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June 13, 1986

* Hildenbrand Kennedy

MEMORANDUM: Robert E. Browning, Director
Division of Waste Management

FROM: F. Robert Cook, Senior On-Site License
Representative, Basalt Waste Isolation
Project (BWIP)

SUBJECT: OBSERVATIONS, COMMENTS AND RECOMMENDATIONS
FOR THE PERIOD MAY 3 TO JUNE 13, 1986

TECHNICAL ITEMS

1. Waste Package--

a. The testing in this area has been reduced as a result of the stop-work order issued May 1, 1986. (This order was forwarded to Staff via separate correspondence.) Only long-term corrosion or waste form tests are being allowed to continue. Work is focusing on planning, preparation of issue resolution strategy, procedure preparation and QA system implementation. Investigators at PNL and Westinghouse and other subcontractors are being reassigned. I know of no specific lay-offs, although this may be occurring. The stop work appears consistent with a general reduction of budget for FY 87 and 88 BWIP work suggested in my previous memo of May 8, 1986.

b. A Waste Package Coordination Group meeting was held at Columbus on June 11 and 12. This was a restricted meeting. The NRC was not allowed to attend even though attendance was desirable to stay abreast of DOE's planning in this key technical area. I consider the action on DOE's part is inconsistent with the provisions in Appendix 7 of the Site Specific Agreement. A general comment concerning the effectiveness of the OR's interactions with DOE is contained in the "Miscellaneous" comments below. I will attempt to obtain minutes and presentations concerning the meeting for Staff information.

c. Three materials test reports were forwarded to M. McNeil per his request. Attachment B contains the title pages for these

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reports. They should be available from McNeil for Staff review if desired.

2. Repository Engineering--

a. Attachment A is a report of a review of rock mechanics associated with BWIP. It contains the comments of five experts relative to the in-situ stresses and rock strength of the basalts being considered for BWIP. In particular it appears that the group recommended that extreme values for in-situ horizontal stress be used in design studies to ensure conservatism. (See page 10 of Attachment A.) This recommendation is being implemented by specifying an average horizontal stress, $1/2(\text{maximum horizontal stress component} + \text{minimum horizontal stress component})$ for conceptual design for repository sizing purposes by BWIP designers. The plan is to adjust waste package bore hole spacing upon investigating and measuring local stresses at depth along with rock strength, presumingly to consider the actual local extremes in the stress. The local spacing of waste packages is the key parameter affected by stress and rock strength and which largely determines the size of the repository according to sensitivity studies carried out by the repository designer.

b. The Attachment A report contains a summary of principal engineering criteria--page 36--including the identification of criteria regarding thermomechanical/hydrological phenomena which affect isolation. This information and other information in the report could be of use to Staff in preparing a pro-active technical position concerning stability and other key design criteria for BWIP. In this regard I recommend Staff communication with any of the experts noted in the report or the Raymond Kaiser Engineers, for example George Kugler or Birger Schmidt, familiar with the detailed work. George Jackson is cognizant for Rockwell.

Such guidance is needed early to assure sufficient reconnaissance information is obtained to provide adequate verification of stability to justify local detailed siting of the exploratory shaft and other site characterization activities which will be affected by the high in-situ stress conditions in the area.

3. Geology--

a. A review of the geophysical logs indicate what I interpret as an unusual interbed about 12 feet thick above the Palouse Falls flow in DC-23GR. The same interbed does not exist in the DC-23W bore hole a short distance north of the GR hole. However, the Vantage interbed in the W hole is about 20 feet thick compared to about 8 or 9 feet in the GR hole. In addition the Levering Flow--the one above the Cohasset--exists at the GR hole. It does not exist in other bore holes near the current exploratory shaft location. I have requested copies of the geophysical logs

for these two holes and the BN 1-9 Shell well on Saddle Mountain for Staff information.

b. Television pictures of the DC-23 holes have been or will be taken. I plan to review these pictures and report to Staff per request of Weber when they become available.

