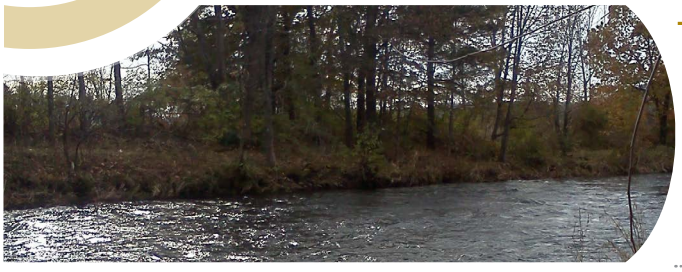
Savage Municipal Water Supply Well
Superfund Site, Milford, NH

U.S. EPA | SUPERFUND CLEANUP PROGRAM AT EPA NEW ENGLAND



THE SUPERFUND PROGRAM *protects human health and the environment by investigating and cleaning up often-abandoned hazardous waste sites and engaging communities throughout the process. Many of these sites are complex and need long-term cleanup actions. Those responsible for contamination are held liable for cleanup costs. EPA strives to return previously contaminated land and groundwater to productive use.*

YOUR OPINION COUNTS: OPPORTUNITIES TO COMMENT ON THE PLAN

As the lead agency[1], EPA will be accepting public comments on this proposed cleanup plan from August 4, 2015 through September 3, 2015. You don't have to be a technical expert to comment. If you have a concern, suggestion, or preference regarding this Proposed Plan, EPA wants to hear from you before making a final decision on how to protect your community. Comments can be sent by mail, email, or fax. People also can offer oral or written comments at the formal public hearing (see page 15 for details). If you have specific needs for the public meeting or hearing, questions about the facility and its accessibility, or questions on how to comment, please contact Rodney Elliot (see below).

PUBLIC INFO MEETING
DAY 8/3/15 • 6:30 PM
Town Hall, 1 Union Square
Milford, NH 03055

FORMAL PUBLIC HEARING
DAY 8/26/15 • 6:30 PM
Town Hall, 1 Union Square
Milford, NH 03055

CLEANUP PROPOSAL SNAPSHOT

This Proposed Plan presents EPA's fundamental change to the current cleanup remedy for Operable Unit 1 at the Savage Municipal Water Supply Well Superfund Site (Site) in Milford, NH. In a 1991 Record of Decision (ROD), EPA selected a cleanup remedy for the entire Site. Subsequent to the issuance of the ROD, EPA renamed the OK Tool Source Area where the concentrated contaminant plume is found as Operable Unit 1 (OU1) and the Extended Plume Area as Operable Unit 2 (OU2) (see enclosed FS Figure 1-1). In 1996, EPA issued an Explanation of Significant Differences (ESD) which augmented the cleanup approach in OU1.

While the cleanup remedies at OU1 and OU2 have greatly reduced the amount

continued >

[1] *New Hampshire Department of Environmental Services (NHDES) is the support agency for the Site.*

KEY CONTACTS:

RICHARD HULL
EPA New England Superfund Project Manager
(617) 918-1882
hull.richard@epa.gov

RODNEY ELLIOTT
EPA New England Superfund Community Involvement
(617) 918-8372
elliott.rodney@epa.gov

ROBIN MONGEON, P.E.
Federal Sites Program Mgr. NH Department of Environmental Services
(603) 271-7378
robin.mongeon@des.nh.gov

GENERAL INFO:

EPA NEW ENGLAND
5 Post Office Square
Suite 100
Boston, MA 02109-3912
(617) 918-1111
www.epa.gov/region1/

TOLL-FREE CUSTOMER SERVICE
1-888-EPA-7341
www.epa.gov/region1/superfund/sites/savage

EPA United States Environmental Protection Agency
printed on 100% recycled paper, with a minimum of 50% post-consumer waste, using vegetable-based inks

twitter.com/EPAnewengland
facebook.com/EPARegion1

August 2015

SDMS Doc ID 578391

of contaminated groundwater since their implementation in 1997 and 2006, groundwater contamination still remains at the Site. Therefore, EPA is proposing to amend the 1991 ROD; the revised groundwater remedy for OU1 will include several new components, as well as retaining some components from the original remedy.

New OU1 Remedial Components

- Reducing contaminant concentrations in groundwater through chemical treatment;
- Establishing a Technical Impracticability Zone (TI Zone) within which drinking water standards will not be achieved (but restrictions will prevent any exposure to the groundwater); the TI Zone is the area of highest groundwater contamination where it is not technically practical to achieve those standards; and
- Monitoring and assessing the natural attenuation of contaminants in groundwater outside of the TI Zone, where drinking water standards will eventually be achieved.

Retained OU1 Components from the 1991 ROD Remedy

- Controlling the migration of contaminants in groundwater; and
- Placing controls to prohibit the use of contaminated groundwater.

EPA's proposed amended remedy, including construction, operation and maintenance, and long-term monitoring, has an estimated present-day cost of approximately $10,800,000. The proposed remedy is expected to take approximately 1 year to construct and implement. Once implemented, it will prevent the ingestion of contaminated groundwater and remove or contain groundwater contamination within OU1. Following construction, the proposed remedy may require up to 30 years of *in-situ* groundwater treatment within the proposed TI Zone in order to prevent the long-term migration of contaminants from the TI Zone into adjoining areas.

The proposed remedy change will reduce contaminant volume through treatment so that it does not pose a risk of migration beyond the boundary of the proposed TI Zone. Groundwater in bedrock outside of the proposed TI Zone (in what has been designated the "Groundwater Cleanup Area" or "GC Area.") is expected to achieve drinking water standards within 100 years. At this time, groundwater inside the proposed TI Zone is not expected to achieve drinking water standards due to complex conditions at the Site and the large volume of contamination present in both the overburden and bedrock groundwater. A more detailed description of this proposal is outlined in this document.

SCOPE OF THIS PROPOSED PLAN

Remedial actions have been initiated and are in operation at both OU1 and OU2 at the Site. The remedial actions have made significant progress towards reducing the extent of contamination in groundwater and in lowering the risk to potential receptors. But in the past few years, the extent of contamination in the bedrock aquifer at the Site has been characterized further. It is now apparent that the current remedy in OU1 is not addressing the extent of contamination in bedrock and will need to be amended. Since at this time, the extent of contamination in bedrock in OU2 is not as significant as that in OU1, the ongoing remedy within OU2 is not being changed by the proposed amended remedy.

A CLOSER LOOK AT EPA'S AMENDED CLEANUP APPROACH

Following the implementation of the OU1 remedy in 1997, extensive groundwater sampling has been conducted to monitor the effectiveness of the remedy. Because of the close proximity of residential wells on North River and Cortland Roads, EPA and NHDES began a three-year investigation in 2010 into the extent of contamination in the bedrock aquifer at the Site.

In March 2014, EPA issued a Remedial Investigation Report that detailed the nature and extent of groundwater contamination in the bedrock aquifer at the Site. The results from the remedial investigation were used to prepare a Feasibility Study in 2015 that identified all of the options EPA considered for amending the OU1 remedy. The 2015 Feasibility Study evaluated different combinations of cleanup options (also called "alternatives") to restrict access to, contain, remove, and/or treat contamination to protect human health and the environment by preventing risk of exposure from site-related contaminants in groundwater. In addition, the 2015 Feasibility Study included an evaluation of whether it was technically practicable to clean up contamination in groundwater within OU1 to the applicable cleanup goals. Based upon the alternatives evaluated in the 2015 Feasibility Study and the evaluation of technical practicability, EPA is proposing the following fundamental change to the long-term groundwater cleanup approach for OU1 at the Site.

EPA's Preferred Alternative

EPA's preferred alternative for the groundwater cleanup within OU1 is Alternative TI-5 from the 2015 Feasibility Study: *In-situ* (i.e. in place) Chemical Oxidation (ISCO),

Permeable Reactive Barrier (PRB), institutional controls (ICs) and monitoring (see enclosed FS Figure 5-17). All four components will be implemented in the proposed TI Zone, while the last two will be implemented in the GC Area.

The preferred alternative includes the establishment of an area encompassing the most highly contaminated groundwater in the overburden and bedrock aquifers within OU1 where it has been determined that it is technically impracticable from an engineering perspective to achieve the ROD cleanup goals for cis-1,2-Dichloroethene, 1,1,1 trichloroethane, 1,1 dichloroethylene, trans-1,2-dichloroethene, 1,1-dichloroethane, tetrachloroethene (PCE) and trichloroethene (TCE) in groundwater (see Table 1). This area is referred to as the proposed TI Zone. A Technical Impracticability (TI) Waiver (see explanatory box) of the requirement to meet federal and state groundwater standards will be applied to the proposed TI Zone, where the remedial action cannot achieve cleanup standards in a reasonable time-frame. The enclosed FS Figure 5-17 provides a conceptual layout of Alternative TI-5, along with the boundary of the proposed TI Zone. For the remaining area of OU1 referred to as the GC Area, groundwater standards will be achieved over time through natural attenuation processes that will be monitored until the standards are met.

