



HANFORD NATURAL RESOURCE TRUSTEE COUNCIL



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(non-voting)

November 23, 2016

TO: Doug Shoop, U.S. Department of Energy, Richland Operations Office

RE: Fiscal Year 2016 Activity and Accomplishment Report

I am pleased to transmit the enclosed Fiscal Year (FY) 2016 Activity and Accomplishment Report on behalf of the Hanford Natural Resource Trustee Council (HNRTC). This report summarizes the Hanford Natural Resource Damage Assessment (NRDA) activities and accomplishments for FY 2016. The report is organized by the key work breakdown structure elements that were established for planning, budgeting and scheduling the Hanford NRDA project and subsequent progress reporting. These elements include Assessment Planning, Injury and Service Loss Studies, Restoration Planning, Technical Analysis, Project Management, Information Management and Administration.

Please contact me if you have questions regarding this report, or if you need additional information.

Sincerely,

/s/ Troy Baker

Troy Baker
Chair, Hanford Natural Resource Trustee Council

Cc: HNRTC Senior Trustees

Enclosure

FY 2016 Hanford Natural Resource Damage Assessment

Activity and Accomplishment Report

Summary

This report provides a summary of the Hanford Natural Resource Damage Assessment (NRDA) activities and accomplishments during FY 2016. The report is organized by the key work breakdown structure (WBS) elements that were established for planning, budgeting and scheduling the Hanford NRDA project and subsequent progress reporting. These elements include Assessment Planning, Injury and Service Loss Studies, Restoration Planning, Technical Analysis, Project Management, Information Management and Administration. See Figure 1 for the project WBS.

Hanford NRDA work in FY 2016 was focused on 11 injury/restoration studies that are in various stages of completion. The studies are based on the Injury Assessment Plan (IAP) approved by the Hanford Natural Resource Trustee Council (Council) in 2013. The Council goal is to complete the injury assessment and prepare a Restoration Plan by 2024. Planning efforts resulted in an update of the Hanford NRDA Project Execution Plan (PEP). The PEP defines the overall work scope, schedule, and budget for the Hanford injury assessment and establishes the means to execute, monitor, and control the project in a disciplined manner. The PEP is a “living document” that is updated annually based on actual budgets and new information gained from the injury assessment process. Actual funding over the last few years has been less than requested which has constrained the assessment process.

The Council has prioritized the list of studies from the IAP which are subject to the funding availability. Implementation of the IAP is a dynamic, iterative process and the list of studies is subject to change as additional data becomes available during the injury assessment process.

Initial injury studies are in various stages of completion. Final reports summarizing results of a Groundwater Contaminant Plume Mapping Study and Mussel Toxicity Study conducted by the United States Geological Survey (USGS) are in the process of being finalized. A terrestrial disturbance inventory geodatabase and report were completed for two operable units (100-F and 100-B/C). Other studies that are in various stages of completion include: Three Tribal Service Loss Studies; Near Shore Aquatic; Evaluation of Contaminant Concentrations in Soils of Non-process Areas; Habitat Recovery Analysis/Restoration Planning; and Groundwater Policy/Injury.

A revised Memorandum of Agreement (MOA) was approved by the Trustees in FY2016. The MOA supersedes the 1996 Hanford Site Trustee MOA. The MOA provides the framework for coordination and cooperation of the Trustees in conducting the NRDA at Hanford.

The Council continued to meet on a monthly basis to plan, organize, implement, and direct Hanford NRDA activities. The Administrative Record Procedures Manual was revised to be more consistent with regulations and their intent.

A new model for conducting technical work was adopted on a trial basis. This new model provides a shift to a project management approach by dissolving existing technical work groups (TWGs) and creating project teams. The new structure is intended to increase accountability, continue to integrate technical work into the Council work plans and reduce redundancy of meetings caused by the overlap of participating in TWG and Council meetings.

Senior Trustees began to meet more frequently to review status and provide guidance to the Council on various issues. Project teams also met on a regular basis to assist in study development, oversee studies, review environmental/contaminant release data, and make recommendations to the Council.

