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000022855

MEETING NOTES

TO: Distribution

DATE: November 30, 1993

FROM: Philip Nixon

MEMO #: SP307:120393:01

PROJECT #: Solar Pond IM/IRA

ATTENDANCE:

Harlan Ainscough, CDH
Mark Austin, EG&G
Phil Nixon, ES
Richard Henry, ES
Ernie O'Toole DOE/MMES
Randy Ogg, EG&G
Andy Ledford, EG&G
Alan MacGregor, ERM
John Haasbeek, ERM

DISTRIBUTION:

Attendees
L. Benson
A. Conklin
P. Breen
H. Heidkamp
K. Cutter
D. Myers
S. Stenseng
A. Fricke
R. Stegen
T. Kuykendall
T. Evans
B. Cropper
C. Montes
B. Wallace, EG&G (Admin. Record) (2)
K. Ruger, EG&G
K. London, EG&G
R. Wilkinson
Steve Howard DOD/SMS
Jim Hartman, DOE
Helen Belencan, DOE
Steve Cook
Joe Schieffelin, CDH
Steve Paris, EG&G
Ted Kearns, DOE/KMI
Bob Segris, DOE
Frazer Lockhart, DOE
Arturo Duran, EPA

MAR 1994
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SUBJECT: Weekly Status Meeting

ADMIN RECORD

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A-OU04-000655

1) **Schedule Update**

Andy Ledford passed out an updated schedule, and specified that the float associated with the activities is appropriate because it is the total float for the specific line item.

2) Additional Comments on the Portions of Part I and Part III of the IM/IRA-Decision Document.

Alan MacGregor commented that the costs specified in the document should be standardized. He also commented that the text should be clarified to state that a technology needed to be full scale demonstrated, but not necessarily demonstrated at a DOE facility. **ES will address these additional comments along with the comments that were received at the previous team meeting.**

3) **Contaminants of Concern**

Richard Henry discussed that gray areas have been identified during implementation of the agreed upon approach to identifying COCs. The gray areas exist with certain contaminants that were initially thought to be Preliminary COCs based on historical data and RFI/RI data that had not been fully validated. Upon receipt of final RFI/RI validation results some contaminants are determined to be non-detected in the RFI/RI data, but the IM/IRA data (and PRG calculations) include these contaminants. Therefore, there is a potential for inconsistencies between Part II and Part III of the IM/IRA decision document, or a confusing explanation of the data interpretation requirements of the different programs (Risk Assessment Guidance vs RFI/RI guidance). It was decided that professional judgement would be used during data interpretation because 3 basic scenarios could occur:

1) The historical data might not be accurate or valid and should not be included (such as posting non-detects as the detection limit)

2) The historical data might be accurate, but was not identified by the RFI/RI program

3) The historical data might have been accurate when it was taken but the contaminants may have migrated or degraded prior to the RFI/RI sampling.

Andy Ledford specified that all COC deletions based on professional judgement should be presented to the team.

ES will consider these scenarios on a case by case basis during the review of the analytical data and present a list of COCs based on the agreements made at previous meetings and engineering judgement for any identified gray areas. As the COC list changes the modified PRGs may also change.

It was discussed that additional characterization samples may be required to delineate horizontal and vertical extent of "hotspot"/hillside contamination. The characterization could be done prior to IM/IRA implementation, or during implementation. This might depend upon the selected alternative and how the contaminated soils would be handled. If the soils were to be disposed off-site, then the characterization could be performed during implementation. However, if the contaminated media were to be consolidated under an engineered barrier, then additional characterization would be necessary during the IM/IRA design phase.

Andy Ledford requested that a logic chart be developed for additional sampling and analysis. **ES will work with Randy Ogg to develop a logic chart.**

Harlan Ainscough indicated that it might be possible to address the hillside contaminated soils as part of the groundwater corrective actions. He also indicated that the PRGs might be modified again to address only the COCs identified on the hillside. Phil Nixon stated that the PRG equations would not change, but the PRGs would be reduced if the number of COCs were be reduced. **Harlan Ainscough will investigate this idea with his risk assessment specialists at CDH. ES will investigate whether there will be a change in the number of COCs will change.**

4) **U-235 Background Issue**

Becky Cropper issued a revised calculation that includes data for U-234 and specified that the statistics for U-235 were still being verified to confirm on the background + 2 standard deviation result. In general it was discussed that the U-235 background data is considered to be reflective of the natural isotopic ratios, and the standard deviation is high due to a high variability in the analytical results.

5) **Re-establishment of the IHSS Boundaries**

The IHSS boundaries were established to determine the point-of-compliance for the SEPs. Upon closure, the point of compliance will have to change for the post-closure care monitoring because the extent of an engineered barrier will likely cover the original point-of-compliance. Harlan Ainscough indicated that re-defining the IHSS would permit the movement of contaminated media within the IHSS without triggering the LDR placement issue. However, Harlan stated that the IHSS boundaries could only be expanded to encompass the area of the original SEPs. Randy Ogg indicated that it was agreed at previous team meetings that the scope of the IM/IRA did not include the original SEPs. Contaminated media is likely to exist outside of the boundaries of the original SEPs. Therefore, it is not likely that there is anything to be gained by re-defining the IHSS boundaries.

Phil Nixon specified that most of the COCs had concentrations that were less than the LDR treatment levels for soil and could therefore be consolidated within the SEPs. Cadmium and nickel are two COCs that exceed the PRGs and the LDR treatment levels. Therefore, a CAMU concept would need to be adopted for the IM/IRA to allow the consolidation of soils contaminated with these constituents within the SEPs.

