

**Department of Environmental Conservation
Division of Environmental Health**

**Alaska Railroad Corporation
Application for
Permit to Use Herbicide
for Vegetation Management
on the Fairbanks and Healy Railyards
and Selected Portions of Nearby Track**

**Decision Document
May 6, 2011**

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Acronyms and Abbreviations

AAC	Alaska Administrative Code
AMPA	Aminomethylphosphoric acid
ARRC	Alaska Railroad Corporation
CFR	Code of Federal Regulations
DEC	Alaska Department of Environmental Conservation
DOE	United States Department of Energy
EPA	United States Environmental Protection Agency
EPSP	Enolpyruvylshikimate phosphate synthase
FEIS	Final Environmental Impact Statement
FRA	Federal Railroad Administration
K_{oc}	Organic carbon partition coefficient
LC50	Concentration lethal to 50% of exposed organisms
mg/L	Milligrams per liter
NPE	Nonylphenol polyethoxylate
POEA	Polyethoxylated tallow amine
RED	Re-Registration Eligibility Document
Reg No.	EPA Registration Number
UAF	University of Alaska Fairbanks
USDA	United States Department of Agriculture
WHO	World Health Organization

**Alaska Department of Environmental Conservation
Decision Document for Alaska Railroad Corporation
Permit Application for Herbicide Application in the
Fairbanks and Healy Railyards
and Selected Portions of Nearby Track**

1.0 DEPARTMENT DECISION – SUMMARY AND CONCLUSIONS

In accordance with Title 18, Chapter 90, Section 525 of the Alaska Administrative Code (18 AAC 90.525), the Alaska Department of Environmental Conservation (DEC) approves the pesticide permit application submitted by the Alaska Railroad Corporation (ARRC) to apply a herbicide within the Fairbanks and Healy Railyards, as well as selected portions of the railroad along the Suntrana, Eielson, and airport branch lines. The permit proposes to apply the herbicide AquaMaster along with Agri-Dex, a non-ionic surfactant and spray oil.

DEC's decision is based upon its analysis of information contained in the permit application, administrative record, and referenced in this Decision Document. DEC finds that existing scientific evidence and other available information demonstrate that there will be no unreasonable adverse effect expected from the proposed activity:

1. The application proposes the use of an herbicide and surfactant that have been widely used for vegetation control and have a history of safe use.
2. Although AquaMaster and Agri-Dex are both approved for aquatic application, the application locations and distance to surface water are adequate to prevent the chemicals from drifting, leaching, or running off to surface water.
3. Given the fate and transport of AquaMaster and Agri-Dex, contamination of groundwater through leaching is not expected.
4. The biochemical mechanism by which AquaMaster acts on plants is not found in animals.
5. The surfactant Agri-Dex does not contain polyethoxylated tallow amine (POEA), which is primarily responsible for the toxicity of other surfactants.
6. Risks to human health, safety, and welfare are considered low based on toxicology studies, the proposed application area, and the low likelihood that the proposed herbicide use will result in off-site transport of herbicides.
7. Risks to animals and the environment are considered low based on toxicology studies, the proposed application area, and the low likelihood that the proposed herbicide use will result in off-site transport of herbicides.
8. There are no unreasonable adverse effects expected, based on social and economic costs and benefits of performing the activity.

2.0 BACKGROUND INFORMATION

On December 17, 2010, DEC received a pesticide use permit application from the Alaska Railroad Corporation (ARRC) to apply herbicide for the purpose of vegetation management at the Fairbanks and Healy Railyards, as well as selected portions of the railroad along the Suntrana, Eielson, and airport branch lines. The total proposed application area is approximately 169 acres.

Specifically, the ARRC submitted an application for a permit to apply:

- **AquaMaster Herbicide**, U.S. Environmental Protection Agency (EPA) Registration Number (Reg. No.) 524-343, with the active ingredient glyphosate; and
- **Agri-Dex**, a non-ionic surfactant and spray oil with principle functioning agents of heavy range paraffinic oil, polyol fatty acid esters, and polyethoxylated derivatives.

Controlling vegetation along or adjacent to the railroad is a federal requirement under 49 Code of Federal Regulations (CFR) 213.37. While non-chemical methods have been generally successful in controlling wayside brush, the ARRC has been unable to effectively control vegetation in and around the track structures (e.g., rails and ties) within the proposed application area. The reasons why control of vegetation around such structures is necessary are twofold:

- The track must be visible to allow inspection of critical components such as ties, rail, and the fasteners that secure the rail to the ties; and
- Vegetation in the track structure holds moisture, increasing the degradation of the track structure. This includes accelerated deterioration of track components such as ties, which rot more quickly in moist environments. The moisture also reduces the ability of the track to support traffic, which increases required maintenance efforts and costs.

AquaMaster is a post-emergent, systemic herbicide used for control of weeds, woody brush, and trees. Plants absorb the herbicide through foliage. The active ingredient, glyphosate, kills target plants by inhibiting the production of aromatic amino acids in plants (Boutin, 2004). EPA approves this product for aquatic uses.

Agri-Dex is a non-ionic surfactant and crop oil concentrate designed to improve herbicide application and efficacy by modifying the wetting and deposition characteristics of the spray solution. EPA does not require registration for adjuvants (including surfactants and crop oils), and the specific ingredients in adjuvants are generally not disclosed. However, Agri-Dex is approved for aquatic use by Washington State, which conducts reviews to ensure that adjuvants are not expected to be sources of water contamination. The State of Washington requires manufacturers of adjuvants to provide information on the specific contents of adjuvants, and conducts a review of documentation and acute toxicology studies for each product and its specific constituents for potential toxicity before allowing registration. These studies and analyses are based on proprietary information and are not available for outside review. However, DEC frequently relies on Washington's process to determine which adjuvants can be safely used.

The proposed herbicide and surfactant will be tank-mixed and applied by certified applicators using low pressure, large droplet size application techniques. The products will be applied from a Hy-rail equipped boom truck with nozzles two to three feet above the ground. In areas that are difficult to access with the Hy-rail boom (e.g., switch stands), a low volume backpack sprayer will be used. A 25-foot buffer zone will be observed for any water body or storm drain near the application area.

3.0 REGULATORY BACKGROUND AND ANALYSIS

The State of Alaska pesticide permitting requirements are found in 18 AAC 90.500 through 18 AAC 90.540.

3.1 PERMIT APPLICATION REQUIREMENTS

Under 18 AAC 90.500, a permit is required for application of pesticide within a state owned or leased right-of-way. With respect to this proposed application, 18 AAC 90.515 states that a permit application must contain the following information:

- The common or brand name of each pesticide to be used, the name of the seller/distributor from whom the pesticide will be obtained, and the EPA registration number(s) of the pesticide(s);
- The targeted pests to be controlled;
- Each type of formulation to be used;
- Each type of adjuvant to be used;
- The percentage of each active ingredient in each formulation;
- The rate of application for each active ingredient;
- A description of the treatment area, including the location and size, vegetation, potentially affected water bodies and drinking water systems within 200 feet, soil characteristics, and annual precipitation;
- The date and time of proposed application of each pesticide;
- The application method;
- The method of disposal of excess pesticide;
- Special precautions to protect human health, safety, welfare, animals, and the environment;
- Evidence that a person who directs or participates in the project has working knowledge of the pesticides, the necessary safety precautions, and impact on the environment, including certification under 18 AAC 90.300 – 18 AAC 90.315;
- Information about endangered and threatened species that may occur in the treatment area; and
- Information that demonstrates the pesticides do not cause unreasonable adverse effects.

On December 17, 2010, DEC received a pesticide use permit application from ARRC to apply herbicide for the purpose of vegetation management within the Fairbanks and Healy Railyards, as well as selected portions of the railroad along the Suntrana, Eielson, and airport branch lines.

3.2 PUBLIC PROCESS

In accordance with 18 AAC 90.520 and 18 AAC 15.050, a public notice and comment period were held, and in accordance with 18 AAC 90.520 and 18 AAC 15.060, a public hearing was held.

Notice of the permit application was published in the Fairbanks Daily News Miner on January 28 and January 29, 2011. A correction was printed on February 2 and 3, 2011, and the comment period was extended to March 21, 2011 to ensure a full 45 days. Notice included information about a public hearing and the opportunity to submit comments on the permit application. DEC also posted the public notice online at www.state.ak.us/dec/eh/pest and www.dec.state.ak.us/public_notices.htm. A public hearing was held in Fairbanks on February 22, 2011. No official testimony was made at this hearing.

DEC received five written comments and no oral testimony from the public hearings. DEC reviewed all comments received during this process. DEC prepared a Responsiveness Summary, which summarizes the comments received, and includes DEC responses.

