



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
RESEARCH AND DEVELOPMENT

October 12, 2006

Dr. James H. Johnson, Jr.
Chair, Board of Scientific Counselors
Dean, College of Engineering,
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Howard University
2366 6th Street, NW, Room 100
Washington, DC 20059

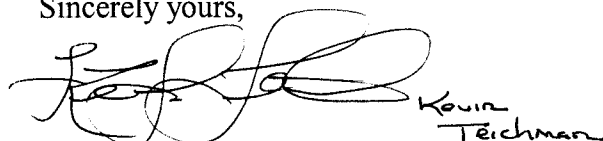
Dear Dr. Johnson:

On December 13–December 15, 2005, Dr. Menzie chaired the Land Preservation and Restoration Subcommittee of the Board of Scientific Counselors' (BOSC) evaluation of the Office of Research and Development's (ORD) Land Preservation and Restoration Research Program in Cincinnati, Ohio. Following that review, the Subcommittee presented a report of its findings and recommendations about program relevance, quality, performance and scientific leadership to the Executive Committee of the Board of Scientific Counselors. After receiving a copy of the final report, the Land Preservation and Restoration Research Program generated a response to the BOSC report (enclosed).

The response of the Land Preservation and Restoration Research Program to the reviewers' comments and recommendations is based on input from members of the Land Preservation and Restoration Research team, program and regional office stakeholders, and the National Program Director for Land Preservation and Restoration. The enclosed narrative identifies specific recommendations made by the reviewers for each of the two Long-Term Goals, provides a brief comment in response, and indicates how the Land Preservation and Restoration Research Program will incorporate the committee's findings into its operation. Also attached is a table summarizing each recommendation, the action to be taken, and a schedule for completion of the action. The Program benefited considerably from your insight and advice and your recommendations were greatly appreciated.

As indicated in the Charge for the Land Preservation and Restoration Research Program, ORD intends to conduct periodic evaluations of its program's progress at intervals of four to five years. The purpose of these reviews determines progress with regard to relevance, quality, performance, and scientific leadership; identifies when clients are applying research to strengthen environmental decisions; and evaluates client feedback about the research. In addition to a formal review every four to five years, ORD intends to conduct an interim evaluation of the Program's progress midway through the review cycle. At a point which will occur approximately within the next two years, a subset of the Land Preservation and Restoration Research Program subcommittee will be invited to participate in a one-day review to evaluate the status of the changes the Program has agreed to implement. In this context, we look forward to the possibility of working with you again.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Kevin Y. Teichman', written over a white background.

Kevin Y. Teichman, Ph.D.

Acting Deputy Assistant Administrator for Science

Enclosure

cc: Dr. Charlie Menzie (Land Preservation and Restoration Subcommittee, Chair)
Dr. James R. Clark (Land Preservation and Restoration Subcommittee, Vice-Chair)
Dr. Todd Bridges
Dr. Barry Dellinger
Dr. Lynne Habert
Dr. Eugene Keating
Dr. Robert Phaneuf
Dr. Robert Siegrist
Dr. Tim Thompson



Office of Research and Development's (ORD) October 2006
Response to the Board of Scientific Counselors (BOSC) July 2006
Final Report that Reviews ORD's Land Preservation and
Restoration Research Program

BOSC Land Preservation and Restoration Subcommittee:

Dr. Charlie Menzie (Chair)
Dr. James R. Clark (Vice-Chair)
Dr. Todd Bridges
Dr. Barry Dellinger
Dr. Lynne Habert
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Mr. Tim Thompson

Submitted by:

Dr. Randall Wentsel
National Program Director
Land Research Program
Office of Research and Development

ORD Response to the Board of Scientific Counselors (BOSC) Review of the Land Research Program (LRP)

A Land Preservation and Restoration Subcommittee of the BOSC conducted a review of ORD's Land Research Program in 2005. As part of the review, the subcommittee conducted conference calls during November, 2005, and held a face-to-face meeting in Cincinnati, Ohio on December 13–15, 2005. The draft subcommittee report was reviewed by the BOSC Executive Committee at their January 2006 meeting, and the final BOSC report was transmitted to ORD in July 2006.

The following is a narrative response to the recommendations provided by the BOSC review of ORD's Land Research Program. The BOSC recommendations are listed below (in *italics* following its reference number) under Overarching Comments or Charge Questions. The ORD response follows each set of recommendations. While expressing overall approval for the Land MYP, the BOSC found that there are places where improvements can be made. A number of overarching comments and issues emerged during the review, and recommendations are provided for each (see *Table 1* in BOSC report). ORD thanks the panel for their time and interest to improve the Land Research Program.

Overarching Comments and Issues

1. The Land MYP as an Organizing Roadmap and Framework. The BOSC members found that the Land MYP achieves its stated purpose of providing a roadmap and framework to achieving EPA's long-term research goals related to land. Areas where the Land MYP could be improved include:

(1a) Clarification of communication within the MYP,

Response: A draft Land multi-year plan on the LRP was included in the information for the subcommittee to review. We appreciate the additional time they took to provide comments on the draft document. We are currently editing the document and have moved some sections from the front of the document to appendices to improve the flow of the description of the Program and planned research. We plan to complete the MYP in January, 2007. The table that communicated planned APMs and APGs was reorganized and updated to better present the progression of research.

(1b) Enhancing the anticipation of future conditions,

Response: Currently, we are discussing how nanotechnology research fits into the LRP and how to present our planned research activities at mega-sites. To support the Brownfields program a research effort has been initiated, drawing upon the expertise in this program. We will continue to use Regional Advisory Workgroups, Technical Support Centers, and communication with OSWER management to assist us in maintaining awareness of future issues that require research activity.

(1c) Discovering how collaborative efforts can be pursued with greater effectiveness, and how certain historical program needs are addressed as programs sunset or are terminated.

Response: A ten-page table on collaboration was provided to the subcommittee that detailed significant collaboration with Federal agencies and state groups. In 2006, we formed a group of Federal agency program directors from NIEHS, DOE, NSF, SERDP and EPA to further document collaboration and limit the duplication of research.

2. The Land MYP as a Communication Tool. The Land MYP is a key communication document and, therefore, the information contained therein should be readily understandable and the goals clearly articulated.

(2a). Improve the readability of the report by highlighting the essential features of the Land MYP and minimizing jargon and acronyms. Consider rephrasing the two LTGs to reflect technical or scientific themes inherent in ORD efforts to enhance the success of OSWER programs in Land Preservation and Restoration.