The estimated total present value of this proposed cleanup approach, including construction, operation and maintenance, and long-term monitoring is approximately $10,800,000. Present value represents the amount of money set aside today to ensure that enough money is available over the expected life of the project, assuming certain economic conditions such as inflation and a discount rate of 7%. Each component is discussed in the Feasibility Study in greater detail.

Technical Impracticability (TI) Zone

Within the proposed TI Zone the preferred alternative provides for the injection of chemicals (ISCO) to treat dense non-aqueous phase liquid (DNAPL) and dissolved phase volatile organic compound (VOC) contamination in bedrock groundwater. *In-situ* chemical oxidation will reduce the level of VOCs in groundwater and help to prevent the migration of contamination away from the proposed TI Zone.

This alternative also includes the construction of a PRB within the existing containment structure to allow for the *in-situ* treatment of dissolved phase VOCs in the overburden groundwater within the proposed TI Zone. The existing containment structure is a slurry wall surrounding the area of higher overburden contamination that was constructed as part of the original remedy. Long-term monitoring will be performed to determine the effectiveness of *in-situ* treatment and management of migration of contaminants in groundwater.

Permanent institutional controls (ICs) will be put into place to prohibit the use of the contaminated overburden and bedrock groundwater. A well restriction zone will also be established around the proposed TI Zone so that wells are not installed that might draw out contaminated groundwater from the proposed TI Zone. ICs will also require evaluation of vapor intrusion risks above the contaminant plume within the proposed TI Zone, if any structures are to be constructed over the plume.

Five-Year Reviews of the remedy performance are required by statute to ensure the ongoing protectiveness of the remedy because contamination is being left in place.

Groundwater Cleanup (GC) Area

EPA's preferred alternative for the GC Area within OU1 includes monitored natural attenuation (MNA), ICs, and Five-Year Reviews to attain the remedial action objectives (RAOs) for the GC Area. These RAOs call for cleanup of the groundwater over time to achieve beneficial reuse standards and to prevent exposure to contaminated groundwater until the cleanup standards are achieved. An MNA program will be established to monitor attenuation of contaminant concentrations in the GC Area. The MNA program will inform a potential future decision to change the remedy if it is determined that the MNA remedy is not performing as expected and will not attain cleanup goals in a reasonable time-frame.

Temporary institutional controls to prevent exposure to contaminated groundwater and to protect the components of the remedy will be established and will be in effect until groundwater cleanup standards are achieved. However, there will be a need for a permanent IC in a portion of the GC Area to maintain a well-restriction buffer zone around the proposed TI Zone.

Five-Year Reviews will be required to assess the protectiveness of the GC Area remedy under this alternative until groundwater cleanup standards are achieved.

POTENTIAL COMMUNITY IMPACTS

During the construction phase, there will be short-term impacts on the surrounding community including increased truck traffic on local streets and construction-related noise. Access to construction areas and the *in-situ* treatment area at the Site will be controlled to ensure public safety.

Table 1
OU1 Groundwater Chemicals of Concern
and Associated Cleanup Levels/Performance Standards[1]

Compound	Amended ROD AGQS/MCL µg/L (ppb)	ROD ICLs µg/L (ppb)
trans-1,2-Dichoroethene[2]	100	100
1,1-Dichloroethylene	7	7
1,1-Dichloroethane	200	3,500
1,1,1-Trichloroethane	200	200
Tetrachloroethene	5	5
Trichloroethene	5	5
cis-1,2-Dichloroethene	70	Not Established

Notes:
(1) These standards in the Amended ROD are Cleanup Levels in the GC Area and Performance Standards for monitoring in the GC Area.
(2) Using the more restrictive MCL Goals for cis-1,2-dichloroethene (Cis = 70, Trans = 100).
AGQS = Ambient Groundwater Quality Standards
MCL = Maximum Contaminant Level
µg/L = micrograms per liter
ppb = parts per billion
ICL = Interim Cleanup Levels

WHAT IS A TECHNICAL IMPRACTICABILITY (TI) WAIVER?

Technical Impracticability is one of the six statutory and regulatory waivers of applicable or relevant and appropriate requirements (ARARs) (either laws or regulations) found in the Superfund law. Cleanup actions selected in a ROD must attain federal and state ARARs that are identified at the time the ROD is signed. Grounds for invoking a waiver under the Superfund law must be provided. It is the expectation of the law that EPA will return usable groundwater to its beneficial uses wherever practicable within a timeframe that is reasonable given the particular circumstances of the site.

The pertinent chemical-specific ARARs which establish cleanup standards for the groundwater contaminants are the federal Maximum Contaminant Levels (MCLs) promulgated pursuant to the Safe Drinking Water Act and, if more stringent, the State of New Hampshire Ambient Groundwater Quality Standards (AGQSs). As part of its proposed remedy, EPA is invoking a waiver of both MCL and AGQS requirements based on the technical impracticability of achieving the standards within the TI Zone (see the discussion below).

Many factors can inhibit the restoration of groundwater to its beneficial use. Hydrogeologic factors include aquifers of very low permeability, certain types of fractured bedrock, and other conditions that make extraction or in-situ treatment extremely difficult. Contaminant-related factors include the presence of dense non-aqueous phase liquid (DNAPL) and a contaminant's potential to become either sorbed into, or lodged within, the soil or rock comprising the aquifer. When these conditions exist and limit the availability of remedial technologies, EPA may invoke a Technical Impracticability (TI) Waiver and select a cleanup alternative that will not achieve the applicable or relevant and appropriate groundwater standards, as long as the chosen alternative is protective of human health and the environment and attains all other ARARs.

Long-term groundwater monitoring data from the Site collected during the operation of the OU1 pump-and-treat system and application of in-situ treatment technologies indicate the existence of conditions in a discrete portion of OU1 within the proposed TI Zone that make it technically impracticable to restore the groundwater in that discrete area to drinking water standards within a reasonable timeframe.

Additionally, injection wells will be placed on the town-owned parcel located within the proposed TI Zone for treating the bedrock contamination. Additional monitoring wells will also be installed as part of the long-term monitoring program within OU1.

Overall, the preferred alternative is expected to take approximately 1 year to construct and is estimated to require up to 30 years of *in-situ* groundwater treatment. Groundwater use will be permanently restricted within the proposed TI Zone and surrounding well restriction area, while groundwater within the GC Area is expected to achieve drinking standards within 100 years.

SITE DESCRIPTION AND HISTORY

The Site is located in Milford, NH approximately 2 miles west of the center of town. The Site extends beyond the Souhegan River on the north and east and is roughly bounded on the south by Old Wilton Road and Tucker Brook. The groundwater flow direction at the Site is to the east, in the general direction of the former Savage Municipal Water Supply Well (Savage Municipal Well).

Historically, the Savage Municipal Well provided potable drinking water to approximately 10,000 residents in the Town of Milford. In February 1983, VOCs above drinking water standards were discovered in samples collected from the Savage Municipal Well. Chemicals identified in the water supply included 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), trans-1,2-dichloroethene (tDCE), tetrachloroethene (PCE), and 1,1-dichloroethane (1,1-DCA). Those chemicals were also detected in water samples collected from a separate water supply well for a nearby mobile home park. Use of both water supply wells was discontinued, a replacement well for the Town of Milford was constructed outside the impacted area, and the mobile home park was connected to the municipal water supply system. The Site was added to the EPA National Priorities List on September 1, 1984.

Following discovery of the VOC contamination in the Savage Municipal Well, EPA identified a group of local manufacturing facilities as potential sources of the

contamination. Those facilities were the OK Tool Company (OK Tool), Hitchiner Manufacturing Company, Hendrix Wire and Cable, and New England Steel Fabricators, Inc.

Remedial Activities

The cleanup remedy for OU1 selected in the 1991 ROD and augmented by the 1996 ESD included the extraction and treatment of contaminated groundwater, the construction of a groundwater containment wall, the implementation of soil vapor extraction (SVE) and air sparging (AS) of contaminants, and institutional controls. Two additional treatment technologies were implemented within OU1 to reduce contaminant mass and thereby enhance groundwater treatment in that area. In 2008 and 2009, subsurface soil (below the water table) contaminated from the former OK Tool facility was identified as an ongoing contaminant source to groundwater and was excavated and treated on-site. The treated soil was then returned to the excavation. From 2003 to 2010, an *in-situ* chemical oxidation (ISCO) pilot program was implemented and included the injection of chemicals to treat shallow contaminated groundwater inside the slurry wall constructed as part of the original OU1 remedy.