c. My review of the BN 1-9 Shell geophysical logs reveals two large (40 to 45 feet thick) interbeds near the bottom of the basalt at about 11,500 feet. One is above the first flow and the second is above the second flow. Coal has been observed by the State geologist in chips taken from these zone of the Shell well. The State representative informed me that their reflectance indicates a sub-bituminous rank for the coal. I recommend further discussion by staff in this area with the helpful State personnel.

d. I have been attempting to review the pros and cons of deeper bore holes to resolve licensing issues for BWIP. Since about 1981 there has been substantial attempts to address this issue and each time it appears that the need for deep bore holes has been decided in the negative by management. Reasons which I have been told are that 'costs were not worth the data which would be obtained,' 'there is no additional information which would be useful,' to, 'the data which would be obtained would only raise new questions.'

To assess the question on costs I reviewed the drilling history of RSH-1 on Rattlesnake Mountain which was drilled to a depth of 10,655 feet during the period of July 1957 to April 1958. Drilling progress was good in the basalts with about 1000 feet advancement every two to three weeks. For example, it took from 2/25/58 until 4/2/58 to drill from 8,575 to 10,655 feet. During a period when large mud losses and lost circulation occurred in an 800 foot interval (4000 to 4847 feet), it took three months (9/12/57 to 12/15/57) to progress from 3375 to 7735 feet. In summary it appears drilling at least through the basalts would be about as expensive on a per foot basis as current drilling expenses for the hydrologic bore holes.

4. Performance Assessment--no items to report

5. Geochemistry--

a. Sampling of the groundwater in the Grande Ronde in DC-23GR is continuing. No tritium measurements have been obtained on the samples from this well to date to help evaluate the quality of the chemistry information collected thus far.

b. Samples from DC-18 indicate relatively dilute ground waters in the Wanupum. I have requested data in various RHO internal letters concerning the DC-18 well water and will forward it upon receipt. These letters, which are prepared by the geochemist

responsible for the field testing, represent an excellent, timely evaluation of data providing credibility to the hydrochemical sampling process. The example provided is worthy of duplication throughout the project for all experimental data gathering activities.

6. Site/Environmental--

a. Integration of the preparation of an environmental report into the site characterization activities and the SCP may not occur, considering DOE's current plans. Plans for resolving the requirements of Part 51 regarding an environmental report should be reviewed with DOE generically so as to determine how coordination with SCP activities will occur. In addition it should be determined if baseline radiological environmental data will be considered important to isolation and collected under an acceptable QA system or whether it would be treated in the same manner as the collection of other non-radiological baseline environmental data.

b. Comments in item 2 above regarding the importance of the in-situ stresses to local site selection within the RRL, described in the EA, are pertinent to this category of my memorandum.

7. Hydrology--

a. BWIP is continuing to perform hydrologic testing and completion of the monitoring instruments in DC-23GR. The stop-work order has not affected this area of the site characterization.

8. Quality Assurance--

a. An audit report concerning peer review activities at Rockwell was recently completed by the MAC group assisting DOE/RL in the QA. The report was useful in that it identified problems and provided incentive for improvement in this important design control activity. It contrasts with earlier reports from MAC which have been insignificant in their identification of areas where improvements are needed. Staff involvement in the earlier audits appears to have had a significant, beneficial effect in improving later audits. I consider the Appendix 7 reviews by QA personnel are useful. I believe DOE/RL QA has interfaced appropriately and has made use of Staff feedback in accordance with the intent of the MOU between NRC and DOE concerning the pre-license application period.

b. I reviewed the draft staff technical position on establishing Q-list items. A marked-up copy of this position is attached to J. Kennedy's copy of this memorandum as Attachment C.

MISCELLANEOUS ITEMS

a. The State of Washington filed suits against DOE following issuance of the EA's in four areas as follows: 1. compliance with the siting guidelines, 2. stoppage of work on the second repository, 3. timing of the preliminary determination of the acceptability to construct the repositories and 4. compliance with provisions in NWPA concerning DOE funding/support of work by the State.

b. I continue to be restricted by DOE/RL in access to important meetings. The latest restriction is from the meetings being conducted by Rockwell personnel during June to plan the resolution of DOE's licensing issues in preparation of writing sections of the SCP. I have raised this issue to Anttonen to no avail. He claims the meetings are not meetings within the context of Appendix 7 and has indicated a concern that my observations would disrupt the activities being conducted by Rockwell. I noted that I considered his reason was not valid.

c. The definitions of "record", "meeting" and "data" as these terms are used in Appendix 7 need specific clarification. DOE does not appear to accept the definitions in Webster's dictionary. I have raised the question of the definition of record to DOE (Pride) who agreed with me that a consensus on the definition seemed needed. He is looking into the issue.