Response: As discussed in (1a), the editing of the draft MYP will focus on readability and flow. Sections of the MYP written in response to SAB panel recommendations on connecting the research to EPA Goal 3 strategic targets and other background information will be placed in appendices.

There is disagreement regarding the rephrasing of LTGs. LTGs were rewritten in the draft in response to SAB and OMB recommendations to have outcome-oriented LTGs. Science themes will be stated when research themes, e.g., ground water, are discussed.

3. Emerging Issues. The Land Research Program does a good job of focusing on near-term needs, but there is a lack of emphasis on emerging issues.

(3a). Consider including periodic forecasting of emerging problems that could be examined in a preliminary way to judge their import.

Response: The Land program has responded to the BOSC and SAB panel recommendations to address emerging issues. Starting in FY07, the 3MRA and some materials management research will be redirected to address nanomaterial fate and transport science questions as well as life cycle issues. The RCT, regional groups, Tech Support Centers, and OSWER management bring forward emerging issues, e.g. vapor intrusion into homes, ground and/or surface water contamination, Brownfields, animal carcass disposal. ORD shifts its research program to address emerging issues.

Land program researchers routinely note emerging issues as part of their professional activities (e.g., reviewing current literature, participating in national and international meetings) and advise the research coordination team of potential research directions. In addition, ORD's Office of Science Policy has an ongoing effort to implement ORD's strategic goal of anticipating future environmental issues

(<http://www.epa.gov/osp/efuture.htm>). The Office of the Chief Financial Officer also has a forecasting function (<http://www.epa.gov/cfo/futures/index.html>) that helped inform development of the new Agency Strategic Plan (http://www.epa.gov/ocfo/plan/2006/entire_report.pdf).

4, Collaboration and Leveraging. In a time of shrinking resources and considering the multidisciplinary nature of today's problems, collaboration and leveraging are critically important.

(4a). Consider opportunities for collaboration and leveraging at the national and international levels. Enhance the use of Web-based support systems for facilitating multifacility research efforts. Look for opportunities to collaborate with EPA research efforts in Homeland Security and in risk communication.

Response: See answer to 1(c). ORD is discussing having web pages for each NPD and we will have further discussion with the Superfund Office on linking into their web and communication system. LRP Researchers communicate extensively with the National Homeland Security Research Center and several individuals conduct work for the NHSRC on a part-time basis where research needs strongly overlap.

5. Development of New Scientists. New scientists will be needed to replace those who are retiring and to provide expertise in emerging areas.

(5a). The MYP should address the current and future processes for replacing retiring expertise and developing new scientists with emphasis on emerging areas, increase support of university-based research to involve these stakeholders and train future generations of environmental researchers.

Response: This is not the purpose of a MYP. The ORD grants and fellowships programs in NCER address this issue by helping to develop the next generation of environmental scientists and engineers. ORD workforce planning is conducted principally by the labs and centers. For example, NRMRL is currently revising its strategic plan to include a workforce goal. Implementation of the workforce goal will include skills mix assessment and succession planning. The Land MYP will inform such efforts.

6. Possible Research Gaps Left by Sunsetting or Terminating Programs. There may be gaps and impacts resulting from sunsetting or terminating particular research initiatives, such as the Hazardous Substances Research Centers and the SITE Program. The rationale for program removal or sunsetting should be stated clearly within the Land MYP along with strategies for addressing those gaps if they indeed exist.

(6a) *If there are recognized gaps associated with sunseting or terminating programs, these could be prioritized for collaborative research efforts.*

Response: Text will be added to the MYP to address this comment. Certainly the MOU with the NIEHS grants program and co-funding from the DoD ESTCP for tech demonstrations are steps which will address the issue. The Land program has continued and will continue to work closely with the STAR grants and SBIR programs to ensure that solicitations include high priority program needs.

7. Balancing Use of Performance Metrics as Research Drivers. A balance needs to be maintained between the benefits of performance metrics and the costs and potential constraints that these metrics sometimes place on programs.

(7a). *The BOSC acknowledges the interplay of forces regarding performance metrics, but endorses their continued use and suggests that the need for balance be borne in mind.*

Response: Agree. The PART for this Program was completed in 2006 and the negotiated measures will be incorporated into the management of the Program.

8. Defining Outcomes. Little information was presented on the connection between short term outcomes (use of advice and guidance documents) and long-term outcomes (faster, cheaper, better cleanups, or waste minimization).

(8a). *Consider how the linkages could be made more clear or enhanced in the Land MYP.*

Response: The subcommittee saw posters at the BOSC review that presented impacts. It could be that these weren't effective in communicating faster, cheaper outcomes. We currently have a contract effort to document the use of ORD products at four Superfund sites where we will communicate the role of ORD products in the management of the site. Wording will be edited in the logic diagram and PART measures will be added to the MYP.

9. Characterization of Uncertainty. Characterizing uncertainty in the assessment techniques and models developed by the Land Research Program is especially important as environmental decisions need to be informed by the uncertainties in the analyses.

(9a). *Consider how to characterize and communicate uncertainties inherent in assessment methods and models. Explore collaborations with ORD efforts that focus on the analysis and communication of uncertainty. Integrate this information into Agency guidance and rules.*

Response: Characterization and communication of uncertainties in risk assessment is a research area that cuts across many ORD research programs in addition to the Land program. For this reason, research aimed at characterizing and representing uncertainty

in risk assessment is currently included under the Human Health Risk Assessment Research Plan. This happens to be a topic of substantial interest to the Assistant Administrator for ORD, Dr. George Gray, who has personally conducted significant research in this area. There are thus several efforts currently underway within the HHRA Research program that will address this topic in a manner suitable for integration into Agency guidance and rules.

BOSC Comments on Charge Questions

Synopses of the BOSC's evaluations for each of the charge questions are provided below. In addition to the recommendations in the overarching comments, the BOSC provided suggestions under each charge question for enhancing the Land Research Program in the future. Suggestions also are provided for improving the content and presentation of information in the Land MYP.

A. Is the research program relevant to and consistent with Agency goals and customer needs, and is it sufficiently flexible?

The Land Research Program is relevant to ORD's research needs and is consistent with EPA's Strategic Plan. ORD's Land Research Program is pursuing research actively in response to interactions with its primary customers in EPA program offices and regions. It is clear that considerable effort has been devoted to engaging the EPA program offices and regions in the formulation of the Land MYP. The outputs generated by ORD in the Land Research Program are used by other EPA program offices and regions, other federal agencies, states, and responsible and regulated parties. It is much less clear, however, how ORD intends to measure or track such use and incorporate this information into statements about the performance and impact of the program. The BOSC identified the following areas where ORD could consider enhancing the relevance of the Land Research Program and the Land MYP:

(A1): State the goals and objectives of the Program in terms of their short-term or long-term nature.