6) **Detailed Evaluation of Alternatives.**

Phil Nixon presented the results of the detailed evaluation of alternatives and provided a draft document for team review and comment. ES recommends an alternative which leaves the liners in place, consolidates contaminated media within the SEPs, and constructs a RCRA compliant engineered cover over the SEPs. The liners will contain the contaminated media and provide a stable base for the construction of the engineered cover. The engineered cover will minimize precipitation infiltration such that the contaminated media and liners are not subjected to a liquid hydraulic head liquid. This alternative was recommended strictly on its technical appropriateness and the political issues were not considered. A determination that the liners can remain in-place and the adoption of a CAMU concept will be required to implement this alternative. **The team was asked to comment on the document by the close of business on Tuesday December 7, 1993. Team concurrence with a selected alternative is required at the December 14, 1993 meeting so that ES can begin the conceptual design according to schedule.**

7) **Landfill Siting Criteria**

In the event that the ES selected alternative is ratified and the resolution of the liner issue indicates that the hazardous waste landfill siting requirements apply to the closure of the SEPs with the liners left in-place, then DOE will need to comply with the substantive requirements of the siting criteria. The team reviewed the requirements to establish whether it might be possible to meet them.

Requirement 2.4.1- Long Term Protection of Human Health and the Environment

It was agreed that compliance with all the other requirements would determine whether this requirement was achieved.

Requirement 2.4.2- Groundwater Quality

It was agreed that compliance with this requirement would be demonstrated by the performance of a vadose zone contaminant flow and transport model that would provide anticipated leachate concentrations as a source of groundwater contamination. Compliance would be achieved if the modeled COC leachate concentrations are less than the groundwater protection standards. It was agreed groundwater flow and transport modelling and risk assessment would not be required.

2.4.3- Surface Water Quality

It was agreed that the design of an engineered cover would address surface water runoff and the siting criteria could likely be achieved.

2.4.4- Air Quality

It was agreed that the engineered cover would address the impacts to air quality. ES is currently performing air quality modeling which may be useful to demonstrate compliance.

2.4.5- Subsurface Migration

It was discussed that the vadose zone modeling that would be performed for 2.4.2 would be used to demonstrate compliance with this requirement. No risk assessment activities would be required.

2.4.6- liner integrity

It was discussed that the integrity of any liner used in the engineered cover design would be adequately protected or covered.

2.4.7- Leachate/runoff control

It was agreed that this requirement would be addressed from a surface water runoff perspective during the design of the engineered cover. Leachate control would not be addressed because the site would be closed and the engineered cover and the cover would minimize infiltration.

2.4.8- Closure

This requirement is not applicable since the SEPs are in the process of being closed.

2.4.9- Groundwater Monitoring

This requirement would be addressed by the post-closure monitoring system that will be installed as a component of the closure plan.

2.4.10- Design Certification

The design of the engineered cover would have to be certified by a Professional Engineer or a Professional Geologist. This is not anticipated to be a problem.

2.5.1- General Siting/Design Requirements

It was agreed that this requirement would be achieved if compliance with the Section 2.4 and 2.5 requirements were met.

2.5.2- Operational Requirements

It was determined that these requirements did not apply to the SEPs since they were undergoing closure. However, the Rocky Flats Plant would meet the requirements.

2.5.3- 1000 Year Protection

It was discussed that it would have to be demonstrated that the site geophysics would have to be shown to be stable for 1000 years. In addition the engineered cover design would have to consider 1000 year effectiveness. This is likely to increase the anticipated cost of the engineered cover. It may also be very difficult to construct an engineered cover designed to last 1000 on the OU4 site due to the existing slope of the northern hillside. **ES will work on a magnitude of cost estimate for a 1000 year cover. Information may be obtained during the upcoming trip to Hanford to discuss their work in designing a 1000 year engineered cover.**

2.5.4- Liner Design

These requirements were determined to be not applicable since the facility is being closed and no new subsurface liner is planned.

2.5.5- Leachate and Runoff Control

It was discussed that the potential for leachate to be generated is low due to the existence of the engineered cover which will minimize infiltration. The cover design will address surface water runoff.

2.5.6- Location Controls

Meeting this requirement will not be difficult due to the existence of the Rocky Flats buffer zone and the site access controls.

It was determined that meeting these requirements would not be impossible, but a good deal of work would be necessary. It should be noted that compliance with many of the requirements would be qualitative as opposed to quantitative. If any one of the requirements is not adequately addressed or demonstrated, then the approval of the alternative is in jeopardy. Phil Nixon recommended that DOE continue to pursue with CDH whether the siting requirements apply to the closure of the SEPs because the design and construction of a 1000 year engineered cover will have a cost and potential implementability impact.

Philip Nixon, Project Manager

OPERABLE UNIT 4/SOLAR EVAPORATION PONDS

DECEMBER 14, 1993

AGENDA

OPTIONS ANALYSIS COMMENTS	8:00-8:30
REGULATORY AGENCY APPROVAL FOR SELECTED ALTERNATIVE	8:30-10:00
NORTH HILLSIDE CONTAMINATION ALTERNATIVES SOIL REMOVAL & DISPOSAL SOIL TRANSFER TO PONDS COVER W/ENGINEERING BARRIER	10:00-11:00
ENGINEERING BARRIER PERFORMANCE OBJECTIVES -FUNCTION IN A SEMIARID REGION -MINIMIZE LIQUID INFILTRATION -FUNCTION W/MINIMAL MAINTENANCE -MINIMIZE THE LIKELIHOOD OF PLANT, ANIMAL, AND HUMAN INTRUSION -ISOLATE WASTE FOR X YEARS -MINIMIZE EROSION -COMPLY W/RCRA/CERCLA	11:00-12:00
LUNCH	12:00-1:00
PHASE II RFI/RI STATUS PROCUREMENT SCOPE	1:00-1:30
PHASE I RFI/RI DRILLING POND 207 C/B NORTH MOBILIZATION	1:30-2:00
SCHEDULE REVIEW/STATUS	2:00-2:30

OU4 PHASE I IM/IRA
ISSUE IDENTIFICATION AND RESOLUTION PROCESS

On September 30, 1993, the OU4 Project Coordinators for CDH, EPA and DOE signed the *OU4 (Solar Ponds) Dispute - Draft and Final Phase I RFI/RI Reports* which modified the IAG schedule milestones. The OU4 Project Coordinators stated that implementation of the revised schedule for the OU4 Phase I activities will require active and continuous coordination between all parties. Because of this need for increased coordination, the parties (CDH, EPA and DOE) have jointly committed to increase the level of participation in the administrative and technical design process.