3.3 PERMIT ISSUANCE CRITERIA

In accordance with 18 AAC 90.525, in order for DEC to issue or deny a permit for application of pesticides, DEC must evaluate the permit application and review the public record that results from the public notice and public hearings, as well as comments from local, state, or federal agencies. DEC also reviews and evaluates existing documentation and data.

In its discretion, DEC will deny a permit if:

- 1) The applicant has failed to supply information or evidence required by 18 AAC 90;
- 2) The applicant or a person under the applicant's direct supervision has failed to abide by a condition of a previous permit;
- 3) A proposed action is unlawful;
- 4) DEC determines that special precautions referred to as part of the permit application are inadequate to prevent unreasonable adverse effects; or
- 5) DEC finds that the application of the pesticide will result in an unreasonable adverse effect.

On December 17, 2010, DEC received a pesticide use permit application from the ARRC to apply herbicide for the purpose of vegetation management within the Fairbanks and Healy Railyards, as well as selected portions of the railroad along the Suntrana, Eielson, and airport branch lines. DEC determined that for purposes of its evaluation, the permit application adequately addressed items required in the application and no further information was needed.

The ARRC and the contracted certified applicators have no record of violation of any conditions of a previous pesticide use permit in Alaska.

The proposed pesticide application does not violate any laws or regulations. Application sites, methods, rates, and other details of the proposed application comply with label requirements.

Evidence and explanation of our analysis of the potential for unreasonable adverse effects, including special precautions, is provided in the following sections.

4.0 UNREASONABLE ADVERSE EFFECT ANALYSIS

The basis of this evaluation to determine if the proposed project would result in unreasonable adverse effects is based on research conducted for pesticide use permit #10-SOL-01, issued to the ARRC in 2010. Permit #10-SOL-01 was issued for similar or identical conditions, including proposed products, application methods, target pests, and environmental conditions; any differences in conditions for this permit decision were carefully considered and evaluated. DEC is not aware of any new scientific documentation since permit #10-SOL-01 was issued that would influence the current permit decision.

A number of studies and documents were reviewed and evaluated in the analysis to determine if the proposed project would result in unreasonable adverse effects. Only unbiased, scientifically based, peer-reviewed or validated data were utilized in this evaluation. Section 6.0 includes a list of references cited in this evaluation.

4.1 UNREASONABLE ADVERSE EFFECT REGULATORY REQUIREMENT

In order for DEC to issue a permit for the application of pesticides, it must find that the proposed activity will result in no unreasonable adverse effect.

- Unreasonable Adverse Effect is defined in 18 AAC 90.990(54) as an unreasonable risk to humans, animals, or the environment, taking into account the economic, social, and environmental costs and benefits of the use of a pesticide, as determined by the department.
- 18 AAC 90.515(16) states that the applicant must include information that demonstrates to the department's satisfaction that the pesticide to be applied does not cause an unreasonable adverse effect.
- Under 18 AAC 90.525(b) the department may deny a permit if the application of the pesticide will result in an unreasonable adverse effect (90.525(b)(5)), or if special precautions are inadequate to prevent unreasonable adverse effects (90.525(b)(2)).
- 18 AAC 90.525(c) also allows the department to include conditions in a permit to protect human health, safety, or welfare, animals, or the environment. (90.525(c)).

The discussion, analysis, and findings regarding DEC's review of the ARRC project regarding unreasonable adverse effect are included in this section.

4.2 EPA REGISTRATION REVIEW

Under the Federal Insecticide, Fungicide and Rodenticide Act, 7 U.S.C. §§136, et. seq., before manufacturers can sell pesticides in the United States, the Environmental Protection Agency (EPA) evaluates the pesticides thoroughly to make sure they can be used without posing harm or "unreasonable adverse effects" to human health or the environment.

Pesticide products must undergo rigorous testing and evaluation prior to registration approval. EPA scientists and analysts carefully review data to determine whether to register a pesticide product, and whether specific restrictions are necessary. EPA uses internal and external reviews involving peers and the public through a comment process when conducting these evaluations.

The scientific data requirements for product registration are very detailed. Required data includes characterizations of the pesticide's chemistry and manufacturing process; mammalian and eco-

toxicology; environmental fate; residues in or on human and livestock food or feed crops; applicator, occupational, and bystander exposures; product efficacy; and incident reports. Registrants can be required to conduct and submit up to 100 or more individual scientific studies for the registration of a new pesticide.

By definition, all pesticides are toxic to some degree. The level of risk from a pesticide depends on how toxic or harmful the substance is, and the likelihood of people coming into contact with it. Uncertainty factors are built into the risk assessment. These factors create an additional margin of safety for protecting people who may be exposed to the pesticides.

In order for a pesticide to be registered, the EPA must determine that the product can be used as labeled without causing unreasonable adverse effects to humans or the environment. If risks or concerns are identified, appropriate risk mitigation measures are required. These are implemented through product label requirements, which may include reductions in application rates, restrictions to approved sites or commodities, advisory statements, implementation of specific management practices, and other restrictions or limitations designed to mitigate risk.

The proposed product label must provide the active pesticide ingredients, application directions, use restrictions, and warnings. This label information is based on the underlying scientific data and conclusions about potential hazards, exposures, and risks from use according to the label.

EPA also conducts regular reassessments of currently registered pesticides. Through this re-registration program, EPA assesses new scientific studies and information about registered products. If there is new evidence documenting unreasonable risk to human health and the environment, the allowed usage is modified and the label changed. When EPA identifies data gaps, new studies are required and reviewed.

If new information or studies show that a pesticide represents an unreasonable risk even after a change of allowable usage, EPA has the authority to cancel registration of products containing that pesticide. Whenever EPA determines there are urgent human and environmental risks from pesticide exposures that require prompt attention, EPA will take appropriate regulatory action, regardless of the registration review status of that pesticide.

EPA's extensive analyses of each pesticide product, and incorporation of new scientific data regarding safety and use of existing products, is considered to be sufficient to protect human health and the environment from unreasonable adverse effects.

All available data indicates that the proposed products will behave as expected and as reported in the literature and on the labels. There are no site-specific conditions at the proposed application locations that would invalidate the EPA registration review process with respect to this particular proposed pesticide use.

4.3 APPLICATION METHODS

Target vegetation along the application area are predominantly weeds, including cow parsnip, foxtail, dandelion, horsetail, sweet clover, and other broadleaves and grasses. Some woody plants (i.e., willow, alder) are also within the proposed application areas.

As previously described, the product will be applied primarily using a Hy-rail equipped boom truck with nozzles close to the ground surface; this method allows for control of spray direction. In areas that are difficult to access with the spray truck, a low volume backpack sprayer will be used. The sprayer will hold no more than four gallons of product and has a maximum spray

pressure of 30-40 pounds per square inch (psi). Drift of product using these methods is expected to be minimal.

All application areas will be pre-marked using yellow and blue marking spray paint to identify the application areas. In areas where application will be done with a track-mounted spray vehicle, a single railroad tie will be spray painted blue to indicate the beginning of the spray area, and three consecutive railroad ties will be spray painted yellow to indicate the end of the spray area. This pre-marking also ensures that the 25-foot buffer zones between application areas and water bodies or storm drains will be met. All water bodies, as defined by Alaska Statutes in AS 46.03.900(37), and storm drains within 25 feet of the application areas will be identified in person onsite, and buffer zones will be measured and marked before application with yellow spray paint.

An ARRC representative who is a licensed certified applicator will accompany the contracted applicator at all times during application activities. The ARRC representative will be in constant radio communications with the applicator to ensure that they are aware of the location of buffer zones and the beginning and ending of application areas.

AquaMaster will be diluted approximately 98% prior to application (3 quarts per 30-40 gallons of water), and Agri-Dex will be diluted 99.75% prior to application (1 quart per 100 gallons of water). The following amounts of product, which comply with label requirements, will be applied:

- AquaMaster: 3 quarts/acre; total application per treatment of 75 gallons; and
- Agri-Dex: 0.3 quarts/acre; total application per treatment of 8.25 gallons.

4.4 CHEMICAL PROPERTIES

The herbicide AquaMaster is a mixture of glyphosate isopropylamine salt (glyphosate IPA; 53.8%) and water (46.2%) (Monsanto, 2005). Glyphosate works by inhibiting an enzyme, enolpyruvylshikimate phosphate synthase (EPSP), which is essential in a pathway for biosynthesis of amino acids that enable the plant to produce proteins necessary for plant growth and survival. The EPSP enzyme and associated amino acid biosynthesis pathway are found only in plants, not in animals, helping to limit the effects of glyphosate herbicides on organisms other than plants (USDA, 2000; Williams et al., 2000).

The surfactant Agri-Dex will be applied with the herbicide to increase the absorption through plant tissues and to increase spray retention (Bakke, 2007). Agri-Dex consists of a proprietary blend of heavy range paraffin base petroleum oil, polyol fatty acid esters, and polyethoxylate derivatives (Helena, 2005).

