



May 10, 2012  
4854.01

Jon Crump  
Area Development & Operations Technician  
Ministry of Transportation and Infrastructure, Chilliwack Area Office  
45890 Victoria Avenue  
Chilliwack, BC V2P 2T1

Dear Mr. Crump:

Re: Lake Errock Gravel Pit, Chilliwack, BC  
Access Review

Bunt & Associates was retained by Lehigh Hanson Materials Ltd. to conduct an access review of the existing gravel pit site located in Lake Errock, Chilliwack, BC. We have completed the study and a summary of our findings and recommendations is attached with this letter.

We trust that the information provided will be of assistance to you. Please contact us should you have any questions or comments.

Yours truly,  
Bunt & Associates

Yulia Liem, P.Eng.  
Transportation Engineer

David Tam, P.Eng., MBA  
Principal

C.C: John Dick, Lehigh Materials  
Doug Blender, Lehigh Materials

## 1. BACKGROUND

The gravel pit operated by Lehigh Hanson Region Canada is located in Highway 7 near Lake Errock, Deroche, north of Fraser River in Chilliwack, about 27km east of Mission.

The gravel pit has been in operations for years, and is in the process to renew its access permit. Some concerns have been raised to the Ministry of Transportation and Infrastructure (MoTI) regarding the access safety because of the visibility conditions for vehicles traveling on Highway 7 from the north. Therefore, MoTI has requested that an access review be conducted as part of the access renewal application.

## 2. EXISTING CONDITIONS

### 2.1 Traffic Volumes

The contractor operating and shipping out the aggregates from the gravel pit site provided us with the information on the site activities. The gravel pit operates on an average of 8 months in a year, open from Mondays to Fridays and the odd Saturdays. According to the hauling data in 2011, there were a total of 4,330 loads within the year which translates to an average of 27 loads a day. There were 7 trucks loading between 7am and 8am and they would return 2 hours later for their second load. Each truck made 3 - 4 loads a day. This means during the peak hour, there are 7 tandem-trucks entering and exiting the site.

For the site operations, there is one scale person and 3 - 4 machine operators working on the site. This translates to a maximum of 5 cars which, most likely, come before the site opens and leave after the site closed, i.e. not at the same time as the trucks peak hour.

Traffic volumes on Highway 7 was obtained from the MoTI traffic data which was collected at 0.8km east of Nicomen Slough Bridge, Deroche, or about 6km west of the gravel pit site. The latest 24-hour traffic data was taken on August 23, 2007, which is the peak seasonal time of the year, shows that the peak period occurs during mid-day with about 550 vehicles per hour (two-way). Assuming a traffic growth of 2% per year, traffic volumes along Highway 7 will reach about 600 vehicles per hour (two-way) in the summer of 2012.

With 600 vehicles (two-way) traveling along Highway 7 during the peak hour, there is no capacity issue for 7 trucks in and 7 trucks out movements at the site access.

