

I. Introduction

This report presents the results of noise monitoring conducted over August 4 – 7, 2011 at the DirtFish Rally School and surrounding area. The purposes of the study were as follows:

- Evaluate noise levels from the DirtFish Rally School with respect to code requirements and ambient noise levels.
- Provide recommendations for environmental noise mitigation, if necessary, for noise from DirtFish activities to meet code requirements.

A vicinity map showing the site, surrounding properties, and sound measurement locations is presented in Figure 3 and Figure 4. Residential properties are located south, east, and northeast of the site. These properties are zoned as rural in King County.

The following are the key conclusions of the study

- Noise levels from the school in typical operation currently meets daytime code limits at the property line. No environmental noise mitigation is necessary.
- The distance between DirtFish Rally School and the remote monitoring locations examined in this study provides a factor-of-safety for these properties of approximately 20 dBA before noise code would be exceeded. This factor-of-safety would, for example, allow DirtFish to double the cars running on their track without exceeding noise code.

Acoustical descriptors used in reports such as this one may be confusing. The following section provides explanations of some of the common descriptors utilized in this report.

Sound Level Descriptors

Sound is measured as sound level in units of decibels, dB. The human ear responds differently to sounds at different frequencies. This is demonstrated by the fact that we hear higher pitched sounds more easily than lower ones of the same magnitude. To compensate for the different “loudness” as perceived by humans, a standard weighting curve is applied to measured sound levels. The weighting curve represents the frequency response of the human ear and is labeled as dBA (“A” weighted decibels).

People normally experience sound levels between 30 and 90 dBA, depending on their activities. Locations near highways or urban arterials may be 70 dBA, whereas quiet rural areas may be 40 dBA.

Each 10 dB increase in sound level corresponds to a tenfold increase of sound energy, but is judged by a listener as only a doubling of loudness. The smallest changes in sound level considered just noticeable are about 2 to 3 dBA.

Sound levels from two or more sources are combined logarithmically, not by adding the levels arithmetically. When two levels are combined, the louder level predominates, and the combined level is the louder level plus 0 to 3 dBA. Some examples: 50 dBA combined with 50 dBA is 53 dBA; 50 dBA combined with 40 dBA results in 50.4 dBA, which is rounded off to 50 dBA since fractions of a dB are negligible from the point of view of perception of environmental noise.

When measuring noise that is fluctuating over time, it is common practice to use a descriptor called equivalent A-weighted sound level, Leq. The Leq is that constant sound level in dBA which contains the same amount of sound energy over a given time period as the measured fluctuating noise. The Leq is often determined for one-hour time periods.

Another descriptor used in this report is the Lmax. The Lmax is the highest instantaneous sound level for a given sound event or time period. Similarly, Lmin is the lowest instantaneous sound level for a given sound event or time period.

II. Zoning and Criteria

The property is currently within the King County Zoning Jurisdiction. We have compared it both to King County Noise Code and the City of Snoqualmie Noise Code, based on its proximity to the City of Snoqualmie.

We understand that DirtFish leases their property from Snoqualmie Mill Ventures, LLC (SMV); however, subsequent maps in this report indicate the property as DirtFish for clarity.

King County Code Requirements

King County noise code specifies permissible sound levels based on the zoning of source and receiving properties in Chapter 12.88, *Environmental Sound Levels* of the King County Code. The four zoning districts specified in the code are Rural, Residential, Commercial and Industrial. The DirtFish Rally School is on property that has an Industrial zoning and the receiving properties within King County are zoned rural to the east (single-family homes) and industrial to the north (the Gravel Mine). There is also a small rural area to the north of the DirtFish property line, and south of the Gravel Mine. Finally, the receiving property on Spruce Street is within the City of Snoqualmie, and is zoned residential.

The zoning map for DirtFish and its surrounding properties is presented in Figure 1. The following table presents the noise limits from an industrial property:

Table 1 - King County Code Limits (Industrial Source Property)

Zoning of Source Property	Zoning of Receiving Properties			
	Rural	Residential	Commercial	Industrial
Industrial	57 dBA (7 a.m. – 10 p.m.)	60 dBA (7 a.m. – 10 p.m.)	65 dBA (7 a.m. – 10 p.m.)	70 dBA (7 a.m. – 10 p.m.)
	47 dBA (10 p.m. – 7 a.m.)	50 dBA (10 p.m. – 7 a.m.)	65 dBA (10 p.m. – 7 a.m.)	70 dBA (10 p.m. – 7 a.m.)

The Dirtfish School operates during daytime hours only, typical hours are between 8:00 AM and 5:00 PM, with initial instruction taking place in the classroom. Therefore, noise levels from Dirtfish to the rural properties are limited to the 57 dBA daytime code limit. As the Gravel Mine property to the north of DirtFish is zoned industrial, noise from the DirtFish site is limited to 70 dBA during daytime hours at this property.

In addition, for short-term noises, the King County code allows during any one-hour period, the basic noise limits can be exceeded by 5 dBA for a total of 15 minutes, 10 dBA for a total of 5 minutes, and 15 dBA for total of 1.5 minutes.