1. Assessment Planning

The Council continued the ongoing process of reviewing, refining, and prioritizing injury assessment studies. A near term goal is to fund and make substantial progress on studies involving the analysis of existing data by the end of FY 2016.

2. Injury and Service Loss Studies

The following injury studies were at various stages of completion in FY 2016:

a. Evaluation of Hanford Groundwater Contaminant Plume Mapping

This study was initiated in FY 2012, and was performed by the United States Geological Survey (USGS) under a contract with the United States Fish and Wildlife Service (USFWS). The purpose of this study was to evaluate whether the groundwater data being gathered by DOE, and therefore the Hanford groundwater plume map contours being made from that data, were reliable enough to be used for determination of groundwater injury. The USGS independently used DOE groundwater data to develop groundwater contaminant plume maps for selected areas of the Hanford site, compared the DOE plume contours to the ones developed by the USGS, assessed the uncertainty of the resulting information and provided an initial assessment of the adequacy of existing contaminant plume maps at Hanford for the Trustee needs. A draft report was issued a few years ago for Trustee review, and those results have been presented to trustees; based on trustee questions and comments, and a revised, final report is expected to be made available to Trustees in October 2017. The conclusion of the report was that the plume contours presented in the USGS draft materials appear generally consistent with existing DOE plume maps.

b. Effects of Hexavalent Chromium and Other Stressors on Native Mussels

The objectives of this study were to (1) propagate the native mussel (western pearlshell) for conducting laboratory toxicity tests, and (2) evaluate acute and chronic toxicity of Cr (VI) to the pearlshell and a commonly tested unionid mussel (fatmucket, *Lampsilis siliquoidea*) with or without a co-stressor of temperature, zinc, or nitrate. In addition, chronic Cr tests were also conducted with fatmucket and amphipod (*Hyaella azteca*).

The US Environmental Protection Agency (USEPA) acute water quality criterion (WQC) for Cr (VI) of 16 µg/L was far below the effective concentration (EC)50s for both mussel species in the four acute exposures with or without a co-stressor. However, at elevated temperature or NO₃, the 14-day EC20s for survival of the pearlshell and fatmucket from the 2013 chronic Cr test and the 28-day EC20s for fatmucket biomass from the 2014 chronic Cr test were close to the chronic WQC for Cr (VI) of 11 µg/L. The 28-day EC20s for amphipod biomass at 20°C (without a co-stressor) and with elevated Zn were about equal to or below the chronic WQC.

In summary, newly transformed juvenile western pearlshell were successfully cultured in the laboratory over two seasons for acute toxicity testing, but the grow-out of juveniles for up to 5 months in culture (reaching a suitable size of >1.0 mm for chronic toxicity testing) was less successful. Acute 96-hour Cr (VI) toxicity tests were successfully completed with newly transformed juvenile pearlshell and fatmucket following the standard test methods (ASTM 2015a). The commonly tested fatmucket was more sensitive to Cr than the pearlshell with or without a co-stressor of elevated temperature, Zn, or NO₃ in the acute exposures, indicating that fatmucket can be a surrogate that would be protective of acute Cr toxicity to the pearlshell. Elevated temperature of 27°C increased the acute Cr toxicity to both mussel species, but elevated Zn of 50 µg/L or NO₃ of 35 mg/L in test water did not influence the acute Cr toxicity to either mussel.

Two chronic 28-day tests conducted in 2012 and 2013 with the pearlshell and fatmucket failed likely due to poor quality of test organisms. A repeat chronic 28-day Cr test with fatmucket and the Cr-sensitive amphipod was successfully completed in 2014. The results of the chronic tests indicate that the elevated temperature or elevated NO₃ increased chronic Cr toxicity to fatmucket, but the elevated Zn did not. In contrast, the elevated Zn increased the chronic Cr toxicity to the amphipod, but the elevated temperature or NO₃ did not. Acute Cr effect concentrations for the pearlshell and fatmucket tested at 20°C and in association with a co-stressor of elevated temperature, Zn, or NO₃ were far above the USEPA acute WQC for Cr (VI), whereas chronic Cr effect concentrations for fatmucket tested at the elevated temperature or elevated NO₃ were about equal to the chronic WQC. Chronic Cr effect concentrations for the amphipod tested at elevated Zn were below the chronic WQC.

