



CAPITAL REGIONAL DISTRICT

Hartland Landfill Alternate Access Transportation Impact Analysis

CRD Contract No. 30.20.03-01

FINAL REPORT



PREPARED BY:

Bunt & Associates Engineering Ltd.

Suite 530, 645 Fort Street, Victoria, BC V8W 1G2

t. (250) 592-6122

September 2, 2020

September 2, 2020
04-20-0118

Genevieve Tokgoz, P.Eng., M.Eng.
Project Engineer
Capital Regional District
625 Fisgard Street
Victoria, BC V8W 1R7

**Re: Hartland Landfill Alternate Access Transportation Impact Analysis
Final Report**

Bunt is pleased to provide the attached Transportation Impact Analysis which assesses the impacts of changing Hartland landfill's vehicle access. We completed a multiple-account evaluation of vehicle access options of moving either only commercial vehicles or all vehicles from the existing Hartland Avenue access to the Willis Point Road access point.

We found that moving the vehicle access location would not cause any significant impacts. We identified a few street infrastructure improvements for consideration; however, no improvements are required to accommodate changing the landfill's vehicle accesses.

This report version addresses questions raised during the July Environmental Services Committee meeting with most of report updates contained in Sections 3.5-3.9, 4.4, 4.7, 4.9, and 4.10.

Please let us know if we can be of any further assistance.

Yours truly,
Bunt & Associates

Simon Button, P.Eng., M.Eng., PMP
Transportation Engineer

cc: Joshua Frederick, Capital Regional District

CORPORATE AUTHORIZATION

Prepared By: Simon Button, P.Eng.
Kyle Brandstaetter, MCIP, RPP

Bunt & Associates Engineering Ltd.
530-645 Fort Street
Victoria, BC V8W 1G2
Canada

Reviewed By: Peter Joyce, P.Eng.
Principal

Telephone: +1 250 592 6122
Facsimile: +1 604 685 6579

Approved By: Peter Joyce, P.Eng.
Principal

Date: 2020-09-02
Project No. 04-20-0118
Status: Final



This document was prepared by Bunt & Associates for the benefit of the Client to whom it is addressed. The information and data in the report reflect Bunt & Associates' best professional judgment in light of the knowledge and information available to Bunt & Associates at the time of preparation. Except as required by law, this report and the information and data contained are to be treated as confidential and may be used and relied upon only by the client, its officers and employees. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. Bunt & Associates accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

TABLE OF CONTENTS

EXECUTIVE SUMMARY	1
1. INTRODUCTION	1
1.1 Study Purpose	1
1.2 Potential Access Changes	1
1.3 Study Scope.....	1
1.4 Reasons to Relocating Vehicle Access	2
2. LANDFILL OPERATIONS	3
2.1 Facilities	3
2.2 Hauling Trends	3
2.3 Users and Hours	3
2.4 Hauling Transactions	3
3. SITE CONTEXT	5
3.1 Street Network.....	5
3.2 Land use	5
3.3 Active Transportation	5
3.4 Transit Service	5
3.5 Transportation Data Sources.....	6
3.6 Vehicle Speeds	6
3.7 Historical Vehicle Growth	7
3.8 Seasonality and COVID-19.....	7
3.9 Study Peak Hours.....	8
3.10 Peak Hour Vehicle Volumes.....	9
3.11 Vehicle Operations	9
4. ANALYSIS	13
4.1 Scenarios.....	13
4.2 Vehicle Volumes	13
4.3 Safety.....	20
4.3.1 Safety Review Process.....	20
4.3.2 Collision Data	20
4.3.3 Audit Findings.....	20
4.3.4 Key Issues and Recommendations	25
4.3.5 Comparison	25
4.4 Street Capacity	26
4.5 Intersection Level of Service.....	27
4.6 Street Grade	29
4.7 Truck Climbing Lanes	29
4.7.1 The Need for a Truck Climbing Lane.....	29
4.7.2 Potential Willis Point Road Truck Climbing Lane.....	30
4.8 Active Transportation	30
4.9 Vehicle Emissions	31
4.10 On-site Circulation.....	31
4.11 Infrastructure Condition	32
5. SUMMARY	34

EXHIBITS

Exhibit 3.1: Transportation Network..... 10

Exhibit 3.2: Existing Vehicle Volumes..... 11

Exhibit 3.3: Existing Vehicle Levels of Service..... 12

Exhibit 4.1: 2030 Vehicle Volumes – No Change in Vehicle Access 15

Exhibit 4.2: Change in Vehicle Volumes – Move Commercial Vehicle Access to Willis Point Road 16

Exhibit 4.3: 2030 Vehicle Volumes – Move Commercial Vehicle Access to Willis Point Road 17

Exhibit 4.4: Change in Vehicle Volumes – Move Primary Access to Willis Point Road..... 18

Exhibit 4.5: 2030 Vehicle Volumes – Move Primary Access to Willis Point Road 19

Exhibit 4.6: On-site Commercial Vehicle Circulation 33

FIGURES

Figure 1.1: Site Context 1

Figure 2.1: Historical and Forecasted Waste (Tonnes) 3

Figure 2.2: Monthly Number of Vehicles 4

Figure 2.3: Daily Number of Vehicles..... 4

Figure 2.4: Number of Vehicles (Tuesday-Thursday) 4

Figure 2.5: Hourly Number of Vehicles (Saturday)..... 4

Figure 3.1: Willis Point Road Vehicle Profiles 7

Figure 3.2: Hartland Avenue Vehicle Profiles 8

Figure 3.3: Weekday Vehicle Profiles 9

Figure 4.1: Hartland Avenue Vehicle Volume – Summer Saturday 26

Figure 4.2: Willis Point Road Vehicle Volume – Summer Saturday 26

TABLES

Table 2.1: Hartland Landfill Operating Hours..... 3

Table 4.1: Existing Landfill Vehicle Trip Generation 13

Table 4.2: 2014 – 2018 Collisions in the Study Area..... 20

Table 4.3: Safety Audit Findings - Intersections 21

Table 4.4: Safety Audit Findings – Street Segments..... 22

Table 4.5: 2030 Vehicle Level of Service..... 28

Table 4.6: Internal Road Attributes..... 32

Table 5.1: Scenario Comparison Summary..... 35

EXECUTIVE SUMMARY

Study Purpose

The Capital Regional District is developing its new Solid Waste Management Plan and is considering relocating vehicle access to the Hartland Landfill from Hartland Avenue to Willis Point Road as it may be the only viable route for trucks to access the future filling areas. This study evaluates this potential vehicle access change.

Context

The landfill is in a rural area on Hartland Avenue. The District of Saanich has jurisdiction over Hartland Avenue and Willis Point Road. The landfill is surrounded by the communities of Prospect Lake, Willis Point, and nearby residents along Hartland Avenue.

Landfill Operations

Additional measures planned by the CRD will maintain annual deposits at similar or lower levels for the next few decades. Approximately 350 vehicles deposit material at the landfill each day causing 350 vehicles to enter and exit the landfill daily. Roughly one-third of this is commercial vehicles and the remainder is residential vehicles. The proportion of commercial vehicles is lower on Saturdays.

Scenarios

Three scenarios were developed to assess the positive and negative impacts of changing vehicle access from Hartland Avenue to Willis Point Road:

1. No change in vehicle access from the current arrangement with Hartland Avenue functioning as the primary access point for commercial vehicles and resident waste/recycling drop-off.
2. Move only the commercial vehicle access to Willis Point Road.
3. Move the primary vehicle access to Willis Point Road.

Multiple-Account Evaluation

Moving a portion or all 350 vehicles per day accessing the landfill from Hartland Avenue to Willis Point Road results in vehicles using intersections and streets that are more appropriate for higher vehicle use, particularly heavy commercial vehicles. This includes moving vehicles turning at the West Saanich Road & Hartland Avenue intersection with poor visibility to the West Saanich Road & Wallace Drive intersection with good visibility and the more appropriate horizontal and vertical design of Willis Point Road compared to Hartland Avenue which also has frequent driveways.

None of the scenarios require any street improvements to accommodate vehicle pattern change. Specifically, there is no need for an additional lane on Willis Point Road. Willis Point Road only meets one of three criteria identified by TAC for adding a truck climbing lane. Most notably, the street grade does not cause heavy trucks to travel below the speed limit and adding a lane on Willis Point Road would increase the number of speeding vehicles as street width (especially when vacant) is directly correlated to vehicle speed. Two additional lane concepts were reviewed and were found to improve travel times by less than 15 seconds.

Recommendation

Moving the vehicle access causes minor impacts and there are more positive than negative impacts of moving either only commercial vehicles or all vehicles to access the site from Willis Point Road. Willis Point Road is designed for higher vehicle use than Hartland Avenue.

Improvements

Regardless of if vehicle access is changed, faded pavement markings on Willis Point Road should be reinstated following nearby construction of the Residual Treatment Facility. The District of Saanich should also review opportunities to reduce the speed of vehicles turning right from Wallace Drive onto West Saanich Road. Potential improvements could also include an improved connection to the Interurban Trail which terminates nearby.

1. INTRODUCTION

1.1 Study Purpose

As part of the continual evolution of the Hartland Landfill, the Capital Regional District (CRD) has identified the opportunity to relocate access from Hartland Avenue to Willis Point Road to improve safety and for Engineering and Operations requirements. In addition, in the CRD's new Solid Waste Management Plan, it is integral to know where the primary access should be located in terms of public impact and landfill operations.

Bunt & Associates Engineering Ltd. has been engaged by the CRD to conduct a thorough investigation regarding the preferred location and routing for vehicle access.

1.2 Potential Access Changes

Figure 1.1 illustrates Hartland Landfill's location in the northwest portion of the District of Saanich as well as the existing two vehicle access routes. The Hartland Avenue access is currently the primary access, providing access for residential and commercial haulers as well as access to the landfill office and the Hartland Learning Centre. The Willis Point Road access currently provides access to the Residual Treatment Facility which is currently under construction. The access previously provided access to a composting facility which is no longer in operation.

1.3 Study Scope

This study evaluates the impacts (both positive and negative) of relocating the commercial hauling access to Willis Point Road or both the commercial and residential hauling access to Willis Point Road.

This study will evaluate the current access arrangement against the two potential alternatives described above by comparing their impacts on safety, vehicle operations, vehicle emissions and on-site landfill operations.

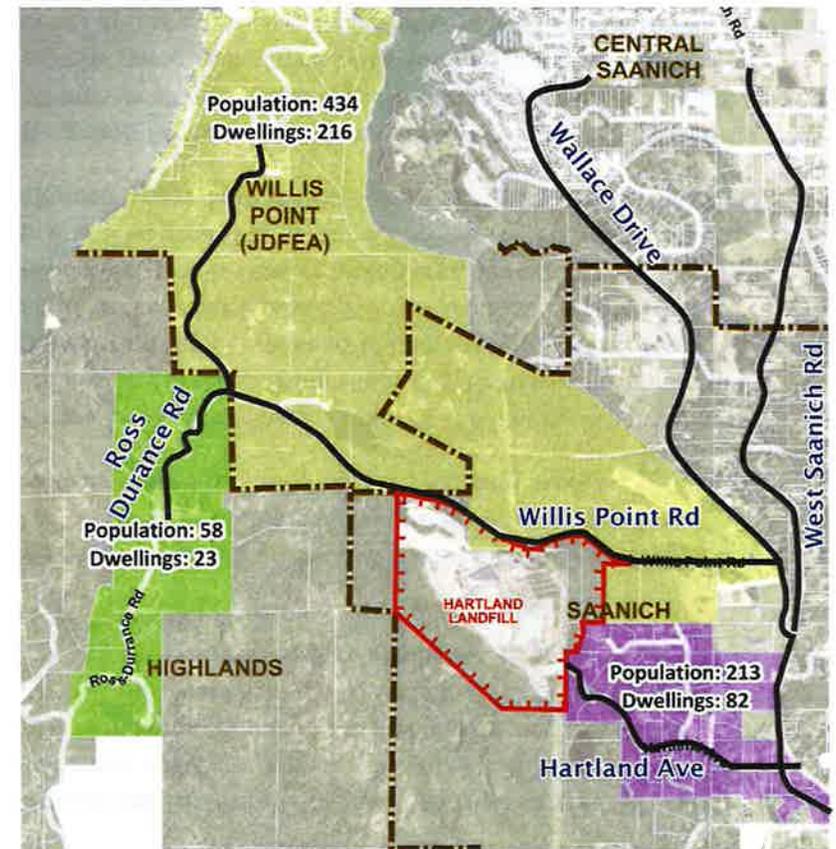


Figure 1.1: Site Context

1.4 Reasons to Relocating Vehicle Access

Within the next few years, the location where commercial haulers directly deposit waste will move towards the northwest of the landfill. CRD staff identified the following reasons for relocating vehicle access to Willis Point Road which primarily relate to the safe transportation of commercial hauling vehicles to the active filling area:

High Level Road Restraints: The steep grades on High level Road are not suitable for loaded trucks. The existing road would pose severe safety risks if a truck's brakes were to fail. A similar impact is currently present on Hartland Avenue. Willis Point Road and Residuals Way are significantly flatter. The High Level Road area is designated for blasting resulting in commercial traffic being paused for a couple of hours or re-routed during blasts.

East Perimeter Road Restraints: Two-way traffic on East Perimeter Road is not feasible as other critical underground gas, leachate, and water infrastructure will be compromised and present other issues if the road is widened. The road has a steep downward grade at North Toe Road and turns abruptly at the base of the steep grade. It is adjacent to a steep embankment making rollovers a serious risk. In addition, the BC Hydro Right-of-Way may limit the possibility of upgrading the road and the RNG project will be affecting North Toe Road. This may cause traffic to be re-routed onto Lagoon Road which will add more turns and does not have the sufficient width or grade.