Further Investigations

Volatile organic compound concentrations in shallow bedrock wells have historically been significantly lower than the concentrations detected in overburden wells. But as concentrations in the overburden decreased in response to the remedial efforts in both OU1 and OU2, a corresponding reduction in contaminant concentrations in bedrock was not observed. The observed VOC concentrations in shallow bedrock at the Site and the lack of an adequate deep bedrock monitoring well network raised concerns that contamination from the Site could migrate through bedrock fractures to nearby residential wells. This concern prompted the investigation of the extent of contamination in bedrock and the publication of a Remedial Investigation Report in 2014 (2014 RI).

The 2014 RI summarizes the significant phases of investigations conducted between 2010 and 2013 to characterize the nature and extent of contamination in the bedrock aquifer. The RI activities included:

- Installation or deepening of 18 bedrock monitoring wells
- Borehole geophysical logging
- Discrete interval (packer) sampling
- Analytical testing
- Extensive bedrock water level monitoring
- Pumping tests and tracer dye study

The 2014 RI concluded that:

- Remedial actions conducted to date had not addressed contamination in the deep bedrock aquifer.
- High levels of contaminants are present in the deep bedrock within OU1.
- The bedrock beneath the Site is relatively competent with a limited number of transmissive fractures.
- The overburden aquifer is the primary source of recharge to the bedrock.
- Risks to human and ecological health are being addressed by the existing OU1 and OU2 remedial systems.
- Existing residential bedrock water supply wells located northwest of the Site do not appear to currently be at risk under current hydrologic conditions.
- The VOC concentrations in deep bedrock in OU2 are substantially less than those observed in OU1.
- The distribution of contamination into the bedrock aquifer across the Site can be attributed to the steeply dipping fracture network.
- The fracture network and the physical properties of the contaminants have facilitated the significant vertical migration of contamination from the areas where releases occurred to depths greater than 500 ft into the bedrock aquifer.

CURRENT & FUTURE LAND USE

The existing land use at OU1 is a mix of former industrial use property and privately- and town-owned undeveloped properties. The former OK Tool facility was located within the proposed TI Zone of OU1; that parcel is currently owned by the State of New Hampshire. The majority of the infrastructure for the existing OU1 remedy, including the slurry wall, monitoring wells, and the groundwater extraction and treatment system is located on the State-owned property.

The Town of Milford owns a parcel within the proposed TI Zone where the police station was formerly located. The former police station, a softball field, and additional groundwater monitoring wells are currently located on the Town-owned property. The current OU1 treatment system recharge gallery is also located on the Town-owned property.

A small portion of a parcel currently used as a residential mobile home park is located in the proposed TI Zone in OU1. The majority of that parcel including all of the residential homes is located in OU2. One monitoring well is currently located on the portion of the parcel within the proposed TI Zone.

The TI Zone also includes a strip of undeveloped property along the north shore of the Souhegan River.

The GC Area consists of undeveloped property north of the Souhegan River and north of the strip of undeveloped property to be included in the proposed TI Zone, as well as commercial property west of the slurry wall in OU1. Much of the undeveloped property is within the floodplain of the Souhegan River, which restricts potential reuse.

The groundwater within OU1 is not currently used as drinking water. However, NHDES has determined that there is a "high use and value" for the groundwater at the entire Site. Although a well restriction zone will be established around the proposed TI Zone, implementation of the preferred alternative will allow groundwater outside of the proposed TI Zone to return to beneficial use over time. In the meantime, ICs will be implemented to prohibit the use of groundwater that has not yet attained cleanup levels.

The 2014 RI concluded that under current hydrogeological conditions, residential drinking water wells to the north and northwest of the Site are not impacted by the Site nor do they appear to be at risk from site-related contaminants. However, changes in local hydrological conditions including the installation and pumping of new wells, or the discontinuation of pumping from existing wells such as the State of New Hampshire fish hatchery well located north of the Site could redistribute contamination in the bedrock.

WHY CLEANUP IS NEEDED

Past industrial operations and the release and disposal of hazardous substances related to those operations resulted in

SAVAGE MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE TIMELINE

1940s - 1987: Manufacturing operations at OK Tool Company, Inc., to produce metal cutting tools and tool hardware.

February 1983: Initial discovery of volatile organic compound contamination in Savage Municipal Water Supply Well.

May 1983: EPA connects the Milford Mobile Home Park to municipal water supply system.

September 1, 1984: Site listed on EPA National Priorities List (NPL) of sites to be cleaned up under the Superfund law.

1985: Soil remediation activities occur within the OK Tool building.

1988 - June 1991: Remedial Investigation/Feasibility Study (RI/FS) conducted by Hitchiner Manufacturing Company and Hendrix Wire and Cable.

July 11, 1991: Proposed Plan identifying EPA's preferred remedy presented to public and public comment period started.

September 27, 1991: ROD selecting the remedy is signed.

June 27, 1994: Consent Decree requiring settling parties (Hitchiner Manufacturing Company and Hendrix Wire and Cable Company) to perform the work in the Extended Plume (OU2).

December 19, 1996: Explanation of Significant Differences (ESD) is signed to address DNAPL at OU1. The ESD describes the creation of OU1 and OU2.

November 1997: OU1 remedial action starts.

June 1998 - October 1998: Construction of slurry wall in OU1 by EPA.

May 1999: Operation of OU1 Treatment Plant by EPA begins.

2003: First ISCO treatment activities in overburden conducted within OU1 by EPA. Additional ISCO injections in 2008 and 2010.

October 27, 2004: Operation of OU2 Remedy begins.

2008 - 2009: Subsurface soil (below the water table) contaminated from the former OK Tool facility was excavated, treated on-site, and deposited back into the excavation as part of groundwater source control.

2010: Investigation of the nature and extent of contamination in deep bedrock is initiated by EPA.

March 2014: Remedial Investigation (RI) Report for bedrock aquifer finalized.

2015: Feasibility Study (FS) and Technical Impracticability (TI) Waiver Evaluation performed by EPA for OU1.

the contamination of groundwater used as drinking water in the overburden and bedrock aquifers at the Site. VOCs above acceptable levels for drinking were found in the groundwater. Remediation of groundwater in both the overburden and bedrock aquifers is required to reduce the extent of human health risk associated with the level of contamination in groundwater. The remedy currently being implemented within OU1 is not adequate to treat contamination in the bedrock aquifer or to manage the migration of contamination.

WHY A TECHNICAL IMPRACTICABILITY WAIVER IS NEEDED

EPA has conducted an evaluation of whether it is technically practicable to restore highly contaminated groundwater in the overburden and bedrock aquifers to drinking water standards within OU1. The evaluation was conducted using available data and concluded that restoration of the overburden and bedrock aquifers to drinking water standards in a reasonable timeframe is not practicable for a discrete highly contaminated portion of OU1 (the proposed TI Zone). Applying a TI Waiver to the most heavily contaminated groundwater within a portion of the overburden and bedrock aquifers within OU1 will allow the remedial action in the preferred alternative to focus on reducing contaminant concentrations to prevent the migration of contaminated groundwater from the designated proposed TI Zone. Preventing the migration of any contamination beyond the proposed TI Zone will facilitate the restoration of the downgradient dilute plume in the GC Area to beneficial reuse and prevent the migration of any OU1 contamination into OU2 or adjoining residential properties.

Protectiveness within the proposed TI Zone can be achieved through the application of ICs to prevent human exposure with groundwater. Contaminant migration across the proposed TI Zone will be prevented using ISCO injections to treat any contamination before it reaches the proposed TI Zone boundary. This will permit downgradient areas in the GC Area and OU2 to attain cleanup goals. Groundwater monitoring will be performed both to verify compliance at the proposed TI Zone boundary and in the GC Area and to document the future recovery to drinking water standards.

EXPOSURE PATHWAYS & POTENTIAL RISK

Just because contamination exists does not mean the environment or people are at risk. There has to be exposure to the contamination to have a potential risk. Exposure occurs when people or other living organisms eat, drink, breathe or have direct skin contact with a substance or contaminant. Based on existing or reasonably anticipated future land use at a site, EPA develops different possible exposure scenarios to determine potential risk, appropriate cleanup levels for contaminants, and potential cleanup approaches.

Human health and ecological risk assessments have been prepared for the Site (detailed risk summaries can be found in the Human Health Risk Assessment (HHRA) and the Baseline Ecological Risk Assessment (BERA)). These assessments use a number of possible exposure scenarios to determine if and where there are current or potential future unacceptable risks.

Threats to Human Health

People have the potential for exposure to contaminants at OU1 through the following exposure pathway: drinking contaminated groundwater. The risk assessment evaluated the exposure pathway as discussed below.

HOW IS RISK TO PEOPLE EXPRESSED?

In evaluating risk to humans, estimates for risk from carcinogens and non-carcinogens (chemicals that may cause adverse effects other than cancer) are expressed differently.

For carcinogens, risk estimates are expressed in terms of probability. For example, exposure to a particular carcinogenic chemical may present a 1 in 10,000 increased chance of causing cancer over an estimated lifetime of 70 years. This can also be expressed as 1×10^{-4}. The EPA acceptable risk range for carcinogens is 1×10^{-6} (1 in 1,000,000) to 1×10^{-4} (1 in 10,000). In general, calculated risks higher than this range would require consideration of clean-up alternatives.

