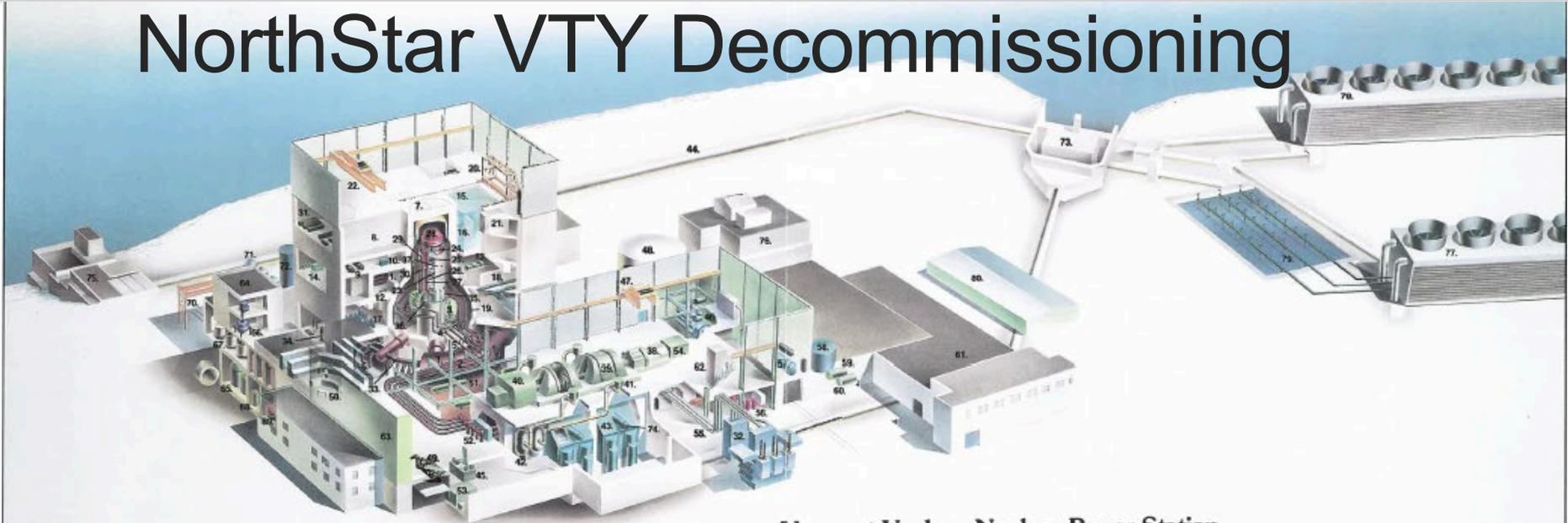




# NorthStar

Nuclear Decommissioning Company, LLC

## NorthStar VTY Decommissioning



Vermont Yankee Nuclear Power Station

### Site Investigation Review

Montpelier, Vermont  
February 28, 2019  
SVY-19-001

- |   |                                  |                                   |                                      |
|---|----------------------------------|-----------------------------------|--------------------------------------|
| 1. Tunnels  | 21. New fuel storage vault       | 41. Intercept valve               | 61. Receiving and stores             |
| 2. Main steam lines                               | 22. Overhead crane               | 42. Moisture separator            | 62. Elevator                         |
| 3. Recirculation pump                             | 23. Biological shield well       | 43. Main condensers               | 63. Turbine building                 |
| 4. Inboard main steam isolation valve             | 24. Steam dryer                  | 44. Cooling water recirculation   | 64. Rad waste building               |
| 5. Outboard main steam isolation valve            | 25. Steam separator              | 45. Turbine oil tank              | 65. Condensate phase separator tanks |
| 6. Downcomers                                     | 26. Fuel assemblies              | 46. Emergency diesel generators   | 66. Centrifuge                       |
| 7. Shield plug                                    | 27. Reactor vessel               | 47. Overhead crane                | 67. Cask filling area                |
| 8. Dryer/separator storage pool                   | 28. Vessel head                  | 48. Condensate storage tank       | 68. Spent resin tank                 |
| 9. Reactor building cooling water heat exchangers | 29. Main steam outlet            | 49. Feedwater pump                | 69. Waste sludge tank                |
| 10. Reactor building cooling water pump           | 30. Recirculation water outlet   | 50. Control rooms                 | 70. Traveling hoist                  |
| 11. Reactor water cleanup heat exchanger          | 31. Uninterruptible power supply | 51. High pressure heaters         | 71. Sample tanks                     |
| 12. Reactor water cleanup pump                    | 32. Main transformer             | 52. Main stop valve               | 72. Surge tank                       |
| 13. Vital AC motor generator set                  | 33. Ring header                  | 53. Turbine lube oil storage tank | 73. Discharge structure              |
| 14. Recirculation motor generator set             | 34. RHTR service water pump      | 54. Excitation cubicle            | 74. Low pressure heaters             |
| 15. Fuel pool (spent fuel storage)                | 35. Recirculation inlets         | 55. Main generator leads          | 75. Intake structure                 |
| 16. Spent fuel rack                               | 36. Manifold                     | 56. Make-up demineralizers        | 76. Advanced oil-gas building        |
| 17. Hydraulic control units                       | 37. Feedwater inlet              | 57. House heating boiler          | 77. West cooling tower               |
| 18. Standby gas treatment                         | 38. Generator                    | 58. Clearwell                     | 78. East cooling tower               |
| 19. Primary containment wall                      | 39. Low pressure turbine         | 59. Acid storage tank             | 79. Spray pond                       |
| 20. Refueling bridge                              | 40. High pressure turbine        | 60. Caustic storage tank          | 80. Warehouse                        |

# Agenda

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Introductions

Site Background

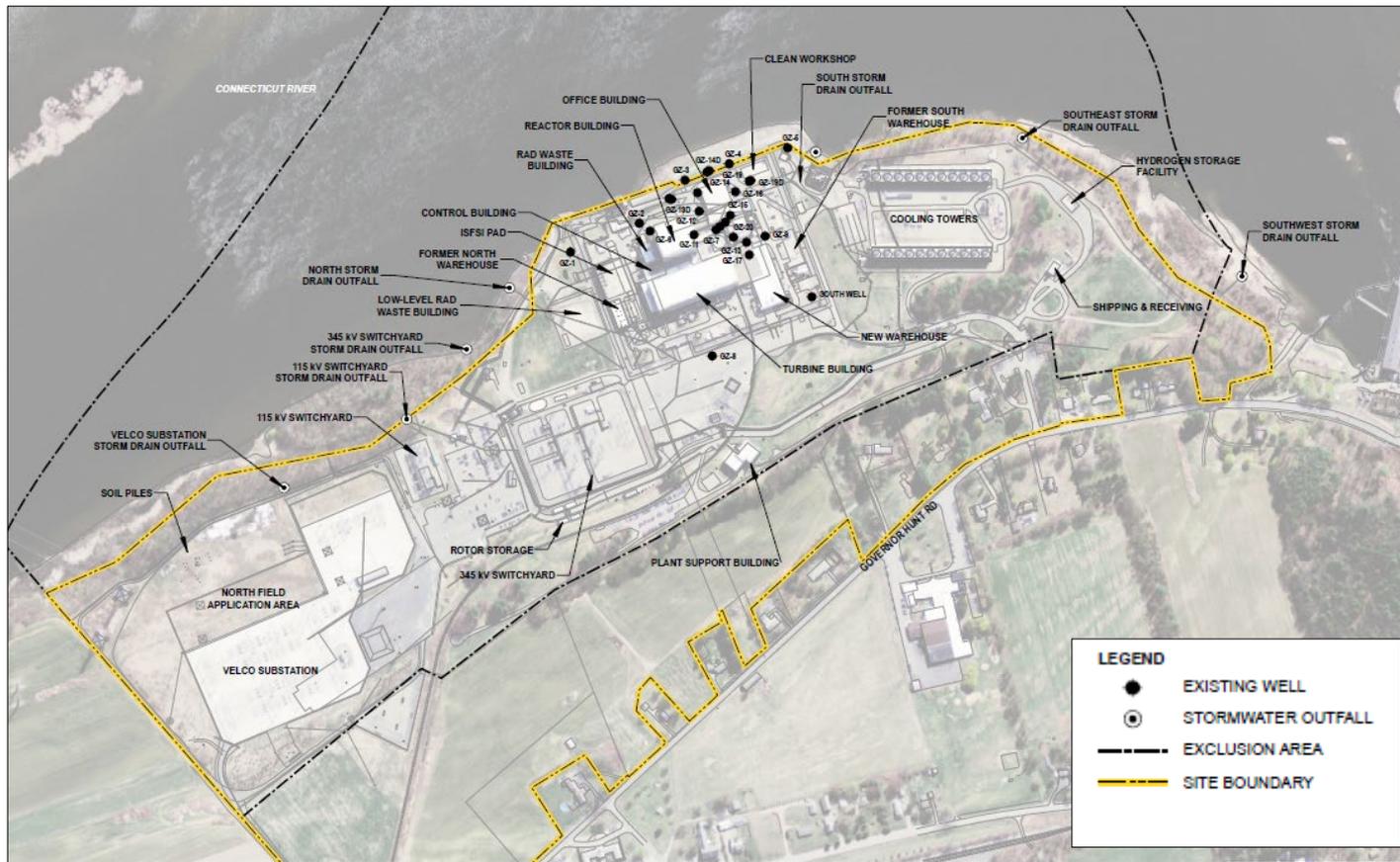
Previous Investigations

Areas of Concern and Proposed Investigations

Coordinated Work Plans

Schedule

# Current Site Conditions



# Project Goals and Schedule

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## **Target Zero Safety**

Streamlined Programs, Work Authorization and Implementation

NNDC Decommissioning Starting 2019 w/ License Transfer

- Optimize RPV/RPVI removal & disposition
- Large Component Removal 2019 - 2020
- Building D&D 2020 – 2026