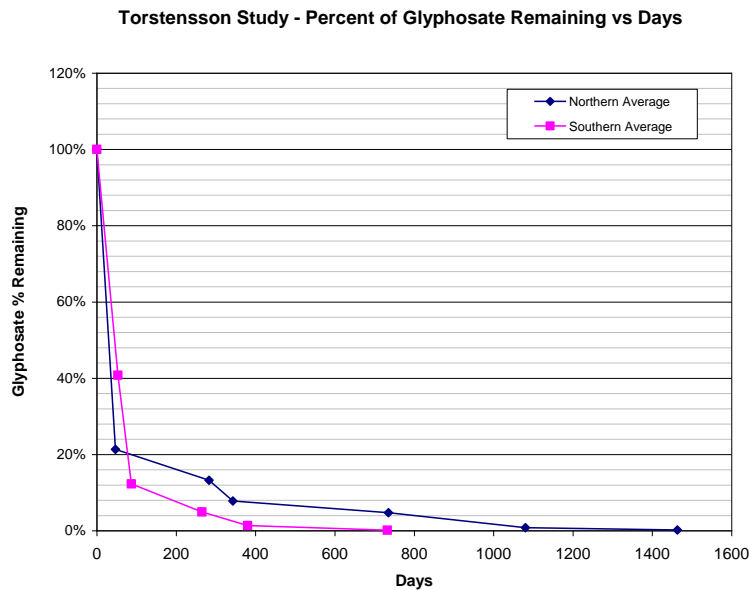
Glyphosate and many of its commercial formulations, including those with and without surfactants, have been studied for a wide variety of potential effects to non-target organisms. Less information is available for the surfactant Agri-Dex, but literature is available on this as well as other surfactants. The results of these studies, as relevant to the proposed use of AquaMaster and Agri-Dex as specified in the permit application, are summarized below.

4.5 PERSISTENCE AND MOBILITY

Glyphosate dissolves easily in water and has a water solubility of 12,000 milligrams per liter (mg/L; USDA 2000). However, it also strongly adsorbs to soil particles, with an organic carbon partition coefficient (K_{oc}) of 24,000 (USDA, 2000; DOE, 2000, Battaglin, 2005). This means that glyphosate is not particularly mobile because of strong sorptive ability. Glyphosate degrades relatively rapidly, with reported half-lives of 3 to 249 days (USDA, 2000).

In a recent study on agricultural soils, the half-life both of applied glyphosate and its primary breakdown product, aminomethylphosphonic acid (AMPA), were studied (Simonsen et al., 2008). Glyphosate was shown to have a soil half-life of 9 days, and AMPA had a half-life in soil of 32 days. This demonstrates that neither chemical is persistent in soil.

In a study on a total of 11 sampling locations at two different cold-climate sites in Sweden, 53 days after application of glyphosate, the remaining soil concentration averaged 30% of the initial concentration. These sampling locations were in humic acidic soils (pH around 5). At one of the sites (Southern Sweden, longitude approximately 57°), all glyphosate was gone after 2 years, and at the other site (Northern Sweden, longitude 67° within the Arctic circle), all glyphosate was gone after 4 years (Torstensson, 1989). However, the chemical was not mobile in either environment, partitioning into the soil and degrading in that medium. As shown in the following graph from the Torstensson (1989) study, glyphosate concentrations decline rapidly after application, with less than 20% of the original mass remaining after about 2 months.



The University of Alaska Fairbanks (UAF) Water and Environmental Research Center has been conducting an ongoing study on the environmental fate of herbicides in Alaska. The results of this study are directly applicable to the proposed permit.

In the first phase of this study, two herbicides, including AquaMaster herbicide mixed with Agri-Dex were applied on selected portions of the southern section of the ARRC rail line near Seward. The study applied the herbicides under similar or identical conditions as the proposed permit, including products, application methods, target pests, and environmental conditions; has been completed

Additional phases of this research using lysimeter experiments and a block plot study are still being completed at the UAF Fairbanks Experiment Farm. However, data from the first phase of the study is available, and was provided in the permit application.

Results from two test locations where glyphosate had been applied to railroad bed materials, and its fate and transport measured for 80 days by UAF Water and Environmental Research Center

professors, support the persistence and mobility information summarized above. On average, no glyphosate was detected in the upper inch of soil 4 days following application in one area, and none was detected in surface soil after two weeks. In the other test area, glyphosate remained at detectable levels for two weeks after application. Data from samples collected from two and six feet below grade from both sites indicated almost no glyphosate was present at or above measurable levels. Detectable levels of the degradation product produced through metabolism by a bacterium were shown to be present in the samples. These results demonstrate that under typical Kenai Peninsula weather glyphosate applied to the soil is not downwardly mobile, is metabolized by soil microorganisms, and dissipates within approximately two weeks.

The strong adsorption of glyphosate to soil particles overrides its relatively high solubility, and glyphosate is relatively non-mobile in soil. Once in the soil, it degrades relatively rapidly and is not considered to be persistent. Additionally, Folmar et al. (1979) showed the toxicity of Roundup (glyphosate and POEA adjuvant) to decrease with decreasing water temperature. While it is not clear if this relationship is specific to glyphosate, the surfactant, or some combination of the two, it likely is relevant towards the use of glyphosate in the proposed application area since water temperatures are low relative to most other application areas.

The ARRC proposes to use glyphosate for vegetation control during warm weather periods when vegetation will be growing. The glyphosate will bind to the soil particles with which it comes in contact. Once it reaches the soil, it will begin degrading through the activity of bacteria. Degradation rates will be highest during warm weather. During cold weather, the mobility of any remaining glyphosate will be further limited by the cold temperatures, snow, and ice, as shown in the study in Sweden (Torstensson, 1989). Although it may take longer to completely degrade in the cold temperatures of Alaska, the mass will remain bound to soil and not move to aquatic systems or other locations where exposure could occur.

Little information is available on the mobility and persistence of Agri-Dex, but water solubility is reported to be low (Helena, 2005). Preliminary information from the test areas evaluated by UAF indicates that AquaMaster and Agri-Dex behave as expected and as reported in the literature and on the labels.

4.6 SYNERGISTIC EFFECTS

While synergistic effects are known to occur for some herbicide-adjuvant mixtures, none have been reported for glyphosate and Agri-Dex. For example, Chen (2004) identified a link between use of Vision (containing glyphosate and a POEA-adjuvant) synergistic effects with food or pH; effects between herbicide and adjuvant were not reported. One article (Diamond and Durkin, 1997) provided evidence that the POEA-based adjuvants are substantially more toxic than glyphosate, and can result in synergistic effects with regard to acute fish toxicity when used as part of a formulation. However, Agri-Dex does not contain POEA and has been shown to be much less toxic than POEA-containing adjuvants (5-100 times less toxic; Diamond and Durkin, 1997). As a result, the potential for the adjuvant and glyphosate to act synergistically is remote. Therefore, the potential for synergistic effects of glyphosate and Agri-Dex to result from application of these products as proposed is considered acceptably low.

4.7 WATER RESOURCES

EPA approves AquaMaster for use in aquatic conditions. As discussed above, although glyphosate has high water solubility, it strongly binds with soil particles and suspended sediment, becoming immobile in soils rather than partitioning to water (Boutin, 2003; USDA, 2000). AquaMaster is not expected to be a source of water contamination through leaching to groundwater, or by runoff or drift to surface water. Although AquaMaster is EPA approved for

use in water bodies, the 25-foot buffer established around water bodies and storm drains provides additional assurance that water contamination should not occur. To add an additional level of protection for water, the permit includes a stipulation to limit product application to periods without heavy precipitation and when the wind speed is between 2 and 10 miles per hour. These stipulations will minimize the potential for drift and runoff.

Agri-Dex is approved for aquatic use by Washington State, which conducts reviews to ensure that adjuvants are not expected to be sources of water contamination. The State of Washington requires manufacturers of adjuvants to provide information on the specific contents of adjuvants, and conducts a review of documentation and acute toxicology studies for each product and its specific constituents for potential toxicity before allowing registration. These studies and analyses are based on proprietary information and are not available for outside review. However, DEC frequently relies on Washington's process to determine which adjuvants can be safely used.

4.8 HUMAN HEALTH, SAFETY, AND WELFARE

Toxicity categories are assigned to pesticides based on their ability to cause harm by various routes of exposure (oral, dermal, inhalation, etc.) There are four categories, with Category I being the most toxic, and Category IV the least toxic, listed as "practically non-toxic".