High-risk Activities: Maintaining vehicle access from Hartland Avenue maintains the longest routes through the landfill for commercial vehicles. This would increase the high-risk activities (blasting, hauling, construction, LFG, etc) that the public will be exposed to by traversing close to active landfill. These activities

put the public, contractors, and CRD employee's health and safety at risk. There is no level of oversight that will prevent a safety incident from happening as all these activities occur in the same space.

Monitoring: East Perimeter Road and High Level Road have numerous areas that are out of sight, so CRD staff will not be able to monitor commercial customers as they move through the landfill. This could lead to incidents on CRD property (accidents, lost customers, U-turns, illegal dumping, trespassing onto other areas of landfill, etc.).

Weather: The steep grades and turns on High Level Road and East Perimeter Roads cause them to be more prone to weather impacts caused by snow, ice, rain, fog, and wind.

Future Expansion: Phase 3 and Phase 4 landfill expansion areas are upslope of the existing High Level Road which would require the existing High Level Road to be buried so Phase 3 could be piggy backed over Phase 2. Phase 4 requires that the current residential drop-off and recycling area be relocated. The only practical way that the Hartland 2100 Master Plan could be attained would be to relocate vehicle access to Willis Point Road.

Recycling Facility: The future relocation of the residential drop-off area would provide an opportunity to construct a purpose-built recycling facility near Willis Point Road that would provide better access and queue capacity than the existing location.

Mount Work Park Entrance: The future relocation of the residential drop-off area would remove all traffic from Hartland Avenue which would provide an opportunity to improve gateway and user experience for mountain bikers and hikers accessing the trail network on Mount Work.

2. LANDFILL OPERATIONS

2.1 Facilities

The Hartland Landfill is the only regional solid waste disposal facility in the Capital Region. It is a multi-purpose facility providing collection for recycling, household hazardous waste, salvageable items as well as yard and garden waste collection and processing, controlled waste disposal and landfill service to commercial and residential customers.

2.2 Hauling Trends

Figure 2.1 illustrates the historical and forecasted waste to be deposited at the Hartland Landfill. There was a sharp increase in waste from the 1950s to 1990; however, the annual weight of waste deposited has decreased since then. Additional measures in the CRD’s Solid Waste Management Plan, currently being developed, are anticipated to maintain annual deposits at similar or lower levels for the next 20-30 years.

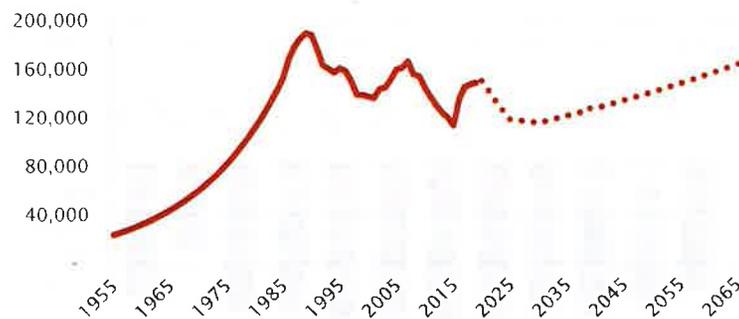


Figure 2.1: Historical and Forecasted Waste (Tonnes)

2.3 Users and Hours

Most users driving to the Hartland Landfill are municipal, commercial trucks (collectively called commercial haulers in this study) and residents arriving with household waste and/or recycling items. Commercial and municipal haulers with a registered account can use an automated scale that opens at 7 am on weekdays versus 9 am for non-registered users (typically residents). **Table 2.1** lists the facility’s operating hours.

Table 2.1: Hartland Landfill Operating Hours

USER	MONDAY-FRIDAY	SATURDAY	SUNDAY
Commercial and Municipal Trucks	7 am - 5 pm	7 am - 2 pm	Closed
Residents	9am - 5pm	7am - 2pm	Closed

In addition to depositing solid waste, CRD staff, contractors and visitors also drive to the site.

2.4 Hauling Transactions

Bunt identified several important trends from the 2019 transaction data.

Figure 2.2 illustrates the monthly number of vehicles into three streams. The number of commercial vehicles remains relatively constant throughout the year with around 3,200 vehicles per month. There is more variation with the residential streams with an average of 6,200 vehicles per month, increasing up 8,000 during August.

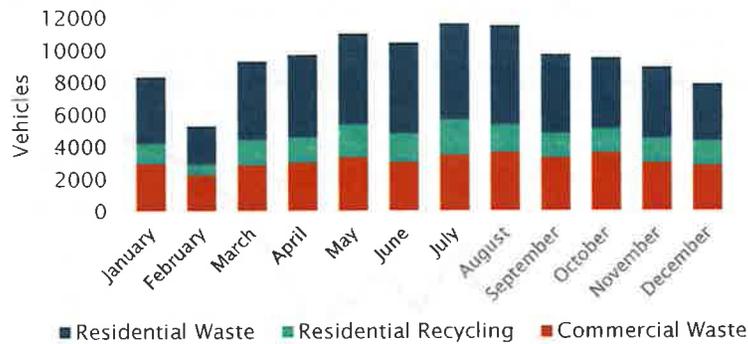


Figure 2.2: Monthly Number of Vehicles

Figure 2.3 illustrates the average daily number of vehicles which is consistently near 350. Most commercial vehicles arrive on weekdays whereas the peak day for residents is on Saturday.

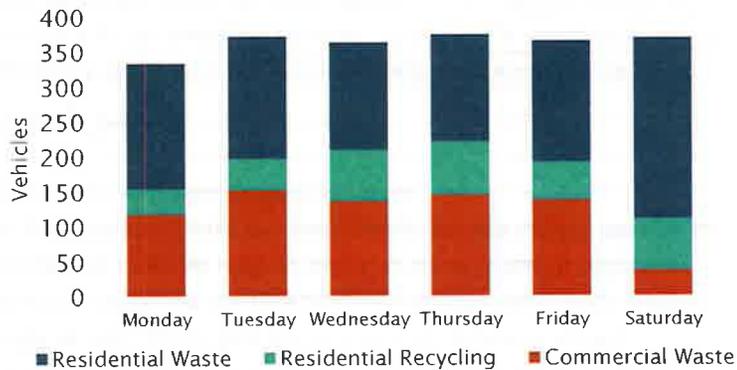


Figure 2.3: Daily Number of Vehicles

Figures 2.4 and 2.5 illustrate the hourly number of vehicles arriving on weekdays and Saturdays. The weekday number of vehicles is the average of Tuesday, Wednesday, and Thursday,

i.e., the midweek period, which is typically used for weekday transportation systems analyses. Weekdays are consistently around 45 vehicles per hour from 9 am to 2 pm and Saturday's peak around 70 vehicles per hour between 1 and 2 pm. Generally speaking, the facility is generating on average about one inbound vehicle per minute during both the weekday and Saturday daytime periods.

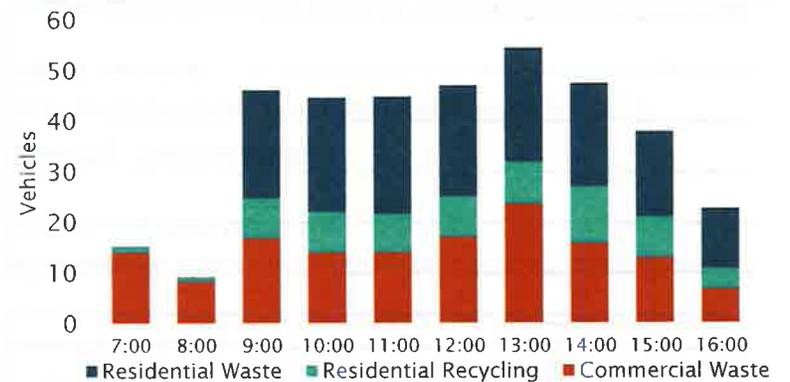


Figure 2.4: Number of Vehicles (Tuesday-Thursday)

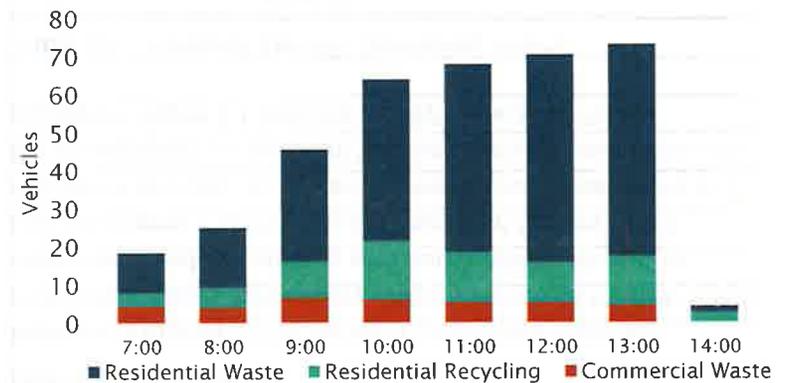


Figure 2.5: Hourly Number of Vehicles (Saturday)

3. SITE CONTEXT

3.1 Street Network

Exhibit 3.1 illustrates the nearby street network including the traffic laning at the study intersections:

- Willis Point Road & Hartland Landfill Access
- Willis Point Road & Wallace Drive
- West Saanich Road & Wallace Road
- West Saanich Road & Hartland Avenue

West Saanich Road is the primary north-south route through the area. Hartland Avenue is directly connected to West Saanich Road whereas Willis Point Road is connected to West Saanich Road via Wallace Drive. All roads one travel lane in each direction. West Saanich Road, Willis Point Road, and Hartland Avenue are designated truck routes. Wallace Drive is only a designated truck route between West Saanich Road and Willis Point Road.

3.2 Land use

Figure 3.1 illustrates the landfill's The Hartland Landfill is in a rural area, outside of Saanich's Urban Containment Boundary. Nearby land uses include single-family homes with a few non-residential destinations (such as Red Barn Market and First Unitarian Church) located on West Saanich Road. Additional destinations are located further south at the Prospect Lake Road Village including an elementary school and a community hall as it forms the hub of the surrounding community.

Over 200 residents access their homes off Hartland Avenue and approximately a hundred homes at the end of Willis Point Road approximately 6 kilometres to the northwest.

The Hartland Landfill is bounded by Mount Work Regional Park on three sides (north, west, and south). One of the park's primary trail head access points is located at the end of Hartland Avenue, adjacent to the landfill entrance. At the entrance near the trail head is a parking lot for the mountain biking community. It is a popular destination with almost 40,000 trail users during 2019. Additional secondary mountain bike trail access points are located on Willis Point Road.

3.3 Active Transportation

West Saanich Road has painted bicycle lanes through the study area. In addition, the Interurban Trail runs parallel to West Saanich Road from Hartland Avenue to Wallace Drive. Aside from the trail, there is no dedicated walking infrastructure which is not uncommon for rural settings.

As shown in the following list, West Saanich Road is the most frequently used street for cycling with over 500 cyclists per day or about 50 per hour during the peak hour (all data from April 2019). Few cyclists were observed on Hartland Avenue, likely due to the lack of road shoulders and the presence of large vehicles associated with the landfill.

- Willis Point Road: 150 bicycles/day
- Wallace Drive: 280 bicycles/day
- West Saanich Road: 550 bicycles/day
- Hartland Avenue: 15 bicycles/day

3.4 Transit Service

BC Transit operates bus route #83 on West Saanich Road with stops at Hartland Avenue and Wallace Drive being the closest locations to the landfill. The stops are 2 and 3 kilometres respectively from the landfill.

3.5 Transportation Data Sources

1. District of Saanich Transportation Data (up to 2019)

The District of Saanich (Saanich) provided historical multi-modal traffic data for various locations within the study area. This includes directional counts that provide three full days of data (Tuesday to Thursday) regarding the time, vehicle length, and vehicle speed on Willis Point Road, Wallace Drive, West Saanich Road, and Hartland Avenue from March and April of 2019.

Saanich also provided weekday intersection turning movement counts at the three intersections (from 2017 and 2019) which would have different vehicle travel patterns if Hartland Landfill's access shifted from Hartland Avenue to Willis Point Road:

- Wallace Drive & Willis Point Road
- West Saanich Road & Wallace Road
- West Saanich Road & Hartland Avenue

2. Turning Movement Data (Spring 2020)

Bunt collected supplemental traffic data on Thursday, April 30, 2020, and Saturday, May 2, 2020, at the three study intersections noted above. The COVID-19 pandemic was on-going during these dates which will have altered the typical travel patterns for the area, e.g., "work from home" advisories, closed schools and other destinations. Therefore, the data was adjusted to estimate 'normal' travel patterns for further use in this study. The raw data was not directly used in the study's analysis.

The weekday data collected in 2020 was compared to the weekday data collected in 2017 and 2019. From this dataset, vehicle volumes in April 2020 on West Saanich Road, Wallace Drive, and Willis Point Road were estimated to be 70% of normal.

There was no significant difference between the weekday vehicle volume on Hartland Avenue which is aligned with data provided by the CRD which illustrates a slight increase in transactions at the Hartland Landfill on Thursday, April 30, 2020, compared to April 2019. The number of transactions at the Hartland Landfill on Saturday, May 2, 2020, was 80% of the same period last year.

The percentages noted above were used to adjust all transportation data from the Spring of 2020 to typical (i.e. if the COVID-19 pandemic was not occurring).

