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**INTRODUCTION TO THE NUCLEAR CRITICALITY
SAFETY EVALUATION OF FACILITY X-705,
PORTSMOUTH GASEOUS DIFFUSION PLANT**

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August 16, 1993

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Diffusion Plant***

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Lawrence Livermore National Lab., CA (United States)

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ACRONYMS

ANSI	—	American National Standards Institute
ANS	—	American Nuclear Society
ANT	—	Applied Nuclear Technology
DOE	—	Department of Energy
DYMCAS	—	Dynamic Material Control Accounting System
ESR	—	Engineering Services Request
FA	—	Field Agreement
FCA	—	Facility Change Agreement
FSAR	—	Final Safety Analysis Report
GAT	—	Goodyear Atomic Corporation
GDP	—	Gaseous Diffusion Plant
HEU	—	Highly enriched uranium
IP	—	In-Hand Procedure (formerly OM)
LLNL	—	Lawrence Livermore National Laboratory
MSDS	—	Material Safety Data Sheet
MMES	—	Martin Marietta Energy Systems, Inc.
NCS	—	Nuclear Criticality Safety
NCSA	—	Nuclear Criticality Safety Approval
PEH	—	Planned Expeditious Handling
PGDP	—	Paducah Gaseous Diffusion Plant, Paducah, Kentucky
PORTS	—	Portsmouth Gaseous Diffusion Plant, Piketon, Ohio
OA	—	Operational Area
OGRU	—	Oil and Grease Removal Unit
OM	—	Operating Method
OSR	—	Operational Safety Requirement
RP	—	Reference Procedure
S	—	System
SS	—	Subsystem
UES	—	Uranium Enrichment Support

ABSTRACT

This report is the first in a series of documents that will evaluate nuclear criticality safety in the Decontamination and Recovery Facility, X-705, Portsmouth Gaseous Diffusion Plant. It provides an overview of the facility, categorizes its functions for future analysis, reviews existing NCS documentation, and explains the follow-on effort planned for X-705. A detailed breakdown of systems, subsystems, and operational areas is presented and cross-referenced to existing NCS documentation.

1.0 INTRODUCTION

As part of its overall Uranium Enrichment Support (UES) Project, the Department of Energy (DOE) has tasked Lawrence Livermore National Laboratory to provide nuclear criticality safety (NCS) support to the gaseous diffusion plants (GDP), operated by Martin Marietta Energy Systems (MMES), near Portsmouth, Ohio, and Paducah, Kentucky. One requirement of this GDP NCS Task, as defined by MMES, is a criticality evaluation of the Decontamination and Uranium Recovery Facility, X-705, at the Portsmouth Gaseous Diffusion Plant (PORTS).

This report is the first in a series of documents that will evaluate nuclear criticality safety in X-705. Its primary purposes are to: (1) provide an overview of the facility, (2) categorize the facility operations and equipment for future analysis, (3) review the existing NCS documentation relative to X-705, and (4) explain the follow-on effort.

Section 2.0 of this report provides a general description of X-705 and discusses a functional breakdown of its systems, subsystems, and operational areas. Section 3.0 summarizes the various types of MMES NCS documentation, with specific details on those relative to X-705, and correlates these numerous NCS documents with the systems, subsystems, and operational areas. An overview of the future effort planned for the X-705 assessment is then presented in Section 4.0.

The information on systems, subsystems, and operational areas presented in this report was current as of September 1992.

2.0 X-705 FACILITY

2.1 Description

The X-705 building is a permanent structure, approximately 520 feet by 160 feet, with a concrete slab floor, concrete and transite walls, and steel support columns. Steel trusses support a metal roof deck, covered by insulation and roofing. The building is sited in the northern part of the plant and centrally located with respect to the X-326, X-330, and X-333 process buildings. X-705 is managed by the Chemical Operations Department, Uranium Production Subdivision.

The primary purpose of the X-705 facility is to decontaminate process equipment from the uranium enrichment cascade prior to maintenance, modification, or other disposition. Other uranium-contaminated items, such as heeled uranium hexafluoride (UF_6) cylinders and chemical trap material, are also processed in X-705.

The procedures used to decontaminate equipment produce a significant quantity of uranium-bearing solutions. Solutions with high uranium concentration are processed in X-705 to recover the uranium (in oxide form) for potential future use and to remove other unacceptable materials before the effluents are released to the environment. Solutions with low uranium content are also treated to remove uranium, which is collected in waste storage drums.

Until 1978 the recovered uranium (U_3O_8) was further converted to UF_6 in X-705 so that it could be reintroduced into the cascade. Environmental concerns resulted in the discontinuance of that process, and the oxide is now simply stored in other plant facilities. No program appears to exist to consider restart of the oxide conversion process.

Finally, in order to perform the above functions of decontamination, uranium recovery, and water treatment, a number of support services are required. These include, for example, utility services, maintenance capability, laboratory analyses, and administrative support. In general, the major support services required in X-705 are located within the building itself.

2.2 Systems

As discussed in Section 2.1, X-705 is a large facility housing numerous activities and support services. In order to perform an NCS evaluation of the entire facility, it is first necessary to divide X-705 into logical categories of related activities that can be analyzed individually. These individual activities can then be consolidated, with particular attention to their interfaces, in order to achieve an overall NCS evaluation.

For this study, X-705 has been divided into five top-level systems based on general functional area:

- (1) Decontamination
- (2) Uranium Recovery
- (3) Oxide Conversion
- (4) Waste Water Treatment
- (5) Support Services

This breakdown is shown schematically in Fig. 2.1. The reader should note the direct correspondence between these functions and the description of X-705 discussed in Section 2.1.

Other criteria, besides functional area, could have been chosen as the basis for breakdown. These include, but certainly are not limited to, location within the building, input stream, output stream, etc. Because the selection of functional area obviously impacts the remainder of the study, it is probably worthwhile to discuss briefly the rationale for its selection. First, it provides a very logical relationship between the various activities and enables a methodical description of the work flow within the facility. It correlates very well with X-705 supervisory responsibilities and reasonably well (but not exactly) with the physical layout of the building. Finally, as will be seen in Section 3.0, it corresponds in general to previous breakdowns used for preparing documentation relative to X-705.

Each of these top-level systems will next be described in more detail.

