

**Nevada  
Nuclear  
Waste  
Storage  
Investigations**



A U.S. DOE PROJECT

**NEVADA NUCLEAR WASTE STORAGE**

**INVESTIGATIONS**

**QUALITY ASSURANCE PLAN**

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PDR WASTE  
WM-10 PDR

**UNITED STATES DEPARTMENT OF ENERGY  
NEVADA OPERATIONS OFFICE  
LAS VEGAS, NEVADA**

NEVADA NUCLEAR WASTE STORAGE  
INVESTIGATIONS

QUALITY ASSURANCE PLAN  
REVISION 4  
NVO-196-17

SIGNATURE PAGE

  
WMPO DIRECTOR

  
QAD DIRECTOR 1-14-86

  
WMPO PROJECT QUALITY MANAGER 1/14/86

Effective Date: 1/31/86

NVO-196-17 (Rev. 4)

NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS

QUALITY ASSURANCE PLAN

UNITED STATES DEPARTMENT OF ENERGY  
NEVADA OPERATIONS OFFICE  
LAS VEGAS, NEVADA

## PREFACE

This document is the fourth revision of the Nevada Nuclear Waste Storage Investigations Project Quality Assurance Plan (NVO-196-17). It contains minor revisions for clarification of the plan. These revisions are indicated by a line with the number 4 in the left hand margin. Minor editorial changes are not indicated. NVO-196-17 (Rev. 4) supersedes NVO-196-17 (Rev. 3).

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NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS  
QUALITY ASSURANCE PLAN  
REVISION 4

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# NEVADA NUCLEAR WASTE STORAGE INVESTIGATIONS

## QUALITY ASSURANCE PLAN

### Revision 4

## INTRODUCTION

The Nevada Nuclear Waste Storage Investigations (NNWSI) Project was established by the Department of Energy-Nevada Operations Office (DOE/NV) to evaluate planned and systematic actions to provide sufficient information to expand the public's confidence in the suitability of a geologic repository site and its subsystems and components for high-level radioactive waste isolation. The location of the potentially acceptable geologic repository site under evaluation is on and adjacent to the Nevada Test Site (NTS). This evaluation includes all systems, structures, and components important to safety for the design, construction, and characterization of barriers important to high-level waste isolation and to related activities.

It is possible that the results of these investigations will support Nuclear Regulatory Commission (NRC) licensing decisions and assess risks to public health and safety for the geologic repository; therefore, a quality assurance plan (QAP) is essential to specify the method of control for the quality aspects of the work. The Quality Assurance (QA) requirements placed on the NNWSI Project are established from three main sources:

4

### NRC

- o 10CFR60 Subpart G, Disposal of High Level Radioactive Wastes in Geologic Repositories - Quality Assurance
- o 10CFR50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants
- o NRC QA Standard Review Plan for High-Level Radioactive Waste (HLW) Geologic Repositories

Department of Energy

- o DOE 5700.6, Quality Assurance
- o NV 5700.6, Quality Assurance

Office of Civilian Radioactive Waste Management (OCRWM)

- o OCRWM Quality Assurance Management Policies and Requirements
- o OGR/B-3, OGR Quality Assurance Plan for Siting and Site Characterization
- o ANSI/ASME NQA-1, American National Standard for Quality Assurance Program Requirements for Nuclear Facilities

4

The Waste Management Project Office - Nevada Operations Office (WMPO) has used the QA criteria from these documents, plus any additional criteria imposed by WMPO, to develop the NNWSI QAP which identifies the QA requirements for the Project. THE NNWSI QAP is the document which the WMPO uses to establish the NNWSI Project QA requirements for the NNWSI Project participants. A detailed description of the criteria applicable to each investigative phase of the project is contained in individual Quality Assurance Program Plans (QAPPs) prepared by each organization responsible for directing and/or conducting an assigned task.

The Waste Management Project Office - Nevada Operations Office (WMPO) has been assigned responsibility for administrating and coordinating the NNWSI Project activities. The WMPO requires each Participating Organization and the NTS Support Contractors to prepare and submit a QAPP that covers their task activities. Essentially, a compendium of these plans could be considered to be the NNWSI Project QAP, but such a compendium would be difficult both to use and to interpret because of the many-faceted aspects of the project. Therefore, this QAP brings together the essential aspects of the QA criteria elements into one document which is intended to be selectively applied depending upon the complexity and relative importance of the investigation being conducted. All QAPPs prepared by the NNWSI Project Participating Organizations and NTS Support Contractors shall meet the requirements set forth in this plan.

Participating Organizations contributing the majority of effort on the NNWSI Project include:

4 | Lawrence Livermore National Laboratory (LLNL)

4 | Los Alamos National Laboratory (Los Alamos)

4 | Sandia National Laboratories (SNL)

4 | Science Applications International Corp. (SAIC)

United States Geological Survey (USGS)

Westinghouse Electric Corporation, Waste Technology

Services Division (W/WTSD)

NTS Support Contractors are also supporting site activities and will develop QAPPs for their operations. They include:

Fenix & Scisson, Inc. (F&S)

Holmes & Narver, Inc. (H&N)

Reynolds Electrical and Engineering Company, Inc. (REECO)

## POLICY

4 The Nevada Operations Office and the Waste Management Project Office consider quality assurance an essential element of the NNWSI Project. The Quality Assurance Plan (QAP) for the NNWSI Project is based upon DOE 5700.6; NV 5700.6; OGR/B-3; 10CFR60, Subpart G; 10CFR50, Appendix B; and the 1983 issue of the ANSI/ASME NQA-1 standard including the mandatory supplemental requirements as modified by Appendix C of this plan. The NNWSI QA Plan and NNWSI-SOP-02-01 will be used by the WMPO/QA Support Contractor to evaluate the QAPPs of the Participating Organizations and of the NTS Support Contractors. It is recognized that not all criteria of these documents are applicable in every case, and this will be reflected in the review process.

4 The WMPO will apply an approach to quality assurance which recognizes the importance of radiological safety related and non-radiological safety related NNWSI activities. This approach is designed to ensure that each activity is assigned a level of quality assurance that is consistent with the relative impact and/or importance to the project with regard to DOE concerns, public health and safety, and/or the Nuclear Regulatory Commission (NRC) licensing process.

4 Quality Assurance Level I are those radiological health and safety related items and activities that are important to either safety or waste isolation and that are associated with the ability of a geologic nuclear waste repository to function in a manner that prevents or mitigates the consequences of a process or event that could cause undue risk to the radiological health and safety of the public. Items and activities important to safety are those engineered structures, systems, components, and related activities essential to the prevention or mitigation of an accident that could result in a radiation dose either to the whole body or to any organ of 0.5 rem or greater either at or beyond the nearest boundary of the unrestricted area at any time until the completion of the permanent closure of the repository. Items and activities important to waste isolation are those barriers and related activities which must meet the criteria that address long-term performance of the engineered and natural barriers to prevent the release of radionuclides from the site to the accessible environment after permanent closure. The criteria for items and

4 | activities important to safety and waste isolation are found in 10CFR60, 40CFR191, and 10CFR20 (Standards for Protection Against Radiation).

4 | Quality Assurance Level II are those items and activities related to the systems, structures, and components which require a level of quality assurance sufficient to provide for reliability, maintainability, public and repository worker nonradiological health and safety, repository worker radiological health and safety and other operational factors that would have an impact on U.S. Department of Energy/Headquarters - Office of Geologic Repositories (DOE/HQ-OGR) and WMPO concerns, and the environment.

4 | Quality Assurance Level III are those items and activities not classified as Quality Assurance Levels I or II.

4 | Site characterization activities including, but not limited to geologic, hydrologic, and seismic data gathering, shall utilize the same approach to quality assurance as described above. Since site characterization involves research, development, and investigative activities, it is necessary to adapt the criteria to fit the content of the work environment. The site characterization activities shall be conducted in accordance with approved procedures to assure the validity of the data supporting the resulting conclusions.

4 | The NNWSI Participating Organizations and NTS Support Contractors shall base their respective QAPPs on the requirements set forth in this QAP and NNWSI-SOP-02-01. The programmatic quality assurance requirements in the NNWSI QAP for Quality Assurance Level I activities shall be based on DOE 5700.6; NV Order 5700.6; 10CFR60, Subpart G; 10CFR50, Appendix B; and ANSI/ASME NQA-1, including the mandatory supplemental requirements as modified by Appendix C. Once applicable quality Assurance criteria have been determined to apply to a QA Level I activity, all requirements under those criteria must be addressed for the activity. For Quality Assurance Level II activities, the programmatic quality assurance requirements in the NNWSI QAP shall be based on ANSI/ASME NQA-1 basic requirements and selected supplementary requirements. The extent to which the basic and selected supplemental requirements are to be applied to

a task shall be determined by the Participating Organizations based on the relative importance of the activity. Quality Assurance Level III activities require the use of good engineering, laboratory, accepted commercial, and quality assurance practices utilizing existing participant administrative and quality assurance procedures.