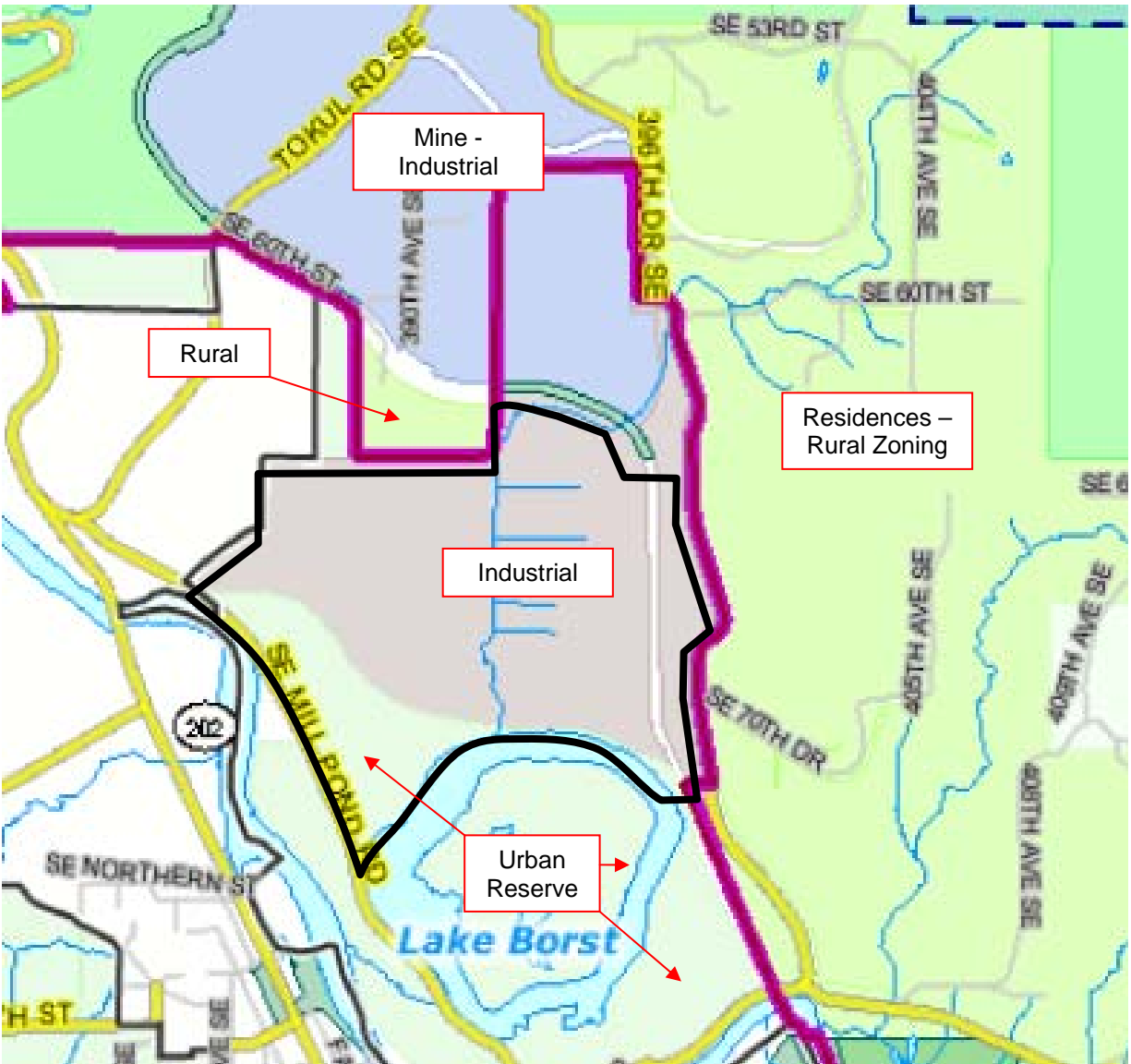


Figure 1 - King County Zoning Map

Note – The black line indicated on the map above illustrates the property line of Snoqualmie Mill Ventures, LLC; DirtFish leases and uses a partition of that property within the Industrial Zoning

City of Snoqualmie Code Requirements

City of Snoqualmie has adopted the limitations imposed by King County Noise Code Chapter 12.88, as outlined in City Code section 8.16.050, item H. The King County requirements are outlined in the prior section.

In addition, the City of Snoqualmie imposes limits on public disturbance noises, which are defined as “any sound which unreasonably either annoys, injures, interferes with or endangers the peace, comfort, tranquility, sleep or repose, health or safety of a community or neighborhood, although the extent of the damage or interference may be unequal. The City Code mandates that “it is unlawful between the hours of 10:00 p.m. and 7:00 a.m from Sunday evening through Friday morning, between 10:00 p.m. and 8:00 a.m. from Friday evening through Saturday morning, and between 10:00 p.m. and 9:00 a.m. from Saturday evening through Sunday morning, for any person to cause by any means a public disturbance noise, whether emanating from public or private property.” Since the Dirtfish school operates between 8:00 AM and 5:00 p.m., this portion of the code does not apply.

Table 2 summarizes the limitations imposed by the King County Noise Code.

Table 2 - Summary of Noise Code Limitations for Sound Emanating from DirtFish

Receiving Property:	Daytime King County Code Limit at Receiving Properties
39701 SE Spruce Street	60 dBA
6819 409th Ave SE	57 dBA
Control – SE 70th Dr	57 dBA
39728 SE 53rd St	57 dBA
Mill Pond to South	57 dBA
Mine to North	70 dBA

DirtFish Operations

DirtFish Rally School currently operates from approximately 8:00 AM to 5:00 PM on Monday through Saturday. A typical instructional day involves both classroom instructional time and driving time out on the course. We understand that occasionally courses have been behind schedule and have run until approximately 5:30 PM.

There are typically four cars in operation when students are occupying the road course. This can, on rare occasions, be increased to five cars; however, that has occurred only once in the school's year in operation.

Currently, the rally cars being used for school activities are outfitted with mufflers.

According to the school, the following classes were in operation during the noise monitoring:

On August 4, 5 and 6, DirtFish Rally School conducted a 3-Day Advanced Rally Techniques course. The course was operated from 8:30 to 4:30 on each of the three days, using four school cars. According to the school, the Advanced Rally course is the most intense course, and cars are driven harder than other courses, and therefore would be the loudest possible condition for a course.

The following is the operating schedule during each day of the course:

Session	Start Time	Duration
Classroom (no driving)	8:30 A.M.	45 – 60 minutes
Driving	9:15 – 9:30 A.M.	2 ½ - 2 ¾ hours
Lunch	12:00	1 hour
Classroom	1:00	15 – 30 minutes
Driving	1:15 – 1:30 P.M.	3 – 3 ¼ hours

We understand that the school has three main driving course components: a braking course, a driving course, and a skid pad. The locations of these activities are shown in figure 2 on the following page.

This constitutes typical school activities. The school also may have RallyCross events on occasion, for which they will obtain a special use permit. Additionally, DirtFish has conducted training courses for the military. This training takes place after dark, but is not expected to persist later than 10:00 PM. The military training utilizes street legal vehicles with the headlights off.

