

CH2M HILL Plateau Remediation Company  
**ADMINISTRATIVE DOCUMENT PROCESSING AND APPROVAL**

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I. Reviewers	Yes	Print	Signature	Public Y/N (If N, complete J)
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J. Comments

Information Clearance Approval

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**APPROVED**  
By Lana Perry at 11:09 am, Jun 05, 2017

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# Summary Analysis: Hanford Site Composite Analysis Update

Prepared for the U.S. Department of Energy  
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy  
under Contract DE-AC06-08RL14788



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# Summary Analysis: Hanford Site Composite Analysis Update

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Date Published  
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P.O. Box 1600  
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**APPROVED**

*By Lana Perry at 11:11 am, Jun 05, 2017*

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Release Approval

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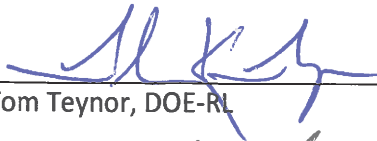
# Summary Analysis

## Hanford Site Composite Analysis Update

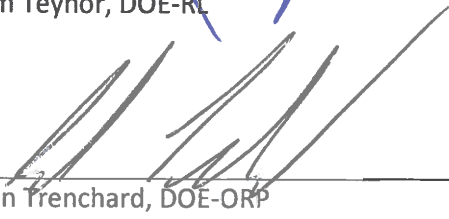
April 25, 2017

Revision 0


Approval of Summary Analysis / Authorization, by:

  
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Tom Teynor, DOE-RL

May 2, 2017  
Date

  
\_\_\_\_\_  
Glen Trenchard, DOE-ORP

5-10-17  
Date

  
\_\_\_\_\_  
Michael Cline, DOE-RL

5/2/2017  
Date



## Introduction

This Summary Analysis has three primary purposes:

1. Define the overall technical scope and approach for conducting the Hanford Site CA update.
2. Define the approach for complying with modeling requirements in the Williams (2012) memorandum.
3. Serve as the mechanism for the Groundwater Vadose Zone Executive Council to review and approve the overall modeling approach for the Hanford Site CA.

The Hanford Site's currently maintained Composite Analysis, originally completed in 1998, requires an update. A previous update effort was undertaken by the U.S. Department of Energy (DOE) in 2001-2005, but was ended before completion to allow the Tank Closure & Waste Management Environmental Impact Statement (TC&WM EIS) (DOE/EIS-0391) to be prepared without potential for conflicting site-wide models. This EIS was issued in 2012, and the deferral was ended with guidance in memorandum "Modeling to Support Regulatory Decisionmaking at Hanford" (Williams, 2012) provided with the aim of ensuring subsequent modeling is consistent with the EIS. In 2015, DOE in memorandum "Review of Richland Fiscal Year 2013 Annual Summaries for 200 West and 200 East Burial Grounds, Composite Analysis, Environmental Restoration Disposal Facility, and Integrated Disposal Facility" (Gilbertson and Marcinowski, 2015) requested:

"CA for the Central Plateau: It is understood that while the PAs for the tank farms are being completed and other Central Plateau PAs are being revised, that the Tank Farm Closure & Waste Management Environmental Impact Statement will be a substitute for the Central Plateau CA. However, as soon as the relevant PAs are complete, the CA will be revised to account for all of the new information. Please provide the LFRG Co-Chairs the schedule for the preparation of the CA. Continued planning and careful maintenance of records in anticipation of the CA revision will be monitored by the LFRG."

### CURRENT HANFORD SITE COMPOSITE ANALYSIS

The current (last updated in 2001) Hanford Site Composite Analysis is comprised of:

- PNNL-11800, *Composite Analysis for Low-Level Waste Disposal in the 200-Area Plateau of the Hanford Site* (1998), and
- PNNL-11800-Addendum-1, *Addendum to Composite Analysis for Low-Level Waste Disposal in the 200 Area Plateau of the Hanford Site* (2001)

The Hanford Site Composite Analysis supports the following Hanford Site Performance Assessments (PAs) and the disposal authorization statements based on these assessments:

- 200-West Low-Level Burials Grounds PA (operating disposal facility) – PA issued in 1995 (WHC-EP-0645), with addendum in 1996 (HNF-SD-WM-TI-798)

- 200-East Low-Level Burial Grounds PA (operating disposal facility) – PA issued in 1996 (WHC-SD-WM-TI-730), with addendum in 1998 (HNF-2005)
- Environmental Restoration Disposal Facility PA (operating CERCLA disposal facility) – PA issued in 2013 (WCH-520)
- Immobilized Low-Activity Waste PA (now the Integrated Disposal Facility; future disposal facility) – PA issued in 2001 to enable construction (DOE/ORP 2000 24)

These analyses, required under DOE O 435.1 Chg 1, *Radioactive Waste Management*, were approved by DOE Headquarters and give the basis for the Hanford Site's Low-Level Waste Disposal Authorization Statement (Frei, 2002). The completed PAs and Composite Analysis have been maintained under approved maintenance plans. Work was conducted from 2000 to 2005 to produce a revised Composite Analysis, but this analysis was not completed at DOE direction following the settlement agreement for the Hanford Solid Waste Environmental Impact Statement.

### DEFERRAL PERIOD IMPACT ON HANFORD SITE MODELING

DOE directed in 2005 that all updates to Hanford Site DOE O 435.1 PAs and Composite Analysis were to be deferred until the TC&WM EIS (DOE/EIS-0391) was completed. Consequently, the update of the Hanford Site Composite Analysis that would have been submitted in 2006 was set aside, and an update was deferred until the TC&WM EIS was issued.

During the deferral period (2005-2012), annual summary reports required under the Composite Analysis maintenance plan were prepared that reported additional changes in information affecting the basis for the Composite Analysis.

With the issue of the Final TC&WM EIS in 2012, this deferral period ended. DOE issued direction (Williams 2012) lifting the deferral but requiring that modeling for Hanford Site decision-making (including PAs and the Composite Analysis) use the models developed for the TC&WM EIS as a starting point, and further requiring that departures from that baseline be identified and justified in order to assure consistency is maintained with the NEPA compliance provided by the TC&WM EIS.

### NEED FOR UPDATE TO THE COMPOSITE ANALYSIS

Three PAs are currently in preparation at the Hanford Site:

- Waste Management Area C PA (for tank residuals) – submittal planned for 2016
- Integrated Disposal Facility PA – submittal planned for 2017
- Waste Management Area A-AX PA (for tank residuals) – submittal planned for 2018

Other PAs will be prepared in the future as other tank farms approach closure. In addition, the 200 East and the 200 West Low-Level Burial Ground PAs are two decades old, and need to be updated. A plan for this update is under development.

