

Optimizing Remediation to Achieve Closure at Multiple Sites at Vermont Air National Guard Base



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75 Years of Airbase Operations



LEGEND
 VTANG Base Boundary
 RA Site Boundary

North
 Approximate scale in feet
 1" = 1,600 feet
 0 400 800 1,600

Figure 1
 Site Installation Map
 VTANG, South Burlington, Vermont

- August 1946 Vermont Air National Guard 134th Fighter Squadron recognized
- P-51, F-89D, F-4D
- 1986 F-16 Fighting Falcon
- 2019 F-35 Lightning II



P-51 Mustang



F-16

7 Environmental Restoration Program Sites:

- FT001 – Former Fire Department Training Area & Old Landfill
- FL002 – Former Construction Debris Landfill
- DP003 – Pumps, Oils, Lubricants (POL) Pumphouse
- SD004 – Stormwater Drainage Ditch
- SS005A – Former Refueling Pits
- SS005B – Former POL Pumphouse and Underground Storage Tanks (USTs)
- DP006 – AOC Former Oil Pit



National Guard Base

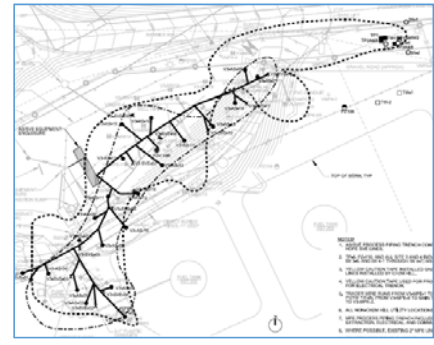
Burlington International Airport

Source: Google Maps

Site 1



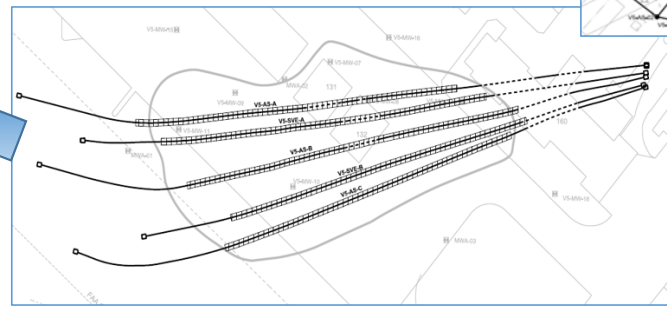
Site 3



Site 5B



Site 5A



History of Decisions

Regulatory Lead – Vermont Department of Environmental Conservation

- Following a CERCLA-like process
 - Site Characterization – 1980's
 - Interim Actions – 2000's (SVE, MPE, LNAPL Recovery, Hyd. Containment)
 - Remedial Investigation Report – March 2010
 - Feasibility Study – August 2010
 - Proposed Plan / Record of Decision – November 2010
 - Remedial Design – December 2011
 - Remedial Construction – 2012
 - Remedial Action Construction Completion Report – April 2013
- ➔ **Operation, Maintenance, Monitoring**

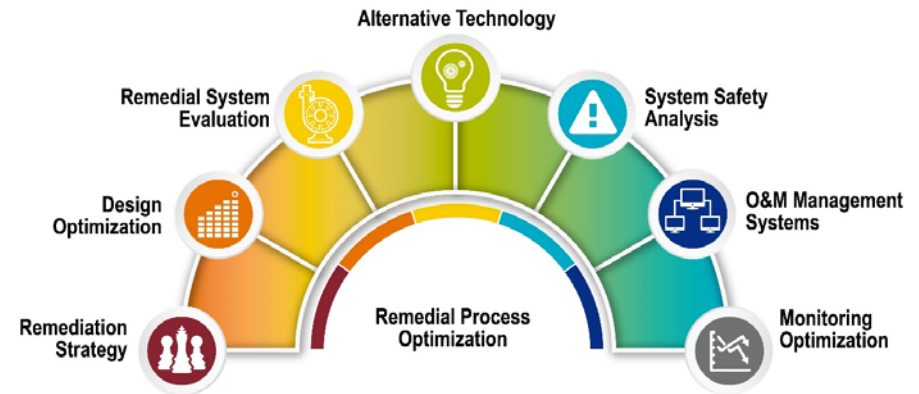


OM&M under a Performance-Based Contract

- Implementation of the Final Remedies and OM&M was conducted under competitively procured PBC with specific metrics:
 - RIP within specific date for each Site (6 total)
 - Maintain high system run times (90 to 95%) for each system
 - Attain no measurable LNAPL (<0.01 ft) in Monitoring Wells
 - Achieve % Reductions in COC concentrations in GW
 - Achieve Site Remediation Goals (MCLs) in Seeps
 - Receive DEC approval to shut down systems
 - Approval of NFRAP DD (ANG and VT DEC)
 - Achieve Site Management Activities Complete status from VTDEC

