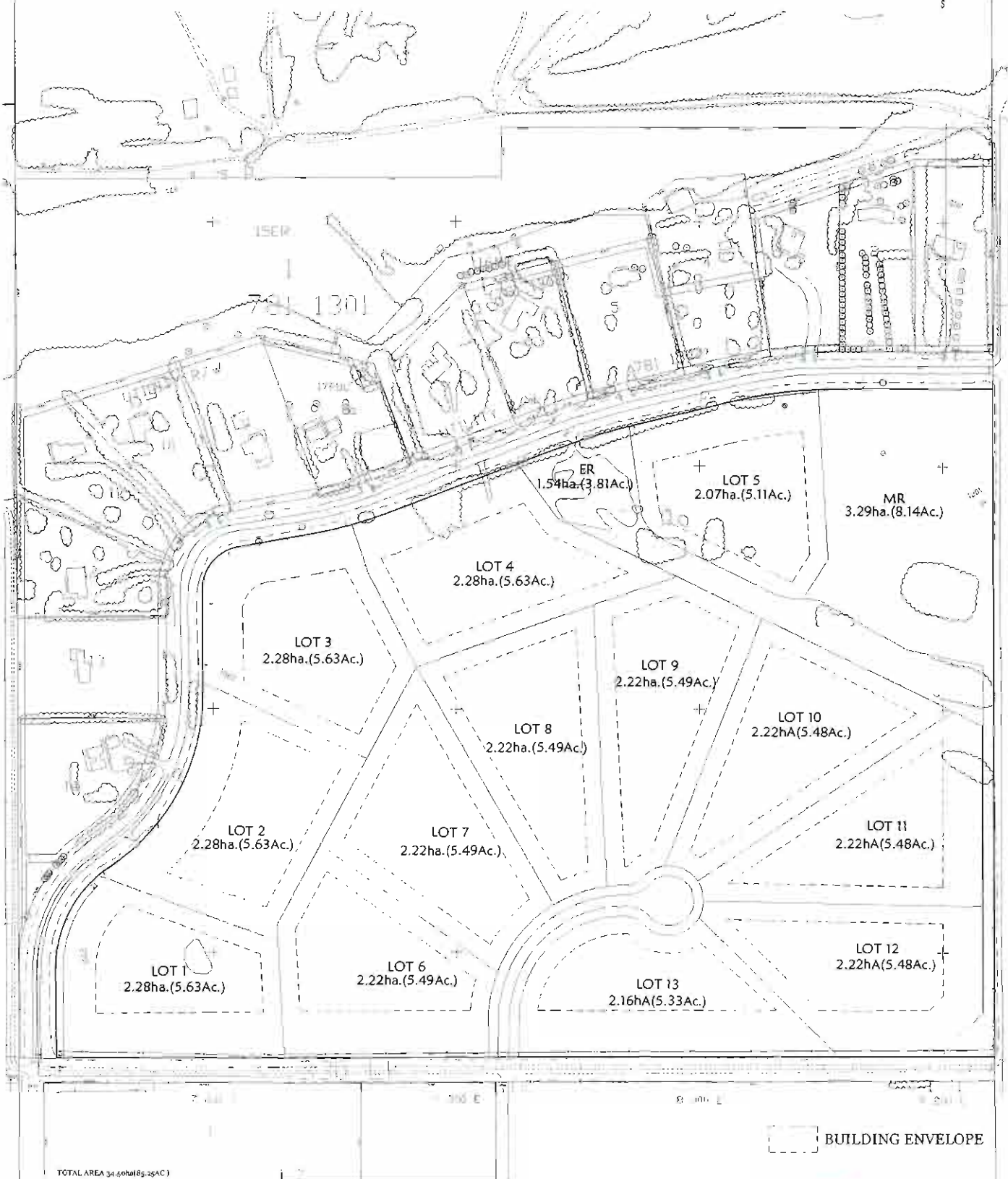
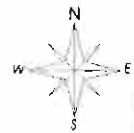
As is outlined in the General Municipal Plan, the development concept conforms with Section 5.0 by taking advantage of existing site surroundings and conditions.

Furthermore, the subdivision plan incorporates 13, 5-acre parcels in addition to the existing 14 Bow View Estates parcels. Subsequently the total number of parcels on the quarter section is 27.

According to Section 2.3 in the General Municipal Plan, the maximum allowable lots per quarter section on a country residential zoning is 32. Therefore the plan for Foxboro Country Estates is well under the maximum allowable units per quarter section, thereby complying with M.D. of Foothills density regulations.



1525 LK



TOTAL AREA 34.60ha (85.25Ac)

BUILDING ENVELOPE

3100-105-010A.DWG  
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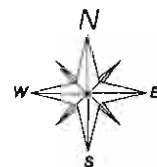
# FOXBORO COUNTRY ESTATES

## PROPOSED SUBDIVISION AND BUILDING SITE LOCATION PLAN

N.T.S.



Figure  
8



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PLANNING AND DESIGN

# FOXBORO COUNTRY ESTATES CONCEPT WITH AERIAL PHOTO



Figure  
9

## **6.0 SERVICING PROPOSAL**

### ***6.1 Wastewater Treatment***

Sewage treatment and disposal will be managed on site with individual septic tank and tile field installations. Alberta Environment prefers a minimum of 0.4ha (1 ac) of developable land on each lot proposed through subdivision to facilitate the proper siting of tile fields. The proposed subdivision has been designed to accomplish this.

Percolation testing was conducted throughout the entire subject site by Jacques Whitford. The results are included in Appendix 1 and indicate that the subject lands are suitable for septic fields.

*Policy 6.1.1: Sewage treatment shall be by individual septic tank and tile field for each lot proposed for residential development to the satisfaction of Alberta Labor.*

### ***6.2 Water Supply and Distribution***

Water is to be supplied to each proposed parcel through the drilling of individual water wells. Groundwater Exploration and research have completed an analysis of the capacity of the aquifer to sustain the proposed subdivision and existing surrounding development.

The report is contained in Appendix 2 and concludes that there is a very consistent water depth capable of servicing the proposed subdivision of 13 lots.

### ***6.3 Utility Services***

Power, cable and natural gas are readily available in the area with sufficient capacities to service the proposed development.

### ***6.4 Internal Subdivision Roads***

All internal subdivision roads will be constructed to full municipal standards. Roads have been located to minimize the need for extensive earthworks, thereby minimizing the impact on the natural topography.

The proposed internal subdivision road access's the site from 242 Ave. ending in a short cul-de-sac that services the internal lots for the proposed subdivision. Lots 6-13 shall only gain access by the internal subdivision cul-de-sac. Lots 1&2 and 3&4 will share joint accesses off of the Municipal Bow View Estates Road. In addition, Lot 5 will share an access with the MR parcel off of the Bow View Estates Road.

*Policy 6.4.1: Internal subdivision road access shall be via public roadways constructed to full municipal standards.*

## **6.5 Stormwater Management**

All residential post development runoff will be contained on site

## **7.0 TRAFFIC IMPACT ANALYSIS**

### **7.1 Future Traffic Volumes**

Additional traffic generated by the proposed subdivision can be estimated by observing the rate of trip generation from existing country residential developments and applying this rate to the proposed subdivision on a per dwelling unit basis.

The current trip generation per dwelling is 7-10 trips per day. Applying this formula to the proposed subdivision would result in an increase of an additional 91 - 130 trips per day on 80<sup>th</sup> Street and Dunbow Road, assuming Highway 2 (Macleod Trail S.) is the desired destination.

By adding the new traffic volumes to the existing volumes currently occurring on Dunbow Road, 242<sup>nd</sup> Ave. and 80<sup>th</sup> Street, the probable impact of this additional traffic can be assessed by comparing the existing volumes to the projected volumes occurring on these roads.