The updated Composite Analysis will consider new information for inclusion in the evaluation:

- Information provided in the TC&WM EIS, 2012
- Information reported in the Annual Summary Reports (ASRs), 2002 to the present
- Updated modeling software and analysis tools
- DOE quality assurance requirements, applicable since 2006

The updated Composite Analysis that incorporates this new information will support risk-informed cleanup decisions with a site-wide context.

## Proposed Approach

This Summary Analysis document provides a high-level narrative for the update to the Hanford Site Composite Analysis (CA). This update will be prepared in compliance with U.S. Department of Energy (DOE) Guidance provided in Williams (2012). This guidance requires use of a phased approach to plan, scope and conduct vadose zone and groundwater modeling analyses at the Hanford Site, including the CA. This phased approach includes:

- Planning Phase - identification of modeling requirements;
- Scoping Phase - development of specific requirements and new information to identify the degree to which the modeling platform developed for the *Final Tank Closure and Waste Management Environmental Impact Statement for the Hanford Site, Richland, Washington* (TC&WM EIS) (DOE/EIS-0391,) meets modeling requirements; and
- Analysis Phase - conducting modeling efforts within scope.

The purpose of the Hanford Site CA is to meet the requirements of DOE Order 435.1 Chg 1, *Radioactive Waste Management*. DOE Manual 435.1 Chg 1, *Radioactive Waste Management Manual*, requires a composite analysis be prepared to support Performance Assessments (PAs), which in turn are required to demonstrate the protection of human health and the environment of low-level radioactive waste disposal facilities. In this instance, the Hanford Site CA supports the following Hanford Site PAs:

- 200-East Low-Level Burial Grounds (LLBGs)
- 200-West LLBGs
- Environmental Restoration Disposal Facility (ERDF)
- Integrated Disposal Facility (IDF)
- Waste Management Area C (WMA C)
- WMA A/AX

The operation of the LLBGs and ERDF, future disposal at the IDF, and closure of WMA C all depend on a Disposal Authorization Statement (DAS), which in turn depends on the preparation and maintenance of a CA.

Preparing an update to the Hanford Site CA is a major undertaking of considerable complexity. Therefore, the scoping phase has been segmented into two steps: first, to define the key aspects of the CA update, and second, to define the detailed technical approach for all of the major facets of the analysis. Accordingly, the Summary Analysis is also being provided in two stages, reflective of these steps. This Summary Analysis documents the identification of key aspects of the CA update and the proposed technical approach for each major facet of the CA update. It will be submitted to the Hanford Site Groundwater/Vadose Zone Executive Council for concurrence before work begins on the second step, development of the detailed technical approach.

The first scoping step for the Hanford Site CA update, culminated in a “Key Aspects” workshop conducted in May 2016. This workshop facilitated participation in scoping decisions by, and collected input from, the DOE Low-Level Waste Disposal Facility Federal Review Group (LFRG), DOE Headquarters (DOE HQ), as well as senior managers from the DOE Richland Operations Office (DOE RL) and the Office of River Protection (DOE ORP). Since the initial CA was completed in 1998 (PNNL-11800) with an addendum in 2001 (PNNL-11800-Addendum-1), numerous technical investigations and modeling efforts have been completed on the Hanford Site Central Plateau as detailed in annual status reports prepared under the CA maintenance program. Technical understanding of vadose and groundwater movement has improved further since publication of the TC&WM EIS in 2012 (DOE/EIS-0391), particularly with respect to understanding of hydraulic behavior of the Gable Gap area as the water level of the unconfined aquifer continues to recede to pre-operational levels. Prior site-wide modeling studies (initial CA, incomplete 2006 CA, and the TC&WM EIS) all had significant differences in scope and approach. Therefore, the scoping process for the CA update was structured in two steps to determine first the key aspects of the analysis with DOE guidance, and then subsequently to develop the detailed technical approach. In the first step, key overarching questions on items such as the extent of sources to include, approaches to screening contaminants and waste sites for detailed evaluation, location of reporting boundaries, periods of analysis, location and characteristics of receptors were posed and proposed key aspects were recommended. A “Key Aspects Scoping Workshop” was conducted on May 25 and 26, 2016 where consensus was reached on the majority of the questions and approaches. This workshop was attended by representatives of DOE HQ; LFRG leaders; Performance Assessment leads from DOE RL and DOE ORP; CERCLA/RCRA cleanup program managers from DOE RL and DOE ORP; and technical managers from CHPRC.

The consensus with regard to the guidance provided in Williams (2012) is that the scope of the evaluation should be determined first, and only after that will appropriate tools (software, models, databases, etc.) to perform the work be selected. Therefore, the tools available to complete the CA scope as identified in the outcomes of the Key Aspects Scoping Workshop (including those available from the TC&WM EIS), were assessed for applicability during the second phase of scoping, development of the technical approach.

The second step culminated in a “Technical Approach” Workshop conducted in March 2017. In this workshop, the proposed technical approach to meet the scope (as identified in the first workshop) was presented and discussed. Adjustments to the proposed approach were considered, based on feedback received from workshop participants, which included the DOE Headquarters (DOE HQ) as well as

managers from DOE RL and DOE ORP. DOE and contractor representatives of each of the PAs supported by the Hanford Site CA were also invited and participated in this workshop. The technical approach presented in the workshop, and summarized in this Summary Analysis, is supported by a series of Technical Approach Description documents that provide more comprehensive information on the proposed approach for each major facet of the CA update:

- CP-60405, *Hanford Site Composite Analysis Technical Approach Description: Vadose Zone.*
- CP-60406, *Hanford Site Composite Analysis Technical Approach Description: Groundwater*
- CP-60407, *Hanford Site Composite Analysis Technical Approach Description: Integrated Computational Framework*
- CP-60408, *Hanford Site Composite Analysis Technical Approach Description: Atmospheric Pathway*
- CP-60409, *Hanford Site Composite Analysis Technical Approach Description: Groundwater Pathway Dose Calculation*
- CP-60410, *Hanford Site Composite Analysis Technical Approach Description: Waste Form Release*
- CP-60411, *Hanford Site Composite Analysis Technical Approach Description: Automated Quality Assurance Process Design*

The elements of this Summary Analysis are:

- The questions defining key aspects of the technical scope and approach for the Hanford Site CA update, the proposed resolution, and the resolution reached in the Key Aspects Scoping Workshop. This element is addressed in Table 1, which provides a summary of the results of the Key Aspects Scoping Workshop. The key question, aspect or topic is listed in the first column. The second column provides the proposed option, while the last column describes if that proposal was accepted by the group and whether there is further research or any additional conditions attached to that acceptance. After considerable discussion on each topic or question, all but one of the proposals were accepted. One topic remained undecided at the end of the workshop and that topic was deferred to the LFRG for resolution. That topic dealt with the time that the compliance period (1,000 years) would commence. The DOE *Radioactive Waste Management Manual* (DOE M 435.1-1) may be interpreted in different ways, for instance, should the period start at the close of all disposal facilities or at the date the site is expected to reach its end state configuration.
- The approach for complying with the Williams (2012) memorandum. This element is addressed in Table 2.
- The modeling tool set to be used and any differences from the TC&WM EIS tool set, based on the information presented and concurred upon in the Technical Approach Workshop. This element is addressed in Table 3.

