PEER 12 - Design Review Comments Regarding Shaft Seals

WPO 37382

Final

WIPP Shaft Seal System

Design Review

SWCF-A:1.1.03.2.2 DES: Final WIPP Shaft Seal System Design Review

1. Introduction

2. Review Panel Summary Letters

3. Comment/Resolution Documentation

4. Review Material

5. Attendance Record

Sandia National Laboratories
Albuquerque, New Mexico 87185
Livermore, California 94551-0969

date: April 27, 1996

to: Distribution

R. E. Stinebaugh

from: R. E. Stinebaugh, 5165

subject: WIPP Shaft Seal System Design Review

The review of the Compliance Submittal Design (CSD) for the Waste Isolation Pilot Plant (WIPP) shaft sealing system was held in Albuquerque on April 24, 25, and 26, 1966. The review package was provided to reviewers on April 1, 1996 in preparation for the comment resolution meeting.

The review panel consisted of the following individuals:

- R. E. Stinebaugh, Sandia Laboratories Organization 2165 (Chairperson)
- Malcolm Gray of AECL Whiteshell laboratories located in Pinawa, Manitoba, Canada
- John Tinucci of the Itasca Consulting Group located in Minneapolis, Minnesota
- Stephen Phillips of Phillips Mining located in Tucson Arizona

During the first half of the 24th, the WIPP technical staff made presentations aimed at providing the review panel with additional information covering the design, laboratory and in-situ experimentation results, and analyses that have been completed. These presentations provided the WIPP staff opportunity to answer questions relating to the design and the information provided in the review package. This session proved to be very helpful, in retrospect its main impact was that it provided the reviewers a new perspective on the amount of work that has been done and the rigor of the analyses that support the design. After the presentations were completed, the reviewers finished the 24th working on individual comments.

During the morning of the 25th, the designers and the reviewers met in smaller groups tailored specifically to match the reviewers with the designers and analysts that could best address questions relating to the reviewer's area of expertise. These sessions proved to be very efficient and effective exchange of information. At the close of this day, the reviewers had essentially completed their comments. The completed comments were provided to the WIPP staff so that they could started preparation of responses.

Residual comments were provided to the WIPP staff early on the 26th. Comment resolution was started by mid-morning and was completed by approximately 2:00 PM.

This is the second review of the WIPP seal system design accomplished by this review panel. The first (preliminary review) was the review of design concepts documented in the Waste Isolation Pilot Plant Sealing System Design Report (DOE/WIPP95-3117). The records package for the preliminary review is "Waste Isolation Pilot Plant Sealing System Design Report" and contains the review plan, reviewers' qualifications, and training records applicable to the current CSD review. In a number of instances, the comments from the first review were resolved with promised action to be reflected in the CSD. In some instances, the reviewers accepted these responses conditionally. At the conclusion of the CSD review, the reviewers, without exception, stated that they believed the actions promised in the responses to the first review had been completed.

Full or conditional acceptances were obtained for all comments made by the reviewers. It should be noted that in some cases, the WIPP staff, in response to the review panel comments, promised to make certain changes or additions to the design drawings, the documentation of the analyses, or the report text. The panel conditionally accepted these responses on the bases of the agreed to changes. It is imperative that the WIPP staff follow through with the actions promised and provide the reviewers with evidence that the requested actions have been implemented.

In summary, I thank the review panel and the WIPP staff for what I believe was a very thorough review. I would particularly like to note that I feel that the review panel was exceptional in both expertise and depth of experience. The WIPP staff did an exceptional job in presenting the material in a manner that clearly conveyed the magnitude and quality of the work that has been done and in working with the reviewers to develop mutually agreeable responses to their comments. Additionally, I would like to thank Sheryl Vahle and Mike Schuhen for their support in recording comments and resolutions and in overseeing the quality aspects of the review.

The report documenting this design review is divided into 5 sections, these sections are described as follows:

1. Introduction

2. Summary letters written by the reviewers concerning the Compliance Submittal Design are contained in this section.

3. The completed comment/resolution forms are contained in this section.

4. The review package (Extended A/O and 5 CSDR Appendices) primarily made up of the CSD is included in this section. This section is completed only in those copies of this design review report that will be placed in The WIPP Central File.

5. The attendance record for the design review is included in this section

Distribution w/review materials:
SWCF-A:1.1.03.2.2 DES:Sealing System Design Report
Review Documents

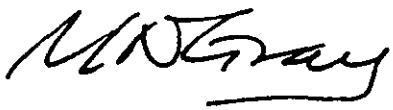
Distribution w/o review materials:
M. Gray
S. Phillips
J. Tinucci
D. Galbraith, DOE/CAO
B. Thompson, CTAC
MS 0483 R. Stinebaugh
MS 1395 L. Shephard
MS 1330 M. Chu
MS 0701 D. Lynch
MS 1322 J. Tillerson
MS 1322 E. Ahrens
MS 1322 A. Dennis
MS 1395 F. Hansen
MS 1322 L. Hurtado
MS 1322 K. Knowles
MS 1322 M. Schuhen
MS 1322 S. Vahle

AECL EACL

FUEL WASTE TECHNOLOGY BRANCH

Whiteshell Laboratories
M.N. Gray, Ph.D., FEIC, P.Eng.,
Pinawa, Manitoba, Canada, ROE 1LO.
TEL: 204/753 8424 Ext 2618
FAX: 204/753 8486
e-mail <graym@wl.aecl.ca>

TO: Robert E. Stinebaugh, SNL, NM 87185



FROM: Malcolm Gray

1996, April 25

RE: WIPP Sealing System Design Report -
Review Comment Resolution

Further to our discussions and in consideration of the information provided by SNL staff and contractors at the meeting held in Albuquerque on 24 and 25 April, I have reappraised my previous comments of 1996, March 7.

The information provided by SNL staff and contractors has satisfied many of the comments that I provided after my review of the preliminary design document. Accordingly, I withdraw the conditions that, previously, I placed on acceptance of all of the responses that were given to my initial comments and questions.

In brief, I accept previous responses to comments MG-1 to MG-25 on Form No 430-A (14 pages) and dated 4/24/96 (attached) with the following remarks and observations.