4

Each participating organization shall assign the QA level and applicable QA criteria to the project activities for which they are responsible in accordance with prescribed, written approved procedures. The assignment of QA levels shall be approved by WMPO prior to the start of the activity.

## PURPOSE AND SCOPE

4 | This Quality Assurance Plan describes the overall quality assurance requirements for the NNWSI Project which the quality assurance program plans (QAPPs) of the WMPO, individual Participating Organizations, and NTS Support Contractors must satisfy. The details of how each of these organizations will meet the QA criteria may differ among Participating Organizations and NTS Support Contractors. Those details are given in the QAPPs listed in Appendix A. It is the purpose of this QAP to provide guidance to the NNWSI Project Participating Organizations and Support Contractors to assure a common approach to meeting the quality assurance requirements to be applied to NNWSI Project activities and to describe the duties and responsibility of each of the participants and their interface with WMPO.

4 | Quality Assurance Level I activities will provide the basis for the NRC to approve a license for the Department of Energy (DOE) to receive and possess source, special nuclear, and by-product material at the geologic repository. This will involve NRC inspection and enforcement. Level I Quality Assurance controls and documentation must be applied to activities, including data collection, investigation, analysis, design, construction, fabrication, operation, decommissioning, or sealing when they are specifically concerned with the protection of the public's health and safety with respect to a radiological hazard. To keep radionuclides out of man's environment, a high-level radioactive waste repository will utilize engineered systems, structures, and components to contain the waste and ensure the short-term safety. The repository also will utilize the earth to afford long-term isolation. Within this context, Quality Assurance Level I must be applied for near-term safety as well as long-term isolation as per the following:

- o Where radiological safety is dependent on the analysis, design, construction, fabrication and operations of engineered structures, systems and components essential to the prevention of an accident that could result in a radiation dose either to the whole body or to any organ of 0.5 rem or greater at or beyond the nearest boundary of the unrestricted area at any time until the completion of the permanent closure of the repository.

- o Where field and laboratory data, and subsequent analysis serves as the basis for making the determination that the intrinsic and perturbed geologic, hydrologic and geochemical environment is capable of providing long-term waste isolation based on the radionuclide release criteria as specified in 40CFR191 to the controlled area.

4 | Quality Assurance Level II controls and documentation shall be applied to the  
4 | NNWSI Project activities and items that are specifically concerned with  
4 | non-radiological operation of the repository, and the radiological safety of  
4 | the repository worker. The HLW repository will utilize engineered systems,  
4 | structures, and components which must be designed, constructed, fabricated,  
4 | tested and operated to meet the performance objectives during the operational  
4 | phase, and to minimize the non-radiological hazard to the public and repository  
4 | worker, and the radiological hazard to the repository worker. Additionally,  
4 | activities that have a major impact on project costs or schedules that could  
4 | delay the achievement of DOE/OGR milestones must be appropriately controlled.  
4 | Therefore, Quality Assurance Level II must be applied to activities and items  
4 | in the following manner:

- o Where activities or items involve engineered systems, structures, or components that are essential to the operational phase of the repository which impact public and worker non-radiological occupational health and safety.
- o Where activities or items involve engineered systems, structures, or components that impact the repository worker radiological health and safety.
- o Where activities or items involve the operational reliability and maintainability of engineered items.
- o Where activities and items could have or could effect cost or schedule impacts that could delay or cause a DOE/OGR program milestone to slip.

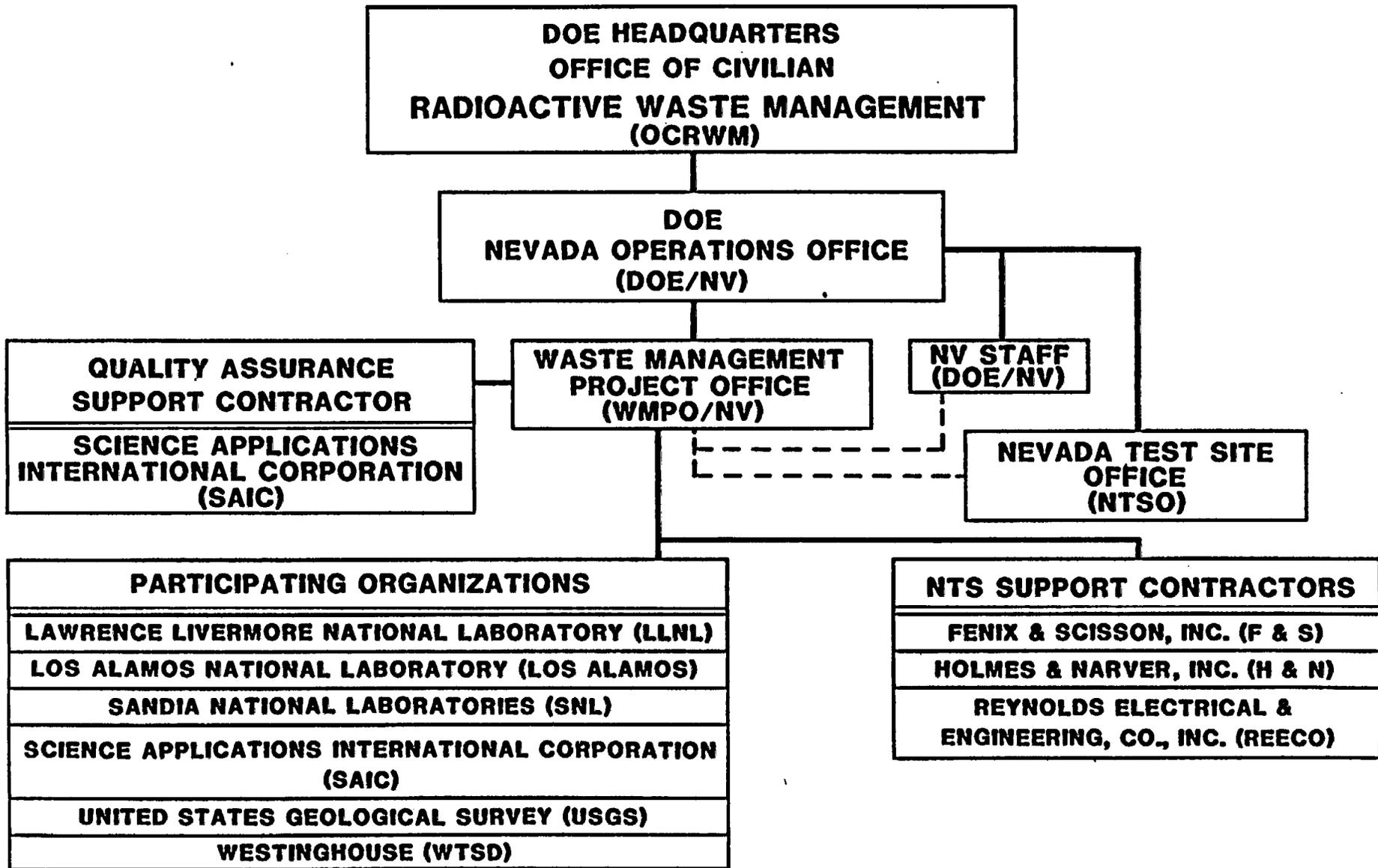
- o Where activities are concerned with evaluating alternative solutions, materials, or conceptual designs prior to the final selection for use in the high-level waste repository.

4 | Quality Assurance Level II activities may have equal importance as Quality Assurance Level I; however, except when used to support a QA Level I activity as indicated below, they neither support the licensing efforts nor are they subject to NRC inspection and enforcement. In most cases, activities controlled in accordance with a Quality Assurance Level II program cannot subsequently be used to support QA Level I activities, unless it can be substantiated that the quality assurance requirements equivalent to those which would have been applied to a Quality Assurance Level I activity were implemented, and a technical justification process is applied.

4 | Level III QA activities are such that they have no major function in the design, operation, and characterization of the repository, but they require  
4 | good engineering, laboratory, accepted commercial, and quality assurance  
4 | practices for the intended use. Those activities controlled in accordance with a Quality Assurance Level III program cannot subsequently be used to support QA Level I activities.

