



# **SPY HILL LANDS DEVELOPMENT PROJECT PHASE 1 REPORT**

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Prepared for  
**Alberta Transportation  
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## **EXECUTIVE SUMMARY**

### **Introduction and Terms of Reference**

The Spy Hill subject site includes two sections of land owned by the Province of Alberta and located within the City of Calgary. The site is legally described as Section 28 and Section 33 - 25 - 2 - 5. The majority of the site is currently undeveloped and contains a significant deposit of high-quality, non-renewable aggregate resources.

The Spy Hill Lands Development project has been undertaken on behalf of Alberta Infrastructure and Alberta Transportation by Brown and Associates Planning Group and Russ Gerrish Consulting. This Phase 1 report is intended to “determine/evaluate development options and identify the optimum way of assuring that the Spy Hill gravel reserves are utilized to their optimum levels.” A subsequent Phase 2 report will provide more detailed draft plans for approval under applicable provincial legislation.

### **Extraction Area and Aggregate Quantity**

Aggregate extraction operations are recommended on Section 33 and the north half of Section 28. This generalized operating area encompasses some 960 acres and contains an estimated 130 million tonnes of high quality aggregates. The aggregate resource on the site averages 19.3 metres in depth and is overlain by an average 13.2 metres of overburden material, representing a gravel to overburden ratio of 1.46:1.

Remaining Provincial lands totalling approximately 305 acres at the south end of Section 28 are not recommended for aggregate extraction due to existing buildings, facilities and University of Calgary lease commitments extending to 2042. Uncommitted remaining lands could be considered for additional leasehold uses or held for future disposition for urban development.

### **Aggregate Requirements and Depletion Timeframes**

Alberta Transportation has indicated a requirement for a maximum of 45 million tonnes of gravel from the subject site for provincial roadway rehabilitation and construction projects during the next 50 years. Use of this aggregate supply will provide significant cost advantages for taxpayer funded public infrastructure projects.

There is an estimated 170 million tonne supply of gravel in approved operations in the Calgary region. This supply is much less than the expected demand for up to 700 million tonnes of gravel during the next 50 years. Given

the anticipated scarcity of critical resources it is important that the full 130 tonnes of recoverable aggregate reserves be extracted in support of the regional economy. It will also be desirable to recover this aggregate supply within a period of 40 to 60 years in order to allow permanent urban land uses to be developed on a phased basis as initial extraction areas are reclaimed.

### **Operating Scenarios**

The Province of Alberta should maintain ownership of the subject lands to ensure full recovery of the scarce, non-renewable aggregate resource prior to urban development. In order to recover all aggregate resources within 40 to 60 years, aggregates in excess of public requirements will need to be used by local private industry and the general public. The following potential operating scenarios were reviewed during the study:

1. Tender or Contract to Highest Bidder
2. Sale of Land with Special Aggregate Extraction Agreement
3. Contract with Specialized Management Company
4. Public/Private Partnership
5. Public Partnerships

Although elements of various operating scenarios could be mixed in a final operating approach, a "Single Pit, Public / Private Joint Venture" operation is recommended so that a private partner/contractor can manage a high quality, large scale operation with maximum efficiency, minimize environmental impacts, share financial and operating risks with Alberta Transportation, and phase-in the release of aggregates for use by local industry and the general public.

### **Stakeholder Concerns**

A public consultation program undertaken during the fall of 2002 identified the following stakeholder concerns.

- Existing Spy Hill aggregate producers support extraction for public infrastructure projects. Producers want any operation that sells aggregates to local industry and the general public to meet the same standards as private industry.
- Commercial aggregate consumers (e.g., paving and road contractors) generally seek additional competition and lower prices in the Calgary aggregate market. Some commercial consumers believe existing aggregate operators are already doing an excellent job serving the needs of industry.

- Residents of communities located near the site are concerned about dust, noise, visual, and traffic impacts. MD of Rocky View residents would like to see state-of-the-art impact mitigation techniques; significant setbacks along the west edge of the operation; and upgrading of the roadway and setback areas along 101<sup>st</sup> Street. Residents in the City of Calgary want to see truck traffic from the aggregate operation routed appropriately and advance planning to identify future major road system requirements.
- All stakeholder groups are interested in being consulted, and receiving additional information about the Spy Hill aggregate projects as the project proceeds.
- The City of Calgary generally supports the extraction of aggregate resources prior to surface development and wants to review aggregate plans to ensure integration with current planning and future urban development for the Spy Hill area.

### **Some Key Concept Plan Recommendations**

The Study provides a Conceptual Extraction Plan and a Conceptual End Use Plan (see Map 12 and Map 13). Highlights of the Concept Plans include the following recommendations.

- High standards of visual, dust, and noise impact mitigation to ensure operations are comparable to the private operations in the Spy Hill area and compatible with the built-up land use context of the site.
- Construction of a 3-4 metre planted berm within a meandering 60 to 100 metre setback area at the west side of the property adjacent to 101<sup>st</sup> Street (Rocky Ridge Road). Construction of this berm should occur prior to Phase 1 aggregate extraction activities.
- Construction of a safe driveway intersection onto 85<sup>th</sup> Street NW to be aligned with the existing Provincial Young Offenders Centre driveway.
- Extraction operations that proceed from south to north to allow for phased urban development. Within phases the extraction face will move from east to west to ensure the face is not visible from residential areas west of the site.
- Direct and sequential stripping and placement of overburden to create a reclaimed final grade plan that supports future urban servicing and development.
- A reclamation planting plan that will replace existing drainage ravines and associated vegetation with recreated linear drainage channels and vegetation suitable as permanent natural open space.

### **Additional Studies**

The following additional work should be undertaken in support of plans for the Spy Hill aggregate operation.

- Preparation of a dust emissions study by a qualified professional.
- Preparation of a hydro-geological baseline study by a qualified professional to determine any potential impact on the groundwater aquifer in the vicinity of the site.
- Extended public and stakeholder consultation including door-to-door information dissemination to all residents within a one-mile radius.
- Additional Historical Resources Impact Analysis.
- Appropriate studies as required to meet the requirements Federal Species at Risk legislation.



## 1.0 INTRODUCTION

### 1.1 Study Initiation and Scope

The Spy Hill Lands Development project has been undertaken on behalf of Alberta Infrastructure and Alberta Transportation by a consulting team headed by Brown and Associates Planning Group (land use planning) and Russ Gerrish Consulting (gravel mining engineering).

The purpose and scope is provided in the Terms of Reference for this project. "The consultant shall determine/evaluate development options and identify the optimum way of assuring that the Spy Hills Gravel reserves are utilized to their optimum levels. The scope of work includes identifying all relevant issues, identifying and reviewing all utilities/easements, and adjacent land uses and providing recommendations. A report shall be prepared documenting issues, stakeholder groups, aggregate extraction scenarios and the affect of such scenarios on the identified issues. The report shall also identify any portions of the lands, which may not be gravel bearing, or economically mined, that might be leased or sold immediately."

The terms of reference also includes the following tasks and deliverables:

1. Review existing testing, identify further testing, and identify any lands surplus to gravel extraction.
2. Undertake consultation with stakeholders including gravel producers, the City of Calgary, the MD of Rocky View, the University of Calgary, and local residents.
3. Produce a Phase 1 report including:
  - a. Review of pit operating practices in the area (landscaping, noise, dust, and sound mitigation).
  - b. Identify any issues related to Environmental approvals and provide recommendations to respond to these issues.
  - c. Development and operation costs along with timelines.
  - d. Transportation route issues considering existing and future development in the area.
  - e. Identify potential operating approaches/staging/sequencing and the impacts.
4. Identify a reasonable life for the pit and whether non-government use of gravel is appropriate within that time frame. If appropriate for non-government use, recommend business arrangements to accomplish this being sensitive to government being in the gravel market.

5. Detail various scenarios and recommend what scenario to pursue.
6. Develop a draft pit operation plan and a draft Conservation and Reclamation plan.
7. Reporting requirements.

The project commenced in August 2002 based on two phases of activity.

Phase 1A:	Draft Feasibility Study and Concept Plans
Phase 1B:	Public Consultation and Phase 1 Report
Phase 2:	Draft Conservation and Reclamation Plan

This report presents the findings of work undertaken during Phase 1 of the project including a public open house meeting held on December 3, 2002 at the Rocky Ridge Ranch Information Centre.

## **1.2 Site Location**

The subject site for this study includes 1,255 acres of land held by the Province of Alberta and located within the City of Calgary adjacent to the northwest boundaries of the City (see Map 1). The site's location within the Spy Hill area of northwest Calgary is illustrated in Map 2. As illustrated in Map 2, the site is bounded by the following existing land uses and features:

- To the north, 144<sup>th</sup> Avenue (Burma Road) is a City of Calgary major roadway and truck route built to a rural two-lane paved roadway standard. North of 144<sup>th</sup> Avenue is the Burnco Spy Hill Aggregate facility, operating within the MD of Rocky View.
- To the east, 85<sup>th</sup> Street is a City of Calgary major roadway built to a rural two-lane paved roadway standard. East of 85<sup>th</sup> Street is the Lafarge Canada Aggregate facility, operating within the City of Calgary.
- To the south, the new City community of Royal Oak is under development. Growth of this community is expected to approach the south boundary of the subject site during the next year. The future right-of-way for Country Hills Boulevard, an urban major roadway is to be located adjacent to the south boundary of the subject site.
- To the west, 101<sup>st</sup> Street (Rocky Ridge Road) is a City of Calgary major roadway built to a rural two-lane paved roadway standard. Land uses west of 101<sup>st</sup> Street are predominantly residential dwellings located in the MD of Rocky View.

The 1,255 acre study area is legally described as Section 28 and Section 33, Township 33, Range 25, West of the 5<sup>th</sup> Meridian. All land within Sections 28

and 33 is held by the Province with the exception of 14.4 acres owned by the City of Calgary for the Top Hill Water Reservoir.

### **1.3 Site History**

Historically the subject site has been part of a larger Provincial Spy Hill landholding that included the subject site, the current Spy Hill Correctional Facility land, and the current City of Calgary sanitary landfill operation.

Economic development studies in the late 1970's identified a need for expanding research-based activities within the Province and within Calgary in particular.<sup>1</sup> In response, the Calgary Research and Development Authority (CRDA) was formed in 1981 through legislation enacted by the Provincial legislature comprised of membership from the City of Calgary, the University of Calgary, and the Calgary Chamber of Commerce. The CRDA entered into an agreement with the Province to lease the subject lands for phased development of a Research and Development Park. The proposed Research and Development Park was to include high technology research industries and related manufacturing. The land was annexed to the City of Calgary effective July 1982 and the Calgary Research and Development Park Area Structure Plan was approved by the City in April 1983.<sup>2</sup>

The Province entered into a number of leases with the University of Calgary for interim use of the land that are still in effect today.

Between 1982 and 2001 the subject site was held by the Province for CRDA's proposed research park. In 2001 Calgary Technologies Inc (formerly CRDA) informed Alberta Infrastructure that it is no longer planning to construct a Research and Development Park on the Spy Hill property.

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<sup>1</sup> Annexation Submission, Calgary Research and Development Park. Prepared by CEP Consultants for the Calgary Research and Development Authority, June 1982.

<sup>2</sup> Calgary Research and Development Park Area Structure Plan. Prepared by the City of Calgary Planning Department, Approved by City Council April 1983.

## **2.0 EXISTING SITE CONDITIONS**

### **2.1 Land Use**

#### **2.1.1 The Former Bow River Correctional Centre**

The former Bow River Correctional Centre facility contains a single-storey institutional building originally built in 1981 to accommodate young offenders. This function was transferred to the new Young Offenders Centre on the east side of 85<sup>th</sup> Street in 1988. From 1989 to 2001 the building served as a minimum security facility. This building has been vacant since 2001. It is located on a leasehold area of approximately 80 acres at the southeast corner of the subject site. The leasehold site is designated "PS – Public Service District" under the City of Calgary Land Use Bylaw.

Alberta Infrastructure has been working with the Alberta Mental Health Board (AMHB) on the feasibility of converting the existing building to accommodate a Southern Alberta Forensic Psychiatry Centre. This proposal is currently delayed as the AMHB is being encompassed under the jurisdiction of the Calgary Health Region by the spring of 2003.

#### **2.1.2 The University of Calgary**

The University of Calgary currently leases the majority of the subject site for operations associated with the University's Agricultural Research Centre. The primary activity is animal research. Other activities, as approved by Alberta Infrastructure, include aquatic research, ecological research, and support of any university teaching and research activities that require large areas of land. Long term storage is also accommodated in quonset barns located on the property. The University places a high value on this property since it provides lands that support university programs within a reasonable ½ hour commuting distance from the main campus.

The main activities and built facilities of the University Research Centre occur on a 120 acre lease area located in the east half of Section 28 (See Map 3). The Province of Alberta has committed to extending this lease through to the year 2042. On the basis of this lease commitment the University is currently building a new 80,000 sq. ft. animal research centre. Once completed the existing research centre building will be used for storage.

The University of Calgary currently leases the remaining lands within Section 28 and all of Section 33. These leases are set to expire in 2005 and 2006. The

Province has committed to consider additional lease renewals for an additional 120 to 180 acres for the University's ongoing research and cattle grazing requirements. The location of the additional 120 to 180 acres is yet to be defined and is contingent on "rotation" of the lands to accommodate gravel extraction.

### **2.1.3 The City of Calgary Top Hill Reservoir**

The City of Calgary's Top Hill Reservoir is located on the prominent "kame" or morainal knoll feature at the south end of Section 28. This 14.4 acre parcel is owned by the City of Calgary. A reservoir expansion project is currently under construction.

## **2.2 Site Context**

The subject site is located in the extreme northwest corner of the City of Calgary. Full urban servicing and urban development has not yet occurred in this area. The area contains a number of aggregate operations and land-extensive institutional uses. Future urban development in this area is expected to be business and industrial land uses.

Adjacent land uses are illustrated in Map 4. The City boundary is located to the immediate north and west of the subject property. Adjacent uses in the MD of Rocky View include rural residential subdivisions to the west, and the Burnco Spy Hill aggregate operation to the north. In the longer term future country residential infill development at higher density is anticipated within the existing country residential area.

### **2.2.1 East of 85<sup>th</sup> Street**

Existing land uses immediately east of the subject site include the Provincial Jail complex and the Lafarge Spy Hill Aggregate operation. The Provincial Jail complex is considered a permanent land use. Aggregate extraction at the Lafarge site is expected to last for about 40 years at current rates of extraction and could be depleted much sooner under expedited depletion assumptions described in Section 3.0 and Attachment "A" of this report. Ultimate land use for the Lafarge site is "industrial" as described in The Calgary Plan, Municipal Development Plan.

### **2.2.2 South of Subject Site**

Existing lands immediately south of the subject site are currently under development as part of the new City residential community of Royal Oak. Land use approvals are in place for a future sector shopping centre at the corner of 85<sup>th</sup> Street and Country Hills Boulevard. Development of the shopping centre

and residential development along the south boundary of the subject site are expected to occur during 2003 and 2004.

### **2.2.3 West of 101<sup>st</sup> Street**

Lands west of 101<sup>st</sup> Street are located in the MD of Rocky View and are subdivided for rural residential lots and a single commercial business, the Butterfield Acres Farm. Residential lots range in size from 2 to 40 acres. The majority of lots are 10-20 acres in size although infill subdivision for lots as small as 2 acres has occurred in recent years. Development trends in this area indicate the future and permanent use of these lands will be a rural acreage community.

### **2.2.4 North of 144<sup>th</sup> Avenue**

The Burnco Spy Hill Aggregate Operation is currently located directly north of the subject site. Aggregate extraction at the Burnco site is expected to last for 30 years at current rates of extraction or could be depleted sooner under expedited depletion assumptions described in Section 3.0 and Attachment "A" of this report. The ultimate land use for the Burnco site has not been designated but is assumed to be agricultural or country residential under the jurisdiction of the MD of Rocky View.

### **2.2.5 Future Land Use Policy**

The Calgary Research and Development Park Area Structure Plan<sup>3</sup> was approved by the City of Calgary in 1982 to accommodate future development of a research and development park under the auspices of the Calgary Research and Development Authority (CRDA). The CRDA was established by the Alberta Legislature and included board members appointed by the City of Calgary, the University of Calgary, and the Calgary Chamber of Commerce. With the demise of the Authority and any associated development intentions, the existing Area Structure Plan is now out of date. A new Spy Hill area plan is scheduled to be prepared by the City of Calgary in 2003.

Current City policy for the subject site envisions future development of the site for urban "Industrial" land uses<sup>4</sup>. In addition, City policy supports development of future "Employment Area" in the south half of the property<sup>5</sup>.

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<sup>3</sup> Calgary Research and Development Park Area Structure Plan. Prepared by the City of Calgary Planning Department, Approved by City Council April 1983

<sup>4</sup> The Calgary Plan Municipal Development Plan. Adopted by City Council July 20, 1998. As shown in Figure 1: Future Conceptual Urban Structure, page 30.

<sup>5</sup> City of Calgary Employment Centres Strategy. Approved by City Council July 1999. As shown in map entitled Employment Centre/Areas by Type on page 11.

The subject site is located within the boundary of the MD of Rocky View/City of Calgary Intermunicipal Development Plan<sup>6</sup>. Under the policies of the IDP any development proposals for the subject site will be circulated to the MD of Rocky View for review and comments.

### **2.3 Environmental Features**

A biophysical/ecological inventory of the subject land has been prepared by Ursus Ecosystem Management Ltd.<sup>7</sup> Ursus' ecologists undertook a detailed site visit on September 26<sup>th</sup> 2002. All habitat types on the property were visited on foot. Notes concerning vegetation, topography, landforms, and wildlife habitat were taken at 59 sampling sites. Information included at these plots included vegetation association based on dominant shrubs and vascular plants; slope angle and aspect; and a subjective rating of grazing intensity. Photographs were taken of representative habitat types and land uses. All significant wildlife observations were noted. Photographs were obtained at most sites. All sites were mapped on a 1:10,000 scale color aerial photograph. Vegetation cover type classes were noted for selected photo signatures in order to facilitate mapping of habitat types.

Habitat types that currently exist on the Spy Hill lands are illustrated in Map 5 and listed in Table 1.

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<sup>6</sup> M.D. of Rocky View / City of Calgary Intermunicipal Development Plan. Approved by Rocky View Council on October 6, 1998 and by Calgary Council on October 5, 1998.

<sup>7</sup> Biophysical Impact Assessment, Ecological Component Baseline, Spy Hill Lands. Ursus Ecosystem Management Ltd. October 2002.

**Table 1:  
Habitat Types on the Provincial Spy Hill Lands**

Map Code	Habitat Type	Total Area	
		hectares	acres
AN	Anthropogenic	12.41	30.7
Aw	Aspen Forest	18.34	45.3
DG	Disturbed Grassland	295.17	729.4
GRV	Willow Groveland	90.18	222.8
LS	Low Shrub	20.71	51.2
NG	Native Grassland	34.1	84.3
Pb	Balsam Poplar	3.15	7.9
UTS	Upland Tall Shrub	35.4	87.5
W	Water	1.03	2.5
WG	Wet Graminoid	6.25	15.4
<b>Total</b>	<b>Habitat Area</b>	<b>516.74</b>	<b>1,276.8</b>

The following points provide a summary of the findings and conclusions from the Ursus report.

- a) Over half (59.5%) of the Spy Hill property has been significantly disturbed by human settlement and land clearing.
- b) The remaining native component of the property occurs in relatively large contiguous patches that have a high level of native ecological integrity.
- c) The large ravine that transects the northern section of the property is a regionally significant ecological feature that is uncommon in the Calgary area.
- d) The two most significant habitats on the property are tall willows maintained by low volume groundwater on the north slopes of the large ravine; and the willow-fescue groveland that occur in two relatively large patches in the eastern and northern portion of the property.
- e) The Bebb's Willow-Wild Raspberry-White Geranium community on the north-facing slope of the large ravine is identified by the Alberta Natural Heritage Information Centre as a regionally rare plant community, and has been reported in regional ecological inventories.
- f) The adjacency of a large tract of willow groveland south of the ravine adds to the ecological integrity of the ravine system.



- g) Twenty-six species at risk have potential to occur on the property. Fifteen of these species have habitat rated as highly-very highly suitable with native grassland the most important habitat from this perspective.
- h) The Spy Hill lands and surrounding area have already been degraded to a great extent due to fragmentation and the property's importance to wildlife movement is limited to the local scale. The property is likely important to local movement of wildlife but is not significant regionally.

## **2.4 Historical and Cultural Resources**

A Historical Resources Overview Report was prepared for the subject site in February 1982 by Lifeways of Canada Limited.<sup>8</sup> The study provided results from a reconnaissance level survey of Sections 28 and 33, file review and literature searches. The study observed seven locations containing evidence of prehistoric occupation. These included two possible buried campsites, four stone feature sites, and an isolated artifact find. These sites were all located in the south half of Section 28, with the exception of the isolated artifact find. On the basis of these observations and the general topography of the land, the Overview Report recommended a Historical Resources Impact Assessment be undertaken to assess the observed prehistoric sites, prepare tipi ring mapping, and recover basic ring distribution data and assess the value of the individual ring sites.

A Historical Resources Impact Assessment (HRIA) was undertaken for a portion of Section 28 in September 1982 by Lifeways of Canada Limited<sup>9</sup>. The study consisted of an HRIA level subsurface prospecting of sensitive areas in the vicinity of the large "kame" or hillside where the City water reservoir is located. This involved shovel testing, backhoe testing and the re-examination of known sites. A moderate number of shovel tests and 14 backhoe tests failed to yield cultural material or meaningful patterns of stone distribution. Re-examination of other stone features in the area resulted in negative or ambiguous findings.

Correspondence received from Alberta Community Development as part of this study states that "Previous research in the general area indicates a strong correlation between the hilltop ridge and the recovery of archaeological remains. The potential of development to impact historical resource sites is considered to be very high. On this basis staff of the Heritage Resource Management Branch has recommended that a Historical Resources Impact Assessment be required

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<sup>8</sup> Historical Resource Overview, Research Park Sections 28 and 33, Township 25, Range 2, Crowchild Sector, Northwest Calgary. Prepared for IBI Group by Lifeways of Canada Limited. February 1982.

<sup>9</sup> Historical Resources Impact Assessment, Calgary Research and Development Park (ASA Number 82-129). Prepared for CEP Consultants Ltd. by Lifeways of Canada Limited, September 30, 1982.

for this project....<sup>10</sup> Therefore, arrangements for additional HRIA work will need to be made to the satisfaction of Alberta Community Development prior to commencing gravel extraction operations on the subject site.

## **2.5 Road System**

### **2.5.1 Existing Roads and Traffic**

Map 6 illustrates the existing road system in the vicinity of the subject site. All roads bordering the site (i.e., 144<sup>th</sup> Ave., 85<sup>th</sup> Street, 101<sup>st</sup> Street) are located within the jurisdiction of the City of Calgary. Currently, these roads are constructed to a two-lane undivided rural road standard. The intersection of 85<sup>th</sup> Street with Country Hills Boulevard and 112<sup>th</sup> Avenue will be revised during 2003 to accommodate new development in the area. The intersection shown in Map 6 will be in place by fall of 2003 and will be built in conjunction with the new Royal Oak Shopping Centre.

Existing daily traffic volumes are illustrated in Map 6. Existing traffic volumes are derived from traffic counts undertaken by Finn Transportation Consultants at locations in the vicinity of the site on Tuesday October 8<sup>th</sup> 2002.

### **2.5.2 Future Roads and Traffic**

As indicated in the Calgary Research and Development Park Area Structure Plan<sup>11</sup>, access to the subject lands will ultimately include an extension of Country Hills Boulevard to 101<sup>st</sup> Street and a realigned 85<sup>th</sup> Street as shown in Map 7. The timing for construction or upgrading of the various access roads will be dependent upon the pace of development within and adjacent to the site, as well as the availability of capital funds.

