TAB G

North Boundary Containment System

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Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: North Boundary System	**Date of inspection:** 3-24-15
Location and Region: RMA Region VIII	**EPA ID:** CO5210020769
Agency, office, or company leading the five-year review:	**Weather/temperature:** 60's, Calm

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☐ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Gayle Lammers (Name) O&M Manager (Title) 3-24-15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Joe Opila (Name) Operator (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____
   Not present during inspection

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Env. Protection Agency
Contact Greg Hargreaves | RPM | 3-24-15 | 303 312 6061
Name | Title | Date | Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ | _____ | _____ | _____
Name | Title | Date | Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ | _____ | _____ | _____
Name | Title | Date | Phone no.
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ | _____ | _____ | _____
Name | Title | Date | Phone no.
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☐ Up to date	☐ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☒ Maintenance logs	☒ Readily available	☐ Up to date	☐ N/A

Remarks

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
   ☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
   Remarks Not inspected

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
   Remarks Not inspected

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits	☐ Readily available	☐ Up to date	☒ N/A

Remarks

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A

Remarks

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
    Remarks

IV. O&M COSTS N/A

1. **O&M Organization**
   - ☐ State in-house
   - ☐ PRP in-house
   - ☐ Federal Facility in-house
   - ☐ Contractor for State
   - ☐ Contractor for PRP
   - ☐ Contractor for Federal Facility
   - ☐ Other _____

2. **O&M Cost Records**
   - ☐ Readily available ☐ Up to date
   - ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate _____ ☐ Breakdown attached

   Total annual cost by year for review period if available

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
   Remarks Gate secured @ adjacent 96th Ave; plant and systems are accessible from within refuge

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks Signage at plant - Danger, Do Not Enter, Auth. Personnel Only

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting by USFW, Navarro
Frequency
Responsible party/agency
Contact See Part II

Name	Title	Date	Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☐ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No ☐ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks No obvious issues regarding IC's observed

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks

3. **Land use changes off site** ☒ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks_____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks Not inspected

2. **Performance Monitoring** Type of monitoring N/A
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ~~☒ Needs Maintenance~~ JMD
Remarks See Part JMD

3. **Spare Parts and Equipment**
☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks Observed in Treatment Facility

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☒ Carbon adsorbers
   ☒ Filters BAG
   ☐ Additive (*e.g.*, chelation agent, flocculent)
   ☒ Others UV Oxidation for NDMA
   ☒ Good condition ☐ Needs Maintenance
   ☒ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☒ Equipment properly identified
   ☒ Quantity of groundwater treated annually Avg. 320 gpm
   ☐ Quantity of surface water treated annually N/A
   Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☒ Good condition ☐ Needs Maintenance
   Remarks Electronics upgrades in procurement process

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☒ Good condition ☒ Proper secondary containment ☐ Needs Maintenance
   Remarks

4. **Discharge Structure and Appurtenances**
   ☒ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks

5. **Treatment Building(s)**
   ☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
   ☒ Chemicals and equipment properly stored
   Remarks Orderly

6. **Monitoring Wells** (pump and treatment remedy)
   * ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks See Part XI

D. Monitoring Data N/A

1. Monitoring Data
   ☐ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests:
   ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The North Boundary System involved observation of the treatment plant and the extraction & recharge systems east of the plant & west of the plant within refuge. Inspections conducted 03-24 & 04-23-15. Inspected performance water quality well 23119, the lockable lid on the outer casing was not secured. Observed monitoring well 24150 with no lid on outer casing and no cap on inner pvc casing

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: North Boundary Containment System	**Date of inspection:** 3/24/15
Location and Region: RMA Region VIII	**EPA ID: CO5210020769**
Agency, office, or company leading the five-year review: U.S. Army	**Weather/temperature:** Mild

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- Institutional controls
- (Groundwater pump and treatment)
- Surface water collection and treatment
- Other _____
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

256 gm motor
350 design

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Gayle Lamere (Name) Ops Manager (Title) 3-24/5 (Date)
   Interviewed: at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** Joe Ofila (Name) Lead Operator (Title) 3-24-15 (Date)
   Interviewed: at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Tri-County Health
Contact Deanne Kelly (Name) RMA Field Sup. (Title) 3/24/15 (Date) 303-439-5909 (Phone no.)
Problems; suggestions; Report attached n/a

Agency CDPHE
Contact Ken Vogler (Name) Engineer (Title) 3/24/15 (Date) 303 692-3383 (Phone no.)
Problems; suggestions; Report attached none

Agency Greg Hargreaves (EPA)
Contact → (Name) (Title) (Date) 303 872 6061 (Phone no.)
Problems; suggestions; Report attached

Agency Sentinel/CDPHE
Contact Vince Steward (Name) (Title) (Date) 720-252-2826 (Phone no.)
Problems; suggestions; Report attached

4. **Other interviews** (optional) Report attached.

V. ACCESS AND INSTITUTIONAL CONTROLS Applicable N/A

A. Fencing

1. **Fencing damaged** Location shown on site map Gates secured N/A
Remarks only boundary fence present

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A
Remarks Building locked

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	No	N/A
Site conditions imply ICs not being fully enforced	Yes	No	N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date	Yes	No	N/A
Reports are verified by the lead agency	Yes	No	N/A
Specific requirements in deed or decision documents have been met	Yes	No	N/A
Violations have been reported	Yes	No	N/A

Other problems or suggestions: Report attached

2. **Adequacy** ICs are adequate ICs are inadequate N/A
Remarks _____

D. General

1. **Vandalism/trespassing** Location shown on site map No vandalism evident
Remarks _____

2. **Land use changes on site** N/A
Remarks _____

3. **Land use changes off site** N/A
Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** Location shown on site map Roads adequate N/A
Remarks _____

B. Other Site Conditions

Remarks _____

IX. GROUNDWATER/~~SURFACE~~ WATER REMEDIES (Applicable) N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks
   Monitoring well 24150 needs cap after removing 9565 cont. ? monitor

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

C. Treatment System (Applicable) N/A

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation
   Air stripping (Carbon adsorbers)
   Filters
   Additive (*e.g.*, chelation agent, flocculent)
   Others UV Oxidation - 3,000 hr change tubes
   Good condition Needs Maintenance
   Sampling ports properly marked and functional
   Sampling/maintenance log displayed and up to date 15Kw/lamp
   Equipment properly identified
   Quantity of groundwater treated annually
   Quantity of surface water treated annually
   Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A (Good condition) Needs Maintenance
   Remarks
   will upgrade PLCs & control system

3. **Tanks, Vaults, Storage Vessels**
   N/A (Good condition) Proper secondary containment Needs Maintenance
   Remarks

4. **Discharge Structure and Appurtenances**
   N/A (Good condition) Needs Maintenance
   Remarks

5. **Treatment Building(s)**
N/A Good condition (esp. roof and doorways) Needs repair
Chemicals and equipment properly stored
Remarks Built in 1981

6. **Monitoring Wells** (pump and treatment remedy)
Properly secured/locked Functioning Routinely sampled Good condition
All required wells located Needs Maintenance N/A
Remarks

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

pump and treat system is operating as intended.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

none observed
MW 24150 repair called in immediately

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TAB H

Northwest Boundary Containment System

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Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: NWBCS	**Date of inspection:** 3-24-15
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review:	**Weather/temperature:** 60's, Calm

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- ☐ Monitored natural attenuation
- ☒ Groundwater containment
- ☒ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Gayle Lammers (Name) Opt m Manager (Title) 3-24-15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Charlie Hreem (Name) Operator (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____
   Not Present during inspection

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Env. Protection Agency
Contact Greg Hargreaves (Name) RPM (Title) 3-24-15 (Date) 303 312 6061 (Phone no.)
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)
Problems; suggestions; ☐ Report attached _____

Agency _____
Contact _____ (Name) _____ (Title) _____ (Date) _____ (Phone no.)
Problems; suggestions; ☐ Report attached _____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☒ O&M manual — ☒ Readily available — ☐ Up to date — ☐ N/A
   - ☐ As-built drawings — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☒ Maintenance logs — ☒ Readily available — ☐ Up to date — ☐ N/A

   Remarks

2. **Site-Specific Health and Safety Plan** — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks Not inspected

3. **O&M and OSHA Training Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks Not inspected

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Other permits ____ — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

7. **Groundwater Monitoring Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Water (effluent) — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — ☒ N/A

    Remarks

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ PRP in-house
   - ☐ Federal Facility in-house
   - ☐ Contractor for State
   - ☐ Contractor for PRP
   - ☒ Contractor for Federal Facility
   - ☐ Other _____

2. **O&M Cost Records** N/A
   - ☐ Readily available ☐ Up to date
   - ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate _____ ☐ Breakdown attached

   Total annual cost by year for review period if available

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: N/A

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A
   Remarks Refuge fencing, locked gates along Highway 2 (west). Plant and systems are fully accessible from within refuge.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks Signage for Plant: Danger - Do Not Enter - Auth. Personnel Only

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting by USFW, Navarro
Frequency
Responsible party/agency
Contact See Part II

Name	Title	Date	Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☒ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A
Violations have been reported ☐ Yes ☐ No ☒ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks No obvious issues regarding IC's observed during inspections

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident

Remarks

2. **Land use changes on site** ☒ N/A

Remarks

3. **Land use changes off site** ☒ N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A

Remarks All areas (plant and systems) accessible from within refuge

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks_____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks Not inspected

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks Not inspected

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☒ Needs Maintenance
   Remarks Inspected Extn. Well Vault #DW1; Pipe from Valve noted into bottom of vault

3. **Spare Parts and Equipment**
   ☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks Maintained in Treatment Plant

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
   ☐ Good condition ☐ Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☐ Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☒ Carbon adsorbers
   ☒ Filters Bag
   ☐ Additive (*e.g.*, chelation agent, flocculent)
   ☐ Others
   ☒ Good condition ☐ Needs Maintenance
   ☒ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☒ Equipment properly identified
   ☒ Quantity of groundwater treated annually Avg 900 gpm
   ☐ Quantity of surface water treated annually N/A
   Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☒ Good condition ☐ Needs Maintenance
   Remarks Software & electronics upgrades being procured

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☒ Good condition ☒ Proper secondary containment ☐ Needs Maintenance
   Remarks

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks Recharge wells not observed in detail

5. **Treatment Building(s)**
   ☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
   ☒ Chemicals and equipment properly stored
   Remarks Clean, orderly

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks See Part XI

D. Monitoring Data N/A

1. Monitoring Data
   ☐ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests:
   ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The inspection of the NWBCS involved observation of the treatment plant and the northern & southwest extensions of the well fields. Inspections ocurred seperately 3-24 & 4-23-15. Issues: Inspected performance water quality well # 22801. This well was observed to be not secured. Also, as noted in Part IX, extraction well vault DW-1 was observed to have a valve dripping into the vault. In addition the extraction well DW-1 and vault are not secured.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Northwest Boundary Containment System	**Date of inspection:** 3/24/15
Location and Region: RMA Region VIII	**EPA ID: CO5210020769**
Agency, office, or company leading the five-year review: U.S. Army	**Weather/temperature:** mild

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- Institutional controls
- Groundwater pump and treatment
- ~~Surface water collection and treatment~~
- Other _____
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Gayle Lammers (Name) Ops. Manager (Title) 3-24-15 (Date)
   Interviewed: at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

2. **O&M staff** Charlie Hreen (Name) lead operator (Title) 3-24-15 (Date)
   Interviewed: at site at office by phone Phone no. 720 625-3621
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Tri-County Health
Contact Deanne Kelly (Name) RMA Field Sup. (Title) 3/24/15 (Date) 303-439-5909 (Phone no.)
Problems; suggestions; Report attached n/a

Agency CDPHE
Contact Ken Vogler (Name) Engineer (Title) 3/24/15 (Date) 303 692-3383 (Phone no.)
Problems; suggestions; Report attached none

Agency Greg Hargreaves (EPA)
Contact (Name) (Title) (Date) 303 872 6061 (Phone no.)
Problems; suggestions; Report attached

Agency Sentinel/CDPHE
Contact Vince Steward (Name) (Title) (Date) 720-252-2826 (Phone no.)
Problems; suggestions; Report attached

4. **Other interviews** (optional) Report attached.

V. ACCESS AND INSTITUTIONAL CONTROLS Applicable N/A

A. Fencing – only boundary fence

1. **Fencing damaged** Location shown on site map Gates secured N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A
Remarks Building locked when un-manned

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	No	N/A
Site conditions imply ICs not being fully enforced	Yes	No	N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date	Yes	No	N/A
Reports are verified by the lead agency	Yes	No	N/A
Specific requirements in deed or decision documents have been met	Yes	No	N/A
Violations have been reported	Yes	No	N/A

Other problems or suggestions: Report attached

2. **Adequacy** ICs are adequate ICs are inadequate N/A
Remarks _____

D. General

1. **Vandalism/trespassing** Location shown on site map No vandalism evident
Remarks _____

2. **Land use changes on site** N/A
Remarks _____

3. **Land use changes off site** N/A
Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** Location shown on site map Roads adequate N/A
Remarks _____

B. Other Site Conditions

Remarks _____

IX. GROUNDWATER/SURFACE WATER REMEDIES Applicable N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks Bag filters, other in Bldg. 887

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation 940gpm
   Air stripping Carbon adsorbers
   Filters Cuyflow
   Additive (*e.g.*, chelation agent, flocculent)
   Others
   Good condition Needs Maintenance
   Sampling ports properly marked and functional
   Sampling/maintenance log displayed and up to date
   Equipment properly identified
   Quantity of groundwater treated annually
   Quantity of surface water treated annually
   Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A Good condition Needs Maintenance
   Remarks

3. **Tanks, Vaults, Storage Vessels**
   N/A Good condition Proper secondary containment Needs Maintenance
   Remarks

4. **Discharge Structure and Appurtenances**
   N/A Good condition Needs Maintenance
   Remarks

5. **Treatment Building(s)**
N/A (Good condition (esp. roof and doorways) Needs repair
Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
Properly secured/locked (Functioning) Routinely sampled Good condition
All required wells located Needs Maintenance N/A
Remarks Small leak in DW-1 Extraction well

XI. OVERALL OBSERVATIONS

22301

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

no problems identified
Dripping leak in DW-1 was called in immediately for repair.

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TAB I

Off-Post Groundwater Intercept and Treatment System

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Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: OGITS	**Date of inspection:** 3-24-15
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review:	**Weather/temperature:** 60's, Calm

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- ☐ Monitored natural attenuation
- ☒ Groundwater containment
- ☒ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Gayle Lammers (Name) O&M Manager (Title) 3-24-15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Cory Green (Name) Lead Operator (Title) 3-24-15 (Date)
   * Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____
   Mr Green not present; interviewed G. Lammers & C. Hreem

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Env. Protection Agency
Contact Greg Hargreaves RPM 3-24-15 303 312 6061
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached

Agency
Contact
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached

Agency
Contact
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached

Agency
Contact
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☒ O&M manual	☒ Readily available	☐ Up to date	☐ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☒ N/A
☒ Maintenance logs	☒ Readily available	☐ Up to date	☐ N/A

Remarks

2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☐ N/A
   ☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☐ N/A
   Remarks Did not inspect

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
   Remarks Did not inspect

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	☒ N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	☒ N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	☒ N/A
☐ Other permits	☐ Readily available	☐ Up to date	☒ N/A

Remarks

5. **Gas Generation Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

7. **Groundwater Monitoring Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date ☒ N/A
   Remarks

9. **Discharge Compliance Records**

☐ Air	☐ Readily available	☐ Up to date	☒ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	☒ N/A

Remarks

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☒ N/A
    Remarks

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ PRP in-house
   - ☐ Federal Facility in-house
   - ☐ Other
   - ☐ Contractor for State
   - ☐ Contractor for PRP
   - ☒ Contractor for Federal Facility

2. **O&M Cost Records** N/A
   - ☐ Readily available
   - ☐ Up to date
   - ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate _____ ☐ Breakdown attached

   Total annual cost by year for review period if available

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period** N/A
   Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☒ Gates secured ☐ N/A
   Remarks Gate secured @ adjacent 96th Avenue; systems and plant accessible from inside refuge

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks Signage (authorized personnel only) present

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting by USFW & Navarro
Frequency
Responsible party/agency
Contact See Part II

Name	Title	Date	Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☒ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A
Violations have been reported ☐ Yes ☐ No ☒ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks No obvious issues regarding IC's observed during inspection

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks

2. **Land use changes on site** ☒ N/A
Remarks

3. **Land use changes off site** ☒ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks_____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
Remarks_____

VIII. VERTICAL BARRIER WALLS ☒ Applicable ☐ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
Areal extent_____ Depth_____
Remarks Not inspected

2. **Performance Monitoring** Type of monitoring_____
☐ Performance not monitored
Frequency_____ ☐ Evidence of breaching
Head differential_____
Remarks Not inspected

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☒ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
Remarks The vaults at the First Creek Pathway that were inspected include FE2 (well 37801) and FE3 (well 37802). The extraction systems were functional; signs of rodents were apparent. The vaults inspected at the Northern Pathway Intercept were NE4 (37808) and NE12 (well 37816). No action items were recorded

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks No issues were identified, no action items were recorded

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks Maintained at Treatment Plant

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
☐ Good condition ☐ Needs Maintenance
Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
☐ Good condition ☐ Needs Maintenance
Remarks

3. **Spare Parts and Equipment**
☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
Remarks

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☒ Carbon adsorbers
   ☒ Filters Bag & Sand Media
   ☐ Additive (*e.g.*, chelation agent, flocculent)
   ☐ Others
   ☒ Good condition ☐ Needs Maintenance
   ☒ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☒ Equipment properly identified
   ☒ Quantity of groundwater treated annually Avg 250 gpm - designed for higher capacity
   ☐ Quantity of surface water treated annually N/A
   Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☒ Good condition ☐ Needs Maintenance
   Remarks Software upgrades in process; older electronics in process of being upgraded.

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☒ Good condition ☒ Proper secondary containment ☐ Needs Maintenance
   Remarks

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☐ Good condition ☐ Needs Maintenance
   Remarks

5. **Treatment Building(s)**
   ☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
   ☒ Chemicals and equipment properly stored
   Remarks

6. **Monitoring Wells** (pump and treatment remedy)
   ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks None of the monitoring wells at the First Creek Pathway intercept were secured with a lock. All wells at the Northern Pathway Intercept were locked except 37001 and 37028.

D. Monitoring Data N/A

1. Monitoring Data
   ☐ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests:
   ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

During inspection, operator informed that an alarm callout occurred today due to FE-2 extraction well shut down. The well vault shifted and cracked the plumbing. All systems continued operation except for the extraction well FE-2 expected to be repaired 03-25-15. However, O&M issues similar to this could be expected with First Creek well vaults and systems located in the drainage area.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Off-Post Groundwater Intercept and Treatment System	**Date of inspection:** 3/24/15
Location and Region: RMA Region VIII	**EPA ID: CO5210020769**
Agency, office, or company leading the five-year review: U.S. Army	**Weather/temperature:** mild

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Other _____
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

258 gpm now
Design = 350 gpm

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Gayle Lammers (Name) Ops. Manager (Title) 3-24-15 (Date)
   Interviewed: at site at office by phone Phone no. 720498-2120 cell
   Problems, suggestions; Report attached _____

2. **O&M staff** Cory Green (Name) Lead operator (Title) 3-24-15 (Date)
   Interviewed: at site at office by phone Phone no. _____
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Tri-County Health
Contact Deanne Kelly (Name) RMA Field Sup. (Title) 3/24/15 (Date) 303-439-5909 (Phone no.)
Problems; suggestions; Report attached n/a

Agency CDPHE
Contact Ken Vogler (Name) Engineer (Title) 3/24/15 (Date) 303 692-3183 (Phone no.)
Problems; suggestions; Report attached none

Agency Greg Hargreaves (EPA)
Contact (Name) (Title) (Date) 303 872 6061 (Phone no.)
Problems; suggestions; Report attached

Agency Sentinel/CDPHE
Contact Vince Steward (Name) (Title) (Date) 720-252-2826 (Phone no.)
Problems; suggestions; Report attached

4. **Other interviews** (optional) Report attached.

Field staff: FE-2- Spring leak c 2pm today
- leak detector went off
locked out/tagged out
Back in service tomorrow.

V. ACCESS AND INSTITUTIONAL CONTROLS (Applicable) N/A

A. Fencing

1. **Fencing damaged** Location shown on site map (Gates secured) N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A
Remarks Gates locked to facility

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	No	N/A
Site conditions imply ICs not being fully enforced	Yes	No	N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date	Yes	No	N/A
Reports are verified by the lead agency	Yes	No	N/A
Specific requirements in deed or decision documents have been met	Yes	No	N/A
Violations have been reported	Yes	No	N/A

Other problems or suggestions: Report attached

2. **Adequacy** ICs are adequate ICs are inadequate N/A
Remarks _____

D. General

1. **Vandalism/trespassing** Location sbown on site map No vandalism evident
Remarks _____

2. **Land use changes on site** N/A
Remarks _____

3. **Land use changes off site** N/A
Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** Location shown on site map Roads adequate N/A
Remarks _____

B. Other Site Conditions

Remarks _____

IX. GROUNDWATER/SURFACE WATER REMEDIES Applicable N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation
   Air stripping Carbon adsorbers downhole - 54ksa
   Filters Mixed media sand + Bag filters 20k used
   Additive (*e.g.*, chelation agent, flocculent)
   Others
   Good condition Needs Maintenance
   Sampling ports properly marked and functional
   Sampling/maintenance log displayed and up to date
   Equipment properly identified
   Quantity of groundwater treated annually
   Quantity of surface water treated annually
   Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A Good condition Needs Maintenance
   Remarks

3. **Tanks, Vaults, Storage Vessels**
   N/A Good condition Proper secondary containment Needs Maintenance
   Remarks

4. **Discharge Structure and Appurtenances**
   N/A Good condition Needs Maintenance
   Remarks

5. **Treatment Building(s)**
N/A Good condition (esp. roof and doorways) Needs repair
Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
Properly secured/locked Functioning Routinely sampled Good condition
All required wells located Needs Maintenance N/A
Remarks

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

no problems identified

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TAB J

Railyard Containment System

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Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Railyard Containment Sys.	**Date of inspection:** 3-24-15
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review:	**Weather/temperature:** 60's, calm

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☒ Access controls
- ☒ Institutional controls
- ☒ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Gayle Lammers (Name) O&M Manager (Title) 3-24-15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Charlie Hreem (Name) Operator (Title) 3-24-15 (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____
   Not present during inspection

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Environmental Protection Agency
Contact Greg Hargreaves | RPM | 3-24-15 | 303 312 6061
Name | Title | Date | Phone no.
Problems; suggestions; ☐ Report attached

Agency
Contact
Name | Title | Date | Phone no.
Problems; suggestions; ☐ Report attached

Agency
Contact
Name | Title | Date | Phone no.
Problems; suggestions; ☐ Report attached

Agency
Contact
Name | Title | Date | Phone no.
Problems; suggestions; ☐ Report attached

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**
   - ☒ O&M manual — ☒ Readily available — ☐ Up to date — ☐ N/A
   - ☐ As-built drawings — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Maintenance logs — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

2. **Site-Specific Health and Safety Plan** — ☐ Readily available — ☐ Up to date — ☐ N/A
   - ☐ Contingency plan/emergency response plan — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks Not inspected

3. **O&M and OSHA Training Records** — ☐ Readily available — ☐ Up to date — ☐ N/A

   Remarks Not inspected.

4. **Permits and Service Agreements**
   - ☐ Air discharge permit — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Effluent discharge — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Waste disposal, POTW — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Other permits ____ — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

5. **Gas Generation Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

6. **Settlement Monument Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

7. **Groundwater Monitoring Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

8. **Leachate Extraction Records** — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

9. **Discharge Compliance Records**
   - ☐ Air — ☐ Readily available — ☐ Up to date — ☒ N/A
   - ☐ Water (effluent) — ☐ Readily available — ☐ Up to date — ☒ N/A

   Remarks

10. **Daily Access/Security Logs** — ☐ Readily available — ☐ Up to date — ☒ N/A

    Remarks

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ PRP in-house
   - ☐ Federal Facility in-house
   - ☐ Other
   - ☐ Contractor for State
   - ☐ Contractor for PRP
   - ☒ Contractor for Federal Facility

2. **O&M Cost Records** N/A
   - ☐ Readily available ☐ Up to date
   - ☐ Funding mechanism/agreement in place
   - Original O&M cost estimate _____ ☐ Breakdown attached

   Total annual cost by year for review period if available

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

   From _____ To _____ _____ ☐ Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons: N/A

V. ACCESS AND INSTITUTIONAL CONTROLS ☒ Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A
   Remarks Fencing is present to restrict Bison. plant and systems accessible via roads within refuge.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks Treatment Plant is locked when unattended; signage (authorized personnel only) present.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes ☒ No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes ☒ No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Self-reporting by USFW & Navarro
Frequency
Responsible party/agency
Contact See Part II

Name	Title	Date	Phone no.

Reporting is up-to-date ☐ Yes ☐ No ☒ N/A
Reports are verified by the lead agency ☐ Yes ☐ No ☒ N/A

Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☒ N/A
Violations have been reported ☐ Yes ☐ No ☒ N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** ☐ ICs are adequate ☐ ICs are inadequate ☐ N/A
Remarks No obvious issues regarding IC's observed during inspection

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident
Remarks Area is proximal to visitor center, potentially subject to trespassing

2. **Land use changes on site** ☒ N/A
Remarks

3. **Land use changes off site** ☒ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒ Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A
Remarks All areas (plant & systems) accessible

B. Other Site Conditions

Remarks_____

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on site map ☐ Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** ☐ Location shown on site map ☐ Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** ☐ Grass ☐ Cover properly established ☐ No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** ☐ N/A
   Remarks_____

7. **Bulges** ☐ Location shown on site map ☐ Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** ☐ Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable ☒ N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map ☐ N/A or okay
Remarks_____

C. Letdown Channels ☐ Applicable ☒ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map ☐ No evidence of settlement
Areal extent_____ Depth_____
Remarks_____

2. **Material Degradation** ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☒ N/A

1. **Gas Vents** ☐ Active ☐ Passive
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed ☐ N/A
Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☒ N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____

F. Cover Drainage Layer ☐ Applicable ☒ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☒ N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____

H. Retaining Walls ☐ Applicable ☒ N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☒ N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   ☐ Good condition ☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks Appear to be operational as intended.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☒ Good condition ☐ Needs Maintenance
   Remarks Two extraction wells & two discharge wells; third extraction well is not used.