According to recent survey by the M.D. of Foothills, the traffic volumes on Dunbow Road are approximately 4000 trips per day at the east end. This count would be somewhat lower at the east end of Dunbow Road near 80<sup>th</sup> Street. In addition the traffic volumes on 80<sup>th</sup> Street are approximately 2000 trips per day.

The preceding analysis demonstrates that the impact of additional traffic resulting from the proposed subdivision on the adjacent municipal road network will be a 3.25% increase in traffic volume, resulting in minimal impact.

## **8.0 PUBLIC INPUT**

In order to provide more detailed information to the community regarding the proposed Concept Plan, surrounding residents were contacted to provide their input and comments.

The results of these discussions will be summarized and provided under separate cover at a later date.

## **APPENDIX 1**

### **PERCOLATION TEST RESULTS**



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ENGINEERS  
LEGAL SURVEY  
STRATEGIES

CONCEPTS INTO COMMUNITIES

File No. 3109.980

March 19, 2001

MD of Foothills  
309 Macleod Trail  
Box 5605  
High River, Alberta  
T1V 1M7

Dear Coreena,

Regarding: Foxboro Country Estates (SE ¼ Sec 12 TWP 22 R 29 W4M)  
Geotechnical Evaluation Study for Septic Tile Field Installation

I have attached the Geotechnical Study completed by Jacques, Whitford and Associates Ltd. for the above-mentioned lands. Please disregard Ultima Development Corporation in the cover letter, as this was the previous landowner.

Please note that the drill tests completed within the study area were *not* according to future septic tile field installation locations. The tests were completed in a linear fashion across the site, allowing for a preliminary analysis of soil percolation rates.

It is important to note that the 5 drill test holes outlined in the report, which do not comply with Alberta Private Sewage Treatment and Disposal Regulations, are not located near future building site locations.

However, to insure future septic tile field installations meet Alberta Private Sewage Treatment and Disposal Regulations each lot within the subject site will be required to undergo an individual percolation test to determine feasibility for on site septic tile field installations. This will be a condition of subdivision approval.

Given the overall test results, the site is suitable for septic tile field installations.

Yours truly,  
WALKER NEWBY AND PARTNERS INC.

A handwritten signature in black ink, appearing to read 'Jaydean Boldt', written over a horizontal line.

Jaydean Boldt  
Planner

**Jacques, Whitford  
and Associates Limited**

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Environmental Scientists  
Risk Consultants

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February 1, 1999

File No.: ABC10213

Ultima Development Corporation  
c/o Mr. Martin Grady, MCIP  
Walker, Newby & Partners Inc.  
Suite 200, 1212 First Street SE  
Calgary, Alberta  
T2G 2H8

Dear Mr. Grady:

**RE: Sanitary Disposal Systems Feasibility Study**  
**SE ¼, Section 12, Township 22, Range 29, West of the Fourth Meridian**

### Introduction

As requested, Jacques Whitford and Associates Limited (Jacques Whitford) has conducted a geotechnical assessment of the above captioned site to determine the feasibility of installing septic disposal fields. The purpose of this letter report is to present the results of our assessment and to provide recommendations regarding appropriate sanitary systems.

Jacques Whitford's scope of work was as follows:

- Determine the percolation rate of the site soils in accordance with Alberta Private Sewage Treatment and Disposal Regulations. Jacques Whitford recommended that this feasibility study be performed to determine the general suitability of site soils with respect to installation of septic disposal fields. The regulations require that a minimum of 2 percolation tests be conducted at each disposal field site prior to installation, and this work is not included in this feasibility study as individual lots are not yet identified.
- Determine the suitability of the soil for disposal field usage based on the percolation rate and the requirements for design and approval of residential septic systems as laid out in the regulations.
- Ascertain that the disposal field will not be located within a vertical distance of 900 mm from a seasonally saturated layer or 1500 mm from an impervious layer of rock or a water table by advancing four 6.1 m boreholes on the site and installing standpipes in each.



Geotechnical Engineering • Materials Engineering • Mining Engineering • Petroleum Engineering  
Air Quality • Environmental Sciences • Environmental Engineering • Hydrogeology  
Environmental Management Systems • Integrated Risk Management Services



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- Provide a factual report that includes the borehole logs, the soil percolation rate at each test location, the water table elevation readings, and a general discussion of the suitability of the site soils for installation of septic disposal field. Give recommendations for areas of the site that do not meet the suitability criteria specified in the regulations.

### Field Work

The field work was carried out on December 1 and 2, 1998, under the supervision of Jacques Whitford personnel. Locations for percolation testing were determined by Jacques Whitford to provide a general estimate of site conditions as indicated on the attached Drawing 1. The property lines of the lots have not yet been determined by the Owner. A total of 18 locations that were representative of the developable area of the site were selected, and all were successfully drilled.

To establish the depth to groundwater, four boreholes were advanced to a depth of 6.1 m at the locations indicated on Drawing 1. A standpipe was installed in each borehole and the depth to groundwater was checked on December 8, 1998, approximately one week after drilling, and on January 12, 1999, approximately one month after drilling.

### Subsurface Conditions

Soil conditions generally consist of a thin layer of topsoil overlying poorly graded sand and/or sandy clay. Soil descriptions for the percolation testhole are included in Table 1 and in the attached Borehole Records.

The area in and around the subject site has been identified as a sandy clay till overlain in some areas with poorly sorted silt, clay and organic sediments. (Moran, 1986)<sup>1</sup>.

The percolation rates measured at the 18 test locations are variable, as summarized in Table 1. The percolation rates varied from under one minute per 25 mm up to 14.3 minutes per 25 mm. The rates which are faster than 3 minutes per 25 mm (five tests in total) do not meet the minimum requirements for standard septic field disposal systems outlined in the Alberta Private Sewage Treatment and Disposal Regulations.

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<sup>1</sup> S.R. Moran, 1986. *Surficial Geology of the Calgary Urban Area Quaternary Geology - Southern Alberta*. Alberta Research Council. Bulletin No. 53



Table 1 - Percolation Test Results

Percolation Test Number	Environment Site Type	Percolation Rate (min./25 mm)
P1	Compact, light brown, <b>POORLY GRADED SAND</b> , damp (GP)	1.7*
P2	Very stiff, light brown, <b>SANDY CLAY</b>	1.7*
P3	Compact, light brown, <b>POORLY GRADED SAND</b> , coarse grained, dry (SP)	0.8*
P4	Very stiff, light brown, <b>SANDY CLAY</b>	1.7*
P5	Very stiff, light brown, <b>SANDY CLAY</b> , coal, oxides, sulphates (CI) TILL	14.3
P6	Very stiff, light brown, <b>SANDY CLAY</b> , coal, oxides, sulphates (CI) TILL	1.7*
P7	Very stiff, light brown, <b>SANDY CLAY</b> , oxides, coal, sulphates, pebbles, dry (CI) TILL	13.9
P8	Very stiff, light brown, <b>SANDY CLAY</b>	1.7*
P9	Very stiff, light brown, <b>SANDY CLAY</b> , oxides, coal, sulphates, pebbles, dry (CI) TILL	7.4
P10	Very stiff, light brown, <b>SANDY CLAY</b>	1.7*
P11	Very stiff, light brown, <b>SANDY CLAY</b> , oxides, coal, sulphates, pebbles, dry (CI) TILL	9.4
P12	Very stiff, light brown, <b>SANDY CLAY</b>	1.7*
P13	Very stiff, light brown, <b>SANDY CLAY</b> , oxides, dry, TILL	7
P14	Very stiff, light brown, <b>SANDY CLAY</b>	1.7*
P15	Compact, light greyish brown, <b>POORLY GRADED SAND</b> , coarse grained, dry (SP)	<1*
P16	Compact, light greyish brown, <b>POORLY GRADED SAND</b> , coarse grained, dry (SP)	<1*
P17	Very stiff, light brown, <b>SANDY CLAY</b> , oxides, sulphates, dry (CI) TILL	4.6
P18	Very stiff, light brown, <b>SANDY CLAY</b>	1.7*

\* Does not meet the minimum requirements for standard septic field disposal systems outlined in the Alberta Private Sewage Treatment and Disposal Regulations.