2.3 Subsystems and Operational Areas

Each of the five top-level systems described above can be further divided into activities or groups of activities. For the purposes of this study the level of breakdown below the system will often be referred to as subsystems (SS). In many cases it is advantageous to divide these subsystems further into operational areas (OA). This section provides a more-detailed description of X-705 and the relationship among the systems, subsystems, and operational areas. Table 2.1 summarizes this breakdown and provides the detailed numbering system referenced in later sections. Fig. 2.2 is a schematic layout of X-705 to assist the reader in following the discussion below. (This figure is not exactly to scale and displays only sufficient detail to enable the reader to understand the relative layout of the building.)

2.3.1 Decontamination System [S1.0]

Equipment usually enters X-705 through the large doors on the east and west side of the north end of the building. (Highly contaminated equipment or equipment containing high-assay material is generally first processed in the South Annex [OA1.1.3].)

*No longer operational

Figure 2.1 Major systems of the X-705 facility

Table 2.1 Breakdown of X-705

SYSTEM/ SUBSYSTEM/ OPERATIONAL AREA

- 1.0 Decontamination (High Bay)
 - 1.1 Large Parts Disassembly & Decontamination (C Area)
 - 1.1.1 Compressor Disassembly
 - 1.1.2 Converter Disassembly
 - 1.1.3 South Annex Operations
 - 1.1.4 Spray Booth Operations
 - 1.1.5 Truck Alley Cleaning
 - 1.1.6 General Storage and Handling
 - 1.2 Small Parts Cleaning (A Area)
 - 1.2.1 30-in. and 48-in. Cylinder Cleaning
 - 1.2.2 8-in. and 12-in. Cylinder Cleaning
 - 1.2.3 5-in. Cylinder Cleaning
 - 1.2.4 Cylinder Drying, Conditioning, and Testing
 - 1.2.5 Sodium Fluoride Pellet Conditioning
 - 1.2.6 Seal and Small Parts Dismantling
 - 1.2.7 Small Parts Handtable Operations
 - 1.2.8 Small Parts Pit Operations
 - 1.2.9 *Sand and Glass Blasting*
 - 1.2.10 General Storage and Handling
 - 1.2.11 *Trichloroethylene Degreasing*
 - 1.3 Vacuum Cleaners
- 2.0 Uranium Recovery (B Area)
 - 2.1 Mixed Acids Precipitation (A Area)
 - 2.2 Trap Material Leaching
 - 2.2.1 Spray Tank Operations (A Area)
 - 2.2.2 Flocculating Columns/Vacuum Filter Table
 - 2.2.3 Unmeasured Storage
 - 2.3 Fluorides-Complexing Handtable (A Area)
 - 2.4 Recovery/Blending Handtable Operations
 - 2.5 Measured Solution Storage (B-36, B-38, B-1, and Tunnel)
 - 2.6 Volume Reduction/Chemical Processing
 - 2.7 Calciners
 - 2.8 Nitrogen Oxide Scrubbers
 - 2.9 Raffinate Storage
 - 2.10 Heavy Metals Precipitation
 - 2.11 Technetium Ion Exchange
 - 2.12 General Storage and Handling
 - 2.13 *Continuous Dissolver*
 - 2.14 *Mixed Acids Precipitation (B Area)*
 - 2.15 *Neutralization System*
 - 2.16 *Incinerator*

Table 2.1 Breakdown of X-705 (continued)

SYSTEM/ SUBSYSTEM/ OPERATIONAL AREA

- 3.0 *Oxide Conversion (E/F/H Area)*
 - 3.1 *UNH Calciner (F Area)*
 - 3.2 General Storage and Handling

- 4.0 Waste Water Treatment Systems
 - 4.1 Condensate Recovery
 - 4.2 Rinse Booth Recirculating Storages
 - 4.3 Cylinder Solution Microfiltration
 - 4.4 Oil and Grease Removal Unit
 - 4.5 Solution Collection and Storage
 - 4.6 Microfiltration/Pressure Filtration
 - 4.7 Effluent Pumping Station
 - 4.8 Tunnel Sumps
 - 4.9 General Storage and Handling

- 5.0 Support Areas
 - 5.1 Maintenance Shop (D Area)
 - 5.2 Process Laboratory (G Area)
 - 5.3 Laundry
 - 5.4 Office Area
 - 5.5 Acid/Solvent Receiving, Storage, Transfer (H Area)
 - 5.6 Ventilation, Exhaust, and Utilities
 - 5.7 Drains
 - 5.8 General Storage and Handling
 - 5.9 Miscellaneous

Notes:

- (1) Systems, subsystems, or operational areas that are no longer operational are indicated with italics.
- (2) A category of "General Storage and Handling" has been added to various systems and subsystems to include activities that are difficult to assign specifically to a given area.

Figure 2.2 Schematic layout of X-705

Large equipment [SS1.1], such as compressors [OA1.1.1] and converters [OA1.1.2], are disassembled in the northeast side of the high bay, which is often referred to as "C" area. Converters have not been processed recently in X-705, and, in fact, some of the equipment unique to this operation is currently being removed from the building. Large parts are cleaned with acid sprays and a water rinse in the spray booth [OA1.1.4], often called the tunnel area. The northern-most center of the high bay, called the truck alley [OA1.1.5], is used for weakly contaminated large equipment that can not be easily cleaned in the spray booth.

Small equipment [SS1.2] is treated in the northwest side of the high bay, known as "A" area. "Empty" UF_6 cylinders are cleaned [OA1.2.1-1.2.3] to remove the nonvolatile heels that remain. Because the assay of UF_6 that can be stored in a cylinder depends on its size, the cleaning procedures vary with the size of the cylinder. Cleaned cylinders are then dried, conditioned, and tested [OA1.2.4] prior to release. Sodium fluoride pellets, purchased as HNaF_2 , are first dried [OA1.2.5] in X-705 to remove hydrogen fluoride gas before being used as trapping material in various plant processes. Small parts that require special handling (e.g., for airborne contamination) are treated in the seal and small parts dismantling room [OA1.2.6]. Other small parts are cleaned in the small parts handtables [OA1.2.7] and, after visible contamination is removed, steam cleaned in the small parts pit [OA1.2.8]. Glass blasting [OA1.2.9] is sometimes required to remove contamination remaining after normal cleaning processes. (The sand blasting aspect of [OA1.2.9] and trichloroethylene decreasing [OA1.2.11] are no longer performed.)

The last subsystem under decontamination is vacuum cleaners [SS1.3]. This category has been separately identified because several types of vacuum cleaners are used at various places in the decontamination process.

2.3.2 Uranium Recovery System [S2.0]

Highly concentrated solutions are processed in X-705 to recover the uranium (in oxide form) for potential future use and to remove other unacceptable materials before the effluents are returned to the environment. Most of this uranium recovery operation takes place in "B" area, the ground floor/mezzanine shown in Fig. 2.2, although initial treatment may begin in the small parts ("A") area.