For non-carcinogens, exposures are first estimated and then compared to a reference dose (RfD). RfDs are developed by EPA scientists to estimate the amount of a chemical a person (including the most sensitive person) could be exposed to over a lifetime without developing adverse health effects. The exposure dose is divided by the RfD to calculate the measure known as a hazard index (HI) (a ratio). An HI greater than 1 suggests that adverse effects may be possible.

Because there are currently no residents within OU1 and no residents off-site are known to be exposed to contaminated groundwater from OU1, the HHRA determined that human health risk exists only for future groundwater use conditions, and not current use conditions. Upon discovery of contaminants in groundwater above drinking water standards, a water supply line was constructed to provide municipal water to residents at the mobile home park in 1983. No Site-related contaminants have been detected in samples collected from residential water supply wells located north of the Site to date.

A baseline health risk assessment was initially prepared as part of the 1991 RI to determine the extent to which Site conditions may impact human health and the environment. The assessment showed that carcinogenic risks associated with future potential residential use of groundwater were outside of EPA's acceptable risk range and that there was the potential for adverse human health cancer and non-cancer effects from lifetime exposure to the impacted groundwater. At that time, the assessment determined that there was no unacceptable or actionable risks associated with contamination in other media (air, soil, etc.).

As part of the 2014 RI, a baseline human health screening level risk assessment (SLRA) was performed to assess the potential risks associated with contaminated bedrock groundwater. Based on the calculations conducted as part of this SLRA, the 2014 RI concluded that future potential risk to a resident associated with direct contact with groundwater from the bedrock aquifer exists at OU1 above EPA maximum risk criteria for both screening level cancer risk (SLCR = 2E-02) and screening level health index (SLHI = 5E+03).

In 2000, EPA conducted a study of the quality of the air inside the former police station and discovered elevated levels of VOCs inside the building as well as in the soil gas around the building. The study concluded that VOCs discovered inside the building included Site COCs, and that a number of factors including the infiltration of soil gas, and air discharges from nearby industrial operations (Hitchiner, Hendrix) and from the storage of police uniforms that had been professionally dry cleaned may have contributed to the elevated levels. EPA concluded that any future reuse of the police station building or new development on the Town-owned property would require the implementation of vapor intrusion mitigation measures to protect human health.

Threats to the Environment

The ecological risk assessment conducted for the Site as part of the 1991 RI used two methods: an aggregate approach based on toxicity data from a range of freshwater species, as well as an indicator species approach based on toxicity data for species known to be present in the Souhegan River.

Both the aggregate and indicator species methods show no cause for concern due to contamination from VOCs, although aquatic toxicity data were not available for all the VOCs of concern.

The environmental concentration values used for hazard assessments of indicator chemicals are lower than the standard National Recommended Water Quality Criteria (NRWQC) values for protection of aquatic organisms. It can be argued that this approach to hazard assessment is more sensitive than an approach based strictly on the NRWQCs. By using a conservative approach, potential risk may have been overestimated. In fact, no fish kills have been observed in the area of the Site, and no unusual morbidity has been identified in the avian, terrestrial, or aquatic populations.

Sediment concentrations of metals and PCBs were compared with levels predicted to produce adverse biological effects, based on a federal review of numerous published studies. Maximum concentrations of most of the metals exceeded the level at which adverse effects could be expected. PCB concentrations at two stations also exceeded the effects level. However, all of the sediment results were strongly influenced by very high concentrations at one station in the Hitchiner-Hendrix discharge area within OU2. The assessment from the 1991 RI concluded that much if not all of the ecological risk associated with the surface-water contamination may be alleviated when discharges to the drainage ditch were eliminated. Hitchiner and Hendrix have ceased discharge of wastewater to the drainage ditch.

Recently, ecological risk has been reviewed and contaminant data has been compared to updated risk benchmarks. Although some contaminant concentration data from the 1991 RI exceed current ecological benchmarks, the exceedances are not ecologically significant because VOCs are rapidly volatilized and because average concentrations were below the updated benchmarks. In addition, no VOCs have been detected in surface water samples collected since the 1991 RI.

CLEANUP ALTERNATIVES CONSIDERED

Once possible exposure pathways and potential risks have been identified at a site, cleanup alternatives are developed to address the identified risks and achieve the site-specific Remedial Action Objectives (RAOs).

The 1991 ROD identified the following RAOs:

- Prevent ingestion of contaminated groundwater that would pose an unacceptable risk to human health.
- Restore groundwater quality to meet federal and state ARARs.

The OU1 remedy specified in the 1991 ROD and 1996 ESD has resulted in significant progress in remediating the overburden groundwater. But the findings of the 2014 Remedial Investigation indicated that the original remedy for OU1 has not been as effective in remediating the bedrock groundwater. The RAOs developed as part of the 2015 Feasibility Study are based on a presumed future residential use of the Site. In areas where a TI Waiver may be invoked, the RAOs have been developed to prevent use of groundwater within the proposed TI Zone and to prevent migration of groundwater contamination beyond the boundary of the proposed TI Zone.

The RAOs developed for the proposed TI Zone are:

- Prevent ingestion of groundwater that exceeds ARARs standards.
- Prevent migration of contaminants beyond the compliance boundary for the TI Zone, thereby preventing expansion of the area impacted by site-related contaminants at concentrations that exceed ARARs standards.
- Remove and/or contain DNAPL and other groundwater contaminants, to the extent practicable, as a source control measure to inhibit contaminant migration from the TI Zone.
- Prevent potential future inhalation exposure to indoor air vapor contamination that exceeds applicable screening and health-based standards.

The RAOs developed for the GC Area are:

- Restore groundwater quality to beneficial use.
- Prevent ingestion of groundwater until groundwater cleanup standards are achieved.

EPA believes that the preferred alternative presented in this Proposed Plan will meet the RAOs described above, and protect human health and the environment. A detailed description and analysis of each alternative developed to meet these RAOs and reduce risks from contaminated groundwater in bedrock are presented in the 2015 Feasibility Study. The 2015 Feasibility Study is available for public review. (See page 15 for more information on where you can find site-related documents). The proposed cleanup levels provided in Table 1 for groundwater have been developed to be protective of human health and the environment as well as to achieve the cleanup objectives for the Site. Below is a summary of the multiple cleanup alternatives considered in the 2015 Feasibility Study:

Technical Impracticability (TI) Zone

Alternative TI-1: Current ROD remedy
Alternative TI-1 is the current remedy being carried out at OU1 under the 1991 ROD and 1996 ESD. This alternative provides remediation to the extent it is already being implemented in the overburden and bedrock groundwater within OU1. The slurry wall will remain intact and the existing groundwater extraction wells and treatment system will continue to operate providing hydraulic containment and contaminant removal. Natural attenuation will continue as the remedy outside of the capture zone of the groundwater extraction and treatment system within OU1. There is limited monitoring of the deep bedrock, and currently no measures to treat the deep bedrock contamination. The continued implementation of the current remedy will cost a total of $2,700,000 in operations & maintenance (O&M) over the next 30 years. There are no new capital costs associated with the current ROD remedy alternative.

Alternative TI-2: Physical Containment
Alternative TI-2 will include the construction of a grout curtain in the bedrock directly beneath the existing overburden slurry wall. The grout curtain will physically contain the contamination within the area of highest DNAPL contamination and help to prevent contaminant migration. Physical containment will also include an impermeable cap covering the overburden area contained within the existing slurry wall in order to eliminate groundwater mounding and prevent further vertical migration of contamination. ISCO injections in bedrock will be implemented outside of the grout curtain to reduce the concentration of contaminants and manage migration away from the source area. This alternative will cost approximately $32,500,000, including O&M costs of $3,400,000. This alternative will take approximately 12 to 18 months to implement in order to physically contain and prevent the ingestion of contaminated groundwater. Following construction, the proposed remedy may require up to 10 years of *in-situ* groundwater treatment outside of the slurry wall/grout curtain, but within the proposed TI Zone, in order to prevent the migration of contaminants.

Alternative TI-3: Hydraulic Containment and Treatment

Alternative TI-3 will include the installation of extraction wells in the bedrock in order to provide hydraulic containment of contamination within the boundary of the proposed TI Zone. The extraction wells will be installed within the area of highest concentration of contaminants in the bedrock. Contaminated groundwater extracted from the bedrock aquifer will be treated in an on-site treatment plant where VOCs will be removed by tray aerators. Treated groundwater will be recharged into the overburden aquifer through the existing on-site recharge chamber. This alternative will cost approximately $7,000,000 including O&M costs of $5,400,000. This alternative will take approximately 6 months to construct and implement, at which time RAOs will be attained. However, the system will need to be operated indefinitely to prevent contaminant migration from occurring over the long-term.