To achieve this participation goal, the OU4 representatives from CDH, EPA and DOE/EG&G have agreed to meet on a regularly basis to status the project, to review interim deliverables, to discuss administrative, technical and regulatory requirements of the project, and to identify and resolve any issues. The key to the success of the IM/IRA project is the early identification and resolution of significant issues that could have an impact on meeting the IAG milestones. The purpose of this document is to provide the framework that will be followed for the identification and resolution of these key issues.

1.0 General

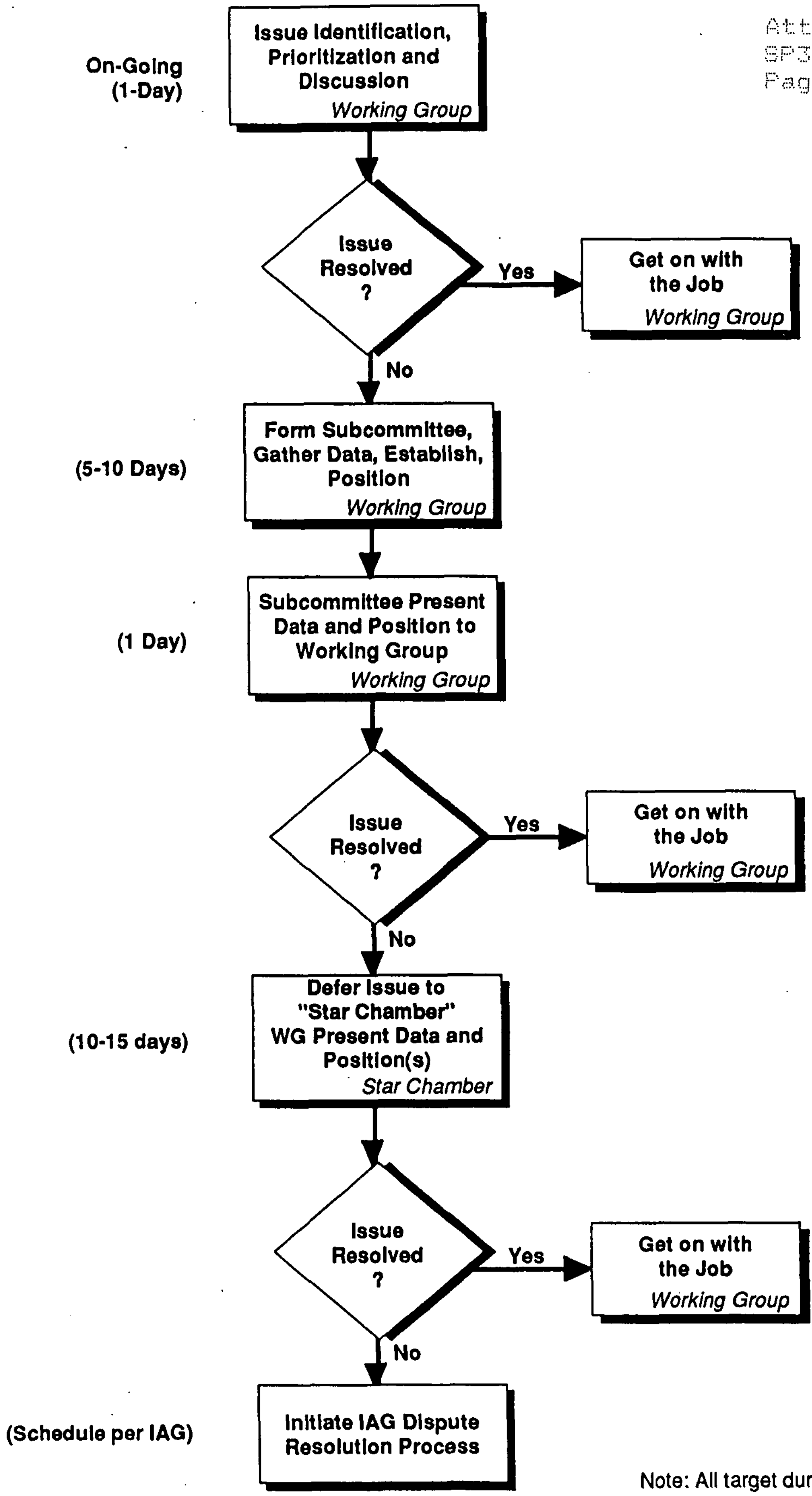
The issue resolution process is executed through the early identification, collegial planning, consultation and review from a multi-disciplinary CDH/EPA/DOE/EG&G team (e.g., working group). The focus of the team is to select and implement a IM/IRA which is mutually agreeable to all parties (CDH, EPA and DOE). **[As used in the issue resolution process, mutual agreement will be by consensus (unanimous) between CDH, EPA and DOE. This issue identification and resolution process was also written with the understanding that the spokesperson for each party (CDH, EPA and DOE) present at the scheduled working group meetings has the authority to act on behalf of the designated OU4 Project Coordinator.]**

The process that will be followed to identify and resolve OU4 IM/IRA issues is shown as Figure 1. The OU4 working group will consist of be representatives (including CDH, EPA, DOE, EG&G and ES) involved with the development and implementation of the OU4 IM/IRA. The working group will identify, prioritize and discuss potential issues. A subcommittee may be formed to further evaluate and discuss those issues that can not be resolved at the working group meeting. The subcommittee will present their findings and recommended resolution to the working group for consideration. If the issue still remains unresolved, the issue will be deferred to the "Star Chamber" for resolution. The "Star Chamber" consists of representatives from CDH, EPA and DOE to provide an informal forum for technical experts and decision makers to discuss and resolve issues prior to invoking formal dispute resolution under the IAG. The actual membership of the "Star Chamber" will be determined on a case-by-case basis and will be dependent on the nature of the issue. If the "Star Chamber" can not resolve the issue, the formal IAG dispute resolution provisions will be followed.

