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Effective Date: 02/01/11

WP 15-SE.01
Revision 2

Science Experiment Support Plan

Cognizant Section: Operations Support

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CHANGE HISTORY SUMMARY

REVISION NUMBER	DATE ISSUED	DESCRIPTION OF CHANGES
1	09/13/10	Changed wording in Step 1.1 from physics experiments to several science activities Changed wording in Step 1.3 to include "other groups" for providing support Changed wording in Steps 1.1 and 1.4 from two to several experiments Changed wording in Step 2.1.5 from proponents to researchers Deleted sentence in Step 2.2.2 on contact information Changed wording in Steps 1.2, 1.3, 2.0, 2.1.2, 2.2, 2.2.1, 2.2.3 and 2.2.4.2 for clarity. Added Step 2.2.1.3
2	02/01/11	This revision is effectively a rewrite to clarify the roles and responsibilities of scientific personnel who perform experiments at WIPP and the WTS experiment support liaison.

1.0 INTRODUCTION

The Waste Isolation Pilot Plant (WIPP) has provided space for underground science experiments and activities unrelated to waste isolation since the 1990s.

The purpose of this document is to define responsibilities and requirements, and to provide guidance for experimenters and Washington TRU Solutions LLC (WTS) personnel supporting and overseeing scientific efforts to assure proper safety and function.

1.1 DOE Direction

A "Workshop on the Next Generation U.S. Underground Science Facility" in Carlsbad in June 2000, co-hosted by the Carlsbad U.S. Department of Energy (DOE) office, explored the potential need and use of the WIPP underground as a next generation laboratory for conducting nuclear and particle astrophysics, as well as other basic science research. When the Carlsbad Area Office (CAO) was elevated to the Carlsbad Field Office (CBFO) in September 2000, the Secretary of Energy gave it the added task to "host members of the scientific community as they conduct advanced research into the science of repositories and ‘particle’ physics -- to understand the smallest and most fundamental components of matter." The Secretary’s decision was based on a provision in the WIPP Land Withdrawal Act allowing "such non-WIPP related uses of the Withdrawal as the Secretary determines to be appropriate."

CBFO started implementing the Secretary’s directive by issuing an "Environmental Assessment for Conducting Astrophysics and Other Basic Science Experiments at the WIPP Site" in January 2001. Gradually increasing contacts with interested scientists led to the establishment of several science activities in the WIPP underground during the following years.

1.2 EPA Authorization

As the WIPP’s principal federal regulator, the U.S. Environmental Protection Agency (EPA) must have reasonable assurance that any activities at WIPP have no adverse effects on satisfactory long-term repository performance. This includes science experiments unrelated to the WIPP’s principal mission that are conducted in underground areas spatially removed from the waste disposal area. The EPA reserves the right to determine the impact of any such activities and to approve or deny their commencement. Sufficient information on any experiment proposed to be located at WIPP must therefore be submitted to the EPA for its approval. Typical documentation includes a project description, a National Environmental Policy Act (NEPA)

assessment in accordance with WP02-EC3801, Environmental Compliance Review and NEPA Screening, an Unreviewed Safety Question (USQ) evaluation, a Job Hazard Analysis (JHA), a waste management plan, and appropriate Material Safety Data Sheets (MSDSs).

1.3 CBFO and WTS Roles

CBFO is the landlord and owner of WIPP. The CBFO provides direction, guidance, and budget to WTS to support science experiments. As the Management and Operating Contractor (M&OC), WTS provides oversight and support to science experiments in close cooperation with CBFO Site Operations management.

A WTS Experiment Support Liaison within the Operations Support section of the Site Operations and Disposal department serves as the primary interface for science experiments support activities. The Experiment Support Liaison oversees day-to-day safe operation of underground science experiments. The WTS Industrial Safety and Health (IS&H), Training, Mine Engineering and other WIPP groups as appropriate, provide support in their respective areas of expertise. Depending on complexity, the support for setup and installation of experiments may require the temporary appointment of a project manager to formulate and implement an appropriate project execution plan (PXP).