3. **Spare Parts and Equipment**
   ☒ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. **Collection Structures, Pumps, and Electrical**
   ☐ Good condition ☐ Needs Maintenance
   Remarks

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☐ Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks

C. Treatment System ☒ Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping ☒ Carbon adsorbers
   ☐ Filters_____
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   ☒ Good condition ☐ Needs Maintenance
   ☒ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☒ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☐ Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A ☒ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A ☒ Good condition ☒ Proper secondary containment ☐ Needs Maintenance
   Remarks_____

4. **Discharge Structure and Appurtenances**
   ☐ N/A ☒ Good condition ☐ Needs Maintenance
   Remarks 2 Discharge wells

5. **Treatment Building(s)**
   ☐ N/A ☒ Good condition (esp. roof and doorways) ☐ Needs repair
   ☐ Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   * ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☒ Good condition
   ☐ All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks All monitoring wells observed associated with this system have caps that are not secured

D. Monitoring Data N/A

1. Monitoring Data
   ☐ Is routinely submitted on time ☐ Is of acceptable quality

2. Monitoring data suggests:
   ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation N/A

1. **Monitoring Wells** (natural attenuation remedy)
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

The inspection of the RYTS involved observation of the treatment plant and the extraction & recharge well systems. Inspections occurred separately on 3-24 and 4-23-15
Issues: Although all of extraction & recharge system wells and electrical controls were observed to be secure (locked), the associated monitoring wells are not secured. Specifically, monitoring well 03528 was inspected and observed to be not secured and had no well tag. Although not inspected in detail, the other monitoring wells associated with this system are not secured.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

Five-Year Review Site Inspection Checklist

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION	
Site name: Railyard Containment System	**Date of inspection:** 3/24/15
Location and Region: RMA Region VIII	**EPA ID: CO5210020769**
Agency, office, or company leading the five-year review: U.S. Army	**Weather/temperature:** mild

Remedy Includes: (Check all that apply)

- Landfill cover/containment
- Access controls
- Institutional controls
- Groundwater pump and treatment
- Surface water collection and treatment
- Other _____
- Monitored natural attenuation
- Groundwater containment
- Vertical barrier walls

Attachments: Inspection team roster attached Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Gayle Lammers (Name) Ops. Manager (Title) 3-24-15 (Date)
   Interviewed: at site at office by phone Phone no. 720 498-2120
   Problems, suggestions; Report attached _____

2. **O&M staff** Charlie Haeen (Name) Ops lead (Title) 3/24/15 (Date)
   Interviewed: at site at office by phone Phone no. 720 625-3624
   Problems, suggestions; Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency Tri-County Health
Contact Deanne Kelly (Name) RMA Field Sup. (Title) 3/24/15 (Date) 303-439-5909 (Phone no.)
Problems; suggestions; Report attached n/a

Agency CDPHE
Contact Ken Vogler (Name) Engineer (Title) 3/24/15 (Date) 303 692-3383 (Phone no.)
Problems; suggestions; Report attached none

Agency Greg Hargreaves (EPA)
Contact → (Name) (Title) (Date) 303 872 6061 (Phone no.)
Problems; suggestions; Report attached

Agency Sentinel/CDPHE
Contact Vince Stewart (Name) (Title) (Date) 720-252-2826 (Phone no.)
Problems; suggestions; Report attached

4. **Other interviews** (optional) Report attached.

V. ACCESS AND INSTITUTIONAL CONTROLS Applicable N/A

A. Fencing

1. **Fencing damaged** Location shown on site map Gates secured ~~N/A~~
Remarks Bison fence surrounds facility & well field in good condition

B. Other Access Restrictions

1. **Signs and other security measures** Location shown on site map N/A
Remarks Building locked

C. Institutional Controls (ICs) N/A

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented	Yes	No	N/A
Site conditions imply ICs not being fully enforced	Yes	No	N/A

Type of monitoring (*e.g.*, self-reporting, drive by) _____
Frequency _____
Responsible party/agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.

Reporting is up-to-date	Yes	No	N/A
Reports are verified by the lead agency	Yes	No	N/A
Specific requirements in deed or decision documents have been met	Yes	No	N/A
Violations have been reported	Yes	No	N/A

Other problems or suggestions: Report attached

2. **Adequacy** ICs are adequate ICs are inadequate N/A
Remarks _____

D. General

1. **Vandalism/trespassing** Location shown on site map (No vandalism evident)
Remarks _____

2. **Land use changes on site** (N/A)
Remarks _____

3. **Land use changes off site** (N/A)
Remarks _____

VI. GENERAL SITE CONDITIONS

A. Roads Applicable N/A

1. **Roads damaged** Location shown on site map (Roads adequate) N/A
Remarks _____

B. Other Site Conditions

Remarks _____

IX. GROUNDWATER/SURFACE WATER REMEDIES Applicable N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines Applicable N/A

1. **~~Pumps, Wellhead~~ Plumbing, and Electrical**
   Good condition All required wells properly operating Needs Maintenance N/A
   Remarks Auto dialer - calls pump failure, water level in sump, power failure - tested quarterly

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   Good condition Needs Maintenance
   Remarks

3. **Spare Parts and Equipment**
   Readily available Good condition Requires upgrade Needs to be provided
   Remarks Stored in another building

C. Treatment System Applicable N/A

1. **Treatment Train** (Check components that apply)
   Metals removal Oil/water separation Bioremediation
   Air stripping Carbon adsorbers 2 in parallel; tested for WQ to determine change interval.
   Filters
   Additive (*e.g.*, chelation agent, flocculent)
   Others
   Good condition Needs Maintenance
   Sampling ports properly marked and functional
   Sampling/maintenance log displayed and up to date
   Equipment properly identified
   Quantity of groundwater treated annually
   Quantity of surface water treated annually
   Remarks

2. **Electrical Enclosures and Panels** (properly rated and functional)
   N/A Good condition Needs Maintenance
   Remarks

3. **Tanks, Vaults, Storage Vessels**
   N/A Good condition Proper secondary containment Needs Maintenance
   Remarks

4. **Discharge Structure and Appurtenances**
   N/A Good condition Needs Maintenance
   Remarks

5. **Treatment Building(s)**
N/A Good condition (esp. roof and doorways) Needs repair
Chemicals and equipment properly stored
Remarks

6. **Monitoring Wells** (pump and treatment remedy)
Properly secured/locked Functioning Routinely sampled Good condition
All required wells located Needs Maintenance N/A
Remarks
Extraction wells; Monitoring wells not locked

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

no problems identified

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APPENDIX E

Responses to Regulatory Agency Comments

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U.S. Army and Shell Oil Company Responses to
U.S. Environmental Protection Agency October 14, 2015 Comments on the
2015 Five-Year Review Report for
Rocky Mountain Arsenal, Revision B, August, 2015

Comments for Incorporation

General Comments

Comment 1. The U.S. Environmental Protection Agency's (EPAs) disagrees with the protectiveness statements in the draft Five-Year Review (FYR) Report:

- Operable Unit (OU) 3 should be identified as protectiveness deferred due to preliminary data indicating contamination in wildlife and Remedial Action Objectives (RAOs) to prevent exposure to wildlife.
- OU4 is not under construction, so "will be protective" language is not appropriate (EPA 2001). Because dieldrin has been detected in wells downgradient of the Northwest Boundary Containment System there are indications that the objective to restore groundwater to applicable or relevant and appropriate requirements (ARARs) is not being met. Therefore, OU4 should be identified as "protective in the short-term."

Please revise the overall protectiveness statements for OU3 and OU4 appropriately. Alternate protectiveness statements and an alternate issues and recommendations list will be sent by EPA separately.

Response: For OU3, the Army and Shell disagree with the protectiveness deferred recommendation. As expressed in the subsequent protectiveness statements provided by the EPA, this recommended determination is driven by a few detections of dieldrin in kestrel eggs collected as part of the long-term biomonitoring program. The Army and Shell acknowledge that the long-term biomonitoring program has not been completed and that a path forward for completion needs to be determined. However, low-level detections of dieldrin are not unexpected because dieldrin is still present in some surface soils at low concentrations. In addition, the reference to the RAO is incomplete. The RAO states *"Ensure that biota are not exposed to COCs in soil and sediment at toxic concentrations via direct exposure or bioaccumulation."* Although there have been detections of dieldrin in wildlife tissues, there is no evidence of *unacceptable* exposure to wildlife populations. Therefore, the Army's determination is protective in the short term.

For OU4, the statement will be revised to indicate protective in the short term. The Army and Shell agree this determination is appropriate since boundary groundwater treatment systems continue to operate. However, this determination is not due to contaminant detections downgradient of the boundary containment systems. Although aquifer restoration is a desirable outcome of remedy implementation, it is not a remedy objective or requirement. Evaluations of the systems, as discussed in the FYSR and FYRR, indicate that the systems are

operating as intended based on meeting the primary performance criteria established in the *Long-Term Monitoring Plan for Groundwater and Surface Water*.

Comment 2. FYR issues are situations that currently prevent the response action from being protective, or are early indicators of a situation that may be a protectiveness problem in the future (EPA 2001). The following issues should be included in the FYR for follow-up action, because they may affect future protectiveness:

a. Issue: New information regarding the persistence of mustard and the nerve agent VX in the environment, as well as reduced toxicity criteria.

Discussion: New information has come to light regarding the persistence and toxicity of mustard and VX. As described in additional detail below, research conducted after implementation of the RI indicates that sulfur mustard and VX are more persistent than previously understood. In addition, reporting limits for the existing historical mustard and VX data are above the current health-based screening levels.

- In 2014, during definition of the scope of a post-remedy risk assessment, it became evident that information regarding the persistence of mustard (in particular Sulfur Mustard or HD) and the nerve agent, VX, may not have been considered during the remedial investigation that was conducted in the 1980's and 1990's. The *Remedial Investigation Summary Report* states, "… agents generally have short half-lives when exposed to natural elements and, with the exception of mustard that may have been trapped in voids beneath buildings, are generally not persistent in soils" and "With the exception of mustard under certain conditions where it is protected from weathering effects (e.g., in soil beneath a concrete pad), chemical warfare agents are highly unstable and very rapidly degrade to breakdown products …" (Ebasco et al 1992). However, based on research conducted by the Oak Ridge National Laboratory, the U.S. Army Environmental Center, and others, the persistence of mustard and VX in soil, is now know to be much longer than previously understood (Munro et al 1999)(Marrs et al 2007). This research was conducted after the Remedial Investigation (RI) was completed at the Rocky Mountain Arsenal (RMA) and after the *Record of Decision for the On-Post Operable Unit* (On-Post ROD) was signed in 1996.

- Based on this information, EPA reviewed soil data in the Rocky Mountain Arsenal Environmental Database (RMAED) for mustard and VX concentrations and reporting limits. Soil sampling for these two chemical agent compounds was conducted during the RI in the late 1980's and early 1990's. Review of this data shows that while there were few detections of mustard, and only one detection of VX, the reporting limits for mustard and VX were often above current health-based screening levels (USAPHC 2011). The Remedial Action Objective (RAO) in the *Record of Decision for the On-Post Operable Unit* (On-Post ROD) for agent states, "Prevent ingestion of, inhalation of, or dermal contact with acute chemical agent

hazards." (FWENC 1996). Therefore, as a result of this new information, EPA requests that measures be initiated to demonstrate/ensure protectiveness against a possible agent exposure to mustard and VX.

Response: The Army and Shell disagree that chemical agent should be identified as a FYR issue. The comment indicates that new information has been developed since the ROD was completed. While the Army acknowledges that multiple documents have been published since the ROD was completed, the information provided does not alter the understanding of the persistence or toxicity of the chemical agents, how it was evaluated for remedy selection, or the protectiveness of the remedy.

EPA contends that the references cited indicate that mustard and VX persistence is much longer than previously understood. However, review of the site record and references cited reveal that this is not the case. Although the documents were published after completion of the ROD, the information presented is largely from studies which predate the ROD and is consistent with discussions provided in the RI. The literature reviewed consistently characterizes agents as persistent under certain conditions. These conditions are associated with bulk disposal or where the agent is protected from degradation, such as disposal in a container. Field and laboratory studies do not indicate long-term persistence of chemical agents as a result of releases to surface soil. Specific citations from chemical agent references provided by EPA on February 26, 2016 did not identify any new information related to persistence or toxicity of sulfur mustard or VX.

During the RI/FS, potential agent areas were identified based on extensive review of historical information, review of aerial photography for potential disposal sites, and review of environmental data for agent occurrence or the occurrence of agent degradation products. The Army acknowledges that the available data from RI sampling include several detections of mustard; however, there are no detections of VX as a result of soil sampling at RMA. Mustard and Lewisite were also detected during installation of groundwater monitoring wells associated with the Lime Basins remedy. The areas with mustard detections, located in Basin A and the Lime Basins, are contained beneath the Integrated Cover System soil cover, eliminating any potential exposure pathway.

The IEA/RC included a qualitative assessment of chemical agents in part due to the lack of sufficient data to quantify risks. The qualitative assessment included a review of historical information, RI documentation, and sampling results to ensure that all potential agent areas were identified for evaluation of remedial alternatives to address agent. As a result, remedial actions were performed for all areas identified with agent potential.

In addition, an extensive review was performed in 2001-2002 to evaluate the entire RMA for additional potential agent areas. Technical experts from the Army, Shell, USFWS, EPA, CDPHE, and TCHD collaborated on this 18-month effort. A detailed, systematic review of historic aerial photography and associated

documentation was used to identify areas with potential chemical agent production, demilitarization, storage, testing, or disposal activities. Over 800 aerial photos, from 1937 through 1992, were reviewed using digital computer imaging and mapping technology to identify ground disturbances that could represent historic use or disposal areas. Field investigations were performed as necessary to enhance the evaluations. This effort confirmed that all potential chemical agent areas were addressed by the selected remedy and no additional potential agent areas were identified.

In summary, all potential chemical agent areas at RMA have been addressed in accordance with the selected remedy in the ROD. Sites identified were presumed to contain agent based on history and/or presence of agent-related breakdown products. Persistence and toxicity information has not changed significantly since the ROD was signed. There is no evidence of bulk subsurface disposal that could provide a continuing source of agent contamination, and the remedy as performed continues to be protective of human health. However, soil sampling for Mustard and VX will be conducted to provide additional data to verify final site conditions.

b. Issue: Indications of bioaccumulation of contaminants

Discussion: Data has become available that indicate that there may be wildlife exposure that do not meet the soil Remedial Action Objectives (RAOs) identified in the On-Post ROD (FWENC 1996):

Ensure that biota are not exposed to COCs in surface water, due to migration from soil or sediment, at concentrations capable of causing acute or chronic toxicity via direct exposure or bioaccumulation.

Ensure that biota are not exposed to COCs in soil and sediment at toxic concentrations via direct exposure or bioaccumulation.

Data have become available (some is preliminary data) indicating the presence of contaminants in the soil resulting in surface water detections and bioaccumulation, including: the surface water detection of contaminants that exceed aquatic life standards; pesticide detections in kestrels; an exceedance of the ROD site evaluation criteria (an acute human health exceedance) in surface soil detection in a completed remedy area in Basin C; lysimeter percolation water that contained dieldrin; and dieldrin detected in the fat of a 2-year-old bison. An evaluation of these indications of residual contamination and the associated risks to biota is needed to determine if additional source controls are needed.

Response: The Army and Shell disagree that this should be identified as a FYR issue. Although there have been isolated detections of dieldrin in soil and tissue samples collected during post-remedy sampling programs, the results do not suggest that exposures to contaminants at toxic concentrations are occurring.

The RAOs are being met and the remedy remains protective. However, as discussed in the response to Comment 2e, the long-term biomonitoring program has not been completed and completion of the program will be added as an issue. In addition, the EPA implies that positive detections in environmental data (soil samples, surface water samples, and lysimeter water samples) is evidence of bioaccumulation. Although the environmental data indicate the presence of low-level post-remedy contamination, the tissue data do not suggest that unacceptable exposures are occurring.

c. Issue: Inadequate performance of the Integrated Cover System (ICS)

Discussion: Monitoring data and inspections conducted during this FYR period indicate that the ICS is not performing as designed:

- As identified in the FYR Report, percolation measurement for the Shell Disposal Trenches (SDT) RCRA-Equivalent Cover (a component of the Integrated Cover System) have exceeded the percolation compliance standard. This percolation could mobilize contaminants to the groundwater.

- In October 2013, several sinkholes were identified on the north part of the Integrated Cover System (ICS). Ultimately, over 1,000 sinkholes were identified and surveyed (Navarro 2014). Section 6.3.7.3 of the FYR Report describes the sinkholes in the ICS and explains that the cause of the sinkholes has not been definitively determined, though natural consolidation of the loosely-placed soil is the most like cause. EPA agrees that loosely-placed soil is the most likely cause of the sinkholes and acknowledges that discussions have been initiated with the Army/Shell to investigate the cause of the sinkholes in more detail. It appears that the cause of the sinkholes may potentially be related to design criteria that were not achieved (e.g., areas within the ICS where the specified soil density of 80 and 85 percent of the maximum dry density as determined by standard proctor) was not consistently achieved. The presence of the sinkholes is considered to be an early indicator of a potential problem with this component of the remedy. Because the sink holes provide a preferential pathways in the cover that can allow migration of precipitation, the cover is not meeting the compliance standard to maintain a minimum cover thickness, or the On-Post ROD goals to minimize erosion by wind and water, maximize runoff and minimize ponding (FWENC 1996). The sink holes indicate that this portion of the cover system is not functioning as designed.

Currently, the ICS does not meet the On-Post ROD remediation goals for serving as an effective long-term barrier, and minimizing erosion by wind and water (FWENC 1996). Therefore, EPA requests that inadequate performance of the ICS be identified as an issue requiring investigation and resolution.

Response: The percolation performance of the ICS, specifically the SDT RCRA-Equivalent Cover, qualifies as a Five-Year Review issue because the percolation compliance standard was not met after the ICS compliance period began in 2015.

The widespread presence of sinkholes in the ICS qualifies as a Five-Year Review issue because the condition could be an early indicator of a situation that may be a protectiveness problem in the future. However, the cover was constructed to design specifications as documented by the Construction Quality Assurance Engineer during construction. Furthermore, the soil density specification of 75 to 85 percent (not 80 to 85 percent as stated in the comment) of the Standard Proctor maximum dry density value did not apply to the upper 12 inches of the cover soil in anticipation of disturbance caused by revegetation activities. Also, 12-month percolation totals for the three lysimeters in the affected area (numbers 005, 006, and 008) have consistently been below action levels. Therefore, no direct correlation can be made between the presence of sinkholes and reduced percolation performance.

d. Issue: Land transfers outside of federal ownership

Discussion: The Federal Facility Agreement (FFA) (EPA et al 1989), Refuge Act (Public Law 1992), and the On-Post ROD explain that the U.S. Government shall retain title/ownership of RMA (FWENC 1996). The FFA explains that the United States shall assure that the future use of resources on and under the Arsenal by the United States or persons entering on the Arsenal with consent of the United States, shall be in compliance with the land use restrictions and that any lease, license or other instrument by which the United States provides for the use of any portion of the Arsenal by non-Federal parties shall also require compliance with the land use restrictions (EPA et al 1989). The Refuge Act identifies only specific property for disposal out of Federal ownership. The risk assessment for the remedy states, "The effect of the United States retaining ownership of RMA lands on future land uses is significant. The United States will control future use and could preclude or limit private or other public uses." (Ebasco et al 1990). Further, the On-Post ROD explains that federal ownership, along with the other land use restrictions, was an element of not only the selected remedy but also of each alternative for cleanup that was considered (FWENC 1996).

However, it has come to the attention of EPA during discussions with U.S. Fish and Wildlife Service (USFWS) and representatives of Commerce City on a tour and presentation on May 29, 2014, that the city is interested in a 40-acre land swap with the USFWS, for a parcel at the northernmost part (parts of Section 28 and 33) (CC 2014). In addition, the *Final Environmental Impact Statement* (EIS) issued by USFWS this year states, "Continued expansion of 96th Avenue west of Buckley Road would require a minor land exchange to ensure adequate rights-of-way for the refuge's Perimeter Trail. Consistent with our policies (342 FW 5), approximately 12,000 square feet of land in the

refuge's northeastern most corner would be exchanged for lands of equal value that benefit the refuge near our main gate." (USFWS 2015). The discussion of land-swaps is an indication that land use changes are being considered by local officials that are not consistent with the ownership requirements identified for RMA. Land ownership changes such as this appear to be inconsistent with FFA, with the underlying assumptions for the remedial investigation and in the human health exposure assessment and the On-Post ROD which state that the United States shall retain title to the Arsenal. It is also unclear how a land swap is consistent with the definition of land disposal identified in the Refuge Act. In addition, previous land transfers, such as the Section 20 parcel, should be reviewed for adherence to the land ownership requirements of the FFA and other documents.

Response: Although the ROD and FFA include statements that the U.S. Government shall retain ownership of RMA, the Refuge Act does not. The parties will work to resolve whether land transfers are consistent or inconsistent with the terms of the FFA, ROD and Refuge Act with the goal of providing clear direction for any possible future land transfer actions contemplated by the USFWS. Concerns related to land transfers will be discussed in Section 7.2.4.4 and this will be identified as an issue in Section 8.0.

e. Issue: Incomplete Biomonitoring Program.

Discussion: The On-Post ROD requires long-term biomonitoring and states, "Monitoring activities for biota will continue by USFWS in support of evaluating the effectiveness of the selected remedy" and explains that this activity is included as a long-term operation which will be performed after the initial remediation work is completed and that will continue after EPA releases the site to USFWS as a wildlife refuge. (FWENC 1996). The purpose of the biomonitoring program is to determine whether the remedy is effective. The biomonitoring program includes collection of samples from American Kestrels. While the kestrel egg data was collected from 2010 through 2013, the program is incomplete because not all the sampling requirements have been achieved and because the data indicate results are greater than the decision criteria. In addition, the data quality reviews to verify the data is adequate for decision making, reporting, and documentation are incomplete for the program (including sampling of both Starlings and Kestrels).

As explained in Section 6.3.5 of the FYR Report, results from some American Kestrel eggs include dieldrin concentrations that exceed the decision criteria (No-Observed Adverse Effect Concentration or NOAEC). While it was agreed in February 2014 to suspend kestrel sampling in 2014 because it was possible that other types of sampling programs may be initiated to support a post-remedy risk assessment, EPA requests that completion of the biomonitoring program be included as a 2015 FYR issue. Concepts for other post-remedy sampling programs are still in initial development stages and because funding of these possible post-remedy sampling programs is not

dedicated, they will not serve as a suitable substitute for the biomonitoring program. At this point in time, additional monitoring is needed at 15 of the 22 monitoring locations to either collect the minimum amount of data (3 years of eggs) and/or to obtain additional data from locations where the mean concentration of dieldrin in eggs exceeds the NOAEC defined in the *Long-Term Contaminant Biomonitoring Program for Terrestrial Ecological Receptors at Rocky Mountain Arsenal* (BAS 2006). In addition, data and data quality reviews need to be documented in Data Summary Reports. Finally, the Biological Advisory Subcommittee (BAS) should reconvene, review the biomonitoring plan, and if revisions are determined to be appropriate, those should be documented in an Operational Change Notice (OCN).

Response: The Army and Shell agree that the long-term biomonitoring program has not been completed and this will be added as an issue. Although mean concentrations of dieldrin in kestrel eggs at several nest box locations exceed the NOAEC, the Biomonitoring Plan also states that because there is a lack of clear association between egg concentrations and the NOAEC, this will not be considered sufficient evidence that unacceptable pathways remain or that the remedy is ineffective. Low-level detections of dieldrin are not unexpected based on cleanup criteria and post-remedy surface soil concentrations. Although there have been are a few detections of dieldrin in kestrel eggs, there is no evidence to date of unacceptable exposure to wildlife populations. However, because Phase 2 as described in the BMP was suspended, a determination of appropriate additional sampling to complete the program is required.

f. Issue: Dieldrin detection in bison fat sample collected in December 2014

Discussion: Based on discussions held in a Committee Meeting on August 20, 2015, it is understood that results of bison tissue sampling conducted in December 2015, included one fat sample in a 2-year-old bison with dieldrin concentrations of 21 ppb. The presence of dieldrin in the bison fat should be identified as a 2015 FYR issue for additional investigation and resolution. If the bison was born on the Rocky Mountain Arsenal Wildlife Refuge then this concentration would reflect bioconcentration of the pesticide from the bison pasture area. In addition, the tissue sampling data has not been documented. A Data Summary Report should be prepared documenting the final data along with the results and conclusions of the data quality review.

Response: Although the samples were collected in December 2014, laboratory analysis was not completed within the FYR window and so results were not presented or discussed in the draft FYR report. The USFWS has implemented the bison tissue sampling to support a potential change to the game consumption restriction to allow consumption of bison from RMA. Although the data summary report and subsequent evaluation have not been reviewed and finalized, this is not considered a FYR issue because the sampling being performed is to support a potential change to the restriction and the existing

restriction has not been violated. However, discussion of the tissue sample results to date will be added to the text and the concern will be noted in Section 8.16 as an Other Unresolved Concern.

g. Issue: Inconsistencies between the FFA and On-Post ROD land use restrictions and proposed land uses identified in the selected alternative of the USFWS *Final Environmental Impact Statement for the Rocky Mountain Arsenal National Wildlife Refuge* (USFWS 2015).

Discussion: The selected alternative in the USFWS Environmental Impact Statement (Alternative C) for their future Comprehensive Conservation Plan includes several activities that are inconsistent with Land Use Restrictions defined in the FFA (EPA et al 1989), the On-Post ROD (FWENC 1996), and the Land Use Control Plan (Navarro 2013). For example, this alternative proposes:

- Hunting of deer and dove with no apparent restriction on use, when hunting for consumptive use is prohibited by the FFA, and what hunting is allowed must be appropriately restricted;
- Increased access through new trailheads on the fence line and expanded auto tour routes, which appear to be inconsistent with the requirement for the U.S. to take reasonable precautions to assure that only Federally authorized access will occur to protect response action structures;
- Discussion of divestiture of land by USFWS to non-federal parties, while the FFA states that the United States shall retain title to the Arsenal.
- The responses to Army comments indicate that summer camps may include overnight stays (USFWS 2015). However, the Final Integrated Endangerment Assessment/Risk characterization explains that camping and unrestricted or evening access were found to be prohibited on the 450 refuges that were researched within the National Wildlife Refuge system at the time of the exposure assessment, and therefore these uses were not considered (Ebasco et al 1994).