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The depth to groundwater measured at the standpipe locations exceeded 6.1 m, as summarized in Table 2 below.

**Table 2 - Measured Depth to Groundwater**

BH1	Southwest corner of site	Dry to 6.1	Dry to 6.1
BH2	Southeast corner of site	3.95	4.05
BH3	Northeast corner of site	5.00	5.27
BH4	Northwest corner of site	4.31	4.42

#### **Discussion and Recommendations**

Requirements for design and approval of residential septic systems are laid out in the Alberta Private Sewage Treatment and Disposal Regulations, which is currently administered by the Alberta Safety Codes Commission. This regulation states that soil percolation rates must be between 5 and 60 minutes per 25 mm for a site to be considered suitable for the installation of a standard disposal field. Areas where soil percolation rates are between 3 and 5 minutes per 25 mm may have septic disposal fields installed if sufficient test data is provided to indicate that contamination of the groundwater is not likely to occur. Areas where soil percolation rates are faster than 3 minutes per 25 mm are not permitted to have standard septic disposal fields.

The percolation rates for the tests performed at test locations P4, P5, P7 through P11, P13 and P18 fall between 5 and 60 minutes per 25 mm, and indicate the areas represented by these testholes are feasible for standard septic disposal fields.

The results for tests P2, P6, P12, and P17 fall between 3 and 5 minutes per 25 mm. The test results indicate that, with the groundwater table located well over 1.5m below grade, the areas represented by these five testholes are feasible for standard septic disposal fields.

The remaining test values all do not meet the minimum 3 minutes per 25 mm specification outlined by the Alberta Private Sewage Treatment and Disposal Regulations. The test results indicate that standard septic disposal fields are not feasible in the areas represented by P1, P3, P14 through P16.



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In general all areas of the subject site meet the requirements related to the depth to the water table and to any impervious layer of bedrock, based on the borehole records and local topography.

However, isolated areas of the subject site are not considered suitable for the installation of standard disposal fields as these lots did not meet the minimum of 3 minutes per 25 mm specification, indicating that the percolation of water into the soil occurs at an unacceptable high rate. The soil drainage within these pervious materials would not allow proper biological treatment of the effluent to occur, with the possibility of contamination problems in the future.

Based on these results, the subject site is generally considered to be feasible for the installation of standard septic disposal fields. The areal extent of isolated unsuitable soils is unknown, and would require delineation prior to disposal field placement. The possibility that the area of suitable soil may be too small to accommodate the required length of weeping laterals within some individual lots should be taken into consideration for future development planning.

There are four options for the disposal of sanitary wastes on lots with soils that are unsuitable for standard disposal fields:

- Option 1 - Sewage holding tanks
- Option 2 - Sewage lagoon
- Option 3 - Treatment mounds
- Option 4 - Alternate systems not described in the regulations

The following sections present discussion and recommendations regarding these alternatives.

### **Holding Tanks**

Water tight sewage holding tanks can be used for on-site storage of sanitary waste. Holding tanks must be emptied on a regular basis and this entails ongoing costs for removal and disposal of sewage. The high operating costs for this type of system dictate that this method be used only when absolutely necessary.<sup>2</sup>

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<sup>2</sup> Handbook Supplement to the Alberta Private Sewage Treatment and Disposal Regulations, Alberta Labour, Edmonton, Page 11



Mr. Martin Grady

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February 1, 1999

### **Sewage Lagoon**

Lagoons are suitable for use in areas where heavy clay subsoils are present, which were not encountered during the field investigation of the subject site. Land space penalties and construction costs are disadvantages of sewage lagoons. We understand after a conversation with you that sewage lagoons are not considered to be a desirable option.

### **Treatment Mounds**

Treatment mounds are an alternative to disposal fields when the percolation rate is too fast. Treatment mounds require a minimum of 300 mm of natural soil or fill material where the percolation rate is slower than 5 minutes per 25 mm, and a minimum of 300 mm of sand on top of the natural soil or fill material. Proper construction practices for mound construction are very important. Treatment mounds should only be installed by an experienced, licenced septic contractor who is familiar with the special design and construction issues related to treatment mound systems and is willing to guarantee the workmanship and performance of the septic system for at least 20 years. Specific details on the construction of treatment mounds are given in the regulations. The key disadvantage of treatment mounds is that they can be somewhat more expensive than a typical disposal field installation.

### **Alternate Systems**

An alternate system not described in the Code may be installed if "it provides equivalent or greater performance with respect to persons and property and it is Approved for installation and use by the chief inspector."<sup>3</sup> An alternative system would typically consist of a disposal field that has been designed to function properly in the gravelly soils present on site. Modifications to a standard disposal system could include increasing the size of the disposal field and/or septic tank, and modification or replacement of existing soils. Due to the high percolation rate of the site soils, an alternative septic disposal system must be designed to prevent contamination of groundwater. Special consideration must be given to the sizing of the various system components and to the method of construction of the disposal field.

Other types of alternative systems may also be suitable if properly designed.

Alternative systems should be designed and installed by a licenced septic contractor who is familiar with the local soil conditions. Since the specific design requirements for alternative systems are not described in the regulations, the governing body may be hesitant to grant approval of such a system, unless the design is prepared by a Professional Engineer and/or guaranteed by the septic contractor. The selection of a qualified contractor who has a Professional Engineer on staff to design the systems and who will guarantee the systems performance may facilitate the permitting process, while also helping to protect the interests of Mr. Martin Grady

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<sup>3</sup> Alberta Labour, 1990. *Alberta Private Sewage Treatment and Disposal Regulations*, Edmonton, Section 8.8.1



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February 1, 1999

the system purchaser. The contractor should be willing to guarantee the workmanship and performance of the alternate system for at least 20 years to protect the interests of the system purchaser.

### Summary

In general, the subject site soils are suitable for the installation of standard septic disposal fields. The subject site may require the use of alternative disposal systems in isolated areas as discussed above to effectively treat and dispose of the effluent generated by residents. Proper delineation of site soils that are suitable for standard septic disposal fields is required before installation.

### Limitations

This report has been prepared for the exclusive use of Ultima Development Corporation and Walker, Newby & Partners Inc., for the design and construction of the project described above. The report may not be relied upon by any other person or entity without the permission of Ultima Development Corporation and Jacques Whitford and Associates Limited. The report was prepared in accordance with current, generally accepted geotechnical engineering practices. No other warrantee is provided.

The conclusions and recommendations submitted in this report are based upon the data obtained from a limited number of widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction or further investigation. If variations or other latent conditions do become evident, it will be necessary to reevaluate the recommendations presented in this report.



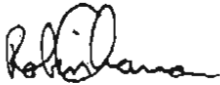
Mr. Martin Grady  
Page 8  
February 1, 1999

### Closure

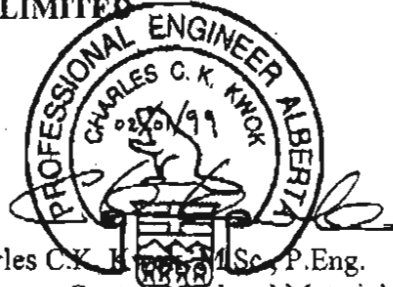
We trust this letter report satisfies your requirements at this time. If you have questions or comments, please contact this office.