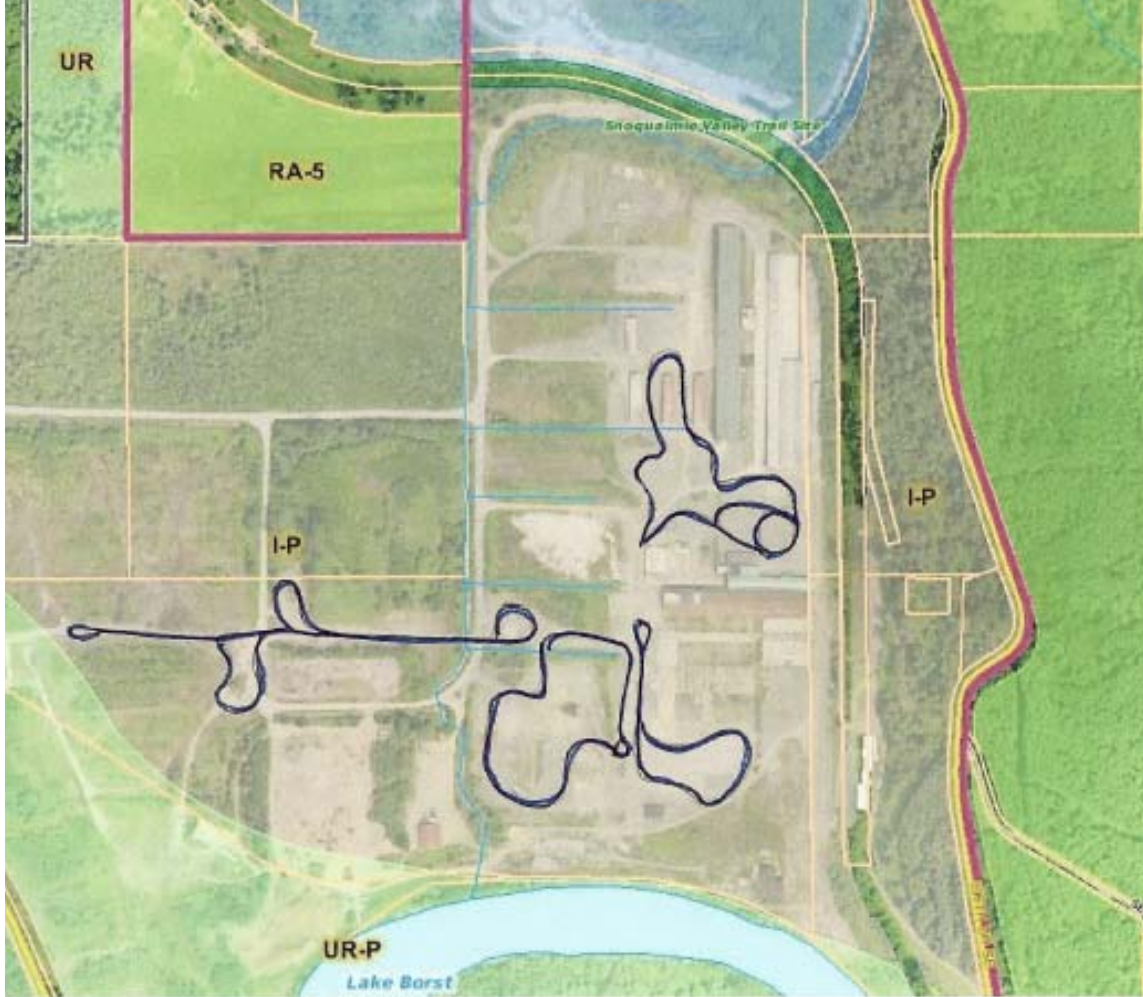


Figure 2 - DirtFish Activity Areas

III. Noise Measurements

Noise levels were monitored at the DirtFish Rally School property lines to the north, east and south. These locations are shown in Figure 3. Additionally, long-term environmental noise monitors were deployed at off-site locations to determine the impact of the Rally School at these properties. These locations are shown in Figure 4. The graphs in Appendix I present the noise levels measured at the long-term measurement locations compared with the code limits.

Sound level measurements at the long-term monitoring locations were taken using Larson-Davis Model 820 precision integrating sound level meters. The property line noise levels were measured using Larson-Davis Model 824 precision integrating sound level meters and real-time analyzers, and a Larson-Davis Model 2800 spectrum analyzer. All instruments used meet the American National Standards Institute (ANSI) requirements for a Type 1 instrument.

Long-term noise monitoring was recorded hourly from approximately 9:00AM on Thursday, August 4, 2011 through 3:00 PM on Sunday, August 7, 2011. Property line noise measurements were made for approximately 5 hours on Thursday, August 4, 2011.

The sound levels meters recorded hourly (Leq) average noise levels in addition to the descriptors that correspond to the code limit exceedences: L25 corresponds to 15 minutes, L8.3 corresponds to 5 minutes and L2.5 corresponds to 1.5 minutes.



Figure 3 - Property Line Noise Monitor Locations

P1	North Property Line near Gravel Mine Haulway
P2	East Property Line near small structure on hill
P3	South Property Line near Garage