3. Directional Data (Summer 2020)

Additional data was collected from July 19 to 27, 2020, to identify any seasonality changes. Transportation planning is typically completed using data from September to June, however, due to the presence of multiple nearby recreational areas, supplementary data was collected during July as the use of the nearby parks would be higher during the summer.

Vehicle volume, length, and speed was collected on Willis Point Road and Hartland Avenue. On Willis Point Road data was collected 250 metres west of Wallace Drive where the street is straight and flat as well as 900 metres west of Wallace Drive where the street is straight but at its steepest grade of 8%.

3.6 Vehicle Speeds

Willis Point Road: The average vehicle speed on Willis Point Road 250 metres west of Wallace Drive (which is straight and flat) was 70 km/h eastbound and 68 km/h westbound compared to the posted 60 km/h speed limit. 650 metres west, the effect of the 8% grade increases eastbound (downhill) speeds to 73 km/h (+3km/h) and decreases westbound speeds to 65 km/h (-3km/h).

Wallace Drive: The average vehicle speed on Wallace Drive was 60 km/h compared to the posted speed 50 km/h limit.

West Saanich Road: Average speeds in the high 60's were observed at multiple locations on West Saanich Road and compared to the posted 60 km/h speed limit.

Hartland Avenue: Although Hartland Avenue has a speed limit of 40 km/h, the average vehicle speed at the Tod Creek bridge was around 60 km/h, likely because Hartland Avenue dips down to the bridge for traffic arriving in both directions.

3.7 Historical Vehicle Growth

Over the past 10 years, there has been modest (1-2%) annual vehicle growth on Hartland Avenue, West Saanich Road, and Wallace Road during peak hours.

Vehicle growth on Willis Point Road has been higher with up to 10% annual increases eastbound during the weekday morning peak hour and westbound during the weekday afternoon peak hour. Average annual vehicle growth considering both travel directions is approximately 5%. One possible rationale provided by an area resident at a previous CRD engagement event is that Willis Point Road is increasingly being used for commuters from West Shore to reach the Saanich Peninsula. This could be particularly true during the construction of the McKenzie Interchange which has impacted vehicle travel times. Following construction completion, drivers are anticipated to return to travelling on Highway 1 and McKenzie Avenue due to the reduced travel times. 10% annual growth (or even 5%) is typically never actualized over the long-term.

3.8 Seasonality and COVID-19

Figures 3.1 and 3.2 illustrate the hourly vehicle profiles for Willis Point Road and Hartland Avenue during the summer of 2020 (during the COVID-19 pandemic) and the estimated volumes for the spring of 2020 if the COVID-19 pandemic had not occurred. Mobility data collected by Google indicates that across BC the COVID-19 pandemic has significantly reduced the number of trips to work, transit stations, and retail destinations, but has more than doubled the number of trips to parks which would include locations such as the nearby regional parks.

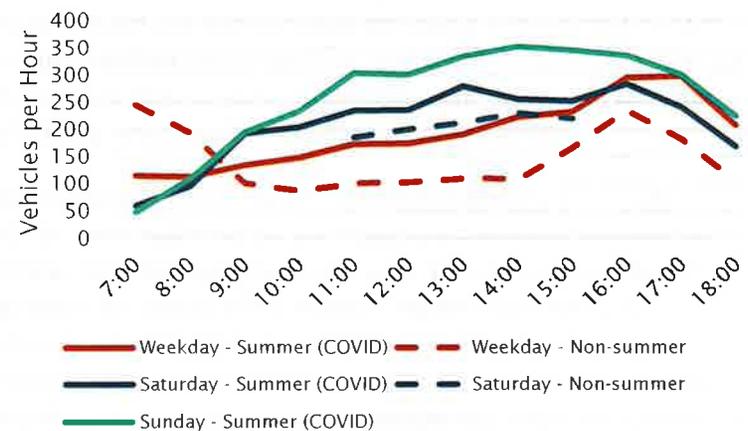


Figure 3.1: Willis Point Road Vehicle Profiles

The combined effect of summer travel patterns (versus the rest of the year) and COVID-19 are particularly evident for the two weekday datasets on Willis Point Road. The data collected in the summer (during COVID-19) illustrates substantially fewer people driving during the morning peak hour which is typically primarily for travelling to work and school, however, the number of midday

trips which tend to be more for recreational and leisure purposes is substantially higher.

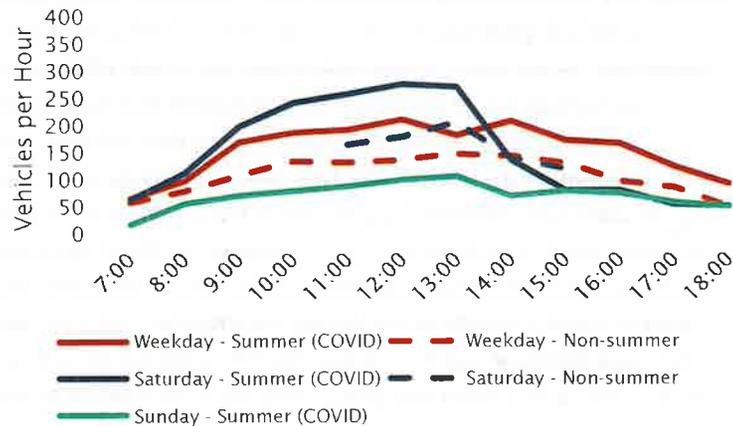


Figure 3.2: Hartland Avenue Vehicle Profiles

The total number of vehicles using Hartland Avenue was 40% higher in July 2020 compared to March 2019 primarily due to increased use midday. This can be attributed to higher use of the Hartland Landfill and Mount Work during the summer. The increase was less significant during typical peak hours

The spring weekday data collected in 2020 was compared to the weekday data collected in 2017 and 2019. From this dataset, vehicle volumes in April 2020 on West Saanich Road, Wallace Drive, and Willis Point Road were estimated to be 70% of normal at that time. There was no significant difference between the weekday vehicle volume on Hartland Avenue which is aligned with data provided by the CRD which illustrates a slight increase in transactions at the Hartland Landfill on Thursday, April 30, 2020, compared to April 2019. The number of transactions at the

Hartland Landfill on Saturday, May 2, 2020, was 80% of the same period last year.

3.9 Study Peak Hours

It is recommended that the impact analysis of relocating the landfill's vehicle access be based on the non-summer period as this represents 10 out of the 12 months of the year and is consistent with transportation planning best practices. In addition, the only summer data available was collected during the COVID-19 pandemic, and such it would be difficult to accurately estimate 'normal' summer vehicle volumes. The study will reference the higher 2020 summer vehicle volumes where appropriate, however, we do not have any evidence to identify if this data was impacted by the COVID-19 pandemic resulting in either higher or lower vehicle volumes compared to normal.

Figure 3.3 illustrates the weekday temporal profiles of vehicle use on West Saanich Road (both directions) and at the Hartland Landfill (inbound and outbound). The Hartland Landfill is typically busiest during the middle of the day which is different from the nearby streets which are typically busiest during the morning and afternoon commuting periods.

8:30 - 9:30 am and 3:30 - 4:30 pm were chosen as the study's weekday peak hours as they represent the best overlap between vehicle trips generated and not generated by the Hartland Landfill. 1:00 - 2:00 pm was chosen as the Saturday peak hour as this is the busiest time period for the Hartland Landfill. Although hourly traffic data was not available for West Saanich Road, the Saturday peak hour for many streets is between 12:00 and 3:00 pm which aligns with the landfill's peak hour.

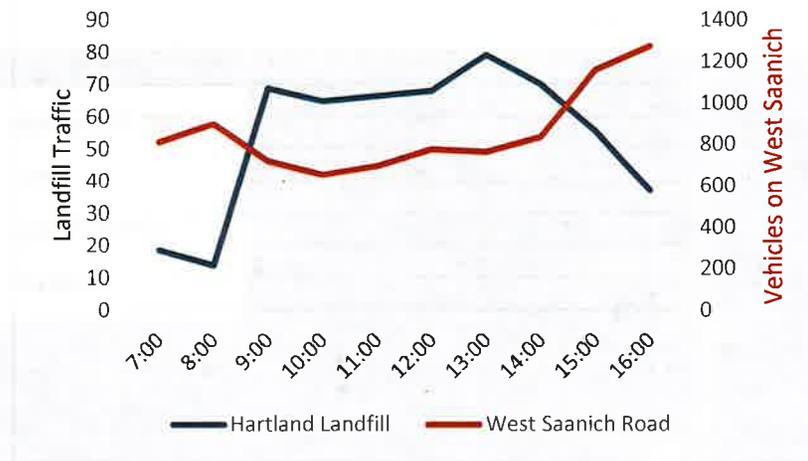


Figure 3.3: Weekday Vehicle Profiles

3.10 Peak Hour Vehicle Volumes

Exhibit 3.2 illustrates the estimated 2020 vehicle volumes for the three time periods considered in this study. The weekday morning and afternoon volumes were obtained from the data collected in 2017 and 2019 with a 1% annual increase applied to movements on West Saanich Road, Wallace Drive, and Willis Point Road which is a common average long-term vehicle growth rate for non-downtown locations. Although a 10% annual increase was previously observed on Willis Point Road in the peak commuting direction, this level of vehicle growth can typically never be sustained over the long-term. In addition, once the McKenzie Interchange is complete, driving from the West Shore to the Saanich Peninsula via the highway system is expected to become quicker, reducing the desire for people to commute on Willis Point Road. No increase was applied to Hartland Avenue as no vehicle growth has occurred on this street in recent years.

3.11 Vehicle Operations

Exhibit 3.3 illustrates the Levels of Service (LOS) which were obtained from Synchro software. LOS measures the average number of seconds vehicles wait to travel through an intersection. Existing operations were assessed at the study intersections except for the Willis Point Road access which is currently only used for construction vehicles and workers.

For unsignalized intersections, LOS ranges from 'A' (0-10 seconds of delay) to 'F' (more than 50 seconds of delay). LOS D, E, and F can be common for critical turning throughout the region.

The analysis accounts for the observed peak hour factors, heavy vehicle percentage, and road grades. Key findings include:

- All movements operate at LOS D or better indicating there are no intersections with significant delay.
- The most critical movements are vehicles turning left from either Wallace Drive or Hartland Avenue onto northbound West Saanich Road during the weekday afternoon and Saturday peak traffic periods.

In addition to LOS, the volume to capacity ratio, and queue lengths were also assessed, however, for all scenarios they were low, indicating that there are no existing concerns for intersections operating near their theoretical capacity or substantial vehicle queues developing.