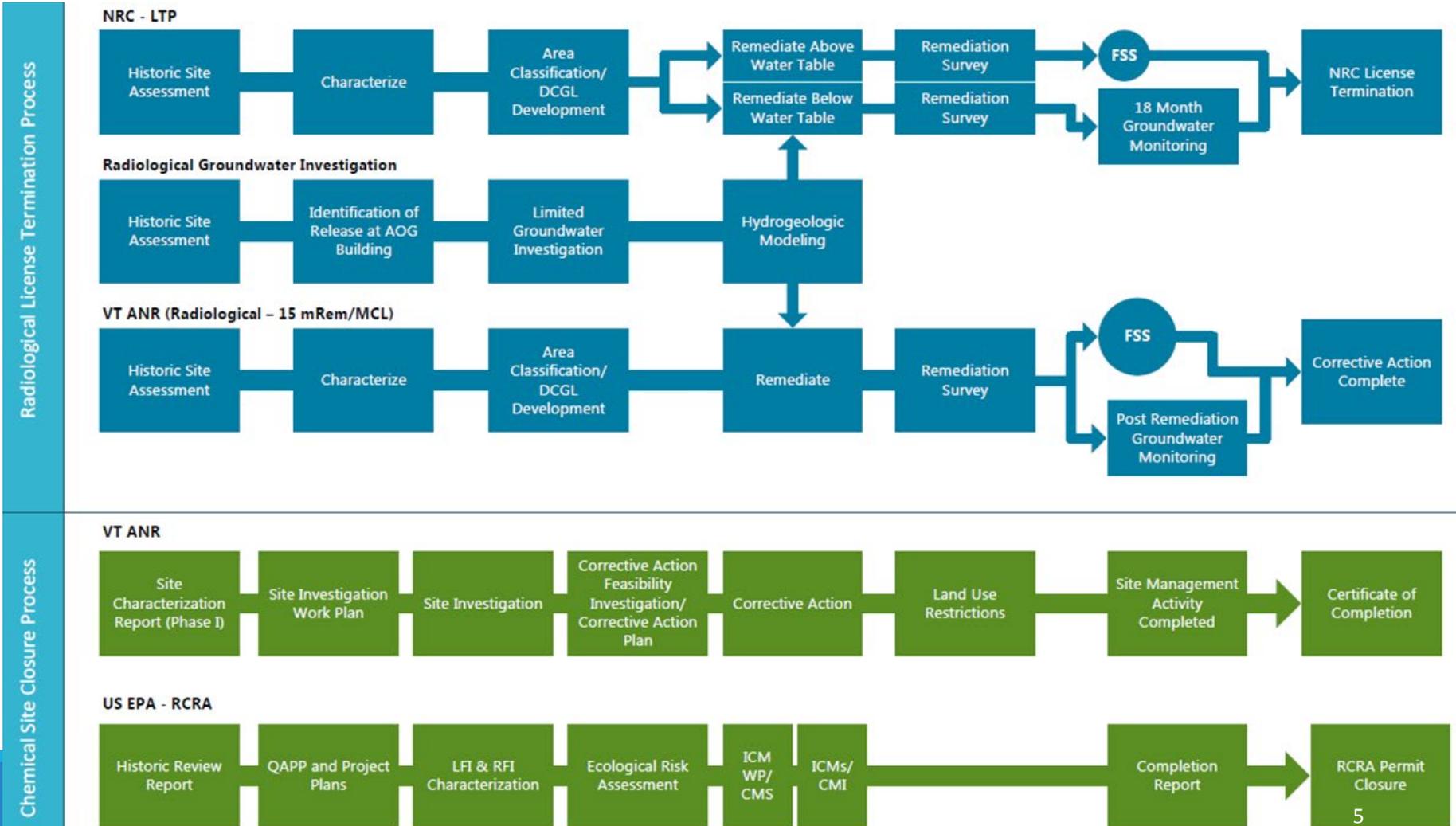
Site Remediation During Decommissioning Phases

- Compliance with I-Rule
- Compliance with the MOU

Partial Site Release by 2026

Project driven w/dedicated decommissioning staff

# Programs Overview/Overlap



# MOU Milestones

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January 11<sup>th</sup> - Site Transfer

February 12<sup>th</sup> - ANR kickoff meeting

- Working meeting requested to go over scope of work and proposed site investigations

March 11<sup>th</sup> - (60 days from transaction) Initial draft work plans due to ANR

- Submitted to ANR on **February 19, 2019**

~~May 10<sup>th</sup>~~ April 19<sup>th</sup> - (60 days from submittal) Receive comments from ANR on work plans

~~June 10<sup>th</sup>~~ May 19<sup>th</sup> - (30 days from receiving comments) Submit final work plans

ANR Final approval

- Field activities to start immediately upon approval

**July 11<sup>th</sup> – (6 months from transaction) Site Investigation Report Due**

# Coordinated Documents

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## \*Limited Non-Radiological Site Sampling Plan, Rev F

- \*Appendix A: Below-Grade Structure Survey Work Plan
- \*Appendix B: Borrow Materials Import Plan
- \*Appendix C: Groundwater Monitoring Plan
- \*Appendix D: Concrete Reuse Plan

Quality Assurance Project Plan, Rev E

Limited Building Characterization Completion Report, Rev C

Waste Acceptance Grouping Identification Plan, Rev E

*\* Denotes MOU required work plans*

# Limited Non-Radiological Site Sampling Plan

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Work plan developed to be iterative and to evaluate if releases occurred,

- Follow up investigations to be completed as warranted
- Will work with ANR, as data are available, to refine the CSM and continue to move forward in the Site Closure Process
- Remediate localized soils as access allows

Treats groundwater as its own AOC

- With separate Groundwater Monitoring Plan

Coordination with D&D work schedule

Prepared to complete field activities immediately after ANR approval with dedicated staff that knows the site and understands the project goals

# Coordinated Approach

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Historical Site Characterization Report is the first step to introduce the Site Conceptual Model and includes a summary table (Table 4.0-2) linking previous work and identifying data gaps

- Phase I and II Investigations
- Historical Site Assessments
- ANR comments

Complementing Work Plans appended to the Limited Non-Radiological Site Sampling Plan

- Imported Fill Management Plan
- Building Materials Characterization
- Below Grade Structures Management Plan
- Groundwater Monitoring Plan

# Areas of Concern

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## Challenges

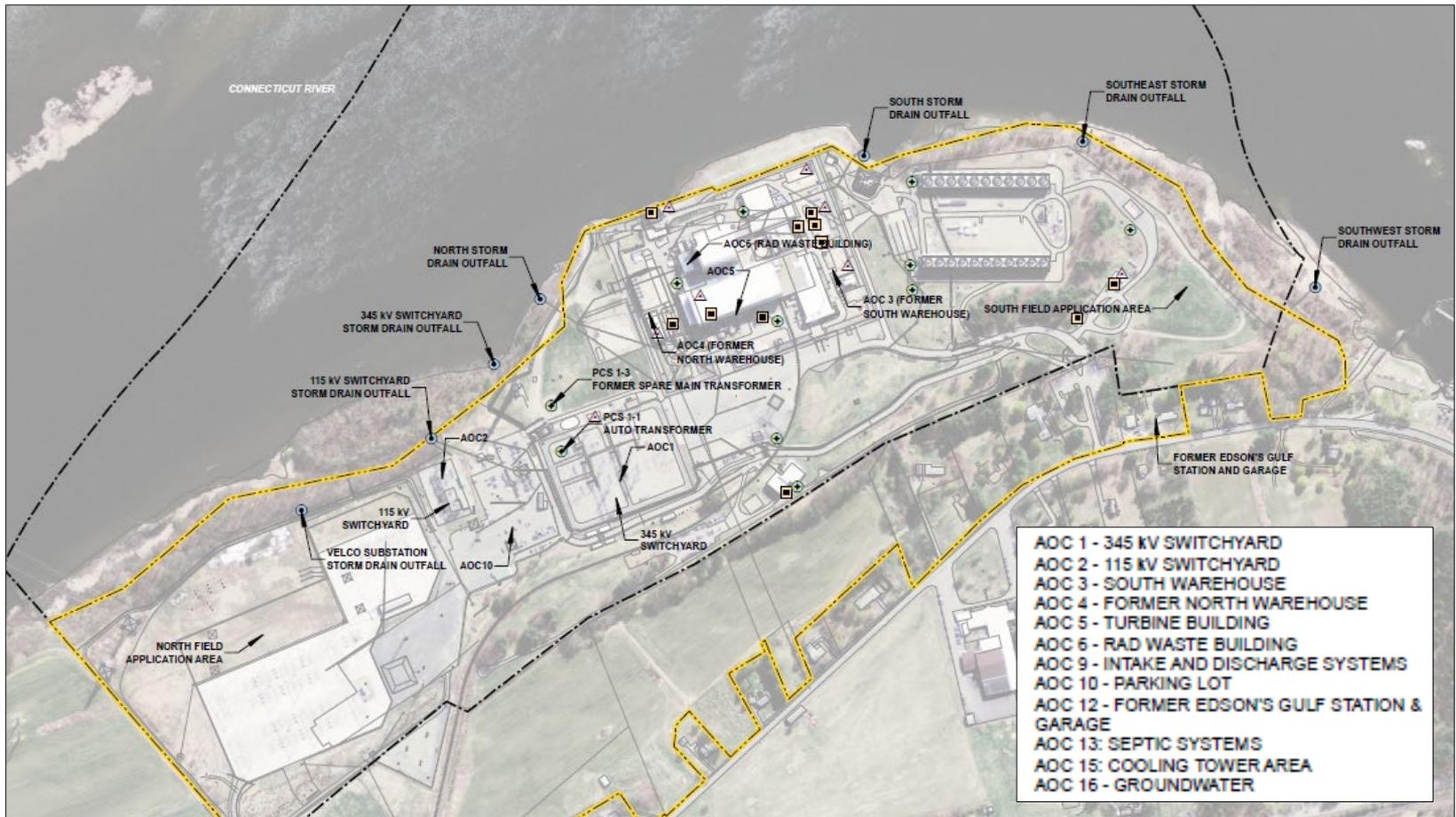
- Each report identified similar issues, but with different names/identification
- Limited access to date to collect samples

## Resolution

- Group AOCs geographically or by type of potential source(s)
  - USTs, Transformers
- Incorporate ANR's comments on locations and analyses
- Coordinate work with D&D efforts

Areas of Concern (AOCs)	
AOC 1	345 kV Switchyard
AOC 2	115 kV Switchyard
AOC 3	Former South Warehouse
AOC 4	Former North Warehouse
AOC 5	Turbine Building
AOC 6	Radiological Waste Building
AOC 7	Fuel Storage Tanks
AOC 8	Transformers
AOC 9	Intake and Discharge Systems
AOC 10	Parking Lots
AOC 11	Hazardous Materials Storage
AOC 12	Former Edson's Gulf Station and Garage
AOC 13	Septic Systems
AOC 14	Storm Water Outfalls
AOC 15	Cooling Tower Area
AOC 16	Site Groundwater

# 16 Areas of Concern



# Integrated Documents

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MOU required Work Plans (appended to the Limited Non-Radiological Site Sampling Plan)

## Waste Acceptance Grouping Identification Plan

- Radiological and chemical waste profile requirements and sample frequency
- Soils handling and documentation

## Quality Assurance Project Plan

- Provide procedures
- Laboratory Detection/Reporting Limits
- QA/QC requirements
- Project Structure

## Generic Voluntary Corrective Action Plan

- Impacted soils will most likely be remediated via excavation and off site disposal
- Work plan sets expectations for soil management and post excavation sampling
- Each area will first be delineated, documented to determine the drivers for the remedial action
- Designed to streamline the approval process