## 1.0 ORGANIZATION

- 4 |
- 1.1 This section describes general organization responsibilities and interfaces within the NNWSI Project. The NNWSI Project Work Breakdown Structure provides the detailed technical responsibilities of each Participating Organization and NTS Support Contractor; and a definitive description of the quality assurance responsibilities are contained in the QAPPs of the individual organizations listed in Appendix A. The NNWSI Project organization is shown in Figure 1.
- 4 |
- 1.2 The DOE Headquarters, Office of Civilian Radioactive Waste Management (OCRWM) provides programmatic and policy guidance to assure that adequate NNWSI Project Quality Assurance programs are established, implemented, and maintained. The OCRWM has assigned the DOE Nevada Operations Office with the responsibility for the implementation of the technical and quality assurance requirements for the NNWSI Project.
- 4 |
- 1.3 The U.S. Department of Energy/Headquarters, Office of Geologic Repositories (DOE/HQ, OGR) provides QA guidance and overview to the NNWSI Project by: (1) review and approval of the NNWSI Project QAP, NNWSI SOP's, the WMPO QAPP, and WMPO implementing procedures; (2) specifying applicable requirements which are contained in the OGR Quality Assurance Plan, OGR/B-3; and (3) performance of quality assurance audits.
- 4 |
- 1.4 The Department of Energy/Nevada (DOE/NV) Manager has the ultimate organization responsibility for the NNWSI Project in the Nevada Operations Office. The Waste Management Project Office (WMPO) has been established within the DOE/NV organization for the management of the NNWSI Project. The WMPO operates as a part of the DOE Nevada Operations Office (DOE/NV) under the programmatic direction of the DOE Headquarters Office of Civilian Radioactive Waste Management. In matters of Department policy, DOE/NV works and cooperates with DOE/OCRWM in establishing a consistent quality assurance approach for accomplishing the objectives of the Geologic Repository Program managed by DOE/OCRWM.
- 4 |



———— DOE/NV & Project Participant - Administrative Responsibility, Authority & Accountability  
 - - - - DOE/NV Matrix - Functional Responsibility & Accountability

**FIGURE 1 NNWSI PROJECT ORGANIZATION**

4 | 1.5 The Waste Management Project Office (WMPO) is programmatically responsible for management and technical direction of the activities of the Participating Organizations and NTS Support Contractors through the issuance of technical and programmatic guidance, technical integration of the project, project planning and documentation, and quality assurance programmatic guidance.

4 | The WMPO Director is responsible for the NNWSI Project management. Project management encompasses planning and directing activities; establishing goals and objectives, and assessing progress toward the attainment of those goals; administration of procurement of materials and services; preparation and issuance of technical guidance; organization and conduct of peer reviews; compliance with laws, regulations and DOE policies; and other administrative duties.

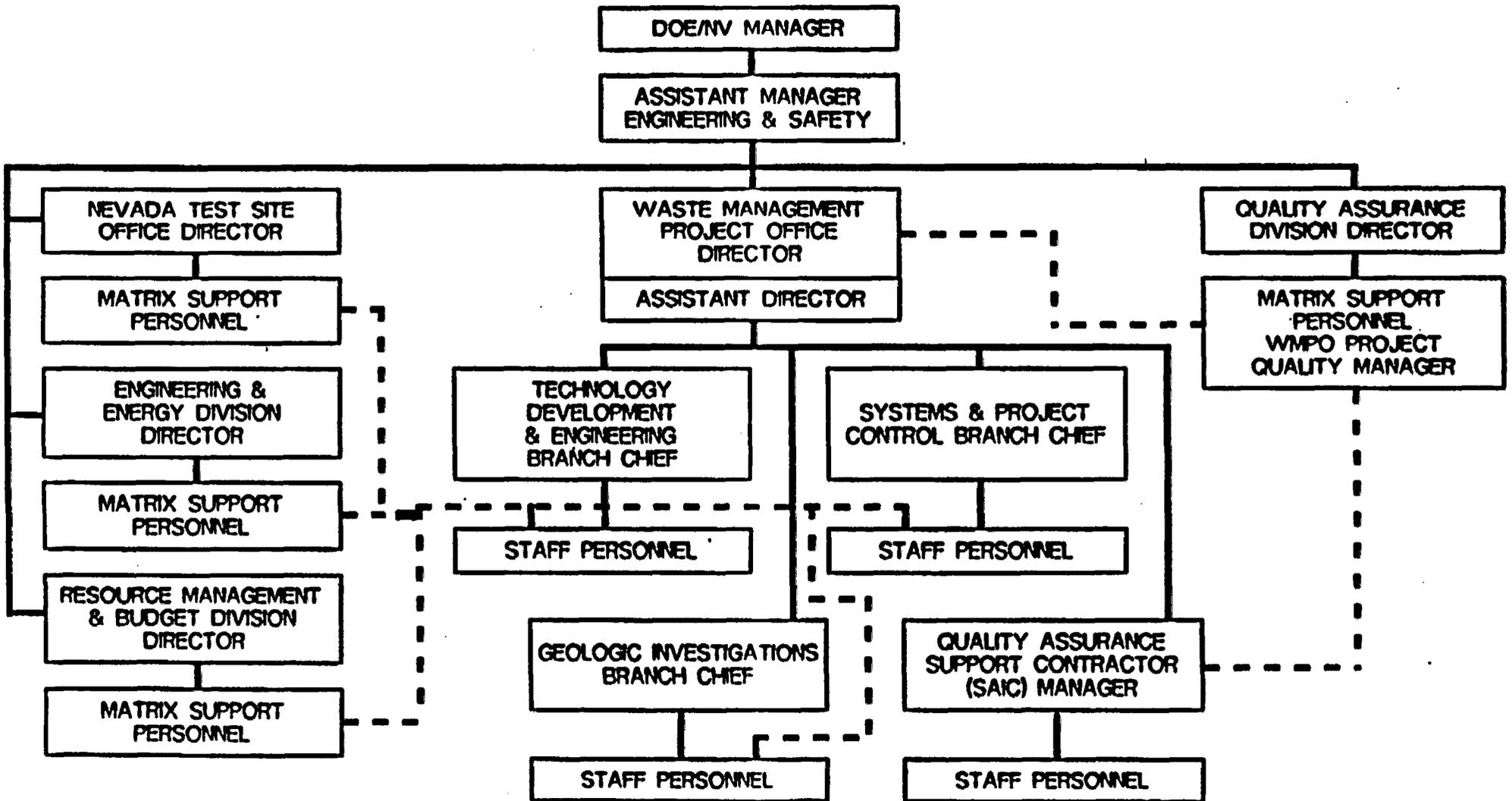
4 | The technical responsibilities of the WMPO focus in three areas, each under the direction of a Branch Chief. Each Branch Chief is responsible for implementing the QA program in their area of responsibility. The Geological Investigations Branch is responsible for Site Characterization (including geology, hydrology, geochemistry, geophysics and administrative support); performance assessment (including computer code documentation, analysis, and radionuclide migration field experiments); drilling operations and borehole testing; quality control; regulatory interface; environmental analysis; and institutional liaison. The Technology Development and Engineering Branch is responsible for systems description, analysis and integration; waste package design and development; design, construction and operation of major test facilities; operational safety; repository engineering including conceptual design, rock mechanics, and borehole sealing; instrument and equipment development; quality control; and exploratory shaft design, construction, and operation. The Systems and Project Control Branch is responsible for the administration and management support to integrate and control the NNWSI Project including preparation of networks, monitoring milestones, and overseeing issuance of project documentation, state liaison, records management and quality assurance records administration.

4

The WMPO utilizes a matrix management organizational concept to support some of the NNWSI Project activities. The administrative responsibility, authority, and accountability for DOE/NV personnel supporting the NNWSI Project remains with the respective DOE/NV organizational element, while the functional responsibility and accountability of NNWSI Project personnel is to the WMPO. Figure 2 details the WMPO as one organization with major DOE/NV organizations that provide matrix support staff. The DOE/NV staff assists the WMPO Director by providing reviews, recommendations, and expertise on various aspects of the NNWSI Project in terms of their respective responsibilities as established in accordance with the matrix management approach. Matrix support personnel work under the controlling procedures of the WMPO QA Program Plan. The quality assurance responsibilities of the WMPO are accomplished with guidance and support from QAD/NV and support from the Quality Assurance Support Contractor (QASC). The responsibilities of the QASC are to provide support in development, documentation, administration, and implementation of the NNWSI Project QAP; development and implementation of the WMPO QAPP which delineates the interface responsibilities of WMPO and the QASC. QASC activities include participation in QA audits, review of test plans and QA procedures, provision for QA surveillance and policy guidance, and review of the Quality Assurance Program Plans (QAPPs) prepared by the Participating Organizations and NTS Support Contractors. The overall responsibility to assure that quality is maintained throughout the NNWSI Project is retained by the WMPO.

- 4
- 1.6 The DOE/NV Quality Assurance Division (QAD) Director provides independent QA overview including QA guidance, surveillance, and audit capabilities in accordance with the NV QA Manual and QAD instructions for the DOE/NV management to establish an assessment of the NNWSI QA plan and WMPO QAPP; and reviews and approves the NNWSI Project QAP, the WMPO QAPP and implementing procedures for both documents. The QA Division has assigned a Project Quality Manager (PQM), under the matrix management approach, dedicated to support the QA responsibilities on WMPO activities.

The dedicated PQM reports functionally to the WMPO Director for the maintenance and implementation of the NNWSI QAP and WMPO QAPP. The PQM's



——— Administrative Responsibility, Authority and Accountability  
 - - - Matrix Support Functional Responsibilities and Accountabilities

**FIGURE 2 WMPO ORGANIZATION**

4 | support to the NNWSI Project includes the review and approval of Participating Organizations' and Support Contractors' QAPPs and implementing procedures, conducting audits and surveillances, and coordination of the Quality Assurance Support Contractor (QASC) activities. The PQM is supported by the QASC to conduct WMPO QA activities.

