

DOE-ID NEPA CX DETERMINATION

Idaho National Laboratory

SECTION A. Project Title: National Oceanic and Atmospheric Administration (NOAA) Project Sagebrush Atmospheric Tracer Dispersion Study Revision 1

SECTION B. Project Description:

This revision of this EC is being prepared to provide estimated quantities of tracer emissions to account for greenhouse gas (GHG) emissions and to clarify that the National Oceanic and Atmospheric Administration (NOAA) would report GHG emissions as required by Executive Order (EO) 13514.

The National Oceanic and Atmospheric Administration's (NOAA) Atmospheric Tracer Dispersion Study, formally called Project Sagebrush, would be conducted under the umbrella of the NOAA/Idaho National Laboratory (INL) Meteorological Research Partnership Memorandum of Agreement (MOA) between NOAA and the Idaho Office of the U.S. Department of Energy (DOE-ID). This MOA permits the sharing of resources and information that benefit both agencies. The purpose of this study is to enhance the accuracy of atmospheric transport and diffusion models used by both agencies to determine the dispersion characteristics of radioactive materials and toxic gases released into the atmosphere.

The project would use the previously established Grid III tracer dispersion test area on the INL Site located north of the Idaho Nuclear Technology and Engineering Center and east of the Advanced Test Reactor Complex. The Grid III test facility was established in the mid-1960s and has been occasionally used since then. The Grid III test facility has established tracer sampling arcs with access roads extending 50 to 3200 m from the center of the release point. The local terrain has only minor elevation variations, and the vegetation is a mixture of sagebrush and grasses. Typically, the wind blows along the axis of the Snake River Plain (northeast-southwest), so the upwind fetch to the tracer facility is over open terrain. Existing meteorological equipment at Grid III include instrumented 100 and 200 ft. meteorological towers, a radar wind profiler with radio acoustic sounding system (RASS), a sodar, and a surface momentum and energy flux station. All field deployments would use existing permanent facilities and roads of the Grid III test area. No additional areas would be utilized.

The main objectives of the project are to:

1. Improve the understanding of short-range atmospheric dispersion from continuous releases in nearly flat terrain using modern meteorological sensors and tracer technology
2. Collect simultaneous measurements of both mean tracer concentrations and tracer concentration fluctuations
3. Assess the overall variability of individual tracer studies by comparing the new tracer results with those from classical tracer studies
4. Develop improved parameterizations linking plume dimensions to observed boundary-layer structure and turbulence
5. Develop improved atmospheric dispersion models for both mean concentrations and concentration fluctuations
6. Provide new high quality data sets for testing and validating existing atmospheric dispersion models
7. Make measurements incorporating a broad range of atmospheric stability conditions from very unstable to very stable in different seasons
8. Directly measure the full extent of the plume at as many atmospheric stabilities and downwind distances as practicable.

The following different release configurations would be used over the series of experiments to address specific atmospheric dispersion issues:

- A continuous point source at the center of the established tracer arcs would be used to primarily study horizontal dispersion and concentration fluctuations but also include some limited measurements of vertical dispersion.
- A continuous extended line source would be placed at various distances upwind of the 64 m tower to study vertical dispersion. A line source would maximize the chances of the plume striking the tower. Balloons may also be used to measure vertical dispersion beyond the height of the tower.
- Simultaneous point sources both at the surface and aloft would be used to directly study the effects of source height on surface concentrations. Each source would use a different tracer.
- Area sources would be used as a hybrid source to study horizontal dispersion while increasing the odds of obtaining vertical dispersion information at fixed locations downwind. The concentration fluctuations in area sources would differ from those in point sources.

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During tracer releases, extensive measurements of atmospheric boundary-layer structure, stability, and turbulence would be collected using sophisticated modern meteorological equipment. Bag samplers would be programmed and deployed to collect sequential time-average tracer concentrations. If each bag samples for ten minutes, for example, the 12 bags per sampler would provide mean concentrations with averaging times between ten minutes and two hours. Continuous analyzers would also be deployed to measure concentration fluctuations near the plume centerline. These fluctuations are important for determining the toxic load of various chemical compounds.

Tracer samples will be collected on the existing arc roads and on portable towers set up along the existing arc roads that extent to a maximum height of 100 ft. Up to 10 of these portable towers may be installed for vertical sampling and will be removed at the end of the study. Tethered balloons located at various places on the existing arc roads may also be used to collect vertical tracer samples. Bag samplers would be placed along the established 50, 100, 200, 400, 800, 1000, 1600, and 3200 arcs that extend both to the northeast and southwest of the center of the grid. Bag samplers are powered with their own internal D-size battery. The samplers would be collected at the end of each test day and the samples would be analyzed in the NOAA tracer analysis facility in Idaho Falls. In addition, up to 10 real-time tracer analyzers would be deployed strategically on the sampling arc roads and collocated with bag samplers. These would be housed in vehicles and on lab carts and powered by car batteries or small portable generators. These analyzers would be installed and removed each test day. Only existing two-track roads would be used for deployment, servicing, and retrieval of the bag and real-time samplers. No disturbance of vegetation or cultural resources is anticipated.