- The proposed action to be evaluated and any differences from the TC&WM EIS based on the information presented in the Technical Approach Workshop. This element is addressed in Table 4.
- The representation(s) of the natural system and any differences from the TC&WM EIS assumptions and modeling parameters. This element is addressed in Table 5.

**Table 1. Key Aspects, Proposed Approach, and Decisions on Modeling Scope for the Hanford Site Composite Analysis Update**

Key Aspect Topic and Question	Proposed Key Aspect Scope	Resolution – Path Forward
<i>Topic 1-Sources</i>		
<p>Sources – Topic 1 <b>Question 1</b></p> <p>Should the updated CA conduct its own screening for radionuclides to evaluate, or rely on TC&amp;WM EIS and other CAs screening?</p>	<p>Utilize previous work, and then perform additional screening.</p> <p>Screen out radionuclides based on intruder results and on impact to groundwater results.</p>	<p><b>Proposal Accepted.</b></p>
<p>Sources – Topic 1 <b>Question 2</b></p> <p>Should additional screening be performed for waste sites, or use information from past studies?</p>	<p>Perform waste site screening as follows:</p> <ul style="list-style-type: none"> <li>• Start with TC&amp;WM EIS screening as the initial list.</li> <li>• Cross check against databases and evaluate the existing inventory estimates in various databases to verify the basis of initial list estimates.</li> <li>• Include consideration of remedial activities that reduce remaining inventory at waste sites (using the Hanford Site Disposition Baseline)</li> </ul>	<p><b>Proposal Accepted w/Caveat.</b></p> <p>Compare with initial CA and Addendum (PNNL-11800 plus PNNL-11800-Addendum-1) waste site list.</p>
<p>Sources – Topic 1 <b>Question 3</b></p> <p>Should the updated CA consider uncertainty in inventory?</p>	<ul style="list-style-type: none"> <li>• Review and refine uncertainty estimates based on current information.</li> <li>• Include uncertainty propagation in the Hanford Soil Inventory Model (SIM) (note: this work is already underway).</li> <li>• Uncertainty in inventory from past leaks are being evaluated – implement this uncertainty in the SIM.</li> </ul>	<p><b>Proposal Accepted.</b></p>

**Table 1. Key Aspects, Proposed Approach, and Decisions on Modeling Scope for the Hanford Site Composite Analysis Update**

Key Aspect Topic and Question	Proposed Key Aspect Scope	Resolution – Path Forward
<p>Sources – Topic 1 <b>Question 4</b></p> <p>Should the updated CA undertake site-wide mass balance for key radionuclides or only inventory remaining on Central Plateau?</p>	<ul style="list-style-type: none"> <li>• Evaluate inventory estimates in Hanford databases/reports to identify waste sites where key radionuclides were disposed (verify accuracy).</li> <li>• The Hanford Soil Inventory Model (SIM) is being revised and reviewed now for ~400 waste sites and tank farms.</li> <li>• Evaluate WMIS &amp; SWITS databases for ERDF &amp; LLBGs inventory.</li> <li>• Base planned inventory disposed at IDF on Inventory Data Package to support IDF PA.</li> <li>• Use inventory info for US Ecology landfill.</li> </ul>	<p><b>Proposal Accepted w/Caveat.</b></p> <p>Consider original 1998 CA (PNNL-11800) and addendum (PNNL-11800-Addendum-1) 800 waste sites, and bundle extra 400.</p>



**Table 1. Key Aspects, Proposed Approach, and Decisions on Modeling Scope for the Hanford Site Composite Analysis Update**

Key Aspect Topic and Question	Proposed Key Aspect Scope	Resolution – Path Forward
<b>Topic 2 - Remediation/Modeling</b>		
<p>Remediation – Topic 2 <b>Question 1</b></p> <p>Temporal Extent - What is the date when dose reporting is to be evaluated?</p>	<p>Report peak dose for the following key periods:</p> <ul style="list-style-type: none"> <li>• From the present to 2140 (end of longest remedy with a documented decision) for reference purposes;</li> <li>• From 2140 to 3140 for comparison to performance objective (DOE M 435.1-1 1,000-year reporting period); and</li> <li>• From 3140 through 13,140 years (to 10,000 years) for reference purposes.</li> <li>• A sensitivity analysis will be run to determine the peak dose, which may occur after year 13,140.</li> </ul>	<p><b>Unresolved.</b></p> <p>LFRG to discuss as a group and return a determination regarding linking the start of the performance objective evaluation to the end of the longest remedy.</p> <p><i>Note that the technical approach can be developed before this question is resolved (nothing in the approach will be dependent on the specific reporting period definitions).</i></p>
<p>Remediation – Topic 2 <b>Question 2</b></p> <p>How will the analysis address the historic period?</p>	<p>Apply hybrid approach:</p> <ul style="list-style-type: none"> <li>• Use the 1944-forward approach for inventory, waste form release and vadose zone flow and transport in the historic period to provide estimates of vadose zone contamination in the future; and</li> <li>• Use the present-forward approach for groundwater transport (starting from plumes based on present-day monitoring data).</li> </ul>	<p><b>Proposal Accepted w/Caveat.</b></p> <p>Augment this hybrid approach to use present-forward in the vadose zone at those waste sites where adequate characterization data support this approach.</p> <p>(Examples might include 200-WA-1 and 200-EA-1 Operable Unit characterization data.)</p>

**Table 1. Key Aspects, Proposed Approach, and Decisions on Modeling Scope for the Hanford Site Composite Analysis Update**