S:\PROJECTS\SR\04-20-0118 Hartland Access\5.0 Deliverables\5.1 Dft Rpt\Graphics

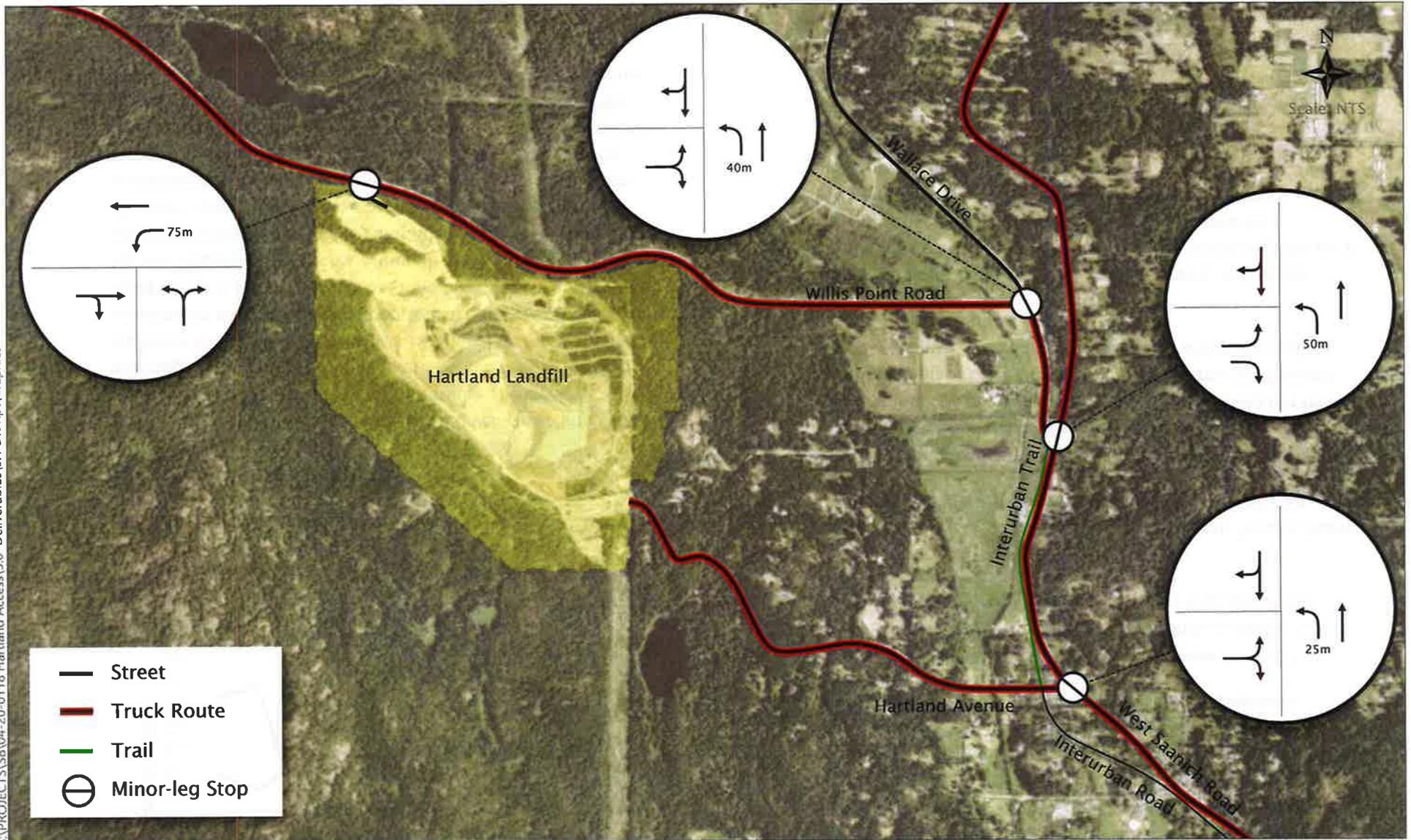


Exhibit 3.1 Transportation Network

Hartland Landfill Alternate Access Transportation Impact Study
04-20-0118

May 2020



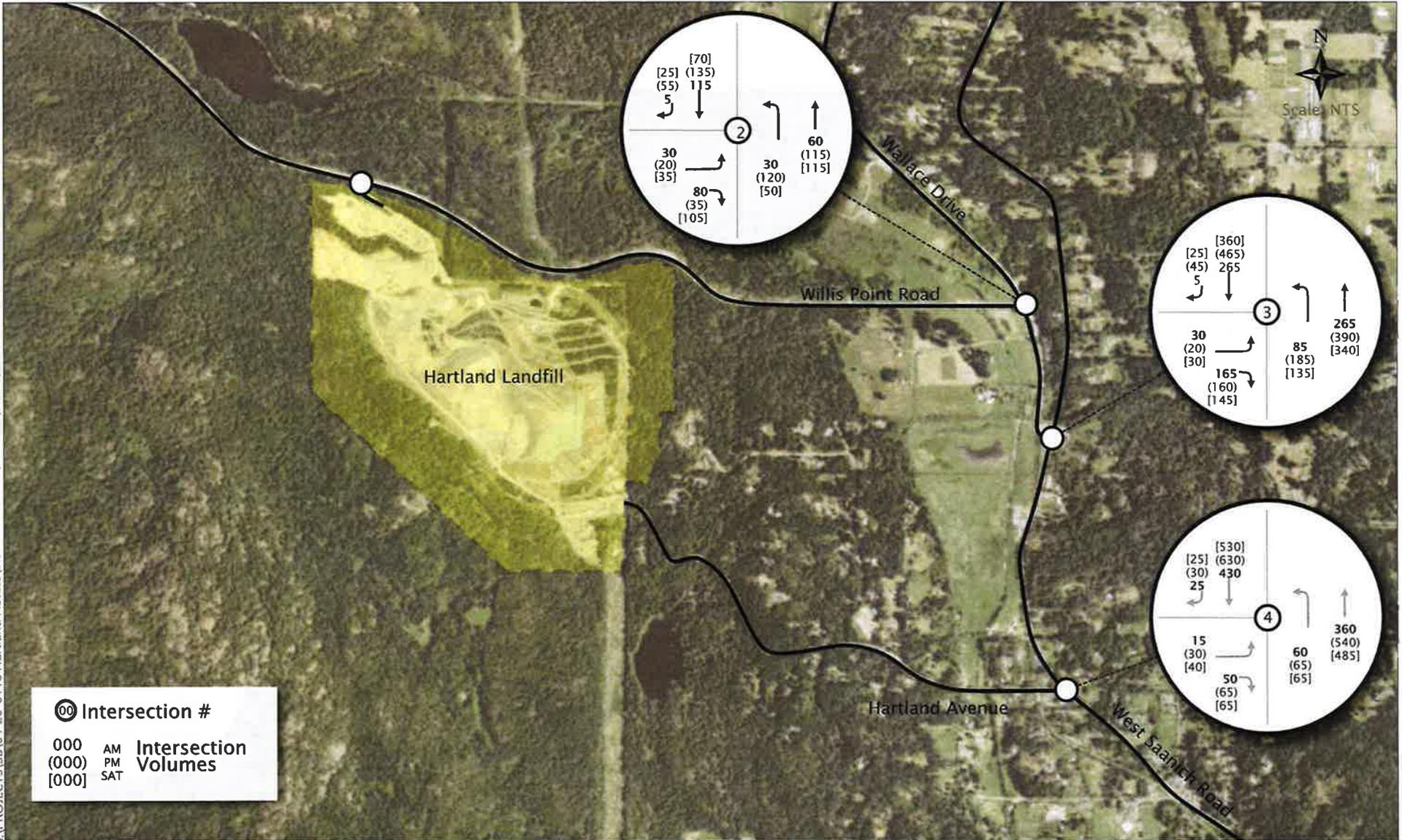


Exhibit 3.2 Existing Vehicle Volumes

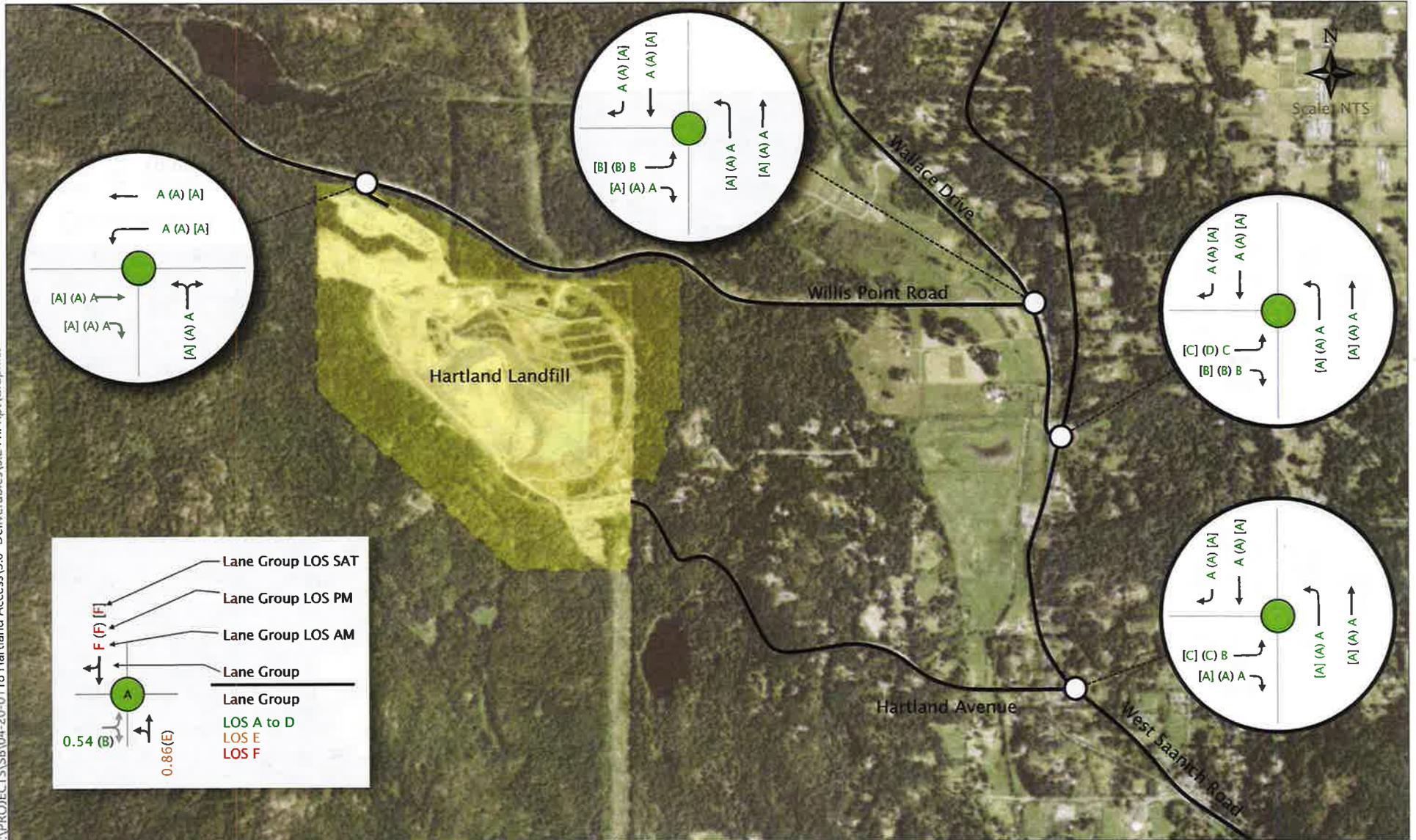


Exhibit 3.3 Existing Vehicle Levels of Service

4. ANALYSIS

4.1 Scenarios

Three future scenarios were developed to assess the positive and negative impacts of changing the vehicle access routing for the Hartland Landfill from the current condition with Hartland Avenue as the primary access to Willis Point Road becoming the primary access:

1. No change in vehicle access

- a. The vehicle access arrangement remains as-is with no changes to how vehicles enter or exit the site

2. Move commercial vehicle access to Willis Point Road

- a. The automated scale is moved to near Willis Point Road which is where all registered haulers (commercial and municipal trucks) would enter and exit the site.

3. Move the primary vehicle access to Willis Point Road

- a. The large majority of vehicles accessing the site would do so via Willis Point Road including all residential traffic and the commercial haulers. The site office would also be relocated to near Willis Point Road. The Hartland Avenue access would remain for emergency use or landfill operations only.

4.2 Vehicle Volumes

Exhibit 4.1 illustrates the 2030 vehicle volumes if there is no change in vehicle access. They were estimated by applying a 1% annual increase to movements on West Saanich Road, Wallace Drive, and Willis Point Road. No increase was applied to Hartland Avenue as no vehicle growth has occurred on this street in recent years.

For the additional two scenarios, the existing number of vehicles and their route through the study area was estimated so that they could be re-assigned to use the Willis Point Road access.

Table 4.1 summarizes the average number of vehicles accessing the landfill between March and October of 2019. The vehicle trip estimates are based on the landfill's transaction data. Data from the winter (November to February) was excluded since there are fewer vehicles accessing the landfill during this period (see Figure 2.2).

Table 4.1: Existing Landfill Vehicle Trip Generation

TRIP GENERATOR	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR			SATURDAY PEAK HOUR		
	Total	In	Out	Total	In	Out	Total	In	Out
Commercial Customers	28	14	14	23	11	12	10	5	5
Residential Customers	34	18	14	52	25	27	150	74	76
Staff/Contractors	12	10	2	15	5	10	4	2	2
TOTALS	74	42	30	90	41	49	164	81	83

Residential customers represent approximately two-thirds of the vehicles accessing the landfill during the weekday peak hours and almost all of the vehicles during the Saturday peak hour. The Saturday peak hour has the highest vehicle trip generation at approximately 80 vehicles both entering and exiting the landfill.

For analysis purposes, the landfill's vehicle trip generation was assumed to remain the same over the medium-term since the weight of deposited waste is forecasted to remain at a similar or lower level over the next 30 years (see Figure 2.1).

There is a potential for additional vehicle trips caused by aggregate production at the landfill. There is a potential for up to

12 additional round trips per hour on weekdays (12 trucks inbound and outbound) during select time periods to remove aggregate from the landfill. Due to uncertainty regarding the vehicle trip generation during this study's weekday peak hours (8:30 - 9:30 am and 3:30 - 4:30 pm), the impacts of additional vehicle trips due to aggregate production (or other causes) is considered within **Section 4.4 and 4.5** which illustrates the excess vehicle capacity on the study streets and intersections.

Based on observed travel patterns for existing landfill traffic, it was assumed that 70% of vehicles accessing the site were coming to/from the south (via West Saanich Road) and 30% were coming to/from the north (20% via West Saanich Road and 10% via Wallace Drive).

Exhibit 4.2 illustrates the estimated change in vehicle volumes for changing the commercial vehicle access to Willis Point Road. For this scenario, 15 commercial vehicles (one vehicle each way every four minutes) are relocated from Hartland Avenue to Willis Point Road during the weekday morning peak hour with a lower amount during other hours. **Exhibit 4.3** presents the resulting 2030 vehicle volumes if the commercial vehicle access is changed to Willis Point Road.

Exhibit 4.4 illustrates the estimated change in vehicle volumes for the primary vehicle access to Willis Point Road. In this scenario, up to 80 vehicles (inbound and outbound) are relocated from Hartland Avenue to Willis Point Road during the Saturday peak hour which is the busiest period for residential hauling.

Exhibit 4.5 presents the resulting 2030 vehicle volumes if the primary vehicle access is changed to Willis Point Road.