Yours truly,

**JACQUES WHITFORD AND ASSOCIATES LIMITED**



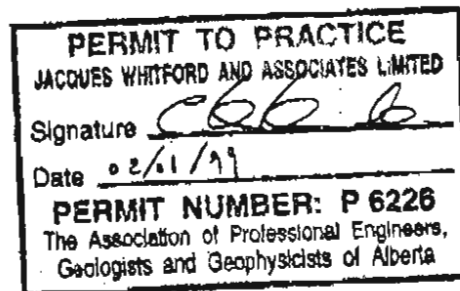
for Chris M. Ollenberger, P. Eng.  
Geotechnical Engineer



Charles C.K. Kwok, P. Eng.  
Manager, Geotechnical and Materials Engineering

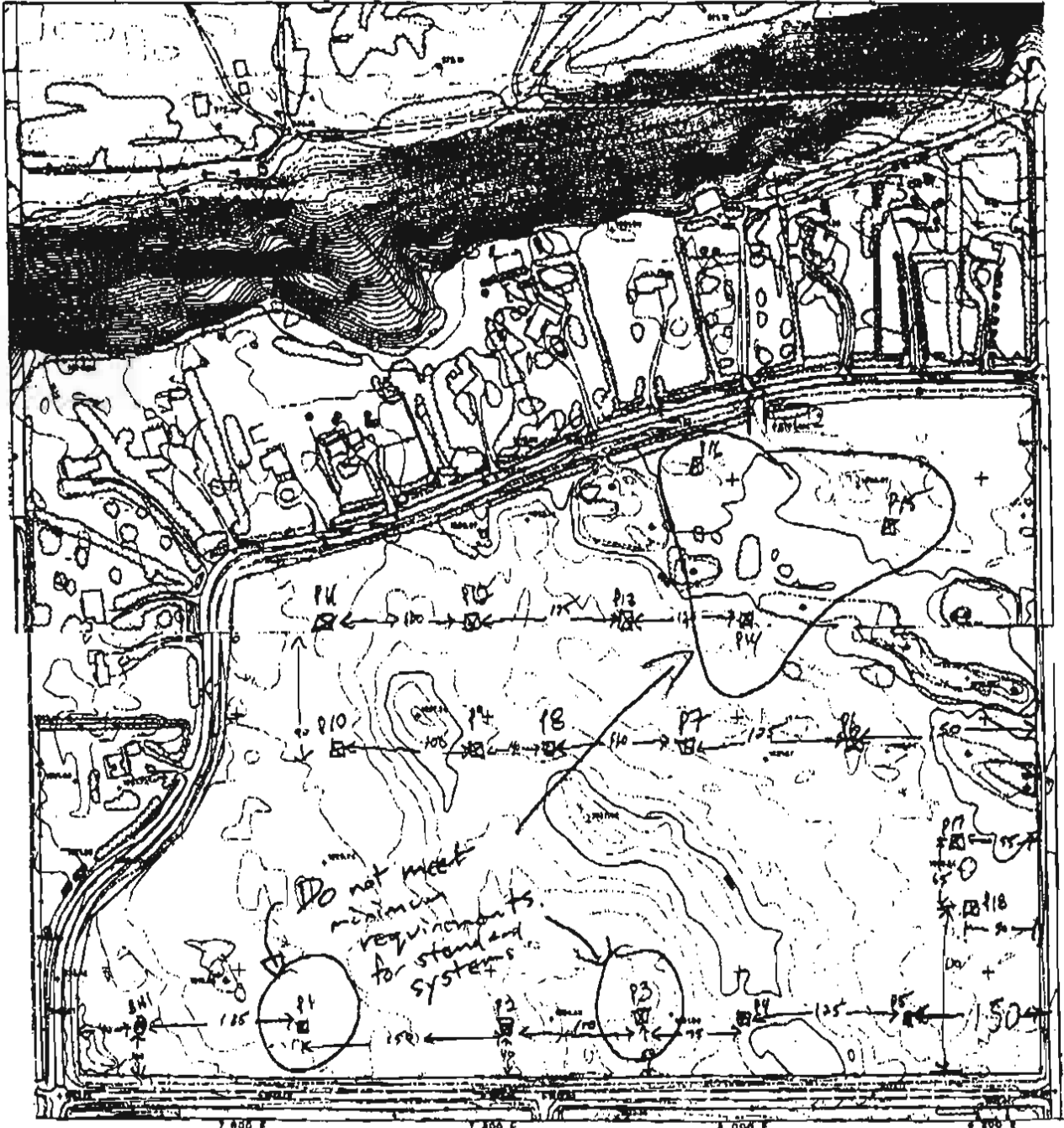
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**APPENDIX A**  
**DRAWING AND BOREHOLE RECORDS**



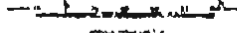


WALKER NEWBY AND PARTNERS INC.

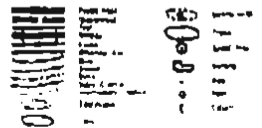
SE 12 T22 R29 W4M

Alberta

Scale 1:500



Map of topography to be used for the purpose of the survey. The map is a reproduction of a map published by the Government of Alberta, 1980. The map is not to be used for any other purpose.



Jacques Whitford and  
Associates Limited


## BOREHOLE RECORD

BH1

CLIENT Ultima Development Corporation c/o Walker NewbyPROJECT No. 10213LOCATION SE1/4 12-22-29 W4M, Septic Field Feasibility StudyBOREHOLE No. BH1DATES: BORING 98-12-01WATER LEVEL Dry 98-12-04

DATUM \_\_\_\_\_

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	STANDPIPE	WATER LEVEL	SAMPLES			Undrained Shear Strength - kPa		Water Content & Atterberg Limits	
						TYPE	NUMBER	N-VALUE OR QD	100	200	300	400
0		Ground Surface										
		Stiff, dark brown, TOPSOIL, frozen (OL)										
		Hard, light brown, SANDY CLAY, trace sulphates, trace oxides, dry (CI)										
1												
2		- trace gravel, oxides, sulphates, coal particles below 1.5 m				SS	1	34				
3		- damp below 3.0 m				BS	2					
4												
5		END of BOREHOLE (4.7 m)				SS	3	34				
6		Borehole open and dry upon completion of drilling										
7		25 mm PVC standpipe installed, hand slotted from 2.1 m										
8		Annulus backfilled with cuttings										
9		Bentonite seal at surface										
10												



Δ Undisturbed Field Vane Test  
 □ Pocket Penetrometer kPa  
 X Remoulded

Jacques Whitford and  
Associates Limited

## BOREHOLE RECORD

BH2

CLIENT Ultima Development Corporation c/o Walker NewbyPROJECT No. 10213LOCATION SE1/4 12-22-29 W4M, Septic Field Feasibility StudyBOREHOLE No. BH2DATES: BORING 98-12-01WATER LEVEL 3.95 m 98-12-04

DATUM

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	STANDPIPE	WATER LEVEL	SAMPLES			Undrained Shear Strength - kPa				Water Content & Atterberg Limits					
						TYPE	NUMBER	N-VALUE OR QCD	100	200	300	400	W <sub>p</sub>	W	W <sub>L</sub>			
0		Ground Surface																
		Stiff, dark brown, TOPSOIL, dry (OL)																
1		Compact, light brown, POORLY GRADED SAND, trace clay, oxides, trace gravel, damp (SP)																
2		Very stiff, light brown, SANDY CLAY, trace gravel, oxides, coal particles, damp (CI)				BS	1											
3																		
4		Compact, dark brown, POORLY GRADED SAND WITH CLAY, moist (SP) - wet below 4.3 m				SS	2	29										
5																		
6						BS	3											
7		Very stiff, grey, SANDY CLAY, wet (CI)				BS	4											
8		END of BOREHOLE (7.6 m) Borehole dry upon completion of drilling Depth to slough 4.6 m on completion of drilling 25 mm PVC standpipe installed, hand slotted from 3.0 m Annulus backfilled with cuttings Bentonite seal at surface				BS	5											
9																		
10																		

