EXHIBIT 2
COMBAT JET NOISE FROM LANDING AND TAKING OFF AT WHIDBEY ISLAND-OLF COUPEVILLE IS PERMANENTLY INJURING THE EXPOSED POPULATION
March 13, 2015

This is a report to describe the serious and well documented adverse health effects of noise. This report will also describe the health effects that have almost certainly already occurred from years of noise pollution from thousands of take off and landings of the combat jets. The issue in this case is whether there is evidence that this noise pollution actually harms people. The Navy has suggested that there is no proof of harm to health from the jet noise.

Noise pollution is unwanted or harmful sound that intrudes upon human activity. Here is a graphic that describes where jet aircraft noise compares with other loud noise.
Noise is measured in the amount of pressure occurring at different levels and is noted in decibels (dB) on log scale. An increase from 90 to 100 dB is not a 10% increase; it is a 10-fold increase in the pressure. There are two basic causative types of health effect impacts from noise pollution: (a) those arising from short term, but high intensity sound, and (b) those arising from longer term exposure to lower levels of sound. The first type might manifest in extremely close encounters with jet engine back-blast, and leads to permanent hearing impairment, acute nausea or blood pressure elevations. The longer-term, noise level exposure is strongly associated with permanent hypertension, heart attacks, anxiety, depression, gastrointestinal changes, and learning impairment. The association in epidemiological studies is not the only evidence that noise causes adverse health effects; there are animal and mechanistic studies that explain how noise pollution at the levels and circumstance present on Central Whidbey Island causes these health problems. The weight of the evidence provided shows that noise is causative of serious injuries.

Although noise pollution is annoying, annoyance is by no means the only adverse health effect. Decades of research have shown that the issue of noise pollution is a serious, disabling and even a life threatening issue. The loud, short-term noise from the Navy jet flying over Whidbey Island is an issue of life and death. The noise exposure levels that have been documented from low flying combat jets in this case and in the literature are in the range that is certain to injure members of the exposed population.
Both JGL and AICUZ measured annual sound levels well above 70 dB. In a Navy document\(^1\) on environmental impact on the residents near Coupeville OLF it states:

"*Residential land uses are normally considered incompatible with noise levels above 65 DNL.*"

Even more egregious, the Navy states there is no scientific evidence that noise that occurs from combat jets taking-off and landing that has shown the noise pollution at OLF Coupeville to be hazardous to health.

In fact, the noise impact from combat jets, like the situation in this case, has been studied. The high-level noise exposure from a combat jet flying over a person has been shown in a scientific study to causes a significant increase blood pressure and "shock" to the body with some individuals becoming acutely ill from the noise. If the noise rises and subsides quickly, such as occurs in this case when there are multiple jets flying one after the other, the blood pressures do not return to the pre-noise level and continues to climb higher and higher. This is shown in the graphic above from a published, peer reviewed study of combat jet noise by Michalak and colleagues (1).

\(^1\) Page I-14, Final Environmental Assessment for the Transition of Expeditionary EA-6B Prowler Squadrons to EA-18G Growler at Naval Air Station Whidbey Island, Oak Harbor, Washington. October 2012.
Fig. 3. Time response of blood pressure and heart rate changes after low-altitude flight noise exposure on Day 0 in subjects who had a maximum systolic blood pressure increase of more than 25 mm Hg. The differences for each person are related to the averaged initial values before the first noise exposure. The averaged values and standard errors of those differences (n = 8) are presented.

