Site Background

• Former landfill that operated from the 1930s to approximately 1968
• Approximately 170 acres
• Approximately 35 acres of the landfill are on the Great Swamp National Wildlife Refuge, owned by the United States and managed by the United States Fish and Wildlife Service (USFWS)
• 2018 Draft Feasibility Study (FS)
  ▪ Purpose of FS is to evaluate remedial alternatives based on Remedial Action Objectives (RAOs)
  ▪ Analysis primarily based on:
    ▪ Protection of Human Health and the Environment
    ▪ Compliance with laws and related requirements
    ▪ Effectiveness
    ▪ Implementability
    ▪ Cost
• Two additional ‘modifying criteria’ must be considered for remedy selection:
  ▪ State acceptance
  ▪ Community acceptance
Document Review

- 2018 Draft Feasibility Study (FS)
  - 2018 Remedial Investigation (RI)
  - 2016 Baseline Ecological Risk Assessment (BERA)
  - 2014 Baseline Human Health Risk Assessment (BHHRA)
Draft Feasibility Study
Landfill Alternatives

1) No Action
2) Site Controls
3) Cap approx. 25 acres of the 140-acre landfill.
4) Same as 3 above except approx. 2-4 feet of soil/waste would be excavated from approx. 25 acres of the 140-acre landfill and disposed off-site rather than capped; excavated area would be backfilled and revegetated
5) Capping of all landfill with offsite material
Rolling Knolls Site – Assessment of Draft Feasibility Study Alternatives

Do draft alternatives meet DOI/FWS (Agencies) requirements & concerns?

- Refuge’s Comprehensive Conservation Plan (CCP)
- DOI Environmental Compliance Memorandum (ECM)
- Requirements specific to the Refuge portion of the Site

Assessment Questions

1. Has the Refuge been impacted by landfill wastes?
2. If the Refuge has been impacted, is the impact significant and impairing?
3. If the Refuge has been significantly impacted, do the remedial/removal alternatives proposed in the FS address the impacts?
4. Are there other remedial/removal alternatives or modifications of existing remedial/removal alternatives that would address the impacts?
Refuge-Specific Protected Species

- **Bog turtle**: Federally-listed threatened; managed as priority species
- **Indiana bat**: Federally-listed endangered; breeding colonies, priority species
- **Northern long-eared bat**: Federally-listed threatened species
- **Wood turtle**: State-threatened; priority species
- **Blue-spotted salamander**: State-endangered
- **Barred owl**: State-threatened
- **Cooper’s hawk**: State-threatened (breeding population)
- **Red-shouldered hawk**: State-endangered (breeding), threatened (winter population)
Ecological Risk Assessment

Evaluates the likelihood of adverse effects to plants and animals (“ecological receptors”)

• **Exposure characterization** – Are plants and animals exposed to contaminants and to what degree?

• **Ecological effects characterization** – Is the level of exposure likely to cause harmful effects?

• **Risk management** – What can be done to limit or eliminate the likelihood of harmful effects?
Baseline Ecological Risk Assessment Results

Short Tailed Shrew Exceeding Benchmarks

Meadow Vole Exceeding Benchmarks
Baseline Ecological Risk Assessment Results

American Robin
Exceeding Benchmarks

Little Brown Bat
Exceeding Benchmarks
Human Health Risk Assessment

Evaluates the *likelihood of adverse effects to Humans*

- **Lead (Pb) is a primary human health risk driver**
- **Two Pb clean up goals (Preliminary Remediation Goal)**
  - Recreational exposure scenario = 400 mg/kg
  - Trespasser exposure scenario = 2,700 mg/kg
    - Scenario chosen for the Refuge
- **Refuge manager cannot restrict access to Refuge**
Rolling Knolls Site – Conceptual Site Model

West

LANDFILL WASTE

contaminated groundwater

overland flow

LANDFILL WASTE

WILDLIFE REFUGE

contaminated sediments

contaminated Surface water??