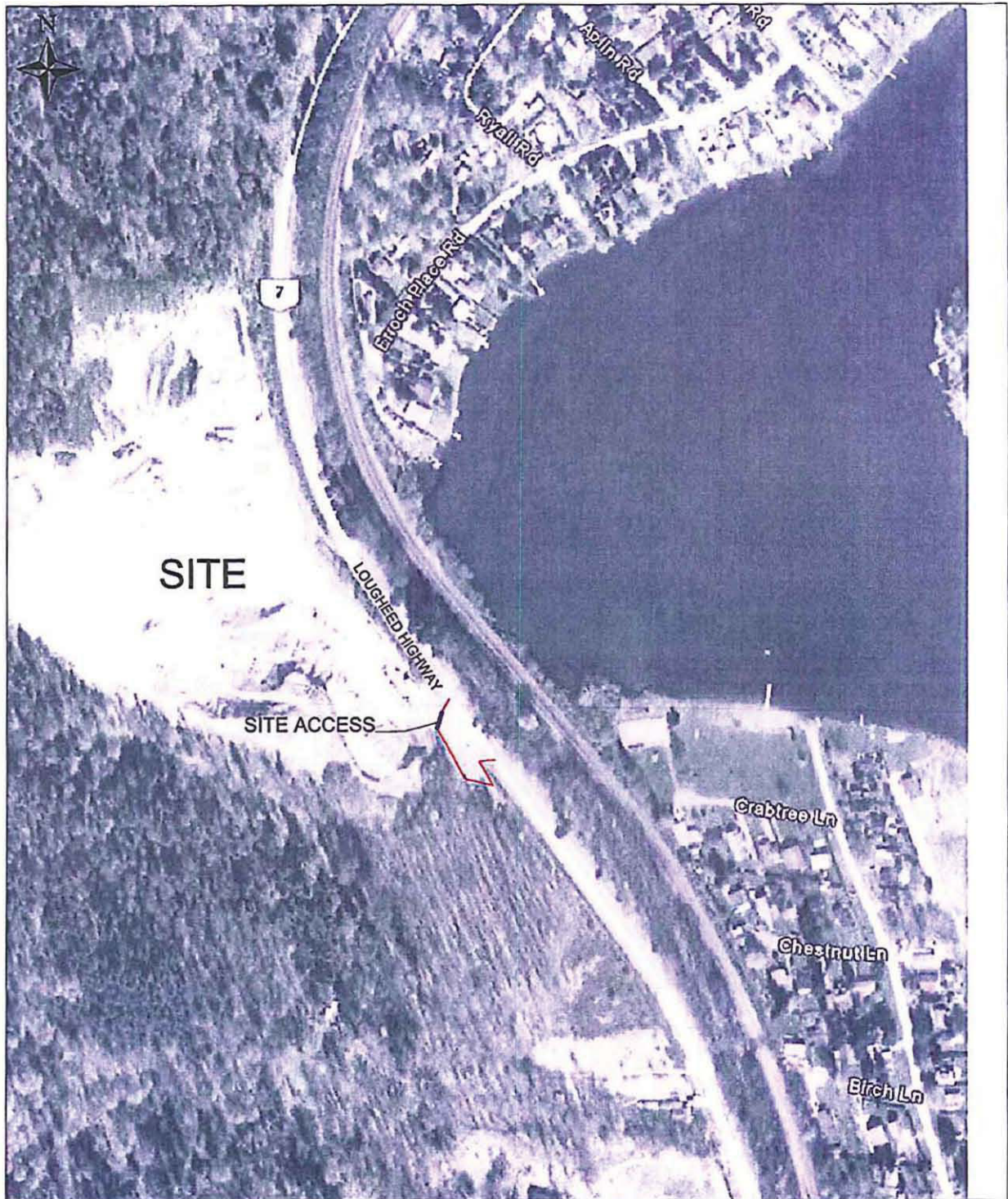
## 2.2 Site Area Conditions

Highway 7 in the Lake Errock area is a 2-lane highway with 80km/h posted speed limit. The Lake Errock gravel pit access is located at the approximate center of a tangent to two long horizontal curves, as well as on a long shallow vertical curve as shown in **Exhibit 1**. There is no passing allowed for at least 1 km in this stretch of Highway 7 with a double yellow solid centrelines and no opening at the gravel pit access.

A site visit was conducted on January 11, 2012 to observe the existing conditions around the area as well as the site access visibility. Sight visibility is limited on both directions by the horizontal curvature. The north direction is also limited by the vertical curvature. Views from the site access to the north and south directions are shown in **Figures 1 and 2**.

Based on the site observation, sight visibility can be achieved as far as about 200m to the north and 250m to the south.





## Exhibit 1 Site Location

Lake Errock Gravel Pit - Access Review  
4854.01 April 2012 Scale NTS







Figure 1: View to the north from Lake Errock gravel pit driveway



Figure 2: View to the south from Lake Errock gravel pit driveway

### 3. SIGHT DISTANCE REQUIREMENTS

Following the site observation, a land survey was conducted by Tracker Survey Services to obtain the street elevations, locations of above-ground utilities, etc. for sight visibility measurements.