1. Many of my previous concerns related to the constructability of the sealing systems. I was impressed by the amount and rigour of work that has been carried out to confirm the constructability of the seals and I am satisfied that the design that I understand will be proposed in the detailed design document will be workable within the constraints of existing engineering practice or reasonably simple extrapolations therefrom. To provide absolute confidence in the constructability of the proposed sealing systems it will be necessary, with time, to effect programs which demonstrate the practicality of the extrapolated technologies
2. I have a general and abiding concern with the relationships between derived design constraints and criteria as they relate to materials specifications. I understand that, generally, the materials specifications have been made to provide constructable seal elements with as minimum as practical permeability and that the properties of the as-placed materials have been incorporated into total system performance assessment models. The derived design criteria were not clear to me from either the documentation provided or the presentations made. From the data

provided, it appears that all of the sealing materials being proposed for use ensure that chemical diffusion is the dominant mechanism of radionuclide transport in a possibly saturated repository at WIPP (see, for example, J.K. Mitchell, 1992). Is this usable as a derived criterion for the specification of the sealing systems?

3. With continuing regard to derived constraints and criteria, it appears that all of the seals, but particularly the clay (bentonite-based) seals are intended not only to limit the migration of brines and, particularly, possibly contaminated brines, but also to limit the migration of gases from the repository horizon to the biosphere. (Are these gases radioactive?). I understand that the proposed application of the clay seals as a barrier against gas movement is derived in major part from an in situ test carried out at the WIPP site. Experiments carried out at the University of Manitoba (Kirkham, 1995) tend to confirm the results of the in situ tests in that 25 mm thick specimens of water saturated compacted bentonite (γ_d~1.3 Mg/m^3) resisted breakthrough pressures of up to 10 MPa. Similar results have been obtained from experiments in Japan (Hara, personal communication). A general rule of thumb seems to be that gases break readily through bentonite layers when and if the degree of saturation decreases below about 80 to 85 %. This rule is conventionally applied in the modelling of oil and gas reservoirs. These results conflict with conventional published wisdom (Pusch, 1985) which suggests that gas breakthrough pressures are related to bentonite swelling pressure. This is an area of concern and question and discussion of the uncertainty and it's effects on the materials specification, associated design assumptions (such as those regarding the rate of resaturation of the clay barriers and the rate of gas generation) and the method of clay seal emplacement are absent from the design documents (both preliminary and detailed). With regard to the method of seal emplacement it is currently proposed that the clay seals should be placed as precompacted blocks. The effects of joints between the blocks need to be considered. During design refinement activities, the method of deep dynamic compaction investigated and proposed for placing the salt seals should be considered as a method for the generation of homogenous almost saturated bentonite seals (see item 1 above). The use of bentonite-salt (sand-sized) mixtures should be considered as a possible alternative to the currently proposed 100% bentonite seals.

4. It is clear from the careful selection of the sealing materials that consideration has been given to their durability and longevity characteristics. However, in neither the preliminary nor the detailed documentation, are these issues discussed in detail. Durability and longevity issues present constraints that can also lead to the materials specifications. How have possible changes in material performance parameters with time (say over the period of 10,000 years) been applied to total system performance assessment modelling? Do short term effects influence long term performance? Mechanisms such as creep, fluid flow, microbiological degradation (and associated gas

generation), seal material interactions, seal material-rock interactions, mineral transformation, silicification, dissolution and precipitation can all lead to changes in material and, hence, seal system performance characteristics. I suggest that the documentation should be expanded to provide confidence that these factors have been thoroughly considered as part of the generation of the sealing materials specifications and seal designs.

5. I am not confident from the information provided that I properly understand the nature and volumes of water flows in, around and through the shaft sealing systems. The time for system saturation remains unclear. This has bearing on the functionality of the shaft sealing system.

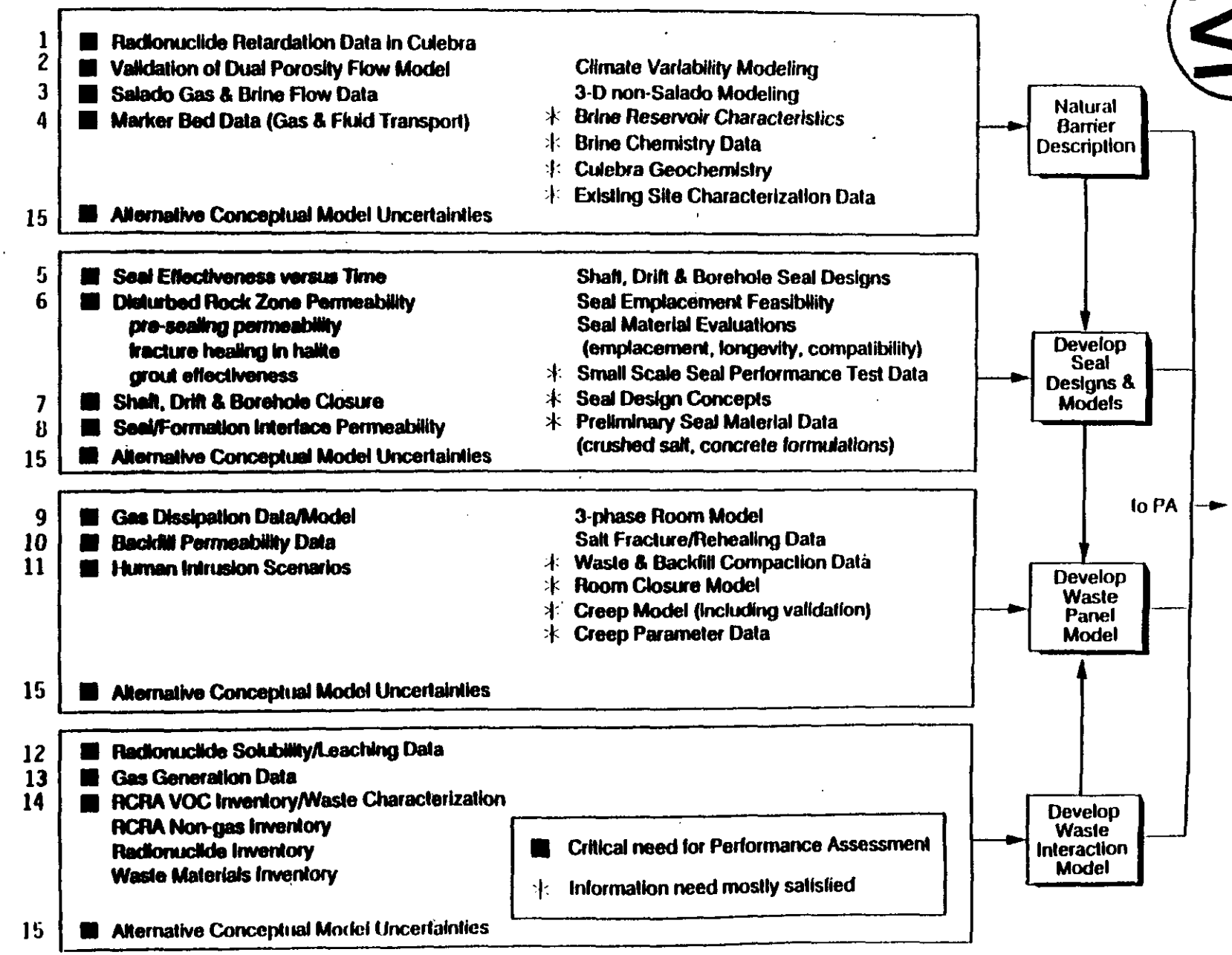
6. Other reviewers have addressed the effects of the disturbed rock zone, which appears to have been extensively and adequately studied for it's mechanical performance characteristics. The hydraulic characteristics of the zone are less clear and consideration of the possible coupling of hydrogeochemical, hydrogeothermal and hydromechanical processes and phenomena is not directly evident. Hence the importance of these coupled phenomena, if any, is not made clear