4 | The NNWSI Project QA organizational structure is such that if disputes in QA arise between the PQM and the WMPO Director, the PQM has the authority, through the QAD Director, to have DOE/NV Manager arbitrate. If not satisfied with the resolution, the PQM has authority to appeal to the OGR QA Manager and finally to the OCRWM QA Manager for final resolution.

1.7 The Nevada Test Site Office (NTSO) provides matrix support personnel functionally responsible and accountable to the WMPO and are responsible for field direction and coordination of the NTS Support Contractor operations, including architect-engineering, drilling, mining, construction, and logistical support for work performed at the NTS in accordance with NTS Operating Procedures. The NTSO acts on requests for NTS Support Contractor services submitted by Participating Organizations per NNWSI-SOP-03-01 and provides assistance to other project participants in areas of specialized expertise.

4 | 1.8 The Engineering and Energy Division provides matrix support personnel to WMPO to support the design activities on the NNWSI Project. The matrix personnel work as part of the various WMPO Branches providing technical direction to the NNWSI Project participants responsible for exploratory shaft and repository (subsurface and surface) design activities.

1.9 The Resource Management and Budget Division provides matrix support personnel to WMPO to assist in the areas of WMPO service contracts and procurement activities.

4 | 1.10 Participating Organizations and NTS Support Contractors are responsible to WMPO for the technical activities assigned to them per the NNWSI Project Work Breakdown Structure, and NNWSI Project specific technical plans. The technical activities are to be accomplished in accordance with the quality

assurance requirements in this NNWSI QAP and their respective QAPPs approved by WMPO.

Interfaces between the WMPO, the Participating Organizations, and the NTS Support Contractors are described in the QAPPs of the respective organizations. From an overall NNWSI Project standpoint, these interfaces are exchanges of technical requirements of work to be performed and liaison until completion of work. Participating Organization and NTS Support Contractor QAPPs describe the methods of conducting inter-organizational interfaces.

4 | All quality assurance personnel across the entire project shall report to management levels such that they have sufficient authority and organizational independence to identify quality problems; to initiate, recommend, or provide solutions; to verify implementation of solutions; and to stop unsatisfactory work. The organizational structure for executing the quality assurance programs varies from organization to organization, and each one shall be described in the individual organization's QAPP. The Technical Project Officer of the respective Participating Organizations and the Manager of the respective NTS Support Contractors are responsible to the WMPO Director to ensure that the NNWSI Project activities they are responsible for are performed to a QAPP and procedures consistent with this QAP.

#### 1.10.1 NTS Support Contractors

1.10.1.1 Fenix and Scisson, Inc. (F&S) F&S is the architect-engineer (A-E) for drilling and mining for the NNWSI Project. Responsibilities also include field surveillance and inspection of drilling and mining, and subsurface facilities construction and testing.

1.10.1.2 Holmes and Narver, Inc. (H&N) H&N is the A-E responsible for above-ground facilities. They provide Material Test Laboratory support, site preparation for surface facilities, drilling, field surveying, and inspection of facility construction.

1.10.1.3 Reynolds Electrical and Engineering Company (REECO) REECO is the prime support contractor providing support for subsurface and surface construction, drilling, and mining. REECO assists in the operation and maintenance of the site facilities and provides procurement and logistical activities for the NNWSI Project when requested.

## 1.10.2 Participating Organizations

1.10.2.1 Lawrence Livermore National Laboratory (LLNL) LLNL is responsible for the development of the waste package for tuff which includes the definition of the package environment, material development and testing, package design, performance analysis, and testing; the Spent Fuel Test-Climax demonstration experiments; and provides assistance to other project participants in areas of specialized expertise.

1.10.2.2 Los Alamos National Laboratory (Los Alamos) Los Alamos is responsible for nuclide migration studies, geochemistry, mineralogy, and petrology studies. Los Alamos acts as the lead technical organization for the Exploratory Shaft (ES) which includes planning and design review for ES construction, technical direction, and coordination and scheduling of the ES testing program. Los Alamos also provides assistance to other project organizations in areas of specialized expertise.

1.10.2.3 Sandia National Laboratories (SNL) SNL is responsible for repository systems development, data management and analysis; systems performance assessment of the repository; conceptual design of the repository; thermal and mechanical properties of the host rock; repository sealing performance requirements, materials evaluation, design, and testing; and provides assistance to other project participants in areas of specialized expertise.

4 | 1.10.2.4 Science Applications International Corporation (SAIC) SAIC is  
4 | responsible for technical and management support services which  
4 | includes technical and management assistance, advice, and consul-  
4 | tation to the WMPO Director; research and technology development;  
4 | project and technical management studies; project management system  
4 | development and project reporting; engineering and technical support  
4 | for project plans, reports, and presentations; institutional sup-  
4 | port; strategic planning; organization of the technical peer review  
4 | process; regulatory support; and environmental support.

4 | 1.10.2.5 United States Geological Survey (USGS) USGS is responsible for site  
4 | characterization of geology, hydrology, tectonism, volcanism, and  
4 | seismicity; acts as lead technical participant for the site charac-  
4 | terization drilling activities; is responsible for the operation of  
4 | the core library facilities at NTS for handling, storing, and  
4 | distributing material samples and core for the commercial nuclear  
4 | waste management activities at NTS; and provides assistance to other  
4 | project participants in areas of specialized expertise.

4 | 1.10.2.6 Westinghouse Electric Corporation/Waste Technology Services Division  
4 | (W/WTSD) W/WTSD is responsible for operation of the Engine Mainte-  
4 | nance Assembly and Disassembly (E-MAD) facility; spent fuel handling  
4 | and packaging tests and demonstrations; and provides assistance to  
4 | other project participants in areas of specialized expertise.

## 2.0 QUALITY ASSURANCE PROGRAM

- 4 |
- 2.1 The quality assurance program for the NNWSI Project as a whole consists of this QAP and the QAPPs of WMPO, the Participating Organizations, and the NTS Support Contractors. Figure 3 details the hierarchy of Quality Assurance criteria to be applied to the NNWSI Project. All appropriate elements of the 10CFR50, Appendix B criteria and ANSI/ASME NQA-1 requirements, as modified (see Appendix C) and adapted to the NNWSI Project activities shall be addressed in the QAPP for each organization. The QAPPs shall provide for the planning and accomplishment of activities affecting quality under suitable controlled conditions. Controlled conditions include the use of appropriate equipment, suitable environmental conditions for accomplishing the activity, assurance that prerequisites for the given activity have been satisfied, and control for verification of quality activities.
- 2.2 Written procedures will be used to implement the WMPO, Participating Organization and NTS Support Contractor QAPPs. Matrices of procedures referenced to the applicable criteria elements will also be included in each QAPP.
- 4 |
- 2.3 Participating Organizations and NTS Support Contractors shall assure that the applicable elements of this QA Plan and its supporting procedures (Appendix D) are covered in their respective QAPPs. Assurance that the elements have been adequately addressed and effectively implemented will be provided by WMPO with support from the QASC during the review and approval of their respective QAPPs, monitoring and surveillance operations, and regularly scheduled audits of the activities. The Participating Organizations' and NTS Support Contractors' management shall also monitor their respective QAPPs through internal audits to assess the adequacy of the program and assure its effective implementation.
- 2.4 To achieve and maintain proficiency, as necessary, a method will be established to indoctrinate, train, qualify, and certify personnel performing activities affecting quality.

NRC

10CFR60 SUBPART G

10CFR50 APPENDIX B

QA STANDARD REVIEW PLAN  
FOR HLW GEOLOGIC REPOSITORIES

DOE 5700.6

NV5700.6

OCRWM QAP

OGR/B-3

ANSI/ASME NQA-1

NNWSI QAP NVO-196-17

WMPO/NV QAPP NVO-196-18

WMPO/NV QMP'S

PARTICIPANT'S QAPP/MANUALS  
OR EQUIVALENT

QAPP'S FOR SPECIFIC TASKS

PROCEDURES

SAIC  
LLNL  
F&S

USGS  
W/WTSD  
REECO

LOS ALAMOS  
SNL  
H&N

SUBTIER SUPPLIERS

FIGURE 3 CRITERIA FOR QUALITY ASSURANCE

### 3.0 DESIGN AND SITE INVESTIGATION CONTROL

#### 3.1 Design Control

4 | 3.1.1 Design control applies to any information which defines or describes either how and by what means (equipment, methods, etc.) an engineered system, structure or component is to be formulated. Requirements are translated into such controlled documents as criteria letters, work requests, drawings, sketches, specifications, test plans, instructions, and procedures. All such documentation will be subject to the design control methodology of the organization responsible for that phase of the work to which it is applied. In every case, design verifications will be conducted to verify the adequacy of design, to assure appropriate quality assurance requirements are specified, ensure the documentation is identified and controlled, ensure changes are controlled and approved by the originating organizations, and ensure applicable regulations and standards are incorporated.