The Michalak study of combat jet noise documented that the people exposed to combat jet aircraft noise significantly raised their blood pressure and the brief noise exposure at these levels made some of the test subjects sick. The dBA levels used in this experiment were 106, 110 and 112 dBA. The graphic used 106 dB and as you can see the blood pressure rises significantly at that level. The "shock" reaction and acute illness occurred when the noise level rose quickly, as occurs around the Coupeville OLF. When the noise rose quickly, by 30 dB over 0.4 seconds, as opposed to 4.0 seconds, 10 to 20% of the subjects experienced "shock" and sickness. Two study subjects had 40 mm rise in systolic blood pressure after four fly-overs at a maximum of 106 dBA. These authors noted that repeated exposures were additive, each exposure drove the BP higher, especially in the subjects who had an initial higher BP response. The presence of these blood pressure elevations is most dangerous, especially if it occurs...
repetitively for months and years. Severe acute increases in blood pressure are itself dangerous. Acute elevations of blood pressure can trigger strokes and heart attacks. In this case the people near Coupeville OLF have been exposed for years. We do not know if there have been strokes or heart attacks triggered by these flyovers, but it is likely that such events have occurred. Michalak et al noted that elderly people are more sensitive to adverse effects from combat jet flyover noise.

The development of noise-induced hypertension discussed below has occurred in community noise exposures of adults and children and in noise exposed workers. Several community studies have stressed that aircraft noise is more harmful than traffic noise. The noise patterns that have been studied in communities and in factories do show adverse effects, even when the noise is rising and falling as it does in Coupeville. It is the repeated stress reactions that lead to permanent hypertension. Noise induces an acute stress reaction, which over time becomes permanent.

The Michalak research examined people living in noisier versus quieter areas. They found that in girls, ages 10 to 13 that lived in the noisier area compared to the quieter, reported higher blood pressure by an average of 9mm systolic.

In addition, the subjects of the combat jet experiment became sensitized to the jet noise pattern. Becoming sensitized or developing permanent conditioned response meant that when the test subjects heard the jet noise at a lower level intensity, they responded with a similar rise in blood pressure to the high level of noise. This sensitization or conditioned response occurred even though the level of noise was not elevated to the point that it would have been predicted to cause the blood pressure to rise. This study is very relevant for the Whidbey Island population.

Michalak’s study refutes Captain M. K. Nortier’s opinion that there is no evidence of health effects from the type of noise generated by the Navy’s Growler jets flying, landing and taking off from Coupeville OLF.
The noise pattern at Central Whidbey Island has been measured and the noise levels are higher than the Michalak study. The noise measured at OLF Coupeville is illustrated by this graphic derived from JGL’s study:

**Decibels**

**Average over 40 minutes is 102 dB**

**with Peak Over 115**

Time of each Flight in area ~10 minutes

This graph represents the sound wave pressure of four take off and landings.

Here is the graph of the sound frequency pattern from the study of noise at OLF Coupeville area:
An exhaustive monograph by the World Health Organization (WHO) on the subject of adverse health consequences of auditory and non-auditory effects of noise writes in the abstract (2):
“Our understanding of molecular mechanisms involved in noise-induced hair-cell and nerve damage has substantially increased, and preventive and therapeutic drugs will probably become available within 10 years. Evidence of the non-auditory effects of environmental noise exposure on public health is growing. Observational and experimental studies have shown that noise exposure leads to annoyance, disturbs sleep and causes daytime sleepiness, affects patient outcomes and staff performance in hospitals, increases the occurrence of hypertension and cardiovascular disease, and impairs cognitive performance in schoolchildren.”

World Health Organization (WHO) summarized the evidence of the non-auditory adverse health effects in these two paragraphs from page 16:

“Non-auditory health effects of noise have been studied in humans and animals for several decades, using laboratory and empirical methods. Biological reaction models have been derived, based on the general stress concept (17,23–30). Noise is a nonspecific stressor that arouses the autonomous nervous system and the endocrine system (9,11–14,31,32) (C. Maschke & K. Hecht, unpublished data, 2005). A neuro-endocrinological definition of stress is that it is a state that threatens homeostatic or adaptable systems in the body (16,33,34). Increased allostatic load is associated with various diseases, including ischaemic heart disease (35). The epidemiological reasoning is based on three facts. First, experimental studies in the laboratory have been carried out for a long time and revealed an increased vegetative and endocrine reactivity during periods of exposure (1,36–70). However, the question regarding long-term effects of chronic noise exposure cannot be answered from short-term experiments. Second, animal studies have shown manifest disorders in species exposed to high levels of noise for a long time (71–83). However, effects in humans and animals cannot be directly compared, particularly because two pathways may be relevant – the direct effect due to nervous innervation and the indirect effect due to the cognitive perception of the sound; the latter is certainly different in humans. Furthermore, noise levels in animal studies were higher than in ambient situations. Third, occupational studies have shown health disorders in workers chronically exposed to noise for many years (20,84–98). However, noise levels were higher than in the ambient environment. Epidemiological research has therefore been carried out with respect to community noise levels to test the hypothesis and to quantify the risk.

Among other non-auditory health end-points, short-term changes in circulation, including blood pressure, heart rate, cardiac output and vasoconstriction, as well as stress hormones (epinephrine, norepinephrine and corticosteroids), have been studied in experimental settings for many years (32,99). Classical biological risk factors have been shown to be elevated in subjects that were exposed to high levels of noise (44,54,79,100–111).”

There are millions of disability lost life years from noise pollution as
illustrated by this figure from the WHO study:

![Figure 2: DALYs attributed to environmental noise exposure in Europe](image)

WHO utilized a very large database of studies and derives conclusions from thousands of studies that note serious, adverse health effects from even modest elevations of noise levels. Most of the studies of interest have found injurious effects at sound levels far lower than those experienced by the residents of Whidbey Island. The residents experiencing noise pollution from the jets landing and taking off at OLF Coupeville on Whidbey Island are experiencing the adverse health effects that we would expect; annoyance, hearing loss, sleep disturbance and cardiovascular problems. The WHO monograph illustrates the serious nature of what has happened and still is happening to the citizens living near the Coupeville landing field. The impact on the health of these people is certain to be devastating and has likely already increased morbidity and even
shortened their lives.

The community of Central Whidbey Island is adversely impacted by the noise from combat jets landing and taking off from their practice airfield. In 1978 the US EPA published a monograph on noise pollution and recommended the community noise levels not exceed 70 decibels to prevent hearing loss (3). They included a graphic, which indicates that a community with significant noise pollution does react vigorously and justifiably if there is elevated noise levels. Here is the graphic from that monograph.

![Graphic showing community reaction to noise levels](image)

**FIGURE 11. COMBINED DATA FROM COMMUNITY CASE STUDIES ADJUSTED FOR CONDITIONS OF EXPOSURE**

This graphic suggests that until the community noise levels are less than 70 dB, the community will be up in arms. The JGL studies of the sound levels near the landing field are indicative of noise levels that results in vigorous community reaction.

A study of noise and whole body vibration (the Navy study indicates that whole body vibration, i.e. shaking of building, is caused by the Growler Jets) finds that the combination of noise and vibration is additive, causing more health problems than with noise alone (4). These authors also looked at the
susceptibility of some people to be more impacted by noise and vibration. The people who were under chronic medical care by a doctor labeled as unhealthy had a greater adverse reaction to the noise and vibration than healthy people. Here is a table from that study.

**Table 2**

*Average number of positive responses to 190 questions by health status*

<table>
<thead>
<tr>
<th></th>
<th>Healthy</th>
<th>Unhealthy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of respondents</td>
<td>893</td>
<td>294</td>
</tr>
<tr>
<td>Average number of positive responses</td>
<td>29.6</td>
<td>42.6**</td>
</tr>
</tbody>
</table>

The difference in the average number is significant at the 1% level(**) compared to healthy respondents, according to the Student t-test (two-tailed).

By no means does this imply that the healthy people did not have adverse non-auditory responses to the noise and vibration energy. Rather, the noise and vibration significantly increases the harm to those already sick.