While the final EIS and response to EPA comments on the EIS acknowledge that these proposed uses would require modification of the Land Use Restrictions, the fact that these are included in the selected alternative is considered an early indication of a failure to comply with land use restriction that are a component of the remedy. As stated in the LUC Plan, "Because these land uses were restricted for the On-Post OU [operable unit], risks for such uses were not considered in the human health risk characterization portion of the Integrated Endangerment Assessment/Risk Characterization (IEA/RC) (Ebasco et al 1994). The portions of the On-Post OU transferred to other parties (e.g., Prairie Gateway, Klein Property, and 100-Foot Highway Setbacks) continue to be subject to these land use restrictions and are enforceable through deed restrictions placed on the transferred property." (Navarro 2013). Resolution of these land use discrepancies is necessary to avoid an

inadvertent use of land that is inconsistent with the land use restrictions and the clean-up performed at RMA. The proposed land uses would result in exposure scenarios, populations, and activities that were served as the basis for the risk assessment and the On-Post ROD remedy. Therefore, this should be identified as an issue for the 2015 FYR.

Response: The Army and Shell disagree that this should be identified as a five-year review issue. As stated in the EIS and acknowledged in the comment, the USFWS confirmed their understanding of the restrictions and the need to modify the ROD before implementing changes inconsistent with current restrictions. The existing restrictions are being maintained by USFWS and the Army and compliance is monitored and reported annually. Inconsistent activities are identified and reported through the Land Use Control Monitoring Reports and corrective actions are identified as appropriate.

h. Issue: Inconsistencies between the FFA, On-Post ROD, and Refuge Act land use restrictions and proposed land uses identified in Commerce City planning documents for the Western Tier Parcel.

Discussion: Inconsistencies have been identified between the land use restrictions and the Prairie Gateway Planning Unit Development (PUD) document in 2010 and again in 2012. In addition to these PUD documents, changes in land use were identified by Commerce City in a handout/ presentation to the EPA Region 8 staff on May 29, 2014, identifying their desire to add multi-family housing on Victory Crossing (the Western Tier Parcel) (CC 2014). These land use discrepancies are early indicators of potential conflicts with the existing land use restrictions that served as the underlying foundation for the cleanup. As stated in the LUC Plan, "Because these land uses were restricted for the On-Post OU, risks for such uses were not considered in the human health risk characterization portion of the *Integrated Endangerment Assessment/Risk Characterization* (IEA/RC) (Ebasco 1994). The portions of the On-Post OU transferred to other parties (e.g., Prairie Gateway, Klein Property, and 100-Foot Highway Setbacks) continue to be subject to these land use restrictions and are enforceable through deed restrictions placed on the transferred property." (Navarro 2013). Resolution of these land use discrepancies is necessary to avoid an inadvertent use of land that is inconsistent with the land use restrictions and the clean-up performed at RMA. The proposed land uses would result in exposure scenarios, populations, and activities that were served as the basis for the risk assessment and the On-Post ROD remedy. Therefore, this should be identified as an issue for the 2015 FYR.

Response: This is already identified as a FYR issue in Section 8.0 and has been identified each year in the annual Land Use Control Monitoring Reports. The Army continues to meet regularly with the Commerce City Planning Department to maintain open communications regarding land use control issues. In addition, the Army provided a description of the inconsistent uses in a letter to the city

in September 2010. Planning Department personnel have consistently confirmed their awareness of the residential use exclusion for the Prairie Gateway, and have confirmed that these uses would not be approved while the residential restriction was in force. In response to this review, the Army issued a follow-up letter to Commerce City in March 2016 summarizing the inconsistent uses identified in the PUD. The response received from Commerce City confirmed that the City has no plans to implement these uses. The Army will continue to coordinate with the Planning Department to clarify use language in the next amendment to the PUD.

i. Issue: Northern Pathway System monitoring well property lease

Discussion: At the September 17, 2015, Water Team Meeting, the Army/Shell indicated that a new developer had purchased the property on which the Northern Pathway System is located. The new developer initiated discussions with the Army/Shell regarding removal of wells from the property. During these discussions, it was mentioned that the Army's lease on the property is going to expire in six years. Given that the Northern Pathway System may need to operate longer than six years, the lease expiration should be identified as an issue.

Response: The Army and Shell disagree that this should be a five-year review issue. There is currently no development plan and the property may change ownership again. Furthermore, it is unknown if any of the wells will be needed long-term since they are associated with the original system and not the modified system as implemented in 2007.

j. Issue: Contaminant detections in Bedrock Ridge Groundwater Extraction System, downgradient performance monitoring well

Discussion: Section 7.2.1.3 of the FYR Report discusses the Bedrock Ridge Groundwater Extraction system. The text concludes that increasing concentrations of three contaminants in downgradient performance well 36566 is not caused by decreasing effectiveness of the extraction system or bypass. However, Well 36566 was identified as an acceptable downgradient performance monitoring well during the LTMP revision by all parties and therefore representative of system performance. Increasing contaminant concentrations in this well, which is on the end of the extraction system, should be identified as an indication of a potential remedy problem and an issue for the 2015 FYR

Response: Additional evaluation of the Bedrock Ridge Extraction System (BRES) has been added to the FYSR. Based on this evaluation, performance of the BRES will be added to the FYRR as an issue.

k. Issue: Evaluation of IMPA concentrations in groundwater at the boundary systems.

Discussion: Review of isopropylmethylphosponic acid (IMPA) data from Basin F downgradient wells indicates that significant concentrations of this compound have been detected during the FYR period. However, IMPA has not been collected from upgradient performance wells at the boundary systems for some time. IMPA is a breakdown product of diisopropyl methyl phosphonate (DIMP) both in the human body and under natural conditions. Therefore, reductions in DIMP concentrations at RMA could lead to increased IMPA concentrations. Review of the toxicological information for IMPA and evaluation of IMPA concentrations at the boundary systems should be included as a potential issue.

Response: The Army and Shell do not believe that IMPA should be a FYR issue for the following reasons: 1) IMPA was evaluated in the Human Health Endangerment Assessment and it was not selected as a COC; 2) the reference dose has not changed since 1992; 3) it does not have a CBSG; and 4) it is not a CSRG analyte at any system.

l. Issue: 1,4-dioxane as a potential ARAR

Discussion: As described in Section 5.0 of the FYR Report, the 2010 FYR identified the issue of 1,4-dioxane as an emergent contaminant and the question of whether it should be added as an ARAR for RMA. A separate groundwater monitoring project was conducted during the current FYR period in response to the 2010 FYR issue. 1,4-dioxane was found above the Colorado Basic Standard for Groundwater (CBSG) of 0.35 ppm extensively on post and in some locations off post so that the existence of 1,4-dioxane as a contaminant at RMA is confirmed. The 2015 FYR Report indicates that based on a risk calculation performed by Army/Shell, 1,4-dioxane is below the risk threshold of $1x10^{-6}$ and therefore should not be added as an ARAR (e.g., a containment system remediation goal (CSRG) for treatment systems) at RMA. However, because a technical memorandum has not been provided to the Regulatory Agencies for review, as required by the 2010 FYR, it is not clear how the risk evaluation was performed or what data and assumptions were used to support this conclusion. Federal regulations provide that all ARARs are "frozen" as of the date of a given ROD unless the EPA determines that new standards are "necessary to ensure that the remedy is protective of human health and the environment." 40 CFR 300.430(f)(1)(ii)(B)(1). Such a protectiveness determination still needs to be made concerning the presence of 1,4-dioxane. Per the NCP, this evaluation must thoroughly document whether or not the standard for 1,4-dioxane should be considered as applicable or relevant and appropriate for protection of human health and the environment. As a result, the Army/Shell conclusion that 1,4-dioxane should not be added as a ARAR cannot be agreed to at this time. The FYR issue of protectiveness given the standard for 1,4-dioxane is not resolved and should be carried over to the 2015 FYR.

Response: The FYR Report will be revised to include resolution of the 1,4-dioxane evaluation as an issue. Discussion of the risk calculation provided in the draft report will be removed and the risks will be evaluated as part of the project documentation.

m. Issue: Dieldrin concentrations above the practical quantitation limit (PQL) in downgradient wells at the North Boundary Containment System.

Discussion: Table 5.1.1.2-2 in the *Five Year Summary Report for Groundwater and Surface Water* (FYSR) indicates that the downgradient performance wells are showing dieldrin concentrations above the PQL (Navarro 2015). Section 6.3.1.2 in this FYR suggests that the downgradient contamination is not indicative of current system effectiveness, which is the same conclusion made before improvements to the downgradient performance monitoring network were implemented in the revised *Long-Term Monitoring Plan for Groundwater and Surface Water* (LTMP) in 2010, to provide wells more suitable for evaluating system performance (TTECI-URS 2010). It was anticipated that the new wells would provide results more representative than the previous Conformance Wells that were monitored prior to the LTMP revision. Eight of the downgradient performance wells identified in the 2010 LTMP are former recharge wells which should have been screened in the more coarse-grained portions of the alluvium and where recharge would have flushed residual contamination during years of pumping treated recharge water from these wells. Without additional evaluation and discussion involving the new downgradient performance monitoring network, the determination that there are no potential issues at NBCS may be premature. Therefore, the presence of dieldrin in the downgradient wells at the NBCS should be identified as an issues requiring additional evaluation to validate conclusions with respect to system effectiveness.

Response: The Army and Shell disagree that the presence of dieldrin in the downgradient wells at the NBCS should be identified as a FYR issue. Dieldrin typically is the only organic CSRG analyte detected above the PQLs/CSRGs in the downgradient performance wells. A reverse hydraulic gradient is consistently maintained in the alluvium which meets the primary performance criterion. If there were a performance issue related to underflow or bypass, other organic contaminants that are present at concentrations above CSRGs upgradient of the slurry wall would also be detected downgradradient of the slurry wall above the remediation goals, but that is not the case. Dieldrin is more sorptive and less soluble than the other CSRG analytes. Consequently, residual dieldrin present in the aquifer sediments downgradient of the NBCS slurry wall appears to be acting as a secondary source of dieldrin to the groundwater. The same mechanisms that affected the NBCS former conformance wells appear to be affecting the downgradient performance wells.
Contemporaneous water quality data were collected from both sets of wells during this FYR period, and they were found to be comparable.
Consequently, with Regulatory Agency approval, sampling of the former

conformance wells was discontinued. Therefore, the conclusions that applied to the conformance wells also apply to the performance wells. An evaluation of the hydrogeology in the areas of the NBCS former conformance wells and performance wells will be added to the FYSR to better compare their water quality data.

The recharge wells were installed across the full length of the system at uniform spacing in order to attempt to create a reverse hydraulic gradient across the entire system. They were not necessarily installed in more coarse-grained portions of the alluvium. Flushing of the more mobile contaminants by the recharge wells, and later, by the recharge trenches likely has occurred, but flushing of the less mobile and less soluble compound dieldrin is still ongoing. The evaluation of the hydrogeology in the areas of the NBCS former conformance wells and performance wells, some of which are recharge wells, will be added to the FYSR to better compare their water quality data.

n. Issue: Inadequacy of confined flow system (CFS) monitoring

Discussion: The FYSR (Section 5.1.3.2) discusses the CFS monitoring results. There are several problems identified with this monitoring system, which call into question the adequacy of the CFS monitoring program (Navarro 2015). Monitoring the CFS is a component of the On-Post ROD remedy (FWENC 1996). The following are issues identified with the CFS monitoring network:

- Per the FYSR, CFS Well 23193 is damaged and cannot be sampled (Navarro 2015). This well should be replaced to meet the requirements of the LTMP and the On-Post ROD.
- The FYSR indicates that Wells 01067, 02057 and 35067 may have questionable aquitards and may display semi-confined conditions rather than confined conditions. Therefore, these wells may be unsuitable for the CFS monitoring program and should be replaced to meet the requirements of the LTMP and the On-Post ROD.
- The FYSR explains that Well 35083 has a defective well seal which would make it unsuitable for the CFS monitoring program. This well should be replaced to meet the requirements of the LTMP and the On-Post ROD.

Based on the discussion above the adequacy of the CFS program to provide groundwater data of sufficient quality for decision making is in doubt. The LTMP states, “The RMA well networks will be maintained to ensure implementation of the remedy.” As a result, the problems related to well construction, well damage and wells not necessarily installed in areas where confined conditions can be verified, point to a problem with the groundwater monitoring program. Therefore CFS monitoring program deficiencies should be identified as an issue.

Response: The Army and Shell disagree that the CFS monitoring program should be identified as a FYR issue because the existing network is adequate to meet the ROD requirements. The FYSR and FYRR will be revised to include more recent information and recommendations presented in RMA Water Team meetings.

o. Issue: Previously unidentified contaminant pathway north of Basin A.

Discussion: The subsection titled "Dieldrin" in Section 5.1.5.1 of the FYSR indicates that a previously unidentified contaminant pathway exists in the sub-cropping Denver Formation north of Basin A (Navarro 2015). However, there is little information provided in the FYSR as to the nature and extent of this groundwater pathway. Discovery of a new contaminant pathway out of Basin A constitutes new information which may have implications for remedy assessment. An evaluation should be initiated with the Regulatory Agencies and a plan presented for evaluating this groundwater contaminant pathway.

Response: An evaluation of the Basin A pathway has been added to the FYSR. Based on this evaluation, the pathway is not significant and does not call into question the protectiveness of the remedy.

p. Issue: Addition of diisopropyl methyl phosphonate (DIMP) to the CSRG list for the Basin A neck System.

Discussion: DIMP has never been added to the CSRG list for the Basin A Neck System even though it is a major component of the mass removed by this system. DIMP should be added as a CSRG so that the mass removal of this compound is formally incorporated into the requirements for this system.

Response: The mass removal requirements for DIMP have been formally incorporated into the remedy with completion of the 2010 LTMP. Inclusion of DIMP on the BANS CSRG list is not a FYR issue because DIMP is effectively treated at BANS and its exclusion does not prevent the remedy from being protective. However, the Army and Shell will review the impacts of adding DIMP to the BANS CSRG list. A discussion will be added under Other Unresolved Concerns.

q. Issue: Changes in the groundwater flow around the HWL, as indicated by Well 25194

Discussion: Section 6.3.3.6 describes HWL Monitoring Well 25194 and explains that the higher water level results in this well indicate significant recharge is occurring from the perimeter ditch around the HWL. This recharge is affecting the groundwater pathways in the vicinity of the HWL and causing an upgradient condition in this area where a downgradient condition existed previously. This condition effects the groundwater monitoring program for the HWL. Reevaluation of the groundwater in this

area and an appropriate monitoring arrangement for the HWL has been initiated. This should be identified as a FYR issue requiring resolution.

Response: As noted in the comment, this issue is being addressed at the working group level. The current tracking mechanisms in use are sufficient to track completion of this effort and it is expected to be resolved in 2016. The change in groundwater behavior at the HWL does not meet the criteria for an FYR issue; i.e., a situation that currently prevents the response action from being protective, or an early indicator of a situation that may be a protectiveness problem in the future.

r. Issue: Presence of n-nitrosodipropylamine (NDPA) in groundwater.

Discussion: Based on the results of EPA's oversight sampling program at RMA, there are indications that the compound n-nitrosodipropylamine (NDPA) is present in groundwater samples analyzed for n-nitrosodimethylamine (NDMA) (i.e., the NDPA results are received from the laboratory as part of the same analytical suite used for NDMA). NDPA is listed in the Colorado Basic Standards for Groundwater with a value of 0.005 µg/L and is not currently monitored at RMA. The discovery of NDPA should be identified as new information that has come to light since the previous FYR and this should be identified as an issue requiring evaluation.

Response: EPA has not provided results of their split sample program to the Army and has made no mention of these results until commenting on the draft FYR Report. Discussion of this new information will be added to the FYR Report and evaluation of NDPA will be added as an issue. The Army will coordinate with EPA to obtain their sample results.

Comment 3. Generally, the FYR Report references data sources to support description of data trends and observations. While it is acknowledged that the data sources for RMA are extensive, the FYR Report must include the appropriate excerpt from those supporting data reports (e.g., tables or graphs) to support the information provided within the text. For example, while it is not necessary to provide all of the dewater data for the OU3 dewater systems, a figure should be included that shows groundwater elevations with respect to the dewatering goals. Please provide the necessary support data summaries or excerpts to support information described within the FYR Report.

Response: The supporting information is provided in the FYSR. The next version of the FYRR will be combined with the FYSR such that they will be companion volumes, instead of separate reports.

Specific Comments

Comment 4. **Five-Year Review Summary Form.** This form summarizes issues and recommendations. The following are comments on this form:

a. The form identifies a month and year for milestone dates. Please specify a month, day, and year for each milestone to meet the requirements of EPA's FYR tracking system.

b. This form should evaluate OU3 separately from OU4, and the rest of the FYR Report should also clearly make the distinction between these two OUs.

c. The table indicates that the issues with the Prairie Gateway Planned Unit Development is applicable to both OU3 and OU4. However, the Prairie Gateway is within OU3 (the on-post operable unit). Please clarify the need to identify applicability to OU4.

Response: a. Milestone dates will be revised to conform with EPA's request.

b. The form indicates that there are multiple OUs, provides a clear indication of the applicable OU for each issue, and provides separate protectiveness statements for each OU. The existing form is consistent with current guidance and provides adequate distinction between the OUs.

c. The designation for OU4 for this issue has been removed.

Comment 5. **Tables 4.0-1, 4.0-2, and 4.0-3, Pages 13 through 20.** These tables provide a summary of the selected remedy identified in the On-Post ROD. The majority of the information listed on these tables describes only the remedy described in the On-Post ROD (of subsequent On-Post ROD change documents). However, there are some descriptions that include a status of the remedy and other additional details. For example, the description of the groundwater treatment systems, the CERCLA Wastewater Treatment Plant, Section 36 Lime Basins Dense Non-Aqueous Phase Liquid (DNAPL) Remediation, Groundwater Mass Removal, and the Trust fund include much more detail than what is specified in the On-Post ROD and/or On-Post ROD change documents. For internal consistency, and to avoid misunderstanding of the actual On-Post ROD requirements, these tables should be revised to summarize just the On-Post ROD remedy, and the additional detail and status should be provided in the following sections of the FYR Report. The summaries provided on Table 3.0-2 of the Remedial Action Summary Report could be used as a good summary of the On-Post ROD remedy (TTECI 2011).

Response: Tables 4.0-1, 4.0-2 and 4.0-3 were revised as follows:
Table 4.0-1 is now titled Summary of On-Post Remedy Requirements.
Table 4.0-2 is now titled Summary of Off-Post Remedy Requirements.

The tables listed above are now consistent with the ROD requirement summaries provided on Tables 3.0-2 and 3.0-3 of the Remedial Action Summary Report (TtEC 2011). Additional detail and status of components can be found in the text of the report and Table 4.0.-3 included under the Tables Tab.

Comment 6. **<u>Table 4.0-1, Pages 14 and 15</u>.** This table summarizes the groundwater remedy requirements. The follow are comments on this table:

a. The Shell Trenches Dewatering System and the Complex (Army) Disposal Trenches Dewater Systems are listed on Table 4.0-1 for the groundwater remedy. However, these actions are both included within the soil remedy in the On-Post ROD. Please revise the tables appropriately.

b. The On-Post ROD remedy requirements for well closure are missing and should be added to the table.

Response: a. The table has been revised as suggested.

b. The table has been revised as suggested.

Comment 7. **<u>Table 4.0-2, Page 16</u>.** This table describes the "No Future Use" structure remedy as, "demolish and disposed of in Basin A, which was subsequently covered as part of the soil remedy." However, this description does not match the On-Post ROD remedy. The On-Post ROD identifies the category of "No Future Use" structures to included agent history (AH), significant contamination history (SCH), and other contamination history (OCH) structures that were to be demolished, and disposed of either in the landfills (AH and SCH structural debris) or in Basin A (OCH structural debris) (FWENC 1996). The table should be corrected appropriately.

Response: The table (now 4.0-1) has been revised as suggested.

Comment 8. **<u>Table 4.0-3, Pages 16 through 18</u>.** This table summarizes the On-Post ROD soil remedy. The following are comments on this table:

a. Backfilling contaminated soil excavations is not mentioned. Backfilling is specified in the On-Post ROD and was an important component of these remedies to break potential exposure pathways. For medium groups and subgroups that required excavation of soil, outside of cover areas, please add that the On-Post ROD required backfill with on-post borrow.

b. The table uses the phrase "Landfill human health exceedance" which could be misunderstood to be just a single soil sampling point that exceeded the human health exceedance criteria. Please revise these statements to clarify that the On-Post ROD required landfilling of soil that exceeded the human health exceedance criteria, to more accurately describe the On-Post ROD remedy for soil.

c. In several places, the description of the remedial action identifies construction of a crushed concrete barrier. Rather than naming the specific material that was identified in the remedial designs, it is more appropriate to explain that the On-Post ROD remedy require construction of a biota barrier.

The term biota barrier is consistent with the On-Post ROD change documents that were prepared for the covers (Army 2007). Please revise the table appropriately.

d. The description for some projects indicates that vapor control was required. Most of these projects also had a requirement for odor controls. Odor control was an important aspect of the remedy. Please revise the table to identify projects where the On-Post ROD required odor control.

e. The description of the remedy for the South Plants Ditches indicates that biota-risk soil could be consolidated into excavated areas or South Plants Central Processing Area. The On-Post ROD does not state that biota-risk soil could be consolidated into excavated areas. Biota-risk soil was required to be consolidated under a cover. Please correct this description.

f. Descriptions of the South Plants Balance of Areas and the Section 36 Balance of Areas explain that soil covers were required. However, the On-Post ROD-cover thicknesses are not identified. The On-Post ROD-specified cover thickness (3-feet and 2-feet respectively) should be added for context.

g. Descriptions of the Complex Trenches and Shell Trenches identify construction of slurry walls. However the On-Post ROD also requires dewatering. Please identify dewatering as a component of the soil remedy, as identified in the On-Post ROD.

h. The description of the chemical sewers explains that the sewer lines in South Plants Central Processing and Complex Trenches were to be plugged. The On-Post ROD also requires that these areas be covered. Please add this requirement. In addition, the description should be revised to make it clear that the On-Post ROD required landfilling of the remaining sewer lines, in addition to the principal threat and human health exceedances soil in locations outside of the covers.

i. The table is missing the On-Post ROD requirements for sanitary/process water sewers. Please add this component of the remedy to the table.

j. The description of the remedy requirements for North Plants and Toxic Storage Yards identifies caustic washing. Caustic washing was not identified on this table for any of the other projects that had potential agent, except with footnote 1. It is not clear why caustic washing is specifically identified for these two projects. The table should be revised to identify the On-Post ROD requirement for caustic washing consistently throughout.

k. The description of the remedy for Munitions Testing identifies “munitions screening.” This term is not used in the On-Post ROD and it is recommended that the term be removed or clarified. In addition, the On-Post

ROD required implementation of geophysical survey so this should be added to the description.

l. The description of the remedy for Lake Sediments indicates that biota-risk soil could be consolidated in South Plants. This is not stated in the On-Post ROD (FWENC 1996). Please remove this statement or provide clarification.

m. The description of surficial soil should also explain that the remedial action included landfilling soil from the pistol and rifle ranges.

n. This table includes a description of off-post revegetation. However, this was a component of the Off-post On-Post ROD, not the On-Post ROD, and therefore should not be included on Table 4.0-3. Please revise the table appropriately.

o. The table is missing the On-Post ROD requirement to revegetate areas disturbed during remediation (FWENC 1996). Please add this remedy requirement.

Response: The table (now 4.0-1) has been revised as suggested.

Comment 9. **Table 4.0-4, Pages 19 and 20.** This table lists other components of the remedy. The following are comments on this table:

a. Descriptions of the CERCLA Wastewater Treatment Plant, Trust Fund, and Biological Advisory Subcommittee include additional information that is not identified in the On-Post ROD remedy. Please remove the status/history and details to the appropriate sections of the FYR Report.

b. This table is missing the On-Post ROD requirements for drummed waste and for development of a detailed schedule. These remedy requirements should be added. The summaries provided on Table 3.0-2 of the Remedial Action Summary Report could be used as a good summary of the On-Post ROD remedy (TTECI 2011).

Response: The table (now 4.0-1) has been revised as suggested.

Comment 10. **Section 4.2.1.3, Page 52.** This section describes the SDT RCRA-Equivalent Cover and states that the CCR-Part 2 will be prepared to document the cover O&M determination and that this document is scheduled for preparation in 2016. However, based on the percolation performance issues with the SDT RCRA-Equivalent Cover, it is not expected that an O&M determination will be feasible in 2016. This statement should be revised to explain that the O&F determination will be made when appropriate.

Response: Agreed. The statement will be revised as suggested.

Comment 11. **Section 4.2.3, Pages 53 through 75.** This section describes on-post soil remedies where the construction is complete. Three of these projects also have an operating component. Please include an explanation to Section 4.2.3.4, Section 4.2.3.5, and Section 4.2.3.7 that explains that the Complex Trenches, Shell Trenches, and Section 36 Lime Basins projects, respectively, also include constructed slurry walls and dewatering systems that were operating during this five-year-review period. A reference to Section 4.1.1.2 could be added for additional detail.

Response: The sections will be revised as appropriate.

Comment 12. **Section 4.2.3.4, Page 65, Section 4.2.3.5, Page 68, Section 4.2.3.6, Page 71 and Section 4.2.3.7, Page 74.** These sections describe O&M requirements for the ICS, Shell Trenches, Basin F, and Section 36 Lime Basins respectively. All of the projects have very similar O&M requirements. However, the descriptions are not always consistent regarding interim O&M, long-term O&M, compliance standards, and O&F determinations. Please revise these sections for internal consistency.

Response: The sections will be revised for consistency as appropriate.

Comment 13. **Section 4.2.3.7, Page 74.** This section describes the Section 36 Lime Basins remedy and states that the remedial actions for this project are completed. However, while construction of the slurry wall and cover are complete, the dewatering component of the remedial action is ongoing. Please revise this statement appropriately.

Response: The text has been revised as follows, "As documented in the CCR (TtEC 2010f), the Section 36 Lime Basins Slurry/Barrier Wall Construction project has been completed. The dewatering component of the remedial action is ongoing (see Section 4.1.1.2 and Section 4.1.2.4)."

Comment 14. **Section 4.2.3.8, Page 75.** This section describes the borrow area operations. The following are comments on this section:

a. It is explained that several issues related to unexpected discoveries of contamination were identified during borrow area operations, including identification of high pH soil, munitions debris, and MEC. For completeness, please also acknowledge that asbestos containing material was identified during excavation in Borrow Area 9A (TTECI 2008).

b. This section explains that the borrow areas are subject to restrictions on land and water use which will continue to be evaluated in future FYR's. Please explain that the explain that the (sic) restrictions on land and water use are defined in the Land Use Control Plan (Navarro 2013) and implementation of the LUCs is evaluated during annual monitoring defined in the LUC Plan as well as during the FYRs.