East

NOT TO SCALE
Key Findings - Surface Soils

Findings

Insufficient data to support FS alternatives that do not remove landfill waste from the Refuge

Surface soils on the Refuge contaminated by Pb, PCBs and other chemicals related to landfill wastes at concentrations that suggest risk to Refuge ecological receptors and recreational users

Ecological, wildlife risk-based soils PRGs required for key COPECs

Ecological PRGs guide soils remedial action alternatives affecting the Refuge

FS Assessment

1. Only Alternative 5 (extensive capping) would fully contain source landfill waste at the Site and cover some, but not all of the impacted areas of the Refuge

2. Only alternatives that include full removal of contaminated materials from the Refuge meet the requirements of the Refuge CCP, the DOI ECM and other Requirements

3. Expand Alternative 3 to include removal of all areas on the Refuge where the Eco PRG is exceeded, consolidate on private portion of Site and cap with onsite material to reduce truck traffic. This modified alternative would most closely address the Refuge requirements
Ecological Benchmarks calculated for Pb

~ 50 mg/kg (American Robin LOAEL)

~ 130 mg/kg (Short-tailed Shrew NOAEL)

~ 400 mg/kg (Short-tailed Shrew LOAEL & Recreational users)

~ 900 mg/kg (Meadow Vole NOAEL)
Significant Refuge Area Is Impacted – Typically Pb

> 50 mg/kg ~ 87 acres
  (American Robin LOAEL)

> 130 mg/kg ~ 38 acres
  (Short-tailed Shrew NOAEL)

> 400 mg/kg ~ 30 acres
  (Recreational users & Short-tailed Shrew LOAEL)

> 900 mg/kg ~ 27 acres
  (Meadow Vole NOAEL)
### Significant Refuge Area And Receptors At Risk

<table>
<thead>
<tr>
<th>Representative receptor</th>
<th>Acreage posing risk</th>
<th>~ Home Receptor Range - Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>American robin</td>
<td>87 Acres</td>
<td>0.3 to 2.0</td>
</tr>
<tr>
<td>Short-tailed shrew</td>
<td>30 Acres</td>
<td>1.0</td>
</tr>
<tr>
<td>Meadow vole</td>
<td>27 Acres</td>
<td>0.05</td>
</tr>
</tbody>
</table>
Meadow Vole (*Microtus pennsylvanicus*)
## Sediments – Many Ecological Benchmarks Exceeded In Refuge Sediments

### Black Brook (East Side)

<table>
<thead>
<tr>
<th>Chemicals of Potential Ecological Concern (COPEC) from BERA Figure 4-3</th>
<th>Unit</th>
<th>Black Brook Upstream</th>
<th>Black Brook Upstream of Vernal Ponds</th>
<th>Vernal Ponds</th>
<th>Black Brook Downstream of Vernal Ponds</th>
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</thead>
<tbody>
<tr>
<td>Total DDx (^A)</td>
<td>µg/kg</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>4,4-DDE</td>
<td>µg/kg</td>
<td>9.2</td>
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<td>7.1</td>
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<tr>
<td>DDD</td>
<td>µg/kg</td>
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<tr>
<td>o,p-DDD</td>
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<td>11</td>
<td>-</td>
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<tr>
<td>o,p-DDE</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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</tr>
<tr>
<td>Total PCBs (^A)</td>
<td>µg/kg</td>
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<td>-</td>
<td>82</td>
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<tr>
<td>Aroclor 1254</td>
<td>µg/kg</td>
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<td>-</td>
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<tr>
<td>Aroclor 1260</td>
<td>µg/kg</td>
<td>-</td>
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<td>-</td>
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<td>Barium</td>
<td>mg/kg</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Copper</td>
<td>mg/kg</td>
<td>28.3</td>
<td>21.1</td>
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<tr>
<td>Lead</td>
<td>mg/kg</td>
<td>116</td>
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<td>Mercury</td>
<td>mg/kg</td>
<td>0.32</td>
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<tr>
<td>Nickel</td>
<td>mg/kg</td>
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<tr>
<td>Zinc</td>
<td>mg/kg</td>
<td>135</td>
<td>128</td>
<td>125</td>
<td>293</td>
</tr>
</tbody>
</table>
Key Findings – Sediments