Each of the major components of the OU4 issue identification and resolution process are described in the sections that follow. The target durations for each step in the issue identification/resolution process is provided on Figure 1. The durations may need to be adjusted depending on the complexity of the issue.

FIGURE 1

ISSUE IDENTIFICATION AND RESOLUTION FLOW DIAGRAM



Note: All target durations are working days

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2.0 Issue Identification

As IM/IRA alternatives are developed, potential technical and regulatory disagreements may be identified. The identification of these potential issues is a continual process throughout the IM/IRA effort.

In keeping with the Total Quality Management philosophy, brainstorming sessions to identify potential issues will periodically occur at the scheduled working group meetings. The brainstorming sessions are not intended to fully resolve the issue, but to obtain mutual agreement that the item is an issue, to define what the issue entails, and to assign a priority for discussing and resolving the issue. Along with the priority of the issue, a target date by which a resolution is required will be established. It is intended to establish the target date so that none of the IAG milestones will be adversely impacted.

The EG&G program/project manager will maintain a list of the issues and their assigned priority. This list will be updated as new issues are identified and old ones are resolved. The EG&G program/project manager will also integrate the target dates for issue resolution with the IM/IRA master schedule. The master schedule will be maintained and updated to ensure that all critical path issues are resolved in a timely manner.

3.0 Issue Discussion and Resolution

In general, a reasonable amount of time will be allocated to discuss each issue at one of the routine working group meetings. Following discussion, the issue will either be resolved by mutual agreement, tabled until another meeting (if resolution requires addition information or consultation with an individual not present), or referred to a subcommittee for further evaluation and development of a recommended resolution (if the issue can not be resolved within the meeting format). Listed below are the guidelines that will be followed for the resolution process.

1) **Scheduling of Issues:** It is recognized that time constraints will limit the number of issues that can be placed on a single meeting agenda. As such, the scheduling of issues will be based on the priority assigned to the issue; the most critical issues (e.g., those which could adversely impact critical path tasks) will be discussed first. The EG&G program/project manager will place the most critical issues on the meeting agenda and allow a time for discussion that is consummate with the complexity of the issue.

   It is also recognized that some of the more complex issues will require a substantial amount of preparation time to discuss the issue. To ensure that the parties (CDH, EPA and DOE) have a sufficient amount of time to prepare, the EG&G program/project manager will maintain and distribute a master schedule that includes proposed dates for discussing and resolving each identified issue.

2) **Issue Discussion:** As stated above, a reasonable amount of time will be provided to discuss the issue. A moderator may be assigned to control the issue discussion.

   Each party (CDH, EPA and DOE) will be given an opportunity to provide an initial statement regarding their position and any justification for the position. The statement presenter should not be interrupted and only questions for clarification of the position should be asked.

After each party has provide their position, an interactive discussion regarding the basis for the positions will commence. The discussion will continue until either the issue is resolved, the parties determine that the issue will not be resolved within the time allocated or additional information is required. If the discussion time has expired prior to resolution, the parties may mutually agree to extend the discussion time if it is believed that resolution can be reached.

If resolution within the time allocated appears unlikely, the parties may either table the issue until another meeting (if resolution requires additional information or consultation with an individual not present at the meeting), or refer the issue to a subcommittee for further evaluation and development of a recommended resolution. The subcommittee members will be chosen by mutual agreement of the parties (CDH, EPA and DOE). The number and expertise of the members will be dependent on the complexity of the issue, the nature of the issue and any schedule constraints.

Each party will be provided an opportunity to make a closing statement.

3) **Subcommittee:** As stated above, the parties may charter the formation of a subcommittee to further evaluate and discuss the issue outside of the meeting format. The subcommittee will generally consist of a limited number of working group members. The selected subcommittee members shall meet as frequently as required to formulate a recommended resolution within the time constraints established to meet the IAG milestone dates. The parties will establish a date when the subcommittee's recommendation is required. If necessary, each party (CDH, EPA and DOE) will provide the subcommittee a written paper that presents the details and justification for their position on the subject issue. The subcommittee will review these position papers in preparing the recommended resolution.

The subcommittee chairperson will issue the recommended resolution to each of the parties prior to the scheduled working group meeting. The chairperson will also make a presentation at the working group meeting. At this point in time, the parties may mutually accept, modify or reject the recommended resolution.

If no resolution of the issue can be achieved, the issue will be evaluated to the "Star Chamber".

4) **Issue Resolution:** Mutual agreement of the issue shall be documented in the meeting minutes and shall be formally accepted upon concurrence of the meeting minutes. Formal acceptance of the resolution is not intended to preclude any party (CDH, EPA or DOE) of their rights to invoke dispute resolution as provided under the IAG or to challenge any resolution under applicable laws consistent with Part 29 of the IAG.

4.0 "Star Chamber"

If the working group can not resolve the issue, the issue will be elevated to the OU4 "Star Chamber". The "Star Chamber" consists of representatives from CDH, EPA and DOE that have particular expertise or decision making authority required to resolve the issue. The function of the "Star Chamber" is to informally resolve OU4 issues outside of the IAG dispute resolution process.

