HISTORICAL REVIEW MEETING

Former Naval Auxiliary Landing Field

Charlestown, Rhode Island

February 7, 2019

Meeting Agenda

9:00 – 9:15	Introductions, meeting agenda overview, meeting goals
9:15 – 9:30	Site background
9:30 – 10:50	Project 08 (Town Property) - Boiler House No. 2 - Boiler House No. 4 - Boiler House No. 3 - Underground Electrical Vault
10:50 – 11:00	Break
11:00 – 12:00	Project 09 Charlestown Landfill (Town/USFWS Property)
12:00 – 12:30	Lunch
12:30 – 1:05	Project 09 Burn Pit Area (USFWS Property)
1:05 – 1:50	Project 09 Eastern Area Landfill (USFWS Property)
1:50 – 2:00	Break
2:00 – 2:45	Project 09 Ninigret Wildlife Refuge Landfill (USFWS Property)
2:45 – 3:30	Summary, next steps and action items

Meeting Attendees

- U.S. Army Corps of Engineers (USACE) – executing agency for CERCLA and RCRA sites; *Project Manager Carol Charette*
- Rhode Island Department of Environmental Management (RIDEM) – *Shawn Lowry, Richard Gottlieb*
- U.S. Fish and Wildlife Service (USFWS) – landowner, Charles Vandemoer
- Town of Charlestown – landowner, Mark Stankiewicz
- The Johnson Company (JCO) – USACE contractor developing the work plans; *Project Manager Chris Turner*; Subcontractors – Woodard & Curran (Risk Assessment), Hager-Richter Geoscience (Geophysics), Bay West (UXO)

USACE Project Delivery Team

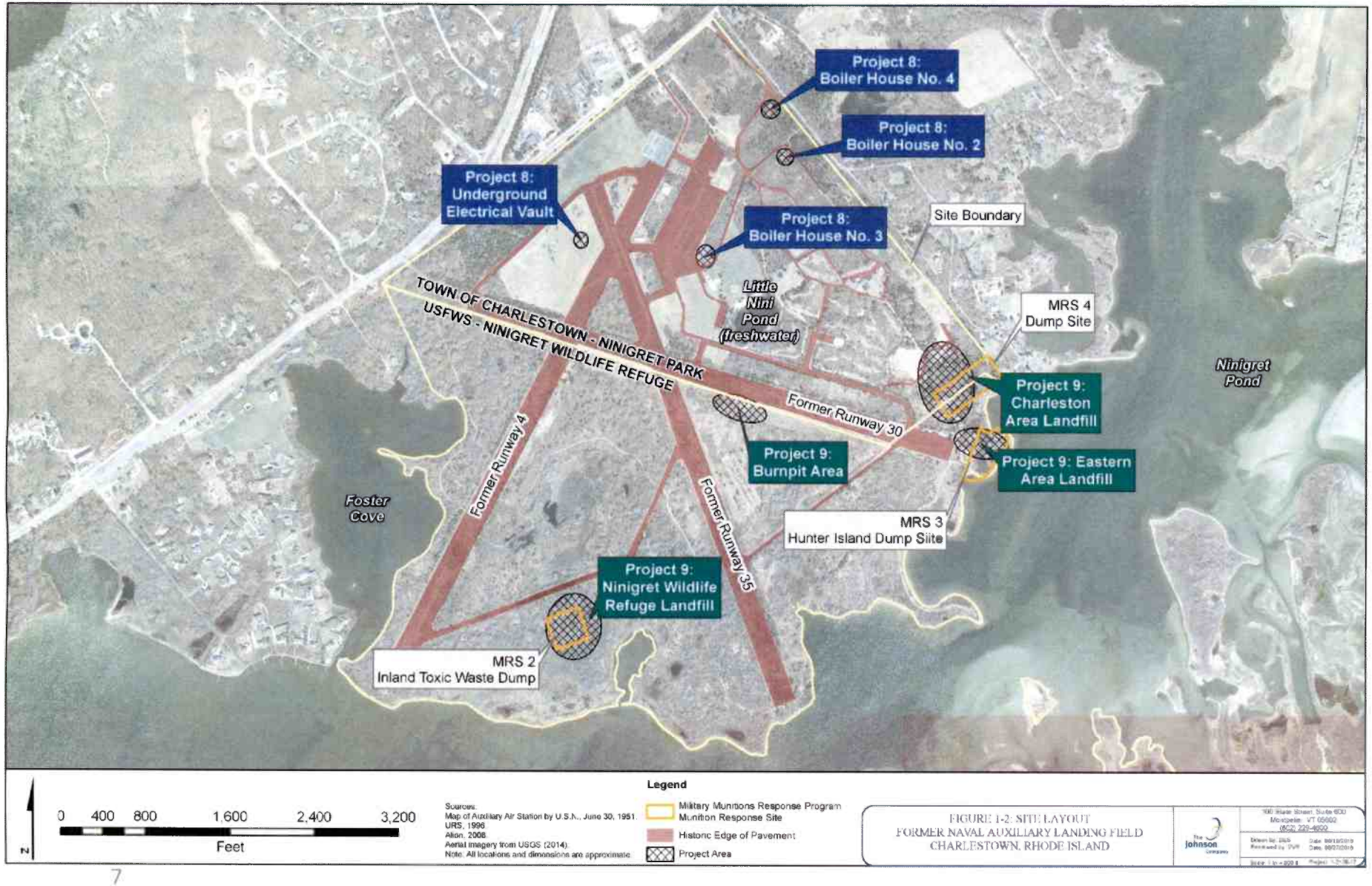
- Carol Charette – Project Manager
  - *Email: Carol.A.Charette@usace.army.mil*
  - *Phone: 978-318-8605*
- Tracy Dorgan – Project Geologist
- Yixian Zhang – Project Chemist
- David Oster – Project Biologist
- Cynthia Auld – Project Risk Assessor

Meeting Goals

- Review key information presented in Historical Review Technical Memorandum
- Present proposed path forward and next steps for each site
- Provide forum for questions and input from stakeholders prior to drafting Work Plans (Town of Charlestown, USFWS, RIDEM)

Site Location

Reference Map: Site Layout



Reference Map: Current Ninigret Park Features

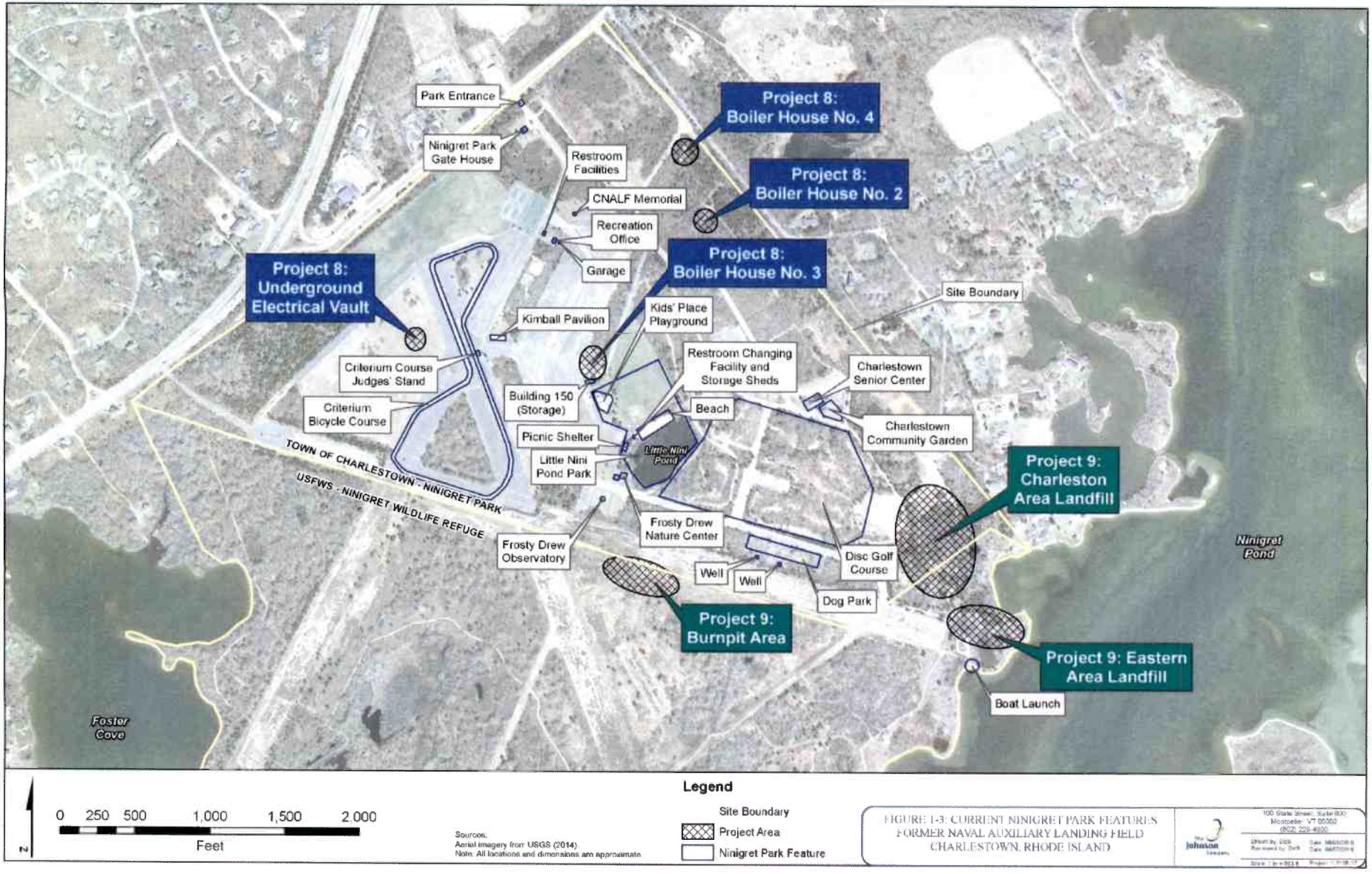
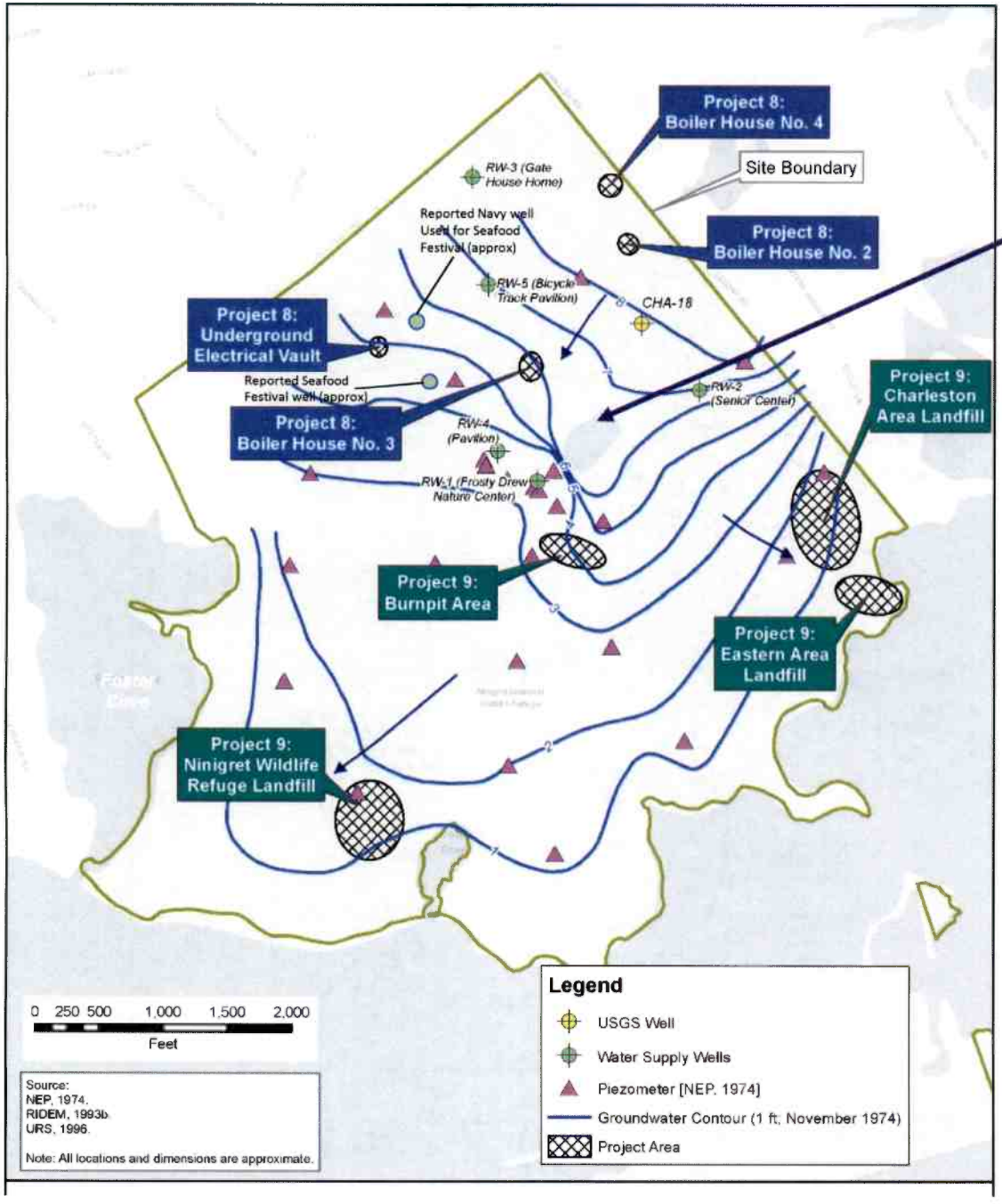


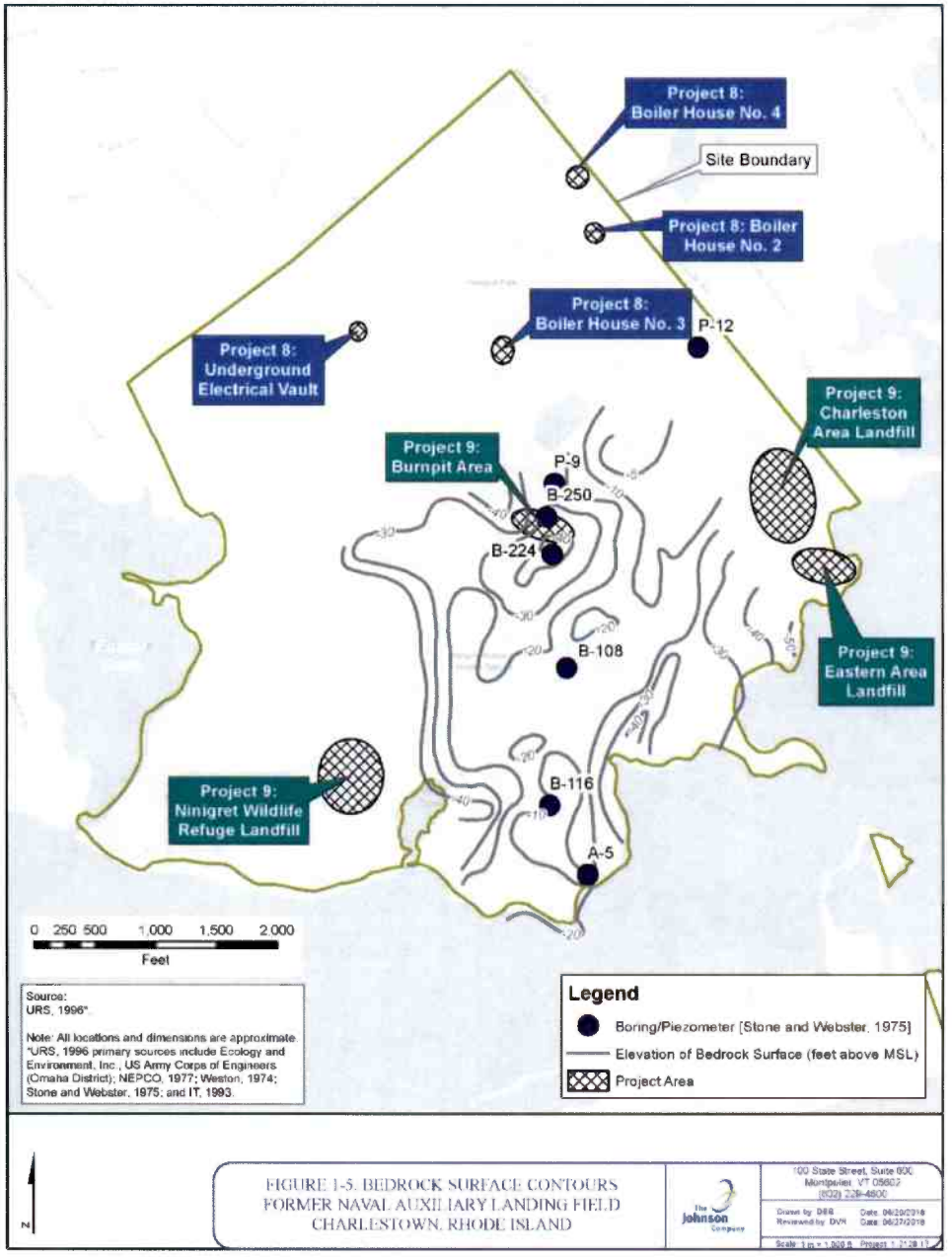
FIGURE 1-3: CURRENT NINIGRET PARK FEATURES
FORMER NAVAL AUXILIARY LANDING FIELD
CHARLESTOWN, RHODE ISLAND

1974 Groundwater Contours and Flow Direction

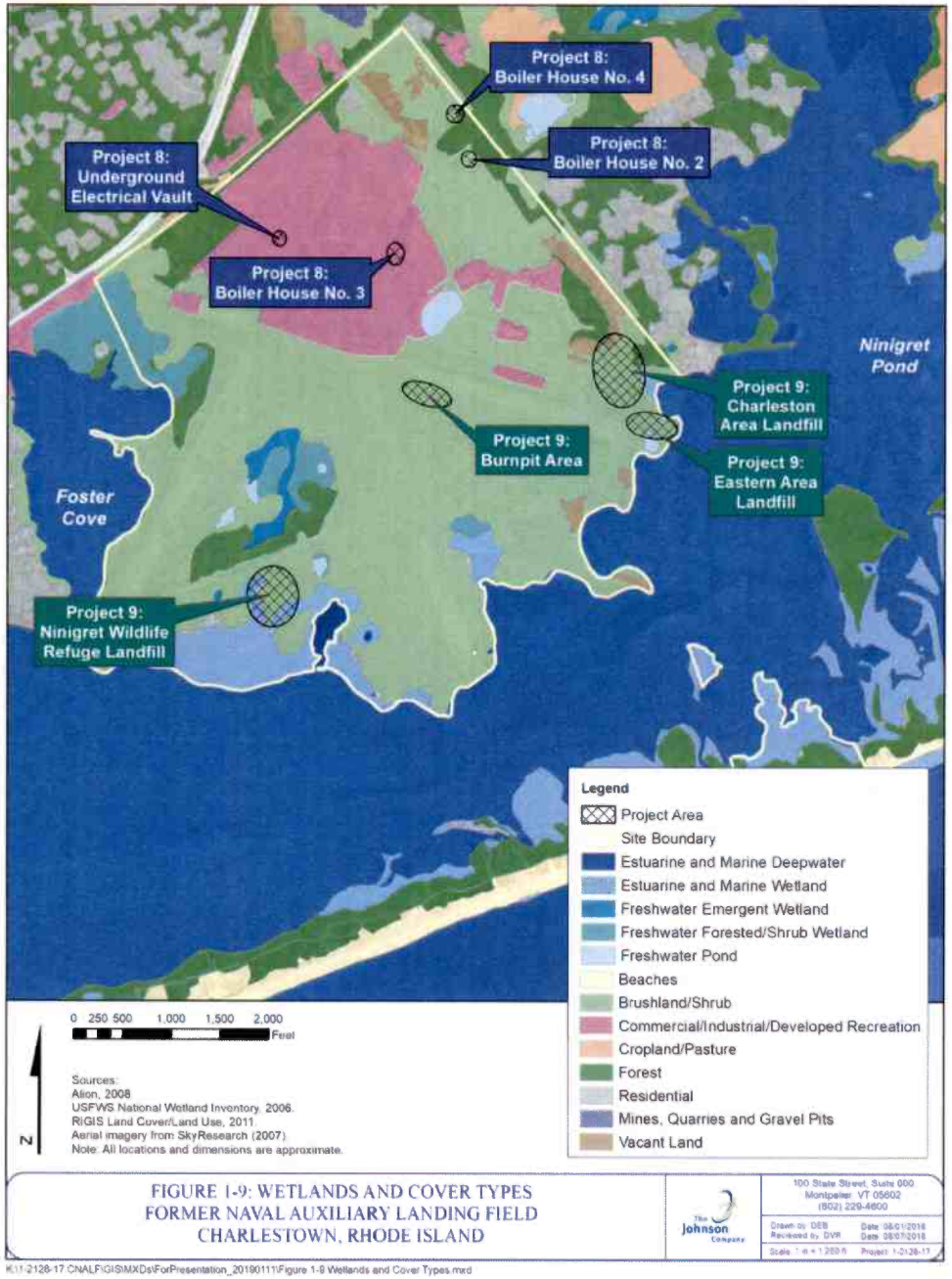


Little Nini Pond acts seasonally as a groundwater recharge area (outward radial flow) in wet conditions, and groundwater discharge area (inward flow) in dry conditions

1974 Bedrock Surface Contours

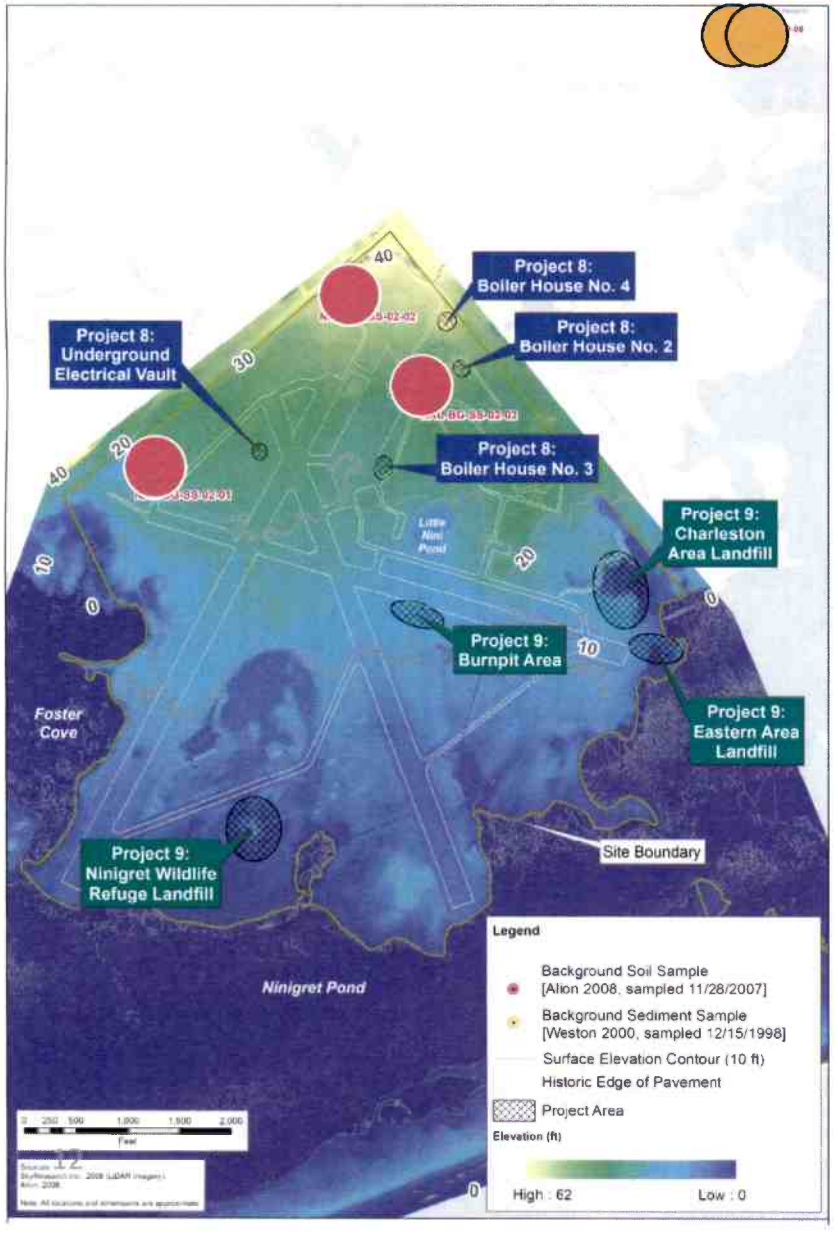


Wetlands and Ground Cover Types



Limited Historical Background Soil and Sediment Results

Shown with shaded surface topography



- **3 Discrete Soil Samples (2007)**
  - Analyzed for 6 metals
  - Results below RIDEM and EPA residential standards, exceed some EPA risk-based screening levels
- **2 Discrete Sediment Samples (1998)**
  - analyzed for metals, VOCs, SVOCs, PCBs, and pesticides
  - Some results exceed USEPA risk-based screening levels