This study is anticipated to last approximately 5 years and consist of occasional 2-3 week long field deployments when funding permits and when weather conditions are conducive to proper test conditions. At this time we envision 1 or 2 deployments in a calendar year, again depending on availability of funding. Each of these deployments will be identified consecutively as Phase 1, Phase 2, etc. All field deployments would be coordinated with DOE-ID. Phase 1 has been fully planned and is expected to occur during the last part of September and the first part of October of 2013. Additional phases have not been planned in complete detail but have been developed sufficiently to determine probable tracer release amounts. Phase 1 is described in detail below along with the general concepts of follow-on phases.

The atmospheric tracers sulfur hexafluoride (SF_6) and/or perfluorocarbons (PFCs) would be released during each test to create the required tracer plume or plumes, depending on the study design. A majority of the tracer releases will consist only of SF_6 . A few tests may include releasing simultaneously up to as many as four tracers. Sulfur hexafluoride is a non-toxic, odorless, colorless, tasteless gas at standard atmospheric pressures and temperatures. It is an asphyxiant in quantities above 1,000 parts per million (ppm). However, the concentrations sampled in this study would be several orders of magnitude below 1,000 ppm. PFCs behave similarly to SF_6 but are liquids at room temperatures and must be heated to vaporize the liquid into a gas for release into the atmosphere. PFCs therefore are not asphyxiants. The specific PFCs that might be used are fluorinated cyclobutanes and hexanes: PDCB (hexafluoro-bis(trifluoromethyl)cyclobutane), PMCH (Perfluoromethylcyclohexane), and PDCH (Perfluoro-1,3-dimethylcyclohexane). Both types of atmospheric tracers (SF_6 and PFCs) have been used successfully for many years in many tracer studies using approved NEPA Categorical Exclusions. Some of the studies have been conducted in densely populated areas such as Midtown Manhattan, all of which have been successfully completed without any safety concerns.

It is widely recognized that SF_6 and PFCs are greenhouse gases. Sulfur hexafluoride is one of the most potent of all greenhouse gases because of its atmospheric lifetime and relatively high radiative efficiency. The Intergovernmental Panel on Climate Change (IPCC) (2007) places its global warming potential (GWP) at 22,800 relative to CO_2 over a 100-year time horizon. However, because of its relatively low emission to the atmosphere compared with CO_2 , the overall contribution of SF_6 to global warming is less than 0.04%. The GWP of the PFCs that will be released are not precisely known but are estimated to be much less than SF_6 .

Executive Order 13514 includes the requirement for federal agencies to report their annual emissions of SF_6 along with other greenhouse gas emissions. NOAA accepts the responsibility specified in EO 13514 to report the actual amounts SF_6 and PFCs released to the atmosphere as tracers. DOE-ID should not report these emissions to avoid double-counting.

Since SF_6 has such a high GWP, the question arises: why does SF_6 need to be used for this study? The answer is simple: NOAA does not have the capability to measure other compounds with real-time analyzers. NOAA has considered undertaking the research to needed to determine an appropriate substitute for SF_6 but initial cost estimates for this effort range up to several hundred thousand dollars. There is no NOAA funding that is available for this purpose. As mentioned earlier, SF_6 has been a very reliable tracer for many years because of its relative low cost, detectability at low concentrations (resulting, incidentally, in the need to release less material than would be required of tracers that are not detectable at concentrations in the parts per trillion), and detectability using specially-built real-time analyzers, among other desirable characteristics. An Internet check for the use of alternate tracers reveals that there are no other tracers being used for the type of dispersion study being proposed here. NOAA will minimize its atmospheric release of SF_6 and PFCs to the smallest amount necessary to obtain satisfactory tracer detector responses.