Response: Long term and annual measures from the PART will be incorporated in the MYP. APGs in the MYP vary based on the long-term or short-term nature of the science being addressed.

(A2): Articulate the benefits of the Land Research Program within the Land MYP by mapping the goals and activities within the Land MYP to the customer's performance measures.

Response: We concur with the concept of linking our research activities to the customer's (OSWER's) performance measures. However, OSWER's performance measures are formulated as numbers and percentages (e.g., number of sites cleaned up, percent of waste diverted to beneficial use, etc.) and don't include metrics for quality,

cost reduction, or time savings. The text of the MYP explains how the work in the research themes can promote the program's achievement of its numeric targets. The MYP will link research activities to: program office research needs; EPA Strategic Plan Goal 3 strategic targets; and Land Research Program PART measures.

(A3): Clarify within the Land MYP those who are stakeholders and clients.

Response: This comment will be addressed in the final MYP.

(A4): Identify gaps not being covered by existing projects and the intersections among the projects. Such a gap analysis will position the Program to respond rapidly to circumstances where additional resources or leveraging opportunities present themselves.

Response: To better communicate the types of research conducted under this plan and to demonstrate how leveraging occurs among ORD MYPs, a matrix was placed in the MYP (*Figure 5*) to present Land MYP and other ORD MYP research areas (e.g., human health effects, remediation technology, etc.) versus media (e.g. soil, ground water, etc.) to highlight the focus of the Land MYP and collaboration with other MYPs. The matrix presents where ORD research is leveraged to support more than one customer. Also, a gap analysis is embedded in Appendices A and B of the MYP, which describe the research needs, identify ongoing research, and prioritize among the intersections and gaps. As a result of the analysis, changes in research direction were incorporated into the MYP.

(A5): Emphasize to a greater degree within the Land MYP how and by what means the outputs and products generated from the Land Research Program will be transferred to the field. This includes placing greater emphasis on transferring technologies to the private sector so that they can come into more common use and have greater impact.

Response: The subcommittee was provided with information on technical support and transfer of research products. Collaboration information also included activities with state technical workgroups (ITRC) to provide guidance or transfer technologies. Additional efforts to enhance communication of research products involving linkage of line management to wider communication mechanisms are underway.

B. How is quality ensured in the awarding of research funds and in research products?

The BOSC believes that ORD's Land Research Program continues to generate high quality products and outputs. Quality is ensured, in part, by identifying projects most useful to the clients. Prioritization is achieved through various means, including the involvement of senior management and liaisons from client offices to ORD. The BOSC found that the routine application of peer reviews by ORD throughout the Land Research Program helps to maintain high quality output. These reviews range from high-level program and organizational reviews of individual guidance documents to publications appearing in peer-reviewed literature, and these reviews apply to various phases of

particular products. In the course of this program review, the Subcommittee learned that EPA routinely modifies both the direction of research and specific research products in response to external and internal reviews; however, the MYP would benefit by including more discussion on how this is accomplished. Funds for work conducted outside of EPA are awarded competitively based on merit; however, there is little extramural funding in the Land Research Program. Factors that indicate that quality is being maintained within the Land Research Program include: (1) the credentials of investigators; (2) the selection of appropriate projects to support the goals; (3) the design of the projects; (4) in-place quality assurance systems; and, (5) the resulting level of quality evident in the peer-reviewed and well cited publications of scientific work. The BOSC identified the following areas in which EPA could consider enhancing the quality of the Land Research Program and the Land MYP:

(B1): Provide greater description of how criteria were used to prioritize needs and projects for both LTGs, but specifically for LTG 2.

Response: A high degree of detail was provided on regional criteria and the process of utilizing regional workgroups for LTG 1. For LTG 2, OSW (the customer) utilized a category 1, 2, and 3 process that was described in the MYP. We'll consider this comment when revising the MYP, but it is likely that readability and flow issues will prohibit us from adding much more detail.

(B2): Incorporate input from outside groups (other government agencies, academia, industry, and other stakeholders), especially for future Land MYPs, and ensure that all valid scientific advice is heard and considered apart from policy issues.

Response: The EPA is very proud of the extent of the peer review it conducts of its research programs. First and foremost, when the MYP is final, it will be publicly available on the web. The subcommittee was also provided with the various levels of peer review that are already incorporated into the program. In addition to internal and external review of the research programs and organizational units in ORD, input from outside groups is an integral part of program development. For example, as research was shifted from contaminated soils to contaminated sediments ORD participated with OSWER and the regions in a series of open workshops with a full range of stakeholders, beginning in 2001 and continuing through the present

(B3): Articulate the mechanisms for ensuring periodic quality reviews during the conduct of projects. Such periodic (e.g., quarterly or annual) review and feedback are important for both ensuring that research is on track technically and for feedback from the customer. Where relevant, it may be appropriate to include the customer (e.g., regional staff, state agencies) in the process of obtaining periodic feedback.

Response: A formal annual review with clients has been in place since the inception of the research coordination team. Since the BOSC review, we have committed to semiannual topical progress reviews with clients using the regional research advisory workgroups. At the project level, the Government Performance and Results Act tracking

system ensures that progress toward current-year products is reviewed quarterly. In addition, out-year plans are reviewed at least twice a year.

C. Is the research program design logical and appropriate?

The BOSC finds that the Land Research Program has a logical and comprehensive design for producing knowledge, know-how, and decision-support tools to address and mitigate known current problems (e.g., remediation of leaking underground storage tanks [USTs], remediation of dense nonaqueous phase liquids [DNAPLs] in groundwater, risk, and remediation of contaminated sediment sites) and contribute to the LTGs of the Land MYP. Some aspects of the Program, however, could be clarified or improved as highlighted in the BOSC's recommendations below. The Land Research Program has done an excellent job of coordination and communication between ORD and the program and regional offices that the Land Research Program is intended to support. The research needs presented in the current MYP have been developed in a rational and inclusive manner with consideration of leveraging and coordination with other agencies working in related areas. The Land MYP responds to Science Advisory Board (SAB) recommendations to develop a holistic MYP by combining the Contaminated Sites and Resource Conservation and Recovery Act (RCRA) MYPs. The RCRA component of this Land MYP (LTG 2), however, appears to be emphasized to a lesser level than the contaminated sites component of the plan. The BOSC commends EPA and the Land Research Program on the performance of its Technical Assistance Group. Technical assistance provided by ORD provides a vital conduit for EPA researchers to identify and refine research questions.