There is evidence that the OLF Coupeville area residents have already developed noise induced hearing loss. A loss of hearing in the higher frequencies that is typical of noise induced hearing loss. Here is the pattern that we see in one of the residents who has been tested and we would see if we tested other residents, a drop of hearing at 4000 Hz.
The 2011 World Health Organization (WHO) published the monograph quoted above that reviewed the literature on adverse auditory and non-auditory health effects caused by noise. WHO concluded that in addition to hearing loss, non-auditory health effects were a serious public health and environmental health problem. WHO quoted numerous high quality studies to document the deadly effect of noise on cardiovascular health.

The study by Babisch and colleagues in Germany provided a meta-analysis of increase levels of noise causing cardiovascular problems, heart attacks and ischemic heart disease. Here is a graphic from a 2014 article that illustrates the pathways.

Below is a table from Babisch showing an increased risk of ischemic heart disease and heart attacks (myocardial infarction) arising in the context of noise exposure levels far below the noise levels documented on Whidbey Island when the jets land and take off at OLF Coupeville.
Another graphic from Babisch shows the multiple cardiovascular effects of noise:
The adverse effect of environmental traffic noise on cardiovascular health remains even when the impact from concomitant air pollution is controlled (7). There are numerous studies, analyzed by the weight of the evidence, that provide overwhelming evidence that noise exposure causes hypertension in both adults (2, 6-39) and children (2, 40-43). The duration and the dB level of the noise act together, the higher the exposure the shorter the duration of exposure that is needed. Noise induces a reaction in the body of immediate increase in many elements that raise blood pressure and other risk factors for cardiovascular damage, such as blood lipids. I include a bibliography of relevant articles that give a sense of the amount of information we have on this aspect of noise related personal injury (2, 8, 10, 18, 22, 25, 27-29, 32, 36, 37, 39, 44-54). Several studies document aircraft noise, specifically, as a cause of the adverse effects of noise.

One study of noise notes a dose response of noise and HBP. There is a large increase in hypertension prevalence as the sound pressure (SPL) increases (35). Here is a table from that study:

**A dose response relation for noise induced hypertension**

**Table 2  Sound pressure level and prevalence of hypertension in female textile mill workers**

<table>
<thead>
<tr>
<th>SPL 1B(A)</th>
<th>No with hypertension</th>
<th>Total</th>
<th>Hypertensive prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>104</td>
<td>25</td>
<td>164</td>
<td>15.2</td>
</tr>
<tr>
<td>96</td>
<td>25</td>
<td>294</td>
<td>8.5</td>
</tr>
<tr>
<td>86-90</td>
<td>18</td>
<td>428</td>
<td>4.2</td>
</tr>
<tr>
<td>75-80</td>
<td>11</td>
<td>215</td>
<td>5.1</td>
</tr>
<tr>
<td>Total</td>
<td>79</td>
<td>1101</td>
<td>7.2</td>
</tr>
</tbody>
</table>

As with all diseases there is a genetic susceptibility factor. Not everyone exposed to noise develops clinically significant hypertension, cardiovascular
disease, or other adverse effect. There is a well-described phenomenon of gene-environment interaction. An excellent prospective study followed hundreds of subjects exposed to noise over a 20 year period and measured their hypertensive susceptibility gene sub-types. A gene known to increase the risk of high blood pressure (HBP) is the angiotensin TT gene. In this study the presence of the TT subtype and noise exposure were synergistic for developing hypertension (13). The noise levels experienced by these subjects were less than the Central Whidney Island subjects. Duration of exposure in some subjects was similar.