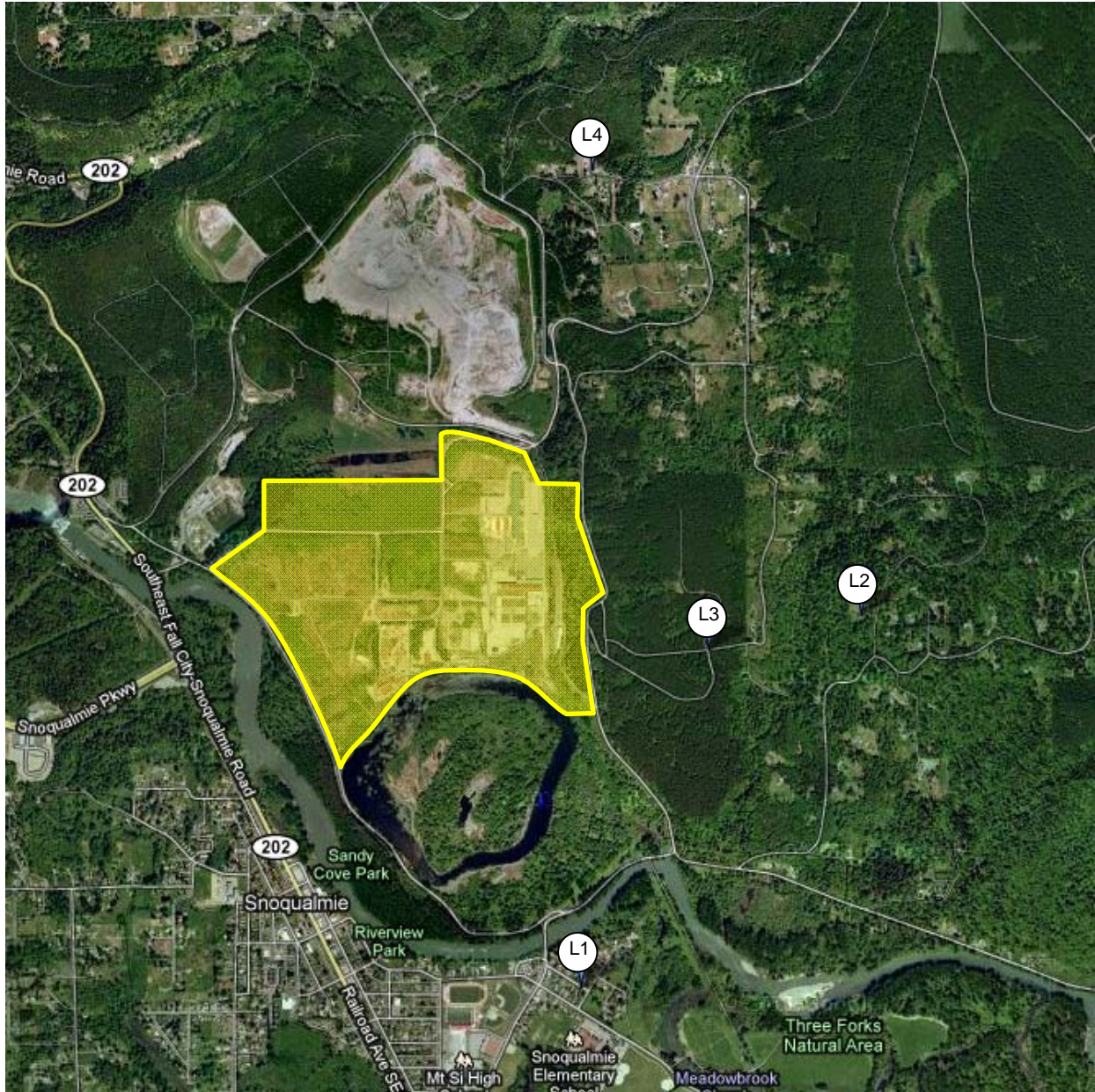


Figure 4 - Long-term Noise Monitor Locations

L1	39701 SE Spruce St
L2	6819 409th Ave Se
L3	Control Location, SE 70th Dr. near Water Tower entrance
L4	39728 SE 53rd St

IV. Measurement Results

Results from the remote monitoring locations, compared both to code requirements and to measured daytime ambient noise levels when DirtFish was not in operation are presented below. We have presented this data as an hourly breakdown from 8:00 AM to 5:00 PM, compared to DirtFish activity taking place during those hours on the 4-6 of August when school was in session. These levels are compared to ambient levels during the same hours on the 7th of August, and to noise code.

In addition, DirtFish property line noise measurements were taken to establish noise levels of typical activity during driving sessions. Graphs of the measured noise levels at remote monitoring locations are presented in Appendix I.

Short-Term Noise Monitoring Results:

P1 – North Property Line

Daytime L_{eq} noise levels measured at the north property line during DirtFish operations were between 63-64 dBA, due to activities from the adjacent Gravel Mine. Gravel mine operations dominate the noise levels at the north property line. During the course of our measurements, we obtained typical mine equipment levels between 55-61 dBA and mine truck pass-bys of 73-80 dBA. During a brief period of time, mine equipment was shut down and there were no truck activities, and ambient sound levels were reduced to 49 dBA.

P2 – East Property Line

Daytime

	DirtFish Operational Levels
Leq	44-46 dBA
L25	45 dBA
L8.3	47-48 dBA
L2.5	49-52 dBA

Location P2 was located on the hill to the east of the school, east of the primary driving course and skid course at DirtFish.

P3 – South Property Line

Daytime

	DirtFish Operational Levels
Leq	44-50 dBA
L25	44-52 dBA
L8.3	46-53 dBA
L2.5	49-56 dBA

Location P3 was located near the DirtFish Garage and the main course the students were using primarily from around noon to closing.

Long-Term Noise Monitoring Results:

The following are the results of the long-term noise monitoring conducted at the properties shown in figure 4.

L1 – 39701 SE Spruce St

This location lies within the City of Snoqualmie. The noise monitor was placed in the front yard of the single family home.

The following are the hourly dBA sound levels measured 8:00 AM – 5:00 PM:

Hour	Dirtfish Activity	Cars driving	8/4/11	8/5/11	8/6/11	Ambient 8/7/11	Code Limit
8:00-9:00 AM	None 50% Classroom 50%	N	45	48	41	42	60
9:00-10:00 AM	Classroom 50% Driving 50%	Y	43	43	42	47	60
10:00-11:00 AM	Driving	Y	51	51	48	44	60
11:00 AM-12:00 PM	Driving	Y	55	44	45	44	60
12:00 PM-1:00 PM	Lunch	N	52	51	47	51	60
1:00 PM-2:00 PM	Classroom 50% Driving 50%	Y	40	49	46	42	60
2:00 PM-3:00 PM	Driving	Y	47	45	46	50	60
3:00 PM-4:00 PM	Driving	Y	53	51	49	48	60
4:00 PM-5:00 PM	Driving	Y	50	46	51	50	60

The following is a summary of sound level descriptors measured during this time:

	During DirtFish Operating Hours (8/4/11 – 8/6/11)	Daytime Ambient Levels (8/7/11)	Code Limit
Leq	41-54 dBA	39-51 dBA	60
L25	39-51 dBA	35-55 dBA	65
L8.3	42-59 dBA	38-63 dBA	70
L2.5	45-63 dBA	43-67 dBA	75

Noise code was not exceeded at any time during DirtFish School operation, and levels were typically within the range of the ambient levels measured on 8/7/2011. Levels were notably above ambient for only one of the hours that DirtFish was in operation, between 11:00 AM and 12:00 PM on 8/4/2011. During the 11:00AM-12:00AM hour, the measured level was 55 dBA, however on the following days the noise level was 44-45 dBA, indicating that these noise levels were due to local activity (traffic or other events) and not from DirtFish. Noise levels measured at the south property line of Dirtfish were 44-50 dBA, and at this property, which is over 4,000 feet away, would be on the order of 20 or more dBA lower and not contribute to the noise environment.

L2 – 6819 409th Ave SE

This location was on a secluded residential property on a hill above the DirtFish School. The noise monitor was placed just off a path to the west of the home.