The BOSC identified the following actions that ORD could consider taking to enhance the design and organization of the Land Research Program and the Land MYP:

(C1): State the Program goals more clearly in terms of their scientific research focus. The goals could be recast in terms of the two major environmental challenges with problems and the scientific advancements needed to aid their resolution then described as subgoals. Projects and outputs could be organized by major problems (e.g., assessment and cleanup of DNAPLs in groundwater, design and operation of landfill bioreactors) along with the planned workflow.

Response: In working to prepare for the PART, most of the MYPs shifted to customer-focused LTGs instead of LTGs that reflect a scientific research focus. For each research theme, e.g., ground water contamination, we will state the scientific research focus for that theme in the MYP. For the "projects and outputs" comment, the table in the MYP that presents APGs and APMs was reorganized to address this issue.

(C2): Review potential needs related to current issues that cross-cut multiple programs (e.g., biosolids and animal waste application to land, mining and megasites, oil and gas operations, infectious disease agents, beneficial reuse of waste materials, uncertainty in risk assessments, and communication of risk results).

Response: Cross-cutting issues are typically assigned to a particular MYP with an understanding of which other MYPs include related work. For example, land application of waste is conducted under the Water Quality MYP, but is of interest to OSWER. Beneficial use of wastes is in the Land MYP, but the sustainability program contributes results as well. In the 2003 editions of the MYPs, we attempted to cross reference outputs that addressed multiple programs. It proved impractical to maintain the cross-references as the programs evolved due to changing priorities and resources.

Within the labs and centers, Assistant Directors routinely consult each other and relevant staff and management on synergies between various research programs and bring that information back to the various research coordination teams. For example, the Land program routinely works with the National Homeland Security Research Center, including sharing staff. Particular issues in the Land program are coordinated with specific MYPs (e.g., leaching from coal combustion residue disposal and use is supported by both the Land and Mercury MYPs).

Uncertainty in Risk Assessments – See Response to Section (9a). Research related to uncertainty in risk assessment is conducted under the Human Health Risk Assessment Research Plan, primarily through ORD's National Center for Environmental Assessment (NCEA). NCEA also participates in the development of the Land Research Program, ensuring appropriate linkage between assessment research needs of the Land Research Program and plans within the HHRA Research Program. The next version of the Land Multi Year Plan will include a section documenting linkages to cross-cutting research being conducted in other ORD Multi Year Plans, including HHRA.

(C3): Clarify in the Land MYP the sequence of research questions along a timeline and the activities that are to be conducted.

Response: The text in Section 3 of the document will be edited to clarify the progression of research. The reorganization of the Land APMs and APGs will also assist in presenting the timeline of research (see the response to C1).

(C4): Identify, to the extent they exist, the opportunities for staff scientists or engineers to initiate ideas, for example through a seed funding program.

Response: Investigator-initiated research ideas are incorporated into the planning process during the annual planning cycle and in consultation with the clients. New ideas are incorporated into the needs lists and existing/proposed research activities (MYP Appendices A and B) for prioritization. Investigators are also encouraged to compete for outside funding (e.g., SERDP projects) and to develop cost-shared projects that support program goals (e.g., Cooperative Research & Development Agreements). In FY 2006 we had a rare opportunity to have the clients propose additional research needs, and projects were competitively selected from PI proposals.

D. Is the research program making timely progress in addressing key scientific questions and LTGs?

Timely progress is being made on LTG 1; however, some aspects of LTG 2 seem to be lagging behind. The BOSC presumes that the apparently slower progress for LTG 2 initiatives is likely related to funding, and/or is an artifact that the research initiatives tracked under LTG 1 are more mature initiatives. Regardless of the reason, the BOSC is of the opinion that this disparity could have been addressed in the Land MYP. The BOSC identified the following areas where ORD could consider enhancing the Program's timely progress in addressing key scientific questions:

(D1): Consider leveraging and collaborating with others so as to ensure timely progress for LTG 2.

Response: It is important to note that transition of half of the LTG 2 program to nanomaterials will be leveraged with other federal programs and that the MYP will present a smaller focused materials management program. In the next version of the MYP, more APMs will be shown in LTG 2 to present the progress of the revised research effort more clearly.

Leveraging and collaboration is the only way we will be able to maintain work in any of our long term themes in LTG 2. The leaching research is heavily leveraged with program office funds, resources from the Mercury MYP, and external in kind contributions. The landfill cover research, particularly evapotranspiration covers, was leveraged with in-kind and cash resources from the private sector and federal agencies outside EPA. All of the field work for landfill bioreactors is in collaboration with landfill owners/operators, including ongoing CRADAs. Regional Applied Research Effort resources have been used to fund seed work on prion disposal.

(D2): Improve the process for updating Integrated Risk Information System (IRIS) values for chemicals currently in the database and for developing values for potentially important chemicals not in the IRIS database. The BOSC recognizes that this falls only partially within the domain of the Land Research Program.

Response: The Integrated Risk Information System (IRIS) is guided under Long Term Goal 1 of the Human Health Risk Assessment (HHRA) Research Program, and is not a part of the Land Research Program. It is recognized that IRIS is a cross cutting Agency database of interest and relevance to many ORD Research Programs. The IRIS program is currently undergoing a period of significant revision with the aim of increasing the transparency and inclusiveness of the IRIS chemical evaluation process; including formal, quantitative uncertainty analysis in IRIS assessments; and developing guidance for incorporating uncertainty analysis into decision making. There is a trade-off to be made, in that more transparency and consideration of uncertainty inevitably results in more time needed to complete assessments, and hence delays the development of values for potentially important chemicals not within the IRIS database. However, ORD is committed to increasing the availability of current, scientifically rigorous chemical toxicity information within the IRIS database.

(D3): Articulate how planned and future research programs support decision-making on sustainability issues and on life cycle assessment determinations related to solid and hazardous waste management.

Response: Brownfields research activities will address sustainability issues; however, the shift to nanotechnology will reduce the research program activities in hazardous waste management. The Sustainability MYP, undergoing revision subsequent to BOSC review, has a long-term goal focused on decision making tools, e.g., life cycle assessment.

(D4): Update key technology documents related to landfill design. ORD could collaborate with the geosynthetic industry to help fund such work.

Response: ORD's landfill researchers have leveraged their activities to a significant extent (see the response to D1) and have collaborated with the geosynthetic industry in the past, as well as with the waste management industry. A new CRADA is in development to investigate GCL cover performance problems that appear to stem from ion exchange processes. Little financial support has been offered by the industry for obvious reasons.