Both oral and dermal absorption of glyphosate are low (Williams et al., 2000). The United States Department of Agriculture (USDA) provides rankings for glyphosate and Agri-Dex based on the acute toxicity categories for pesticide products specified in 40 CFR 156.62 (40 CFR 156.62). Glyphosate was categorized as "Slightly Toxic" (Category III) based on acute effects from both oral and dermal exposure to laboratory animals, as well as eye irritation (Mild Irritant; Category III). These data are used by EPA and USDA to make inferences about toxicity to humans (USDA, 1997). For skin irritation, glyphosate was classified as "Not an Irritant" (Category IV). One study reviewed by Williams et al. (2000) showed that Roundup had a skin irritation potential similar to baby shampoo, and was less irritating than both dishwashing detergent and a common household cleaner. The Agri-Dex surfactant was classified as "Practically Non-toxic" (Category IV) for oral toxicity and "Slightly Toxic/Slightly Irritating" (Category III) for dermal toxicity and eye irritation, respectively. Agri-Dex was classified as "Moderately Irritating" (Category II) to skin (USDA, 1997).

As part of a human health safety evaluation and risk assessment for Roundup and glyphosate, Williams et al. (2000) reviewed studies performed for regulatory purposes as well as published research reports. This review indicated that no significant toxicity occurred in acute, sub-chronic, or chronic studies, and that glyphosate was not teratogenic or developmentally toxic. Williams et al. (2000) also concluded that no effects from glyphosate on reproductive tissues and no evidence of endocrine modulation were apparent, and summarized two multigeneration reproduction studies that showed no effects on fertility or reproductive parameters. The effects to humans observed following occupational and accidental exposures to Roundup herbicide were limited to minor skin and eye irritation. The only instances of death associated with ingestion of Roundup occurred in suicide attempts involving very large doses; in these cases the clinical symptoms associated with the cause of death were attributed to the surfactant POEA, and not to glyphosate (Williams et al., 2000). POEA is not present in the glyphosate formulation found in AquaMaster.

The studies examined in this review, which also included evaluations of the glyphosate breakdown product and POEA, lead to the conclusion that "under present and expected conditions of use, Roundup herbicide does not pose a health risk to humans." In addition, a World Health Organization (WHO) document on glyphosate in drinking water stated that due to the low toxicity of glyphosate, the health-based value is orders of magnitude higher than the

concentrations normally found in drinking water, and therefore establishment of a guideline value for glyphosate in drinking water “is not deemed necessary” (WHO, 2003).

4.8.1 Carcinogenicity

The EPA’s Re-Registration Eligibility Document (RED) classified glyphosate as a Group E chemical, indicating evidence of non-carcinogenicity in humans (EPA, 1993). Most chemicals that are unlikely to be carcinogenic in humans are assigned to Group D (Not classifiable regarding carcinogenicity). The Group E categorization implies a strong weight of evidence that glyphosate is not carcinogenic.

The WHO Environmental Health Criteria document # 159 for glyphosate states that “Animal studies show that glyphosate is not carcinogenic, mutagenic or teratogenic” (WHO, 1994). A critical review of the human health literature on glyphosate also concluded that glyphosate is noncarcinogenic, stating that “Multiple lifetime feeding studies have failed to demonstrate any tumorigenic potential for glyphosate” (Williams et al., 2000). Some studies have shown tumor incidence in mice and rats, but these have so far been determined not to be treatment-related effects (Williams et al., 2000; EPA, 2010).

As summarized in USDA (2000), the US Forest Service Pacific Northwest Region Final Environmental Impact Statement (FEIS) assumed that glyphosate was a carcinogen and conducted a human health risk assessment under this assumption. The highest resulting worst-case cancer risk was 4 in 100 million, which is much lower than the EPA and Forest Service threshold risk value of one in one million. Another more recent risk assessment, also summarized in USDA (2000), assumed a much higher cancer potency estimate than that used in the FEIS assessment; the highest worst-case risk estimate resulting from that study was 0.8 in one million, which is still below the EPA/Forest Service threshold of concern.

Some types of ethoxylated ingredients, including ethylene oxide (unreacted) and 1,4-dioxane, are likely human carcinogens. Agri-Dex does contain ethoxylated ingredients, but information about the exact types it may contain is not available. It is possible that ethylene oxide (unreacted) and 1,4-dioxane could be present in the final formulation as a result of ethylene oxide reactions in the manufacturing process (Bakke, 2007). Based on the fact that Agri-Dex has much lower toxicity than other adjuvants containing ethoxylated ingredients, it can be assumed that if either is present, the concentrations are low.

4.8.2 Endocrine Disruption

Recent research has shown endocrine-related effects of low-level exposures of amphibians to atrazine and other triazine herbicides. Both the chemical components and mode of action of these herbicides are completely different from those of AquaMaster. Atrazine works via photosynthesis inhibition, while glyphosate works by inhibiting the production of amino acids necessary to plants (Diana et al., 2000; Sipcam, 2000). Due to these significant differences, conclusions drawn about endocrine impacts from atrazine and other triazine herbicides is not relevant for glyphosate-based herbicides, and should not be considered an indication that they would have similar effects in the environment.

Specific studies focusing on endocrine disruption of glyphosate are available but not numerous. Most consider specific formulations, which include additives and other ingredients not found in AquaMaster. For example, Roundup was used in a Walsh (2000) study where effects on protein synthesis associated with steroidogenesis in Leydig cells were reported. This endpoint may be a biomarker for endocrine disruption effects. However, it is not clear if the effects were due to glyphosate, the relatively more toxic adjuvant, or the formulation. Given the large effort focused

on identifying endocrine disrupting compounds over the past several years, the lack of literature indicating potential endocrine disruption effects from glyphosate is strong negative evidence.

Many endocrine disruptors are identified through effects on amphibians. In a review of potential products to use for weed control, a member of the North Carolina Partners in Amphibian and Reptile Conservation recommended Agri-Dex to “ensure we are using the least toxic product currently available to us. In this case that means obtaining a surfactant-free 53.8% glyphosate product such as Accord Concentrate, Foresters Non Selective, AquaMaster, AquaNeat, Rodeo or a comparable herbicide and mixing it with the surfactant Agri-Dex” (Hughes, 2009).

4.9 ANIMALS AND THE ENVIRONMENT

As summarized by the USDA (USDA; 1997, 2000), glyphosate itself is relatively non-toxic to fish, algae, aquatic invertebrates, and aquatic macrophytes. Studies have shown commercial formulations of glyphosate such as Roundup and Kleeraway, which contain surfactants, to be toxic to fish, aquatic invertebrates, and amphibians at low levels (Folmar et al., 1979; Cauble and Wagner, 2005; Smith, 2001). However, many of the toxic effects associated with commercial glyphosate formulations have been shown to be due to the presence of the surfactants rather than the glyphosate itself (Folmar et al., 1979; Howe et al., 2004; USDA, 2000).

One study that examined the effects of a glyphosate formulation (Roundup) and its components on aquatic invertebrates and fish found the surfactant to be the primary source of toxicity. The LC50 values (concentrations lethal to 50 percent of test organisms) for glyphosate alone were one to two orders of magnitude higher than those for the Roundup surfactant, indicating that glyphosate has much lower toxicity than the surfactant in Roundup (Folmar et al., 1979).

Another study that examined the acute and chronic effects (including endocrine-related effects) of glyphosate, several commercial glyphosate formulations, and the polyethoxylated tallow amine surfactant POEA commonly found in Roundup, on four amphibian species showed that the surfactant POEA and glyphosate formulations containing either POEA or other ethoxylated tallow amine surfactants were much more toxic than glyphosate alone. In most cases, glyphosate alone had no effects (Howe et al., 2004).

A similar study in which tadpoles of four Australian frog species were exposed to several formulations, including Roundup and glyphosate IPA alone, showed that while Roundup and other formulations demonstrated acute toxicity to the tadpoles, glyphosate IPA was found to be nontoxic (Mann and Bidwell, 1999).

In a University of Washington study comparing the toxicity of four surfactants commonly used with glyphosate herbicides to juvenile rainbow trout with respect to survival and behavior, Agri-Dex was found to be the least toxic, with LC50s almost two orders of magnitude higher than the most toxic surfactant (Smith et al., 2004). This study states “To minimize non-target effects...we recommend Agri-Dex over the other three surfactants.” Three of the four surfactants tested by Smith et al. (2004) were also compared by USDA (1997) and Diamond and Durkin (1997) using other available studies; while the LC50 values reported in these studies were higher than those in the Smith et al. (2004) study, the relative toxicity was similar; LC50s for Agri-Dex were one to two orders of magnitude higher than those for the other two tested surfactants. Agri-Dex was classified as “Practically Non-toxic” for both fish and aquatic invertebrates (USDA, 1997).

As summarized in USDA (1997, 2000), most studies show no adverse effects of glyphosate on soil microorganisms. While non-target terrestrial plants may be affected by unintentional drift, the effects are likely to be most evident within 50 meters of the intended application (USDA, 2000).