The design speed used for sight distance calculation is 90km/h, since the posted speed limit on Highway 7 is 80km/h. The Transportation Association of Canada stipulates that sight requirements for accesses are the same as those for intersections. Three criteria are given: Stopping Sight Distance (SSD), Decision Sight Distance (DSD), and Turning Sight Distance (TSD).

#### 3.1 Stopping Sight Distance (SSD)

All calculations of the required stopping sight distance were in accordance with Section 1.2.5.2 of the TAC Geometric Design Guide for Canadian Road (1999). TAC identifies the required SSD as a function of design speed, perception-reaction time, and coefficient of friction & grade.

Stopping Sight Distance (SSD) is equal to the distance travelled while perceiving and reacting to a situation, plus the time it takes to brake to a stop. This represents the minimum distance required for a vehicle on the major road to come to a safe stop in the event of an obstruction at the access point. The sight distance available at the access must be at least equal to the stopping sight distance for safety measure.

From the land survey drawing obtained, the required SSD has been calculated as 174m for vehicles from the north, and 169m for vehicles approaching from the south. The difference between these two numbers is caused by differences in grade: -1.5% slope approaching from north and +1.2% slope approaching from south. Based on the surveyed vertical and horizontal profiles of Highway 7 in the vicinity, the gravel pit access has clear sight lines on both approaches as shown in Exhibits 2 and 3 for horizontal and vertical profiles, respectively.

SSD	Required	Available	
North of site	174m	200m	✓
South of site	169m	250m	✓

#### 3.2 Decision Sight Distance (DSD)

Decision Sight Distance (DSD) takes into the account the fact that drivers in unfamiliar situations, or situations with a large amount of sensory information presented to them, take longer to make decisions. The DSD is the sum of the stopping sight distance as well as an additional distance travelled during the time it takes a driver to interpret information received. If the decision sight distance cannot be met, it is beneficial to provide advanced warning of any unexpected conditions ahead.



At the gravel pit entrance, while the context of the road is simple, drivers may not expect a large truck to be turning in front of them. The minimum DSD is about 185m (TAC Table 1.2.5.6) for stopping on a rural roadway. Based on the surveyed vertical and horizontal profiles of Highway 7 in the vicinity, the sight distance available at the gravel pit entrance is sufficient.

DSD	Required	Available	
North of site	185m	200m	✓
South of site	185m	250m	✓

In order to provide warning of trucks turning, a W-317 (WC-8 as per Manual of Uniform Traffic Control Devices for Canada) Truck Crossing/Turning Ahead sign is recommended. This signage is currently in place south of the site, however it is located only 150m away from the site entrance. The current BC MOTHS standard recommends a distance of 200m for the W-317 sign for roads with a speed limit of 80km/hr. We recommend that the existing signage be relocated to 200m from the driveway access to provide more advanced warning of trucks turning ahead. The same sign, W-317, should be installed 200m north of the site as well.

### 3.3 Turning Sight Distance (TSD)

TSD was examined as per the criteria defined by TAC in Figure 2.3.3.4 of the Design Guide using a design speed of 90 km/h. When a vehicle turns, it should be able to see far enough in each direction that it is able to turn and accelerate without a significant impact on the speed of other road users. A significant impact is defined as a reduction to less than 85% of the posted speed. The TAC Design Guide separates the TSD requirements into three independent scenarios:

Scenario 1 - Sight distance for a passenger vehicle turning left onto a two-lane roadway across a passenger vehicle approaching from the left;

Scenario 2 - Sight distance for the same passenger vehicle turning left without being overtaken by a vehicle approaching from the right; and

Scenario 3 - Sight distance for a passenger vehicle turning right onto a two-lane roadway without being overtaken by a vehicle approaching from the left.

The requirements for each of the abovementioned scenarios are summarized in Table 1.



**Table 1: Summary of Turning Sight Distance (TSD) Requirements**

Scenario	Turn Movement	Conflicting Vehicle	TAC TSD Requirement
1	Left Turn	From Left	250m
2	Left Turn	From Right	442m
3	Right Turn	From Left	399m

Based on a car height of 1.5m and a viewing height of 2.1m for trucks, the site access meets the Scenario 1 sight line requirement, but not Scenarios 2 and 3. This means that as a driver turns left or right from these driveways, oncoming vehicles may have to slow down to a speed lower than 85% of the design speed of 90km/h before the turning vehicle is able to accelerate to 85% of the design speed.