There are no pending regulatory actions to spur renewed interest in conventional landfill design, although ORD is supporting OSWER in developing revised technical guidance for landfill covers.

(D5): Identify within the Land MYP the mechanisms for tracking progress for specific projects with respect to the LTGs.

Response: The ORD Management has quarterly reporting for progress toward completing APMs and APGs that lead to addressing LTGs. These reports are forwarded to the NPDs and the DAA for Management. Management is held accountable for completing scheduled milestones. See response to Section B3

E. Is ORD playing a leadership role in land research and effectively collaborating with the larger research community?

ORD and the research efforts that currently comprise the Land Research Program historically have provided excellent leadership to EPA, the states, and the regulated community on identifying and addressing environmental problems. The BOSC believes it is vital that ORD continue its environmental leadership role to ensure environmental regulations are based on sound science and risk-based understanding. The current Land MYP indicates that ORD will exemplify leadership for the short-term, problem-driven research areas. Examples include the methods for evaluating monitored natural recovery (MNR) in sediments, advective flux through sediment caps, and the models and risk values developed for human health exposure and risk assessment (IRIS/PPRTV [Provisional Peer Reviewed Toxicity Values], IEUBK/AALM [Integrated Exposure Uptake Biokinetic Model for Lead in Children/All Ages Lead Model], and 3MRA [multimedia, multi-pathway, multi-receptor exposure and risk

assessment]). The BOSC identified the following areas in which ORD could consider enhancing the Program's leadership role on land research issues.

(E1): Identify a process for acquiring or developing key leaders for those programs where clear leadership may be lacking. Such leadership should be reflected in personnel, as well as programs. Particular emphasis should be given to leadership in emerging fields.

Response: ORD has a hiring process in place to add senior scientists to lead emerging or high priority research areas and ORD labs and centers have staff development programs that include short- and long-term training opportunities. Land program personnel have participated in temporary assignments to acquire new skills, and several have pursued advanced degrees related to their research at work. Promotion beyond grade 13 is dependent on publications and leadership, among other factors. We have been using several mechanisms to acquire individuals holding post doctorate degrees in emerging areas of research. Labs and Centers have their own approaches to workforce planning and development, which address the leadership issue and the expected wave of retirements.

(E2): Describe or develop mechanisms for identifying mature research fields, emerging issues, and/or ensuring that the ORD-planned research is not duplicating efforts being conducted by other government or state agencies or by private industry. This could be guided by external peer review by experts drawn from universities, nongovernmental organizations (NGOs), state agencies, and private industries

Response: This is an ongoing issue that we will continue to address. Addressing customer research needs, collaboration of research efforts, and limiting duplication of research are always of concern in this research area (see response to 1c). The formation of a collaborative Federal agency workgroup will assist in addressing this comment as will ongoing topic-centered communications activities for several of the research themes (see the sediments example in response B2).

However, ORD believes a fuller discussion of the issue, “ensuring that the ORD-planned research is not duplicating efforts being conducted by other government or state agencies or by private industry,” could have occurred at the face-to-face meeting with the subcommittee. If the subcommittee had brought up duplication of research during the question and answer periods, ORD scientists could have tried to address this concern to the satisfaction of the panel. [Note: ORD provided comments on this section of the subcommittee's draft report; however, our suggested changes were not made in the final report.]

The paragraphs below provide text from the BOSC final report and ORD and EPA regional staff statements, for three of the specific duplication issues brought up by the BOSC, as examples of additional clarifying information on ORD roles. The examples address the application of sediment profile image (SPI) cameras and modeling support at the Lower Willamette River and Housatonic River. We believe that if the subcommittee had asked for this information, they would have understood more completely the role of ORD in sediment modeling and the application of SPI cameras at regional sites.

The BOSC report stated in Section VII, page 48:

“During the formulation of the Land MYP, EPA could determine whether similar work is being funded by other government agencies and/or the regulated community. This part of the planning process is articulated in OMB Circular M-03-15, and, if a research topic is being funded elsewhere, ORD might consider this as a factor when allocating its resources. For example, the Land MYP lists sediment research programs that relate to fate and transport modeling, sediment sampling, MNR measurements through radioisotope measurements, resuspension in dredging, post-dredging residuals, and the application of SPI to benthic infaunal recovery—all of which have been used and developed extensively within the Superfund Program by other federal agencies (e.g., USACE, U.S. Navy), state agencies (e.g., Michigan Department of Environmental Quality [DEQ], Oregon DEQ, Wisconsin Department of Natural Resources, and Washington State Department of Ecology), and private responsible parties at multiple sites throughout the country.

ORD’s efforts have contributed substantively to the Subcommittee’s understanding of contaminant fate and transport in sediments. Examples of past “gold standard” ORD-funded programs include the Equilibrium Partitioning model, and the Hydrologic Simulation Fortran Program. These were cutting-edge, forward-looking development efforts that contributed significantly to the science of sediment management.

In evaluating effective allocation of resources, the Land MYP should distinguish between the otherwise unfunded research needs that ORD is meeting and those needs that are funded through other mechanisms. The Subcommittee describes here the situation for sediments, as some members of the Subcommittee are familiar with work in that area; similar comments might apply to other parts of the Land Research Program. Fate and transport modeling has been done at the Hudson River, the Lower Fox River, the Housatonic River, and more recently has been initiated at the Passaic River and the Lower Willamette River. Most of these modeling efforts have been developed as part of the Superfund Program with the Agency in a lead development role. The Land MYP states that ORD has a role in the development of modeling for these sites, but what is less clear in the MYP is to what degree ORD research funds are needed at those sites. All of the sites listed have identified responsible parties, from which the EPA funds its efforts through the cost-recovery mechanisms in Superfund; thus, the fate and transport modeling program is leveraged through indirect funding from the responsible parties. In that case, ORD should consider that program leveraged and allocate those resources to other research needs. To the extent that ORD resources are funding work that is not covered by cost recovery (or by internal Agency contracting mechanisms when conducting region-specific work), then it is appropriate for the Land MYP to cover those cases.”

ORD examples of clarifying additional information on the application of sediment profile image (SPI) cameras and modeling support at the Lower Willamette River and Housatonic River.