EPA (1993) classified glyphosate as no more than “Slightly Toxic” to upland game birds and waterfowl when ingested in the diet, and concluded that glyphosate was not expected to cause reproductive impairment in birds. The avian studies evaluated by EPA (1993) were conducted using technical grade glyphosate at much higher concentrations (83% - 98.5%) than that found in AquaMaster (53.8% glyphosate IPA; Monsanto, 2005).

While data for other terrestrial wildlife species, such as mammals, are limited, USDA (2000) states, “very few studies suggest the potential for toxic effects.” Glyphosate has been shown to not bioaccumulate or breakdown in rats given oral doses. As a result, “most glyphosate is excreted unchanged in urine and feces”. The primary effects noted were changes in population density related to changes in food and habitat availability resulting from herbicide application (USDA, 2000). Affected vegetation will be limited to the immediate spray area, and as such, food and habitat availability changes will not be an issue. DEC does not believe there is a significant risk to mammal and other terrestrial wildlife based on a limited exposure pathway and evidence that glyphosate does not bioaccumulate.

4.10 OVERALL FINDING OF ENVIRONMENTAL ANALYSIS

Based on the analysis provided above, DEC does not expect an unreasonable adverse effect to water resources, animals, the environment, or human health, welfare, and safety.

4.11 SOCIAL AND ECONOMIC COSTS AND BENEFITS

DEC evaluated the social and economic costs and benefits of the proposed ARRC herbicide application proposal.

4.11.1 Social and Economic Cost/Benefit Issues

Issues related to social and economic costs and benefits were discussed in the permit application, and were brought forward as part of the public comment period. These issues are presented in this subsection.

Permit application discussion of social and economic cost and benefits

Part 9.1 of the permit application includes a discussion of Economic and Social Costs and Benefits, from the ARRC perspective. Part 9.1 starts with establishing the need to use herbicides to control vegetation around railroads. Reasons given include:

- 1) The need for the track to be visible to allow inspection of critical components such as ties, rail, and the fasteners that secure the rail to the ties.
- 2) The need to remove vegetation to allow safe walking by train crews, to maintain visibility of wayside signals and signs, and to prevent vegetation from brushing against the sides of trains or track equipment.
- 3) The need to remove vegetation in the track structure, because it holds moisture that increases the degradation of the track structure, including ties that rot in moist environments. The moisture also reduces the ability of the track to support traffic and increases maintenance efforts and costs.

This discussion notes that vegetation maintenance is a federal safety requirement. It also mentions the Federal Railroad Administration (FRA) inspections, which have resulted in monetary fines for lack of vegetation control.

The discussion in the application mentions that the ARRC has been able to control wayside brush using conventional brush cutters and hand labor, but vegetation control in and around the track structure has not been effective. ARRC uses of a number of non-chemical control methods, including mechanized rail-based brush cutters, off-rail hydro axing, and manual cutting. ARRC has tested methods such as steam, infrared, hot water, and burning, but these methods have proven ineffective.

The FRA has stated that the vegetation problems on the railroad are unacceptable, and that there has been no visible progress in dealing with these problems. In a letter attached to the permit application, the FRA states that if the vegetation management problem persists or worsens, FRA may use additional enforcement tools, including speed restrictions, a compliance order, assessment of civil penalties, and an emergency order removing the affected track from service (Strang, 2009).

The permit application includes three examples of economic and social impacts of delays or interruptions in Alaska Railroad service:

- 1) Delay example – The railroad transports 500,000 passengers annually between communities along the railbelt. Impacts of delays listed include increased congestion on the highways. It also cites that delays will result in late arrivals of passengers, which will negatively affect small businesses that serve tourists.
- 2) Service interruption example – The Alaska Railroad hauls petroleum products from the North Pole Refiners to Anchorage for distribution to military bases and the Anchorage International airport and coal from the Usibelli coal mine in Healy to the port of Seward. Highway transportation of these products is not economical.
- 3) Fines and penalties – The fines for non-compliance with Federal regulations in 2009 are estimated to range between \$130,000 and \$2,000,000.

Social and economic costs and benefits from public comments

The public comment period brought forth several issues relevant to social and economic costs and benefits of the proposed project. These issues include:

- Impacts on state's tourism, sport fishing, and commercial fishing industries because of damaging the perception of Alaska as a pristine environment.
- ARRC has not considered the liability, clean up costs, and monitoring if herbicides contact groundwater.
- Other railroads in the United States routinely use herbicides for vegetation control.

4.11.2 Analysis of Economic Costs and Benefits

The economic costs of herbicide application involve both the cost to the applicant of performing the herbicide application, and the economic costs of either performing or not performing the proposed herbicide application.

The ARRC stated in their application materials that they employ rail-based brush cutters, off-rail hydro-axing, and wayside manual cutting. In addition they've tested alternative methods such as steam, infrared, hot water, and burning. However, they have found these methods to be ineffective and uneconomical to achieve adequate weed control.

The threat of fines and threat of track closures or slowdowns by FRA is a significant factor in DEC's opinion. ARRC does have a significant history of attempting to manage vegetation using a number of non-chemical methods, and in spite of these efforts, vegetation management has not

been adequate in the opinion of the FRA. Most railroads in the United States use herbicides as part of vegetation management.

The fines that FRA has assessed and is threatening to assess are significant; however, the greater economic cost is the threat of track slowdowns or closures. The ARRC is a significant component of the State of Alaska's economy, and it is a critical component of other Alaska industries, including coal and tourism. The ARRC has been hurt by worldwide economic conditions, and track slowdowns or closures between Anchorage and Seward or Fairbanks would make this economic condition worse. If ARRC's economic situation becomes bad enough that its economic survival is threatened, this would more broadly impact Alaska's economy, including impacts on the North Pole refinery and Anchorage International Airport.

Other economic impacts were considered, such as the threat to other industries (such as the fishing industry), activities, and to property values based on negative perception of herbicide application. DEC considered these issues, but does not believe that there will be any negative economic impact to these industries, or to property values. The proposed herbicide application is to rail yard only, and the herbicide is not particularly mobile or persistent.

- EPA has approved the herbicide for use on water. It will not adversely affect fish; furthermore, based on its mobility and buffers required by the permit, it will not reach water, so fisheries will not be impacted.
- This application is to the railroad railyard. The railyard does not contain recreation areas, gathering areas, or other public areas. Even so, the low mobility of the herbicide will also ensure that adjacent areas which might be recreation areas, gathering areas, and other areas where the public may be present will not be impacted.
- As trespassing on the railroad right-of-way is prohibited, it will not impact subsistence gathering activities.
- The railyard is in an urban/industrial area with little wildlife, and hunting is not permitted within the municipality. The wildlife discussion in this document indicates that animals will not be adversely impacted; therefore, there will be no adverse effect on hunting.
- Property values are not expected to be impacted. Glyphosate is routinely used for vegetation control, and this use has not been shown to adversely affect property values.

There are potential economic costs to tourism both from conducting or not conducting this activity. The potential economic costs of applying herbicide on tourism are potential negative perceptions will make Alaska less desirable to tourists. The potential economic cost on tourism of not applying herbicide would be if ARRC is forced to slow down railroads or if tracks are closed. DEC believes that there is a greater potential cost to tourism if herbicide is not used, due to the sanctions likely to be imposed by FRA. DEC does not believe that this limited application of herbicide will have a significant impact on tourists' perception of Alaska and whether they will or will not travel to Alaska.

4.11.3 Analysis of Social Costs and Benefits

DEC evaluated the potential social costs and benefits of the proposed herbicide application. The potential social costs involved with this project involve the following:

- Potential job losses from potential impacts to industry from any FRA-based curtailment of ARRC activities.
- Potential job losses to both ARRC employees and affected industries from any FRA-based curtailment of ARRC activities.
- Perceptions and concerns of individuals on herbicide use.

Potential social benefits involved with this project involve the following:

- Decreased risk to ARRC passengers from better track inspections and conditions due to vegetation removal.

As discussed in the economic review in Section 4.11.2, DEC does not believe that there will be significant economic impacts on tourism or other industries from herbicide application, and as such, the activity should not affect jobs of individuals. DEC recognizes that some individuals are opposed to herbicide use, and the application of herbicides for vegetation control will concern them. The amount of public comment received specific to general opposition was not substantial. The social impact on ARRC employees who could lose their jobs if weeds are not adequately controlled is significant, given the realistic threat of curtailment of ARRC activities by FRA due to not adequately managing vegetation. From a potential social benefit perspective, the safety to passengers of maintaining the rail lines is important, as any train derailment due to unsafe track conditions would have a serious social impact, in addition to potential economic and environmental impacts.

4.11.4 Finding on Social and Economic Costs and Benefits

Based on its analysis, DEC does not believe there is an unreasonable adverse effect based on social or economic issues, and that there is a greater potential economic cost if the herbicide permit is not issued.