The parties will establish a date when the OU4 "Star Chamber's" decision is required. Generally, a time period of 10 to 15 days will be provided to the OU4 "Star Chamber" to evaluate and resolve the issue. More or less time will be allowed depending on the nature of the issue and potential IAG schedule milestone impacts. The OU4 "Star Chamber" members shall meet as frequently as required to formulate a resolution within the time constraints established to meet the IAG milestone dates. If necessary, each working group party (CDH, EPA and DOE) will provide the OU4 "Star Chamber" a written paper that presents the details and justification for their position on the subject issue. The OU4 "Star Chamber" will review these position papers in resolving the issue.

If the "Star Chamber" can not resolve the issue, the formal IAG dispute resolution provisions will be followed.

5.0 Dispute Resolution Under the IAG

If the "Star Chamber" can not resolve the issue, the EPA and/or DOE may invoked formal dispute resolution as specified in the IAG. [Note: The State has ultimate approval authority over the Decision Documents generated for State Lead OUs. Invoking the IAG Dispute Resolution process is also not intended to preclude any of the parties from seeking resolution of the issue by other appropriate means.]

For those issues which DOE disagrees with the State's position, the provisions of the IAG Part 12 RESOLUTION OF DISPUTES, which is the dispute resolution process for State lead OUs, will be followed. If appropriate, any position paper developed by the Working Group, Subcommittee, and/or "Star Chamber" will be provided to the OU4 Project Coordinators for consideration.

For those issues which EPA disagrees with the State's position, the provisions of the IAG Part 27 DISPUTE RESOLUTION BETWEEN STATE AND EPA will be followed. If appropriate, any position paper developed by the Working Group, Subcommittee, and/or "Star Chamber" will be provided to the OU4 Project Coordinators for consideration.

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December 14, 1993
SP307:121493:02

Mr. Randy T. Ogg
Program Manager, Environmental Restoration
EG&G Rocky Flats
P.O. Box 464, Building 080
Golden, Colorado 80402-0464

Dear Mr. Ogg:

Enclosed is the ES trip report for the Hanford trip that was taken with you and your staff on December 7 and 8, 1993. The purpose of the trip was to investigate the 1000-year Hanford engineered cover design and sonic drilling techniques.

If you have any questions, please feel free to contact me at 831-8100, extension 207.

Sincerely,

ENGINEERING-SCIENCE, INC.

Philip A. Nixon
Project Manager: Solar Pond IM/IRA

cc: M. Austin
K. Ruger
R. Wilkinson
T. Kuykendall
R. Henry
R. Stegen
S. Stenseng
L. Benson
H. Heidkamp
D. Myers
K. Cutter
T. Evans
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PARSONS

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TRIP REPORT

TO: Distribution

DATE: December 7, 1993

FROM: Philip Nixon

REPORT #: SP307:121493:01

PROJECT #: Solar Pond IM/IRA

PLACE: Hanford - Richland, Washington

ATTENDANCE:

Randy Ogg, EG&G
Mark Austin, EG&G
Steve Paris, EG&G
Ernie O'Toole, DOE
Richard Henry, ES
Sandy Stenseng, ES
Phil Nixon, ES
Alan MacGregor, ERM
Lorne Everett, Geraghty & Miller
Dick Wing, Hanford
Jerry Cammann, Hanford
Glen Gee, Hanford
Denny Myers, Hanford
Mike Ligotke, Hanford
Ken Peterson, Hanford
Mike Fayer, Hanford
Dave Freeman, Hanford
Wally Walters, Hanford
Dave Fort, Hanford

DISTRIBUTION:

SUBJECT: Trip Report

TRIP REPORT

Members of the OU4 Solar Evaporation Pond (SEP) IM/IRA project representing EG&G, DOE, ES, ERM, and G&M traveled to the DOE Hanford site in Richland, Washington to investigate the engineered cover research that is ongoing. Westinghouse, Battelle Pacific Northwest Laboratory, and Kaiser are studying and developing an engineered cover that will maintain its integrity for 1000 years.

The days events commenced with a morning meeting where Randy Ogg presented a history of the Rocky Flats OU4 IM/IRA project to the Hanford team. The Hanford team then presented their study results and engineered cover design to the Rocky Flats team. The afternoon consisted of a field trip to the 200-BP-1 area where a prototype 5-acre Hanford barrier will be constructed and a visit to the Field Lysimeter Test Facility (FLTF). A list of the Hanford team is enclosed as Attachment 1. An agenda for the day is enclosed as Attachment 2.

1.) Rocky Flats Presentation to the Hanford Team

Randy Ogg presented a history of the SEPs and summarized the environmental constraints and issues at the OU4 SEPs as follows:

- The contaminants of concern are primarily nitrate, metals and radionuclides.
- The water table may be as shallow as 6 feet which is very close to the bottom of the 207B-South Pond.
- There is a steep slope to North Walnut Creek off the north edge of the basins.
- Seepage occurs on the north hillside and there is evidence that the hillside may have a tendency to slump.
- Surface soils on the hillside are contaminated.
- An inteceptor trench system (ITS) has been installed to collect contaminated ground water and to prevent contaminants from entering the North Walnut Creek.
- A suspected ground water contaminant plume extends past the ITS.
- The OU4 IM/IRA is being prepared under an Interagency Agreement that requires compliance with both the RCRA and CERCLA regulations.

Randy Ogg indicated that he would make copies of his slides and send them to the Hanford team.

2.) Hanford Team Presentations to the Rocky Flats Team

- **Jerry Cammann** presented an overview of the approach that Hanford has developed for engineered cover design. Dames and Moore performed a component comparison analysis of the Hanford engineered cover to the RCRA requirements and prepared a report stating that the Hanford barrier is functionally equivalent to a RCRA compliant engineered cover. The Hanford barrier has two 6 inch lifts of asphalt concrete covered by a 200-300 mil liquid polymer asphalt coating. The regulatory agencies have determined that this asphalt liner is equivalent to a composite membrane system. In addition, the Hanford barrier has a capillary break that is equivalent to the upper liner in an RCRA cover which functions to keep moisture away from the lower barrier.