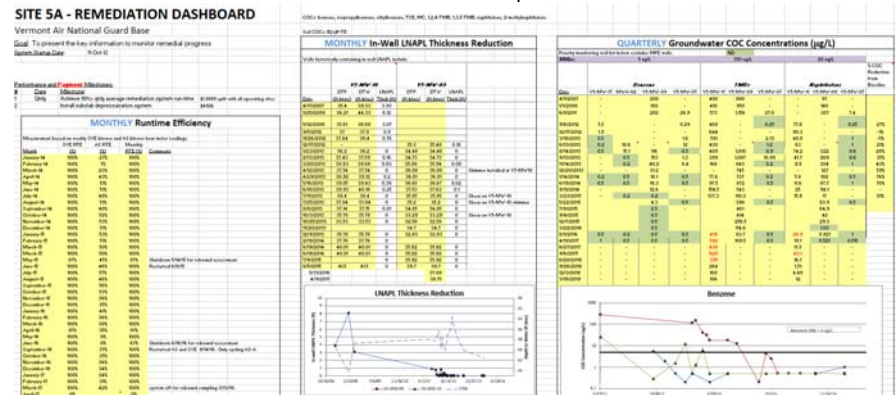
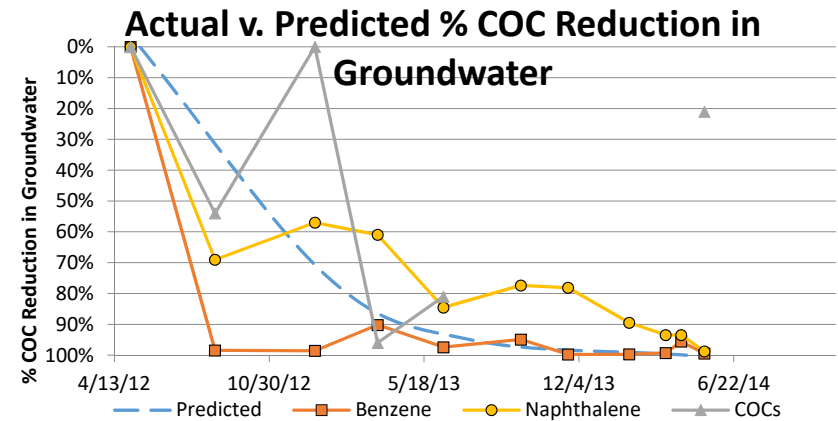
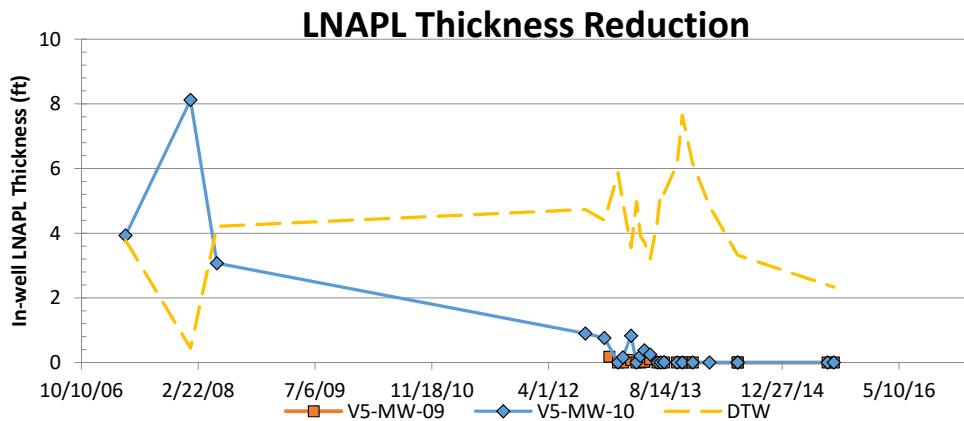
Optimization is Key

- Establish Metrics (Final and Intermediate)
- Track Progress – Dashboards
- Engage Subject Matter Experts Routinely to Review Progress
 - Trends via Data Analytics, Operational Challenges
- If progress is not sufficient, ACT!