c. Near Shore Aquatic

Planning and analysis for the Near Shore Aquatic Study continued through the year. A draft of the Near Shore Aquatic Study Work Plan was presented to the Council in June. The primary products from this study will contribute information to supplement the injury assessment plan and the data gaps report. Key tasks in the work plan include:

- Develop and formalize consensus on using parts of the Stratus Conceptual Site Model (CSM) and other Hanford products for aquatics.
- Construct a polygon boundary in the riparian and wetted portion of the Columbia River near the 100-F area. Assess suitability of the polygon as the initial work area.

- Compile examples of written material describing injury layer approaches from other settled NRDA's, especially in situations where cultural and ecological evaluations have been presented together.
- Develop working definitions/WLAs for nearshore, riparian, islands and other key terms, etc.
- Consider whether ordinary high water mark is the suitable upper riparian "boundary" for nearshore aquatic as a WLA, and whether islands are "terrestrial" or considered part of "nearshore".
- Prepare a NRDA Contaminant of Concern (COC) threshold memo for all aquatic rads combined.

d. Evaluation of Contaminant Concentrations in Soils of Non-process Areas

The purpose of this study is to fill existing gaps in Council understanding of the nature and extent of COCs in the surficial soils of non-process areas. Information from the study will be used to assess terrestrial injury for the NRDA. In the fall of 2015, a subgroup met several times to discuss the purpose and scope of the study, and ultimately decided to make these decisions and others via the Data Quality Objective (DQO) process.

Consequently, Council funds were approved for a facilitated DQO process, which began in July 2016. A DQO report is expected in December 2016 and will be presented to Council. The Council will then decide whether to proceed with a study plan and scope of work. If the Council approves funding for soil sampling, it will probably not commence until FY 2018.

e. Inventory of Terrestrial Habitat Disturbance

The purpose of this study is to provide an inventory of terrestrial soil disturbance on the Hanford site as a result of various activities such as remediation, operations and

pre-Hanford activities. The disturbance inventory geodatabase and report were completed for two operable units (100-F and 100-B/C). The geodatabase provides a synthesis of information related to the type, quantity, extent, and chronology of disturbance in the 100-B/C and 100-F Areas of the Hanford Site. The geodatabase, layers, and visualizations were completed and uploaded to the Council Data Management System. The disturbance inventory geodatabase is capable of managing subcategories of disturbance information to allow analysis on spatial and temporal bases for injury to a high level of detail. These products will inform Council decisions, support terrestrial study planning, injury scaling, sensitivity analysis for disturbance factors, cost/benefit analyses, and potential Habitat Equivalency Analysis (HEA) quantification. The geodatabase will support other terrestrial studies, and allow assessment of the level of detail necessary to assess injury or make decisions at 100-F and 100-B/C. Completion of all operable unit inventories were approved by the Council for continuation of the project for the rest of the 100, 200, and 300 areas.

f. GW Policy/Injury

The focus of this study is to describe the services provided by groundwater under baseline conditions at Hanford and how services may have been adversely impacted by contaminants. This work will also include quantifying the nature, extent, and duration (past and future) of groundwater contamination at Hanford.

Accomplishments/results for the year include:

- Tabulated year to achieve maximum contaminated level/water quality standard for 12 contaminants of concern using contaminant mass removed from active pump and treat operations.
- Listed possible continuing sources of contaminants from the vadose zone for prediction of future contaminant movement to groundwater.

- Developed a map view of the groundwater plume with Hanford Operations both with and without contamination. Contamination due to Hanford Operations reduced the uncontaminated groundwater by approximately 45 %.

Issues requiring Council resolution include:

- Need to obtain agreement on groundwater baseline services both legally and economically.
- Need to identify and scale appropriate restoration projects to restore or replace lost services.