Hanford applies a 3 pronged integrated approach to permanently isolate wastes:

1. Control of surface phenomenon such as recharge, erosion, and gas emission, by the use of infiltration barrier materials, biotic barriers, and human intrusion prevention measures.

2. Control of the waste form via *in situ* stabilization or other methods to increase the waste stability, reduce the potential for contaminant leaching, and provide a stable base for the construction of an engineered barrier.

3. Control of subsurface flow and transport via technologies such as slurry walls, sorbent barriers, grout curtains to control the flow and transport of contaminants.

Jerry Cammann recommended that EG&G grout utility lines in place to stabilize the pipes and prevent subsidence of an engineered barrier. This recommendation is consistent with discussions that ES has had with EG&G.

- **Dick Wing** presented an overview of the Hanford Barrier Program. Hanford is a DOE facility that has operated for approximately 40 years. It is anticipated that clean-up of the Hanford site could take as long as 30 years. Research on engineering cover design has been conducted at Hanford since 1985. Hanford uses a multidisciplinary team of experts to plan and conduct the studies and design. He indicated that the 1000 year design life of the Hanford barrier was selected in meetings and discussions with the regulatory agencies and the public. The cap is designed to maintain its integrity (i.e., without maintenance) for a 1,000 year period. Natural materials were used in the engineered cover design due to the 1000 year design life. Design water drainage through the barrier is <0.5 mm/year which equates to hydraulic conductivity of 1.0×10^{-9} cm/sec. The hydraulic conductivity of the asphalt system has been tested at less than 1.0×10^{-11} cm/sec.

Hanford uses 3 methods to evaluate the performance of the engineered cover:

1) Field evaluations - research and testing of lysimters and small scale test caps.

2) Study of Natural Analogs - study the effectiveness of natural soil materials in ancient mounds and archeological evidence of asphalt stability.

3) Computer simulations

The primary technical issues associated with the design of an engineered cover are:

1. Infiltration of precipitation - limit drainage to <0.5 mm/yr.
2. Erosion control (wind and water)
3. Physical stability
4. Bio-intrusion
5. Human interference
6. Selection of materials
7. Remain maintenance free
8. Control exhalation of noxious gases
9. 1000 year design life

The Hanford design utilizes a capillary break which consists of a sandlayer, gravel layer, and rip rap which roots will not penetrate due to the lack of moisture. The capillary break is based on the unsaturated flow principle where flow is restricted from fine-grained soils to coarse-grained soils unless the fine-grained soils reach saturation. The plant roots are therefore restricted to the silt loam gravel admix and the silt loam. Vegetation has been shown to be very effective at removing moisture from the upper layers of the engineered cover. Evapotranspiration is the mechanism by which infiltrated precipitation is removed from the silt loam layers.

Dick Wing specified that Hanford considered natural clay materials for their engineered cover design, but determined that clay was not appropriate for the arid Hanford environment. Clay has a tendency to desiccate and crack in arid environments, which leaves channels for the migration of infiltration. Dick also mentioned that there is a test site in Ogden, Utah where one RCRA cover, two Los Alamos covers, and one monolithic soil cover are being constructed for testing. Hanford expects to add one Hanford engineered cover to the Ogden research program.

- **Dave Fort** presented the details of the Hanford engineered cover design.

  The layers of the Hanford engineered cover consist of (from surface to depth):

  1) Silt loam/gravel admix - supports vegetation
  2) Silt loam - supports vegetation
  3) Sand - prevents finer soils from filtering into riprap
  4) Gravel - prevents finer soils from filtering into riprap
  5) Basalt riprap - biotic barrier/capillary break
  6) Gravel - drainage layer
  7) Asphaltic system - infiltration barrier
  8) Compacted top course - structural base.

  Dave indicated that the thickness of the layers was developed based on the required performance needs.

The asphalt system has a 2% slope to promote lateral drainage, thereby reducing the hydraulic head. These materials cover the underlying waste. The basalt riprap is the layer which provides the majority of the side slope. Since precipitation that falls within the side slopes can infiltrate unimpeded, the lower asphalt system must extend under the side slopes. In addition, the sand and gravel layers under the silt loam layers turn up and run to the surface to contain the silt loam layers. This prevents filtering of the silt loams into the side slope riprap, and helps prevent lateral migration of liquids. Geotextile filter fabrics will be utilized between the filtering layers to maintain material segregation during construction. These fabrics are not expected to survive the life of the cover.

Dave specified that the required "overhang" distance was based upon the depth of the waste and the geologic conditions. The "overhang" distance is defined as the lateral distance that the full cover system components must extend beyond the limits of the waste, to limit lateral infiltration into the waste. Ten meters may be used as a rule of thumb distance.

Hanford is constructing a proto-type five-acre test cap that includes instrumentation for monitoring soil moisture content within and beneath the various layers that are intended to prevent the migration of moisture. The test engineered cover will use 2-inch to 2 1/2 inch standard aluminum conduit for monitoring access tubes. Neutron probes and pan lysimeters will be installed 1 meter beneath the asphalt layer because they did not want the asphalt to cause interference. Final covers will not be instrumented at Hanford.

Rocky Flats will have to be careful if neutron probes are installed beneath the SEPs due to the location of the water table.

- **Glen Gee** presented a discussion on testing and monitoring. Glen Gee discussed the water balance equation that Hanford uses to design their engineered cover:

$$P = \Delta S + ET + O + D$$

where

P	=	Precipitation
ΔS	=	Change in storage
ET	=	Evapotranspiration
RO	=	Runoff
D	=	Drainage recharge

He predicted that the Rocky Flats evapotranspiration rate would be 2 to 3 times higher than Hanford and the amount of precipitation at Rocky Flats is 3 times higher than Hanford. Hanford is trying to maximize the rate of evapotranspiration as a means of removing water that infiltrates into the silt loam layers. Their research has shown that the optimum plant selection is dependent upon the soil type. Deep rooted shrubs are best for coarse sandy soils. Shallow grasses are effective for fine soils. It has been demonstrated by the lysimeter studies that engineered covers which have vegetated surfaces remove more infiltrated precipitation than bare soil surfaces.