A robust site-wide background evaluation of contaminants in soil and sediment is proposed

Two USACE Projects:

- Project 08: Four locations on Ninigret Park Property
  - Former Boiler Houses No. 2, No. 3, and No.4 (RCRA/State Regs)
  - Underground Electrical Vault (CERCLA)
- Project 09: Four locations on Ninigret Wildlife Refuge Property (one partially on Ninigret Park Property)
  - Three historical landfills and a former fire training area (CERCLA)

USACE PROJECT 08

- Four Sites on Ninigret Park property
  - Former Boiler Houses No. 2, No. 3, and No.4 (RCRA/State Regs)
  - Underground Electrical Vault (CERCLA)

- Path Forward
  - Remedial Action Work Plan (RAWP)
  - Objective: Permanent closure of each site

USACE PROJECT 08

- RCRA Process: Follow State Regs
  - RIDEM is the regulatory agency
  - RAWP in accordance with Rhode Island Remediation Regulations
  - Applicable Screening Levels/Standards:
    - Current RIDEM Residential Direct Exposure Criteria (DEC)
    - Current RIDEM GA Leachability Criteria

PROJECT 08

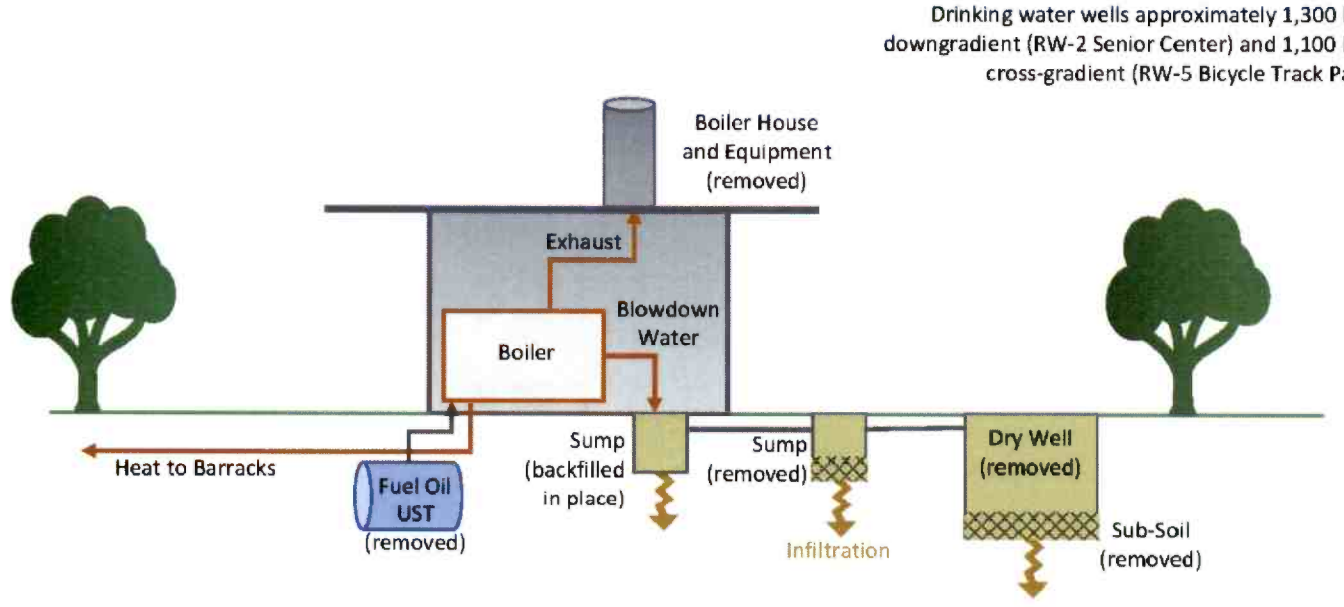
BOILER HOUSE NO. 2, NINIGRET PARK

Background

- Boiler building built in the 1940s
  - removed by USACE in 2002
- Adjacent 10,000 gallon fuel oil Underground Storage Tank (UST)
  - UST decommissioned 1986
- The boiler house had one interior sump and one exterior sump with an associated dry well
  - Soil under sumps and dry well was sampled; interior sump backfilled in place; exterior sump and dry well removed and surrounding soil excavated/ resampled then backfilled; work by USACE in 2002 and 2003

Boiler House #2, Ninigret Park

Project 08, Boiler House No. 2 Conceptual Site Model



Not to scale

FIGURE 2-2: PROJECT 08 BOILER HOUSE NO. 2
CONCEPTUAL SITE MODEL
FORMER NAVAL AUXILIARY LANDING FIELD
CHARLESTON, RHODE ISLAND

The Johnson Company

100 State St., Suite 600
Montpelier VT, 05602

Drawn by: DEB	Date: 10/31/2018
Reviewed by:	Date:
Scale: Not to Scale	Project: 1-2128-17

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Boiler House #2, Ninigret Park

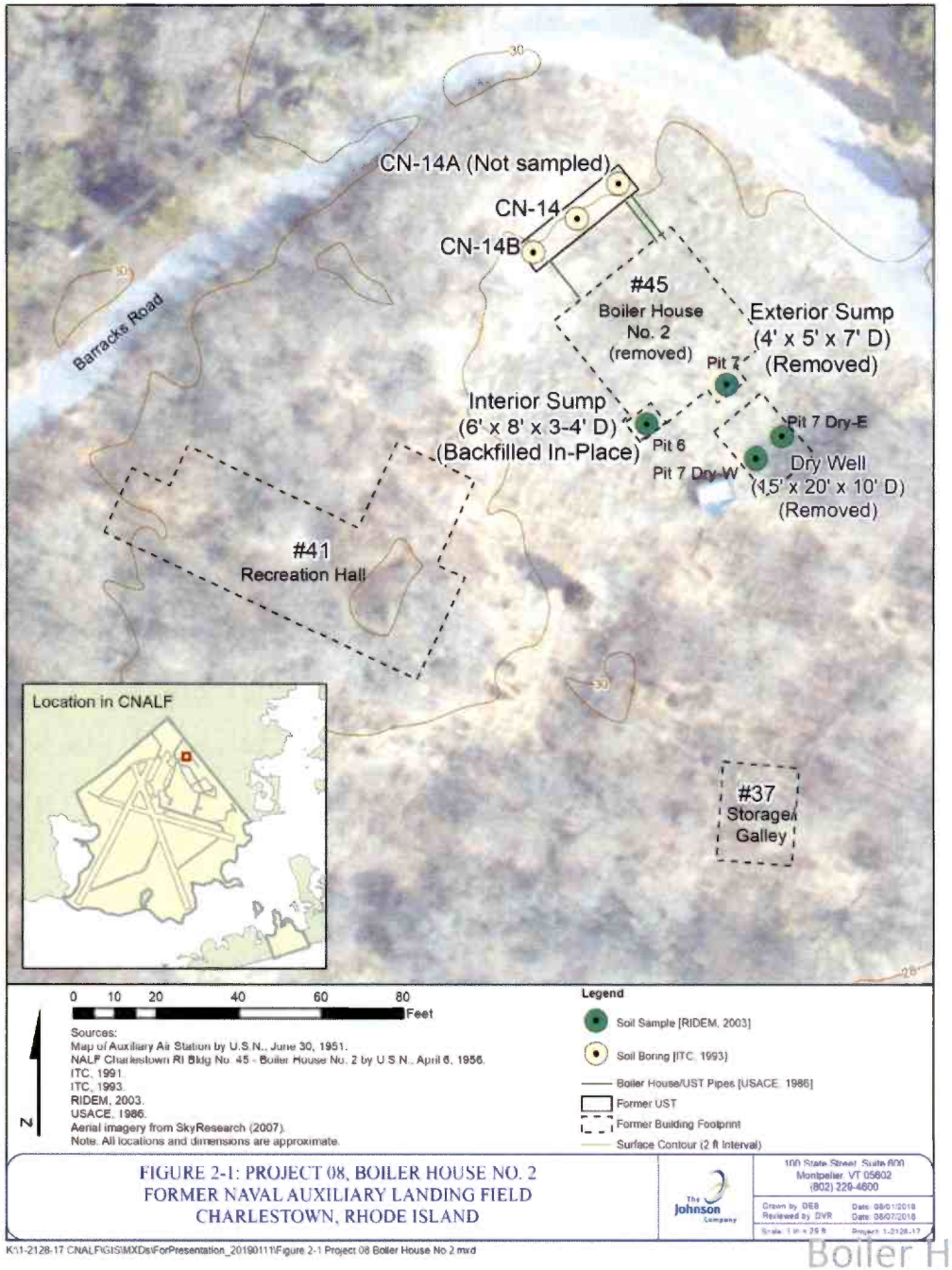
Geology

- Fine to coarse sand and gravel (glacial outwash deposits)
- Bedrock assumed at 22-28 ft depth based on soil boring refusal
- Groundwater not encountered in the soil borings at this location (appears to be no permanent saturated overburden)

Potential Constituents of Concern

- Petroleum from the former fuel oil UST and associated piping in deep soil below the tank and piping
- Metals from the boiler blowdown water in soil below the former sumps and well, mercury from possible broken gauges on the boilers – Note – No evidence of this potential contaminant based on sampling performed during building, sump, and soil removals.
- Petroleum from possible leaks or spills in the building while servicing the boilers

Previous Investigation & Remediation - Project 08, Boiler House No. 2



Boiler House #2, Ninigret Park

Findings from Previous Investigations

- UST: three borings and soil samples in former UST footprint (ITC, 1993).
  - Field screening indicated no stained soil or VOCs.
  - Low levels of TPH in composite soil samples (0-20.5 & 20-29.1 ft bgs), below current RIDEM standards (max 36 mg/kg).
  - Metals concentrations below current RIDEM Residential DEC; no samples analyzed for SPLP/TCLP metals leachability
- Sumps and dry well - soil samples and excavations (2002)
  - No detectable VOCs or SVOCs
  - Pit 6: metals and TPH below current RIDEM DEC
  - Pit 7: metals (arsenic and lead) and TPH initially above RIDEM standards. Pit and drywell excavated; confirmation samples showed metals and TPH below current RIDEM Residential DEC; no samples analyzed for SPLP/TCLP metals leachability.

Data Gaps

- Site-specific background concentrations of metals in soil unknown
- Soil samples not analyzed for metals leachability by SPLP/TCLP for comparison to current RIDEM leachability criteria
- Laboratory reporting limit for beryllium exceeds current RIDEM Residential DEC value

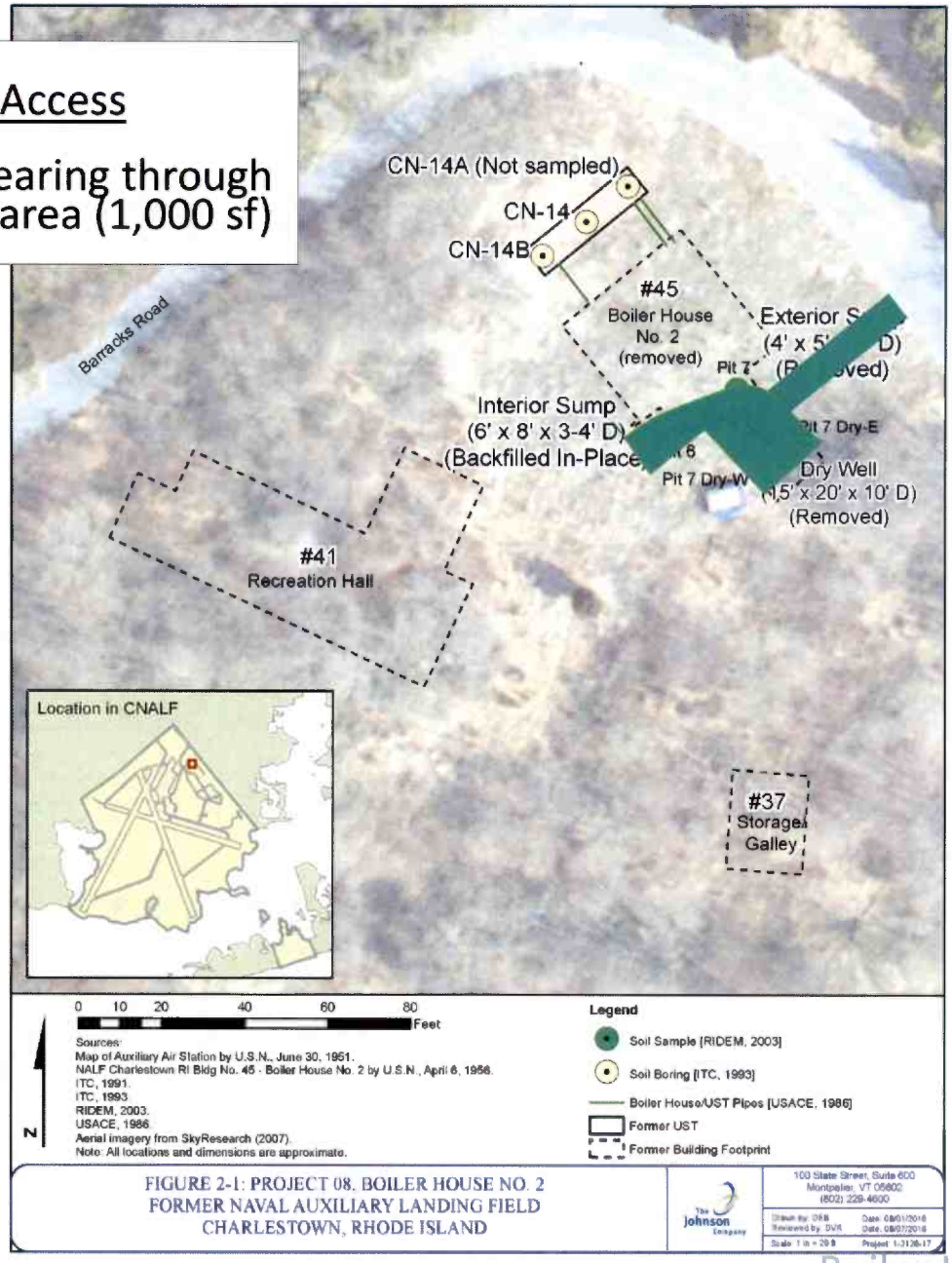
Recommendations for Future Actions

- Conduct site-specific background study for metals
  - Background study can be utilized for both Project 8 and 9
  - If remaining metals concentrations are above background levels and 20X RIDEM TCLP criteria at former sumps and drywell, collect soil samples for TCLP analysis & compare results to leachability criteria [requires brush clearing for drill rig access]
  - If remaining metals concentrations represent background levels, no further field investigation or remediation is recommended.

Proposed Access Pathways and Vegetation Clearing (if required)

Vehicle / Drill Rig Access

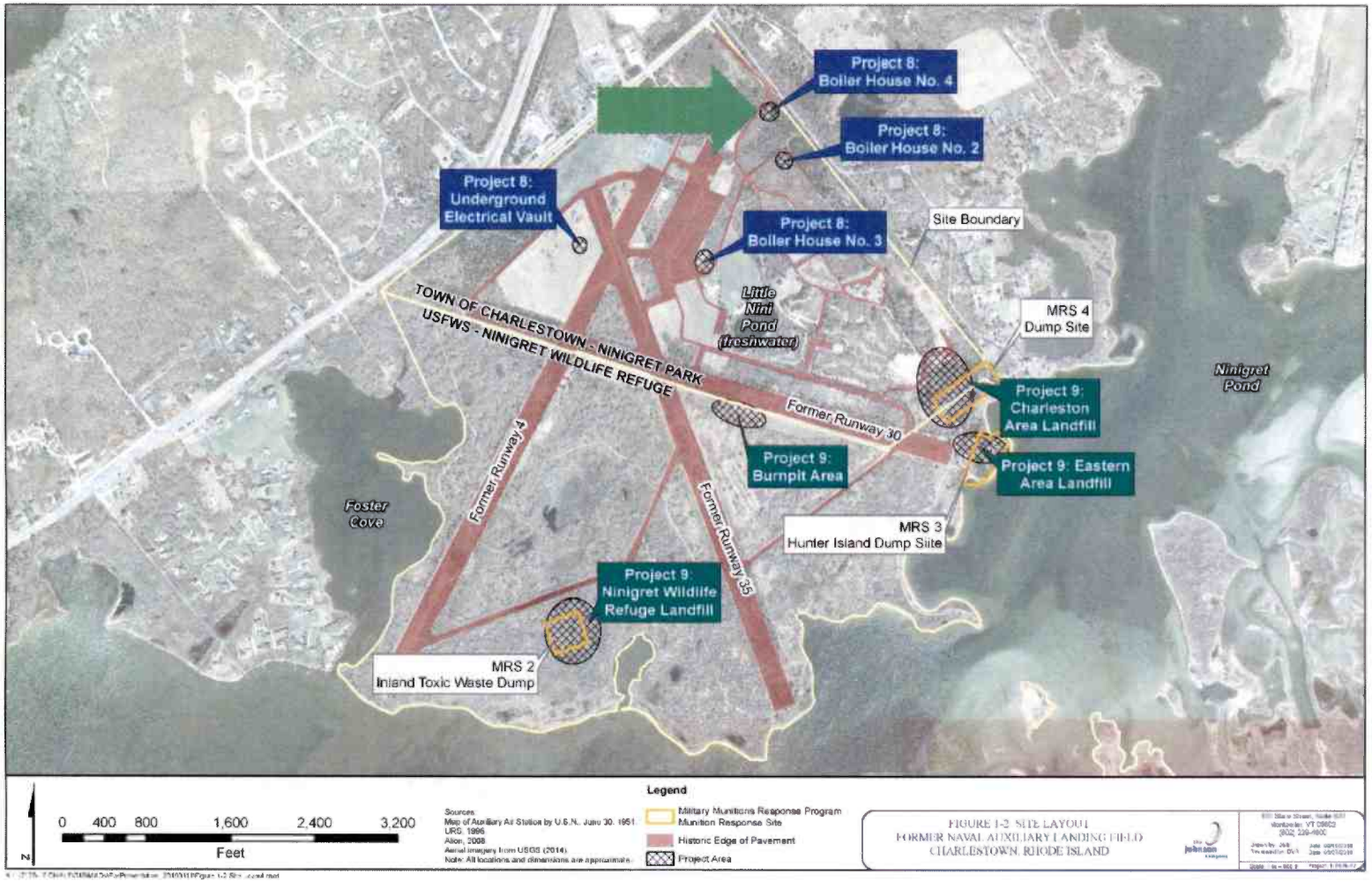
8-ft path clearing through overgrown area (1,000 sf)



Boiler House #2, Ninigret Park

Soil Background Investigation Details: Metals, PAHs and Dioxins/Furans

- 20 to 30 discrete surface soil samples (0 to 2 feet depth)
- Target undisturbed or relatively low-intensity historical use areas based on historical air photos, representing:
  - Northern area near Boiler Houses 2, 3, and 4
  - Eastern area near Burn Pit, Charlestown/Eastern Landfills
  - Southern area near NWF Landfill
- Results to represent naturally-occurring metals concentrations and regional anthropogenic aerial deposition (lead, PAHs, dioxins/furans)



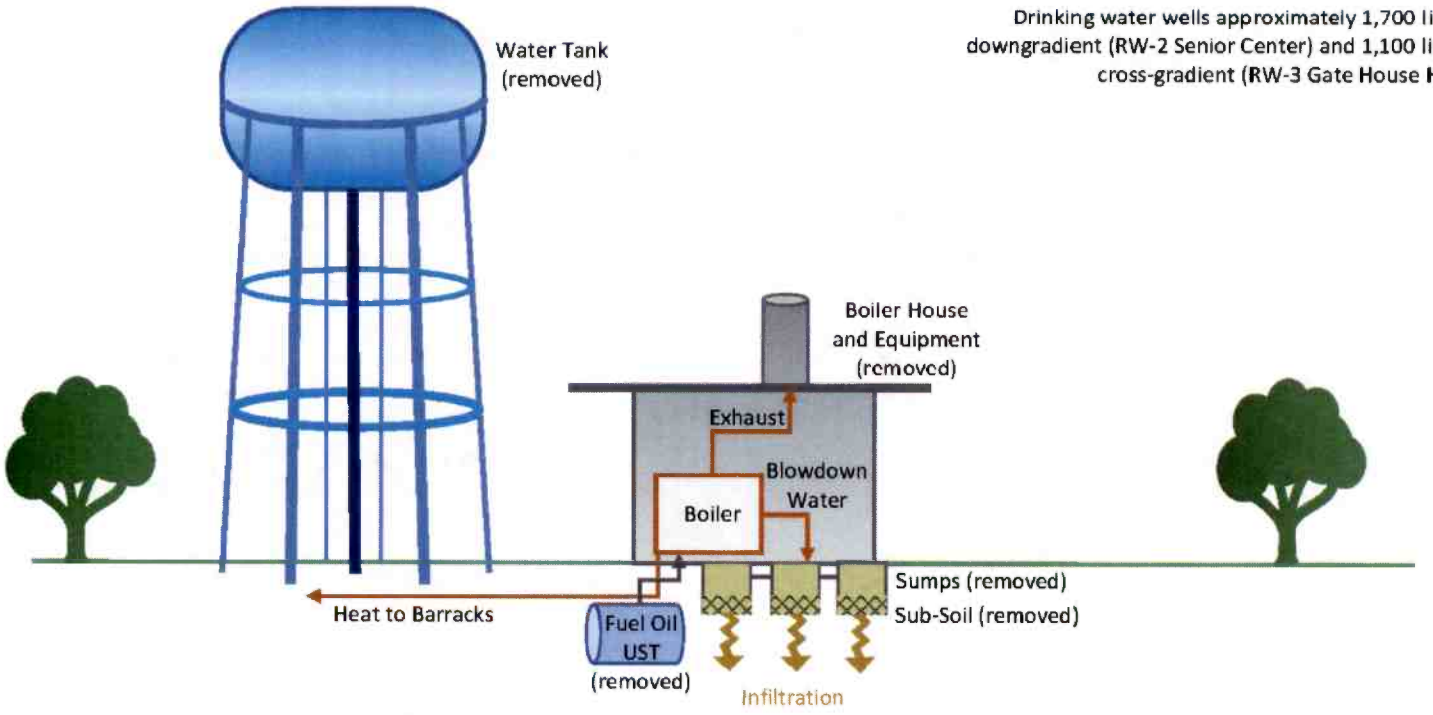
PROJECT 08

BOILER HOUSE NO. 4, NINIGRET PARK

Background

- Boiler building built in the 1940s
  - removed by USACE in 2002
- Adjacent 5,000 gallon fuel oil UST
  - UST decommissioned 1986
- The boiler house had two interior sumps, one exterior sump, and one discharge area near the chimney presumably for steam condensate and boiler blowdown water.
  - All removed in 2002 by USACE followed by confirmation sampling