4 | 3.1.2 Consideration for the design of structures, systems, and components shall include the design criteria and performance criteria as required by the applicable Code of Federal Regulations (CFR) such as 10CFR20, 10CFR50 Appendix B, 10CFR60, and proposed 40CFR191. Considerations related to site characterization are found in 10CFR960.

4 | 3.1.3 Final design verifications will be conducted and documented for all Quality Assurance Level I and II items by either the Participating Organization or NTS Support Contractor responsible for the activity. The final design verification shall be completed prior to the approval of the design. The WMPO will participate in the design verification process by the reviews of all Quality Assurance Level I and II final design drawings.

## 3.2 Site Investigation Control

4 | 3.2.1 Site investigation control applies to any information which defines or describes either how or by what means the geologic conditions and ranges of parameters of the natural barriers for the geologic repository are to be characterized. The requirements for site investigations shall be translated into such controlled documents as criteria letters, drawings, plans, specifications, and procedures.

4 | 3.2.2 Prior to the start of a site investigation, the responsible Participating Organization shall develop a plan which will describe the tests and experiments including personnel requirements, organizational interfaces, and controls which will be utilized to determine the geologic, hydrologic, geotechnical, or tectonic mean values and range of uncertainties of the natural host formation. The plan shall present sufficient detail to determine whether or not the activities to be conducted, the methods of analyzing the data to be gathered, and the modeling methods will ensure that the end results will provide sufficient information necessary to evaluate the characteristics of the natural barriers against the criteria specified in 40 CFR 191.

4 | 3.2.3 The responsible Participating Organization shall conduct a technical review on the plan prior to the start of any activities associated with the plan. WMPO shall approve the plan prior to use.

## 3.3 Peer Reviews

3.3.1 Peer reviews shall be conducted or directed by WMPO when there is a unique application of an established or standard practice. The peer review process shall also be used when the activity involves untried practices, when the work exceeds the state of the art, and when new or unusual experimental techniques are used by a Participating Organization or NTS Support Contractor.

3.3.2 Peer reviews shall be performed by individuals which are independent from the originating Participating Organization or NTS Support Contractor. The QASC and QAD/NV will participate in reviews and verifications as requested by the WMPO.

#### 3.4 General

4 | 3.4.1 For work done at the NTS by NTS Support Contractors, criteria letters and/or work requests which stipulate specific requirements will be prepared by the organizations responsible for the activity. The criteria letters and/or work requests shall specify any approved documents (procedures, drawings, etc.) by which the activity is to be performed and is used by NTSO to direct the activities for WMPO at the NTS. Criteria letters and/or work requests shall be forwarded to the NTSO for coordination of the approval process (with a copy to the WMPO).

4 | 3.4.2 The NTS A-E Support Contractors will use the criteria letters and additional inputs, if any, to formulate engineering and construction drawings, specifications, test programs, drilling programs, or other documentation as necessary to accomplish the work. The formulated documents will then become the "design" documents from which the other NTS Support Contractors will perform the activity.

3.4.3 Those NNWSI Project activities which require the use of computer programs, including the design of equipment and facilities, analysis of test data, and shielding analysis, shall utilize, as applicable, the guidelines as set forth in NUREG-0856, Final Technical Position on Documentation of Computer Codes for High Level Waste Management, June 1983.

#### 4.0 PROCUREMENT DOCUMENT CONTROL

- 4.1 Procurement activities by DOE/NV and Participating Organizations and NTS Support Contractors in support of their tasks will be accomplished according to their written procedures and by their internal groups dedicated to that work. The WMPO requires Participating Organizations and NTS Support Contractors to assure that these internal groups include applicable regulatory requirements, design bases, and other requirements so that adequate technical and quality assurance requirements are included or referenced in their procurement documents.
- 4.2 Participating Organizations and NTS Support Contractors shall invoke the applicable QA requirements of this plan on their subcontractors in procurement documentation. Quality Assurance Program Plans and documents of subcontractors for Quality Assurance Level I purchases shall be reviewed and approved by the procuring Participating Organization or NTS Support Contractor. Those which do not adequately define quality assurance requirements, as judged by the QA representative of the participant, are to be corrected prior to initiation of activities specified by the purchase order or contract.
- 4.3 Participating Organization and NTS Support Contractor purchase orders to subtier contractors involving Quality Assurance Level I activities shall provide for access to the contractors' facilities and quality assurance records by WMPO or its authorized representative. WMPO access to subtier contractor facilities shall be arranged by the contracting Participating Organization or NTS Support Contractor.
- 4.4 Participating Organizations and NTS Support Contractors shall forward a copy of all procurement documents, as issued, to WMPO when the purchase involves Quality Assurance Level I items.
- 4.5 WMPO procurements for contractors shall be controlled through the use of the Federal Acquisition Regulations (FAR) and Department of Energy Acquisition Regulations (DEAR). When WMPO procures services from contractors or requests services from national laboratories and

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supporting Federal agencies, WMPO shall prepare work agreements, memos of understanding, interagency agreements, management agreements, or other suitable procurement documents which shall identify the relationship between WMPO and the organization on the quality assurance and technical requirements required, and interface for the control of the requirements.

## 5.0 INSTRUCTIONS, PROCEDURES, AND DRAWINGS

4 | 5.1 All activities affecting quality on the NNWSI Project will be performed utilizing approved instructions, procedures, drawings, or other documents which will include or reference appropriate quantitative or qualitative acceptance criteria. QA administrative procedures or documents provide instructions for implementation and application of this QAP and the Participating Organizations' and NTS Support Contractors' QAPPs. These are issued and controlled by the respective QA organizations and apply to all applicable technical programs. The detailed technical documents will be developed by each organization's technical group, and issued and controlled in accordance with QA administrative procedures. These technical documents contain the instructions for actual performance of the activities which include, but are not limited to, sample gathering, investigation, design, testing, experiments, construction, and operation.

5.2 Each Participating Organization and NTS Support Contractor is responsible for ensuring that they have approved documentation to perform their assigned tasks prior to implementation. These documents shall be available at the work location. The technical documentation shall have an independent review. In cases involving state-of-the-art test procedures, experiments, data acquisition and reduction, and interpretation of results, the Participating Organization or NTS Support Contractor responsible for the activity will assure that an independent technical review is conducted by qualified personnel to assure confidence in the data obtained.

4 | 5.3 For QA Level I activities, a copy of the QA administrative and technical documents shall be sent to WMPO and the QASC. The administrative QA Procedures and Quality Assurance Program Plans of the NNWSI Project participants will require WMPO review and approval prior to use.

4 | 5.4 For QA Level I and II activities, each Participating Organization and NTS Support Contractor shall provide the WMPO and the QASC with an up-to-date index of all the documents defined in 5.1.

4 | 5.5 Detailed technical and QA administrative documents for QA Level I and II activities shall be available for WMPO or QASC review at the location where the activity is performed.

4 | 5.6 A list of supporting procedures for this QAP is included in Appendix D. The requirements of these procedures shall be followed by the Participating Organizations and NTS Support Contractors for NNWSI Project activities.

## 6.0 DOCUMENT CONTROL

- 6.1 Each of the Participating Organizations and NTS Support Contractors on the NNWSI Project shall have written procedures which describe how they control their quality-related documents and interfaces with other participants (methods and controls for document exchange). These methods must be fully defined in the QAPPs written by these groups for this project and in the procedures referenced therein. To assure adequate quality assurance coverage, all these documents and interface control methods shall include the basic elements of issuance and distribution control and change control of content.
- 4 | 6.2 A master list or equivalent document control system shall be established to identify the current revision of instructions, procedures, specifications, drawings, etc. for Quality Assurance Level I and II activities. The Participating Organizations and NTS Support Contractors shall provide WMPO and the QASC with a copy of the current listing as issued.
- 4 |
- 6.3 Each Participating Organization and NTS Support Contractor shall establish a method of controlling their respective QAPPs and implementing procedures to ensure that the latest approved revision is in use by all personnel of the organization performing work on the NNWSI Project.

## 7.0 CONTROL OF PURCHASED MATERIALS, EQUIPMENT, AND SERVICES

- 4 | 7.1 The WMPO has delegated the procurement of materials, equipment, and services to the Participating Organizations and NTS Support Contractors as needed to properly conduct their activities. The procurement of these items and services shall be controlled to assure conformance with specified requirements. The QAPPs of the organizations will define and reference in written procedures, the method of vendor evaluation and selection, evaluation of quality of furnished items or services, verification of supplier's conformance to specifications, and periodic surveillance of vendors.
- 4 | 7.2 WMPO shall perform unannounced surveillances on the activities conducted by the Participating Organizations, NTS Support Contractors, and other contractors. These organizations will be contacted by the observer upon entry into the facility or work area. The organizations' management shall provide the observer with the necessary guides, access, documents, etc., that are required in the performance of the surveillance.
- 7.3 When a Participating Organization and/or NTS Support Contractor contracts NNWSI Project activities to another Participating Organization and/or NTS Support Contractor, the contracting organization shall conduct surveillances of the contracted organization. As necessary, the surveillance shall be conducted to determine that the item and activity are being conducted in accordance with the contracting organization's requirements.