The following are the hourly dBA sound levels measured 8:00 AM – 5:00 PM:

Hour	Dirtfish Activity	Cars driving	8/4/11	8/5/11	8/6/11	Ambient 8/7/11	Code Limit
8:00-9:00 AM	None 50% Classroom 50%	N	-	30	46	32	57
9:00-10:00 AM	Classroom 50% Driving 50%	Y	35	30	41	28	57
10:00-11:00 AM	Driving	Y	33	31	35	30	57
11:00 AM-12:00 PM	Driving	Y	33	32	34	33	57
12:00 PM-1:00 PM	Lunch	N	38	34	37	34	57
1:00 PM-2:00 PM	Classroom 50% Driving 50%	Y	36	35	33	34	57
2:00 PM-3:00 PM	Driving	Y	37	33	49	36	57
3:00 PM-4:00 PM	Driving	Y	47	29	49	38	57
4:00 PM-5:00 PM	Driving	Y	33	34	37	38	57

The following is a summary of sound level descriptors measured during this time:

	During DirtFish Operating Hours	King Co.Code Limit	Daytime Ambient Levels
Leq	30-49 dBA	57	26-38 dBA
L25	29-46 dBA	62	25-39 dBA
L8.3	31-50 dBA	67	29-41 dBA
L2.5	33-52 dBA	72	32-45 dBA

Noise code was not exceeded at any time during the time when the DirtFish School was in operation. Noise levels measured during hours when Dirtfish cars were driving were within the ambient range of noise levels for the majority of the noise monitoring (between 30-38 dBA). Measured levels were higher than ambient during just 5 of the hours measured over the three day period. Noise levels were 47 dBA between 3-4 PM on 8/4/11, 46 dBA between 8-9 AM, 41 dBA between 9-10 AM on 8/6/11, and 49 dBA between 2-4 pm on 8/6/11. The higher noise levels in the morning were clearly due to local activity as they occurred at times when the DirtFish students were primarily in the classroom. The higher noise levels during the afternoon hours were also a result of local activity, as at all other times when cars are in operation levels are less than 38 dBA. Noise levels measured at the east property line of Dirtfish were 44-46 dBA, and at this property, which is over 4,000 feet away, would be on the order of 20 or more dBA lower and not contribute to the noise environment.

L3 – Control Location – SE 70th Dr

Location L3 was located near the entrance to the water tower site on a hill to the east of the DirtFish School. The monitor was placed just to the west of the access gate to the site.

The following are the hourly dBA sound levels measured 8:00 AM – 5:00 PM:

Hour	Dirtfish Activity	Cars driving	8/4/11	8/5/11	8/6/11	Ambient 8/7/11	Code Limit
8:00-9:00 AM	None 50% Classroom 50%	N	-	36	36	38	57
9:00-10:00 AM	Classroom 50% Driving 50%	Y	37	32	37	40	57
10:00-11:00 AM	Driving	Y	54	38	40	36	57
11:00 AM-12:00 PM	Driving	Y	36	38	38	37	57
12:00 PM-1:00 PM	Lunch	N	42	38	48	40	57
1:00 PM-2:00 PM	Classroom 50% Driving 50%	Y	41	41	42	38	57
2:00 PM-3:00 PM	Driving	Y	43	39	52	40	57
3:00 PM-4:00 PM	Driving	Y	51	36	44	42	57
4:00 PM-5:00 PM	Driving	Y	38	39	42	40	57

The following is a summary of sound level descriptors measured during this time:

	During DirtFish Operating Hours	King Co.Code Limit	Daytime Ambient Levels
Leq	32-54 dBA	57	30-50 dBA
L25	32-40 dBA	62	30-38 dBA
L8.3	34-52 dBA	67	32-43 dBA
L2.5	35-62 dBA	72	33-50 dBA

Noise code was not exceeded at any time during the time when the DirtFish School was in operation. Noise levels during times when DirtFish cars were in operation were within the ambient range. Noise levels were notably above ambient between 10-11 AM, and also between 3-4 PM. These levels were due to local activity as noise levels during these times were higher than the average levels measured for during the same hours on the following days. Noise levels measured at the east property line of Dirtfish were 44-46 dBA, and at this property, which is over 2,000 feet away, would be on the order of 14 or more dBA lower and not contribute to the noise environment.

L4 – 39728 SE 53rd St

The following are the hourly dBA sound levels measured 8:00 AM – 5:00 PM:

Hour	Dirtfish Activity	Cars driving	8/4/11	8/5/11	8/6/11	Ambient 8/7/11	Code Limit
8:00-9:00 AM	None 50% Classroom 50%	N		48	47	39	57
9:00-10:00 AM	Classroom 50% Driving 50%	Y	-	47	46	41	57
10:00-11:00 AM	Driving	Y	44	47	41	39	57
11:00 AM-12:00 PM	Driving	Y	48	49	47	44	57
12:00 PM-1:00 PM	Lunch	N	49	50	50	45	57
1:00 PM-2:00 PM	Classroom 50% Driving 50%	Y	49	51	51	45	57
2:00 PM-3:00 PM	Driving	Y	50	52	50	42	57
3:00 PM-4:00 PM	Driving	Y	41	50	51	48	57
4:00 PM-5:00 PM	Driving	Y	51	44	45	45	57

The following is a summary of sound level descriptors measured during this time:

	During DirtFish Operating Hours	King Co.Code Limit	Daytime Ambient Levels
Leq	41-52 dBA	57	37-54 dBA
L25	35-51 dBA	62	30-48 dBA
L8.3	42-61 dBA	67	35-56 dBA
L2.5	48-68 dBA	72	41-60 dBA

Location L4 was located near the gated pasture enclosing the property owner’s horses. During retrieval of the noise monitor, we noted a truck pass-by and the subsequent unloading of a horse into the pasture area. The level of this activity was measured at 71-74 dBA for a period of approximately 3 minutes. Regardless, noise code was not exceeded at any time during the time when the DirtFish School was in operation.

The range of DirtFish levels when the cars were in operation falls within the range of ambient noise levels. During some hours, ambient levels measured on Sunday registered lower than the hourly levels measured during DirtFish activity; however, upon closer examination, we note that the levels were relatively consistent during 8/4-8/6 throughout the course of the day. If these noise levels were attributable to DirtFish activity, they would decrease during the hours when cars were not in operation such as the 12:00PM-1:00PM hour when DirtFish is at lunch. In fact, noise levels during this time are 49-50 dBA, and levels during times when cars were driving are 41-52 dBA, indicating that typical ambient noise levels are higher during the week than on Sunday.

It should also be noted that noise levels at this location would be more impacted by the Gravel Mine, which had significantly higher noise levels than those measured from DirtFish. However, our noise monitoring indicates that ambient noise levels at this location are due to local activity (local traffic, residential activity).

V. Discussion

Property Line Noise Measurements

Measurements conducted at the east and south property lines are below daytime code limits for both residential and rural receiving properties.

Noise levels measured at the North Property Line were dominated by activity from the adjacent Gravel Mine. While intermittent screeching from tires in the DirtFish braking course was occasionally audible above the mine, these sounds were less than one second in duration, and did not affect the overall hourly L_{eq} measurements. Noise levels measured at the north property line are therefore not representative of the typical DirtFish operations, and properties located to the north and east of the mine will be primarily dominated by noise from the mine, not DirtFish.

