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File Code: 1950 **Date:** April 15, 2013
Route To:

Subject: Supplemental Information Report- South Fork Flathead Watershed, Westslope Cutthroat Trout Conservation Program

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Introduction

The Council of Environmental Quality regulations for implementing the National Environmental Policy Act at 40 CFR 1502.9© (1) require the agency to prepare a supplement to either a draft or final Environmental Impact Statement (EIS) if:

(i) The agency makes substantial changes in the proposed action that are relevant to the environmental concerns; or

(ii) There are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts.

In addition, Forest Service Handbook 1909.15 Section 18.1 further defines the procedures for complying with 40 CFR 1502.9. The selected alternative as described in the South Fork Flathead Watershed, Westslope Cutthroat Trout Conservation Program EIS has changed during implementation. The following Supplement to the Project Record documents the analysis which will form the basis of the decision concerning whether or not a supplement is needed to the Final EIS.

Background

The ROD for the South Fork Flathead Watershed, Westslope Cutthroat Trout Conservation Program EIS was signed in April 2006. Alternative B was selected which authorized the use of piscicides (pesticides that target fish) within several lakes in the Bob Marshall Wilderness for the purpose of eliminating hybrid trout populations and the short term use of aircraft, outboard motors, pumps, and mixers within the Bob Marshall Wilderness and Jewel Basin Hiking Area to transport equipment, materials and personnel needed to accomplish the goals of the project.

The Forest Service is a cooperating agency for this project and has jurisdiction and responsibility for the use and management of National Forest System lands, including the Bob Marshall Wilderness and Jewel Basin Hiking Area, all of which occur on the Flathead National Forest. For this project, my decision is related to the application of registered and approved fish toxicants in the Bob Marshall Wilderness with the assistance of motorized equipment/mechanized transport in the Bob Marshall Wilderness and Jewel Basin Hiking Area. The authority to manage fish and wildlife populations falls under the jurisdiction of the State of Montana Fish, Wildlife and Parks.

Bonneville Power Administration is the lead Federal agency for this project. BPA is responsible for protecting, mitigating, and enhancing fish and wildlife affected by the development, operation, and management of federal hydroelectric facilities on the Columbia River and its tributaries (see Pacific Northwest Electric Power Planning and Conservation Act, 16 U.S.C. 839 et seq., Section 4(h)(10)(A)).

Montana Department Fish Wildlife, & Parks is a cooperating agency and has jurisdiction and responsibility to manage all fish and wildlife resources that occur on the state, federal, and private lands of Montana. The decision on whether or not to restock the lakes that are being treated is a decision in which MFWP has authority. They have decided that restocking the lakes with genetically pure westslope cutthroat trout will serve the best interest in meeting the project goals, maintaining established social and recreation opportunity, and minimizing socioeconomic impacts.

<u>Consideration of Changed Conditions</u>

New information has come forward since the ROD was signed in April 2006. Specifically, antimycin is no longer in production and is unavailable for purchase. The use of rotenone and its effects were analyzed in the EIS outside of the wilderness; however the effects of rotenone were not analyzed for Lena and Koessler Lakes which are located within the Bob Marshall Wilderness. Lena Lake is scheduled for treatment in September 2013 and Koessler Lake is scheduled for treatment in Fall 2014.

Westslope Cutthroat Trout EIS Proposed actions with Supplemental Information

The Proposed Action is similar to that described and analyzed in the Westslope Cutthroat Trout EIS of 2006, supplemental actions that would differ are the switch from antimycin to rotenone in Lena and Koessler Lakes. The delivery method that was analyzed in the EIS will deviate due to the increased volume of rotenone and safety concerns associated with increased pack stock use. Helicopter will be used to deliver rotenone to Lena and Koessler Lakes rather than pack stock as originally proposed. Pack stock will be used to pack in all remaining supplies as to reduce the number of required flights.

Environmental Consequences

This section discusses the environmental effects of changing from antimycin to rotenone on various resources and other considerations.

Changes in use of piscicides: In 2007, the EPA completed reregistration for antimycin and rotenone and licensed both products for use in piscicidal applications. Currently, there are three manufacturing-use product registrants for rotenone; however, Fintrol (Aquabiotics Corp.) is the only registered antimycin product. In the past, there have been problems with variable toxicity levels among batches of Fintrol and, currently, Aquabiotics Corp. is no longer manufacturing Fintrol.