# Investigation Approach

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## Iterative steps to characterize impacts

- Identify if impacts are present
- Delineate extent of impacts (vertical and horizontal)
- Identify if remediation is warranted
- Soils – Excavate for off site disposal
  - Confirm extent with bottom and sidewall samples
  - Documentation
- Groundwater – evaluated per I-Rule Standards
- Sediments – evaluate per risk assessment

# Summary of AOCs and Proposed Investigations

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# AOC 1 – 345 kV Switchyard

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## Main Site Switchyard

- Includes the Auto Transformer and the Former Spare Main Transformer
- Previous report of oil leak at the Auto Transformer in 2003 – soils contaminated with TPH above VT Reuse Criteria (No PCBs detected)
- Stained soils noted at the Former Spare Main Transformer location
- COCs include: PCBs, PAHs, metals, herbicides

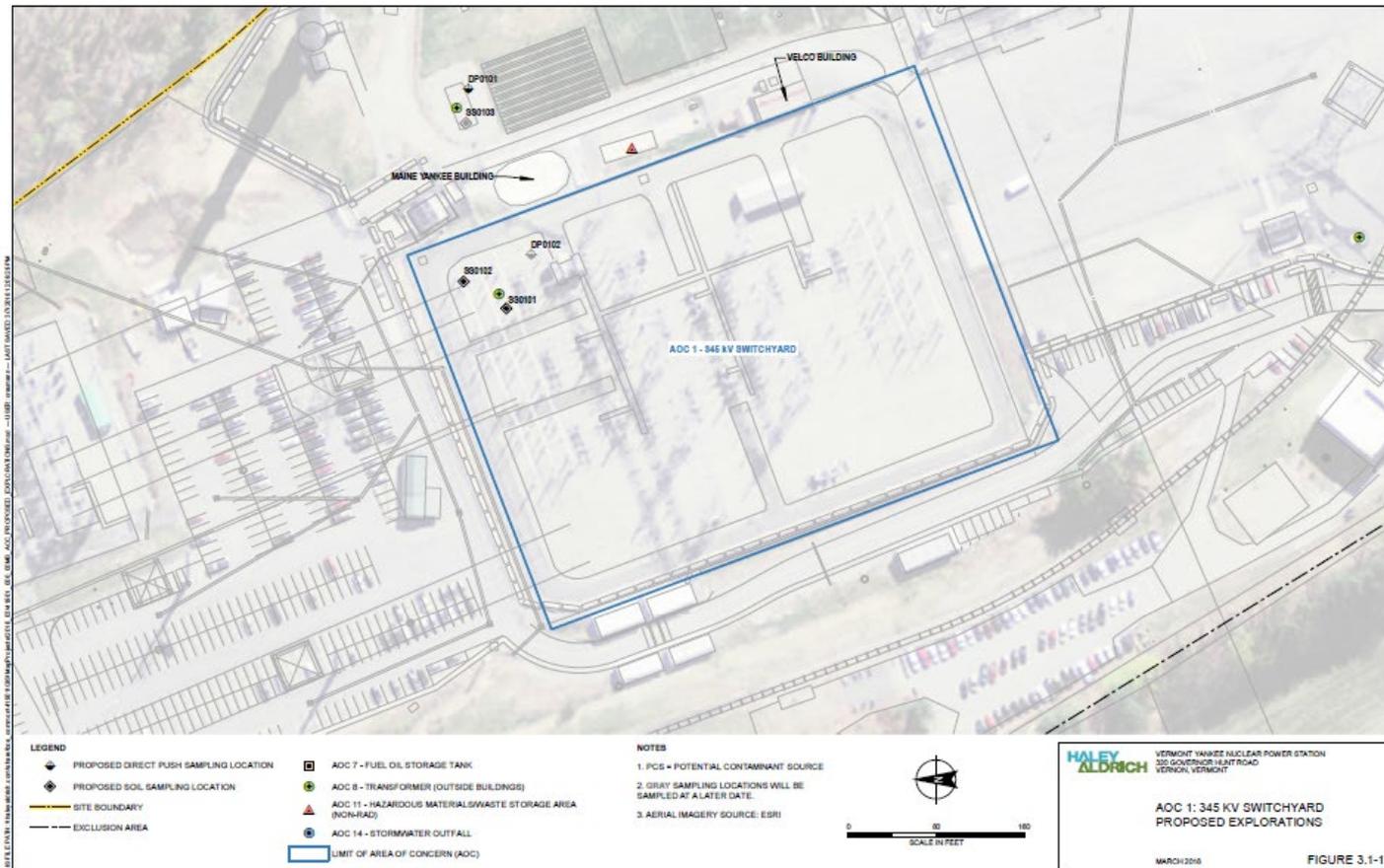
### Initial Proposed Investigation

- Surface Soil Samples at Auto Transformer
- Subsurface Samples at Former Spare Main Transformer

### Additional Proposed Investigations

- Subsurface Samples at Auto Transformer
- Surface Soil Samples at Former Spare Main Transformer
- Additional investigations if yard is dismantled

# AOC 1 – 345 kV Switchyard



# AOC 2 – 115 kV Switchyard

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- Switchyard containing 99 kV Distributor Transformer and Keene Line, Bus Line, and Coolidge Line Breakers
- COCs include: PCBs, PAHs, metals, herbicides

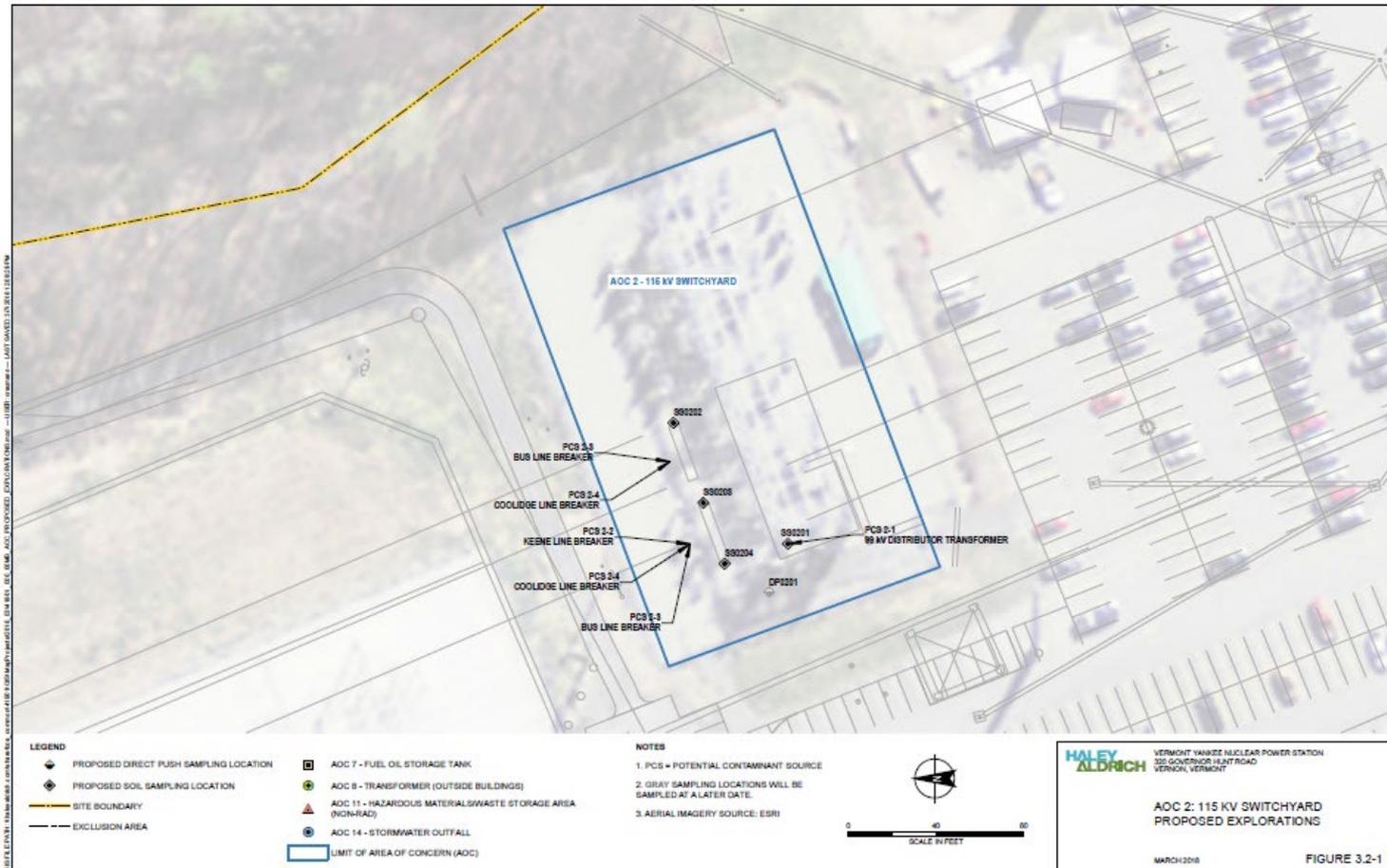
## Initial Proposed Investigation

- Surface Soil Samples at the Transformer and Breaker locations

## Additional Proposed Investigations

- Subsurface Samples at Transformer location

# AOC 2 – 115 kV Switchyard



# AOC 3 – Former South Warehouse

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- Warehouse used for materials storage (virgin and waste oils, lead-acid batteries, other misc. materials)
- Area previously used for vehicle maintenance activities
- Several existing ASTs and former USTs
- COCs include: VOCs, SVOCs, metals, PCBs