Project 08, Boiler House No. 4 Conceptual Site Model



Not to scale

FIGURE 4-2: PROJECT 08 BOILER HOUSE NO. 4
CONCEPTUAL SITE MODEL
FORMER NAVAL AUXILIARY LANDING FIELD
CHARLESTON, RHODE ISLAND

The Johnson Company

100 State St., Suite 600
Montpelier VT, 05602

Drawn by: DEB	Date: 10/31/2018
Reviewed by:	Date:
Scale: Not to Scale	Project: 1-2128-17

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Boiler House #4, Ninigret Park

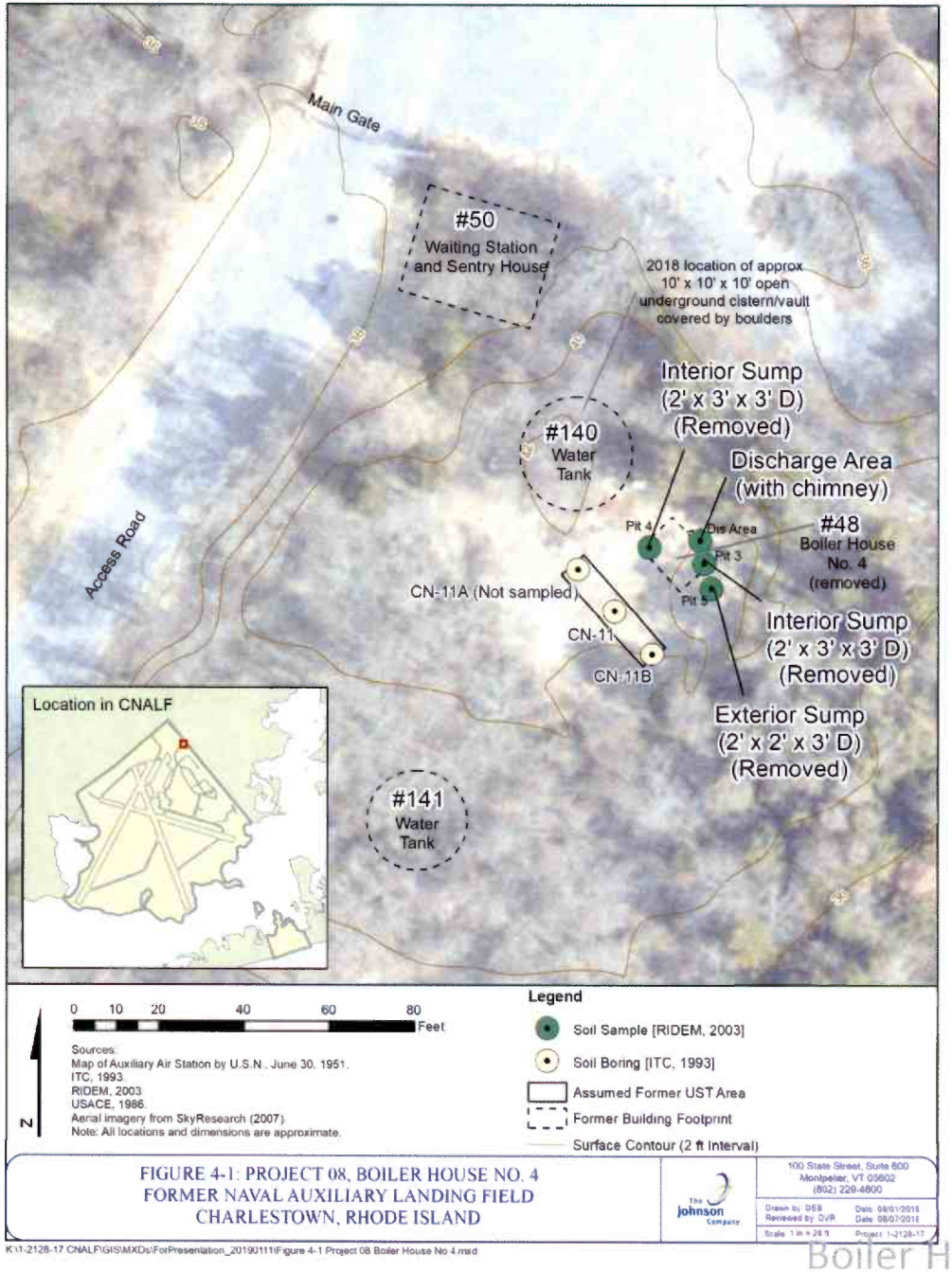
Geology

- Fine to coarse sand and gravel (glacial outwash deposits)
- Bedrock present at 25.5 foot depth based on a rock core sample
- Groundwater was not encountered in the soil borings at this location (appears to be no permanent saturated overburden)

Potential Constituents of Concern

- Petroleum from the former fuel oil UST and associated piping in deep soil below the tank and piping
- Metals from the boiler blowdown water in soil below the former sumps and discharge area, mercury from possible broken gauges on the boilers – Note – No evidence of this potential contaminant based on sampling performed during building, sump, and soil removals.
- Petroleum from possible leaks or spills in the building while servicing the boilers

Previous Investigation & Remediation - Project 08, Boiler House No. 4



Boiler House #4, Ninigret Park

Findings from Previous Investigations

- UST Area: three borings and soil samples in former UST footprint (ITC, 1993).
  - No stained soil, field screening: intermittent VOCs 14-25 ft depth
  - No TPH, VOCs, or SVOCs detected in soil samples
  - Concentrations of one metal (beryllium) at 20-25 ft depth exceeded current RIDEM Residential DEC; may be naturally-occurring; no samples analyzed for SPLP/TCLP metals leachability
- Sumps and Discharge Area – soil samples and excavations (2002)
  - No VOCs or SVOCs detected, except benzo(a)anthracene below current RIDEM Residential DEC.
  - TPH below current RIDEM Residential DEC & Leachability criteria
  - Concentrations of two metals (arsenic and lead) initially above RIDEM standards. Sumps and discharge area excavated; confirmation samples showed metals below current RIDEM Residential DEC; no samples analyzed for SPLP/TCLP metals leachability

Data Gaps

- Site-specific background concentrations of metals in soil unknown
- Soil samples not analyzed for metals leachability by SPLP/TCLP for comparison to current RIDEM leachability criteria
- Laboratory reporting limits for two metals (beryllium and thallium) exceed current RIDEM Residential DEC values

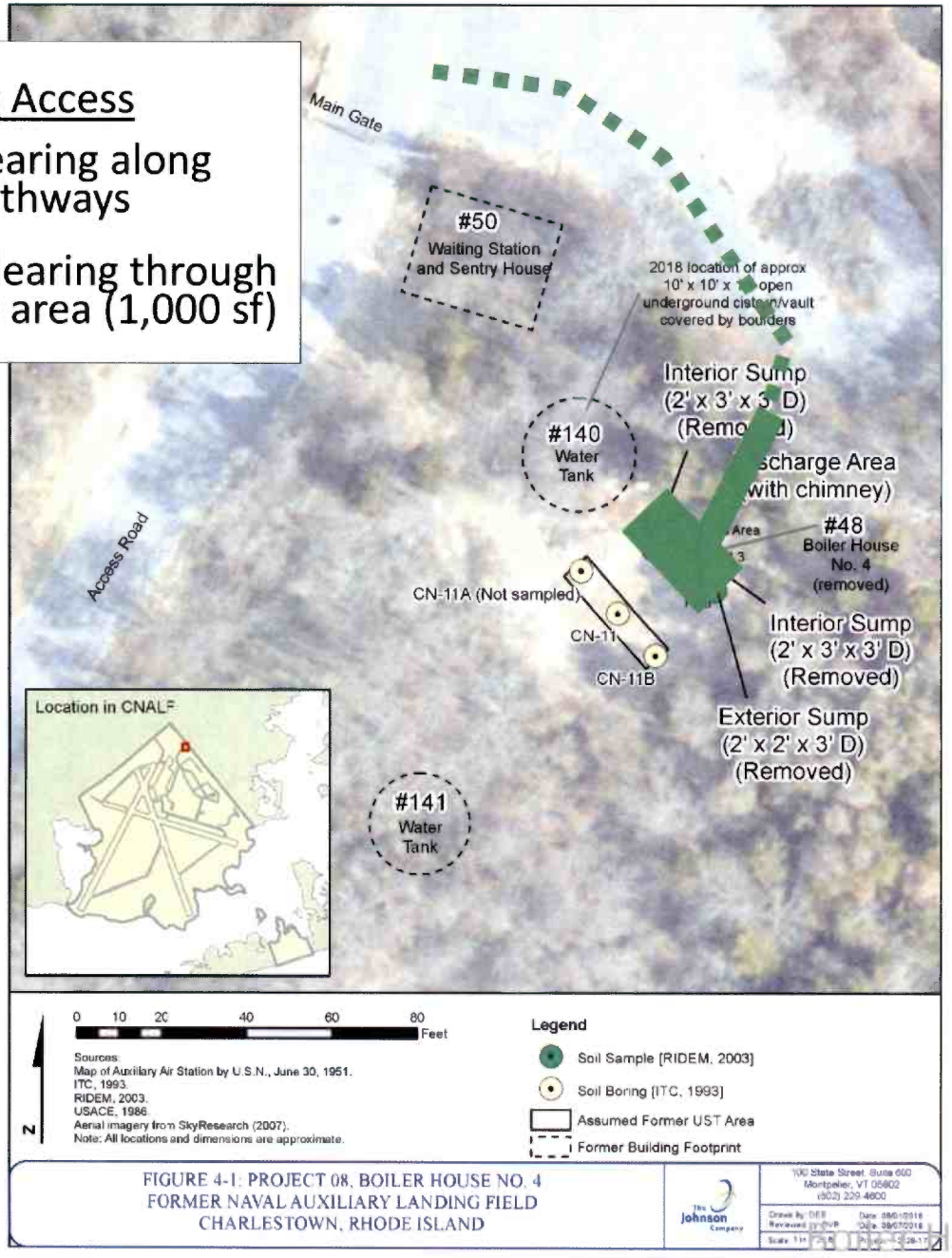
Recommendations for Future Actions

- Conduct the site-specific background study for metals discussed for Boiler House #2
  - If remaining metals concentrations are above background levels and 20X RIDEM TCLP criteria at sumps and discharge area, collect soil samples for TCLP analysis & compare results to leachability criteria [requires brush clearing for drill rig access]
  - If remaining metals concentrations represent background levels, no further field investigation or remediation is recommended.

Proposed Access Pathways and Vegetation Clearing (if required)

Vehicle / Drill Rig Access

- Limited clearing along existing pathways
- 8-ft path clearing through overgrown area (1,000 sf)



PROJECT 08

BOILER HOUSE NO. 3, NINIGRET PARK

Background

- Boiler building built in the 1940s
  - Building removed between 1985 and 1988
- Adjacent 5,000 gallon fuel oil UST
  - UST decommissioned 1986
- The boiler house had one exterior "blow-off pit" sump located near the UST presumably for discharge of steam condensate & boiler blowdown water.

Project 08, Boiler House No. 3 Conceptual Site Model

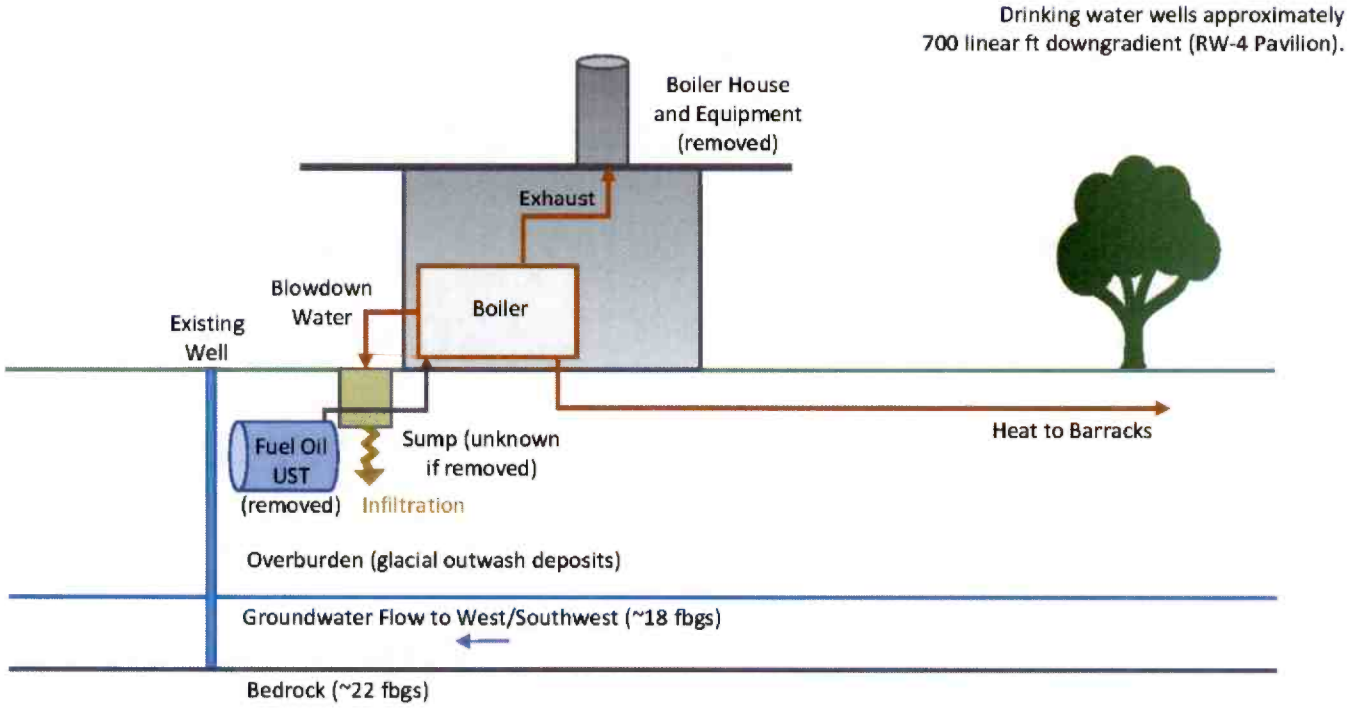


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FIGURE 3-2: PROJECT 08 BOILER HOUSE NO. 3
CONCEPTUAL SITE MODEL
FORMER NAVAL AUXILIARY LANDING FIELD
CHARLESTON, RHODE ISLAND

The Johnson Company

100 State St., Suite 600
Montpelier VT, 05602

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Reviewed by:	Date:
Scale: Not to Scale	Project: 1-2128-17

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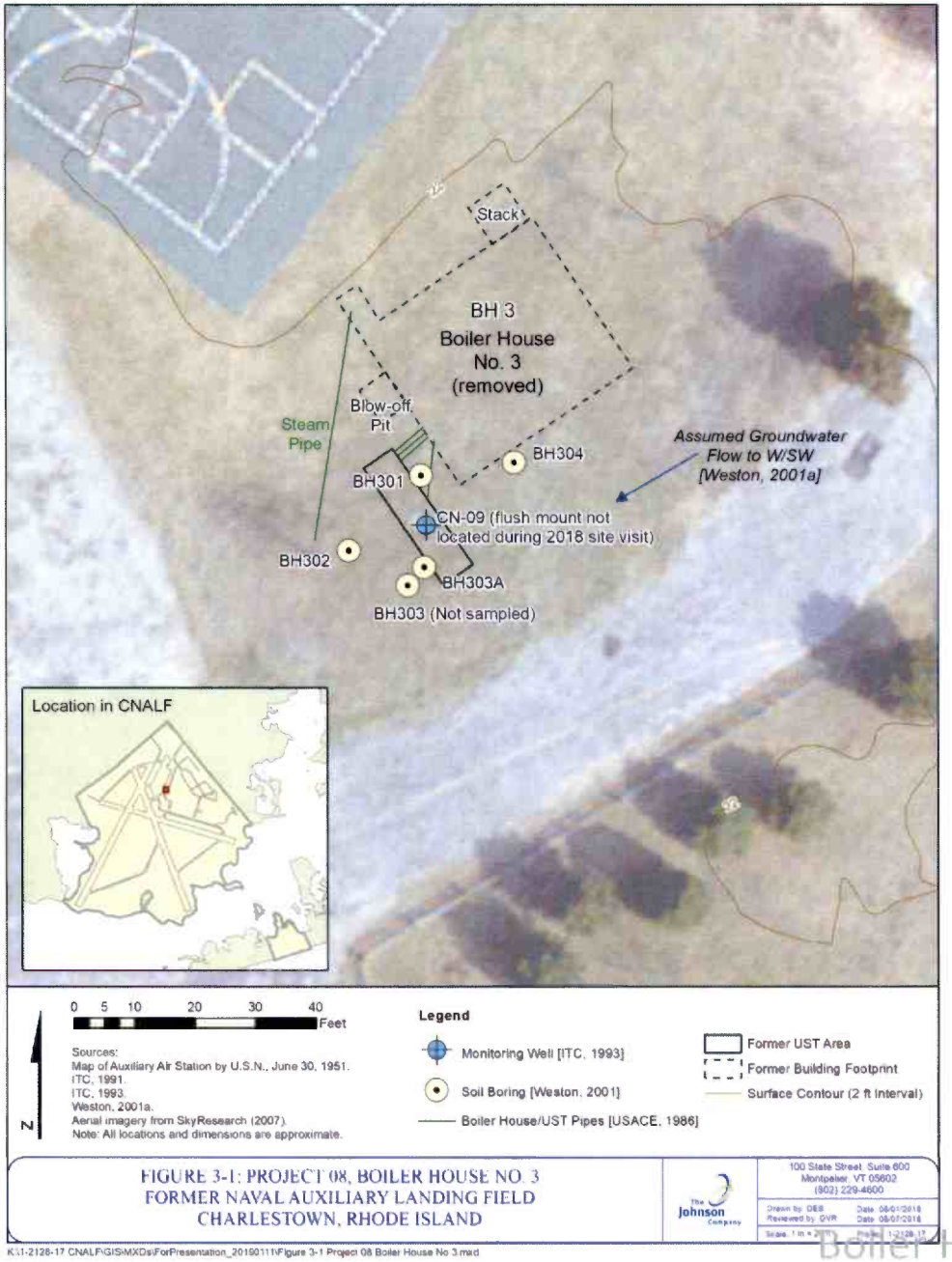
Geology

- Fine to coarse sand and gravel (glacial outwash deposits)
- Bedrock assumed at 22 ft depth based on soil boring refusal
- Groundwater was encountered at 18 ft depth in the overburden (winter 1991/1998)
- Historical investigation reports (1974, 1992) indicate groundwater flow is to the west-southwest

Potential Constituents of Concern

- Petroleum from the former fuel oil UST and associated piping in soil below the former tank and piping
- Metals in soil below the former blow-off pit from the boiler blowdown water and mercury from possible broken gauges – Note – No evidence of this potential contaminant based on available records
- Petroleum from possible leaks or spills in the building while servicing the boilers

Previous Investigation & Remediation - Project 08, Boiler House No. 3



Findings from Previous Investigations

- 1991 Investigation: one soil boring and monitoring well in UST grave
  - Field observations: sheen & petroleum odor near the water table
  - Soil: TPH in soil (0-23 ft depth) 9,200 to 16,000 mg/kg, above current RIDEM standard
  - Soil: No metals above current RIDEM Residential DEC.
  - Groundwater: No metals above current RIDEM standards; TPH detected at 0.7 mg/L; no other VOCs or SVOCs detected.
- 1998 Investigation: 5 soil borings, groundwater sample
  - Field observations: no stained soil or product
  - Soil: Low levels of TPH detected in deep (10-19 feet depth) soil samples below current RIDEM standards
  - Groundwater: Lead below current RIDEM standards; no VOCs, SVOCs, or TPH detected.

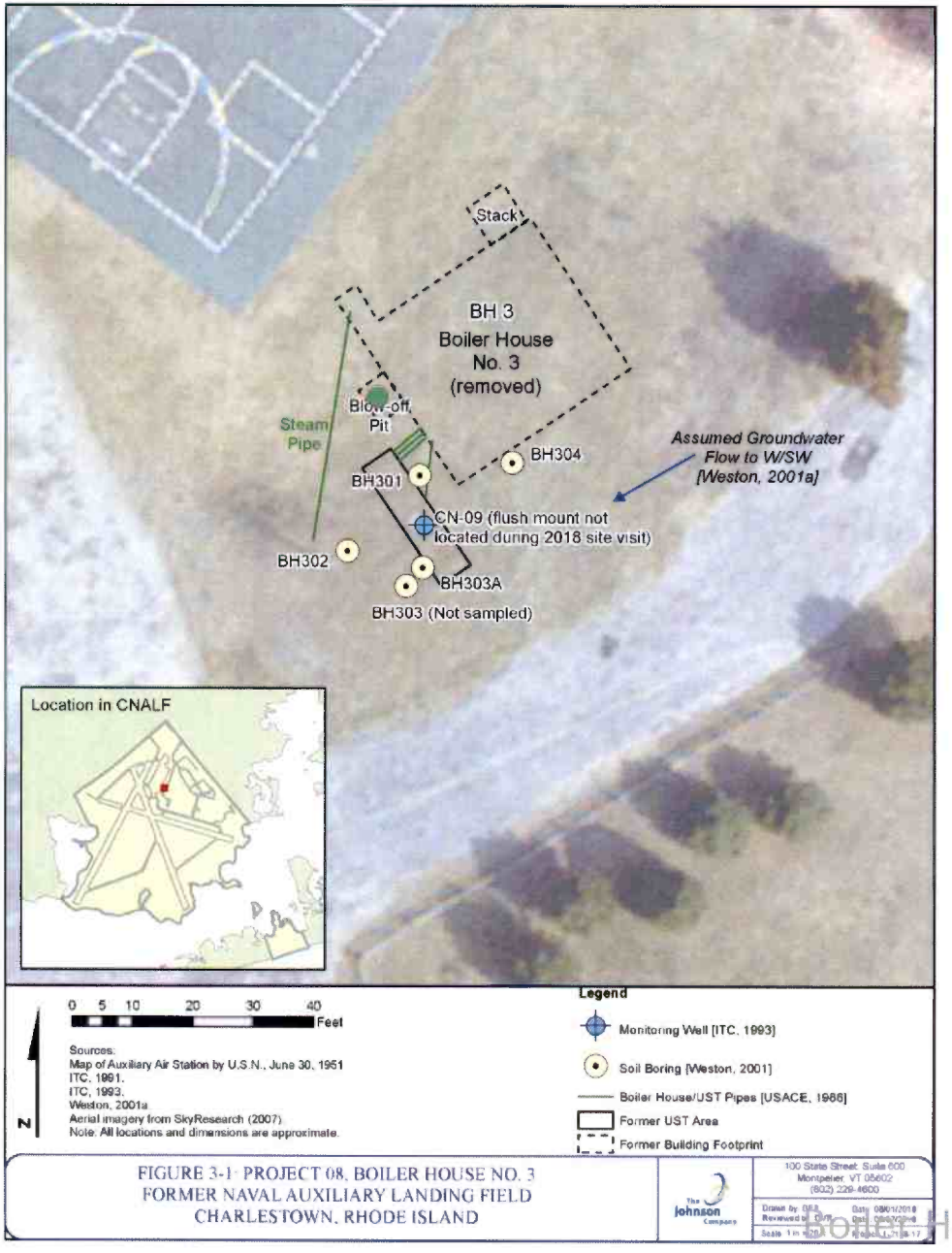
Data Gaps

- No record of investigation or closure/removal of the former sump
- Site-specific background concentrations of metals in soil are unknown
- Soil samples not analyzed for mercury
- Soil samples not analyzed for metals leachability by SPLP/TCLP for comparison to current RIDEM leachability criteria