△ Undisturbed Field Vane Test

□ Pocket Penetrometer kPa

✕ Remoulded



△ Undisturbed Field Vane Test  
 □ Pocket Penetrometer kPa  
 ✕ Remoulded

Jacques Whitford and  
Associates Limited

# BOREHOLE RECORD

# BH3

CLIENT Ultima Development Corporation c/o Walker Newby

PROJECT No. 10213

LOCATION SE1/4 12-22-29 W4M, Septic Field Feasibility Study


BOREHOLE No. BH3

DATES: BORING 98-12-01

WATER LEVEL 5.00 m 98-12-04

DATUM \_\_\_\_\_

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	STANDPIPE	WATER LEVEL	SAMPLES			Undrained Shear Strength - kPa		Water Content & Atterberg Limits		Becker blows/300 mm	Standard Penetration Test, blows/300 mm
						TYPE	NUMBER	N-VALUE OR QD	100	200	300	400		
0		Ground Surface												
		Stiff, dark brown, TOPSOIL, dry (OL)												
		Compact, light brown, POORLY GRADED SAND, trace gravel, dry (SP)												
1														
2		Hard, dark brown, SANDY CLAY, trace gravel, oxides, damp (CI)				SS	1	45						
3						BS	2							
4														
5		- olive brown, coal particles, damp to moist below 4.6 m				SS	3	47						
6						BS	4							
7		END of BOREHOLE (6.1 m) Borehole open and dry upon completion of drilling 25 mm PVC standpipe installed, hand slotted from 3.0 m Annulus backfilled with cuttings Bentonite seal at surface												
8														
9														
10														



△ Undisturbed Field Vane Test  
 □ Pocket Penetrometer kPa  
 ✕ Remoulded

Jacques Whitford and  
Associates Limited

# BOREHOLE RECORD

# BH4

CLIENT Ultima Development Corporation c/o Walker Newby

PROJECT No. 10213

LOCATION SE1/4 12-22-29 W4M, Septic Field Feasibility Study

BOREHOLE No. BH4

DATES: BORING 98-12-01

WATER LEVEL 4.31 m 98-12-04

DATUM

DEPTH (m)	ELEVATION (m)	SOIL DESCRIPTION	STRATA PLOT	STANDPIPE	WATER LEVEL	SAMPLES			Undrained Shear Strength - kPa	
						TYPE	NUMBER	N-VALUE OR ROD	100 200 300 400	Water Content & Atterberg Limits
										$w_p$ $w$ $w_L$ * Standard Penetration Test, blows/300 mm $\blacksquare$
0		Ground Surface								10 20 30 40 50 60 70 80 90
		Stiff, dark brown, TOPSOIL, dry (OL)								
		Compact, dark brown, POORLY GRADED SAND, dry (SP)								
		- organics from 0.5 - 1.8 m								
1										
						BS	1			
2										
3										
						SS	2	21		
4		- wet below 4.0 m								
5		Very stiff, olive brown, CLAY WITH SAND, oxides, gravel, coal particles, wet (CI)				BS	3			
		- grey below 5.2 m								
6										
7										
						SS	4			
8										
9						BS	5			
10		END of BOREHOLE (7.6 m) Borehole open and dry upon completion of drilling 25 mm PVC standpipe installed, hand slotted from 3.0 m Annulus backfilled with cuttings Bentonite seal at surface								



$\Delta$  Undisturbed Field Vane Test  
 $\square$  Pocket Penetrometer kPa  
 $\times$  Remoulded

## **APPENDIX 2**

### **GROUNDWATER SUPPLY FEASIBILITY STUDY**

## **APPENDIX 3**

### **ARCHITECTURAL CONTROLS**

-1-

**RESTRICTIVE COVENANT AS TO USE OF LAND**

Pursuant to Section 71(1) and Section 52 of  
the *Land Titles Act* (Alberta)

**RECITALS:**

**KNOW ALL MEN BY THESE PRESENTS** THAT FOXBORO COUNTRY ESTATES (the Covenantor), being registered owner of an estate in fee simple of those parcels of land which are set forth and described in the schedule annexed hereto and marked Schedule A to this agreement (the Lands) does for itself and its successors in title to the Lands **COVENANT AND AGREE** for itself, its transferees and assigns and its successors in title to observe and be bound by the hereinafter mentioned covenants provided that the said covenants shall be personally binding upon the Covenantor and its respective successors, successors in title and assigns only which and so long as it or they are and remain the owner or owners of any portion or portions of the Lands then only in respect of such portion as is owned by it or any one or more of them inasmuch as the said covenant shall be construed to be and shall be covenants running with the Lands and shall be appurtenant to all of the Lands for the benefit of all of the respective owners thereof from time to time, that:

1. All of the Lands shall be subject to the building restrictions, conditions and controls as described in the schedule annexed hereto and marked Schedule A to this agreement, which shall be deemed to be covenants running with the Lands and shall be binding upon and enure to the benefit of all of the Lands and the owners thereof which they are owners from time to time; such building restrictions and conditions having been imposed as a building scheme with a view to maintaining the general character of all of the Lands and to controlling the same with respect to the manner of design for residential housing purposes. Such design restrictions and conditions may be enforced by the owner of any Lot described in Schedule A.
2. The Lands shall not be developed or used otherwise than in conformity with the conditions and covenants set out in this building scheme.
3. No action shall lie against the Covenantor for damages for breach of any one or more of the covenants contained in this Restrictive Covenant unless the Covenantor is registered as owner of the Lands alleged and proven by a court of competent jurisdiction to be in breach of this Restrictive Covenant. This covenant shall constitute an absolute defence to any action and may be pleaded as such.

-2-

4. This Restrictive Covenant shall be enforceable by the Covenantor and failure on the part of the Covenantor to enforce promptly and fully the conditions and covenants and restrictions of this Restrictive Covenant shall not be deemed to be a waiver of the right of the Covenantor to enforce the conditions, covenants and restrictions of this Restrictive Covenant.
5. If any provision of this Restrictive Covenant or the application thereof to any person or circumstance shall to any extent be invalid or unenforceable, the remainder of this Restrictive Covenant shall not be affected thereby and each remaining provision shall be valid and shall be enforceable to the extent permitted by law.

IN WITNESS WHEREOF the Owner has hereunto affixed its name and corporate seal, attested by its duly authorized officers, this \_\_\_\_\_ day of August, 2000.

FOXBORO COUNTRY ESTATES

Per: \_\_\_\_\_

Per: \_\_\_\_\_

AFFIDAVIT OF EXECUTION

CANADA ) I,  
PROVINCE OF ALBERTA ) of the City of Calgary, Province of Alberta  
TO WIT ) MAKE OATH AND SAY AS FOLLOWS:

1. That I was personally present and did see \_\_\_\_\_ named in the  
within instrument, who is known to me to be the person named therein, duly sign and execute  
the same for the purpose named therein.

2. That the same was executed at Calgary, Alberta and that I am the subscribing  
witness  
thereto.

3. That I know the said \_\_\_\_\_ who is in my belief of the full age of  
eighteen (18) years.

SWORN BEFORE ME at Calgary )  
in the Province of Alberta )  
on the \_\_\_\_\_ day of \_\_\_\_\_ )  
2000 )

\_\_\_\_\_  
A COMMISSIONER FOR OATHS IN AND  
FOR THE PROVINCE OF ALBERTA

-3-

**SCHEDULE B** attached to and forming part of a  
**RESTRICTIVE COVENANT AS TO THE USE OF LAND**  
made by **FOXBORO COUNTRY ESTATES**  
the \_\_\_\_\_ day of August, 2000

**FOXBORO COUNTRY ESTATES**  
**BUILDING RESTRICTIONS, CONDITIONS AND CONTROLS**

1. The lands shall only be used for the purpose of a single family, country residential development. No attached or semi-detached dwelling, duplex or apartment shall be erected on the said lands, provided that nothing herein shall prevent the owner of any Lot making adequate provision for domestic staff.
2. Formal standards and requirements for development will be those as established by the Municipal District of Foothills No. 31 Land Use Bylaw. Conformity with these guidelines does not supersede the required approval process of the Municipal District of Foothills No. 31.
3. No Lot nor any building thereof shall at any time be used for the purposes of any profession, trade or business of any description unless it is permitted under the Home Occupation provisions of the Bylaws of the Municipal District of Foothills No. 31.
4. No equipment, material or supplies will be stored or stockpiled on the property other than as normally and regularly used in conjunction with a single family residence. Such use permits the screened storage of recreational vehicles, machinery or equipment owned by the occupants of the Lot for their personal residential use.
5. No Lot shall be used for depositing, dumping, burning or storing of any refuse, trash, garbage or discarded building materials. All rubbish, trash, garbage or discarded building materials shall be removed from the property and shall not be allowed to accumulate thereon. Burning of garbage or any other material is strictly prohibited. No trucks and related use trailers exceeding one ton capacity shall be

-4-

parked or placed on the lands.