1.4 Science Experiments at WIPP

WIPP accommodates several experiments underground. The two largest ones have the goal of aiding in the search for neutrino-less double beta decay.

1.4.1 SEGA & Mega Experiment

Since about 2004, the Segmented Enriched Germanium Assembly and Multiple Element Germanium Array (SEGA & MEGA) with the associated Copper Electroforming Project (CEP) has been operating in the Room-Q alcove.

1.4.2 EXO Experiment

Modules for the Enriched Xenon Observatory (EXO) arrived in the WIPP underground in 2007. They are stationed in the North Experimental Area (NExA), the former E-300 shop between the N-1100 and N-1400 drifts.

1.4.3 Dark Matter Experiment

Scientists from Massachusetts Institute of Technology (MIT), Boston University and Brandeis University form the collaboration for the Dark Matter - Time Projection Chamber (DM-TPC) experiment currently located in the NExA, E-300 N-1400. This goal of this experiment is to directly observe dark matter weakly interacting massive particles (WIMPS) in a laboratory environment.

1.5 Future Possibilities

From time to time, scientists inquire about, and investigate, WIPP's suitability to field additional experiments. They range across the scientific spectrum, but are focused mostly on experiments requiring shielding against background radiation. The addition of experiments at WIPP depends on resource availability and CBFO direction.

2.0 SCIENCE EXPERIMENT SUPPORT COMPONENTS

Underlying principles of WTS support and oversight of science experiments include:

- Avoiding adverse effects on the primary WIPP mission,
- Providing level-of-effort (personnel and material) support within operational constraints, and
- Accommodating special projects funded by sources external to WIPP and DOE-EM (Environmental Monitoring).

Program elements are implemented in compliance with applicable WTS safety, security, operational, engineering and administrative regulations.

2.1 Environmental Protection Agency Approved Package Elements

When an initial science proposal is considered generally feasible for emplacement and operation at WIPP, researchers and WTS project personnel jointly develop a documented information package for CBFO to submit for EPA review and approval. As a minimum the information package must contain a project description, an environmental compliance review, an USQ Determination, and a JHA.

2.1.1 Project Description

A project description explains the scientific principles and focuses on the technical aspects of equipment installation and operation, including interfaces with safety and engineering systems.

2.1.2 Environmental Compliance Review

When a university or research institution desires to initiate an experiment unrelated to WIPP's primary mission, the project undergoes environmental review and approval prior to the decision to proceed.

2.1.3 Unreviewed Safety Question Determination

Any test or experiment not evaluated and included in the existing documented safety analyses must be reviewed for an USQ in accordance with WP 02-AR3001. Any proposed science experiment must undergo the USQ process before the experiment or test can be conducted at WIPP.

2.1.4 Job Hazard Analysis

A JHA breaks a job down into its component tasks, screens those tasks for hazards, and helps specify requirements to ensure the safety of those performing the task. The most important ingredients are identification and mitigation of hazards. Experiments must formally recognize any hazards that are associated with their work and document these through JHAs. JHAs are generated by, or with the assistance of, the personnel working on proposed experiments. An experiment may have a single JHA specific to the experiment, but with added complexity will need additional JHAs that apply to the work specific to installing, operating, or repairing the experimental equipment. The JHA(s) may need to address controls specified on material safety data sheets (MSDSs) associated with chemicals, cleaning agents, gasses, refrigerants, etc., associated with the experiment. Other items include but are not limited to electrical hazards, fire hazards, oxygen deficient atmosphere, and equipment specific hazards. The experimental personnel can use their own process for identification of hazards if it can be shown to be equivalent to or better than the WIPP job hazard analysis process contained in WP12-IS3002, Job Hazard Performance and Development.

2.1.5 Other

Additional documentation useful to the EPA in its evaluation of proposed experiments may include memoranda of understanding between WIPP and the researchers or their institutions, MSDSs on materials used while conducting experiments, and relevant correspondence.

2.2 WTS Organizational Responsibilities and Interfaces

WTS assists experimenters with oversight and planning for science experiments, with relevant guidance, and with interface issue identification and resolution.