Modeled traffic volumes for the key intersections in the vicinity of the subject lands have been obtained from the City of Calgary's Forecasting Division for the Year 2010 and Year 2020 planning horizons. These volumes, expressed in terms of average vehicle trips per day, are shown in Map 7. These City forecasts have assumed the realignment of 85<sup>th</sup> Street will be in place by the Year 2010 scenario. One implication of the proposed aggregate extraction operation is that this new 85<sup>th</sup> Street alignment may not be in place for a number of years beyond 2010. As such, the City Forecasting Division would need to revisit Year 2010 traffic volumes to remove the assumed realignment of 85<sup>th</sup> Street.

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<sup>10</sup> Correspondence dated October 4, 2002 to Ron Wrigley, Brown and Associates Planning Group from Mark Rasmussen, ADM, Cultural Facilities and Historic Resources Division.

<sup>11</sup> Calgary Research and Development Park Area Structure Plan, The City of Calgary, Planning Department, April 1983.

### **2.5.3 Existing Aggregate Truck Traffic**

Finn Transportation Consultants carried out a cordon survey on Wednesday October 9, 2002 to determine the characteristics of existing gravel-related traffic in the immediate area of the subject site (i.e., the existing Burnco, City of Calgary, Inland, Lafarge and Volker Stevin operations). Key findings from this one-day, peak season count include the following:

- The five existing aggregate operations generated 321 trucks in the a.m. peak hour and 268 trucks in the p.m. peak hour;
- Total aggregate vehicles consisted of 85% aggregate trucks, approximately 10% asphalt trucks, and 5% concrete trucks;
- Based on the one-day, peak hour counts and assuming a typical distribution of aggregate trucks throughout the day, it is estimated that the five existing operations generated 5,200 trucks per day (2,600 inbound and 2,600 outbound) during the 2002 peak fall construction season.

## **2.6 Utility Servicing**

### **2.6.1 Existing Sanitary Sewer**

There is an existing 300 mm (private) sanitary sewer located in a utility right of way on the east side of 85<sup>th</sup> Street. This sewer extends from a private lift station, located at the north entrance to the correctional institute, to approximately 820 m north of the entrance. Sewage draining to the lift station is pumped south to 112<sup>th</sup> Avenue, through a 250 mm (private) force main into the City's 375 mm, 85<sup>th</sup> Street sanitary trunk sewer. The private sewer serves the University of Calgary's Experimental Farm, the Bow River Correctional Centre, and the Provincial Correctional Institute.

The existing provincial facilities are connected to the City's 85<sup>th</sup> Street trunk sewer by virtue of a private development agreement that was entered into with the City prior to annexation of these lands to the City. The capacity of the 85<sup>th</sup> Street trunk system to accommodate additional development from the provincial lands warrants further evaluation to determine the specific capability of this system to accommodate future urban development of the subject lands.

### **2.6.2 Future Sanitary and Stormwater Servicing**

Existing servicing concepts for the subject land are based on existing surface grades and existing drainage patterns (rather than post-gravel extraction grades and drainage patterns). These existing servicing concepts are illustrated in Map 8.

A portion of the SW ¼ of Section 28 can be serviced by extending sanitary and storm sewers from the adjacent Royal Oak subdivision south of 112<sup>th</sup> Avenue. These connections will be available during the next few years. Therefore, from a servicing perspective these lands would be developable in the short-term future (i.e., 0 to 5 years).

The majority of the remaining lands in Section 28 would be serviced by sanitary and storm sewers that will be extended from the east. These lands drain east across Section 27 (Provincial Jail and Inland Aggregates operation on City-owned land) into a ravine located in Section 35. The ravine crosses the Volker Stevin gravel pit (SW ¼ Section 35). Trunk sewers will be extended from the Symons Valley residential area east of the City's Spy Hill sanitary landfill site. These trunk sewers will need to be extended through properties east of the subject lands, such as the Provincial Jail land and the Inland Aggregates operation to connect to the storm trunks east of the current Volker Stevin aggregate operation. Therefore, from a servicing perspective these lands could be developable in the medium term future (i.e., 5 to 20 years).

Section 33 and an adjoining portion of Section 28 would be serviced by extending sanitary and storm trunk sewers from the northeast through the ravine system that crosses 85<sup>th</sup> Street and the northwest corner of the Lafarge property. The ravine, part of the Nose Creek drainage basin, extends from Beddington Creek across lands north of the City into the Lafarge gravel pit in Section 34, where the ravine crosses the Lafarge property into Section 33. Although this servicing scheme is described in the Research and Development Park Area Structure Plan, it is not clear that this particular sanitary trunk connection will ever be available since this particular drainage basin extends into the MD of Rocky View well north of existing City of Calgary limits.

### **2.6.3 Post Gravel-Extraction Servicing Concept**

In order to support ultimate (post gravel extraction) urban development of Section 33 and the north half of Section 28 within a reasonable timeframe, it will be necessary to connect to a future sanitary trunk sewer to be extended from the Lafarge and Volker Stevin properties to the east (see Map 9 – Ultimate Servicing Concept – Post Gravel Extraction). There are a number of potential routings to make this connection, however a routing through the adjacent reclaimed aggregate operations of Lafarge and Volker Stevin would be most direct. Given the approved final grading plans for the Lafarge property and the Volker Stevin property, much if not all of this sanitary trunk routing could drain by gravity. However, it is likely that a sanitary lift station would be required to connect from the low point on the subject lands to a point on the Lafarge property approximately 500 metres east of 85<sup>th</sup> Street.

Under the above-noted sanitary servicing concept, stormwater drainage would be released at pre-development rates of flow from a sedimentation pond located at the reclaimed low point on the Provincial land. Drainage would then proceed to the natural ravine system located on the Lafarge property to the east and into the natural West Nose Creek drainage system north of the City of Calgary.

Non-mined lands in the south half of Section 28 could continue to be serviced by connecting to a future trunk system extended from the Provincial Jail lands to the east. Alternatively, if the need for servicing these lands is delayed, or where the required connections are not readily available, the South half of Section 28 could be graded to drain toward the proposed Lift Station serving the excavated areas in Section 33 and north half of Section 28.

#### **2.6.4 Water**

The existing Top Hill water reservoir located in the SW ¼ of Section 28 has sufficient storage capacity to supply future development in Sections 28 and 33. With existing pre-excavation grades the Provincial lands contain two water pressure zones; the Top Hill water pressure zone and the Research Park water pressure zone.

Gravel extraction on the property will place the reclaimed gravel mining areas into the lower Top Hill water pressure zone. This benefits future development since all of these previously mined areas will have good water pressure.

After gravel extraction operations, only the SW quarter of Section 28 will remain in the lower Research Park water pressure zone. Although water service will continue to be satisfactory for urban development, pressure will be lower and may limit the number of water intensive industrial/commercial users in this quarter section.

#### **2.6.5 Shallow Utilities**

Atco Gas mains exist along the west side of 85<sup>th</sup> Street and the south side of 144<sup>th</sup> Avenue in rights-of-way within the subject property. Telus does not have any facilities within the subject area

#### **2.6.6 Power Transmission Line**

A 240 KV transmission line traverses the subject land from east to west within a 50 metre easement registered along the north edge of Section 28. The transmission line is owned by Alta Link, a private company that has taken over some former TransAlta Utilities transmission lines.

Where future gravel extraction is planned to occur on both sides of the transmission line, the feasibility of relocating or lowering the power line will need to be considered in order to allow for continuous extraction operations and an

efficient final grade plan for urban development. There are six existing transmission towers on the subject lands. Discussions with Alta Link engineers indicated that the cost to relocate, replace, or lower the towers would be in the range of \$250,000 per tower. In order to lower the towers, new towers would have to be constructed next to the existing towers and new lines strung. After the new line is in operation the old line would be abandoned and dismantled.

The cost of replacing/relocating the towers to the reclaimed pit bottom will be recovered by the value of additional gravel recovery, additional reclaimed development land, and more efficient urban development servicing. During gravel operations, extraction could occur on both sides of the existing transmission lines until such time as relocation or upgrading of the line is required for urban development or for upgrading by Alta Link. It may be appropriate to delay relocation/lowering of the lines until post-extraction urban development is imminent or the existing lines have been depreciated to a point where the relocation/lowering cost can be offset by Alta-Link.

## **2.7 Existing Land Use Policies**

This section identifies the existing land use policies that will be relevant to extraction of aggregates and future land use of the subject lands. In recent years, both provincial and municipal policies have recognized the need to consider non-renewable natural resources in the land planning process.

### **2.7.1 The Province of Alberta Land Use Policies**

The Province of Alberta Land Use Policies have been adopted pursuant to the Municipal Government Act (O.C. 522/96). Section 6.2 contains the following Non-Renewable Natural Resource policies.

- 1 Municipalities are encouraged to identify, in consultation with the appropriate provincial land management agency and the Alberta Geological Survey, areas where the extraction of surface materials (e.g., sand and gravel) should be a primary land use.*
- 2 Municipalities are encouraged to identify, in consultation with Alberta Energy, areas where the extraction of mineral resources should be a primary land use.*
- 3 Municipalities are encouraged to direct subdivision and development activity so as not to constrain or conflict with non-renewable resource development, particularly with respect to the areas identified in accordance with policies #1 and #2.*
- 4 In addressing resource development municipalities are expected to, within the scope of their jurisdiction, utilize mitigative measures to minimize possible negative impacts on surrounding areas and land uses.*

### **2.7.2 Rocky View / Calgary Intermunicipal Development Plan**

The City of Calgary and the MD of Rocky View adopted an Intermunicipal Development Plan (IDP) in February 1998. The IDP identifies the gravel deposits in the Spy Hill area of northwest Calgary as development constraints. Policies contained within the IDP support continued extraction of gravel from existing gravel pit operations subject to appropriate approvals and impact mitigation. Policy 2.5.4.1 deals with new gravel operations as follows,

*“When reviewing applications for new sand and gravel operations, each municipality will give due consideration to:*

- a) The possible impacts that approval of such applications may have on existing uses in the vicinity;*
- b) Comments received from the adjacent municipality; and*
- c) Comments received from Alberta Environmental Protection with respect to conservation and reclamation, release of substance or waste management activities.”*

### **2.7.3 The Calgary Plan Municipal Development Plan (July 1998)**

The Calgary Plan identifies sand and gravel deposits on a map entitled “Natural Extractive Resources” (page 29 of the Calgary Plan). Policy 2 -1.5 (d) is relevant for new gravel operation proposals.

*“Encourage the protection of resource extraction through the early identification of areas where extraction should be the primary land use and through the development of appropriate measures to mitigate any safety or nuisance factors associated with retrieval of the resource”.*

Figure 1 of the Calgary Plan identifies the subject lands as appropriate for future, urban “Industrial” land uses (see page 30 of the Calgary Plan).

### **2.7.4 The City of Calgary Employment Centres Strategy July (1999)**

The Employment Centres Strategy, approved by Council in 1999, recommends future development of an “Employment Area” on the subject land. An Employment Area would “accommodate business activity that prefers a more land extensive but quality environment such as business/office parks in a campus-like setting or “flex” uses comprising substantial office with clean manufacturing. These areas tend to be auto-oriented with no residential use and limited retail”.

### **3.0 PRELIMINARY AGGREGATE CONSIDERATIONS**

This section of the report sets out research findings that will ultimately be incorporated into the design of an aggregate operation on the subject land. These findings include:

- Identification of a generalized proposed mining site area and the estimated quantity of recoverable aggregates associated with the generalized site area (not the final proposed mining boundaries);
- The potential role of this aggregate deposit in terms of the aggregate market in the Calgary region;
- The general operating issues and standards that have been established for previous aggregate operations in the Spy Hill area and likely to be associated with any new operation on the subject land.

#### **3.1 Mining Area and Aggregate Quantity**

The proposed mining area will include the majority of Section 33 and the north half of Section 28. Aggregate recovery from the south half of Section 28 will not be feasible due to the number of permanent structures in this half section, as well as a 40 year lease to the University of Calgary. These existing structures include the University of Calgary Animal Research Building, the former Bow River Correctional Facility building, and the City of Calgary Top Hill water reservoir.

Based on data taken from on-site drill testing and preliminary assumptions about setback areas, the proposed mining area encompasses a gross area of six quarter sections or 960 acres and contains approximately 130 million tonnes of good quality recoverable aggregates. Note that actual quantities of recoverable aggregates may be somewhat less than 130 million tonnes depending on final pit operating areas, setback distances, etc.

The depth of overburden within the proposed mining area varies between 9.9 metres and 14.6 metres, with an average 13.2 metres of overburden. The depth of gravel extends an additional 16.1 to 22.7 metres below the overburden. The average depth of gravel is approximately 19.3 metres. The gravel to overburden ratio on the property ranges from 1.16:1 to 1.82:1, with an average of 1.46:1.

Extraction operations on the site will be quite deep, averaging 32 metres deep at the bottom of the gravel. Operations will need to stockpile, or strip and place an average of 13 metres of overburden. These numbers are similar to other operations in the Spy Hill area. A final grading plan and reclamation phasing



plan will be useful to minimize the expense of “double-handling” overburden during extraction and reclamation operations.

## **3.2 Supply and Demand for Spy Hill Aggregates**

### **3.2.1 Alberta Transportation’s Aggregate Requirements**

Alberta Transportation has indicated that it will require up to 45 million tonnes of aggregates that could logically be acquired from the Spy Hill site for public road rehabilitation and construction projects during the next 50 years.

Annual highway rehabilitation projects will require up to 700,000 tonnes of aggregate per year. In addition, Calgary ring road construction projects will create a high demand for aggregates during years when these ring roads are being built. Attachment A provides further details regarding Alberta Transportation’s estimated aggregate requirements for public roadway projects during the next 50 years.

### **3.2.2 Role of the Subject Site in the Regional Aggregate Market**

Aggregates are a non-renewable natural resource that can be found only in locations where they have been deposited by nature. Aggregates are essential for development of the infrastructure on which our communities depend, including roadways, bridges, utilities, sidewalks, foundations and buildings.

The supply of gravel in existing approved pits in the greater Calgary area is estimated to be about 170 million tonnes (2002). Map 10 and Attachment A provide further details of this inventory. This existing, approved supply is far short of long term requirements. Demand for aggregates in the Calgary region can be expected to average 9.5 million tonnes per year, totaling 710 million tonnes during the next 50 years.

Finding new supplies of gravel to meet the long term supply gap is becoming increasingly difficult and expensive. The ability of the industry to find, and obtain approvals to operate, significant new aggregate supplies is uncertain. As existing supplies of gravel become depleted, and as nearby supplies become scarce, the cost of infrastructure development for all residents and taxpayers will increase, due to increased transportation costs. It is in the public interest to ensure that known aggregate supplies are recovered and used for infrastructure projects wherever possible.

### **3.2.3 Depletion Timeframe for the Subject Site**

The aggregate deposit that exists in the northwest Calgary area is the largest aggregate deposit in the vicinity of the City. Existing Spy Hill area aggregate

operations are estimated to contain about 100 million tonnes of aggregates, or 60% of the current regional supply (see Attachment A for details). Without any additional new reserves, existing regional supplies of aggregates could be depleted prior to the year 2020.

The proposed extraction area at the Provincial Spy Hill subject site provides additional aggregate reserves of approximately 130 million tonnes. This is a very significant addition to the existing regional and Spy Hill supplies and may represent the only remaining recoverable deposit of aggregate of this size and quality within the region.

Additional supplies of gravel will be found by the industry and brought on stream to serve regional needs. The timeframe to depletion of the existing Spy Hill area gravel operations and the proposed Provincial Spy Hill deposit will vary depending on the amount of new supplies that are found and the dynamics of local markets. Three demand scenarios have been modeled as part of this study. These scenarios are described in Attachment A. Based on the most likely scenario (modest additional supplies found in the north Calgary region and controlled sales of aggregates from the Spy Hill site to the general market) the life of the Provincial Spy Hill gravel deposit of 130 million tonnes could last to about 2040 with additional holdback of supplies for Alberta Transportation's public roadway projects for up to 50 years (2052). Longer depletion timeframes would be associated with any option where less gravel was sold to local industry and the general public.

### **3.3 Approval Process**

Operating, development and reclamation requirements for new aggregate operations are typically established through municipal and provincial approval processes. Municipal requirements are stipulated through land use redesignation and development permit approval processes established under the Municipal Government Act. Alberta Environment is the Provincial approval authority for sand and gravel operations. Alberta Environment issues Conservation and Reclamation Approvals under the Environmental Protection and Enhancement Act.

A private proposal to develop a new aggregate operation in the Spy Hill area would be required to undergo a thorough review process and obtain a number of approvals from the City of Calgary. These include:

- Amendment of the outdated Calgary Research and Development Area Structure Plan;
- Land Use Bylaw amendment or redesignation (rezoning);
- Development Permit;

- Gravel Mining Agreement and Deferred Services Agreement.

Under Section 14 of the Interpretation Act, the Municipal Government Act is not binding on Her Majesty. Thus, where the Province is undertaking a development, it is not required to obtain municipal subdivision or development approvals. Where the Province has leased or transferred title to another party, however, that party generally is expected to comply with the requirements of the Act.<sup>12</sup> unless conditions of the lease specify otherwise for clarity of intent.

Alberta Transportation's Spy Hill aggregate operations will require Conservation and Reclamation approval from Alberta Environment under the Environmental Enhancement and Protection Act. This approval process includes public notification, opportunities for public and stakeholder input, and opportunities for appeal of a decision.

### **3.4 Typical Development Standards**

Alberta Transportation intends to extract aggregate at the Spy Hill site in a manner that is consistent with other aggregate operations in the area and appropriate for the location. This section outlines the operating requirements and standards that have typically been applied to existing private aggregate operations in the Spy Hill area during recent years. Alberta Transportation's aggregate operation will be expected to meet similar standards wherever possible given the scope of operations required to supply public infrastructure projects. Specific measures to meet these requirements will be built into operating and development plans for the proposed extraction operation.

- |  |   |
|--|---|
| a) Extraction Phasing Plan, Operations Plan and Reclamation Plan | Plans describing mining area setbacks, depth of extraction, phasing of extraction operations, interim storage of black and brown soil profiles, erosion and sediment control measures during the operations, and final grading and planting materials for reclamation of the site. These plans provide the basic information required for provincial and municipal approvals. |
| b) Asphalt and Concrete Plants                                   | The City of Calgary reviews plants individually on a site-specific basis. Typically, plants are setback from the property line to minimize the visual exposure from   |

<sup>12</sup> The Legislative Framework for Municipal Planning, Subdivision, and Development Control. Alberta Municipal Affairs, Updated March 2002. page 6.

public roads. The operating area at the base of these plants should be visually screened from nearby public roads and adjacent lands. Issues related to air quality and plant emissions are dealt with under Alberta Environmental Protection and Enhancement Act (AEPEA) Clean Air standards and Provincial requirements.

c) Traffic Impact Analysis (TIA) and Driveway Intersection Improvements

The City requires safe access conditions onto public roadways as part of the development approval process. A Traffic Impact Analysis is required to demonstrate the level of traffic anticipated from the proposed operation and the anticipated impact of this traffic on the road system. Driveway locations must meet roadway engineering standards for site distance, spacing, and geometry. Provision of an upgraded intersection by the aggregate operator is common where necessary due to proposed truck volume and existing traffic volumes on the road. Most aggregate operators in the Spy Hill area have provided improved intersections that incorporate dedicated acceleration and deceleration lanes for gravel trucks.

d) Public Road Improvement Fund

Although not part of a municipal or provincial approval requirement, existing operators in the Spy Hill area have voluntarily contributed to a special agreement fund to upgrade truck route roads throughout the northwest Calgary area. This cooperative endeavour was intended to resolve truck network issues in the area. In addition to the voluntary City of Calgary fund, Burnco contributes extra funds toward MD road improvements and general public works.

e) Final Grading for Urban Development

The City of Calgary requires that aggregate operations provide a final grade plan that will support urban servicing for the ultimate (post-extraction and reclamation) urban land use. This has included engineering studies to show that the final grades can be connected to the City's storm and sanitary sewer

systems. In many cases, the final grade plan can change the drainage pattern of the land significantly from the pre-extraction grades.

- f) Final Planting and Reclamation Plan
- The City of Calgary Parks Department is responsible for planning and maintaining a network of recreational and natural open spaces throughout the City. The Department typically protects ravines and vegetation associated with ravines through the Environmental Reserve provisions of the Municipal Government Act. The Department recognizes that protection of a ravine is not possible where gravel extraction occurs to significant depths on both sides of the natural ravine. Therefore, where gravel extraction would remove the functionality of a ravine, the Department requires an inventory of existing vegetation associated with the ravine and a Planting and Reclamation Plan that demonstrates how the natural values associated with the ravine can be replaced as part of the Reclamation Plan for the aggregate operation. Typically these plans have shown replanting of natural vegetation onto new engineered drainage courses built into the final grading and servicing plans for the gravel operation.
- g) Noise
- All operations approved in the City of Calgary must comply with City of Calgary Noise Bylaw requirements. The Noise Bylaw requirements specify maximum permissible noise levels as measured in daytime and nighttime periods within industrial and residential areas.
- h) Gravel Mining Agreement
- The Gravel Mining Agreement (GMA) is registered by the City as a caveat against the Certificate of Title for the lands that accommodate a gravel operation. The Agreement requires a letter of credit be maintained in favour of the City against reclamation obligations over and above the basic Provincial Conservation and Reclamation approval letter of credit and reclamation obligations. The GMA also allows the City's Manager of Urban Development to stop

operations should certain objectionable conditions occur with regard to dust, stormwater, etc.

- i) Deferred Services Agreement

The Deferred Services Agreement or DSA is registered by the City as a caveat against the Certificate of Title for the lands that accommodate a gravel operation. The DSA acknowledges that the aggregate operation has been approved without provision of normal urban services such as water and sewer lines, urban roads, curbs, gutter, street lighting, etc. The DSA acknowledges that the City may call on the owner to pay for such services in the future as required by the Manager of Urban Development. DSA obligations are normally only incurred at the time the landowner makes future application for development that requires such services.
  
- j) Hours of Operation

Spy Hill aggregate operations located within the City of Calgary are not subject to any restrictions on hours of operation. The Burnco operation, immediately north of the Provincial Spy Hill site, was originally restricted to 7am to 7pm, 5 days per week for sales of aggregates, and 6:30am to 6:30 pm, 5 days per week for crushing. Recently the MD has relaxed these rules based on demonstrated operations, to allow aggregate sales from 7 am to 5 pm on Saturday and crushing from 6:30 am to 11 pm Monday through Friday only.
  
- k) Visually Screening from Public Roads

Where possible use of an earth berm to screen operations from adjacent public roadways has been incorporated into recent aggregate operations such as the Inland Spy Hill and the Burnco Spy Hill operations. These berms are most useful where adjacent roads are at the same elevation as the majority of the aggregate site. Berms are also often used to screen views of the operations from adjacent land uses.

- l) Setback From Property Lines and Municipal Roadways

Extraction area setbacks from property lines have been as low as 0 to 5 metres in recent approvals where no concern regarding compatibility with adjacent land uses or where extraction through the interface between aggregate operations is anticipated. Setbacks are typically greater adjacent to public roadways. For example, the new Inland aggregate operation provides a planted berm within a setback distance of 30 metres from the 112th Avenue property line. The Burnco operation provides a minimum 60 metre bermed and landscaped setback between the 144<sup>th</sup> Avenue (Burma Road) property line and any extraction or processing operations.
  
- m) The Calgary Truck Registry System

This system allows the public to report any incidents of improper aggregate truck driver behaviour and provides a mechanism for follow-up and monitoring of all complaints. All existing aggregate operators in the Spy Hill area are participating members in this system.
  
- n) Dust Emissions

Dust emissions have traditionally been controlled wherever necessary in the opinion of the operator. Through terms of the Gravel Mining Agreement, the City of Calgary can initiate enforcement actions in response to complaints and/or where warranted in the opinion of the Manager of Urban Development.