This is an operational condition. It is not considered to be a major safety issue, though it will impact the northbound and southbound vehicle speeds on Highway 7. Because the frequency of the trucks entering and exiting the gravel pit is very low within certain time of the day, as mentioned in section 2, it will only marginally reduce the average operating speed on Highway 7.

#### 4. PROPOSED IMPROVEMENTS

A truck crossing/turning ahead sign is proposed to be installed 200m to the north and south of the site access to warn motorists of a possibility of truck turning ahead, as suggested in section 3 previously. In addition to the warning signs, we propose to have flashing beacons or similar device attached to the warning signs to draw driver's attention to the sign. These flashing beacons may be set flashing only during the operating time of the gravel pit and off during the other time.

The centreline on Highway 7 at the site access is continuous with double yellow solid lines, as mentioned in section 2, which indicates no crossing or passing allowed. We recommend open the centreline, i.e. remove the paint, where the site access is located to indicate that access to the site is allowed.

The recommended improvements are shown in Exhibit 4.

## 5. CONCLUSION AND RECOMMENDATION

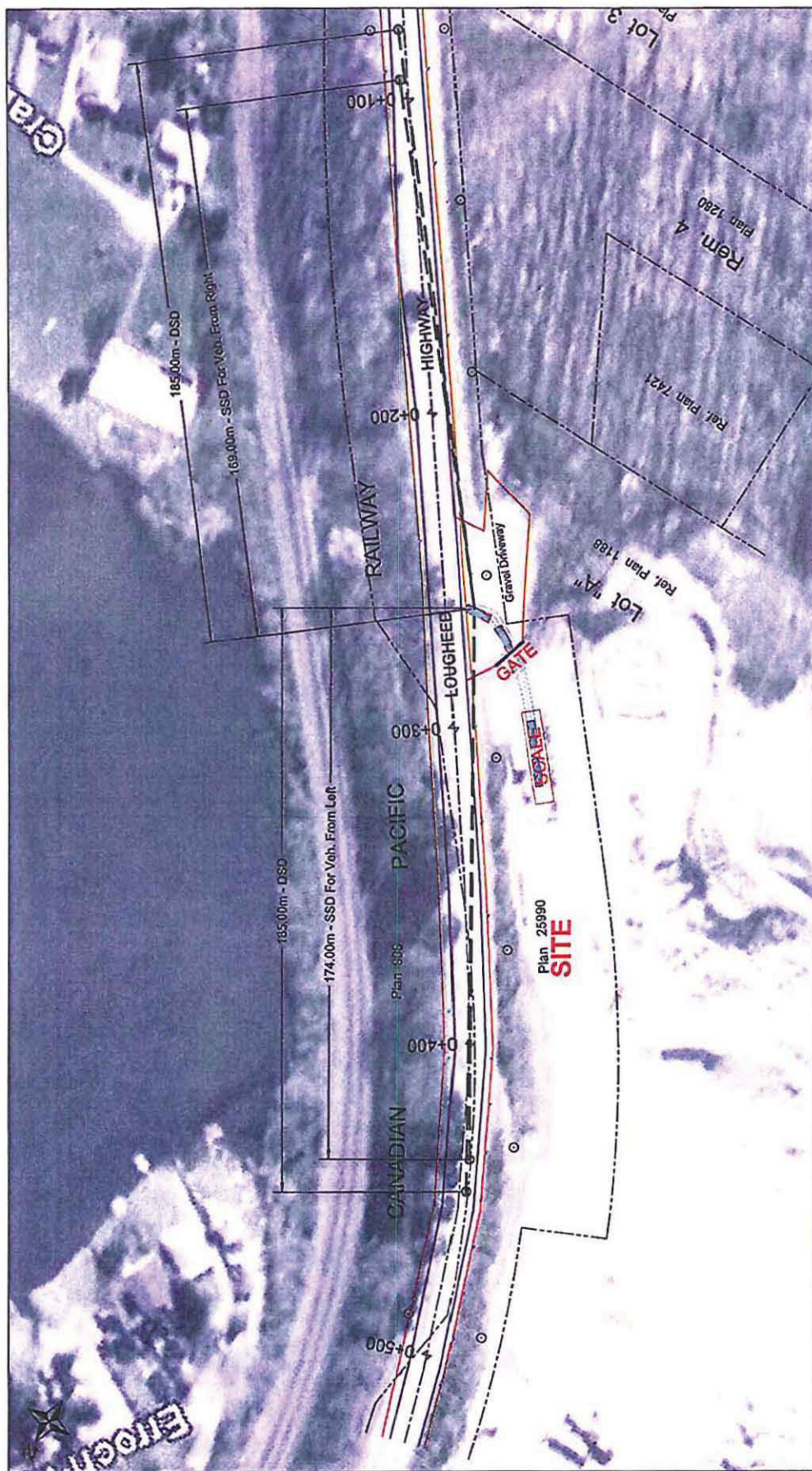
Upon completion of the site access review of the gravel pit site, we can conclude that the site access at the Lake Errock gravel pit meets the sight distance required to safely stop (SSD), with clear visibility at both directions, as per TAC standards for design vehicle of 90km/h. The access also meets the decision sight distance (DSD) required which is slightly longer than the stopping sight distance.