Alternative TI-4: *In-situ* Chemical Reduction

Alternative TI-4 will include the *in-situ* chemical reduction (ISCR) of contaminated groundwater in bedrock using zero-valent iron (ZVI) to remove the source material and prevent contaminants from migrating out of the proposed TI Zone. Injection wells would be installed within the area of highest contaminant concentration in bedrock within the proposed TI Zone and injections will occur for approximately 15 years. A permeable reactive barrier (PRB) gate in the existing slurry wall will be installed and operated to allow overburden groundwater to be treated. This alternative will cost approximately $14,800,000, including O&M costs of $2,900,000. This alternative will take up to one year to construct and implement in order to prevent the ingestion of contaminated groundwater and remove or contain groundwater contamination. Following construction, the proposed remedy may require up to 30 years of *in-situ* groundwater treatment within the proposed TI Zone in order to prevent the migration of contaminants.

Alternative TI-5: *In-situ* Chemical Oxidation

Alternative TI-5 (see enclosed FS Figure 5-17, EPA's preferred alternative) will include the *in-situ* chemical oxidation (ISCO) of contaminated groundwater in bedrock using sodium permanganate to treat DNAPL contamination and prevent contaminants from migrating out of the proposed TI Zone. These injections in the source area will be implemented for approximately 15 years. ISCO will also be implemented in the bedrock downgradient from source area to intercept contaminated groundwater and keep it from migrating beyond the proposed TI Zone. An ISCO PRB gate will be installed and operated to allow overburden groundwater within the existing slurry wall to be treated. This alternative will cost approximately $10,8000,000, including O&M costs of $4,100,000. This alternative will take approximately one year to construct and implement, in order to prevent the ingestion of contaminated groundwater and remove or contain groundwater contamination. Following construction, the proposed remedy may require up to 30 years of *in-situ* groundwater treatment within the proposed TI Zone in order to prevent the migration of contaminants.

Alternative TI-6: *In-situ* Thermal Treatment

Alternative TI-6 uses thermal conductive heating to destroy VOCs in the overburden and bedrock aquifers. *In-situ* thermal treatment (ISTT), which is the introduction of heat into the contaminated aquifer, will be implemented in the most highly contaminated areas of bedrock and overburden groundwater to reduce contaminant mass and concentrations migrating beyond the proposed TI Zone. The ISTT in bedrock will be supplemented by ISCO in the downgradient portion of the proposed TI Zone in order to prevent migration of groundwater contaminants beyond the proposed TI Zone. A PRB gate will be used to treat the low levels of groundwater contaminants exiting the area enclosed by the existing slurry wall in order to prevent the migration of overburden contaminants past the proposed TI Zone boundary. This alternative will cost approximately $77,000,000, including O&M costs of $4,400,000. The implementation of ISTT will take approximately 2 months to construct and implement in order to prevent the ingestion of contaminated groundwater and remove or contain groundwater contamination. Following construction, the proposed remedy may require up to 30 years of *in-situ* groundwater treatment with ISCO in the downgradient portion of the proposed TI Zone in order to prevent the migration of contaminants.

TI Alternatives Common Elements

The remedial elements common to Alternatives TI-1 to TI-6 are institutional controls, monitoring, and Five-Year Reviews. Monitoring will be conducted to assess the effectiveness of the remedy and assess compliance with cleanup goals. Institutional controls (ICs) will be implemented to prohibit the use of contaminated groundwater within the proposed TI Zone and to evaluate potential vapor risks in any buildings constructed within the proposed TI Zone. The ICs also include a well-restriction zone around the proposed TI Zone. Five-Year Reviews will be carried out as long as contamination remains in place in order to continue to assess the protectiveness of the revised remedy.

Groundwater Cleanup (GC) Area

Alternative GC-1: Current ROD Remedy
Alternative GC-1 includes the continued implementation of the current remedy which consists of natural attenuation, long-term monitoring, ICs, and Five-Year Reviews in the overburden and shallow bedrock groundwater. Under Alternative GC-1, other than continuing the existing limited monitoring program, no remedial actions would be implemented for the deep bedrock groundwater. This alternative relies on natural processes to reduce the levels of contamination in bedrock groundwater but does not meet EPA guidance standards for MNA. This alternative will cost a total of $500,000 in O&M. There are no capital costs associated with this alternative.

Alternative GC-2: Monitored Natural Attenuation (MNA)
Alternative GC-2 includes MNA, the potential installation of new monitoring wells, ICs, and Five-Year Reviews in order to attain the RAOs for the GC Area. An MNA program will be established to monitor attenuation of contaminant concentrations in the GC Area. If it is determined that the MNA remedy is not performing as expected and would not attain cleanup goals in a reasonable timeframe a future decision document will be issued that changes the remedy to meet protectiveness and ARARs standards. Based on modeling calculations, MNA is estimated to achieve cleanup standards in the bedrock aquifer in 100 years. ICs will be maintained and Five-Year Reviews conducted until groundwater cleanup standards are attained. This alternative will cost a total of $1,100,000, including O&M costs of $740,000.

COMPARISON OF CLEANUP ALTERNATIVES

The proposed TI Zone and GC Area alternatives for groundwater were compared with each other to identify how well each alternative meets EPA's evaluation criteria. The following discussion and Table 2 (enclosed) present a general comparison summary of the alternatives. Detailed evaluations and comparisons of alternatives are included in the 2015 Feasibility Study.

THE NINE CRITERIA FOR CHOOSING A CLEANUP PLAN

EPA uses nine criteria to evaluate cleanup alternatives and select a final cleanup plan. EPA has already evaluated how well each of the cleanup alternatives developed for the Savage Municpal Water Supply Well Superfund Site meets the first seven criteria in the Feasibility Study. Once comments from the state and the community are received and considered, EPA will select the final cleanup plan.

1. Overall protection of human health and the environment: Will it protect you and the plant and animal life on and near the site? EPA will not choose a cleanup plan that does not meet this basic criterion.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs): Does the alternative meet all federal and state environmental statutes, regulations and requirements? The cleanup plan must meet this criterion unless a waiver is invoked.

3. Long-term effectiveness and permanence: Will the effects of the cleanup plan last or could contamination cause future risk?

4. Reduction of toxicity, mobility or volume through treatment: Using treatment, does the alternative reduce the harmful effects of the contaminants, the spread of contaminants, and the amount of contaminated material?

5. Short-term effectiveness: How soon will site risks be adequately reduced? Could the cleanup cause short-term hazards to workers, residents or the environment?

6. Implementability: Is the alternative technically feasible? Are the right goods and services (i.e. treatment equipment, space at an approved disposal facility) available?

7. Cost: What is the total cost of an alternative over time? EPA must select a cleanup plan that provides necessary protection for a reasonable cost.

8. State acceptance: Do state environmental agencies agree with EPA's proposal?

9. Community acceptance: What support, objections, suggestions or modifications did the public offer during the comment period?

Technical Impracticability (TI) Zone

Overall Protection of Human Health and the Environment

Each of the alternatives, except for the current ROD remedy alternative (TI-1), will be protective of human health and the environment by providing protection from contaminated groundwater. Alternative TI-1 does not provide any protection from contamination in bedrock and does not prevent the migration of contaminants in bedrock. All of the alternatives will prevent human exposure to contaminated groundwater through the implementation of ICs. Alternatives TI-1, TI-2, and TI-3 involve less destruction of contaminant mass and, therefore rely to a greater extent on the ICs for protection of human health and the environment. Alternatives TI-2 through TI-6 all manage the migration of contaminants from the proposed TI Zone.

Alternatives TI-4, TI-5, and TI-6 will aggressively treat the contaminants in bedrock within the proposed TI Zone. Alternatives TI-2, TI-4, TI-5, and TI-6 provide additional treatment that will minimize the risk of contaminant migration of bedrock groundwater beyond the downgradient boundary of the proposed TI Zone.

Alternative TI-3 will use hydraulic containment to manage contaminant migration but will provide only limited treatment of source zone contamination (through the pump and treat (P&T) system). As a result, this alternative will allow larger amounts of contaminants to persist in the proposed TI Zone than alternatives TI-4, TI-5, and TI-6.

Alternative TI-2 will prevent migration of contamination beyond the proposed TI Zone through the addition of ISCO treatment of contaminated groundwater. The most highly contaminated portion of the bedrock aquifer enclosed by the grout curtain will be prevented from migrating, thereby reducing the risk of future human exposure.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

None of the alternatives can meet either federal maximum contaminant levels (MCLs) or state ambient groundwater quality standards (AGQSs) in the proposed TI Zone within a reasonable period of time. Therefore, EPA is invoking a waiver of the chemical-specific ARARs requirements that establish groundwater cleanup standards.

All of the alternatives, except potentially Alternative TI-1, will meet Action-Specific ARARs that pertain to the remedial components of each alternative. Based on the known capture zone of the existing groundwater extraction system, Alternative TI-1 will not be able to adequately manage the migration of contaminants, particularly in deep bedrock.