Key Aspect Topic and Question	Proposed Key Aspect Scope	Resolution – Path Forward
<p>Remediation Topic 2 <b>Question 3</b></p> <p>Spatial extent of the groundwater system?</p>	<ul style="list-style-type: none"> <li>• Site-wide groundwater flow model for hydraulic conditions coupled with a scale-appropriate groundwater transport model using present-forward approach for existing CP contaminant plumes.</li> <li>• Link with 1944-forward vadose zone flow and transport to provide future continuing sources.</li> <li>• Exclude evaluation of River Corridor sources based on restoration achievements, change in groundwater flow direction, and extent of plumes.</li> </ul>	<p><b>Proposal Accepted.</b></p>
<p>Remediation Topic 2 <b>Question 4</b></p> <p>Where will the peak dose be reported?</p>	<p><b>Where:</b></p> <ul style="list-style-type: none"> <li>• <u>Beyond</u> the Central Plateau Inner Area;</li> <li>• <u>Beyond</u> the Central Plateau Outer Area; and</li> <li>• <u>At</u> the Columbia River.</li> </ul>	<p><b>Proposal Accepted.</b></p>

**Table 1. Key Aspects, Proposed Approach, and Decisions on Modeling Scope for the Hanford Site Composite Analysis Update**

Key Aspect Topic and Question	Proposed Key Aspect Scope	Resolution – Path Forward
<p>Remediation – Topic 2 <b>Question 5</b></p> <p>How to account for simulation of remedial actions?</p>	<p>For low-level disposal facilities with a PA, use a PA-Consistent Approach; inventory and releases based on latest available PAs (ERDF, IDF, LLBGs, WMA C).</p> <p>For CERCLA operable units, where remedial decisions are in place, use design information from latest approved Remedial Design. For waste sites and groundwater units for which no remedial decisions are yet in place, assume a (small) range of potential remedial actions. More detail is provided under Topic 2 Question 6, below.</p>	<p><b>Proposal Accepted.</b></p>
<p>Remediation – Topic 2 <b>Question 6</b></p> <p>How should end-states of waste sites be identified?</p>	<p>Conditions of waste sites over time, including end states, will be identified in the Hanford Site Disposition Baseline (HSDS) Rev 1 (currently in development) based on remedial actions taken, remedial decisions made, and anticipated dispositions.</p> <p>For waste sites with an unknown future end-state, the range from maximum to minimum plausible effort alternatives as identified in Appendix B of DOE/RL-2015-10, 2016 <i>Hanford Lifecycle Scope, Schedule and Cost Report</i>, will be simulated.</p>	<p><b>Proposal Accepted.</b></p>

**Table 1. Key Aspects, Proposed Approach, and Decisions on Modeling Scope for the Hanford Site Composite Analysis Update**

Key Aspect Topic and Question	Proposed Key Aspect Scope	Resolution – Path Forward
<p>Remediation – Topic 2 <b>Question 7</b></p> <p>Should pump-and-treat systems be an explicitly included feature of the saturated zone model?</p>	<p>Include pump-and-treat for groundwater flow hydraulic impacts and groundwater contaminant mass removal.</p> <p>Hydraulic impacts would endure until impacts of both the operational period liquid discharges and the remediation period pump-and-treat systems on the unconfined aquifer have past, and this system recedes to pre-operational period water levels.</p>	<p><b>Proposal Accepted.</b></p>
<b>Topic 3 – Scenarios</b>		
<p>Scenarios Topic 3 <b>Question 1</b></p> <p>Should ecological impacts be evaluated?</p>	<p>Ecological impacts will not be evaluated:</p> <ul style="list-style-type: none"> <li>• Remain consistent with 1998 CA;</li> <li>• Evaluation is only required if human dose rates are not adequate to be protective of biota; and</li> <li>• Previous dose projections are very low.</li> </ul>	<p><b>Proposal Accepted.</b></p> <p>Basis of acceptance:</p> <ul style="list-style-type: none"> <li>• No mention of ecological impacts in DOE O 435.1 or implementation documents;</li> <li>• If no language in new Order to require this evaluation, it will not be necessary to include;</li> <li>• Could address ecological impacts qualitatively unless 1) not protective of HH based on all pathways at 100 mrem/year and 2) time dependent</li> <li>• Cover ecological impacts in the cumulative Impact Evaluation (CIE) and point to River Corridor Remedial Investigation reports.</li> </ul>

**Table 1. Key Aspects, Proposed Approach, and Decisions on Modeling Scope for the Hanford Site Composite Analysis Update**

Key Aspect Topic and Question	Proposed Key Aspect Scope	Resolution – Path Forward
<p>Scenarios – Topic 3 <b>Question 2</b></p> <p>Where and when should receptor dose be evaluated?</p>	<p><b>Where:</b></p> <ul style="list-style-type: none"> <li>• <u>Beyond</u> the Central Plateau Outer Area;</li> <li>• <u>Beyond</u> the Central Plateau Inner Area; and</li> <li>• <u>At</u> the Columbia River.</li> </ul> <p><b>When:</b></p> <ul style="list-style-type: none"> <li>• From present to start of 1,000-year evaluation period for reference purposes;</li> <li>• 1,000 year evaluation period for evaluation of performance measures;</li> <li>• 10,000 year period for reference purposes; and</li> <li>• At peak dose (if later than 10,000-year period) based on a sensitivity case.</li> </ul>	<p><b>Proposal Accepted.</b></p>
<p>Scenarios – Topic 3 <b>Question 3</b></p> <p>Can the air pathway be screened out from evaluation based on insignificant dose contribution?</p>	<p>Perform a limited evaluation of the air pathway for only the graphite cores of the site production reactors (shown previously to be the maximum contributors to post-closure air pathway dose).</p>	<p><b>Proposal Accepted.</b></p> <p>[Note: preliminary review has determined that the dose from the air pathway dose in the initial CA, and from PAs, are insignificant, supporting screening the air pathway out of the analysis. However, the limited documentation of the basis for initial CA leads to the recommendation that the air pathway calculation be verified in confirmatory calculations and documented.]</p>

**Table 1. Key Aspects, Proposed Approach, and Decisions on Modeling Scope for the Hanford Site Composite Analysis Update**