Many discarded laboratory solutions contain acids (other than nitric), which for various reasons should not be processed through normal recovery hardware. Although mixed acids precipitation was previously performed in "B" area [SS2.14], these procedures have been discontinued. Current plans envision the use of the mini-microfiltration system (once used for cylinder wash solutions) in "A" area [SS2.1]; however, the exact procedures have yet to be refined and implemented.

Another recovery operation beginning in "A" area is trap material leaching [SS2.2]. Alumina and sodium fluoride trap materials are cleaned in the spray tanks [OA2.2.1] (as opposed to spray booths discussed in Section 2.3.1). Uranium solutions

are then pumped to flocculating columns and the vacuum filter table in "B" area [OA2.2.2], where solids are filtered out and the solutions stored in columns for later processing. These unmeasured storage columns [OA2.2.3] were previously part of a continuous dissolver [SS2.13], which is no longer operational.

Various uranium-bearing solids and solutions that may contain fluoride ions are treated in the fluorides-complexing handtable [SS2.3] in "A" area to reduce corrosion in the stainless steel plumbing throughout the recovery process. These solutions and other uranyl nitrate solutions that have been collected in polybottles are taken to the recovery/blending handtable [SS2.4] in "B" area.

Solutions from both the recovery/blending handtable and the unmeasured storage (leaching operation and contaminated acids from spray booth) are pumped to the B-36/B-38 storage columns [SS2.5], where they can be properly mixed and their volume, concentration, and assay accurately determined before transfer to the B-1 measured storage columns or measured tunnel storage.

Continued processing of the uranium solutions can be performed in any of three (A, B, or C) essentially identical loops [SS2.6], in which the solution is separated into a product (uranium-bearing) and waste (uranium-depleted) stream. The concentrated product stream proceeds through a calciner [SS2.7]. Here the uranyl nitrate is converted to oxide (U_3O_8), which is collected in 5-in. cans for storage. Gases produced from the calcining process are scrubbed to remove nitrogen oxides [SS2.8].

Liquids depleted in uranium are collected at various stages during the recovery process. The waste streams (called raffinates [SS2.9]) from A, B, or C loop are further treated to remove heavy metals [SS2.10] and the fission product technetium [SS2.11] before discharge from X-705 to the biodenitrification facilities in X-700. Other depleted waste solutions are processed through the waste water treatment system [S4.0]. The neutralization system [SS2.15] and incinerator [SS2.16] are no longer operational.

2.3.3 Oxide Conversion System [S3.0]

The oxide conversion processes in "E/F/H" areas are generally not operational. A glove box in "F" area is occasionally used, and the areas are available for general storage [SS3.2]. The calciner in "F" area that was previously used for uranium nitrate compounds [SS3.1] is no longer functional, although still in place.

2.3.4 Waste Water Treatment System [S4.0]

The decontamination and recovery operations produce various slightly contaminated solutions for which the uranium is not economically recoverable, but, nevertheless, must be removed before the solution can be discharged to the environment. During the volume reduction process of uranium recovery, low uranium-concentration condensate [SS4.1] is produced by the vapor separator/condenser segment of both the pre- and post-evaporators. Rinse-water solutions from spray-

booth-rinse recirculating storage [SS4.2] and cylinder rinsing [SS4.3] are also slightly contaminated. Uranium must also be removed from the effluent of the Oil and Grease Removal Unit (OGRU) [SS4.4], located in truck alley.

The slightly contaminated solutions are collected in a 7000-gal. overhead storage unit [SS4.5]. This unit consists of 14 stainless steel pipes (5-in diameter), which traverse north-south along most of the length of the high bay. Uranium removal is accomplished by the microfiltration/pressure filtration subsystem [SS4.6]. The sludge produced from the concentrate of this process is batched into 55-gal drums; the permeate is transferred to the effluent pumping station [SS4.7], before discharge from X-705.

The final and distinct subsystem of waste water treatment is the tunnel sumps [SS4.8]. These sumps are located in the north and south ends of the basement of the spray booth tunnel. Ground water that accumulates in these sumps is slightly contaminated with non-uranium compounds and cannot be discharged directly to the environment. This water is pumped to truck-mounted water tanks for transport to additional processing facilities.

2.3.5 Support Services System [S5.0]

This system consists of all the functions needed to provide general support for the operations in X-705. The maintenance shop [SS5.1] in "D" area contains all tools necessary for disassembly and selected rebuilding of process equipment. The primary purpose of the "G"-area laboratory [SS5.2] is to determine uranium concentrations of solutions. Uranium assays (percent enrichment) are performed by personnel from Applied Nuclear Technology (ANT). The laundry [SS5.3] and administrative offices [SS5.4] in X-705 are also included in this system. In addition, several of the decontamination and recovery operations require acids and solvents that are stored in "H"-area tanks [SS5.5] for distribution throughout the building as needed.

A number of other subsystems have been included under support services primarily because they do not fit well in other systems but need to be examined. These include ventilation, exhaust, and utilities [SS5.6] and drains [SS5.7]. Finally, a general miscellaneous category [SS5.9] was added to collect any remaining activities that may be identified for examination.

3.0 EXISTING NCS DOCUMENTATION

During the approximately 40 years of PORTS operation an extensive amount of NCS documentation has been published. This section presents a general overview of the various types of NCS documents and provides more detailed information on those specific to X-705.

3.1 Final Safety Analysis Report and Operational Safety Requirements

The top-level safety-related PORTS document is the Final Safety Analysis Report (FSAR)¹, a three-volume report originally published in 1985. Volume 1 provides an introduction to the plant, general site information, and a summary safety analysis. Volume 2 describes detailed operations of the entire plant, and Volume 3 discusses accident scenarios and analyses.

The majority of the information in the FSAR relative to X-705 is contained in Section 4.3 (Volume 2) and Section 5.3 (Volume 3). Although the FSAR has been updated several times since first published, a number of X-705 operations appear to be no longer accurately documented, and a significant revision of the FSAR is presently in progress. Appendix A is a detailed listing of the systems, subsystems, and operational areas in X-705 and the respective sections in which they are discussed in the FSAR. Those areas presented in the FSAR but no longer operational are indicated in italics.

Another top-level document mandated by DOE is the Operational Safety Requirements (OSRs), reported in GAT/GDP-1074. (DOE Order 5480.22 now prescribes Technical Safety Requirements, rather than OSRs.) Part H (Rev. 3) of GAT/GDP-1074 contains safety limits, limiting conditions for operations, surveillance requirements, design features, and administrative controls for X-705. This information is cross-referenced to the X-705 systems, subsystems, and operational areas in Appendix B.