Recommendations for Future Actions

- Decommission well CN-09 if it can be located
- Conduct proposed site-specific background study for metals
  - If remaining metals concentrations are above background levels and 20X RIDEM TCLP criteria, collect soil samples for TCLP analysis & compare results to leachability criteria
- Install 1 soil boring in the location of the former sump to confirm sump was remediated in the same fashion as those at Boiler Houses #2 and #4.
  - Collect a discrete soil sample from the assumed sump depth (3 to 7 ft bgs) and analyze the sample for SVOCs, VOCs, and metals including mercury

Proposed Sample Locations



- Soil Samples

PROJECT 08

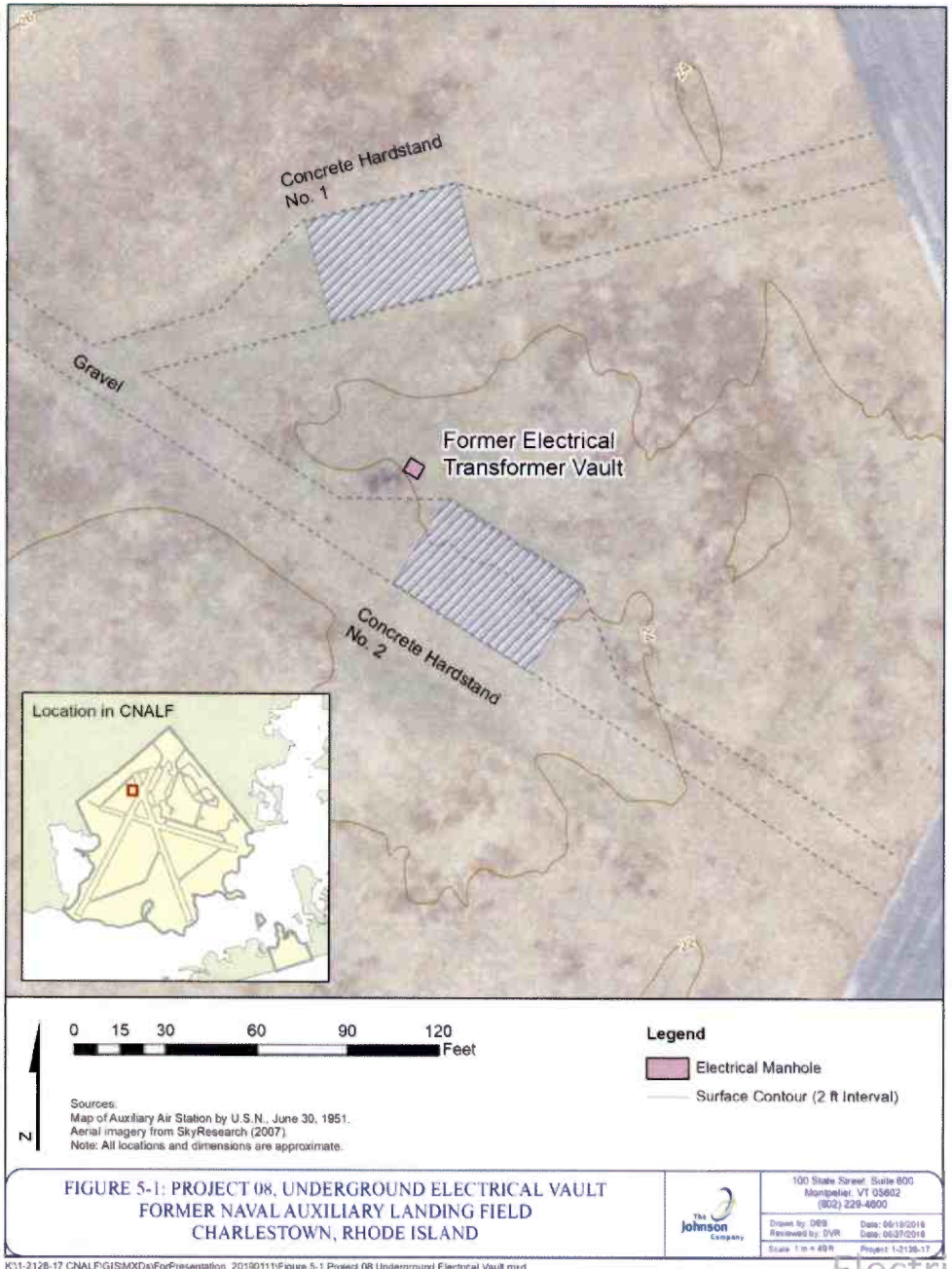
UNDERGROUND ELECTRICAL VAULT, NINIGRET PARK

Background

- Approximately 50 square foot area located in Ninigret Park on the west side of CNALF.
- Consists of an old transformer and the remains of electrical switching equipment which were part of the runway lighting system.
- The vault is approximately 7x7 ft and 7 ft deep, with 6-in thick concrete walls and floor and a 3-ft diameter watertight manhole (with a broken inner seal).
- The transformer is approximately 2.5 ft in diameter and 3 ft in height.

Electrical Vault, Ninigret Park

Project 08, Underground Electrical Vault



Electrical Vault, Ninigret Park

Project 08, Underground Electrical Vault Conceptual Site Model

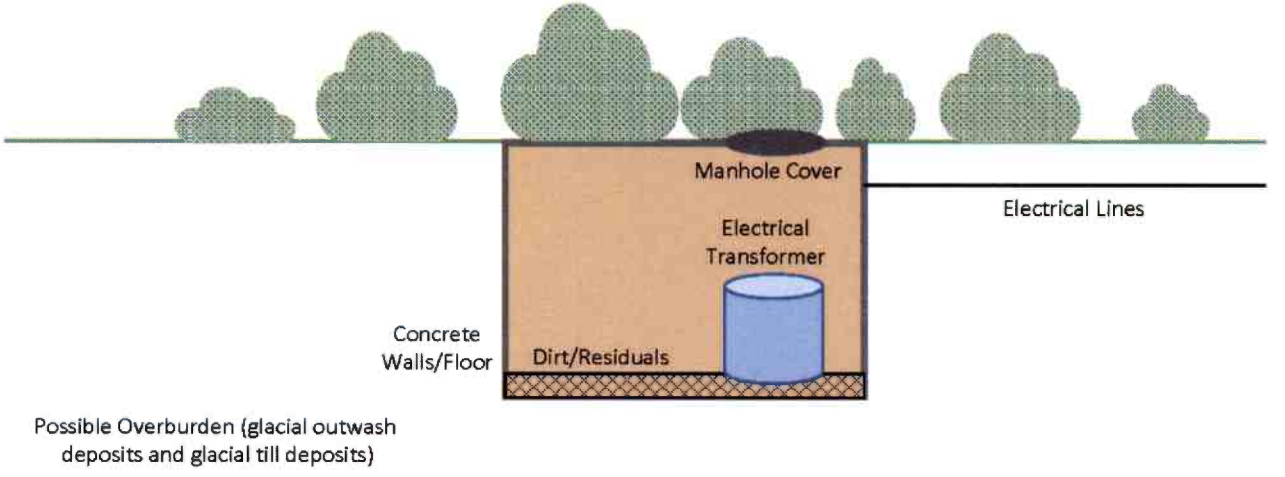


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FIGURE 5-2: PROJECT 08 UNDERGROUND ELECTRICAL VAULT
CONCEPTUAL SITE MODEL
FORMER NAVAL AUXILIARY LANDING FIELD
CHARLESTON, RHODE ISLAND

The Johnson Company

100 State St., Suite 600
Montpelier VT, 05602

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Scale: Not to Scale	Project: 1-2128-17

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Electrical Vault, Ninigret Park

Geology

- The overburden geology in the northern portion of the CNALF property is composed of both well-stratified fine to coarse sand and gravel glacial outwash deposits and dense, poorly sorted clay, silt, sand, and gravel - glacial till deposits.
- Groundwater estimated at 18 ft depth based on 1974 piezometer survey

Potential Constituents of Concern

- PCBs in transformer oil

Findings from Previous Investigations

- No previous investigations have been conducted

Data Gaps

- Unknown if PCBs are present in former transformer fluid, residuals in the vault or in soil surrounding the vault. – Will use a step by step process to determine if fluid is present in transformer, the nature of transformer fluid, presence/absence and magnitude of potential release within and potentially beyond concrete vault.

Recommendations for Future Actions

- Sample remaining transformer oil, capacitors, and accumulated debris at the bottom of the vault for PCBs.
  - If PCBs are detected, sample underlying soil for PCBs
- Remove oil, debris, transformer, and electrical equipment in the vault for disposal.
- Excavate soil with PCB concentrations above CERCLA standards (if present) and remove or fill vault

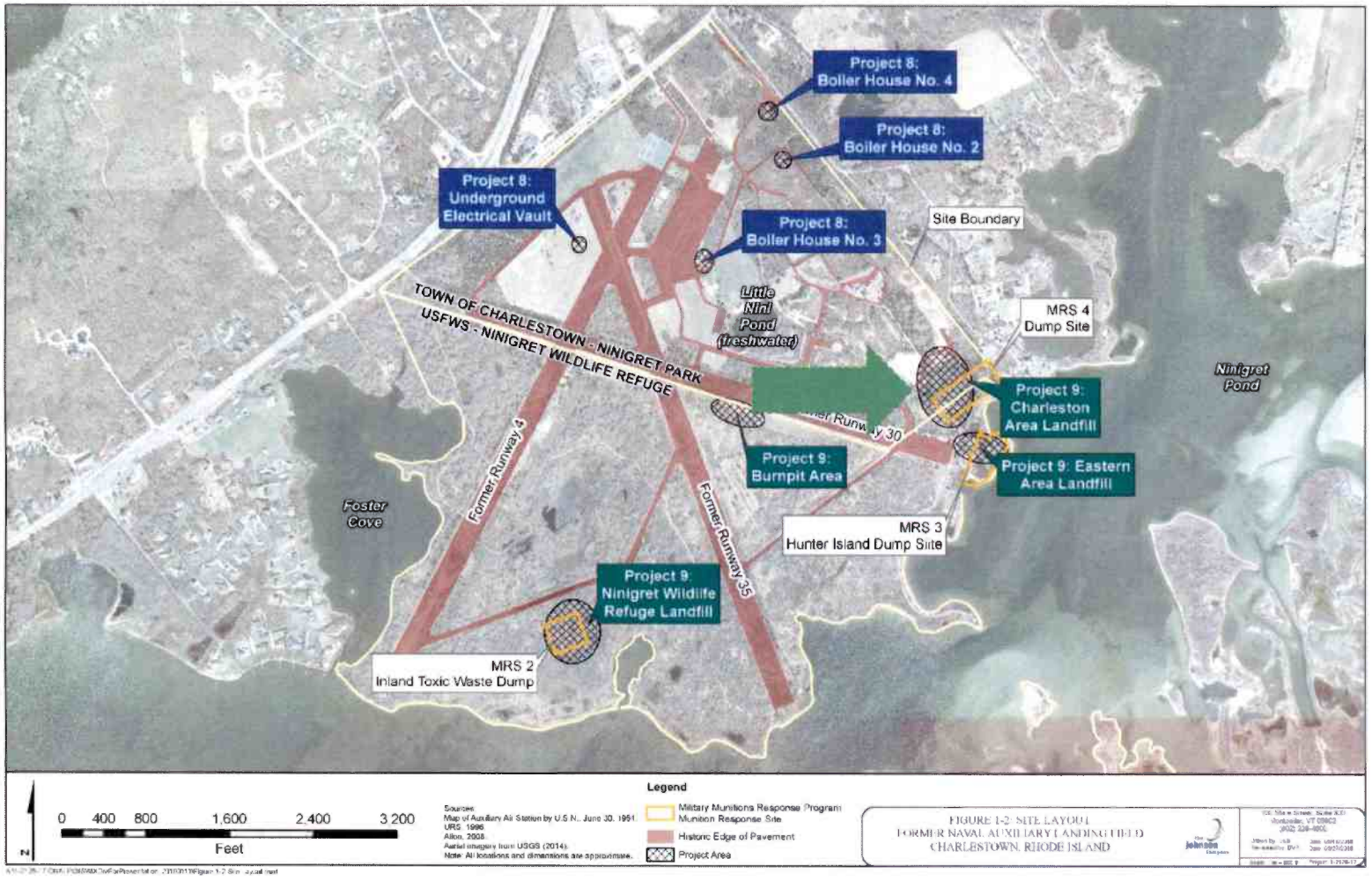
USACE PROJECT 09

- Four Sites
  - MRS 4 HTRW Charlestown Landfill (MMRP Dump Site) - Ninigret Park & NWR
  - Burnpit Area - Ninigret NWR
  - MRS 3 HTRW Eastern Area Landfill (MMRP Hunter Island Dump Site) - Ninigret Park & NWR
  - MRS 2 HTRW Ninigret Wildlife Refuge Landfill *(MMRP Inland Toxic Waste Dump)* - Ninigret NWR

- Path Forward
  - Remedial Investigation Work Plan (RIWP) – HTRW-only
  - USACE Objectives:
    - Develop robust investigation to support ecological and human health risk assessments and characterize the nature and extent of contamination and potentially hazardous landfill material
    - Define vertical and horizontal extent of solid waste fill and contaminants in all media and investigate the potential for hazardous materials sources (e.g., drums) in the landfills in one phase of work, to the extent practicable
  - Munitions support/ investigation to be addressed in a separate work plan

USACE PROJECT 09

- CERCLA process
  - USACE is the overseeing regulatory agency
  - RIWP in accordance with CERCLA
  - Purpose of the RI is to determine nature and extent as well as Fate & Transport of any hazardous contaminants
  - Results of the RI will be used to support a CERCLA Risk Assessment and if needed a Feasibility Study
  - Applicable or Relevant and Appropriate Requirements (ARARs) will be determined in the RI Reporting phase



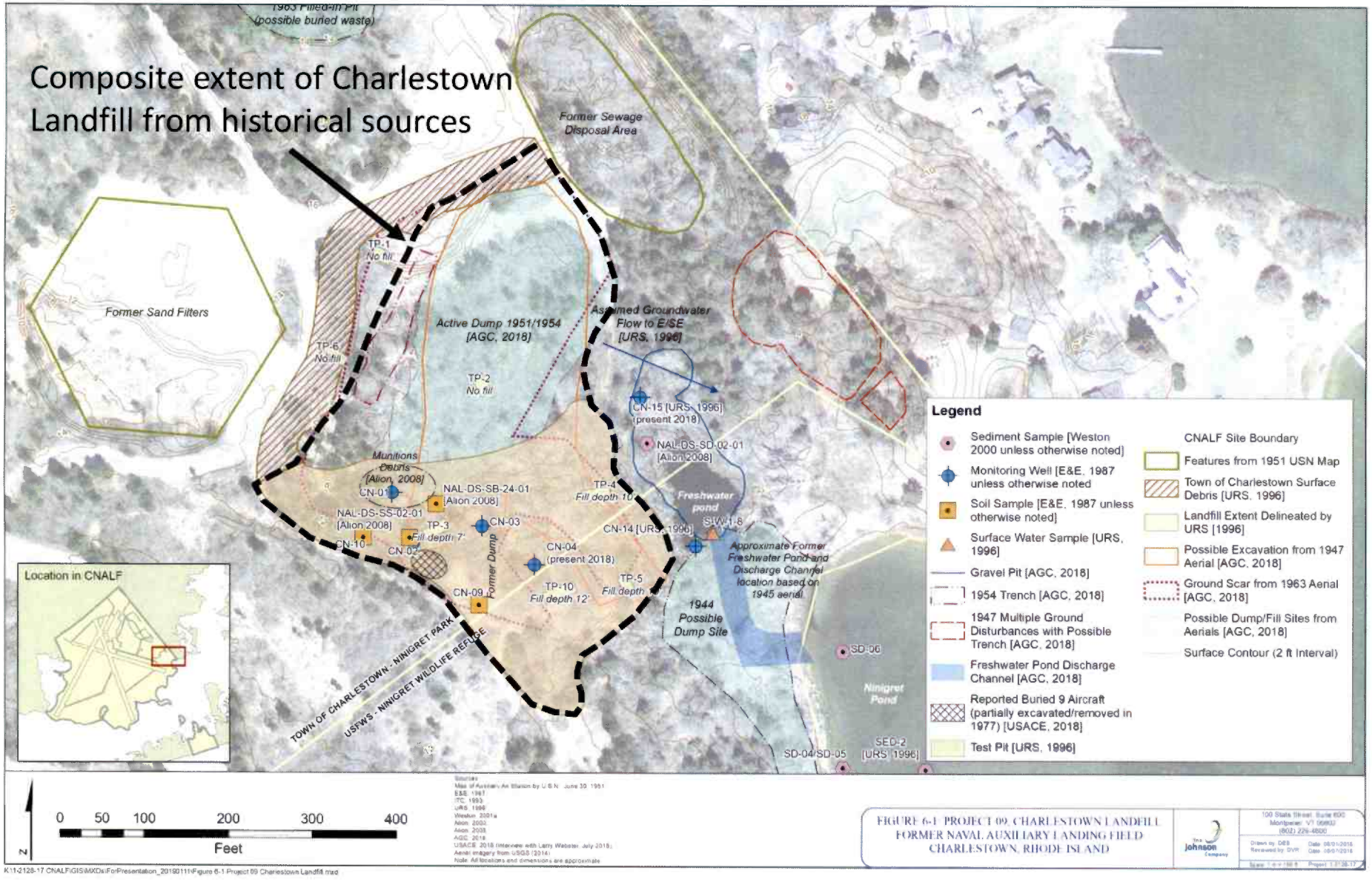
PROJECT 09

CHARLESTOWN LANDFILL *[MRS 4]*, NINIGRET PARK & NINIGRET REFUGE

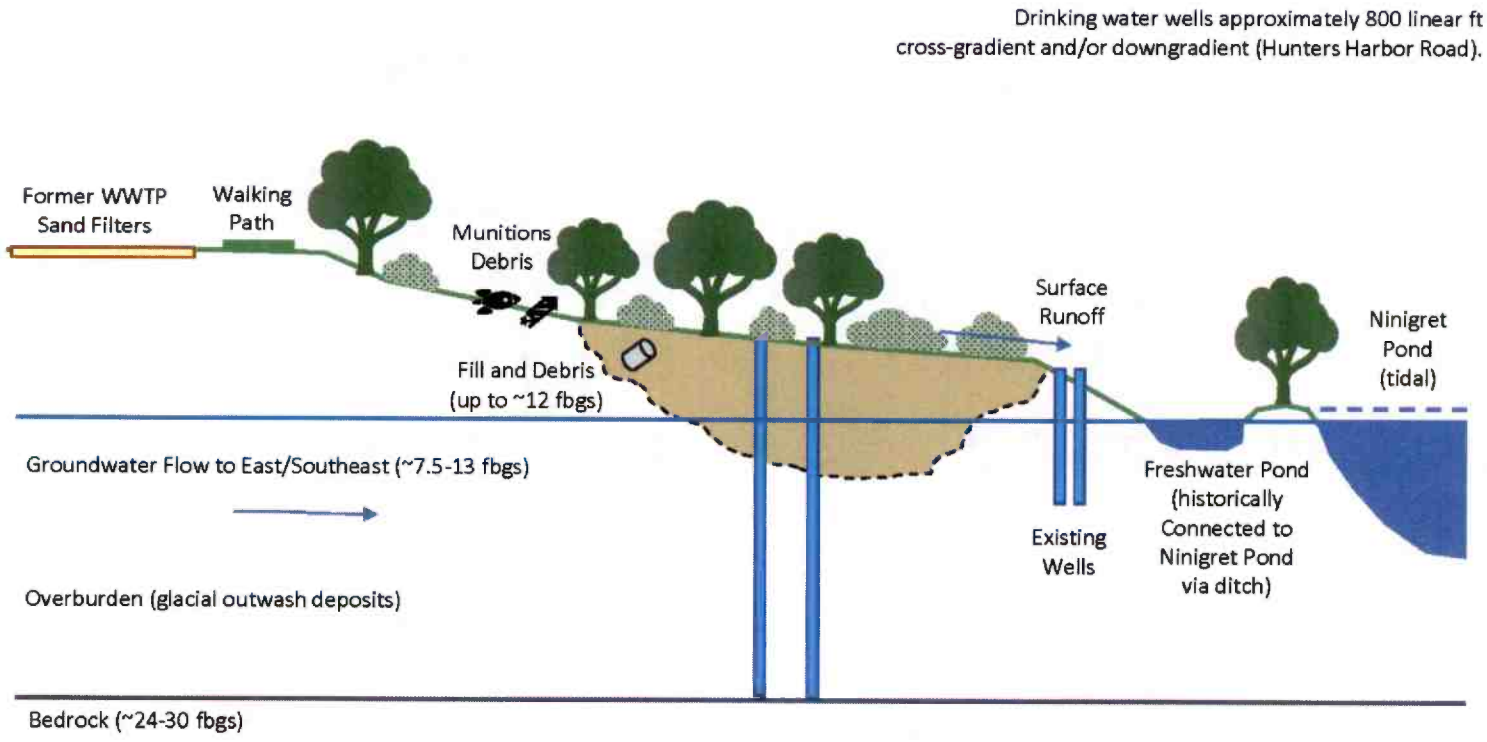
Background

- Approximately five acres and 7-12 feet deep
- Content: military debris, including airplane and vehicle parts, scrap metal, and inert practice bombs from the 1940s-1970s.
- Partially excavated in 1970s in search of airplane parts; parts from nine separate aircraft were uncovered.
  - Observed coal clinkers, household debris, practice bombs, and drums (some reportedly leaking, others intact containing liquids)
- Around 1987, the Town of Charlestown used the area for disposal of road debris, asphalt, and soil.
- A munitions investigation in 2007 found munitions debris (MD), but no evidence of munitions and explosives of concern (MEC)

Project 09, Charlestown Landfill



Project 09, Charlestown Landfill Conceptual Site Model



Not to scale

FIGURE 6-3: PROJECT 09 CHARLESTOWN LANDFILL
CONCEPTUAL SITE MODEL
FORMER NAVAL AUXILIARY LANDING FIELD
CHARLESTON, RHODE ISLAND

The Johnson Company

100 State St., Suite 600
Montpelier VT, 05602

Drawn by: DEB	Date: 10/31/2018
Reviewed by:	Date:
Scale: Not to Scale	Project: 1-2128-17

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Geology

- Above bedrock: fill and well-stratified fine to coarse sand and gravel glacial outwash deposits.
  - At most locations the fill is covered with soil (unknown depth), except along the northwest edge of the landfill where asphalt and road debris are exposed.
  - No evidence of impermeable cover/liner; non-uniform soil cover over fill
- Groundwater was encountered at 7.5-13 feet depth; flow toward Ninigret Pond
- Bedrock below approx. 24 to 30 feet depth

Potential Constituents of Concern

- VOCs, SVOCs, petroleum hydrocarbons, PCBs, pesticides, and metals from fill and debris.
- Munitions constituents (MC) metals and explosives from munitions debris in the fill.

Findings from Previous Investigations

- Relatively few samples collected relative to the large (~5-acre) area and heterogeneous nature of landfill
  - 15 discrete soil samples total (9 surface and 6 subsurface), collected from 1986 to 2008
  - 5 groundwater wells sampled multiple times
  - 1 surface water and 1 discrete sediment sample
- Soil: no indication of gross contamination or high concentrations, but some constituents above EPA screening levels, metals may be naturally occurring
- Groundwater: three organics near detection limit & above current EPA or RIDEM screening levels, intermittent metals in bailer samples
- Surface Water: no contaminants detected
- Sediment: no detections of explosives

Critical Data Gaps

- Insufficient quantity/distribution of samples collected relative to 5-acre size of landfill (all media)
- Laboratory reporting limits exceeded current EPA screening levels for many analytes
- Samples not analyzed for hexavalent vs. trivalent chromium.
- Groundwater not characterized downgradient from the landfill area, flow direction near abutting residential area unclear
- Monitoring wells do not fully penetrate the saturated overburden (10 foot well screens vs. up to 20 feet of saturated overburden) and no wells are installed in bedrock.
- Insufficient data available for site-specific natural/background concentrations of constituents in soil, sediment, groundwater, and surface water
- The 2008 qualitative munitions risk evaluation did not use the most recent guidance (2017); more data is needed to use the 2017 guidance to provide an "acceptable" versus "unacceptable" risk designation.