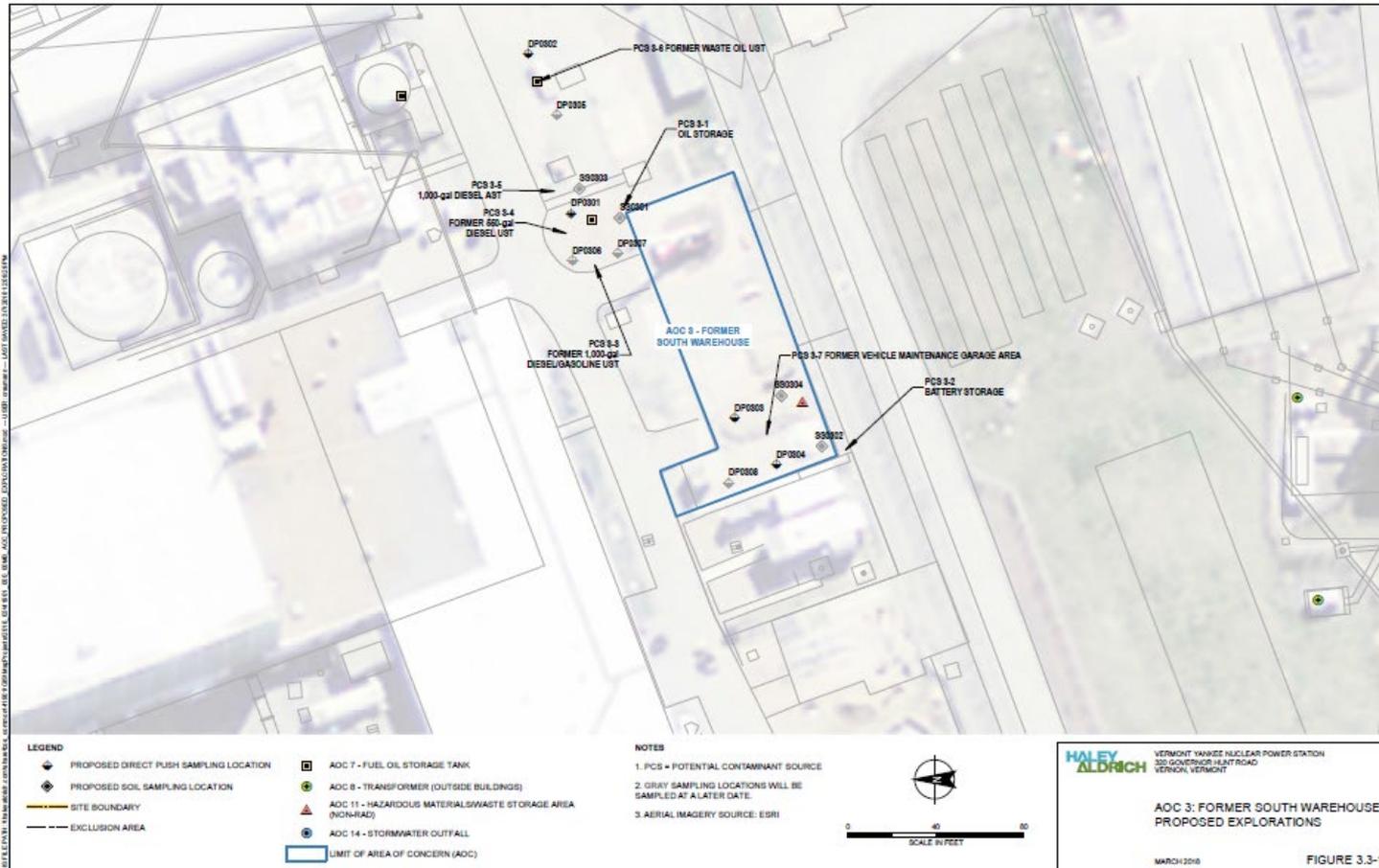
## Initial Proposed Investigation

- Subsurface Samples from areas of existing ASTs and former USTs

## Additional Proposed Investigations

- Subsurface Samples from former storage areas
- Surface Soil Samples from AST locations following asphalt/concrete removal

# AOC 3 – Former South Warehouse



# AOC 4 – Former North Warehouse

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- Warehouse used for radiological and RCRA hazardous waste storage
- Contained furnace to burn used lubricant and fuel oils from AST
- Former diesel UST
- Lead and silver in paint on the structure
- COCs included: VOCs, SVOCs, metal, PCBs, dioxin

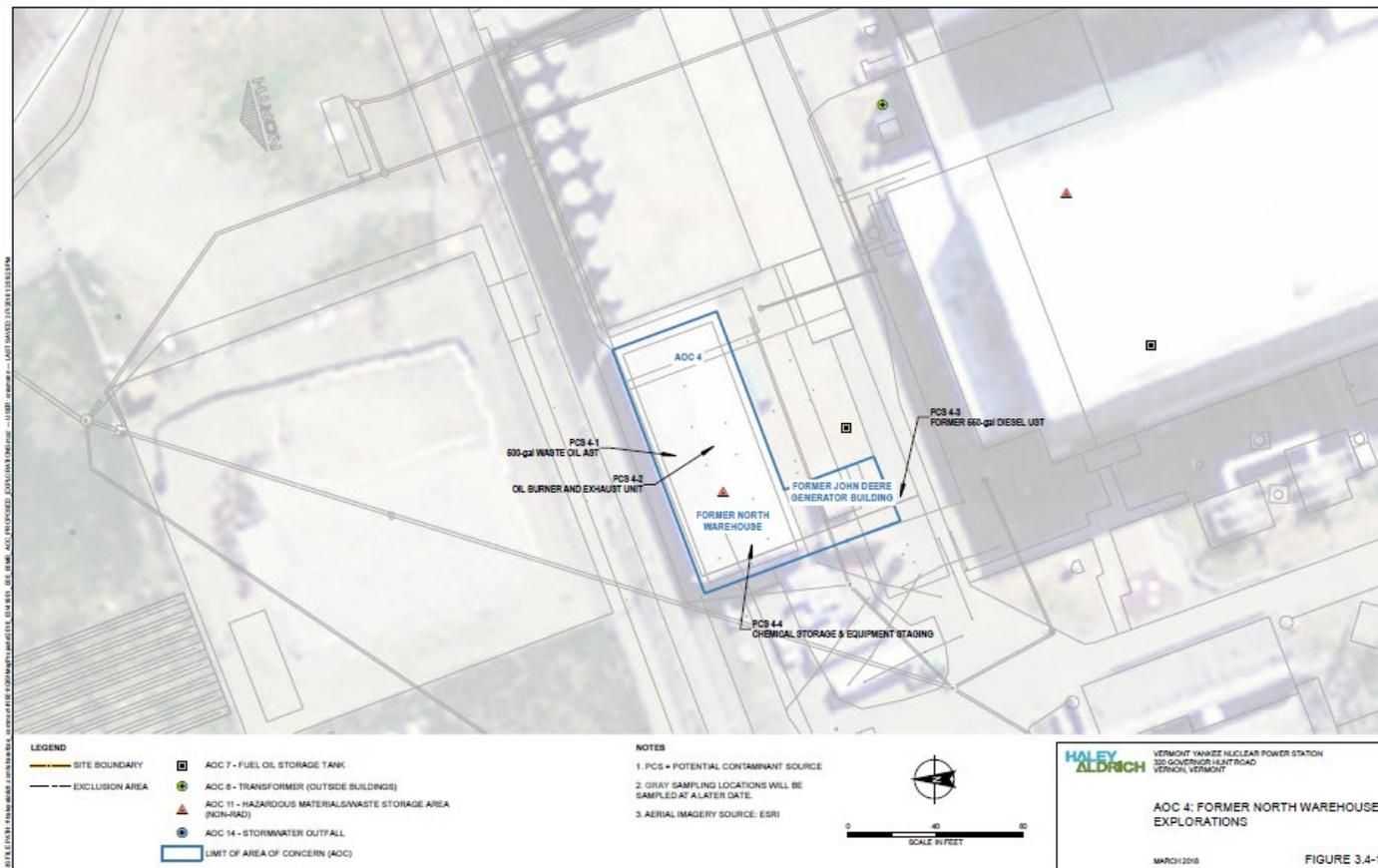
## Initial Investigation Activities

- Building and components have been demolished/removed. Soil sampling completed with no results above Criteria
- UST removed, with ANR approval
- ANR approved investigation report.

## Additional Proposed Investigations

- No further action required

# AOC 4 – Former North Warehouse



# AOC 5 – Turbine Building

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- Previous leaks from UST reported, required LNAPL removal and monitoring
  - Site Management Activities Completed (SMAC) issued from VT ANR
- Chlorinated solvents detected in groundwater during UST investigation
- COCs include: VOCs, SVOCs, PCBs, metals. Current fuel oil AST, former fuel oil UST, former dry cleaning operations, interior transformers

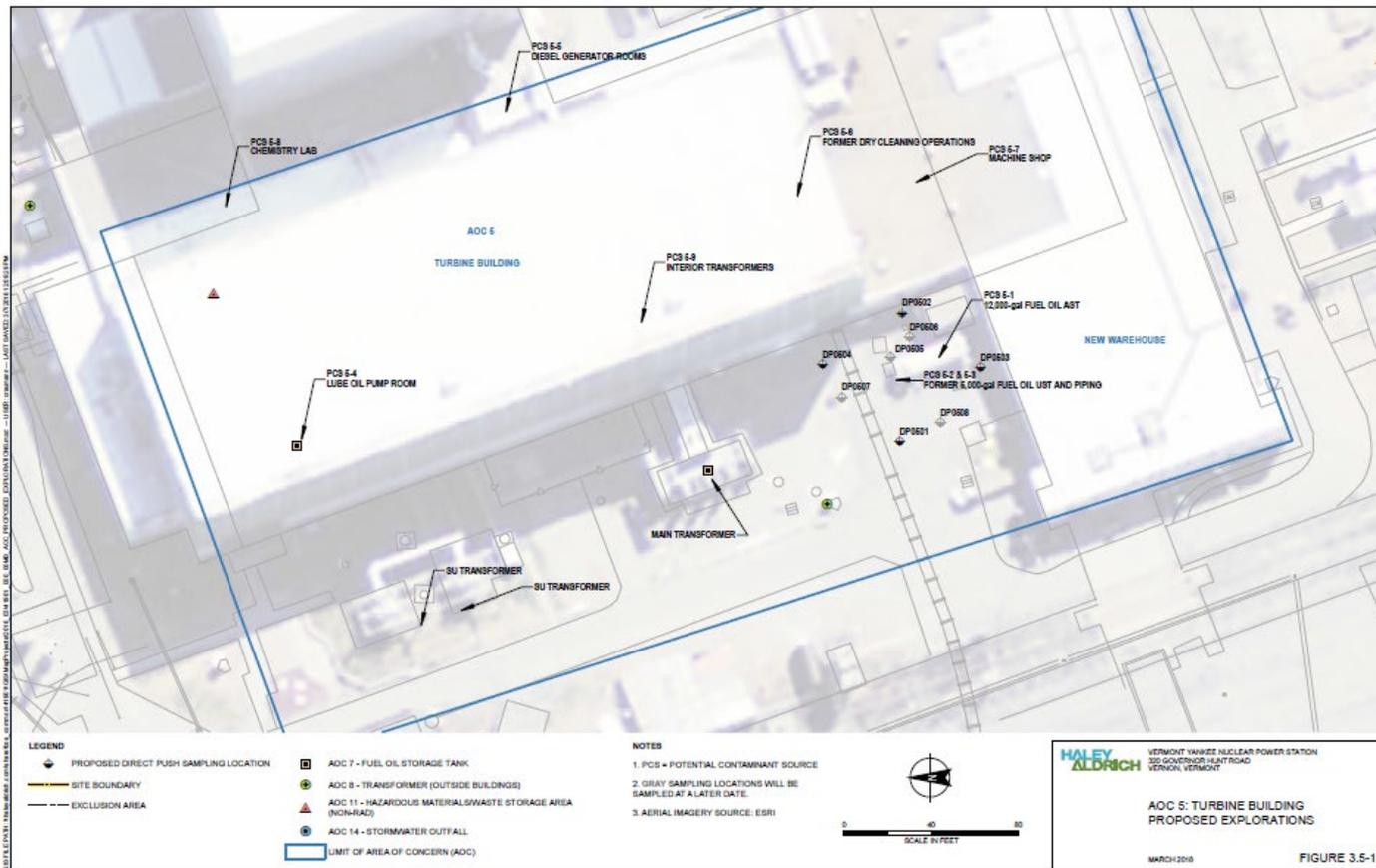
## Initial Proposed Investigation

- Subsurface Samples from areas around the fuel oil tanks

## Additional Proposed Investigations

- Subsurface Samples from additional areas around the fuel oil tanks and piping

# AOC 5 – Turbine Building



# AOC 6 – Radiological Waste Building and Tanks

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- Building used for storage of radiological wastes being prepared for disposal off-site
- COCs include: VOCs, SVOCs, metals