Remaining work and schedule for FY 17 include:

- Apply present and future contaminated groundwater volume to service loss.
- Tie groundwater service losses to predicted future land use, long term stewardship and use of institutional controls.
- Develop Washington stewardship interest in protecting availability of groundwater resource for potential beneficial use.
- Solicit other Trustees' input into groundwater service loss.
- Develop white paper to address institutional, policy, legal, economic, and hydrological factors that delineate how groundwater will have been used absent contamination.

g. Tribal Lost Service (TLS) Studies

The three Hanford tribal trustees [Yakama Nation (YN), Nez Perce (NP) and Confederated Tribes of the Umatilla Indian Reservation (CTUIR)] have each initiated studies to determine the nature and extent of potential impacts of Hanford releases on the cultural services provided to tribal communities by natural resources. These services may have been diminished in quality, or interrupted by the presence of contaminants released by Hanford Operations. The CTUIR study is initially focused

on the 100-F Area to analyze existing data for evidence of residual injury and to develop and test injury assessment methodologies. The YN study is more comprehensive in nature and addresses areas of the Hanford site traditionally used by them.

i. YN

The YN TLS study assesses the nature and extent of tribal services that have been lost and are expected to be lost in the future due to natural resource injury associated with Hanford contaminant releases. Natural Resources in the Hanford assessment area provide many services to tribal members in ways that are distinct from the general public, including: social, traditional, religious, cultural, spiritual, medicinal, recreational, and subsistence. Data will provide a basis for determining baseline tribal services by which the compensable value of losses can be determined and quantified.

Goals met include:

- Development and maintenance of document database for easy retrieval of pertinent documents and other data.
- Development and maintenance of a Geographic Information System (GIS) geodatabase for all geographic information.
- Attend/participate in trainings, professional meetings, and intertribal discussions for NRDA and TLS.
- Kept YN Upper management/leadership informed of progress of TLS study.

Goals partially met include:

- Identify injured &/or missing traditional natural resources based on Yakama Nation ecological studies, Traditional Ecological Knowledge, and Oral History through Ethnographic Study.
- Identify the nature and extent of services natural resources currently present and historically present on the Hanford Site provided to YN Tribal members.
- Evaluate the cultural landscape of the Hanford Site to determine places that provide unique services through a Traditional Cultural Property (TCP) study.

Goals not met

- Develop and conduct a traditional plant survey.

ii. NP

The NP study finished the 2nd year of the 3 year study to establish the baseline and possible injury for cultural service loss. Data collection, both written and verbal, is almost complete and the study will be entering the analysis stage this coming year.

iii. CTUIR

The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) are currently engaged in Phase 2 of its Tribal Lost Services Study for the 100-F Area pilot project. The purpose of this study is to identify potential injury to natural resources and the related lost use of services provided by those resources that are specific to members of the CTUIR. The ultimate objective is to expand the analysis conducted for 100-F to the rest of the Hanford Site.

As of the end of September 2015, all of the data for the 100-F area has been collected, mapped, and stored in the database for this pilot project. In Phase 2 of the study, which has taken place throughout FY2016, the data and associated references have been mapped using a GIS platform. The layers for the interactive ArcGIS website include: waste sites, wildlife and vegetation, groundwater monitoring wells, soil samples, and RI/FS exposure risks for contaminants of potential concern.

The next step of the project is to assess the impact to natural resources and the services they provided at this site due to the release of contamination, along with the cleanup activities associated with remediating the contamination. This requires a cultural layer for the GIS platform, which is still under development. Ultimately, the results will be mapped over the entire 100 F Area to show where there is a loss of cultural services due to contamination and cleanup activities that have adversely affected the natural resources in the area.

h. Injury Threshold Analysis

The focus of this project is to develop injury based thresholds for contaminants of concern (COCs) as identified by Trustees. This involves the preparation of technical reviews and reports, delivered to Trustees through Webinars, Meetings, and Memos.

Accomplishments/results for the year include:

- Delivered Webinar on methodologies used for preparing threshold memos.
- Distributed to Trustees drafts of 8 COC memos; U, Sb, Cr6, Pb, Cu, As, Cd, Zn.
- Delivered Workshop on the memos, with focus on U, Cr6, and Pb.