Integrated Optimization during OMM

- Routine RPO calls with team and SME (Monthly or Quarterly)
- Assessment of performance relative to metrics
- Identification of activities necessary to enhance performance
- Facilitation of regulatory approval when needed
 - RA WP addenda



Optimization Output

Resampling of Key Wells

Redevelopment of Wells

LTMO – Assessment of location, frequency, and analytes needed for each site (ongoing)

Brushing/cleaning of HDD SVE wells due to corrosion

Focused treatment in areas of rebound

- AC-Based injections
- Supplemental AS/SVE Wells
- Packer Installation in HDD AS wells



AC-Based injections in areas of COC rebound

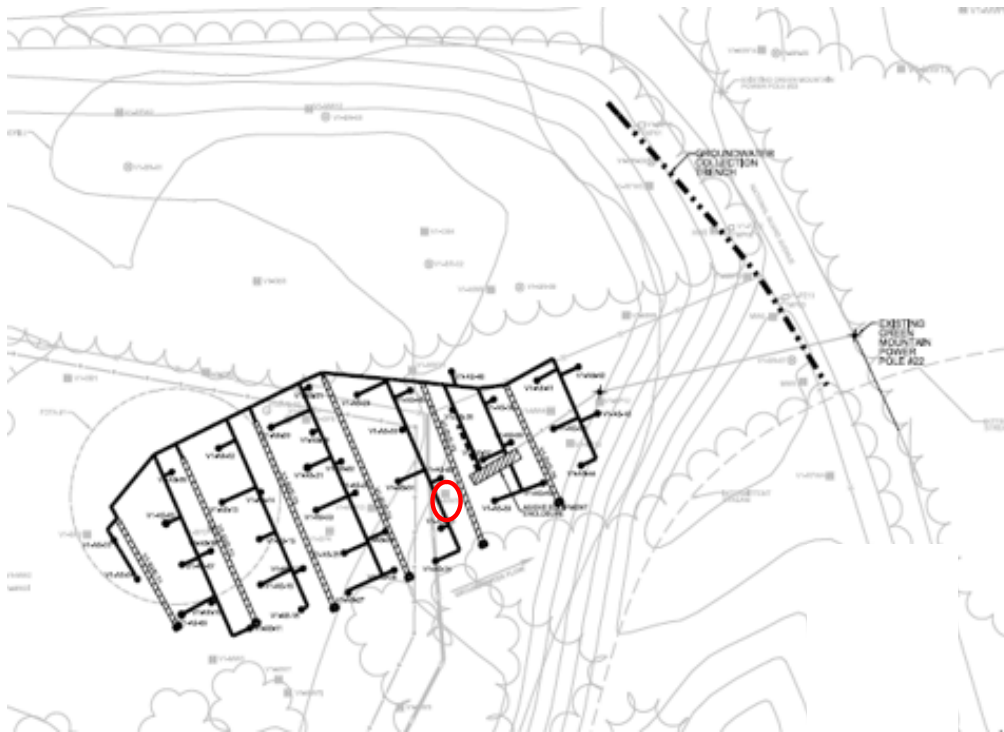


Packer in HDD wells to focus sparge in distal well end



Iron Fouling of Process Pipes

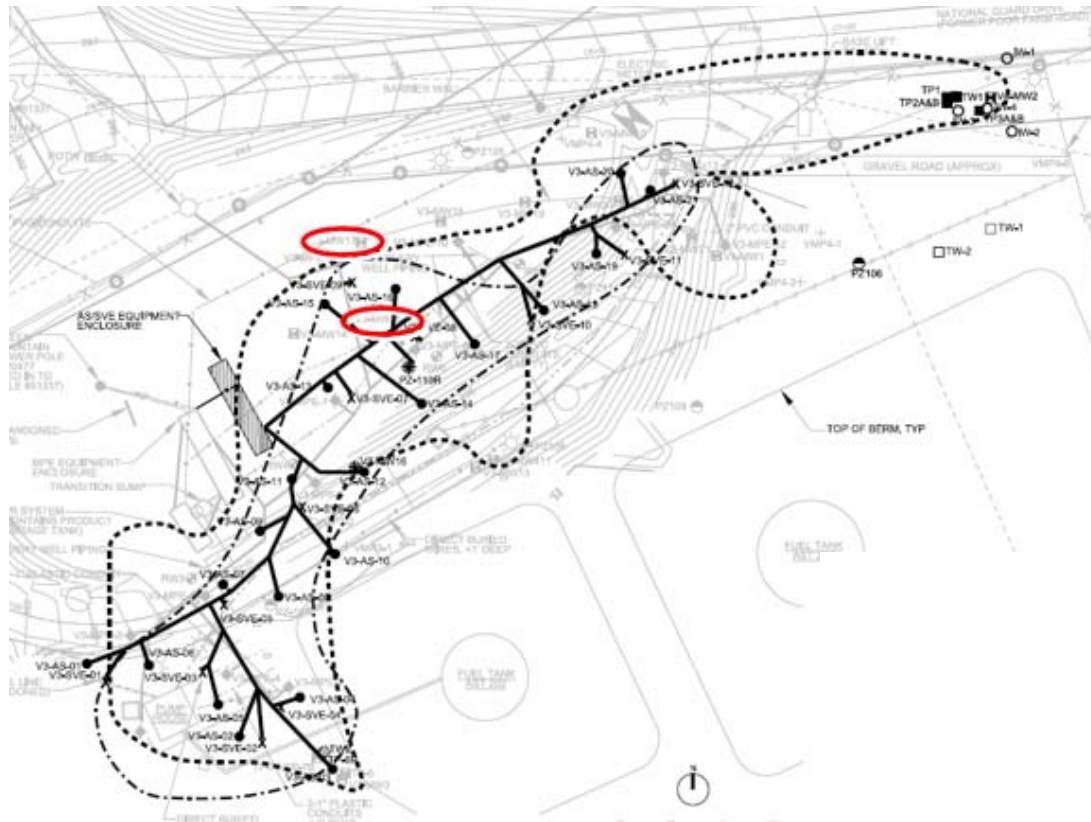
Site 1



- June 2012 – Startup of AS/SVE system
- February 2013 – LNAPL no longer measurable
- November 2014 – Rebound Assessment