In recent approval processes for aggregate operations, including the Inland Spy Hill operation in the City, and the Burnco operation in the MD of Rocky View, operators have prepared dust emission and mitigation studies in response to increasing public concern in this area. Both operators have worked closely with the Calgary Health Region to identify potential dust emissions and effectively mitigate against any associated nuisance and/or health risks.

## **4.0 STAKEHOLDER CONSULTATION**

Consultations have been undertaken with various stakeholder groups to identify issues, concerns and opportunities associated with opening the Provincial Spy Hill site for aggregate production. This section of the report summarizes the key themes arising from each stakeholder group contacted during the Phase 1 stakeholder consultation. The key stakeholder groups contacted include representatives from each of the following:

- Existing Spy Hill aggregate operators;
- Major commercial consumers of aggregates (paving and road building companies);
- The City of Calgary;
- The University of Calgary;
- The MD of Rocky View;
- Landowners and residents in the adjacent communities of Rocky Ridge/Royal Oak and Bearspaw.

### **4.1 Existing Spy Hill Aggregate Operators**

Concerns expressed by existing aggregate operators in the Spy Hill area included the following.

- The gravel at the Spy Hill site is valuable and should be taken out prior to surface development.
- The Province and the City should support extraction as being important for the regional economy and design the operation to be as compatible as possible with adjacent land uses.
- The aggregates at the Provincial Spy Hill site should be recovered under conditions where a “level-playing field is maintained for existing private operators.
- The rights to extract, process and sell gravel for the “general market” (beyond AT needs) should be made available in a fair tender process that will maintain a level-playing field with private operators.
- A new operation should not be allowed to lower standards or use unique government advantages to undercut the pricing and market share of the existing private producers.

### **4.2 Commercial Aggregate Consumers**

Interviews with major commercial aggregate consumers (e.g., paving and road building/maintenance companies) identified the following key concerns.



- A non-renewable aggregate resource of this quality and extent should be used to the fullest extent possible. It is harder today for small operators to find gravel supplies and get approvals to operate a gravel pit.
- The Province should ensure the gravel will be available to all highway maintenance and paving contractors. Mobile paving contractors often work for Alberta Transportation as their main customer. These contractors need access to resources at a set price.
- A single, full-time operator/manager will be required for this urban location. An aggregate operation in the City needs a large operator to invest in up-front costs, and capture a large enough market to ensure a well-managed, high quality operation similar to existing operations in the Spy Hills area.

Among the aggregate consumers interviewed, there was a split in opinion about whether additional competition in the aggregate supply industry would be desirable. Some commercial gravel consumers felt strongly that more competition in the aggregate supply industry would help to stabilize price. Other consumers believed equally strongly that existing Spy Hill operators maintain very high quality, competitive operations that are fair to contractors and consumers.

### **4.3 The City of Calgary**

The City of Calgary has a 20 year supply of gravel remaining at their Spy Hill site on 112<sup>th</sup> Avenue – the City's only permanent gravel supply site. Calgary Roads staff indicated a preference to have a 50-year supply of gravel. They felt it would be wise to use the gravel at the Provincial Spy Hill site in order to avoid the situation in the Edmonton area where gravel is trucked from sources located a long distance from the City.

At a meeting held in June 2002 senior Provincial and City staff met to discuss development of the Spy Hills lands for gravel operations. At that meeting the City indicated that development of the gravel resource is important and will be supported in principle by the City. City staff also provided the following advice and requests:

- Development of the resource should allow the land to be reclaimed and used for surface development as soon as possible while providing for long-term servicing by standard methods after reclamation.
- Operations should be phased to allow for gravel extraction while releasing serviceable land for development to urban standards in a timely manner.

- A biophysical inventory and evaluation of existing natural resources should be prepared along with an assessment of the impact of the proposed extraction operation.
- The provision of truck access to mining operations and the adjacent road network should be addressed.
- Appropriate municipal Land Use Bylaw amendments and Development Permits should be obtained.

#### **4.4 The MD of Rocky View**

Staff at the MD of Rocky View provided the following preliminary advice.

- The MD of Rocky View is in the process of securing additional gravel supplies to satisfy its own road maintenance requirements. The MD is always interested in considering strategic supplies that are well-located relative to MD requirements.
- The Province should anticipate that nearby Rocky View residents will expect a high standard of operation, similar to those currently being met by Burnco Rock Products aggregate operation on 144<sup>th</sup> Avenue (Burma Road).

#### **4.5 The University of Calgary**

The University of Calgary's interests in the subject land and the proposed aggregate operation include the following:

- An interest in renewing leases on as much of the property as possible because access to extensive lands close to the main campus is valuable for university program support and research purposes.
- Prefer a long term commitment to the south two quarters but can co-exist with extraction operations on a rotational basis.
- Extraction operations on the site may provide additional research opportunities related to geology, mining engineering, reclamation science, etc.
- The specific configuration of the current 120 acre lease parcel could be modified where necessary to accommodate specific details of the aggregate operation or future roadway alignments.
- Where the "rotational" lease lands are separated from the 120 acre main parcel and research buildings, the University would require a corridor connection for moving animals and equipment.

#### **4.6 Nearby Landowners and Residents**

The Brown and Associates Planning Group/Russ Gerrish Consulting team hosted a public open house meeting at the Rocky Ridge Ranch Community Centre on Tuesday December 3<sup>rd</sup> 2002. In order to reach local landowners and residents, notice of the open house meeting was published in the Calgary Herald, the Calgary Sun, and the Rocky View Times on Thursday November 28<sup>th</sup>.

A total of 42 individuals and households signed the guest list at the open house. Guests included MD residents, City residents, and aggregate industry representatives. Comments received from the open house comment sheets and by letter are summarized below. These comments have subsequently been considered in finalizing the Concept Plan recommendations that are contained in this report.

##### Summary of Main Comments Submitted by Nearby Residents and Landowners

- Need perimeter berms with mixed deciduous and evergreen planting for noise, dust and visual mitigation
- Operation of noisy equipment should only occur during weekdays, similar to the Burnco operation
- Gravel trucks should not be allowed to use 101<sup>st</sup> Street
- Enclose the crusher for noise and dust control
- Information about this project needs to be delivered to each home within one mile of the site
- Information presented at the open house was very useful and informative
- Impact on nearby residential properties should be minimal where landscaped berms are used, and where dust abatement and noise abatement techniques are used
- Noise from the crusher needs to be mitigated more effectively than the crusher at one of the existing Spy Hill operations
- The open house should have been advertised more broadly in advance of the meeting
- Noise, dust and air quality concerns, particularly with the prospect of an asphalt plant
- The Alberta Government should provide a “model” operation for the entire aggregate industry
- Concerns regarding the impact of the operation on the quality and quantity of drinking water for homes in the area that are still on water wells
- Blasting should not be permitted

- The future traffic system should be re-examined to provide direct routing for trucks to the future Stoney Trail and reduce use of Country Hills Boulevard
- Ensure that grading and planning are consistent with the City of Calgary's plans for future development
- The standards applied to the Burnco operation should be the minimum standard for any new gravel pit
- Setback from 101<sup>st</sup> Street should be up to 500 feet and contain walking and bike paths as a separation from the existing residential area
- Place crusher at bottom of pit
- Water spray stockpiles as required
- Extract the gravel bordering 85<sup>th</sup> Street first
- AT should not be in the gravel business. AT should only extract gravel for its own needs and sell the remainder of the land
- Any berm along the west side of the gravel operation should be "serpentine", well-planted and located to protect existing treed areas at lower elevations
- The Province should upgrade two lanes of 101<sup>st</sup> Street (Rocky Ridge Road) as compensation to the residents using 101<sup>st</sup> Street
- No concrete or asphalt plants located near 101<sup>st</sup> Street (Rocky Ridge Road)
- A review of Alberta Transportation's changing role in providing access to gravel resource should be conducted with all stakeholders

## 5.0 OPERATING SCENARIOS

### 5.1 Introduction

This section of the report identifies an appropriate planned life expectancy for the Provincial Spy Hill aggregate deposit. An optimum life prior to depletion is recommended by considering factors such as other aggregate sources in the vicinity, future demand for aggregates and the acceptability of maintaining a long-term operating pit in this location as the City of Calgary expands. Based on supply and demand information presented in Section 3.0, it is clear that in order to deplete the aggregate resource within a reasonable timeframe the material will need to be used by local industry and the general public as well as government.

This section of the report also considers various scenarios for managing the extraction of aggregates to satisfy the Government's material requirements while ensuring that the Government is not perceived to be competing unfairly with other local suppliers in the sale of aggregates.

### 5.2 Private vs. Public Ownership

On balance, the consulting team is of the view that The Province of Alberta should maintain ownership of the subject lands until such time as the non-renewable aggregate resource is depleted. Where it becomes necessary to allow the use of gravel by the local industry and the general public (in order to accelerate the depletion timeframe to allow for permanent surface development) arrangements will need to be made (i.e., partnerships, royalty leases, etc.) that ensure the Government is not competing unfairly with local suppliers.

Maintaining ownership supports the following public objectives:

- Respect existing lease commitment to the University of Calgary;
- Respect the objectives of Alberta Justice in controlling the transition of land use adjacent to the Provincial Spy Hill Correctional Facilities on the east side of 85<sup>th</sup> Street;
- Ensure recovery and use of the non-renewable natural resource; an objective shared by all stakeholders. Provincial ownership will demonstrate the public interest in protecting the aggregate resource for use in the public and private infrastructure development process. If sold on the private market, it may be difficult to ensure recovery of all resources at the site prior to surface development.
- Ensure that operations are carried out in a manner compatible with the built-up context of the Spy Hill site;

- Ensure that the impact on existing private aggregate operators in the Spy Hill area can be minimized through phasing of operations so that a large quantity of competitive aggregates is not suddenly brought into the private market;
- Ensure that necessary operating approvals can be obtained in cases where local interests might otherwise prevent or delay issuance of the municipal approvals and permits required of a private landowner/operator;
- Providing flexibility to respond to possible future changes in provincial aggregate or public infrastructure requirements.

### **5.3 Operating Timeframes**

#### **5.3.1 Provincial Requirements Only**

Alberta Transportation has indicated a requirement for a maximum of 45 million tonnes of gravel from the subject site for provincial roadway rehabilitation and construction projects during the next 50 years.<sup>13</sup> At this rate of usage, the 130 million tonne supply of gravel at the subject site would supply Alberta Transportation requirements for a period in excess of 100 years.

#### **5.3.2 Expedited Timing to Accommodate Urban Development**

The main timing alternative to “Provincial needs only” as described above, is an “expedited depletion” approach that would aim to recover the gravel resources within a relatively “short” timeframe and would not unduly delay urban development of the lands. The consulting team believes that a period of 50 years would be an appropriate target timeframe for depletion of the aggregates within Section 33 and the north ½ of Section 28, while not unduly interfering with the urban development process for these lands.<sup>14</sup> Fifty years is recommended for the following reasons:

- Urban sanitary and storm trunk services for Section 33 and the north ½ of Section 28 may be extended to a point 2 miles east of the site in about 10-20 years but connecting the subject lands to these services would be very expensive until such time as intervening gravel operations are reclaimed

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<sup>13</sup> See Section 3.0 and Attachment 1 for details. Annual Provincial requirements for road rehabilitation are estimated at a maximum 700,000 tonnes per year. Occasionally, during particular years where ring road construction projects are underway, Provincial requirements are estimated to peak at just over 2 million tonnes (including annual regional rehabilitation).

<sup>14</sup> Note that fifty years is a long-term planning estimate. An actual depletion period within a 40 to 60 year window could still be considered to be well within the long-range land use planning timeframe for this project.

and sewer trunk mains are extended through these intervening properties. Timing for reclamation and development of these intervening properties can be expected to occur in 20 to 40 years under anticipated regional aggregate market conditions.

- Early phases of extraction are recommended to occur at the south end of the mining area in order to facilitate possible employment centre development prior to full depletion of the site. In other words, development could occur on the reclaimed area at the south end of the site, while gravel extraction continues on the north end of the site. It is likely that a strong market for employment centre uses could arise in about 20 years and the realignment of 85<sup>th</sup> Street would occur at the time of development. The absence of economical connections to sewer trunk mains may delay development of employment centre uses beyond 20 years.

Therefore, a 50 year timeframe, with initial phases of extraction at the south end of the mining area, would provide a relatively “short” timeframe for depletion of the resources, while not interfering with the urban development process. This approach would require a portion of the aggregate resources be used by local industry and the general public.

#### **5.4 Operating Scenarios**

Several basic operating scenarios were identified by the consulting team in consultation with Alberta Transportation and industry stakeholders. All the scenarios identified are not necessarily mutually exclusive. Components of some options could be incorporated into other options.

The basic operating scenarios assume that all gravel is to be extracted from the recommended mining area within a timeframe of approximately 40 to 60 years. This means that aggregates will be used by local industry and the general public as well as for Provincial requirements. The scenarios include the following:

1. Tender or Contract to Highest Bidder
2. Sale of Land with Special Aggregate Extraction Agreement
3. Contract with Specialized Management Company
4. Public/Private Partnership
5. Public Partnerships

See Attachment B for a description and evaluative comments for each operating scenario.

### **5.5 The Recommended Scenario: A “Single Pit” Operation with a Private Partner or Series of Contractors**

There is not a single operating scenario that effectively resolves the concerns of all public and private stakeholder groups. The consulting team’s recommended operating scenario is based on Scenario #4 – Public / Private Partnership and the following three considerations. Where the following considerations are not accepted or where these assumptions change through subsequent discussions with stakeholder groups, the ranking of recommended operating scenarios may also change.

- a) Multiple pit operations within the subject site are not desirable due to increased environmental impacts, operating costs and reclamation costs that would be associated with multiple pits. The unique circumstances of the Spy Hill property will require relatively sophisticated soil and operations management techniques that can most effectively be provided through experienced management of a single pit operation.
- b) It is desirable to recover all aggregates at the site within a time period of 40 to 60 years in order to accommodate urban development.
- c) The Province can tender or contract to the highest bidder in a manner that will allow a private partner or series of contractors to sell aggregates to the open market in a manner that is as fair and “level” as possible with the operating conditions of private companies. A maximum aggregate quota on sales to the open market during the early years of the operation could provide additional assurance for existing local operators.

Based on the three considerations noted above, it is recommended that Alberta Transportation take on a long-term private partner or series of shorter-term private contractors to:

- manage the day to day operating requirements, aggregate extraction and processing activities, and environmental requirements associated with the Spy Hill operation;
- provide access to aggregates for AT’s highway contractors and other requirements, and
- sell regulated quantities of gravel to the open market in order to ensure the resource is depleted in a timely manner prior to urban development.

This approach will allow the private partner to operate a high-standard aggregate operation, comparable to other private aggregate operations in the Spy Hill area. The operation would occur as a “single pit” operation to support comprehensive operations and high standards of environmental impact mitigation and reclamation. An additional benefit to Government would be the transfer of some



risk and cost to the private partner who would be responsible for on-site operations.

The “single pit” management approach could include the following recommended components:

- It will be important that the private partner/contractor opportunity be made available through a fair tender or “request for proposals” process. AT would issue a request for proposals to operate a Public/Private Partnership aggregate operation.
- A private partner should be able to demonstrate the ability to obtain bonding to operate a large-scale, high-quality aggregate operation comparable to recently approved operations in the Spy Hills area, and compatible with the surrounding built-up context of the site.
- Alberta Transportation would provide the land, the aggregate resources, all necessary government approvals, and oversee implementation of all approval obligations including sequential and final reclamation of the land.
- The private partner/contractor would be responsible for full-time day-to-day management of the aggregate operation including initial stripping, site preparations and ongoing sequential reclamation operations.
- The private partner would set aside an area within the “single pit” for Alberta Transportation’s highway contractor requirements. Alberta Transportation could be charged either a royalty rate price or a management fee price on a tonnage basis with the specific rate to be determined through the tender process. Alberta Transportation has the necessary expertise to determine the most appropriate internal financing mechanisms for charging AT contractors and compensating the private partner/operator for site services.
- The private partner would be permitted to access aggregate for the partner’s own needs and/or to sell to the general market. The private partner’s extraction face, operating area, processing facilities would be maintained separately from those of Alberta Transportation contractors. Alberta Transportation contractors and the private partner would maintain separate extraction areas, stockpiles and processing facilities but could share a common scale-house to be operated by the private partner.
- During any period of highway construction, Alberta Transportation could have two separate contractors operating within the processing area of the site. Allowance should be made for multiple asphalt plants on the site during these periods. Although this approach will require a larger processing area than a standard private operation, the environmental

advantages of a single pit with sequential and ongoing reclamation remain significant.

- The need for a concrete plant will depend on the business plan of the private partner selected for the Spy Hill operation. Although AT does not historically use concrete, there is some possible need for an AT concrete plant depending on future infrastructure project specifications. The quality and quantity of aggregates at the Provincial Spy Hill site suggests that plans should accommodate the possible addition of a concrete plant at the site. Any asphalt and concrete plants will be located near the east side of the site, maximizing the separation from residential areas.
- A private partner should be willing to commit to minimum annual extraction quantities in order to ensure that the resources of the site are depleted over a reasonable timeframe. The minimum quantity will be set at a level that will allow the north half of Section 28 to be ready for urban development in approximately 20 years, and the remainder of the site to be ready for urban development in approximately 30-40 years when trunk sewer connections are expected to be available. This minimum annual depletion requirement is not expected to be onerous and would not unduly impact the market share of existing operators in the Spy Hill area.
- Consideration should be given to stipulating a maximum quantity of aggregates for sale to the general market, especially during the early years of the operation. The maximum quantity quota would ensure a gradual market impact for existing operators in the area. The quota would also ensure that impact mitigation measures are effective prior to expansion of operations to greater annual depletion rates.
- Limiting the quantity of aggregates extracted during the early years of operation could be achieved by operating the site for Alberta Transportation's aggregate requirements only. This approach will allow Alberta Transportation to access its immediate needs in the near future, while addressing long-term issues associated with private partnership agreements and integration of mining plans with City of Calgary plans and urban development requirements.
- A long-term Public / Private Partnership agreement is recommended in order to implement a long term comprehensive plan for the Spy Hill site. However, if AT prefers to maximize future flexibility through use of a shorter-term contractor business arrangement (say 5 to 10 years) then AT will need to play a more continuous full-time role to ensure appropriate day-to-day management of the property throughout the life of the extraction and reclamation operation.

## **6.0 THE RECOMMENDED CONCEPT PLAN**

This section of the report describes the recommended Extraction Concept Plan and the End-Use Concept Plan for the Spy Hill site. This concept plan will provide a general basis for proceeding with further work on Conservation and Reclamation Approval plans.

### **6.1 Plan Objectives**

The recommended Concept Plan has been prepared in consideration of the following objectives.

- a) Use Spy Hill aggregate resources to maintain or reduce taxpayer-funded costs of highway construction and minimize the environmental costs of trucking aggregates from remote locations.
- b) Promote timely recovery of the aggregate resources at the Province's Spy Hill property.
- c) Ensure that operations are carried out in a manner compatible with the built-up land use context of the Spy Hill site. Impact mitigation measures similar to or better than those used for existing Spy Hill aggregate operations should be incorporated into the operation.
- d) Respect existing lease commitments with the University of Calgary.
- e) Respect stated objectives of Alberta Justice in controlling the transition of land use adjacent to the Provincial Spy Hill Correctional Facilities on the east side of 85<sup>th</sup> Street.
- f) Respect the spirit and intent of the Province of Alberta Land Use Policies to recover aggregate resource prior to surface development wherever impacts on adjacent land uses can be successfully mitigated.
- g) Ensure that the economic and market impact on existing Spy Hill aggregate producers is considered in tendering, operating, management, or other procedures for recovering the gravel resources at the subject site.
- h) Provide flexibility to start operations as early as 2003 for Alberta Transportation requirements in response to public infrastructure funding opportunities.
- i) Coordinate and cooperate with the City of Calgary and the MD of Rocky View to integrate aggregate operations with current and long-range municipal land use plans.

- j) Prepare a final reclamation grading and planting plan that replaces surface drainage features and associated vegetation that will be lost through mining operations.

## **6.2 Concept Plan Overview**

The recommended concept plan will recover approximately 130 million tonnes of gravel from 6 quarter sections over the next 40 years. This depletion timeframe assumes that Alberta Transportation and a Public / Private Joint Venture Partner will manage the operation and use gravel for public projects and for the general market.

The most southern two quarter sections (south half of Section 28) will not be included in the extraction operation. These sections contain a number of built facilities and a large morainal knoll that will make aggregate extraction uneconomical. These lands will provide a ½ mile buffer between the south limit of aggregate operations and the Rocky Ridge/Royal Oak residential community. These lands will also accommodate the University of Calgary lease.

Under the recommended concept plan, gravel operations would commence adjacent to 85<sup>th</sup> Street NW. All truck traffic will access 85<sup>th</sup> Street. During final phases of the operation at the north end of the site (20+ years), additional or alternate access to 144<sup>th</sup> Avenue (Burma Road) is likely to be required.

A 60 to 100 metre setback area including a 3 to 4 metre planted berm should be constructed along the west edge of the property adjacent to 101<sup>st</sup> Avenue. This setback area and landscaped berm should be constructed prior to, or simultaneous with commencement of extraction operations in order to define the operation, allow vegetation to establish and mature, and minimize the impact of construction on nearby residents. The setback strip and berm will be required to provide effective visual, dust and noise impact mitigation for the existing country residential area located on the west side of 101<sup>st</sup> Street. The berm should be planted with a mix of deciduous and evergreen trees. The berm should be designed to “meander” in a natural fashion within the 60 to 100 metre setback area where the broader setback areas will protect existing clusters of natural vegetation on the site. The berm and setback area should be planned as a permanent transitional landscape feature at the intermunicipal interface between the MD of Rocky View and the City of Calgary. This will allow the berm and associated landscaping to be retained in the future, if compatible with actual urban development plans at that time.

Extraction operations should generally proceed from south to north and from east to west. This will ensure that the south end of the property is depleted at an early date to allow for urban development consistent with ongoing University of

Calgary leasehold uses at the south end of the Provincial lands. The extraction face should not be visible when viewed from lands located west of the operation.

Facilities such as a scalehouse, an asphalt plant, and a possible concrete plant will be located close to the 85<sup>th</sup> driveway, visually screened from the public roadway, and separated from residential areas to the south and the west.

The first phase of operations will open up a working area immediately south of the existing power transmission line. The existing transmission line can remain in place while aggregate operations proceed to the south and ultimately to the north side of the power line. The power line will be relocated to the post gravel operation grade level and the gravel under the existing power line easement would be recovered at that time. Relocation of the transmission lines need not occur until such time as upgrading/replacement of the line is undertaken by Alta-Link; urban development occurs on the property; or as a final phase of aggregate operations on the full site.

The gravel operation will need to employ a range of impact mitigation techniques to effectively control noise to City of Calgary noise bylaw standards and to effectively prevent off-site dust emissions. A range of techniques including acoustical housing or blanket on all crushers and/or limited hours of operation will be in order to control noise to appropriate levels<sup>15</sup>. In order to meet appropriate impact mitigation standards it may be necessary to restrict aggregate processing functions including crushing, screening, stockpiling, and loading areas to the east half of Section 33 and the east half of Section 28. This will provide an 800 metre (1/2 mile) distance separation between processing areas and the country residential land uses located adjacent to the west boundary of the site.

Final grading of the aggregate operation will require careful placement of overburden and soil material to provide grades suitable for ultimate urban sewer services and overland drainage. A final grade plan provides for a low area adjacent to 85<sup>th</sup> Street across from the Lafarge aggregate operations and envisions future sewer connections to the east to link to the developing Symons Valley area.

