

# MEMO

Job **Cedar Hills Regional Landfill – Construction Noise Study**  
Client **King County Solid Waste Division**  
Date **December 28, 2015**  
To **Lynde Eller**  
From **Kevin Warner**  
Copy to **Tim Reinhardt, AMEC Foster Wheeler**

## 1. Introduction

Ramboll Environ US Corporation (Ramboll Environ) was retained by AMEC Foster Wheeler, Inc. (AMEC) and King County Solid Waste Division (KCSWD) to complete a noise assessment for the King County Cedar Hills Regional Landfill (CHRLF). The goal of the noise assessment was to estimate sound levels from new construction projects that are expected to have overlapping schedules in 2016. Construction activities evaluated in this assessment include:

- Construction of a new gas pipeline along the western perimeter road at CHRLF. The new pipeline would carry landfill gas from the North Flare Station (NFS) around the west side of the landfill and connect to the existing BioEnergy Waste facility (BEW), currently in operation at the southwest corner of the active landfill area
- Excavation of a new landfill area – Area 8, located adjacent to the north of the existing south perimeter road
- Construction of a new stormwater pond, including supporting concrete structures, located south of the existing south perimeter road

Pipeline construction is scheduled to begin in May 2016 and be completed by October 2016. For the purposes of this assessment, construction of Area 8 and the stormwater pond are assumed to occur concurrently during pipeline construction.

The remainder of this memorandum provides an overview of the regulatory setting at CHRLF, a brief description of the proposed construction activities, a description of the existing environment, and results of the assessment.

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## 2. Regulatory Setting

King County recently adopted a new noise ordinance in the King County Code (KCC), effective May, 2015. The noise criteria established in the KCC apply to the CHRLF site and surrounding properties. These criteria are defined in KCC Title 12, Chapter 12.86 (KCC 12.86) and are reproduced in [Table 1](#).

**Table 1. King County Maximum Permissible Sound Levels**

District of Sound Source	District of Receiving Property Within King County			
	Rural Day/Night	Residential Day/Night	Commercial	Industrial
Rural	49 / 39	52 / 42	55	57
Residential	52 / 42	55 / 45	57	60
Commercial	55 / 45	57 / 47	60	65
Industrial	57 / 47	60 / 50	65	70

The limitations for noise received in Rural and Residential Districts are reduced by 10 dBA during nighttime hours, defined in the King County rule as 10 p.m. to 7 a.m.

**Source: KCC 12.86.110 and KCC 12.86.120**

The sound level limits identified in [Table 1](#) are based on the energy-average sound level over a given time period, or “Leq”. KCC does not explicitly define the time period during which the limits in [Table 1](#) shall apply, however, unless otherwise specified, a one-hour time interval is most universally applied in jurisdictions where sound level limits are based on an Leq. The limits in [Table 1](#) therefore are understood to be the Leq sound level received over a 1-hour period, regardless of whether the sound source is constant over an hour or active only for a portion of the hour (i.e., non-continuous). When determining compliance of a sound source relative the limits identified in [Table 1](#), KCC 12.86.110(A) states that sound level measurements shall be taken for a minimum of one-minute for “constant” sound sources (i.e., sources that emit a constant sound that would not change over a given time period), and a minimum of thirty-minutes for “non-continuous” sound sources (i.e., sources that are not continuous over a given time period).

Exemptions to the sound level limits in KCC 12.86 are provided for various types of construction activity during specific times of day, found in KCC 12.86.520 as follows:

12.86.520(1): For heavy equipment, including crawlers, tractors, bulldozers, rotary drills and augers, loaders, power shovels, cranes, derricks, graders, off-highway trucks, ditchers, trenchers, compactors, compressors and other similar equipment (note that this exemption applies the construction equipment included in this assessment):

- Exempt between the hours of 7:00 a.m. and 7:00 p.m. on weekdays, and between 9:00 a.m. and 7:00 p.m. on weekends