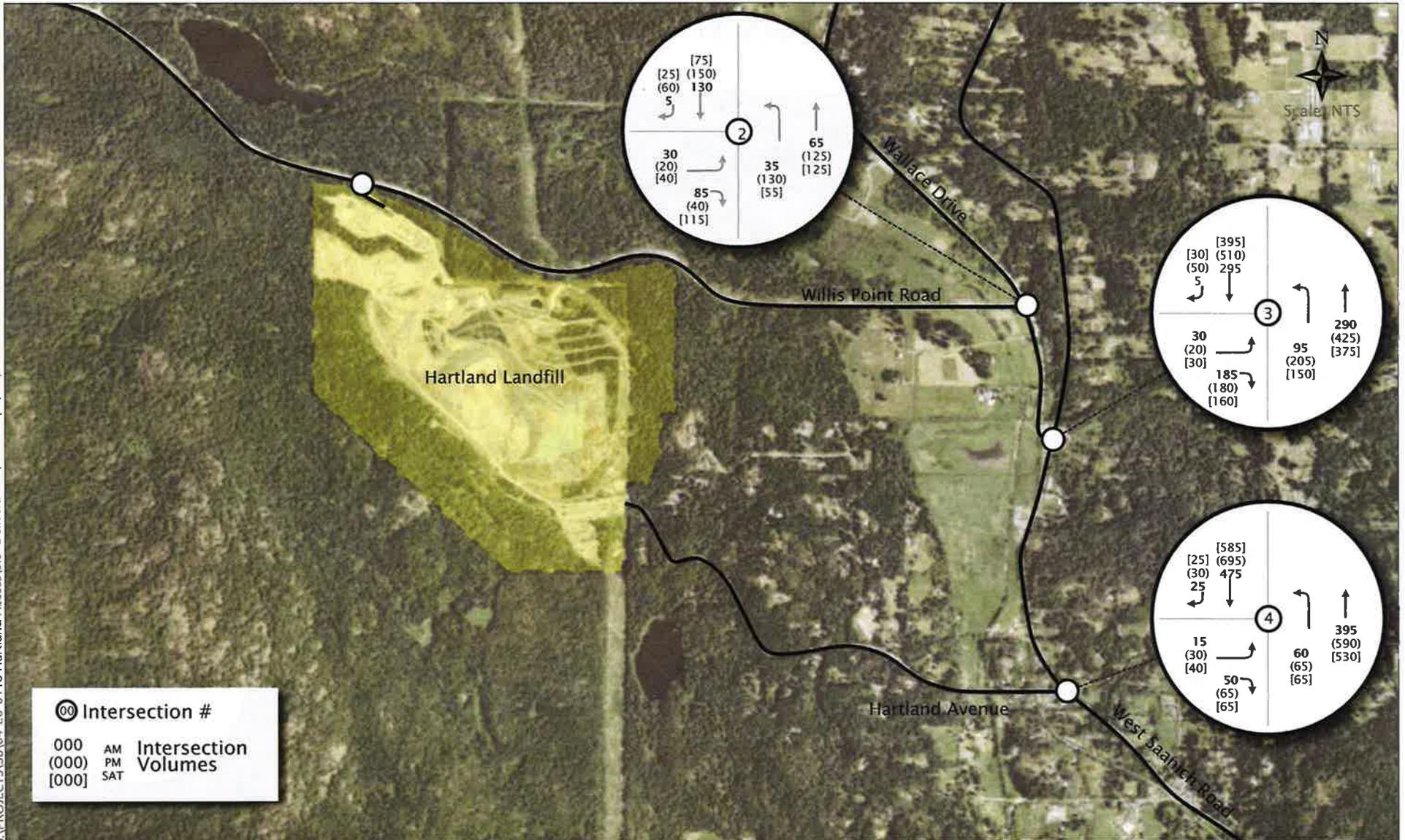


Exhibit 4.1 2030 Vehicle Volumes - No Change in Vehicle Access

S:\PROJECTS\58\04-20-0118 Hartland Access\5.0 Deliverables\5.1 Dft_Rpt\Graphics

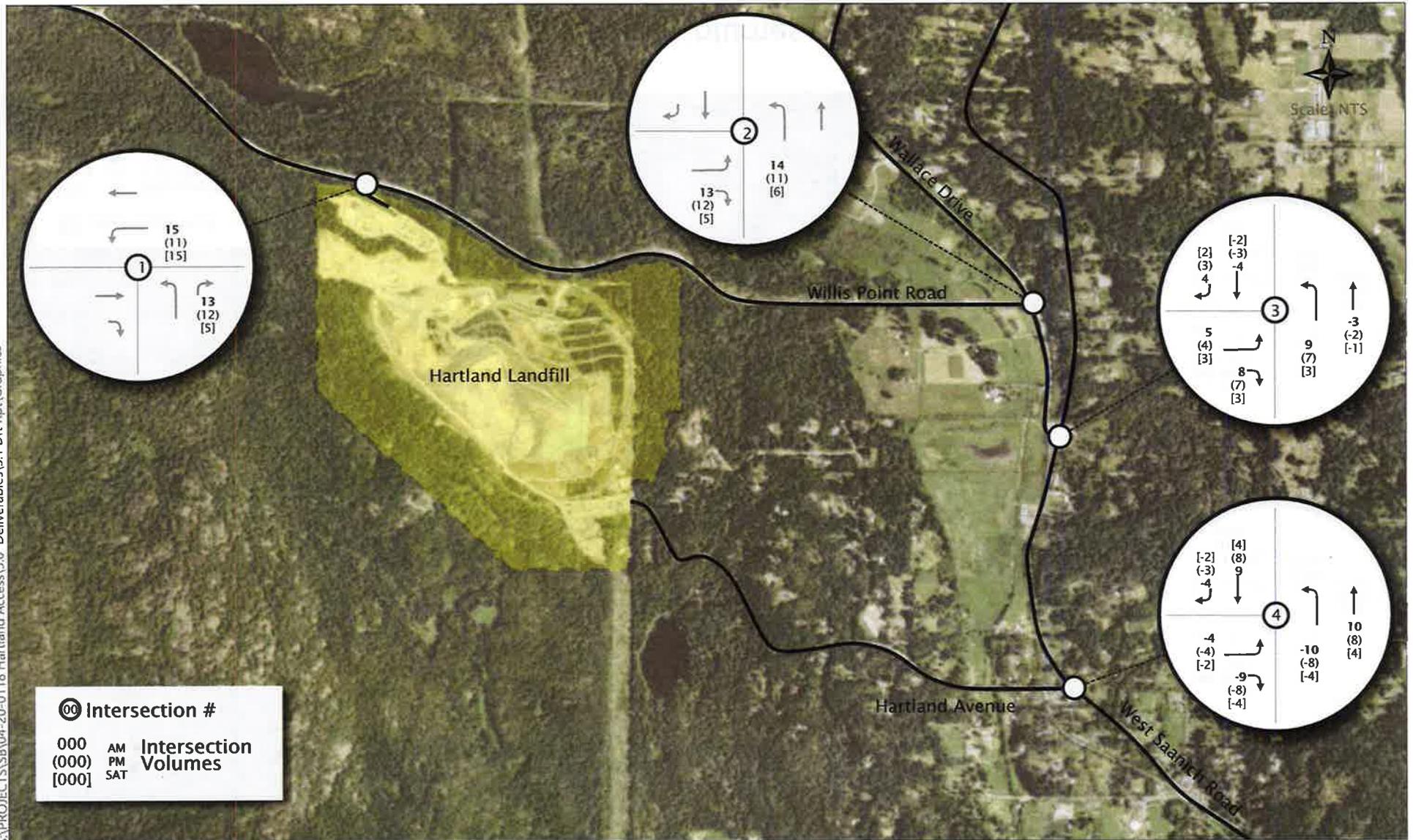


Exhibit 4.2 Change in Vehicle Volumes - Move Commercial Vehicle Access to Willis Point Road



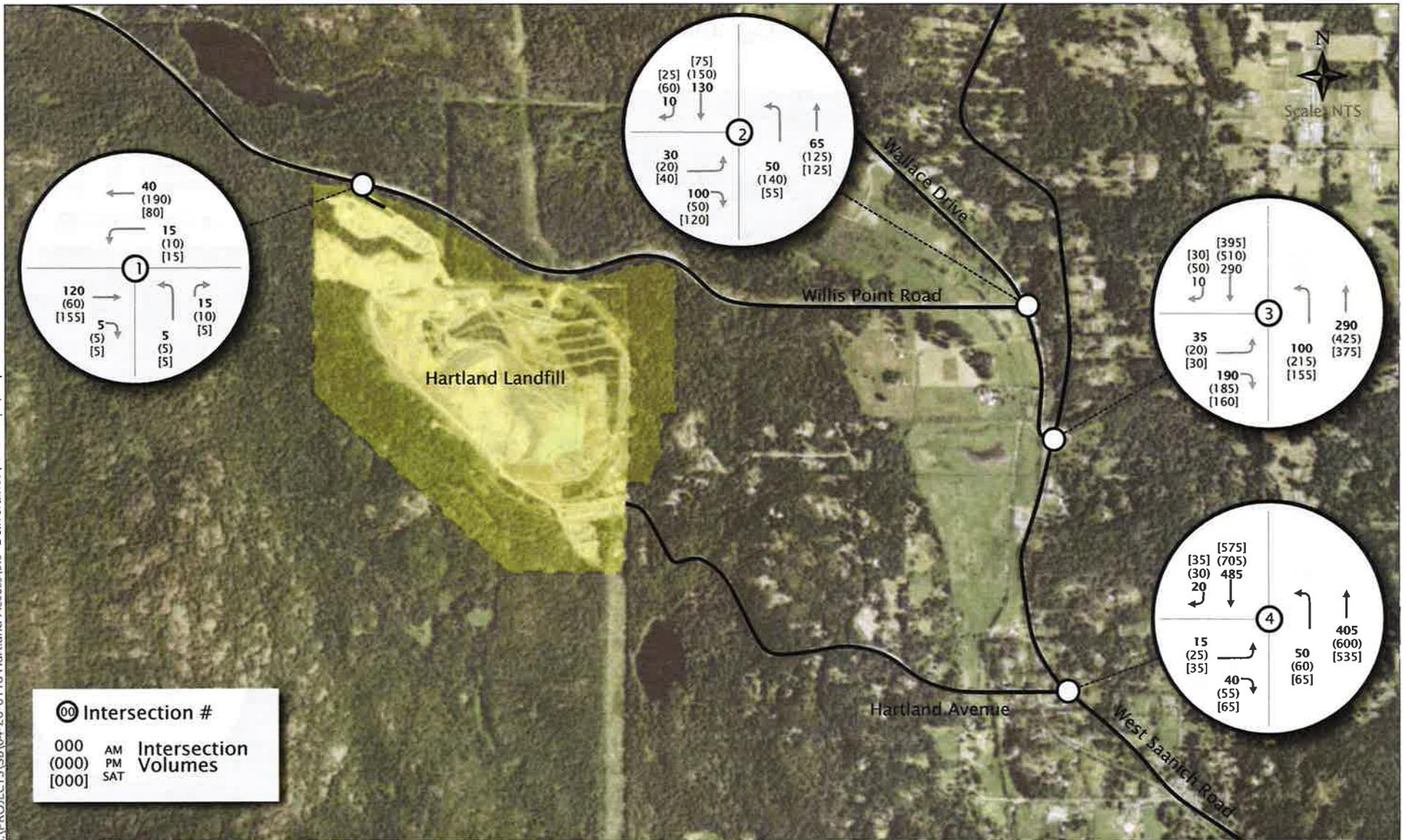


Exhibit 4.3 2030 Vehicle Volumes - Move Commercial Vehicle Access to Willis Point Road