- May 2015 – Restart
- August 2015 – Rebound Assessment, V1-MW5 remains above SRGs
- April 2016 – Restart in Focused Areas
- May 2016 – Shutdown
- May 2018 – No Further Remedial Action Required for non-PFAS COCs from VT DEC
- May 2018 to Present – Continued OMM for PFAS treatment system

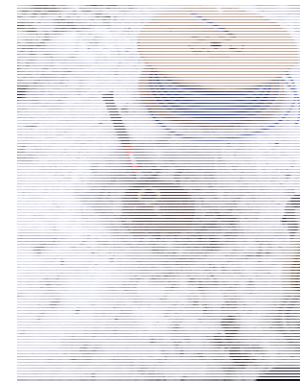
1,740 lbs VOCs removed

Site 3

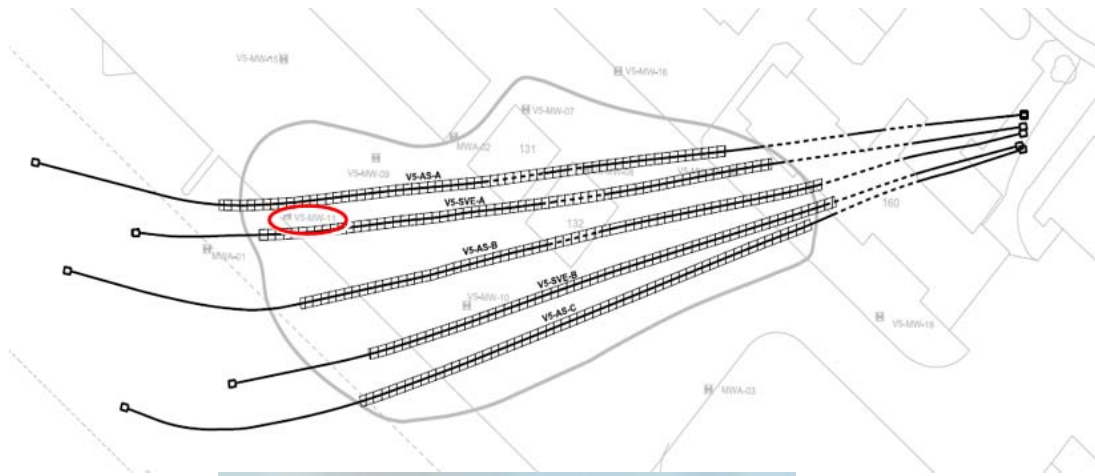


- May 2012 – Startup of expanded multi phase extraction with enhanced bio and ISCO
- July 2013 – LNAPL no longer measurable
- January 2014 – Rebound Assessment
- February 2014 – Restart in Focused Areas
- March 2014 – Rebound Assessment
- August 2014 – Restart in Focused Areas
- October 2014 – Rebound Assessment, V3-MW-15 remains above SRGs
- October 2015 – Focused AC-Based Injections (BOS®200)
- March 2016 – V3-MW15R Installed
- July 2018 – Restart
- November 2018 – Shutdown
- April 2019 – No Further Remedial Action Required from VT DEC