Remote Property Noise Measurements

As presented above, the DirtFish Rally School did not exceed noise code limits at any time during our measurements at the remote monitoring locations. These results are for the school running a maximum of four cars at any one time.

In examining the hourly breakdown of L_{eq} data compared to ambient noise levels, we note that at no time does the hourly L_{eq} exceed noise code during the time DirtFish is in operation. According to the noise levels and discussion presented earlier, the range of DirtFish levels when the cars were in operation falls within the range of ambient levels at all noise monitoring locations. Noise levels at times when noise levels were above ambient were due to local events, such as traffic, residential activity, animals, etc, and were not caused by DirtFish.

Noise levels measured at the South and East DirtFish property lines are representative of actual Dirtfish car activity, and noise levels at locations further away will be lower. At the remote monitoring locations L1 to the south and L2 to the east, which are more than 4,000 feet away, noise levels would be 20 dBA or more lower, which will reduce the noise levels to below ambient such that they do not contribute to the noise environment.

Although the school does not currently plan to expand the number of vehicles, if it were to double the number of cars, the worst-case increase in noise levels would be 3 dBA. Based on the measurement results, a doubling of cars would not increase source levels enough to exceed code, either at the property line or at any of the remote monitoring locations.

Summary and Recommendations

Based on the results indicated above, neither King County nor City of Snoqualmie Noise Code is exceeded by the typical operational activity at DirtFish Rally School. No environmental noise mitigation is required.

In our discussion with the DirtFish staff and the City of Snoqualmie representatives, we understand that noise complaints about the DirtFish activities were generated by atypical events, such as the Global RallyCross championship held at DirtFish in Spring 2011. We understand that, at the time of this event, DirtFish was operating under a temporary use permit and that DirtFish will apply for a permit in the future if another event of this type is desired.

If you have any questions, or require additional information, please contact our office.

Sincerely,
SSA Acoustics, LLP

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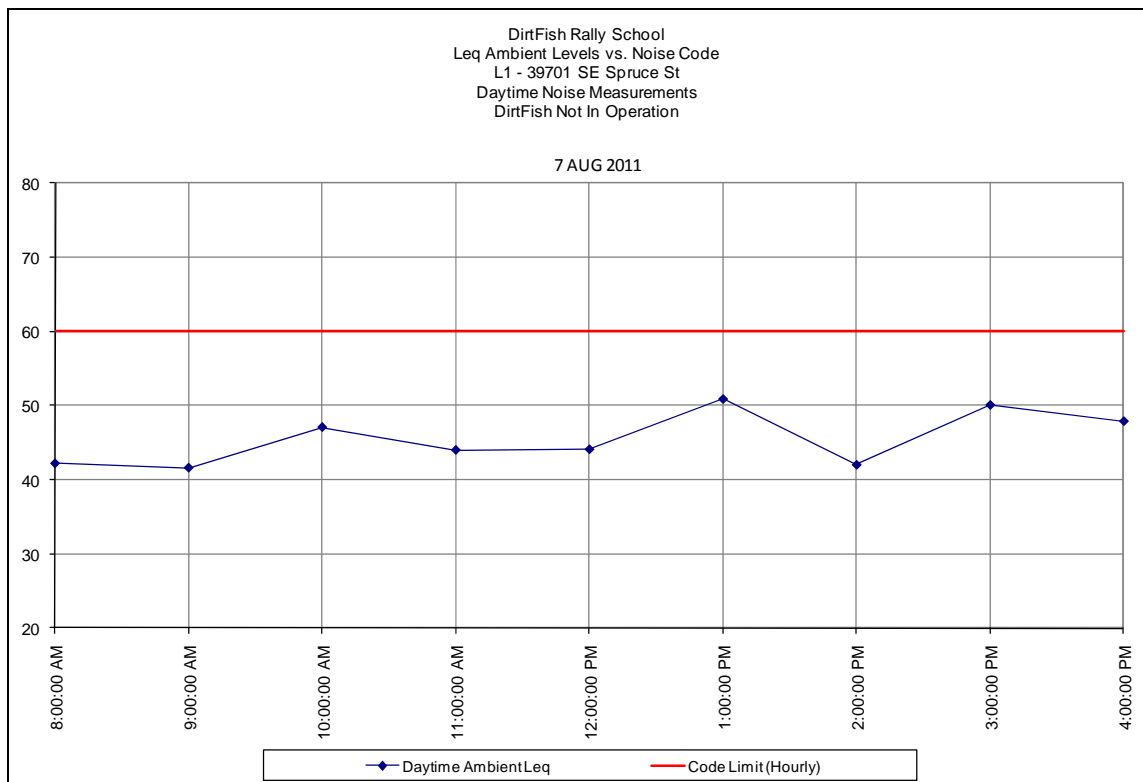
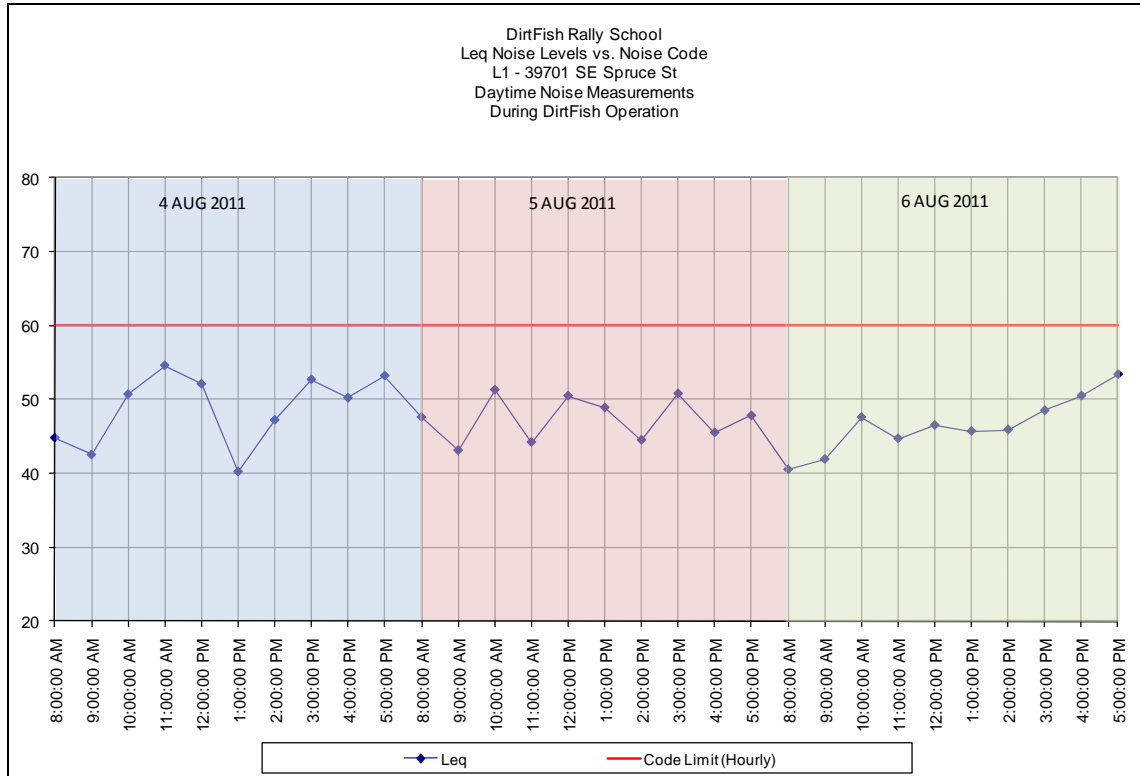