## Initial Proposed Investigation

- Subsurface Samples from areas surrounding the building and tanks

## Additional Proposed Investigations

- Dependent on initial investigation results

# AOC 6 – Radiological Waste Building and Tanks



# AOC 7 – Fuel Storage Tanks

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- Six additional fuel storage tanks not associated with other AOCs
- Materials include fuel oil, diesel, gasoline, and waste oil
- No reported leaks/issues
- COCs include: VOCs, SVOCs, metals

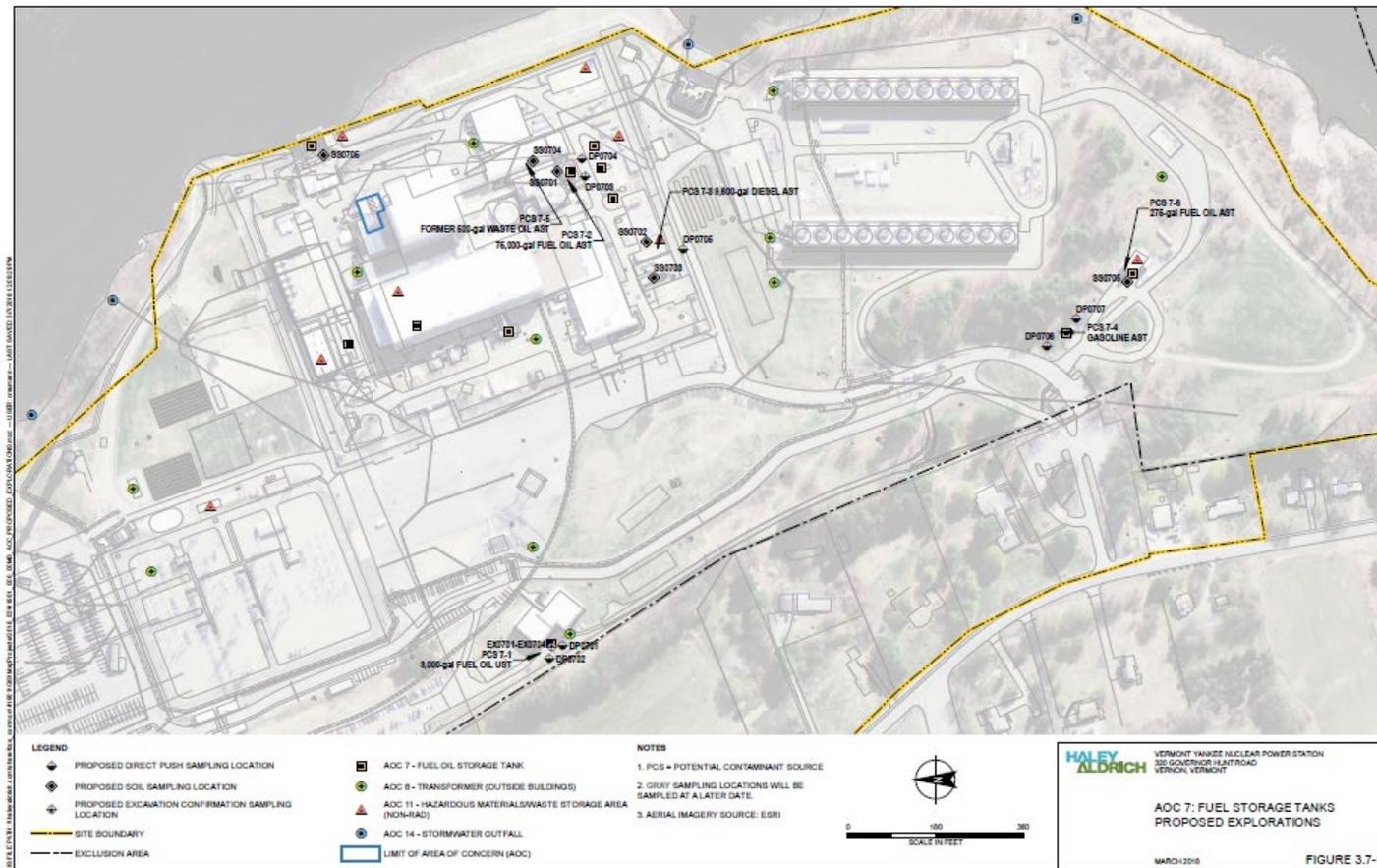
## Initial Proposed Investigation

- Surface Soil Samples from each tank location
- Subsurface Samples from each tank location

## Additional Proposed Investigations

- Dependent on initial investigation results

# AOC 7 – Fuel Storage Tanks



# AOC 8 – Transformers

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- Ten additional transformers not associated with other AOCs
- Reported spill and fire in 2014 at the Main Transformer
- Previous report of explosion and fire at the Auxiliary Transformer
- COCs include: PCBs, dioxins, PFOAs (for fire suppressants)

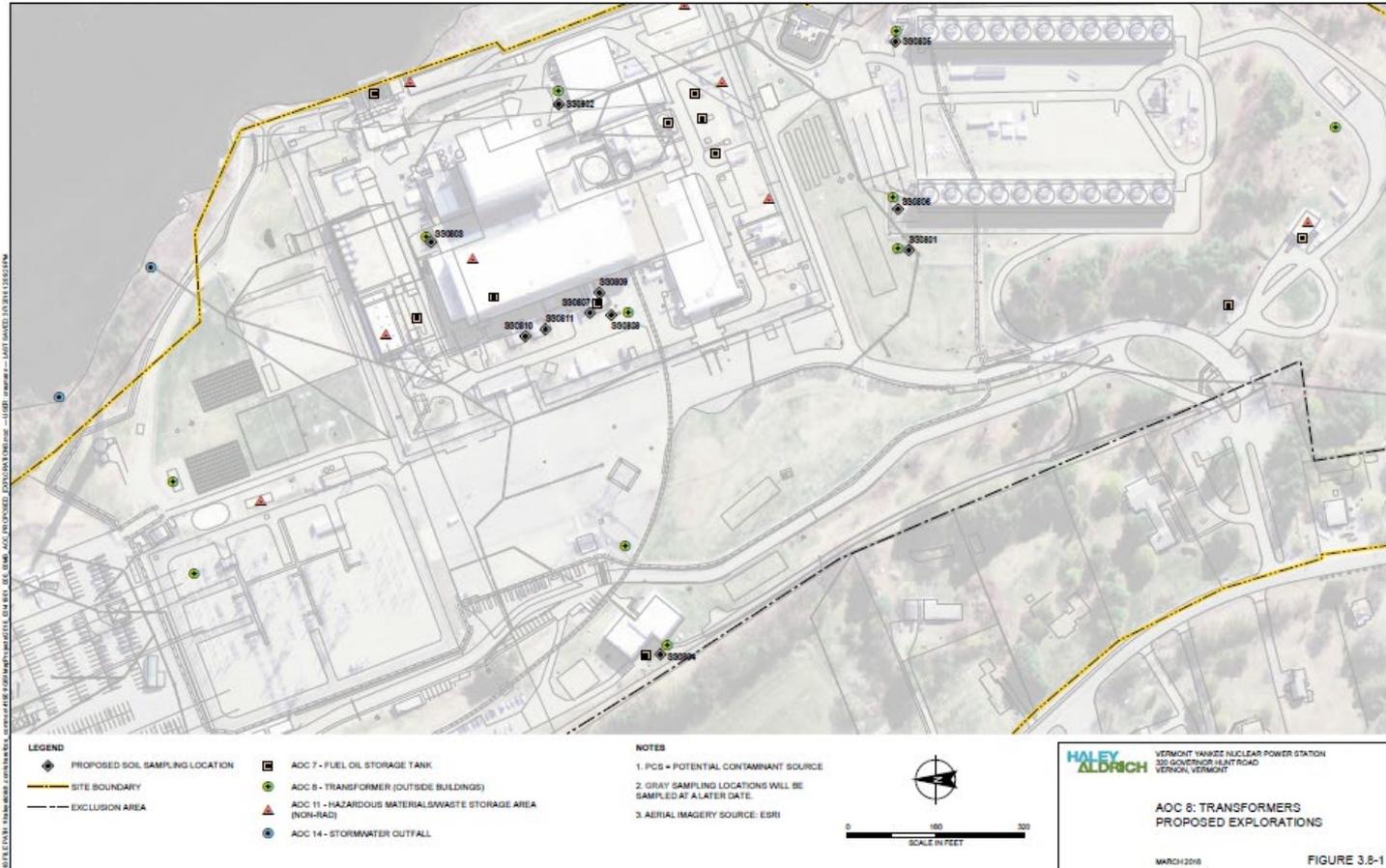
## Initial Proposed Investigation

- Surface Soil Samples from each transformer location
- Subsurface Samples from each transformer location

## Additional Proposed Investigations

- Dependent on initial investigation results

# AOC 8 – Transformers



# AOC 9 – Intake and Discharge Systems

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- Both systems contained hydraulic gates to control flow with associated sump tanks
- Fuel oil AST within the Intake Building Structure
- No reports of spills/issues – components have been removed
- COCs include: SVOCs, sodium hypochlorite (bleach) and metals/PCBs associated with the coatings/paint

