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DOE's HAZMAT SPILL CENTER AT THE NEVADA TEST SITE ACTIVITIES AND CAPABILITIES

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DISCLAIMER

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1.0 INTRODUCTION

The U.S. Department of Energy (DOE) owns and operates the Hazardous Materials (HAZMAT) Spill Center (HSC) as a research and demonstration facility available on a user-fee basis to private and public sector test and training sponsors concerned with safety aspects of hazardous materials. Though initially designed to accommodate large liquefied natural gas releasers, the HSC has accommodated hazardous materials training and safety-related testing of most chemicals in commercial use. The HSC is located at DOE's Nevada Test Site (NTS) near Mercury, Nevada.

The HSC provides a unique opportunity for industry and other users to conduct hazardous materials testing and training. This is the only facility of its kind for either large- or small-scale testing of hazardous and toxic fluids under controlled conditions. It is ideally suited for test sponsors to develop verified data on release prevention, mitigation, cleanup, and environmental effects of toxic and hazardous materials. The facility site also supports structured training for hazardous spills, mitigation, and cleanup. Since 1986, the HSC has been utilized for releases to evaluate the patterns of dispersion, mitigation techniques, and combustion characteristics of select materials. Use of the facility can also aid users in developing emergency planning under U.S. Public Law 99-499; the Superfund Amendments and Reauthorization Act of 1986 (SARA); and other federal, state, and international laws and regulations. The HSC Program is managed by the DOE, Office of Emergency Management, Nonproliferation and National Security, with the support and assistance of other divisions of DOE and the U.S. government.

2.0 FACILITY CHARACTERISTICS

The HSC (originally known as the Liquefied Gaseous Fuels Spill Test Facility) is located on Frenchman Flat, a natural geological basin located at the southeast corner of the NTS, 74 miles northwest of Las Vegas, Nevada. DOE elected to use the Frenchman Flat area because it is remote and uniquely suited in topography, ecology, and meteorology for the testing of hazardous and toxic materials. The

winds are relatively consistent and predictable from April through October. In addition, the area downwind is federally managed land which is essentially unpopulated with access controlled by the U.S. government. The HSC became fully operational in 1986 and is available for use by industry and governments on a user-fee basis.

The HSC Program is an extension of efforts begun in 1976 by the U.S. Energy Research and Development Administration, the predecessor agency to the DOE, to study the safety aspects of liquefied gaseous fuels. In 1982, Congress provided funding to build a permanent spill test facility for testing liquefied fuels and other hazardous and toxic gaseous liquids.

The HSC can accommodate both large- and small-scale testing. The facility has been designed to reproduce the size and rate of accidental releases envisioned to be encountered in industrial application of the actual materials of concern. The effects of cryogenic temperatures and aerosols on dispersion can be directly observed. This allows the facility to be used for the validation of models; for the observation and measurement of new and/or important phenomena; and for the design and evaluation of protective measures such as water curtains, vapor barriers, and foams.

The HSC complex consists of four test areas including the "tank farm," the spill pads, and the test cell and elevated stacks areas. Located approximately one mile from the test areas is the control center. Included within the HSC complex are electronics shops, maintenance shops, a conference facility, and storage buildings.

Test Area 1, the "Tank Farm," has the capability for releasing large volumes of cryogenic and non-cryogenic liquids at rapid rates through a 152-meter (500-foot) spill line to the experimental area supporting the tank farm.

Test Area 2 is characterized by the presence of the "wind tunnel" measuring 2.5 m by 5 m by 29 m (8 ft by 16 ft by 96 ft). The wind tunnel is not the conventional design used for typical aerodynamic studies, but rather provides controlled environmental conditions to allow for mixing and mitigation technology research. The wind tunnel design has also been utilized for controlled plume releases. The wind tunnel is designed so that test sponsors are able to vary intake air temperature, humidity, release rates, and release volumes.

Two spill pads are located in Test Area 3 and are available for use to perform contained open air releases of volumes of 0.2 m^3 to 38 m^3 (50 to 1,000 gallons). This area has been mainly used by test sponsors for determining mitigation strategies for episodic releases of dense gaseous fluids and to provide HAZMAT training.