4.12 OVERALL UNREASONABLE ADVERSE EFFECT FINDING

In issuing or denying a permit application, the criteria given for potentially denying a permit based on unreasonable adverse effect are included in 18 AAC 90.525(b)(2) and (5). As discussed in this section, DEC finds that proposed herbicide application will not pose an unreasonable risk to humans, animals, or the environment, based on consideration of economic, social, and environmental costs and benefits of the use of the herbicide.

5.0 CONCLUSION

A permit application was provided to DEC by ARRC. A public notice, comment period, and hearings were held in accordance with the regulatory requirements, and DEC reviewed the record resulting from the public notice and hearings. DEC also considered all comments received from local, state and federal agencies. The proposed herbicide application project meets applicable regulatory requirements.

The available literature on glyphosate, the primary ingredient in AquaMaster herbicide, and Agri-Dex, the surfactant that will be used with AquaMaster by ARRC, was reviewed to evaluate the potential health effects and fate and transport of these products in a cold environment. Based on this review, glyphosate appears to be relatively non-toxic and its use in the proposed setting seems appropriate. Agri-Dex has been shown to be much less toxic than other surfactants recommended for use with glyphosate herbicides, and appears to be the best option for use in the proposed setting.

The potential economic costs of not performing the proposed activity are significant, and in the opinion of DEC outweigh any potential economic costs of performing the activity. Furthermore, the social costs of not applying herbicides to control vegetation outweigh the social costs of applying herbicides.

Based on the information contained in the permit application and the available literature, as summarized above, and based on its analysis of the proposed project, DEC has concluded that the application of the herbicide and surfactant would result in no unreasonable adverse effect and therefore this permit application is approved. Under the authority of 18 AAC 90.525, DEC will approve the permit application. The permit will take effect 40 days after issuance, and will expire five years after the effective date.

6.0 REFERENCES

- 40 CFR 156.62. *Code of Federal Regulations, Title 40: Protection of the Environment, Section 156.62: Toxicity Category*. Current as of March 2, 2010. Available online (accessed 3/04/10): <http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&rgn=div8&view=text&node=40:23.0.1.1.7.3.1.2&idno=40>
- Bakke, D. 2007. *Analysis of Issues Surrounding the Use of Spray Adjuvants with Herbicides*. USDA Forest Service, Pacific Southwest Region. December 2002. Revised, January 2007.
- Battaglin, WA, et al. 2005. *Glyphosate, Other Herbicides, and Transformation Products in Midwestern Streams, 2002*. Journal of the American Water Resources Association, April 2005.
- Boutin, C., N. Elmegaard, and C. Kjaer 2004. Toxicity Testing of Fifteen Non-crop Species with Six Herbicides in a Greenhouse Experiment: Implications for Risk Assessment. *Ecotoxicology* 2004:349-369.
- Cauble, K and RS Wagner. 2005. *Sublethal Effects of the Herbicide Glyphosate on Amphibian Metamorphosis and Development*. Bull. Environ. Contam. Toxicol. 75: 429-435.
- Chen, CY, KM Hathaway, and CL Folt. 2004. Multiple Stress Effects of Vision Herbicide, pH, and Food on Zooplankton and Larval Amphibian Species from Forest Wetlands. *Environ. Toxicol. Chem.* 23(4):823-831.
- Diana, SG, WJ Resetarits Jr., DJ Schaeffer, KB Beckmen, and VR Beasley. 2000. *Effects of Atrazine on Amphibian Growth and Survival in Artificial Aquatic Communities*. *Environmental Toxicology and Chemistry*. 19(12): 2961-2967.
- Diamond, GL and PR Durkin. 1997. *Effects of Surfactants on the Toxicity of Glyphosate, with Specific Reference to Rodeo*. Submitted to USDA. February 6. SERA TR 97-206-1b.
- EPA. 2010. Integrated Risk Information System. Online database (accessed 3/03/10): <http://www.epa.gov/iris/>.
- Folmar, LC, HO Sanders, and AM Julin. 1979. *Toxicity of the Herbicide Glyphosate and Several of Its Formulations to Fish and Aquatic Invertebrates*. Arch. Environ. Contam. Toxicol. 8: 269-278.
- Helena Chemical Company (Helena). 2005. Material Safety Data Sheet, Agri-Dex. Effective Date: 29-APR-2005. Updates available at www.Greenbook.net
- Howe, CM, M Berrill, and BD Pauli, CC Helbing, K Werry, and N Veldhoen. 2004. *Toxicity of Glyphosate-based Pesticides to Four North American Frog Species*. *Environmental Toxicology and Chemistry*. 23(8): 1928-1938.
- Hughes, K. 2009. Observations on Herbicide Choices and Amphibian Conservation. North Carolina Partners in Amphibian and Reptile Conservation. <http://www.ncparc.org/pubs/Herbicide%20Choices%20&%20Amphibian%20Conservation.pdf>.

- Mann, RM and JR Bidwell. 1999. *The Toxicity of Glyphosate and Several Glyphosate Formulations to Four Species of Southwestern Australian Frogs*. Arch. Environ. Contam. Toxicol. 36: 193-199.
- Monsanto Company (Monsanto). 2005. *Material Safety Data Sheet, Commercial Product, AquaMaster Herbicide*. Version: 2.0. Effective date: 02/03/2005.
- Simonsen, L., I.S. Fomsgaard, B. Svensmark, N.H. Spliid. 2008. Fate and availability of Glyphosate and AMPA in Agricultural Soil. J. Environ Sci Health B 43:365-375.
- Sipcam Agro USA, Inc. (Sipcam). 2000. *Atrazine 4L Herbicide Material Safety Data Sheet*. Issue date: 3/14/00. Available online (accessed 3/03/10): <http://www.cdms.net/LDat/mp3QT000.pdf>
- Smith, GR. 2001. *Effects of Acute Exposure to a Commercial Formulation of Glyphosate on the Tadpoles of Two Species of Anurans*. Bull. Environ. Contam. Toxicol. 67: 483-488.
- Smith, BC, CA Curran, KW Brown, JL Cabarrus, JB Gown, JK McIntyre, EE Moreland, VL Wong, JM Grassley, and CE Grue. 2004. *Toxicity of Four Surfactants to Juvenile Rainbow Trout: Implications for Use over Water*. Bull. Environ. Contam. Toxicol. 72: 647-654.
- Strang, J. April 15, 2009. Letter to Mr. Patrick K. Gamble "Re: Vegetation Management on the Alaska Railroad".
- Torstensson, NTL, et al. 1989. Influence of Climatic and Edaphic Factors on Persistence of Glyphosate and 2,4-D in Forest Soils. *Ecotoxicology and Environmental Safety*, 18, p 230-239, 1989.
- United States Department of Agriculture (USDA). 1997. *Glyphosate Herbicide Information Profile*. Forest Service, Pacific Southwest Region. February.
- USDA. 2000. *Glyphosate Herbicide Information Profile*. Forest Service, Pacific Southwest Region. November 17.
- United States Department of Energy (DOE). 2000. Bonneville Power Administration, *Glyphosate Herbicide Fact Sheet*, March 2000.
- United States Environmental Protection Agency (EPA). 1993. *Re-Registration Eligibility Decision (RED), Glyphosate*. EPA 738-R-93-014. September.
- Walsh, LP, C McCormick, C Martin, and DM Stocco. 2000. Roundup Inhibits Steroidogenesis by Disrupting Steroidogenic Acute Regulatory (StAR) Protein Expression. *Environ. Health Perspect.* 108:769-776
- Williams, GM, R Kroes, and IC Munro. 2000. *Safety Evaluation and Risk Assessment of the Herbicide Roundup and Its Active Ingredient, Glyphosate, for Humans*. *Regulatory Toxicology and Pharmacology*. 31: 117-165.

World Health Organization (WHO). 2003. *Glyphosate and AMPA in drinking water*. Summary statement, Extract from Chapter 12 – Chemical facts sheets of WHO *Guidelines for Drinking-water Quality*, 3rd edition, 2004. WHO/SDE/WSH/03.04/97.

WHO. 1994. *Environmental Health Criteria No. 159, Glyphosate*. International Programme on Chemical Safety. World Health Organization, Geneva. Available online (accessed 3/03/10): <http://www.inchem.org/documents/ehc/ehc/ehc159.htm#PartNumber:10>

**Department of Environmental Conservation
Division of Environmental Health**

**Alaska Railroad Corporation
Application for
Permit to Use Pesticide
for Vegetation Management
on the Fairbanks and Healy Railyards
and Selected Portions of Nearby Track**

**Public Noticed
January 28, 2011 – March 21, 2011**

**RESPONSIVENESS SUMMARY
May 6, 2011**

Acronyms and Abbreviations

AAC	Alaska Administrative Code
ARRC	Alaska Railroad Corporation
AS	Alaska Statute
DEC	Alaska Department of Environmental Conservation
EPA	United States Environmental Protection Agency
FRA	Federal Railroad Administration
USDA	United States Department of Agriculture

Introduction

Summary of Project

On December 17, 2010, the Alaska Department of Environmental Conservation (DEC) received a pesticide use permit application from the Alaska Railroad Corporation (ARRC) to apply herbicide for the purpose of vegetation management.