## 8.0 IDENTIFICATION AND CONTROL OF MATERIALS, PARTS, AND COMPONENTS

4 | 8.1 Materials, parts, and components (including core, cuttings, and other field and laboratory samples) used in the NNWSI Project will be identified and controlled by the user organization or contractor. Their identification and method of control will be documented and this information will be available to the WMPO at the site of work. A procedure, as applicable, for control and identification of material, parts, and components will be part of each individual QAPP.

4 | 8.2 All Quality Assurance Level I and II items will have their identification maintained on the items or on records traceable to the items as required throughout fabrication, erection, installation, collection, preparation and use. Item identification shall be traceable to documents including, but not limited to, logs, test records, inspection documents, and nonconformance reports.

## 9.0 CONTROL OF PROCESSES

9.1 All processes affecting quality of items or services shall be controlled by instructions, procedures, drawings, checklists, or other appropriate means.

4 | 9.2 When special processes are required to control quality, the use of qualified personnel, equipment, and procedures is necessary. The criteria for qualification of personnel, equipment, and procedures, and the maintenance of the qualification records will be as specified in the Participating Organizations' and NTS Support Contractors' QA programs. Special process verification methods and criteria will also be documented and retained.

9.3 A special process is a process in which the results are highly dependent on either the control of the process or the operator's skill, or both, and in which the specified quality cannot be readily determined by inspection or testing of the item. Examples of special processes include, but are not limited to, welding, nondestructive testing and core sample preparation.

4 | 9.4 For QA Level I activities, the Participating Organizations and NTS Support Contractors will forward their special process procedures to WMPO for review and approval prior to use.

4 | 9.5 The Participating Organizations and NTS Support Contractors shall submit to WMPO and the QASC a current master index of special process procedures for QA Level II activities.

## 10.0 INSPECTION

- 10.1 Individual participant QAPPs shall provide for inspections to be performed in accordance with written procedures by qualified personnel who did not perform the work being evaluated. Qualified personnel include personnel from independent inspection organizations as well as personnel from the same organization if they were not responsible for the actual work being evaluated. It is the function of the QA personnel from the performing organization assigned to an activity to assure that qualified individuals are selected to perform the inspection. The results of all inspection activities will be documented by the inspecting organization.
- 10.2 The one-of-a-kind items of hardware or equipment which are developed and built to support research activities are subject to the inspection controls previously described. The extent of inspection (source or receiving), the inspection procedures, the designation of inspection personnel or organizations, and provisions for monitoring are all considered and applied as necessary to establish design conformance of the item.
- 4 | 10.3 Procedures, instructions, or checklists for inspection of QA Level I  
4 | items or services shall provide the following: identification of the  
item or service to be inspected, identification and qualification of  
personnel performing the inspection, acceptance and rejection criteria,  
method to document the results of the inspection, and accuracy of the  
equipment necessary to perform the inspection.
- 10.4 Under the direction of WMPO, the QASC shall conduct unscheduled surveillances of activities performed by the Participating Organizations and NTS Support Contractors.

4 | 11.0 TEST AND EXPERIMENT/RESEARCH CONTROL

11.1 Test Control

4 | 11.1.1 Tests shall be conducted when they are required to verify conformance of an item to specified requirements and/or to demonstrate that the item will perform as intended. Tests may also be conducted to demonstrate the validity of conclusions based on experimental data and/or to assess the overall status of an experiment. The characteristic to be tested and test methods to be employed shall be specified. The completed test results shall be documented and conformance with acceptance criteria shall be evaluated.

4 | 11.1.2 For Quality Assurance Level I activities, test procedures will be submitted to WMPO for review and approval prior to testing. These procedures will define the test and plans for its execution; provide a means of assuring that test prerequisites are met; specify adequate instrumentation and suitable environmental conditions; provide for documentation, evaluation, and retention of test results; and delineate necessary quality assurance provisions.

4 | 11.2 Experiment and Research Control

4 | 11.2.1 Experiments and Research shall be conducted to establish characteristics or values not previously known and shall be performed under controlled conditions.

4 | 11.2.2 Quality Assurance Level I and II experiments or research shall be controlled by the use of logbooks (or other suitable means to provide uniform documentation). The experiment or research logbook shall include but is not limited to the entries listed in paragraph 11.2.2.1 and 11.2.2.2.

11.2.2.1 One-time entries - the following logbook entries shall be made prior to the start of the activity and as the experiment or research changes dictate:

- o The title of the experiment or research
- o The name of the individual(s) performing the activity
- o Objectives
- o List of the equipment and materials used
- o Equipment calibration requirements
- o Dated signature of the individual(s) making the above entries

11.2.2.2 Periodic Entries - the following entries shall be made as appropriate during the performance of the experiment or research.

- o The date and name of the individual making the entry
- o A description of the experiment or research element attempted
- o Any conditions which may adversely affect the experiment or research
- o Identification of samples utilized
- o A brief listing of the results with notation of unexpected results
- o Any deviations to the entries in paragraph 11.2.2.1
- o Interim conclusions reached if appropriate
- o The final results and a summary of the outcome of the experiment or research which addresses the original objectives.

11.2.3 The physical control of completed (or partially completed) logbooks shall be addressed in the organizations document control system.

## 12.0 CONTROL OF MEASURING AND TEST EQUIPMENT

- 12.1 Calibration methods for measuring and test equipment being used in activities affecting quality shall be addressed in the QAPPs of the Participating Organizations and NTS Support Contractors. Measuring and test equipment is a device or system used to calibrate, measure, gage, test, or inspect in order either to control, to acquire data to verify conformance to specified requirements, or to establish characteristics or values not previously known.
- 12.2 The basic controls will include a recall system, periodic calibration, records of calibration, and a suitable equipment marking method to indicate calibration status. All measuring and test equipment calibration will be traceable either to the National Bureau of Standards or to other nationally recognized physical standards. If no nationally recognized standards exist, the basis for calibration shall be documented.
- 12.3 Measuring and test equipment which is of special design for a particular investigative activity will be designed, developed, and manufactured under the control of the Participating Organization or NTS Support Contractor involved. Before using such equipment in an NNWSI Project test or experiment, a complete check-out will be conducted per approved written procedures to assure conformance to specifications and to assure that the equipment is calibrated in accordance with paragraphs 12.1 and 12.2.
- 12.4 When measuring and test equipment is found to be out of calibration, an evaluation shall be made of the validity of previous inspection, test, or experiment results, and of the items previously inspected or tested.

## 13.0 HANDLING, STORAGE, AND SHIPPING

4 | 13.1 Written procedures are to be prepared by the responsible Participating Organizations and NTS Support Contractors to delineate the identification, packaging, handling, shipping, preservation, and storage of both sample and hardware materials involved in their task activity to preclude damage, loss, or deterioration by environmental conditions.

## 14.0 INSPECTION, TEST, AND OPERATING STATUS

- 14.1 Identification of inspection, test, and operating status is a requirement to be addressed, as applicable, in the QAPPs of the Participating Organizations and NTS Support Contractors. Implementing methods will include systems capable of assuring that activities are completed in a planned sequence to assure that items, or associated data, which have not passed the required inspections and tests, are not inadvertently used within the Project.
- 14.2 Status will be identified during the conduct of activities through indicators such as physical location and tags, markings, logs, stamps, inspection and verification records, or other suitable means. The method for control and application of status indicators will detail the authority for application and removal of the indicators.
- 14.3 The criterion in the above paragraphs will also apply to research and development activities for operations that include a planned sequence of activities that are to be verified. The criterion will be especially applicable to test or data generation hardware that is fabricated, performance tested or verified during the progress of work.

## 15.0 NONCONFORMANCES

- 4 | 15.1 Nonconformances are deficiencies in characteristics, documentation, or procedures that render the quality of items or activities unacceptable or indeterminate. All personnel from the Participating Organizations and NTS Support Contractors are responsible for reporting nonconformances. The QAPPs of the Participating Organizations and NTS Support Contractors shall identify the interface controls to meet the requirements of the NNWSI QA Plan and supporting procedures.
- 4 | 15.2 When nonconforming items or components are identified, they will be segregated, when practical from acceptable items until adequate disposition can be made. If services or data appear to be nonconforming, the suspected condition will be documented and appropriate action will be taken. All nonconformances are to be documented by the appropriate Participating Organization or NTS Support Contractor to fully define the condition and the disposition of the nonconformance. The action taken to correct the nonconformance shall be verified and documented. Distribution of documentation shall be to all affected organizations.
- 4 | 15.3 Nonconformances for QA Level I and II activities will be dispositioned by the individual organization and shall have WMPO approval prior to implementation of the disposition when the disposition involves repair or use-as-is. WMPO will decide whether the activities are to be suspended until disposition is taken, or to continue conditionally.
- 4 | 15.4 Copies of all closed-out Quality Assurance Level I and II nonconformances will be sent to the WMPO and the QASC by the issuing Participating Organization or NTS Support Contractor.
- 4 | 15.5 Each Participating Organization and NTS Support Contractor shall develop a procedure for reporting unusual occurrences which meets the requirements of DOE Order 5000.3, (latest revision). Reports of unusual occurrences shall be submitted to the WMPO for further processing.

