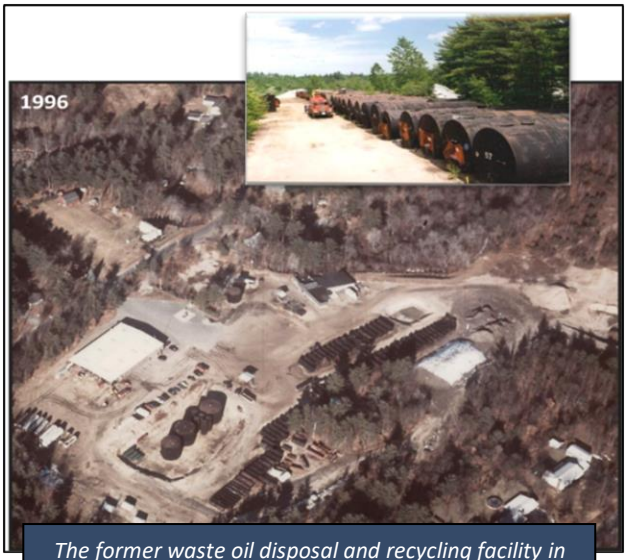
SUSTAINABLE REMEDIATION A CATALYST FOR WATER CONSERVATION AND MULTI-YEAR WILDLIFE REHABILITATION AND ENHANCEMENT PROGRAM

SURF Case Study #0016

This case study highlights how embedding sustainable design principles provides a greater environmental benefit for overall site remediation and the surrounding community.

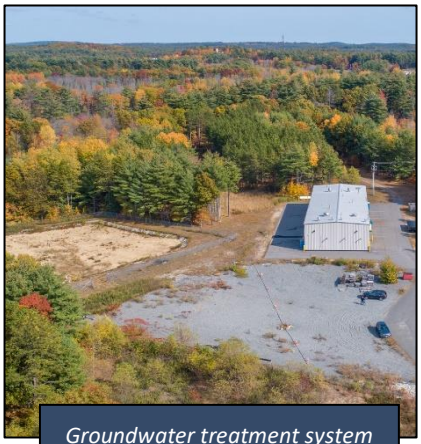
BACKGROUND

- In a New England town where most residential properties rely on private drinking water wells, groundwater remediation and conservation are being addressed through a combination of remedies with a focus on greener cleanup best practices.
- The approach is being implemented in the source area and downgradient plume to address the following:
  - Polychlorinated biphenyls (PCBs) in surface soils, and
  - Chlorinated and aromatic volatile organic compounds (VOCs; including 1,4-dioxane) and PFAS impacting the aquifer due to the hydraulic influence of downgradient residential drinking water wells.
- Two main waste oil source areas included a former lagoon and above- and underground storage tank areas.
- Poor waste handling resulted in impacts to shallow soil and groundwater.



The former waste oil disposal and recycling facility in 1996 when it was placed on the National Priorities List

REMEDIAL STRATEGY

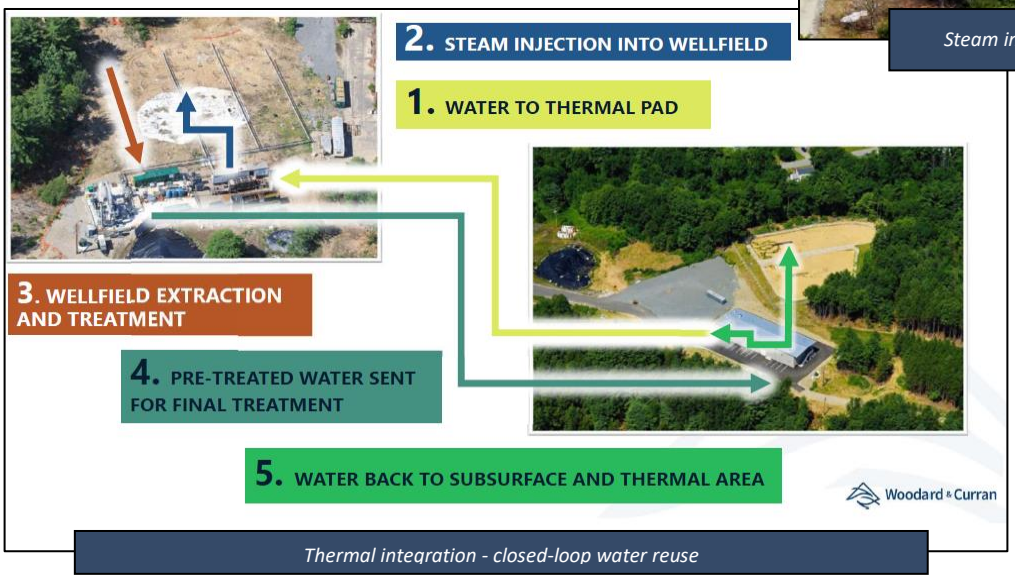

Groundwater treatment system

- Remedial Goal: Restore groundwater aquifer and prevent impacts to adjacent brook.
- The project team worked collaboratively with the Agency team to re-sequence the remedy in the Record of Decision (ROD) and implement groundwater treatment first to:
  - Mitigate the highest level of identified risk (i.e., downgradient drinking water impacts); and
  - Use the treatment system for process water supply during future source remediation and removal activities.