Response: a. The text has been revised as suggested.

b. The text has been revised as suggested.

Comment 15. **Section 4.4.1.2, Page 80 and 82.** This section describes land use controls. The following are comments on this section:

a. On page 80 it is explained that *the Rocky Mountain Arsenal National Wildlife Refuge Public Use Plan*, 2004, identifies the access controls used by the USFWS in implementing Public Use programs. EPA is not familiar with this document. Access control requirements are defined in the FFA (EPA 1989) and the LUCP (Navarro 2013). Therefore, the *Rocky Mountain Arsenal National Wildlife Refuge Public Use Plan* should be provided to the Regulatory Agencies for review/verification to ensure that it is consistent with the requirements and goals of the FFA and the specific requirements of the LUCP.

b. On page 82, a summary is provided of the issues that were identified for this FYR related to LUCs as well as a list of additional issues that were addressed during the FYR period. However, other discussions in Section 4 do not provide these summaries of issues. For consistency, a summary of FYR issues and issues that were addressed during the FYR period should be provided for each of the remedial action projects described in Section 4, when applicable.

Response: a. This plan is no longer in use by USFWS and the reference will be removed.

b. Section 4.4.1.2 will be revised to include only a discussion of the remedy components for consistency with the rest of Section 4. Section 6.3.8 will be added to review and summarize findings associated with land use control monitoring. The discussion of identified issues will be included in Section 7.2.4.4.

Comment 16. **Section 4.4.3.2, Page 84.** This section describes unexploded ordinance (sic) management. The following are comments on this section:

a. This section explains that in the fall of 2014 munitions debris was observed in the western half of Section 32 during soil sampling and that regulatory agencies acknowledged that some debris was left in Section 32 after the remediation activities were completed in 2010. This paragraph should be revised to clarify that the regulatory agencies approved the construction completion reports even when they acknowledged that some debris was left in place based on the fact that LUCs are required, as identified in the FFA, that restrict access to RMA.

b. It is explained that the Army plans to conduct periodic, systematic clearance of munitions debris from the historical use area of Section 32. A summary of

the findings from the clearance conducted in the summer of 2015 should be described.

c. This section refers to a work plan that was developed for a systematic surface sweep. It is not clear if this is referencing the work plan prepared for the sweep that was conducted during the summer of 2015 or a more general work plan that will be used periodically. This section should be clarified as appropriate and a reference to the plan and/or plans should be provided.

Response:

a. The LUCs restricting access to RMA are very general and do not provide specific restrictions for access to Section 32. The Land Use Control Plan (LUCP) does include more detail for access concerns related to ordnance issues. The LUCP indicates that areas with ordnance potential are not open for general public access and requires training for workers and visitors with potential access to these areas. In addition, the LUCP requires a re-evaluation of access control requirements as refuge access changes. Review of the CCP confirms that there are no refuge visitor activities planned for Section 32.

b. Although the sweep was performed outside the FYR period, a summary of the results will be provided.

c. The work plan developed for the Section 32 munitions debris removal is set up to include periodic clearance as a long-term strategy. While the plan was initially developed for the 2015 clearance, the scope includes periodic clearance. Although the plan was finalized outside the FYR period, a reference to the final plan will be added.

Comment 17. **<u>Section 5.2.2, Pages 93 through 95</u>.** This section describes the status and follow-up actions from the 2010 FYR for land use controls and describes ongoing inconsistencies between the FFA land use restrictions and the Prairie Gateway PUD (i.e., initially identified in 2010 and again in 2012). As indicated in the General Comments, this should be identified as a (sic) issue for this FYR because this is a (sic) an early indicator of a potential land use inconsistent with the LUCs.

Response: This is already identified as a FYR issue in Section 8.0. See also response to General Comment 2h.

Comment 18. **<u>Section 5.2.7, Pages 100 and 101 and Section 7.4.1.1, Pages 199 through 202</u>.** Section 5.2.7 provides follow-up information on the 2010 FYR issue related to 1,4-dioxane and explains that the new standard (the CBSG of 0.35 µg/L) has not been adopted as a CSRG because a risk evaluation illustrates that the potential carcinogenic risk is 7.7 X 10^{-6} based on concentrations present upgradient of the treatment plants. Section 7.4.1.1, discusses 1,4-dioxane in response to Question B, regarding new toxicity data and clean-up levels, and whether a change is needed to the current water ARARs for RMA. The discussion in both these sections concludes that 1,4-dioxane does not need to be added as an ARAR (i.e., CSRG for the treatment systems at RMA) based on a risk calculation performed

by Army/Shell that shows the risk is below the threshold of $1x10^{-6}$. However, it is not clear how the risk value was calculated or what data and assumptions were used for the risk evaluation. As a result, the conclusion that 1,4-dioxane should not be added as an ARAR/CSRG cannot be agreed to at this time. In addition, the action from the 2010 FYR was to prepare a technical memorandum to document evaluation and decision regarding the need to include 1,4-dioxane as at RMA ARAR. EPA has not received a technical memorandum or documentation or the risk calculations that are described in this section. Back-up information for the 1,4-dioxane evaluation must be provided before EPA can concur with the conclusions of this section. As stated in the General Comments, the issue for 1,4-dioxane is not resolved and should be carried over to the 2015 FYR.

Response: Because a final Data Summary Report and technical evaluation have not been completed, this section will be revised to indicate that the evaluation is not complete and the issue will be carried forward for the next FYR period. Discussion of the risk calculation provided in the draft report will be removed and the risks will be evaluated as part of the project documentation. See also response to General Comment 2l.

Comment 19. **Section 5.2.8, Page 102.** This section describes follow-up actions for the 2010 FYR issue regarding seasonal worker residential use and explains that a draft risk assessment was prepared in December 2011 to estimate exposure to individuals who would stay in the bunkhouses. It is explained that the assessment was not finalized due to concerns with data uncertainty. What this summary does not explain is that the risk assessment was conducted almost solely with existing historical data (except for new soil data collected around the bunkhouse). This section should be revised to explain that the scope of the seasonal worker risk assessment was to use existing historical data to evaluate risk. As a result, the draft risk assessment is based on many significant uncertainties and with such large uncertainty there was not sufficient confidence in the risk estimates (EPA 2012).

Response: The text will be revised to clarify that the assessment was conducted primarily using existing historical data. However, the Army and Shell disagree that the draft risk assessment was based on "many significant uncertainties."

Comment 20. **Section 6.0, Page 103.** This section lists individuals who participated in the five-year review. Please add Wendy O'Brien, EPA Toxicologist, and Andy Lensink, EPA Legal Counsel.

Response: The text has been revised as suggested.

Comment 21. **Section 6.3.3.6, Page 122 through 130.** This section describes document and data review for the Hazardous Waste Landfill (HWL). The following are comments on this section:

a. This section includes observations from Well 25194. In several places this section discusses reclassification of the well from a downgradient well to an upgradient well. However, as explained by the Regulatory Agencies on several occasions, there is not concurrence with the Army proposal to reclassify this well (Army 2015). Groundwater conditions in the vicinity of the well have clearly changed and the Regulatory Agencies have explained that they believe a better understanding of the groundwater is needed to ensure that the landfill monitoring network if effective. Please remove any discussion of well reclassification. Instead, expand this discussion to describe the actions that were identified in the Consultative meeting regarding Well 25194 (Army 2015), including the goal to identify the source of the detection of dieldrin in Well 25194 in 2015.

b. On page 128 it is explained that there were recurrences of analyte detection in the leak detection system (LDS) sumps and that on November 22, 2011, the Army and Regulatory Agencies agreed to suspend monthly sampling events. However the reason for suspending sampling is not provided. To provide context for FYR reviewers who are not familiar with the historical rationale, this section must provide the basis for changing monitoring of a LDS associated with a hazardous waste landfill.

c. A summary of LDS monitoring is provided for 2010 through 2014. However, the discussion is difficult to follow and the information provided is not always consistent. For example, signature dates on Nonroutine Action Plans (NRAPs) and/or or Operations and Maintenance Change Notice (OCNs) is provided in some cases, but not in others; rationale for changing the analyte monitoring of the LDS is not always provided; yearly summaries do not consistently identify indicator compounds as well as additional analytes that were detected in the LDS sumps; the discussion of detections in 2010 does not explain whether any actions were necessary but actions are described for the subsequent years; and the bulleted list of chemical detections discussed does not always match the list of chemicals identified in the introductory paragraph. Results of analytical sampling and detections may be better presented in a table, along with associated criteria, the associated NRAP and/or OCN when relevant, and a brief explanation of rationale for actions, when applicable. Please revise this section appropriately.

Response:

a. The section will be revised as requested. The Consultative meeting regarding the approach to well 25194 was held after Revision B of the FYR was issued and is outside the FYR window. The identification of the source of dieldrin in Well 25194 will be addressed in 2016.

b. The section will be revised as requested.

c. The section will be revised as requested.

Comment 22. **Section 6.3.3.7, Page 133 through 137.** This section describes LDS detections in the ELF. The following are comments on this section:

a. Similar to Section 6.3.3.6, it is difficult to follow the discussion of analyte detections, the resulting actions and rationale for actions. For example, the discussion of the 2011 ELF LDS analytical results explains that chloroform, dieldrin, 1,2-dichloroethane, DIMP, and lead were the indicator compounds detected in the ELF LDS sumps. Additional information is provided for all of the compounds except for lead.

b. The first paragraph on page 135 also references a July 2011 report titled *Detection of Contaminant of Concern in ELF Leak Detection System – investigation Summary*. However a reference to this report is not provided. In addition, this section states, "The Army was unable to determine the source or provide an explanation of the detected concentrations found in LBLDS2." However, what the FYR does not explain in Section 6.3.3, is that the numerous and frequent occurrence of detections in the LDS are often attributed to contaminants in the clay liner material, rather than indications of leaks in the liner system. Section 6.3.3 should be revised to explain this overarching issue with the LDSs for the ELF and the HWL.

Response: a. The section will be revised as requested.

b. The section will be revised as requested.

Comment 23. **Section 6.3.5, Page 147.** This section describes the biomonitoring program and states that the Regulatory Agencies agreed in February 2014 to terminate the kestrel study. This statement is incorrect. In the February 2014 meeting, the Regulatory Agencies agreed to suspend kestrel monitoring until the scope of the post-remedy supplement soil sampling program was defined. It was never agreed that the program could be terminated. However, this soil sampling program has not been defined to date. Therefore, as stated in the general comments, the incomplete biomonitoring component of the remedy is identified as an issue for this FYR that needs follow-up action.

Response: The text will be revised to state that the biomonitoring program has not been completed and that additional monitoring requirements need to be determined. This will be added as an issue for the FYR Report.

Comment 24. **Table 6.3.5.3-1, Page 159.** This table lists ICS percolation exceedance events. The following are comment/question on this table:

a. It is not clear if the values for percolation shown are the rolling 12-month percolation quantities. Please clarify.

b. The column header for percolation refers to "peak" quantities. It is not clear if each month that exceeds the 1.3 mm/year standard is shown on the table or if only the highest quantities are shown.

c. The table includes information on the "Cause of Excess Percolation." It is not possible to know the exact cause of percolation because the lysimeters are below grade. This header should be revised to explain that these are expected or presumed causes of percolation.

d. The expected cause for percolation from Lysimeters 004, 008, and 015 explains that water from construction and irrigation was drained from the lysimeters. This information could be misunderstood to mean that there was a deliberate action to drain the construction/irrigation water which is not necessarily the case. It is recommended that this information be revised to explain that the percolation observed in the lysimeters in November 2010 was expected to be water present in the cover from construction and irrigation.

e. The table should be expanded to reflect percolation exceedances through the rest of the FYR period.

f. The table should clarify which percolation quantities were collected before and after the start of the compliance period.

Response: Note this table has been renumbered to be Table 6.3.7.3-1.

a. The values shown are the highest rolling 12-month percolation quantities for the percolation breakthrough event. A note will be added to the table clarifying the meaning of the values in this column.

b. Only the highest quantity of the rolling 12-month percolation total is shown in the table, hence the term 'Peak' in the header. Since 12-month rolling totals are cumulative, percolation exceedances last a minimum of 12 months, and typically last longer. The peak value was reported in the table to provide the reader with a sense of magnitude for each event. A note will be added to the table clarifying the meaning of the values in this column.

c. The header will be revised as suggested.

d. The description will be revised as suggested.

e. The FYR period is April 1, 2010 to March 31, 2015. All percolation exceedance events for this timeframe are represented on the table.

f. The compliance period for ICS began on April 21, 2015, which is outside of the reporting period for this FYR. Thus, all percolation exceedance events shown on Table 6.3.5.3-1 occurred prior to the compliance period.

Comment 25. **Section 6.3.6, Page 149.** This section describes air monitoring and refers to results of the monitoring program conducted since the last FYR. A reference for this data should be provided.

Response: The reference has been updated. PM-10 sampling results were presented in an addendum the Air MCR (TtEC 2010j).

Comment 26. **Section 6.3.7.1, Page 151 and Section 6.3.7.2, Page 154.** These sections describe erosion settlement monitoring for the HWL and the ELF respectively. Both sections explain that there were signs of located settlement immediately round the monuments. However, the monuments are not designed or monitored to track overall settlement of the cover. It is understood that the settlement be (sic) referred to is just in the top soil layer of the cap. To clarify that this settlement was just identified in the soil cover, rather than settlement of the entire cap (which is a much more serious situation), these two statements should either be revised to explain that there was localized soil settlement around the monuments, or additional explanation should be revised to address settling of the entire RCRA Subtitle C cap.

Response: The section will be revised as suggested. Note that the erosion/settlement monuments installed in the HWL and ELF caps are surveyed to track overall settlement of the caps, which is why the monument locations are surveyed (horizontally and vertically) semiannually.

Comment 27. **Section 6.3.7.3, Page 160.** This section describes the document and data review for the ICS and explains that all cover soil thickness loss measurements collected on the ICS between October 2009 and September 2014 were below the non-routine trigger level of 0.25 foot and the compliance standard of 0.5 feet. While there is no disagreement with this statement for soil thickness measured at the erosion monuments, this discussion should include a description of the sinkholes that were identified in the ICS beginning in October 2013 and refer to the more detailed description of these on page 166. While the size and shape of the sinkholes varies, there are clearly areas where the minimum cover thickness is not present due to these holes and cracks in the cover, some of which were measured to be more than 1-foot deep. As explained in the Army/Shell responses to EPA's comments on the 2013 Annual Covers Report for the ICS (Army 2014) the largest holes which presented potential safety hazards were filled with stockpiled cover soil.

Response: According to the requirements of the RCRA-Equivalent, 2-, and 3-Foot Covers Long-Term Care Plan (LTCP) (TtEC 2011), cover thickness monitoring is quantitatively measured at erosion/settlement monuments on the RCRA-equivalent covers on a semiannual basis. Speculation regarding the impact of sinkholes on cover thickness is not appropriate for Section 6.3.7.3. As noted in the comment, the sinkholes are discussed elsewhere in the report.

Comment 28. **<u>Section 6.3.7.3, Page 164 and 165</u>.** The subsection on these pages describes the soil cover moisture monitoring system. The following are comments on this discussion:

a. This section explains that the moisture probes are used to monitor and demonstrate the formation of a capillary barrier. For completeness and accuracy, please expand this statement to clarify that the moisture probes are used to monitor soil moisture throughout the soil cover profile including the area directly above the soil-capillary barrier material interface. Information from the soil moisture monitoring is used to determine whether a functional capillary barrier is present at the interface between the soil cover moisture storage layer and the underlying capillary barrier material, as designed. The soil moisture information is also useful in understanding moisture storage within the soil cover profiled, as described further in this section.

b. This section states that opportunities to use the data to assist in selection of appropriate corrective actions in the event of a percolation exceedance and to provide diagnostic information that may assist in selection and assessment of O&M activities has been rare. This statement should be followed with an explanation that the soil moisture data will be used to evaluate the current percolations exceedances of the compliance standard and in conjunction with a geotechnical investigation of the covers.

c. The last paragraph in this subsection is a summary of the soil moisture data evaluation. In addition to the information provided, the EPA team provides the following information based on the detailed evaluation of the soil moisture data. Evaluation of the performance of the covers is grouped into three periods of time:

- <u>July 2007 to December 2009</u>: The newly constructed cover was stressed with irrigation, precipitation, and lack of vegetation establishment. Intense irrigation of the cover from July 2, 2007 to September 15, 2007 led to significant increase in moisture content throughout the soil profile, and particularly at the base of the soil cover. The volumetric moisture content information collected indicates that the early performance of the cover for over two years after the irrigation period (i.e. until 2009) may not be considered representative of the long-term performance. It is the interpretation of the EPA Team that the evapotranspirative (soil) component of the cover performed below expectations during the initial years this evaluation period of time. Specifically, many of the nests of moisture sensors show that the lower half of the covers often reached uniform, very high moisture content values (perhaps saturation). It is acknowledged, however, that the vegetation may have not been fully established at that time.

- <u>January 2010 to December 2012</u>. The well-established cover was subjected to comparatively below-average precipitation. This period is

considered to have been less affected by the initial (2007) heavy irrigation of the SDT RCRA-Equivalent Cover. Also, the vegetation is considered to have been established during this period. Additional irrigation reported to have occurred over Lysimeter 1 may have affected the results in this lysimeter. Nonetheless, the performance of the lysimeters are consider to correspond to a performance that is more representative of the long-term performance of the covers. It should be noted, however, that the total annual precipitation between 2010 and 2012 was comparatively low. The average annual precipitation values for the cities of Denver and Commerce City have been reported as 15.81 and 17.07 inches, respectively. Yet, the annual precipitation during these three years was always below average, with 2012 being a record low precipitation of 6.41 inches at the site. Following the rainy periods of April 2009, April 2010, and May 2011 the lysimeters showed an increase in moisture content that reached the base of the cover in comparatively short periods of time. In February 2012 (record dry year) the moisture front did not reach the base of the cover but reached past mid-depth of the cover. Consequently, the evapotranspirative component of the cover alone has not been able so far to preclude the advance of moisture during the wet season.

- January 2013 to June 2015. The well-established cover was subjected to more significant precipitation events during this period. This period is considered to be no longer affected by the initial (2007) heavy irrigation. Also, the vegetation is considered to be established during this period. Accordingly, the performance of the lysimeters during this period is also considered to correspond to a performance that is representative of the long-term performance of the covers. It should be noted, however, that the total annual precipitation during the 2013 to 2015 period is higher than that recorded during the previously analyzed period (i.e., 2010 to 2012). The precipitation recorded at the site in years 2013 and 2014 (16.23 inches and 19.23 inches, respectively) has exceeded this average precipitation for the first time during the monitoring period. Significant thawing and rainy periods were identified in 2013 (March and September 2013), with the precipitation in September causing flooding in the Denver area and significant runoff. The May 2014 precipitation subsequently occurred at a time in which the moisture content in the entire cover was particularly high. While the 2013 precipitation certainly stressed the cover more than any previous year during the monitoring period, the pattern of 2013 precipitations may not be critical to test the performance of the RMA covers. This is because 2013 precipitation occurred in the form of comparatively short, yet heavy events that led to significant volumes of surface water runoff. Following the rainy periods of September 2013, the lysimeters showed an increase in moisture content that reached the base of the cover in comparatively short periods of time. In 2014, the movement of the moisture front during the May 2014 rainy season was not clearly observed because of the significantly high moisture content in the cover

by the time of this precipitation event. On the other hand, the precipitation of May 2014, while not as intense as the September 2013 event, occurred at a time in which the cover had not recovered from the winter season. Similarly, the performance of the covers around May 2015 correspond to a period of comparatively high precipitation following a winter during which the cover did not have a chance to dry/recover.

Response: a. The section will be revised as suggested.

b. The investigation into the 2015 percolation compliance standard exceedance at the SDT RCRA-equivalent cover began after this FYR reporting period ended. It is not appropriate to discuss future events in this section of the report.

c. Comment noted. The Army and Shell will continue to consider observations made by EPA in evaluation of the soil cover moisture monitoring system.

Comment 29. **Table 6.4.1-1.** This table summarized the 2015 FYR field inspections and includes observations and a response/correction action. There are several observations that do not have a response. The table should be completed with responses/corrective actions.

Response: Then table has been revised as suggested.

Comment 30. **Section 6.4.1, Page 172.** This section describes the FYR inspections. Several wells were identified that do not have locks and it is explained that wells requiring locks are identified in the Land Use Control Plan. Based on review of the USFWS EIS, it is clear that there are plans to expand visitor access to RMA (USFWS 2015). Therefore, it is requested that the FYR identify a follow-up action to conduct an annual review of USFWS visitor access areas and the wells and other remedy structures within those areas to identify the need for additional locks/security. This action could be conducted as a component of the annual LUC monitoring.

Response: The existing land use control annual monitoring requirements already include an inquiry into whether the USFWS has modified the public use area of the refuge, particularly for access to areas with potential munitions debris. This effort will be expanded to evaluate changes in access with the potential to impact security of remedy structures.

Comment 31. **Section 7.1.2.1, Page 174.** This section discusses the ICS with respect to FYR Question A: is the remedy under construction functioning as intended by the decision documents? The following are comments on this section:

a. The response to this question is that there are no early indicators of potential remedy failure. However, as identified in the General Comments, the development of sinkholes in the ICS and other indications of differential settlement are an early indication that the cover is not performing as intended

by the On-Post ROD goals and standards or by the Remedial Design. Also, while it is true that the compliance standards may be achieved that are defined in the LTCP, there are early indications that the performance standards identified in the On-Post ROD may not be met. This discussion should be revised appropriately.

b. This section explains that during vegetation establishment routine monitoring and maintenance are ongoing. However, routine monitoring and maintenance are required after vegetation is established as well. Further, the vegetation is established and the establishment period is complete. This discussion should be revised to make these clarifications.

c. This section indicates that the O&F determination is expected in 2016. However, it is not clear that the cover will achieve O&F with the current settlement/sinkhole issues. This discussion should be revised to clarify that the O&F determination will be made when appropriate.

Response: a. The widespread presence of sinkholes could be an early indicator of a situation that may be a protectiveness problem in the future.

b. The section will be revised as suggested.

c. The section will be revised as suggested.

Comment 32. **Section 7.1.2.3, Page 175.** This section provides a response to Question A for the SDT RCRA-Equivalent Cover. This section explains that during vegetation establishment routine monitoring and maintenance are ongoing. However, routine monitoring and maintenance are required after vegetation is established as well. Further, the vegetation is established and the establishment period is complete. In addition, this section indicates that the O&F determination is expected in 2016. However, it is doubtful that the cover will achieve O&F with the current percolation compliance issues. This discussion should be revised to make these clarifications.

Response: The section will be revised as suggested.

Comment 33. **Section 7.2.1.9, Pages 182 through 183**. This section discusses the NBCS and states that no early indicators of potential issues have been identified. This section also states that residual contamination is present in downgradient wells above the CSRGs/PQLs but this contamination is not representative of current system effectiveness. However, the rationale for this statement is not provided. As identified in the General Comments, this section should be revised to explain that dieldrin concentrations above the PQL are present in the downgradient performance wells and that additional evaluation will be performed for the downgradient NBCS performance wells to validate conclusions with respect to system effectiveness.

Response: Detailed discussion of the evaluation of the downgradient performance well data is included in the FYSR. A summary of the rationale supporting the conclusion in Section 7.2.1.9 will be added to Section 6.3.1.2.

Comment 34. **Section 7.2.3.1, Page 186 and Section 7.2.3.2, Page 187.** These sections describe sampling wastewater in the HWL and ELF LDS sumps respectively. These sections should include additional discussion to respond to the question: Is monitoring being performed and is it adequate to determine effectiveness and protectiveness of the remedy? As described in Section 6.3.3.6 and Section 6.3.3.7, monitoring of the HWL and ELF LDS wastewater frequently has a variety of contaminants. It should be explained that the contaminant source is attributed to on-site borrow source of clay for the liner and that a variety of information is reviewed to evaluate the effectiveness of the HWL and the ELF to contain waste, including the evaluation of leachate analytical results, LDS volumes, and groundwater data.

Response: The section will be revised as suggested.

Comment 35. **Section 7.2.3.1, Page 187 and Section 7.2.3.2, Page 188.** These sections address the HWL and ELF respectively, in regard to Question A. Both sections conclude that there were no early indicators that the protectiveness of the HWL/ELF is at risk. However, this statement does not directly answer the question addressed in this section of the FYR Report: Is the operating remedy functioning as intended? The conclusion should be revised to answer the question appropriately.

Response: The text for these sections already states that the projects are operating and functioning as designed. However, the statements will be moved to the concluding paragraphs for clarity.

Comment 36. **Section 7.2.4.1, Pages 188 and 189.** This section addresses the biomonitoring program in regard to Question A: Is the operating remedy functioning as intended? The following are comments on this section:

a. This section concludes that the biomonitoring program is functioning as designed and the activity is performing as expected. EPA disagrees with these conclusions and the incomplete biomonitoring program is identified in the General Comments as an FYR issue. Implementation of the biomonitoring program is incomplete, data gaps exist, and reporting and evaluation of existing data is incomplete (e.g., data, data quality reviews, and evaluation of results has not been submitted for 2010, 2011, 2012, or 2013 sampling events). It is agreed that in February 2014, the Regulatory Agencies concurred to postpone additional field sampling of kestrels until the scope of possible site-wide soil sampling was defined. However, the site-wide soil sampling program is still undefined, therefore, the biomonitoring program must be reinitiated to comply with the biomonitoring component of the selected On-Post ROD remedy (FWENC 1996) and the *Long-Term Contaminant Biomonitoring Program for Terrestrial Ecological Receptors at Rocky*

Mountain Arsenal (BAS 2006). Missing documentation must be prepared, reviewed, comments resolved, and finalized.

b. This section also explains that there have been no issues identified with the effectiveness of the remedy based on the starling and kestrel studies and concludes that no early indicators of potential issues have been identified. This statement is incorrect with respect to existing kestrel data. Based on the criteria defined in the *Long-Term Contaminant Biomonitoring Program for Terrestrial Ecological Receptors at Rocky Mountain Arsenal* for determining whether the remedy is effective, results of kestrel monitoring to date do not currently meet the criteria for deciding that the remedy was effective (mean concentration of dieldrin in eggs exceeds the NOAEC) (BAS 2006).

This section should be rewritten to correct these inaccuracies and to identify the biomonitoring issues.