2.2.1 Experiment Support and Oversight

WTS oversight of science experiments is a function of the relative importance and complexity of the experiment or related activity, as well as the experimenters' experience at WIPP and previous performance. Oversight of experiments rests with the Experiment Support Liaison and the Operations Support Manager. Any budget requirements to support underground experiments are coordinated through the Operations Support Manager.

The Experiment Support Liaison is the WTS key point of contact for coordinating the support of scientific experiments. The Experiment Support Liaison works with scientists proposing or designing new experiments, and becomes and stays well informed on daily experimental activities, including but not limited to scientific experiment set-up, installing, replacing, removing scientific and support equipment within the underground and to and from the surface. The Experiment Support Liaison assists the scientists in determining interfaces and coordinating activities with those interfaces to ensure that potential hazards, problems, or undesirable situations are avoided.

The Liaison assists in determining which site procedures are applicable for the experimental activities, ensuring that the procedures are complied with, and ensuring that experimental personnel are trained on the applicable procedures.

2.2.2 Experimental Personnel Responsibilities

Experimental personnel are not only responsible for their own health and safety, but are also responsible for the safety of fellow employees, and for the safe operation of the experiment. Experimental personnel and their subcontractors must at a minimum receive General Employee Training and 40 hour Miner training to have unescorted access to the WIPP underground. In general, meet the WIPP training and qualification requirements for the job

function to be performed. Experimental personnel are expected to complete required reading, which as a minimum includes the WP 02-EC.12, Site Users Guide for Organizations, Personnel, or Companies That Perform Work on U.S. Department of Energy Property or Rights-of-Way on or Around the Waste Isolation Pilot Plant Site. Experimental personnel who need to perform electrical work shall do so in accordance with the requirements of the WIPP Electrical Safety Program and Work Control process and they should be trained in WIPP Lockout/Tagout (LO/TO). If the experimental personnel want to use their own procedures, those procedures must be reviewed and approved by WTS Industrial Safety and the Experiment Support Liaison and must be shown to be equivalent to or better than the WIPP processes.

2.2.3 Conduct of Operations

Conduct of Operations, as described in WP 04-CO.01 and the eighteen associated modules, is an operational philosophy that ensures organizational entities understand their roles and responsibilities, authority and accountability, and interfaces. This philosophy also applies to experimental personnel who work at WIPP. WP 02-EC.12, is the primary vehicle by which this understanding is facilitated and documented. All experimenters must read the guide and document their understanding by submitting signed signature sheets to the WTS IS&H group.

The Experiment Support Liaison coordinates with experimental personnel to establish a required reading book that contains WIPP documents and programs applicable to the experimental personnel. Attachment 1 of this document identifies documents that the Experiment Support Liaison considers when establishing required reading for experimental personnel. The Liaison provides oversight of the experiments to ensure that elements of Conduct of Operations applicable to the experiments are being adhered to. Items such as Job Hazard Analysis, Lockout/Tagout, and ensuring that work on experimental equipment or support systems is shown on the plan of the day are of particular importance.

The Experiment Support Liaison may choose to conduct an orientation meeting with new experimental personnel to identify interfaces (engineering, operations, maintenance, safety, etc.), and review experiment work documents and drawings.

The WIPP work control process ensures that proposed work is appropriately reviewed and authorized before work is released to be performed in the field. The performance of work which will require LO/TO, hot work permit, or other hazardous work shall be processed through the site work control processes. Experimental personnel should participate in the Plan of the Day (POD) meetings, safety meetings and activities, work site inspections and hazard

evaluations to ensure that their work activities are also coordinated with other WIPP activities. Any scientific work activity that requires WTS support, coordination or interface shall be scheduled and identified on the POD schedule and the work represented by cognizant experimental personnel at the POD meeting.

2.2.4 Security

WIPP Security manages access to project facilities for employees and contractors, including scientific personnel. Experimenters, both U.S. citizens and foreign nationals, are subject to applicable WIPP security controls and processes to gain unescorted access to the WIPP site. Security and the Experiment Support Liaison coordinate to ensure that experimenters who arrive at WIPP for the first time are identified in advance so that escorts are available as necessary.