AQUIFER RESTORATION AND CONSERVATION

- Over 470 million gallons of contaminated groundwater have been treated to drinking water standards and discharged back to the ground. The groundwater treatment system has been successful in:
    - Maintaining the residential water supply, and
    - Preventing water loss from an adjacent brook that has been identified as a wildlife habitat corridor by the Nature Conservancy's Connect the Coast efforts.
- In September 2018, the state reduced the 1,4-dioxane standard from 3 µg/l to 0.32 µg/l. The groundwater treatment system had been operating for nearly five years and, because it was designed to address the anticipated reduction, was immediately in compliance and required no modifications.
- Two source areas were thermally treated to remove oil and reduce soil concentrations below leachability goals.
    - Removed over 500,000 pounds of VOC mass.
    - Recovered over 70,000 gallons of oil.
    - Used treated groundwater to generate steam during thermal remediation, conserving over 27 million gallons of water.
- Avoided transporting over 11.3 million gallons of water to the site by using treated water, reducing greenhouse gas emissions by 65.4 metric tons.

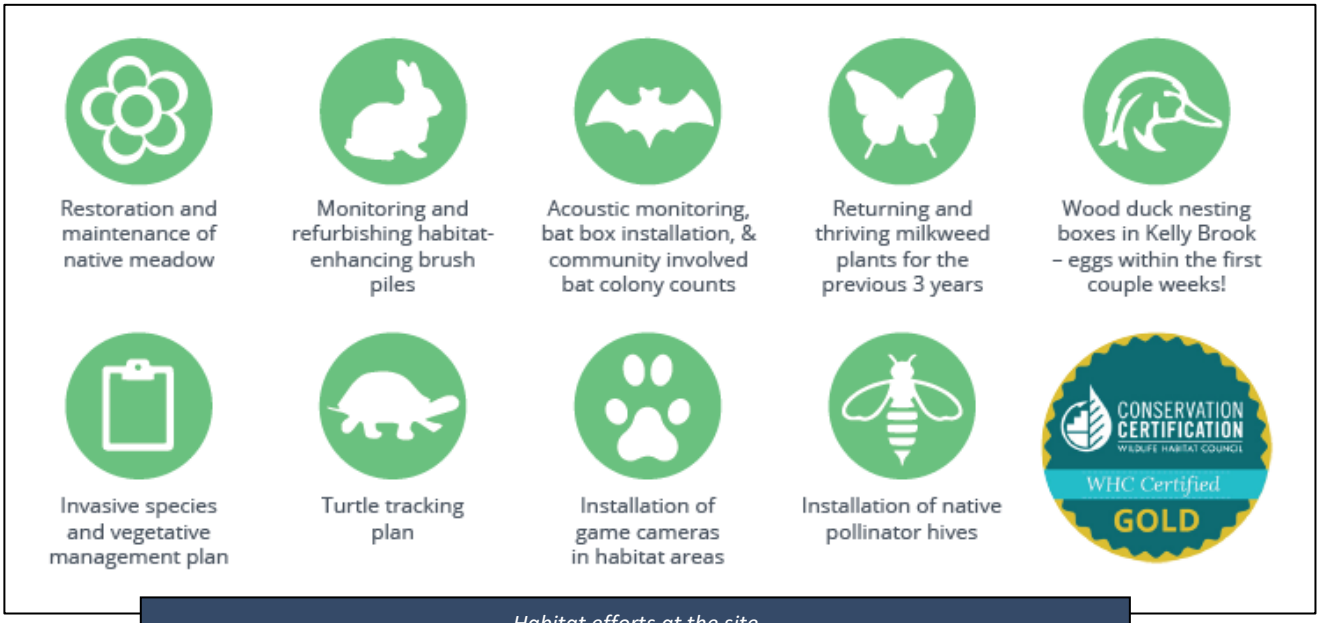
Steam injection into wellfield



Thermal integration - closed-loop water reuse

WILDLIFE HABITAT RESTORATION AND ENHANCEMENT

- The installation of the groundwater system injection well network disturbed an on-site area , which sparked a multi-year conservation effort to rehabilitate and foster habitat for area wildlife at the site.
- A native wildflower meadow and additional habitat for local birds and small mammals was established first; these efforts were recognized by the Wildlife Habitat Council with certification in 2015.