- Prepared an introductory document which outlined the background, theory, assumptions, and methodology used in developing the thresholds.
- Prepared 11 Working Level Agreements (WLAs) which guide the technical approaches to developing the thresholds and the structure of the memos.
- Distributed revised version of Pb memo based on Trustee comments and the WLAs.

Issues requiring Council resolution include:

- Need to obtain agreement on definitions and implications of background and baseline.

Remaining work and schedule for FY17 and beyond:

- Review existing Hanford environmental datasets against screening level thresholds to refine and prioritize additional COCs for further evaluation.
- Update existing COC memos (U, Sb, Cr6, Cu, As, Cd, Zn) to reflect the WLAs and Trustee comments.
- Prepare memos for additional COCs as identified by Trustees - currently, Ba, B, Pu, and total Rad.
- Review and propose methods for translating thresholds into injury curves relating to service loss.

3. Technical Analysis

This element includes work planned and conducted by the Council and project teams. Project teams met on a regular basis to assist in study development, to review and analyze existing Hanford environmental/contaminant data, and to make recommendations to the Council for action. Results of these efforts are reflected in the status of injury/restoration studies discussed in other sections of this report.

4. Restoration Planning

Shrub-Steppe Habitat Recovery Analysis and Restoration Planning

The goal of the study was to collect and analyze information on past and current habitat conditions of disturbed, revegetated and habitat enhancement areas on the Hanford Site (including the Arid Lands Ecology Reserve, McGee Ranch-Riverlands, Saddle Mountain, and Wahluke Units, in addition to the central DOE-managed areas) as well as conduct a literature review and identify reference sites and conditions to support a variety of restoration planning actions that had been outlined in the Restoration TWG work plan. The study does not aim to identify the current condition of all habitats across the Hanford Site, but collate and analyze data from sites that are recovering from disturbance

Over 150 references were compiled on restoration and remediation activities on and off the Hanford Site in shrub-steppe habitats. As available, from each reference the following was collected: site location, area, initial conditions; goals of restoration; required regulatory actions for remediation or restoration; restoration or remediation activities including seeding, weed control, irrigation, and month and year initiated; number of years of monitoring; and, metrics collected to define success. In addition to published literature, experts were contacted to collect any unpublished data or “grey literature” as well as their best professional judgment on restoration in shrub-steppe habitats.

Databases were created summarizing findings for central DOE-managed Hanford (bin 1), ALE and the Monument Lands (bin 2), and outside Hanford (bin 3). An annotated bibliography was drafted of all references for each bin.

All metrics were compiled from the literature and categorized into two categories, those needed for creating a framework for an NRDA case and those used when doing on the ground restoration. A state and transition model framework was developed to assess services restored and credits for restoration activities in terrestrial shrub-steppe

habitat adapted for conditions found at Hanford. Two Council working level agreements were established: 1) for our framework (2016-WLA-17) and 2) for the metrics used to define the states in the model (2016-WLA-16).

Available data was analyzed for the 99 central DOE-managed Hanford sites and sites were categorized based on precipitation, starting conditions, and number of years monitored. Samples were then randomly selected to analyze based on those categorizes. Percent cover was calculated over for each of our five metrics used in the state and transition model (native shrubs, native perennial grasses, native forbs, total non-native cover, and cheatgrass) for each of the 28 selected sites. The same five metrics were analyzed where possible for all sites in bins 2 and 3.

Where data was available, recovery curves were developed for each bin for each metric and linked to the states in the state and transition model. Data gaps were identified.

Phase II of the study was also initiated. A literature review was performed of landscape metrics and a database was compiled of the following: landscape metrics; services, species, and habitat type influenced by each metric; support for influence (professional judgment or data); and, reference source. References used for this task were included in the annotated bibliography noted above.

Four sites were visited in October 2015, November 2015, January 2016, and June 2016 and the study team met with regional experts to gain knowledge of shrub-steppe ecosystems.