Using Sediment Profile Image (SPI) Cameras

The BOSC review is correct when it highlights that using sediment profile image (SPI) cameras to examine benthic disturbance has been done for many years. However, that is not what the NHEEL-AED project proposes to do. The project objective is to evaluate whether or not recent (i.e., before 2001) advances in sediment profile image technology (e.g., digital cameras with improved resolution and real-time viewing ability) allow for an actual determination of benthic animals present, to what level of biological organization (e.g., family, genus, species) that determination can be made, and to what degree that information can be related to the more expensive and time-consuming traditional benthic community analysis (i.e., sieving and sorting sediment). A further objective is to address the question of whether QA/QC practices can be delineated to a point where SPI data can be used in the regulatory environment beyond, for instance, measuring the depth of a cap (e.g., percent recovery of benthic community, prevalence of low dissolved oxygen). The following is a quote from a recent meeting of international SPI experts (December 2005), attended by both Don Rhodes and Joe Germano (whose journal articles were cited by the BOSC review), held at NHEERL's Atlantic Ecology Division:

“Despite these advantages [rapid assessment, greater spatial coverage, low cost], sediment profile cameras have not been widely used for environmental assessments towards regulatory work, in part because of perceptions on the part of some managers that the image analyses were somewhat subjective and lacked repeatability. The science of image analysis has evolved tremendously in the last decade, however, and new techniques have recently become available. Better standardization and Quality Assurance/Quality Control procedures for sampling, image analysis, and data reporting would strengthen the regulatory applications of sediment profile imaging.”

Therefore, in response to this consensus, a guidance document is being created by the EPA (NHEERL-AED) in conjunction with these international experts to put forth standards and QA/QC procedures to promote comparability and consistency between users. Three independent outside experts (Ray Valente, Isabelle Williams, Jim Blake) who are users of SPI reviewed AED's Benthic Assessment Project in 2005 and all agreed that the project would add significantly to the knowledge available on the utility of SPI cameras for regulatory purposes.

Lower Duwamish Waterway (LDW) Site Modeling Support

A NERL scientist asked me to provide a brief summary of his support work at the Lower Duwamish Waterway (LDW) site. First, I can't overstate how valuable his technical support has been. Sediment transport is a critical issue at many of our sediment sites, and there aren't many experts in this field. I and many other RPMs would be in a world of hurt without his support.

Tetra Tech (for King County) had developed an EFDC model to look at contaminant transport from their combined sewer overflows over a large area (Elliot Bay and LDW) long before LDW became a Superfund site. Once the site was listed and we started the RI/FS, I consulted with the NERL scientist regarding what we would need to better understand sediment transport at this site. He reviewed the previous modeling that had been done for the King County Elliot Bay-wide study (of which LDW was a small part), and deemed it inadequate to accurately portray hydrodynamics at the LDW. King County's model used only three cells across the LDW, and did not represent the navigation channel, and thus was not able to accurately represent the movement of the salt wedge up and down the navigation channel during flood and ebb tides, respectively. He also provided technical support in guiding the PRPs towards an appropriate data collection plan.

As part of a contaminated sediments modeling research project, the NERL scientist was interested in testing the EFDC model under various circumstances, including a salt-wedge estuary like the LDW. He obtained the work King County had done and used it as a starting point, refining the grid to using seven computational cells across the LDW. The finer grid was necessary to represent the navigation channel and to better represent lateral circulation in the LDW. The PRP group's consultant, QEA, then used the NERL scientist's refined model in a sediment transport analysis report, which we are currently reviewing. So, the work the NERL scientist has done for LDW did not duplicate King County or the PRP group's work. The ORD scientist was able to use the LDW modeling work to meet two objectives: 1) advance EPA's knowledge of the use and limitations of the EFDC model in a salt-wedge estuary; and, 2) provide some site-specific support to better understand hydrodynamics at the LDW site, which the PRPs were able to use in their analysis of sediment transport.

Allison Hiltner, Regional Project Manager
EPA Region 10

The Housatonic River Site: ORD Support of the Regional Modeling Study.

- 1) Role at your site – The NERL scientist has provided, over the years, an independent assessment (much like a peer reviewer) of issues encountered in developing the modeling study. Obtaining this peer review - like input was important in our decision-making and preparation for the formal peer reviews required under the CD. In addition, when there were questions on contractor performance and/or deliverables, he was able to provide EPA technical input in resolving these questions with the IAG through the ACE.
- 2) How it is separate from what the contractors do - As described above, the NERL scientist served as internal and independent reality check on the “nuts and bolts” work the contractors performed, and
- 3) How it benefits your site assessment - having to go through three formal peer reviews has been a challenge, and the NERL scientist helped us perform a modeling study that to date has been reviewed very favorably.

If you need additional information, please let me know.

Susan Svirsky, Ecological Risk Assessor
EPA Region 1

(E3): Enhance ORD's position as a global leader by encouraging continued participation in international panels and meetings.

Response: Agree

(E4): Ensure that funding is directed toward areas in which large gains in understanding can be made through research. This involves favoring research areas that are new or emerging over mature areas of research. The BOSC recognizes the balance that must be struck between new research and technical assistance.

Response: The shift to nanomaterials, in part, addresses this comment. This is a problem-driven research program where importance is placed on addressing customer research needs. Every year, new issues are brought forward, e.g. vapor intrusion into homes, ground and/or surface water contamination, Brownfields, animal carcass disposal, where we shift the research program and partner with OSWER to address the issue.

Land Research Program

Summary of BOSC Recommendations from March 2006 Final Report and Proposed ORD Actions Timelines

(includes entries only for those recommendations that require ORD action)

Recommendation	ORD Action	Timeline for Action
<i>(1a) how the MYP could communicate information more clearly,</i>	Addressed in revised MYP	Final MYP Jan. 2007
<i>(1b) how future conditions can be better anticipated,</i>	We will continue to use Regional Advisory Workgroups, Technical Support Centers, and communication with OSWER management to assist us in being aware of future issues that require research activity	Report progress at BOSC mid-cycle review
<i>(1c) how collaborative efforts can be pursued with greater effectiveness, and how certain historical program needs are addressed as programs sunset or are terminated.</i>	In 2006, we formed a group of Federal agency program directors from NIEHS, DOE, NSF, SERDP and EPA to further document collaboration and limit duplication of research.	Ongoing
<i>(2a). Improve the readability of the report by highlighting the essential features of the Land MYP and minimizing jargon and acronyms. Consider rephrasing the two LTGs to reflect technical or scientific themes inherent in ORD efforts to enhance the success of OSWER programs in Land Preservation and Restoration.</i>	Disagree on rephrasing LTGs. LTGs were rewritten in the draft in response to SAB and OMB recommendations to have outcome-oriented LTGs. Science themes will be stated when research themes, e.g., ground water, are discussed.	Final MYP Jan. 2007
<i>(3a). Consider including periodic forecasting of emerging problems that could be examined in a preliminary way to judge their import.</i>	The RCT, regional groups, Tech Support Centers, and OSWER management bring forward emerging issues, e.g. vapor intrusion into homes, ground water – surface water contamination, Brownfields, and animal carcass disposal. ORD shifts the research program to address the issues. In addition, the MYP will attempt to highlight emerging issues that are part of the research program.	Final MYP Jan. 2007