Antimycin was selected because certain physical properties of antimycin allow it to be more easily used in a manner consistent with traditional wilderness values. For example, the volume of antimycin needed is much less (a factor of 3-4) than that for rotenone and, as such, can more easily be transported to remote wilderness areas by pack stock. Additionally, under natural conditions antimycin detoxifies more rapidly than rotenone. This property makes it an attractive tool in situations where a lake population is targeted for eradication and downstream populations are not. Rapid neutralization also greatly reduces the length of time that motor-powered detoxification stations need to be operated. Finally, the chances of achieving a complete fish kill with a single treatment may be greater with antimycin than with rotenone. Antimycin is usually not detected by fish, making it less likely that fish will survive by seeking groundwater upwelling or spring areas during treatments, which sometimes occurs with rotenone. Rotenone was used in Necklace Chain of Lakes in 2011 and Lick Lake in 2012 and a 100% was achieved.

Piscicide Background: Rotenone is a naturally occurring substance derived from roots of certain tropical plants in the Leguminosae (bean) family; antimycin is a chemical structure isolated from the bacteria *Streptomyces*. Both products interfere with mitochondrial electron transport and are potent inhibitors of aerobic respiration in fishes and other gill-bearing animals. In a comparison of antimycin A and rotenone, rotenone has to be applied at a relatively higher dose (parts per million [ppm] vs. parts per billion [ppb]), has longer degradation time when not detoxified by potassium or sodium permanganate, and can be detected by fish (and thus evaded without proper mixing). Extensive research has been conducted by the U.S. Fish and Wildlife Service (USFWS) and the U.S. Environmental Protection Agency (EPA) on rotenone to determine the safety of rotenone use in fisheries management. The results of this research demonstrated that when rotenone is applied according to the label instructions it is an environmental and human safe product (USEPA 2006). The American Fisheries Society has published a rotenone use manual in an effort to have rotenone continue to be available for fisheries management because of rotenone's usefulness in complete eradication on non-native fish (Finlayson et al. 2000).

The proposed application of rotenone for this supplemental decision would be a 5 percent formulation of rotenone applied at a rate equal to or less than 1 ppm (<0.05 ppm pure rotenone) based on bioassays, and would be neutralized with potassium permanganate at selected downstream stations. The application methods, the mitigation and monitoring measures and the method of neutralization are the same for both antimycin and rotenone. However, research has shown that dissolved electrolytes and suspended organic matter have a major influence on the amount of potassium permanganate required to neutralize a given concentration of rotenone (Engstrom-Heg 1971, 1972). The rotenone use manual recommends using a ratio from 2:1 to 4:1 (potassium permanganate: formulated rotenone) for neutralization compared to the 1:1 ratio for antimycin (Finlayson 2000; CDFG 1994). The effectiveness of detoxification will be determined using a bioassay of live, caged fish. As with antimycin, the application of rotenone would occur under the supervision of a certified pesticide applicator and with biologists experienced in the application of both antimycin and rotenone.

Soil and Vegetation: Pack stock was originally chosen to deliver Antimycin to Lena and Koessler Lakes. The change to rotenone results in an increase of 2-5 times the number of pack animals that would be needed to deliver piscicides. A helicopter is proposed to deliver the piscicide to reduce the number of mule loads, reduce the likelihood of a pack wreck and to protect bull trout in Holland Creek. Using a Huey "H" helicopter to deliver just the rotenone rather than Montana Department Fish, Wildlife & Parks OH58 helicopter reduces the number of trips significantly, from 21 trips to 3 trips for Lena Lake for example. The equipment would be packed by stock as originally planned. The impacts to soil and vegetation would be somewhat less than originally planned due to fewer trips, however would differ slightly by lake. The trail into Lena Lake is flat and well maintained and there should be little impact to the trail. Koessler Lake has a steep trail that has had less maintenance over the years. Montana Conservation Corp will improve the trail in 2013, impacts from packing equipment into the lake will benefit from the trail maintenance.

Lake	#Mule loads in FEIS Antimycin	# Mule loads proposed Rotenone	# Mule loads for equipment if Helicopter is used for Rotenone delivery
Lena	15	56	7
Koessler	30	106	7

The number of helicopter trips for a Huey "H" to deliver piscicide would be 3 for Lena and 6 for Koessler.

The effects to soil and vegetation would not change significantly with the proposed action because the number of trips would be less than originally proposed. The effects of rotenone versus antimycin in the lakes would have no effect on soil and vegetation.