The OSRs for X-705 are similar, but not identical, to information contained in Section 4.3.2.2 of the FSAR. The rationale for the differences is not clear.

3.2 Development Memos and Reports

Development Memos (DMs) were initiated in 1954 by the Development Subdivision in order to transmit functional information directly to individuals concerned. Development Reports were similar in purpose to DMs but were reserved for the results of a study or investigation and were addressed only to the manager of Development Engineering. Both of these types of documents were initially rather informal in nature².

Over the years, however, these procedures have evolved into a much more formal reporting system, which now consists of Development Memos and T-Reports. Sometimes the DMs for a particular facility or building have been consolidated into a single DM, whose length can exceed 100 pages. Whether or not a topic is covered in a DM or T-Report has varied in recent years. Although these documents contain very authoritative language (e.g., "ACTIONS TO BE TAKEN"), they apparently serve only as a *guide* for the operating department³.

During the early 1960s the various DMs pertaining to X-705 were consolidated into DM-868. The most current revision, Rev. 4, was published in 1984 and incorporated all previous DMs, T-Reports, and FCAs (see next section) pertaining to X-705. (One addendum to DM-868 was published in 1985, but this was later superseded by FCA-382, as discussed in the next section.) Over the past seven years, however, a number of additional DMs and a few T-Reports concerning the operations in X-705 have been separately published. Appendix C cross-references pages of DM-868, other DMs, and T-Reports to the appropriate systems, subsystems, and operational areas of X-705.

DM-868 is obviously not current. Major hardware/equipment changes have occurred since the document was last revised, and many of the activities discussed are either no longer performed or are performed in a manner different from that described. Overall, the document is rather confusing. The breakout by functional area is not obvious without reference to the Table of Contents, which unfortunately does not include page numbers. The format of the discussions is not consistent, probably the result of their being written over a several-decade time frame. DM-868 also contains numerous errors, some that appear substantive as well as typographical. References to figures by number are often inaccurate.

No plans exist to revise DM-868. Instead, a Nuclear Criticality Safety Approval (NCSA) will be prepared on each operational area in X-705. The follow-on effort by LLNL, discussed in Section 4.0, should be the basis for many of these NCSAs.

3.3 Field Agreements and Facility Change Agreements

Field Agreements (FAs) and Facility Change Agreements (FCAs) are formal interim agreements, signed by all parties involved, concerning safe operating practices³. FAs are more temporary, with lifetimes that have typically varied from a few weeks to a few months. FCAs define the NCS aspects of more permanent operations. Some FCAs (e.g., FCA-272 and FCA-273) appear to have been initially written as FAs.

With their formality and signature requirements, FCAs appear to be very authoritative in nature. They explicitly state actions that will or will not be performed. In the past, however, FCAs have often been canceled after being incorporated into the next revision of the applicable DM. Since DMs now appear to be guides, it could be

argued that the actions required by these FCAs are no longer mandatory. The use of NCSAs, discussed above, should clarify this situation.

Since the last revision of DM-868, at least 67 FCAs have been implemented for X-705, and 53 of these are still active. (A total of 50 FCAs specific to X-705 were identified; two other FCAs pertaining to vacuum cleaners and one on UF₆ cylinders are included in the 53.) Determining which FCAs are applicable to X-705 and which have not been canceled or superseded is not a straightforward task. Some FCAs that pertain to other facilities also contain information relevant to X-705 operations. For example, FCA-523, which permits the on-site use of 48X (10-ton) cylinders for 5% enrichment, is indexed under X-326 and X-333. This practice, however, definitely impacts Large Cylinder Cleaning [OA1.1.1] in X-705. Appendix D provides a listing of all FCAs identified for X-705 since 1985 (previous FCAs were superseded by Rev. 4, DM-868) and the authority for cancellation, if applicable. Because of the possibility that canceled or superseded FCAs may have been removed from the data base, this listing may not be complete. A cross-reference of FCAs currently active for X-705 is shown along with the DMs in Appendix C.

At the time this document was initially prepared (summer 1992), two active Field Agreements for X-705 were identified. FA 92-16 addressed the expansion joints in the pre- and post-evaporators of the recovery area [SS2.6] and superseded FCA-564. FA 92-17 provided temporary authorization to use the cylinder microfiltration subsystem [SS4.3] for mixed-acid processing, as mentioned in Section 2.3.4 of this report.

3.4 Operating Methods

Each of the specific operations performed in a PORTS facility is generally covered in an Operating Method (OM). Recently, the nomenclature for these documents has been changed to In-Hand Procedures (IPs), Reference Procedures (RPs), and other types of Procedures, depending on their intended use. As Operating Methods are revised, the designation of OM will gradually disappear.

OMs and IPs are very detailed, usually step-by-step, instructions designed to instruct operations personnel on the actual procedures for a given activity. New IPs and final revisions to existing OMs and IPs are approved by the Operations Committee, although interim (red-line) changes can be instituted unilaterally by line management. For ease in identification, interim changes are now printed on yellow paper, final revisions on blue paper.

A list of the OMs and IPs for X-705, referenced to the applicable system, subsystem, or operational area, is shown in Appendix E. Because a significant effort is now under way to update OMs and modify their numbering procedure, only the basic OM number is indicated in each case. Future analyses of the individual areas will provide the actual revision, changes, and addenda in effect at that time.

4.0 FUTURE EFFORT

As discussed in earlier sections, the NCS documentation for X-705 is extensive. Over the years an impressive effort has been devoted to analysis of criticality safety. The fact that X-705 has operated safely for almost 40 years is a tribute to both the operational personnel and NCS staff. As operational procedures change and new equipment is introduced, however, it eventually becomes prudent to reevaluate the overall facility from a bottoms-up basis. Such is the task for this future effort.

4.1 Detailed NCS Evaluations

A detailed NCS evaluation will be performed for all subsystems and operational areas identified (in priority) by MMES. A report on each of these areas will include a more detailed description of the operations performed, the equipment in the area, and input/output fissile streams. Specific attention will be devoted to interfaces among the subsystems and operational areas.

The evaluation will be performed in general accordance with the ANSI series 8 requirements, and in particular with ANSI 8.14 (as modified by current DOE orders). This analysis will be fully documented and will address control parameters, safety systems, and administrative controls. Both normal and off-normal (including accident) events will be examined, and a specific assessment of the double contingency principle will be provided.