Key Aspect Topic and Question	Proposed Key Aspect Scope	Resolution – Path Forward
<p>Scenarios – Topic 3 <b>Question 4</b></p> <p>Can the surface water pathway be screened out from evaluation based on insignificant dose?</p>	<p>Remain consistent with previous CA’s: do not evaluate a surface water pathway (or the associated ecological impacts).</p>	<p><b>Proposal Accepted.</b></p>
<p>Scenarios – Topic 3 <b>Question 5</b></p> <p>Should all previous Composite Analysis and EIS exposure scenarios be evaluated (residential, agricultural, recreational, industrial, and Native American) or should evaluation focus only on required exposure scenarios to meet DOE O 435.1?</p>	<p>Exposure scenarios will be defined in technical approach scoping;</p> <p>Exposure pathways are proposed that align to those used in the recent PAs (ERDF, WMA C, IDF) and that are sufficient for the anticipated exposure scenarios.</p>	<p><b>Proposal Accepted with Additional Exposure Pathway.</b></p> <p>A fish pond / fish consumption pathway was added to the exposure scenario at recommendation of the workshop.</p>
<p>Scenarios – Topic 3 <b>Question 6</b></p> <p>Should the 2019 CA include the same COPCs as used in the 1998 CA and TC&amp;WM EIS or a reduced set of COPCs based on the results of these analyses and recent performance assessments?</p>	<ul style="list-style-type: none"> <li>• Compile list of key radionuclides derived from COPCs identified in the previous composite analyses, EIS, and recent performance assessments;</li> <li>• Evaluate and verify existing inventory estimates from databases and reports to identify where key radionuclides are disposed;</li> <li>• Evaluate list against current knowledge of the site-wide distribution of the identified radionuclides and needs of the exposure pathways to be evaluated;</li> <li>• Use prior analyses transport results to screen out radionuclides that were found insignificant in evaluated pathways.</li> </ul>	<p><b>Proposal Accepted.</b></p>

**Table 2. Proposed Approach to Address Modeling Planning Direction in Williams (2012) Guidance Memorandum in Development of the Hanford Site Composite Analysis Update**

<b>Modeling Planning Direction in Williams (2012) Guidance Memorandum</b>	<b>Proposed Approach to Address Modeling Planning Direction in Updated Composite Analysis</b>
<p>“A phased process shall be followed to plan, scope, and carry out vadose zone and groundwater modeling analyses at Hanford.”</p>	<p>A phased process has been adopted. The planning phase has been completed. The Scoping Phase first stage has been completed with a key aspects workshop held with DOE HQ, DOE RL and DOE ORP and LFRG and Contractor staff. The Scoping Phase second stage will be completed in FY 2017 to develop the detailed technical approach (reflected in this Summary Analysis and supporting Technical Approach Description documents), which will, when adopted, allow the commencement of the Analysis Phase.</p>

“...identify the degree to which the modeling platform developed for the EIS meets modeling requirements”

It has been determined that the EIS modeling platform provides a useful starting point for the CA, but has notable limits with respect to the CA scope:

1. With respect to inventory, there is need to update the basis used in the EIS to represent newer information including tank retrieval data, improved tank leak estimates, updated Soil Inventory Model and Best Basis Inventory, and other newer inventory information.
  2. With respect to waste form release models, the models used in the EIS and other prior site-wide assessments are under review to determine the appropriate modeling to represent waste form degradation and release. [The results of this review will lead to recommendations for the appropriate models to use in the CA; this may be the ones used in the EIS, but this is still under review.]
  3. With respect to the vadose zone flow and transport models, these represented a significant advancement over prior site-wide assessments, particularly in using 3D models. However, there is opportunity for significant improvement in the defensibility of these models by simulating areas of adjacent waste sites in unified vadose zone models to account for lateral fluid migration, and in accounting for a transient water table boundary. Regardless, the existing vadose zone models can be utilized in the CA framework to provide an EIS reference case.
  4. With respect to the groundwater flow model, there have been substantial advancements at Hanford since the EIS groundwater model was developed. In particular, the application of the boundary layer gridding methodology, as recommended by reviewers of the EIS model, has been achieved allowing for greater fidelity to the geologic framework with greater computational efficiency.
  5. With respect to the groundwater transport model, the particle tracking methodology utilized in the EIS met the needs of that analysis. However, is not capable of representing pump-and-treat
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**Table 2. Proposed Approach to Address Modeling Planning Direction in Williams (2012) Guidance Memorandum in Development of the Hanford Site Composite Analysis Update**

Modeling Planning Direction in Williams (2012) Guidance Memorandum	Proposed Approach to Address Modeling Planning Direction in Updated Composite Analysis
	<p>remedies. It also cannot be used to initiate transport simulations from present-day groundwater observational data, as required by the key scope of the CA. Successful application of the MT3D software, recommended by reviewers of the EIS, is now possible with application of the boundary layer gridding methodology in the groundwater flow model. MT3D is capable of simulating the required features, events, and processes.</p> <p>6. The EIS technology transfer did not provide tools for risk or dose calculation; these will need to be generated to support the CA dose calculation needs.</p>
<p>“...the EIS modeling platform will provide the starting point for subsequent regulatory compliance modeling activities.”</p>	<p>The EIS modeling platform is the starting point for modeling tools for the CA update. The EIS modeling platform has been evaluated for the capability to fulfill the key aspects of the scope (Table 1). The technical approach proposed for the CA based on the CA scope expands on the EIS modeling platform where necessary to fulfill that scope.</p>

**Table 2. Proposed Approach to Address Modeling Planning Direction in Williams (2012) Guidance Memorandum in Development of the Hanford Site Composite Analysis Update**

Modeling Planning Direction in Williams (2012) Guidance Memorandum	Proposed Approach to Address Modeling Planning Direction in Updated Composite Analysis
<p>“Any changes from the EIS modeling approach, software, and/or input parameters to accommodate site/facility-specific needs or new information will follow the requirements of DOE O 414.1D for configuration control. Changes must be documented and the bases of the changes are subject to the approval by the RL/ORP Groundwater Vadose Zone Executive Council.”</p>	<p>The details of the EIS modeling approach, software and input parameters are contained in the <i>Technology Transfer Document</i> provided by DOE-ORP (DOE-ORP, 2013) and maintained under configuration management since that transfer.</p> <p>Documentation of changes in the approach and implementation are provided in this Summary Analysis.</p> <p>DOE O 414.1D will be followed for configuration control of modeling software, data, and assessments, as specified in the project-specific Quality Assurance Plan for the CA (PRC-PRO-EP-53107, Appendix B). Additionally, quality assurance will be strengthened through an automated quality control strategy as described in CP-60411, <i>Hanford Site Composite Analysis Technical Approach Description: Automated Quality Assurance Process Design</i>.</p>
<p>“For modeling tied directly to the decisions made in the EIS...a modeling case needs to be included that uses the same assumptions and methods used to support the EIS base case.”</p>	<p>The TC&amp;WM EIS made decisions for tank closure, waste management, and FFTF disposition. The cumulative impacts analysis in the TC&amp;WM EIS was conducted to support those facility-specific decisions. The cumulative impacts analysis in the TC&amp;WM EIS was not created to meet the needs of a CA. For example, CERCLA source and groundwater unit remedies were not included for the Central Plateau. The EIS did not support a cumulative impacts decision.</p>

