Union Chemical Company Site
Hope, ME

U.S. EPA | HAZARDOUS WASTE PROGRAM AT EPA NEW ENGLAND

THE SUPERFUND PROGRAM *protects human health and the environment by locating, investigating, and cleaning up 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 MATTERS: OPPORTUNITIES TO COMMENT ON THE PLAN

EPA will be accepting public comments between **June 12, 2013** and **July 12, 2013** on this proposal to amend its cleanup approach at the Union Chemical Company Site. 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, e-mail, or fax. People also can offer oral or written comments at the formal public meeting/hearing. If you have questions about how to comment, or if you have specific needs for the public hearing or questions about the facility and its accessibility, please contact Pam Harting-Barrat (see below).

PUBLIC INFO MEETING & HEARING

THURSDAY, 6/20/13 • 7 PM

HOPE ELEMENTARY SCHOOL
34 Highfield Road
Hope, Maine 04847

SUMMARY OF THE PROPOSED PLAN:

This Proposed Plan presents a proposed change to the cleanup remedy for the Union Chemical Company Superfund Site (Site). In a 1990 Record of Decision (ROD), EPA selected a cleanup remedy for the Site that included four components: (1) cleaning, demolition, and removal of structures; (2) cleaning unsaturated soils (the soil above the water table) on-site; (3) further testing of off-site soils; and (4) restoring groundwater in the saturated soils and bedrock through a pump and aboveground treatment (pump-and-treat) system. EPA later augmented its cleanup approach to treating groundwater through the application of three different innovative in-situ treatment technologies. The first three components of the cleanup remedy have been successfully completed. While the operation of the groundwater pump-and-treat system and in-situ technologies have greatly reduced the amount of groundwater contamination at the Site, some groundwater contamination still remains. Based on a review of available remedial technologies to address the remaining groundwater contamination in light of historical data, and Site-specific hydrogeological and contaminant conditions, EPA is proposing to amend the 1990 ROD to change the groundwater cleanup remedy.

This Proposed Plan outlines EPA's preferred approach for addressing the remaining contamination in groundwater. The proposed approach includes implementing:

1. A Technical Impracticability Waiver (See explanatory box) of the requirement to meet federal and state groundwater standards because Site-specific hydrogeological and contaminant conditions limit the availability of an advantageous remedial technology. This waiver will be applied to the portion of the Site where groundwater contamination remains (see Figure 1);

2. Measures to ensure that this amended cleanup approach continues to be protective of human health and the environment, including:
   - Long-term monitoring of the remaining

continued >

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EPA United States Environmental Protection Agency

June 2013

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contaminants in groundwater;

- An environmental deed restriction on the Site property to (1) prohibit the use of groundwater, (2) ensure access for monitoring and oversight, and (3) prohibit activities that interfere with the remedy and monitoring equipment on-site;
- Five-Year Reviews to assure that the amended cleanup approach remains effective.

In addition, because of concerns that there is the potential for a vapor intrusion pathway to exist, in the deed restriction Maine Department of Environmental Protection (MEDEP) will require the application of appropriate vapor barrier or remediation technology in any future buildings on the Site. This requirement is consistent with the Maine Uniform Building Code for radon control options. The estimated total present value cost for implementing this proposed remedial approach over 30 years is $322,370.

In accordance with Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act, the law that established the Superfund program, this document summarizes EPA's proposed change to the cleanup remedy currently being implemented at the Site. For more detailed information on the cleanup alternatives evaluated for the remaining groundwater contamination, please see the Union Chemical Company Superfund Site Technical Impracticability Evaluation Report, available for review at the information repositories at the Town of Hope Maine office and at EPA's 5 Post Office Square office in Boston or online at www.epa.gov/region1/superfund/sites/union.

SCOPE AND ROLE OF THIS PROPOSAL:

In 2009, the Settling Defendants for the Site updated the Conceptual Site Model, a document that integrates historic site data into a picture depicting the movement of Site contaminants and their degradation over time and space. In January 2011, EPA and MEDEP conditionally approved a Technical Impracticability Evaluation Report, in which three cleanup alternatives to address the remaining groundwater contamination in both the saturated soils and bedrock were evaluated. The updated Conceptual Site Model and Technical Impracticability Evaluation Report form the basis for EPA's preferred method for addressing the remaining contamination at the Site.