4.2 Documentation Listing

Each evaluation will be accompanied by a complete listing of applicable documentation. This listing will include all current NCS documentation for the specific subsystem or operational area under review and any other safety-related documents deemed appropriate by LLNL or MMES.

4.3 Update of Subsystems, Operational Areas, and Documentation

As discussed earlier, one of the primary purposes of this report is to serve as a starting point and road map for future evaluations. The breakdown of X-705 into subsystems and operational areas (and cross-referencing with NCS documentation) presented in previous sections of this report was performed after a summary review of existing documentation and initial discussions with MMES NCS and operational personnel. Because of the large number of significant changes that have occurred in X-705 since some of the documentation was published, it was often difficult to determine if specific documentation is still applicable and, if so, to which (much-changed) operational area. Obviously, no totally accurate breakdown can be completed until the individual subsystems and operational areas are evaluated and all existing documentation examined in detail. During these detailed evaluations it is envisioned that the X-705 breakdown (especially interfaces) will be refined and

additional documentation identified. It is therefore anticipated that the information presented in this initial report will also need to be modified and the document revised in some manner before the overall task is completed.

5.0 REFERENCES

- 1 GAT/GDP-1073, *Portsmouth Gaseous Diffusion Plant Final Safety Analysis Report*, Volume 1-3, April 1985.
- 2 Development Memo No. 2, *Format for the Preparation of Development Memos and Reports*, Goodyear Atomic Corporation, April 7, 1954.
- 3 Standard Practice Procedure H-30, *Nuclear Criticality Safety*, Martin Marietta Energy Systems, Inc., April 16, 1991.
- 4 ANSI/ANS 8.1, *American National Standard for Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors*, American Nuclear Society, October 7, 1983.

APPENDIX A

CORRELATION OF FSAR WITH SYSTEMS, SUBSYSTEMS, AND OPERATIONAL AREAS

Note: In addition to the specific sections listed in this appendix, Section 4.3.2.2 of the FSAR contains information that is similar, but not identical, to that contained in the OSRs (see Appendix B).

SYSTEM/ SUBSYSTEM/ OPERATIONAL AREA				FSAR (Vol 2)	FSAR (Vol 3)	COMMENTS
1.0	Decontamination (High Bay)			4.3.1.3	5.3.1.2, 5.3.1.4	
	1.1	Large Parts Disassembly & Decontamination (C Area)		4.3.1.3.1	5.3.1.4	
		1.1.1	Compressor Disassembly	4.3.1.3.1.1		
		1.1.2	Converter Disassembly	4.3.1.3.1.2		Currently not operational
		1.1.3	South Annex Operations	4.3.1.3.1.3	5.3.1.4.2, 5.3.1.4.3	
		1.1.4	Spray Booth Operations	4.3.1.3.1.4	5.3.1.4, 5.3.2.2.1	
		1.1.5	Truck Alley Cleaning	4.3.1.3.1.5	5.3.2.2.1	
		1.1.6	General Storage and Handling			
	1.2	Small Parts Cleaning (A Area)		4.3.1.3.2	5.3.1.2	
		1.2.1	30-in. and 48-in. Cylinder Cleaning	4.3.1.3.2.1	5.3.1.2.1, 5.3.2.2.1	
		1.2.2	8-in. and 12-in. Cylinder Cleaning	4.3.1.3.2.2	5.3.1.2.1, 5.3.2.2.1	
		1.2.3	5-in. Cylinder Cleaning	4.3.1.3.2.3	5.3.1.2.1, 5.3.2.2.1	
		1.2.4	Cylinder Drying, Conditioning, and Testing	4.3.1.3.2.4	5.3.2.2.1	
		1.2.5	Sodium Fluoride Pellet Conditioning	4.3.1.3.2.5		
		1.2.6	Seal and Small Parts Dismantling	4.3.1.3.2.6		
		1.2.7	Small Parts Handtable Operations	4.3.1.3.2.7	5.3.1.2.2	
		1.2.8	Small Parts Pit Operations	4.3.1.3.2.8	5.3.2.2.1	
		1.2.9	Sand and Glass Blasting	4.3.1.3.2.9		Only glass blasting operational
		1.2.10	General Storage and Handling			
		1.2.11	Trichloroethylene Degreasing	4.3.1.3.2.11		Not operational
	1.3	Vacuum Cleaners		4.3.1.3.3		

				FSAR (Vol 2)	FSAR (Vol 3)	COMMENTS
SYSTEM/	SUBSYSTEM/	OPERATIONAL AREA				
2.0	Uranium Recovery (B Area)		4.3.1.4	5.3.1.3		
2.1	Mixed Acids Precipitation (A Area)					Planned for mini-microfiltration
2.2	Trap Material Leaching					FSAR not descriptive
	2.2.1	Spray Tank Operations (A Area)	4.3.1.3.2.10	5.3.1.2.2		
	2.2.2	Flocculating Columns/Vacuum Filter Table	4.3.1.4.1			
	2.2.3	Unmeasured Storage	4.3.1.4.1			Continuous dissolver storage
2.3	Fluorides-Complexing Handtable (A Area)		4.3.1.4.6			
2.4	Recovery/Blending Handtable Operations					Not covered in FSAR
2.5	Measured Solution Storage (B-36, B-38, B-1, Tunnel)		4.3.1.4.4, 4.3.1.4.3			
2.6	Volume Reduction/Chemical Processing					Evaporation, extraction, stripping
2.7	Calciners		4.3.1.5	5.3.1.3.1		
2.8	Nitrogen Oxide Scrubbers		4.3.1.4.5			
2.9	Raffinate Storage		4.3.1.4.4			
2.10	Heavy Metals Precipitation		4.3.1.4.4, 4.3.1.4.8	5.3.1.3.1		
2.11	Technetium Ion Exchange		4.3.1.4.4, 4.3.1.4.9			
2.12	General Storage and Handling					
2.13	Continuous Dissolver		4.3.1.4.1			Not operational
2.14	Mixed Acids Precipitation (B Area)		4.3.1.4.2			Not operational
2.15	Neutralization System		4.3.1.4.3			Not operational
2.16	Incinerator		4.3.1.4.7			Not operational
3.0	Oxide Conversion (E/F/H Area)		4.3.1.6	5.3.1.6		Not operational
3.1	UNH Calciner (F Area)		4.3.1.5.1	5.3.1.7		Not operational
3.2	General Storage and Handling		4.3.1.6			Some no longer operational

[illegible]