The ARRC proposes to apply AquaMaster Herbicide, Environmental Protection Agency Registration Number 524-343, with active ingredient glyphosate; and Agri-Dex, a non-ionic surfactant and spray oil.

The mixture is proposed to be applied by the licensed contractor, DeAngelo Brothers Incorporated under the direct supervision of an ARRC representative certified by the state of Alaska as a pesticide applicator. Applications will be made using low pressure and large droplet size techniques from a track mounted spray vehicle with nozzles two to three feet off the ground. Back-pack sprayer applications may also be used, with a pressure of 30-40 psi.

The application area would include the ARRC Railyard located in Fairbanks, the ARRC Railyard located in Healy, and 12 foot wide swaths along the following branch lines; 1.5 miles on the Suntrana branch line, 12.5 miles on the Eielson branch line, 6.0 miles on the airport branch line. The total proposed application area is approximately 169 acres.

Within the treatment area buffer zones have been proposed to prevent impacts to water resources. Proposed identification of these areas using yellow and blue paint in addition to the presence of an ARRC representative have been outlined by the ARRC to ensure correct application of pesticides within the Anchorage Railyard.

The ARRC states in the application that use of herbicide is necessary to control vegetation which obscures visibility along the tracks. Federal regulations require that the track be visible to allow inspection of the rails, ties, and fasteners. Vegetation also increases degradation of the track structures and creates slip, trip and fall hazards for ARRC employees performing job related activities. ARRC has been issued repeated fines by the Federal Railroad Administration (FRA) for lack of vegetation control along the railway.

Opportunities for Public Participation

The public comment period for the permit application began on January 28, 2010, when the ARRC published notice in the Fairbanks Daily News Miner. A correction was printed on February 2 and 3, 2011, and the comment period was extended to March 21, 2011 to ensure a full 45 days. Publication included information on public hearings and the opportunity to submit comments on the permit application. DEC also posted the public notice online at www.state.ak.us/dec/eh/pest and www.dec.state.ak.us/public_notices.htm.

A public hearing was held in Fairbanks on February 22, 2011. No official testimony was made at this hearing. The public comment period ended March 21, 2011. DEC received five written comments within the comment period.

Decision Process and Purpose of Responsiveness Summary

The purpose of this document is to respond to comments received during the public comment period. Detailed information regarding DEC's evaluation of the permit application, as well as scientifically-based evidence to support DEC's decision, is included in a separate Decision Document. In its decision, DEC considers whether the proposed pesticide use complies with requirements of Title 18, Chapter 90 of the Alaska Administrative Code (18 AAC 90), and whether the proposed use could result in an unreasonable adverse effect, including an unreasonable risk to human, animals, or the environment, taking into account the economic, social, and environmental costs and benefits of the use of a pesticide.

The following pages provide information about DEC's decision process and a summary of the comments that were submitted by one or more individuals during the public comment period, and DEC's response.

Pesticide Product Registration Process

Before manufacturers can sell pesticides in the United States, the Environmental Protection Agency (EPA) evaluates the pesticides thoroughly to make sure they can be used without posing harm or "unreasonable adverse effects" to human health or the environment.

Pesticide products must undergo rigorous testing and evaluation prior to registration approval. EPA scientists and analysts carefully review data to determine whether to register a pesticide product, and whether specific restrictions are necessary. EPA uses internal and external reviews involving peers and the public through a comment process when conducting these evaluations.

The scientific data requirements for product registration are very detailed. Required data includes characterizations of the pesticide's chemistry and manufacturing process; mammalian and ecotoxicology; environmental fate; residues in or on human and livestock food or feed crops; applicator, occupational, and bystander exposures; product efficacy; and incident reports. Registrants can be required to conduct and submit up to 100 or more individual scientific studies for the registration of a new pesticide.

By definition, all pesticides are toxic to some degree. The level of risk from a pesticide depends on how toxic or harmful the substance is, and the likelihood of people coming into contact with it. Uncertainty factors are built into the risk assessment. These factors create an additional margin of safety for protecting people who may be exposed to the pesticides.

In order for a pesticide to be registered, the EPA must determine that the product can be used as labeled without causing unreasonable adverse effects to humans or the environment. If risks or concerns are identified, appropriate risk mitigation measures are required. These are implemented through product label requirements, which may include reductions in application rates, restrictions to approved sites or commodities, advisory statements, implementation of specific management practices, and other restrictions or limitations designed to mitigate risk.

The proposed product label must provide the active pesticide ingredients, application directions, use restrictions, and warnings. This label information is based on the underlying scientific data and conclusions about potential hazards, exposures, and risks from use according to the label.

EPA also conducts regular reassessments of currently registered pesticides. Through this re-registration program, EPA assesses new scientific studies and information about registered products. If there is new evidence documenting unreasonable risk to human health and the environment, the allowed usage is modified and the label changed. When EPA identifies data gaps, new studies are required and reviewed.

If new information or studies show that a pesticide represents an unreasonable risk even after a change of allowable usage, EPA has the authority to cancel registration of products containing that pesticide. Whenever EPA determines there are urgent human and environmental risks from pesticide exposures that require prompt attention, EPA will take appropriate regulatory action, regardless of the registration review status of that pesticide.

EPA's extensive analyses of each pesticide product, and incorporation of new scientific data regarding safety and use of existing products, is sufficient to protect human health and the environment from unreasonable adverse effects. There is no data indicating a different impact in colder climates or environments from the proposed product. In fact, local studies show that the proposed products behave as expected in Alaska. Therefore DEC has no indication that additional restrictions are necessary with the proposed products. The EPA evaluation and registration process is sufficient to ensure no unreasonable adverse effects should be expected from the proposed use of pesticides specified in the permit application for Alaska Railroad.

Response to Comments

Comment Summary 1:

Several comments, both in support and in opposition to herbicide use, were submitted related to the availability of information about the proposed herbicides. Statements included:

- There is not enough information about the properties of the herbicide and its potential impacts.
- Herbicide use has been proven over time to be safe and efficient.

Response: Both glyphosate and Agri-Dex have been widely used for vegetation control and have a long history of safe use. They (particularly glyphosate) have been extensively studied, and their hazards are generally well established.

Prior to making a permit decision DEC does a thorough evaluation and considers the characteristics and properties of the pesticide, including potential impacts to water resources, animals and the environment, and human health, safety, and welfare.

Comment Summary 2:

The permit application was incomplete because aerial photos are not detailed enough to show the location of water bodies.

Response:

18 AAC 90.515(8)(D) requires that pesticide use permit applications identify each potentially affected surface water or marine water body within 200 feet of the treatment area. The application contained aerial photographs which depicted major water bodies. In addition, and more importantly, the railroad has proposed that a licensed applicator precede application equipment at all times to identify any water bodies and mark the appropriate buffer zones to ensure that surface water bodies are identified and the proposed 25 foot buffer is adhered to.

DEC is satisfied that the identification of water bodies in the application materials and the process for pre-marking all surface water bodies immediately prior to application ensures that all surface water bodies will be adequately identified.

Comment Summary 3:

Glyphosate may be transported to surface water or leach into ground water. Statements included:

- The local water table is high, putting ground water at risk for contamination.
- Surface water is in close proximity, and is at risk for contamination.
- The application does not show that the 25 foot buffer is adequate.

Response:

Glyphosate is approved by EPA for use directly on water. Glyphosate adsorbs strongly to soil particles, and is either taken up by plants or degraded by microorganisms. Once in the soil, it degrades relatively rapidly and is not considered to be persistent. These characteristics make it unlikely to be transported or to leach through soil to groundwater.

The railroad has proposed to apply pesticide only in specific sections of track that do not contain any known surface water bodies within 25 feet. A licensed applicator will precede application equipment at all times to identify any water bodies and mark the appropriate buffer zones to ensure that surface water bodies are identified and the buffer is adhered to.

DEC is satisfied that the identification of water bodies in the application materials and the process for pre-marking all surface water bodies immediately prior to application ensures that all surface water bodies will be adequately identified. Furthermore, DEC is satisfied that the proposed 25 foot buffer is adequate to prevent pesticide product from impacting surface water bodies.

Comment Summary 4:

Soil filtration has not been examined or tested in the specific proposed locations.

Response:

Glyphosate adsorbs strongly to soil particles and is known to be relatively immobile, regardless of soil type or properties. DEC is satisfied that the proposed pesticide will not migrate significantly from the application site.

Comment Summary 5:

Leaseholders at the Healy Railyard noted that their drinking water well is within 100 feet of the track at the Healy yard.