7. Results from experiments at AECL's Underground Research Laboratory in Canada (Graham, in preparation) show that in low permeability, low porosity, saturated rocks, due to phenomena that can be described by theories of thermo-elasto-porosity, minor changes in temperature may signficantly affect the hydraulic flow fields in the temperature affected zones. The changes may be reversible but hysteresis may be a factor to consider in the systems and the time required for reversibility may be long. Due to a lack of clear understanding of these phenemonena and their influence, the use of materials and processes that cause changes in rock temperature should be very carefully reconsidered and alternatives should be presented. Specifically in this regard, I note my understanding that for the hydraulic models being applied for the total system and shaft seal system analyses isothermal conditions are assumed.

I offer these comments and items of information for your consideration in the preparation of the detailed design document that you intend to submit. I appreciate that it may not be possible to fully respond to all of my concerns and questions. In many instances the concerns are recognized internationally as being unresolved or, possibly, irresolvable. In such instances I should be satisfied with recognition of the concern in the documentation and a description of approaches in the design that minimise the effects of the uncertainties.

In summary and conclusion, I consider that when completed as stated immediately above, it is likely that the documents being developed will present a design that will meet the general requirement of shaft sealing systems that will mitigate against water and gas flows from the repository to the biosphere and that can be built using existing technologies or reasonable extrapolation therefrom.

Information Needs for 40 CFR 191 with Limited Input for RCRA PA



PANEL ON THE WASTE ISOLATION PILOT PLANT (WIPP)
ROSTER

Charles Fairhurst, CHAIRMAN NAE
Department of Civil and Mineral Engineering
University of Minnesota
Minneapolis, Minnesota 55455
(612) 625-1869 / 5522
FAX: (612) 626-7750

****

Howard Adler
ORAU Medical Sciences Div.
140 East Vance Road
Oak Ridge, Tennessee 37831-0117
(615) 574-1222
FAX: (615) 576-3194

John O. Blomeke
3833 Sandy Shore Drive
Lenoir City, Tennessee 37771
(615) 986-8227
FAX:

John D. Bredehoeft
U.S. Geological Survey (M/S 439)
Water Resources Division
345 Middlefield Road
Menlo Park, California 94025
(415) 329-4431
FAX: (415) 329-4463

Fred M. Ernsberger
1325 NW Tenth Avenue
Gainesville, Florida 32601
(904) 377-5089
FAX: (904) 372-9411
or 250 Old Mill Road
Pittsburgh, PA 15238
(412) 963-8555

Rodney C. Ewing
Department of Geology
University of New Mexico
Albuquerque, New Mexico 87131
(505) 277-4163 / 4204
FAX: (505) 277-0090

B. John Garrick
PLG, Inc.
4590 MacArthur Blvd., Ste. 400
Newport Beach, CA 92660-2027
(714) 833-2020
FAX: (714) 833-2085

Leonard F. Konikow
U.S. Geological Survey
431 National Center
Reston, Virginia 22092
(703) 648-5878
FAX: (703) 648-5274

Jeremiah O'Driscoll
Jody Incorporated
505 Valley Hill Drive
Atlanta, Georgia 30350
(404) 394-4082 & FAX

Chris G. Whipple
Clement International
160 Spear Street
San Francisco, California 94105
(415) 882-3144
FAX: (415) 512-1721

****

STAFF

Ina B. Alterman, Staff Officer
Ricky A. Payne, Project Assistant

Mailing Address:
2101 Constitution Avenue NW
Washington, DC 20418

Office Location:
2001 Wisconsin Avenue NW/HA 456
Washington, DC 20007
(202) 334-3066
FAX: (202) 334-3077

FEBRUARY 1992

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
MG-6	General	Yes	Other reviewers have addressed the effects of the disturbed rock zone, which appears to have been extensively and adequately studied for it's mechanical performance characteristics. The hydraulic characteristics of the zone are less clear and consideration of the possible coupling of hydrogeochemical, hydrogeothermal and hydromechanical processes and phenomena is not directly evident. Hence the importance of these coupled phenomena, if any, is not made clear	x		Hydrologic characterization of the DRZ and its hydromechanical influence on the seal system are addressed in response to other review comments. Geochemical effects--or possibilities--are proposed to be addressed within the context of *longevity* in response to reviewer's Comment #4. Response to this comment has been discussed with the reviewer and the intent is demonstrate awareness of potential issues and at least address the impact, or lack thereof. As an example, potential flow of brine through the DRZ into the clay column could effect performance of the clay via mineral alteration. Recognition of the hydrogeothermal regime caused by hot asphalt and hydrating concrete will be made--but probably not quantified--as noted in response to Comment #7. Resolution will be to raise and discuss these items--not to resolve all issues--but to demonstrate awareness.	X	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
MG-7	General	Yes	Results from experiments at AECL's Underground Research Laboratory in Canada (Graham, in preparation) show that in low permeability, low porosity, saturated rocks, due to phenomena that can be described by theories of thermo-elasto-porosity, minor changes in temperature may significantly affect the hydraulic flow fields in the temperature affected zones. The changes may be reversible but hysteresis may be a factor to consider in the systems and the time required for reversibility may be long. Due to a lack of clear understanding of these phenemonena and their influence, the use of materials and processes that cause changes in rock temperature should be very carefully reconsidered and alternatives should be presented. Specifically in this regard, I note my understanding that for the hydraulic models being applied for the total system and shaft seal system analyses isothermal conditions are assumed.	x		Current design element will remain unchanged with text recognition of the reviewer's concerns. Phenomena caused by heat, caused be concrete hydration and placement of heated materials.	X	

WASTE ISOLATION PILOT PLANT

Sandia National Laboratories

Document Review and Comment Form

Form Number: 430-A Effective 3/31/96

Procedure: QAP 6-3 Revision 1

This form may be used for test plans, procedures, reports, design packages, abstracts, Technical Operating Procedures, and other documents.