Test Area 4 contains a test cell within which materials and instrumentation can be exposed to a known, high concentration of a test material in a confined space. The test cell was first constructed to test the integrity of totally encapsulating chemical protective (TECP) suits. Test Area 4 also contains two elevated release stacks measuring 0.4 m by 22 m (1.3 ft by 72 ft) and 0.56 m by 15.2 m (1.8 ft by 50 ft), which can be used to simulate emissions from industrial facilities. Both release stacks and the wind tunnel have multiple independently variable release source capabilities.

The HSC is equipped with a remote Command, Control, and Date Acquisition System (CCDAS). The CCDAS building, located approximately one mile and upwind from the spill site, is the overall control center for the HSC. The computer-based system provides local and remote control for the large-scale test process system, and provides control of and data recording from the Data Acquisition System (DAS) which is adaptable for a full range of testing.

Mercury, Nevada, is the base camp of the NTS and is allocated approximately 15 miles from the HSC. It is a small government town providing housing, food, and services for employees, customers, and DOE visitors and guests. Emergency medical care is available at Mercury, 24 hours a day. Facility fire protection service is provided from the Mercury fire station.

3.0 HSC SERVICES

There are four categories of services provided by the HSC:

- Emergency response training
- Sensor research, development, and testing, including hardened sensor design, testing, and demonstration
- Dispersion, flow, and spill testing, including model validation, mitigation technologies testing, and real-time data collection
- Emergency response testing, including procedures development, and protective equipment and materials testing

3.1 Emergency Response Training

The HSC facilities are used for live releases of hazardous materials as part of advanced hazardous materials training programs. The HSC air permit also allows for live materials to be burned, thereby providing first responders and firefighters with hands-on-training not available anywhere else in the nation. The capabilities

of the HSC can be expanded to include advanced training for a variety of disaster responses:

- Incidents involving weapons of mass destruction, including chemical and biological weapons
- Industrial accidents, including large-scale chemical fires and accidents, and explosions
- Natural disasters, including large-scale seismic events, fires, hurricanes, major floods, and disease outbreak.

Advanced programs can be developed and implemented for a variety of first-responders, including firefighters, police, medical personnel, news media, and facility operators.

3.2 Advanced Sensor Research, Development, and Testing

The HSC, in association with U.S. Department of Energy, Nevada Operations Office's Remote Sensing Laboratory, Special Technologies Laboratory, and the DOE national laboratories, has both the facilities and the experience to perform advanced remote detector design and testing. These services include detector design, testing, evaluation (e.g., sensitivity, configuration, response times, and accuracy) and demonstration. The HSC can provide support in experiment setup and demobilization, as well as data collection. The HSC's unique capabilities allow customers to field-test detectors with live hazardous material releases to assure that they will function as required in the operating environment.

3.3 Dispersion, Flow, and Spill Testing

As a uniquely permitted test and demonstration site, specifically designated in the Clean Air Act § 103, the HSC offers a world-class test and demonstration location for hazardous materials plume-dispersion testing. Because of the broad range of experience, the HSC's staff is uniquely qualified to assist in the safe performance of dispersion experiments with hazardous materials. These experiments could include research in chemical or vapor-cloud dispersion characteristics under various conditions, as well as the validation of mathematical models or computer simulations. The HSC has the capability to perform complex data collection for analysis by the experiment sponsor or by the HSC staff.

A wide variety of flow and spill experiments can be performed because the HSC has the ability to release live hazardous material. In addition, the HSC has on-site mechanical equipment and can modify the facility on a case-by-case basis. These

experiments can be used for verification of flow models and spill effects, and for testing of mitigation technologies. The HSC's wind tunnel can also be used as an environmental test chamber to study the effects of a variety of meteorological conditions on a flow/spill experiment. The HSC provides not only the facilities, but also the experienced staff for remote command and control and data collection

3.4 Emergency Response Testing

The HSC has the capability to provide testing of emergency response materials, equipment, and procedures under actual use conditions with live materials. This is an important service to manufacturers, who typically provide equipment or material effectiveness information with their product. The HSC can provide independent testing of protective equipment effectiveness under actual hazardous conditions, and of equipment configurations rather than subcomponent testing under laboratory conditions.

4.0 RELEASE GUIDELINES

The guiding principles for HSC operating procedures are as follows:

- No materials will be considered for testing that have cumulative, long-term persistence in the environment, unless the proponent of the tests of such material can show that the materials will be completely contained, neutralized, or cleaned up as part of the test plan.

