

**FOREIGN TRIP REPORT**

**FOR**

**OFFICIAL TRAVEL**

**TO THE**

**FEDERAL REPUBLIC OF GERMANY**

**BY**

**DONALD E. CLARK**

**OFFICE OF NUCLEAR WASTE ISOLATION**

**BATTELLE PROJECT MANAGEMENT DIVISION**

**DECEMBER 2-13, 1986**

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**PDR WASTE PDR**  
**WM-16**

SUMMARY

OFFICIAL TRAVEL TO THE FEDERAL REPUBLIC OF GERMANY

December 2-13, 1987

Trip Report Date: January 1987

SRP/ONWI Traveler: Donald E. Clark, SRP Representative to the  
FRG, Battelle Project Management Division

Itinerary: December 3-4:  
Battelle-Institut e.V., Frankfurt

December 5:  
DWK (German Fuel Reprocessing Company), Hannover  
BGR (Federal Institute for Geosciences and  
Natural Resources), Hannover

December 8-11:  
GSF/IfT (Company for Radiation and Environmental  
Research/Institute for Underground Storage),  
Braunschweig

### Purpose

The purpose of this trip to the FRG was, in conjunction with D. E. Clark's assignment as the long-term SRP representative to the German waste management program, to (1) meet key FRG technical personnel who will be primary sources of information, (2) be clearly identified to the FRG personnel as the main contact person in the FRG for details regarding technical and administrative matters for the SRP, and (3) become familiar with the logistical configuration of the area in order to finalize relocation plans. Logistical issues of interest include physical location and access to the FRG waste project-related sites (e.g., repository facilities, laboratories, offices, ministries, and key personnel), and availability of centrally located housing and support facilities.

### Report Abstract

This foreign trip report covers the official travel of Donald E. Clark, Battelle Project Management Division, to the FRG as a necessary preparation to his being relocated there as the long-term representative of the SRP. The stated objectives of this travel were fully realized in that he met with key persons in the FRG program to discuss the assignment from both U.S. and FRG perspectives, and he was able to finalize arrangements for needed living and working accommodations in the Braunschweig-Peine area.

Meetings were held with cognizant personnel at Battelle-Frankfurt (technical and administrative support through a European-based Battelle component); DWK and BGR (technical interactions with the SRP); and GSF/Ift (technical interactions with the SRP; working and living accommodations in the Braunschweig-Peine area). Additional meetings were held with key representatives of the KfK and DBE concerning the assignment and planned technical interactions with the SRP.

### Cost of Trip

The total cost of this trip included travel cost (\$2,260), staff travel time (72 hours), plus staff time for preparation and report writing (80 hours).

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SCHEDULED VISITS

Battelle-Institut e.V.

The principal purpose of the visit to Battelle-Frankfurt was to discuss the long term assignment of a SRP representative to the FRG, and the availability of technical and administrative support for the assigned representative, who is employed by the Battelle Project Management Division, on an as-needed basis. In connection with administrative support from Battelle-Frankfurt, discussions were held with Mr. Eckirt Waller, Manager of Personnel. It was noted that while on assignment in the FRG, D. E. Clark will be paid by Battelle and be covered by the normal employee benefits such as medical insurance. In order to comply with employment and medical insurance requirements in the FRG, it appears that the medical insurance coverage should be augmented by a program obtainable through Battelle-Frankfurt, and further information exchange will be needed and shall be supplied later in order for them to coordinate these matters. D. E. Clark will have access to Battelle-Frankfurt for needed administrative support but it appears that the interactions will be relatively infrequent due to the physical separation (approximately 200 miles) of his work station from Frankfurt.

Technical discussions, including the feasibility of establishing a computer data link to Columbus through Battelle-Frankfurt, were held with Mr. Bodo Ruediger, Director of Business Sector Engineering, and Dr. Werner Baukal, Manager of Energy Technology. The Battelle-Frankfurt staff members were briefed on the purpose and planned objectives of the assignment of D. E. Clark to the FRG nuclear waste disposal program. Pertinent programs currently underway at Battelle-Frankfurt in the areas of nuclear waste management, reactor safety and technology, and measurement and experimental techniques were discussed. Battelle-Frankfurt staff have capabilities and continuing interest in the high-level waste disposal area, and have had close contacts with both KfK (Karlsruhe Nuclear Research Center) -- with whom they have ongoing programs -- and the DBE (German Company for Construction and Operation of Waste Disposal Facilities). Mr. Ruediger expressed strong interest in facilitating the establishment of a computer data link to Columbus, and will serve as principal contact at Battelle-Frankfurt for this purpose.