Section of document to be reviewed and review criteria: (See sample criteria in QAP 6-3.).

Review Requester: Robert Stinebaugh Date: 4/24/96

Response Prepared By: _____ Date: 4/26/96
Signature of Author/Designer

Reviewed By: John Pinucci Date: 4/26/96

Response Concurrence: _____ Date: 4/26/96

Review Type: ☒ Independent Technical ☐ QA ☐ Management ☐ Other Specify:

Title of Document to be Reviewed: Waste Isolation Pilot Plant Sealing System Design Review

☒ Pre-Publication ☐ Post-Publication

Signature of Reviewer Signature of Reviewer

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
JT-1	General	Yes	Alternatives are not presented but critical to providing confidence that construction can obtain specified performance. Suggest adding discussion of alternatives (without minimizing the selected option).	✓		Text in report will include appropriate *mention of alternative construction* methods; for example, emulsified asphalt vs heated asphalt, dynamic compacted clay vs clay blocks, ultra-high density clay pellets vs clay blocks, concrete water stops vs asphalt water stops. Mention will also be made of the rationale for using "overkill" materials when it is just as cost effective as switching to another material. The report presents a single design that can be built and will work and primary recognition must be retained because the report is primarily for regulatory purposes, not to present a detailed design or specifications for bidding purposes.	CA*	
JT-2	General	Yes	Analyses Results are presented as deterministic "lines" but there are many factors influencing these values (analysis methods, assumptions, properties, etc.). It is suggested that "bands" be added to bracket response	✓		To the extent they are available and appropriate, bounds on expected results or properties will be added. The purpose of the bounds will be to establish the range in results that different properties or analysis methods might produce, and will also demonstrate the conservatism of the approach used in this document.	CA	

*CA is a conditional response whereby I agree with the response to the comment but require a copy of the marked up document to remove the condition for full acceptance

Reviewer's Comment				*Author/Designer's Response*			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
JT-3	General	Yes	The DRZ, especially along 1 ft near wall, seems to have been analyzed in a "simplified" manner. Reviewer does not feel that it has been demonstrated that the mechanical DRZ compares well with the hydrologic DRZ. Suggest adding comparison curves of conductivity vs vol. strain and mechanical damage vs vol. strain. Also add a comparison of ongoing lab tests of damage vs conductivity (if possible) and the need for the 32 parameter constitutive relation in salt.	✓		For clarification, a figure will be included in the report that ties field observations and model DRZ characterizations together; for example, a figure will be included to compare calculated and measured DRZ extents and how the calculated DRZ depends on the method or criteria chosen to define it. This will essentially involve overlaying Figure 3-1 (Appendix C) on Figure D-19 (Appendix D). The DRZ based on mechanical considerations can be defined in two ways: either the historical stress-strain history (damage evolution) or the existing stress conditions. The required complexity of the constitutive law for salt depends on the chosen DRZ characterization. Because the DRZ in salt is the key to seal system performance, argumentative characterization based on damage is more appropriate. Tracking of damage evolution and healing requires a complex constitutive relationship for the salt. A simpler model can only provide qualitative characterization of the DRZ. This aspect of constitutive model selection will be discussed in the main report as well as in Appendix D.	GA	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
JT-4	General	Yes	It wasn't clear how DRZ conductivity was input to Flow Model (i.e., integration across the area). Suggest adding description and discussion on mesh sensitivity to add confidence . The results (i.e. inflows) would not be vastly different.	✓		Radial integration of permeability across the mechanically calculated extent of the DRZ yields an average conductance which is applied to a fixed grid (mesh) of the hydrological analysis. More thorough descriptions and justifications of the approach and mesh selection will be provided in Appendices C and D.	CA	
JT-5	General	Yes	Has the pressure difference across the waterstop been examined in detail? Will the asphalt flow down the DRZ? It won't matter if there isn't any pressure difference. Suggest quantifying the magnitude to eliminate the issue. Concrete waterstop would eliminate this issue and should be considered.	✓		The detailed design will determine appropriate asphalt viscosities such that neither brine (uppermost waterstop) nor gas (lowermost waterstop) will "wormhole" asphalt, because of a pressure difference across the waterstop. Whether or not asphalt will flow into the DRZ surrounding the waterstop (or elsewhere) depends on the asphalt viscosity, which will be specified in the detailed design. At this time the design assumes that the asphalt has a viscosity after cooling that prevents significant migration into the DRZ. See JT-1 relative to concrete-filled waterstops.	✓	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
JT-6	General	Yes	Many analyses have been performed to look at sensitivities to input properties (eg Leo's tables of clay stiffness vs DRZ, etc.) Reviewer doesn't get a feel from reading the document for which components and seal properties are critical. Suggest adding summary tables or curves to indicate range and where within that range the specifications fall. This will provide basis for trade-off between properties and performance.	✓		The cross-sectional seal materials (concrete, asphalt, clay, and eventually crushed salt) are assumed to be adequate in sealing the shaft cross section. Therefore the fluid flows will be most sensitive to the path afforded by the surrounding DRZ. Different materials cause differences in healing of the DRZ surrounding the shaft. The effectiveness for healing is directly relatable to the stiffness of the seal material. A summary table from the calculation file will be included in the report to better illustrate the significance of stiffness on the DRZ extent at representative times.	CA	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
JT-7	General	Yes	The design description only describes what the components are and where they are located. There is no basis for why they are located where they are (eg why is there a concrete bulkhead between MB135 & MB136). Suggest adding brief basis to Section 4 and tie it back to how it qualitatively ties back to design guidance in Sec. 3.	✓		Discussions will be provided of why *certain seal materials are located* where they are can be provided in the text. For example, the upper concrete seal is located well below the top of salt for the following reasons: 1) so the concrete and waterstop are situated in clean salt, 2) so no significant marker beds intersect the emplacement, 3) so any water migration from the Rustler through the DRZ will have become salt-saturated before reaching behind the structure, and, 4) so the asphalt column can be placed across the Rustler/Salado contact and in the region of the shaft key. *The crushed salt is placed as low as* feasible in the shaft so that the maximum benefit can be obtained from shaft closure induced salt consolidation. A lower clay component is placed lowest in the shaft in order to: 1)provide an immediately effective gas barrier across the shaft cross section at the repository horizon and, 2) to restrict flow of gases from marker beds immediately above the repository (for example, clay seams "a" and "b").	CA	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
JT-8	General	Yes	To address the long-term issue of subsidence influence on shaft seals, it would be useful to have a plot of lateral displacement along the length of the shaft in Section D.6.2.	✓		The shaft seal within the Salado are outside the angle-of-draw for any horizontal displacements caused by the subsidence over the waste panels. *Moreover, horizontal strains* caused by subsidence induced by closures within the shaft pillar are compressive in nature and insignificant in magnitude. Supplementary calculations of horizontal strains and differential horizontal displacements are not warranted. This point will be made in the text of the report.	CA	
JT-9	General	Yes	The document does not provide a clear basis for "Why does the shaft need sealing and why has a complicated *redundant system been selected*". Suggest adding preliminary findings from PA analyses (10 -12 won't work; it looks more like 10 -17 will and conservative vs lack of data approach) in order to provide this basis.	✓		When the annotated outline is expanded into a report, it will include discussion that resolve this comment.	CA	
JT-10	General	Yes	The report presents results nicely in appendix but does not tie conclusions back to guidance criteria. Suggest adding discussion in Sec. 9 Conclusions as to how sealing components meet criteria set forth in Table 3-1.	✓		When the annotated outline is expanded into a report, it will include discussion that resolve this comment.	CA	