S:\PROJECTS\58\04-20-0118 Hartland Access\5.0 Deliverables\5.1 Dft Rpt\Graphics

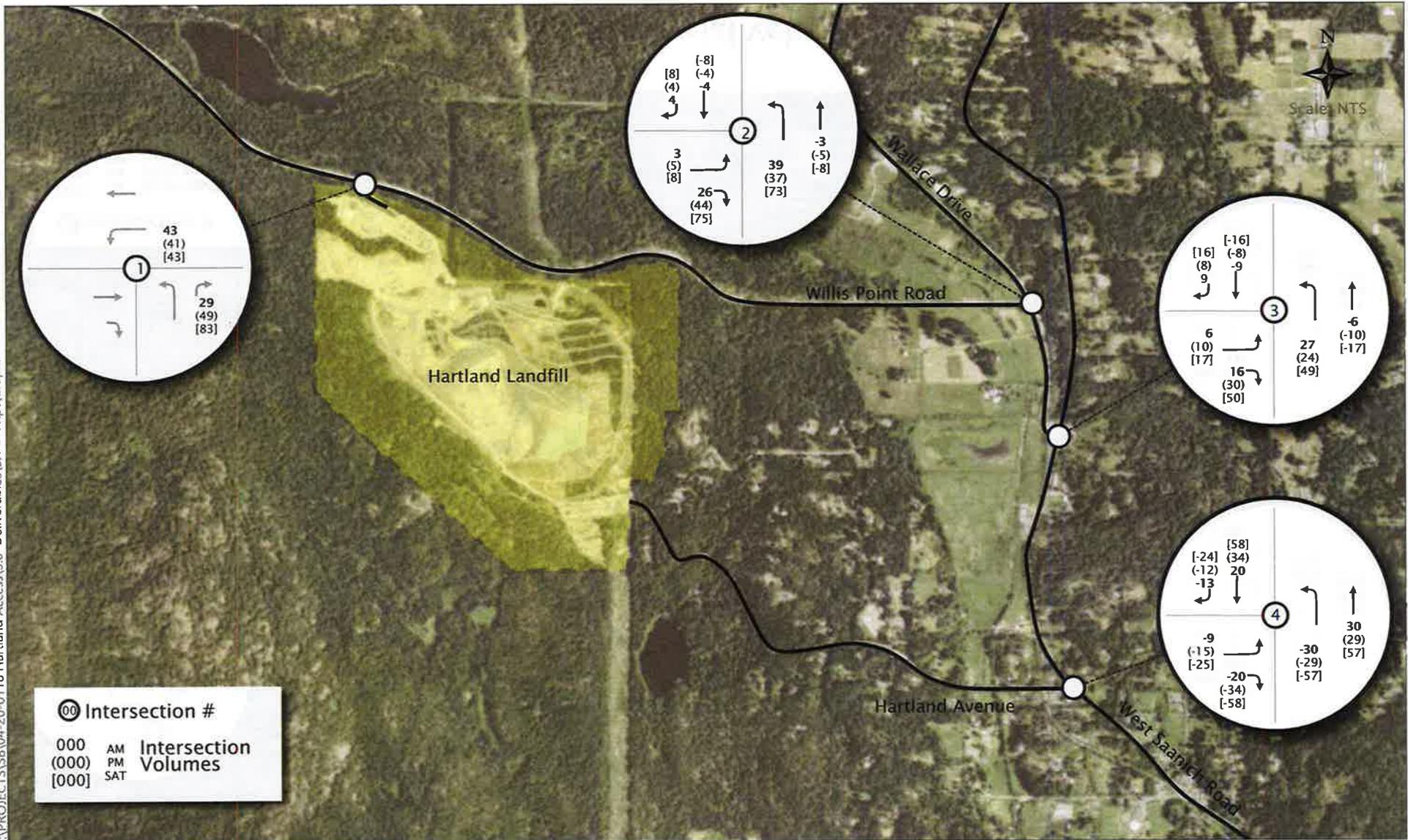


Exhibit 4.4 Change in Vehicle Volumes - Move Primary Access to Willis Point Road

S:\PROJECTS\SR\04-20-0118 Hartland Access\5.0 Deliverables\5.1 Dft Rpt\Graphics

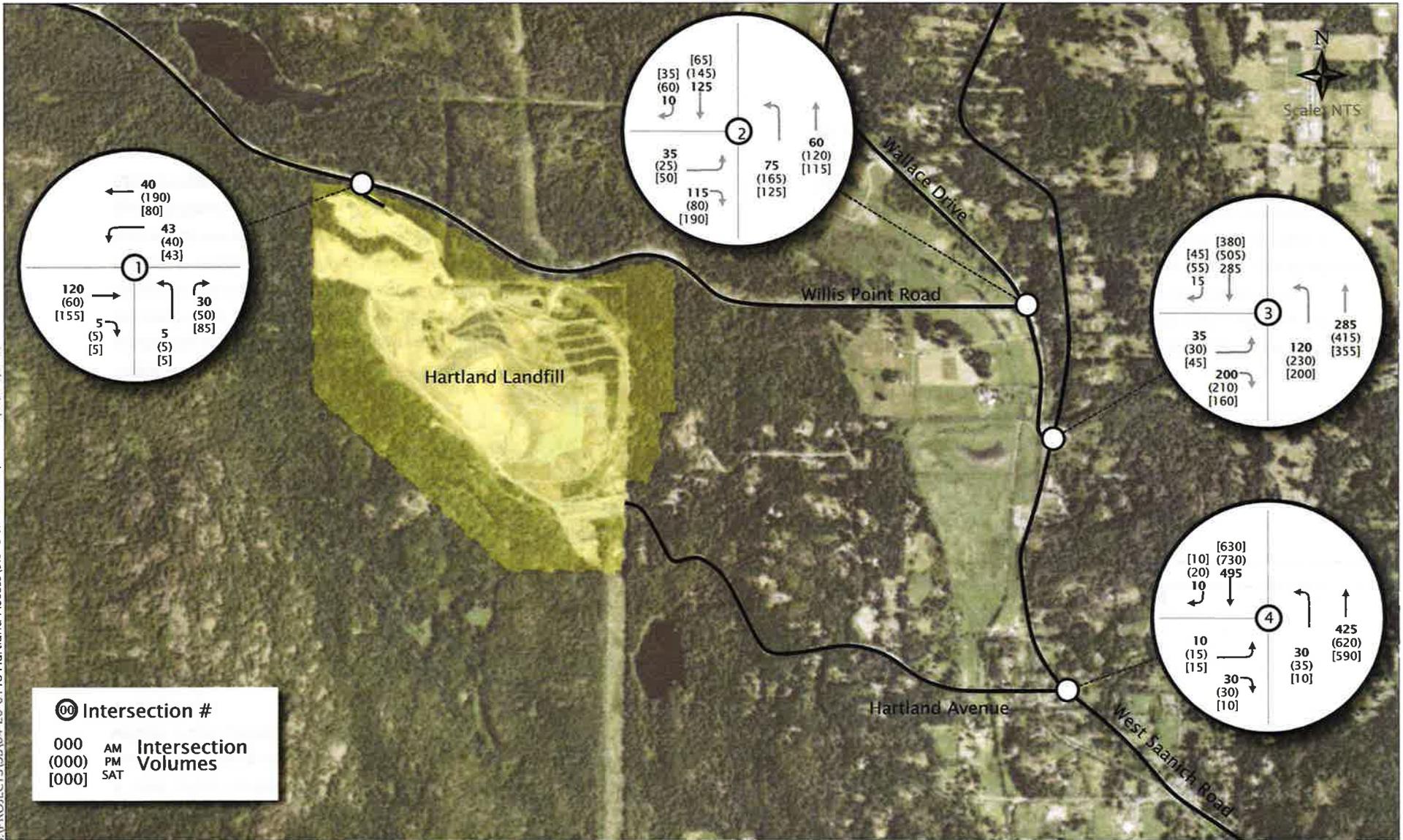


Exhibit 4.5 2030 Vehicle Volumes - Move Primary Access to Willis Point Road

4.3 Safety

4.3.1 Safety Review Process

A road safety review of the study area was completed with the goal of assessing the road safety impacts of changing local vehicle travel patterns by changing the landfill's vehicle access arrangement.

Collision data was obtained from ICBC's public website for the 5-year period from 2014 to 2018, for the different roads within the study area. Detailed collision data describing each reported collision was not available at the time of writing this report.

A site visit was completed during the daytime on April 30, 2020. Although the landfill typically does not operate when it is dark outside, for completeness, a nighttime review was completed on May 6, 2020, to identify visibility issues.

4.3.2 Collision Data

Table 4.2 summarizes the available collision data within the study area which is based on insurance claims submitted to ICBC for the 5-year period from 2014 to 2018 inclusive. There were no reported fatalities within this period. Overall, the majority of the collisions within the study area occur at the intersections of Wallace Drive with (i) Willis Point Road (four per year) and (ii) West Saanich Road (12 per year). Discussion regarding the safety of each section is provided in the following section.

Table 4.2: 2014 – 2018 Collisions in the Study Area

LOCATION	TOTAL	INJURY	PDO	CYCLIST	PEDESTRIAN
Willis Point Road & Hartland Access	0	0	0	0	0
Willis Point Road	0	0	0	0	0
Wallace Drive & Willis Point Road	19	5	10	0	0
Wallace Drive	0	0	0	0	0
West Saanich Road & Wallace Drive	69	18	45	3	3
West Saanich Road	4	2	2	0	0
West Saanich Road & Hartland Avenue	3	1	2	0	0
Hartland Avenue	4	1	3	0	0

Source: ICBC

PDO - Property Damage Only

4.3.3 Audit Findings

Tables 4.3 and 4.4 summarize the audit findings for the study intersections and street segments, respectively. Pictures are provided following the audit finding tables.

The available Intersection Sight Distance (ISD) was measured and compared to the suggested distances in the Geometric Design Guide for Canadian Roads. The suggested distances were established by TAC with the goal of minimizing the speed drivers in the opposing direction must slow down to accommodate a vehicle turning in front of them. The critical sight direction is typically not the direction a driver is turning (i.e. the critical direction for a driver turning right onto the main road is looking left on the main road for oncoming vehicles).

Table 4.3: Safety Audit Findings - Intersections

INTERSECTION	INTERSECTION SIGHT DISTANCE		INFRASTRUCTURE OBSERVATIONS	BEHAVIOUR OBSERVATIONS
	Available	Suggested		
Willis Point Road & Hartland Access	NBL: 200 m NBR: 300 m EBL: 330 m	NBL: 150 m NBR: 130 m EBL: 110 m (70 km/h design speed)	Pavement markings are faded and need to be replaced. [Picture 1]	No unusual or unsafe behaviour observed.
Wallace Drive & Willis Point Road	NBL: 150 m EBL: 175 m EBR: 125 m [Picture 2]	NBL: 95 m EBL: 130 m EBR: 110 m (60 km/h design speed)	Damage to channelization island from car tires. [Picture 3]	No unusual or unsafe behaviour observed.
West Saanich Road & Wallace Drive	NBL: 190 m EBL: 250 m EBR: 160 m [Picture 4]	NBL: 110 m EBL: 150 m EBR: 130 m (70 km/h design speed)	Multi-use trail terminates 20 m from the intersection which could cause conflicts for trail users. [Picture 5] Northbound bus stop located at the intersection could cause conflicts from the bus stopping in the intersection.	Vehicles were observed turning right very quickly from Wallace Drive to West Saanich Road.
West Saanich Road & Hartland Avenue	NBL: 70 m EBL: 150 m EBR: 60 m	NBL: 110 m EBL: 150 m EBR: 130 m (70 km/h design speed)	Very poor sight distance for drivers looking north on West Saanich Road due to topography. [Pictures 6 and 7] Northbound and southbound bus stops located at the intersection could cause conflicts from the bus stopping in the intersection.	Drivers turning from Hartland Avenue to West Saanich Road were observed creeping forward from the stop bar to gain additional sight distance and accelerate quickly indicating their concern of not knowing if there is an oncoming vehicle.

NB - Northbound, EB - Eastbound, SB - Southbound, L - Left, R - Right

Table 4.4: Safety Audit Findings – Street Segments

STREET	LAND USES	DRIVEWAY & INTERSECTION FREQUENCY	WIDTH	CHARACTERISTICS	INFRASTRUCTURE OBSERVATIONS
Willis Point Road	Hartland Landfill & Department of National Defence.	Minimal	Travel Lane: 3.5 m Shoulder: 1.2 – 1.4 m	Typical rural road.	The white line on the westbound shoulder needs to be repainted.
Wallace Drive	Rural	Infrequent	Travel Lane: 3.5 m Shoulder: 1.2 – 1.6 m	Typical rural road.	None
West Saanich Road	Rural residential and commercial	Moderate	Travel Lane: 3.5 m Shoulder: 1.3 – 1.8 m	Moderate horizontal and vertical curves.	None
Hartland Avenue	Rural residential	Frequent	Travel Lane: 3.6 m Shoulder: 0 – 0.2 m	Frequent horizontal and vertical curves. Unforgiving roadside due to vegetation, rocks, and vertical changes. [Picture 8]	The white line on the westbound shoulder needs to be painted.



1: Willis Point Road & Hartland Access - Worn pavement markings



2: Willis Point Road - Looking north on Wallace Drive (reasonable visibility but could be improved by trimming vegetation)



5: Willis Point Road & Wallace Drive - Damaged traffic island



4: Wallace Drive - Looking north on West Saanich Road (good visibility)



5: Interurban Trail trailhead located near West Saanich Road & Wallace Drive intersection



6: Hartland Avenue - Looking north on West Saanich Road from the stop bar (very poor visibility)



7: Hartland Avenue - Looking north on West Saanich Road from in front of the stop bar (only the roof of the oncoming vehicle is visible)



8: Hartland Avenue - Frequent horizontal and vertical profile changes. No shoulders.

4.3.4 Key Issues and Recommendations

Key issues and recommendations to improve safety include:

- The pavement markings at the Hartland Landfill access on Willis Point Road should be repainted following construction completion of the adjacent Residual Treatment Facility.
- The westbound white edge line on Willis Point Road should be repainted.
- Vegetation should be trimmed on a regular basis surrounding the Wallace Drive & Willis Point Road intersection to improve sight distances.
- The multi-use trail terminates at Wallace Drive, 20 metres from West Saanich Road. Two collisions involving people walking and cycling were reported to ICBC during the 5-year collision history which may be due to people accessing the trail without any connecting active transportation infrastructure. Saanich should investigate opportunities to allow people to cross Wallace Drive safely either at the West Saanich Road intersection or further away from the intersection. Saanich could also investigate the feasibility of widening Wallace Drive to provide bicycle lanes or extending the multi-use trail.
- The West Saanich Road & Wallace Drive intersection had the highest occurrence of collisions in the study area. Drivers make the eastbound right turn from Wallace Drive to West Saanich Road very quickly. This could cause collisions either when vehicles merge onto West Saanich Road or if drivers need to stop abruptly and cause a rear-end collision with the vehicle behind them. This is potentially the reason for the high number of collisions reported to ICBC at this

intersection. Saanich should consider options to reduce vehicle turning speed by reducing the turning radius while still providing sufficient space for large vehicles. This would be a fairly simple improvement to improve the intersection and should be reviewed in more detail by Saanich.

- There is very poor visibility of southbound vehicles on West Saanich Road approaching Hartland Avenue. Saanich should consider opportunities to reduce southbound vehicle speeds. Note, relocating the landfill's access to Willis Point Road will significantly reduce the number of vehicles turning at this intersection.
- A white edge line should be painted on Hartland Avenue in the westbound direction to improve nighttime visibility. The lack of shoulder on Hartland Avenue and unforgiving roadside containing many obstacles will increase the severity of collisions if vehicles depart from the travel lane

4.3.5 Comparison

Overall, the route to the Willis Point Road access is more suitable for larger volumes of vehicles and heavy vehicles since the West Saanich Road & Wallace Drive intersection provides improved turning opportunities (less oncoming traffic) than the West Saanich Road & Hartland Avenue, and vehicle sight-distance is better at both the Willis Point Road intersection with Wallace Road and at the Wallace Road intersection with West Saanich Road.

In addition, compared to Hartland Avenue, Willis Point Road has a more consistent horizontal and vertical road profile as well as providing road shoulders.