DWK (Germany Fuel Reprocessing Company)

At DWK (Germany Fuel Reprocessing Company), discussions were held with Dr. Franz Wolfgang Popp concerning the planned role of the long-term SRP representative to the FRG, and related technical activities of DWK. Dr. Popp discussed DWK's involvement with the AFR spent fuel storage facilities at the Gorleben and Ahaus sites, the PAMELA pilot plant at Mol, Belgium, and the fuel reprocessing plant currently under construction at Wackersdorf, Bavaria. The Wackersdorf plant has been focus of considerable anti-nuclear sentiment; some corporate changes were recently made at DWK to specifically address the problems they are facing with that situation.

Dr. Popp provided an extensive discussion of the Pollux cask system which is designed for use in the disposal of spent fuel in a salt repository. This disposal system is based on investigations that were conducted in the Project PAE "Project for Alternative Disposal Techniques" -- a research and development program of the German Ministry of Research and Technology (BMFT) -- during the years 1980-84. Since then, DWK has continued this development on their own for the planning and construction of a pilot plant for conditioning and encapsulating spent fuel. The Pollux cask system includes the spent fuel waste form; the final disposal cask to assure containment that is gas tight and provide protection against mechanical loads and impacts (including lithostatic pressure), and a corrosion barrier realized with Hastelloy C4 resurfacing by welding; and an overpack to provide shielding for transport and handling. The fundamental strategy for obtaining licensing approval for this disposal concept is based on the principle that only specific well-tried materials are used, their behavior is well known, and validated ASME boiler pressure codes can be applied to them with confidence. The disposal container has both a screwed primary lid and a welded secondary lid, thus eliminating the need for remote welding in a hot cell. The Pollux cask system appears to be a very well designed concept that should be carefully reviewed by U.S. waste package design groups.

At the conclusion of this meeting, Dr. Popp expressed the view that DWK is very supportive of the plan to assign a long-term representative to the FRG and welcomes this opportunity of establishing direct contact with the U.S. program (SRP).

#### BGR (Federal Institute for Geosciences and Natural Resources)

Technical discussions were held at the BGR (Federal Institute for Geosciences and Natural Resources) with Drs. A. Pahl (Director of Geology), Lutz Liedtke, Hans-K. Nipp, and Otto Schulze concerning BGR activities in support of the FRG nuclear waste disposal program. Views were exchanged concerning current and future activities in both the U.S. and FRG programs. Rock mechanics testing and modeling, sealing and backfill concepts, and behavior of irradiated salt were the principal subjects. Dr. Liedtke recently participated in the U.S./FRG Sealing Workshop (September 1986) and earlier had provided D. E. Clark with key publications on salt as a backfill material. FRG activities underway in Switzerland in cooperation with NAGRA/CEDRA (National Cooperative for the Disposal of Radioactive Waste) were discussed; these primarily relate to field testing in the granite formation at Grimsel Pass, a facility which has been operational since 1984. Dr. Schulze is an expert on the thermomechanical properties of irradiated rock salt and he provided comments on the recent SRP report on salt radiation effects testing (BMI/ONWI-626). Again, the staff members contacted at BGR appear to be very supportive of the enhanced interactions with SRP that are expected to result from the assignment of a long-term representative to the FRG.

GSF/IFT (Company for Radiation and Environmental Research/  
Institute for Underground Storage)

The primary purpose of this visit was to make arrangements for working and living accommodations in the Braunschweig area. At GSF/IFT (Company for Radiation and Environmental Research/Institute for Underground Storage), technical discussions were held with Drs. Klaus Kuehn (Director), Herman Gies, Horst-J. Herbert, Norbert Jockwer, and Tilman Rothfuchs. Dr. Kuehn had previously offered at the U.S./FRG Bilateral Agreement (Waste Management) Technical and Principal Coordinators' Meeting, held in October 1986, to provide local and administrative support to the long-term SRP representative. The GSF/IFT offer was reaffirmed, and details concerning the working office accommodations, etc. were provided during the discussions at Braunschweig. The principal focus for the GSF/IFT is to manage and perform research and development activities at the Asse Mine and the related technology development and demonstration for the Gorleben repository, and so, the work at Braunschweig is central to the FRG nuclear waste disposal program. Dr. Kuehn expressed strong support for the assignment of a SRP representative to the FRG and promised to assist in establishing SRP contacts with all other components of the FRG program.