Response: This section will be revised to indicate that the program is incomplete. Although mean concentrations of dieldrin in kestrel eggs at several nest box locations exceed the NOAEC, the BMP also states that because there is a lack of clear association between egg concentrations and the NOAEC, this will not be considered sufficient evidence that unacceptable pathways remain or that the remedy is ineffective. Although there have been isolated detections of dieldrin in kestrel eggs, there is no evidence to date of unacceptable exposure to wildlife populations. The RAOs are being met and the remedy remains protective. However, because Phase 2 as described in the BMP was suspended, a determination of appropriate additional sampling to complete the program is required.

Comment 37. **Section 7.2.4.3, Page 190.** This section discusses the groundwater monitoring program and indicates that there are no early indicators of potential remedy problems. However, Section 5.1.3.2 in the FYSR identifies several problems with the CFS monitoring system (Navarro 2015) and this is identified as an issue in the General Comments. In addition, the FYR inspections identified some wells where the protection and security were inadequate, which is also identified as an issue in the General Comments. This section should be revised appropriately.

Response: The existing CFS monitoring program has shown no significant impacts to the CFS. Section 6.3.3.3 will be revised to discuss subsequent proposed actions regarding selected CFS wells.

Comment 38. **Section 7.2.4.4, Page 191.** This section describes land use controls with respect to Question A. It is explained that the Commerce City Prairie Gateway PUD document show there are early indicators of potential issues. In addition to these PUD documents, changes in land use proposed by Commerce City in a handout/presentation to the EPA Region 8 staff on May 29, 2014, identifying their desire to add multi-family housing on Victory Crossing (the Western Tier Parcel) (CC 2014), and future land uses/activities proposed in the selected alternative in

the Final EIS prepared by USFWS (USFWS 2015) also are early indicators of potential conflicts with the existing LUCs. The discussion in this section should be expanded to reflect these planning documents that identify proposed land uses inconsistent with the LUCs as an early indication of a potential issue.

Response: Although the PUD, Commerce City planning documents, and the USFWS EIS identify potential uses in conflict with existing controls, the documents acknowledge the existing controls and the need to revise the controls prior to implementing these uses. In addition, annual monitoring includes discussion with Commerce City and the USFWS to ensure compliance with the LUCs. Existing controls have not been violated. The section will be revised to discuss future land use planning; however, the acknowledgement of and adherence to existing controls demonstrates that the LUCs are being effectively implemented, and the remedy remains protective.

Comment 39. Section 7.3, Pages 192 through 199. These sections responds to Question A for completed remedial actions: Are the completed remedial actions functioning as intended by the decision documents? Evaluation of many of the completed remedial actions state, "No early indicators of potential remedy failure were identified." However, Question A does not ask for identification of remedy failure. The summaries in Section 7.3 should be revised to identify whether the completed remedial actions are functioning as intended.

Response: These sections will be revised to directly address the question as stated in the guidance. However, guidance also suggests that early indicators of potential remedy problems should be identified and discussed. Where appropriate, this terminology will be included in the project discussion.

Comment 40. Section 7.3.4, Page 194 and Section 7.3.6, Page 195. These sections response (sic) to Question A for completed remedial action for the ICS and the Shell RCRA-Equivalent Cover respectively. As identified in the comment above, both of these sections state, "No early indicators of potential remedy failure were identified." However Question A does not ask for identification of remedy failure. In addition, monitoring data for both the ICS and the Shell RCRA-Equivalent Cover indicate that these covers may not be functioning as intended by the decision documents (the On-Post ROD and the remedial design documents in this case). These sections should be revised appropriately.

Response: Sections 7.3.4 and 7.3.6 were intended to address only the construction activities for the covers, while interim O&M activities and potential issues were included in Sections 7.1.2.1 and 7.1.2.3. To avoid confusion, Sections 7.3.4 and 7.3.6 will be revised to eliminate statements that the covers are functioning as intended, and will reference Sections 7.1.2.1 and 7.1.2.3. These sections will be revised to directly address the question as stated in the guidance.

Comment 41. Section 7.3.18, Pages 198 and 199. This section states, "The Remediation phase is now considered 100% complete and no further costs are expected to be

recorded under this category." However, remediation of groundwater is ongoing. This statement should be revised for clarify (e.g., construction of the remedy is considered complete).

Response: The text will be revised as suggested.

Comment 42. **Section 7.4, Page 199.** This section provides information in response to Question B: Are the exposure assumptions, toxicity data cleanup levels and remedial action objectives used at the time of the remedy selection still valid? As identified in the General Comments, this section should include the identification of toxicity criteria for Mustard and nerve agent VX that are lower than at the time of the Remedial Investigation.

Response: Toxicity information has not changed significantly since the ROD was signed. In addition, remedial actions were performed for all areas identified with agent potential, and toxicity criteria were not used to set cleanup levels. Specific citations from chemical agent references provided by EPA on February 26, 2016 did not identify any new information related to toxicity of sulfur mustard or VX. Based on the site history and remedy performed, there is no impact on protectiveness of the remedy (see also response to General Comment 2a).

Comment 43. **Section 7.4.1.1, Pages 199 through 202.** This section evaluates changes in water standards in response to Question B. Calculated risks are shown on Table 7.4.1.1-2 for some compounds and reference is made in the text regarding risk that approaches or exceeds 1×10^{-4} for 1,1,2,2-tetrachloroethane. However, back-up information is not provided for this risk values. Please provide the back-up information and assumptions for these calculations. In addition, please confirm that cumulative risks are considered.

Response: The text will be revised to provide the information necessary to support the calculations. Consistent with EPA guidance, each contaminant was evaluated individually and no cumulative risk evaluation is necessary.

Comment 44. **Section 7.4.5, Page 205.** This section addressed changes in exposure assessment variables and states, "the demographics and associated exposure scenarios considered in the On-Post and Off-Post OU have not changed significantly since the signing of the On-Post RODs." However, as identified in the General Comments, there are several indications that current land users (e.g., Commerce City and USFWS) are interested in pursuing land use changes that could impact demographics and associated exposure scenarios from those identified in the On-Post RODs. This should be tracked along with the land use FYR issue.

In addition, this section states that monitoring data indicate that no adverse changes in exposure concentrations were discovered. However, the acute human health exceedance identified in former Basin C is an exposure concentration above the On-Post ROD site-evaluation criteria. This statement should be revised to address this new soil data in Basin C.

Response: Although there are indications that changes to land use might be pursued, Commerce City and USFWS have consistently confirmed their understanding of the existing restrictions and the need to modify the ROD before implementing changes inconsistent with current restrictions. At this point, there have not been changes inconsistent with the restrictions and the exposure assumptions are still valid.

Although results of recent soil sampling identified an area in Basin C with contaminant concentrations greater than the ROD human health criteria, the overall site exposure concentrations have decreased as a result of remedial actions so the statement remains true. The text will be revised to discuss the Basin C sample result as an exception to this general statement.

Comment 45. **Section 7.5, Page 207.** This section addresses Question C: Has any other new information come to light that could call into question the protectiveness of the remedy? The response to this questions (sic) indicates that other than the post-remedy surface water sampling program, no other new information was obtained during the FYR that would call into question the effectiveness of the remedy. The following is a list of other information that has come to light that should be identified in this section and considered when responding to Question C.

a. The discussion of HWL Well 25194 in Section 6.3.3.6 identifies that the water table in the area of this well may be attributed to recharge from the perimeter ditch around the HWL. This recharge is affecting the groundwater pathways in the vicinity of the HWL and causing an upgradient condition in this area where a downgradient condition existed previously. The change in the groundwater flow in this area affects the groundwater monitoring program for the HWL and represents new information that was not known at the time of the previous FYR.

b. Based on the results of EPA's oversight sampling program at RMA, there are indications that the compound n-nitrosodipropylamine (NDPA) is present in groundwater samples analyzed for n-nitrosodimethylamine (NDMA) (i.e., the NDPA results are received from the laboratory as part of the same analytical suite used for NDMA). NDPA is listed in the Colorado Basic Standards for Groundwater with a value of 0.005 µg/L and is not currently monitored at RMA. The identification of NDPA in groundwater should be identified as new information.

c. Section 7.2.4.3 discusses the site-wide groundwater monitoring and indicates that there are no early indicators of potential remedy problems. However, the results of the plume mapping project discussed in Section 6.3.3.9 have provided updated information on contaminant plume nature and extent that was not available when the LTMP was revised in 2010 or for the 2010 FYR. The 2014 plume mapping identifies changes that have occurred to plumes since last mapped in 1994 which may have implications for the site-wide groundwater monitoring program and for the groundwater treatment systems.

Therefore, the results of the plume mapping project represent new information gained since the last FYR and should require evaluation with respect to the LTMP and the On-Post ROD remedies at RMA.

d. The subsection titled "Dieldrin" in Section 5.1 of the FYSR indicates that a previously unidentified contaminant pathway exists in the sub-cropping Denver Formation north of Basin A (Navarro 2015). Discovery of a new contaminant pathway out of Basin A constitutes new information which may have implications for remedy assessment. This pathway should be identified as new information, and a plan prepared for evaluating this pathway.

e. The dieldrin exceedance of the ROD acute site evaluation criteria, identified in Basin C where the On-Post ROD remedy was completed during the 2014 soil sampling program should be identified in this Section.

f. Kestrel egg data that exceeds the NOAEC level for dieldrin should be identified as new information that has come to light since last FYR.

g. Revised toxicity criteria for Mustard and VX as well as new research regarding persistence of these chemicals is new information that has come to light since the last FYR.

h. The detection of dieldrin in fat from a 2-year old Bison should be identified as new information that has come to light indicating the bioaccumulation of this COC that should be evaluated.

i. Land uses are proposed in the selected alternative in the USFWS Final EIS and in Commerce City planning documents that are inconsistent with the current land use restrictions. While there appears to be an understanding from USFWS and Commerce city that land use restriction would need to be modified prior to implementation of these land uses, the fact that these changes are being considered in an early indication of potential exposures that were not considered in the On-Post ROD clean-up.

j. Knowledge of land transfers out of Federal Ownership have been identified that appear to be inconsistent with the land ownership requirements identified in the FFA, risk assessment, and On-Post ROD.

Response: Response by bullet item:

a) This issue is discussed in Section 6.3.3.6 and is not other new information. This issue is being addressed at the working group level and is expected to be resolved in 2016. The change in groundwater behavior at the HWL does not meet the criteria for an FYR issue; i.e., a situation that currently prevents the response action from being protective, or an early indicator of a situation that may be a protectiveness problem in the future.

b) This information will be added and identified as an issue in Section 8.0.

c) This is not other new information because a summary of the plume mapping effort is provided in Section 6.3.3.9 and detailed discussion is provided in the FYSR. Section 7.2.4.3 will be revised to clearly state that there is no indication of remedy problems from the plume mapping effort.

d) An evaluation of this Basin A pathway has been added to the FYSR. Based on this evaluation, the pathway is not significant and does not call into question the protectiveness of the remedy.

e) This issue is currently discussed in Section 7.5 and is identified as an issue in Section 8.0.

f) Discussion of the kestrel monitoring results is discussed in Sections 6.3.5 and 7.2.4.1. Those sections will be revised to reflect that the biomonitoring program is incomplete and that additional monitoring requirements need to be determined. This will be added as an issue for the FYR Report.

g) There is no new significant information related to chemical agent that would call into question the protectiveness of the remedy.

h) Although this information was generated outside the FYR window, a discussion will be included. This will also be added as an Other Unresolved Concern in Section 8.0 to provide forward tracking for completion of the data evaluation.

i) The LUCs are discussed in Section 7.2.4.4. This section will be revised to discuss future land use planning; however, the acknowledgement of and adherence to existing controls demonstrates that the LUCs are being effectively implemented, and the remedy remains protective. At this point, there is no information to suggest that inconsistent land uses are occurring.

j) A discussion will be added to Section 7.2.4.4 to identify the apparent inconsistency with the land ownership requirements identified in the FFA and the need to evaluate this potential conflict. This will also be added as an issue in Section 8.0 to provide forward tracking for completion of the evaluation.

Comment 46. Section 8.0, Page 209. This section describes the issues that have been identified by the Army/Shell. EPA concurs with the issues identified in this section. In addition, Section 8.0 should be revised to incorporate the additional issues identified in the General Comments. Should any Army-identified issues be removed during finalization of the FYR Report, EPA would then provide additional comments on these issues.

Response: The section will be revised to incorporate issues as identified in the responses to these comments.

Comment 47. Section 8.5, Pages 213 through 214. This section describes the dewatering goals issues involving the Shell, Complex Trenches, and Lime Basins remedy systems.

It would be better to identify the three issues separately rather than combine them as one issue. This will allow for better tracking of progress on resolving the individual issues.

Response: This issue will be divided into three separate issues.

Comment 48. **Section 8.6, Page 214**. This section discusses addition of 1,1,2,2-tetrachloroethane as CSRG for the Basin A Neck System, and adjusting the analytical method so as to achieve results sufficient to achieve the CBSG value. However the CBSG for 1,1,2,2-tetrachloroethane is not identified. Please provide the current CBSG for 1,1,2,2-tetrachlorethane and indicate that this is the proposed CSRG for this compound.

Response: The CBSG will be included in this section.

Comment 49. **Section 8.8, Page 214.** This section identified other unresolved concerns. EPA requests that the following concerns and problems be added to Section 8.8:

a. All analytical data collected at Rocky Mountain Arsenal (RMA) is compiled into a database called the RMA Environmental Database (RMAED). Numerous technical documents have been provided to the Environmental Protection Agency (EPA) in which the RMAED is referenced for further data and information not found in the reports. However, remote access to the RMAED, which the regulatory agencies were previously given has been curtailed. This lack of real-time access to the RMAED has significantly affected the EPA's ability to perform document reviews in a timely manner and may require the EPA maintain their own database for this purpose which has not currently been budgeted. It is requested that problems in accessing the RMAED be identified as a concern in Section 8.8 of the FYR report.

b. Diisopropyl methyl phosphonate (DIMP) has never been added to the CSRG list for the Basin A Neck System even though it is a major component of the mass removed by this system. DIMP should be added as a CSRG so that the mass removal of this compound is formally incorporated into the requirements for this system. Addition of DIMP to the CSRG list for basin A Neck should be identified as an additional unresolved concern.

c. The site inspections performed for the FYR and included in Section II of the FYR Report are used to indicate whether proper well maintenance, protection, and security were implemented during the FYR period for groundwater monitoring wells. These components of the groundwater monitoring program have achieved increased importance because of plans to grant more public access to areas of the RMA. Review of the site inspection forms indicates that there are numerous wells where proper well protection and security are inadequate. In most cases, the inadequacy stems from lack of inner and/or outer well covers and lack of locks on the well covers that do exist. In some cases there is no protective casing for the wells, which could result in damage

either by the public or by animal activities. Because only a subset of the monitoring wells were inspected, the magnitude of the deficiencies cannot be quantified. The inadequacy of proper well protection and security should be identified as an additional unresolved concern.

Response:

a. The Army understands the difficulties in maintaining access to the RMAED; however, security of Army computer networks has been changed at a level beyond local site control. The Army will continue to work with EPA to provide access as appropriate. If access is not available, the Army will ensure that all data necessary for document reviews be included in each document. This concern is not a FYR issue.

b. Although the mass removal requirements for DIMP have been formally incorporated into the remedy with completion of the 2010 LTMP, inclusion of DIMP on the BANS CSRG list is not a FYR issue because it does not prevent the remedy from being protective. However, the Army and Shell agree to identify this as an unresolved concern and add DIMP to the BANS CSRG list.

c. This will be included as an unresolved concern.

Comment 50. <u>Section 8.4, Page 212</u>. This section describes percolation observed at the SDT RCRA-Equivalent Cover and notes that the lysimeters on the ICS and Basin F covers have not had the same percolation breakthrough issue. It is agreed that the lysimeters on the Basin F cover have not recorded percolation above the compliance standard. However, Lysimeters 7, 10, and 15 have records breakthrough above the standard on occasion since construction was complete. It is agreed that the percolation recorded in Lysimeters 7, 10, and 15 has not been on the scale as that recorded in the SDT lysimeters, but the statement regarding ICS percolation should be revised for accuracy.

Response: The statement regarding Basin F and other ICS lysimeters will be removed because Section 8.4 is intended to focus on the SDT RCRA-equivalent cover percolation issues.

Comment 51. <u>Section 9.0, Pages 215 through 217</u>. This section identifies recommendations and follow-up actions. This section should be expanded based on the additional issues identified in the General Comments.

Response: The section will be revised to include recommendations corresponding to all issues identified in Section 8.0.

Comment 52. <u>Section 9.5, Page 216</u>. This section recommends additional monitoring to address the issues with the meeting dewatering goals at the SDT, Complex (Army) Trenches, and Lime Basins. It is not clear how additional monitoring data will achieve the dewatering goals. Additional recommendations should be considered.

Response: Per RMA Water Team discussions, cost-benefit evaluations for installing dewatering wells in the Shell Trenches and Complex Trenches will be conducted Trenches subsequent to the FYRR. For the Lime Basins, an OCN to the LTMP will be prepared to set new compliance dates for meeting the dewatering goals. These actions will be included as part of the recommendations.

Comment 53. **Section 10.0 and Section 10.1, Page 219.** These sections describe protectiveness and provide the protectiveness statement for the On-Post OU. The following are comments on this section:

a. Section 10.0 states that all controls are in place to adequately minimize risks. However, to ensure protectiveness to workers, the following additional actions should be considered based on the issues identified for this FYR:

- Because of the new information regarding the acute exceedance in the soil sample in Basin C, and because workers at RMA may no longer have the appropriate Occupational Safety and Health Act training or medical monitoring, etc. that would have been required during the soil remedy, consideration should be given to implementing some sort of temporary access control for this area, until further characterization/actions are completed in this area.

- Because of the new information regarding the persistence and toxicological criteria for Mustard and VX, consideration should be given to implementation of access restriction or restrictions on excavation within historical Mustard and VX areas that are outside of the Army-Maintained Areas, to prevent any inadvertent disturbance of the subsurface soil, until further actions are taken in response to this issue.

b. Section 10.2 states that remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Please revise this statement based on the issues identified in these comments.

c. As stated in the General Comments, there is not agreement with the statement that the biota monitoring program was effectively implemented. Please remove this statement.

Response: a. The USFWS is aware of the existing sample results and the efforts for characterization of and potential remediation of the Basin C exceedance area. The Army will continue to coordinate with the USFWS to complete this effort.

As discussed in the response to General Comment 2a, review of documentation for sulfur mustard and VX did not identify any information

related to persistence or toxicity of these chemical agents that have any effect on protectiveness of the remedy. Long-term persistence can be associated with bulk disposal or where the agent is protected from degradation, such as disposal in a container; however, these conditions are not indicated in the areas outside covers. No access restrictions are required.

b. The text will be revised to indicate that the remedy is protective in the short term. However, the assessment that the remedy currently addresses all exposure pathways in the off-post OU is correct.

c. The text will be revised as requested.

Comment 54. <u>Figures</u>. It is recommended that the following figures be included in the FYR Report:

a. A landownership/LUC map and table. As recommended in the EPA Guidance, *Recommended Evaluation of Institutional Controls: Supplement to the "Comprehensive Five-Year Review Guidance*," (EPA 2011) a figure of RMA showing land ownership, along with a table such as that provided in the LUC Plan, would be extremely useful in illustrating what land use restrictions apply to different areas.

b. The 2014 plume maps should be included in the FYR Report. Because this is new information and reflects a once-in-twenty-year characterization of the groundwater plumes it is a valuable representation of this large data collection effort and should be included in the FYR Report.

Response: A figure depicting the existing land use controls will be added for reference. The 2014 plume maps are included in the FYSR, which will be issued as part of the final FYR report.

Comment 55. <u>Figure 6.3.1.1-1</u>. This figure shows the change in water levels during the FYR period. However, the groundwater level difference map (Figure 5.1.3-7) from the FYSR is much more useful for this purpose and should be substituted for the current figure.

Response: The two figures have different purposes. Both figures are provided in the FYSR, which will be a companion volume to the FYRR in the next version.

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U.S. Army and Shell Oil Company Responses to
Colorado Department of Public Health and Environment (CDPHE) October 13, 2015
Comments on the 2015 Five-Year Review Report for Rocky Mountain Arsenal
August, 2015

Comments for Incorporation

General Comments

Comment 1. The Colorado Department of Public Health and the Environment (CDPHE) has completed its review of the Draft 2015 Five-Year Review Report for Rocky Mountain Arsenal, Revision B, dated August 2015. The Technical Assessment Section (Section 7) contains minimal supporting information. According to the Environmental Protection Agency's (EPA) Comprehensive Five-Year Review Guidance, evaluation of the remedy and their protectiveness determination should be sufficiently supported by data and observations.

Response: Comment noted. The document will be reviewed to provide additional detail where appropriate. Significant additional detail is also provided in Section 6.

Comment 2. The On-Post RMA Record of Decision (ROD), Section 9.4, stipulates that the ongoing United States Fish and Wildlife Service (USFWS) biomonitoring programs "*will assess through monitoring, the efficacy of remedies in breaking unacceptable pathways to biota.*" Section 9.7 of the ROD further identifies long-term operations as continuing on "*after EPA releases the site to USFWS as a wildlife refuge*." This Five-Year Review Report incorrectly represent this program as complete and consistently mischaracterizes preliminary monitoring results. The selected long-term biomonitoring approach for kestrels is in fact, incomplete. Furthermore, preliminary results indicate a potential exposure pathway may still exist (see decision criteria in the *Long Term Contaminant Biomonitoring Program for Terrestrial Ecological Receptors at Rocky Mountain Arsenal* (Biomonitoring Plan).

The kestrel sampling was postponed in favor of a soil sampling program that had been proposed by the US Army to characterize the post-remedy surface conditions more directly (with the understanding that killing kestrels is undesirable and should be avoided if there is another way to assess post-remedy site conditions. However, the soil sampling program did not turn out to be sufficiently robust to fulfill that purpose, so the biomonitoring program should resume. There has been no agreement to terminate this ROD-required program. Please revise these sections, including sections 6.3.5 and 7.2.4.1, to accurately reflect the program's preliminary findings and discuss continuation of this ROD mandated biomonitoring program.

Response: The Army and Shell agree that the long-term biomonitoring program has not been completed and that a path forward for completion needs to be determined. The

relevant sections of the FYR will be revised to reflect this. Although mean concentrations of dieldrin in kestrel eggs at several nest box locations exceed the no observable adverse effect concentration (NOAEC), the Biomonitoring Plan also states that because there is a lack of clear association between egg concentrations and the NOAEC, this will not be considered sufficient evidence that unacceptable pathways remain or that the remedy is ineffective. Low-level detections of dieldrin are not unexpected based on cleanup criteria and post-remedy surface soil concentrations. Although there have been are a few detections of dieldrin in kestrel eggs, there is no evidence to date of unacceptable exposure to wildlife populations. However, because Phase 2 as described in the BMP was suspended, a determination of appropriate additional sampling to complete the program is required, and completion of the program will be added as an issue.

Comment 3. The Army/Shell should assess issues related to restrictions on ownership, use, and transfer of Arsenal properties. The Refuge Act, the Federal Facility Agreement, and the RMA ROD by incorporation, specify that the United States government is to retain ownership of RMA. While it is understood that the RMA Refuge Act identified specific areas of the RMA for disposal outside federal ownership (i.e., Section 5), it has become clear to the Division that additional lands (Section 20 Parcel, 40-acres in Section 28 and 33) have been or may be transferred outside Federal control. This is inconsistent with current remedy agreements and controls, and has the potential to impact future remedy protectiveness. As a fundamental component of the ROD, land-use restrictions are integral to overall remedy protectiveness, therefore land transfers outside Federal ownership warrant further attention in this FYR.

Response: Although the ROD and FFA include statements that the U.S. Government shall retain ownership of RMA, the Refuge Act does not. The parties will work to resolve whether land transfers are consistent or inconsistent with the terms of the FFA, ROD and Refuge Act with the goal of providing clear direction for any possible future land transfer actions contemplated by the USFWS. Concerns related to land transfers will be discussed in Section 7.2.4.4 and this will be identified as an issue in Section 8.0.

Comment 4. Given the recent reclassification of the lakes and reservoirs located in the RMA National Wildlife Refuge (RMANWR) (Aquatic Life Warm 2, Recreation E, and Agriculture) and given the fact that a limited number of bison raised on RMA have already been transferred off-site, this Five-Year Review should reevaluate the Applicable or Relevant and Appropriate Requirements (ARARs) for surface water, as related to agriculture and aquatic use classifications. Agricultural and aquatic life standards in the Colorado Basic Standards for Surface Water may apply.

Response: The current classification is consistent with the classification existing at the time of the ROD. The ARARs identified in the ROD already include aquatic life standards specified in the Colorado Basic Standards for Surface Water. Despite the classification as including Agriculture, the determination made in the ROD

remains appropriate. Evaluation of the agriculture standards as ARARs is not necessary because the FFA and ROD prohibit agricultural activities. The presence of the bison herd on the refuge and transfer of animals to other sites is not considered an agricultural activity.

Comment 5. Contingent Soil Volume (CSV) sampling is unnecessarily discussed, without context throughout the document. CSV sampling was not intended to provide verification that *all* contaminated soils were removed from a given soil excavation project. CSV sampling was intended as a tool for the agencies, at their discretion, to direct removal of additional, potentially contaminated soil. Verifying that all contamination, laterally and vertically, was entirely removed was not the goal of the CSV program. Furthermore, there were limitations on the amount of volume that could be removed for the extra contaminated soils that were discovered via CSV samples. The CSV sampling program was not designed to demonstrate the effectiveness of the soil removals, and it should not be presented or implied that it served that purpose.

Response: The current text neither states nor implies that the ROD-identified confirmatory sampling program was designed to verify that all contaminated soils were removed. Where mentioned, the collection of confirmatory samples and removal of contingent soil volume (CSV) is summarizing information already provided in the project Construction Completion Report.

In addition, CDPHE misrepresents the ROD-stated purpose for the sampling by indicating it as a Regulatory Agency discretionary tool to direct additional soil removal. The ROD only states that the confirmatory samples could be used to identify contingent soil volume. Although the Army and Shell generally deferred to the Regulatory Agencies for selecting sample locations, additional soil removal was determined based on the sample results and agreed to by all the parties.

The description on Table 4.0-3 was revised to be more consistent with the ROD language. Table 4.0-1 was revised to include additional context for CSV sampling.