To varying extents, all of the alternatives will be conducted in areas subject to location-specific ARARs and can be implemented in a manner that complies with those ARARs. Alternative TI-2 may have some issues with building and maintaining an impermeable cap in the floodplain of the Souhegan River. FEMA floodplain management and wetland protection standards are relevant and appropriate to this alternative because of the significant potential for filling within the floodplain and the need to conduct remedial work, including installing the grout curtain and monitoring/treatment wells, and capping within the 500-year floodplain of the Souhegan River.

Long-Term Effectiveness

All of the alternatives include ICs that need to be maintained permanently within the proposed TI Zone in order to prevent exposure to groundwater contaminants. Over the long-term, Alternative TI-6 (ISTT) will be the most effective in preventing migration of contaminants to areas beyond the proposed TI Zone.

Alternatives TI-4 and TI-5 will have similar levels of long-term effectiveness and will provide a significant degree of treatment of the DNAPL contamination. The ISCO alternative will require repeated injections over a period of approximately 15 years, while the ISCR alternative will rely on fewer injections in order to maintain effectiveness over longer periods of time. Both alternatives require a longer period of time for injections to manage the migration of contaminants.

Alternative TI-3, will effectively prevent contaminant migration beyond the proposed TI Zone over the long-term; however, it will result in a very slow reduction in contaminant concentrations from treatment. The pump and treat system will require very long-term operation and maintenance time to ensure that there is no reduction in the long-term effectiveness.

Alternative TI-2 will not actively treat any DNAPL contamination inside of the slurry wall and grout curtain. The slurry wall and grout curtain should effectively isolate and prevent migration of groundwater contaminants to the downgradient overburden and bedrock, although there may be challenges in cutting off flow in the deep bedrock beneath the grout curtain. The cap will effectively eliminate infiltration of precipitation into the overburden within the slurry wall/grout curtain area.

The PRB in the overburden slurry wall for

Alternatives TI-4, TI-5, and TI-6 will minimize the risk that overburden groundwater contaminants will migrate from the area enclosed by the slurry wall to downgradient areas and will enhance the performance of Alternative TI-4, TI-5, and TI-6 relative to Alternatives TI-2 and TI-3.

Alternative TI-2, TI-4, TI-5, and TI-6 would each treat contaminated bedrock to further aid with the management of contaminant migration to ensure long-term effectiveness in meeting the management of migration RAO.

Alternative TI-1 will provide some long-term effectiveness in the overburden through the operation of the existing pump and treat system and ICs, but does not include a management of migration component for bedrock.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternatives TI-4, TI-5 and TI-6 will provide the most significant reduction of toxicity, mobility or volume (TMV) of DNAPL contamination in bedrock through treatment. Treatment of DNAPL may be more significant through thermal treatment included in Alternative TI-6.

Alternative TI-3 will provide some reduction of TMV in groundwater through removal and treatment of dissolved phase contamination in the overburden and bedrock aquifers. Removal of DNAPL will not occur under the hydraulic containment Alternative TI-3.

Alternative TI-2 will not provide any reduction of TMV through treatment, except for limited ISCO treatment outside of the grout curtain. No removal or treatment of DNAPL will occur.

Alternative TI-1 will only provide reduction of TMV within the area contained by the slurry wall through the existing pump and treat system in the overburden. No reduction of DNAPL in the overburden or bedrock will occur.

Short-term Effectiveness

Alternative TI-1 is already in place and the short-term impacts associated with construction of the slurry wall and groundwater treatment system have already occurred. Otherwise, Alternative TI-3 will have the least overall short-term impacts from the installation of three additional bedrock extraction wells, subsurface pipelines, and modifications to the existing treatment plant. The short-term impacts for Alternative TI-3 should have a duration of 6 months. Containment of contaminant migration will be achieved shortly after startup of the new extraction wells.

Alternatives TI-4 and TI-5 will have similar types of well drilling impacts as Alternative TI-3, but to a much greater extent because of the significant number of ISCR and ISCO injection wells that will be installed. There are worker safety issues associated with on-site handling and injection of the treatment chemicals and with construction of the PRB gate. Some impacts to the surrounding community are expected from construction activities, including increased truck traffic, noise, and potentially dust during drilling; dust control measures will be implemented based on regulatory requirements. Construction activities for Alternative TI-4 and TI-5 will be completed (including the initial injection events) within approximately 12 months.

Alternative TI-2 raises significant concerns regarding short-term effectiveness in connection with the installation of the grout curtain and multimedia cap due to increased construction related traffic, dust, and construction related risks. There will also be short-term risks associated with the limited ISCO treatment component associated with Alternative TI-2.

Alternative TI-6 raises the greatest short-term effectiveness concerns in connection with the installation of heater wells and vapor recovery wells. High voltage electricity will be used to generate heat in the subsurface and large mechanical equipment will be used to extract and treat vapors and liquids from the subsurface thermal treatment zones.

Implementability

Alternative TI-3 will be relatively easy to implement because it uses technologies and procedures that have already been successfully used in OU1. Pumping tests have already been completed and have shown effective capture of the contaminated bedrock groundwater.

Alternatives TI-2, TI-4, TI-5, and TI-6 all involve the use of technologies that have not been implemented in deep bedrock environments, creating a greater level of uncertainty concerning the implementability of each of those alternatives. Even though several ISCO injections have previously been used very successfully to treat contaminated groundwater in the overburden in the proposed TI Zone, it has not been used in bedrock at the Site. The installation of an impermeable cap over the area enclosed by the slurry wall (TI-2) and PRBs (TI-4, TI-5, TI-6) should present minimal construction challenges, although there may be implementability issues with developing mitigation measures for floodplain and wetland impacts from the cap.

Cost

Net present value costs based on a 30-year time period and 7% discount rate were developed for comparison of the alternatives. It has been determined that no technology is available for achiev-

ing groundwater cleanup standards in bedrock within the proposed TI Zone in a reasonable timeframe.

The estimated 30-year net present value costs for these alternatives are as follows:

Alternative TI-1, ROD Remedy: $2,700,000
Alternative TI-2, Physical Containment: $32,500,000
Alternative TI-3, Hydraulic Containment: $6,700,000
Alternative TI-4, ISCR: $14,800.000
Alternative TI-5, ISCO: $10,800,000
Alternative TI-6, ISTT: $77,000,000

Groundwater Cleanup (GC) Area
Both alternatives would provide protection of human health and the environment through natural attenuation combined with ICs to prevent use of contaminated groundwater. However, Alternative GC-1 does not adequately address groundwater contamination in the bedrock, because there are currently limited bedrock monitoring wells in the GC Area. Alternative GC-1 also does not meet MNA Guidance requirements and therefore may not achieve chemical-specific groundwater cleanup ARARs within a reasonable time period. Alternative GC-2 includes required MNA components for confirming that chemical-specific ARARs will be achieved through MNA within a reasonable timeframe (including the installation of sufficient bedrock monitoring wells).
Alternative GC-2 adds a bedrock monitoring component providing additional overall protection of human health relative to Alternative GC-1. In addition, Alternative GC-2 includes the addition of MNA parameters, additional bedrock wells, and related studies (geophysical testing, tracer testing, microcosm study, and groundwater modeling) to ensure that natural attenuation is occurring within the desired time frames. Alternative GC-2 therefore potentially has greater long-term effectiveness, and a higher degree of protectiveness.
Neither remedial alternative for the GC Area would reduce toxicity, mobility, or volume through treatment. Both alternatives would have similar short-term impacts and are easily implementable. While Alternative GC-1 is somewhat more implementable than Alternative GC-2 because it only involves carrying on the existing limited monitoring and IC remedy, the added MNA components of Alternative GC-2 are readily implementable. Implementation of the temporary ICs needed under both alternatives also is easily implementable.

The estimated 30-year net present value costs for these alternatives are as follows:

Alternative GC-1, ROD Remedy: $500,000
Alternative GC-2, MNA: $1,100,000

WHY EPA RECOMMENDS THIS PROPOSED CLEANUP PLAN

EPA believes the proposed fundamental change to the OU1 cleanup plan for the Savage Municipal Water Supply Well Superfund Site achieves the best overall balance among EPA's nine criteria used to evaluate the various alternatives presented in the 2015 Feasibility Study. Two of the nine criteria, state and community acceptance, will be reconsidered following public comment. This cleanup approach (Alternatives TI-5 and GC-2) provides both short and long-term protection of human health and the environment; reduces the toxicity, mobility, and volume of contaminated groundwater through treatment, to the maximum extent practicable; utilizes permanent solutions; and uses land use restrictions to prevent unacceptable exposures in the future to the remaining site-related contaminants that will remain on-site.

