Chapter 13: Transportation

This chapter describes how the implementation of any of the alternatives for the Cedar Hills Regional Landfill (CHRLF) could affect traffic in the vicinity of the site. The analysis focuses on the effects of the project using peak-day landfill traffic, during peak-hour conditions when traffic would be heaviest and, as such, represents worst-case traffic conditions.

The environmental review determined that no significant unavoidable adverse impacts to traffic are anticipated during construction or operation of any of the alternatives.

13.1 Affected Environment

Figure 13-1 shows the key roads and intersections along the primary access route between the I-405/SR 169 interchange and the CHRLF. These roads and intersections comprise the study area for the traffic impact analysis.

13.1.1 Traffic Volumes

The Washington State Department of Transportation (WSDOT) and the King County Department of Transportation (KCDOT) provided current traffic volumes for use in the traffic analysis (WSDOT 2008, KCDOT 2008). Weekday/afternoon peak-hour traffic volumes were used to estimate the average daily trips (ADT) data. Field data collected on August 13, 2008, provided supplemental turning movement counts (HDR 2009a). Data was collected in June 2009 to analyze truck traffic levels, the business generators, and distribution on Cedar Grove Road between SE Lake Francis Road and 228th Avenue SE.

13.1.2 Landfill Traffic

CHRLF generates three types of traffic: 1) waste haul truck traffic, 2) employee and visitor traffic, and 3) occasional construction traffic. Waste haul traffic consists of KCSWD transfer trucks, private facility transfer trucks, and other local deliveries. Visitor traffic includes other KCSWD employees, contractors, and other occasional visitors. Construction traffic includes construction employees and shipment of equipment and materials necessary to develop and operate the landfill. Table 13-1 summarizes the existing, one-way landfill trips, as provided by CHRLF personnel. The reported numbers represent the peak daily traffic observed over the last year.

Table 13-1. 2008 Cedar Hills Regional Landfill Traffic

Type of Landfill Traffic	2008 Daily Trips (One-way)
Waste Haul Trucks	185
Employees, Visitors, and Construction[1]	200
Total Landfill Traffic	385

[1] Assumes no carpooling of either employees or visitors.