F. Robert Cook

F. Robert Cook,
Senior On-Site Licensing
Representative, Basalt
Waste Isolation Project
(BWIP)

cf:	JTBuckley		
JOBunting	WLilley		
JJLinehan	JMLibert		
JMHoffman	SGBilhorn		
MRKnapp	PTPrestholt		
JTGreeves	TRVerma		
PHildenbrand	FRCook	PJustus	I&E
MFWeber	DOE	HLeffevre	OLOlson
DBrooks	VDHedges	KCChang	FXCameron

Rockwell Hanford Operations

Attachment B

BWIP SUPPORTING DOCUMENT				Number	Rev./Chg. No.	Page 1 Of 20																																																						
End Function Activity: Waste Package		Project No.: B 314		SD- BWI-TS-008	0	Total Pages 20																																																						
Document Title: Slow-Strain-Rate Testing of 9%Cr, 1%Mo Wrought Steel and ASTM A27 Cast Steel in Hanford Grande Ronde Groundwater				Baseline Doc.: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Class: _____																																																								
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Borehole No.: N/A	Stratigraphic Formations: N/A	Doc. Type 2056	Subj. Code W300	Prepared by (type & sign name) Author: S.G. Pitman <i>S.G. Pitman</i> BWIP Contact: R.L. Fish <i>R.L. Fish</i>		Date 10/84																																																						
THIS DOCUMENT IS FOR USE IN PERFORMANCE OF WORK UNDER CONTRACTS WITH THE U.S. DEPARTMENT OF ENERGY BY PERSONS OR FOR PURPOSES WITHIN THE SCOPE OF THESE CONTRACTS. DISSEMINATION OF ITS CONTENTS IS HANDLED IN ACCORDANCE WITH THE FREEDOM OF INFORMATION ACT.				<table border="1"> <thead> <tr> <th>* Distribution</th> <th>Name</th> <th>Mail Address</th> </tr> </thead> <tbody> <tr> <td>*</td> <td>R. P. Anantatmula</td> <td>1135 J/1100</td> </tr> <tr> <td>*</td> <td>W. J. Anderson</td> <td>CDC-1/3000</td> </tr> <tr> <td>*</td> <td>R. L. Fish (5)</td> <td>1135 J/1100</td> </tr> <tr> <td></td> <td>L. R. Fitch</td> <td>PBB-5th/1100</td> </tr> <tr> <td></td> <td>T. B. McCall</td> <td>1135 J/110C</td> </tr> <tr> <td>*</td> <td>M. J. Smith</td> <td>1135 J/1100</td> </tr> <tr> <td>*</td> <td>S. C. Yung</td> <td>1135 J/110C</td> </tr> <tr> <td>*</td> <td>W. F. Todish (orig)</td> <td>CDC #2/3000</td> </tr> <tr> <td>*</td> <td>BRMC</td> <td>CDC #2/3000</td> </tr> <tr> <td>*</td> <td>J. E. Faleide</td> <td>1135 J/1100</td> </tr> <tr> <td>*</td> <td>PRS</td> <td>Fed. Bldg. 700</td> </tr> <tr> <td></td> <td>P. J. Reder</td> <td>CDC #2/3000</td> </tr> <tr> <td colspan="3">PNL</td> </tr> <tr> <td>*</td> <td>S. G. Pitman (5)</td> <td>PSL/414</td> </tr> <tr> <td>*</td> <td>R. E. Westerman (2)</td> <td>306W/206</td> </tr> <tr> <td colspan="3">DOE-RL</td> </tr> <tr> <td></td> <td>R. Southworth</td> <td>Fed. Bldg.</td> </tr> </tbody> </table>			* Distribution	Name	Mail Address	*	R. P. Anantatmula	1135 J/1100	*	W. J. Anderson	CDC-1/3000	*	R. L. Fish (5)	1135 J/1100		L. R. Fitch	PBB-5th/1100		T. B. McCall	1135 J/110C	*	M. J. Smith	1135 J/1100	*	S. C. Yung	1135 J/110C	*	W. F. Todish (orig)	CDC #2/3000	*	BRMC	CDC #2/3000	*	J. E. Faleide	1135 J/1100	*	PRS	Fed. Bldg. 700		P. J. Reder	CDC #2/3000	PNL			*	S. G. Pitman (5)	PSL/414	*	R. E. Westerman (2)	306W/206	DOE-RL				R. Southworth	Fed. Bldg.
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Abstract				(Continued on reverse side)																																																								
<p>Strength and ductility data are presented for a cast low-carbon steel (A27) and a low-alloy steel (A387) in both air and a basalt groundwater environment. These data are used in conjunction with fracture mode analyses to evaluate the susceptibility of these materials to environmentally assisted cracking processes. Implications of the observed behavior relative to waste package container design and container material selection are discussed. The work was performed during FY 1984.</p>				<p>* COMPLETE DOCUMENT (No asterisk, title page/summary of revision page only)</p>																																																								
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	Author's Manager			
<input checked="" type="checkbox"/>	R. L. Fish <i>R. L. Fish</i>	3/12/85		
<input checked="" type="checkbox"/>	R. P. Anantatmula <i>R. P. Anantatmula</i>	3/11/85		
	Peer Review			
<input checked="" type="checkbox"/>	W. L. Heilman <i>W. L. Heilman</i>	9/11/85		
	Patentability / Sensitive Material			
<input checked="" type="checkbox"/>	L. R. Fitch <i>L. R. Fitch</i>	8/8/85		
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	Project Integration			
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Rockwell Hanford Operations