APPENDIX B

CORRELATION OF OSRs WITH SYSTEMS, SUBSYSTEMS, AND OPERATIONAL AREAS

<u>SYSTEM/ SUBSYSTEM/ OPERATIONAL AREA</u>			<u>OPERATIONAL SAFETY REQUIREMENT</u>
1.0	Decontamination (High Bay)		
1.1	Large Parts Disassembly & Decontamination (C Area)		
	1.1.1	Compressor Disassembly	
	1.1.2	Converter Disassembly	5.3.2.1
	1.1.3	South Annex Operations	5.3.2.2
	1.1.4	Spray Booth Operations	2.8, 3.3.3, 5.3.2.3(10)
	1.1.5	Truck Alley Cleaning	2.3.1, 5.3.2.3(6a), 5.3.2.5(1a)
	1.1.6	General Storage and Handling	3.3.3
1.2	Small Parts Cleaning (A Area)		
	1.2.1	30-in. and 48-in. Cylinder Cleaning	5.3.2.3(1-3)
	1.2.2	8-in. and 12-in. Cylinder Cleaning	5.3.2.3(1-3)
	1.2.3	5-in. Cylinder Cleaning	4.4, 4.7, 5.3.2.3(2)
	1.2.4	Cylinder Drying, Conditioning, and Testing	2.9
	1.2.5	Sodium Fluoride Pellet Conditioning	
	1.2.6	Seal and Small Parts Dismantling	2.2
	1.2.7	Small Parts Handtable Operations	4.2
	1.2.8	Small Parts Pit Operations	2.4, 5.3.2.3(4)
	1.2.9	Sand and Glass Blasting	
	1.2.10	General Storage and Handling	
	1.2.11	Trichloroethylene Degreasing	
1.3	Vacuum Cleaners		

<u>SYSTEM/ SUBSYSTEM/ OPERATIONAL AREA</u>			<u>OPERATIONAL SAFETY REQUIREMENT</u>
2.0	Uranium Recovery (B Area)		
2.1	Mixed Acids Precipitation (A Area)		
2.2	Trap Material Leaching		
	2.2.1	Spray Tank Operations (A Area)	
	2.2.2	Flocculating Columns/Vacuum Filter Table	4.2, 4.3, 5.3.2.4c
	2.2.3	Unmeasured Storage	
2.3	Fluorides-Complexing Handtable (A Area)		
2.4	Recovery/Blending Handtable Operations		4.2
2.5	Measured Solution Storage (B-36, B-38, B-1, Tunnel)		
2.6	Volume Reduction/Chemical Processing		
2.7	Calciners		1.1.1-3, 1.2.1-3, 2.1(1-3), 2.1.1-2, 3.2-4, 5.1.1
2.8	Nitrogen Oxide Scrubbers		
2.9	Raffinate Storage		5.3.2.4d
2.10	Heavy Metals Precipitation		
2.11	Technetium Ion Exchange		5.3.2.4e
2.12	General Storage and Handling		4.5
2.13	Continuous Dissolver		4.2, 5.3.2.4c
2.14	Mixed Acids Precipitation (B Area)		4.2
2.15	Neutralization System		4.2
2.16	Incinerator		
3.0	Oxide Conversion (E/F/H Area)		
3.1	UNH Calciner (F Area)		
3.2	General Storage and Handling		

<u>SYSTEM/ SUBSYSTEM/ OPERATIONAL AREA</u>			<u>OPERATIONAL SAFETY REQUIREMENT</u>
4.0	Waste Water Treatment Systems		
	4.1	Condensate Recovery	
	4.2	Rinse Booth Recirculating Storages	2.8, 5.3.2.3(10)
	4.3	Cylinder Solution Microfiltration	2.10, 5.3.2.3(7)
	4.4	Oil and Grease Removal Unit	2.3, 2.10, 5.3.2.3(6b-c), 5.3.2.5(1b)
	4.5	Solution Collection and Storage	5.3.2.3(5)
	4.6	Microfiltration/Pressure Filtration	1.1.4-5, 1.2.4-5, 2.1(5-6), 2.1.4-5, 2.5-6, 2.10, 3.2, 3.4, 5.3.2.3(8,9), 5.3.2.4a, 5.3.2.5(2)
	4.7	Effluent Pumping Station	2.7
	4.8	Tunnel Sumps	
	4.9	General Storage and Handling	4.6
5.0	Support Areas		
	5.1	Maintenance Shop (D Area)	
	5.2	Process Laboratory (G Area)	
	5.3	Laundry	
	5.4	Office Area	
	5.5	Acid/Solvent Receiving, Storage, Transfer (H Area)	
	5.6	Ventilation, Exhaust, and Utilities	4.5
	5.7	Drains	
	5.8	General Storage and Handling	4.1, 5.3.2.3(11)
	5.9	Miscellaneous	2.1(4), 2.1.3, 3.1, 4.1, 5.1.1-2, 5.2-7

APPENDIX C

CORRELATION OF DMs, T-REPORTS, AND FCAs WITH SYSTEMS, SUBSYSTEMS, AND OPERATIONAL AREAS

SYSTEM/ SUBSYSTEM/ OPERATIONAL AREA			DMs/T-REPORTS (Page DM-868/Other)	FCA's
1.0	Decontamination (High Bay)			
1.1	Large Parts Disassembly & Decontamination (C Area)			
	1.1.1	Compressor Disassembly	96-98, 104	
	1.1.2	Converter Disassembly	96-98, 101-103	
	1.1.3	South Annex Operations	96-98, 106	291
	1.1.4	Spray Booth Operations	99-100	305, 356
	1.1.5	Truck Alley Cleaning		273, 431, 494
	1.1.6	General Storage and Handling	105, 107, 130-131	510
1.2	Small Parts Cleaning (A Area)			
	1.2.1	30-in. and 48-in. Cylinder Cleaning	29-31, 45, Add. 1, T-3495, T-3563, T-3597	382 (Supersedes Add. 1), 523
	1.2.2	8-in. and 12-in. Cylinder Cleaning	24-28	
	1.2.3	5-in. Cylinder Cleaning	24-25, 28	322, 381
	1.2.4	Cylinder Drying, Conditioning, and Testing		361, 403
	1.2.5	Sodium Fluoride Pellet Conditioning		
	1.2.6	Seal and Small Parts Dismantling	14-16, 18	
	1.2.7	Small Parts Handtable Operations	33-37, 46	320, 494
	1.2.8	Small Parts Pit Operations	19, 20	327, 360
	1.2.9	Sand and Glass Blasting	32	
	1.2.10	General Storage and Handling	17, 38-44, 46-51	320
	1.2.11	Trichloroethylene Degreasing	21	
1.3	Vacuum Cleaners		132	475, 485