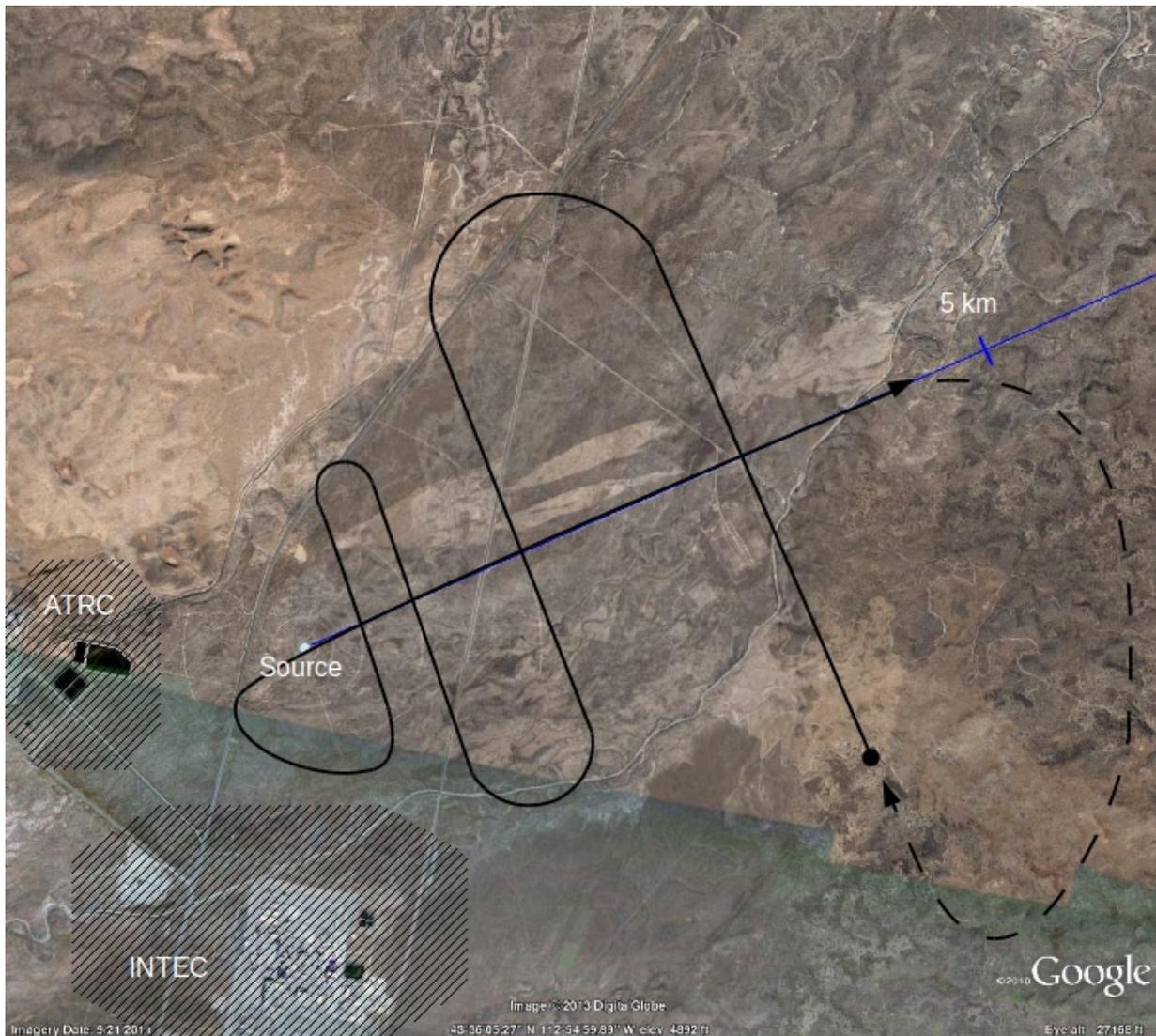
Specific plans for Phase 1, to be conducted in October 2013, call for the use of SF_6 only. Phase 1 plans also include the use of an aircraft to sample the vertical distribution of the tracer during this phase only. Phase 1 will be conducted when the atmosphere is unstable, which will cause the tracer material to disperse very quickly. Modeling of tracer dispersion under these conditions indicates that SF_6 will need to be released at a rate of 10 g s^{-1} to provide sufficient concentrations for measurement by the aircraft. Of the estimated 7,300 metric tons of SF_6 produced annually, NOAA will use approximately 450 kg in Phase 1, which is 0.0062% of the total.

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The tracer sampling aircraft is being provided without cost by the University of Tennessee Space Institute. The Cessna 210 aircraft would fly a modified race track pattern at several altitudes while attempting to fly through the tracer plume. Minimum flight altitude would be 300 ft. An example of the flight pattern is shown in Figure 1.

Figure 1. Proposed aircraft tracer sampling flight pattern.



Plans for successive phases in following years call for conducting the experiments in stable atmospheric conditions. Modeling of tracer dispersion under these conditions indicates that SF₆ will need to be released at a rate of approximately 1 g s⁻¹ to provide sufficient concentrations for the ground samplers. This release rate is one-tenth the release rate called for in Phase 1. The total amount of SF₆ released in a given year in succeeding phases will be approximately 45 kg, which is 0.00062% of the total estimated annual production. Additional study phases will also include the simultaneous release of PFCs together with SF₆. PFCs will be released at the rate of approximately 2 g s⁻¹, which will total approximately 90 kg annually for each PFC. The maximum total PFCs released in any one year would be 270 kg, but it is anticipated this would happen only once. Most of the follow-on phases would consist of only 1 PFC and SF₆. The largest release of tracer gases is planned for Phase 1.