12.86.520(2): For impact type equipment, including pavement breakers, pile drivers, jackhammers, sandblasting tools or other types of equipment or devices that create impulse noise or impact noise:

- Exempt between the hours of 8:00 a.m. and 5:00 p.m. on weekdays, and between 9:00 a.m. and 5:00 p.m. on weekends

12.86.520(3): For all other construction activities:

- Exempt between the hours of 9:00 a.m. to 10:00 p.m. on weekdays, and between 9:00 a.m. and 8:00 p.m. on weekends

### 3. **Construction Activities**

Pipeline construction would include installing approximately 10,700 linear feet of a new 30-inch diameter gas pipeline that would connect the NFS to the BEW along the west perimeter road of the current active landfill area. The pipeline would be in addition to an existing pipeline that connects the NFS to the BEW along the east side of the landfill. Following is a summary of the equipment proposed to complete the installation of the new pipeline:

- 1 TracStar 900 for fusing pipe sections
- 2 Excavators (e.g., Caterpillar Model 300 or 336)
- 1 Backhoe (e.g., Caterpillar 400 series)
- 1 Loader (e.g. Caterpillar 900 series)
- 3 Rough-terrain forklifts
- 2 10-yard dump trucks
- 3 material deliveries, daily

Construction would occur along the entire length of the new pipeline and most equipment would operate within a relatively small area during placement of each pipe section. Ramboll Environ assumes that only the dump trucks, material deliveries, and pickup trucks would operate over a larger area, moving materials and people to and from the active construction areas.

Excavation of Area 8 and construction of a new stormwater retention pond has been assumed to include use of the following equipment:

- 4 Excavators (e.g., Caterpillar Model 300 or 336)
- 2 Backhoe (e.g., Caterpillar 400 series)
- 4 Loaders (e.g. Caterpillar 900 series)
- 2 concrete trucks
- 10 10-yard dump trucks

#### 4. Existing Environment

CHRLF is an active landfill that operates during daytime hours **and includes multiple “areas”** that are filled to a finished grade elevation. Existing operational equipment at the landfill include heavy trucks hauling materials and waste, loaders, dozers, tippers, soil scrapers, and other equipment and activities related to solid waste landfilling. At the southeast corner of the active landfill area is the BEW facility, which generates electricity from landfill gas. South of the landfill is the Cedar Grove Compost facility.

Residential areas are located along the east and west perimeters of the landfill. The existing acoustic environment at multiple residential locations was documented in a KCSWD 2012 study prepared by AMEC titled *Detailed Perimeter Noise Study at Cedar Hills Regional Landfill*. Of the several monitoring locations included in this study, P1 is located along the western property boundary, approximately 990 feet west of the nearest location of the new pipeline construction. P1 is representative of the eastern-most property line (backyard) of 20921 SE 159th Street. Note that there are several properties north and south of this location that are approximately equal distance from the west perimeter road, and thus equal distance from the proposed pipeline construction.

The average hourly sound levels at all perimeter locations, including P1, were summarized in a KCSWD October 2015 modeling report prepared by AMEC and Ramboll Environ titled *Noise Modeling Assessment Cedar Hills Regional Landfill*. The measured daytime average hourly sound level (hourly Leq) at P1 was 45 dBA, and activity contributing to measured daytime levels included landfill noise and the BEW.

#### 5. Construction Noise Assessment

A construction noise model was prepared for this assessment to evaluate noise at a receiving location nearest where ambient noise measurements have been collected (i.e., P1) so that construction noise can be compared with existing ambient sound levels. P1 was selected as the noise receiving location because it would be nearest the proposed pipeline construction (distance from P1 is similar to other residences along west perimeter), as well as nearest to Area 8 and the stormwater pond construction areas.