2.2.4.1 Site Access

Visitors and assignees are cleared through Visitor Programs and Security before first admission to the site. Clearance may require up to 45 days, especially for experimenters who are citizens of "sensitive" countries. Escort requirements vary depending on country of origin, areas to be entered, and training qualifications.

2.2.4.2 Foreign Visitor Assignments

Foreign collaborators in science experiments are subject to scrutiny beyond that for U.S. citizens. General requirements include a signed and approved Unclassified Foreign Visit & Assignment Form and a Foreign National Visitor/Assignee Specific Security Plan. Specific additional requirements may apply. The Experiment Support Liaison and Security typically communicate in advance of foreign collaborators arriving at WIPP, to facilitate resolution of any issues that may arise.

2.2.4.3 Computer Security

Experimenters are personally accountable for their actions when using any WIPP computing resource, including the WIPPnet. Each user must complete computer security training before being granted access to WIPP computer resources. Initial computer security training is provided during general employee training (GET).

2.2.5 Training

Science experiment personnel must meet WIPP qualification requirements for the job functions to be performed. For example, scientific experiment personnel are required to take GET to have unescorted access to the WIPP Site. Since the experiments are conducted underground, scientific personnel typically complete 40 hour Underground Miner Training and its annual refresher, if the experiment is long term and personnel go to the underground on a frequent and regular basis. It is acceptable for scientific personnel to be escorted underground after completing underground hazard awareness training. Other training specific to hot work, use of compressed gas cylinders or liquid gas dewars or LO/TO may also be required if the experiment or maintenance of the equipment associated with the experiment involves welding, gases, or hazardous energy control.

Training requirements are based on the complexity of the experiment, but may include:

- GET
- LO/TO
- Electrical Safety
- Underground Miner Training
- Ladder Safety
- JHA Training
- Compressed Gas Cylinder Training

Any electrical work other than operating switches within the experimental boundary and specific to the experiment or plugging or unplugging experimental equipment will typically require a WIPP work order to be performed by qualified electricians. Unless the experimenters have their own support electricians, trained to industry standards, electrical work will be performed by WIPP electricians.

The Experiment Support Liaison coordinates with the experimenters to assist them in obtaining the training appropriate to their activities.

As stated earlier in 2.2.1.1, experimental personnel are required to read WP02-EC.12 and sign that they have read and understand the content.

2.2.6 Safety

Full compliance with applicable federal, state, and local regulations ensures protection of workers, visitors, and the general public, including participants in science experiments. Safety is the first project priority. Every experimenter must comply with WP 12-IS.01, Industrial Safety Program, and has the right and the responsibility to identify unsafe conditions, to stop work, and to report hazards to ensure that unsafe conditions are corrected before proceeding.

2.2.6.1 Industrial Hygiene

Preservation of health and well-being of all WIPP participants includes anticipation, identification, evaluation, and control of environmental factors and stresses found in the workplace. These include chemical (e.g., liquid, particulate, vapor, and gas); physical (e.g., electromagnetic radiation and noise); biological (e.g., agents of infectious diseases); temperature extremes; and ergonomic (e.g., body position in relation to task, repetitive motion, and mental or physical fatigue) considerations. Experimenters must observe all WIPP safety and health rules as described in WP12-IH.01, WIPP Chemical Hygiene Plan and WP12-IH.02, WIPP Industrial Health Program, and associated implementing procedures, use prescribed personal protective equipment (PPE), and follow established health and safety practices including but not limited to having MSDS sheets at the experiment location for chemicals, gasses, refrigerants, etc. used in the experiment, Experimenters must notify WTS immediately of suspected exposures to harmful agents or conditions.

2.2.6.2 Industrial Safety

Experimenters must comply with all applicable local, state, and federal safety, health, and environmental regulations, as well as WIPP site-specific and DOE requirements. Their own safety programs and policies that meet or exceed WIPP requirements are acceptable, provided they do not conflict with site rules. They must provide written certification that all participants comply with the requirements and standards applicable to their task or function, and that critical equipment such as cranes, hoists, powered-industrial trucks, chains, slings, and spreaders, has been inspected and meets all applicable requirements. Before installing and operating science experiments, involved personnel must attend applicable pre-job safety briefings in which WIPP interfaces participate as appropriate.