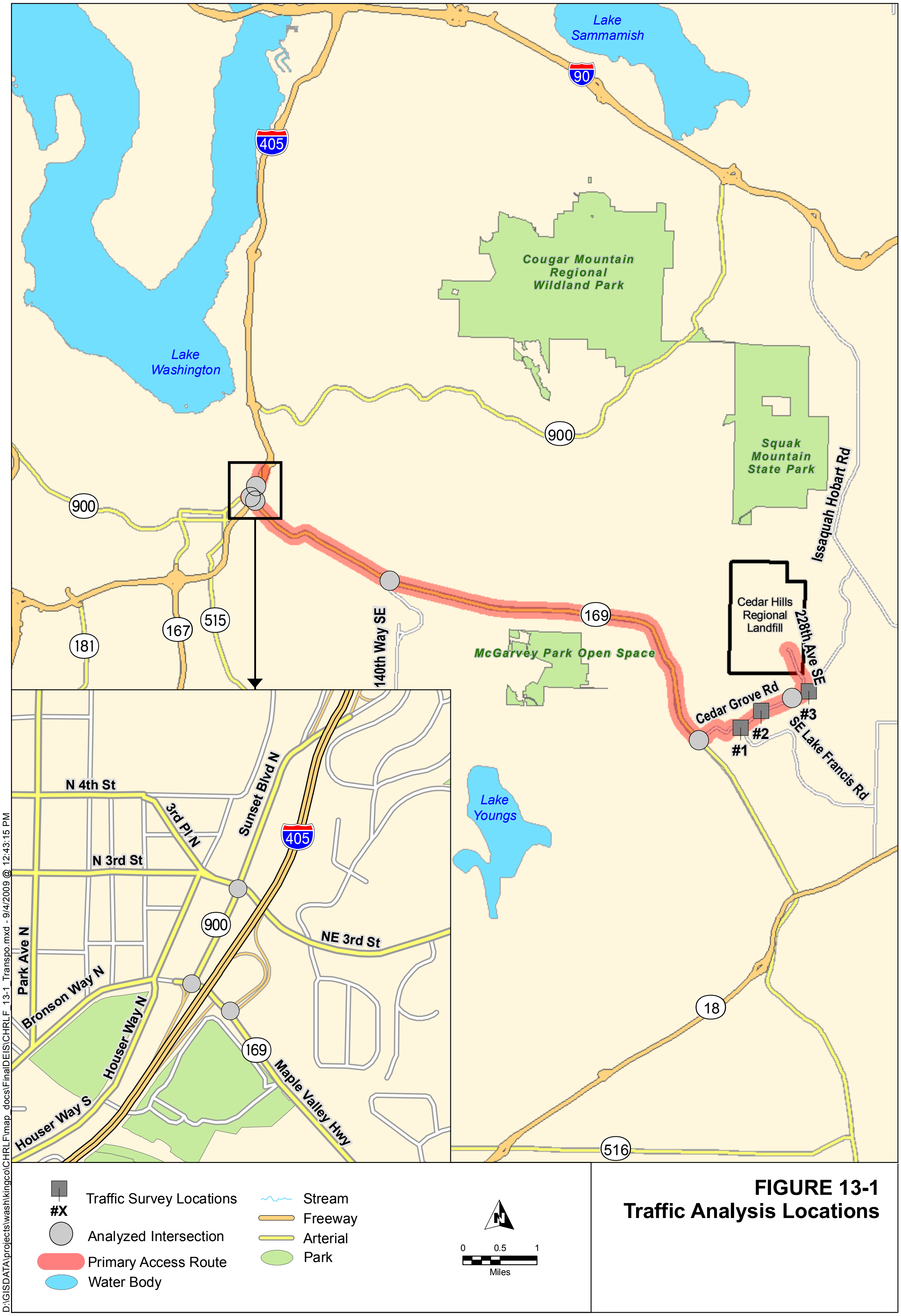
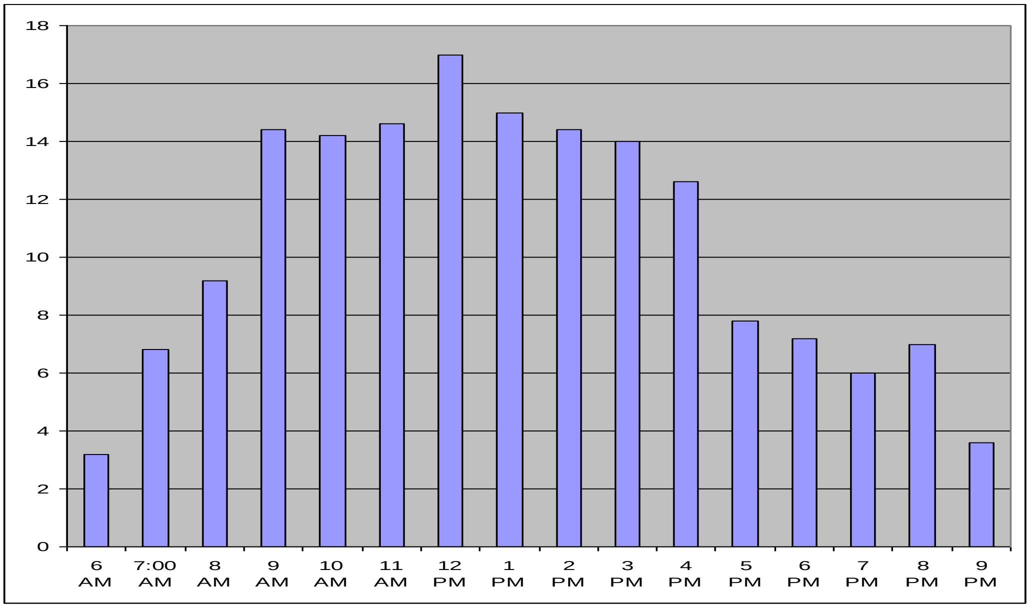