The construction noise assessment was completed using the CadnaA noise model, based on the same noise model setup that was used for the 2015 *Noise Modeling Assessment Cedar Hills Regional Landfill* report. Note that this model was validated in the 2015 study and found to predict sound levels within 3 dBA at P1 when comparing measured landfill activity with model-predicted landfill activity (considered to be in good agreement and thus validating the model). Note also that this modeling assessment was completed using topography as it existed in 2012 and therefore does not account for re-graded topography within the vicinity of Area 8 or the new stormwater pond. However, slight re-grades in topography between P1 and Area 8 or the stormwater pond are not expected to significantly alter noise modeling results for these construction activities.

1/1 octave sound power data<sup>1</sup> for the proposed construction equipment were input to the model using sound level measurement data of similar equipment, and adjusted as needed based on the difference in broadband sound levels of proposed equipment. [Table 2](#) summarizes the sound power data used in the noise model to represent each sound source.

**Table 2. Construction Equipment Sound Power Levels (dBA)**

Construction Project	Construction Equipment Type	Number of Units Proposed	Sound Power Level (dBA)
New Gas Pipeline <sup>(a)</sup>	TracStar 900	1	95
	Excavator	2	117
	Loader	1	116
	Backhoe	1	114
	Rough-terrain Forklifts	3	116
	Heavy Duty Trucks	3	104
	Dump Trucks	2	104
Area 8 Excavation and New Stormwater Pond <sup>(b)</sup>	Excavator	4	117
	Backhoe	2	114
	Loader	4	116
	Concrete Trucks	2	104
	Dump Trucks	10	104

<sup>(a)</sup> Equipment list provided by King County

<sup>(b)</sup> Equipment list estimated based on typical construction activity of similar facilities; assumes even distribution of equipment between areas, concrete trucks only at new pond

Note that diesel-powered pickup trucks also would be present during construction to move personnel to and from the construction sites, however these trucks emit acoustically-negligible sound levels when compared to the construction equipment identified in [Table 2](#), and so were not included in the modeling assessment.

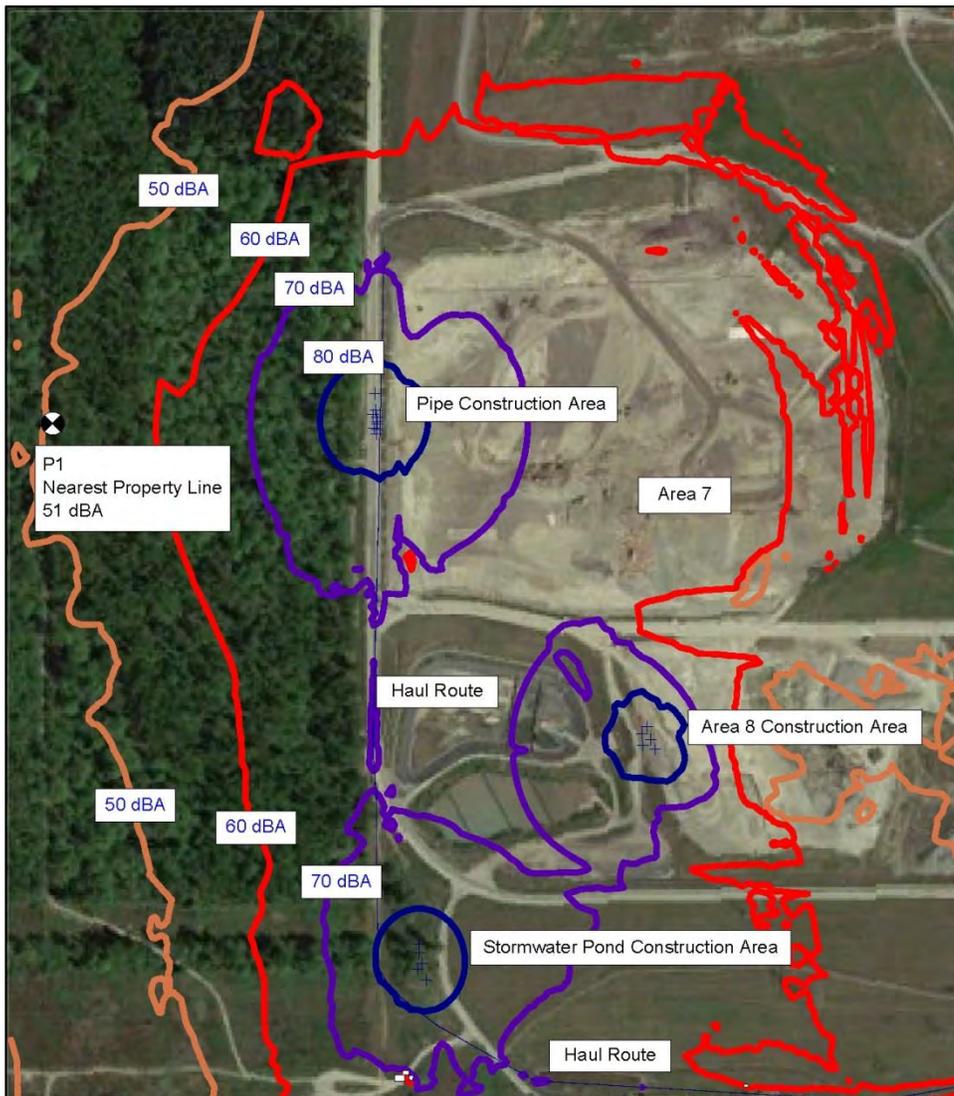
Using the same noise model that was prepared for the 2015 modeling study, construction equipment for the pipeline were placed within a relatively small area to represent work at a single pipe section, and to represent the nearest location to P1. Heavy duty haul trucks and dump trucks were modeled as linear sources that would move materials along the west