### **6.3 Mining Area and Extraction Boundaries**

The proposed Extraction Concept Plan is illustrated in Map 12. The only portion of the two square mile Provincial Spy Hill property to be excluded from the

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<sup>15</sup> Conceptual noise analysis prepared by Patching Acoustical Consultants indicates that crushing operations should be able to occur within the east half of Section 28 or 33 and remain well within City Noise Bylaw requirements, even without acoustical enclosure or blanket. Consideration of noise control for crushing operations would allow additional flexibility for location and timing of crushing operations while also addressing noise levels below allowable bylaw levels.

aggregate activities is the south half of Section 28. This area of approximately 320 acres in total has been excluded from mining plan for the following reasons:

- Existing built facilities in this area include the new University of Calgary Agriculture Research Building, the former Bow River Correctional Institute building, and the City of Calgary Top Hill reservoir. Aggregate extraction between these facilities will not be economical or practical due to the depth of overburden, and the limited area of land to work backslopes between developed sites and buildings.
- The larger morainal knoll containing the Top Hill Reservoir contains regionally significant vegetation (i.e., native grassland, aspen forest, and upland tall shrub communities) while presenting an economic constraint to mining of any gravel that may exist beneath this feature. Extraction of gravel between the morainal knoll, the property boundaries, and adjacent built facilities to the east will not be practical due to the limited distances for backsloping and working areas. A reasonable transition area to the north of the knoll has also been excluded from the mining concept plan to support a logical final grade plan for permanent urban development.

Extraction boundaries are typically set back from property lines. Where earth berms are built for visual or noise mitigation, the berm is normally located within this setback area. Proposed extraction boundaries include the following:

50 metres from 144<sup>th</sup> Avenue (North) property line

- 50 metre setback includes 20 metre high pressure gas line right-of-way, 20 metres for construction of an earth berm, and an existing poplar hedgerow.
- Removal of the existing gas lines is not practical for this operation but could be considered as part of a possible future scheme to mine through the interface with the Burnco operation on the north side of 144<sup>th</sup> Avenue.
- A moderate scale berm will be sufficient to visually screen the later phases of the operation from 144<sup>th</sup> Avenue (Burma Road). Construction of this berm could occur once the operation is ready to move into final phases of the operation north of the power transmission line.

60 to 100 metres from 101<sup>st</sup> Street (west) property line

- The 60-100 metre setback will include an allowance for future road widening, and land for a 3 to 4 metre visual screening along the west side of the operation. Figure 1 is a photograph of a typical section of

frontage berm at the Inland aggregate operation on 112<sup>th</sup> Avenue NW.

- 101<sup>st</sup> Street is designated as a future major roadway and will need to be widened from 20 metres to 36 metres. Normally, 8-metres of road widening would be taken from each side of the existing road allowance.
- A meandering visual screening berm should be located along the west edge of the extraction area to provide visual screening, dust mitigation and noise mitigation. The berm should meander within the 60 to 100 metre distance to incorporate existing drainage lows and treed areas adjacent to 101<sup>st</sup> Street. The berm should be planted with a mix of deciduous and evergreen material to provide a natural appearance when viewed from 101<sup>st</sup> Street. Figure 2 illustrates a typical cross section of the setback area and berm along the west edge of the subject site.
- The mature planted berm may be retained as part of a buffer feature between country residential development and permanent City of Calgary business park development.

40 metre and 25 metres from 85<sup>th</sup> Street (east) property line.

- A 40-metre extraction setback at the corner of 85<sup>th</sup> Street and 144<sup>th</sup> Avenue NW will accommodate major road widening requirements and retention of an existing poplar hedgerow.
- A 25-metre setback adjacent to 85<sup>th</sup> Street NW will accommodate sufficient land for future road widening and minor landscaping treatments such as driveway entry features.
- Berming that is 2-3 metres in height will apply adjacent to 85<sup>th</sup> Street to screen surface operations from traffic. A moderate setback is consistent with the opportunity arising to mine through the interface with the adjoining Lafarge operation.

No setback from half section line, Section 28.

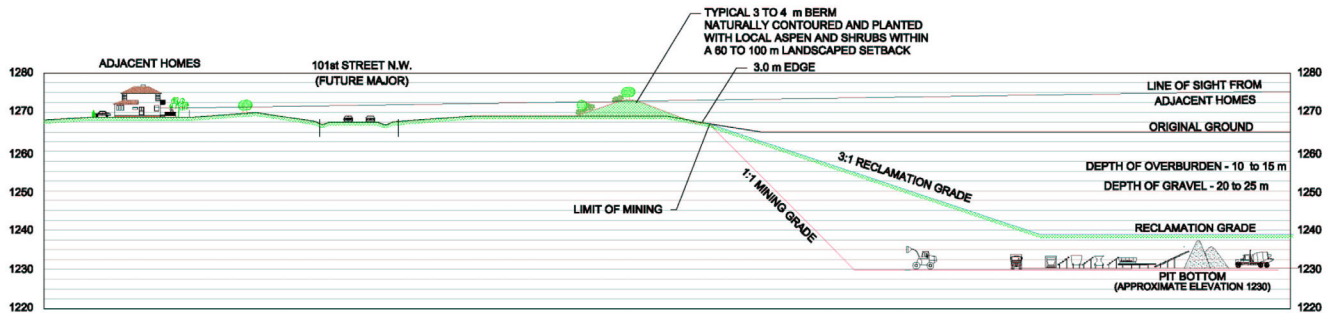
- No setback will be required at the south limit of the mining area. The Province controls the adjacent lands to the south. There is no public roadway.

Adjacent land uses are anticipated to be compatible with the aggregate operation at least until such time as extraction operations are completed within Section 28.



**Figure 1:**  
**Photo of Existing Berm at south boundary of Inland Aggregates Spy Hill Operation, as viewed from 112<sup>th</sup> Avenue NW.**





**Figure 2:**  
**Cross-Section of West Setback Area with Planted Berm**

### 6.3 Eliminating Suspended Ridge Features

An important concept affecting the design of aggregate operations at the Provincial Spy Hill property will be the concept of “suspended ridge” features in the post-extraction grade plan. A suspended ridge feature is an existing power line, an existing roadway, or an existing ravine, that is left at original grade after mining has proceeded to lower adjacent grades by 25 metres or more. These suspended ridge features can be unsightly in the ultimate urban landscape, sterilize a significant amount of land in backsloping, and create constraints and additional costs in servicing urban development sites.

#### 6.3.1 Natural Ravine

The major drainage ravine on the Provincial Spy Hill site has been identified by Ursus Ecosystem Management Ltd. as a regionally significant natural feature. However, the aggregate resources on the property extend to a depth that is lower than the bottom of this ravine. All options were examined for protecting the functionality of the ravine and the vegetation communities associated with the natural ravine while recovering the gravel from the site. However, most of the functionality of the ravine and the majority of the vegetation associated with the ravine slopes would be left “suspended” (non-functional) following removal of the gravel on both sides of the ravine.

It is recommended that aggregate operations proceed through the natural ravine where necessary and that final site grading and reclamation planting efforts be directed toward providing a drainage pattern that best supports ultimate urban

servicing requirements and a planting plan that replaces the ravine vegetation community lost to the mining operation.

### **6.3.2 Power Transmission Lines**

As described in Section 2.7, a 240 KV power transmission line traverses the Provincial Spy Hill property from east to west on the section line between Sections 28 and 33. Relocation of the power transmission line is not necessary to facilitate aggregate operations on the property. Aggregate operations can proceed separately on each side of the power line. Operations on both sides of the power line can be facilitated by deep cuts between transmission towers to allow for truck driveways and/or drainage. Nevertheless, the existing power transmission lines will ultimately need to be relocated/lowered to the reclaimed, post-extraction grade level. Otherwise, an unsightly power line corridor would be suspended high above adjoining urban development lands, and sterilize up to 70 acres of urban land in power line easement and associated permanent backsloping requirements.

Ultimately the power transmission lines will need to be relocated to the reclaimed final grade level of the aggregate operation. Due to the cost of this relocation, it is recommended that relocation be undertaken at such time as upgrading of the line is required by the utility operator, or as one of the final phases of aggregate operations once a permanent location can be integrated with post-extraction urban development plans.

### **6.3.3 Existing Major Roadways**

Existing major roadways that could be left as suspended ridge features include 85<sup>th</sup> Street and 144<sup>th</sup> Avenue. Both of these roads will be located between gravel operations where the final permanent grade level is expected to be 20 to 25 metres below the existing roadway grade.

This concept plan illustrates a relocation of 85<sup>th</sup> Street that allows for mining through between the Provincial property and the adjoining Lafarge aggregate operation subject to an agreement between the landowners. Under this concept, the future realignment of 85<sup>th</sup> Street, as proposed in City of Calgary plans, would be located at the final grade levels of the adjoining gravel operations (subject to required approvals and agreements).

In other cases where existing major roads may be left as suspended ridge features it is recommended that cooperative planning, design, and financing mechanisms be explored for mining through the interface between adjacent aggregate operations and building the ultimate urban road system at the final grade level for the general area.

#### **6.4 Final Grade Plan and Ultimate Urban Services**

The final grade plan for the site will drain the property toward two locations adjacent to 85<sup>th</sup> Street. The first location will be the existing natural low at the existing ravine and 85<sup>th</sup> Street. The second location will be to extend the natural low southward toward the section line at 85<sup>th</sup> Street. The entire mining area will be graded to drain toward this low area adjacent to 85<sup>th</sup> Street.

The final grading plan will allow ultimate urban storm water runoff to be routed to the low point of the site and then through the natural ravine on the east side of 85<sup>th</sup> Street (Lafarge property). Ultimate urban sanitary storm trunks will be extended to connect to the future trunk system located on the Lafarge property to the east. A broader low area in the final grading plan allows for some flexibility with regard to the precise routing of this sanitary trunk connection. A lift station site may need to be identified to provide a continuous connection from the subject lands through the aggregate operations to the east of 85<sup>th</sup> Street.

#### **6.5 Reclamation Planting and Ravine Replacement Plan**

Final grading of the property to create a drainage low area adjacent to 85<sup>th</sup> Street will provide an area that is ideal for reclamation as natural open space within the ultimate urban environment. The concept plan will be to replace both the drainage function and the natural vegetation associated with the former natural ravine system.

The Reclamation Planting Plan for the Provincial Spy Hill site will be intended to replace the two regionally significant vegetation types that will be lost through aggregate extraction operations. These include the "Upland Tall Shrub" (willow) community located on the north facing slope of the ravine, and the "Willow-Fescue Groveland" that occurs over a large area immediately south of the ravine in the eastern portion of the property.

The small portion of the existing ravine crossing at 85<sup>th</sup> Street will be a "no-mining" area that will be maintained as the drainage low point for the property in the post-extraction final grade plan. This will allow stormwater flows to pass along the natural overland drainage course through the Lafarge property to the northeast. This natural low point will be the focal point for a system of constructed linear drainage channels on the reclaimed site. Existing vegetation from the site should be transplanted onto the north facing slopes of these shallow linear drainage courses. These drainage channels will be designed as permanent features of the property for urban development.

Future design work for construction and planting of these linear channels should examine the potential for planting these relatively shallow channels with

“wetland” vegetation types, in substitution for the original vegetation that is associated with the steeper existing ravine slopes.

In addition to the system of constructed drainage channels, all backslopes created by the aggregate operation should be designed to appear as meandering, natural escarpment slopes within the ultimate urban environment of the site. In particular the north facing backslopes (located at the south end of the aggregate operation) should be planted with natural vegetation obtained from other areas of the property, or equivalent new material.

## **6.6 Extraction Phasing Plan**

As a general principle extraction operations are recommended to proceed

- a) From south to north in order to make the most readily serviceable lands at the south end of the site ready for urban development at an early date;
- b) From east to west in order to minimize the visual impact of operation and the impact of trucking upon existing and future residential dwellings to the west.

Following these general guiding principles it is recommended that extraction operations commence from a point adjacent to 85<sup>th</sup> Street immediately south of the power transmission line. From this point operations would proceed southerly on the property and then southwesterly. Once extraction is completed in the north half of Section 28 operations would proceed northward into Section 33 for the final phases of the operation.

The following are key features of the Extraction and Phasing Plan as illustrated in Map 12.

- Driveway access onto 85<sup>th</sup> Street aligned with the existing driveway for the Young Offender’s Centre. This location provides good sight-lines and convenient access to operations in the north half of Section 28 (south of the power line). An alternative location aligned with the existing Lafarge driveway was also evaluated as a potential driveway that would be central to long term operations on both Section 28 and Section 33. This location, although technically acceptable in terms of sight distances, was not the preferred location for operations in the north half of Section 28.
- Phase 1 extraction operations commence immediately south of the existing power line. Scalehouse and plant areas will be established immediately south of the proposed driveway access. Phase 1 extraction will cover the northeast quarter of Section 28. Phase 2 extraction operations proceed west to incorporate the majority of the mining area in

the northwest of Section 28 to the south of the existing drainage ravine. Together, Phase 1 and 2 extraction operations can proceed without needing to breach the power transmission line or the existing drainage ravine system. This represents a logical area for submission of initial Conservation and Reclamation approvals.

- Phase 1 and 2 will proceed from east to west to minimize the impact of the operation on dwellings located to the west. This visual impact is minimized by ensuring the extraction face is never visible from the west as it moves from east toward the west. In addition all truck traffic is focused on 85<sup>th</sup> Street and a driveway location separated from dwellings by at least one mile. Processing and operating facilities such as the scalehouse and an asphalt plant will also be located near the driveway, thereby maximizing the separation from residential areas
- Phase 3 extraction operations will be located north of the Phase 1 area and north of the power line. This phase includes lands between the power transmission line and the existing ravine system. All phases are planned to extract gravel up to the south side of an existing drainage ravine system. This will allow the existing natural drainage ravine to remain functional as long as possible.
- Phase 4 will occur on the west side of the property and is located between two natural drainage courses. Phase 4 is the first time the natural drainage ravine will be breached. Prior to mining through the ravine, off-site drainage will be routed through a new channel on the Phase 1 and 2 reclaimed pit areas. Note that Phase 3 and Phase 4 could be interchanged if required to accommodate lowering of the power transmission line at an early date.
- Operations can proceed north of the power line and be connected to the driveway and operating areas via a deep cut driveway through the power transmission line easement. The easement can remain un-mined until such time as relocation of the transmission towers is economical. Interim treatment of the power line easement will require some backsloping for safety reasons. Previous experience suggests interim backsloping of approximately 2:1 will be appropriate. Once the ultimate urban development plan for Section 28 has been approved the power transmission lines should be lowered to final grade level and aggregates extracted from the former easement.
- Final phases of the extraction operation will proceed from east to west within the northern portion of Section 33. Relocation or the addition of an additional driveway access onto 85<sup>th</sup> Street, Burma Road, or the future realignment of 85<sup>th</sup> Street may be appropriate depending on conditions at that future time.

## **6.7 University of Calgary Lease**

In order to accommodate a logical boundary for backsloping of aggregate operations and ultimate urban development, the south extraction boundary has been located across the half section line of Section 28. This boundary does not impact the built facilities of the Agricultural Research Centre but does cut off approximately 40 acres from the previously defined 120-acre lease area that is not subject to mining. It is recommended that these 40 acres be replaced by contiguous land in SW 28 located north of the morainal knoll. In total this will provide the University with the 120 acres of land, not subject to mining, contemplated in the 40-year lease commitment.

The Province is also committed to providing the University with an additional area of up to 180 acres during the next 40 years on a rotational basis with aggregate extraction. Under the proposed concept plan this area would initially be located in Section 33 (Phase 3). At such time as the extraction operations move north of the power line, into Section 33, available options for moving the lease lands will include longer term mining area at the north end of the site (Phase 6) or location on reclaimed areas in Section 28 pending urban development.

## **6.8 Traffic Impact**

Existing traffic levels have been reviewed in Section 2.5 of this report. Once a Concept Plan for aggregate operations has been finalized this information will be incorporated into a Traffic Impact Analysis report for the proposed aggregate operation. A traffic impact report, detailing specific roadway network and/or intersection issues that need to be addressed to support the aggregate operation will be prepared during Phase 2 of this study.

The net additional truck traffic to be added to the area road system by this operation will be approximated by AT's own aggregate requirements for public infrastructure projects. Other aggregate volumes sold from the site to private industry and the general public will be part of a common market pool shared with other Spy Hill aggregate operators. (In other words, trucks using this site would otherwise be accessing a neighbouring aggregate site in any case).

AT's own aggregate needs will be in the range of 250,000 to 700,000 tonnes per year for regional roadway rehabilitation projects. This traffic would occur every year. During years of ring road construction, the total demand for aggregates from the Spy Hill site for AT needs is expected to increase to an estimated 1,800,000 tonnes in a single peak construction year. For purposes of traffic impact modeling, an estimate of 1 to 2 million tonnes of gravel will provide a reasonable estimate of aggregate quantities that are likely to be shipped from the Spy Hill site during a peak ring road construction year.

Based on a number of standard traffic modeling assumptions, Finn Transportation Consultants has estimated that aggregate quantities in the range of 1 to 2 million tonnes per peak construction year would generate between 420 and 840 vehicle trips per day (210 to 420 trips inbound and outbound)<sup>16</sup>. The peak hour traffic volumes associated with these daily trips will be examined during the next phase of work on this project to determine the appropriate intersection treatment for the driveway intersection with 85<sup>th</sup> Street.

## **6.9 Noise Mitigation**

Conceptual noise analysis has been undertaken by Patching Associates Acoustical Engineering Ltd. in support of this Phase 1 study<sup>17</sup>. The potential noise sources for operations that were used in the model include a portable crusher plant operation, electrical power plant, a conveyor, front-end loaders, scrapers, haul truck traffic, an engine/water pump, an asphalt plant and a concrete plant. Patching Associates modeled "worst-case" noise impacts at the west property line adjacent to 101<sup>st</sup> Street (Rocky Ridge Road). Worst case assumptions included:

- Winds from the east at 7.5km/hour.
- Crusher located at the top of the gravel layer in the centre of the quarter section.
- Asphalt/concrete plants located near 85<sup>th</sup> Street entrance.
- Temperature of 0 degrees.
- No noise mitigation measures.
- Continuous and simultaneous operation of all equipment.

The City of Calgary Noise Bylaw (#45M95) has established daytime and night-time noise level criteria for industry at the receptor locations. The maximum predicted worst-case (unmitigated) noise levels for the continuous operation of all gravel extraction activities is 61 dBA Leq (1-hour) which is below the City Noise Bylaw standard of 65 dBA Leq (1hour). The worst-case predicted noise levels (unmitigated) for the west property line are just above 65.0 dBA Leq (1 hour) daytime when including the surface stripping operation that would temporarily occur adjacent to the west property line, and continuous operations of all equipment.

By using a range of appropriate noise control methods, the mitigated noise levels associated with a gravel operation are predicted to be within City of Calgary

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<sup>16</sup> Spy Hill Lands Development Project, Traffic Impact Study, Phase 1 – Site Evaluation. Finn Transportation Consultants, October 2002.

<sup>17</sup> Conceptual Noise Assessment for the Spy Hill Lands Development Project, Phase 1. Patching Associates Acoustical Engineering Ltd., February 24, 2003.

noise bylaw requirements. Noise mitigation measures to be considered include the following:

- Enclosure or acoustical blanket on the crusher plant
- Rubber liners at all transfer points to reduce impact noise
- Installing a berm
- Installing noise reducing accessories for equipment where available
- Placement of gravel stockpiles in strategic locations to provide a barrier effect to the receiver locations, and thereby also reducing noise levels
- Orientation of the equipment to direct noise away from the receptor location, thereby also reducing the noise level
- Locating noise sources at lower depths (bottom of excavation)
- Adding additional noise control to the electrical power plant enclosure
- Operator awareness when operating mobile equipment
- Limiting the duration of an activity in a particular location
- Keeping equipment maintained for peak efficiency and overall reduction of noise

Several noise control techniques have been identified that can be used to reduce the overall noise levels at receptor locations to achieve acceptable levels. Through use of such techniques it should be feasible to meet the daytime noise level of 65.0 dBA Leq (1 hour) established by the City of Calgary Noise Bylaw. The feasibility of operating in conformity with the Noise Bylaw night-time standard will depend on specific details of actual operations and the effectiveness of noise mitigation techniques implemented.

### **6.10 Dust Control**

In response to the built-up land use context of the site, effective dust control measures will need to be used consistently throughout the life of the gravel operation. Aggregate phasing and processing locations should recognize that prevailing winds are from the west, away from residential areas. The most common source of dust is from trucks traveling within the pit. Other sources of dust are “point sources” such as the crusher or stockpiles, where dust can be controlled effectively through enclosures and watering techniques as required on unusually dry or windy days. The following range of dust control measure should be considered and built into final plans wherever appropriate.

- Locate major driveway locations and on-site haul roads away from dust sensitive land uses.
- Pave or oil the access road into the property and through the scale area.
- Dust abatement on commonly used driveways within the pit area.



- Install a system of sprinklers on other intra-pit access routes and stockpile areas as necessary.
- Seed the perimeter berms as soon as possible after they are constructed.
- Establish a policy to progressively strip and backfill phases in sequence, then seed completed areas immediately to re-establish vegetation. This minimizes soil handling as well.
- Limit the maximum size of the area that may be disturbed at any one time.
- Consider an enclosure or acoustical blanket on the crusher, particularly where the enclosure or blanket also aids in noise reduction.

Where new aggregate operations have been proposed in the Spy Hill area in recent years (i.e., Burnco, Inland), the Calgary Health Region has recommended that the applicant prepare and submit a dust modelling study that addresses ambient air quality impacts as well as on-site mitigation of airborne dust and air monitoring. In the case of recent applications for new aggregate operations in the Spy Hill area, the Calgary Health Region has noted the presence of a number of gravel pits located in this sector of the city and indicated that their cumulative contribution to ambient air quality in adjacent residential areas is a developing issue.

Given the proximity of residential land uses to the west of the subject site, concerns related to dust emissions from the proposed aggregate operations should be addressed in a professional study. Dust emission concerns can normally be dealt with effectively, even in relatively close proximity to residential areas, through good operating practices and use of appropriate dust suppression methods. Therefore, it is recommended that Alberta Transportation commission a dust emissions study and implement dust control recommendations arising from this study as part of any aggregate operations at the Spy Hill site.

## **6.11 End Use Concept Plan**

### **6.11.1 Roadway Circulation Network**

The End Use Concept Plan is illustrated in Map 13. The future realignment of 85<sup>th</sup> Street has been designed to bypass the City water reservoir and descend to the reclaimed final grade on a backsloped road grade built into the final grade plan for the aggregate operation. Once 85<sup>th</sup> Street reaches the lower grade it will remain at this grade level until it reconnects with the existing and future low point on the existing 85<sup>th</sup> Street alignment. This road alignment could also provide an alternative driveway access for later phases of gravel operations if required.

Future realignment of 85<sup>th</sup> Street through the Spy Hill provincial land has been incorporated into City of Calgary plans since 1983 with adoption of the Calgary Research and Development Park Area Structure Plan. With closure of the former Corrections Facility on the west side of 85<sup>th</sup> Street the Province no longer has an interest in consolidating a "Corrections Facility precinct" that encompasses both side of 85<sup>th</sup> Street and closure of the existing 85<sup>th</sup> Street alignment as a through road. Therefore, other options for future alignment of 85<sup>th</sup> Street, including retaining the existing alignment could be explored by a future City of Calgary Area Structure Plan for the broader Spy Hill area of the City.

### **6.11.2 Subject Lands Not Contained in the Mining Area**

The 80-acre leasehold site in SE28 that accommodates the former Bow River Correctional Facility building is not required as part of the aggregate operation. The existing building is considered a fixed asset that will be maintained by the Province and leased to new users in the future. Depending on the nature of the ultimate lessee, remaining lands within the 80 acre parcel are readily serviceable and could be considered as part of the lands to meet University of Calgary lease requirements, or sold for urban infill subdivision and development.

Remaining lands in SW28 totaling approximately 98 acres is illustrated in Map 13. This land contains the large knoll west of the City water reservoir and surrounding lands to the west and south of the knoll. The majority of this property is serviceable for urban development in the short term future through connections into the Royal Oak suburban development area. Any interim use of the property should consider protecting the significant natural features and slopes associated with the large knoll. The remainder of this area could be considered as part of lands to meet University of Calgary lease requirements, or sold for future urban infill subdivision and development.