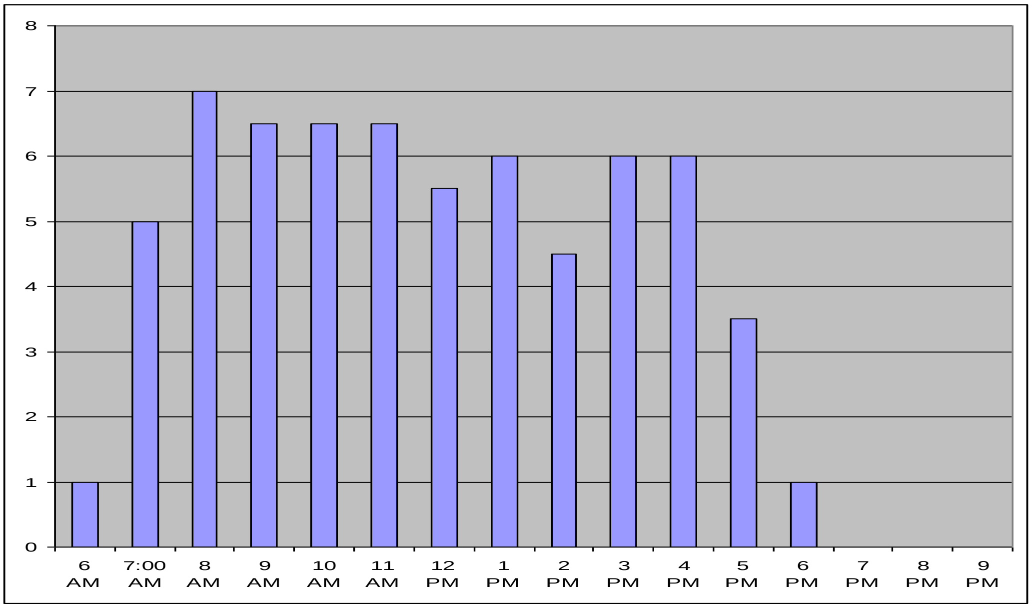
FIGURE 13-1
Traffic Analysis Locations

Records of haul trucks crossing the scales at the entrance to CHRLF over a 10-week period from December 10, 2008, through February 17, 2009, indicate that very few trucks arrive before 7 a.m. or after 8 p.m. Figures 13-2 and 13-3 show average hourly haul truck arrivals on weekdays and weekends. During both the week and on weekends, truck traffic is greatest between 8 a.m. and 5 p.m. Typically, fewer than three trucks arrive during the first and last hours of operation during the week. On weekends, haul truck traffic is normally less than half of weekday traffic, with an average of one truck arriving before 7 a.m. or after 6 p.m.



During the period December 10, 2008 through February 17, 2009

Figure 13-2. Average Hourly Weekday In-Coming Haul Trucks



During the period December 10, 2008 through February 17, 2009

Figure 13-3. Average Hourly Weekend In-Coming Haul Trucks

13.1.3 Traffic Analysis

Much of the traffic to and from CHRLF uses I-405 to reach the main highway to the landfill, SR 169. Since the project-related traffic on I-405 represents such a miniscule portion of I-405's traffic volume (less than 0.3%), it was not included in the traffic analysis.

Six key intersections are included in the traffic analysis. These intersections are representative of the higher-volume side streets on the SR 169 primary access route from the I-405/SR 169 interchange exits to CHRLF. The capacity analysis for the study area intersections used Synchro traffic software (Version 7) to model the afternoon peak-hour traffic, since this period represents the highest traffic volumes at the analyzed intersections and a worst-case scenario for traffic conditions.

Transportation engineers and planners commonly use a grading system called Level of Service (LOS) to measure and describe the operational status of a local roadway network. LOS is a description of intersection operations, ranging from LOS A (indicating little or no delay for side street traffic) to LOS F (representing significant delays and long queues for side street traffic). Table 13-2 shows the threshold limits for each LOS for both signalized and un-signalized intersections (two-way stop-controlled).

Table 13-2. Intersection Level of Service Thresholds

Level of Service (LOS)	Signalized Control Delay (sec/veh)	Unsignalized Control Delay (sec/veh)	General Description
A	0 – 10	0 – 10	Little to no congestion or delays
B	10 – 20	10 – 15	Limited congestion, short delays
C	20 – 35	15 - 25	Some congestion with average delays
D	35 – 55	25 – 35	Moderate congestion and delays
E	55 – 80	35 – 50	Extensive congestion and delays
F	> 80	> 50	Total breakdown with extreme delays

Source: 2000 Highway Capacity Manual (HCM) – Chapters 16 and 17
sec/veh = seconds per vehicle

Table 13-3 shows the LOS for the study area intersections during the afternoon peak hour. Due to their proximity, this analysis combines the SR 169 intersections with both I-405 ramps and the Shari's Restaurant driveway.