WASTE ISOLATION PILOT PLANT
Sandia National Laboratories

Document Review and Comment Form

Form Number: 430-A Effective 3/31/96

Procedure: QAP 6-3 Revision 1

This form may be used for test plans, procedures, reports, design packages, abstracts, Technical Operating Procedures, and other documents.

Section of document to be reviewed and review criteria: (See sample criteria in QAP 6-3.).

Review Requester: Robert Stinebaugh Date: 4/24/96

Response Prepared By: [signature] Signature of Author/Designer Date: 4/26/96

Reviewed By: [signature] Date: 4.26.96

Response Concurrence: [signature] Date: 4.26.96

Review Type: ☒ Independent Technical ☐ QA ☐ Management ☐ Other Specify:

Title of Document to be Reviewed: Waste Isolation Pilot Plant Sealing System Design Review

☒ Pre-Publication ☐ Post-Publication

Signature of Reviewer Signature of Reviewer

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
SP-1	95-3117 Pg 33	Yes	If all the lining is not removed, the seal is only as good as that existing between the liner and the rock, including the DRZ. It is therefore over-kill to fill the shaft with a very low permeability material where the lining is not removed and the DRZ permeability are not reduced by grouting. The overall system is optimized by removing all the lining, having previously grouted the DRZ; a daunting task.	X		Based on discussions with the reviewer, the lining will be retained throughout the mudstone underlying the Culebra for safety/structural reasons and the lining will be removed as follows below the Culebra: Waste Shaft - below the 769 ft level to top of plug AIS Shaft - below the 760 ft level to top of plug Exhaust Shaft - below the 776 ft level to top of plug Salt Handling Shaft - below the 758 ft level to top of plug The portion of the key remaining in each shaft will be grouted to limit early time flow in the DRZ and along the interface. Elevations listed above may be changed if modification is required by other design considerations. Optimization of the design is not part of the mission of this design effort. Optimization studies during detailed design will resolve such concerns.	✓	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
SP-2	95-3117 Pg 45	Yes	Throughout the text there are generalized statements regarding the sealing of the shafts. However, they are not always put completely into contents. Undoubtedly, the asphalt will increase redundancy and add assurance that the transport of brine down the ***inside*** (previously open) portion of the shaft, is precluded. The asphalt will not however, seal the DRZ initially but it will allow the DRZ of the Salado to seal over a period of time. These statements should be put completely into context.	x		The report will be reviewed for clarification of this point . The general shaft sealing strategy will be better explained in the text. For instance, greater emphasis will be given to explaining why redundancy is incorporated in the design philosophy and why cross-sectional seals and DRZ "seals" are both required in the system.	✓	
SP-3	95-3117 Pg 46	Yes	Specifications for the asphaltic components should be such that they optimize the sealing in the various locations. For example, the properties for the asphalt in the waterstop should be such that they promote rapid healing of the DRZ around the waterstop. The specs for the asphalt filler for component 6 may need to be very different as some penetration into the DRZ may be beneficial.	x		The review comment is absolutely correct that different asphalt properties may be desired when comparing the asphalt column (migration into the DRZ desired) to the waterstops (pressurization to induce salt healing desired). The properties of the asphalt waterstop should provide fast (i.e. two years) healing rates around the waterstops. Properties of the asphalt column should allow some migration into the surrounding DRZ. The text will include a "qualifier" that the viscosity will be tailored in the detailed design to provide the desired properties of the asphalt.	✓	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
SP-4	95-3117 PG D8	Yes	There will be interface flow, the extent of which will depend upon how well the various components can be placed against the rock wall and the characteristics of the rock wall, i.e. either blasted or drilled/reamed. The interface flow are initially expected to be a minimum past the asphaltic seals (if a relatively low viscosity asphalt is used) and probably reasonably low past a plug constructed with concrete having a high workability.	x		Construction of vertical shaft seals provides the ideal situation for minimizing interfaces between the rock and seal materials. Concrete and asphalt will flow under their own weight to provide intimate contact; this was shown for concrete in the SSSPT tests. Dynamic compaction will provide an as yet undetermined residual lateral stress which will ensure a tight interface. This construction method does completely close the interface, as demonstrated in the "thumper" test on salt. In similar construction situations interface grouting is usually performed and will be attempted in the appropriate locations. The impact of a flow along interfaces was previously analyzed during a preliminary study of the Rustler sealing system. These calculations showed that downward flow rate is controlled by the Salado DRZ conductance.	✓	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
SP-5	95-3117 General	Yes	The characteristics, and the eventual sealing, of the DRZ around the shafts, especially in the lower Rustler will have a significant effect on the eventual shaft seal achieved. The DRZ immediately above the Salado will never heal and never be completely sealed. Therefore, there is a potential for unsaturated brine to enter the top of the Salado. The asphalt filled waterstop at elev. 2420 ft. is the primary seal against brine migration downwards through the Salado. This should therefore be located as high as possible in the Salado and every effort made to seal its DRZ as soon as possible, eg. apply a head to the asphalt. Similarly, the short term effectiveness of the asphalt column in component 6 could be improved by completely removing the existing key and applying a head to the asphalt and/or grout to accelerate healing of the upper Salado.	X		Additional liner removal in this region and grouting the remaining portion of the key and around the Rustler concrete plug have been added to the design. These steps will provide an additional short-term barrier to downward migration of Rustler groundwater. Grouting will be performed in all areas where the liner is removed (10 ft above and below the removed sections will also be grouted) and throughout the length of the key. This grout will provide flow control in the DRZ during seal system construction and for some time following completion of the seal system. The reviewer is correct in stating that the asphalt filled waterstop is an important short-term seal for the DRZ. For this reason, the design has placed the upper waterstop at an elevation of 2420 ft amsl in what is considered "good" salt. We do not consider it appropriate to move the waterstop to any higher elevation because it could move it into poorer quality salt and undermine its function. Based on discussions with the reviewer, the length of the asphalt column (i.e., head on the asphalt column), will not be increased to achieve greater effectiveness in sealing the DRZ. Consistent with the reviewers' comment, the healing of the Rustler DRZ was not considered in performance models.	✓	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
SP-6	General	Yes	The overall performance of the shaft seal is very dependent upon the short term ability to form a seal in the upper Salado. It appears to be a race against time. Will the Rustler undersaturated brines penetrate the DRZ to the upper concrete component before the asphalt waterstop becomes 100% effective? The calculations given, indicate that the flow is minimal and that the waterstop will seal in 2 years. I suspect that the calculations are sensitive to the value of the permeability chosen for the DRZ in both the Rustler and top of Salado. *Please explain the rationale used to* determine the permeabilities used in the DRZ of the Rustler. Will there be any difference between the *permeabilities in the same formation in* different shafts, bearing in mind the differing construction methods? Will the fact that the Rustler brines are undersaturated, make any difference to the permeabilities used in the flow calculations? Will this influence the final outcome?	x		DRZ permeabilities in the Rustler are not based upon field data but are assumed values. However, the DRZ permeability in the Rustler is not the controlling factor in flow through the seal system. The hydraulic conductance (ka) of the DRZ in the Salado is the limiting factor. Therefore, increasing the DRZ permeability of the Rustler will not significantly impact total flow. No distinction is drawn between treatment of shaft DRZ based upon shaft excavation methods. However, we feel that the conservative conceptualization of DRZ permeability in the Salado likely encompasses any possible variation between shafts. Currently we use *conservative estimates of halite skin* permeability and DRZ extent relative to field results. In addition, we hold the skin permeability at its maximum value throughout the DRZ healing period. The skin permeability dominates the calculation of the effective permeability. The potential for dissolution of salt within the DRZ will be considered and added to the final document.	✓	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