**Table 2. Proposed Approach to Address Modeling Planning Direction in Williams (2012) Guidance Memorandum in Development of the Hanford Site Composite Analysis Update**

Modeling Planning Direction in Williams (2012) Guidance Memorandum	Proposed Approach to Address Modeling Planning Direction in Updated Composite Analysis
<p>“Documentation of additional cases and assumptions is subject to approval by the RL/ORP Groundwater Vadose Zone Executive Council.”</p>	<p>The primary sensitivity analysis planned at the systems-model level of the CA is for the range of site future dispositions from least-effort to greatest-effort dispositions based primarily on information provided in the <i>Hanford Lifecycle Scope, Schedule and Cost Report</i> (DOE/RL-2015-10) or subsequent version of this report. This sensitivity will demonstrate the utility of the revised CA as a planning tool, consistent with the objective of DOE M 435.1-1.</p> <p>Other sensitivity cases will be defined at the process model level for various facets of the CA to explore model sensitivity to key parameters at that level.</p> <p>Further sensitivity cases will be defined and evaluated as part of the CA maintenance program, and in response to CA review findings.</p>
<p>“Simulation software used for modeling will meet DOE and EM software quality assurance requirements.”</p>	<p>The software to be used for the updated CA will meet all DOE and EM software QA requirements including those specified in DOE O 414.1D-1, <i>Quality Assurance</i> and DOE’s EM-QA-001, <i>EM Quality Assurance Program</i>. This is generally meant to imply that the software will meet the NQA-1 requirements specified in ASME NQA 1-2008 with the NQA-1a 2009 addenda, <i>Quality Assurance Requirements for Nuclear Facility Applications</i>, as implemented in CHPRC’s quality assurance plans and procedures.</p>
<p>“Selection of simulation software that meets these standards will be based on efficiency for use in implementing the features, events, and processes necessary to adequately represent conceptual site models.”</p>	<p>The capability, as well as efficiency, to implement and represent the required FEPs (features, events and processes) identified as key aspects of the updated CA scope will be considered in the selection of software.</p> <p>For example, inclusion of pump-and-treat processes has been established as a key aspect of the updated CA Scope (Table 1); the simulation software selected for implementation will therefore require the capability to represent this FEP.</p>

**Table 2. Proposed Approach to Address Modeling Planning Direction in Williams (2012) Guidance Memorandum in Development of the Hanford Site Composite Analysis Update**

Modeling Planning Direction in Williams (2012) Guidance Memorandum	Proposed Approach to Address Modeling Planning Direction in Updated Composite Analysis
<p>“Previously authorized modeling software at the Hanford Site (RESRAD, STOMP<sup>1</sup>, and MODFLOW) remain applicable, but additional simulation software may be used as long as the same standards are satisfied.”</p>	<p>STOMP<sup>1</sup> is anticipated to continue to be utilized in the updated CA as the vadose zone flow and transport simulator.</p> <p>It is not anticipated that RESRAD will be used in the updated CA because the CA analysis does not require use of that computer code for screening purposes, but this tool may be used for benchmarking, confirmatory work or similar needs.</p> <p>MODFLOW is anticipated to continue to be used in the updated CA as the saturated zone flow simulator; however, a newer version of this software will likely be used (MODFLOW-2000 was used in the TC&amp;WM EIS; several major revisions of this software have been issued and widely adopted since that version).</p> <p>Any additional software selected to implement the updated CA in the technical approach to be developed will be qualified and managed to all applicable NQA-1 standards.</p>

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<sup>1</sup> Battelle Memorial Institute (Battelle) retains copyright on all versions, revisions, and operational modes of the Subsurface Transport Over Multiple Phases (STOMP) software simulator, as permitted by the U.S. Department of Energy. STOMP is used under a limited government use license.

**Table 3. Proposed Approach to Address Modeling Tool Set in the Hanford Site Composite Analysis Update**

Modeling Tools In TC &WM EIS	Proposed Approach for Modeling Tools in the Updated Composite Analysis	Justification
Waste form release	A new waste-form release tool will be needed to support updated vadose zone models that represent multiple waste sites, an updated inventory database, and the selected waste form release models.	The transferal of the “release to vadose” tools used in the TC&WM EIS was stipulated to be for evaluation/comparison purposes only and not a formal tool transfer. During the EIS model transfer workshops, the EIS contractor staff verbally noted that this tool was being provided upon request strictly for informative purposes, and that the integration contractor would need to develop their own tools for this function.
Vadose zone flow and transport – 3D STOMP	<p>STOMP© (PNNL-12030; PNNL-15782; PNNL-11216) will be used to implement vadose zone fate and transport models for all waste sites included in the updated CA, consistent with the identified key aspects scope (Table 1). Vadose zone models will be implemented as fully three dimensional in STOMP.</p> <p>Vadose zone models will not be constructed or applied where detailed facility-specific information is already provided by completed PAs; the release to saturated zone provided in facility PAs will be directly incorporated into the CA modeling framework.</p>	STOMP© has been qualified and accepted for use at the Hanford Site. This tool remains the most suitable vadose zone simulator available and approved for use at Hanford, and is capable of representing all FEPs identified as key aspects of the updated CA.

**Table 3. Proposed Approach to Address Modeling Tool Set in the Hanford Site Composite Analysis Update**

Modeling Tools In TC &WM EIS	Proposed Approach for Modeling Tools in the Updated Composite Analysis	Justification
Groundwater flow – 3-D site wide MODFLOW	<p>The TC&amp;WM EIS implemented a site-wide groundwater flow model modular 3-D finite-difference site-wide groundwater flow code MODFLOW (USGS Open-File Report 00-92); the MODFLOW software will continue to be used in the updated CA, although a newer version with improved capabilities to represent Hanford Site flow features will likely be used to implement the groundwater flow model.</p> <p>The groundwater flow model will be revised to apply the latest available geologic framework that incorporates up-to-date geologic data and interpretations.</p> <p>The groundwater flow model will be revised to utilize boundary-matching gridding techniques that enable better representation of the geologic framework and support utilization of the MT3DMS groundwater transport code.</p> <p>The groundwater flow model will be recalibrated against an expanded data set that includes key hydraulic observations collected since the TC&amp;WM EIS was issued, reflecting the period of hydraulic gradient changes in the hydraulically important Gable Gap area.</p>	<p>The MODFLOW family of codes remains widely accepted and several key versions have been qualified and accepted for use at Hanford. However, significant advances in this software will provide efficiencies needed to produce a maintainable CA.</p> <p>Identified key aspects of the updated CA include incorporation of updated geologic and hydraulic data and interpretations.</p> <p>The MODFLOW Technical Review Group in their 2007 review of the EIS groundwater model (MTRG 2007) noted:</p> <ul style="list-style-type: none"> <li>• “The MTRG expressed concern the practice of encoding material properties in the model introduced heterogeneities that appeared artificial.”</li> <li>• “Hydraulic properties were encoded from lithologic interpolation of boreholes on a row-by-row basis. MTRG felt that the use of horizontal, uniform-thickness model layers might have several drawbacks.”</li> <li>• “The MTRG repeatedly supported use of deformable grid layers as a superior approach to fixed-layer discretization in large, regional-scale flow and transport models.”</li> </ul>