Three intersections are currently operating at an undesirable LOS E or LOS F during the afternoon peak hour: 1) SR 900 at NE 3rd Street, 2) SR 900 at SR 169, and 3) SR 169 at 140th Way SE.

Table 13-3. 2008 Existing Intersection Level of Service

Study Intersection	Traffic Control	LOS	Control Delay[1] (sec/veh)
SR 900 at NE 3rd St	Signal	F	109.9
SR 900 at SR 169	Signal	E	62.2
SR 169 at I-405 northbound ramp	Signal	C	25.4
SR 169 at 140th Way SE	Signal	F	92.8
SR 169 at Cedar Grove Rd	Signal	D	38.2
Cedar Grove Rd at 228th Ave SE	One-Way Stop Control	B	10.2

[1]Control delay, measured in seconds per vehicle (sec/veh), is a measure of all the delay attributable to traffic control measures, such as traffic signals or stop signs. At signalized intersections, the delay reported is the average of all control delay experienced for all the movements. At stop-controlled intersections, the reported delay is only for the one movement experiencing the worst control delay, which is typically one of the stop-controlled side street approaches.

13.1.4 Truck Study

Traffic count data were collected along Cedar Grove Road in June 2009. Data were collected on weekdays over a 15-hour period (from 6 a.m. until 9 p.m.) for three weekdays at the following locations (see Figure 13-1):

- The intersection of Cedar Grove Road and SE Lake Francis Road (Location #1)
- The intersection of Cedar Grove Road and the entrance to the Cedar Grove Composting facility (Location #2)
- The intersection of Cedar Grove Road and 228th Avenue SE (Location #3)

The data were recorded by turning movement (right-turn, left-turn, and through) and tabulated by vehicle type as one of the following:

- KCSWD solid waste haul trucks
- Other large trucks such as tractor/trailer vehicles and dump trucks
- Other vehicles (passenger cars, pickup trucks, delivery and service trucks)

The data were then averaged for the 3-day period so that traffic trends could be analyzed. According to the survey, an average of about 3,500 to 4,800 vehicles per day use Cedar Grove Road between 228th Avenue SE and SR 169 (both directions). Most of the vehicles, about 80%, are passenger cars and other smaller vehicles. About 6% to 7% of the total number of vehicles is KCSWD solid waste haul trucks. Other trucks make up about 8% to 14% of the traffic. The variability in other truck traffic reflects the fact that much of the other truck traffic is generated by Cedar Grove Composting, Stoneway Rock and Recycle, Quality Aggregates, and Pacific Topsoil, and moves to and from SR 169. The traffic survey also demonstrated that no CHRLF haul truck traffic used Cedar Grove Road east of 228th Avenue SE (landfill entrance road). Haul truck traffic using Issaquah–Hobart Road and Cedar Grove Road east of 228th Avenue SE only occurs in emergency situations.

13.1.5 Crash Analysis

Tables 13-4 and 13-5 show crash information for the most recent 3 years of data (2005–2007) provided by WSDOT (WSDOT 2008). Crash analysis limits on SR 169 are from I-405 to Cedar Grove Road. Cedar Grove Road limits for the crash analysis are from SR 169 to 228th Avenue SE. These crash analysis limits capture the number of incidents involving vehicles entering and exiting the landfill.

Table 13-4. Crash Rates (2005–2007)

	Total Crashes	Length (miles)	Weighted ADT (veh/day)	Section Crash Rate[1]	WSDOT 2007 average crash rate[1]
SR 169	308	7.6	28,200	1.31	2.77
Cedar Grove Rd	14	1.61	2,730	2.91	2.14

[1]Crash rates are reported by crashes per million miles vehicles of travel (mvmt).
veh/day = vehicles per day

As shown in Table 13-4, Cedar Grove Road has a crash rate of 2.91 per million miles of vehicle travel, which is higher than the average for a similar road type. About half of the crashes on this analyzed section of Cedar Grove Road occurred at the SE Lake Francis Road intersection; however, KCSWD trucks were not involved in the accidents recorded during this analysis.

Table 13-5 shows which intersections have a higher frequency of left-turn and angle crashes. These two types of frontal impact crashes are generally the most severe crash types seen at an intersection, so they are worth noting. None of the intersections within the study area where landfill truck traffic would be making left-turns has a high frequency of left-turn crashes.