Results to date will be written up in a white paper. The study team plans to complete a compiled draft by October 31, 2016, and a final draft by mid-November to the Council.

A data gap exists from about 5 years post restoration activities until restoration is complete, likely decades. The team has proposed 2 paths forward, a Space for Time substitution study with expert advice, or an Expert Panel. These options will be further explored and fleshed out with the Council in FY2017.

In the second phase of study 18b, the study team is proposing to fill remaining data gaps and begin restoration planning. More specifically, the team will be prioritizing shrub-steppe services for NRDA purposes; recommending restoration and long-term habitat management approaches for incorporation into the Restoration Plan; developing crediting templates; and examining some of the benefits and drawbacks for conducting shrub-steppe restoration/preservation either on or off site.

5. Project Management

This element includes staffing for the Council, Project Coordination and Trustee Management Oversight. The Council met on a monthly basis to plan and oversee Hanford NRDA activities. The FY 2017 budget request was developed and submitted to US DOE in March, 2016. A key Council objective for FY 2016 was to fund and make substantial progress on injury studies focused on analysis of existing data. Current year funding/costs were reviewed on a routine basis.

Strategic planning which was initiated in FY 2012 resulted in the completion of a Project Execution Plan (PEP) during 2014. The PEP defines the overall work scope, schedule, and budget planned for the Hanford injury assessment over the next 10 years. The PEP is designed to culminate in a Restoration Plan which will quantify damages and outline restoration projects for the Site. The Council may also choose to prepare a “Report of Assessment” that outlines the results of the injury assessment phase. The PEP continues to be reviewed and updated annually.

A new model for conducting technical work was adopted on a trial basis by the Council. This new model provides a shift to a project management approach by dissolving existing

technical work groups (TWGs) and creating project teams. The new structure is intended to increase accountability, continue to integrate technical work into the Council work plans and reduce redundancy of meetings caused by the overlap of participating in TWG and Council meetings.

The Council has adopted a number of working level agreements throughout the year. WLAs are non-binding decisions that shape the direction of future work, and generally move the Council forward toward developing the NRDA narrative. While WLAs are non-binding, there is a shared expectation among trustees that any trustee that determines to later withdraw support for a WLA will provide the rationale for this change of mind.

Jack Bell, NP was chair of the Council for FY 2016 and Troy Baker was vice-chair. Matthew Johnson, CTUIR was elected as vice chair for FY 2017.

6. Information Management

The purpose of this activity is to implement, operate and maintain a data management system (DMS) as outlined in the Data Management Plan approved by the Council. This includes: (1) implementing, operating and maintaining a DMS and (2) providing the following functions: data management; document management; GIS and non-GIS data stewardship; QA and data access coordination. The goal of this data management effort is for the DMS contractor, Trustees, other DOE contractors, and research organizations to collaboratively maintain a working database for assessing potential injury to natural resources and the services they provide, resulting from releases of hazardous substances from the Hanford Site.

The Council has contracted with MSA to provide a DMS through its subcontractor, ddms, in FY2016. The DMS is referred to as Project Portal and has the capabilities to store and retrieve documents, images, environmental data, GIS data, and Calendar/Schedule functions. The DMS is password protected and up to 40 users are authorized to access the system. To manage the DMS the Council has contracted with Freestone Environmental Inc. for a half-time Data Manager/QA Coordinator position. This position will assist Project Leaders and

contractors with import and export of data from the DMS along with acquisition of data from outside sources. The Council has approved data acquisition policies and procedures for uploading data and documents.

7. Administration

The Trustees were assisted in FY2016 by a professional facilitator, a technical assistant for administration, and a technical assistant for website support. The facilitation team assisted the Council in coordinating and conducting Council meetings and maintaining Council records. Specific tasks included scheduling meetings, preparing agendas, tracking action items, issuing meeting materials, facilitating meetings, overseeing the Council website, designing and implementing the administrative record section of the Council website, and supporting the Council in issue resolution. Process improvements continue to be realized for record keeping and general operations of the Council including planning and operations.

Figure 1 - Hanford NRDA Project Work Breakdown Structure