**Table 3. Proposed Approach to Address Modeling Tool Set in the Hanford Site Composite Analysis Update**

Modeling Tools In TC &WM EIS	Proposed Approach for Modeling Tools in the Updated Composite Analysis	Justification
Groundwater transport – MT3DMS	<p>The conceptual model used in the TC&amp;WM EIS was advective-dispersive transport including retardation and radioactive decay. The modeling platform used in the EIS was a 3-D particle tracking routine using the software Blue Dot X developed on a 100 m x 100 m grid spacing with an assumed well screen length of 40 m.</p> <p>Significant advances in modeling software and grid representation techniques, as well the need to represent the key FEP of pump-and-treat systems identified as a key aspect of the updated CA, leads us to recommend implementing the groundwater transport model in MT3DMS (SERDP-99-1) software, an advective-dispersive transport tool that represents sorption, radioactive decay, and pump-and-treat features and processes.</p> <p>The scale (extent) of the groundwater transport model will be set appropriate to the sources identified in key aspects for inclusion in the updated CA, and will be less than the scale of the supporting site-wide groundwater flow model to improve computational efficiency while improving resolution for transport solutions.</p>	<p>MT3MDS is widely accepted and has been qualified and accepted for use at Hanford and is capable of simulating key FEPs including pump-and-treat processes that the TC&amp;WM EIS modeling toolset cannot implement.</p>

**Table 3. Proposed Approach to Address Modeling Tool Set in the Hanford Site Composite Analysis Update**

Modeling Tools In TC &WM EIS	Proposed Approach for Modeling Tools in the Updated Composite Analysis	Justification
<p>Sensitivity and Uncertainty Analysis</p>	<p>The primary sensitivity analysis planned at the systems-model level of the CA is for the range of site future dispositions from least-effort to greatest-effort dispositions based primarily on information provided in the <i>Hanford Lifecycle Scope, Schedule and Cost Report</i> (DOE/RL-2015-10) or subsequent version of this report. This sensitivity will demonstrate the utility of the revised CA as a planning tool, consistent with the objective of DOE M 435.1-1.</p> <p>Other sensitivity cases will be defined at the process model level for various facets of the CA to explore model sensitivity to key parameters at that level.</p> <p>Further sensitivity cases will be defined and evaluated as part of the CA maintenance program, and in response to CA review findings.</p>	<p>The EIS strictly evaluated only “one-off” sensitivities to the models used in that analysis. The primary purpose of that EIS was to evaluate alternatives for waste management, tank closure, and Fast Flux Test Facility disposition.</p> <p>In contrast, the updated CA must function as a planning tool (DOE M 435.1) for DOE. The primary sensitivity proposed for the updated CA is to evaluate the performance metric (dose) for the range of feasible regulatory remedial decisions yet to be made. Other systems-level cases may be defined and evaluated later, in response to review comments and as part of CA maintenance activities.</p> <p>Process model sensitivities will be evaluated similar to the “one-off” sensitivities performed for the TC&amp;WM EIS development.</p>



**Table 4. Proposed Approach to Address Key Elements of Proposed Action in the Hanford Site Composite Analysis Update**

Key Elements of Proposed Action	Proposed Approach to Address Key Elements	Justification and Possible Impacts
Waste form inventory	<p>CP-60195, <i>Hanford Site Composite Analysis Technical Approach</i>  <i>Description: Radionuclide Inventory and Waste Site Selection Process</i>, provides the proposed approach to update the inventory basis for radionuclides to be evaluated in the updated CA.</p>	<p>New information available since the release of the TC&amp;WM EIS needs to be incorporated into an update inventory. This includes:</p> <ul style="list-style-type: none"> <li>• New Hanford Soil Inventory Model (SIM) version with updated and corrected inputs;</li> <li>• Tank residual data for tank systems that have completed waste retrieval operations;</li> <li>• Updated inventory feeds from supporting inventory models including HTWOS;</li> <li>• Updated inventory information for remediated waste sites.</li> </ul>
Waste form release modeling assumptions	<p>CP-60410, <i>Hanford Site Composite Analysis Technical Approach</i>  <i>Description: Waste Form Release</i>, documents the key assumptions.</p> <p>The proposed approach adopts the waste form release models used in the initial CA (PNNL-11800) for soil debris, saltcake, and reactor blocks. Models used in the IDF PA are adopted for cement (encapsulated and solidified).</p>	<p>Waste form release models were reviewed for prior site-wide assessments (including the TC&amp;WM EIS release models), and other models in the literature to provide a comprehensive basis for selection of appropriate models for the updated CA.</p>

**Table 4. Proposed Approach to Address Key Elements of Proposed Action in the Hanford Site Composite Analysis Update**

Key Elements of Proposed Action	Proposed Approach to Address Key Elements	Justification and Possible Impacts
Natural system modeling assumptions	<p>Generally, natural system modeling assumptions will not differ significantly from those used in the development of TC&amp;WM EIS models.</p> <p>Improvements on this approach will include:</p> <ul style="list-style-type: none"> <li>• Spatially (as well as temporally) variable recharge rates based on updated source information;</li> <li>• Use of new Central Plateau Vadose Zone Geoframework to provide current and maintainable structural basis to models.</li> <li>• Multi-site models to explicitly account for adjacent recharge (using facility footprints and discharge histories to logically group releases)</li> <li>• Material properties conditioned on site data;</li> <li>• Direct inclusion of PA results where available;</li> <li>• Dynamic water table location for lower boundary of models.</li> </ul>	(No justification necessary.)
DOE M 435.1-1 performance measures	<p>Performance measures for a CA under DOE M 435.1-1 will be evaluated in accordance with boundaries and timeframes identified in the key aspects for the updated CA. These performance measures are not reported in the TC&amp;WM EIS and the required boundaries and timeframes will differ from that analysis.</p>	<p>The scope of the updated CA is selected in the key aspects (first stage of the Scoping Phase) to meet the needs of a DOE O 435.1 CA to support Hanford Site PAs. This scope differs from the scope and requirements of the TC&amp;WM EIS in ways that will be reflected in the objectives of the models needed.</p>