The sight distance required for the tandem-trucks to turn and attain the operating speed on the Highway 7, TSD, can not be achieved. However, this is not considered a major safety issue, rather an operational issue. Because the anticipated truck volume accessing the site is low, this will not create a significant impact on the Highway 7 speed.

Although there is no safety issue discovered based on the analytical analysis, to improve drivers' awareness of possible truck crossings, we recommend:

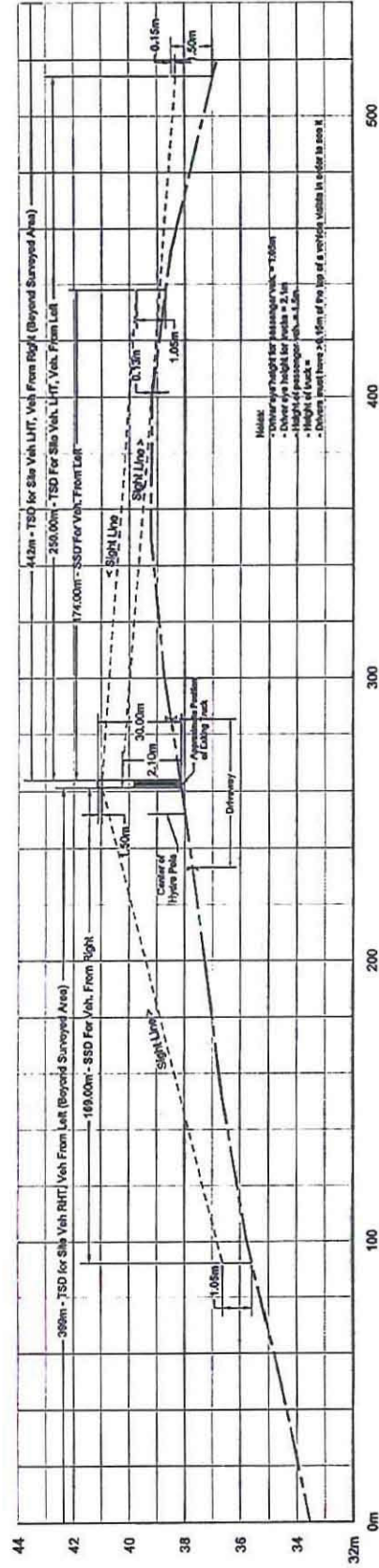
- A truck crossing/turning ahead sign be installed with flashing beacon, or similar device, attached to it in advance of the site, both directions;
- An opening of the centreline pavement markings on Highway 7 at the site access.





### Exhibit 2 Horizontal Sight Distances





Centerline Profile With Sight Lines  
(10x Vertical Ex.)