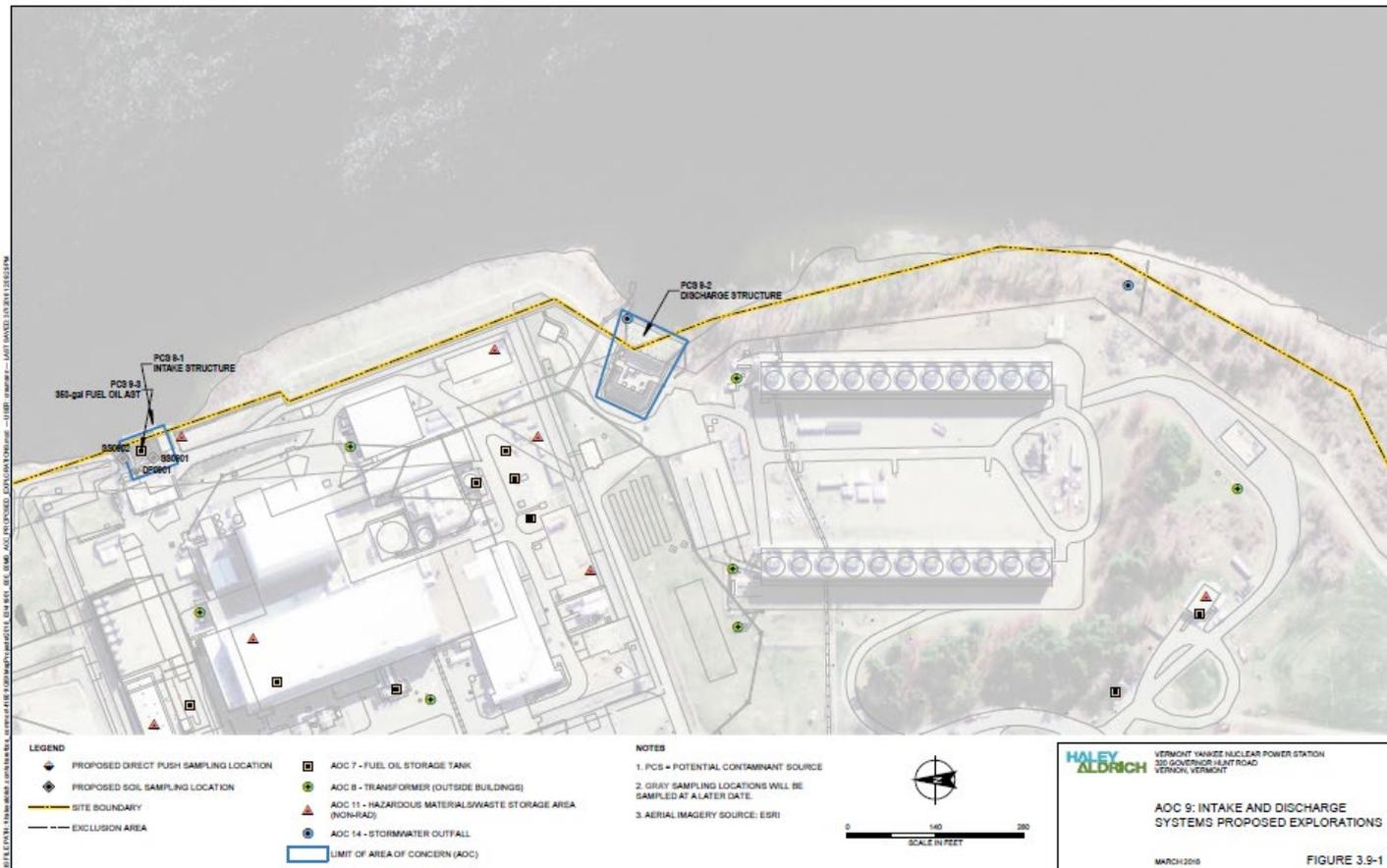
## Initial Proposed Investigation

- Visual inspection following AST removal

## Additional Proposed Investigations

- Surface Soil Sample at the AST location
- Subsurface Samples at the AST location following removal of tank and building

# AOC 9 – Intake and Discharge Systems



# AOC 10 – Parking Lots

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- Three general parking areas onsite – Main Parking Lot, Plant Support Building Parking Lot, and Overflow Parking Lot
- Main and PSB Parking Lots paved, Overflow Lot gravel
- COCs include PAHs, TPH

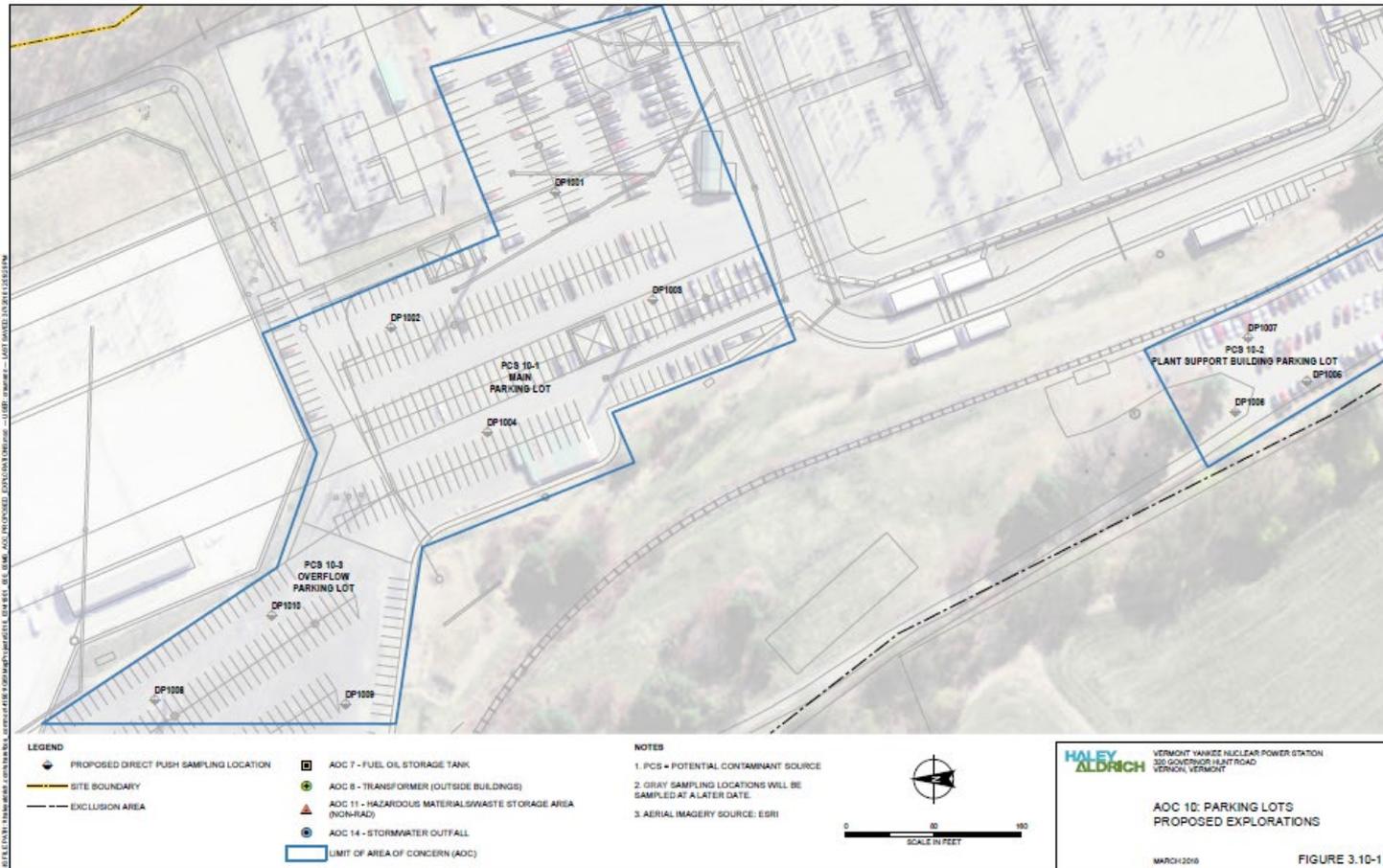
## Initial Proposed Investigation

- Lots still in use – no current proposed activities

## Additional Proposed Investigations

Subsurface Samples throughout the lots following termination of use

# AOC 10 – Parking Lots



# AOC 11 – Hazardous Materials Storage

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- Short-term storage areas for universal and hazardous waste materials
- Located in small modular metal structures and an area within the site warehouse
- COCs include: VOCs, SVOCs, metals, PCBs

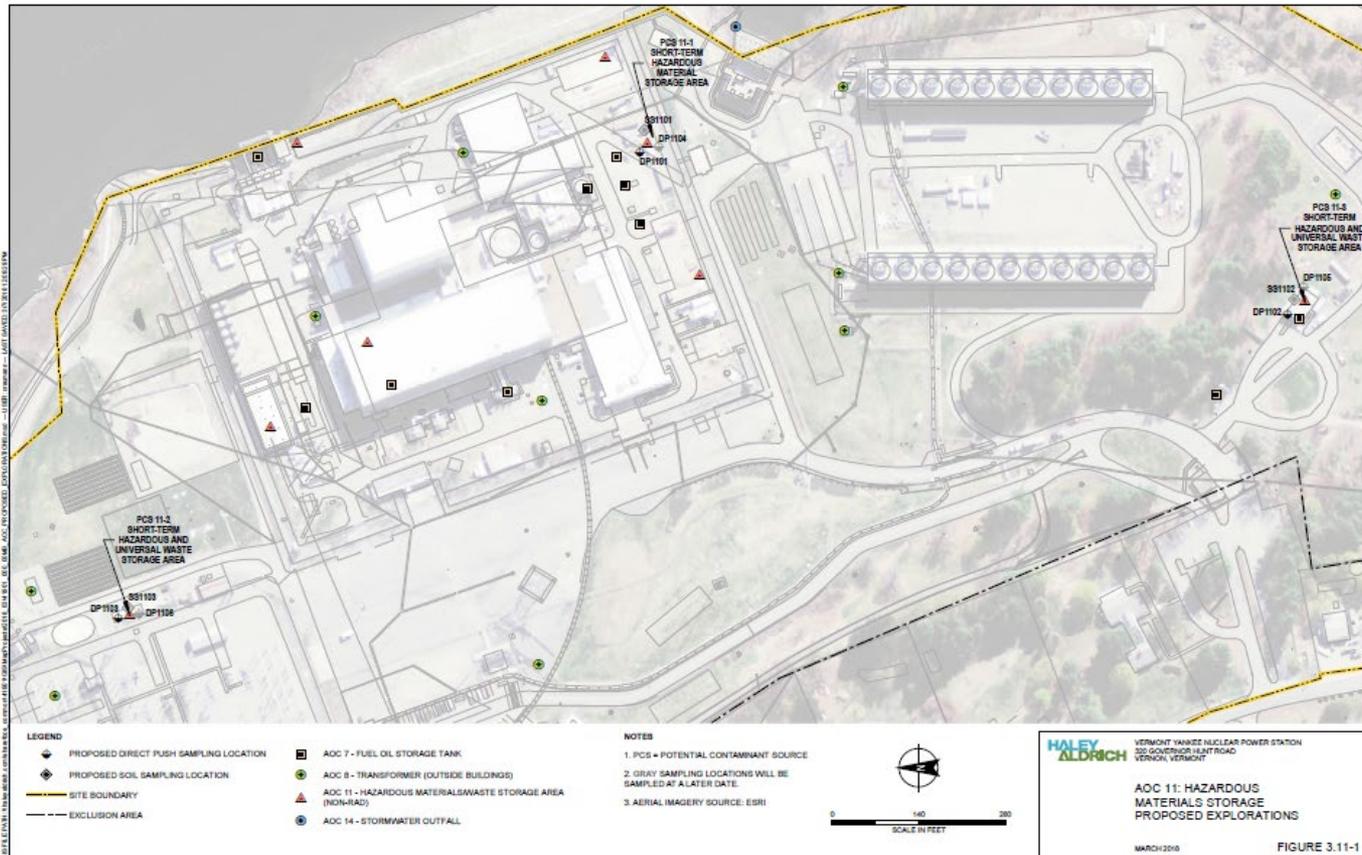
## Initial Proposed Investigation

- Subsurface Samples at each location

## Additional Proposed Investigations

- Surface Soil Samples at each location
- Subsurface Samples at additional locations surrounding the storage areas