SP-7	General	Yes	Does the 2 year time frame for the healing of the new DRZ formed by the waterstop include the time taken to refill the space formed by shrinkage during cooling of the asphalt? Is it worth considering pressurizing the waterstop by grouting to speed the healing of the salt?	x		The 2-year time frame associated with the complete healing of the DRZ around waterstops did not explicitly account for closing any open volume of the waterstop caused by cooling of the asphalt. Cooling could cause about a 0.6 inch gap across the shaft below the concrete component for a 10 deg. C temperature change. The creep of salt will rapidly compress the asphalt and close this gap, especially when the salt has been heated. An alternative would be to inject additional asphalt or grout to fill the gap (and pressurize the asphalt, if desired). Pressurizing the waterstop will cause initiation of healing of the DRZ around the waterstop. Consideration will likely be given to this approach at the time of construction.	✓	
SP-8	General	Yes	Every effort is made to eliminate/reduce the DRZ in critical areas. Removal of the lining in some areas of the Rustler will help, but the placement of asphalt or compacted clay will not seal the DRZ. Is it worth considering grouting around some of the concrete plugs to reduce the permeability of this area by a few orders of magnitude and to apply some state of confinement to the plug?	x		Text of Appendix B will be modified to include grouting of the concrete plug in the Rustler formation. A spin grout pattern, similar to that used to grout the Rustler in areas where the liner is removed, will be used.	✓	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
SP-9	General	Yes	Should the downward movement of surficial water not be restricted as much as possible?	x		Section 4.3.3, Supra-Rustler Subsystem, briefly addresses this point in the 2nd paragraph on page 16 of the draft report. The text will be expanded to state that the shaft fill materials in the Dewey Lake and overlying units will be compacted to inhibit the migration of surficial water into the shaft cross section. Flow is further decreased by a 40-foot long concrete plug at the top of the Dewey Lake.	✓	
SP-10	General	Yes	How will any existing inflow into the shafts be handled during construction?	x		Text to be added is: A water gathering system (similar to the one currently in place at the bottom of the concrete liner) will be moved upward as seal emplacement proceeds. Water collected will be hoisted to the surface for disposal. Additionally, significant inflow, if any, will be located and minimized by grouting	✓	
SP-11	General	Yes	Will the electromagnet holding the tamper be absolutely safe if men are to be working in the bottom?	x		Text to be added: The tamper will be mechanically secured to the polar crane before personnel are allowed under it.	✓	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
SP-12	General	Yes	Should the locking devices not be on the bottom deck rather than the top deck?	x		No text/drawing changes at this time since discussion with the reviewer indicates agreement that the location currently shown will function *satisfactorily. This change may be* incorporated in future optimization of the system.	✓	
SP-13	General	Yes	The long blade of the undercutter should be confined both top and bottom in the salt when cutting. It may be necessary to use a short rigid blade to make the sequential, circumferential cuts for the excavation for the plugs.	x		The text in Appendix B, Section 4.2.2 will be modified to state that two cutter bars will used to make the necessary excavations for the upper, middle, and lower concrete components. The notches for the concrete plugs will be excavated using a short cutter bar (minimum length necessary to excavate notch) and the kerf for the asphalt waterstop will be excavated using a long cutter bar (length sufficient to make a 1 radius excavation).	✓	
SP-14	General	Yes	It may be necessary to cut both upper and lower plug excavation together so that the muck does not have to be cleaned off the top of the asphalt.	x		The text in Appendix B, Section 4.2.2 will be modified to state that the notches for the upper and lower concrete plugs of the concrete components will be cut before the concrete for lower plug is placed. This will insure that muck from the upper notch does not have to be cleaned off the top of the asphalt.	✓	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
SP-15	General	Yes	The work deck could be assembled in the shaft collar. The work scheduled to be performed on the surface beneath to bottom deck of the work deck could also be done with the stage just below the collar. This would allow a smaller headframe to be used and the asphalt pipes to be handled in 20 ft. rather than 10 ft. lengths.	x		We agree that assembly of the stage in the shaft may result in a cost saving. However, the ability to raise the stage 10 ft above the collar provides operational flexibility for: a. maintenance of the polar crane, b. installation and removal of the salt undercutter, and c. installation and removal of the tamper. Therefore, since the design as presented will work, it will not be changed at this time. However, considerations such as this are likely to be part of future optimization activities.	✓	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
SP-16	General	Yes	Will dust be a problem during dynamic compaction, or will the water added keep it to manageable proportions?	x		Per discussions with reviewer, salt dust generated during dynamic compaction is not expected to be a problem - Text to be added is: Experience gained during the large-scale salt compaction demonstration indicated that dust generation during the compaction of WIPP salt is minimal. Additionally, fresh air will flow down over the workers to the vent duct located below the lowest deck of the stage. Therefore, any dust will be exhausted directly out of the working environment.	✓	
SP-17	General	Yes	For safety reasons no major work items should be performed on the top deck. Can the lining be removed on the bottom deck and the material collected off the bottom of the shaft? It would be safer to move up the shaft, breaking out the lining so that no one is working below the unsupported wall.	x		The following text will be added to Appendix B: For safety reasons, no major work will be performed on the top deck. Shaft liner removal will proceed from the bottom up, working from the bottom deck. Broken pieces of the liner will be allowed to fall to the fill surface below. Broken concrete will be gathered by a mucking device, placed in a hoisting bucket, and removed to the surface for disposal.	✓	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
SP-18	General	Yes	Grouting prior to lining removal will be more effective if it proceeds from the bottom and moves upwards. Primary and secondary sequencing of drilling and grouting should also be used. If any formation has significant vertical fracture, the holes should be "spun".	x		Text to be added is: Grouting prior to liner removal will proceed from the bottom up. Holes will be drilled, using reverse circulation diamond drill equipment to avoid plugging fractures with fine-grained drill cuttings. The holes will be drilled in a spin pattern at 45 degrees above horizontal, in the form of an upward opening cone. The holes will be drilled and grouted, using stage grouting procedure and will utilize primary, secondary, and, if needed, tertiary grout holes.	✓	
SP-19	General	Yes	Would it be simpler to construct the Shaft Station Monolith from the shaft?	x		The construction description for the Shaft Station Monolith in Appendix B, Section 4.2.2, will be revised to state that the Shaft Station Monolith concrete will be placed from the multi-deck stage in the shaft. Additionally text will be modified to explain the basis for this choice.	✓	