### Exhibit 3 Vertical Sight Distances

Lake Erreck Gravel Pit - Access Review  
4854.01 April 2012 Scale 1:300 on 11"x17"

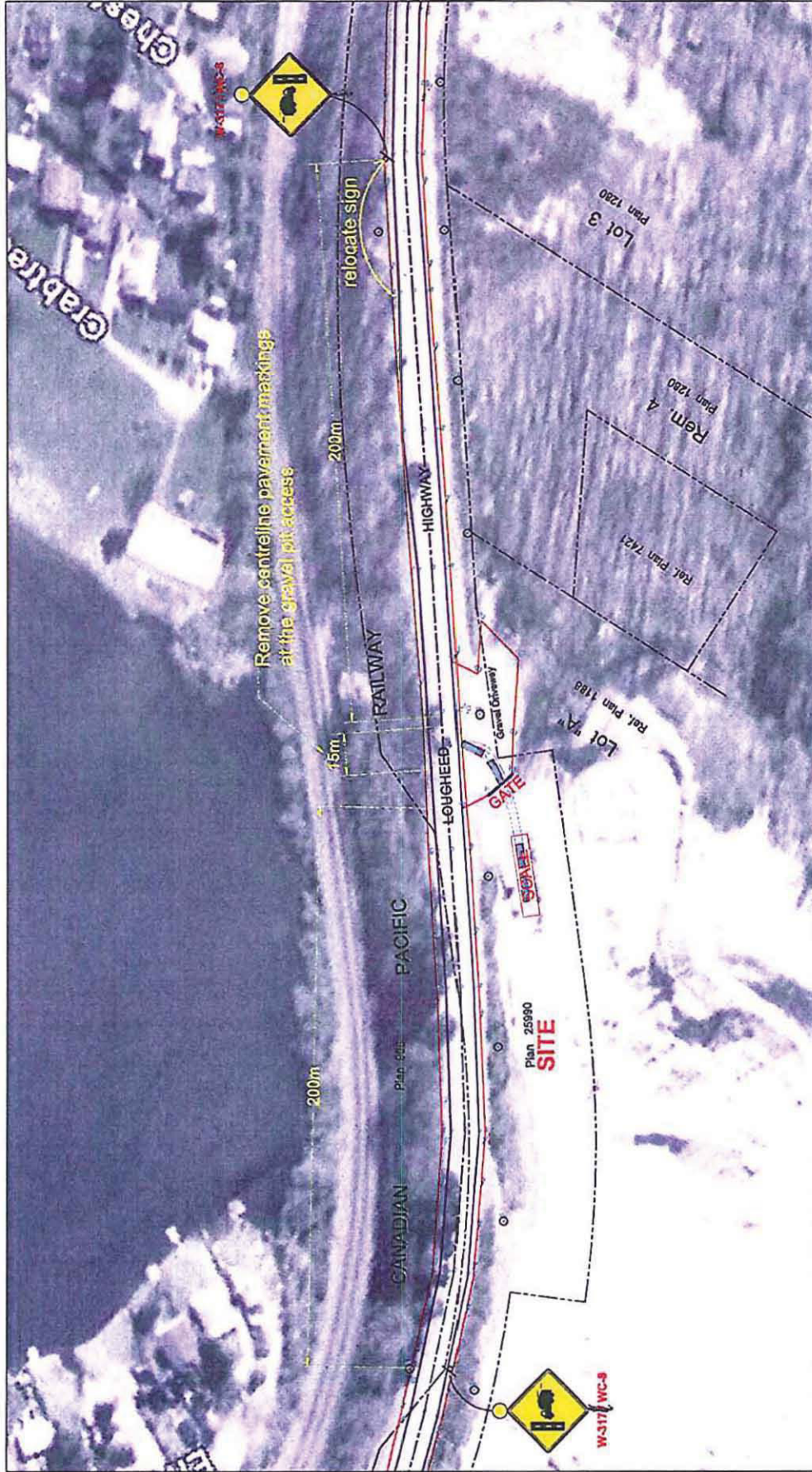


Exhibit 4  
Recommended Improvements

Lake Errock Gravel Pit - Access Review  
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