The planned post test analysis activities associated with the Asse Brine Migration Test (BMT) were discussed. Tilman Rothfuchs provided important information on salt samples obtained from the BMT, some of which are being sent to the SRP. In the U.S.A., salt from the Asse BMT will be tested at SRP contractor laboratories and the results compared with those obtained in the FRG. (Thus far, the Germans have found strong correlation between sodium colloid formation in irradiated salt and the salt's purity with respect to the absence of sulfur -- and possibly other elements.) Dr. Gies expressed his strong feeling that Drs. Paul Levy (Brookhaven National Laboratory, BNL) and Larry Pederson (Pacific Northwest Laboratories, PNL) should visit Asse to see firsthand the visible effects (coloration) of heterogeneous rock salt exposed to gamma radiation, and to reach final agreement on the post-test plans. (Under the Bilateral Agreement, a joint U.S./FRG testing program is planned for BNL in fiscal year 1987.) It is felt that the BMT, in which natural salt was exposed to gamma radiation of varying intensity, could serve to provide important results concerning the effects of radiation on salt in the vicinity of emplaced waste packages.

At Braunschweig, a matter of immediate concern was to become acquainted with the logistical configuration of the area and to procure suitable long-term housing. The rental situation in the Braunschweig area is somewhat grim so far as newcomers are concerned. Apartments are extremely small by U.S. standards, and houses are few and seldom available to rent. Mr. Guether Kappei assisted D. E. Clark in the search for suitable housing. The search was finally successful in that an available house in the community of Gross-Schwuelper was found and subsequently was rented by D. E. Clark. The location is very good (see map in Appendix) in that it is approximately midway between Braunschweig (where GSF/IFT and PTB -- Federal Science/Engineering Laboratory responsible

for HLW disposal in the FRG -- are located) and Peine (where the DBE -- German Company for construction and operation of waste disposal facilities -- is located). Also, it is located only approximately 80 miles from the Gorleben repository site where many of the FRG program meetings are held. Thus, the important matter of finalizing arrangements for housing and support facilities was realized by this visit.

### Other Visits

#### K-D Closs, Kfk

On December 8, 1986, at Braunschweig, D. E. Clark met with Dr. K-D Closs, Project Group Leader at the Karlsruhe Nuclear Research Center (KfK) for the spent fuel direct disposal option, who was in the area for planning meetings at Peine and Gorleben. During discussion of the SRP representative's planned activities, Dr. Closs provided considerable insight and information on key contacts in all of the components of the FRG nuclear waste disposal program. The KfK group is planning a full-scale demonstration test of spent fuel disposal in the Asse mine, including consolidation of salt under influence of heat and pressure, and would welcome U.S. participation in their test as appropriate.

#### Dr. Peter Young and Mr. Hans-Juergen Engelmann, DBE

On December 11, 1986 at Hannover, D. E. Clark met with Dr. Peter Young (President) and Mr. Hans-Juergen Engelmann (Technology and Development Manager) of the DBE (German Company for Construction and Operation of Waste Disposal Facilities -- i.e., the Gorleben Repository) to discuss his planned activities in the FRG. Dr. Young and Mr. Engelmann expressed their strong support for this interaction with the U.S. salt program and plan to discuss specific proposals with D. E. Clark shortly after his relocation to the FRG. It was noted that the proximity of his residence to Peine should facilitate strong interaction on a regular basis with the Gorleben project.

**APPENDIX**

**KEY CONTACTS  
MAP OF LOCAL AREA  
IMPORTANT REPORTS OBTAINED DURING VISIT  
DETAILED ITINERARY**



## KEY CONTACTS

### Battelle-Frankfurt

Battelle-Institute e.V.  
am Romerhof 35  
6000 Frankfurt/Main 90  
Federal Republic of Germany  
Tel: 49-69-7908-0

Mr. Eckirt Waller, Manager, Personnel, 49-69-7908-0  
Mr. Bodo Ruediger, Director, Business Sector Engineering, 49-69-7908-2531  
Dr. Werner Baukal, Manager, Energy Technology, 49-69-7908-2293

### DWK (German Fuel Reprocessing Company)

Deutsche Gesellschaft fuer Wiederaufarbeitung von  
Kernbrennstoffen mbH  
Hamburger Allee 4, Postfach 1407  
D-3000 Hannover 1  
Federal Republic of Germany  
Tel: 49-511-3390-0