## 16.0 CORRECTIVE ACTION

- 4 | 16.1 A corrective action system is to be defined in the approved QAPP of each Participating Organization or NTS Support Contractor. The system will serve to identify significant conditions adverse to quality. These significant conditions include, but are not limited to, breakdown of the NNWSI QAP or participant QAPPs, and repetitive nonconformances. The cause of the condition shall be determined and corrective action taken to preclude recurrence.
- 16.2 The identification, cause, and corrective action taken shall be documented and reported to appropriate levels of management. A follow-up action shall be taken to verify implementation of the corrective actions.
- 4 | 16.3 Copies of QA Level I & II corrective actions will be sent to the WMPO and the QASC.

## 17.0 QUALITY ASSURANCE RECORDS

- 17.1 The Records Management Plan (RMP) establishes the method to assure that necessary and sufficient records will be maintained to support conclusions reached from investigations, tests, analyses, and other activities associated with the project, including the design and construction of required facilities. This overall RMP will be supplemented and expanded by the individual procedures of the Participating Organizations and NTS Support Contractors. The Project Record Center (PRC) reviews the documents to verify adequacy as a record and provides for permanent storage.
- 17.2 The RMP defines what records are to be retained; establishes the provisions for Participating Organizations, NTS Support Contractors, and WMPO records management and control; and outlines the requirements for record submittal, review of incoming records, filing methods, access control, and reproduction methods. Procedures utilized for the administration and control of the PRC are to be outlined in the RMP.
- 17.3 The PRC provides necessary precautions for the preservation and storage of quality records. Access to the records in the records storage areas will be procedurally controlled.
- 17.4 The WMPO is responsible for identifying the record types that should be contained in the Project Record Center by means of the Record Management Plan. Each Participating Organization and NTS Support Contractor will develop a list of records planned for forwarding to the PRC. These lists of records are to be used by the PRC for development and maintenance of an overall record index. The WMPO will approve Participating Organization and NTS Support Contractor record lists to assure that adequate records are planned for retention in the PRC.
- 17.5 The record index will include retention times for all records stored in the PRC. Record retention times are based on requirements set forth in the Record Management Plan.

17.6 Participating Organizations and NTS Support Contractors will define their individual record management system in their QAPPs. Record control requirements will include a method for record identification, content, verification for completeness, and necessary approval. A method for the interim storage of the records, during the period prior to the transfer to permanent storage, and a description of the equipment and facilities to be used will be included in the QAPP or an appropriate implementing procedure.

## 18.0 AUDITS

### 18.1 Scope of NNWSI Project Audit Program

18.1.1 NNWSI Project activities will be subject to audits on the basis of impact to the Project. The method of planned and scheduled audits shall be developed to verify compliance with all aspects of the quality assurance program and to determine its effectiveness.

4 | 18.1.2 The audits shall be performed in accordance with written procedures using checklists by personnel who do not have direct responsibility for performing the activities being audited. Personnel performing audits shall be properly trained and qualified. Audit results shall be documented and reviewed by responsible management/organizations. Follow-up action shall be taken where indicated.

18.1.3 Audit findings will be reviewed with the audited organizations at a closing meeting. Formal written reports which request a response within 30 days of receipt shall be sent to the audited organization. The response shall address the corrective action for each finding and provide a realistic completion date for implementation of the corrective action.

18.1.4 The NNWSI Project audit program will be executed at the programmatic level by the WMPO and at the activity level by individual Participating Organizations and NTS Support Contractors.

### 18.2 WMPO Audits

18.2.1 The QASC will develop a schedule defining the WMPO audits planned for each fiscal year. This schedule will be approved and issued by the WMPO as an annual planning document. Additional audits may be conducted when a unique need arises or when an audit is requested by a Participating Organization or NTS Support Contractor. Participating Organizations and NTS Support Contractors shall be audited periodically

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to verify implementation of all elements of their respective QAPPs and this QAP. WMPO shall also conduct internal audits which cover the complete WMPO QAPP on an annual basis.

18.2.2 The WMPO will select a Lead Auditor to perform WMPO audits. With concurrence from WMPO, the Lead Auditor shall select qualified personnel as audit team members.

18.2.3 Copies of audit documents shall be sent to QAD/NV, the QASC, and the audited organization.

### 18.3 Participating Organization and NTS Support Contractor Audits

4 |  
18.3.1 Each Participating Organization and NTS Support Contractor shall conduct internal (covering their entire QAPP on an annual basis) and external (direct subcontractor) audits of activities under its direct control, but they will not conduct audits of each other.

18.3.1.1 The WMPO shall assure that a programmatic audit of all the Participating Organizations and NTS Support Contractors is conducted to determine the adequacy and effectiveness of their QAPPs. These audits will eliminate the need for the Participating Organizations or NTS Support Contractors to conduct audits of each other. Representatives of the Participating Organizations and/or NTS Support Contractors may be invited to participate in a WMPO audit when the audited organization's activities are of mutual interest.

4 |  
18.3.2 Participating Organization and NTS Support Contractor audits will be scheduled, planned, conducted, and reported as described in their respective QAPPs and this QAP. External and internal audit schedules, and changes thereto, shall be sent to the WMPO and the QASC. Audit schedules shall identify the date of the audit, the activities to be audited, and the requirements to which the activities are to be audited.

18.3.3 The results of these audits will be reported to appropriate levels of the audited organization's management who will review the audit findings and approve the proposed corrective action. Follow-up action or re-audits will be performed as necessary.

4 | 18.3.4 The Participating Organizations and NTS Support Contractors shall send copies of external audit reports and close-out notifications to WMPO and the QASC upon generation.

4 | 18.4 On a selective basis WMPO, or their representative shall participate in external vendor audits conducted by the Participating Organizations and NTS Support Contractors of their vendors.

APPENDIX A

PARTICIPATING ORGANIZATION AND SUPPORT CONTRACTOR QAPPS\*

Participating Organizations

|   |    |  |   |
|---|----|--|---|
|   | 1. | Waste Management Project Office/<br>Nevada Operations Office (WMPO)                            | Waste Management Project Office<br>Quality Assurance Program Plan<br>NVO-196-18                   |
| 4 | 2. | Lawrence Livermore National<br>Laboratory (LLNL)   | Quality Assurance Program Plan<br>NNWSI   |
| 4 | 3. | Los Alamos National Laboratory<br>(Los Alamos)   | NNWSI-QP-01; Quality Assurance<br>Program Plan for Nevada Nuclear<br>Waste Storage Investigation. |
| 4 | 4. | Sandia National Laboratories (SNL)   | Nevada Nuclear Waste Storage Inves-<br>tigations Quality Program Plan                             |
| 4 | 5. | Science Applications International<br>Corporation (SAIC)                                       | T&MSS Quality Assurance Program<br>Plan, QAPP-1.  |
|   | 6. | United States Geological Survey<br>(USGS)  | NWM-USGS-QAPP-01, USGS Quality<br>Assurance Program Plan  |
| 4 | 7. | Westinghouse Electric Corporation -<br>Waste Technology Services Division<br>( <u>W</u> /WTSD) | WTSD-TME-046, Nevada Operations<br>Quality Assurance Program Plan                                 |

\* The WMPO shall maintain a current approved copy of the Participating Organization and NTS Support Contractor QAPPS in the QA files.

Support Contractors (NTS)

- 4 |
1. Fenix & Scisson, Inc. (F&S) F&S Quality Assurance Program Plan,  
QAPP-001
  2. Holmes & Narver (H&N) H&N-0020-1088
  3. Reynolds Electrical & Engineering Company (REECO) NNWSI QAPP, NTS 568-DOC-115

## APPENDIX B

### DEFINITIONS

The definitions of terms used in this Quality Assurance Plan shall be as given in American National Standards Institute specification ANSI/ASME NQA-1, Supplement S-1 with the following additions:

Contractor - Organizations under contract to provide supplies, construction, or services.

Design - The act of developing specifications for construction or analyzing the performance of waste repository engineered structures, systems, components and natural barriers. Design documentation includes, but is not limited to, drawings, sketches, specifications, test plans, design reports, test reports, system design descriptions, configuration status listings, design manuals, and computer code manuals describing computer programs utilized for design or performance analysis.