Due to the nature and extent of contamination within the proposed TI Zone in OU1, it is not technically practicable to achieve compliance with all applicable or relevant and appropriate federal and state environmental laws and regulations. Therefore, EPA is proposing to waive groundwater cleanup (chemical-specific ARARs) standards under a Technical Impracticability Waiver for the proposed TI Zone. The evaluation of cleanup alternatives indicates that no current technology is available for achieving groundwater cleanup standards within the proposed TI Zone in a reasonable timeframe.

Exposure to contamination that remains in the proposed TI Zone will be prevented by controls implemented to (1) prohibit the use of groundwater, (2) ensure access for monitoring and oversight, (3) prohibit activities that interfere with the remedy and on-site monitoring equipment, (4) prevent wells from being installed in a protective zone around the proposed TI Zone, and (5) require the use of appropriate vapor mitigation technology in future on-site buildings.

Alternatives TI-5 and GC-2 are EPA's preferred alternatives for the following reasons:

- The implementation of *in-situ* chemical oxidation treatment will allow for the reduction of contaminant mass in the area of OU1 with the highest concentration of VOCs in the overburden and bedrock groundwater;
- Institutional controls will prevent potential onsite and off-site human exposure to VOCs in overburden and bedrock groundwater that exceeds ARARs or target risk limits. Controls will be permanent in the proposed TI Zone and temporary in the GC Area until cleanup goals are met;

WHAT IS A FORMAL COMMENT?

EPA will accept public comments during a 30-day formal comment period. EPA considers and uses these comments to improve its cleanup approach. During the formal comment period, EPA will accept written comments via mail, email, and fax. Additionally, verbal comments may be made during the formal Public Hearing on August 26, 2015 during which a stenographer will record all offered comments during the hearing. EPA will not respond to your comments during the formal Public Hearing.

EPA will hold a brief informational meeting prior to the start of the formal comment period on August 3, 2015.

Before making a final cleanup decision, EPA will review the transcript of all formal comments received during the hearing, and all written comments received during the formal comment period. EPA will then prepare a written response to all the formal written and oral comments received. Your formal comment will become part of the official public record. The transcript of comments and EPA's written responses will be issued in a document called a Responsiveness Summary. The Responsiveness Summary becomes an attachment to the final cleanup plan which EPA will release in a document called the Amended Record of Decision. The Responsiveness Summary and Amended Record of Decision will be made available to the public on-line (see web address below), at the Wadleigh Memorial Library, and at the EPA Records Center (see addresses below). EPA will announce its final decision on the cleanup plan through the local media and on EPA's website.

- *In-situ* chemical oxidation treatment helps prevent the migration of contamination across the proposed TI Zone boundary; and
- Monitored natural attenuation of VOCs in groundwater within the GC Area will allow the groundwater to meet cleanup goals and be returned to beneficial use within a reasonable timeframe.

For More Detailed Information:
The Administrative Record, which includes all documents that EPA has considered or relied upon in proposing this amended cleanup plan for the Savage Municipal Water Supply Well Superfund Site is available for public review and comment at the following locations:

EPA Records and Information Center
5 Post Office Square, First Floor
Boston, MA 02109-3912
617-918-1440

Wadleigh Memorial Library
49 Nashua Street
Milford, NH 03055

Information is also available for review on-line at http://www.epa.gov/region1/superfund/sites/savage

KEY CONTACTS:

Richard Hull
EPA New England
Superfund Project Manager
617-918-1882
hull.richard@epa.gov

Rodney Elliott
EPA New England
Superfund Community Involvement
617-918-8372
elliott.rodney@epa.gov

Robin Mongeon, P.E.
Federal Sites Program Manager
New Hampshire Department of Environmental Services
Hazardous Waste Remediation Bureau
PO Box 95, 29 Hazen Drive
Concord, NH 03302-0095
603-271-7378
Robin.Mongeon@des.nh.gov

SEND US YOUR COMMENTS

Provide EPA with your written comments about the Proposed Plan for the Savage Municipal Water Supply Well Superfund Site.

Please email (hull.richard@epa.gov) fax (617-918-0882), or mail comments, postmarked no later than September 3, 2015 to:

Richard Hull
EPA Region New England
5 Post Office Sq., Suite 100
Mail Code OSRR07-02
Boston MA 02109-3912

In accordance with Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the law that established the Superfund program, this document summarizes EPA's cleanup proposal. For detailed information on the cleanup options evaluated for use at the Site, see the Savage Municipal Water Supply Well Superfund Site Feasibility Study and other documents contained in the Site's Administrative Record available for review online at http://www.epa.gov/region1/superfund/sites/savage or at the Site information repositories at the Wadleigh Memorial Library, Milford, NH, and at the EPA New England Records Center, 5 Post Office Sq., First Floor, Boston, MA 02109.

ACRONYMS

ARAR	Applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
EPA	United States Environmental Protection Agency
FS	Feasibility Study
GC AREA	Groundwater Cleanup Area
ISCO	*In-Situ* Chemical Oxidation
ISCR	*In-Situ* Chemical Reduction
MCL	Maximum Contaminant Level
NHDES	New Hampshire Department of Environmental Services
NPL	National Priorities List
O&M	Operations and Maintenance
OU	Operable Unit
PRB	Permeable Reactive Barrier
P&T	Pump and Treat
RAO	Remedial Action Objective
RI	Remedial Investigation
TI	Technical Impracticability
VOCs	Volatile Organic Compounds
ZVI	Zero Valent Iron

Table 2 - Comparison of TI Zone and GC Area Alternatives [a]

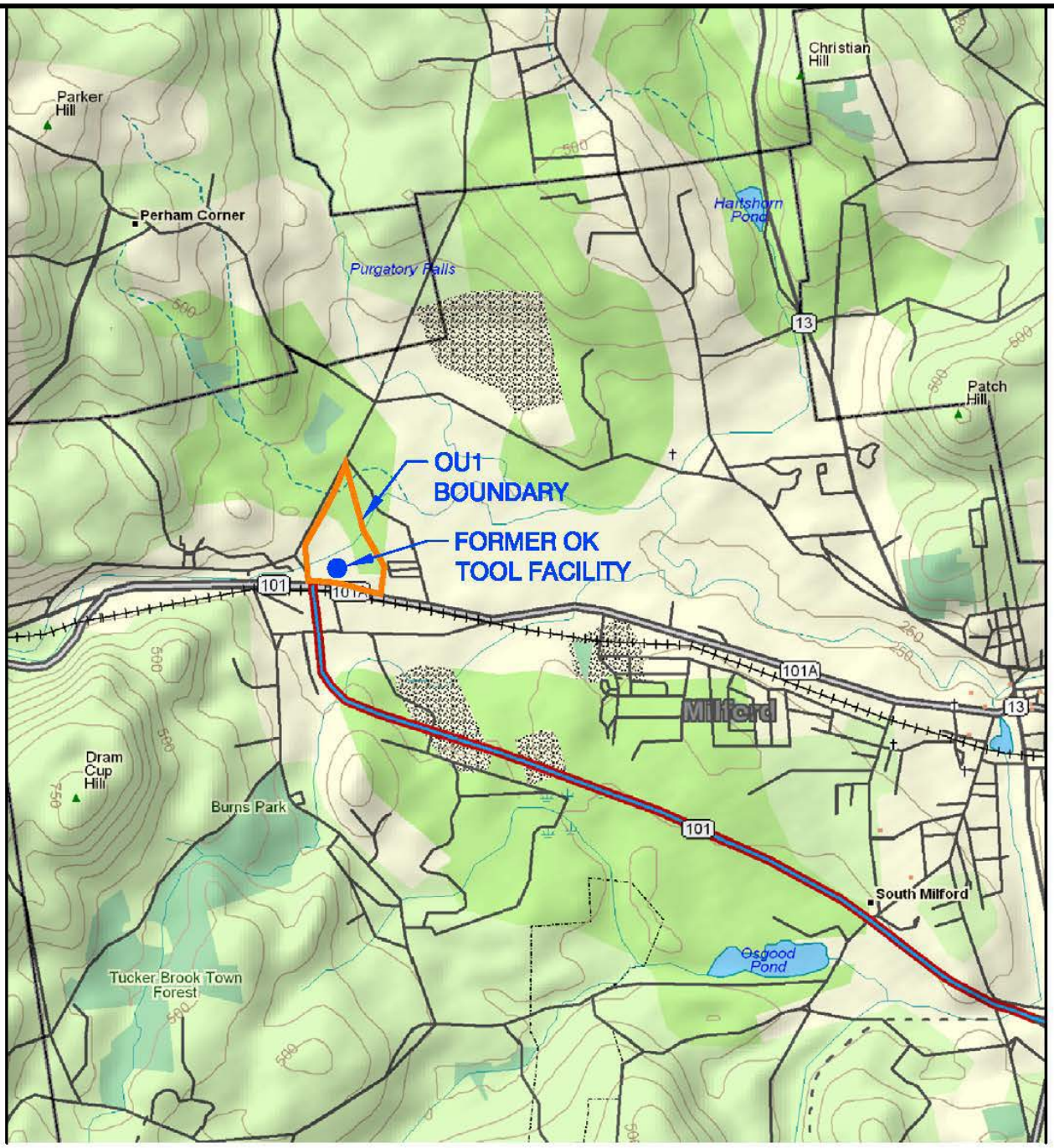
Nine Criteria	TI-1 ROD Remedy	TI-2 Physical Containment	TI-3 Hydraulic Containment	TI-4 ISCR	TI-5 ISCO*	TI-6 Thermal	GC-1 ROD Remedy	GC-2 MNA*
Protects human health & environment	✗	✓	✓	✓	✓	✓	✗	✓
Meets federal & state requirements[b]	✗	✓	✓	✓	✓	✓	✗	✓
Provides long-term protection	✗	✓	✓	✓	✓	✓	✓	✓
Reduces mobility, toxicity & volume through treatment	✓	✓	✓	✓	✓	✓	✗	✗
Provides short-term protection	✓	✓	✓	✓	✓	✓	✓	✓
Implementable	✓	✓	✓	✓	✓	✓	✓	✓
Cost (millions) ■ **Capital Cost**	$0	$29.1	$1.6	$11.9	$6.7	$72.6	$0	$0.27
■ **O&M[c]**	$2.7	$3.4	$5.4	$2.9	$4.1	$4.4	$0.5	$0.74
■ **Total Cost**	$2.7	$32.5	$7.0	$14.8	$10.8	$77	$0.5	$1.1
State of New Hampshire acceptance	To be determined after the public comment period							
Community acceptance	To be determined after the public comment period							