# AOC 11 – Hazardous Materials Storage



# AOC 12 – Former Edson's Gulf Station and Garage

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- Gasoline filling and automobile repair facility
- USTs removed and found to be leaking – investigation and remediation completed with SMAC designation in 2009
- Fuel oil AST still present
- COCs include: VOCs, SVOCs, metals, PCBs

## Initial Proposed Investigation

- Subsurface Samples by the former USTs and dry well

## Additional Proposed Investigations

- Subsurface Samples by the former hydraulic lift and floor drain
- Surface Soil Samples if building is removed

# AOC 12 – Former Edson’s Gulf Station and Garage



# AOC 13 – Septic Systems and Application Areas

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- Six septic systems and two application areas onsite
- South Application Field contains low level radiological materials
- North Application Field never used for septic, but drums and debris observed
- COCs include: SVOCs and metals

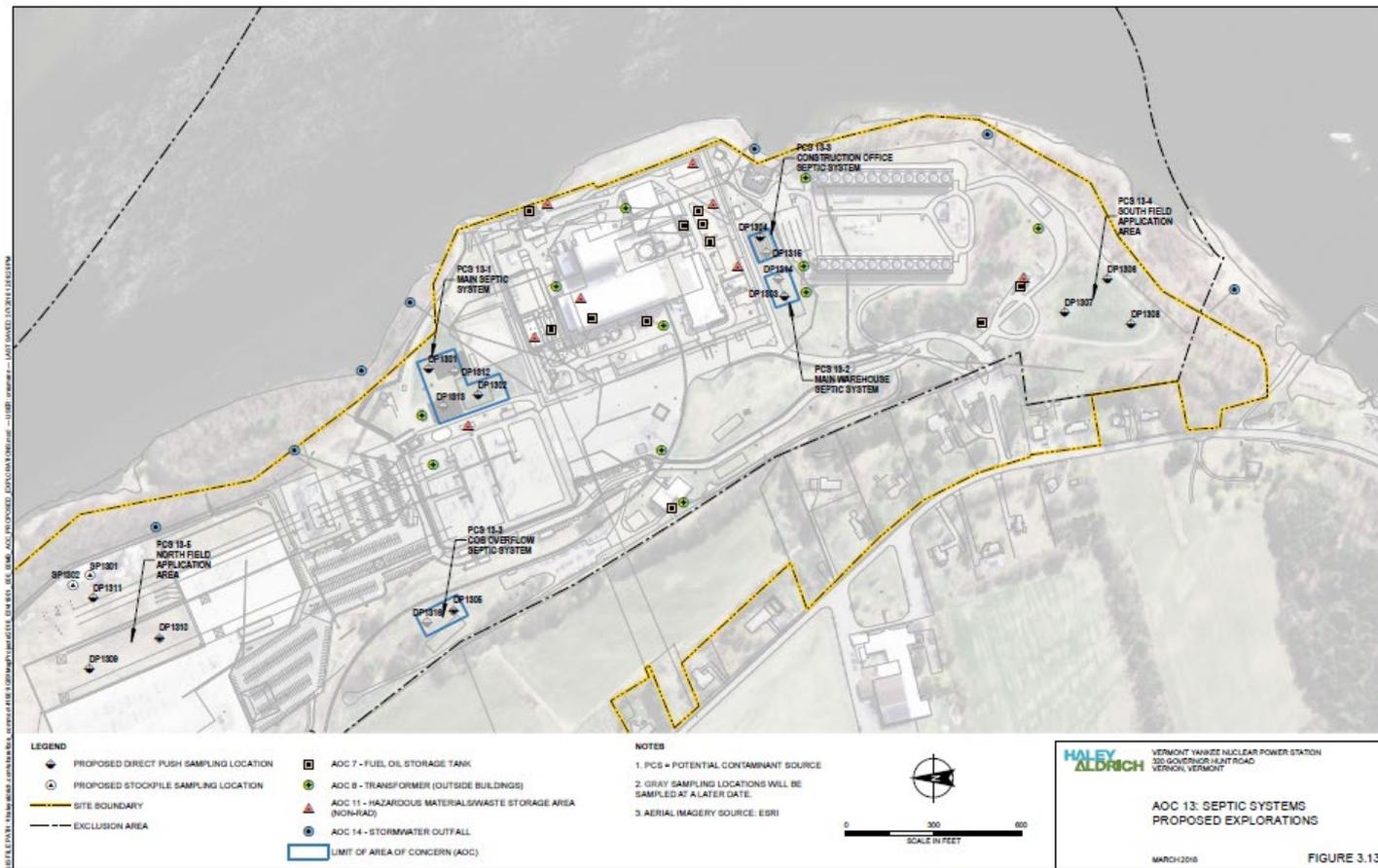
## Initial Proposed Investigation

- Subsurface Samples throughout each septic and application area

## Additional Proposed Investigations

- Subsurface Samples at additional locations within the septic and application areas

# AOC 13 – Septic Systems and Application Areas



# AOC 14 – Storm Water Outfalls

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- Six main outfalls along the Connecticut River
- Oil/water separators in storm water systems
- No reported issues with systems or outfalls
- COCs include: metals and PCBs

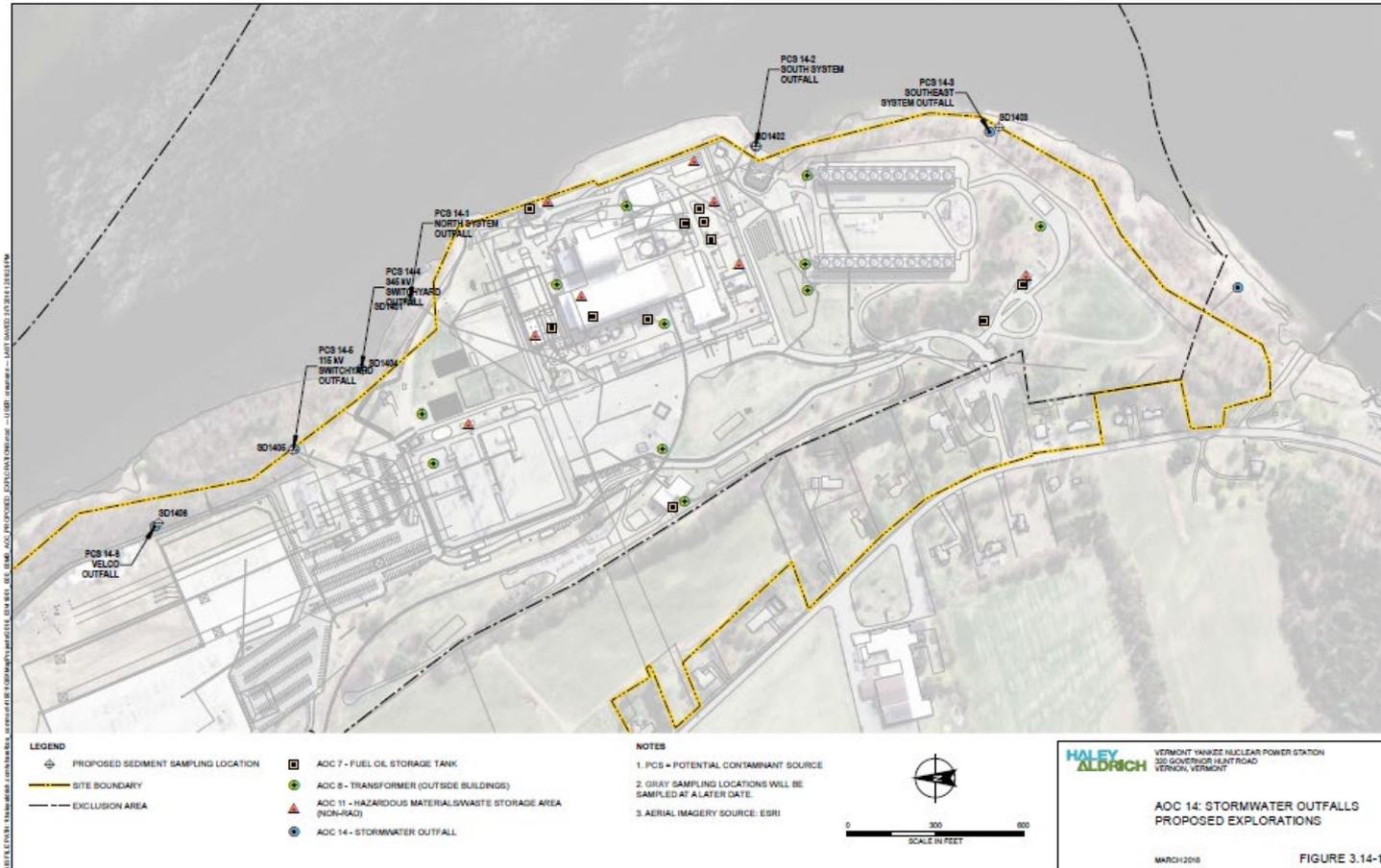
## Initial Proposed Investigation

- Sediment Samples at each accessible outfall location

## Additional Proposed Investigations

- Dependent on initial investigation activities

# AOC 14 – Storm Water Outfalls



# AOC 15 – Cooling Tower Area

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- Supported by creosote-coated timbers reportedly
- Sediment storage area between the towers
- Equipment and materials laydown area SE of the towers
- COCs include: PAHs, metals, ACM, and PCBs