Table 13-5. Intersection Crash Analysis (2005–2007)

Intersection	Total Intersection Crashes	Left-Turn/ Angle Crashes
SR 900 at 3rd Ave N	16	4
SR 169 at SR 900	14	3
SR 169 SB at I-405 northbound off-ramp	33	0
SR 169 at I-405 northbound on-ramp	35	11
SR 169 at 140th Way SE	47	9
SR 169 at Cedar Grove Road	17	2
Cedar Grove Road at Lake Francis Rd	7	6
Cedar Grove Road at 228th Ave SE	0	0

The three intersections worth noting are as follows:

- SR 169 at I-405 northbound on-ramp. This intersection serves substantially high traffic volumes.
- SR 169 at 140th Way SE. Although this signalized intersection has a lower frequency of left-turn crashes than the other two listed, there is a higher traveling speed on SR 169, which increases the possibility of more severe crashes. Non-fatal injury crashes accounted for four of the nine frontal impact crashes that occurred during the analyzed period.
- Cedar Grove Road at SE Lake Francis Road intersection. The left-turn crashes at this intersection comprise 86% of all the intersection's crashes. This intersection is the reason for the higher than average section crash rate on Cedar Grove Road.

13.1.6 Future Improvements to I-405

WSDOT has planned extensive improvements for I-405. For example, WSDOT intends to add two new general-purpose lanes on I-405 in each direction from SR 169 to I-90, and replace all of the interchanges on that part of I-405. A flyover ramp from southbound I-405 to eastbound SR 169 will be part of the improvements (see Figure 13-4), eliminating the effects of vehicles traveling to and from CHRLF on the intersections of SR 900/NE 3rd Street and SR 900/SR 169. A general-purpose lane will also be added to I-405 in each direction from SR 169 to I-5, along with replacement of most of the I-405/SR 167 interchange. According to WSDOT, these improvements will be constructed by 2018 (Trussler 2009).