### **6.11.3 Phasing of Urban Development**

Lands located in the south half of Section 28 and not the subject of lease commitments are serviceable in the short term future and could be released for development once final plans for aggregate operations are in place. A more conservative approach would delay disposition of these lands until such time as adjacent aggregate mining phases (Phase 1 and Phase 2) are well underway or completed and the City has adopted a new Area Structure Plan for the broader Spy Hill area.

Once extraction and reclamation operations are completed in the north half of Section 28 and the Phase 3 portion of Section 33, it would be appropriate to commence urban development on these reclaimed lands. The Phase 3 lands

north of the power transmission line will create the “site low” grades for future urban sewer connections. Timing of urban development may be determined by:

- Timing for extraction of gravel from these on-site areas, and/or
- Timing for depletion of gravel and extension of services through lands to the east of 85<sup>th</sup> Street.

Urban development on the north half of Section 28 may occur while aggregate operations are ongoing in Section 33 north of the power transmission line. In this case, appropriate arrangements for construction of the realigned 85<sup>th</sup> Street and driveway access to this new 85<sup>th</sup> Street alignment will need to be determined.

The final phases of urban development will occur at the north end of the property in Section 33. It is anticipated that later phases of aggregate extraction will occur very quickly due to high annual volumes resulting from depletion of other aggregate sources in the area and throughout the region. Therefore urban development in Section 33 may not necessarily lag many years behind development of the south part of the property. Therefore it may be appropriate to size initial infrastructure requirements (such as a regional sanitary lift station) to accommodate ultimate development requirements of the subject site.

### **6.12 Start-Up Cost Estimate**

The rough cost to open the AT operation in Spy Hill will be in the order of \$2,500,000. This includes:

- Stripping 750,000 m<sup>3</sup> of overburden to build the west and east berms, then place the balance in stockpile.
- Landscape the berms and main entrance.
- Chain link perimeter fence.
- Construct a new intersection at entrance onto 85<sup>th</sup> Street N.W.
- Build and pave internal access roads.
- Prepare the gravel scaling and truck marshalling area, and asphalt and concrete plant sites.
- Scalehouse and twin truck scales.
- Power and gas utilities.

## **7.0 NEXT STEPS**

This report documents the Phase 1 feasibility study component of the current Spy Hill Lands Development Project. Phase 2 of this Project will proceed to prepare Conservation and Reclamation plans under the Alberta Environmental Protection and Enhancement Act.

### **7.1 Additional Phase 2 Technical Work**

As a result of the public consultation program a number of issues have been identified that were not fully anticipated at the time the original work program was approved. As a result of input received during Phase 1, it is recommended that Alberta Transportation undertake the following additional technical work in support of Conservation and Reclamation Plan approvals.

- a) Preparation of a Dust Emissions Modelling and Impact Mitigation Study by a qualified professional.
- b) Preparation of a Hydro-geological baseline report to identify the characteristics of the local groundwater aquifer and the potential impact of the operation, if any, on local groundwater conditions and water wells.
- c) Preparation of a Historical Resources Impact Assessment to the satisfaction of Alberta Community Development.
- d) Preparation of an environmental assessment to comply with any requirements of the federal Species at Risk Act.

### **7.2 Public and Stakeholder Consultation Program**

Phase 1 work has identified a number of concerns among all stakeholders regarding the impact of a large new aggregate operation at the subject site. Additional information dissemination and discussion with stakeholder groups will assist in preparing a design that addresses the concerns of stakeholders. Without limiting future consultations, there are at least three key stakeholder groups that should be kept informed and provided with opportunities to provide feedback as the Spy Hill Land Development Project proceeds into Phase 2 and following the preparation of Conservation and Reclamation plans.

- a) Local landowners and residents should be consulted at regular intervals as the project proceeds (every few months assuming normal progress on the project). In particular, all landowners, residents, and community groups located within one mile of the subject land should be notified by mail following the preparation of draft Conservation and Reclamation plans. Communication material should include information about the plans that responds to input received during the December 2003 Phase 1

stakeholder contact program. Communication material should be distributed well in advance of a Phase 2 Public Open House meeting.

- b) Additional consultation with the University of Calgary to identify options and preferences among alternative land lease locations.
- c) Additional consultation with the City of Calgary is recommended prior to finalizing Conservation and Reclamation plans for submission to Alberta Environment. The City of Calgary has requested that AT obtain normal municipal approvals for a gravel operation. Municipal review may benefit the Spy Hill project by identifying how the lands can be properly integrated into the future urban fabric of the City. This in turn, will protect the future property values associated with the Spy Hill site.

### **7.3 Approvals Process and Timing**

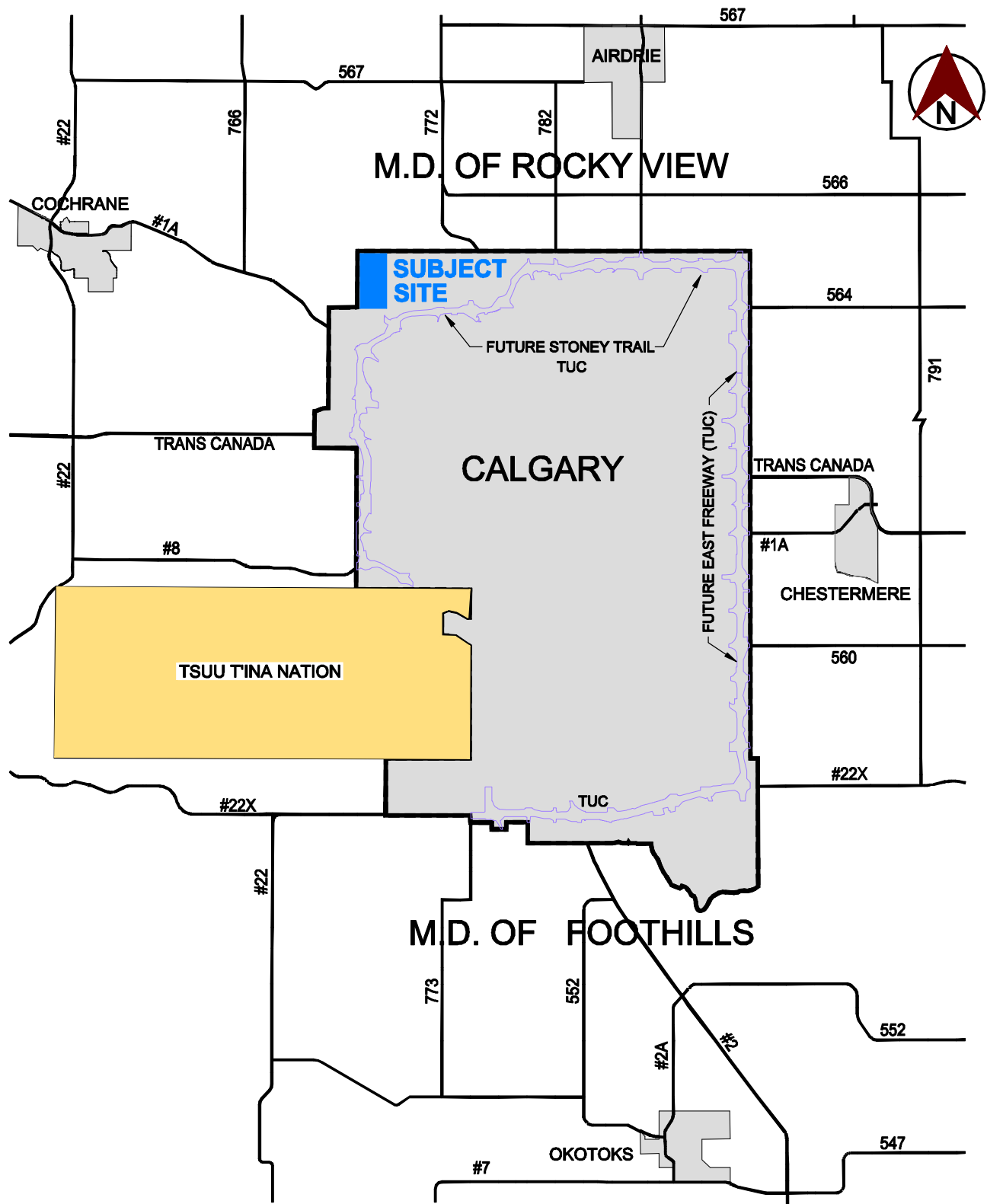
Once Conservation and Reclamation Plans have been prepared and discussed with stakeholder groups as noted above, a final Conservation and Reclamation application can be submitted to Alberta Environment for approval under the Alberta Environmental Protection and Enhancement Act.

The process for review and decision of a Conservation and Reclamation approval normally takes about 2 to 3 months where the Director of Alberta Environment does not require additional information to be submitted. Applications are advertised in local newspapers and the public is invited to submit statements of concern. The timeframe for approval will be extended where Alberta Environment passes Statements of Concern back to the applicant to be addressed prior to an approval.

An approval decision of Alberta Environment is mailed to any individual or organization that has previously filed a Statement of Concern. Those individuals or groups are entitled to file an appeal to the Alberta Environmental Appeal Board. An appeal process including mediation and a full appeal hearing can take as long as a full year prior to a final decision.

### **7.4 Timing for Site Construction Work and Phase 1 Extraction**

Work should proceed on the preparation of Conservation and Reclamation plans as soon as possible in order to meet Alberta Transportation's objective of being in a position to start operations where funding becomes available for major road construction projects. Draft Conservation and Reclamation plans should be available by mid-March 2003 as the basis for additional stakeholder consultation. Alberta Transportation would then be in a position to undertake the remaining recommended technical studies and submit a Conservation and Reclamation application to Alberta Environment for processing.



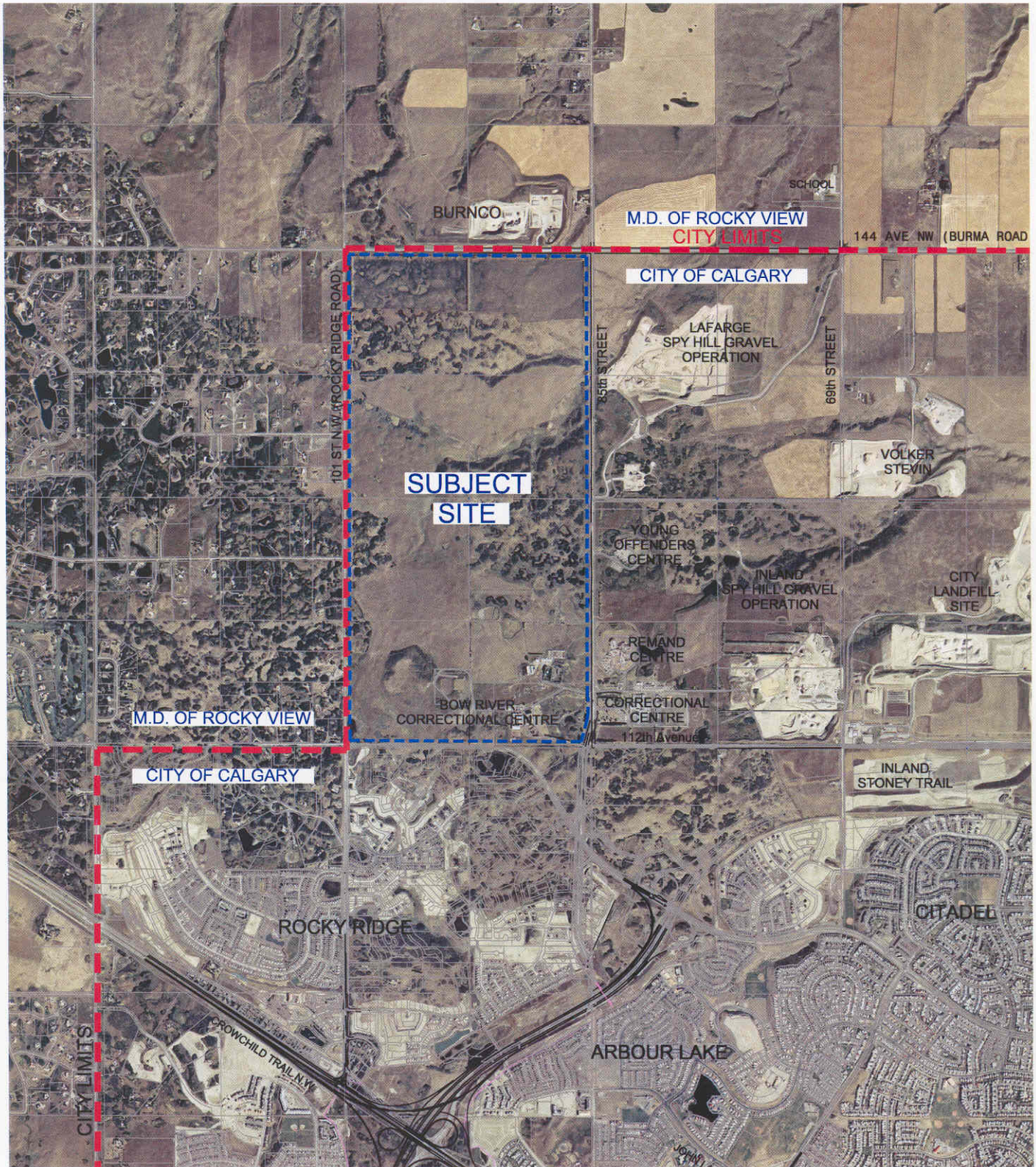
prepared for: ALBERTA TRANSPORTATION  
ALBERTA INFRASTRUCTURE

prepared by: BROWN AND ASSOCIATES  
PLANNING GROUP

DECEMBER 2002

# SPAY HILL LANDS DEVELOPMENT PROJECT

# MAP 1: REGIONAL LOCATION



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ALBERTA INFRASTRUCTURE

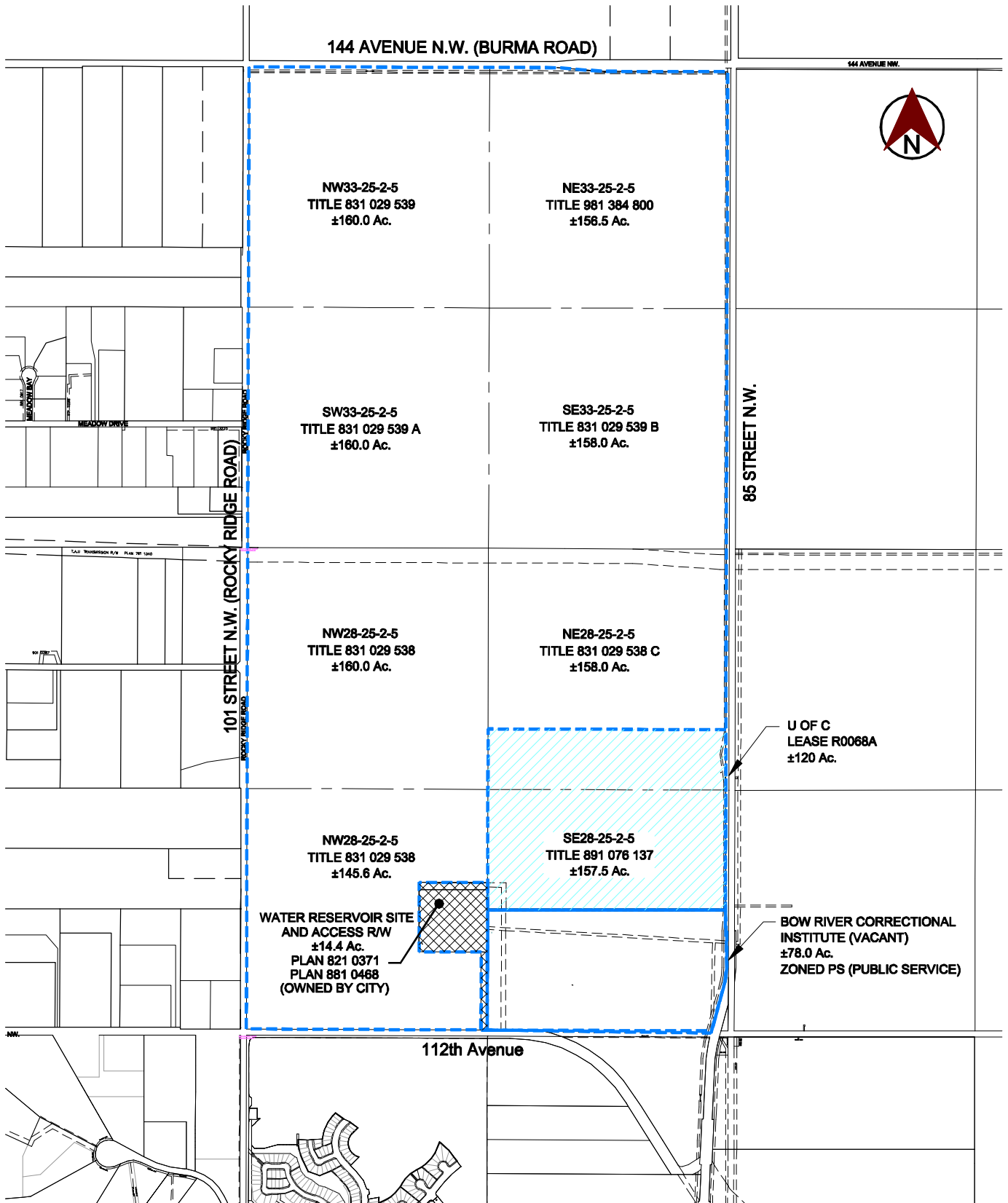
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# SPY HILL LANDS DEVELOPMENT PROJECT

J/REPORT1/LOCATION

## MAP 2: SPY HILL LOCATION



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**ALBERTA INFRASTRUCTURE**

prepared by: **BROWN AND ASSOCIATES**  
**PLANNING GROUP**

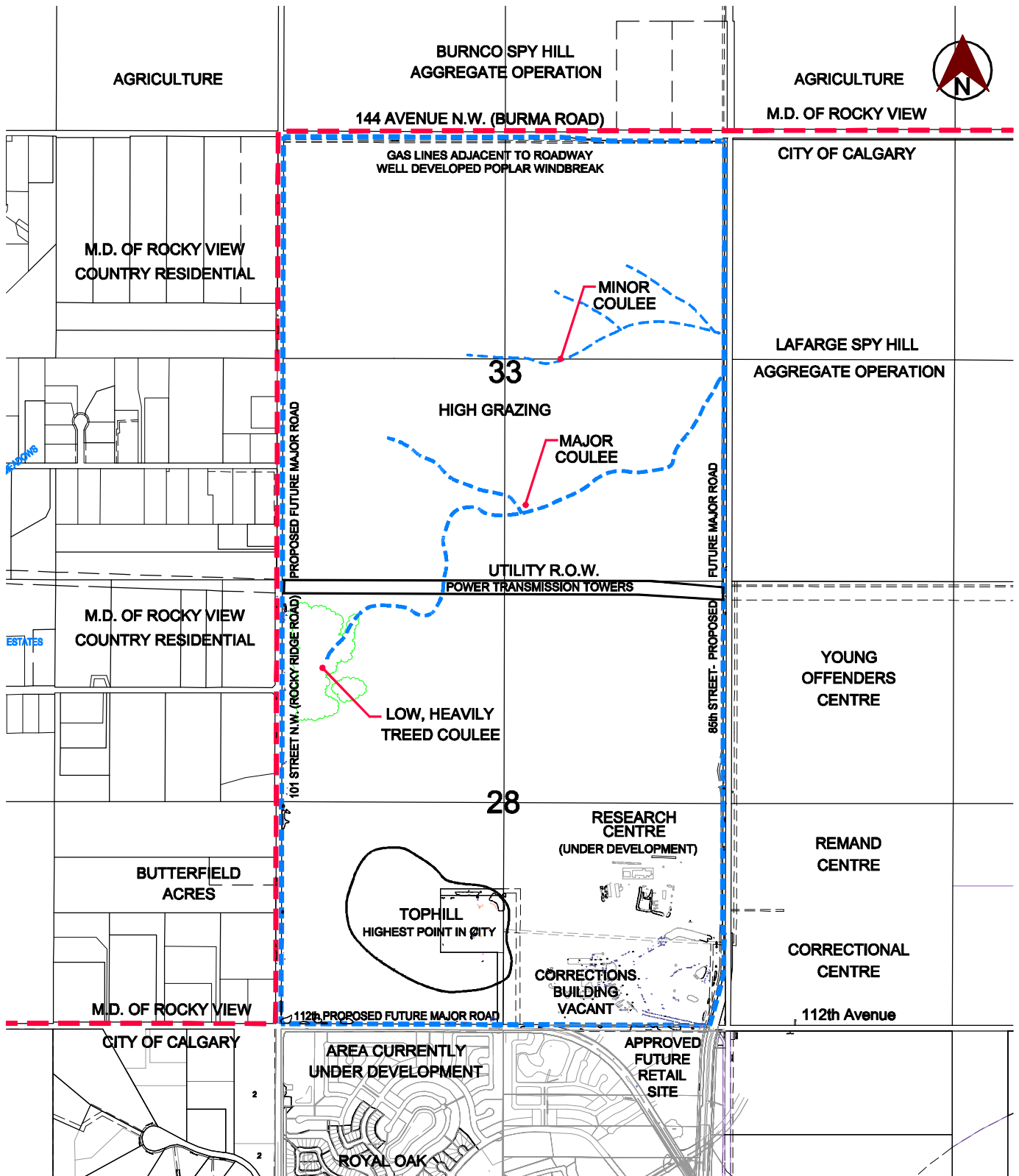
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# SPY HILL LANDS DEVELOPMENT PROJECT

## MAP 3:

# OWNERSHIP AND LEASE AREAS





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ALBERTA INFRASTRUCTURE**

prepared by: **BROWN AND ASSOCIATES  
PLANNING GROUP**

DECEMBER 2002

**LEGEND**

- - - - - SUBJECT PROPERTY
- - - - - CITY LIMITS

**MAP 4:**

**EXISTING  
SITE  
CONTEXT**

**SPY HILL LANDS  
DEVELOPMENT PROJECT**



prepared for: ALBERTA TRANSPORTATION  
ALBERTA INFRASTRUCTURE

prepared by: BROWN AND ASSOCIATES  
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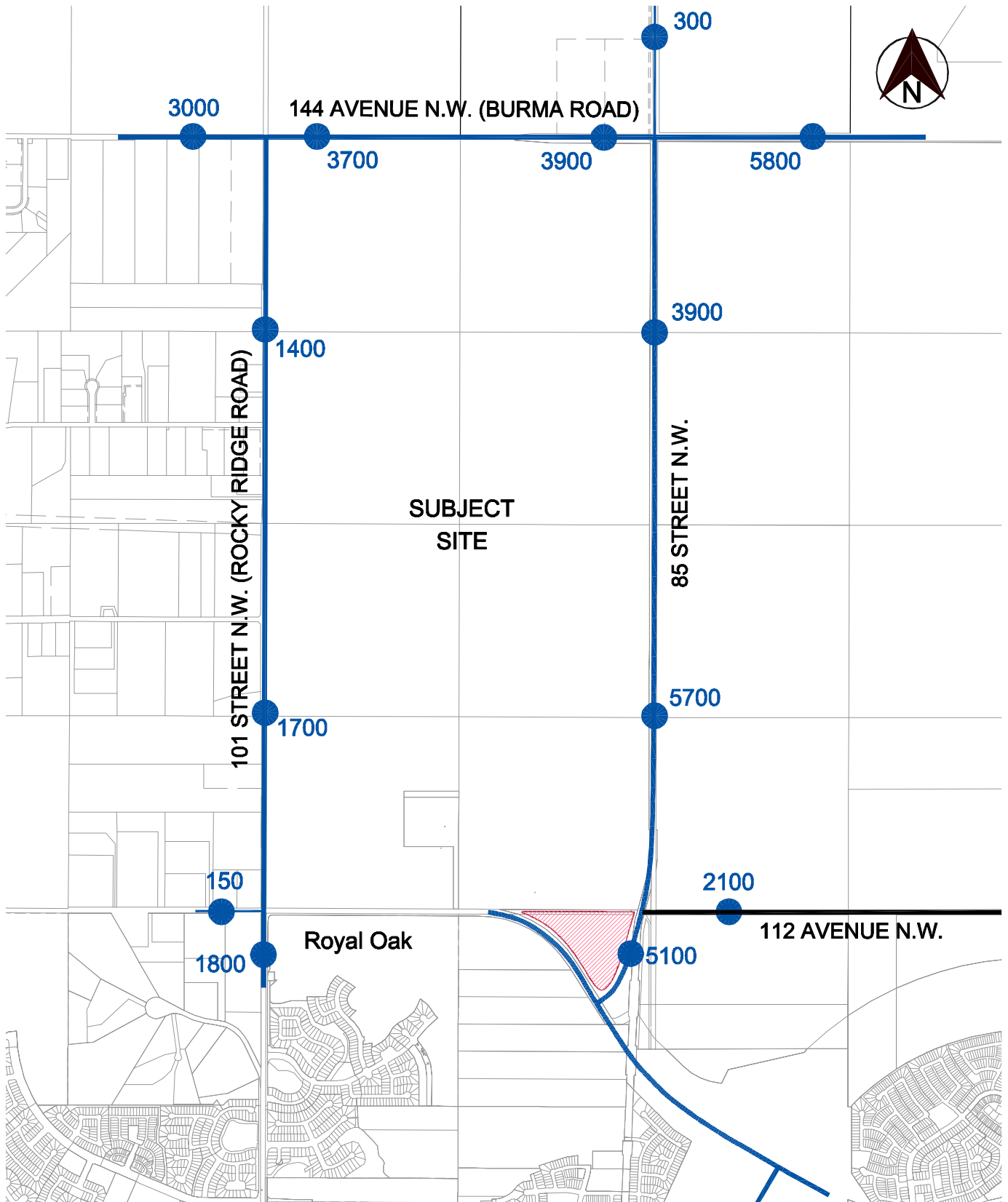
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## SPY HILL LANDS DEVELOPMENT PROJECT