2.2.7 Operation

WIPP conducts all phases of operations, including support for science experiments, in a manner that meets or exceeds safety and environmental policies, objectives, and goals while keeping personnel exposure to radiation source(s) and hazardous chemicals as low as reasonably achievable. Scientific personnel will typically operate the equipment specific to the experiment. WIPP equipment that supplies power, lighting, air, etc. shall be operated by WIPP operators. Some equipment provided by the experimenters may need to be started up and shut down in a specific sequence. The experimenters and WIPP operators should communicate when operation of either group's equipment has the potential to adversely affect the others. Examples include items such as uninterruptable power supplies, and resetting of ground fault indicators.

2.2.7.1 Hoisting Operations

Hoisting Operations provides safe transportation between surface and underground for personnel and materials. Experimenters and their equipment are accommodated to the extent that regular WIPP operations permit. Movement of experimental equipment should be identified on the POD. Special projects require careful planning and scheduling well in advance of actual need.

2.2.7.2 Underground Services

Underground Services maintains cognizance of and are responsible for underground facilities and for day-to-day oversight of underground activities, including science experiments. Experimental personnel should contact the Underground Services or the Experiment Support Liaison if there is any question or uncertainty reqarding underground activities, or if support is needed for a particular activity.

2.2.7.3 Mine Engineering

General requirements and guidance for all WIPP engineering functions are enumerated in WP 09, Engineering Conduct of Operations. Engineering support for installation and operation of experiments affects mostly electrical and ventilation systems and interfaces.

2.2.7.3.1 Electrical Engineering

Compatibility of interfaces with WIPP electrical systems is ensured by close integration of experiment planning and installation with the cognizant engineer responsible for underground electrical systems. Electrical systems of experiments are subject to the same codes and requirements as other WIPP electrical systems.

2.2.7.3.2 Ventilation Engineering

Adequate ventilation of experimental spaces is ensured by close integration of experiment planning and installation with the cognizant engineer responsible for underground ventilation systems. This ensures that potential ventilation hazards originating from experiments are addressed and, if necessary, mitigated.

2.2.7.4 Underground Maintenance

Interfaces between WIPP systems and experiments are subject to occasional repairs or preventive maintenance. Maintenance is conducted in such a way that engineering configuration control and safety classification criteria are maintained. Electrical support for utility feeds to experimental equipment will typically be provided by Underground Maintenance, but may also be supported by Facility Restoration. Experimental personnel may require vendor support for their equipment (such as power supplies and chillers). Electrical work will typically be performed under a WIPP work order to ensure that the work is performed safely and by qualified personnel. The work will also need to be scheduled and shown on the Plan of the Day.

2.3 Foreign Visits and Assignment Host

All foreign national visitors, including experimenters, are assigned a host who is responsible for completing prerequisite visit information and completing a report after the visit. A host is a DOE or DOE contractor employee who is sponsoring a foreign national visitor or assignee. The host serves as the individual responsible for the conduct and activities of foreign national visitors or assignees at the hosting site.

2.4 Visitor Escorts

Unescorted site access is allowed only for individuals with evidence of appropriate qualifications. All other individuals that require WIPP site access are escorted. Escorts are picture-badged individuals who meet visitors, including experimenters, at the guard house and escort them until they leave the site. No limits are set for the number of visitors who can be assigned to one escort on the surface. Underground, WIPP requirements limit the number of visitors to a maximum of five persons per qualified escort.

3.0 ADMINISTRATION

3.1 Budgeting

WTS funding for science experiment support is provided through CBFO. Nominal support activities are covered through regular annual budgets. Substantial initial fielding efforts are funded through special Baseline Change Requests (BCRs). External funding for major items may be provided by the experimenters through CBFO.

3.2 Purchasing

WTS purchases of items for science experiments must comply with procurement procedures WP 15-PC3609, Preparation of Purchase Requisitions, and WP 15-PC3402, Credit Card Purchases.