Recommendations for Future Actions

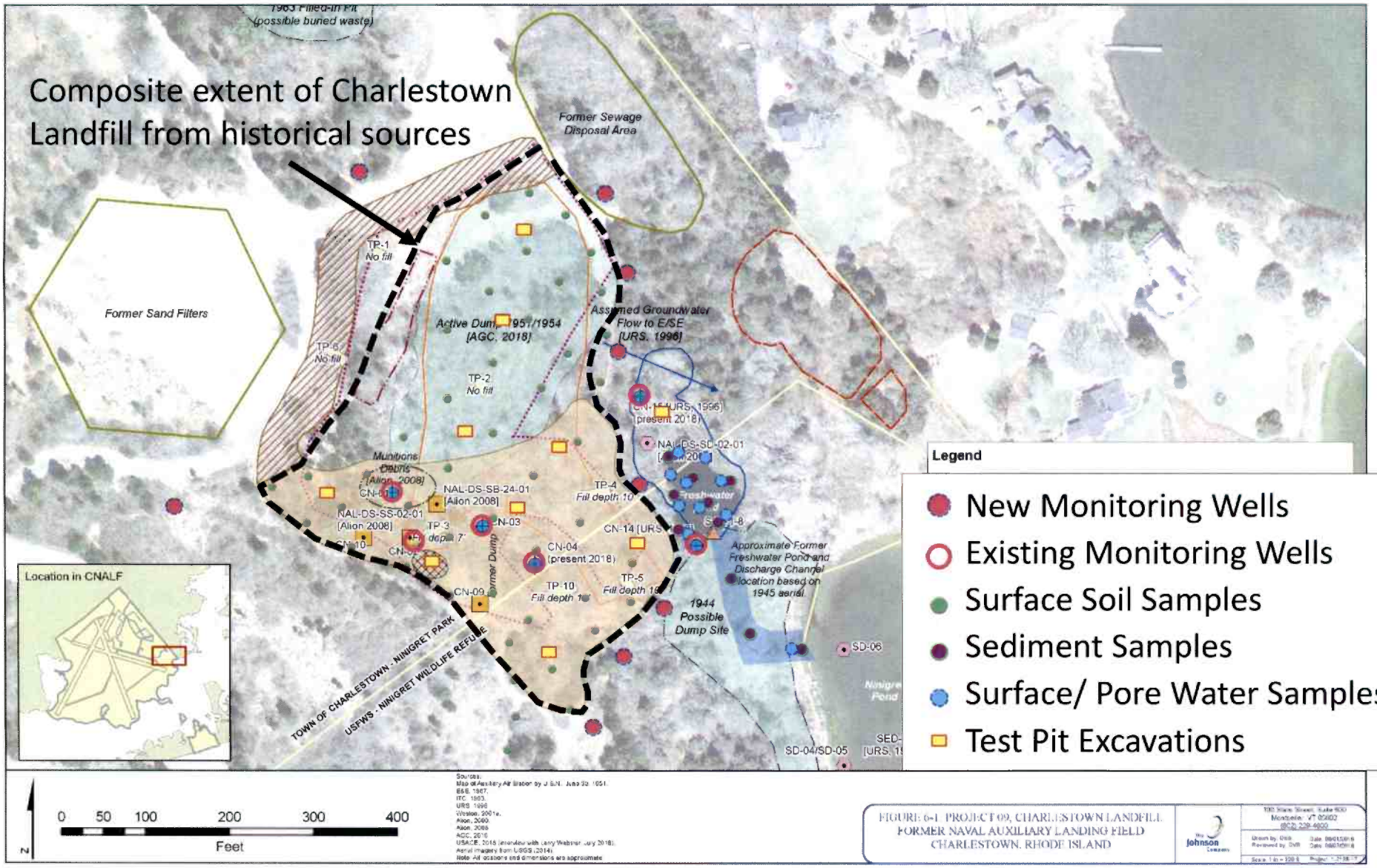
- Vegetative cover (invasive species) and fauna survey; baseline
- Geophysics: conduct geophysical survey across entirety of the landfill including "1944 Possible Dump Site" directly east of landfill [clearing required] and investigate anomalies
- Collect discrete samples for lab analysis:
  - Surface Soil: 35 to 50 surface soil (0-1 ft depth) samples from landfill and near walking trails; analyze for all COCs
  - Groundwater: install and sample monitoring wells at 8 to 10 locations [access clearing required]
  - Sediment: 10 samples from the adjacent freshwater pond and current/former drainage channel; analyze for VOCs, SVOCs, metals, TOC, and MC.
  - Surface/ Pore Water: 10 samples from the adjacent freshwater pond at low tide; analyze for VOCs, SVOCs, PAHs, metals, hardness, and MC.
  - Ninigret Pond: 15 to 20 sediment samples, 10 surface/ pore water samples, & background study
- Test pits – use results from initial geophysical survey to refine test pit locations
  - Dig test pits at 10 locations, log fill depth, contents and observations
  - Collect soil samples from the fill material and the soil below the fill material for all COCs

Recommendations for Future Actions

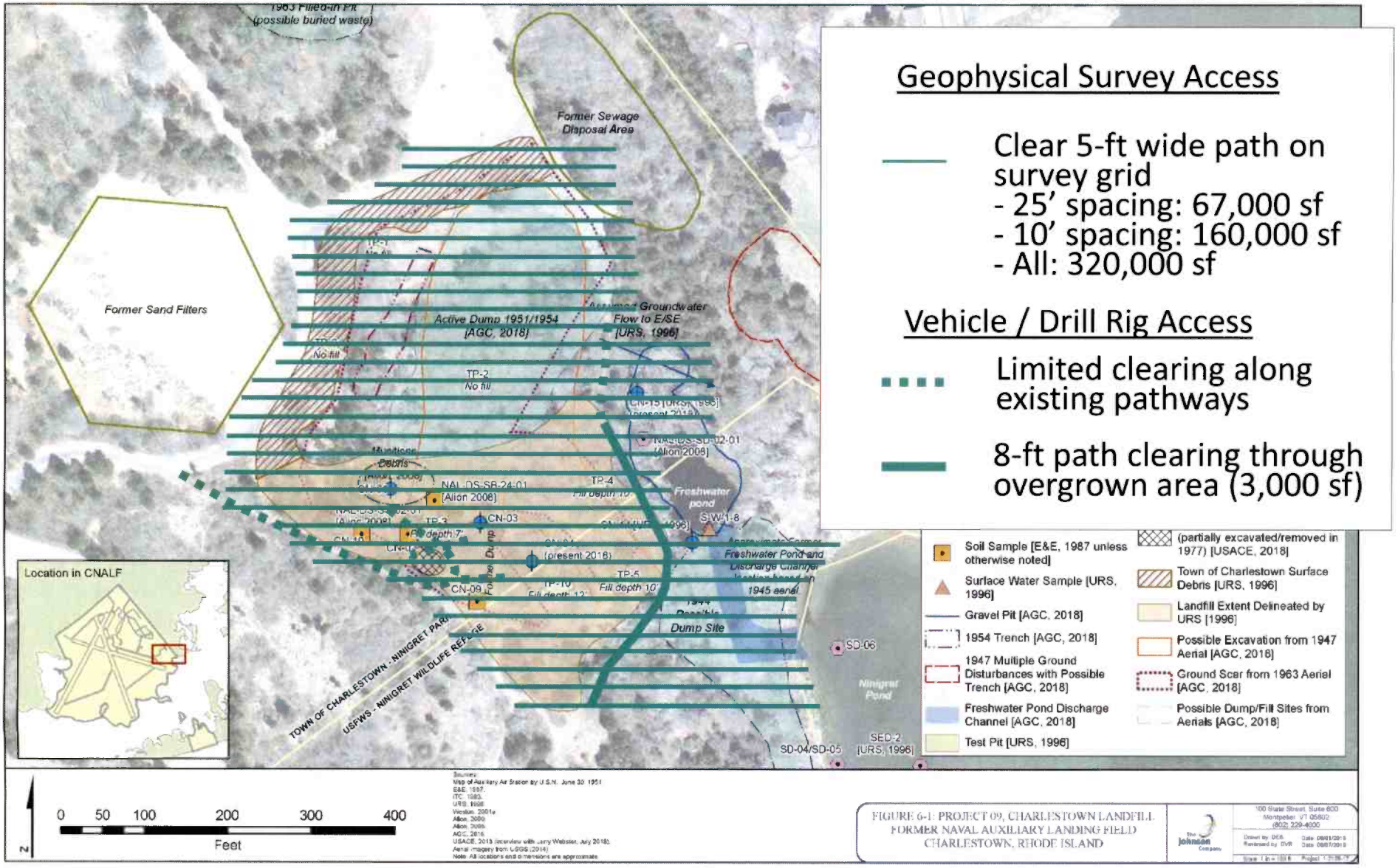
Groundwater Investigation Detail:

- Assess, redevelop, repair as needed and resurvey existing wells.
- Install monitoring well nests at 6 to 8 locations on the downgradient perimeter of the landfill (75 to 100 ft apart).
  - Overburden wells will be paired with one screen across the water table and the other screened in deeper overburden where saturated thickness of the overburden exceeds 12 ft
  - Bedrock monitoring wells will be paired with overburden wells at approximately 3 to 4 locations
- Install monitoring wells at 2 locations upgradient of the landfill.
  - Overburden shallow/deep well pairs
- Sample groundwater using modern low-flow sampling methods for VOCs, SVOCs, pesticides, PCBs, metals, and munitions compounds (MC)
- Collect groundwater data to assess flow directions, flow rates, vertical gradients, seasonal/tidal variations and hydraulic conductivity

Proposed Sampling Locations



Proposed Access Pathways and Vegetation Clearing



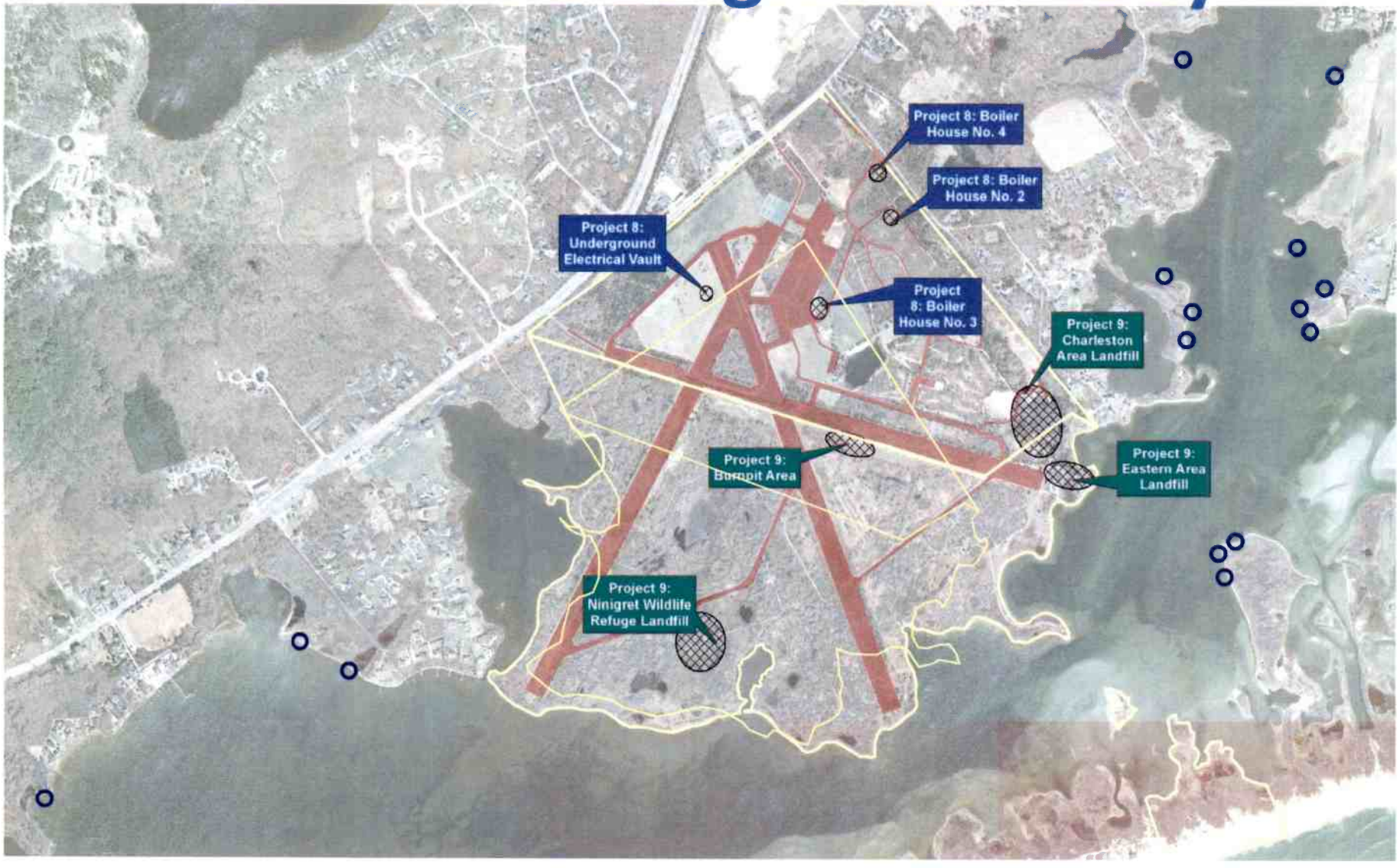
Soil Background Investigation: Pesticides

- 20 discrete surface soil samples (0 to 2 feet depth)
- Target current or formerly open areas adjacent to developed portion of former military base
  - Adjacent to runways and roads, vehicle-accessible wetland areas
  - Avoid areas of known or suspected contamination (e.g., landfills, shoot-in-butt, burn pit as well as fill or materials re-worked/placed by current land owners)
- Results to represent residuals from historical spray application of pesticides

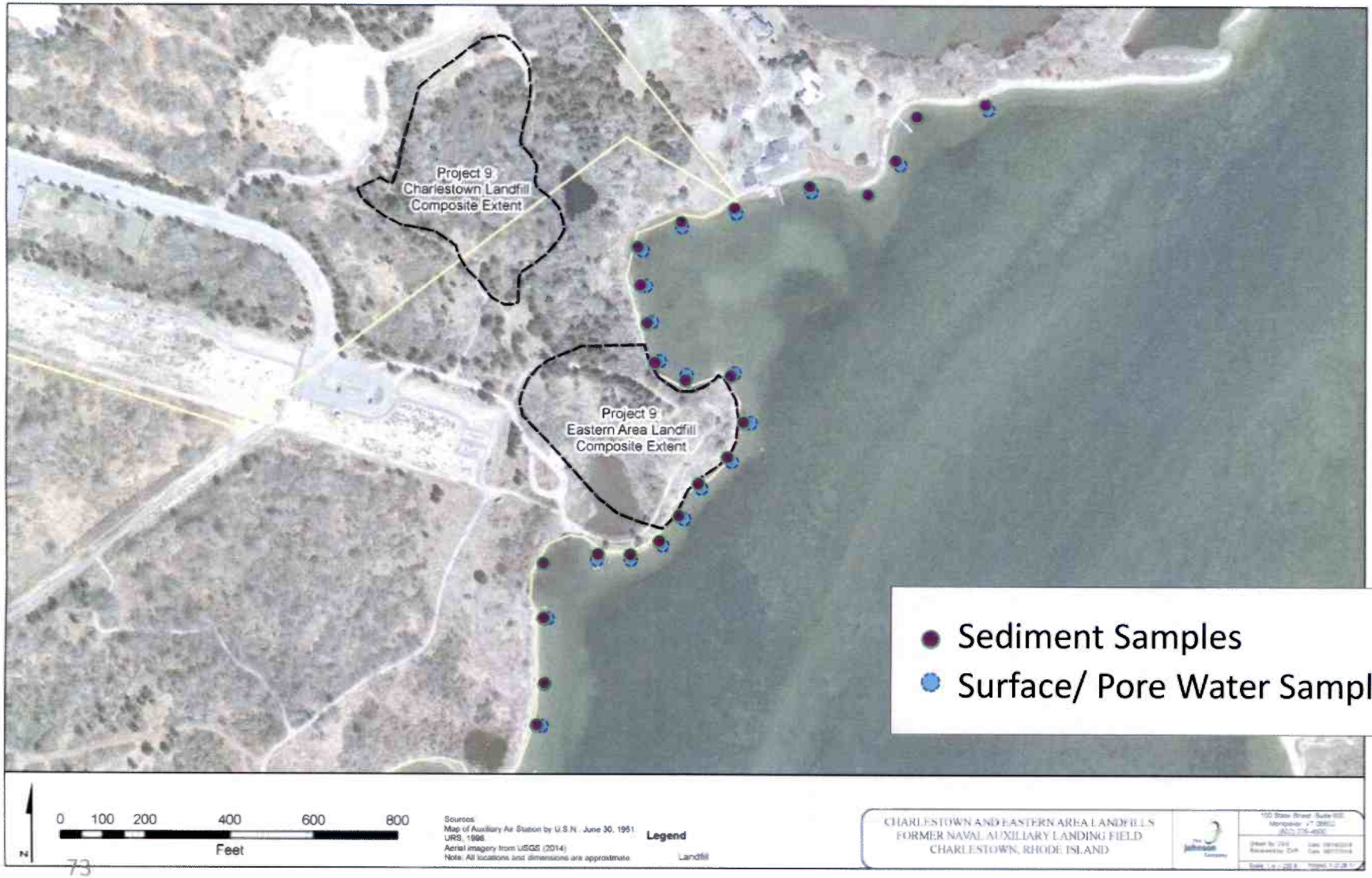
Groundwater - Background/ Existing Water Supply Wells Investigation

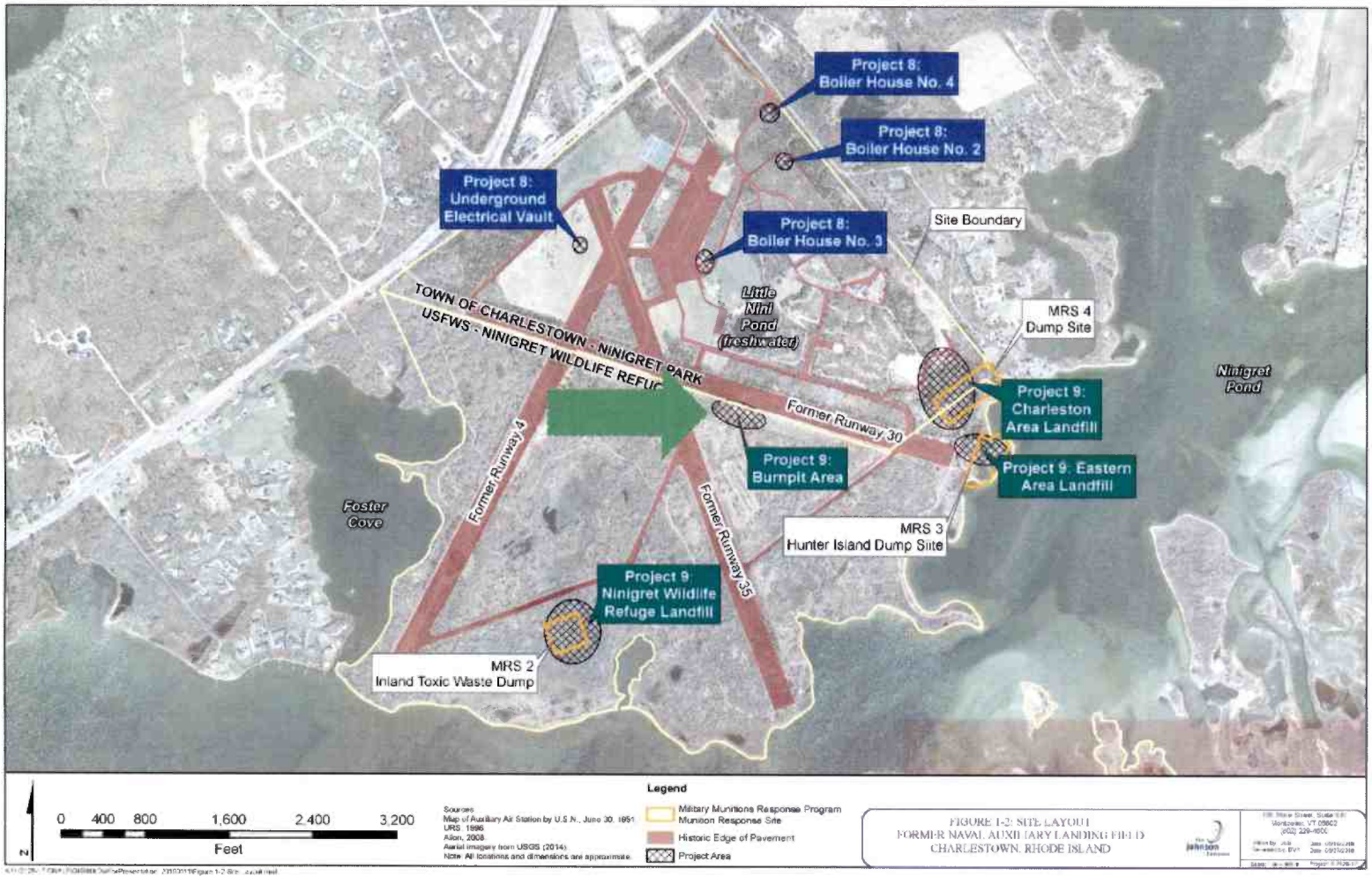
- Collect and Evaluate existing available Supply well Data from Town/contractors
- Collect tap water samples from existing water supply wells and analyze for all constituents of concern
- If the results are potentially impacted by the piping/ conveyance system, collect additional samples directly from the wells