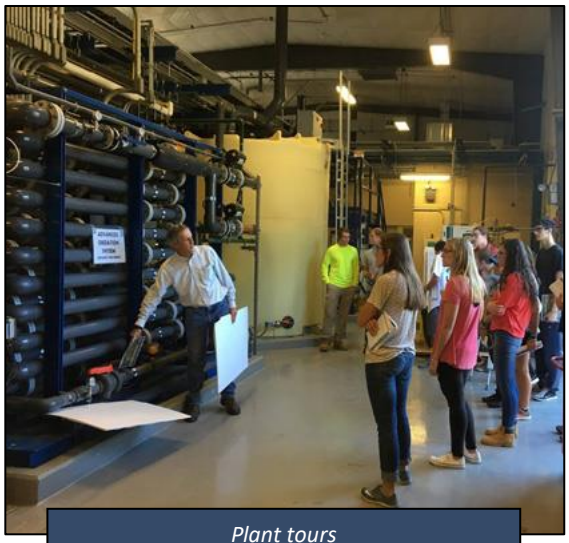
Habitat efforts at the site

- Game cameras at the site show that wildlife is not just passing through but also breeding and starting families in this conservation area. This supports the Connect the Coast work by providing both a safe transfer point for wildlife and a secluded spot away from the busy commercial district not far from the site.

MEANINGFUL STAKEHOLDER ENGAGEMENT

An important part of sustainable remediation involves sharing and collaborating with the community. The client and project team have incorporated these actions into all phases of remediation, which has included:

- Holding annual open houses (virtual during COVID) to provide updates and allow the community to help with bat counts
- Teaming with local high school STEM program leaders