Glen specified that the asphalt layer must be located beneath the frost line so that the frost heave will not damage the system.

- **Denny Myers** presented cost information for the Hanford engineered cover design. Hanford has performed a cost analysis based on different sized covers and has determined that large caps have an economy of scale benefit over small caps. The economy of scale is based on the ratio of covered area to side slope area. The higher the ratio, the larger the economy of scale

Cover Acres Hanford	Hanford Cover $K/Acre	Modified Hanford Cover $K/Acre
1	1,986	1,930
5	1,105	1,004
10	822	705
100	639	492
500	607	451

The numbers are based upon the actual construction estimates for the 5 acre test cap. The modified Hanford engineered cover cost was based on a design that had 1 less meter of soil and one less meter of riprap. The comparison indicates that the costs would be similar for the 1 acre cap, but the difference is maximized for the 500 acre cap. All the natural soils, sand, and gravels will be supplied from onsite sources.

- **Wally Walters** - discussed water erosion. Vegetation is good for the prevention of erosion. An admix of soil and gravel in the surface layer is also good for erosion prevention. Hanford has studied erosion in test plots using different soils and vegetation. The results to date (1990-1992) are as follows:

Test Plot (10'x35')	Percent Moisture	Sediment Yield (kg)
Native Soil	18.2-19.1	3.69-7.76
Native Soil/vegetation	25.0-28.3	0.14-2.28
Soil/Gravel Admix	9.7-11.8	1.62-4.33
Soil/Gravel Admix/ vegetation	14.7-17.5	0.02-1.14

The vegetated plots with gravel admix had the lowest sediment yield. It was noted that "rain splash" is the most destructive form or erosion.

- **Mike Ligotke** presented the Hanford study results on wind erosion. Tests were conducted in a wind tunnel. It was determined that dry sandy soils mobilize easily and are dispersed by wind, and saltation of sands on the finer silty/loam soils of the cover system cause disturbance and erosion of the silty/loam cover soil materials. A 20-30% mixture of pea gravel in the top 6 inches of soil is effective to prevent wind erosion.

- **Ken Peterson** presented Hanford's climate research studies. During the design of the 1000-year Hanford engineered cover, the future climatological changes were predicted.

  The following items were considered during the study:

  1) regional climatology
  2) global climatology
  3) potential greenhouse effects
  4) specific climatology
  5) theories for climatological change.

  Ken used historical pollen and percent organic data from corings taken at Carp Lake near Hanford to reconstruct the Hanford climatological conditions over the past 1000 years. He suggested that Jody Waugh working at the Monticello site in Utah may have information applicable to the expected climatological changes in Colorado. It is predicted that over the next 1000 years, Hanford could receive 3 times more precipitation than is currently received.

- **Dave Freeman** presented the methods that were being used to design and test the asphalt barrier layer. The special polymerized asphalts are commercially available from Shell Oil, Standard Oil, and other vendor contractors familiar with the installation of these materials will be used. The asphaltic concrete will be placed in 10 foot wide strips with alternating overlapping seams. Construction QA/QC will be important for ensuring that the asphalt layer is effective. Hanford is not sure how the asphalt integrity will change over the 1000 year period. Ultraviolet light has the largest degradation effect on asphalt materials. However, since the asphalt layer is buried in the cover UV degradation will be limited. Accelerated asphalt aging tests are being conducted at increased temperature and pressure. In addition, analog studies are being conducted on asphalt Indian artifacts and other historical asphaltic materials.

- **Mike Fayer** stated that the UNSATH model is being used to model the Hanford engineered barrier. The EG&G team will request a copy of this model.

3) Field Trip to the Hanford Lysimeter Test Site.

During the afternoon, the Rocky Flats team was taken on a tour of the FLTF. Dick Wing and Jerry Cammann described the research projects that have been performed at the FLTF to support the design of the Hanford engineering cover. Lysimeters are a contained environment of known mass that are continuously monitored to study change in moisture storage. The Hanford researchers have constructed different cover configurations within the lysimeters and have subjected them to different amounts of precipitation. The design of the Hanford engineered cover is largely based on the results of these tests. In general, lysimeters with vegetation perform better than those without. The lysimeters exposed to 3 times the expected amount of precipitation have not shown a liquid breakthrough from the capillary break. Burrowing mammals have not had a negative impact on the performance of the Hanford engineered cover primarily because they typically do not burrow past 1 meter in depth and the combination of vegetation and evaporation are efficient at removing infiltration from this zone. Burrowing animals tend to mound their excavated soil around the downhill portion of their burrow which channels flow directly into the hole. It was found, however, that although there was increased moisture flow into the burrow, the evaporation/evapotranspiration was enhanced enough to balance the increased infiltration.

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TRIP REPORT

TO: Distribution **DATE:** December 8, 1993

FROM: Philip Nixon

REPORT #: SP307:121493:01 **PROJECT #:** Solar Pond IM/IRA

PLACE: Hanford - Richland, Washington

ATTENDANCE: **DISTRIBUTION:**

Randy Ogg, EG&G
Steve Paris, EG&G
Mark Austin, EG&G
Richard Henry, ES
Sandy Stenseng, ES
Phil Nixon, ES
Lorne Everett, Geraghty & Miller
Ben Volk, Hanford
Greg McLellan, Hanford

SUBJECT: Trip Report

TRIP REPORT

Sonic Drilling Demonstration

EG&G, Engineering-Science, and Geraghty & Miller met with Ben Volk and Greg McLellan of the Westinghouse Hanford Company (WHC) to discuss their sonic drilling research program.