Proposed Ninigret Pond Sediment Background Study



Proposed Ninigret Pond Sediment, Pore Water and Surface Water Samples





PROJECT 09

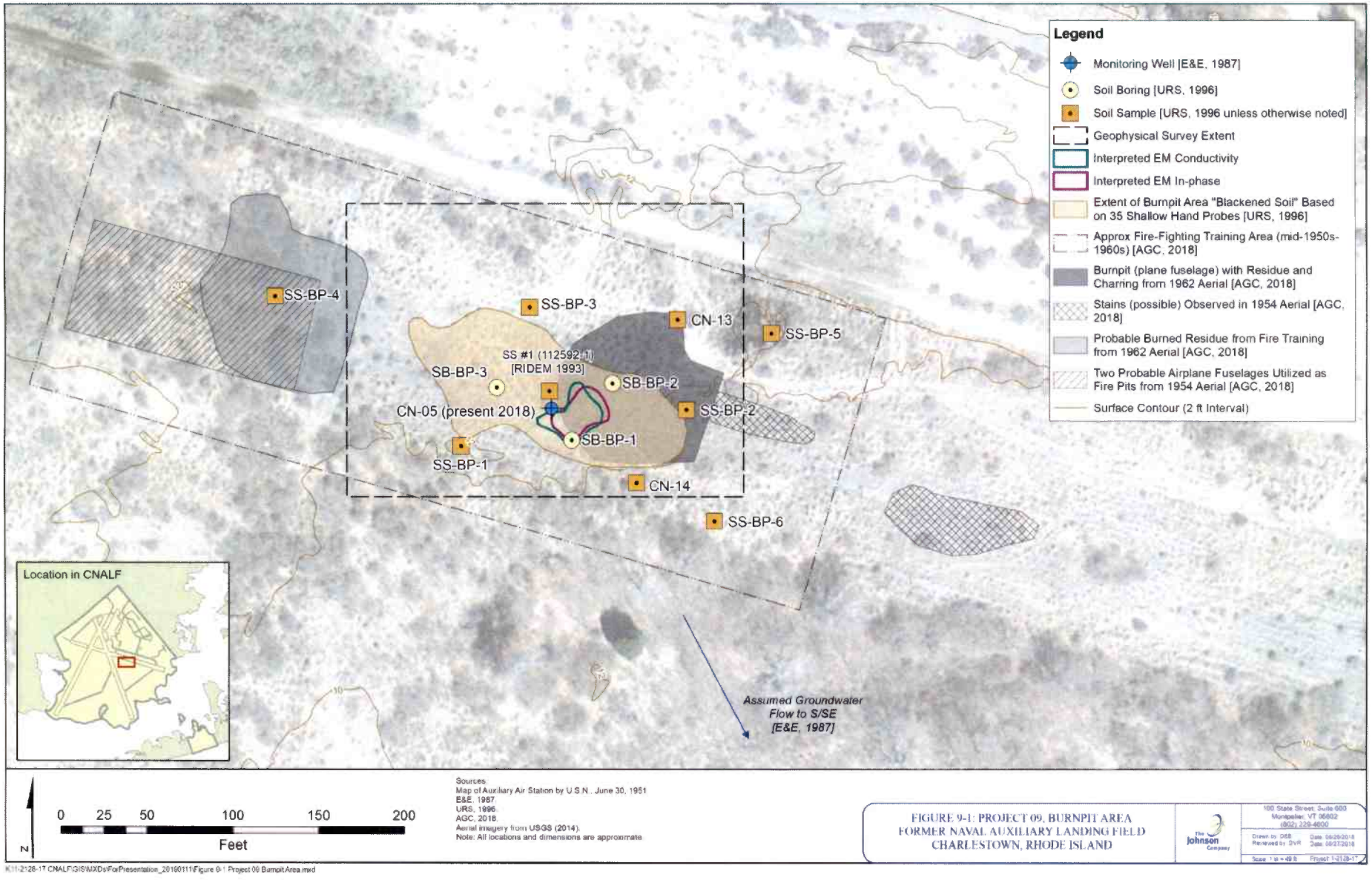
BURNPIT AREA, NINIGRET REFUGE

Background

- Approximately two acres located in Ninigret NWR along the south side of Runway 30
- Used from the early 1950s until the early 1970s by the US Navy for fire and rescue training
  - Aircraft fuselages staged adjacent to runway were filled/doused with fuel or other combustible liquids and ignited
  - Typical fire-fighting practices included the use of dry chemical fire extinguisher agents, protein or light water foam, carbon dioxide, and water
  - Burned-out fuselages ("hulks") removed in the 1960s and 1970s, some dumped in the CNALF landfills

Burnpit Area, Ninigret NWR

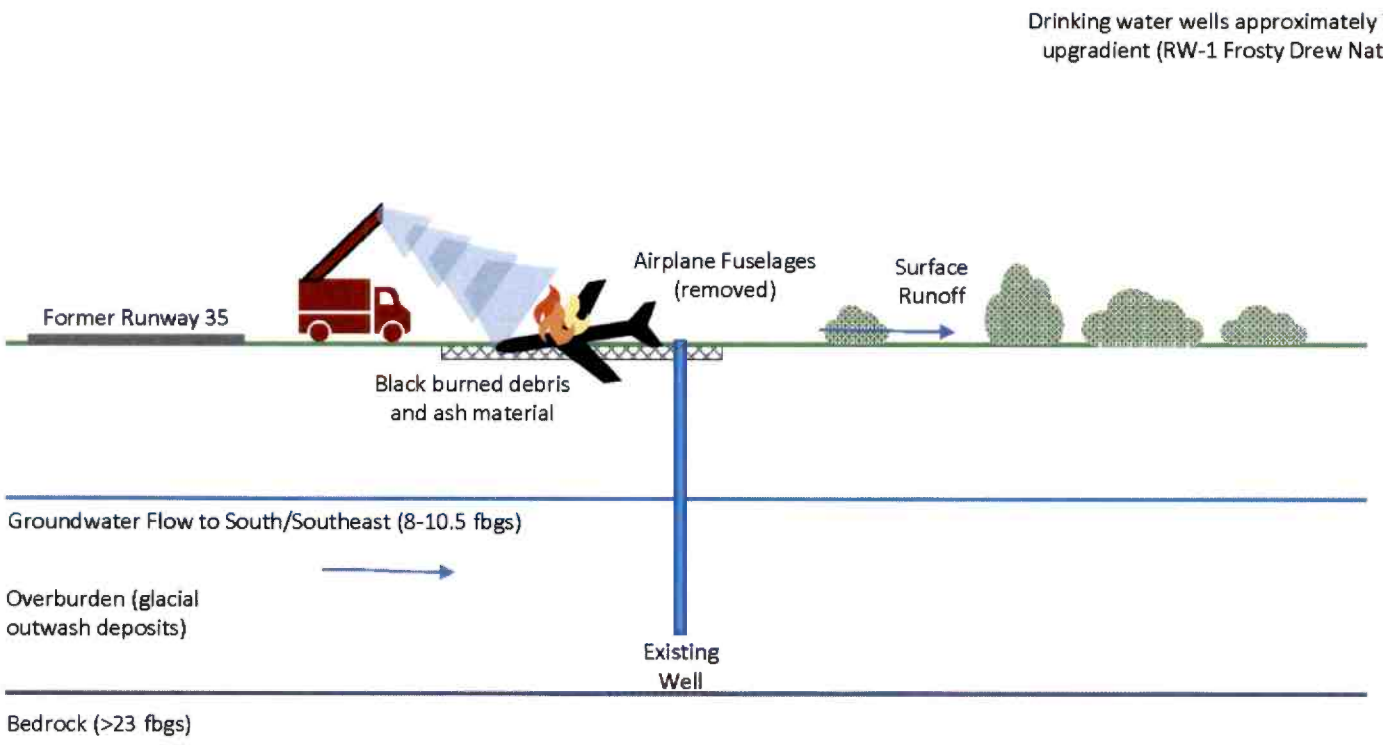
Previous Investigation Locations - Project 09, Burnpit Area



Geology

- Fill and fine to coarse sand and gravel (glacial outwash deposits)
  - surface soil observed as black, sandy silt/silty sand mixture with burned metallic debris, ash, and degrading asphalt to a depth of about 6-inches
- Bedrock is deeper than 23 feet below ground; estimated ~30 to 40 feet depth from 1970s bedrock survey
- Groundwater was encountered at 8 to 11 feet below ground
  - Historical investigation reports indicate groundwater flow in this area is to the south/southeast toward Ninigret Pond

Project 09, Burnpit Area Conceptual Site Model



Not to scale

FIGURE 9-3: PROJECT 09 BURN PIT AREA
CONCEPTUAL SITE MODEL
FORMER NAVAL AUXILIARY LANDING FIELD
CHARLESTON, RHODE ISLAND

The Johnson Company

100 State St., Suite 600
Montpelier VT, 05602

Drawn by: DEB	Date: 11/05/2018
Reviewed by:	Date:
Scale: Not to Scale	Project: 1-2128-17

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Potential Constituents of Concern

- VOCs, SVOCs, petroleum hydrocarbons, dioxins/furans, and metals from the ash and fire training residuals
- Possible use of aqueous fire fighting foam (AFFF) containing Per- and Polyfluoroalkyl Substances (PFAS)?

Findings from Previous Investigations

- Only one sample collected in western stained soil area identified by AGC (2018)
  - 28 soil samples total (14 surface and 12 subsurface), collected from 1986 to 1994
  - 1 groundwater well sampled multiple times
- Soil: no indication of gross contamination:
  - Surface Soil: TPH exceeded RIDEM standard in surface soil samples (max 7,900 mg/kg), possible PAHs (estimated detections
  - Subsurface Soil: No VOCs, SVOCs above screening levels and no detectable PCBs
  - Metals in surface and subsurface soils exceeded EPA screening levels, metals may be naturally occurring
- Groundwater: (single well, near center of stained soil)
  - TPH detected in 1986 (3 mg/L), but not in 1991/1994 (no VOCs or SVOCs detected in any sample event)
  - Metals exceeded screening levels; may be naturally occurring

Critical Data Gaps

- Insufficient quantity/distribution of soil samples: only one sample was collected from the western stained soil area recently identified in air photos (AGC, 2018)
- The vertical and horizontal extent of impacted surface soil has not been fully delineated; delineation was limited to the black ash
- Laboratory reporting limits for many analytes exceeded current screening levels
- Samples not analyzed for dioxins/furans
- Groundwater not characterized up gradient or downgradient from the area including for potential emerging contaminants such as PFAS
- Only one shallow monitoring well, screened at water table. No groundwater samples in bottom 20+ feet of overburden or bedrock
- Insufficient data available for site-specific natural/background concentrations of constituents in soil (metals) and groundwater (metals)

Recommendations for Future Actions

- Vegetative cover survey (invasive species); baseline
- Visual survey of western stained soil area for evidence of historical fire training activity
- Collect discrete samples for lab analysis:
  - Surface/ Subsurface Soil: 30 to 40 surface soil (0-1 ft depth) and subsurface soil (5-7 ft depth) samples; analyze for all dioxins/furans, petroleum hydrocarbons, PAHs, and metals [limited brush clearing for vehicle access]

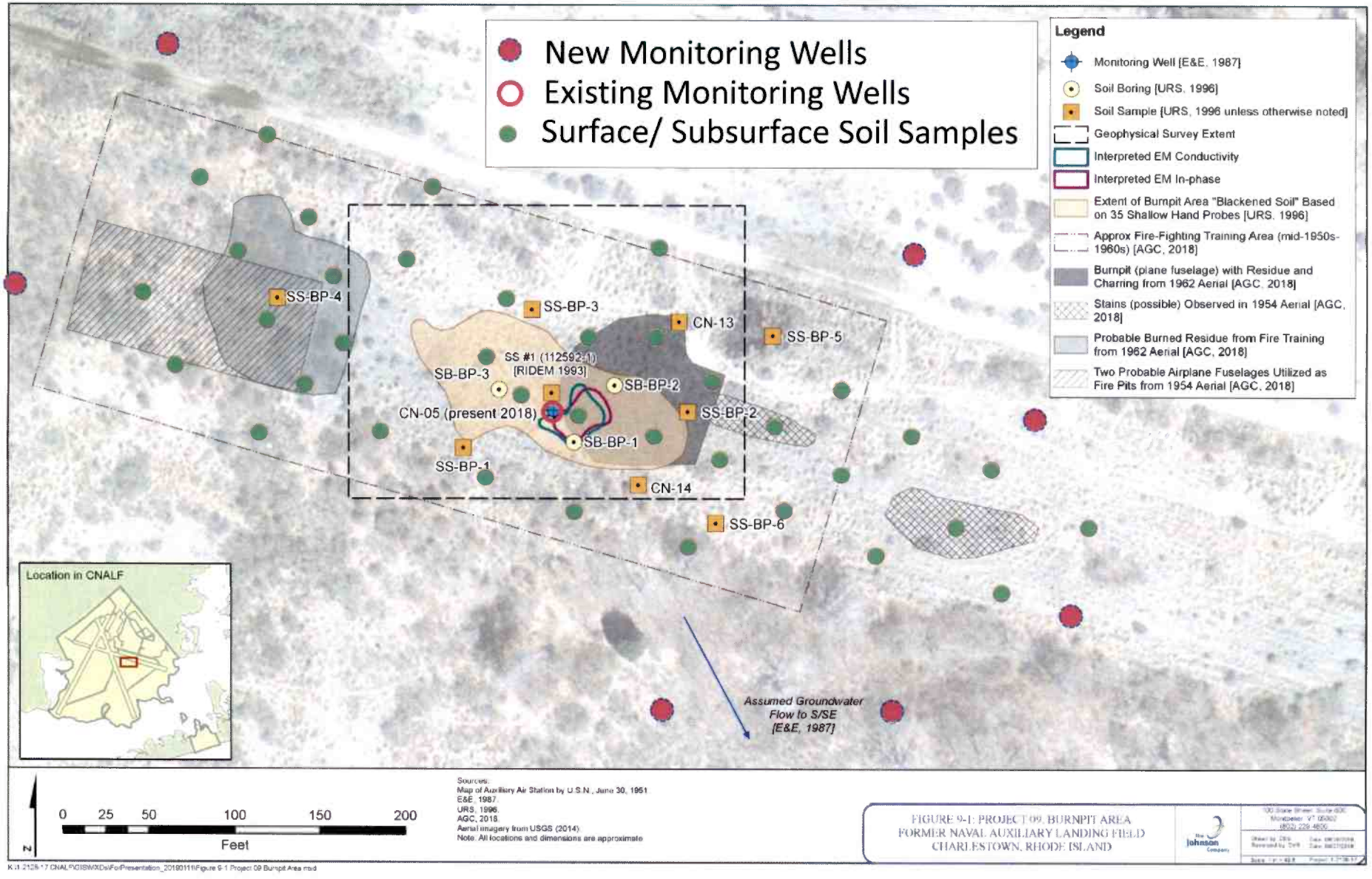
Burnpit Area, Ninigret NWR

Recommendations for Future Actions

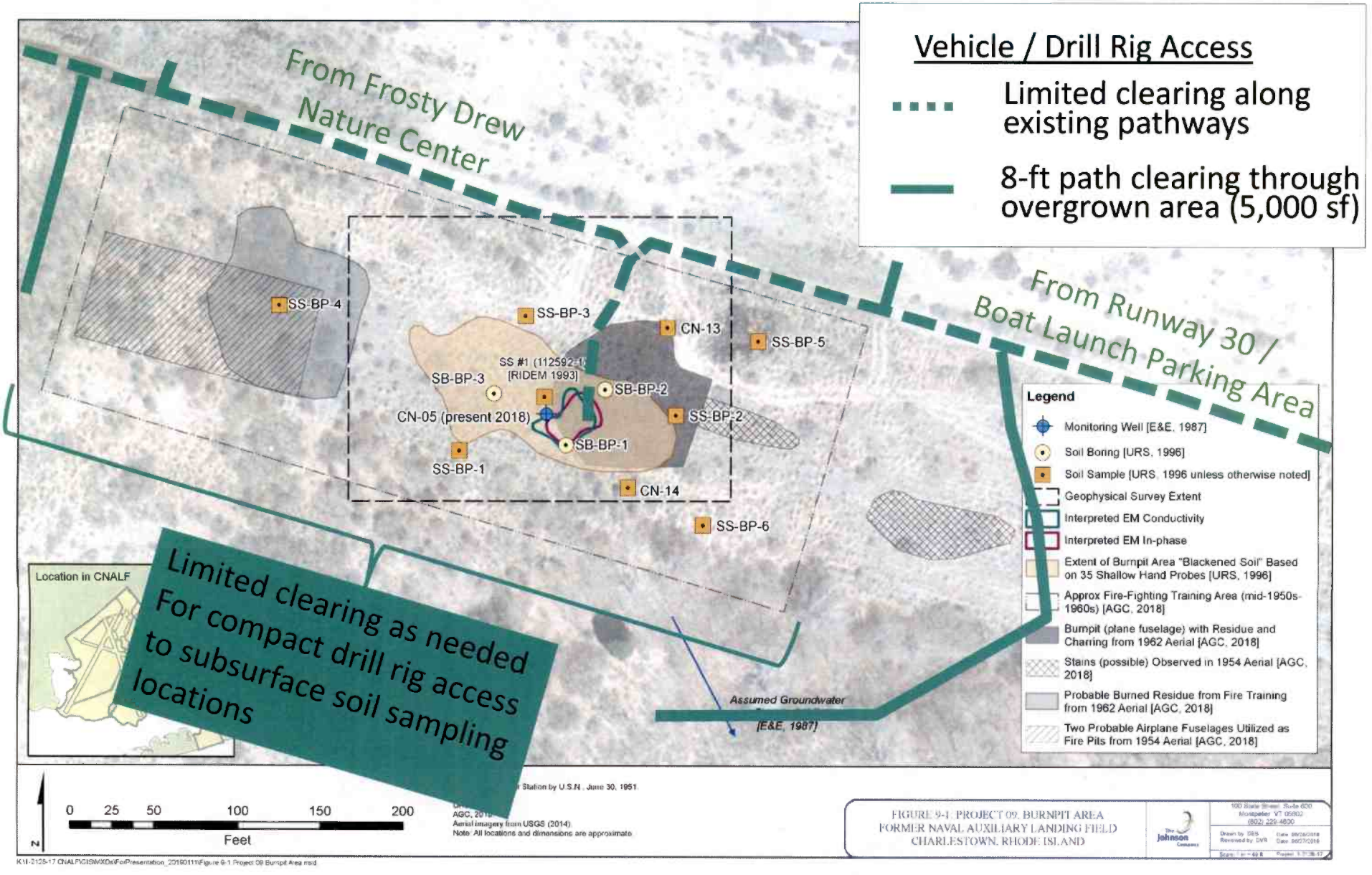
Groundwater Investigation Detail:

- Assess, redevelop, repair as needed and resurvey existing well.
- Install monitoring well nests at 4 to 5 locations on the apparent downgradient perimeter of the Burn Pit area (75 to 100 ft apart).
  - Overburden wells will be paired with one screen across the water table and the other screened in deeper overburden where saturated thickness of the overburden exceeds 12 ft
  - Bedrock monitoring wells will be paired with overburden wells at approximately 3 locations including one upgradient unless existing wells can serve this purpose
- Install monitoring wells at 2 locations upgradient of the Burn Pit area.
  - Overburden shallow/deep well pairs (see comment above re: bedrock).
- Sample groundwater using modern low-flow sampling methods for petroleum hydrocarbons, PAHs, and metals
- Collect groundwater data to assess flow directions, flow rates, vertical gradients, seasonal variations and hydraulic conductivity

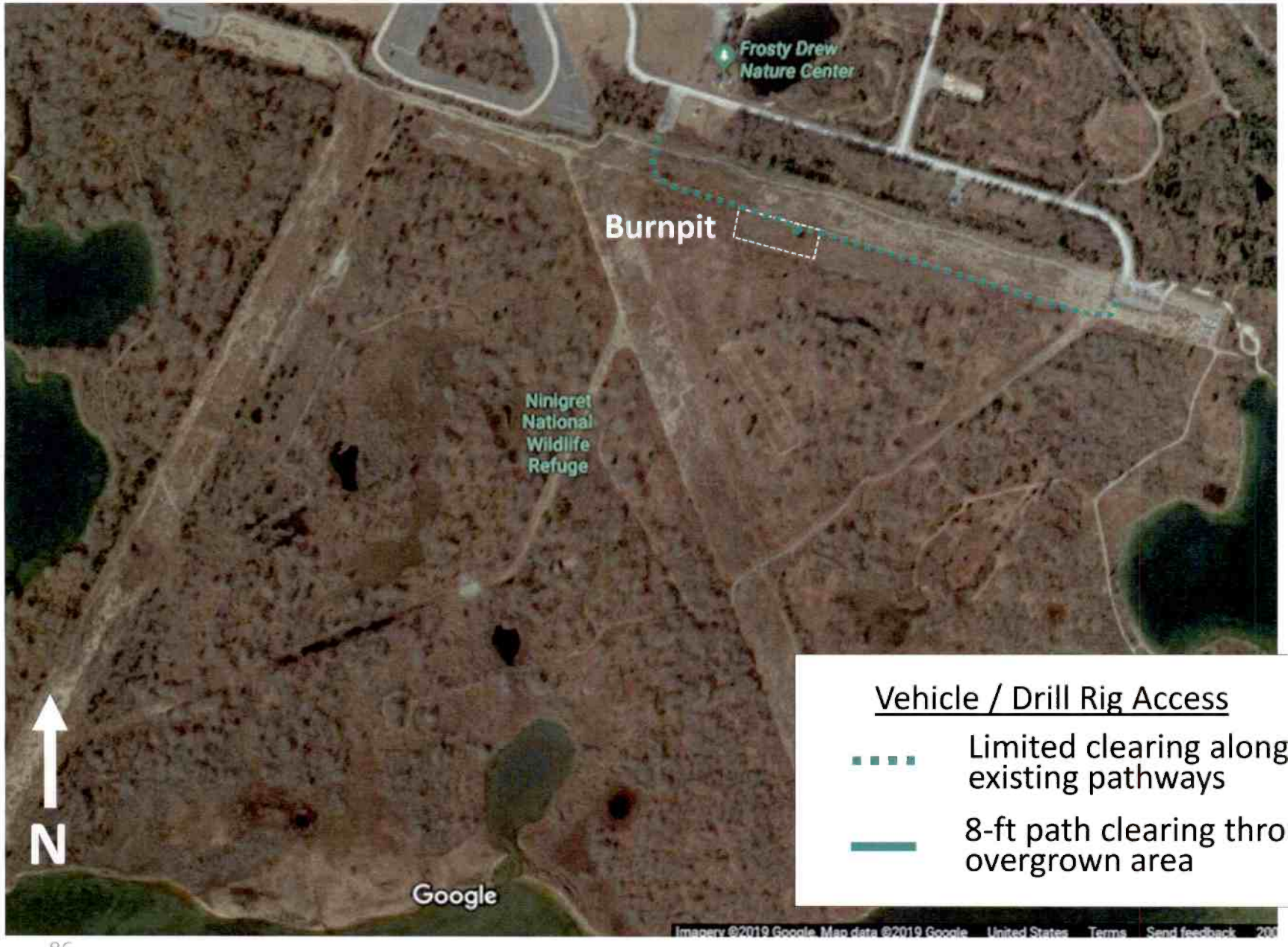
Proposed Sampling Locations



Proposed Access Pathways and Vegetation Clearing



Proposed Access Pathways and Vegetation Clearing



Burnpit Area, Ninigret NWR

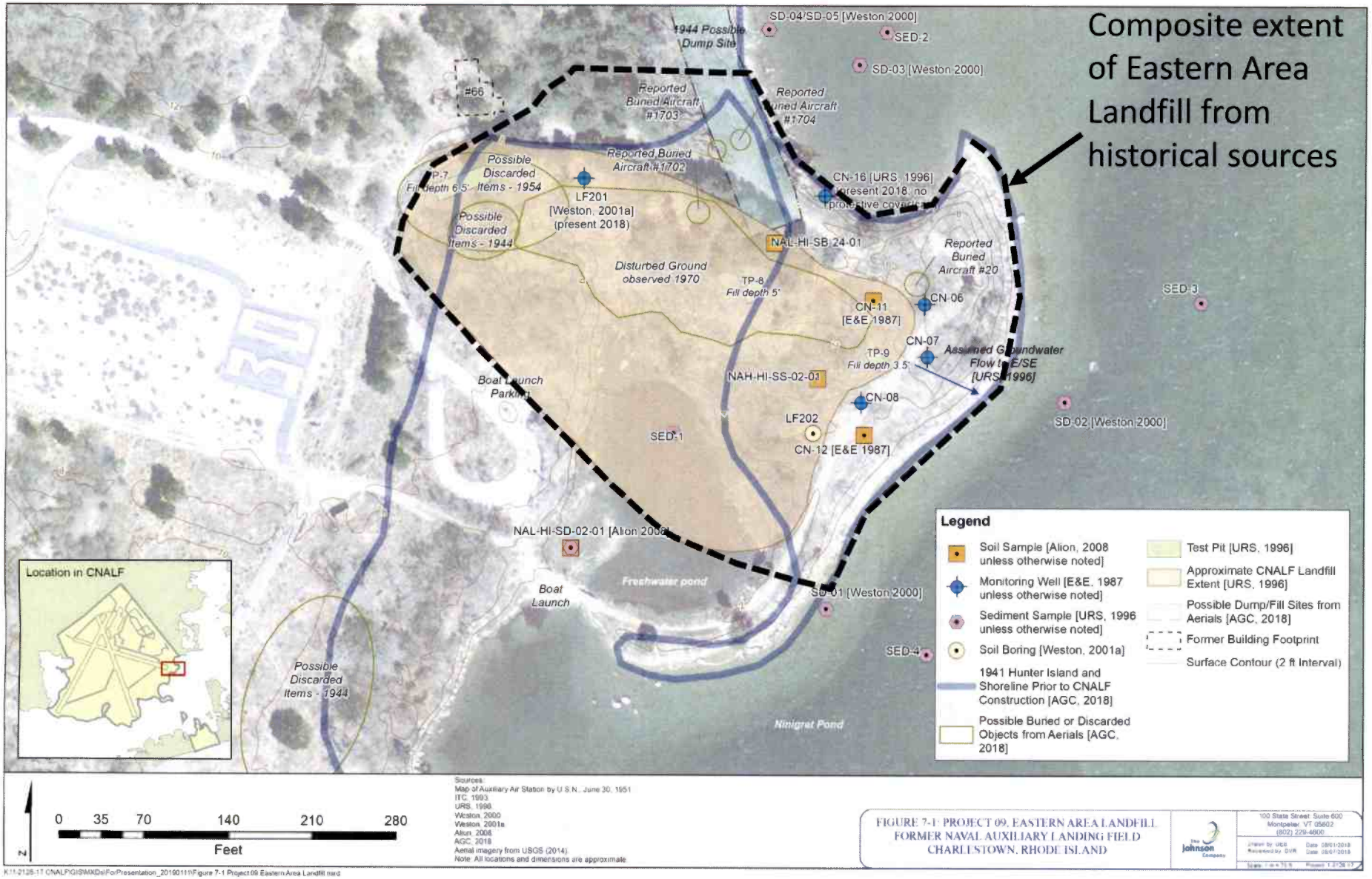
PROJECT 09

EASTERN AREA LANDFILL *[MRS 3]*, NINIGRET REFUGE

Background

- Approximately two acres and 3.5 to 6.5 ft deep, located in Ninigret NWR at the end of Runway 30
- Includes a former island (MMRP Hunter Island Site) on Ninigret Pond that was transformed into a peninsula through the placement of fill by the US Navy – current walking path and footbridge
- Contents: aircraft and construction debris, including concrete, bricks, and metal parts from the 1940s to the 1970s
- Parts from four airplanes removed from landfill in 1969 (previously used as fire-fighting hulks at the Burn Pit Area)
- Anecdotal reports of 20mm ammunition belts found here.
- An MMRP investigation in 2007 found no evidence of munitions and explosives of concern (MEC), but munitions debris (MD) has been identified.