				DMs/T-REPORTS	
				(Page DM-868/Other)	FCAs
SYSTEM/	SUBSYSTEM/	OPERATIONAL AREA			
2.0	Uranium Recovery (B Area)			66, DM-1552, T-3463	
	2.1	Mixed Acids Precipitation (A Area)			
	2.2	Trap Material Leaching			
		2.2.1	Spray Tank Operations (A Area)	22-23, 78	
		2.2.2	Flocculating Columns/Vacuum Filter Table	54-58, 78	
		2.2.3	Unmeasured Storage		
	2.3	Fluorides-Complexing Handtable (A Area)			
	2.4	Recovery/Blending Handtable Operations		52-53, 92, DM-1548?	373
	2.5	Measured Solution Storage (B-36, B-38, B-1, Tunnel)		52-53	
	2.6	Volume Reduction/Chemical Processing		59-62	564
	2.7	Calciners		63-64, T-3562	
	2.8	Nitrogen Oxide Scrubbers		DM-1553	
	2.9	Raffinate Storage			
	2.10	Heavy Metals Precipitation		71, 90	250
	2.11	Technetium Ion Exchange		72, 91	
	2.12	General Storage and Handling		67-68, 73-80, 82-88, 92, 112, 133-135	264, 321, 388, 405, 406, 460
	2.13	Continuous Dissolver		54-58, 78, 81	272
	2.14	Mixed Acids Precipitation (B Area)		69-70, 89	
	2.15	Neutralization System			
	2.16	Incinerator		114, 128-129	
3.0	Oxide Conversion (E/F/H Area)				
	3.1	UNH Calciner (F Area)		108-113	
	3.2	General Storage and Handling		41, 113-121, 133-135	

<u>SYSTEM/ SUBSYSTEM/ OPERATIONAL AREA</u>			<u>DMs/T-REPORTS (Page DM-868/Other)</u>	<u>FCA's</u>
4.0	Waste Water Treatment Systems			
	4.1	Condensate Recovery		358
	4.2	Rinse Booth Recirculating Storages		356
	4.3	Cylinder Solution Microfiltration		351
	4.4	Oil and Grease Removal Unit		362, 480
	4.5	Solution Collection and Storage		327, 355, 359, 360, 361, 363
	4.6	Microfiltration/Pressure Filtration		353, 354, 363
	4.7	Effluent Pumping Station		357
	4.8	Tunnel Sumps		550
	4.9	General Storage and Handling		
5.0	Support Areas			
	5.1	Maintenance Shop (D Area)		
	5.2	Process Laboratory (G Area)	122-127	387, 407, 519, 520, 521
	5.3	Laundry		
	5.4	Office Area		
	5.5	Acid/Solvent Receiving, Storage, Transfer (H Area)		
	5.6	Ventilation, Exhaust, and Utilities	65, 93-95	
	5.7	Drains		480
	5.8	General Storage and Handling	8-11, 13, 38-43, 130-135	247, 257, 267, 378, 379, 419, 442, 443, 444, 476
	5.9	Miscellaneous	12, 136-141	305

APPENDIX D

NUMERICAL LISTING OF FCAs

FOR X-705

(PUBLISHED SINCE 1985)

FCA	DATE	PROBLEM [TITLE]	CANCELED BY	COMMENTS
247	1/30/85	Batching Uranium Concentrated Solutions		
250	3/7/85	Use of Large Containers in Heavy Metal Precipitation Area		
257	5/7/85	Transport of 5" UF6 Cylinders and Oxide Containers in Secured Truck		
264	11/6/85	Storage of Raffinate Calcination Process Solids in 55-gallon drums		
267	11/18/85	Transport of Contaminated Burnables Drums from X-326 to X-705 Radiator		
272	3/21/86	Filter Table for X-705 Dissolver System		
273	3/31/86	Use of 4' x 4.5' Diameter Vat for X-326 Motor Cleaning		
291	3/2/87	Installation of 5' Diameter Can Holders Near West Wall of X-705 Annex		
294	3/17/87	Storage of Contaminated Burnables and Contaminated Scrap Metal...	FCA-324 (2/15/88)	
305	8/7/87	Posting of NCS Administrative Controls and Limits, X-705		
312	9/30/87	Construction of a Caged Storage Area for Gp II ...	FCA-320 (2/15/88)	
320	2/15/88	A Caged Storage Area and Decontamination Area for Gp II Materials in the Hi-Bay Area, X-705		
321	2/15/88	Caged Storage Area on the Mezzanine, X-705		
322	2/15/88	Cage Around the Small Cylinder Decontamination Unit and Storage Areas Within this Cage		
324	2/15/88	Sorting Contaminated Waste ... on the Storage Pad Outside X-705	FCA-434 (5/24/90)	
327	4/19/88	Replacement of Pump P-103, X-705		
350	10/17/88	Truck Alley, Truck Alley Pit ...	FCA-362 (1/6/89)	
351	10/17/88	Small and Large Cylinder Rinse Solutions (X-705 Environmental Projects), X-705		
352	10/17/88	pH Adjustment (X-705 Environmental Projects), X-705	FCA-363 (1/5/89)	
353	10/17/88	Operation of Filter Presses #FP-1A and FP-1B (X-705 Environmental Projects), X-705		
354	10/18/88	Operation of the Effluent Microfiltration System (X-705 Environmental Projects), X-705		
355	10/18/88	Geometrically Safe 7000-Gallon Storage System (X-705 Environmental Projects), X-705		
356	10/18/88	Tunnel Rinse Booth Solutions (X-705 Environmental Projects), X-705		
357	10/18/88	Operation of the Effluent Pumping Station (X-705 Environmental Projects), X-705		
358	10/18/88	Recovery Evaporator Process Condensate (X-705 Environmental Projects), X-705		
359	10/18/88	Recovery NOx Scrubber Solutions (X-705 Environmental Projects), X-705		
360	10/18/88	Steam Pit Solutions (X-705 Environmental Projects), X-705		
361	10/18/88	Cylinder Hydrotest Solutions (X-705 Environmental Projects), X-705		