Water and Watershed:
Water Yield and Quality: There will be no change to water yield or hydrograph as analyzed. Some impacts to water quality would occur with rotenone, including longer degradation time of the chemical. As with antimycin, detoxification at temperatures below 50°F may require longer contact time between the treated water and the application of potassium permanganate. Rotenone readily binds with organic matter and is unlikely to reach groundwater (Dawson 1991). It is uncommon to find rotenone in stream sediments (CDFG 1994). Rotenone has a number of other ingredients including methyl pyrrolidone, diethylene glycol, monoethyl ether, fatty acid esters, and polyethylene glycols which help the product mix with water. A number of trace compounds have also been detected, including naphthalene, substituted benzenes, and hexanol (Fisher 2007). None of the compounds identified are considered persistent in the environment nor will they bio-accumulate. They also rapidly biodegrade, hydrolyze, and/or are broken down by sunlight. None of the constituents identified in extensive lab analysis (Fisher 2007) appear to be at concentrations that suggest human health risks through water or ingestion exposure scenarios, and none of the regulatory criteria were exceeded in estimated exposure concentrations in the study conducted for treatment of Lake Davis in California.

Wetlands, Riparian, and Aquatic Habitat and Biota: As provided in Appendix A, previous studies of the effects of antimycin and rotenone on aquatic macroinvertebrates indicates varied impacts, with some species being highly sensitive. Rotenone, based on recent human health and ecological risk assessments done by California Department of Fish and Game (GDFG) and the U.S. Forest Service (USFS) in 2004 (CDFG and USFS 2005) for various formulations of rotenone (Fisher 2007), is expected to show similar varied effects in aquatic invertebrate communities, with the reduction of certain groups of macroinvertebrates, but no long term elimination of existing taxa. Based on rapid biodegradation and/or photolysis of the constituents in rotenone, no additional ecological impacts are expected beyond those previously described for antimycin. As noted in the existing EIS, amphibians and aquatic invertebrate communities may be affected by the use of piscicides, but they also undergo natural variation in community composition due to other events such as fires and high run off.

Monitoring of treated lakes in the Jewel Basin Hiking Area since 2007 has shown re-colonization of aquatic invertebrates and amphibians within one year.

As previously analyzed there will be no effects to wetland, riparian, or aquatic habitat, other than those analyzed under Water Quality. Additional information is provided below in Appendix A specific to water quality and rotenone.

Wildlife: A Biological Assessment was submitted to U.S. Fish and Wildlife Service in 2002 and the Service concurred in May 2002 with our determination that the project is "not likely to adversely affect" the gray wolf, grizzly bear, Canada lynx, bull trout or bald eagle. No additional species have been listed since 2002 within the project area; therefore no further consultation is required. The effects of helicopter use on wildlife were assessed in the EIS and the new flights into Lena and Koessler Lakes would occur one day each as empty barrels of rotenone will be packed out. As stated in the FEIS, "it is expected that helicopter use and the level of human activity would displace most grizzly bears from the immediate vicinity of a lake during the treatment process." Displacement from the lake could occur for up to 4 days as the lake is treated, as many dead fish as possible netted and air bladders punctured to sink fish.

Impacts to other wildlife species, bald eagle, Canada Lynx, gray wolf and amphibians should be similar as described in the FEIS

Recreation and Economic Impact: Recreational fishing concerns were analyzed in the EIS. The degradation time of rotenone will not increase the length of fishing closures therefore the analysis from the EIS would not change with the use of rotenone instead of antimycin as the piscicide used for renovation. The lakes would be restocked with the same time intervals as proposed in the EIS, therefore the reduction of fishing pressure and the economic impacts that may be sustained by commercial outfitters would remain the same.

Method of Access: The method of access has changed from the FEIS in that now a helicopter will be proposed to deliver rotenone to Lena and Koessler Lakes. The change is needed due to the increase in the volume of chemical from switching to Rotenone from Antimycin. There is a concern with the amount of packstock needed to pack the needed quantity of chemical on Trail #35 along Holland Creek. This trail has a section of one-way traffic for going up in the am and down in the pm and the amount of traffic increases the likelihood of a wreck. Bull trout are present in Holland Creek and flying in Rotenone would decrease the chance of a wreck and the likelihood of chemical getting to Holland Creek and killing bull trout.