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<p><i>(4a). Consider opportunities for collaboration and leveraging at the national and international levels. Enhance the use of Web-based support systems for facilitating multifacility research efforts. Look for opportunities to collaborate with EPA research efforts in Homeland Security and in risk communication.</i></p>	<p>See answer to 1(c). ORD is discussing having web pages for each NPD, and we will have further discussion with the Superfund office on linking into their web and communication system.</p>	<p>Report progress at BOSC mid-cycle review</p>
<p><i>(5a). The MYP should address the current and future processes for replacing retiring expertise and developing new scientists with emphasis on emerging areas Increase support of university based research to involve these stakeholders and train future generations of environmental researchers.</i></p>	<p>The ORD grants and fellowships programs in NCER address this issue by helping to develop the next generation of environmental scientists and engineers. ORD workforce planning is conducted principally by the labs and centers.</p>	<p>Done</p>
<p><i>(6a) If there are recognized gaps associated with sunseting or terminating programs, these could be prioritized for collaborative research efforts.</i></p>	<p>Text will be added to the MYP to address this comment.</p>	<p>Final MYP Jan. 2007</p>
<p><i>(7a). The BOSC acknowledges the interplay of forces regarding performance metrics, but endorses their continued use and suggests that the need for balance be borne in mind.</i></p>	<p>Agree. The PART for this program was completed in 2006 and the negotiated measures will be incorporated into the management of the program.</p>	<p>Done</p>
<p><i>(8a). Outcomes. Consider how the linkages could be made more clear or enhanced in the Land MYP.</i></p>	<p>Wording will be edited in the logic diagram and PART measures will be added to the MYP.</p>	<p>Final MYP Jan. 2007</p>
<p><i>(9a). Consider how to characterize and communicate uncertainties inherent in assessment methods and models. Explore collaborations with ORD efforts that focus on the analysis and communication of uncertainty. Integrate this</i></p>	<p>Characterization and communication of uncertainties in risk assessment is a research area that cuts across many ORD research programs in addition to the Land program. For this reason, research aimed at characterizing and representing uncertainty in risk assessment is currently included under the</p>	<p>Ongoing. Primarily in HHRA MYP</p>

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<p><i>information into Agency guidance and rules.</i></p>	<p>Human Health Risk Assessment Research Plan. This happens to be a topic of substantial interest to the Assistant Administrator for ORD, Dr. George Gray, who has personally conducted significant research in this area. There are thus several efforts currently underway within the HHRA Research program that will address this topic in a manner suitable for integration into Agency guidance and rules.</p>	
<p><i>(A1): State the goals and objectives of the Program in terms of their short-term or long-term nature.</i></p>	<p>Long term and annual measures from the PART will be incorporated in the MYP. APGs in the MYP vary based on their long-term or short-term nature of the science being addressed.</p>	<p>Final MYP Jan. 2007</p>
<p><i>(A2): Articulate the benefits of the Land Research Program within the Land MYP by mapping the goals and activities within the Land MYP to the customer's performance measures.</i></p>	<p>The MYP will link research activities to: program office research needs; EPA Strategic Plan Goal 3 strategic targets; and Land Research Program PART measures.</p>	<p>Final MYP Jan. 2007</p>
<p><i>(A3): Clarify within the Land MYP who is meant by stakeholders and clients.</i></p>	<p>This comment will be addressed in the final MYP.</p>	<p>Final MYP Jan. 2007</p>
<p><i>(A4): Identify gaps not being covered by existing projects and the intersections among the projects. Such a gap analysis will position the Program to respond rapidly to circumstances where additional resources or leveraging opportunities present themselves.</i></p>	<p>To better communicate the types of research conducted under this research plan and to demonstrate how leveraging occurs among ORD MYPs, a matrix was placed in the MYP (Figure 5) to present Land MYP and other ORD MYP research areas (e.g., human health effects, remediation technology, etc.) versus media (e.g. soil, ground water, etc.) to highlight the focus of the Land MYP and collaboration with other MYPs. Also, a gap analysis is embedded in Appendices A and B of the MYP.</p>	<p>Done</p>
<p><i>(A5): Emphasize to a greater degree within the Land MYP how and by what means the outputs and products generated from the Land Research Program will be transferred to the field. This</i></p>	<p>Additional efforts to enhance communication of research products involving linkage of line management to wider communication mechanisms are underway.</p>	<p>Report progress at BOSC mid-point review</p>

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<p><i>includes placing greater emphasis on transferring technologies to the private sector so that they can come into more common use and have greater impact.</i></p>		
<p><i>(B1): Provide greater description of how criteria were used to prioritize needs and projects for both LTGs, but specifically for LTG 2.</i></p>	<p>A high degree of detail was provided on regional criteria and the process of utilizing regional workgroups for LTG 1. For LTG 2, OSW, the customer, utilized a category 1, 2, and 3 process that was described in the MYP. We'll look at this comment in the revised MYP, but it is likely that readability and flow issues will prohibit us from adding much more detail.</p>	<p>Final MYP Jan. 2007</p>
<p><i>(B2): Incorporate input from outside groups (other government agencies, academia, industry, and other stakeholders), especially for future Land MYPs, and ensure that all valid scientific advice is heard and considered apart from policy issues.</i></p>	<p>When the MYP is final, it will be publicly available on the web. The subcommittee was provided with the various levels of peer review that are already incorporated into the program.</p>	<p>March 2007</p>
<p><i>(B3): Articulate the mechanisms for ensuring periodic quality reviews during the conduct of projects. Such periodic (e.g., quarterly or annual) review and feedback are important for both ensuring that research is on track technically and for feedback from the customer. Where relevant, it may be appropriate to include the customer (e.g., regional staff, state agencies) in the process of obtaining periodic feedback.</i></p>	<p>A formal annual review with clients has been in place since the inception of the research coordination team. Since the BOSC review, we have committed to semiannual topical progress reviews with clients using the regional research advisory workgroups.</p>	<p>Report progress at BOSC mid-point review</p>
<p><i>(C1): State the Program goals more clearly in terms of their scientific research focus. The goals could be recast in terms of the two major environmental challenges with problems and the scientific advancements needed to aid their resolution then described as subgoals. Projects</i></p>	<p>In working to prepare for the PART, most of the MYPs shifted to customer-focused LTGs instead of a scientific research focus. For each research theme, e.g., ground water contamination, we will state the scientific research focus for that theme in the MYP.</p>	<p>Final MYP Jan. 2007</p>