J/REPORT1/HABITAT

CODE	HABITAT TYPE	HECTARES
AN	Anthropogenic	12.4
Aw	Aspen Forest	18.3
DG	Disturbed Grassland	295.2
GRV	Willow Groveland	90.2
LS	Low Shrub	20.7
NG	Native Grassland	34.1
Pb	Balsam Poplar	3.2
UTS	Upland Tall Shrub	35.4
W	Water	1
WG	Wet Graminoid	6.3
<b>TOTAL HABITAT AREA</b>		<b>516.8</b>

# MAP 5: HABITAT TYPES



prepared for: ALBERTA TRANSPORTATION  
ALBERTA INFRASTRUCTURE

prepared by: BROWN AND ASSOCIATES  
PLANNING GROUP

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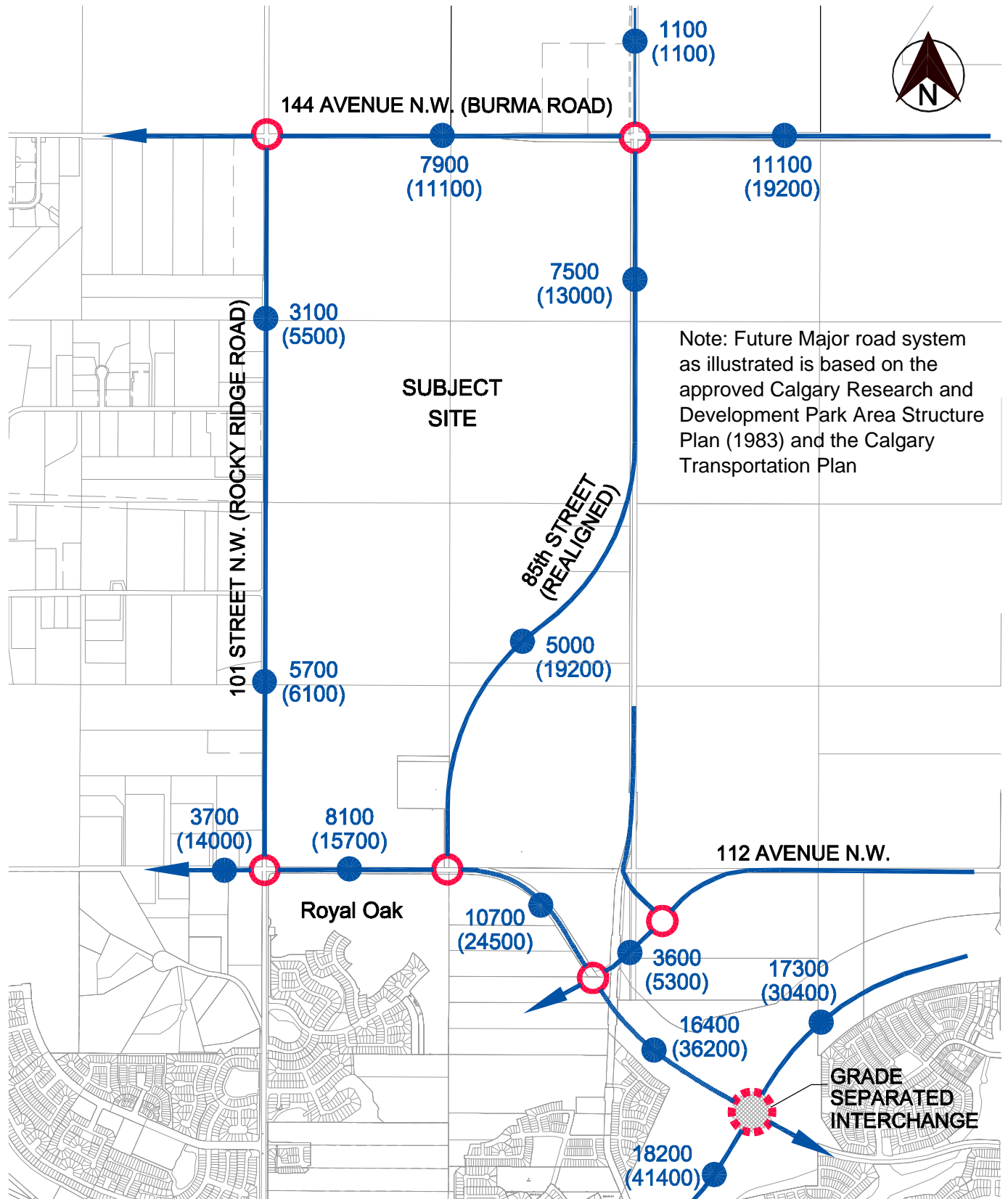
# SPY HILL LANDS DEVELOPMENT PROJECT

## LEGEND

● 1800 VEHICLES PER DAY

▴ ROYAL OAK SHOPPING  
CENTRE (FALL 2003)

# MAP 6: EXISTING ROAD NETWORK (FALL 2003)



prepared for: ALBERTA TRANSPORTATION  
ALBERTA INFRASTRUCTURE

prepared by: BROWN AND ASSOCIATES  
PLANNING GROUP

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# SPY HILL LANDS DEVELOPMENT PROJECT

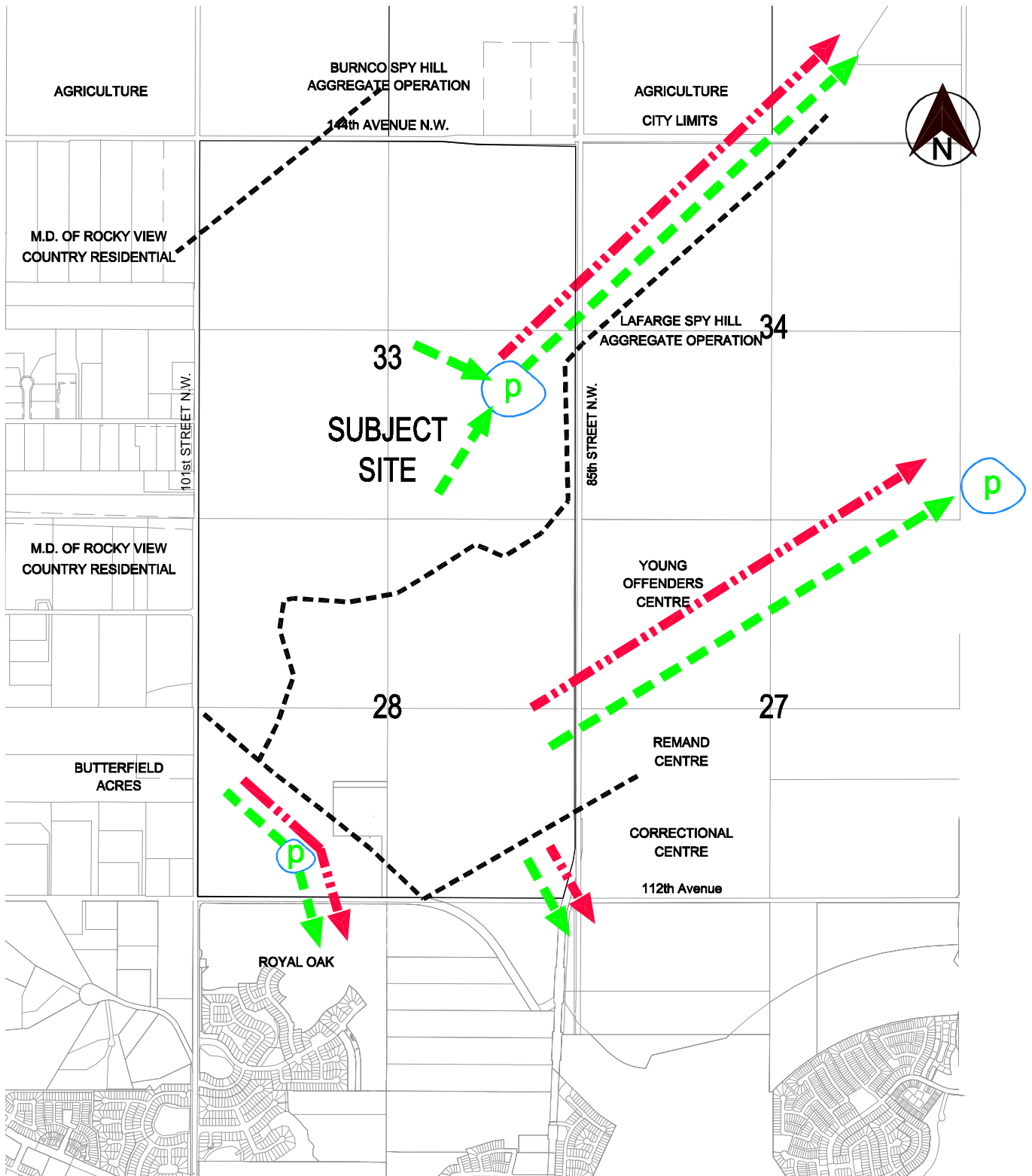
## LEGEND

FORECAST VEHICLES PER DAY

● 7500 YEAR 2010  
(13000) YEAR 2020

○ TRAFFIC SIGNALS

# MAP 7: PLANNED ULTIMATE ROAD SYSTEM







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prepared by: BROWN AND ASSOCIATES  
PLANNING GROUP

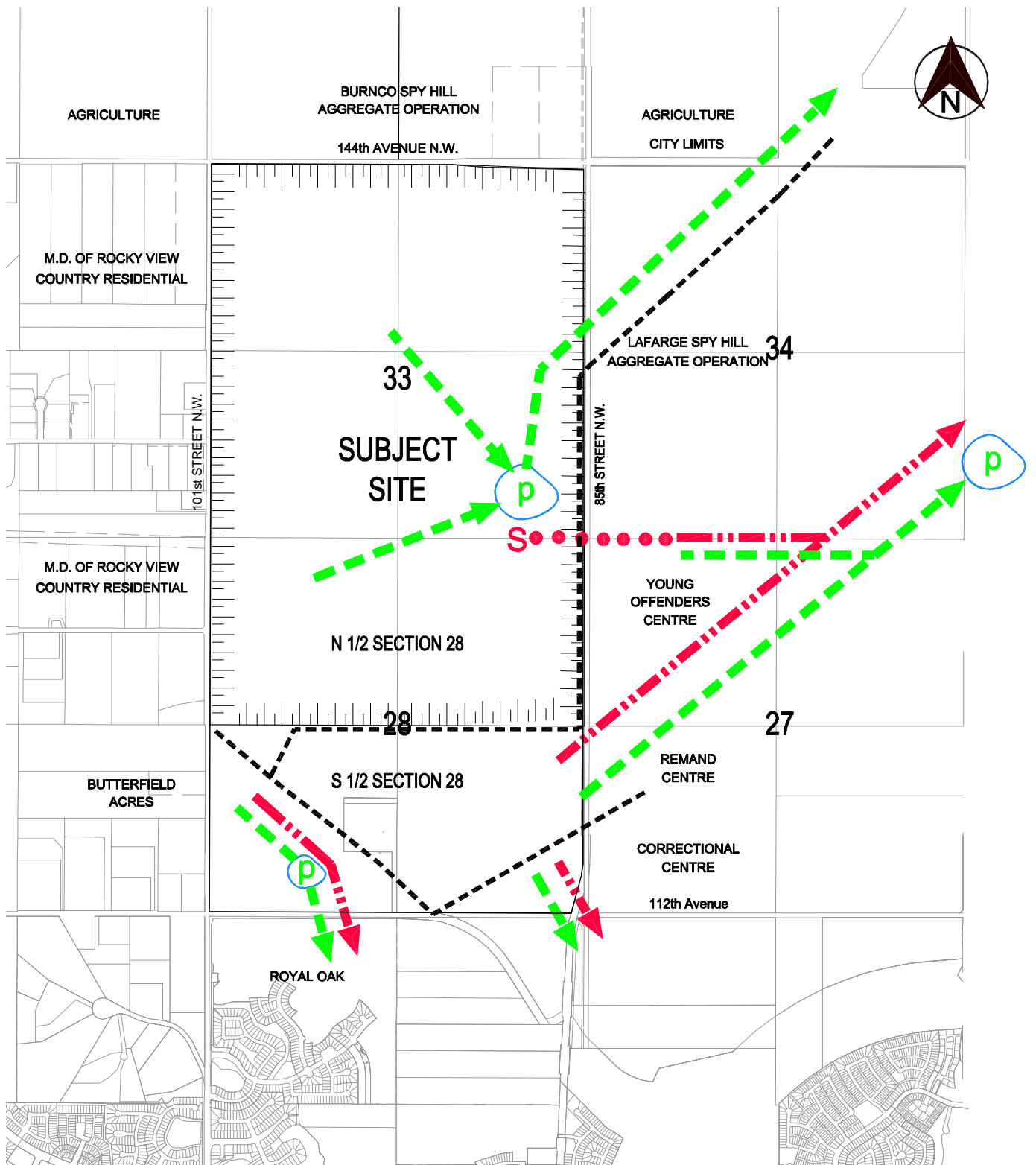
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### LEGEND

-  GENERALIZED STORM AND SANITARY CATCHMENT AREAS
-  FUTURE SANITARY TRUNK
-  FUTURE STORM TRUNK
-  FUTURE STORM POND

# MAP 8: EXISTING SERVICING CONCEPT (PRE-EXTRACTION)

## SPY HILL LANDS DEVELOPMENT PROJECT








prepared for: ALBERTA TRANSPORTATION  
ALBERTA INFRASTRUCTURE

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PLANNING GROUP

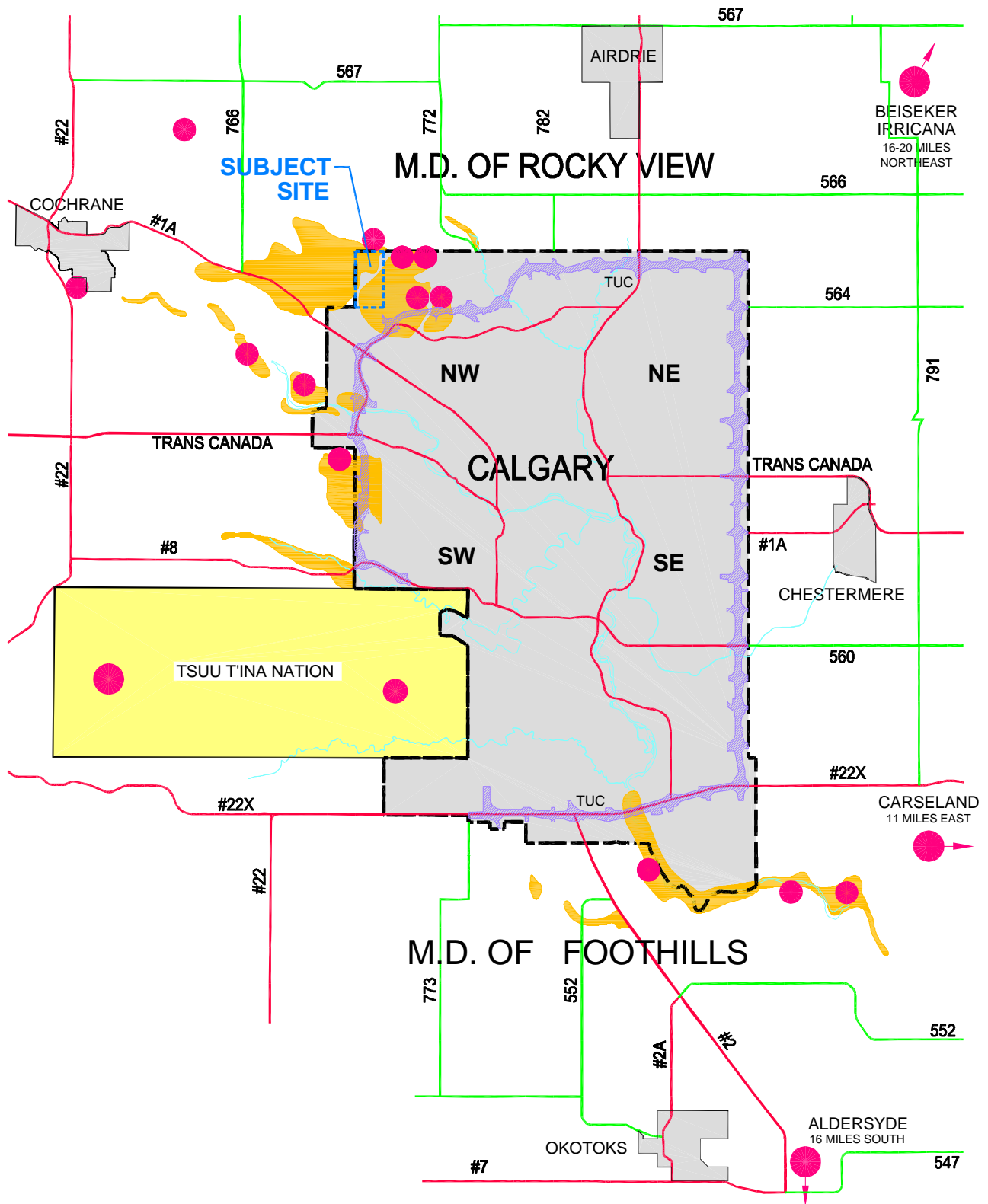
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# SPY HILL LANDS DEVELOPMENT PROJECT

## LEGEND

-  GENERALIZED STORM AND SANITARY CATCHMENT AREAS
-  FUTURE SANITARY TRUNK
-  FUTURE STORM TRUNK
-  FUTURE SANITARY LIFT STATION AND FORCE MAIN
-  FUTURE STORM POND

# MAP 9: ULTIMATE SERVICING CONCEPT (POST-EXTRACTION)



prepared for: ALBERTA TRANSPORTATION  
ALBERTA INFRASTRUCTURE

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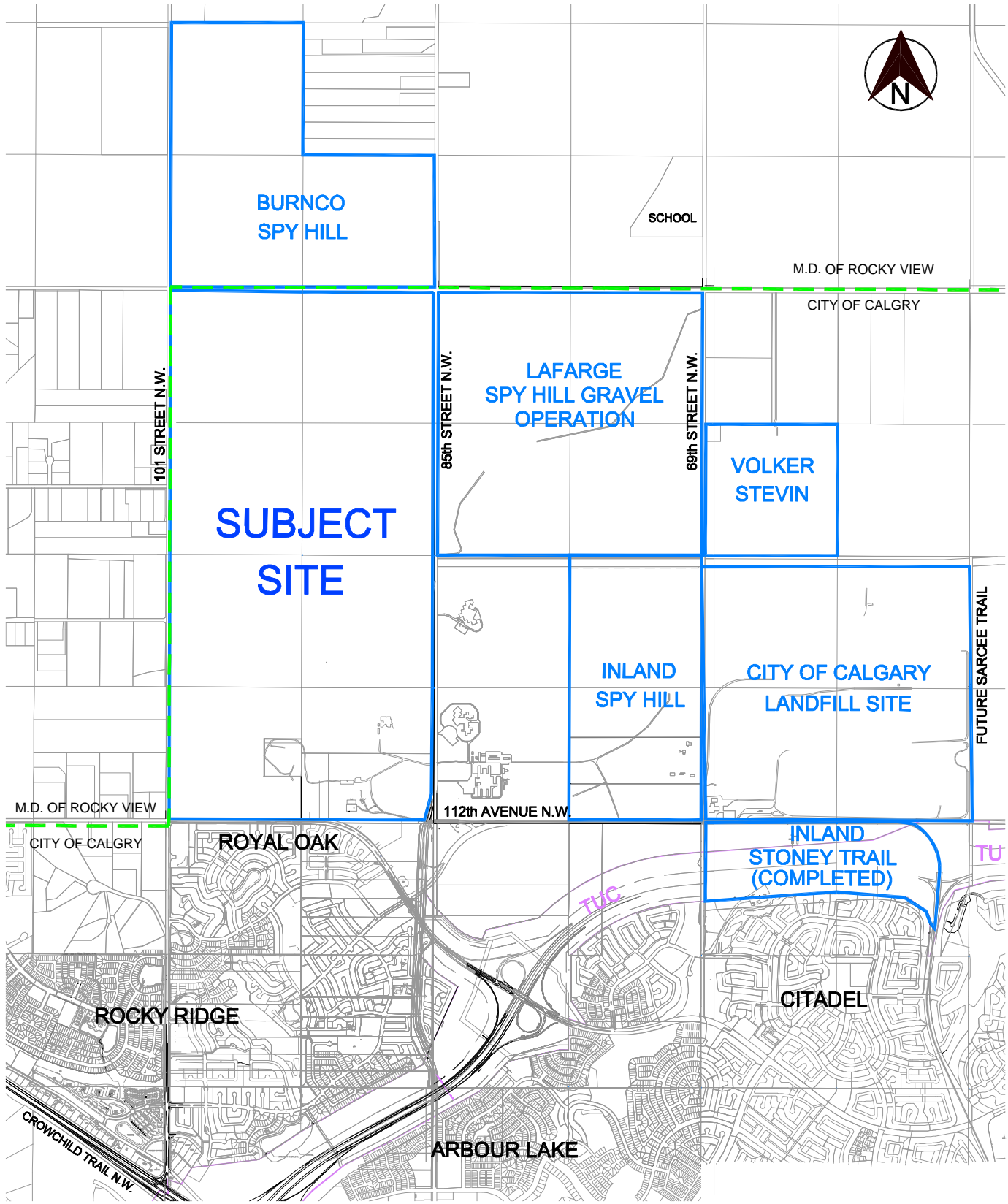
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## SPY HILL LANDS DEVELOPMENT PROJECT

### LEGEND

- APPROVED GRAVEL PITS
- KNOWN GRAVEL DEPOSIT  
(BASED ON S.R. MORAN, ALBERTA RESEARCH COUNCIL, 1986)
- EXPRESSWAY / FREEWAY  
PRIMARY HIGHWAY
- SECONDARY HIGHWAY
- TUC