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<sup>1</sup> Sound Power Level, or SWL, is a measure of the sound energy emitted by noise source, expressed as energy per unit of time. SWL is not to be confused with sound *pressure* level, or SPL, which is the logarithmic measure of the sound pressure of a sound relative to a reference value that is approximately equal to the threshold of human hearing. Both SWL and SPL are expressed in decibels.

perimeter road and the new south perimeter road, to and from the construction area. Equipment for construction of Area 8 and the new stormwater pond also were placed within relatively small areas, respectively, to represent worst-case construction noise scenarios.

Results of the impact assessment are displayed graphically in [Figure 1](#) as sound level isopleths. As noted in this figure, the predicted hourly sound level at P1 is 51 dBA. Note that in the 2012 report, the average daytime ambient sound levels at P1 is 45 dBA. Therefore, noise from the proposed construction activities, should they occur during the same time and under worst-case operating conditions (i.e., nearest the western-most edge of each construction area), would exceed existing ambient conditions by approximately 6 dBA.



**Figure 1. Sound Level Isopleths – Nearest Construction to P1**

As noted earlier, and as summarized in KCC 12.86.520, noise from temporary construction activities during daytime hours is exempt from the King County maximum permissible sound level limits. Therefore, cumulative noise from the construction of a new pipeline, Area 8 excavation, and a new stormwater pond, although predicted to exceed ambient conditions by up to 6 dBA, is exempt from the KCC limits.

Results of this assessment include a conservative assumption that all equipment would operate concurrently and within relatively small areas. In reality, construction equipment likely would not operate all at the same time, and likely would move within each area and not be isolated to one location (and therefore at times farther from P1 than was modeled). Construction-related sound levels during typical construction activities, therefore, are expected to be lower than was conservatively predicted for this assessment.

## **6. Summary**

Construction of a new 30-inch diameter gas pipeline along the west perimeter road of the Cedar Hills Regional Landfill, as well as excavation of Area 8 and construction of a new stormwater pond, is expected to result in a cumulative sound level that exceeds ambient conditions by up to 6 dBA at the nearest residential locations (P1). This conclusion is based on a conservative assumption of all equipment operating within relatively small areas and at the same time. Daytime construction noise is exempt from the King County Code however, and so the estimated increase in sound levels, while minor, would not be subject to the King County sound level limits.