Comment 6. The Army/Shell has correctly identified the changes to groundwater standards as potential changes to ARARs but has chosen not to adopt the Colorado Basic Standards for Groundwater (CBSGs) as Containment System Remediation Goals (CSRGs) at the groundwater treatment systems for 1,2-dichloroethane, 1,2-dichloroethylene, toluene and 1,4-dioxane.

Attaining new ARARs is necessary ensure the remedy remains protective, and the risk calculations provided that support this decision do not provide the necessary detail to appropriately review the process. In order to make protectiveness determination relating to these new standards, CDPHE requires that the full details of these risk evaluations be presented. Moreover, any comparisons to acceptable risk ranges and decisions made from this evaluation must utilize *cumulative* risk assessment methodologies and all applicable changes to groundwater standards and toxicity variables should be used. This includes

incorporating the new standards and toxicity variables that were evaluated, but not adopted, in previous Five Year Reviews (e.g., chloroform).

Response: Attaining new standards for ROD-identified ARARs, in this case the CBSGs, is necessary only when the modified requirement indicates that the remedy is no longer protective. Consistent with EPA guidance, this determination is based on whether the risk is within or below the generally acceptable risk range of 10^{-4} to 10^{-6} for carcinogenic risk and the hazard index is below 1 for non-carcinogenic effects. The risk evaluation performed based on the revised standards indicates that the risks remain acceptable.

The text will be revised to provide the information necessary to support the risk calculations. For 1,4-dioxane, the FYR Report will be revised to include resolution of the 1,4-dioxane evaluation as an issue. Discussion of the risk calculation provided in the draft report will be removed and the risks will be evaluated as part of the project documentation. Consistent with EPA guidance, each contaminant was evaluated individually and no cumulative risk evaluation is necessary.

Specific Comments

Comment 7. Executive Summary, page ES-4, 2nd complete paragraph – The statement is made that On-Post remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas. Given that the recent Supplemental (Surface) Soil Sampling Program (SSSP) identified presumed clean soil backfill in excess of the ROD acute soil criteria from the completed Secondary Basins Soil Remediation Project, it does not appear that the surface soil pathway has in fact been broken. Moreover, without additional characterization in the Secondary Basins, it does not appear that the Army/Shell has the adequate information to qualify exposure risks as acceptable without reliance on access controls. Please qualify this statement by adding additional discussion related to access controls. This statement should be revised throughout this FYR, as it is repeated in numerous sections.

Response: Although two samples have shown dieldrin concentrations slightly above the ROD acute human health criteria, this is unlikely to present an unacceptable exposure. The samples are located in an area where there is not frequent work and any work performed in the area would represent a small fraction of total exposure for a worker. The Army will continue to coordinate with USFWS to keep them aware of characterization efforts and any remediation necessary.

Comment 8. Five-Year Review Summary Form – The Division has the following comments on this form.

a. The issue category regarding institutional controls and the Prairie Gateway Planned Unit Development (PUD) has the potential to impact future protectiveness. Until the inconsistent PUD land uses are eliminated by

Commerce City, these uses could be implemented in Prairie Gateway. Please update the future protectiveness, as appropriate.

b. The impact on current and future protectiveness regarding the 2014 Soil Sampling is unknown. While future protectiveness may be demonstrated by further characterization and subsequent remedial follow-up, no statement can be made regarding the current protectiveness without a strong reliance on access controls. Please modify this determination as appropriate.

c. The protectiveness determination statement for the On-Post Operable Unit requires revision since the "completed" soil remedy for the Secondary Basins Project missed soil in excess of ROD criteria that until further delineated and characterized, has the potential to result in unacceptable risks to human health and the environment.

d. This Five-Year Review Summary Form should be updated to incorporate all additional issues identified in the Division's comments.

Response: a. This issue will be revised to indicate that it could affect future protectiveness.

b. See response to Comment 7.

c. See response to Comment 7.

d. The section will be revised to incorporate issues as identified in the responses to these comments.

Comment 9. Executive Summary, Five-Year Review Summary Form, page ES-9, 1st item – The proposed recommendation to resolve issues with attainment of the dewatering goal is: "*Evaluate existing monitoring programs to determine if additional monitoring is necessary. Review monitoring data and determine estimated target dates for achieving compliance with the dewatering goals.*" This approach to provide additional monitoring appears to presuppose that monitoring goals will ultimately be met, and ignores the possibility that the system(s) may not be able to achieve stated goals without physical or operational changes to the dewatering systems. Please modify the recommendations appropriately.

Response: The recommendations will be revised to include evaluation of dewatering options.

Comment 10. Section 1.0, page 1, 4th paragraph – CDPHE is uncertain how the phrase "under construction" is being defined in this context. Which projects are still "under construction"? Please list the remedy elements that are still "under construction", or remove this reference as appropriate.

Response: Definitions are provided in Section 4.0. The term "under construction" is defined as having an approved 100 Percent Design prior to or on March 31, 2015, but not yet having an approved CCR prior to or on March 31, 2015." For soil cover projects, under construction includes projects where cover construction is complete and interim operations and maintenance (O&M) activities are occurring.

Section 4.2.1 outlines On-Post Soil Remedies Under Construction and includes: ICS Interim O&M, Shell Disposal Trenches Interim O&M, Basin F/Basin F Exterior Interim O&M, and Sanitary Sewer Manhole Plugging Phase II.

Comment 11. Table 4.0-1, Page 14, Shell Trenches Dewatering System – The Shell Trenches remedial action in this table is listed as "passive dewatering to achieve dewatering goals", which is not consistent with the ROD stated goal for the Shell Trenches to "dewater as necessary to ensure containment". Please revise this description.

Response: The table has been revised as suggested.

Comment 12. Section 4.1.1, page 28, 1st paragraph – Please revise the statement that "downgradient performance wells… were found to be comparable to the former conformance wells." New wells were selected in the 2010 Long Term Monitoring Plan for Groundwater and Surface Water (LTMP) to provide a more representative indication of system performance, after the former wells were deemed non-representative. Per discussions at the September 24th, 2015 water team meeting, a more defensible comparison should be made regarding these two sets of monitoring wells, and this statement should be removed pending evaluation.

Response: An evaluation of the hydrogeology in the area of the NBCS former conformance and performance wells will be added to the FYSR to support the conclusions.

Comment 13. Section 4.1.2, Shell Disposal Trenches Slurry Wall, page 36, 2nd sentence – It is understood that dewatering was "unwarranted" after evaluating water levels during design, but final remedy selection is still subject to goals identified in the ROD. Given the current state of the water levels within the remedy structure, dewatering might ultimately be deemed warranted.

Response: This section contains project background information and does not evaluate potential changes to the remedy. The technical assessment in Section 7.2.1.1 indicates that the current water levels represent an indicator of a potential remedy problem. The recommendations provided in Section 9 will be revised to include evaluation of dewatering options for the Shell Disposal Trenches Dewatering System.

Comment 14. Section 4.1.1.3, page 37, 2nd bullet – Please include a description of the operational changes that were made to improve mass removal at the Off-Post Groundwater Intercept and Treatment System (OGITS).

Response: The text will be revised as requested.

Comment 15. Section 4.1.1.3, page 38, 2nd bullet – If water levels have begun to decline, please describe how this can occur in a passively dewatered system, without water/contamination moving beyond the slurry wall. In other words, how can contamination be contained while water levels are declining?

Response: The dual slurry walls undoubtedly provide some level of containment. Although

there may be a small amount of underflow, the head differential across the slurry wall indicates that the flow volume likely is small and much less than if the slurry walls were absent. The text will be revised to clarify this bullet.

Comment 16. Section 4.1.1.3, page 38, last bullet – As a result of the exceedance of aquatic life standards, what conclusions were drawn with respect to protectiveness of the remedy? Please discuss.

Response: This section contains project background information and does not evaluate protectiveness of the remedy. Technical assessment is provided in Section 7.2.4.2. See also response to Comment 41.

Comment 17. Section 4.2.1.1, page 49 - This section states that the Interim O&M Period is the period of time between completion of construction and the Operational and Functional determination. While this statement is true, please also indicate the mandatory compliance date, as detailed in the RCRA-Equivalent, 2-, and 3-Foot Covers Long-Term Care Plan (LTCP).

Response: The section will be revised as suggested.

Comment 18. Section 4.2.1.3, page 52, last paragraph – The Division has the following comments on this section:

a. This section states that the Interim O&M Period is the period of time between completion of construction and the Operational and Functional determination. Please identify the mandatory compliance date, as detailed in the LTCP.

b. Given the current status of the Shell Disposal Trenches Cover (as discussed in this FYR), it appears unnecessary to state that the Construction Completion Report (CCR) – Part 2 will be issued in 2016. This cover will not show conformance with the cover performance standard in 2016.

Response: a. The section will be revised as suggested.

b. Agreed. The section will be revised accordingly.

Comment 19. Section 4.2.1.4, page 52 – Please identify the mandatory compliance date specified in the Basin F Post-Closure Care Plan in this section. The O&F determination does not determine when long-term O&M will begin.

Response: The section will be revised as suggested.

Comment 20. Section 4.2.3.4, page 63, 1st paragraph, Section 4.2.3.5, page 65, 2nd paragraph, and Section 4.2.3.6, page 68, 2nd paragraph – Prior to construction, the feasibility of achieving RCRA Subtitle C equivalence was demonstrated in test plots. The performance standard is based on composite liner Subtitle C cap performance equal to 1.3 mm per year deep percolation. This standard, not "*Maintain cover percolation less than or equal to the percolation of the underlying native soil"* is

relevant to the protectiveness of the RCRA-equivalent cover systems. Please include this standard in your evaluation/discussion.

Response: The text provided in these sections was taken directly from the remediation standards listed in the On-Post ROD. Also included in the list of standards is: "*Allow no greater infiltration through the cap than the range of infiltration that would pass through an EPA-approved RCRA cap.*" The text will be revised to identify the percolation performance standard developed during design.

Comment 21. Section 4.4.3.2, page 84, last paragraph –Where is the work plan to address periodic munitions debris clearance at Section 32 located? Is it appended to the 2012 Munitions Response Plan? Please describe where and how this plan can be accessed.

Response: The Section 32 Munitions Debris Removal Work Plan was provided to the Regulatory Agencies on June 10, 2015. In addition, the 2012 Munitions Response Plan was updated in December 2015 and Revision 1 was provided to the Regulatory Agencies on December 22, 2015. The Munitions Response Plan has been revised to incorporate the involvement, and describe the responsibilities, of the Ft. Carson Explosives Ordnance Disposal Unit.

Comment 22. Section 5.2.7, page 101, 2nd paragraph - Please revise the text to state, "investigative sampling indicates that 1,4-dioxane contamination is likely limited to the uppermost water-bearing zone."

Response: The text will be revised as requested.

Comment 23. Section 6.3.1.2, page 106 – The discussion regarding representativeness of select performance wells should be removed from the text, or more information should be provided. As discussed in Five Year Summary Report (FYSR) comment resolution meetings, a more detailed evaluation is necessary to support this statement.

Response: An evaluation of the hydrogeology in the area of the NBCS former conformance and performance wells will be added to the FYSR to support the conclusions. Summary information will be added to Section 6.3.1.2.

Comment 24. Section 6.3.1.5, page 108 – Please remove the reference to a stagnation point or dead zone. This was discussed in a recent FYSR comment resolution meeting and it was agreed that a separate investigation of the Bedrock Ridge Extraction System (BRES) will be developed to address the increase in analyte concentrations in downgradient well 36566.

Response: The text will be revised as requested.

Comment 25. Section 6.3.1.6 - CDPHE has the following comments on this section:

a. Page 108, fourth paragraph – Please indicate how the higher fluoride concentrations in downgradient/cross gradient wells are unrelated to system effectiveness.

b. Page 109, second paragraph – The refinement of mass removal calculations was discussed in detail within the FYSR and subsequent comment resolution meetings. Please revise this section to reflect the agreement to assess the calculation of mass removal, including treatment of analytes below the Containment System Remediation Goals (CSRG), in future revisions of the LTMP.

Response: a. The text will be revised as requested.

b. The text will be revised as requested.

Comment 26. Section 6.3.3.3 – CDPHE has the following comments on this section:

a. The discussion provided in this section is inconsistent with the proposals contained within the FYSR regarding the status of the well network. The Army/Shell have proposed closing wells 02057 and 35067 without any replacements added to the network. This proposal and any potential impact on network effectiveness, should be discussed in this report.

b. Page 119, fourth bullet – If there is no evidence of vertical and horizontal migration of water in the immediate vicinity of well 35083, then there appears to be no substantial evidence that the well seal is ineffective. Please revise this statement accordingly.

Response: This section will be revised to reflect subsequent discussions by the RMA Water Team.

Comment 27. Section 6.3.3.4, page 121, number 2 – The proposal to add wells 37336 and 37385 to the CSRG exceedance network appears reasonable given the recent exceedances in Northwest Boundary Containment System (NWBCS) performance wells, but the adequacy of this network requires further evaluation before Agency acceptance. Please add the proposal to add wells in Table 9.0-1 Recommendations and Follow-up Actions.

Response: The text will be revised as requested.

Comment 28. Section 6.3.3.5, 1st paragraph – Please revise this paragraph to indicate that private wells are sampled "to determine the water quality of off-post wells as required by the Off-Post ROD, and to respond to citizen requests." The use of wells to provide data to assist in CSRG map refinement is a secondary benefit and should be indicated as such.

Response: The text will be revised as requested.

Comment 29. Section 6.3.3.6, Page 123, 1st full paragraph – In reviewing the information provided for reclassification of well 25194, CDPHE does not agree with the statement that water levels have risen in the well since 2008. While its predecessor, well 25094, had shown slightly rising water levels during the last year of its existence from 2007-2008, well 25194 has maintained a relatively uniform water elevation since its installation in 2008.

Response: The text will be revised as requested.

Comment 30. Section 6.3.4.1, page 145, 5th full paragraph – CDPHE disagrees with the statement that surface water concentrations found in Basin E are consistent with background soil levels. While these are naturally occurring metals, there is not a history of elevated metal concentrations in background surface water samples across the Arsenal. If these surface water concentrations were indicative of background levels, similar results would be expected at other intermittent surface water sites. Please clarify.

Response: As discussed in the December 17, 2015 Water Team meeting, similar metals concentrations have been detected at other surface water sites, which supports the potential background soil source for the Basin E site. The additional information will be added to the paragraph and the text will be revised to indicate that investigation of the potential relationship between the soil and surface water concentrations is ongoing.

Comment 31. Section 6.3.5, page 147 – The conclusions and data analysis in this paragraph are incorrect and misleading. There was never an agreement to terminate the kestrel study, and formal sampling results have not been presented to the regulatory agency for evaluation from either the Phase I studies, or Phase II studies. Additionally, the number of samples and duration of sampling were not sufficient to fulfill the stated requirements of the Biomonitoring Plan. Please update this section to discuss the current status of this program.

Response: The Army and Shell agree that the long-term biomonitoring program has not been completed and that a path forward for completion needs to be determined. The section will be revised to reflect this.

Comment 32. Section 6.3.7.3, page 157, 1st paragraph – The ICS cover system performance criteria *can* in fact become enforceable prior to an O & F determination, contrary to the statement in this section. Please clarify for consistency with the approved LTCP.

Response: The section will be revised as suggested.

Comment 33. Section 7.2.1.1, page 177, 2nd paragraph – The statement that "groundwater contamination is contained within the slurry wall" does not appear to be supported by any evidence, other than the assumed performance of the slurry wall. Containment of SDT waste is currently evaluated only by maintaining water levels below trench bottom elevations. It is also not clear that the remedy is

working as designed because there is no evidence to show whether contamination is actually being contained within the slurry wall. Please revise this paragraph and remove the identified statement.

Response: The dual slurry walls undoubtedly provide some level of containment. Although there may be a small amount of underflow, the head differential across the slurry wall suggests that the flow volume likely is much less than if the slurry walls were absent. The text will be revised to clarify the statement as follows: "In the meantime, the protectiveness of the remedy is not significantly affected because most of the SDT groundwater likely is contained within the dual slurry walls."

Comment 34. Section 7.2.1.3, page 178, 2nd paragraph – The monitoring results regarding the increasing concentrations in downgradient well 36566 and the hydrologic conditions in that area do not appear to support the claim that the "monitoring being performed is adequate". If representativeness of this well is questionable, then the downgradient-monitoring network may need further evaluation.

Response: The text will be revised as requested.

Comment 35. Section 7.2.1.7, page 181, 4th paragraph – The proposal to retain the 75 percent mass removal goal at Basin A Neck System (BANS) is not fully explained in this section. The intent behind evaluating LTMP mass removal goal percentages over a span of 5 years was to create an optimal, yet attainable, metric to assess system performance. CDPHE recognizes that 75 percent mass removal may meet these criteria; however, additional information, including previous removal rates, needs to be provided in this FYR so that the proposed percentage does not appear arbitrary.

Response: The text will be revised as requested.

Comment 36. Section 7.2.1.9, page 183, 1st paragraph – The text states that downgradient performance wells are comparable to the former conformance wells, specifically related to representativeness of system performance and potential for residual contamination. This comparison is overly general and gives the impression that the monitoring being performed is not adequate. Please revise the text to provide more detail regarding what wells, or areas, are not deemed representative. This should include a discussion related to how downgradient performance monitoring is impacted by these wells.

Response: An evaluation of the hydrogeology in the area of the NBCS former conformance and performance wells will be added to the FYSR to support the conclusions. Additional evaluation will be provided in this section as appropriate.

Comment 37. Section 7.2.2.1, page 184, 2nd full paragraph – As stated in previous comments, the proposal to retain the 75 percent mass removal goal at the Off-post Groundwater Intercept Treatment System (OGITS) is not fully explained. Additional information, including previous removal rates, should be provided in this FYR, so that the proposed percentage does not appear arbitrary.

Response: The text will be revised as requested.

Comment 38. Section 7.2.3.1, page 185-187 – Although not necessarily indicative of a protectiveness issue, this section should be expanded to specifically address how the use of on-post 'clean' borrow soil has contributed contamination into the clay liner and from there into the Leak Detection System (LDS) of the Hazardous Waste Landfill (HWL). This situation has introduced impairment in evaluating the system. The HWL Post-Closure Plan had to be modified to address this 'pre-existing' contamination in the consolidation water. A thorough discussion of the impacted leak detection system is necessary to explain the "work-around" that was developed in the Post-Closure Plan to assess the integrity of the landfill. This discussion should include a statement regarding the continued ability to detect a leak, despite the impairment.

Response: The section will be revised as suggested.

Comment 39. Section 7.2.3.2, page 187-188 – As discussed above, this section should be expanded to specifically address how the use of on-post 'clean soil' borrow is contributing contamination into the Leak Detection System (LDS) from the clay liner. As above, the ELF Post Closure Plan had to be modified to address this 'pre-existing' contamination in the consolidation water. This has introduced impairment in the Leak Detection System (LDS) used to evaluate the system. A thorough discussion is required to explain the non-typical, "work-around" approach that is now necessary to evaluate the monitoring results. This discussion should include a statement regarding the ability to detect a leak, despite the system's impairment, independent of exceeding the action leakage rate.

Response: The section will be revised as suggested.

Comment 40. Section 7.2.4.1, Page 188, 2nd paragraph – The conclusions described in this section do not accurately describe the findings and objectives of the biomonitoring program. The program has not been terminated and the majority of results have not been presented in any formal report. Second, preliminary results, per decision criteria in the Biomonitoring Plan, may indicate that an exposure pathway is still open. Please revise this section, and any others, regarding the termination of the biomonitoring program and conclusions made from the data collected.

Response: The technical assessment will be revised to indicate that the long-term biomonitoring program has not been completed and that a path forward for completion needs to be determined.

Comment 41. Section 7.2.4.2, page 189, 7th paragraph – As stated in previous comments, CDPHE disagrees with the statement that surface water concentrations found in Basin E are consistent with background soil levels. Please revise or remove this paragraph consistent with previous CDPHE comments.

Response: The text will be revised to state that further evaluation of this site is needed to determine whether surface water concentrations are consistent with background soil concentrations.

Comment 42. Section 7.3.6, page 195 – The RAO (prevent migration of contaminants to groundwater) is not measured directly, but inferred by achieving a level of percolation performance equivalent to a RCRA Subtitle C cover—in this case 1.3 mm per year. This is not being achieved for the Shell Disposal Trenches RCRA Equivalent Cover, and thus the projected date for compliance is probably unrealistic. It should also be noted that the establishment of cover vegetation is a secondary issue to the primary concern discussed above.

Response: The expected timeframe of O&F determination will be revised. Note that this section does not discuss the start of compliance, but rather the O&F determination, which is independent of the compliance start date.

Comment 43. Section 7.4.1.1, general – The discussion and values presented within this section regarding the risk calculations for 1,1,2,2-tetrachloroethane and 1,4-dioxane are not supported with any specific calculation methodology, nor are the data presented that were used to calculate this risk. It is expected that any calculation of risk, as it pertains to the adoption of a new CSRG, would be calculated using a cumulative risk assessment methodology (e.g., consider the cumulative effect of total exposure). Please include a detailed explanation of the inputs to this risk calculation for appropriate review.

Response: The text will be revised to provide the information necessary to support the calculations. Consistent with EPA guidance, each contaminant was evaluated individually and no cumulative risk evaluation is necessary.

Comment 44. Section 7.4.1.1, page 202, last paragraph - The Division has the following comments on the 1,4-dioxane evaluation:

a. Please include details of the risk evaluation (e.g., receptors/exposure scenarios and exposure parameters), which resulted in the cancer risk estimate of 7.7×10^{-6}.

b. The FYR should include a table showing the data used in the calculation.

c. Most importantly, it is important to compare the concentration of 1,4-dioxane with the CBSG of 0.35 ug/L, irrespective of the magnitude of estimated risk. Our review of the data provided in previous reports indicates levels well above the CBSG.

Response: The FYR Report will be revised to include resolution of the 1,4-dioxane evaluation as an issue. Discussion of the risk calculation provided in the draft report will be removed and the risks will be evaluated as part of the project documentation.

Comment 45: Section 7.4.5, page 205, 3rd paragraph –The 100-acre former Shell property's future planned use as a stormwater retention area could unearth contaminated soil and/or potentially expose contaminated groundwater/surface water. At a minimum, it may be wise to plan to coordinate future development of this property with Commerce City to ensure future protectiveness.

Response: Comment noted. The Army continues to meet regularly with Commerce City officials to maintain open communications regarding land use.

Comment 46. Section 8.0, Table 8.0-1 - Table indicates for several of the identified issues, for example land use controls, that there are no current or future effects on protectiveness. This seems equivalent to saying that these are non-issues because protectiveness is currently maintained. If these represent current problems with the remedy that need addressing, then at a minimum, future protectiveness could indeed be at risk.

Response: Consistent with EPA FYR guidance, issues identified for the FYR include issues that currently prevent the response action from being protective or may do so in the future. However, guidance also suggests that early indicators of potential remedy problems should be identified and discussed, even when the determination is that the remedy is protective. These could be issues related to maintaining the protectiveness of the remedy. Issues included in this FYR report where there is no current or future effect on protectiveness indicated represent early indicators of potential remedy problems. Where appropriate, this terminology is included in the project discussion. All issues were reviewed to identify issues with the potential to affect future protectiveness.

Comment 47. Section 8.0, Table 8.0-1, page 209, item 4 – This description requires additional detail. The Shell Disposal Trenches cover, based on percolation, no longer functions with the equivalence to a RCRA Subtitle C landfill cover. The cover is not functioning as designed, which is intended in part to prevent or reduce mobilization of buried contamination. Containment is the key element of the covers and landfills. Please revise, as appropriate.

Response: The description will be revised as suggested.

Comment 48. Section 8.1, page 210 – The report concludes that the "…NWBCS appears to be functioning as intended, but additional monitoring data are needed to confirm that all the performance criteria are being met." Performance criteria regarding effluent concentrations, downgradient monitoring well standards, and reverse hydraulic gradient have **not** actually been consistently met at various times over the past five years, as well as currently. The Division acknowledges that the Army is working to find ways to correct this situation, but the performance criteria in fact indicate that the NWBCS currently is not functioning as intended.

Response: While there have been PQL exceedances of dieldrin in the plant effluent and downgradient wells, according to the criteria in the LTMP, the NWBCS has not

been out of compliance with respect to effluent four-quarter moving average concentrations and downgradient performance well concentration trends.

Comment 49. Section 8.3, page 211, 4th paragraph – As stated in previous comments, CDPHE disagrees with the statement that surface water concentrations found in Basin E are consistent with background soil levels. Please revise or remove this paragraph to be consistent with previous CDPHE comments.

Response: Please see the response to Comment 41.

Comment 50. Section 8.5, page 213, 2nd paragraph – According to this section, the rise in water levels in the Shell Disposal Trenches was likely due to infiltration resulting from historic rain events. This theory should be explored further in this FYR because this statement implies that cover performance is not RCRA-equivalent. Moreover, if this theory assumes the source of infiltration was through the cover (i.e., not from off-cover sources) then the amount of groundwater change appears to indicate that the lysimeters are not representative of cover percolation. Please clarify this statement and add supporting detail, as necessary.

Response: Increases in SDT groundwater levels are likely the result of infiltration from the cover and from groundwater flowing under the slurry wall that surrounds the trenches. The section will be revised to provide additional detail.

Comment 51. Section 9.4, page 216, 2nd paragraph – Since, the LTCP calls for development of a "schedule", in the event sufficient information is unavailable to write the Corrective Measures Plan of Action (CMPA), this section should state that a schedule has been addressed as part of the consultative process.

Response: The section will be revised as suggested.

Comment 52. Section 9.5, page 216 – Regarding the follow-up recommended actions for meeting dewatering goals, has modification of the trench/pump operations also been considered? It is not clear how monitoring will change the physical outcome.

Response: The recommendations will be revised to include evaluation of dewatering options for the Shell Disposal Trenches and Complex Army Trenches Dewatering Systems.

Comment 53. Section 10.1, page 219 – The protectiveness statements in this report should follow those that are provided in Section 4.5.1 of EPA "Comprehensive Five-Year Review Guidance" EPA 540-R-01-007, June 2001 (or latest version). For those items identified in Table 9.0-1 the Division believes the "…protective in the short-term…" statement provided in Exhibit 4-6 of the Guidance may be appropriate. Also, as discussed in the Division's comments, some additional detail is required in this FYR to support the statement that On-Post remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.

Response: The protectiveness statements will be revised to indicate protective in the short term.