6. The location of the home and outbuildings is the prerogative of the Purchaser subject to all buildings being located within the legal building envelope. Locations chosen should be complimentary to adjacent properties. It is the intention of the parties hereto that all dwelling houses erected on the said lands shall have as far as possible, a desirable view of the surrounding countryside.
7. No particular building form will be imposed. Each design should be in harmony with the country residential neighbourhood.
8. Only one single family dwelling house with attached double or triple garage may be erected on each Lot. A private garage shall in either case conform in style and exterior finish to the dwelling house on the same Lot. The dwelling house shall have a minimum ground floor square area of 1600 square feet if of a single storey construction and 1200 square feet if of a two storey constructions, or 1400 square feet if of a split level constructions. In calculating the ground area of a dwelling house, the measurements for the above calculations shall be taken as the outside measurements of the main walls of the building and ground level and shall not include any garage which does not have habitable rooms above it and shall not include any porch, verandah or unheated sun room. The building height of the dwelling shall not exceed a maximum height of 30 feet above grade level.
9. No structure shall be erected except of new materials Prefabricated or used dwellings cannot be moved onto the lots. The development of a detached accessory building is permitted if less than 1200 square feet. Height shall not exceed 18 feet. The building should be aesthetically pleasing and conform in style and exterior finish to the dwelling house on the same lot.
10. No excavation shall be made except for the purposes of construction or improvement of the buildings, gardens or grounds. No person shall alter the existing drainage and all open areas of the said Lots shall be maintained in a dust-free condition by landscaping with trees, shrubs, suitable ground cover or

-5-

undisturbed natural growth. Fences shall be restricted to a maximum height of 4 feet 6 inches and the same shall not be of solid board construction. The approach to the said Lot shall be of gravel or better quality. All Lots and buildings thereon shall be maintained in a clean and tidy manner and in good and substantial repair. Garbage and refuse shall be removed at least twice monthly. Garbage containers and receptacles shall be enclosed or screened from view.

11. All electrical, telephone or other utility services must be installed underground. Septic tank and fields will be the owners responsibility, and must conform to Municipal District of Foothills No. 31 and Alberta Government code requirements. Well water cannot be used for any commercial purposes and cannot be hauled off lot.
12. No signs will be allowed on any Lot, after construction is complete. Personal name signage and For Sale are permitted; personal names signs not to exceed 18 inches by 24 inches.
13. The keeping of livestock and horses is only permitted as provided by the Land Use of the Municipal District of Foothills No. 31, except there will be no cattle, swine, poultry or sheep allowed on the property. Domestic pets shall be allowed for personal use only and shall be limited to a maximum of 3 per category, such as 3 dogs, 3 cats. All of the above shall be confined to the said lots, adequately housed and shall cause no nuisance to other land owners.
14. There is no building commitment attached to the Lots, however, upon the commencement of construction, the construction to the completion of the exterior of the dwelling or any garage or other outbuilding and landscaping must be completed within a period of 12 months, excepting seasonal deficiencies, which will then be completed as soon as weather permits.
15. Precautions must be taken during the construction period to avoid damage to the natural environment in which these homes are being built. Construction water must be handled with care to avoid damage to the area and must not be released into the natural drainage area.
16. A suitably sized garbage container must be located at the site during construction to avoid debris and garbage blowing into other areas of the subdivision or into

-6-

neighbouring fields.

17. Excess fill arising from basement excavations, etc., must be immediately removed from the site unless it can be incorporated into the site.
18. The Purchaser agrees that he shall be responsible for any damage to the roadway or entrance ways on land adjacent to the Lot or in any common property of the subdivision caused as a result of the actions of the Purchaser or any of the Purchaser's agents, employees or contractors; and he shall indemnify and hold harmless the Vendor from any loss, damage or claims resulting thereto.
19. Mobile homes or trailers will be permitted during construction only. The same must be removed immediately upon completion of construction, when the dwelling is ready for occupancy.
20. All buildings shall be erected on permanent foundations, constructed of durable materials and must conform in all respects to the relevant provisions of the current edition of *The National Building Code of Canada and the Province of Alberta*.
21. That no development of any nature and no construction shall be undertaken without the prior receipt of development and building and other necessary permits for which application shall be made and approval received in compliance with the requirements of the by-laws of the Municipal District of Foothills No. 31.

#99160

**Groundwater Supply Feasibility- Phase 1  
Foxboro Country Property: SE-12-22-29-W4M**

Submitted to:

**Walker Newby**

Prepared by:

**Groundwater Exploration & Research Ltd**

December 1999



# Groundwater Exploration & Research<sup>LTD</sup>

Box 15

Balzac, AB. CANADA T0M 0E0

Phone (403) 226-0330; Fax (403) 226-6593; Email: nowakb@cadvision.com

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December 6, 1999

File No: 99160

Walker Newby  
#200, 1212 First Street SE  
Calgary, AB.  
T2G 2H8

Attention: Martin Grady

**RE: Proposed Subdivision of the Foxboro Country  
property at SE-12-22-29-W4M**

In accordance with the new Water Act that came into effect January 1, 1999, there is now a requirement to submit technical data to the subdivision authority as part of the application for subdivision. The technical data or groundwater supply evaluation has, in essence, two parts. Phase I addresses a groundwater feasibility assessment; and Phase 2 the completion and testing of a water well on each of the proposed lot(s).

Enclosed find our letter report which addresses a Phase 1 groundwater supply feasibility of the Foxboro Country property at SE-12-22-29-W4M in the Municipal District of Foothills.

## **Background Information**

The subject property is located north of Dunbow Road on 80 Street East. The property is bordered on the north by the Bowview Estates subdivision. The subject property is approximately 36.42 hectares [90 acres] in size. There is a maximum number of 32 lots permitted under the MD of Foothills policy. The Bowview Estates subdivision contains 14 existing lots, leaving a potential maximum of 18 more lots.

Extensive country residential subdivision exists to the south in the NE-01 quarter, and to the southeast in the NW-06 quarter section.

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

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

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

### **Geomorphic/Geologic Setting**

Much of the land in the area of SE-12 is characterized by a flat to gently rolling benchland overlooking the Bow River valley. The elevation change across the SE-12 quarter section is less than 7.5 meters [Dalemead 82 I/13; 1:50,000 topographic map sheet] based on contour interval spacing.

The bedrock in the area [Green, 1970: Geologic Map of Alberta; 1:267,000] is mapped as the Paskapoo Formation. The Paskapoo Formation consists of grey to greenish grey, thick bedded, cherty, calcareous sandstone; grey and green siltstone and mudstone; minor conglomerate, thin limestone, coal and tuff beds.

Ozoray & Lytviak [1974: Hydrogeology of the Gleichen area, Alberta; Alberta Research Council, Report 74-9] maps the area as having a groundwater potential of 33 m<sup>3</sup>/day to 164 m<sup>3</sup>/day [5-25 Cgpm]. The regional groundwater flow is northward toward the Bow River drainage basin.