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<p><i>and outputs could be organized by major problems (e.g., assessment and cleanup of DNAPLs in groundwater, design and operation of landfill bioreactors) along with the planned workflow.</i></p>		
<p><i>(C2): Review potential needs related to current issues that cross-cut multiple programs (e.g., biosolids and animal waste application to land, mining and megasites, oil and gas operations, infectious disease agents, beneficial reuse of waste materials, uncertainty in risk assessments, and communication of risk results.</i></p>	<p>Cross-cutting issues are typically assigned to a particular MYP with an understanding of which other MYPs include related work. For example, land application of waste is conducted under the Water Quality MYP, but is of interest to OSWER. Beneficial use of wastes is in the Land MYP, but the sustainability program contributes results as well. In the 2003 editions of the MYPs, we attempted to cross reference outputs that addressed multiple programs. It proved impractical to maintain the cross-references as the programs evolved due to changing priorities and resources. Within the labs and centers, Assistant Directors routinely consult each other and relevant staff and management on synergies between various research programs and bring that information back to the various research coordination teams.</p>	<p>Done</p>
<p><i>(C3): Clarify in the Land MYP the sequence of research questions along a timeline and the activities that are to be conducted.</i></p>	<p>The text in section 3 of the document will be edited to clarify the progression of research. The reorganization of the Land APMs and APGs will also assist in presenting the timeline of research (see the response to C1).</p>	<p>Final MYP Jan. 2007</p>
<p><i>(C4): Identify, to the extent they exist, the opportunities for staff scientists or engineers to initiate ideas, for example through a seed funding program.</i></p>	<p>Investigator-initiated research ideas are incorporated into the planning process during the annual planning cycle and in consultation with the clients. New ideas are incorporated into the needs lists and existing/proposed research activities (MYP Appendices A and B) for prioritization. Investigators are also encouraged to compete for outside funding (e.g., SERDP projects) and to develop cost-shared projects that support program goals (e.g., Cooperative Research & Development Agreements).</p>	<p>Done</p>
<p><i>(D1): Consider leveraging and collaborating with</i></p>	<p>The transition of half of the LTG 2 program to nanomaterials</p>	<p>Final MYP Jan. 2007</p>

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<p><i>others so as to ensure timely progress for LTG 2.</i></p>	<p>will be leveraged with other federal programs. The MYP will present a smaller focused materials management program.</p>	
<p><i>(D2): Improve the process for updating Integrated Risk Information System (IRIS) values for chemicals currently in the database and for developing values for potentially important chemicals not in the IRIS database. The BOSC recognizes that this falls only partially within the domain of the Land Research Program.</i></p>	<p>The Integrated Risk Information System (IRIS) is guided under Long Term Goal 1 of the Human Health Risk Assessment (HHRA) Research Program, and is not a part of the Land Research Program. It is recognized that IRIS is a cross cutting Agency database of interest and relevance to many ORD Research Programs. The IRIS program is currently undergoing a period of significant revision with the aim of increasing the transparency and inclusiveness of the IRIS chemical evaluation process; including formal, quantitative uncertainty analysis in IRIS assessments; and developing guidance for incorporating uncertainty analysis into decision making. There is a trade-off to be made, in that more transparency and consideration of uncertainty inevitably results in more time needed to complete assessments, and hence delays the development of values for potentially important chemicals not within the IRIS database. However, ORD is committed to increasing the availability of current, scientifically rigorous chemical toxicity information within the IRIS database.</p>	<p>Addressed in HHRA MYP</p>
<p><i>(D3): Articulate how planned and future research programs support decision-making on sustainability issues and on life cycle assessment determinations related to solid and hazardous waste management.</i></p>	<p>Brownfields research activities will address sustainability issues; however, the shift to nanotechnology will reduce the research program activities in hazardous waste management.</p>	<p>Final MYP Jan. 2007</p>
<p><i>(D4): Update key technology documents related to landfill design. ORD could collaborate with the geosynthetic industry to help fund such work.</i></p>	<p>A new CRADA is in development to investigate GCL cover performance problems that appear to stem from ion exchange processes. Little financial support has been offered by the industry for obvious reasons. Other landfill design issues will be evaluated and prioritized during the upcoming MYP revision</p>	<p>Final MYP Jan. 2007</p>

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	process.	
<i>(D5): Identify within the Land MYP the mechanisms for tracking progress for specific projects with respect to the LTGs.</i>	The ORD management has quarterly reporting for progress toward completing APMs and APGs which lead to addressing LTGs. These reports are forwarded to the NPDs and the DAA for Management. Management is held accountable for completing scheduled milestones.	Ongoing
<i>(E1): Identify a process for acquiring or developing key leaders for those programs where clear leadership may be lacking. Such leadership should be reflected in personnel, as well as programs. Particular emphasis should be given to leadership in emerging fields.</i>	ORD has a hiring process in place to add senior scientists to lead emerging or high priority research areas.	Done
<i>(E2): Describe or develop mechanisms for identifying mature research fields, emerging issues, and/or ensuring that the ORD-planned research is not duplicating efforts being conducted by other government or state agencies or by private industry. This could be guided by external peer review by experts drawn from universities, nongovernmental organizations (NGOs), state agencies, and private industries</i>	This is an ongoing issue that we will continue to address. Addressing customer research needs, collaboration of research efforts, and limiting duplication of research are always of concern in this research area (see response to 1c and 3a).	Final MYP Jan. 2007
<i>(E3): Enhance ORD's position as a global leader by encouraging continued participation in international panels and meetings.</i>	Agree.	Done
<i>(E4): Ensure that funding is directed toward areas in which large gains in understanding can be made through research. This involves favoring research areas that are new or emerging over mature areas of research. The BOSC recognizes the balance that must be struck between new research and technical assistance.</i>	Agree. The shift to nanomaterials, in part, addresses this comment. This is a problem-driven research program where importance is placed on addressing customer research needs. Every year new issues are brought forward, e.g. vapor intrusion into homes, ground water – surface water contamination, Brownfields, animal carcass disposal, where we shift the research program and partner with OSWER to address the issue.	Final MYP Jan. 2007