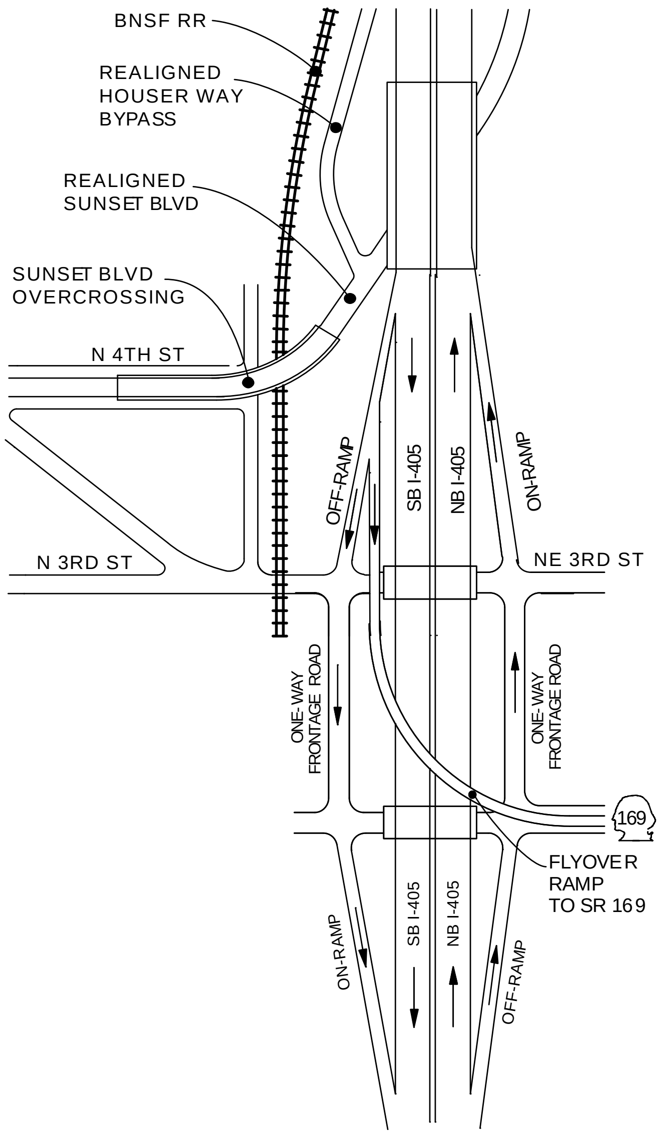


Figure 13-4. Planned Modifications to the I-405/SR 169 Interchange

13.2 Environmental Impacts

13.2.1 Direct Impacts

In any given year while the CHRLF is open, the annual tonnage of solid waste generated would be the same under all the alternatives. From a transportation standpoint, the only difference among the alternatives is the length of time that the CHRLF would remain open. This traffic analysis evaluates the effects of the CHRLF in 2029 because that year has the highest forecasted landfill traffic volumes and represents the worst-case future scenario. The difference in background traffic between 2029 and the closing year of Alternative 5 in 2031 would be minimal.

Future Traffic Volumes

The average background traffic growth rate along the landfill access route was calculated by averaging the change in ADT over the last 4 years at key locations along that route. WSDOT provided ADT data in the form of the Annual Traffic Report, which showed yearly ADT volumes at seven key locations along the access route. Table 13-6 shows the ADTs and growth rates at each location, as well as the calculated average growth rate for the analyzed SR 169 corridor.

Table 13-6. Average Background ADT Growth Rate

Location Description	2004	2005	2006	2007	Growth Rate
SR 169 Before Jct Cedar Grove Rd	18,000	18,000	18,000	19,000	1.8%
SR 169 After Jct Cedar Grove Rd	18,000	18,000	18,000	20,000	3.6%
SR 169 After Jct SE Jones Rd 196th Ave SE	23,000	23,000	23,000	24,000	1.4%
SR 169 Before Jct 149th Ave SE		23,000	23,000	23,000	0.0%
SR 169 Before Jct 140th Way SE	27,000	28,000	28,000	28,000	1.2%
SR 169 After Jct 140th Way SE We Conn	34,000	35,000	35,000	38,000	3.8%
SR 169 Before Cedar River Park			44,000	44,000	0.0%
				Average	**1.7%**

Source: WSDOT 2007 Annual Traffic Report

A conservative average growth rate of 2% was used to adjust the current 2008 traffic volumes to future analysis year 2029. KCDOT identified three planned projects expected to generate traffic in the study area: a rock quarry, a hay and feed store, and a horse-riding facility. The traffic generated by these planned facilities was included in the forecasted 2029 volumes. HDR (2009a) shows the 2029 volumes at the analyzed intersections. The projection of the forecasted background traffic volumes for 2029 was used to evaluate the operation of the transportation facilities without an operational landfill. This was used for comparison purposes to measure any potential impacts of the landfill remaining open.

Landfill Traffic

There is a direct relationship between the annual tonnage of solid waste handled by the CHRLF and landfill-related traffic. KCSWD is currently in the process of equipping the transfer stations with solid waste compactors. Compacted waste will decrease the number of trips needed to haul the same amount of waste by about one-third. Truck volumes are anticipated to shrink initially over time; however, the volumes gradually increase in number close to 2008 volumes due to annual tonnage growth by 2029. HDR (2009a) shows the methodology used to convert future waste tonnage into future landfill traffic, which was then used to estimate afternoon peak-hour trips. Table 13-7 shows the 2029 forecasted regional landfill traffic for a peak day and trips generated during the peak hour. Landfill construction traffic would not increase for the future year scenarios, since it would not depend on the amount of solid waste handled at the landfill.

Table 13-7. 2029 Cedar Hills Regional Landfill Traffic

Type of Landfill Traffic	2029 Daily Traffic	2029 Afternoon Peak Hour 4:00 p.m. – 5:00 p.m.		
		Inbound	Outbound	Total
Waste Haul Trucks	182	13	13	26
Employees and Visitors	130	3	17	20
Construction	75	4	4	8
Total Landfill Traffic	387	20	34	54

None of the 75 construction-related trips would occur during the afternoon peak hour (4:00 p.m. to 5:00 p.m.), so they were not included in the peak-hour traffic analysis. The total afternoon peak-hour traffic that would be generated by the project represents approximately 10% of the daily traffic.

Level of Service

Table 13-8 shows an LOS comparison of the key intersections in the analysis area between current 2008 conditions and forecasted 2029 conditions during the afternoon peak-hour with and without the project. Analysts assumed optimal traffic signal operations for the future with and without the project, since jurisdictions typically update signal timings every 4 to 6 years.