The surficial geology of the site has been mapped as fluvial channel sediment [gravel with minor sand] and some organic sediments deposited within ponds [Moran: 1986; Surficial geology of the Calgary Urban area; Alberta Research Council Bulletin 53]. There are no water well records on file for SE-12. It is our understanding that Bowview Estates has a communal well for their 14 lot subdivision. Although there is no lithologic record, there is a chemical record for a well in the SE-12 [under the name Bowview Estates] quarter which indicates a well depth of 18.3 meters. Another chemical record under the name Bridgewater indicates a well depth of 27.4 meters and a non-pumping water level of 6.1 meters.

Because of the lack of site specific well records, the range in depth of overburden can not be defined. However, a test hole drilled by Alberta Environment in July 1977, encountered 44.5 meters of drift material comprised of silt, silty clay and gravel; overlying bedrock. Site specific, percolation tests will need to be undertaken to confirm suitability and depth of surficial soils for septic field design.

### **Pertinent Regulations**

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

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

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

Water Regulation [AR 205/98]

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

In essence, Section 23(3) of the Water Act asks two basic questions:

- [a] Is there sufficient water to satisfy the maximum requirement of 1250 m<sup>3</sup>/year for each lot in the proposed subdivision?
- [b] Will the allocated volume of water per lot result in a significant adverse effect on neighbouring wells and licensed users existing at the time of subdivision application?

## Groundwater Well Data

A survey of groundwater well data in SE-12 and the surrounding 8 quarter sections of land was undertaken utilizing available information from Alberta Environmental Protection's groundwater database file. A total of 42 well records were available for review. There were no well records on file for the SE-12 quarter, although Bowview Estates does have a communal well. A summary of available water well information is summarized in Table 1, appended to this report.

- [1] Well depths vary significantly from 40 feet to 420 feet over the nine quarter sections. The variability in well depth exceeds the topographic relief across the site, indicating that the water bearing zones are not continuous across the immediate area. There is also a significant contrast in elevation change over the nine quarters to account for difference in well depth. Some of the wells are completed in flood plain gravels adjacent to the Bow River as compared to the escarpment some 175 feet above the river. Within the SE-12 quarter, the well depths vary from 60 to 90 feet as indicated from chemical record data only. The geometric mean well depth for all 42 wells is 206 feet.
- [2] The depth of well production intervals varies from a shallow 20-22 feet [Bridgewater; NE-12]; to a maximum 320-420 feet [Gittens; SW-07]; also suggesting that the water bearing zones are not continuous across the quarter section.

- [3] Preliminary flow estimates vary from 0.5 to 36 Cgpm over the regional nine block section. The variability in flow rates can be attributed to differences in bed geometry, texture and cementation characteristics. The geometric mean flow, based on all 42 well record, is 7.1 Cgpm, which is sufficient to accommodate up to 13 lots.
- [4] Well lithologic descriptions indicate that the water bearing units are sandstones, some of which are relatively thin and other moderately thick; and fractured shale.
- [5] Some of the wells are completed with extensive open areas and/or multi-layer watering bearing zones which generally signifies the presence of low yield water bearing zones.
- [6] The wells tend to be under good artesian pressure resulting in available drawdowns that exceed 10 meters.
- [7] Disregarding the non-pumping water levels in wells completed at shallow depths, there is a very consistent non-pumping water level with a geometric mean depth of 186 feet for wells completed in excess of 200 feet. This depth places the water level at or near the Bow River level. There is some probability that the wells may be in hydraulic connection with the Bow River, which allows the non-pumping water levels to maintain a fairly consistent level.

### Existing Q20 Reports

Groundwater Exploration & Research Ltd has undertaken the assessment of nine Q<sub>20</sub> reports within the nine quarter section block. Flow test data are summarized as follows:

Owner	Transmissive Capacity (m <sup>2</sup> /day)	Calculated Q <sub>20</sub> (m <sup>3</sup> /day)
<b>NE-01</b>		
Edwards	6.4	45.5
Leech	5.5	40.7
Rasco	3.7	32.1
Rasco	0.7	21.2
<b>NW-06</b>		
Thompson	34.0	32.7
Schwartz	8.7	27.8
Schwartz	5.5	26.2
Vanderpole	7.4	45.8
Vanderpole	4.2	26.2

The flow test data, to date, indicates a considerable variation in transmissive capacity from 0.7 to 34.0 m<sup>2</sup>/day. Eight of the nine flow tests indicate a transmissive capacity exceeding 3.5 m<sup>2</sup>/day. In all cases, the calculated Q<sub>20</sub> exceeds the maximum allowable of 3.42 m<sup>3</sup>/day per lot. Based on recommended Q<sub>20</sub> flow rates, the data supports a range in the number of lots from 6 to 13. The lowest number of lots is associated with the Rasco well which was completed at the greatest depth of all the well records [420 feet].

Based on the evaluation criteria [AEP: June 27, 1994] therefore, there exists more than one water bearing zone; and the zones are not continuous beneath the quarter section. This conclusion is based on the variability in well depth, completion interval and preliminary flow estimates. However, there is a strong consistency in non-pumping water level suggesting hydraulic connection with the Bow River, regardless of production interval completion.

From existing water well information, there appears to be sufficient amounts of groundwater to supply up to a maximum of 13 lots based on an allocation of 753 gpd [1250 m<sup>3</sup>/year] per lot. Due to the discontinuous nature of the water bearing units, the presence of fractured and/or discontinuous water bearing zones, the availability of groundwater can only be determined on an individual well basis.

With respect to the potential for well interference as indicated in Section 23(3) of the Water Act, a calculation for well interference, neglecting recharge, at any given distance from the pumping well can be determined from:

$$u = r^2 S / 4 T t \text{ and}$$

$$s = Q W(u) / 4 \pi T$$

where:  $u$  and  $W(u)$  = well function parameters  
 $T$  = transmissive capacity in  $m^2/day$  calculated from actual pump test data  
 $S$  = coefficient of storage, dimensionless  
 $t$  = 20 years of continuous pumping, in days  
 $r$  = distance between pump well and neighbouring well  
 $s$  = projected drawdown at the neighbouring well and assumed to be 1 meter or less  
 $Q$  = pumping rate of  $1250 m^3/year$  or  $3.42 m^3/day$

The calculation for well interference is based on the general assumption that a maximum projected drawdown of 1 meter, after 20 years of continuous pumping and neglecting recharge, is an acceptable drawdown that would not unduly interfere with a neighbouring wells' performance.

With the above defined criteria, critical values for well separation distance and transmissive capacity [TC] value can be determined. Acceptable combinations of transmissive capacity and well separation distance are tabulated as follows:

Well Separation Distance (m)	Transmissivity ( $m^2/day$ )
25	3.5
50	3.0
75	2.5
100	2.5

For a maximum drawdown of one meter, the critical transmissive capacity is  $3.5 \text{ m}^2/\text{day}$  and a well separation distance of 25 meters; This means, that if one assumes the addition of a single well will be completed in the same water bearing zone, then as long as the well separation distance is greater than 25 meters and the transmissive capacity exceeds  $3.5 \text{ m}^2/\text{day}$ , then any well interference can be deemed to be acceptable.

Out of the nine flow tests in the immediate area, only one well test [Rasco - deep well] had a calculated transmissive capacity below  $3.5 \text{ m}^2/\text{day}$ . Because of the variability in water bearing zone characteristics, the TIC value can only be determined from a pump test conducted on a well drilled on each proposed new parcel. Given that the proposed lot sizes will exceed 1.62 hectares [4 acres] because of lot density reasons within the quarter section, a minimum separation distance of 25 meters, should be readily achievable.

### Summary of Findings

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

- [1] Preliminary water well data indicates sufficient groundwater reserves to provide a maximum of 3.42 m<sup>3</sup>/day [1250 m<sup>3</sup>/year] for up to 13 lots.
- [2] To minimize a concern for well interference, the critical parameters are a minimum transmissive capacity of 3.5 m<sup>2</sup>/day and a well separation distance of at least 25 meter. The well separation distance parameter is generally feasible given the proposed lot size. Existing flow test data indicates that a transmissive capacity value exceeding 3.5 m<sup>2</sup>/day is probable.
- [3] The transmissive capacity will need to be calculated on an individual well basis. A minimum well test duration of 12 hours pumping and 12 hours of recovery is sufficient to generate the required data.