3.3 Issues Resolution

The Experiment Support Liaison is the primary WTS designee for resolving issues relating to science experiments.

4.0 QUALITY ASSURANCE

While science experiments themselves are not governed by WP 13-1, Washington TRU Solutions LLC Quality Assurance Program Description, the requirements contained in WP 13-1 apply to WIPP interfaces, equipment designs, and control of work that support the experiments.

5.0 REFERENCES

DOE/EA-1340, Environmental Assessment for Conducting Astrophysics and Other Basic Science Experiments at the WIPP Site (http://www.wipp.energy.gov/library/ea/toc.pdf)

Prospects for an Underground Laboratory in Carlsbad, NM, Report to the Underground Laboratory Committee, February 28, 2001 (http://www.wipp.energy.gov/science/UG_Lab/CUNL_Proposal-Final.PDF)

Open Letter to the Nuclear and Particle Physics Research Community, by Ines Triay, Manager of DOE's Waste Isolation Pilot Plant, Early Spring 2000 (http://www.wipp.energy.gov/science/workshop/Invitation.htm)

Science at WIPP web site (http://www.wipp.energy.gov/science/index.htm)

Public Law 102-579, The Waste Isolation Pilot Plant Land Withdrawal Act (http://www.wipp.energy.gov/library/CRA/BaselineTool/Documents/Regulatory%20Tools/10%20WIPPLWA1996.pdf)

Press Release “Energy Secretary Richardson Expands Role of Carlsbad, Creating Field Office”, DOE News, September 22, 2000 (http://www.wipp.energy.gov/pr/2000/FieldOffice.pdf)

Powers, D.W., 2000, "Geologic Data for WIPP-based High Energy Physics Facility"

WP 02-EC.12, Site Users Guide for Organizations, Personnel, or Companies That Perform Work on U.S. Department of Energy Property or Rights-of-Way on or Around the Waste Isolation Pilot Plant Site

WP 02-AR3001, Unreviewed Safety Question Determination

WP 02-EC3801, Environmental Compliance Review and NEPA Screening

WP 04-CO.01, Conduct of Operations (including WP04-CO.01-1 through 18)

WP 09, Engineering Conduct of Operations

WP 12-IH.01, WIPP Chemical Hygiene Plan

WP 12-IH.02, WIPP Industrial Health Program

WP 12-IS.01, Industrial Safety Program – Structure and Management

WP 12-IS.01-1, Industrial Safety Program – Barricades and Barriers

WP 12-IS.01-6, Industrial Safety Program - Subcontractor Safety

WP 12-IS3002, Job Hazard Performance and Development

WP 13-1, Washington TRU Solutions LLC Quality Assurance Program Description

WP 15-PC3402, Credit Card Purchases

WP 15-PC3609, Preparation of Purchase Requisitions

Attachment 1 – Procedures to be Considered for Required Reading Applicable to Experimental Activity

15-SE.01	Science Experiment Support Plan
WP 02-EC.12	Site Users and Tenants Guide for Organizations, Personal, or Companies That Perform Work on U.S. Department of Energy Property or Rights-of-Way on or Around the Waste Isolation Pilot Plant Site
WP 12-IS.01-6	Industrial Safety Program Visitor, Vendor, User, Tenant, and Subcontractor Safety Controls
WP 12-IH.02-12	WIPP Industrial Hygiene Program Cryogenics, Refrigerants, and Process Gasses
WP 04-CO.01-4	Communications
WP 04-CO.01-8	Control of Equipment and Systems Status
WP 04-CO.01-9	Lockouts and Tagouts
WP 04-CO.01-11	Logkeeping
WP 04-CO.01-13	Operations Aspects of Facility Chemistry and Unique Process
WP 04-CO.01-14	Required Reading
WP 04-CO.01-16	Operations Procedures
WP 04-CO.01-17	Operator Aid Postings
WP 04-CO.01-18	Equipment and Piping Labeling
WP 12-IS (series documents)	WIPP Industrial Safety Documents
WP 12-IS3002	Job Hazard Performance and Development