# MAP 10: CALGARY AGGREGATE OPERATIONS



prepared for: ALBERTA TRANSPORTATION  
ALBERTA INFRASTRUCTURE

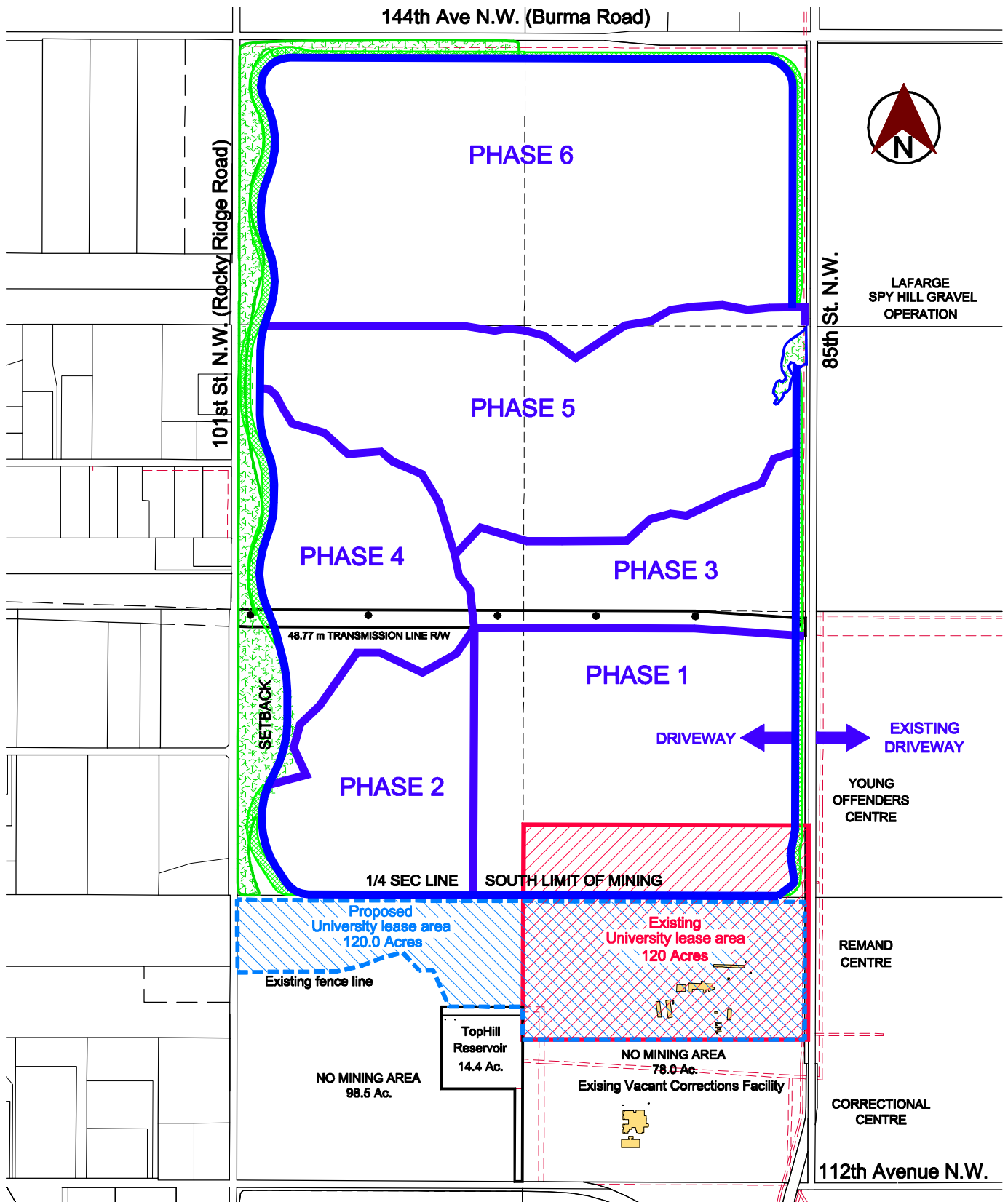
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# SPY HILL LANDS DEVELOPMENT PROJECT

# MAP 11: SPY HILL AGGREGATE OPERATIONS





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ALBERTA INFRASTRUCTURE  
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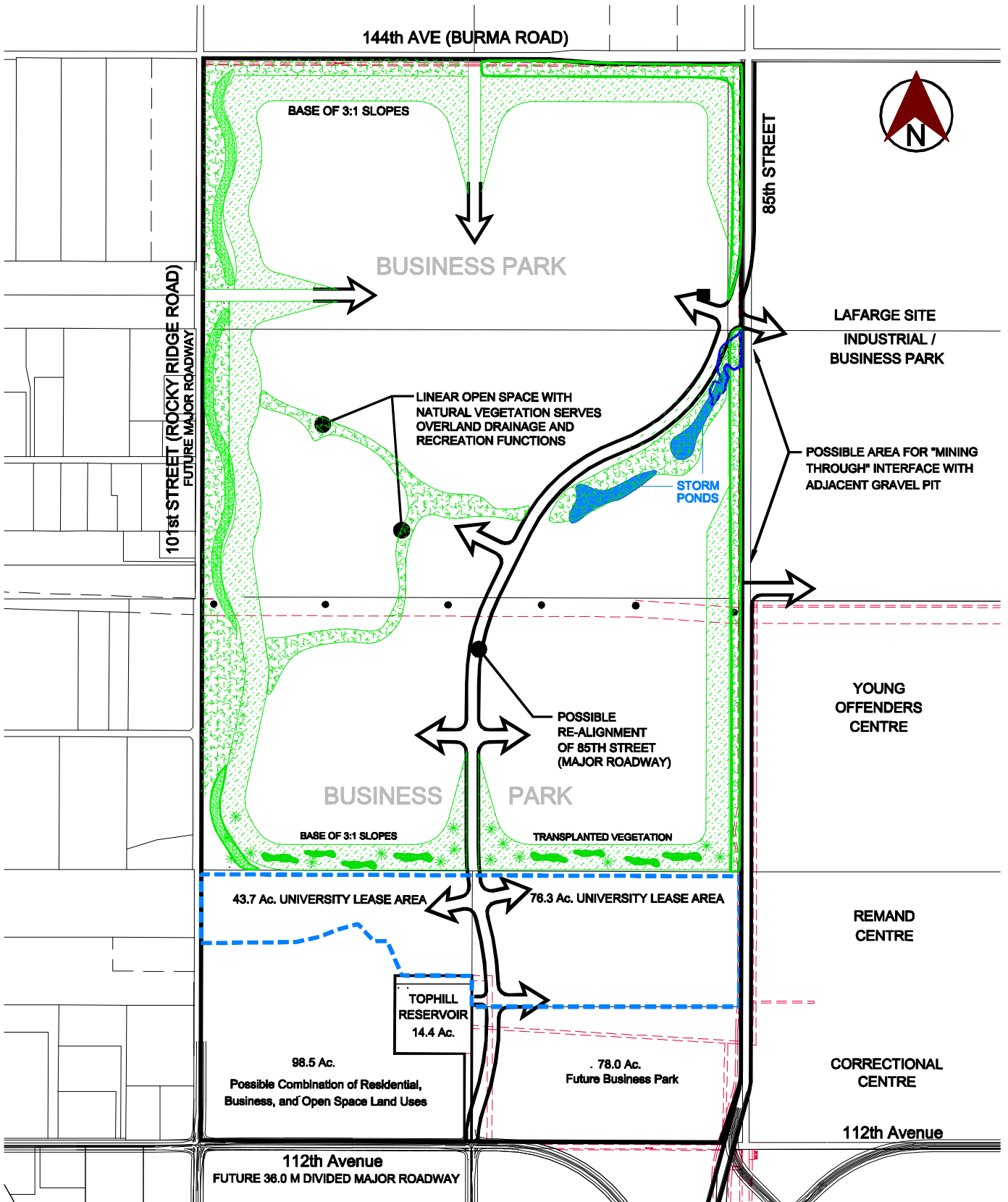
# SPY HILL LANDS DEVELOPMENT PROJECT

## LEGEND



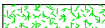

- LANDSCAPED BERM (HEIGHT VARIES TO 4 m)
- EXTRACTION PHASE LINE
- LINEAR OPEN SPACE

# MAP 12:

# EXTRACTION CONCEPT PLAN



**LEGEND**

-  LANDSCAPED BERM (HEIGHT VARIES TO 4 m )
-  AREA OF 3:1 BACKSLOPING
-  LINEAR OPEN SPACE
-  ACCESS ROAD OR INTERSECTION LOCATION

**MAP 13:  
END USE  
CONCEPT**

prepared for: **ALBERTA TRANSPORTATION  
ALBERTA INFRASTRUCTURE**

prepared by: **BROWN AND ASSOCIATES  
PLANNING GROUP**

DECEMBER 2002

**SPY HILL LANDS  
DEVELOPMENT PROJECT**

## **ATTACHMENT “A”: AGGREGATE MARKET CONSIDERATIONS**

Aggregate quantity testing for the Provincial Spy Hill lands has identified approximately 130 million tonnes of recoverable aggregates. This section of the report describes the value of this aggregate deposit in terms of the overall Calgary aggregate market. Possible depletion timeframes are identified for the subject site based on assumptions about AT requirements, the operating scenario for the pit (Public/Private Joint Venture), and the rate of gravel extraction for private sector uses by local industry and the general public.

### ***A-1 Aggregate Resources at the Subject Site***

Aggregate quantity estimates for the subject property have been prepared based on data taken from on-site drill testing<sup>18</sup> and from topographic MicroStation files obtained from the City of Calgary. The actual quantity of gravel that is recoverable at the site may vary depending on the actual mining boundaries that are established through the planning and approvals process.

Based on knowledge the broader Spy Hill gravel deposit and the experience of other pits in the area, the aggregate deposit at the subject site can be expected to be continuous and massive. Secondly, the top and bottom surfaces of the gravel deposit are fairly uniform in plane. Therefore, the deposit was analyzed using elevation information to create digital terrain models of the surfaces: original ground, top of the gravel, and bottom of the gravel.

Original ground elevation was determined as accurately as possible for each test hole. Subtracting topsoil and overburden thicknesses using the drill hole log information then yielded the top of gravel elevation. Where the drill hole reached the bottom of the gravel, the elevation of the bottom of the gravel layer could then be found. Data for all test holes was entered into an earthworks program called EMXS Surface Compiler. The data created digital terrain models for each of the three surfaces and EMXS computed volumes based on cross sectional areas and section intervals. A summary of the quantity results is shown in Table A-1.

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<sup>18</sup> Alberta Transportation Spy Hill Pit Aggregate Testing Summary. Prepared by Albert Perras, CET, Perras Management Inc., May 2001.

**TABLE A-1: AGGREGATE AND OVERBURDEN CALCULATIONS**

Location	AGGREGATES				OVERBURDEN			G:OB Ratio
	Area	Depth	Volume		Area	Depth	Volume	
			m3	tonnes			m3	
NE 33	507,757	16.1	8,195,595	17,210,751	550,078	9.9	5,458,216	1.50
SE 33	533,966	18.4	9,809,863	20,600,712	576,848	12.2	7,050,992	1.39
NW 33	506,167	16.2	8,201,152	17,222,418	542,674	13.0	7,046,982	1.16
SW 33	572,437	19.9	11,413,693	23,968,756	592,935	10.6	6,274,074	1.82
<b>SUB-TOTAL 33</b>			<b>37,620,303</b>	<b>79,002,636</b>			<b>25,830,264</b>	<b>1.46</b>
NE 28	564,438	22.7	12,825,734	26,934,042	601,907	14.6	8,766,724	1.46
NW 28	528,098	22.0	11,610,834	24,382,751	565,066	14.0	7,902,411	1.47
<b>SUB-TOTAL 28</b>			<b>24,436,568</b>	<b>51,316,793</b>			<b>16,669,135</b>	<b>1.47</b>
<b>TOTAL ALL</b>	<b>3,212,863</b>	<b>19.3</b>	<b>62,056,871</b>	<b>130,319,429</b>	<b>3,429,508</b>	<b>13.2</b>	<b>42,499,399</b>	<b>1.46</b>

10% Waste already taken off gravel quantities  
5% added to overburden quantities  
Aggregate in situ density 2.1 t/m<sup>3</sup>

## **A-2 Alberta Transportation's (AT) Aggregate Requirements**

The ability of Alberta Transportation to access aggregates at the subject lands would provide potentially significant savings in taxpayer financed road costs. There is potential to service approximately 1,800 kilometers of Provincial highways from the Spy Hill source. The quantity of gravel required for regional highway maintenance would be in the range of 250,000 to 700,000 tonnes per year. In addition, Alberta Transportation will require gravel for construction of the Stoney Trail and the East Calgary ring roads. The total aggregate requirement for Provincial road maintenance and construction that could be sourced from the Spy Hill lands total approximately 45 million tonnes during the next 50 years as described in Table A-2. This total quantity is based on the "high" estimate for annual highway maintenance needs and therefore represents a maximum usage estimate.

**Table A-2:  
Alberta Transportation's Aggregate Requirements**

Project	Period	Tonnes/Yr	Total Tonnes
Annual Rehabilitation	2003-2052	700,000	35,000,000
Ring Road Construction	2003-2022	—	6,060,000
Ring Rehabilitation	2023-2052	46,500	1,395,000
Long-Term Construction	2023-2052	—	<u>3,030,000</u>
Total (tonnes)		—	45,485,000

### ***A-3: Regional Aggregate Supply and Demand Analysis***

#### **Aggregate Demand**

Aggregates are the basic raw material required for development of communities, including regional roadways, buildings, and local utilities of all types. Sand and gravel is used as foundation base material for roadways, sewer lines, and water lines. Gravel is also used as a critical component of asphalt and concrete mixes for road paving, building foundations, curbs and sidewalks, and sewer pipes.

Based on estimated sales of aggregates by all suppliers, a consensus among aggregate industry experts has identified historic demand for aggregates in the Calgary region in the range of 8 to 9 tonnes per person during the 1990's. Per capita demand for aggregate has been increasing through the late 1990's to a level approaching 10 tonnes per person today. Based on regional population growth and annual demand as shown in Table A-3, the Calgary region could require in the range of 10 to 16 million tonnes of gravel per year to satisfy requirements throughout the study period. During the next 50 years approximately 700 million tonnes of gravel could be required to support population growth and associated development.

**Table A-3:  
Aggregate Demand in the Calgary Region, 2003 - 2052**

Year	Population	Tonnes Per Capita	Plus Additional AT Needs	Total Demand (millions of tonnes)	
				Annual	Cumulative
2003	982,660	9.5	0.70	10.04	10.04
2004	1,000,796	9.5	0.70	10.21	20.24
2005	1,019,267	9.5	2.22	11.90	32.15
2006	1,038,078	9.5	0.70	10.56	42.71
2007	1,057,011	10.0	2.22	12.79	55.50
2008	1,076,289	10.0	0.70	11.46	66.96
2009	1,095,919	10.0	0.70	11.66	78.62
2010	1,115,907	10.0	0.70	11.86	90.48
2011	1,136,258	10.0	0.70	12.06	102.54
2012	1,156,822	9.5	0.70	11.69	114.23
2013	1,177,758	9.5	0.70	11.89	126.12
2014	1,199,073	9.5	0.70	12.09	138.21
2015	1,220,774	9.5	0.70	12.30	150.51
2016	1,242,868	9.5	0.70	12.51	163.02
2017	1,264,929	9.5	0.70	12.72	175.73
2018	1,287,381	9.5	0.70	12.93	188.66
2019	1,310,232	9.5	0.70	13.15	201.81
2020	1,333,488	9.5	1.71	14.38	216.19
2021	1,357,157	9.5	1.71	14.60	230.79
2022	1,380,538	9.0	1.71	14.13	244.93
2023	1,404,322	9.0	0.75	13.39	258.31
2024	1,428,515	9.0	0.75	13.61	271.92
2025	1,453,125	9.0	0.75	13.83	285.75
2026	1,478,159	9.0	0.75	14.05	299.80
2027	1,502,842	9.0	0.75	14.28	314.08
2028	1,527,938	9.0	1.76	15.51	329.59
2029	1,553,453	9.0	0.75	14.73	344.32
2030	1,579,394	9.0	0.75	14.96	359.29
2031	1,605,767	9.0	0.75	15.20	374.49
2032	1,621,825	9.0	0.75	15.35	389.83
2033	1,638,043	9.0	0.75	15.49	405.33
2034	1,654,423	9.0	0.75	15.64	420.97
2035	1,670,967	9.0	1.76	16.80	437.76
2036	1,687,677	9.0	0.75	15.94	453.70
2037	1,704,554	8.5	0.75	15.24	468.94
2038	1,721,600	8.5	0.75	15.38	484.33
2039	1,738,816	8.5	0.75	15.53	499.86
2040	1,756,204	8.5	0.75	15.68	515.53

2041	1,773,766	8.5	0.75	15.83	531.36
2042	1,791,504	8.5	0.75	15.98	547.34
2043	1,809,419	8.5	1.76	17.14	564.48
2044	1,827,513	8.5	0.75	16.28	580.76
2045	1,845,788	8.5	0.75	16.44	597.20
2046	1,864,246	8.5	0.75	16.60	613.80
2047	1,882,888	8.0	0.75	15.81	629.61
2048	1,901,717	8.0	0.75	15.96	645.57
2049	1,920,734	8.0	0.75	16.12	661.69
2050	1,939,941	8.0	0.75	16.27	677.96
2051	1,959,340	8.0	0.75	16.42	694.38
2052	1,978,933	8.0	0.75	16.58	710.97

**Notes:**

1. Regional population growth estimates based on Calgary Census Metropolitan Area forecasts by Clayton Research Associates Ltd., November 2000.
2. Peak AT demand years (2005, 2007, 2020-2021) illustrate the expected effect of ring road construction projects. Actual years of construction will differ.
3. Increases in overall aggregate consumption are forecast through 2011 to reflect increased roadway construction. A longer term decline in per capita aggregate consumption reflects the anticipated transition from "new growth" to "maintenance" demands once the urban area matures and makes more efficient use of infrastructure already in place.

**Aggregate Supply**

Aggregates are a non-renewable natural resource that can only be found in particular locations where they were formed and placed long ago by geological processes. In this sense, aggregates are similar to other non-renewable resources such as oil, gas, and minerals. Locations where aggregates can be expected to be found in the Calgary region have been mapped by S.R. Moran<sup>19</sup> as shown in Map 10.

Most of these gravel resource areas as mapped by S.R. Moran have now been "built-over" with surface developments including city neighbourhoods and country residential subdivisions. Where surface development has already occurred over the gravel deposit it becomes uneconomic to recover the gravel resource. Therefore, the real supply of "recoverable" gravel that exists today in the Calgary region includes existing approved gravel extraction operations and areas where there are large deposits of gravel that could be approved for gravel extraction

<sup>19</sup> Surficial Geology of the Calgary Urban Area, S.R.Moran. Alberta Research Council Bulletin No. 53, 1986. See Figure 2: Tertiary Gravel Distribution (excludes reserves located on Tsuu T'ina Nation land).

operations in the future. Table A-4 summarizes the estimated supply of aggregates that are currently available in approved operations in the Calgary region.

**Table A-4:**

**Estimated Supply of Gravel at Existing Operations / Calgary Region, 2002**

**NORTH CALGARY AREA**

Lafarge Spy Hill  
 Inland Spy Hill  
 Burnco Spy Hill  
 City of Calgary Spy Hill  
 Volker Stevin Spy Hill

**North Calgary Subtotal ..... 100 million tonnes**

**SOUTH CALGARY AREA**

Burnco - Indus  
 Rolling Mix - Indus  
 Burnco -Springbank  
 Inland -Dawes  
 Lafarge – Indus

**South Calgary Subtotal..... 40 million tonnes**

**REGIONAL AREA**

Carseland Sites  
 Aldersyde Sites  
 Beiseker and Irricana  
 Cochrane  
 T'suu T'ina Nation

**Regional Area Subtotal ..... 30 million tonnes**

**TOTAL ESTIMATED SUPPLY ..... 170 million tonnes**

The estimated 170 million tonnes supply of gravel in approved operations is clearly much less than the projected demand for 700 million tonnes of gravel in the Calgary region during the next 50 years. It is not clear where future aggregate requirements will be found. There are very few locations in the region where a large new supply of gravel can be expected to be found and approved.



Surface development has encroached onto, or near to, most of the recoverable aggregate deposits in the region. Many aggregate operators are now beginning to focus on finding more numerous properties with much smaller deposits of gravel located at greater distances from the City.

As existing approved gravel supplies are used and depleted there is a need to open new replacement sources of gravel supply if costs associated with community and infrastructure development of all kinds are to remain reasonable. As operators increasingly seek to find smaller, more widespread sources of gravel at greater distances from the City, gravel costs to the end-user will increase due to higher transportation and operating costs. Environmental costs, including greenhouse gas emissions subject to the Kyoto Accord agreement, can be expected to be significant due to increased truck mileage on roadways.

#### **A-4 Aggregate Depletion Scenarios for the Spy Hill Site**

Tables A-5, A-6, and A-7 provide a summary of three spreadsheet modeling scenarios for evaluating aggregate depletion timeframes in the Calgary region, both with and without the addition of the 130 million tonnes of gravel that the Provincial Spy Hill lands would add to the regional aggregate supply.

The basic components of the depletion models are described in the following points.

- The largest supply of gravel in the Calgary region is located in the Spy Hill area (North Pits) where there is approximately 100 million tonnes of aggregate in approved operations today (see “Current Reserves in Table A-5, A-6, and A-7). The Provincial Spy Hill land would add 130 million tonnes of aggregate to the Spy Hill area (North Pits), more than doubling the supply of aggregates in the area.
- Alberta Transportation will require up to 45 million tonnes of aggregate from the Spy Hill site for its own 50-year needs. The balance of the 130 million tonne supply at the Spy Hill site is 85 million tonnes. In order to expedite resource recovery and urban development of the site, this 85 million tonnes of aggregate would need to be sold to local industry and the general public.
- The Depletion Scenarios modeled in Tables A-5, A-6 and A-7 start with the existing supply of aggregate and an assumed supply of “Other Additions” that might be found and brought into the market during the next 50 years. Estimated annual demand is deducted from the total supply of gravel each year through to 2052. Once the aggregate resources in a particular regional area have been depleted, the demand from the depleted area is transferred to the remaining supplies in another area.

- Assumed output from the Alberta Transportation Spy Hill site is shown under the column labeled “AT Pit Output”. Total output consists of AT’s annual requirements for public roadway projects plus an additional percentage of the total “Spy Hill/North Pits” market. This additional percentage is aggregate that would be sold from the site by a private operator under a future business arrangement with AT. Additional columns describe annual output from the AT pit and cumulative output between 2003 and 2052.
- The “Share of North Market” has been modeled as a lower percentage share during early years of the operation, growing to a larger percentage market share during later years, when other operations in the area are nearer to depletion.
- The percentage “Share of North Market” decreases in scenarios where the assumed replacement supply of aggregate increases; i.e. there is less reliance on the AT pit to supply the whole market where additional supplies are found in the future and more deposits are opened.
- All scenarios assume AT's needs are according to the “HI” (high) consumption scenario.
- All scenarios assume AT will use the deposit for its own needs through 2052.

Highlights of the three depletion scenarios are described below.

**Table A-5: Low Replacement Scenario**

- Assumes minimal replacement supplies of gravel north and south of Calgary, and represents the situation where negative public pressure severely restricts future pit approvals.
- Gravel is sold to the private market as a relatively high percentage of the market through 2034, when overall production decreases and remaining gravel is reserved for AT needs through 2052.
- The majority of the site is ready for urban development by 2034.
- Annual volumes reach high levels between 2020 to 2030 when the AT site supplies a significant portion of regional requirements.