Dr. Franz Popp, Manager, Pollux Cask System, 49-511-3390-429

### BGR (Federal Institute for Geosciences and Natural Resources)

Bundesanstalt fuer Geowissenschaften und Rohstoffe  
Stilleweg 2  
D-3000 Hannover 51  
Federal Republic of Germany  
Tel: 49-511-6468-1

Prof. Dr. A. Pahl, Director, Geology, 49-511-646-8422  
Dr. Lutz Liedtke, 49-511-643-2418  
Dr. Hans-K. Nipp, 49-511-643-2434  
Dr. Otto Schultz, 49-511-643-2415

GSF/IFT (Company for Radiation and Environmental Research/  
Institute for Underground Storage)

Gesellschaft fuer Strahlen-und Umweltforschung mbH Muenchen  
Institut fuer Tieflagerung  
Theodor-Heuss-Strasse 4  
D-3300 Braunschweig  
Federal Republic of Germany  
Tel: 49-531-8012-1

Dr. Klaus Kuehn, Director, 49-531-8012-231  
Dr. Herman Gies, Manager, Geochemistry, 49- 531-8012-271  
Dr. Tilman Rothfuchs, Manager, Asse Testing Program, 49-5336-89232  
Dr. Norbert Jockwer, 49-531-8012-252  
Dr. Horst-J. Herbert, 49-531-8012-0250  
Mr. Guenther Kappei, Mining Engineer, 49-531-8012-217

DBE (German Company for Construction and Operation of  
Waste Disposal Facilities)

Deutsche Gesellschaft zum Bau und Betrieb von  
Endlagern fuer Abfallstoffe mbH  
Woltorfer Strasse 74  
D-3150 Peine 1  
Federal Republic of Germany  
Tel: 49-5171-43-100

Dr. Peter Young, President, 49-5171-43-200  
Mr. Hans Engelmann, Manager, Technology and Development, 49-5171-43-272

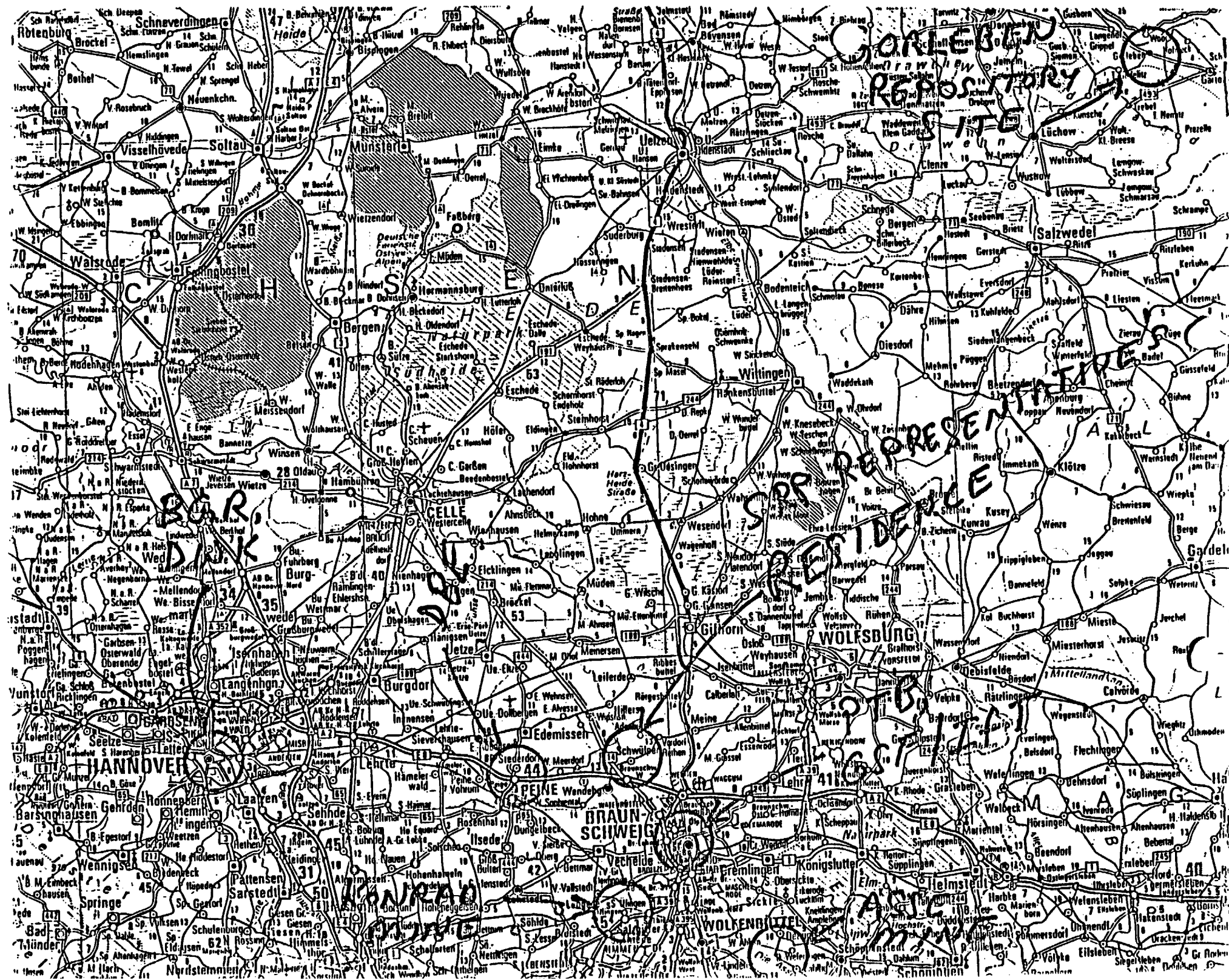
KfK (Karlsruhe Nuclear Research Center)