BWIP SUPPORTING DOCUMENT				Number	Rev./Chg. No.	Page 1 of 68
End Function Activity: Engineered Barriers		Project No.: B-314		SD- BWI-TS-012	0	Total Pages 68
Document Title: Short-Term Stress-Corrosion-Cracking Tests for A36 and A387-9 Steels in Simulated Hanford Groundwater				Baseline Doc.: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Class: N/A		
Borehole No.: N/A		Stratigraphic Formations: N/A	Doc. Type 2056	Subj. Code W300	WBS No. or Work Package No. L2D2	CEI No.: 002
Prepared by (type & sign name) L. A. James - Westinghouse				Date 6/85		
D. R. Duncan - Rockwell contact 6/85 See reverse side for additional approvals 6-0997						
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Abstract Relatively short-term (approximately 2000 hour) tests were conducted on precracked self-loaded fracture mechanics specimens of two candidate container materials in simulated Hanford groundwater at two temperatures: 150°C and 250°C. The two materials tested were wrought ASTM A36 A387-9 steels, and three different levels of applied stress intensity (K) were tested for each material/temperature combination. The results of these short term tests suggested no crack extension in the A36 steel. The results for the A387-9 steel were inconclusive as to whether limited crack extension occurred or not. On-going longer term tests should help clarify the uncertainty. The factors influencing the accuracy of this type of fracture mechanics tests are also discussed.				* R. P. Anantatmula 1135 Jad/1100		
				* D. R. Duncan 1135 Jad/1100		
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				* R. L. Fish 1135 Jad/1100		
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BWIP SUPPORTING DOCUMENT				Number	Rev./Chg. No.	Page 1 of 23
End Function Activity: Waste Package		Project No.: 314		SD- BWI-TS-014	1	Total Pages 24
Document Title: Pitting Behavior of Low-Carbon Steel				Baseline Doc.: Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Class: N/A		
				WBS No. or Work Package No. L2D2		CEI No.: 002
Borehole No.: N/A	Stratigraphic Formations: N/A	Doc. Type 2056	Subj. Code W300	Prepared by (type & sign name) Author: J.B. Lumsden (RSC) R. L. Fish (Rockwell contact) See reverse side for additional approvals		Date 12/85
<p>THIS DOCUMENT IS FOR USE IN PERFORMANCE OF WORK UNDER CONTRACTS WITH THE U.S. DEPARTMENT OF ENERGY BY PERSONS OR FOR PURPOSES WITHIN THE SCOPE OF THESE CONTRACTS. DISSEMINATION OF ITS CONTENTS IS HANDLED IN ACCORDANCE WITH THE FREEDOM OF INFORMATION ACT.