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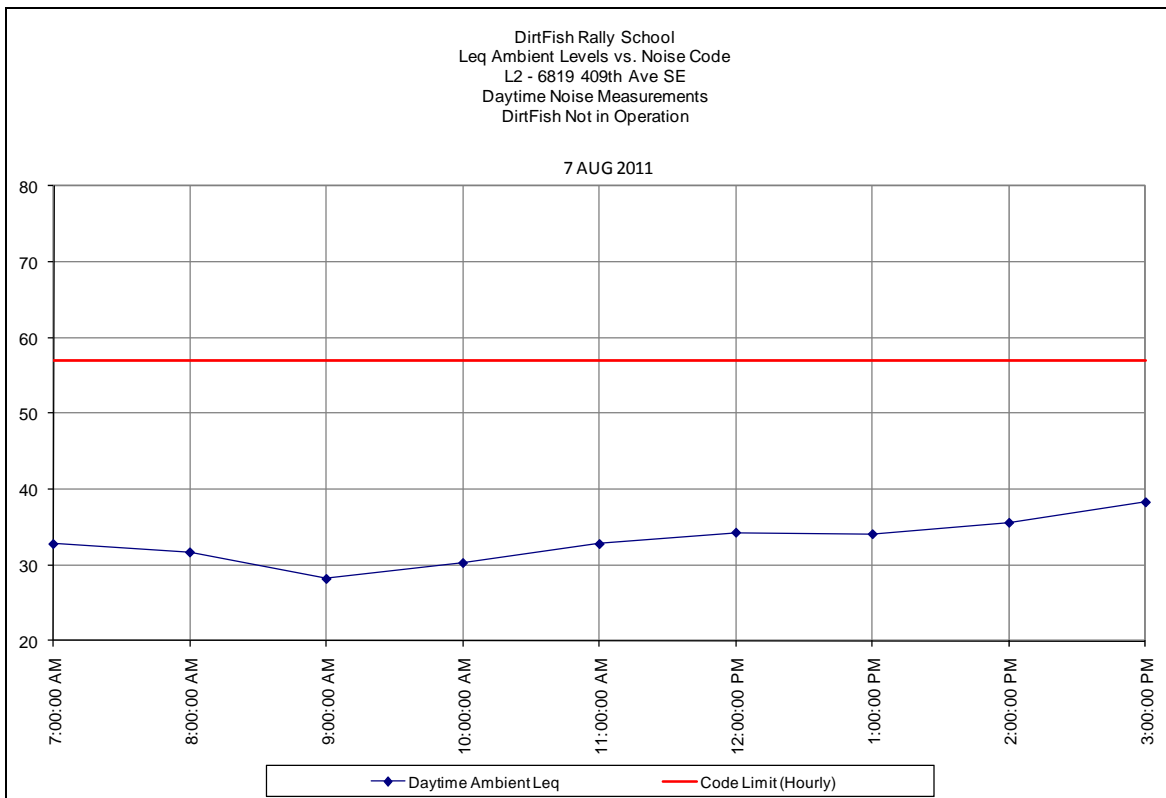
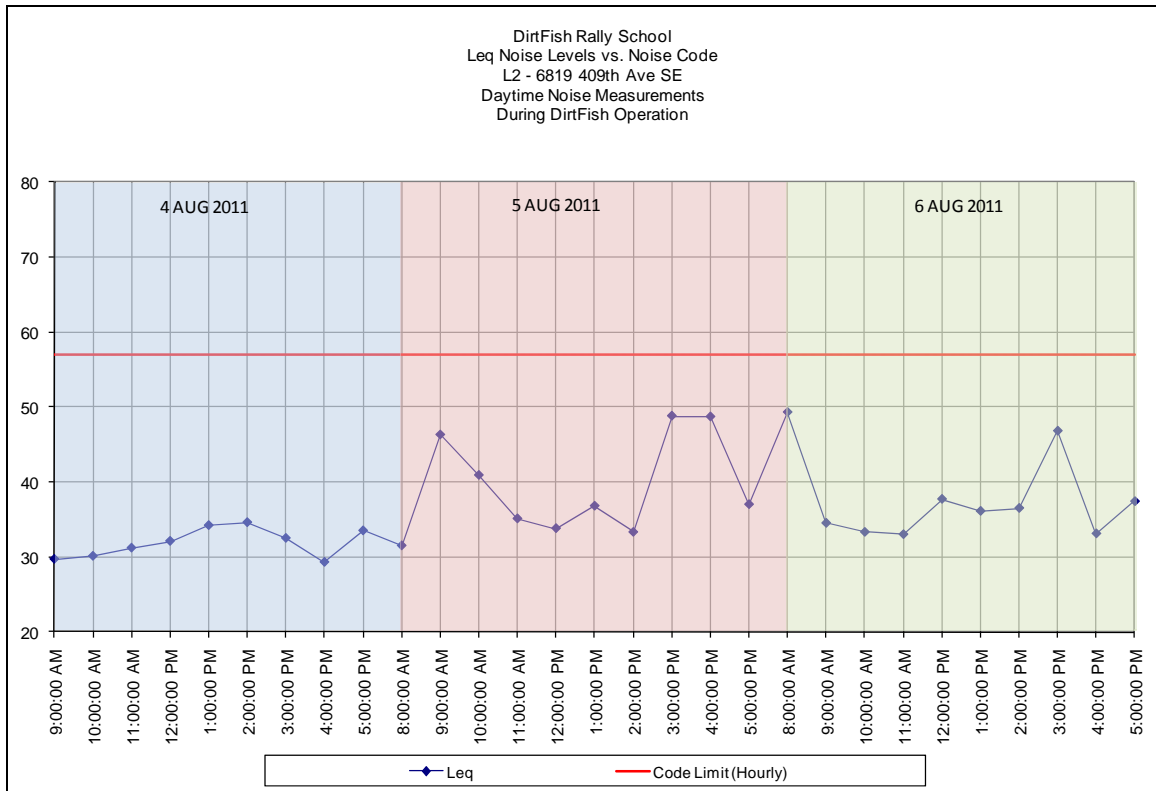