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**Table 5. Proposed Approach to Address Representation of Natural System in the Hanford Site Composite Analysis Update**

Representation of Natural System	Proposed Approach to Address Representation of Natural System	Justification and Possible Impacts
<p>Recharge/net infiltration</p> <p>(Natural infiltration)</p>	<p>As a starting point, recharge rates will be adopted from those applied in the TC&amp;WM EIS for waste site areas. Review of newer information and consideration of spatial variability in waste-site area representation will be considered for inclusion in vadose zone fate and transport models.</p> <p>Recharge rates applied for the more expansive groundwater flow and groundwater transport domains will utilize newer spatially distributed temporally variable recharge rates developed since the TC&amp;WM EIS was issued to improve groundwater model calibration.</p>	<p>TC&amp;WM EIS recharge rates will be applied for waste site vadose zone models unless newer information supports revision of these rates.</p> <p>The groundwater model calibration has been demonstrated to benefit (improved calibration metrics) from use of improved spatially and temporally recharge rate estimates that specifically account for patterns of surface soil types, vegetation, and disturbances. The TC&amp;WM EIS model applied rates developed for waste sites over broad areas outside of waste zones and without evolution as surface conditions change over time.</p>
<p>Facility-specific infiltration rates</p> <p>(Liquid discharges to ground)</p>	<p>The CA assumes the net flux of contaminants and water that was calculated in the Facility Specific PA will be input at the top of the vadose zone beneath the facility.</p> <p>Where possible, modeling done under CERCLA will also be utilized as described above.</p> <p>Liquid discharges for past-practice liquid disposal sites and continuing liquid discharges sites (TEDF, SALDS) will be simulated with vadose zone attenuation for arrival of liquid discharges in the groundwater model (this was not done for the TC&amp;WM EIS).</p>	<p>One identified key aspect of the updated CA is that a PA-consistent approach will be adopted: that is, the CA will not create duplicate models of facilities with completed PAs but will rather simply adopt the releases predicted in those PAs directly into the CA.</p> <p>Vadose zone attenuation of liquid discharges during the Hanford Site operational period has been shown previously to be significant to improved calibration of groundwater flow models for the site (PNNL-14398).</p>

**Table 5. Proposed Approach to Address Representation of Natural System in the Hanford Site Composite Analysis Update**

<b>Representation of Natural System</b>	<b>Proposed Approach to Address Representation of Natural System</b>	<b>Justification and Possible Impacts</b>
Hydrostratigraphy	<p>The saturated zone hydrostratigraphy will be based on the most recent version of the Hanford South Geoframework (ECF-Hanford-13-0029, <i>Development of the Hanford South Geologic Framework Model, Hanford Site, Washington</i>).</p> <p>A new geologic framework will be developed for the vadose zone in the Central Plateau to incorporate available geologic data and interpretations to support development of updated vadose zone fate and transport models at appropriate scales.</p>	<p>The TC&amp;WM EIS documents the cumulative impacts estimated for radionuclides under the assumptions and information available to that analysis. Newer information (geologic interpretations, hydraulic observations, and related information) should be incorporated, particularly to address key observational data collected as gradient conditions have changed in the Gable Gap vicinity since the issue of the TC&amp;WM EIS.</p>
Groundwater flow simulation	<p>The site-wide groundwater flow model originally developed for the TC&amp;WM EIS has been under active maintenance and refinement since transferal following the issue of the TC&amp;WM EIS. Improvements include updated MODFLOW implementation software; incorporation of current geoframeworks; re-calibration to an expanded data set including recent data collected during gradient reversals in the Gable Gap area; grid restructuring using the boundary-matching methodology. These improvements are proposed for use as a site-wide flow model to support the updated CA.</p>	<p>The TC&amp;WM EIS documents the cumulative impacts estimated for radionuclides under the assumptions and information available to that analysis.</p> <p>Utilization of the improvements in this proposal are necessary to sustain use of implementing software for the proposed groundwater transport model that will be able to represent key FEPs (including pump-and-treat) that cannot be represented with the TC&amp;WM EIS modeling system.</p>

**Table 5. Proposed Approach to Address Representation of Natural System in the Hanford Site Composite Analysis Update**

Representation of Natural System	Proposed Approach to Address Representation of Natural System	Justification and Possible Impacts
Groundwater transport simulation	Based on the key aspects selected in the workshop, a groundwater transport model capable of representing the spatial extent appropriate to the updated CA and implemented in software that can represent all of the identified key FEPs (including pump-and-treat, and capability to start from a defined initial contamination plume) is required. It is proposed to use a model of the scale and extent of CHPRC’s Plateau-to-River Groundwater Transport model, implemented in the MT3DMS groundwater transport software, to meet this objective.	<p>MT3MDS is widely accepted and has been qualified and accepted for use at Hanford. It is capable of solving for pump-and-treat systems, as shown in successful applications for the 200-UP-1 RI/FS, the 200-BP-5 RI, and the 200-PO-1 RI.</p> <p>The Blue Dot software used to implement the TC&amp;WM EIS groundwater transport model lacks the capability to simulate pump-and-treat systems (water removal and re-injection, and mass removal) as well as lacking the capability to simulate the evolution of a plume from an initial condition other than an initially clean aquifer.</p> <p>Coupled with use of the boundary-matching gridding technique in the supporting groundwater flow model (described above), this proposal will provide the key aspects required of the updated CA.</p>
Geochemical behavior (i.e., $K_d$ )	$K_d$ values will be obtained from the EIS if defined, representative, and needed. Ongoing laboratory testing is being conducted at PNNL. These additional test data will be considered and will be compared to the EIS values if they are adopted in the Handbook of $K_d$ values to use for Hanford Site analyses.	Recent laboratory testing results are expected to enhance the understanding of the sorption of some COPCs on sediments and water compositions representative of the certain areas or facilities at Hanford. As a result, updated $K_d$ values are proposed to be used when possible in the updated CA.

**Table 5. Proposed Approach to Address Representation of Natural System in the Hanford Site Composite Analysis Update**

Representation of Natural System	Proposed Approach to Address Representation of Natural System	Justification and Possible Impacts
Atmospheric pathway	The atmospheric release calculation performed for the initial CA will be reviewed and updated as necessary to determine if this pathway requires further evaluation.	<p>Atmospheric releases and associated doses to the hypothetical receptor were not calculated in the EIS for long-term consequences.</p> <p>Such calculations are required in the facility-specific PAs. All atmospheric pathway doses calculated for these PAs and in initial CA, analyses were well below levels of concern.</p>

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