</p> <p>Abstract</p> <p>Anodic and cathodic potentiodynamic polarization curves were obtained for low-carbon steel (A27, Grade 60-30) exposed to a synthetic groundwater/packing material mixture at temperatures from 50° to 200° after 1 h, 1 day, and 1 week exposure times. Passivation was observed at 200, 150 and 100°C. The pitting potential and the corrosion current density were determined from the polarization curves. In a separate test series, the corrosion potential and polarization resistance are being monitored continuously during exposure to the synthetic groundwater/packing material mixture at 100, 150, and 200°C. Both the corrosion potential and the corrosion rate as determined from the polarization resistance are decreasing or have reached a steady-state with time of exposure. The corrosion potential for a given material has always remained below its pitting potential.</p>				<p>* Distribution Name Mail Address</p> <p>* R. P. Anantatmula 1135 Jad/1100</p> <p>* D. R. Duncan 1135 Jad/1100</p> <p>* J. E. Faleide 1135 Jad/1100</p> <p>* R. L. Fish (5) 1135 Jad/1100</p> <p>* J. C. Krogness 1135 Jad/1100</p> <p>* M. A. Lacey 1135 Jad/1100</p> <p>* D. J. Meyers 1135 Jad/1100</p> <p>* T. B. McCall 1135 Jad/1100</p> <p>* E. H. Randklev 1135 Jad/1100</p> <p>* P. J. Reder CDC-2/3000</p> <p>* P. F. Salter 1135 Jad/1100</p> <p>* M. J. Smith 1135 Jad/1100</p> <p>* W. F. Todish (orig) CDC-2/1100</p> <p>* S. C. Yung 1135 Jad/1100</p> <p>* G. T. Harper 1135 Jad/1100</p> <p>* R. S. Kelley 1135 Jad/1100</p> <p>* BRMC (2) CDC-2/3000</p> <p>* PRS Fed Bldg</p> <p>Rockwell Science Center**</p> <p>* J. B. Lumsden (5)</p> <p>* F. B. Mansfeld</p> <p>**P. O. Box 1085 Thousand Oaks, CA 91360</p> <p>Department of Energy - RL</p> <p>* P. E. Lamont FED/642A</p> <p>* R. S. Southworth FED/765</p>		
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<input checked="" type="checkbox"/>	W. L. Heilman Patentability / Sensitive Material	1/20/86		
<input checked="" type="checkbox"/>	M. J. Smith Research Manager	12/18/85		
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<input type="checkbox"/>	Project Integ./Perf. Assessment Manager			
<input type="checkbox"/>	Exploratory Shaft Prog. Manager			
<input type="checkbox"/>	Repository Program Manager			
<input type="checkbox"/>	Associate Director			
<input type="checkbox"/>	Director			
<input checked="" type="checkbox"/>	R. T. Johnson Health, Safety & Environment	1-22-86		
<input checked="" type="checkbox"/>	P. J. Reder Quality Assurance	1-23-86		
<input checked="" type="checkbox"/>	W. L. Heilman Configuration Management	1/20/86		
<input checked="" type="checkbox"/>	J. Graham, Mgr. Project Integration	1/16/86		
<input checked="" type="checkbox"/>	G. T. Harper, Mgr. Engineered Barriers Dept.	12/15/85		
<input checked="" type="checkbox"/>	J. Madsen, Mgr. Systems	4/14/86		
<input type="checkbox"/>				
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Peer Review Identification No(s): <u>10992 for Rev. 0</u> No additional peer review required for Rev. 1				