U.S. Army and Shell Oil Company Responses to
Tri-County Health Department (TCHD) October 27, 2015 Comments on the
2015 Five-Year Review Report for Rocky Mountain Arsenal, Revision B, August, 2015

Comments for Incorporation

General Comments

The 5YRR represents an exhaustive amount of history and detail. The detail is particularly helpful in the evaluation of the remedy. The 5YRR identifies areas that need to be addressed currently as well as future ones that could arise over the next 5-year review period.

a) TCHD appreciates the decision to address various issues and revise the LTMP.

b) Some of the assumptions made in the various designs appear to have come into question with respect to the issues identified. This is primarily evidenced by the failure to achieve dewatering goals, but also with respect to the ICS (including SDT) cover percolation issues.

c) The term "system optimization" is mentioned in several areas. The optimization seems to revolve around operational optimization rather than design optimization. As contaminant concentrations trend lower, designs that may have been appropriate at higher concentration levels may trend toward greater inefficiency. TCHD believes that design optimization should be considered as well as operational optimization.

d) Associated with the above comment is the role of dilution in the operation of the treatment systems. The RODs do not directly address dilution but allow it if necessary to maintain a reverse gradient. The report describes a situation at BANS where a reverse gradient is not a ROD requirement in order to meet performance requirements. At BANS, even the presence of a "reverse gradient" was assessed to have caused an increase in downgradient contamination which was eliminated by increasing the reverse gradient. If a reverse gradient is not felt to be effective at BANS.

e) The protectiveness statements seem to imply that uncompleted projects are or will be protective when completed. What seems unclear is the degree of compliance that the RODs desired and the designs assumed. Is the issue of a dewatering goal being out of compliance 50% of the time deemed satisfactory or is 100% compliance expected. Do active dewatering systems need to be in-place and sufficiently robust to guarantee 100% compliance.

Response: General comments noted. Individual responses are provided for the Specific Comments.

Specific Comments

Comment 1. Page ES-3: The first two bullets at the top of the page allude to system improvements. This document and the FYSR discuss improvements taken after operational excursions have occurred. The increased inefficiency alluded to at various places seems valid but calls into question the comprehensiveness of the evaluations. Should more in-depth system evaluations be considered?

Response: The bullets are from the Off-Post ROD. The decreasing efficiencies that TCHD discusses in the FYSR and FYRR comments typically are related to decreasing groundwater concentrations upgradient of systems, and sometimes are counter to the individual system performance criteria. The scale of RMA and the nature of the groundwater contamination make groundwater interception in higher concentration areas upgradient of the boundary systems, for the purpose of making them more efficient, infeasible and not within the current scope of the remedy. The system evaluations and improvements are conducted to address the system performance criteria and the ROD Remedial Action Objectives (RAOs), but also are made to make the systems more robust, when appropriate. The ultimate goal for the groundwater systems is to meet shut-off criteria and shut down portions of or entire systems. Unless the RAOs and performance criteria are changed, shutting down systems or portions of systems when the concentrations decrease below remediation goals (CSRGs) is the primary means for increasing their efficiency, which is secondary to the ROD requirements.

Comment 2. Page ES-3, end of 2nd full paragraph on page: Please consider showing the Shell property on a figure and referencing it here. The ideal map would be a CSRG map (see Minor Comment #2).

Response: A figure showing the Shell property, some of which was transferred to Commerce City/Urban Drainage and Flood Control, will be added.

Comment 3. Page ES-4: It is not clear that the in-place controls are adequate to minimize risks over time. It is also not clear that incomplete projects are progressing toward sustained compliance. Please consider language modifications until identified issues are evaluated and the robustness of some of the remedy designs is verified.

Response: The protectiveness statements will be revised to indicate protective in the short term.

Comment 4. Page ES-6: It is not clear what the Nov. 1, 2014 date means. Can this date be checked?

Response: Per EPA guidance, the review period is meant to correspond to the start and end dates associated with preparation of the report. November 1, 2014 is the date that the Army began working on the 2015 FYR.

Comment 5. Page ES-7: Please see Specific Comment #1. The recommendation is sound but TCHD has concerns over the depth of the plant operation review. Also, it is assumed that a report would be prepared and distributed that would demonstrate the depth and scope.

Response: The scope of the operational review and the proposed and taken operational changes to correct the treatment and downgradient well issues are being addressed in RMA Water Team meetings. Results will be tracked as part of resolution of this FYR issue and relevant reports will be issued as appropriate.

Comment 6. Page ES-8: TCHD believes that the lysimeter issue should be broadened to include all of the ICS lysimeters and RCRA-Equivalent covers. The Army has chosen to treat all the covers as a unit with respect to inspections. Also, there have been problems with other non-SDT lysimeters. A comprehensive investigation and review is suggested.

Response: The three lysimeters located within the SDT RCRA-equivalent cover are the only lysimeters that have exceeded the percolation compliance standard since the compliance period began, therefore, the subsequent investigation has focused on this site. The SDT RCRA-equivalent cover was designed and constructed prior to the larger Integrated Cover System and there are several physical differences that may have attributed to the difference in performance. The investigation is being performed in accordance with the Regulatory Agency-approved Schedule for Investigation of Percolation Exceedance of the Shell Disposal Trenches RCRA-Equivalent Cover and Development of a Corrective Measures Plan of Action, Revision 0, dated November 18, 2015.

Comment 7. Page ES-9: TCHD believes the handling of the dewatering system could be improved by splitting these into 3 separate issues as they are a part of 2 different projects and may require different solutions.

Response: Agreed. The report will be revised as requested.

Comment 8. Page 1, 2nd paragraph: Please review this paragraph and state if the interval for the monitoring and analytical results is consistent with previous FYRRs.

Response: The interval for monitoring and analytical results is consistent with the previous FYRRs.

Comment 9. Page 1, 4th paragraph: Should the clarifying words "...in Interim O & M ..." be added after the word "construction" to clarify and match Table 4.0-5?

Response: The text will be revised as suggested.

Comment 10. Page 1, 5th paragraph: Isn't the completion date of all FYRRs based on the signing date of the Off-Post ROD which was Dec. 19, 1995? If correct, can the last sentence be modified to state this ongoing target date? (Also see page 89, Sec. 5.0. Completed 9/23/2011 appears to be in conflict with the completion date of Dec. 19, 2010, stated here.)

Response: The FYR completion date is based on the scheduled completion date from the last FYR report, which was December 19, 2010.

Comment 11. Page 6, Section 2.1: A useful future oriented map would be a map showing undeleted surface areas, undeleted groundwater, the Shell Property and on- and off-post above CSRG contamination. Please consider.

Response: A figure will be added illustrating the deleted and undeleted areas.

Comment 12. Page 20, 3rd paragraph: Can this paragraph be revised to reflect that CCRs for all but one operating projects in Table 4.0-5 do not have projected completion dates?

Response: Text has been revised as follows, "The table indicates the status of each project/topic as of March 31, 2015, and actual or projected CCR completion dates for each project. Projects classified as "Operating" do not include projected CCR completion dates."

Comment 13. Page 20, 5th paragraph: The RASR would certainly be updated before being used as supporting documentation for the two closeout reports. Can the RASR be more appropriately referenced and more criteria be provided for the development of the Preliminary Closeout Report? Is mention of the closeout reports at this time a bit premature? Please consider.

Response: A reference to the RASR has been added.

Comment 14. Page 21, 5 bullets at top of page:

a) Bullet 3: The text seems to omit the Shell Disposal Trenches project since no dewatering system was in the design nor installed. It is also not clear why approval of final CCRs are required for achievement of dewatering goals. Please clarify.

b) Bullet 5: This category is not included in Table 4.0-5. Should they be the same and is a clarifying statement needed?

Also, it is unclear why certain words in this section are in quotes. Please examine this section.

Response: The quotation marks will be removed since the text is not taken directly from another source.

a) The bullets are examples of the categories in EPA FYR guidance and are not intended to be inclusive of all RMA projects. Achievement of dewatering goals was linked to completion of the covers in the LTMP because cover elements such as cover construction (especially infiltration of precipitation during and after placement of biota barrier material), irrigation to establish vegetation, and the long period of time required to fully establish the vegetation may have impacts on the underlying groundwater levels. Rises in groundwater levels during these activities were observed at the Shell Trenches, Complex Trenches, and Lime Basins and adversely affected achievement of the dewatering goals at these sites.

b) Although this category does not have its own distinct color in the table, the status column does include text indicating if a remedy was incorporated in the RA.

Comment 15. Page 21, 2nd paragraph on page: This paragraph seems to have little relevance to Sections 4.1-4.4. It discusses identifying events, yet these events are not clearly outlined. It appears that the sections referenced are a description of operating vs. completed remedy components. Please review this paragraph.

Response: The text will be revised to clarify the content of Section 4.1 through 4.4.

Comment 16. Page 21, Section 4.1: In the 2nd italicized paragraph, the reference to "...extraction/treatment alternatives..." seems to be an On-Post ROD authorization/encouragement to evaluate and modify alternatives that would improve long-term system performance. The extent that this apparent authorization has been followed is very unclear, but this 5YRR and the greater visibility of the role of dilution, provides a good opportunity for an in-depth review.

Response: The On-Post ROD groundwater RAOs were addressed by completion of the on-post remedy. Accordingly, the on-post groundwater extraction/treatment alternatives were developed and installed. The BANS, BRES, RYCS, Motor Pool, and North of Basin F systems extract(ed) and treat(ed) groundwater contamination upgradient of the boundary systems, thus providing long-term improvement in the boundary system performance. In this context, improvement in boundary system performance refers to reducing the contaminant concentrations upgradient of the boundary systems (potentially reducing treatment requirements) and reducing the width of plumes approaching the boundary systems (potentially increasing plume capture safety factors and making the systems more robust). After remedy completion, ongoing assessment of potential long-term improvements to the performance of the boundary systems is addressed by operations staff, and in the ASRs and FYRRs, as needed. For example, the 2015 FYRR includes a section on the optimization of operation for each system.

Comment 17. Page 22, continuing paragraph at top of page: It is TCHD's opinion that the Section 9.1 criteria have been deservedly modified but that current shut-off criteria may be overly conservative, as evidenced by the on-going RYCS shut-down program. Should the criteria be evaluated and potentially modified during the next 5YR. Also, the assessment of chloride and sulfate do not appear to be specifically addressed in this 5YRR.

Response: Considerable time and effort by the Army, Shell, and the Regulatory Agencies went into revising the ROD shut-off criteria and monitoring details in the 2010 LTMP. The Army and Shell believe that the shut-off criteria are appropriate. A separate section is not provided in the FYRR for the assessment of chloride and sulfate attenuation, but it is addressed in Sections 6.3.1.2., 6.3.1.6, 6.3.3.4, 7.2.1.9, and 7.2.2.1. More specifically, both the CSRGs for chloride and sulfate have been met in the NBCS effluent since FY2005 and were met in the OGITS effluent for the first time in FY2014. Meeting the CSRG goals at NBCS and OGITS has occurred much sooner than predicted (i.e., 2026 for chloride and 2021 for sulfate).

Comment 18. Page 23, Section 4.1.1, 1st paragraph: Were there any changes to the 2010 LTMP during the 5YR?

Response: The text has been revised as follows, "The data used for this FYR were collected pursuant to the 2010 Long-Term Monitoring Plan (LTMP) for Groundwater and Surface Water, as amended (TtEC and URS 2010a).

Comment 19. Page 29, 1st complete paragraph: Can the shut-off process be elaborated on briefly so that it is clearer what is involved rather than "...will continue during the next period."

Response: The Draft RYCS Shut-Off Monitoring SAP was issued for Regulatory Agency review in November 2015.

Comment 20. Page 29, Basin A Neck (#59): TCHD believes the four objectives stated (or rephrased) from the 1989 Decision Document may not be directly applicable at this time. It appears that system efficiency was confused with mass extraction. BANS may improve the mass extraction but may actually decrease the efficiency of the boundary treatment system. This could actually lead to a deceleration of groundwater remediation within RMA unless other system modifications are made. The third bullet refers to data collection to be used in the ROD. Following this 5YR, an overall assessment of treatment efficiency would seem appropriate, due to this potential confusion.

Response: Please see the responses to Specific Comments 1 and 16.

Comment 21. Page 29, last paragraph: Can a reference to Note 6 in Table 4.1.1.1-4 be added to explain the additional contaminants?

Response: The text has been revised as follows, "CSRGs for three additional contaminants (1,2-dichlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene) were added when treatment of Lime Basins groundwater was transferred to the BANS in 2011 (TtEC 2011c)."

Comment 22. Page 31, Performance Criteria: It is not clear where the results of this calculation for each analyte can be found. This data could be helpful in evaluating LTMP revisions. Please clarify.

Response: This section describes the project requirements. The mass removal calculation for each analyte is provided in the ASRs.

Comment 23. Page 31, last paragraph: Can the addition of a 4th well to the BRES in 2005 suggest an under design or assumption problem potentially due to inadequate initial characterization?

Response: The aquifer is a relatively low permeability Denver sandstone and likely is more heterogeneous than the alluvial aquifer. The initial characterization was considered adequate for designing the system. The maximum rate at which a well can be pumped cannot be estimated precisely from an aquifer characterization when the well has not yet been drilled. Operational data indicated that another extraction well was needed. Even under the best of circumstances, it is not uncommon to modify an extraction system because the performance of the system is somewhat different than expected.

Comment 24. Page 35, 1st bullet: Please see Specific Comment #22. Also in Section 4.1.1.2 CDAT (Dewatering#17), there is no issue identified here contrary to the paragraph on page 21. Please see Specific Comment #15.

Response: This section provides a summary of the extraction and treatment systems and does not address performance or identify FYR issues. See also responses to Specific Comments 15 and 22.

Comment 25. Page 35, SDT (Dewatering #17): The design did not require active dewatering since the criteria had already been met at the time of design. Can "Passive" be added to the SDT project name?

Response: The project title name has been retained for consistency with previous FYRRs.

Comment 26. Page 37, 1st full paragraph on page: The LNAPL issue seems resolved but there is no documentation referenced. Was there a documented agreement? Can the continuation of monitoring be reconfirmed for continued monitoring every year or only at the 5YR period?

Response: Annual monitoring was discussed and agreed upon with the Regulatory Agencies in the September 24, 2015 RMA Water Team meeting. Assessment

of the data will be documented in the ASRs and 2020 FYSR. Continuation of monitoring will be reconfirmed annually in the ASRs.

Comment 27. Page 37 and 38, Section 4.1.1. 3: This section somewhat refers back to Specific Comment #15 on page 21.

a) 1st bullet: No reference to a report nor future evaluation is provided.

b) 2nd and 3rd bullet: Appears to be an operational change after the fact. Could the need for these changes have been anticipated?

c) 4th bullet: Looks like an increase in the OGITS well since it was not detected in 2012 or 2013. Is this proven desorption which, if true, would mean the current performance standards may be unworkable. An issue but no clarification or recommendation is provided.

d) 5th bullet: It is not clear that there is a reverse gradient requirement at BANS.

e) Also, if a few analytes increased above the PQL due to the "...reduced..." reverse hydraulic gradient, then that may suggest that just a reverse hydraulic gradient is not effective in and of itself. Is it possible that the emphasis on a reverse hydraulic gradient at NWBCS and NBCS is overly emphasized while under emphasized at BANS? Does this warrant rethinking? It is unclear how much clean water is being pumped for the reverse gradient which contributes to dilution.

f) 6th to 8th bullets: The seriousness of these three Section 8 issues do not seem to be reflected in the text. The potential exists that the assumed effectiveness of the covers and vegetation has been overestimated. Should the potential for remedy failure be reflected? Please evaluate.

Response: This section is a summary of the dewatering/extraction and treatment system and monitoring events, which are discussed in more detail in subsequent sections. Some of these events are later designated as FYR issues. Consequently, expanding the discussion in each bullet referenced by TCHD does not seem necessary. However, the first paragraph will be revised to indicate that the bullets summarize the events that are discussed in detail in subsequent sections.

Comment 28. Page 39, Section 4.1.2.1, LWTS Closure Groundwater Monitoring (#10): There is no closure/status statement concluding this section. Table 4.0-5 references an EPA approval on Oct. 3, 2011. Also, Table 4.0-5 does not reference this section. Please review.

Response: A closure/status statement has been added. LWTS Closure groundwater monitoring was completed under the LWTS Closure Plan (TtEC 2011g), and

EPA did approve the CCR on October 3, 2011. Table 4.0-5 (now 4.0-3) has been updated to reference Section 4.1.2.1.

Comment 29. Page 52, last paragraph of Sec. 4.2.1.3: Based upon the issues raised in this 5YRR, particularly the ICS (+SDT) cover issues, should the reference to any O & F determination be deferred until the scope of the issue is better determined or will O & F be conducted anyway? Please review.

Response: The statement regarding the ICS O&F determination will be revised to explain that the O&F determination will be made when appropriate.

Comment 30. Page 82, last bullet on page: Is any follow-up done/required at the 5-year review period to see that previous live bison transfers are still compliant?

Response: There are currently no requirements for follow-up checks on transferred bison. Commitments to prevent consumption were provided in the transfer letters accompanying the animals. However, to address this concern, USFWS contacted the receiving refuge units and verified that all transferred animals were accounted for and had not been consumed. This information will be added to the text. The discussion has also been moved to Section 6.3.8.

Comment 31. Page 84, Section 4.4.3.2, 4th paragraph on page: It is unclear what a work plan is, how it relates to the SOP, and who is the responsible/ implementing agency? Why was the SOP not modified or amended? Please clarify.

Response: As described in the text, the work plan provides for periodic, systematic clearance of munitions debris from the historical use area of Section 32. The SOP describes the more general response to discovery of a potential munitions item on site. The work plan was provided to the Regulatory Agencies on June 10, 2015. Although the plan was finalized outside the FYR period, a reference to the final plan will be added.

Comment 32. Page 87, Section 4.4.3.4, end of 2nd paragraph on page: Shouldn't a reference be made here that project #60 was closed out in the CCR for the Miscellaneous Structures Demolition and Removal Phase IV which was approved by the EPA on July 13, 2011?

Response: The text has been revised as suggested.

Comment 33. Page 89, Section 5.1, On-Post Operable Unit: For the statement regarding "...all implementation projects are on schedule to be completed in 2010..." seems inaccurate since dewatering goals have not been met and maintained in the current 5-Year period. Was this an overstatement on 9/23/2011 (completed date in Section 5.0) or are achieving and maintaining dewatering goals not considered part of an "implementation" project?

Response: The above text includes the protectiveness statements included in the 2010 FYR.

Comment 34. Page 90, Section 5.2, last line: Was EPA intentionally omitted from the list of parties?

Response: The EPA has been added to the list of parties.

Comment 35. Page 91, Issue 7: The follow-up action for the 1,4-dioxane ARAR does not address the lack of a "...technical memorandum to document evaluation and decision." Please review.

Response: Because a final Data Summary Report and technical evaluation have not been completed, this section will be revised to indicate that the evaluation is not complete and the issue will be carried forward for the next FYR period.

Comment 36. Page 101,Section 5.2.7, 6th paragraph on page continuing to page 101, last paragraph of section: In the absence of a Technical Memorandum, questions arise:

a) Section 7.4.1 does not appear to provide a detailed "risk evaluation" as would be expected in a Technical Memorandum. Instead, only the result seems presented. Please evaluate wording.

b) The resulting risk is "... 7.7 X 10-6 based on concentrations present upgradient of the treatment plants." Review of Table 7.4.1.1-2 on page 201 shows the resulting risk for 1, 4-dioxane to be 7.8 X 10-6 (not 7.7). Please reconcile. In addition, Note 4 (mislabeled as the 2nd Note 3) in the table states the "...calculation based on maximum detected concentration from treatment plant influents." This differs from "...concentrations present up-gradient of the treatment plants."

Please evaluate and reconcile these potential discrepancies.

Response: The discussion of the risk calculation provided in the draft report will be removed and the risks will be evaluated as part of the project documentation. Because a final Data Summary Report and technical evaluation have not been completed, this section will be revised to indicate that the evaluation is not complete and the issue will be carried forward for the next FYR period.

Comment 37. Page 105, Section 6.3.1.1, 2nd paragraph: Can it be clarified if the additional treatment changes fall into the category of operational treatment or design treatment changes?

Response: The text will be clarified that operational treatment changes may be needed.

Comment 38. Page 105-106, Section 6.3.1.2: The selection of appropriate performance wells appears to be an ongoing problem. Can the LTMP be revised/updated and the evaluation of system effectiveness be evaluated? Are there other measures of system effectiveness that could be evaluated and potentially adopted?

Response: The NBCS consistently meets the LTMP primary performance criteria (i.e., reverse hydraulic gradient and plume-edge capture) and thus, is functioning as intended. The secondary criteria (i.e., decreasing concentration trends in downgradient wells) are used to evaluate the NBCS performance if the primary criteria are not met. Residual contamination (primarily dieldrin) present in the aquifer north of the NBCS slurry wall likely is causing the dieldrin concentrations to be above the PQL in the downgradient performance wells. The concentrations of the other 25 NBCS organic CSRG analytes treated by the NBCS have been below the CSRGs/PQLs, and thus, the performance wells are representative of system performance for the great majority of the NBCS CSRG analytes. Contemporaneous water quality data were collected from both sets of wells during this FYR period, and they were found to be comparable. Consequently, with Regulatory Agency approval, sampling of the former conformance wells was discontinued. Therefore, the conclusions that applied to the conformance wells also apply to the performance wells. An evaluation of the hydrogeology in the areas of the NBCS former conformance wells and performance wells will be added to the FYSR to better compare their water quality data.

Comment 39. Page 106, Section 6.3.1.3, Railyard Containment System (#58): The write up is vague about if or when shut-down will occur.

Response: The Draft RYCS Shut-Off Monitoring SAP was issued for Regulatory Agency review in November 2015. When the Agency comments are addressed and the SAP is finalized, shut-off will occur, likely in early 2016.

Comment 40. Page 106-107, Section 6.3.1.4, Basin A Neck System (#59): The following comments relate to the BANS:

a) Can a statement of the average flow from BANS and the inflow from the contributing systems be provided for perspective?

b) No hydraulic gradient is required for BANS; yet the Army sees advantage in one and has made operational adjustments to improve an existing one.

c) It remains unclear how the BANS mass removal improves the performance of the boundary system as the boundary system treatment efficiency may decline with lower concentrations. In fact, the mass removal seems inflated since the mass removal contribution from the two dewatering projects should have been shut down by this time due to attainment of dewatering goals. Is it true that only 10% of the 850 lbs removed by the

BANS treatment system over the past 5 years came from the BANS contribution-the rest coming from LB and CADT? Please clarify.

d) It is stated that meeting the mass removal goal may become more difficult for BANS with lower contaminant concentrations. This may certainly be true, particularly after the CADT and Lime Basin dewatering goals have been met and their mass contribution is shut down. With the modification of the BANS treatment system, are any treatment efficiency vs. concentration data available for BANS only to help set a future realistic goal or should other performance goals be considered?

e) The second paragraph suggests that up-gradient dilution could meet ROD compliance goals. The second paragraph is difficult to follow but should be further discussed in Water Team meetings.

Response:

a) A statement concerning the flow rates for each of the four systems will be added.

b) The BANS was not designed to create a reverse hydraulic gradient along the entire length of the slurry wall. Until 2014, the extent of the reverse gradient in the center of the system had been very consistent. Since the reduced extent of reverse gradient in 2014 likely caused the concentrations of a few analytes to increase in two of the four downgradient performance wells, it is apparent that establishing some criteria for maintaining the extent of the reverse gradient is appropriate. Statements will be added to the text, accordingly.

c) Please see the response to Specific Comments 1 and 16. BANS mass removal is calculated separately from the mass removed by treatment of the Complex Trenches and Lime Basins flows. TCHD is correct, approximately 11 percent of the mass removed by the BANS during the FYR period was BANS specific.

d) The CADT and Lime Basins mass removal does not affect the BANS mass removal performance criteria. As concentrations in wells upgradient of the BANS decrease and approach the CSRGs/PQLs, the calculation of the mass removal becomes more difficult because of small differences in influent and effluent concentrations, especially where the CSRG/PQL is near the MRL. For example, with treatment of the CADT and Lime Basins flows, which have higher concentrations, the BANS effluent concentrations may be higher than the BANS-specific influent concentrations, which yields a negative mass removal even though the effluent concentrations meet CSRGs/PQLs. A possible change in the performance criteria methodology would be to only estimate mass removal for contaminants present at concentrations above CSRGs/PQLs in the wells upgradient of the BANS.

e) Decreases in upgradient groundwater concentrations would be caused by the combined effects of the remedy, not necessarily just dilution.

Comment 41. Page 108, Section 6.3.1.5, bottom of 1st partial paragraph on page: Does the last sentence in this paragraph suggest greater sampling frequency or just more years with current sampling frequency? Should this be considered a Water Team/LTMP issue?

Response: The sentence refers to additional sampling at the current frequency. In response to Water Team discussion, additional evaluation of the BRES will be added to the FYSR to address the performance question.

Comment 42. Page 108, Section 6.3.1.6, 3rd paragraph: There is no specific mention of the NPS in this paragraph. Should the NPS be discussed?

Response: A statement will be added that the NPS met the mass removal goal every year during the FYR period.

Comment 43. Page 109, Section 6.3.1.6, 1st complete paragraph on page: The paragraph proposes a change in meeting the current mass removal standard. Can this issue become a Water Team issue?

Response: Changing the calculation methodology for mass flux/mass removal will be addressed by the RMA Water Team.

Comment 44. Page 110, Section 6.3.2.1 through 6.3.2.3: Each of these paragraphs ends with the statement that "...this event could be an early indicator of a potential remedy problem and has been identified as an issue in Section 8.0." Section 8.0 has combined these together into Issue 5.0. TCHD would suggest giving consideration to keeping these as separate issues since they may have separate priorities.

Response: This issue will be divided into three separate issues.

Comment 45. Page 110, Sec 6.3.2.2: Why is dewatering in the SDT project name since there is no dewatering taking place? Please consider "Passive Dewatering".

Response: The project title name has been retained for consistency with previous FYRRs.

Comment 46. Page 110, Section 6.3.2.3, Section 36 Lime Basin Dewatering:

a) As in the previous section, the assumption that the dewatering goals would be achieved after 5-years of vegetative growth was apparently proven false since vegetation goals were basically in compliance before the end of the 5-year vegetation period.

b) The text seems to imply that the "dewatering" goals were to "meet" the goal rather than to "meet and maintain" the goal. Maintaining the water levels below the waste may not be possible as evidenced by the SDT project. To gain and maintain dewatering goals may require more robust dewatering designs.