**Table A-6: Medium Replacement Scenario**

- Represents the most likely scenario, which is a blending of the “LO” and “HI” replacement scenarios.

- The majority of the site is ready for urban development by 2040.
- Gravel is sold to the private market as a moderate percentage of the market through 2040, when overall production decreases and remaining gravel is reserved for AT needs through 2052.

**Table A-7: High Replacement Scenario**

- Assumes an aggressive replacement program around the city. This would only occur with a significant shift in public opinion, operator practices, and municipal policies to support conservation and recovery of remaining aggregate supplies in the region as a high priority.
- Gravel is sold to the private market as a relatively low percentage of the market through 2050, when overall production decreases and remaining gravel is reserved for AT needs through 2052.
- The majority of the site is ready for urban development by 2050.
- Annual volumes reach high levels between 2040 to 2050 when the AT site supplies a significant portion of regional requirements.

All depletion scenarios retain aggregates in the final phases for AT requirements through 2052. Each of the three depletion scenarios has somewhat different implications for timing of the aggregate extraction phases. Table A-8 describes the expected timing for all phases for the three depletion scenarios. The Medium Replacement Scenario is the “most likely” scenario.

**Table A-8: Aggregate Depletion Timeframe by Phase**

	Low Replacement	Medium Replacement (MOST LIKELY)	High Replacement
Phase 1	2003-2019	2003-2020	2003-2020
Phase 2	2020-2022	2021-2025	2021-2026
Phase 3	2023-2025	2026-2028	2027-2030
Phase 4	2026-2027	2029-2031	2031-2034
Phase 5	2028-2030	2032-2035	2035-2042
Phase 6	2031-2052	2036-2052	2043-2052

Note: See Map 12 for Extraction Plan and Phase Boundaries

**CALGARY RESERVES DEPLETION 2003-2052**  
**Table A-5: Low Replacement Scenario**  
*(millions of tonnes)*

A.T. DEPLETION SCENARIO	REPLACEMENT SCENARIO				TOTAL	A.T.'s SPY HILL PIT OUTPUT		
	HI	NORTH PITS	SOUTH PITS	LO		Share of North Mkt.	Total Output	Cumul. Output
CURRENT RESERVES	0.0	100.0	40.0	170.0	0%	0.70	0.70	
A.T. SPY HILL DEPOSIT	45.5	84.5	30.0	130.0	0%	0.70	1.40	
REPLACEMENTS	45.5	50.0	15.0	201.3	0%	2.22	3.62	
		234.5	55.0	501.3	10%	1.09	4.71	
2003	44.8	230.8	51.7	491.3	10%	2.64	7.35	
2004	44.1	227.0	48.4	481.1	15%	1.35	8.69	
2005	41.9	223.1	45.0	469.2	15%	1.36	10.05	
2006	41.2	219.2	41.6	458.6	20%	1.59	11.64	
2007	39.0	214.9	37.9	445.8	20%	1.61	13.25	
2008	38.3	210.6	34.1	434.3	20%	1.58	14.83	
2009	37.6	206.2	30.3	422.7	20%	1.60	16.43	
2010	36.9	201.8	26.4	410.8	25%	1.84	18.27	
2011	36.2	197.2	22.4	398.8	25%	1.86	20.13	
2012	35.5	192.8	18.5	387.1	25%	1.88	22.01	
2013	34.8	188.4	14.6	375.2	25%	2.34	24.35	
2014	34.1	183.8	10.6	363.1	25%	2.99	27.34	
2015	33.4	179.2	6.6	350.8	25%	3.03	30.38	
2016	32.7	174.4	2.4	338.3	25%	4.09	34.46	
2017	32.0	167.9	0.0	325.6				
2018	31.3	158.7	0.0	312.6				
2019	30.6	149.4	0.0	299.5				
2020	28.8	139.9	0.0	285.1				

2021	27.1	130.2	0.0	113.2	270.5	25%	4.13	38.59
2022	25.4	120.9	0.0	110.1	256.4	30%	4.51	43.10
2023	24.7	111.4	0.0	106.9	243.0	40%	4.54	47.63
2024	23.9	101.8	0.0	103.7	229.4	40%	4.60	52.24
2025	23.2	91.9	0.0	100.4	215.6	40%	4.67	56.91
2026	22.4	82.0	0.0	97.1	201.5	40%	4.74	61.64
2027	21.7	71.8	0.0	93.7	187.2	50%	5.82	67.46
2028	19.9	61.5	0.0	90.3	171.7	50%	6.91	74.38
2029	19.2	51.0	0.0	86.8	157.0	60%	7.04	81.41
2030	18.4	40.4	0.0	83.2	142.1	60%	7.14	88.56
2031	17.7	29.5	0.0	79.6	126.9	70%	8.33	96.89
2032	16.9	18.6	0.0	76.0	111.5	70%	8.41	105.30
2033	16.2	7.5	0.0	72.3	96.0	70%	8.49	113.79
2034	15.5	-3.6	0.0	68.6	80.4		0.75	114.53
2035	13.7	-14.9	0.0	64.8	63.6		1.76	116.29
2036	13.0	-26.3	0.0	61.0	47.7		0.75	117.04
2037	12.2	-37.2	0.0	57.4	32.4		0.75	117.78
2038	11.5	-48.2	0.0	53.7	17.0		0.75	118.53
2039	10.7	-59.2	0.0	50.0	1.5		0.75	119.28
2040	10.0	-70.4	0.0	46.3	-14.2		0.75	120.02
2041	9.2	-81.8	0.0	42.5	-30.0		0.75	120.77
2042	8.5	-93.2	0.0	38.7	-46.0		0.75	121.52
2043	6.7	-104.7	0.0	34.9	-63.1		1.76	123.27
2044	6.0	-116.4	0.0	31.0	-79.4		0.75	124.02
2045	5.2	-128.1	0.0	27.1	-95.8		0.75	124.76
2046	4.5	-140.0	0.0	23.1	-112.4		0.75	125.51
2047	3.7	-151.3	0.0	19.4	-128.2		0.75	126.26
2048	3.0	-162.7	0.0	15.6	-144.2		0.75	127.00
2049	2.2	-174.2	0.0	11.7	-160.3		0.75	127.75
2050	1.5	-185.9	0.0	7.8	-176.6		0.75	128.50
2051	0.7	-197.6	0.0	3.9	-193.0		0.75	129.24
2052	0.0	-209.5	0.0	0.0	-209.6		0.75	129.99

**CALGARY RESERVES DEPLETION 2003-2052**  
**Table A-6: Medium Replacement Scenario**  
*(millions of tonnes)*

A.T. DEPLETION SCENARIO	REPLACEMENT SCENARIO				MED	A.T.'s SPY HILL PIT OUTPUT		
	HOLD FOR A.T.	NORTH PITS	SOUTH PITS	RURAL PITS		TOTAL	Share of North Mkt.	Total Output
CURRENT RESERVES	0.0	100.0	40.0	30.0	170.0			
A.T. SPY HILL DEPOSIT	45.5	84.5			130.0			
REPLACEMENTS	45.5	100.0	31.5	136.3	267.8			
	284.5	71.5	166.3	567.8				
2003	44.8	280.8	68.2	164.0	557.7	0%	0.70	0.70
2004	44.1	277.0	64.9	161.6	547.5	0%	0.70	1.40
2005	41.9	273.1	61.5	159.2	535.6	0%	2.22	3.62
2006	41.2	269.1	58.1	156.7	525.1	10%	1.09	4.71
2007	39.0	264.9	54.4	154.1	512.3	10%	2.64	7.35
2008	38.3	260.6	50.6	151.4	500.8	15%	1.35	8.69
2009	37.6	256.2	46.8	148.6	489.2	15%	1.36	10.05
2010	36.9	251.8	42.9	145.8	477.3	15%	1.37	11.42
2011	36.2	247.2	38.9	143.0	465.3	20%	1.61	13.03
2012	35.5	242.8	35.0	140.3	453.6	20%	1.58	14.61
2013	34.8	238.3	31.1	137.5	441.7	20%	1.60	16.20
2014	34.1	233.8	27.1	134.6	429.6	20%	1.61	17.81
2015	33.4	229.2	23.1	131.7	417.3	20%	1.63	19.44
2016	32.7	224.4	18.9	128.8	404.8	20%	1.64	21.09
2017	32.0	219.6	14.7	125.8	392.1	20%	1.66	22.75
2018	31.3	214.7	10.5	122.7	379.1	20%	1.68	24.43
2019	30.6	209.8	6.1	119.6	366.0	20%	1.70	26.12
2020	28.8	204.7	1.7	116.4	351.6	20%	2.72	28.85

2021	27.1	196.7	0.0	113.2	337.0	20%	3.31	32.16
2022	25.4	187.4	0.0	110.1	322.9	20%	3.57	35.73
2023	24.7	177.9	0.0	106.9	309.5	20%	2.64	38.37
2024	23.9	168.2	0.0	103.7	295.9	20%	2.67	41.05
2025	23.2	158.4	0.0	100.4	282.1	25%	3.20	44.25
2026	22.4	148.5	0.0	97.1	268.0	25%	3.24	47.49
2027	21.7	138.3	0.0	93.7	253.7	25%	3.28	50.77
2028	19.9	128.0	0.0	90.3	238.2	30%	4.85	55.62
2029	19.2	117.5	0.0	86.8	223.5	35%	4.42	60.04
2030	18.4	106.8	0.0	83.2	208.5	40%	5.01	65.05
2031	17.7	96.0	0.0	79.6	193.3	45%	5.62	70.67
2032	16.9	85.1	0.0	76.0	178.0	45%	5.67	76.35
2033	16.2	74.0	0.0	72.3	162.5	45%	5.72	82.07
2034	15.5	62.8	0.0	68.6	146.9	45%	5.77	87.84
2035	13.7	51.6	0.0	64.8	130.1	45%	6.83	94.67
2036	13.0	40.2	0.0	61.0	114.1	45%	5.87	100.54
2037	12.2	29.3	0.0	57.4	98.9	50%	6.18	106.72
2038	11.5	18.3	0.0	53.7	83.5	50%	6.23	112.96
2039	10.7	7.2	0.0	50.0	68.0	50%	6.29	119.25
2040	10.0	-4.0	0.0	46.3	52.3		0.75	119.99
2041	9.2	-15.3	0.0	42.5	36.5		0.75	120.74
2042	8.5	-26.7	0.0	38.7	20.5		0.75	121.49
2043	6.7	-38.2	0.0	34.9	3.4		1.76	123.24
2044	6.0	-49.9	0.0	31.0	-12.9		0.75	123.99
2045	5.2	-61.6	0.0	27.1	-29.3		0.75	124.74
2046	4.5	-73.5	0.0	23.1	-45.9		0.75	125.48
2047	3.7	-84.8	0.0	19.4	-61.7		0.75	126.23
2048	3.0	-96.2	0.0	15.6	-77.7		0.75	126.98
2049	2.2	-107.8	0.0	11.7	-93.8		0.75	127.72
2050	1.5	-119.4	0.0	7.8	-110.1		0.75	128.47
2051	0.7	-131.2	0.0	3.9	-126.5		0.75	129.22
2052	0.0	-143.0	0.0	0.0	-143.1		0.75	129.96

**CALGARY RESERVES DEPLETION 2003-2052**  
**Table A-7: High Replacement Scenario**  
*(millions of tonnes)*

A.T. DEPLETION SCENARIO	REPLACEMENT SCENARIO		REPLACEMENT SCENARIO			TOTAL	A.T.'s SPY HILL PIT OUTPUT	
	HI	HI	NORTH PITS	SOUTH PITS	RURAL PITS		Share of North Mkt.	Total Output
HOLD FOR A.T.								
CURRENT RESERVES	0.0	100.0	40.0	30.0	170.0	0%	0.70	0.70
A.T. SPY HILL DEPOSIT	45.5	84.5			130.0	0%	0.70	1.40
REPLACEMENTS	45.5	243.0	31.5	136.3	410.8	0%	2.22	3.62
		427.5	71.5	166.3	710.8	10%	1.09	4.71
2003	44.8	423.8	68.2	164.0	700.7	10%	2.64	7.35
2004	44.1	420.0	64.9	161.6	690.5	15%	1.35	8.69
2005	41.9	416.1	61.5	159.2	678.6	15%	1.36	10.05
2006	41.2	412.1	58.1	156.7	668.1	15%	1.37	11.42
2007	39.0	407.9	54.4	154.1	655.3	20%	1.61	13.03
2008	38.3	403.6	50.6	151.4	643.8	20%	1.58	14.61
2009	37.6	399.2	46.8	148.6	632.2	20%	1.60	16.20
2010	36.9	394.8	42.9	145.8	620.3	20%	1.61	17.81
2011	36.2	390.2	38.9	143.0	608.3	20%	1.63	19.44
2012	35.5	385.8	35.0	140.3	596.6	20%	1.64	21.09
2013	34.8	381.3	31.1	137.5	584.7	20%	1.66	22.75
2014	34.1	376.8	27.1	134.6	572.6	20%	1.68	24.43
2015	33.4	372.2	23.1	131.7	560.3	20%	1.70	26.12
2016	32.7	367.4	18.9	128.8	547.8	20%	2.72	28.85
2017	32.0	362.6	14.7	125.8	535.1			
2018	31.3	357.7	10.5	122.7	522.1			
2019	30.6	352.8	6.1	119.6	509.0			
2020	28.8	347.7	1.7	116.4	494.6			



2021	27.1	339.7	0.0	113.2	480.0	20%	3.31	32.16
2022	25.4	330.4	0.0	110.1	465.9	20%	3.57	35.73
2023	24.7	320.9	0.0	106.9	452.5	20%	2.64	38.37
2024	23.9	311.2	0.0	103.7	438.9	20%	2.67	41.05
2025	23.2	301.4	0.0	100.4	425.1	20%	2.71	43.76
2026	22.4	291.5	0.0	97.1	411.0	20%	2.74	46.50
2027	21.7	281.3	0.0	93.7	396.7	20%	2.78	49.27
2028	19.9	271.0	0.0	90.3	381.2	20%	3.82	53.09
2029	19.2	260.5	0.0	86.8	366.5	20%	2.84	55.94
2030	18.4	249.8	0.0	83.2	351.5	20%	2.88	58.82
2031	17.7	239.0	0.0	79.6	336.3	20%	2.91	61.73
2032	16.9	228.1	0.0	76.0	321.0	20%	2.94	64.67
2033	16.2	217.0	0.0	72.3	305.5	20%	2.96	67.62
2034	15.5	205.8	0.0	68.6	289.9	20%	2.98	70.60
2035	13.7	194.6	0.0	64.8	273.1	20%	4.01	74.62
2036	13.0	183.2	0.0	61.0	257.1	20%	3.02	77.64
2037	12.2	172.3	0.0	57.4	241.9	20%	2.92	80.56
2038	11.5	161.3	0.0	53.7	226.5	20%	2.94	83.50
2039	10.7	150.2	0.0	50.0	211.0	20%	2.96	86.47
2040	10.0	139.0	0.0	46.3	195.3	20%	2.99	89.45
2041	9.2	127.7	0.0	42.5	179.5	20%	3.01	92.46
2042	8.5	116.3	0.0	38.7	163.5	20%	3.03	95.49
2043	6.7	104.8	0.0	34.9	146.4	30%	5.22	100.71
2044	6.0	93.1	0.0	31.0	130.1	30%	4.24	104.95
2045	5.2	81.4	0.0	27.1	113.7	30%	4.28	109.23
2046	4.5	69.5	0.0	23.1	97.1	30%	4.31	113.54
2047	3.7	58.2	0.0	19.4	81.3	30%	4.14	117.67
2048	3.0	46.8	0.0	15.6	65.3	30%	4.17	121.84
2049	2.2	35.2	0.0	11.7	49.2	30%	4.20	126.05
2050	1.5	23.6	0.0	7.8	32.9	15%	2.49	128.54
2051	0.7	11.8	0.0	3.9	16.5	0%	0.75	129.29
2052	0.0	0.0	0.0	0.0	-0.1	0%	0.75	130.03

## ATTACHMENT “B”: OTHER OPERATING SCENARIOS

Section 5 of this report describes the recommended operating scenario - “A Single Pit – Public/Private Joint Venture Operation”. The following operating scenarios were also considered as options for timely extraction of the aggregate resources at the Spy Hill property.

### **Scenario 1: Tender or Contract to the Highest Bidder**

#### Description

- Gravel would be tendered or contracted to the highest bidder for relatively short periods of time (say 5 to 10 years).
- The successful bidder would sell aggregates to local industry and the general public. The successful bidder would manage day-to-day operations including access to the pit by AT highway contractors.
- Alberta Transportation would be responsible for planning approvals and long-term management of the site. Successive contractors would be responsible for sequential reclamation in conformity with the long-term plan.
- Alberta Transportation’s highway contractors would operate within the same “pit” as the private contractor in order to coordinate operating and reclamation procedures effectively.
- The successful private contractors would manage the day-to-day pit operations including AT highway contractors. AT would maintain overall long-term oversight to ensure continuity between the short-term (5-year) contracts and successful implementation of the long-term reclamation and final grading plan.

#### Evaluation

- The “highest bid” tender mechanism will help to ensure a “level-playing field” with existing private operators.
- Relatively short-term contracts will allow any “bugs” in the operation to be corrected prior to re-tendering.
- The short term nature of the private contract may mean that the initial and final contractors would require help from AT with higher pit start-up and final reclamation costs.
- A series of short term (5-10 year) contractors will need to be coordinated by AT staff in accordance with the long-term operations, grading and reclamation plans.

- Since AT would retain overall control of the property, opportunities for a “gravel exchange”<sup>20</sup> could be solicited as part of any tender offering.
- This approach allows the Province to maintain long-term control of the property and not become tied into long-term contractual obligations. AT staff will need to provide long-term oversight of sequential contractors. This approach is likely to be favoured by aggregate consumers who would like to see more competition in the aggregate market.

## **Scenario 2: Sale of Land**

### Description

- Under this option the Province would sell the land and gravel to a private aggregate operator. The sale would be accompanied by a special agreement ensuring that certain quantities of gravel will be made available to the government as required.
- One variation of this option would be for AT to retain ownership of land for its own gravel requirements and sell remaining lands to a private operator(s). A logical area to accommodate AT’s requirements for 50 years would be the north half of Section 33 which contains approximately 38 million tonnes of gravel.

### Evaluation

- It would be difficult for Alberta Transportation to maintain responsibility for provincial and municipal aggregate approvals once the lands were sold to a private operator. Private landowners may experience more uncertainty in the approvals process.
- Where AT subdivides and retains ownership of land only for its own requirements, long-term management of the site by AT staff (or private management company) will continue to be required to ensure operations in conformity with standards and long-term integration of final grading and reclamation plans with adjoining lands to be sold.
- Where lands in excess of defined AT requirements are sold, there is less flexibility in future years to enter into “gravel exchange” contracts or similar opportunities that may arise.
- Any sale of lands resulting in multiple pit operations on the site will result in additional environmental, reclamation and operating costs

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<sup>20</sup> A “gravel exchange” would allow a private company to have access to gravel at the Spy Hill site in exchange for gravel in other areas of the Province where AT requires gravel for public infrastructure projects.

associated with opening a pit, moving large quantities of overburden, coordinating the ultimate interface between operations, etc.

- Larger companies may favour the “sale” of land since fewer competitors have the financial resources to front-end a large land purchase.

### **Scenario 3: Non-Operating Management Company**

#### Description

- Under the model established at the Susan Lake “pubic pit” in Fort McMurray, the gravel resource is owned by the government, managed by a management company and made available to the public to come in to set up their own extraction and processing operations for short-term projects or ongoing longer term needs.
- Under this option Alberta Transportation would retain the services of a specialized “management company” for purposes of coordinating all operations within a single gravel pit. This management company would not be in the business of processing or selling gravel directly for the open market.
- One variation of this scenario could involve a management company that simply manages the pit on behalf of AT’s public projects, to ensure that the pit is secure and dust free when AT highway contractors are not active on the site.
- A more likely variation (in order to expedite depletion of the aggregate reserves at the site) would be for the management company to coordinate the activities of AT highway contractors along with the activities of a number of qualified companies selling aggregate to the open market. The management company could coordinate activities such as selling pit run, allowing qualified companies to operate for negotiated quantities or time periods, or arranging gravel trades with owners of reserves in other strategic areas of the Province.

#### Evaluation

- Multiple users will not be compatible with the large depth of overburden to be removed and stockpiled to create a large multi-user working and processing area.
- The environmental impact of multiple users will be difficult to control in the Calgary context where potential demand is very high and where the built-up surrounding context demands a high level of mitigation.

- This approach may be favoured by commercial aggregate consumers (e.g., paving and road building companies) concerned that aggregates be made available from non-competitive suppliers.

#### **Scenario 4: Public/Private Partnership**

##### Description

- A “single pit” would be operated by a private partner with the capability of managing a long-term, high-quality aggregate operation within an urban context.
- Alberta Transportation will obtain approvals for the aggregate operation and seek an appropriate long-term partner through a tender or contract process that would be awarded to a bidder with the best combination of experience, qualifications and bid price.
- The private partner will be responsible for managing the site in accordance with approval requirements throughout the life of the operation (or alternatively for a relatively long-term period greater than the 10 year contract envisioned under Scenario #1, above).
- The private partner will provide access to the pit for all AT contractors and requirements. The private partner would also sell regulated quantities of gravel to the open market to ensure depletion of the resource in a timely manner to allow urban development of the property to proceed.

##### Evaluation

- This scenario allows AT to team-up with a single operator that can invest in long-term improvements similar to improvements implemented by other aggregate operations in the Spy Hill area. Up-front costs to AT are minimized.
- AT’s gravel requirements for public projects would come from the same pit area as the private partner’s aggregate that is sold to the open market. This “single-pit” approach will allow the private partner to implement comprehensive long-range plans, effective environmental management and impact mitigation consistent with the built-up context of the site.
- The private partner would manage site operations on a year-round “turnkey” basis. AT would provide advance notice of estimated aggregate requirements for public projects during the upcoming year. This will allow the partner to have adequate areas stripped and ready for AT aggregate and processing requirements.

- The public/private partnership scenario is beneficial in order to minimize up-front costs for the Province and to ensure continuous and effective long-term private management of the operation. For this reason, this approach is likely to be favoured by nearby residents and the municipality.

## **Scenario 5: Public Partnership**

### Description

- Under this option, the Province would reach agreements with other public sector aggregate users to jointly operate a gravel pit for all public requirements. Likely candidates under this option include the City of Calgary and/or the MD of Rocky View.
- Note that this option could also be combined with other options described in this section, particularly the Public/Private Partnership option, whereby there is more than one public partner and the Province functions as senior partner through ownership of the land and resource.

### Evaluation

- A Public Partnership has potential to expedite depletion of the aggregate resources at the subject site without the perception that the Government may be competing with other local suppliers in the sale of aggregates.
- Both the City of Calgary and the MD of Rocky View obtain the majority of their aggregate requirements for public road rehabilitation projects from their own sources. The City of Calgary uses approximately 500,000 tonnes of gravel per year and is interested in securing additional long term supplies. The MD of Rocky View is in the process of securing additional long term aggregate supplies for its own needs.
- City requirements of 500,000 tonnes per year and maximum annual AT requirements of 700,000 tonnes per year represent potential annual extraction for public requirements of 1.2 million tonnes per year. A public partnership would likely mean a depletion timeframe in the order of 100 years for the 130 million tonnes of aggregate on the site.
- In order to expedite depletion of the resources at the site and ensure land is ready for urban development within 40 to 60 years it will still be necessary to consider options that sell gravel to the open market. A public partnership would be logical during the early years of

operations at the site (first 20 to 30 years), while retaining flexibility to sell land or bring on a private partner during later years of operations, once the majority of privately owned aggregate deposits in the area have been depleted or are near depletion.

- This option could be favoured by the City of Calgary and the MD of Rocky View if further discussions indicate an interest in this type of venture. Existing aggregate operators may also support this approach since there would be somewhat reduced sales of aggregate to the open market.