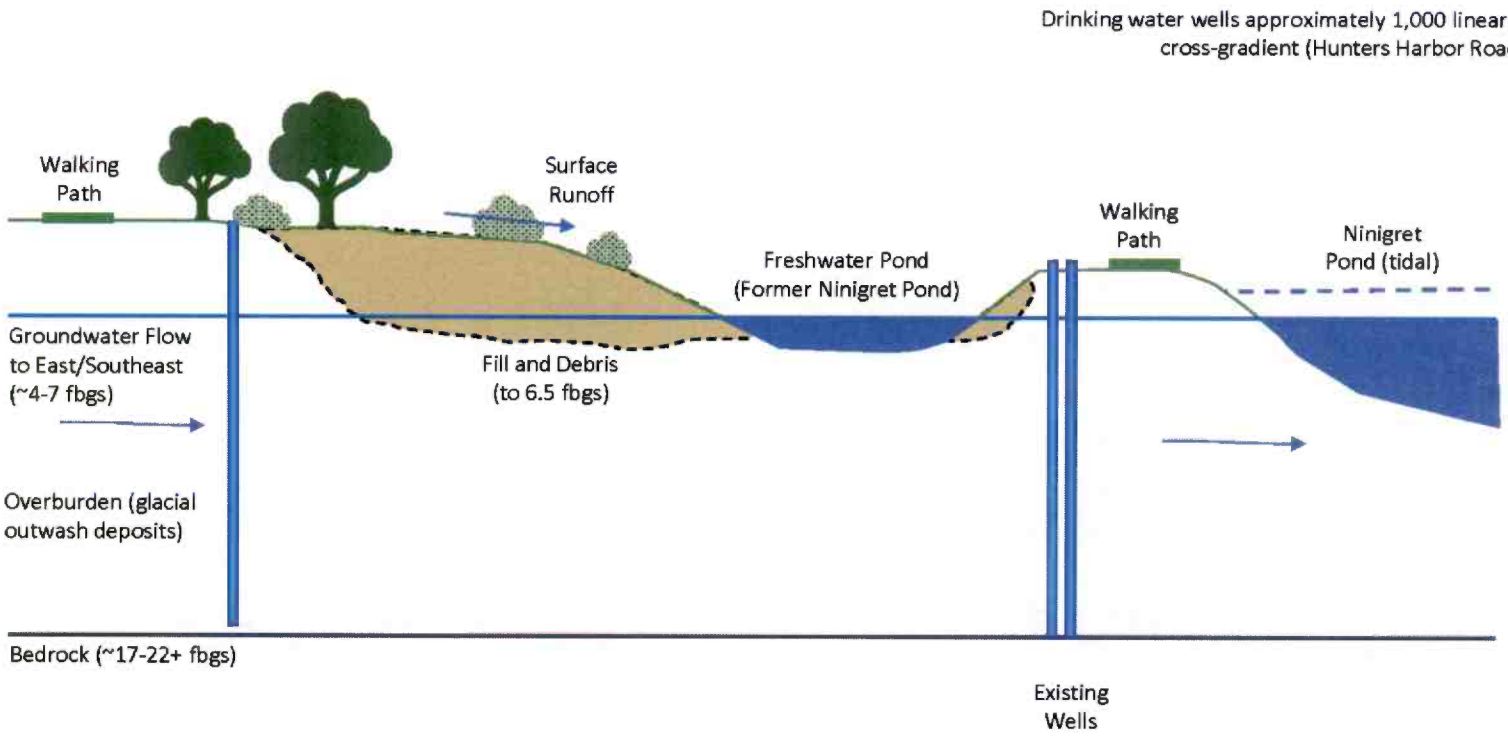
Project 09, Eastern Area Landfill



Geology

- Fill and sand/gravel glacial outwash deposits above bedrock
  - Fill consists of sand and gravel with some silt and clay mixed with landfilled materials
  - No evidence of impermeable cover/liner; non-uniform soil cover over fill
- Bedrock depth 17 to 22+ feet in soil borings
- Groundwater 4 to 7 feet below ground surface (in overburden)
  - Historical investigation reports indicate groundwater flow is to the east/southeast.

Project 09, Eastern Area Landfill Conceptual Site Model



Not to scale

FIGURE 7-3: PROJECT 09 EASTERN AREA LANDFILL
CONCEPTUAL SITE MODEL
FORMER NAVAL AUXILIARY LANDING FIELD
CHARLESTON, RHODE ISLAND

The Johnson Company

100 State St., Suite 600
Montpelier VT, 05602

Drawn by: DEB	Date: 11/05/2018
Reviewed by:	Date:
Scale: Not to Scale	Project: 1-2128-17

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Potential Constituents of Concern

- VOCs, SVOCs, petroleum hydrocarbons, PCBs, pesticides, and metals from the fill and debris.
- MC metals and explosives from MD in the fill.

Findings from Previous Investigations

- Relatively few samples collected relative to the large (~2-acre) area and heterogeneous nature of landfill
  - 12 soil samples total (6 surface and 6 subsurface), collected from 1986 to 2008
  - 5 groundwater wells sampled multiple times
  - 10 sediment samples and no surface water samples
- Soil: no indication of gross contamination or high concentrations, but some constituents above EPA screening levels. Metals above EPA direct contact standards, may be naturally occurring
- Groundwater: metals exceeded current screening levels; may be contaminants, naturally occurring, or due to sample method (bailers)
- Surface Water: not sampled
- Sediment: PAHs and metals above current screening levels. TPH above RIDEM criterion in one sample. No detections of explosives. Background study needed.

Critical Data Gaps

- Insufficient quantity/distribution of samples collected relative to 5-acre size of landfill (soil, groundwater and surface water)
- Laboratory reporting limits for many analytes exceeded current screening levels.
- Samples not analyzed for hexavalent vs. trivalent chromium.
- Groundwater not fully characterized downgradient from the landfill area.
- Existing monitoring wells do not fully penetrate the saturated overburden (10 foot well screens in 10 to 16+ feet of saturated overburden. No wells are screened in bedrock.
- No surface water samples from freshwater pond or Ninigret Pond
- Insufficient data available for site-specific natural/background concentrations of constituents in soil (metals, pesticides), sediment (metals, pesticides, PAHs), groundwater, and surface water (metals)
- The 2008 qualitative munitions risk evaluation did not use the most recent guidance (2017); more data is needed to use the 2017 guidance to provide an "acceptable" versus "unacceptable" risk designation.

Recommendations for Future Actions

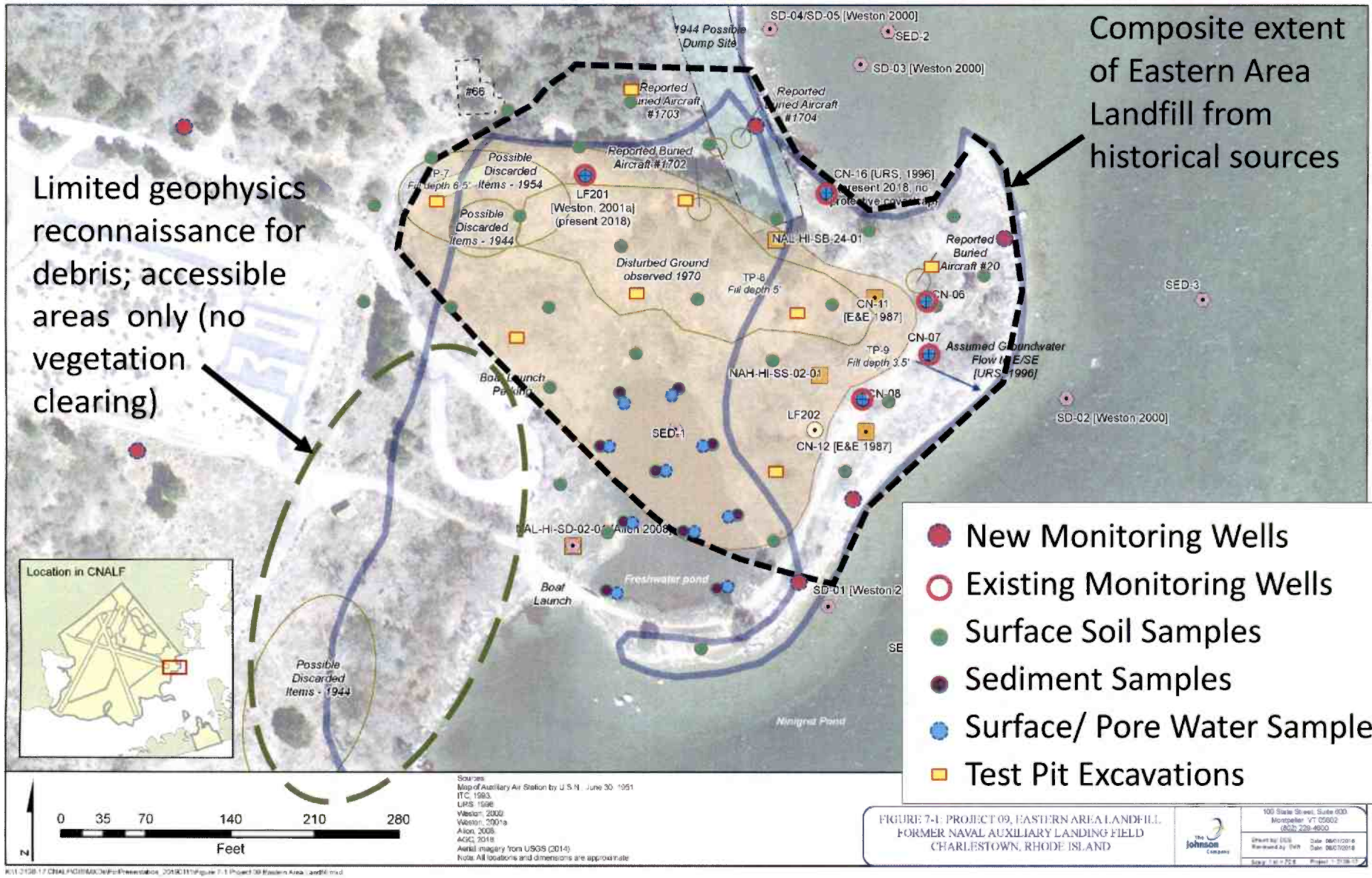
- Vegetative cover survey (invasive species); baseline
- Geophysics: conduct geophysical survey across entirety of the landfill [clearing required] and investigate anomalies
- Collect discrete samples for lab analysis:
  - Surface Soil: 20 to 30 surface soil (0-1 ft depth) samples from landfill and near walking trails; analyze for all COCs [hand tools; no clearing required]
  - Groundwater: install monitoring wells at 6 to 8 locations; sample for all COCs [limited clearing for rig access]
  - Sediment: 10 samples from the adjacent freshwater pond; analyze for VOCs, SVOCs, metals, TOC, and MC.
  - Surface/ Pore Water: 10 samples from the adjacent freshwater pond; analyze for VOCs, SVOCs, metals, hardness, and MC.
  - Ninigret Pond: 15 to 20 sediment samples, 10 surface/ pore water samples, & background study
- Test pits – use results from initial geophysical survey and historical excavations to refine test pit locations
  - Dig test pits at 8 locations, log fill depth, contents and observations
  - Collect soil samples from the fill material and the soil below the fill material for all COCs

Recommendations for Future Actions

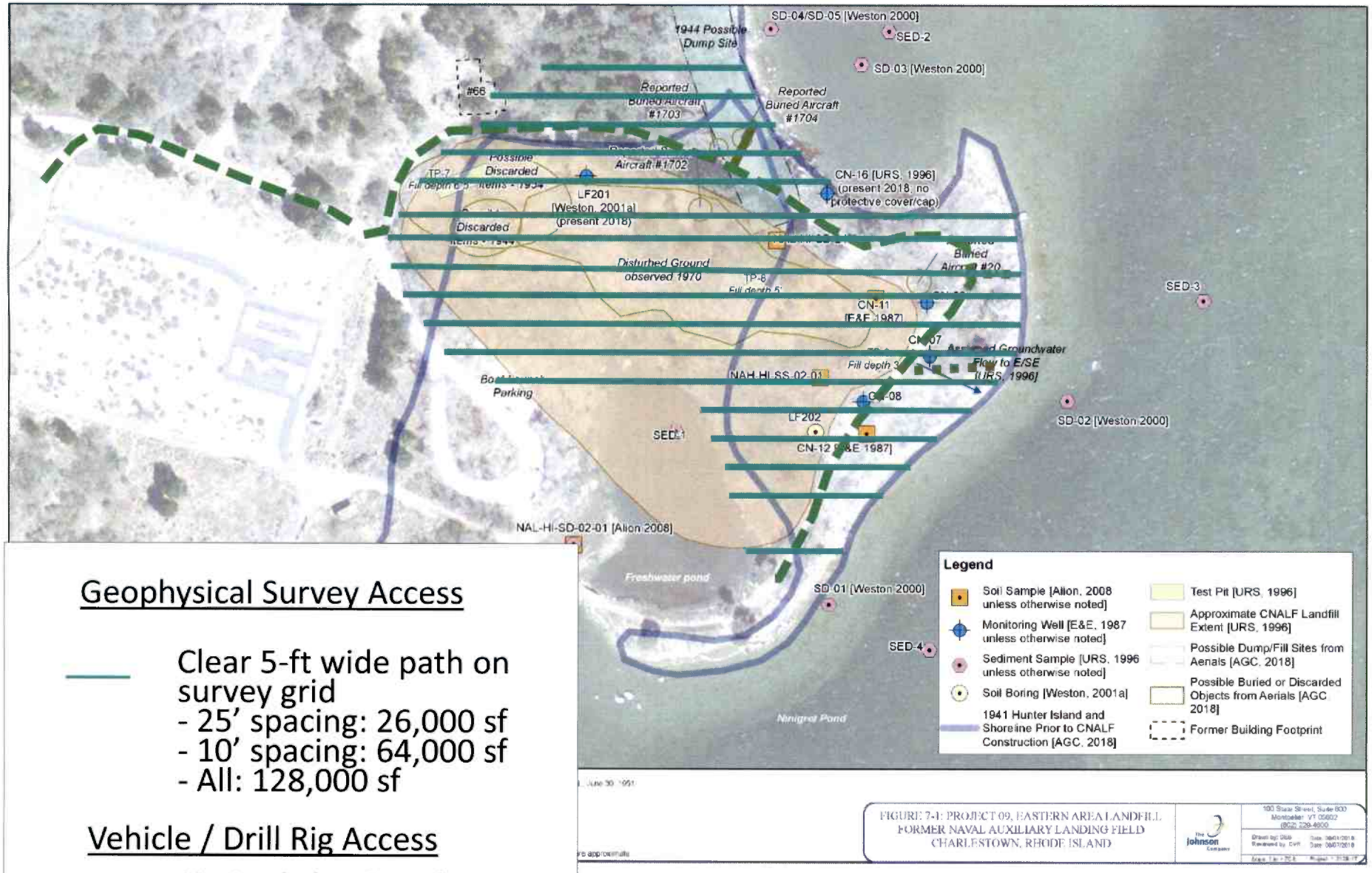
Groundwater Investigation Detail:

- Assess, redevelop, and resurvey existing wells.
- Install monitoring well nests at 4 to 6 locations on the downgradient perimeter of the landfill (75 to 100 ft apart).
  - Overburden wells will be paired with one screen across the water table and the other screened in deeper overburden where saturated thickness of the overburden exceeds 12 ft
  - Bedrock monitoring wells will be paired with overburden wells at 3 locations
- Install monitoring wells at 2 locations upgradient of the landfill.
  - Overburden shallow/deep well pairs and one bedrock well
- Sample groundwater using modern low-flow sampling methods for VOCs, SVOCs, pesticides, PCBs, metals, and munitions compounds (MC)
- Collect groundwater data to assess flow directions, flow rates, vertical gradients, seasonal/tidal variations, and hydraulic conductivity

Proposed Sampling Locations



Proposed Access Pathways and Vegetation Clearing

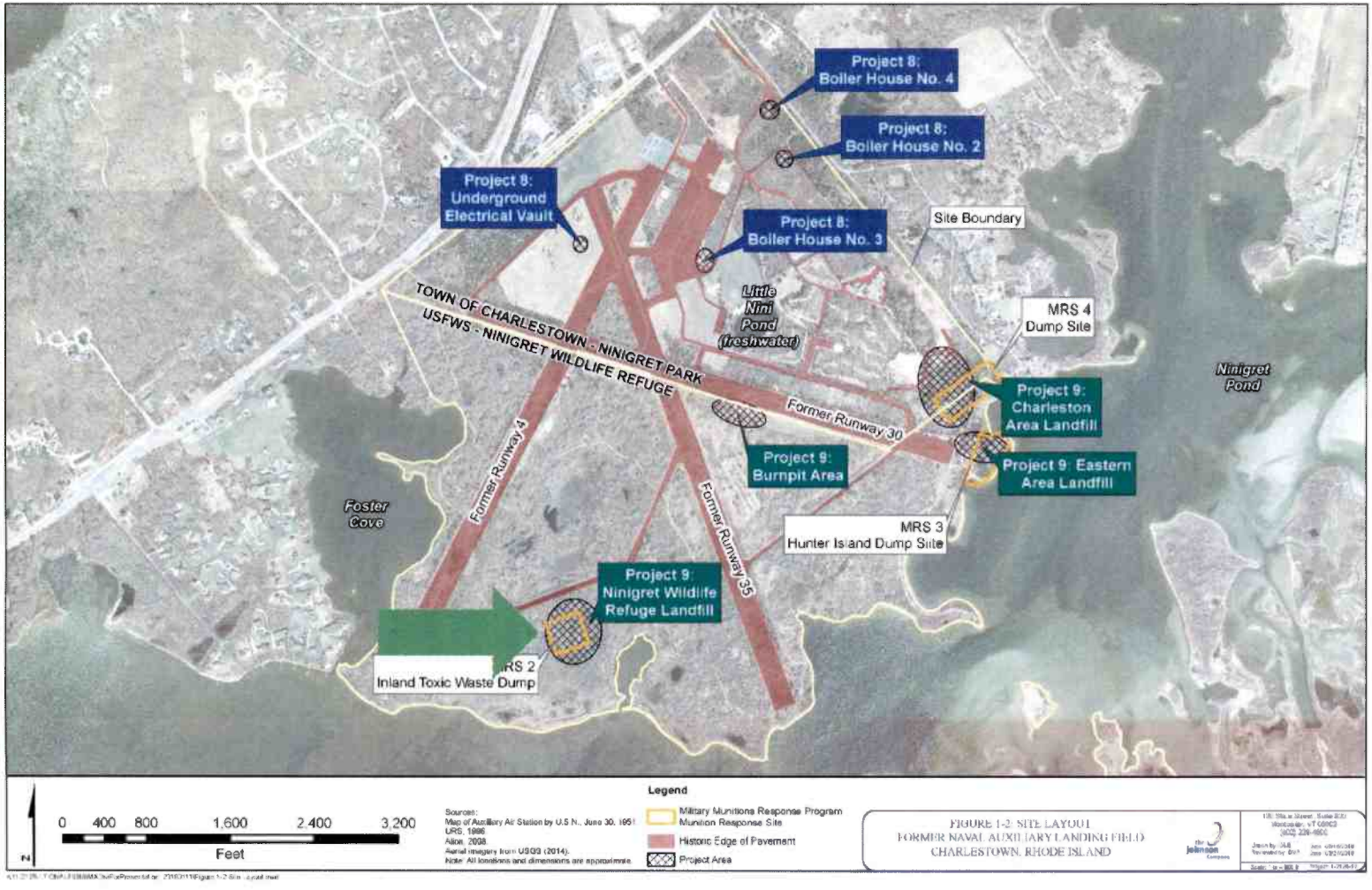


Geophysical Survey Access

Clear 5-ft wide path on survey grid
- 25’ spacing: 26,000 sf
- 10’ spacing: 64,000 sf
- All: 128,000 sf

Vehicle / Drill Rig Access

Limited clearing along existing pathways



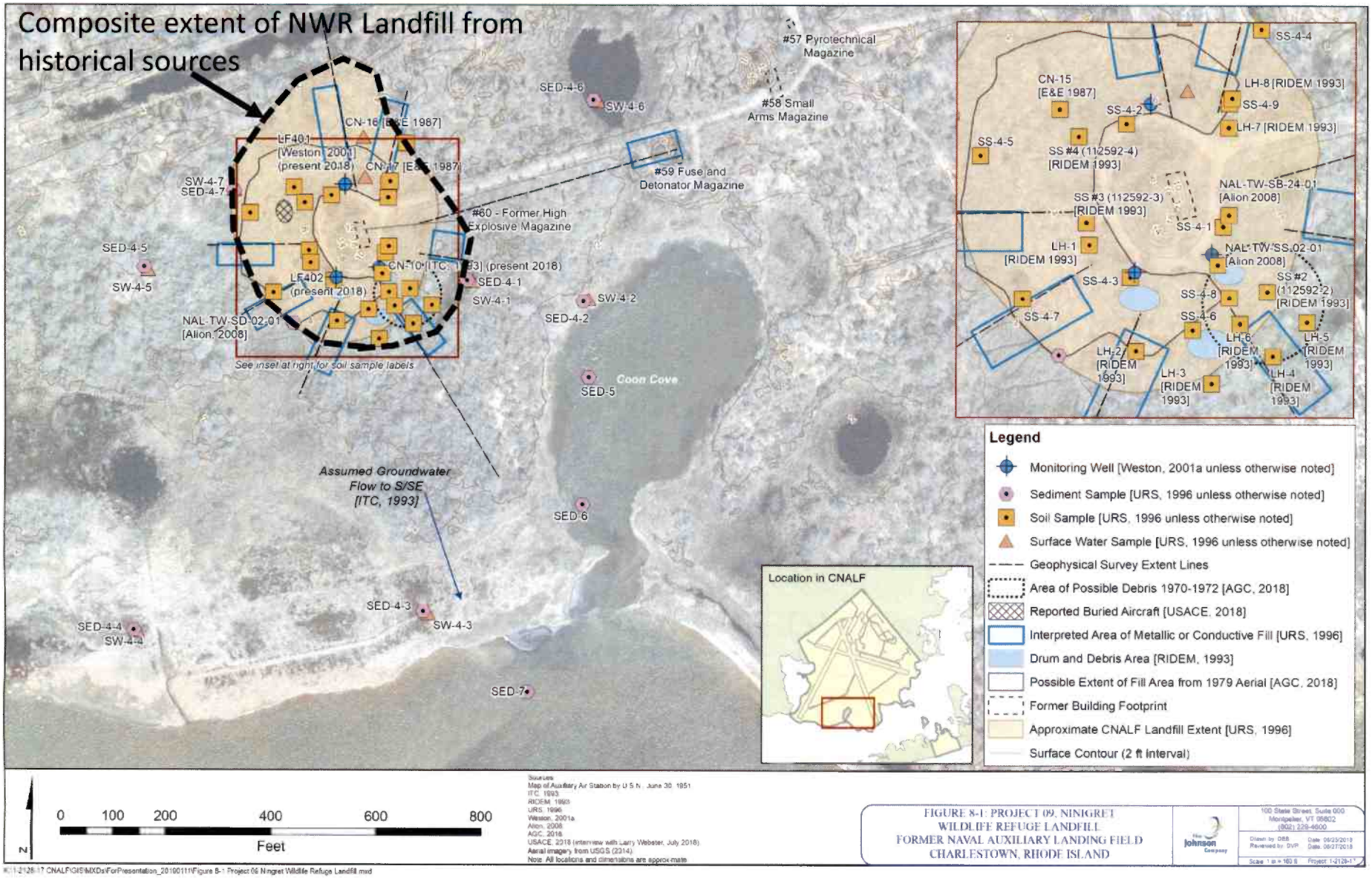
PROJECT 09

NINIGRET WILDLIFE REFUGE LANDFILL *[MRS 2]*, NINIGRET REFUGE

Background

- Approximately five acres and 2 to 4 ft thick, located in Ninigret NWR around former High Explosive Storage bunker
- Reported Contents: trash, small to medium caliber ammunition, airplane parts, at least one burned airplane hulk from the Burn Pit Site, construction debris, scrap metal, appliances, tires, cans, bottles, and empty drums
- There is an unconfirmed report that abandoned Naval personal vehicles were disposed along the access road leading to the bunker
- An MMRP investigation in 2007 found no evidence of munitions and explosives of concern (MEC) or munitions debris (MD), but MD was identified historically.