Walker Newby  
Attention: Martin Grady  
December 6, 1999  
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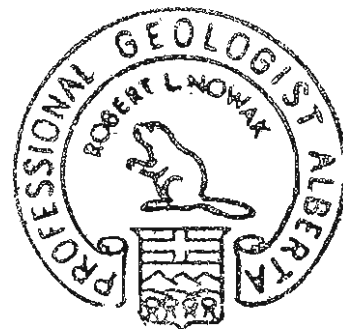
## Closure

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

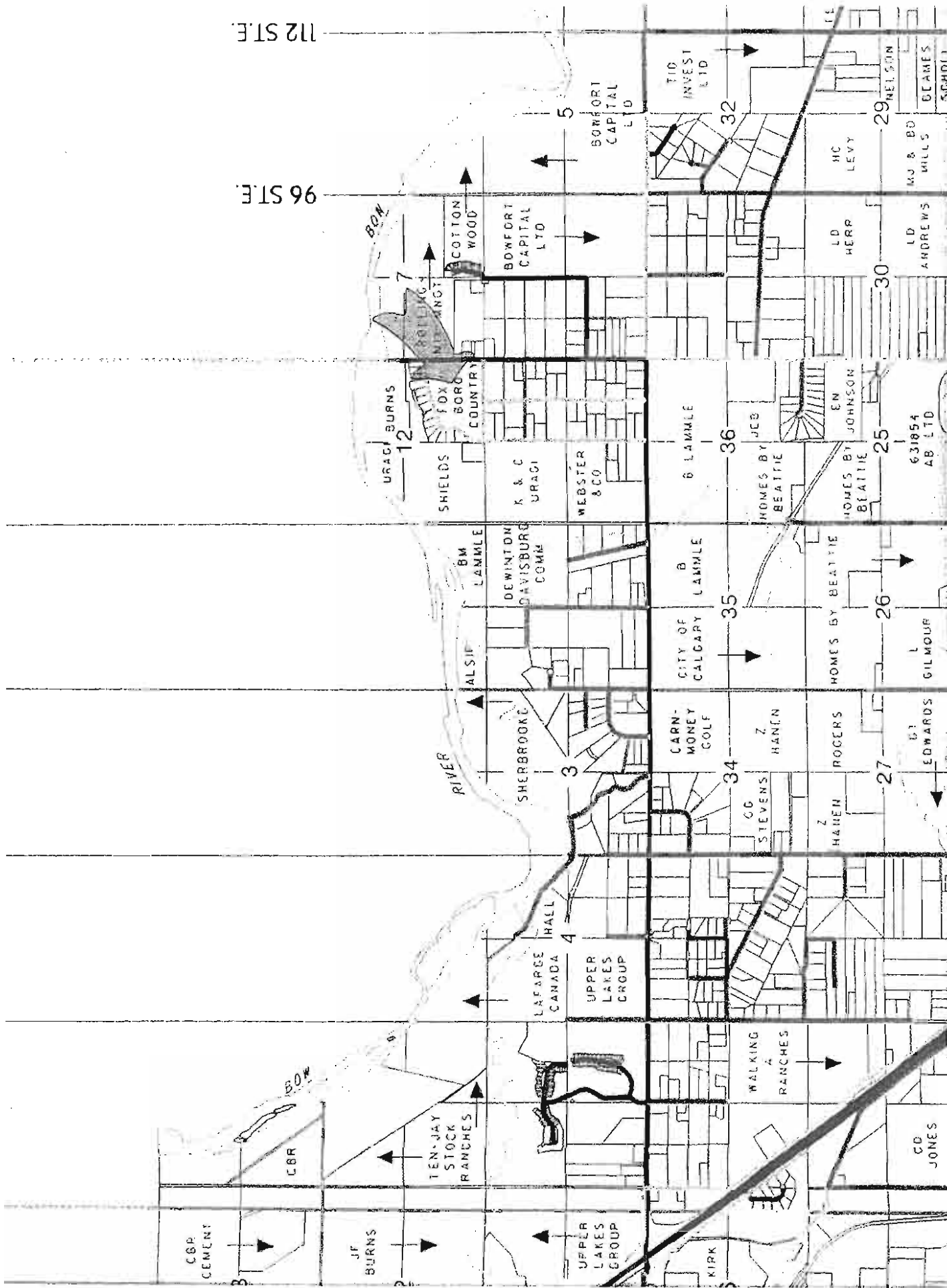
Respectfully yours,  
**Groundwater Exploration & Research Ltd**

*Bob Nowak*

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



# Appendix



**Table 1**  
**Summary of Groundwater Well Data**

Location	Landowner	Date Drilled	Td/Npwl (ft)	Flow Estimate (Cgpm)	Completion Interval (ft)
TP22, R29					
NE-12	Bridgewater	unknown	40/12	20 Cgpm/0.45 hr	20 - 22 & 28 - 36
SW-12	Shields	Mar 90	360/180	10 Cgpm/4 hrs	340 - 360
SW-12	Montreal Trust	Dec 83	40/20	4 Cgpm/3 hrs	open hole
SW-12	Shields	Sep 94	80/6.1	8 Cgpm/2 hrs	40 - 80
NE-01	Bearspaw Dev.	Dec 77	86/19	20 Cgpm/2 hrs	50 - 81
NE-01	Petterson	May 91	260/200	8.5 Cgpm/2.3 hrs	200 - 260
NE-01	Petterson	May 91	260/199	8.5 Cgpm/2.3 hrs	200 - 260
NE-01	Bridgewater	Jul 72	218/170	20 Cgpm/1.3 hrs	193 - 212
NE-01	Glover	Jun 90	420/180	12 Cgpm/2.4 hrs	400 - 420
NE-01	Palma	May 72	250/175	10 Cgpm/1.3 hrs	235 - 245
NE-01	Edwards	Mar 91	275/189	8 Cgpm/2 hrs	235 - 275
NE-01	Nash	Mar 80	300/180	3 Cgpm/3 hrs	260 - 300
NE-01	Nash	Jan 90	285/188.6	6 Cgpm/12 hrs	245 - 285
NE-01	Rasco	Oct 95	420/191.4	4 Cgpm/12 hrs	380 - 420
NE-01	Bridgewater	Oct 70	247/183	7.5 Cgpm/1.2 hrs	223 - 230 & 238 - 245
NE-01	Bridgewater	Sep 70	260/180	6 Cgpm/1.3 hrs	233 - 246 & 252 - 257
NE-01	Bridgewater	Dec 70	257/190	5 Cgpm/1 hrs	unknown
NE-01	Bridgewater	Apr 71	311/183	6.5 Cgpm/1 hrs	220 - 246 & 266 - 304
NE-01	Nash	Jan 90	300/182.8	6 Cgpm/12 hrs	240 - 300
NE-01	Bearspaw Dev.	Oct 77	283/177	13.5 Cgpm/1.4 hrs	unknown
NE-01	Matt	Apr 82	300/225	10 Cgpm/2 hrs	260 - 300
NE-01	Rasco	Nov 95	293/195.3	7 Cgpm/12 hrs	253 - 293
NW-01	Bearspaw Dev.	Dec 77	42/12.4	36 Cgpm/2.3 hrs	37 - 41
NW-01	Alonzo	May 74	300/185	8 Cgpm/1.3 hrs	270 - 295
TP22, R28					
NW-06	Trenchuk	Feb 79	287/190	14 Cgpm/2 hrs	230 - 285
NW-06	Pipe	Feb 79	257/191	9 Cgpm/2 hrs	198 - 253
NW-06	Schneider	Jun 68	250/190	10 Cgpm/2 hrs	125 - 235 & 240 - 248

Table 1 (continued)  
Summary of Groundwater Well Data

[illegible]