- Large tests will generally be limited to releases of 15 minutes or less.

- Sufficient time will be allowed between releases to permit recovery of natural resources.

The full-scale release of hazardous materials for testing and demonstration purposes is the basic function performed at the HSC. The DOE's Environmental Assessment for Hazardous Materials Testing at the Liquefied Gaseous Fuels Spill Test Facility (DOE/EA-0864, dated November 1994) permits the release of chemical materials based on allowable potential health impacts at specific distances from the release point.

The allowable potential health impacts at specific distances are summarized below:

- Zone 1 is a sector from the spill point to 5 km downwind. Zone 1 may contain lethal concentrations for exposures of less than 15 minutes to humans and wildlife. The lowest lethal concentration found in scientific toxicological studies is the maximum allowed concentration at the downwind boundary of Zone 1.

- Zone II is a sector from 5 km to 10 km downwind and may contain concentrations for which an exposure of less than 15 minutes will have a low probability of mortality, although it may cause respiratory damage to humans or animals. Vegetation may be affected, but the degree of damage is species- and test material-specific. The occupational exposure standard immediately dangerous to life and health (IDLH) is the maximum allowed concentration at the downwind boundary of Zone II.

- Zone III is a sector from the 10 km to the 4,400-foot elevation contour in the hills surrounding the spill point, generally a distance of 12 to 25 km downwind. Zone III may contain concentrations which may cause mild and reversible respiratory tract irritation on wildlife and minor and reversible effects on vegetation. The occupational exposure standard short term exposure limit (STEL) is the maximum allowed concentration at the downwind boundary of Zone III.

5.0 DOING BUSINESS WITH DOE AND THE HSC

A major purpose of the site and the HSC is to provide a user-supported (private and public sector-funded) research development, demonstration, and mitigation operations and training area. Individual corporations could also participate through trade association user groups, consortia or on an individual basis. Similarly, state, local, and/or foreign governments may participate singly or in consortia.

The sponsoring user group and/or individual user coordinates with DOE, plans the type of research, testing, training, development or demonstration, and provides the necessary resources to perform the tests. Test sponsors provide for the cost of operating the facility. There are two categories of costs for which test sponsors are responsible:

- Materials, specialized equipment, or services directly required by the test sponsor; and

- Services or materials provided by DOE or its contractors for the performance of tests or training.

DOE provides users with the option to employ their own resources, such as equipment and/or personnel for experiment design, set-up, and documentation. DOE and contractor staff operating the HSC are well qualified to assist users with their experiments providing assistance in design, remote detection, and analytical services. Users provide and transport substances to be tested. There are some areas, such as security, where services will be supplied by DOE, and DOE must give prior approval to the use of private equipment and personnel at the site. DOE/NV or the HSC can be contacted for more details on these arrangements.

Due to the hazardous or volatile nature of the materials being tested, a fair and reasonable allocation of risks and responsibilities associated with their testing is essential. Situations giving rise to liability for damages or injuries may occur during transport of materials to the HSC and as a result of the conduct of tests. The DOE expects that whereas the sponsor is supplying the material to be tested, that sponsor will undertake full responsibility for the safe and proper shipment of the material to the storage point at the HSC. Further, the sponsor will be expected to assume full responsibility for any damage or injury to its property or personnel that may be present on the NTS in connection with a test. Additional measures may be required on a case-by-case basis. The particular risks associated with a given material or test procedure may dictate the DOE's also requiring the sponsor to secure appropriate insurance to cover possible damage or injury to U.S. government or U.S. government contractor equipment and personnel, and to the public generally.

6.0 FUTURE CAPABILITIES

DOE is currently evaluating options to expand the capabilities at the HSC. An Advanced HAZMAT Testing and Training Center is the focus of this evaluation. The facility is envisioned to contain a number of HAZMAT release scenarios such as railcars, tankers, small cylinders, and packaged shipments. These scenarios will be designed to release air, water and "live" material providing advanced "hands-on" testing and training opportunities that are unique within the United States. The center will also include classroom, dress out, and personal hygiene facilities. With the HSC's permits allowing for hydrocarbon burns, the facility will include industrial facility incident training and technology testing.