Wilderness Character: There are four qualities of wilderness character: Untrammeled, Natural, Undeveloped, and Solitude. These characters were addressed in the FEIS and of these four; solitude would be the only one to have impacts from the use of a helicopter. The impacts to solitude were addressed in the FEIS for Lick Lake and would be similar here in that visitor experience would be impacted by the helicopter flying rotenone into the lakes. Three trips are proposed for Lena Lake and six trips for Koessler Lake. The flights would be done in one day for each lake. The flights would occur in early September prior to the early season hunt and after the busy summer season as to minimize encounters with people.

Conclusions

The findings of "not likely to adversely affect" the gray wolf, grizzly bear, Canada lynx, bull trout or bald eagle remain accurate and valid for this project. Other resource determinations such as limiting the extent of soil disturbance around lakes, maintaining the wilderness character and compliance with the Wilderness Act, compliance with air and water quality acts, and consistency with the Flathead National Forest Land and Management Plan also remain valid.

Therefore, I conclude all of the effects of the changes to switch to rotenone with aerially delivery in Lena and Koessler Lakes are essentially the same as those documented in the South Fork Flathead Watershed Westslope Cutthroat Trout Conservation Program EIS and recommend that preparation of a correction, supplement, or revision to the Final EIS is not necessary and that the implementation of the activities as proposed should continue.

Reviewed and recommended by DEB MUCKLOW, District Ranger

CHIP WEBER
ForestSupervisor

APPENDIX A: Comparison of Effects to Non-Target Organisms and Human Health for Rotenone and Antimycin

from "Supplement to the Environmental Assessment for Gila Trout Restoration in the Upper West Fork Gila River, Catron County, New Mexico: Considerations for addition of rotenone to the previous NEPA decision of 2003". USDA Forest Service, Gila National Forest 2008.

Aquatic macroinvertebrates

Rotenone- After laboratory based tests, Chandler & Marking (1982), concluded that: apart from an Ostracod (*Cypridopsis sp*.), aquatic invertebrates are much more tolerant of rotenone than most fishes and amphibian larval stages. In their study the most resistant organisms exposed were a snail (*Helisoma sp.*) and the Asiatic clam (*Corbicula manilensis*) for which the LC50 96h concentrations were 50 times greater than those Marking & Bills (1976) reported for the Black bullhead (*Ictalurus melas*), one of their most resistant fishes. Sanders & Cope (1968) also conducted lab tests examining the effect of rotenone to the nymph or naiad stage of a stonefly (*Pteronarcys californica*). They found that the LC50 24h was 2,900 μg/L and the LC50 96h was 380 μg/L. These values are greater by an order of magnitude to those found by Marking & Bills (1976) for the black bullhead (*Ictalurus melas*) indicating that aquatic invertebrates are much less sensitive to rotenone than fish. Larger, later instar naiads were less susceptible to given concentrations of toxin than were smaller, earlier instars of the same species (Sanders & Cope, 1968). Field studies examining the effect of rotenone on aquatic macroinvertebrate communities have provided varied results. Whereas some workers noticed dramatic, long-term effects (Mangum & Madrigal, 1999; Binns, 1967), others observed rotenone has a negligible effect on most aquatic macroinvertebrates (Demong, 2001; Melaas, 2001). Most researchers would agree, however, that the effects of rotenone are less pronounced and more variable to macroinvertebrates than the effects of the chemical on zooplankton. Like the range of sensitivities demonstrated by various fish species to rotenone, different species of aquatic macroinvertebrates also exhibit a range of tolerances (Mangum & Madrigal, 1999; Chandler & Marking, 1982; Engstrom-Heg et al., 1978) again perhaps based on their oxygen requirements.
Invertebrates in the orders Ephemeroptera (Mayflies), Plecoptera (Stoneflies), and some members of Trichoptera (Caddisflies) are highly sensitive and have been completely eliminated by rotenone treatments in the past (Mangum & Madrigal, 1999). These sensitive species tend to be highly mobile and short life cycles, and may thus have the ability to repopulate depleted areas rapidly through dispersal and oviposition (Engstrom-Heg et al., 1978). Certain escape behaviors such as burrowing into benthos, associating with aquatic vegetation or the ability to trap air bubbles with appendages may reduce rotenone exposure to many benthic invertebrates. Of note, many studies have shown rapid population explosions of invertebrates following initial reductions in their biomass from rotenone treatment (Neves 1975, Cook and Moore 1969).