**Black Brook** sediment impacted
- Sediments adjacent to landfill (Black Brook) exceed Screening Benchmarks
  - Possible bioaccumulation (e.g., PCBs)
- Vernal ponds significantly exceed up gradient concentrations

**Loantaka Brook** and vernal ponds south of the landfill and on the Refuge are impacted
- Sediment concentrations exceed USEPA Probable Effects Levels (PELs), State of New Jersey Severe Effects Levels (SELs), and NJDEP EBSLs
Key Findings – Sediments

FS Alternatives Assessment

1. Alternative 5 would fully contain the landfill waste to prevent contaminant exposures and further migration of contaminants into the surface water and sediment of the Refuge
   - Alternative 5 would not address the contaminated sediment in Black Brook
2. Sediment contamination characterization insufficient to support alternatives that do not fully contain the source landfill waste to prevent further contaminant migration
3. Primary concern for sediments is continued migration of contaminants from the source landfill waste onto the Refuge
   - Modify FS Alternatives to fully contain source landfill waste and remove or contain Refuge resources contaminated by this waste
Key Findings – Groundwater

Findings

• Groundwater in 8 Refuge wells impacted

• Many reported concentrations exceed State of New Jersey water quality requirements for dissolved and total metals and, in one well, benzene

• New Jersey’s groundwater quality requirements identified as possible chemical-specific applicable requirements (ARARs)
Key Findings – Groundwater

FS Alternatives Assessment

1. Draft FS implies that groundwater alternatives 2 and 3 will achieve Requirements at some point in time
2. 8 Refuge impacted wells are not specifically addressed in the FS
3. Potential future impacts to surface water from contaminated groundwater discharges need to be evaluated
4. Unclear if other groundwater alternatives or modifications of groundwater alternatives 2 or 3 will ensure compliance with chemical-specific Requirements
5. Modification of the landfill alternatives to fully contain source landfill waste would address continued migration of contaminants into the groundwater
# Groundwater

8 Wells Exceeding NJ Standards

<table>
<thead>
<tr>
<th>Well</th>
<th>No. Constituents Exceeding New Jersey Groundwater Standards</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW - 2</td>
<td>4</td>
<td>Dissolved Metals</td>
</tr>
<tr>
<td>MW - 4</td>
<td>4</td>
<td>Dissolved Metals</td>
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<tr>
<td>MW-12</td>
<td>5</td>
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<tr>
<td>MW - 14</td>
<td>4</td>
<td>Dissolved Metals</td>
</tr>
<tr>
<td>MW - 19</td>
<td>5</td>
<td>Dissolved Metals and Benzene</td>
</tr>
<tr>
<td>X-1</td>
<td>6</td>
<td>Dissolved Metals</td>
</tr>
<tr>
<td>X-2</td>
<td>4</td>
<td>Dissolved Metals</td>
</tr>
<tr>
<td>X-3</td>
<td>3</td>
<td>Dissolved Metals</td>
</tr>
</tbody>
</table>

Source: RI Figure 4-2 (Geosyntec Consultants, 2018)

*N.J.A.C. 7:9C Ground Water Quality Standards*
Key Findings – Surface Water

Findings

• Contaminants of concern not found in high concentrations at many locations

• Pore water sample collected from one location

• Contaminated groundwater expected to keep discharging into wetland
Rolling Knolls Site – Assessment of Draft Feasibility Study Alternatives

Assessment Questions

1. Has the Refuge been impacted by landfill wastes? **YES**
2. If the Refuge has been impacted, is the impact significant and impairing? **YES**
3. If the Refuge has been significantly impacted, do the remedial/removal alternatives proposed in the FS address the impacts? **NO**
4. Are there other remedial/removal alternatives or modifications of existing remedial/removal alternatives that would address the impacts? **YES**
Questions? - Discussion