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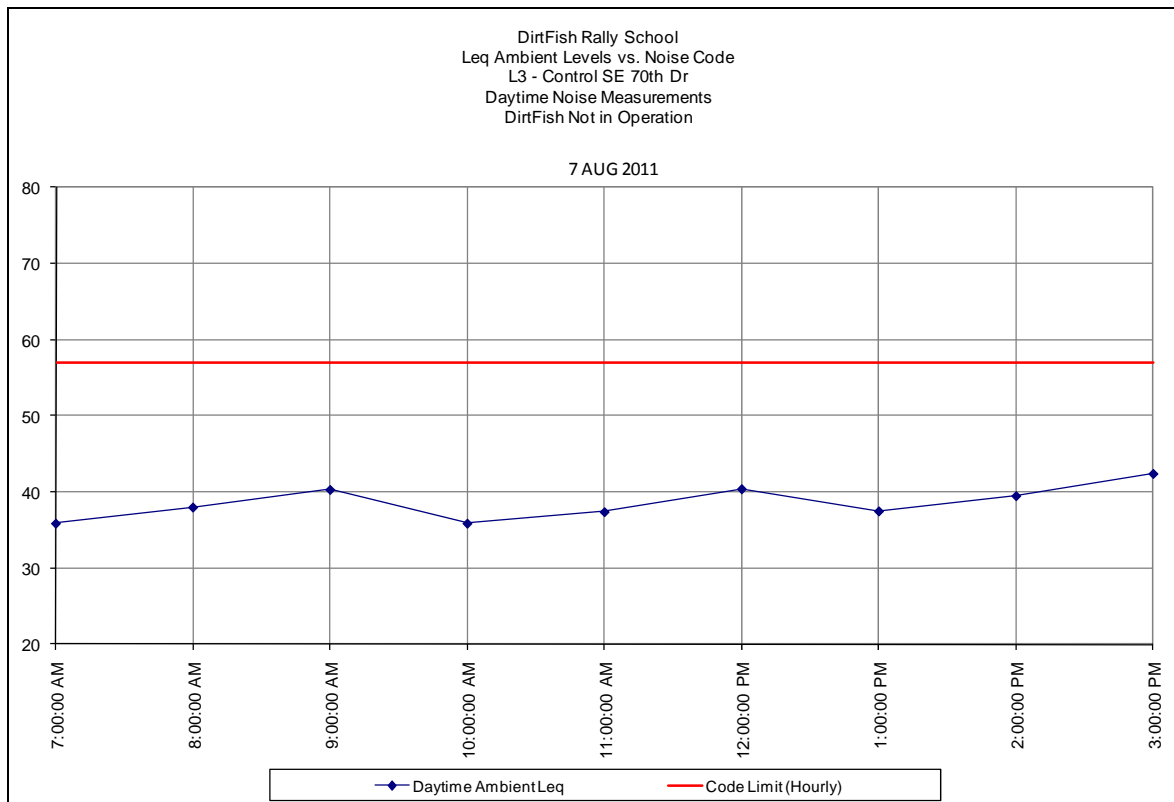
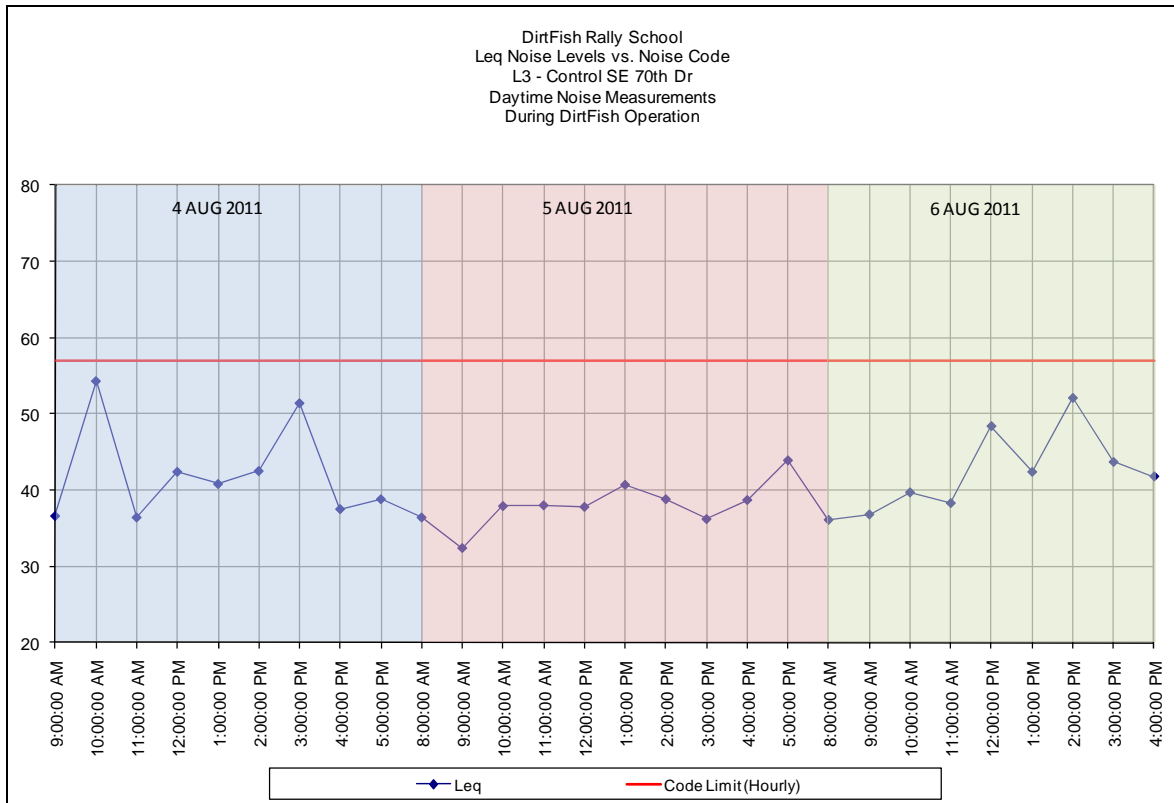
VI. Appendix I: Measurement Results



DirtFish Rally School



DirtFish Rally School



DirtFish Rally School