* **EPA's preferred option** ✓ **Meets or exceeds criterion** ✓ **Partially meets criterion** ✗ **Does NOT meet criterion**

[a] This table depicts a summary of the alternatives. It is not a substitute for the detailed analysis included in the Feasibility Study.

[b] TI-2 through TI-6 meet federal and state requirements with the application of a Technical Impracticability Waiver.

[c] O&M considers Net Present Value and is provided at a discount rate of 7%



SOURCE:
DELORME 3-D TOPOQUADS SOFTWARE; NEW HAMPSHIRE & VERMONT 3-D TOPOQUADS CD

QUADRANGLE LOCATION

GRAPHIC SCALE
3000 1500 0 1500 3000
APPROXIMATE SCALE IN FEET

SITE LOCATION MAP

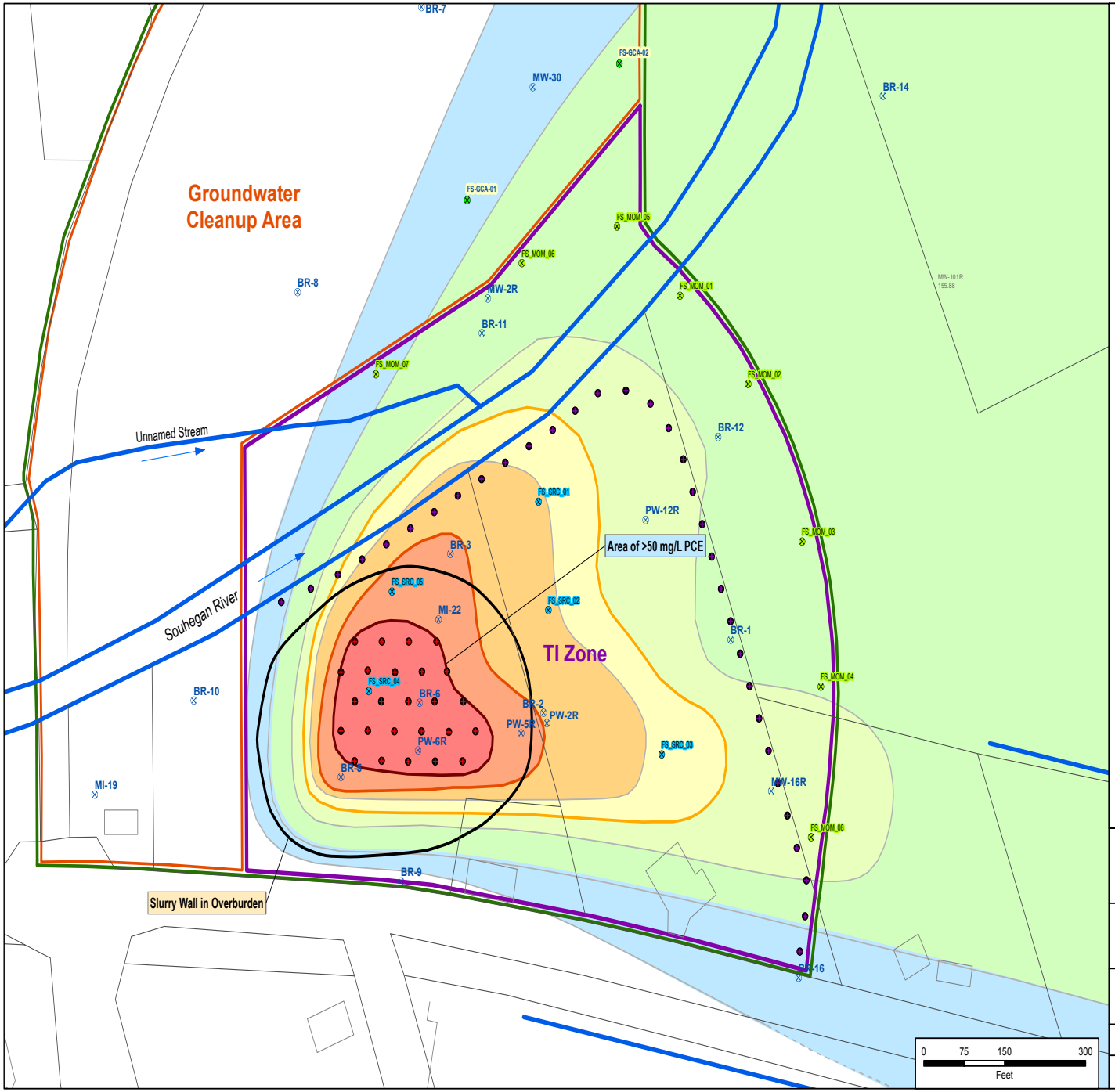
WESTON SOLUTIONS
CONCORD NEW HAMPSHIRE

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

FEASIBILITY STUDY REPORT
SAVAGE MUNICIPAL WATER SUPPLY SUPERFUND SITE
MILFORD, NEW HAMPSHIRE

DRAWN	DATE	DES. ENG.	DATE	W.O. NO.
TAC	NOV 2014			20118.016.001
CHECKED	DATE	SCALE	REVISION	FIGURE NO.
VD	NOV 2014	AS SHOWN		1-1

M:\Design\DWG\NHDES\savage\2014\Feasibility Study Report\figure 1-1.dwg, Layout1, 7/9/2015 1:38:37 PM, girardeb, 1:1



LEGEND

N

Additional Bedrock Monitoring Wells
- Management of Migration Monitoring
- Plume Monitoring
- Proposed Monitoring Locations in GCA

ISCO Injection Points
- Injection Points for Source Removal
- Injection Points for MOM

Existing Bedrock Wells
- Bedrock Monitoring Well

Ground Features
- Slurry Wall
- Buildings
- Property boundary
- Waterway & Wetland

Areal Extent
- OU1 Boundary
- TI Zone
- Groundwater Cleanup Area

PCE Concentrations in Bedrock Groundwater
- > 50,000 ug/L
- 15,000-50,000 ug/L
- 5,000-15,000 ug/L
- 1,500-5,000 ug/L
- 500-1,500 ug/L
- 50-500 ug/L
- 5-50 ug/L

Notes:
1. The PCE plume is configured based on Figure 7-2 of the Remedial Investigation Report, Savage Municipal Water Supply Superfund Site OU3, Milford, NH, 2014, which was based on the highest observed PCE values for each well during the Remedial Investigation (2010 to 2013).

ug/L - micrograms per liter
ISCO - In-situ Chemical Oxidation
DNAPL - Dense Non-Aqueous Phase Liquid
GCA - Groundwater Cleanup Area
MOM - Management of Migration
PCE - tetrachloroethene

WESTON SOLUTIONS
CONCORD NEW HAMPSHIRE

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

PRELIMINARY LAYOUT FOR ISCO BEDROCK INJECTION LOCATIONS ALTERNATIVE TI-5

FEASIBILITY STUDY
SAVAGE MUNICIPAL WATER SUPPLY SUPERFUND SITE
MILFORD, NEW HAMPSHIRE

DRAWN	DATE	W.O. NO.
AL	June 2015	20118.016.001
CHECKED	DATE	FIGURE NO.
FS	June 2015	5-17

FILE: C:\gis\GIS Project Files\SavageWell\FS_2015\MXD\Figure5-5A_ISCO_BR_planview_rev2.mxd 3:12:36 PM 06/18/2015 liua