Experiments - Performance of those operations carried out under controlled conditions in order to establish characteristics or values not previously known.

Functional Characteristics - Those attributes of a repository or its structures/systems/components that determine its performance with respect to safety, reliability, operability, and other design criteria established in the NWTS Program or other federal regulatory documents.

Items - An all-inclusive term used in place of any of the following: appurtenance, assembly, component, equipment, material, module, part, services, structure, subassembly, subsystem, unit, data, sample (geological, environmental or radiological), and prototypic hardware.

Material - a term that includes items plus any hardware or geologic samples used in, or resulting from, research and development or site investigations on the NNWSI Project. Hardware and geologic specimens include, but are not limited to, test apparatus or equipment, special nuclear material, cores, geologic samples, water and gas samples, etc.

Peer Review - A documented verification process over and above the normal independent technical review to assure that the activity conducted by a Participating Organization or NTS Support Contractor is technically adequate and that it will satisfy requirements established to meet the NNWSI Project objectives.

Product nonpermanent records - Documents that specify structures, systems, and components of a repository have been designed and constructed in accordance with applicable requirements, but are such that it is not necessary to retain them as lifetime records. These records include design verification data, receiving records, calibration records, maintenance records, inspection records, radiographs not associated with inservice inspection and test records which are not otherwise designated as life-time records.

Programmatic nonpermanent records - Those documents that are used to prescribe activities affecting quality, but which are not considered permanent records. Such records include documents describing the planning, execution, and auditing of activities affecting quality.

Quality Assurance Program Plan (QAPP) - The document that describes the quality criteria, practices, and procedures necessary to achieve the desired quality levels for the NNWSI Project.

4 | NNWSI Project Quality Assurance Plan (QAP) - The document that describes the planned systematic quality assurance requirements which assure that all activities of the NNWSI Project are accomplished per the QAPPs of the Participating Organizations and NTS Support Contractors to achieve the required quality levels.

Supplier - Organizations under contract to provide material, components, or services.

Procurement documents - Purchase requisitions, or purchase orders, or letter of intent, or work authorization letters, and drawings, contracts, specifications, instructions, or any document which provides a means to acquire possession or ownership of items, or right to the use of services by payment.

Technical Review - A documented review to verify the adequacy of site investigations to ensure correct field and laboratory data acquisition, reduction, and interpretation of results.

APPENDIX C

MODIFICATION TO ANSI/ASME NQA-1 FOR QA LEVEL I  
PROGRAM CONSIDERATIONS

I. Supplement 1S-1

- A. Section 2.1 add the following: (c) the quality assurance and quality control organizations and applicable performing organizations shall be involved and integrated in those quality assurance and quality control aspects in the design and construction of the repository and the characterization of the site. (d) the extent of involvement, as determined by the technical and quality assurance staff, is dependent upon the specific activity and its subsequent effect upon the repository safety and reliability, and the complexity of the quality assurance requirements involved.

II. Supplement 2S-1

- A. Section 2.4 - Training shall include instructions on those changes to the quality assurance program and implementing procedures that affect previous training instructions.

III. Appendix 2A-2

- A. Section 3.1 and 3.2 shall apply with the following addition:

- 1) A plan shall be developed outlining the work to be performed and the work procedures or instructions required to comply with the requirements of the defined work scope.
- 2) Planning shall include a review of the structure, system, or component design/construction/procurement specifications, materials, drawings, work plans, and schedules to insure that fabrication, installation, modification, inspection, testing,

etc., activities have been incorporated; that the work can be accomplished as specified and that time and resources plus training are sufficient to accomplish the work in accordance with the specified requirements. Planning shall define the operations to be performed, the systematic sequential progression of operations, and the overall measures to be employed to preserve the quality of the work.

#### IV. Supplement 3S-1

- 4 | A. Section 2.0 - Design inputs shall consider the inputs of 3A-1, Section 5 where applicable. Design inputs selected shall be traceable to the design.
  
- 4 | B. Section 4 - The use of the designer's immediate supervisor to perform design verification shall be limited to those cases where (1) the supervisor is the only technically qualified individual (2) the need is documented and approved in advance by the supervisor's management, (3) quality assurance audits cover frequency and effectiveness of the practice.
  
- C. Section 4.2.1 - Peer reviews are subject to the requirements of this section.
  
- D. Section 5 - Controls shall ensure that design documents that become quality assurance records reflect the as-built condition of the repository.
  
- E. Section 5 - Controls shall be established to evaluate original designs so that trends may be identified and effective corrections taken to preclude the recurrence of the condition necessitating changes.

V. Supplement 4S-1

4 | A. Section 2.7 - The procurement of spare and replacement parts shall be subject to equal or better technical and quality assurance requirements. When QA and technical requirements of the original item cannot be determined, an engineering evaluation shall be conducted by qualified individuals to establish the requirements. The evaluation shall consider the interchangeability, function, and safety of the item. This evaluation shall be documented.

VI. Supplement 6S-1

A. Section 2 - add the following:

- d) a method for the removal or marking of obsolete or superseded documents to prevent inadvertent use,
- e) a master list or equivalent to identify the correct and updated revisions of documents,
- f) coordination of interfaces.

4 | VII. Basic Requirement No. 11, "Test Control" is modified to read: "Tests required to verify conformance of an item to specified requirements or to demonstrate that items will perform satisfactorily in service, and experiments and research to determine functional characteristics or values not previously known shall be planned and executed. Characteristics and methods to be employed shall be specified. Results shall be documented and their conformance with acceptable criteria shall be evaluated. This requirement applies to geologic investigations that produce data, recommendations, or other bases for a decision on sites for a potential nuclear waste repository. R&D projects providing design bases for such a repository are also included."

4 | VIII. Basic Requirement No. 17, "Quality Assurance Records" is modified to read: Records that furnish documentary evidence of quality shall be specified, prepared, and maintained. Records shall be legible, identifiable, and retrievable. Records shall be protected against damage, deterioration, or loss. Requirements and responsibilities for record transmittal, distribution, retention, maintenance, and disposition shall be established and documented. WMPO shall prepare and submit a records management plan to DOE/HQ for review and concurrence.

4 | IX. Supplement 17S-1

A. Section 4 - This section shall apply to permanent and temporary record storage facilities.

X. Appendix 17A-1

A. Section 3.0 shall apply to supplement 17S-1.

B. Section 3.3 and 3.4.3 - include radiographs (for inservice inspection applications).

C. Section 3.3 - As-built drawings and records shall correctly identify the installed condition of the item. The type of as-built drawings and records to be maintained at the operating repository shall be specified.

XI. Supplement 18S-1

4 | A. Section 2.0 - Internal Audits. All elements of the organization's quality assurance program shall be audited at least annually.

B. Section 2.0 - External Audits. Elements of an external organization (including suppliers) QA program plan shall be audited at least annually or once during the life of the activity, whichever is shorter.

- C. Section 2.0 - Regularly scheduled audits shall be supplemented when (1) significant changes are made in functional areas of the QA program plan such as significant reorganization or procedure revisions; (2) it is suspected that the quality of an item or service is in jeopardy due to deficiencies in the QA program plan; and (3) a systematic, independent assessment of the QA program plan effectiveness is considered desirable.
  
- D. Section 4.0 - This section shall incorporate sections 2.3 and 2.4 from 18A-1. Also, one of the elements that shall be reviewed during an audit is the corrective action taken on the deficiencies that were identified during a previous audit of that area.
  
- E. Section 8.0 Records - Audit records shall include any audit procedures or checklists associated with the audit. The audit records system shall include measures to indicate the extent of completion of the audit and the audit results for each completed audit plan item.

APPENDIX D

List of NNWSI Project Standard Operating Procedures. The requirements of these procedures shall be followed by the Participating Organizations and NTS Support Contractors.

| TITLE  | NUMBER   | △ | COMMENT                                       |
|--|--|---|---|
| o Quality Assurance Program Plan Requirements for NNWSI Project Participating Organizations and NTS Support Contractors, and their subtier vendors | NNWSI-SOP-02-01                                | △ | HQ memo 4/22/85                               |
| o Assignment of Quality Assurance Levels to NNWSI Activities and Items   | NNWSI-SOP-02-02                                | △ | approved<br>HQ memo 4/28/86                   |
| o Engineering, Construction, and Support Services at the Nevada Test Site  | NNWSI-SOP-03-01                                | △ | approved<br>4/6/85                            |
| o Quality Assurance Software   | NNWSI-SOP-03-02,                               | △ | in development<br>Comments<br>HQ memo 4/28/86 |
| o Acceptance of Data or Data Interpretation Not Developed Under the NNWSI QA Plan  | NNWSI-SOP-03-03                                | △ | Comment<br>HQ memo 4/28/86                    |
| o NNWSI Nonconformance Control System  | NNWSI-SOP-15-01                                | △ | Comment<br>HQ memo 4/28/86                    |
| o Records Management Plan  | NNWSI-SOP-17-01, in development<br>(QMP-17-01) |   |   |

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