4.4 Street Capacity

The Transportation Association of Canada (TAC) Geometric Design Guide for Canadian Roads notes that Rural Local Streets (the most applicable category for Hartland Avenue) typically have fewer than 1,000 vehicles per day and Rural Collector Streets (the most applicable category for Willis Point Road) typically have fewer than 5,000 vehicles per day. The difference between the categorization is due to Hartland Avenue primarily providing local access to locations on the street (i.e. frequent driveways), whereas Willis Point Road primarily provides vehicle travel through the street segment being evaluated (i.e. infrequent driveways).

Figures 4.1 and 4.2 summarizes the average Saturday summer vehicle volume on these streets compared to the typical maximum volumes noted by TAC (1,000 and 5,000 vehicles per day, respectively). Note that summer data was collected during the COVID-19 pandemic and is higher than the 'normal' vehicle volumes during the rest of the year.

Hartland Avenue currently has more vehicles than a typical Rural Local Street (1,000 vehicles per day) and will continue operating above the threshold if the landfill's primary access is relocated to Willis Point Road (Scenario 3). On weekdays, the volume of vehicles would be under the threshold for Scenario 3.

Willis Point Road currently has two thirds of the vehicles of a typical Rural Collector Street (5,000 vehicles per day) even during a summer Saturday (during COVID-19) when nearby parks were heavily used. It is forecasted to remain at least 20% below the typical threshold even if all landfill access is relocated to Willis Point Road (Scenario 3).

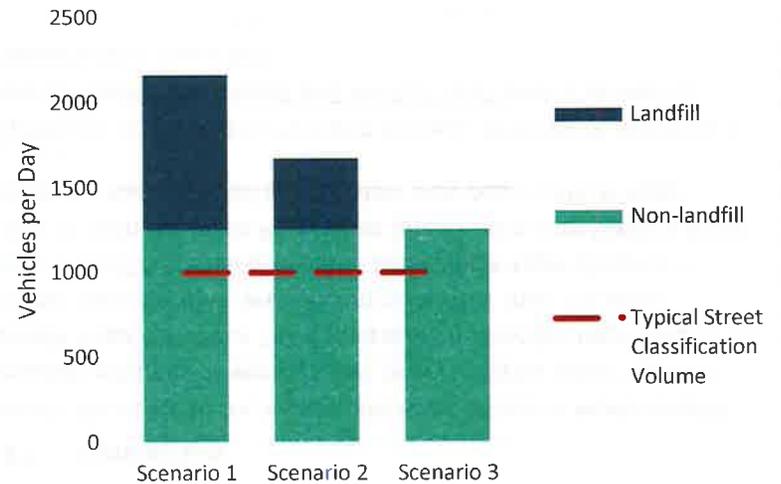


Figure 4.1: Hartland Avenue Vehicle Volume - Summer Saturday

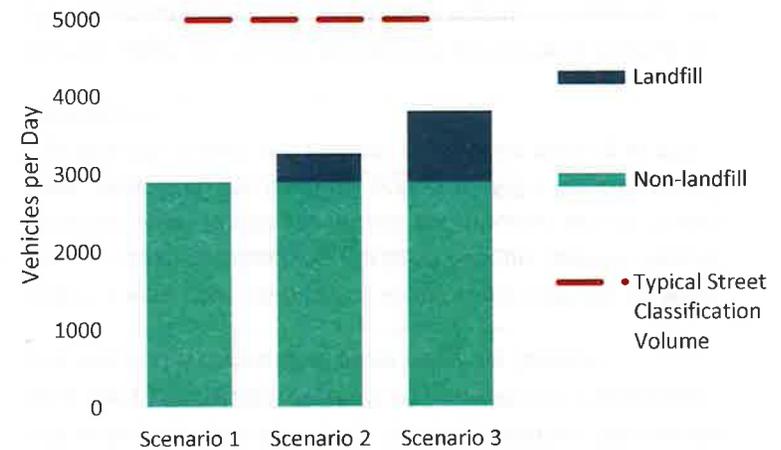


Figure 4.2: Willis Point Road Vehicle Volume - Summer Saturday

4.5 Intersection Level of Service

Table 4.5 summarizes the vehicle operations for the three scenarios being analyzed. The LOS and volume/capacity (V/C) ratio is shown for each movement. A V/C ratio greater than 1.0 indicates that the movement is above its theoretical capacity. V/C ratios of 0.8-0.9 are common in urban settings. All movements are estimated to remain under 0.4 for all scenarios, indicating that they are forecasted to operate well within capacity.

The LOS does not vary between scenarios indicating that changing the landfill's vehicle access will not significantly impact the time it takes to travel through an intersection.

Table 4.5: 2030 Vehicle Level of Service

INTERSECTION	MOVEMENT	WEEKDAY AM PEAK HOUR			WEEKDAY PM PEAK HOUR			SATURDAY PEAK HOUR		
		Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3	Scenario 1	Scenario 2	Scenario 3
Willis Point Road & Hartland Access	EBT/R	-	-	-	-	-	-	-	-	-
	WBL	A, -	A, 0.01	A, 0.04	A, -	A, 0.01	A, 0.03	A, -	A, 0.00	A, 0.07
	WBT	-	-	-	-	-	-	-	-	-
	NBL/R	A, -	A, 0.02	A, 0.04	A, -	A, 0.01	A, 0.05	A, -	A, 0.01	A, 0.11
Wallace Drive & Willis Point Road	EBL	B, 0.05	B, 0.06	B, 0.07	B, 0.05	B, 0.05	C, 0.07	B, 0.08	B, 0.08	B, 0.12
	EBR	A, 0.11	A, 0.13	A, 0.15	A, 0.05	A, 0.06	A, 0.10	A, 0.14	A, 0.15	A, 0.23
	NBL	A, 0.03	A, 0.04	A, 0.06	A, 0.11	A, 0.11	A, 0.14	A, 0.04	A, 0.04	A, 0.10
	NBT	-	-	-	-	-	-	-	-	-
	SBT/R	-	-	-	-	-	-	-	-	-
West Saanich Road & Wallace Drive	EBL	C, 0.10	C, 0.11	C, 0.13	E, 0.15	E, 0.18	E, 0.25	D, 0.17	D, 0.18	D, 0.30
	EBR	B, 0.28	B, 0.29	B, 0.30	C, 0.35	C, 0.36	C, 0.40	B, 0.28	B, 0.28	B, 0.36
	NBL	A, 0.08	A, 0.09	A, 0.11	A, 0.22	A, 0.23	A, 0.25	A, 0.15	A, 0.15	A, 0.2
	NBT	-	-	-	-	-	-	-	-	-
	SBT/R	-	-	-	-	-	-	-	-	-
West Saanich Road & Hartland Avenue	EBL/R	B, 0.15	B, 0.012	B, 0.08	C, 0.32	C, 0.28	C, 0.16	C, 0.33	C, 0.32	C, 0.08
	NBL	A, 0.06	A, 0.05	A, 0.03	A, 0.08	A, 0.07	A, 0.05	A, 0.08	A, 0.07	A, 0.01
	NBT	-	-	-	-	-	-	-	-	-
	SBL/T	-	-	-	-	-	-	-	-	-

Notes:

- NB – Northbound, EB – Eastbound, SB – Southbound, L – Left, T – Through, R – Right
- Scenario 1 – No change in vehicle access
- Scenario 2 – Move commercial vehicle access to Willis Point Road, residential access to remain via Hartland Avenue
- Scenario 3 – Move the primary vehicle access to Willis Point Road for all vehicle streams arriving/departing the landfill
- The eastbound left-turn movements from Wallace Drive and Hartland Avenue are highlighted in grey since they are the movements most impacted by relocating the vehicle access to Willis Point Road. As shown, the impact is insignificant.

4.6 Street Grade

The steepness of a street can affect how fast vehicles travel as well as safety, particularly for larger vehicles, such as the commercial vehicles accessing the landfill. Within the study area, Willis Point Road and Hartland Avenue both have significant elevation changes of approximately 100 metres.

Willis Point Road has a single large hill with a maximum grade of 8% whereas Hartland Avenue has a number of rolling hills with grades up to 15%. TAC suggests a maximum grade of approximately 10% for these environments, indicating that the grades on Willis Point Road are more appropriate for the street's use, particularly for large vehicles.

4.7 Truck Climbing Lanes

4.7.1 The Need for a Truck Climbing Lane

On two-lane roads, short segments of a third lane can assist with overtaking and reduce the amount of time vehicles trail other vehicles. When this is caused by trucks travelling slower than usual due to elevation gain, the preferred treatment is a truck climbing as opposed to a general passing lane.

Both routes to the landfill (Willis Point Road and Hartland Avenue) have a significant elevation gain from West Saanich Road. Depending on specific circumstances, this could cause heavy vehicles accessing the landfill to travel below typical speeds which could cause vehicles to queue behind the slower moving trucks.

The pavement markings on Willis Point Road indicate that passing is allowed in the opposing lane on the 800 metres

closest to Wallace Drive. The remainder of Willis Point Road and all of Hartland Avenue do not provide safe passing opportunities in the opposing lane.

TAC suggests that a climbing lane should be considered when all of the following three conditions are met:

1. Total upgrade vehicle flow in excess of 200 vehicles per hour.
2. Upgrade truck flow in excess of 20 vehicles per hour.
3. One of the following:
 - a. A 15 km/h or greater speed reduction is expected for a typical heavy truck.
 - b. Level of Service E or F on the grade.
 - c. A reduction of two or more levels of service is experienced when moving from the approach road.

The second criterion is currently met on both Willis Point Road and Hartland Avenue with upgrade truck flows exceeding 20 vehicles per hour during select hours of the day.

The first criterion is only met if commercial and residential access is relocated to Willis Point Road and only during the weekday afternoon peak hour. It is not met in any other conditions.

The third criterion is not met for either Willis Point Road or Hartland Avenue for any of the three analysis scenarios, nor is it met if surplus rock removal trucks are included. This is seen as the most important of the three criteria as the purpose of an additional lane would be to provide slower moving trucks with separate space such that faster moving vehicles can continue to travel at their preferred speed. However, there was not a noticeable reduction in truck speeds caused by the elevation gain

on Willis Point Road. Trucks were observed travelling around the 60 km/h speed limit on the uphill and flat sections of Willis Point Road. Therefore, vehicle drivers would still be able to drive the speed limit without an additional lane.

The landfill currently generates up to 28 commercial vehicle trips per peak hour (14 in and out), or approximately one commercial vehicle every four minutes in each direction. Therefore, there is only a small probability of drivers encountering a commercial vehicle in front of them on weekdays and a minuscule probability on weekends. Therefore, the impact on other drivers on Willis Point Road and Hartland Avenue is minimal.

In addition to the financial and environmental implications of constructing a climbing lane, it would also cause drivers to increase their speed due to the street appearing wider. There is a direct relationship between the width of a street and the speed in which drivers choose to travel. Adding a lane on Willis Point Road is anticipated to increase vehicle speeds higher than the existing design where the average speed is already above the speed limit.

Potential Willis Point Road Truck Climbing Lane

Although TAC does not suggest a climbing lane should be considered, two options were prepared by Stantec Consulting Ltd. for consideration:

1. 500 metre road widening beginning 700 metres west of Wallace Drive at the base of the westbound hill and terminating at the first horizontal curve.
2. Extend the existing left-turn lane into the landfill by 450 metres.

The first option is positioned at the steepest part of Willis Point Road where the grade reaches up to 8%. At this location, 76% of

westbound (uphill) vehicles were observed exceeding the 60 km/h speed limit. Assuming that heavy trucks travel at 60 km/h (which was observed) and passenger vehicles travel at 70 km/h, up to two passenger vehicles could pass one heavy truck if they are immediately trailing the truck entering the 500 metre truck climbing lane. These assumptions result in the passenger vehicles being able to pass the landfill 15 seconds quicker if they are able to pass a slower vehicle than if they had to follow a slower vehicle all the way to the landfill's entrance.

The second option allows landfill bound vehicles to exit the westbound through lane on Willis Point Road 450 metres sooner compared to the existing left-turn lane. Using the same assumptions as above, this would result in reducing travel times of westbound through vehicles by up to 4 seconds if they are immediately trailing a slower vehicle.

4.8 Active Transportation

The Interurban Trail is the primary walking facility through the study area with its trailhead at Wallace Drive. It also provides an off-road cycling connection. A significant number of cyclists (500 per day, 50 per hour) were recorded on West Saanich Road; Wallace Drive and Willis Point Road were recorded as having considerably less bike traffic, and Hartland Avenue even less.

Retaining Hartland Avenue as the primary access route to the landfill would retain a higher level of vehicles crossing the Interurban Trail and quite possibly discouraging people from cycling on Hartland Avenue due to the frequent passing vehicles.

Moving the vehicle access to Willis Point Road would reduce the number of vehicles crossing the Interurban Trail and would enable people to feel comfortable cycling on Hartland Avenue.

However, it would also increase the number of vehicles on Wallace Drive and Willis Point Road which would reduce the comfort of cycling on those streets.

4.9 Vehicle Emissions

The particles that vehicles emit from engine exhaust and as well from vehicle braking generate air pollution which has health impacts immediately surrounding the source. Engine exhaust also emits carbon dioxide which is a greenhouse gas that contributes to climate change.

The difference in vehicle emissions was estimated using the SimTraffic traffic analysis model which considers vehicle volume, vehicle speed, driving distances, and street grades, including all public streets in the immediate surrounding area and the internal landfill roads. The analysis was based on the future active face location near the northwest end of the site where commercial vehicles will deposit waste within a few years.