Reviewer's Comment				Author/Designer's Response			Reviewer's Response	
Item No.	Ref. Loc.	Mandatory	Comment	Accept	Reject	Reasoning	Accept	Reject
SP-20	General	Yes	The dynamic compaction of bentonite in the shaft (when a proven technique) should provide a much higher degree of confidence in the density achieved for this material. Installing blocks will be a very time consuming, labor intensive activity with difficult quality control on first outcome.	x		We agree that dynamic compaction of bentonite is both efficient and cost effective. However, at this time it has not been established that dynamic compaction will produce the required average bentonite density of 1.8 g/cc. Therefore, the design will retain bentonite block as the construction method for the bentonite columns.	✓	

WIPP CSDR Attendance Record Name	Organization	Phone	FAX/e-mail	24-Apr	25-Apr	26-Apr
Ernst Ahrens	6121	848-0606	848-0605	X	X	X
Michael Schuhen	6121	848-0646	848-0605	X	X	X
David Mann	Parsons Brinckerhoff	815 281 8700	281-8707	X	X	X
FRANK D. HANSEN	SNL 6121 CB → ABQ →	505-284-0066 505-848-0609	505-889-1691 505-848-0605	✓	✓	✓
BILL THOMPSON	CTAC	505 865 4730	505 887 5494	✓	✓	✓
Don Galbraith	DOE/CAO	(505) 234-7460	(505) 234-7430	DG	DG	DG
Malcolm Grey	AECL	(204) 753 2311	204 753 8486	✓	MG	MG
John Tinucci	Itasca	612/371-4711	612/ 371-4717	X	✓	✓
STEPHEN PHILLIPS	PMTC	520 297 2162	520 297 2162	X	X	X
LEO L VAN SAMBEEK	RE/SPEC	605 394 6457	LVSAMBEE@RESPEC.COM 605 394 6456	X	X	X
M. Kathryn Knowles	SNL/6121	5058480611	5058480605 mkknowl@nwer.sandia.gov	X	X	✓
L. Diane Hurtado	SNL/6121	505-848-0541	505-848-0605 ldhurta@nwer.sandia.gov	X	not present	
Marc Loken	RE/SPEC	605 394 6423	MLOKEN@RESPEC.COM 605 394 6456	X	X	X
Mark Reeves	INTERA	(512) 346-2000	346-9436	X	X	X
Van Kelley	INTERA	512 346 2000	346 9436	X	X	X
Al Dennis	Sandia, 6121	505-848-0607	505-848-0605	X	X	X
JOE R. TILLERSON	SANDIA - 6121	505-848-0612	Fax 505-848-0605	X	X	X
MARK MATTHEWS	DOE	505-234-7467	234-7430		✓	✓
Dick Lahr	DOE/CAO	505-234-7496	7430	X	X	

WIPP CSDR Attendance Record Name	Organization	Phone	FAX/e-mail	24-Apr	25-Apr	26-Apr
R.E. STINEBAUGH	SNL /2165	(505) 844-2534	(505) 844-8745	✓	✓	✓

REVIEW PLAN

SHAFT SEAL SYSTEM DESIGN FOR THE WASTE ISOLATION PILOT PLANT (WIPP)

Principal Investigator: F. D. Hansen, Dept. 6121 Date: 12/21/95

Review Chairman: R. E. Stinebaugh, Dept. 5105 Date: 1/12/96

Approved By: J. R. Tillerson, Dept. 6121 Date: 1-9-96

Approved By: S. Y. Pickering, Acting QA Chief Date: 12-21-95

Introduction

Sandia National Laboratories is responsible for production of a credible shaft seal design as part of the Compliance Certification Application (CCA) being prepared by the Department of Energy (DOE) for the Environmental Protection Agency (EPA). The CCA will demonstrate compliance with the requirements outlined in Title 40, Part 191 (or 194, if promulgated) of the Code of Federal Regulations for the permanent disposal of transuranic wastes. Much of the technical content of the shaft seal system design will be included in the CCA. Ultimately, the shaft seal system will be published as a comprehensive, stand-alone document including design considerations beyond the scope of the CCA.