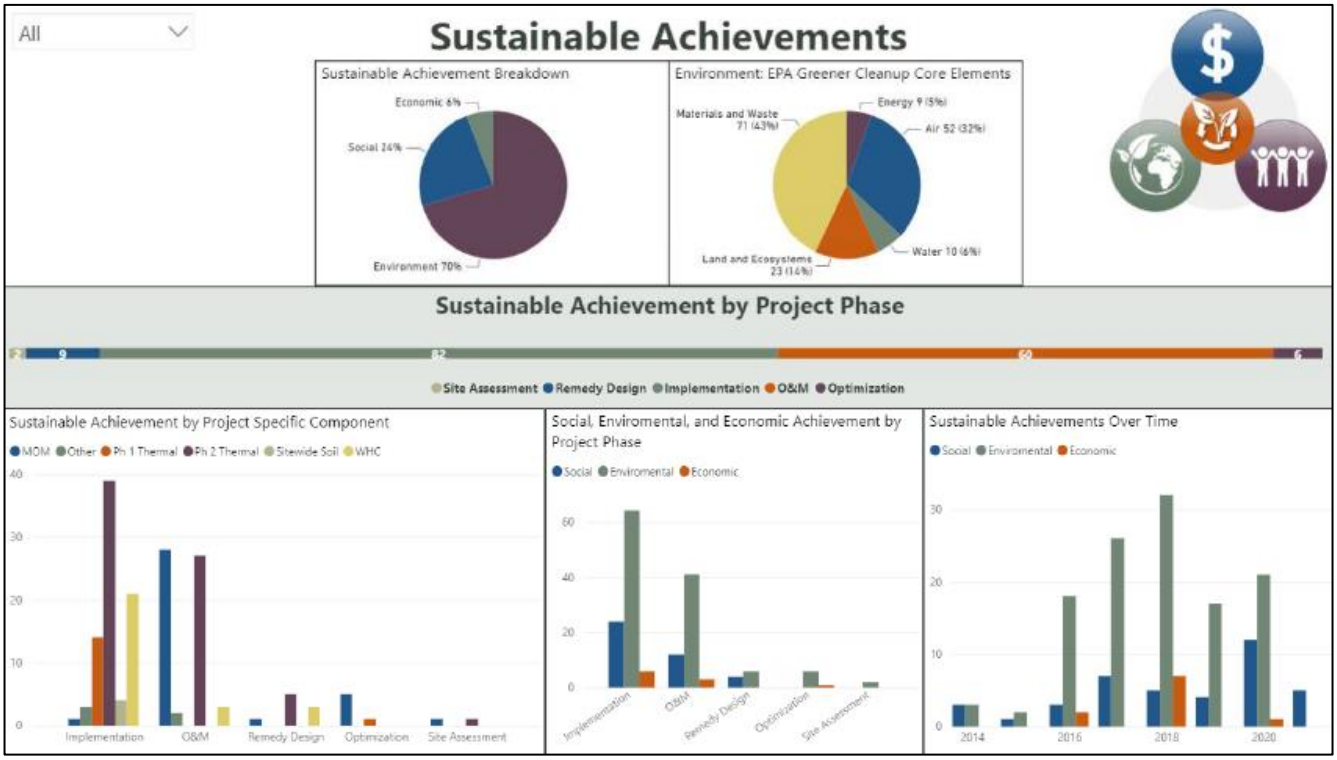


Plant tours

- Working with local Girl Scouts who help support habitat work
- Conducting treatment plant tours for University of New Hampshire students
- Participating in the town's annual Earth Day cleanup of surrounding roadways
- When possible, working with area contractors and businesses to support the local economy (over 70 area businesses supported).

SUSTAINABLE REMEDIATION

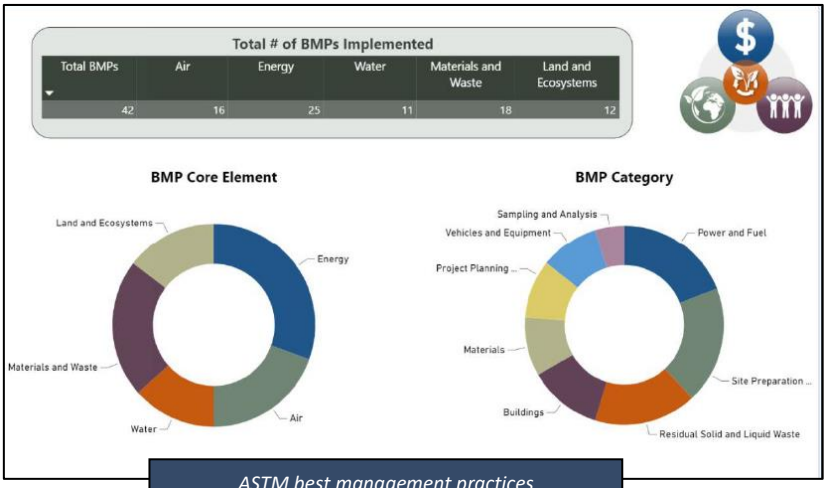
Through mid-2022, 173 sustainability actions have been implemented and tracked, with 144 of these focused on environmental efforts. The project team routinely documents these actions, and progress can be reviewed by stakeholders through an interactive dashboard (screenshots below).



Some of the sustainability actions implemented include the following:

- Used treated groundwater for steam generation during thermal remediation and for dust suppression during subsequent construction and remediation activities, reducing greenhouse gas emissions associated with transporting water to the site by 65.4 metric tons.

- Used treated water for dust suppression during construction, saving over $10,000.
- Reused materials on-site – soil, piping, and cleared logs and brush for habitat enhancement.
- Used the on-site system to treat decontamination water, saving over $100,000.
- Used extracted groundwater to geothermally heat the treatment building (break-even savings).
- Used remote technology to enhance safety and reduce the number of trips to the site, which reduced greenhouse gas emissions.
- Used solar-powered remote monitoring stations (air, dust, weather).



ASTM best management practices

During thermal remediation, the Agency team expressed concern about potential oil migration outside the treatment area when the ground was heated. Solar-powered belt skimmers were used at select locations between the treatment area and the brook to recover oil, thereby reducing monitoring and labor efforts.

In addition to sustainability actions, the project team documents ASTM Greener Cleanups best management practices (BMPs). To date, 42 BMPs have been implemented.

KEY LESSONS LEARNED

Resequencing the remedy in the ROD provided opportunities for water conservation, reuse, and the overall sustainability of the project. Integrating these remedial components was critical to the success of the site's sustainable approach to mass removal; to addressing source and downgradient groundwater impacts; and, importantly, conserving the area's water resources and maintaining base flow conditions in the adjacent surface-water body. Highlights of key lessons learned are below.

- Conservation efforts can lead to engagement opportunities with the surrounding community, academia, and other stakeholders.
- Building on the success of early actions allows habitat work to expand.
- Translating metrics for other audiences helps understanding and promotes meaningful engagement (e.g., 65.4 metric tons saved by using treated water from the on-site plant for steam generation during the thermal treatment process is equivalent to avoiding using 7,362 gallons of gas, which would require the sequestration of 85 acres of U.S. Forest in one year to offset carbon emissions).
- A project website, Facebook page, and YouTube channel reinforces face-to-face stakeholder engagement and transparency.

FOR MORE INFORMATION…

This case study will be the topic of a SURF webinar on October 5, 2022.

Go to SURF's YouTube channel to access the recording.

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