Table 13-8. 2008 and 2029 Level of Service Comparison

Study Intersection	Traffic Control	2008 Current - PM Peak Hour			2029 Without Project - PM Peak Hour			2029 With Project - PM Peak Hour		
		LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c	LOS	Delay (sec/veh)	v/c
SR 900 at NE 3rd St[1]	Signal	F	109.9	1.14	F	105.5	1.15	F	105.5	1.15
SR 900 at SR 169[1]	Signal	E	62.2	1.12	F	93.4	1.14	F	93.3	1.14
SR 169 at I-405 northbound ramp*	Signal	C	25.4	0.82	E	78.3	1.21	E	79.6	1.21
SR 169/Shari's Dr	Signal	N/A	N/A	N/A	A	8.7	0.66	A	8.8	0.67
SR 169 at 140th Way SE	Signal	F	92.8	0.92	F	212.8	1.61	F	211.6	1.61
SR 169 at Cedar Grove Rd	Signal	D	38.2	0.69	D	51.2	1.03	D	51.9	1.01
Cedar Grove Rd at 228th Ave SE	Stop	B	10.2	0.11	B	10.6	0.14	B	10.8	0.17

[1]These study intersections would not be used after the I-405/SR 169 interchange was reconfigured.
Note: LOS, v/c, and delay at stop-controlled intersections are reported for worst movement.
PM = afternoon
sec/veh = seconds per vehicle; v/c = vehicle capacity

Based on these results, the additional traffic from the CHRLF would have a negligible impact on the transportation network. Although four of the analyzed intersections would operate at LOS E or LOS F (a typical “failing” intersection) in 2029, these intersections would also operate at LOS E or LOS F without the project. In fact, three of these intersections currently operate at LOS E or LOS F. Several of the intersections close to the I-405/SR 169 interchange would not be affected by traffic traveling to and from CHRLF because of the reconfiguration of the interchange to handle more traffic.

The background traffic unrelated to the CHRLF would cause future congestion and delay in the analyzed area, with or without the presence of the landfill traffic. Since there would be no substantial impact in 2029, there would be no substantial impact under any of the alternatives that closed the landfill prior to 2029.

Traffic associated with the continued operation of the landfill would cause no substantial difference in future traffic conditions. However, the continued operation of the landfill would generate more truck trips, and therefore could contribute to the physical deterioration of the roadway surfaces.

Truck Traffic

One clear trend is that solid waste haul trucks generally operate in a pattern opposite to the other traffic on Cedar Grove Road. Most of the Cedar Grove Road traffic reflects morning and evening peak periods consistent with typical commuting patterns in the region. By contrast, solid waste haul truck volumes build slowly in the morning to a peak around noon, and then begin to decline. The result of these two contrasting travel patterns is that CHRLF haul truck traffic contributes very little to the morning and evening volume peaks associated with commuting (see Figure 13-2).

13.2.2 Indirect and Cumulative Impacts

The traffic analysis for CHRLF accounted for transportation infrastructure improvements planned by WSDOT, King County, and the City of Renton. As a result, the traffic analysis and conclusions presented above are cumulative in nature. Future traffic volume forecasts comprise existing traffic volumes, background traffic growth, trips generated by other developments unrelated to CHRLF, and trips generated by CHRLF. The background growth rate was determined from a review of historical traffic volumes. Other developments not associated with CHRLF that are within the study area and expected to be constructed and operational prior to this project were identified by King County and the City of Renton. Traffic generated by these "pipeline" projects was generated according to industry recognized trip generation methodologies and distributed and assigned to the study area roadway network according to the King County travel demand model.

13.3 Mitigation Measures

None of the alternatives would result in a substantial impact on the analyzed transportation network. Therefore, mitigation measures related to congestion or delay would not be necessary. Truck trips are anticipated to decline initially as solid waste compactors are installed at county transfer stations, as compaction will decrease the number of trips needed to haul the same amount of waste. By 2029, truck haul traffic is anticipated to return to 2008 levels as annual solid waste tonnage increases. Additional truck trips in these future years could contribute to the physical deterioration of the roadway surfaces along the haul route. Truck licensing fees, a portion of which is applied to roadway resurfacing or maintenance projects, provide mitigation for this potential impact.

13.4 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts to traffic would occur under any of the alternatives.