Design activities have been conducted by Sandia and subcontractors under the auspices of an approved quality assurance program. This design review will adhere to requirements of SNL Quality Assurance Procedure (QAP) 3-2, entitled Verification of Design Adequacy, Revision 1, approved 7/31/95.

Scope

This review plan governs preliminary and final review of the WIPP shaft seal system. Preliminary design is embodied in a single published report. Final design will include considerable additional detail developed on the basis of the preliminary design. Final design documents include but are not limited to: 1) an enhanced annotated outline of the compliance design report, 2) design drawings, 3) framework of material specifications, 4) fluid flow analyses, and 5) structural analyses.

Preliminary Design Review will consider the adequacy of design concepts summarized in the report entitled Waste Isolation Pilot Plant Sealing System Design Report (SSDR) (DOE/WIPP-95-3117, Printed October 1995). The report includes descriptions of the WIPP setting, design guidance derived from the regulations, a description of the design, materials comprising the seal components, and preliminary evaluations of the shaft seal system. The report itself is the only document that will be reviewed in the preliminary design review. Based on the information included in the SSDR, the review panel will be asked for their evaluations of the following general questions:

- Will this shaft seal system satisfy design guidance?
- Are there elements of the design which will prevent the sealing system from meeting design requirements?
- Can the design be successfully implemented?

The panel is not expected to optimize the design summarized in the SSDR, though comments will be resolved in keeping with QAP 3-2. Resolution of comments may include details of analyses, drawings or specifications that will be addressed and included in the package presented for the final design review.

Final design review will consider several products:

- An enhanced annotated outline for the compliance shaft seal design report
- Detailed drawings
- Material specifications framework
- Structural calculations in topical summaries
- Fluid flow calculation in topical summaries

The final design report for compliance is scheduled to be published in August 1996. The enhanced annotated outline used in the review process will be developed into the compliance design report and incorporate the final design review comments. The compliance design SAND report will be subjected to peer review in keeping with established Quality Assurance procedures for publications. The products identified for examination during final design review will address comments generated during preliminary design review.

Review Panel Members

Members of the design review team are selected on the basis of their respective knowledge, experience and independence from the WIPP shaft seal design effort. Independence does not mean total lack of experience with any WIPP activities, rather independence means no involvement with the seal design, analysis or materials development.

Name/Organization	Key Review assignment	Phone Number
Robert E. Stinebaugh/SNL	Review Team Chairman	505-844-2534
Malcomb Gray/AECL	Scientist/Programmatic	204-753-2922
John Tinucci/Itasca	Modeling/Analyses	612-371-4711
Steve Phillips/Phillips Mining	Materials/Safety	520-297-2162

Schedule

The schedule presented in this plan is based on the assumptions that the panel members will be available on the dates specified and that the material to be reviewed will also be available on these dates. This schedule may be revised by the Chairman to accommodate any or all parties to this review without revision of this plan.

Approval of design review plan: On or before 12/22/95
Note: Approval of the design review plan includes assignment of the review chairman and review panel members.

Preliminary design review: 01/10/96 through 02/13/96

01/04/96-01/09/96:	Distribute seal design report (DOE/WIPP-95-3117) to review panel.
01/10/96-01/23/96:	Review design package per review plan instructions.
01/23/96:	Formal comments submitted to Chairman.
01/30/96:	Comment resolution complete. The Chairman has the discretion to hold a summary meeting to discuss resolutions.
02/13/96:	Preliminary design report completed by Chairman and delivered to Sandia QA for review and approval. Pending QA approval, the preliminary design review package will be submitted to the Sandia WIPP Central File (SWCF). Delivery of the design report to SWCF concludes the preliminary design review.

Final design review: 03/21/96 through 04/29/96

03/21/96:	Distribute an enhanced annotated outline of the Seal System Compliance Design Report and supporting documents to the review panel. Distribution will be accomplished in a joint meeting wherein the design and supporting calculations are presented to the review panel.
03/22/96-04/03/96:	Review design package.
04/04/96:	Submittal of all review comments to the Chairman.
04/05/96-04/18/96:	Comment resolution.
04/19/96-04/23/96:	Verify resolution acceptance by review panel.
04/24/96-04/26/96:	Prepare design review report.
04/29/96:	Submit design review report to SNL QA for review, approval and submittal to the SWCF.
04/30/96:	Milestone SS002--Complete design review of Shaft Sealing System Compliance Design

The concept of "comment resolution" for purposes of design reviews means that agreement is reached on how a comment will be addressed as the design progresses. Resolution does not require the solution to the comment be completely obtained or achieved. Certification of completion of review comments rests with the Chairman.

This schedule supports two project milestones: 1) Seal design input to CCA (07/96), and 2) Publication of the Seal System Compliance Design Report (08/96).

Review Procedure

The Chairman has the authority to make schedule changes and logistical arrangements as felt necessary to accomplish the reviews, if such arrangements do not jeopardize quality, the ability to complete the review in a technically competent fashion, or the milestone date for completion (04/30/96). If practical, design reviews will be initiated at a central location to provide an opportunity for presentation of the products by Sandia. If it is not possible for a panel member to meet at the designated location and time, the Chairman can implement alternative arrangements for initiating the design reviews.

The Chairman will provide guidance for the review process including training in accordance with QAP 3-2. Training forms and other QA documentation will be assembled early in the review process. The Chairman will instruct reviewers to stay within their areas of expertise and offer concise comments suitable for a technical response. The guidance will include methods for comments submittal and resolution (a standard form #430 from QAP 6-3 or an equivalent word processing form will be used). Unresolved comments (disputes) will be resolved by majority of the panel. If the panel cannot achieve resolution, a final decision regarding the unresolved comment will be made by the Department Manager, J. R. Tillerson in consultation with DOE. Minority opinions can be included in the Chairman's report.

The Chairman's report on the preliminary and final design will include:

- The Review Plan.
- The reviewed material.
- Reviewer's qualifications in accordance with SNL WIPP QAP 2-1.
- Guidance for the review. This may include materials such as view graphs used for technical presentations or instructions.
- Documentation of training and orientation of reviewers.
- Completed review and comment forms consistent with QAP 6-3.
- Discussion of minority opinions, if appropriate.
- Summation of the review process, if appropriate.