Kernforschungszentrum Karlsruhe GmbH  
Postfach 3640  
D-7500 Karlsruhe 1  
Federal Republic of Germany  
Tel: 49-7247-821

Dr. Klaus-Detlef Closs, Project Manager, Spent Fuel Disposal Option,  
49-7247-825790

**IMPORTANT REPORTS OBTAINED DURING VISIT**  
(Copies are available from D. E. Clark)

- Otto Schulze:** Der Einfluss radioaktiver Strahlung auf das mechanische Verhalten von Steinsalz  
(influence of radiation on the mechanical behavior of rock salt)
- Untersuchung der thermomechanischen Eigenschaften radioaktiv bestrahlter Salzproben  
(investigation of thermomechanical properties of irradiated salt samples)
- Arno Pahl and Lutz Liedtke:** Water Injection Test and Finite Element Calculations of Water Percolation Through Fissured Granite
- Manfred Wallner:** Stability Demonstration Concept and Preliminary Design Calculations for the Gorleben Repository
- K. Einfeld, F. W. Popp, and U. Knapp:** Material Selection for Final Storage of Spent Fuel in Salt Repository
- K.-J. Hoelting, T. Rothfuchs, and K. Wiczorek:** Information on Heated and Irradiated Salt Samples Obtained from the FRG/US Brine Migration Test, Asse Salt Mine, Federal Republic of Germany



**GOETTERBUCH**  
**Repositary**  
**Dietsche**

**BAR**  
**BAR**

**SPR**  
**SPR**

**HANNOVER**

**BRAUN**  
**SCHWEIG**

**WOLFENBÜTTTEL**

**AN**

DETAILED ITINERARY

DATE	DAY	LOCATION	CONTACT	SUBJECT OF DISCUSSION
December 2	Tuesday	Flight to Frankfurt, Germany		Travel
December 3-4	Wednesday, Thursday	Arrive in Frankfurt, travel to Hannover	Battelle-Institut e.V. Eckirt Waller Bodo Ruediger Werner Baukal	Travel; technical and administrative support in the FRG
December 5	Friday	Hannover	DWK Franz Popp BGR A. Pahl Lutz Liedtke Hans-K. Nipp Otto Schulze	Technical interactions with the SRP Technical interactions with the SRP
December 6-7	Saturday, Sunday	Braunschweig		Travel; rest
December 8-10	Monday, Tuesday, Wednesday	Braunschweig	Kfk K.-D. Closs GSF/IFT Klaus Kuehn Herman Gies Horst-J. Herbert Norbert Jockwer Tilman Rothfuchs	Technical interactions with the SRP Technical interactions with the SRP; conclusion of the BMT; logistics and working/living accommodations in the FRG
December 11	Thursday	Braunschweig, Hannover	GSF/IFT Guenther Kappei DBE Peter Young Hans-Juergen Engelmenn	Conclude housing arrangements Technical interactions with the SRP
December 12-13	Friday, Saturday	Flight to Columbus, Ohio (emergency landing in Newfoundland resulted in an 18-hour delay)		Travel