WHC and Water Development Corporation (WDC) is testing sonic drilling as a means of drilling vertical, angle, and horizontal wells/borings. They have successfully completed 1500 ft. of sonic drilling over the past w months. Mechanically, WDC's resonant sonic drill rig has performed extremely well over this time period with only 3 days breakdown time. Sonic drilling may be a preferred drilling method because it is typically faster than conventional methods and significantly reduces drill cutting waste. Hanford has drilled a 167 foot 45 degree angled well in 5 hours. A 3-inch core sample was removed and a 4 1/2 inch well casing and screen was installed.

Resonant sonic drilling at Hanford uses a 300 hp WDC truck-mounted drill rig. Because of the subsurface materials present at the site drilling is accomplished by advancing 6 5/8" or 8 5/8" casing and conventionally coring the soil inside the casing. Conventional caring is necessary because the sonic energy destroy the wire line latching system. The core barrel is 4 1/2" o.d. and 3" i.d. Core growth does occur up to about 20-25 percent. Core growth is controlled by underdriving the sampler. Cores for analyses are collected in 2-foot long laboratory-decontaminated split spoons lined with 5-inch long lexan liners. There are 2 types of sonic drilling methods:

1) Resonant sonic - Water Development Corporation
2) Rotosonic - Alliance, Northstar, and Wisconsin Testing

Resonant sonic is the preferred method because it is a dry drilling procedure. Rotosonic uses dry drilling procedures to advance the pipe, but fluids are used when the casing is advanced. The use of liquids is undesirable because of the potential for cross-contamination.

Fine silty sand is the toughest material for sonic drilling because the temperature can increase such that the chemistry of the core sample can be impacted. For example, high temperature can "drive off" volatile organic contaminants that maybe present. Typical sonic drilling temperatures are approximately 85° F. Hanford has found that temperature effects can be controlled by drilling at 75% of the normal drilling rate, use of Lexan liners, or by using dry ice to cool the downhole sampling equipment.

The highest temperature that has been measured during the testing activities is 211° F. If temperature is an important factor, at a drilling location, then it is important for the drilling oversite personnel to communicate closely with the drill operator so that high temperatures can be mitigated. The activity which generates the most heat is driving the casing. The heat is produced at the tip of the drill where friction and pressure are greatest. Depth of drilling has less of an impacted on temperature than the subsurface geological conditions. The average temperature was about 78°F. The average *in situ* soil temperature at Hanford is about 54°F.

Sonic drilling can penetrate cobbles or boulders, but air or water may be required to lift cuttings out of the boring. Air may also be used to sonically drill through fine, silty sand material.

The research at Hanford has not yet determined whether sonic drilling has any impact on the subsurface permeability. However, it is not anticipated to have any more effect than other drilling methods.

Ben Volk and Greg McLellan took the EG&G team to a site at Hanford where sonic drilling is currently ongoing, so that the Hanford team could see the equipment and watch the drilling procedure. A five-foot core run was completed in about 30 seconds while the team watched.

AGENDA

Hanford Barrier Development Team/EG&G Rocky Flats, Inc.

Tuesday, December 7, 1993
345 Hills, Room 28

INTRODUCTIONS	8:00-8:15
SOLAR EVAPORATION PONDS OVERVIEW	8:15-9:00
SOLAR PONDS HISTORY PHASE I RFI/RI RESULTS INTERCEPTOR TRENCH SYSTEM	
RFP CLIMATOLOGICAL/BIOLOGICAL CONDITIONS	9:00-9:15
MEETING OBJECTIVES	9:15-9:30
BREAK	
HANFORD PERMANENT ISOLATION SURFACE BARRIER	9:45-11:30
IN SITU REMEDIATION APPROACH BARRIER DEVELOPMENT PROGRAM OVERVIEW DEFINITIVE DESIGN OF THE PROTOTYPE TESTING AND MONITORING PLAN STATUS OF PROTOTYPE BARRIER	
GRADED APPROACH TO ENGINEERED BARRIERS	11:30-12:00
POST-CLOSURE MONITORING TECHNIQUES	12:00-12:30
LUNCH	12:30-1:30
SITE VISIT	1:30-5:00

Barrier Development Team Members

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CJ KEMP	345HILLS/8A/H4-14	376-1630	376-4081
DS LANDEEN	345HILLS/12/H4-14	376-1038	376-4081
MJ McMAKIN (RECORDS MGT)	345HILLS/12/H4-14	376-1038	376-4081
DR MYERS	345HILLS/11/H4-14	376-1723	376-4081
KL PETERSEN	345HILLS/15A/H4-14	376-9765	376-4081
MR SACKSCHEWSKY	345HILLS/14A/H4-14	376-2554	376-4081
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MD CAMPBELL	SIGMA-5/2627/K6-77	376-9681	376-5368
MJ FAYER	SIGMA-5/2607/K6-77	376-8326	376-5368
HD FREEMAN	3720/331/P8-38	376-8561	372-0308
GW GEE	SIGMA-5/1115/K6-77	376-8424	376-5368
BG GILMORE	SIGMA-4/406/K6-60	372-1461	372-1069
RR KIRKHAM	SIGMA-5/2302/K6-77	376-1174	376-5368
MW LIGOTKE	331/34/P7-54	376-5003	376-3968
WIND TUNNEL		376-4497	
SO LINK	SIGMA-4/507/K6-63	376-6828	376-1069
TL PAGE	ROB/1512/K1-37	372-4550	375-3606
JC RITTER	SIGMA-5/1423/K6-77	376-9784	376-5367
RA ROMINE	3720/328/P8-38	372-0057	372-0308
WH WALTERS	SIGMA-4/411/K6-60	376-8323	372-1069

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LA GADDIS	TCPC/300/E6-33	376-6741	376-9686
RI WATKINS	TCPC/4/E6-41	376-3383	376-9686

PROPOSED STRATEGY

ALTERNATIVE A

Meets the Requirements of the IAG