SECTION C. Environmental Aspects or Potential Sources of Impact

Air Emissions - Fugitive dust may be generated traveling to and from the study locations on existing gravel roads and two track trails. All reasonable precautions will be taken to prevent particulate from becoming airborne. If dust control methods are required, the date, time, location, and amount/type of suppressant used shall be recorded in the project records. These records will be used to demonstrate compliance with the INL Title V Air Permit. Personnel bringing non-INL owned air emission sources onto the INL (e.g., internal combustion equipment) are responsible for determining if any permitting requirements apply to that equipment and, if necessary, obtaining the permit and maintaining an on-site file of the documentation. This requirement does not apply to mobile equipment (an engine that is connected to a drive train to propel a vehicle).

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The atmospheric tracers sulfur hexafluoride, hexafluoro-bis(trifluoromethyl)cyclobutane, Perfluoromethylcyclohexane, and Perfluoro-1,3-dimethylcyclohexane would be released. SF₆ will be the only tracer gas released in Phase 1 with a maximum total release of up to 450 kg. Only in Phase 1 will the total amount be so high in order to support tracer measurements by the aircraft. In all but one succeeding phases of the study, 45 kg and 90 kg of SF₆ and perfluorocarbons, respectively, will be released. In one succeeding phase, up to 45 kg of SF₆ and 270 kg of perfluorocarbons will be released.

Disturbing Cultural or Biological Resources - The proposed action has the potential to disturb Cultural or Biological resources. Brenda Pace (526-0916) with the INL Cultural Resource Management (CRM) office should be contacted early in the planning process to arrange for a cultural resource review and for identification of any potential project restrictions due to cultural resource requirements. Jackie Hafra (525-9358) with Gonzales-Stoller Surveillance should be contacted early in the planning process to arrange for a biological resource review and for identification of any potential project restrictions due to biological/ecological requirements. If objects of potential archaeological or historical significance (e.g., arrowheads, flints, bones, etc.) are encountered during project activities, personnel would discontinue disturbance in the area and contact the CRM office [Brenda Pace (526-0916)].

Generating and Managing Waste - Project activities are expected to generate only minor amounts of uncontaminated industrial waste. The small amount of waste that may be generated could include uncontaminated garbage such as plastic water bottles or other miscellaneous waste. All waste would be disposed of in appropriate recycling containers at INL facilities or in the INL Landfill Complex through Waste Generator Services (WGS). Project personnel would incorporate waste minimization measures by using reusable materials where practical.

Using, Reusing and Conserving Natural Resources - Fuel would be used in vehicles while traveling to and from the study locations. Project personnel would carpool and/or use alternative fuel vehicles when appropriate. All applicable waste would be diverted from disposal in the landfill when possible. Project personnel would incorporate waste minimization and recycling where practical. Fuel would also be used in small portable generators where necessary, but this will be kept to a minimum.

<p>SECTION D. Determine the Recommended Level of Environmental Review (or Documentation) and Reference(s): Identify the applicable categorical exclusion from 10 CFR 1021, Appendix B, give the appropriate justification, and the approval date.</p>
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For Categorical Exclusions (CXs) the proposed action must not: 1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, or similar requirements of DOE or Executive Orders; 2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment or facilities; 3) disturb hazardous substances, pollutants, contaminants, or CERCLA-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; 4) have the potential to cause significant impacts on environmentally sensitive resources (see 10 CFR 1021). In addition, no extraordinary circumstances related to the proposal exist which would affect the significance of the action, and the action is not "connected" nor "related" (40 CFR 1508.25(a)(1) and (2), respectively) to other actions with potentially or cumulatively significant impacts.

References: 10 CFR 1021, Appendix B to Subpart D item B3.1, "Site characterization and environmental monitoring"

Justification: The proposed action is consistent with 10 CFR 1021, Appendix B to Subpart D categorical exclusion B3.1, "Site characterization and environmental monitoring (including, but not limited to, siting, construction, modification, operation, and dismantlement and removal or otherwise proper closure (such as of a well) of characterization and monitoring devices, and siting, construction, and associated operation of a small-scale laboratory building or renovation of a room in an existing building for sample analysis). Such activities would be designed in conformance with applicable requirements and use best management practices to limit the potential effects of any resultant ground disturbance. Covered activities include, but are not limited to, site characterization and environmental monitoring under CERCLA and RCRA. (This class of actions excludes activities in aquatic environment. Specific activities include, but are not limited to: (h) Installation and operation of meteorological towers and associated activities (such as assessment of potential wind energy resources)."

Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act) Yes No

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer on: 9/13/2013