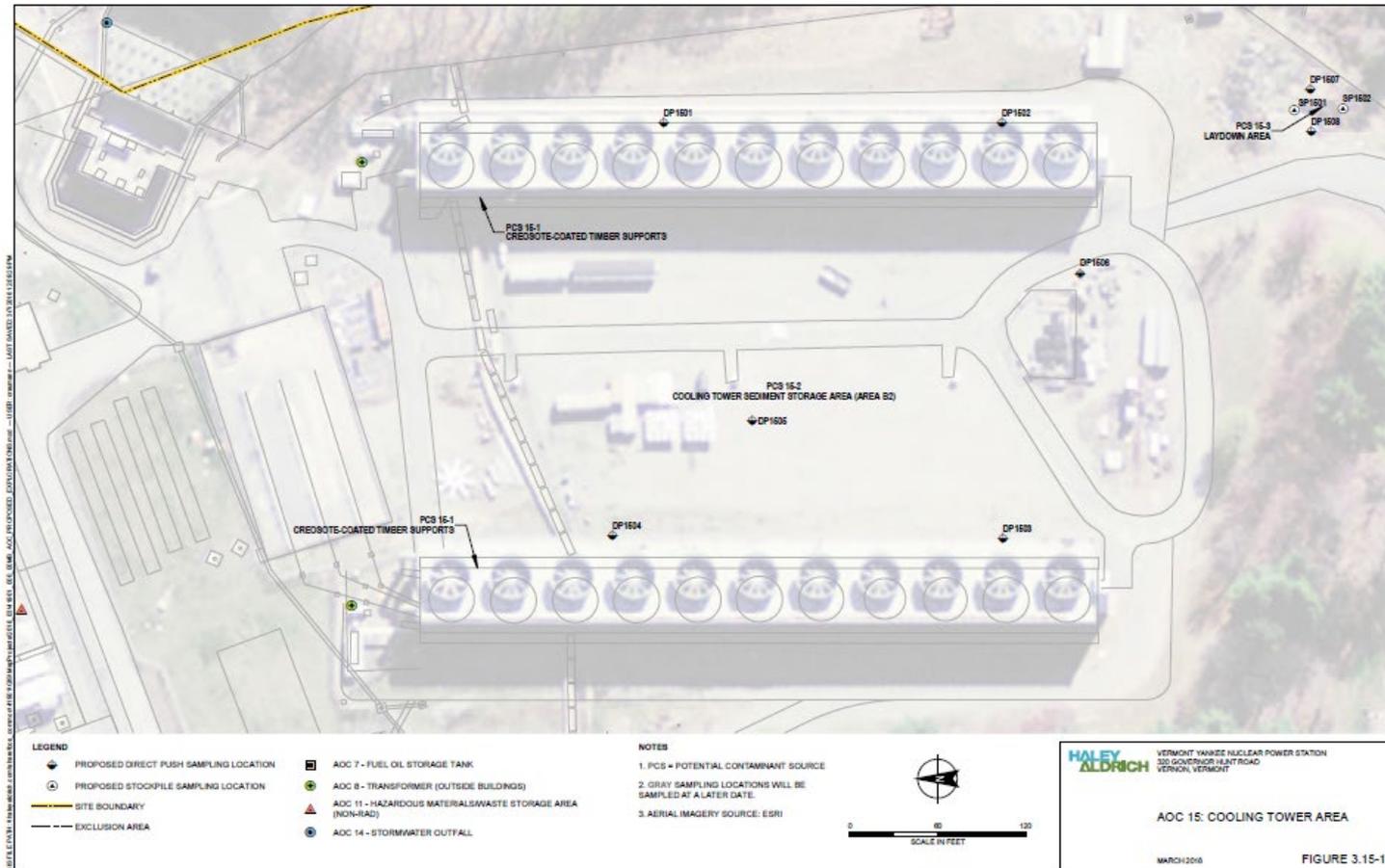
## Initial Proposed Investigation

- Subsurface Samples from each of the areas
- Stockpile Samples from the sediment storage area

## Additional Proposed Investigations

- Dependent on initial investigation activities

# AOC 15 – Cooling Tower Area



# AOC 16 – Groundwater

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- Groundwater in overburden and bedrock, flows to the river, first encountered 15 to 10 feet below grade
- Robust groundwater modeling completed for the release associated with the AOG. Groundwater characterized for radiological constituents, but not for chemical parameters
- 31 wells to be samples quarterly per the groundwater monitoring program
- COCs include: VOCs, SVOCs, metals (PFOAs, PCBs where warranted)

## Initial Proposed Investigation

- Collect groundwater samples from selected wells
- Grab samples from piezometers at identified AOCs

## Additional Proposed Investigations

- Collect samples to understand seasonal variation
- Bound impacted areas (vertically and horizontally)
- Refine groundwater conceptual site model as needed



# Groundwater Monitoring Plan

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- Quarterly monitoring of Site wells
  - Well condition survey (condition of some wells and construction details not known)
  - Plan for quarterly samples for VOCs, SVOCs, and Metals.
  - PCBs and Petroleum will be collected for one round from wells located near current and former oil storage areas (i.e. USTs, ASTs, transformers, etc.)
  - PFOAs and dioxins will be collected for one round from wells near the main and auxiliary transformers
- Characterization work plan: collect grab samples from AOCs and from where soil/groundwater impacts are confirmed, additional wells will be added
- 4 quarters of clean samples, specific parameters/analyses may be discontinued
- If no contaminants exceed the GWPC criteria, and no sources identified up gradient, sampling of that well may be discontinued

# Building Characterization Work Plan

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Developed to understand:

- IH concerns with paints and coatings
- Off-Site disposal disposition
  - Hazardous Materials
  - Lead Based Paint
  - PCBs/EPA Toxic Substance Control Act compliance
  - Asbestos Containing Material

Initial characterization effort completed in 2017

- Coatings, paint, roofing materials, and caulks tested
- Total and TCLP Metals and PCBs
- Limited areas of impacted materials
  - All types of paint tested
  - 10 types of cables tested for PCBs
- All buildings and structures tested
  - Facilitates removal of minor structures (sheds, shacks, support buildings) when needed

As soils are exposed, survey (and possibly sample) soils to document conditions

# Building Characterization Results

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- A total of 126 samples have been collected to-date from building materials (paints/coatings, siding, caulking, concrete, roofing)
- No PCBs detected above US EPA TSCA thresholds
- Lead-based paint discovered in several buildings
- Lead and mercury detected above RCRA Hazardous Waste criteria in 15 total samples
- ACM detected in one caulking sample

# Borrow Materials Import Plan

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NNDC will require fill to be placed on site to backfill deeper basements

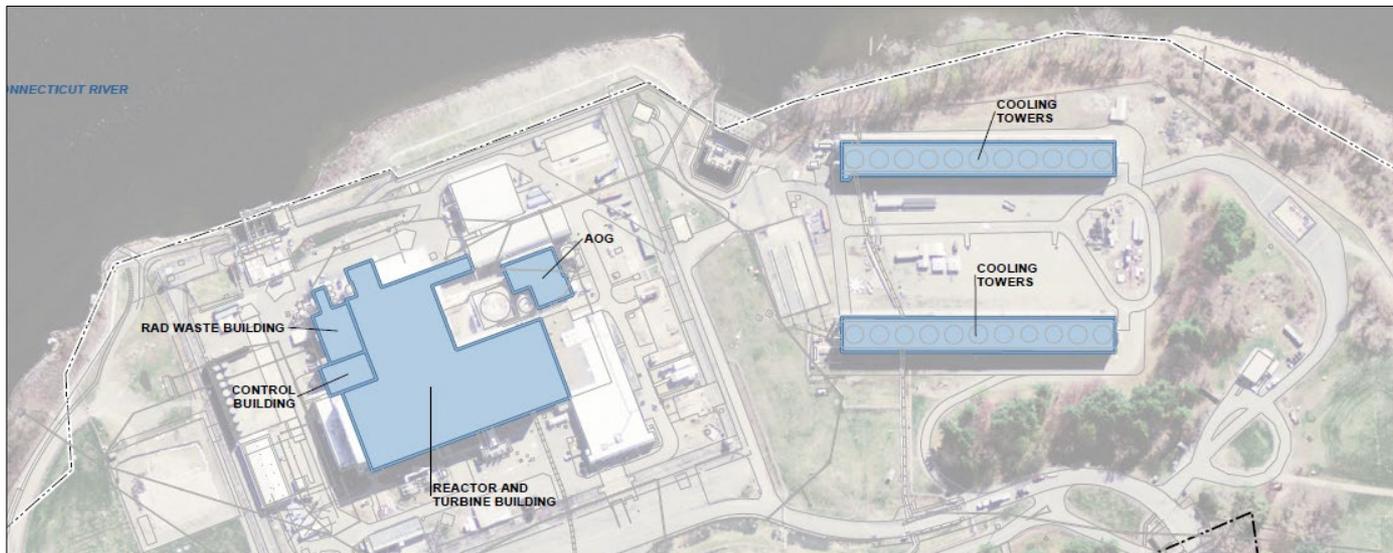
Borrow pit/fill sources will be reviewed prior to acceptance, supported by laboratory testing to confirm that the soil meets ANR criteria

- Borrow pits will provide virgin sands and gravels
- Samples will be collected at a frequency of approximately 1 per 1,000 cubic yards
- Source materials will be free of debris
- Locally sourced to minimize truck traffic

# Below Grade Structure Survey Work Plan

Deeper Basement Structures to remain on site below 4 feet bgs

- Turbine Building
- Reactor Building
- Radwaste Building
- Service/Admin Building
- Advance Off Gas Building
- Cooling Towers
- Intake and Discharge Structures
- Tunnels and Piping



# Concrete Reuse Plan

Per the MOU, concrete from the cooling towers and the intake structures may be reused

- Samples for metals if not coated
- If coated/painted, metals, TCLP metals and PCBs
- Visual survey for stained areas
  - Then sample for SVOCs and PCBs as warranted



# Contacts

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Billy Reid  
Vice President, Program Manager  
[BReid@NorthStar.com](mailto:BReid@NorthStar.com)  
865.384.6789

Nelson Langub  
Senior Decommissioning Manager  
[NLangub@NorthStar.com](mailto:NLangub@NorthStar.com)  
404.707.1587

Corey Daniels  
Senior ISFSI Manager  
[CDaniels@NorthStar.com](mailto:CDaniels@NorthStar.com)  
802.451.5354, ext 2501

Gregory DiCarlo  
Vice President and General Counsel  
[GDicarlo@northStar.com](mailto:GDicarlo@northStar.com)  
203.222.0584

Nadia Glucksberg  
Environmental Lead  
[NGlucksberg@HaleyAldrich.com](mailto:NGlucksberg@HaleyAldrich.com)  
207.632.4016

Miles van Noordennen  
Investigation Lead  
[MvanNoordennen@HaleyAldrich.com](mailto:MvanNoordennen@HaleyAldrich.com)  
860.290.3114

Elida Danaher  
Permit Compliance  
[EDanaher@HaleyAldrich.com](mailto:EDanaher@HaleyAldrich.com)  
860.290.3116