15,492 lbs VOCs removed



Site 5A



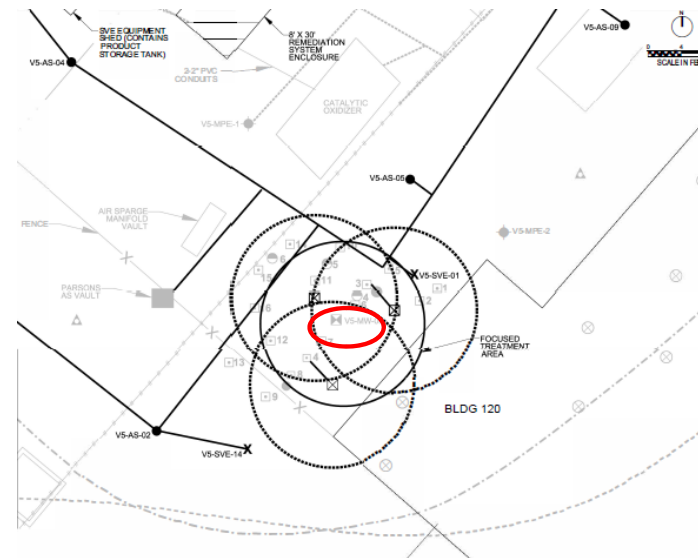
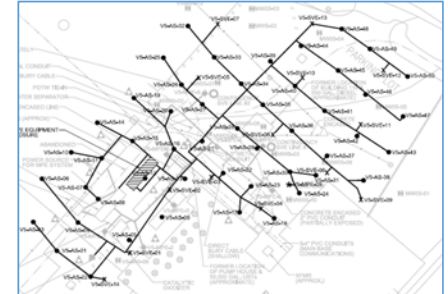
- October 2012 – AS/SVE with HDD Startup
- October 2013 – LNAPL no longer measurable
- February 2014 – Approval to remove catalytic oxidizer vapor treatment
- May 2015 – Rebound Assessment
- June 2015 – Restart with Focused AS/SVE
- June 2016 – Rebound Assessment, V5-MW-11 above SRGs for TMB and naphthalene
- September 2016 – Focused sparging at well AS-A
- March 2017 – Rebound Assessment
- January 2018 – System Operated with SVE due to low gw elevations
- July 2018 – Inflatable Packer installed in AS-A to promote sparging at the distal end of the well
- August 2018 – Restart focused at well AS-A
- November 2018 – System Shutdown
- April 2019 – No Further Remedial Action Required from VT DEC

24,165 lbs VOCs removed

Site 5B

- April 2012 – AS/SVE/MPE System Startup
- July 2013 – LNAPL no longer measurable
- October 2014 – Rebound Assessment
- October 2015 – Focused AC-Based Injections (BOS®200) in V5-MW06 area
- March 2016 – Rebound Observed V5-MW06
- October 2016 – Focused SVE operation
- December 2016 – Installation of 3 additional AS wells in V5-MW06
- January 2017 – Restart Focused AS/SVE at 3 new wells
- June 2017 – System Shutdown
- May 2018 – No Further Remedial Action Required from VTDEC

24,625 lbs VOCs removed during system operations



The Outcome

- Average run times exceeded 98% for treatment systems in northern winter climate
- Achieved ~\$300K savings in operations through optimization activities (not including savings in avoiding future operations)
- Achieve Closure at 4 IRP Sites in 6 – 7 years after implementation of Final Remedies
- Achieved full contract value by meeting all operational and closure metrics for these sites

The Take-Away

- Performance Based Contracts pushed the team to aggressively optimize systems
- Remedial Process Optimization was key to staying on track and progressing to Site Closure
- PBC allowed flexibility to modify approaches once in OM&M phase
- Engaging the regulator early and often minimized transactional and administrative burden



Wrap Up

- No Further Remedial Action Planned achieved for four sites
- NFRAP DD achieved for three sites described in this presentation
 - Site 1 – Continued operation (PFAS treatment)
 - Site 2 – Long term rebound assessment
 - Site 4 – Rebound Assessment
 - Site 6 – No remediation required, AOC closed
- Site 3, 5A, 5B were completely decommissioned Summer 2020 and returned to original use for ANG

Thank you to Project Team:

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Peter Dufault, State Environmental Officer, Vermont Air National Guard