Response: a) Please see the response to Comment 14.

b) Meeting and maintaining the dewatering goals are the objectives. The LTMP requires Regulatory Agency notification and consultation if the goals are not maintained. Active dewatering in the Lime Basins is making steady progress toward meeting the goals. Design modeling showed that four dewatering wells would be sufficient to meet the Lime Basins dewatering objectives. However, to make the dewatering design more robust, six dewatering wells were installed instead.

Comment 47. Page 111, Section 6.3.2.3, first full paragraph on page: It is unclear why dewatering adjustments were not made earlier. Please clarify.

Response: The system was operated in batch mode initially because analytical testing was required after treatment to make sure that each batch met the CSRGs before being released to the BANS recharge trenches for reinjection. The dewatering adjustments were not made earlier because sufficient analytical data and operations experience had not yet been gained to eliminate the analytical testing, which was required for continuous operation.

Comment 48. Page 111, Section 6.3.2.4: It is not clear if this section is properly located. Section 6.3.2 (page 109) states that what follows are currently operating remedial actions. Yet Table 4.0-5 says this project is completed and does not reference Section 6.2.3.4. Please review.

Response: The section has been revised to describe as Section 36 Lime Basins DNAPL Remediation (O&M) to distinguish it from construction activities and the completed component has been retitled Lime Basins DNAPL Remediation Project (Construction). An operating component for the DNAPL Remediation Project has been added to Table 4.0-3 (previously Table 4.0-5). Section 4.1.1.2 has been updated to include discussion of the operating components of the project.

Comment 49. Page 120, Section 6.3.3.4, 2nd full paragraph on page: The private wells are sampled by TCHD and are variable depending on owner permission. TCHD believes they should not be lumped into a "network" concept for Army purposes but can be used in an aid to interpretation.

Response: The text will be revised to indicate that the private wells may be used for plume mapping, but they are not part of a plume mapping well network.

Comment 50. Page 120, Section 6.3.3.4, first bullet at bottom of page: It is not clear why a CSRG map is not used here in lieu of a DIMP map. Please consider using one or more CSRG maps.

Response: The DIMP plume map has been used because it has been the RMA contaminant with the greatest off-post areal extent and because it is difficult to show temporal changes in the CSRG exceedance areas for multiple analytes in map view. The Army and Shell will examine using a composite CSRG/PQL exceedance map instead of a DIMP map.

Comment 51. Page 121, Section 6.3.3.4 lower part of page to Section 6.3.3.5: It is unclear why these proposed changes are being discussed and presented in this report and have not apparently been taken up in Water Team meetings. Showing the 2014 dieldrin plume on Figure 6.3.1.4-2 would help relate to the NWBCS proposed wells and the TCHD well 1402-B. Please consider.

Response: Making recommendations for changes in monitoring networks in response to changes in plumes during the FYR period is within the scope of the FYR. Figure 6.3.1.4-2 currently shows the 2007 composite CSRG exceedance areas. This map, now Figure 6.3.3.4-3, will be revised to show the 2014 CSRG exceedance areas (including dieldrin).

Comment 52. Page 122, Section 6.3.3.5, 2nd complete paragraph on page. TCHD suggests making Well 359-A an issue in Section 8. There was a potential direct route of ingestion for this domestic water well. The Army has moved aggressively to provide an alternative water supply and additional sampling data is available to justify this as a potential well replacement issue that is being pursued.

Response: Contamination in well 359A will be added as an issue.

Comment 53. Page 123, Section 6.3.3.6, Statistical Evaluation of 2009 Analytical Data: This first paragraph is very brief and unclear. Can the procedure for calculations be more detailed, particularly if upper prediction limits are recalculated after every sampling event for up-gradient wells and then applied to downgradient wells? Also could some raw data be graphed or charted that would show the raw data for both up-gradient and downgradient wells, and the prediction limit changes for both on a couple of significant dieldrin wells? Please try to clarify this procedure.

Response: The procedure for calculating upper prediction limits is included in the HWL Post-Closure Groundwater Monitoring Plan as Attachment A. This procedure

describes how the upper prediction limits are calculated and how they are applied to determine compliance with post-closure and RCRA requirements. A reference to the procedure will be included in the first paragraph of this section.

Comment 54. Page 127, 2nd full paragraph: It is implied but not clearly stated that LDS and LCS consist of analytical sampling. Is this true and if so, isn't there some role for volumes to play in this remedy evaluation?

Response: The LCS is the landfill's Leachate Collection System and the LDS is the landfill's Leak Detection System. Wastewater collected in each of these systems is sampled and analyzed routinely. The volume of water collected in each of the systems is expected to decrease over time, and that has indeed been the case. However, the volume of water generated by the landfill, or any of its collection systems, is not a performance criterion.

Comment 55. Page 141, 2014 Post-Closure Groundwater Monitoring, 3rd paragraph: Please review this paragraph for clarity. It would appear that exceeding the upper prediction limit has no meaning if the exceedance is within the historic range. Please explain.

Response: In accordance with the Basin F Post-Closure Groundwater Monitoring Plan, the upper prediction intervals are calculated using data collected since 2006 for the WP groundwater monitoring network, and since 2007 for the PT groundwater monitoring network. These dates were chosen because the upper prediction limits used during the post-closure period were intended to reflect the state of residual contamination that would be present at the sites during post-closure, that is, after the WP and PT soils had been excavated and disposed in the ELF. Historical levels of chloroform were much higher before the WP and PT soils were excavated and disposed in the ELF. Therefore the chloroform levels were within the historical range, but exceeded the post-closure upper prediction limit.

Comment 56. Page 144, Section 6.3.4.1, last paragraph on page: It is unclear why confirming samples of these exceedances were not more promptly obtained.

Response: The copper detections in the lake samples in FY12 were clearly anomalous compared to historical data. The source of the water supply for the lakes had changed and was dechlorinated potable water from the Denver Water Department. Denver Water was contacted to determine if the water supply was a potential new source of copper in the lakes. Copper was not detected in the Denver Water supply to RMA. Thus, there was no evidence to suggest that the copper detections in FY12 were representative. Confirmation sampling was not considered necessary, and the lakes were sampled again in FY13 according to the annual sampling schedule.

Comment 57. Page 145, 2nd full paragraph on page: Did the May, 2014 storm event provide an opportunity to sample or was this outside the time frame of the short term sampling program?

Response: The surface water follow-up sampling was not agreed to by the Army, Shell, and the Regulatory Agencies until the end of 2014.

Comment 58. Page 146, Summary of Off-Post Surface Water Results: This brief section states that arsenic is leaving the RMA at levels above applicable water quality standards. Text that follows states that treatment at NBCS and OGITS "appear" to be having a positive effect on First Creek water quality. Should arsenic be excepted in the sentence?

Response: Arsenic is not detected at concentrations above the CSRG at surface water site SW24004 because of interaction with groundwater. Arsenic is present in surface water at this site likely because arsenic is present at background concentrations in soil. Section 6.3.4.3 will be revised to indicate that the highest contaminant concentrations at surface water site SW37001 occur when groundwater is discharging into First Creek under low-flow or base flow conditions. The arsenic concentrations in groundwater in this area are below the CSRG. Thus, the text related to site SW37001 and groundwater treatment is accurate and should not be revised.

Comment 59. Page 147, Section 6.3.5: The various write-ups on this issue are confusing in defining the roles of the USFWS, the agencies, and the Army in bringing this issue to a conclusion. The quote from Section 9.7 in the ROD implies significant decision-making for the USFWS. In addition, with the results described in the 3rd paragraph in this section, it appears that the conclusion/assessment described in Section 7.2.4.1 would have to come from the USFWS. Also, Table 4.0-5 lists an MCR forecast of late 2015 and does not reference the technical data presented in Section 6.3.5. Please review and clarify.

Response: The table was revised to reference Section 6.3.5. The MCR forecast is to be decided.

Comment 60. Page 147, Section 6.3.5.1 Aquatic Ecosystem Monitoring: This section seems logical and is also under Biota Monitoring (#48) but appears to be a separate issue. Please clarify the administrative approach and how the continuing ROD requirement will be reported.

Response: As stated in the text, compliance for this ROD requirement is evaluated as part of the LUC Plan monitoring and reporting.

Comment 61. Page 157, Section 6.3.7.3, last paragraph on page: Please review the 1st sentence of this paragraph for location and wording. Should it be located

after the bulleted standards? Also, doesn't enforcement come after O & F or are they combined? Please review.

Response: The location and wording of the sentence are appropriate. Enforcement of the compliance standards are not linked to the O&F determination or the O&M status of the site. The first sentence of the paragraph will be revised for clarity.

Comment 62. Page 158, Section 6.3.7.3, 1st complete paragraph: Is an O & F determination the same as a compliance determination? Please clarify.

Response: No, the O&F determination is independent of the compliance start date.

Comment 63. Page 159, paragraph below Table 6.3.5.3-1: The paragraph states that percolation exceedance quantities were measured above the standard in May, 2015, on the SDT cover, which is part of the ICS Monitoring Program described in Section 6.3.7.3 on page 157. As stated in Section 8.4 (page 212), the SDT cover was completed first and was "...expected to perform within compliance standards after the 2012 growing season when the 5-year establishment ended." The 2nd paragraph under Section 8.4 gives increased importance and applicable data relative to capillary breakthrough on the SDT portion of the ICS. Until lysimeter construction alone can be firmly rejected as a cause, TCHD would suggest SDT continue as a part of the overall ICS during the issue resolution. The major issue is a narrowing of the investigation too soon. The problem may not be just that the SDT cover was different and is currently not performing.

Response: The investigation into the May 2015 exceedance of the percolation compliance standard at Lysimeters 001, 002, and 003 is being performed in accordance with the Regulatory Agency-approved Schedule for Investigation of Percolation Exceedance of the Shell Disposal Trenches RCRA-Equivalent Cover and Development of a Corrective Measures Plan of Action, Revision 0, dated November 18, 2015. The investigation is focused on the locations were the compliance standard has been exceeded. If the compliance issue appears in other lysimeters, the Army will discuss expanding the investigation with the Regulatory Agencies. The lysimeter network is the only quantitative means by which the percolation performance of the ICS can been assessed.

Comment 64. Page 159, Table 6.3.5.3-1, September, 2013: The reason for the excess percolation is precipitation combined with "...poor perennial grass establishment in the area." Unfortunately, having combined the SDT into the ICS inspections in 2012, the report does not evaluate SDT vegetation separately. SDT showed good soil cover in FY 2011, the last year it was reported separately. On page 213 it is stated that the "...SDT RCRA-equivalent cover ... has the most well-established and diverse

vegetation of the RMA covers." Specific inspection data should be able to reconcile this apparent conflict.

Response: The statement in Table 6.3.5.3-1 is in regard to vegetation over, and adjacent to, the footprint of Lysimeter 003. General statements regarding the excellent establishment of native grasses on the SDT RCRA-equivalent cover are correct; however, perennial grass establishment over Lysimeter 003 was poor in September 2013 and continues to be less dense that the balance of the cover. The table will be revised for clarity.

Comment 65. Page 165, end of 3rd paragraph on page: This text seems to state that the assumptions upon which the design was based may be valid most of the time, but not under all conditions that may be encountered.

Response: The text makes no statements regarding the effectiveness of the design.

Comment 66. Page 166, 4th complete paragraph: Should the sinkholes be flagged as an issue? Please consider. An evaluation seems to be progressing as though it is being addressed as an issue.

Response: The FYRR has been revised to identify the widespread presence of sinkholes as an early indicator of a potential remedy problem and a FYR issue.

Comment 67. Page 167, 3rd paragraph under 6.3.7.4: Please see Specific Comment 62 relating to the 1st sentence.

Response: Please see the response to Specific Comment 62.

Comment 68. Page 178, Section 7.2.1.3, 2nd paragraph: If the zone is stagnant, it is not clear why the concentrations are increasing? Can this be clarified?

Response: The text will be revised to indicate that the hydraulic gradient is very flat in this area. As discussed in a Water Team meeting, additional evaluation of the BRES will be added to the FYSR.

Comment 69. Page 179, Section 7.2.1.4, end of 3rd paragraph: Could the results be reviewed annually by the Water Team and a decision made on the need for continued monitoring?

Response: Please see the response to Comment 26.

Comment 70. Page 180, Section 7.2.1.5, 1st partial paragraph on page: Mass removal is occurring but it is not required once the water level is maintained below the waste. This would make a 75% mass removal difficult or impossible to maintain. See Specific Comment 41.

Response: The Lime Basins Dewatering Project only has water level/water elevation performance criteria, not water quality or mass removal criteria.

Comment 71. Page 181, Section 7.2.1.7, 2nd paragraph: The BANS removal system is doing its' job but it would not be necessary to treat two of the 3 streams coming to it if the dewatering goals were met and maintained. Also, the statement about improving the performance of the boundary system is unclear and potentially misleading since reduced contaminant loading decreases the treatment efficiency according to text in the 4th paragraph of this section. Please review.

Response: BANS mass removal is independent of the Complex Trenches and Lime Basins groundwater treatment. Please see the responses to Comments 1 and 16 regarding improvement of boundary system performance.

Comment 72. Page 181, Section 7.2.1.7, 3rd paragraph: The text sounds like a reverse hydraulic gradient is an objective at BANS. While a possibility, it is not currently a requirement. Please clarify.

Response: The text will be clarified as requested.

Comment 73. Page 183, 2nd full paragraph on page: Is it possible that optimization alternatives should be considered that are broader than those presented?

Response: The optimization alternatives presented in the FYRR are feasible in the near term (i.e., during the next FYR period). Since the NBCS is functioning as intended according to LTMP criteria, broader or more extensive optimization alternatives are not needed. Longer term alternatives might include breaching the slurry wall, and increasing the flow rates in the South Channel extraction wells (24355 and 24356) if the fluoride concentrations in the wells decrease.

Comment 74. Page 185, 2nd full paragraph: TCHD believes that subsequent results should be mentioned here regarding private well 359-A. It has been resampled, bottled water has been provided and a permanent alternative water supply is being discussed. The Army has moved very quickly and responsibly to break a direct exposure pathway. Please consider further discussion of this issue.

Response: Although much of the progress toward resolving this issue occurred outside the FYR window, well 359A will be added as an issue and the current status will be discussed.

Comment 75. Page 188, Section 7.2.4.1: Please see (Specific Comment #60).

Response: See response to Comment 60.

Comment 76. Page 190, Off-Post Surface Water Monitoring (#50c): Please see Specific Comment #59.

Response: It is assumed that Specific Comment 58 is the correct reference. Consequently, please see the response to Comment 58.

Comment 77. Page 195, Section 7.3.6: This write up does not seem to reflect this as an issue based on cover percolation issues. Shouldn't this text be modified and the conclusion changed?

Response: The text will be revised to acknowledge the exceedance of the percolation compliance standard in 2015. However, since the cover will not be considered O&F until the percolation issue is resolved, the conclusion that the cover will function as intended when the O&F determination is made remains valid.

Comment 78. Page 201, Table 7.4.1.1-2: It appears that the second footnote 3 should actually be a 4. Also, the reference to treatment plant influent is in apparent conflict with the basis stated in the 2nd complete paragraph on page 202. Please review and align.

Response: Discussion of the risk calculation for 1,4-dioxane provided in the draft report will be removed and the risks will be evaluated as part of the project documentation; therefore, the second footnote 3 and reference to treatment plant influent have been removed.

Comment 79. Page 202, 2nd complete paragraph on page: The absence of a Technical Memorandum as indicated in the last 5YRR is never explained. TCHD feels that this should continue as an issue until proper data evaluation can be performed and documented.

Response: Because a final Data Summary Report and technical evaluation have not been completed, this section will be revised to indicate that the evaluation is not complete and the issue will be carried forward for the next FYR period.

Comment 80. Page 203, Section 7.4.1.3: Did the process described in this section develop a review process for periodic evaluation/updating of PQLs?

Response: The PQL study completed did not include any requirement for a periodic evaluation of PQLs.

Comment 81. Page 206, Section 7.4.7, Changes is Risk Assessment Methods: Can more detail be provided as to the depth/scope of the investigation that led to this conclusion?

Response: The general risk assessment methodology remains consistent with EPA risk assessment guidance.

Comment 82. Page 207, Section 7.6: TCHD suggests that the private well 359-A be included in this paragraph.

Response: Well 359A is discussed in Section 6.3.3.5 as part of the Private Well Network Monitoring. This section will be revised to include additional discussion, and although the evaluation and decision to replace the well occurred outside the FYR window, replacement of the well will be identified as an issue in Section 8. Section 7.6 does not provide a description of each of the identified issues.

Comment 83. Page 209, Section 8.0, Issues: The expanding of issues in the 5YRR is to insure/encourage a broad discovery and investigative process. From Table 8.0-1, some issues could be reframed and two additional issues added.

a) Reframed issues:

(1) Issue 1 from this section could be expanded to the NBCS where the downgradient performance wells are presented as potentially unrepresentative due to potential desorption of dieldrin under high ground water levels. If true, this makes the performance criteria invalid and more a factor of water elevations than treatment plant efficiency. Please consider.

(2) Issue 4 could be expanded to all the ICS RCRA covers until verified that capillary breakthrough on the SDT will not occur on the other covers. Evaluating only SDT seems too restrictive, and clearly should include comparison with the other covers. In addition, it is assumed that lysimeter installation and inspection procedures would be compared between the SDT lysimeters and the other cover lysimeters.

TCHD believes this is planned and expansion of the ICS would just match the existing approach.

(3) It appears logical to break Issue 5 into three issues, since different solutions, timelines, or priorities might develop for each. Please consider.

b) Proposed new issues:

(1) As stated in Specific Comment 75 (page 185), TCHD believes that well 359-A should be addressed as an issue.

(2) As stated in Specific Comment 80 (page 202), although the Army may have legal grounds for not incorporating the 1,4-dioxane standard, TCHD believes it should list it as an issue since there was no Technical Memorandum prepared during this 5YR. Even if not adopted, the Army might want to act as though it had been adopted and sample and report accordingly. Please consider.

Response: a) (1) According to the LTMP performance criteria, the NBCS is functioning as intended. Thus, no change to Issue 1 is warranted. Due to the variability of the NBCS water table because of the influence from First Creek, with the current LTMP primary performance criterion (i.e., maintaining a reverse hydraulic gradient), setting water elevation limits on the north side of the slurry wall is not feasible.

(2) Refer to the response to Specific Comment 63.

(3) The Army and Shell agree that the three dewatering projects should be addressed separately.

b) (1) Although the evaluation and decision to replace the well occurred outside the FYR window, replacement of the well will be identified as an issue in Section 8.

(2) Because a final Data Summary Report and technical evaluation have not been completed, this section will be revised to indicate that the evaluation is not complete and the issue will be carried forward for the next FYR period.

Minor Comments

Comment 1. Page iii, Table of Contents, Section 6.3.3: The subheadings under this section seem variable. Would the section be helped by inserting a Section 6.3.4 and reallocating some of the sub- headings?

Response: The subheadings are all related to groundwater monitoring and are appropriate under Section 6.3.3.

Comment 2. Page ix, Figure 6.3.1.4-1: Would this figure be more relevant if the most recent CSRG map were used (or multiple maps) instead of just the DIMP plume maps? Please consider.

Response: Please see the response to Comment 50.

Comment 3. Page xii: Can the full title of the FYSR be added to provide a clearer distinction between the FYRR and the FYSR?

Response: Acronyms have been updated as requested.

Comment 4. Page ES-10: Please review the page for correctness and potential typos in the last protectiveness statement.

Response: Comment noted.

Comment 5. Page 6: March 2006 line in Table 2.0- 1: Should this be moved ahead of May 2006.

Response: The table has been revised as requested.

Comment 6. Page 9, Sec. 3.2, end of 3rd paragraph: Can the applicable ROD be designated?

Response: The text has been revised as requested.

Comment 7. Page 10, Sec. 3.3, end of 2nd paragraph: This results in confusion as to why surface media was deleted in the off-post as stated in Section 2.1.5. Can the deletion of surface media be clarified?

Response: The text will be revised for clarity.

Comment 8. Page 22, 3rd dash on page: Typo. Groundwater monitoring is repeated.

Response: The text has been revised.

Comment 9. Page 52, last paragraph of Section 4.2.1.3. Table 4.0-5 shows no Part 1 for RCRA-equivalent. Cover Construction. Is Part 1 lacking on the first CCR or just omitted from Table 4.0-5.

Response: Shell Disposal Trenches RCRA – Equivalent Cover was the first cover constructed, and a CCR was prepared. However, O&M of the Shell Disposal Trenches RCRA – Equivalent Cover and 2-ft Soil Cover is captured in the ICS Construction project, and a Part 2 CCR is forecast for late 2016. Item # 39 in Table 4.0-3 (previously 4.0-5) has been revised to differentiate between the CCR completed for Shell and the Part 1 and Part 2 CCRs completed for ICS.

Comment 10. Page 53, Section 4.2 .1.4, last line of 1st paragraph on page 53: Please consider inserting "RCRA-equivalent" between Basin F and cover to make it parallel to SDT write-up on page 52.

Response: The text has been revised as requested.

Comment 11. Page 79, Section 4.4.1.1: The table referenced should probably be Table 4.0-5 rather than 2.0-2. Please check.

Response: The text has been revised as requested.

Comment 12. Page 83, Section 4.4.3.1: Is Table 2.0-2 actually Table 4.0-5? Please check. Also, the DDESB concurrence letter is not referenced in Section 12. Should this reference be included?

Response: The text has been revised as requested. The DDESB concurrence letter has been added to Section 12.

Comment 13. Page 89, Section 5.0: Shouldn't the completed date be deleted since the review period on the 2010 Five-Year Review is different from the completed date?

Response: Although the date is accurate for approval of the 2010 FYR Report, the date will be removed from the section heading to avoid confusion.

Comment 14. Page 102, last paragraph: Please evaluate the first sentence for the need to add a couple of words.

Response: The text has been revised as requested.

Comment 15. Page 121, 2nd paragraph on page after bullets: The correct figure reference would be Figure 6.3.1.4-2. Please check.

Response: The figure reference has been updated to 6.3.3.4-2.

Comment 16. Page 122, Section 6.3.3.6: At this point, the subheadings under Section 6.3.3 look like they could be reevaluated. Would the creation of a Section 6.3.4 Project Specific Monitoring Results be helpful? This would allow for a regrouping of some of the Section 6.3.3 subheadings. Please evaluate.

Response: The subheadings are all related to groundwater monitoring and are appropriate under Section 6.3.3.

Comment 17. Page 135, 1st paragraph: Can the Army report cited be included in the reference section?

Response: Reference has been updated in text and is now included in Section 12.

Comment 18. Page 151, 3rd complete paragraph on page, last sentence: The word "recovered" is confusing. Would the word "located" be more appropriate?

Response: The text has been revised as requested.

Comment 19. Page 163 and 164, Tables 6.3.5.3-4, -5, and -6: Please consider dropping the reported accuracy in these tables to one decimal place as a minimum.

Response: The table has been revised as requested.

Comment 20. Page 172, 3rd paragraph: Please provide Table tab in final report.

Response: A tab for tables and figures will be provided in the final report.

Comment 21. Page 175, Section 7.1.2.3, 2nd paragraph: This looks like old verbiage. Based on Section 8.4, this verbiage should be reviewed.

Response: The paragraph will be revised as suggested.

U.S. Army and Shell Oil Company Responses to
U.S. Environmental Protection Agency August 24, 2016 Comments on the
2015 Five-Year Review Report
for Rocky Mountain Arsenal, Revision D, July 7, 2016

GENERAL COMMENT

Comment 1. The U.S. Environment Protection Agency (EPA) agrees that Operable Unit (OU) 4 is currently protective of human health and the environment, that many parts of the OU3 remedy are functioning as intended, and that human health is currently protected. However biomonitoring work is incomplete and EPA believes an ecorisk determination cannot yet be made. Because only one protectiveness determination can be made per OU, EPA's protectiveness determination for OU3 is Protectiveness Deferred. EPA's protectiveness statement and issue/recommendations table will be provided under separate cover.

Response: Comment noted.

SPECIFIC COMMENTS

Comment 2. **Executive Summary, Page ES-6.** The first issue, involving the Northwest Boundary Containment System (NWBCS), was revised from Revision C to list specific monitoring wells that are recommended for monitoring off post, downgradient from the NWBCS. However, the number of monitoring wells, monitoring frequency, and analyte list have not been finalized at this time, so the listing of specific wells is premature. The recommendation from Revision C could be enhanced to state, "Review opportunities to optimize plant operation and perform additional monitoring On Post and Off Post to determine dieldrin concentration extent."

Response: The information provided and associated well list represents the Army's recommendation to address this issue. The Army recognizes that the specifics related to the additional monitoring will need to be negotiated with and approved by the Regulatory Agencies prior to implementation.

Comment 3. **Table 7.4.1.1-1, Page 224.** This table lists new or revised standards for the water treatment systems. It is recommended that the table be revised to more clearly explain the meaning of the information listed.

Response: The Army believes that the text accompanying the table in this section provides adequate explanation of the information.

Comment 4. **Section 8.16, Page 242.** This section discusses other unresolved issues, describes three topics that have follow-through actions, and states that there are no other unresolved concerns from EPA. While there is not disagreement with the three

topics discussed in this section, there are additional issues that EPA has identified during this Five-Year review including:

- ensuring the property lease at the Northern Pathway System is in place before the expiration date to ensure access to extraction, recharge and monitoring wells associated with this system;
- implementing improvements and/or repairs to the confined flow system monitoring well network;
- evaluating changes to the groundwater flow around the Hazardous Waste Landfill; and
- evaluation of surface water sample data with respect to agricultural standards, as identified by the Colorado Department of Public Health and the Environment.

Please revise this section to acknowledge these additional unresolved concerns and follow-up actions that are described elsewhere in the Five-Year Review Report.

Response: A brief description of these concerns will be added to this section.

Comment 5. **Volume II, Figures.** Comment 10a on Revision B of the Five Year Summary Report (FYSR) indicated that the results of the 2014 Plume Mapping Project, represented in Figures 5.1.5.1-1 through 5.1.5.1-12, are too small, do not list the well numbers or the actual contaminant concentrations, and that larger figures should be provided which contain the necessary information for evaluating the plume mapping results. Revision D of the FYSR still does not provide maps with the requested information. Please revise these figures accordingly.

Response: As stated in our response to the original comment, the 2014 plume maps are included in the FYSR at the same scale as the 1994 plume maps to facilitate comparison between the two efforts, which was an objective of the program. Listing of well numbers and associated contaminant data is not necessary for interpretation of changes in plume location or configuration. Please refer to the 2014 Plume Mapping DSR for specific data associated with the program.