Response: This well was not identified in the permit application. However, DEC and the Railroad have since noted the location of this drinking water well on the aerial photos. The Railroad has agreed that no spraying will be conducted within 100 feet of the well on the leasehold. This no-spray area will be reflected in the permit.

In addition, glyphosate adsorbs strongly to soil particles, and is either taken up by plants or degraded by microorganisms. Once in the soil, it degrades relatively rapidly and is not considered to be persistent. These characteristics make it unlikely to be transported significantly or to leach through soil to groundwater. DEC is satisfied that ground water will not be impacted by the proposed pesticide application.

Comment Summary 6:

DEC should inspect the entire area before issuing the permit.

Response:

DEC is confident that the information contained in the permit application is sufficient to determine if the proposed project can be conducted safely and with no unreasonable adverse effects. DEC may inspect the treatment area at any time during the term of the permit.

Comment Summary 7:

Approval of this permit will lead to eventual use of herbicide along the entire railroad.

Response:

DEC conducts a thorough evaluation for each permit application.

Comment Summary 8:

Several comments, both in support and in opposition to herbicide use, were submitted related to the need to use herbicides. Statements included:

- There is no information showing that a vegetation problem exists at the proposed spray areas.
- Prudent use of herbicides is necessary to protect track from degradation.

Response:

A narrative explaining the need to apply pesticides was included as Attachment Fifteen of the application. This justification stated that vegetation along the railroad right-of-way must be kept clear to allow visual inspection of rail components, to ensure safe walking areas for railroad staff, to ensure visibility of signs and signals, to prevent vegetation from damaging equipment, and to prevent deterioration of track components. Vegetation control is required by Federal law, and the ARRC provided a warning letter issued by the FRA related to inadequate vegetation control (Strang, 2009). DEC considered these and other factors in making a determination that the proposed project would result in no unreasonable adverse effect.

Comment Summary 9:

Alternative methods of control would be sufficient.

Response:

A narrative explaining the need to apply pesticides was included as Attachment Fifteen of the application. This justification included a description of alternative methods for controlling vegetation that have been attempted, and documentation that these methods have proven ineffectual. The ARRC does have a significant history of attempting to manage vegetation using a number of non-chemical methods, and in spite of these efforts, vegetation management has not been adequate in the opinion of the FRA. Most railroads in the United States use herbicides as part of vegetation management. Vegetation control is required by Federal law, and the ARRC provided a warning letter issued by the FRA related to inadequate vegetation control (Strang, 2009). DEC considered these and other factors in making its determination that the activities contemplated under the permit application will result in no unreasonable adverse effect.

Comment Summary 10:

There is no indication that herbicides would resolve the vegetation problem, or whether they would just remove the above-ground portion of the plants.

Response: Glyphosate is well documented as an effective herbicide, and has a long history of successful use in similar applications. While contact pesticides kill only the foliage they are

directly applied to, glyphosate is a systemic pesticide. This type of pesticide is absorbed through foliage and is then transported throughout the rest of the plant, resulting in death of the entire plant.

Comment Summary 11:

Herbicide is only a short term solution, since seeds will remain viable and require continued treatment.

Response:

Regardless of control method, vegetation control is generally an ongoing process, and weed seeds remain active in soil for long periods.

Comment Summary 12:

The herbicide will be applied by experienced professionals.

Response: Pesticide regulations and the pesticide permit require that only licensed and certified pesticide applicators may apply pesticides under this permit.

Comment Summary 13:

Spills of this chemical are inevitable.

Response:

When carefully handled by licensed and certified professionals, pesticide spills are rare. This permit will involve relatively small quantities of pesticide. In addition, glyphosate is relatively non-toxic compared with other pesticides or transported chemicals, and is immobile in soil. If a spill were to occur, it should not lead to any acute or chronic damage to the environment.

Comment Summary 14:

There were a number of comments regarding potential impacts to human health. Statements included:

- Glyphosate is an endocrine disruptor.
- Biochemical effects of this pesticide are documented (Glyphosate-based herbicides are toxic and endocrine disruptors in human cell lines, June 2009, Gasnier, Dumont, Benachour, Clair, Chagnon, Seralini.)

Response:

There is no human exposure expected due to the proposed project, either during or after application. Pesticides will be applied close to the ground by a slow moving vehicle during periods of low wind, reducing chance for aerial drift during application. Glyphosate adsorbs strongly to soil particles, and is either taken up by plants or degraded by microorganisms, making it unavailable for dispersion after application.

Glyphosate has been extensively studied and its low toxicity has been documented across many species in multiple studies. Glyphosate works by inhibiting an enzyme that enables the plant to produce proteins necessary for plant growth and survival. The enzyme and protein production

process are found only in plants, not in animals, which limits the effects of glyphosate herbicides on organisms other than plants (USDA, 2000; Williams et al., 2000).

As described above under “Pesticide Product Registration Process”, EPA considers all known information through their registration review, which includes an extensive analysis of each pesticide product. If there is new evidence documenting unreasonable risk to human health and the environment, the allowed usage is modified and the label changed. When EPA identifies data gaps, new studies are required and reviewed. EPA also has the authority to cancel registration of products containing that pesticide.

Specific studies focusing on endocrine disruption of glyphosate are available but not numerous. Most consider specific formulations, which include additives and other ingredients not found in AquaMaster. For these studies, it is not clear if reported effects were due to glyphosate, the relatively more toxic inactive ingredients found in some formulations such as Roundup (but not in the proposed pesticide), or the formulation itself. Given the effort focused on identifying endocrine disrupting compounds in glyphosate over the past several years, the lack of evidence indicating potential endocrine disruption effects from glyphosate is strong negative evidence.

Given the current information on the toxicity of glyphosate, the likely environmental concentrations following application, and glyphosate’s lack of mobility in the environment, health effects from glyphosate are not anticipated.

Comment Summary 15:

Workers who apply the herbicides will not be adequately protected from exposure.

Response:

As explained above, glyphosate has few toxic health effects. In addition, all application of pesticides under this permit will be conducted by trained and certified pesticide applicators, and will be conducted using appropriate personal protective equipment, as required by the product label. Exposure to the pesticide is expected to be low, and there are no adverse impacts to human health are anticipated under this permit.

Comment Summary 16:

Recreational and other users and pets may be exposed to the herbicide.

Response:

As explained above, there is no human (or pet) exposure expected due to the proposed project, either during or after application. Trespassing on the railroad right-of-way is prohibited. Given glyphosate’s lack of mobility, any impacts would be limited to the immediate application areas, which include only the tracks and its right-of-way, and does not include the surrounding areas where recreational users would be present. Even immediately after spraying, only very insignificant exposures would be expected to result from walking or recreating in the spray area, if allowed. Also, as explained above, glyphosate has few toxic health effects. As a result, no adverse impacts to human health (or pets) are anticipated under this permit.

Comment Summary 17:

Leaseholders at the Healy Railyard expressed concern about potential impacts to their vegetable garden.

Response: The Railroad has agreed that no spraying will be conducted within 100 feet of the leasehold. This no-spray area will be reflected in the permit.

Pesticides will be applied close to the ground by a slow moving vehicle during periods of low wind, reducing chance for aerial drift during application.

In addition, glyphosate adsorbs strongly to soil particles, and is either taken up by plants or degraded by microorganisms. Once in the soil, it degrades relatively rapidly and is not considered to be persistent. These characteristics make it unlikely to be transported significantly or to leach through soil to groundwater.

Comment Summary 18:

Cumulative effects from use of these chemicals over several years are not addressed.

Response:

Given the lack of persistence of the chemical, no accumulation is anticipated from annual application. These products have been extensively studied, and their hazard, including chronic or long-term effects, are known to be low.

Comment Summary 19:

Herbicide will have an adverse effect on bees.

Response:

Glyphosate works by inhibiting an enzyme that enables the plant to produce proteins necessary for plant growth and survival. The enzyme and protein production process are found only in plants, not in animals, which limits the effects of glyphosate herbicides on organisms other than plants (USDA, 2000; Williams et al., 2000).

Given glyphosate's lack of mobility, any impacts would be limited to the immediate application areas, which include only the tracks and its right-of-way, and does not include the surrounding habitats.

Citations

Strang, J. April 15, 2009. Letter to Mr. Patrick K. Gamble “Re: Vegetation Management on the Alaska Railroad”.

USDA. 2000. *Glyphosate Herbicide Information Profile*. Forest Service, Pacific Southwest Region. November 17.

Williams, GM, R Kroes, and IC Munro. 2000. *Safety Evaluation and Risk Assessment of the Herbicide Roundup and Its Active Ingredient, Glyphosate, for Humans*. *Regulatory Toxicology and Pharmacology*. 31: 117-165.

Gasnier, Dumont, Benachour, Clair, Chagnon, and Seralini. 2009. Glyphosate-based herbicides are toxic and endocrine disruptors in human cell lines. *Toxicology*. 262(3):184-91.