The effect of noise at night when people are trying to sleep occurs at very low level and there is growing evidence that night time noise is devastating to health. Here is a graphic from the WHO monograph on night time noise:

<table>
<thead>
<tr>
<th>Average night noise level over a year $L_{night, outside}$</th>
<th>Health effects observed in the population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 30 dB</td>
<td>Although individual sensitivities and circumstances may differ, it appears that up to this level no substantial biological effects are observed. $L_{night, outside}$ of 30 dB is equivalent to the NOEL for night noise.</td>
</tr>
<tr>
<td>30 to 40 dB</td>
<td>A number of effects on sleep are observed from this range: body movements, awakening, self-reported sleep disturbance, arousals. The intensity of the effect depends on the nature of the source and the number of events. Vulnerable groups (for example children, the chronically ill and the elderly) are more susceptible. However, even in the worst cases the effects seem modest. $L_{night, outside}$ of 40 dB is equivalent to the LOAEL for night noise.</td>
</tr>
<tr>
<td>40 to 55 dB</td>
<td>Adverse health effects are observed among the exposed population. Many people have to adapt their lives to cope with the noise at night. Vulnerable groups are more severely affected.</td>
</tr>
<tr>
<td>Above 55 dB</td>
<td>The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed. There is evidence that the risk of cardiovascular disease increases.</td>
</tr>
</tbody>
</table>

I expect that if we were to study the Whidney island residents that have been exposed to the very high levels of aircraft noise we would find an increase in the prevalence and severity of hypertension and cardiovascular disease.
Noise-disturbed sleep is linked with multiple health effects. Sleep is a physiological state required for normal recuperation by the body and systems. Reduction and disruption are detrimental. In a clinical review of research and literature, Muzet finds sleep awakenings and sleep stage modifications that occur between 45 and 55 dB and above over the long-term can lead to detrimental health impacts (55). Partial sleep deprivation induces tiredness, increases a low vigilance state, and reduces both daytime performance and the overall quality of life (56). Sleep deprivation activates levels of stress known to be linked to hypertension, cardiovascular disease and other severe medical problems.

The presence of increased noise especially aircraft noise pollution has been associated with learning problems in children (57). Here is a table showing this association.