Antimycin- Reduction in abundance of certain groups of aquatic invertebrates is likely following antimycin treatments (Minckley and Mihalick, 1981). However, no invertebrate taxa are likely to be eliminated by antimycin treatments and abundance typically recovers with one to two years (Mangum1985, Mangum 1986, Jacobi 1988, Brooks and Propst 2001). Toxicity tests using antimycin found that Cladocera, Copepoda, Amphipoda, Ephemeroptera, and Trichoptera may experience marked declines in abundance following antimycin treatments and that Amphipoda are particularly sensitive (Schnick, 1974). Antimycin typically does not adversely affect Protozoa, Rotatoria, Nematoda, Nematomorpha, Annelida, Ostacoda, Decapoda, Plecoptera, Odonata, Hemiptera, Coleoptera, Diptera, Gastropoda, and Pelecypoda (Schnick 1974).

Amphibians
Rotenone- Rotenone is toxic to amphibians, but generally less toxic than to fish. Rotenone may be absorbed into both skin and respiratory membranes, but skin may prevent more of a barrier due to a greater distance for the chemical to diffuse across (Fontenot et al., 1994), and a smaller surface area relative to gill structure. Indeed, Fontenot et al. (1994) reported that amphibian larvae with gills are most sensitive to rotenone. In standard laboratory 24-hour and 96-hour aquatic rotenone toxicity tests, the LC_{50} values for tadpoles and larval amphibians have ranged between 5 μg/L and 580 μg/L (24-hour tests and 25 μg/L to 500 μg/L in 96-hour tests (Fontenot et al. 1994, Chandler 1982). The adult Northern Leopard Frog demonstrated a much greater resistance with LC_{50} concentrations ranging from 240 μg/L and 1,580 μg/L (24 hours) and 240 μg/L and 920 μg/L (96 hours). This highlights the fact that tadpoles and other larval forms of amphibians that utilize gills for respiration are just as sensitive to rotenone as fishes while adult forms, no longer having to utilize gills, have a much lower susceptibility to rotenone. Larval amphibians appear to have resistance roughly equivalent to the most tolerant fish species. Rotenone is variably toxic to amphibians, depending on their mode of respiration (i.e. gills, skin, buccopharyngeal, or lungs). Differences in sensitivity occur among taxa and lifestages. Adults that are obligatory aquatic or have high rates of cutaneous respiration are more sensitive as well.

Antimycin-Field studies of Fintrol® application found no effect on frogs or tadpoles (genera not specified) at an application rate of 10 ppb (Berger 1965, Berger 1965b, Berger 1966a, Berger 1966a). Frogs and tadpoles in these studies were exposed for an indefinite amount of time (i.e. longer than 96 hours). The field tests were conducted in ponds and Streams. Water temperatures ranged form 6°C to 21°C (43 to 70°F) and pH ranged from 7.9 to 8.8. Other field tests found no effect of 10 ppb antimycin over an indefinite period of time on Ranidae tadpoles (Gilderhus et al. 1969). Lab exposure studies found Fintrol-Concentrate to have no effect on leopard frog (R. pipiens) at concentration up to 48 ppb (Lesser 1972). However, bullfrog tadpoles were killed within 24 hours when exposed to antimycin at a concentration up to 40 ppb (Berger 1966c; Walker et al. 1964).

Mammals
Rotenone-Mammalian acute oral toxicity LD_{50} values for rotenone range from 39.5 mg/kg for female rats to 1,500 mg/kg for rabbits. For most lab mammals, rotenone is much more toxic when introduced intravenously or inhaled rather than taken orally. For example, the average oral LD_{50} for rats is 60 mg/kg compared with just 0.2 mg/kg for rotenone introduced directly into the bloodstream. Efficient breakdown of rotenone by the liver, oxidation of rotenone in the gut, and slow absorption in the stomach and intestines account for this significant difference in toxicity (Narongchai et al. 2005, Ling 2003). This explanation may also account for the significant difference in rotenone sensitivity between mammals and fishes, and not from a difference in the primary site of action between fishes and mammals (Fukami et al. 1969).
Antimycin- Extremely high levels of antimycin are required to produce toxic effects in carnivorous mammals similar to those that may occur in the project area. The oral LD_{50} for domestic dog is 5,000 mg antimycin/kg body weight. Thus, a domestic dog weighing 4.5 kg (10 lbs) would have to consume 57,900 kg (127,800 lbs) of antimycin-killed fish, using Ritter and Strong's (1966) maximum tissue concentration of 388 μg/kg. Field trials of 10 ppb antimycin treatments found no effects on raccoons.