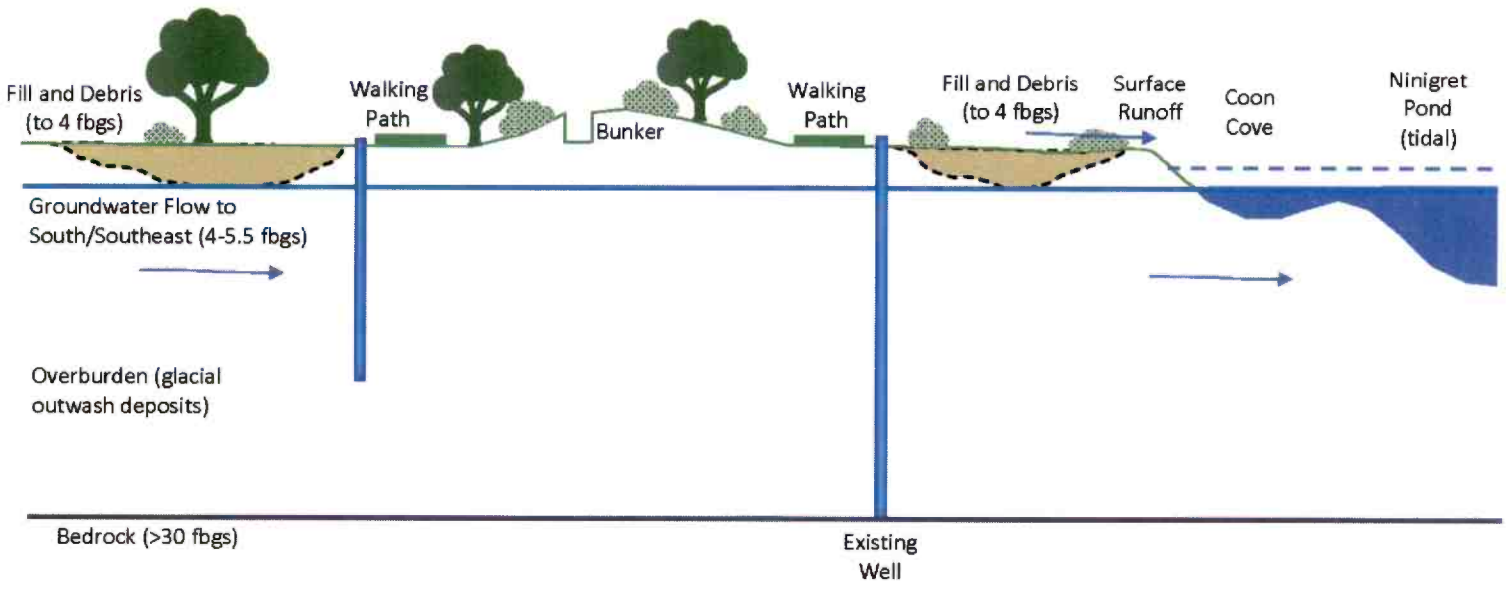
Previous Investigations - Project 09, Ninigret Wildlife Refuge Landfill



Geology

- Fill and fine to coarse sand and gravel (glacial outwash deposits) above bedrock
  - Fill described as silty sand mixed with trash
  - No evidence of impermeable cover/liner; non-uniform soil cover over fill in limited areas; at most locations the fill and debris are exposed
- The top of bedrock is assumed to be deeper than 30 feet below ground (max boring depth)
- Groundwater approx. 2 to 5 feet below ground
  - Historical investigation reports indicate groundwater flow is to the south/southeast toward Coon Cove and Ninigret Pond

Project 09, Ninigret Wildlife Refuge Landfill Conceptual Site Model



Not to scale

FIGURE 8-2: PROJECT 09 NINGRET WILDLIFE REFUGE LANDFILL
CONCEPTUAL SITE MODEL
FORMER NAVAL AUXILIARY LANDING FIELD
CHARLESTON, RHODE ISLAND

The Johnson Company

100 State St., Suite 600
Montpelier VT, 05602

Drawn by: DEB	Date: 11/05/2018
Reviewed by:	Date:
Scale: Not to Scale	Project: 1-2128-17

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Potential Constituents of Concern

- VOCs, SVOCs, petroleum hydrocarbons, PCBs, pesticides, and metals from the fill debris
- MC metals, explosives, and perchlorates from MD in the fill

Findings from Previous Investigations

- Insufficient quantity of samples collected relative to the large (~5-acre) area and heterogeneous nature of landfill
  - 26 soil samples total (22 surface and 4 subsurface), collected from 1986 to 2008
  - 1 groundwater well sampled multiple times (1991, 1994, 1998); 2 wells sampled once (1998)
  - 15 sediment samples and 9 surface water samples
- Soil: no evidence of gross contamination; however, in surface soil:
  - VOCs and SVOCs (PAHs) above current EPA screening levels
  - Metals above EPA direct contact standards, may be naturally occurring
  - TPH above RIDEM standard at two locations (530 - 1610 mg/kg)
  - Pesticides (DDT family) slightly above levels detected elsewhere at CNALF
- Groundwater: no VOCs, SVOCs, TPH, PCBs, or pesticides detected. Metals exceeded current screening levels; may be contaminants, naturally occurring, or due to sample method (bailers)
- Surface Water: turbid samples; metals and pesticides (lindane and DDE) above screening levels
- Sediment: Metals (all samples) TPH (several samples), PAHs (one sample) exceeded current screening levels. Metals may be naturally occurring.

Critical Data Gaps

- Poor-resolution geophysical data and few borings to investigate extent and depth of landfill materials
- Insufficient quantity/distribution of samples collected relative to 5-acre size of landfill (soil, groundwater and surface water)
- Laboratory reporting limits for many analytes exceeded current screening levels
- Groundwater not fully characterized upgradient and downgradient from the landfill area.
- Groundwater monitoring wells are shallow – screened across upper 10 feet of overburden, more than 10 feet above the top of bedrock. No wells screened in bedrock
- MC at the surface or in the fill and debris material is not fully characterized
- Insufficient data available for site-specific natural/background concentrations of constituents in soil (metals, pesticides), sediment (metals, petroleum hydrocarbons, pesticides, PAHs), groundwater, and surface water (metals)
- The 2008 qualitative munitions risk evaluation did not use the most recent guidance (2017); more data is needed to use the 2017 guidance to provide an "acceptable" versus "unacceptable" risk designation.

Recommendations for Future Actions

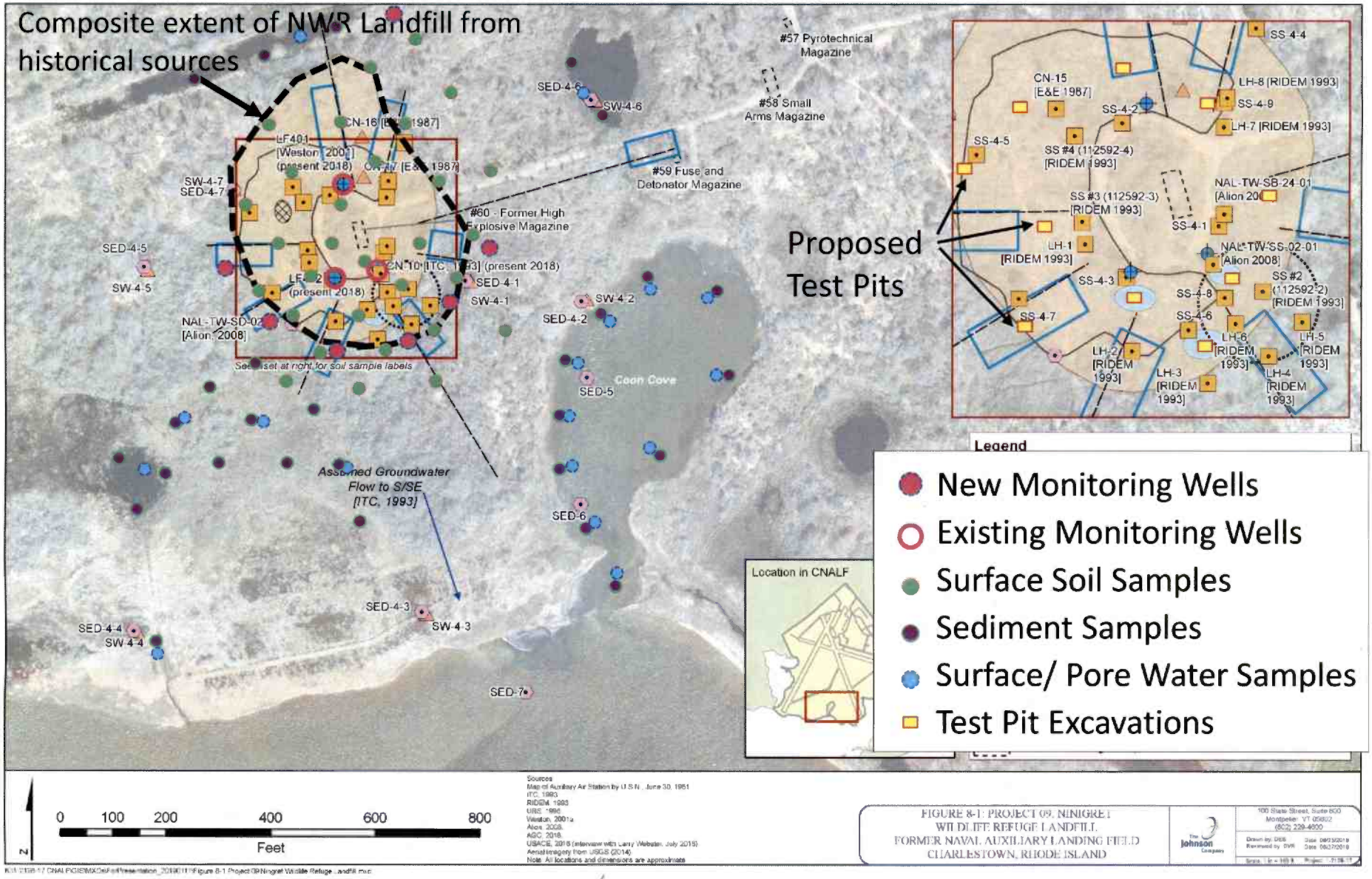
- Wetland delineation
- Vegetative cover survey (invasive species); baseline
- Geophysics: conduct geophysical survey across entirety of the landfill [clearing required] and investigate anomalies
- Collect discrete samples for lab analysis:
  - Surface Soil: 25 to 35 surface soil (0-1 ft depth) samples from landfill and near walking trails; analyze for all COCs [hand tools; no clearing required]
  - Groundwater: install and sample monitoring wells at 9 to 11 locations [brush clearing for rig access]
  - Sediment: 20 to 25 samples from adjacent wetlands; 10 samples from Coon Cove; analyze for SVOCs, VOCs, metals, and MC
  - Surface/ Pore Water: 10 samples from adjacent ponds and wetlands; 10 samples from Coon Cove; analyze for SVOCs, VOCs, metals, and MC
- Test pits – use results from initial geophysical survey and historical excavations to refine test pit locations
  - Dig test pits at 10 locations, log fill depth, contents and observations
  - Collect soil samples from the fill material and the soil below the fill material for all COCs

Recommendations for Future Actions

Groundwater Investigation Detail:

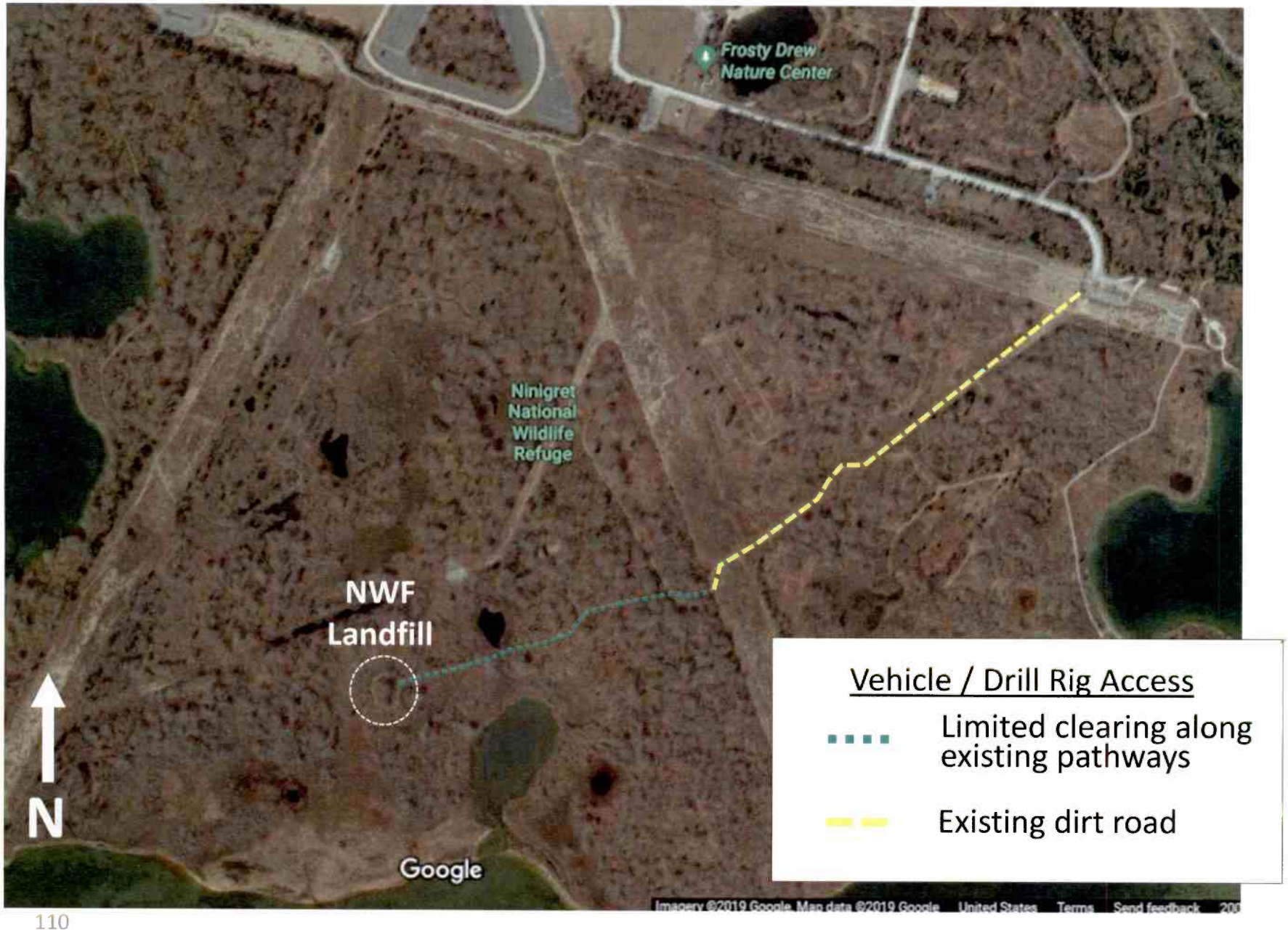
- Assess, redevelop, repair as needed and resurvey existing wells.
- Install monitoring well nests at 8 to 10 locations on the downgradient perimeter of the landfill (75 to 100 ft apart).
  - Overburden wells will be paired with one screen across the water table and the other screened in deeper overburden where saturated thickness of the overburden exceeds 12 ft
  - Bedrock monitoring wells will be paired with overburden wells at approximately 3 locations
- Install monitoring wells at 1 location upgradient of the landfill.
  - Overburden shallow/deep/rock well cluster
- Sample groundwater using modern low-flow sampling methods for VOCs, SVOCs, pesticides, PCBs, metals, and munitions compounds (MC)
- Collect groundwater data to assess flow directions, flow rates, vertical gradients, seasonal/ tidal variations, and hydraulic conductivity

Proposed Sampling Locations

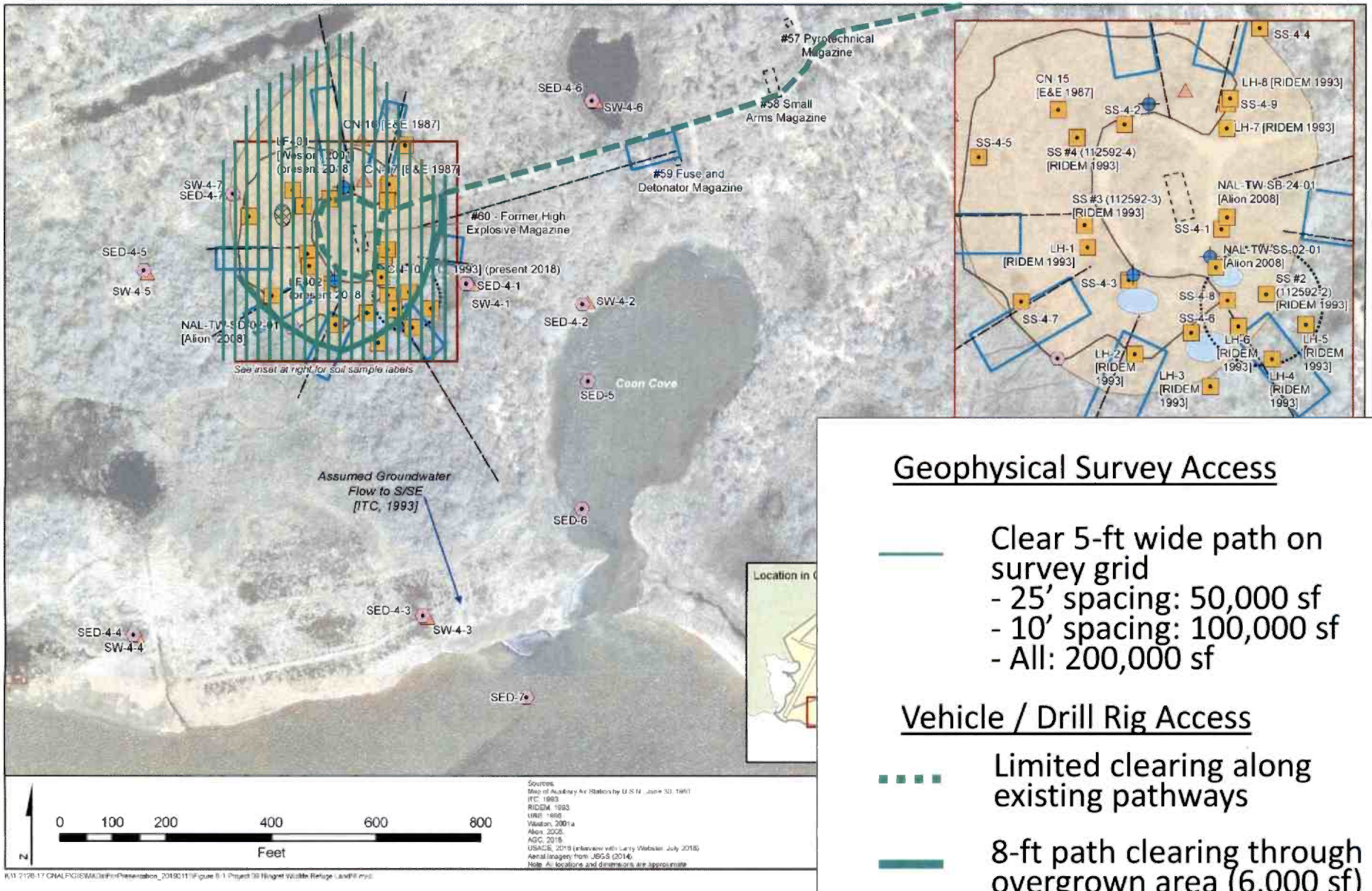


URS soils not on legend

Proposed Access Pathways and Vegetation Clearing



Proposed Access Pathways and Vegetation Clearing



Geophysical Survey Access

Clear 5-ft wide path on survey grid
- 25’ spacing: 50,000 sf
- 10’ spacing: 100,000 sf
- All: 200,000 sf

Vehicle / Drill Rig Access

Limited clearing along existing pathways

8-ft path clearing through overgrown area (6,000 sf)

Next Steps

- **Ninigret Park Boiler Houses and Transformer Vault** (USACE Project 08)
  - Remedial Action Work Plan for permanent closure of each of the four sites;
  - Review and comment by RIDEM & Town in summer 2019
- **Three Landfills and Burnpit** (USACE Project 09)
  - HTRW/MMRP Remedial Investigation Work Plan for collecting additional/updated data from each site to support remediation decisions
    - HTRW RI Work Plan (JCO)
    - MMRP portion of RI Work Plan prepared by others
  - Review and comment by RIDEM, USFWS, & Town in summer 2019

Summary
and
Action Items