<table>
<thead>
<tr>
<th>Variable</th>
<th>No. of Participants</th>
<th>P Value</th>
<th>95% CI</th>
<th>No. of Participants</th>
<th>P Value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive outcomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading comprehension</td>
<td>864</td>
<td>0.001</td>
<td>-0.014, 0.011</td>
<td>651</td>
<td>0.002</td>
<td>-0.017, 0.013</td>
</tr>
<tr>
<td>Road traffic noise</td>
<td>-0.010</td>
<td>0.06</td>
<td>-0.022, 0.005</td>
<td>641</td>
<td>-0.011</td>
<td>-0.022, 0.002</td>
</tr>
<tr>
<td>Aircraft noise</td>
<td>-0.012</td>
<td>0.47</td>
<td>-0.046, 0.021</td>
<td>641</td>
<td>-0.012</td>
<td>-0.048, 0.023</td>
</tr>
<tr>
<td>Aircraft noise</td>
<td>-0.035*</td>
<td>0.01</td>
<td>-0.061, -0.009</td>
<td>641</td>
<td>-0.042*</td>
<td>-0.069, -0.016</td>
</tr>
<tr>
<td>Recognition memory</td>
<td>837</td>
<td>0.039</td>
<td>-0.030, 0.108</td>
<td>638</td>
<td>0.040</td>
<td>-0.014, 0.094</td>
</tr>
<tr>
<td>Road traffic noise</td>
<td>-0.025</td>
<td>0.39</td>
<td>-0.080, 0.026</td>
<td>638</td>
<td>-0.040</td>
<td>-0.082, 0.001</td>
</tr>
<tr>
<td>Aircraft noise</td>
<td>-0.007</td>
<td>0.37</td>
<td>-0.008, 0.022</td>
<td>636</td>
<td>0.007</td>
<td>-0.007, 0.021</td>
</tr>
<tr>
<td>Conceptual recall</td>
<td>834</td>
<td>0.011</td>
<td>-0.023, 0.001</td>
<td>634</td>
<td>0.015</td>
<td>-0.025, -0.004</td>
</tr>
<tr>
<td>Road traffic noise</td>
<td>0.028</td>
<td>0.45</td>
<td>-0.003, 0.142</td>
<td>765</td>
<td>0.036</td>
<td>-0.096, 0.167</td>
</tr>
<tr>
<td>Aircraft noise</td>
<td>-0.004</td>
<td>0.92</td>
<td>-0.063, 0.142</td>
<td>765</td>
<td>0.00077</td>
<td>-0.096, 0.097</td>
</tr>
<tr>
<td>Health outcomes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological distress</td>
<td>842</td>
<td>0.025</td>
<td>-0.014, 0.002</td>
<td>634</td>
<td>0.030</td>
<td>-0.093, 0.033</td>
</tr>
<tr>
<td>Road traffic noise</td>
<td>-0.017</td>
<td>0.36</td>
<td>-0.064, 0.029</td>
<td>866</td>
<td>-0.023</td>
<td>-0.073, 0.026</td>
</tr>
<tr>
<td>Aircraft noise</td>
<td>0.006</td>
<td>0.96</td>
<td>-0.024, 0.025</td>
<td>866</td>
<td>0.003</td>
<td>-0.024, 0.030</td>
</tr>
<tr>
<td>Self-rated health</td>
<td>851</td>
<td>0.002</td>
<td>-0.018, 0.022</td>
<td>276</td>
<td>0.007</td>
<td>-0.015, 0.028</td>
</tr>
<tr>
<td>Systolic blood pressure</td>
<td>351</td>
<td>-0.09</td>
<td>-0.25, 0.08</td>
<td>276</td>
<td>-0.092</td>
<td>-0.303, 0.118</td>
</tr>
<tr>
<td>Road traffic noise</td>
<td>0.02</td>
<td>0.77</td>
<td>-0.12, 0.15</td>
<td>351</td>
<td>0.024</td>
<td>-0.131, 0.179</td>
</tr>
<tr>
<td>Aircraft noise</td>
<td>-0.002</td>
<td>0.76</td>
<td>-0.11, 0.15</td>
<td>351</td>
<td>0.042</td>
<td>-0.125, 0.211</td>
</tr>
<tr>
<td>Diastolic blood pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road traffic noise</td>
<td>0.01</td>
<td>0.83</td>
<td>-0.05, 0.12</td>
<td>276</td>
<td>0.016</td>
<td>-0.104, 0.144</td>
</tr>
<tr>
<td>Aircraft noise</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

The levels of noise that interfere with children’s learning are far lower.
than the levels at central Whidbey Island. There are schools in the noise impacted area near OLF Coupeville. Those children are surely suffering from impaired learning ability due to the frequent loud noise impacting their schools. In the above study they review a number of studies that document serious noise induced impairment of children’s cognitive function. The intermittent high and rapid increase and decrease in noise levels that are typical of aircraft noise cause more problem with learning than a continuous noise source (58). The presence of an unexpected sound is more disruptive than a sound of the same level that is expected. The brain responds to an unexpected sound because we are hard wired to detect an unusual or unintended sound as possible danger. Here is a quote from Banbury et al. on this issue (59).

"When considering the functional character of the sense of hearing – as opposed to vision – one is struck by its omnidirectional nature and the fact that it has the capacity to receive information at almost all times, even in darkness or during sleep. To these features of hearing is added a superlative capacity to respond to change. Part of the evolutionary refinement of hearing has been its capacity to respond to sharp changes in energy, which might be associated with danger in the environment. Given these qualities, it comes as no surprise that hearing has been dubbed "the sentinel of the senses." This capacity to capture attention even while a person is otherwise engaged can be exploited usefully for the purpose of designing alarms. However, the same sentinel capacity carries with it the disadvantage that our attention will be captured by sounds with no relevance or significance, even when we are intent on concentrating on something else."