FCA	DATE	PROBLEM [TITLE]	CANCELED BY	COMMENTS
362	1/6/89	Oil Grease Removal System Operation, X-705		
363	1/5/89	pH Adjustment Systems, X-705		
366	4/6/89	Handtable for Cleaning Greasy Parts, X-705	FCA-494 (3/20/91)	
373	6/9/89	Use of Handtable in Recovery Area, X-705		
374	6/16/89	Five-Inch Diameter Container Storage Area, Process Lab, X-705	FCA-392 (11/29/89)	
377	7/6/89	5-Inch Diameter Container Storage Area, X-705	POEF-532 Letter	Storage area removed
378	7/6/89	5-Inch Diameter Container Storage Area, X-705		
379	7/7/89	5-Inch Diameter Container Storage Area, X-705		
381	7/24/89	Modification to Small Cylinder Rinse Area, X-705		
382	8/22/89	Decontaminating 2.5-, 10-, and 14-Ton Cylinders, X-705		
383	8/25/89	Handtable for Cleaning Greasy Parts, X-705	FCA-494 (3/20/91)	
387	9/18/89	Laboratory Waste Solution Holder, X-705		
388	10/20/89	Small Rack in Recovery Area, X-705		
392	11/29/89	Five-Inch Diameter and Sample Container Storage Areas, Process Laboratory, X-705	FCA-407 (2/9/90)	
403	2/5/90	Posting NCS Administrative Controls and Limits		
405	2/7/90	Recovery of North-South Safe Boundary Lines, X-705		
406	2/7/90	Parking Spaces for Polybottle Carts in Recovery Area, X-705		
407	2/9/90	Five-Inch Diameter and Sample Container Storage Areas, Process Laboratory, X-705		
419	4/9/90	Posting of NCS-related Administrative Controls and Limits		
431	5/16/90	Cleaning Area 1 Seal Exhaust Oil Separators in X-705		
442	6/19/90	Posting of Administrative Controls and Limits		
443	6/19/90	Posting of Administrative Controls and Limits		
444	6/19/90	Posting of Administrative Controls and Limits		
448	6/26/90	Sample Storage in X-705 Laboratory	FCA-519 (8/6/91)	
460	10/19/90	Posting of NCS Administrative Controls and Limits		
475	12/13/90	Use of Vacuum Cleaners		
476	12/17/90	Sorting Contaminated Waste in X-705		
480	1/2/91	Relocation of Drains in the North Truck Alley, X-705		

FCA	DATE	PROBLEM [TITLE]	CANCELED BY	COMMENTS
485	1/30/91	Use of Modified "Nuclear Safe" Vacuum Cleaners		
494	3/20/91	Use of Movable Handtables, X-705		
510	6/13/91	Sample Rack in High Bay Area, X-705		
519	8/6/91	Sample Storage in Process Laboratory, X-705		
520	8/6/91	Removal of 5-Inch Diameter Storage Position, X-705		
521	8/6/91	Contaminated Burnable Barrel in X-705 Process Laboratory		
523	8/8/91	Withdrawal of Greater Than 4.5% U-235 Material into 48X 10-Ton Cylinders		Affects cylinder cleaning
533	12/11/91	Treatment of Contaminated Ground Water in X-700 and X-705 Sumps	FCA-550 (4/8/92)	
546	3/20/92	Treatment of Contaminated Ground Water in X-700 and X-705 Sumps	FCA-550 (4/8/92)	
550	4/8/92	Treatment of Contaminated Ground Water in X-700 and X-705 Sumps		
564	6/5/92	Evaporator Expansion Joints	FA 92-16 (6/29/92)	

APPENDIX E

CORRELATION OF OMs and IPs WITH SYSTEMS, SUBSYSTEMS, AND OPERATIONAL AREAS

SYSTEM/ SUBSYSTEM/ OPERATIONAL AREA				OPERATING METHODS
1.0	Decontamination (High Bay)			
1.1	Large Parts Disassembly & Decontamination (C Area)			
	1.1.1	Compressor Disassembly		RD2.2.1
	1.1.2	Converter Disassembly		RD2.2.1
	1.1.3	South Annex Operations		RD2.2.1, RD2.2.3
	1.1.4	Spray Booth Operations		RD2.2, RD2.2.2, RD2.3, RD2.4, RD2.10
	1.1.5	Truck Alley Cleaning		RD1.4.1, RD2.2.5, RD5.3.1
	1.1.6	General Storage and Handling		RD1.6
1.2	Small Parts Cleaning (A Area)			
	1.2.1	30-in. and 48-in. Cylinder Cleaning		RD1.2.4
	1.2.2	8-in. and 12-in. Cylinder Cleaning		RD1.2.2, RD1.2.3
	1.2.3	5-in. Cylinder Cleaning		RD1.2.1
	1.2.4	Cylinder Drying, Conditioning, and Testing		RD1.7, RD5.4
	1.2.5	Sodium Fluoride Pellet Conditioning		RD5.4.1
	1.2.6	Seal and Small Parts Dismantling		RD1.1.1, RD1.1.2, RD1.2.5
	1.2.7	Small Parts Handtable Operations		RD1.14, RD1.16, RD1.17
	1.2.8	Small Parts Pit Operations		RD1.14
	1.2.9	Sand and Glass Blasting		RD1.12
	1.2.10	General Storage and Handling		RD1.6
	1.2.11	Trichloroethylene Degreasing		
1.3	Vacuum Cleaners			RD5.9

SYSTEM/ SUBSYSTEM/ OPERATIONAL AREA				OPERATING METHODS
2.0	Uranium Recovery (B Area)			RR1.0
2.1	Mixed Acids Precipitation (A Area)			RD1.2.6 (Cylinder Microfiltration)
2.2	Trap Material Leaching			
2.2.1	Spray Tank Operations (A Area)			RD1.4, RR3.5.1
2.2.2	Flocculating Columns/Vacuum Filter Table			RR3.5.1
2.2.3	Unmeasured Storage			
2.3	Fluorides-Complexing Handtable (A Area)			RR3.5
2.4	Recovery/Blending Handtable Operations			RR1.1
2.5	Measured Solution Storage (B-36, B-38, B-1, Tunnel)			RR1.1
2.6	Volume Reduction/Chemical Processing			RR1.2, RR1.7
2.7	Calciners			RR1.10, RR3.2.1
2.8	Nitrogen Oxide Scrubbers			RR1.10.1
2.9	Raffinate Storage			
2.10	Heavy Metals Precipitation			RR5.1
2.11	Technetium Ion Exchange			RR5.3
2.12	General Storage and Handling			
2.13	Continuous Dissolver			
2.14	Mixed Acids Precipitation (B Area)			RR1.1.2
2.15	Neutralization System			RCN4.0, RR1.1.3
2.16	Incinerator			
3.0	Oxide Conversion (E/F/H Area)			
3.1	UNH Calciner (F Area)			RR2.14, RR3.2, RR3.2.1
3.2	General Storage and Handling			

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END