Birds
Rotenone- Rotenone has a very low toxicity to wildfowl, and birds are extremely unlikely to be affected by 'normal' usage in fisheries management practices (Ling, 2003). Avian acute toxicity LD_{50} values range from 130mg/kg for the nestling English song sparrow (Cutcomp 1943) to

2200mg/kg for an adult mallard duck (USEPA 1988). In general, young birds are about 10 times more sensitive to rotenone poisoning (DFG 1994) and, like mammals, birds have a much-reduced tolerance to rotenone when it is introduced intravenously. Ling (2003) also examined rotenone poisoning and sublethal toxicity in birds as a result of consuming fish or even fish management baits. Ling concluded that "rotenone is slightly toxic to wildfowl, and birds are extremely unlikely to be affected by normal fisheries management programmes." For example, baits used to kill carp for management purposes have around 0.01 g of rotenone each. Ling calculated that a duck would need to consume approximately 200 baits to receive a fatal dose. It is very unlikely that birds would consume baits but they could consume fish killed by rotenone. The concentration of rotenone in poisoned fish is usually 25,000 times lower than that found in baits.

Antimycin- Vezina (1967) studied the toxicity of antimycin to mallard duck (Anas platyrhyncos) and found that ingestion of 2,900 mg/kg of antimycin was required to cause mortality of 50% of the test organisms. Using the highest residual concentration in dead trout of 338 μg/kg Reported by Ritter and Strong (1966), this translates to consumption of 7,474 kg (16,480 lbs) of dead trout. The amount of fish biomass that the treatment would generate (i.e. the total weight of all fish killed in the project area) would only be a fraction of this quantity. Field investigations found not effect on pelicans, cormorants, herons, surface-feeding ducks or diving ducks, or osprey from consumption of fish killed by antimycin (Berger et al., 1967; Gilderhus et al.,1969). Berger and Lennon (1967) found no effect on osprey, gulls, or terns exposed to antimycin in dead fish and water after antimycin treatment.

Human Health

Rotenone- Millions of dollars have been spent on research to determine the safety of rotenone before approval of use from the U.S. Environmental Protection Agency. Much of this research has been directed toward potential effects on public health. This research has established that rotenone does not cause birth defects (Hazelton Raltech Laboratories 1982), reproductive dysfunction (Spencer and Sing 1982), gene mutations (Biotech Research 1981;Goethem et al. 1981; NAS 1983), or cancer (USEPA 1981, Tisdel 1985). When used according to label instructions for the control of fish, rotenone poses little, if any, hazard to public health. The USEPA has concluded that the use of rotenone for fish control does not present a risk of unreasonable adverse effects to humans and the environment.

Antimycin- Antimycin is an organic compound, discovered in 1945, that was isolated form Streptomyces griseus at the Department of Plant Pathology at the University of Wisconsin (Leben and Keitt 1948, Dunshee et al. 1949, Lehninger 1979). Degredation compounds of antimycin include blatmycic acid and antimycin lactone. These degredation compounds have very low toxicity for either fish or mammals (Herr et al. 1967). Direct ingestion of normal quantities of water containing 10 ppb anticycin during the peak of the treatment would have no effect on humans or livestock. Oral LD_{50} values for mammals range from 1.0 mg antimycin/kg body weight for lambs to 55 mg antimycin/kg body weight for mice (Herr et al.,1967). Oral LD_{50} is defined as the amount of antimycin that, when administered orally over a specified period of time, is expected to cause death of 50% of the group of test animals. For example, if a person weighing 70 kg (154.3 lbs) drank 1.5 liters (0.39 gallons) from a stream during treatment, he would ingest 15μg of antimycin, or 0.00021 mg antimycin/kg body weight. A 70 kg person would have to drink 12,600 liters (3,329 gallons) of treated water during the six-hour period that antimycin is active in the project area to ingest the amount required to achieve the LD50 for the most sensitive mammal tested (Guinea pig, LD_{50} = 1.8 mg antimycin/kg body weight). This translates to a water consumption rate of about 2,100 liters (555 gallons) per hour, which is physically impossible. Similarly, a 363 kg (800 lbs) horse would have to ingest about 65,300 liters (17,250 gallons) of treated water to reach the oral LD_{50} value of 1.8 mg antimycin/kg body weight for Guinea pigs. Numerous studies have been conducted on the effects of antimycin at the cellular level. None have reported any carcinogenic effects.

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