The non-auditory adverse health effects of sound include stomach ulcers and other GI problems(60). Here is a graphic from Jorge da Fonseca et al. study of rats exposed to low frequency noise (LFN) <200Hz. The rats experienced severe damage to stomach tissue.
The effect on stomach tissue was due to direct impact of the sound waves on the tissue. The Growler jets have a pattern of noise frequency that includes sound wave frequency down to 10 Hz. The study of Low Frequency Noise (LFN) explains why a person feels the high level of sound in their gut. It is likely that the gastrointestinal system of the Whidbey residents is impacted adversely by the frequent loud noise especially the lower frequency sounds. Studies of people and dogs exposed to loud noise have altered stomach acid secretions and ulcers (61). Patients’ with Crohn’s disease have sensorineural hearing loss at 4000 Hz, the exact type of hearing loss caused by noise (62-65). The authors of the Crohn’s disease studies have not ascribed the sensorineural hearing loss to noise injury but rather to autoimmune damage to the auditory nerve. The pattern of hearing loss is only caused by noise exposure! The finding of gastrointestinal damage in the studies of noise-induced injury to the intestinal tract makes it more likely that the Crohn’s disease is caused by noise exposure in susceptible people.

Low Frequency Noise and noise frequencies below audible ranges, i.e. infranoise, have received less attention than audible noise. However, there is evidence that it adds to the risk, especially the risk of non-auditory effects such as gastrointestinal effects. One study found increased GI effects even though the
subjects were wearing ear protection, presumably not experiencing threshold shifts in hearing. The subjects still felt the non-auditory effects of noise, experiencing GI symptoms including diarrhea (66).

Studies of non-auditory effects of noise pollution causing gastrointestinal problems include a number of animal and human studies that establish GI upset as a likely and common problem for the noise impacted residents of Whidbey Island (61, 67-77).

The residents of Whidbey Island are experiencing sudden, unexpected, incontrollable, unwanted loud sounds. The noise and vibration is intense enough to cause unacceptable interference in their lives. In addition to the serious physical effects caused by the jet noise, the citizens of the OLP Coupeville area are denied the quiet enjoyment of life.

The science quoted above indicates that there is solid uncontroverted evidence that health problems have occurred in the exposed population. If the flights continue more health damage will occur.

My methodology to reach conclusions about the effect of noise and health is based on the weight of the evidence. There are nine considerations when determining causation, often referred to as the weight of the evidence (78). The nine “Hill viewpoints” are fulfilled in the case of noise and health impairment. The viewpoints are (1) strength of association i.e. increased relative risk or similar metric showing a higher than expected occurrence of disease or end-point of interest, (2) consistency i.e. the studies are generally in agreement, (3) specificity i.e. do the studies show the same effect in various populations, (4) temporality i.e. did the exposure occur before the outcome, (5) biological gradient i.e. is there a dose response, (6) plausibility i.e. the cause and effect consistent with known biology, (7) coherence i.e. does the body of evidence make sense without major confounding (other effects that would occur with the cause of interest), (8) experiment i.e. do animal studies or laboratory simulations reflect a similar outcome and is there a mechanism that links the cause and effect, and (9) analogy i.e. does the cause have parallels from other cause and effect paradigms such as in this case other forms of stress causing similar outcomes. All
of these factors do not need to be present to establish causation. In this case all of the elements are present, providing sufficient evidence for a conclusion that excessive noise causes the serious illnesses: auditory, cardiovascular, learning, psychiatric, neurological and gastrointestinal systems illnesses. The very high short term and repeated noise pollution present in and around OLF Coupeville on Whidbey Island from the jets landing and taking off is a certain cause of ill health. Noise pollution from the combat jet exercises must cease immediately to protect the health of the people living there.

Sincerely,

[Signature]

James Dahlgren MD

March 13, 2015