The vehicle emissions analysis in the previously issued report did not include emissions associated with travel within the landfill property. When these emissions are included, the results indicate that the Willis Point Road access scenarios have marginally lower greenhouse gas emission profiles than keeping the Hartland Avenue access.

During landfill operating hours, moving the commercial vehicle access only to Willis Point Road is anticipated to reduce vehicle emissions in the study area by 5% during peak hours. With the relocation of all landfill vehicle traffic to Willis Point Road, the emissions are estimated to decrease by 3%. The reduction is primarily caused by commercial vehicles being able to access the landfill's active face using flatter higher speed roads (Wallace

Drive and Willis Point Road) compared to steeper lower speed roads (Hartland Avenue and internal landfill roads).

The Hartland Landfill is a regional destination which people commonly drive 10 to 15 kilometres to reach. The scope of the vehicle emissions analysis is limited to the incremental change in emissions within the immediate surrounding area. The portion of emissions changes previously stated are a small fraction of the total emissions from vehicles traveling from their origin to the landfill.

There are no residential properties along the section of Willis Point Road where landfill bound traffic will pass and there are over 200 residents living on or near Hartland Avenue. Therefore, the proximity-based health effects of air pollution would be lower if vehicle access was relocated to Willis Point Road.

4.10 On-site Circulation

Exhibit 4.6 illustrates the access routes between the two vehicle access points for the landfill with the active filling area which is planned to progress to the northwest within the next few years. Only commercial and landfill trucks are used within the site.

Table 4.6 summarizes the three internal roads that could be utilized to access the active filling area. All routes would require some degree of road widening to facilitate two-way truck traffic which would require at least 7.0 m of road width.

Table 4.6: Internal Road Attributes

ROUTE	HIGH LEVEL ROAD	PERIMETER ROAD	REISDUALS WAY
Distance On-site	1,400 m	2,100 m	700 m
Vertical Profile	Max 20% grade Steady Uphill	Max 15% grade Up and downhill	Max 11% Steady Uphill
Horizontal Profile	Minimal turns	Multiple turns including	A couple of wide turns
Road Width	6.0 – 7.5 m	3.5 – 7.0 m	8.0 m

Perimeter Road on the east side of the landfill would be a poor access route as it would present the highest risk out of the three roads caused by being the longest route and containing the most turns. Some turns have a radius as sharp as 21 metres which is minimum suggested radius TAC for low-speed (30 km/h design speed) environments. Tractor trailer vehicles are required to access the active filling area and would not be able to make these turns. Improving the road such that it has appropriate grades, width, and turn radii would require a significant amount of effort and may not be feasible given the proximity to existing landfill infrastructure.

High Level Road on the west side of the landfill would also be a poor access route. The road would need to be widened and re-graded to reduce the grades to within 10% for regular use by commercial vehicles. There would be feasibility challenges to improving the road. The current filling area is directly to the east of the road, creating a 25 metre elevation drop and widening the road to the west would require blasting and rock removal. In addition, there is a 400 millimetre buried landfill gas header on the east side of the road which would have to be carefully monitored throughout nearby construction.

Residuals Way is the most appropriate access route as it is shorter and less steep than High Level Road and Perimeter Road. These two attributes would reduce the potential for risks occurring on-site and would provide a feasible driving route to commercial drivers.

By only moving the commercial access to Willis Point Road, there would be fewer on-site conflicts between commercial and residential vehicles where they merge/diverge into their respective streams.

Another consideration is the Mount Work Regional Park mountain bike trailhead/parking lot located immediately before the existing Hartland Avenue landfill access. The current design causes landfill-bound vehicles to pass through the parking lot which can interrupt the ease of park users accessing the trails and restroom facilities. Relocating the landfill's vehicle access to Willis Point Road would allow for a trailhead/parking lot that is more inviting to trail users and reduces safety risks.

4.1.1 Infrastructure Condition

There is a short bridge on Hartland Avenue over Tod Creek 260 metres west of West Saanich Road. Although a bridge inspection was not completed, it appeared to be in a well-worn state. High use by heavy vehicles (such as commercial hauling trucks) significantly impacts a bridge's lifespan.

Maintaining vehicle access to the landfill on Hartland Avenue will cause the bridge to deteriorate at a faster rate than if vehicle access was on Willis Point Road. In addition, as the only entrance to the local area, if the bridge were damaged it would affect access to residents' homes, Mount Work Regional Park, and the landfill.

S:\PROJECTS\SB\04-20-0118 Hartland Access\5.0 Deliverables\5.2 Fnl Rpt\Graphics

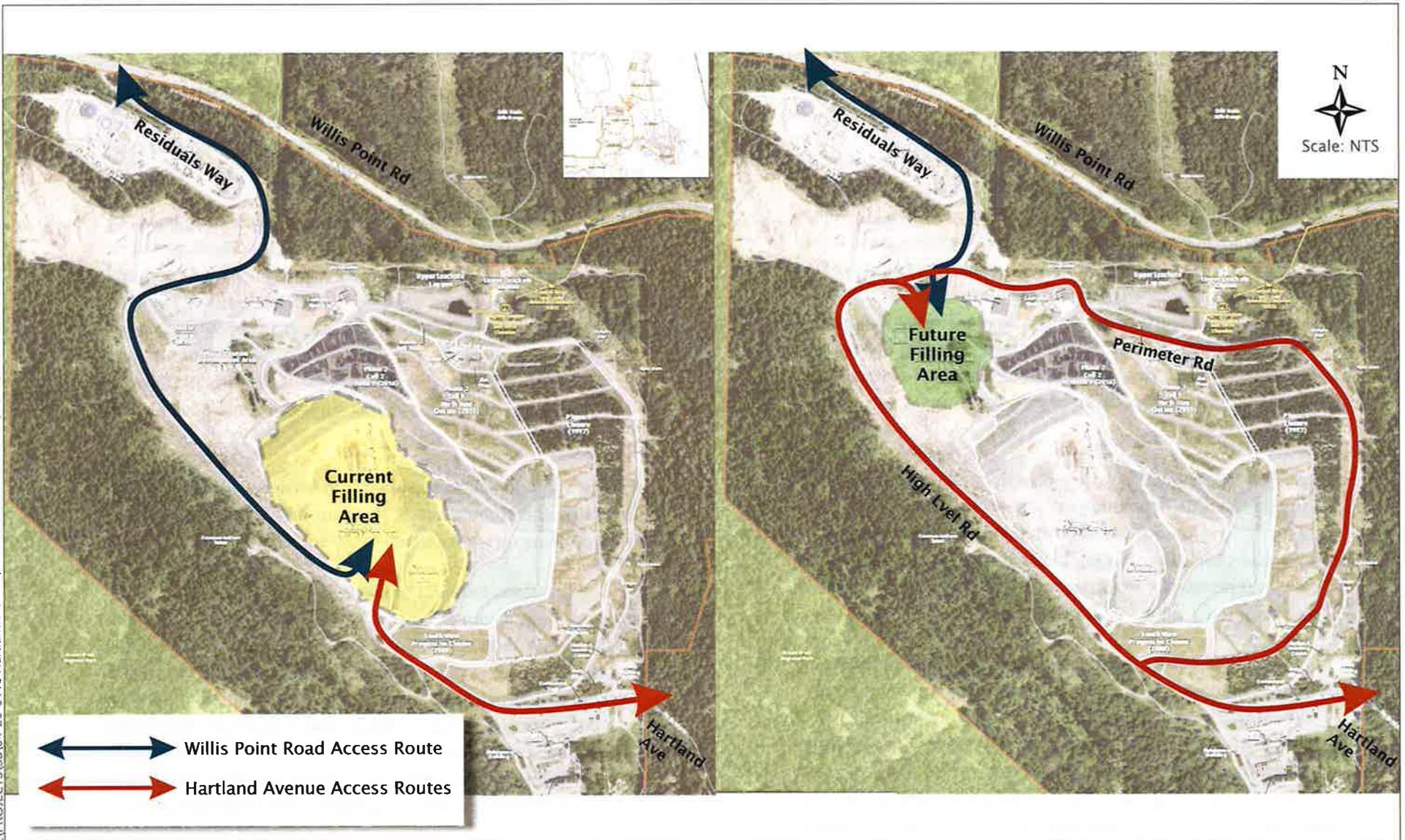


Exhibit 4.6 On-site Commercial Vehicle Circulation

Hartland Landfill Alternate Access Transportation Impact Study

04-20-0118

August 2020

5. SUMMARY

There are benefits and drawbacks to the three scenarios considered, however, overall, the impacts of re-routing vehicles to/from the Hartland Landfill are relatively modest compared to the number of vehicles not related to the landfill travelling through the study area, and the entire distance vehicles must travel to reach the landfill. In addition, CRD staff identified Willis Point Road as the only feasible route for commercial haulers to deposit waste in the northwest portion of the landfill which will become the active filling area within the next few years.

Table 5.1 summarizes the assessment for each category analyzed indicating that there are some benefits of moving either only commercial vehicles or all vehicles to the landfill's Willis Point Road access.

The route to reach the Willis Point Road access is more appropriate for higher vehicle use than the Hartland Avenue access due to the street and intersection designs. Most notably, Willis Point Road is designed for through vehicle traffic whereas Hartland Avenue has many driveways and minor intersections. In addition, the West Saanich Road & Willis Point Road intersection is more appropriate for accommodating higher vehicle use than the West Saanich Road & Hartland Avenue intersection.

We do not view any significant concerns that would restrain the CRD from moving vehicle access to Willis Point Road, nor did we identify any additional off-site infrastructure improvements that are triggered by changing the vehicle access.

There is no need for an additional lane on either Willis Point Road or Hartland Avenue for any of the three vehicle access scenarios analyzed. Both streets only meet one of three criteria identified by TAC for adding a truck climbing lane. Most notably, the street designs do not cause heavy trucks to travel below the speed limit. We analyzed two truck climbing lane options and found that their maximum impact would be reducing travel times westbound on Willis Point Road by 15 and 4 seconds respectively, by allowing drivers to exceed the 60 km/h speed limit.

Even if all vehicle access is relocated to Willis Point Road, the street would operate at least 20% below the typical threshold for a two-lane rural collector street during the busier summer season (existing summer traffic data collected during COVID-19). In addition to the financial and environmental impacts, adding a lane on Willis Point Road would also increase the number of speeding vehicles.

Regardless of if the vehicle access arrangement is changed, deteriorated pavement markings on Willis Point Road should be reinstalled following nearby construction of the Residual Treatment Facility. Saanich should also consider reviewing traffic safety at the West Saanich Road & Wallace Drive intersection and consider improvements to reduce the speed of vehicles turning right from Wallace Drive onto West Saanich Road which appears to be the cause of some collisions. Potential improvements should also include an improved connection to the Interurban Trail which has a trailhead near the intersection.

Table 5.1: Scenario Comparison Summary

CATEGORY	NO CHANGE TO THE EXISTING ACCESS CONFIGURATION	MOVE COMMERCIAL VEHICLE ACCESS TO WILLIS POINT ROAD	MOVE PRIMARY VEHICLE ACCESS TO WILLIS POINT ROAD
Vehicles	The landfill accounts for 700 vehicles per day (350 vehicles each direction) on Hartland Avenue, 50% of current daily traffic	Daily traffic on Willis Road increases by 15% from 2,000 to 2,300 Daily traffic on Hartland Avenue decreases by 20% from 1,400 to 1,100	Daily traffic on Willis Road increases by 35% from 2,000 to 2,700 Daily traffic on Hartland Avenue decreases by 50% from 1,400 to 700
Safety	West Saanich Road & Hartland Avenue has poor visibility for passenger vehicle drivers, increasing the risk and severity of collisions	West Saanich Road & Hartland Avenue has poor visibility for passenger vehicle drivers, increasing the risk and severity of collisions	History of collisions at West Saanich Road & Wallace Drive manageable with modest improvements
Street Vehicle Volume Compared to Street Classification	Hartland Avenue - Higher than appropriate Willis Point Road - Appropriate (all seasons)	Hartland Avenue - Higher than appropriate Willis Point Road - Appropriate (all seasons)	Hartland Avenue - Appropriate volume during normal conditions - Slightly higher than appropriate during the summer (COVID-19 data) - Willis Point Road - Appropriate (all seasons)
Intersection Level of Service	No significant differences		
Street Grade	Poor	Better	Best
Truck Climbing Lane	Not warranted on Willis Point road or Hartland Avenue and would increase the number of speeding vehicles		
Active Transportation	Maintains vehicles crossing the Interurban Trail Minimizes vehicles on Willis Point Road	Elements of the other two scenarios	Reduces vehicles on Hartland Avenue including crossing the Interurban Trail Increases vehicles on Wallace Drive and Willis Point Road
Vehicle Emissions		A modest reduction in air pollution affecting the health of Hartland Avenue residents A slight decrease in greenhouse gas emissions affecting climate change	Most reduction in air pollution affecting the health of Hartland Avenue residents A slight decrease in greenhouse gas emissions affecting climate change
On-site Circulation	Poor access to the future fill area Highest vehicle volume travelling through the Mount Work mountain bike trailhead	Fewer on-site conflicts between vehicles Good access to the future fill area Moderate vehicle volume travelling through the Mount Work mountain bike trailhead	Good access to the future fill area No vehicles travelling through the Mount Work mountain bike trailhead
Infrastructure Condition	Increased risk of deterioration to the Hartland Avenue bridge	Reduced risk of deterioration to the Hartland Avenue bridge	Landfill traffic does not deteriorate the Hartland Avenue bridge

Black - No significant differences between scenarios
 Green - Noticeable improvement compared to other scenarios
 Red - Noticeable decrease compared to other scenarios