Figure 1

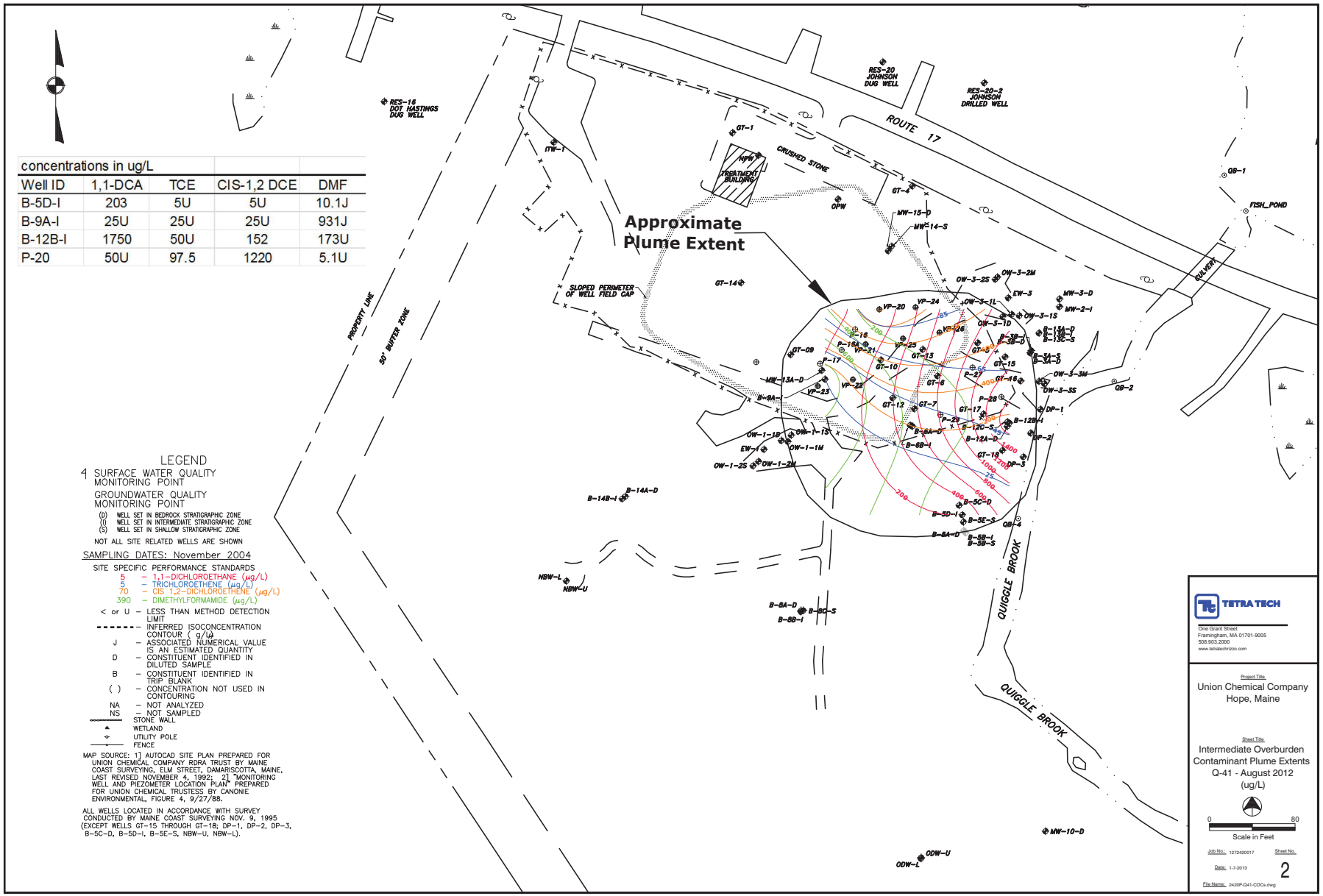
A CLOSER LOOK AT EPA'S AMENDED CLEANUP APPROACH:

Cleanup efforts from 1996 through 2000 removed about 8,550 pounds of volatile organic compounds (VOCs) from the unsaturated soil and about 950 pounds from the groundwater. Despite these cleanup results, however, it is estimated that approximately 420 pounds of VOCs remain adsorbed in the soil and bedrock or dissolved in the groundwater. The remaining contaminated groundwater is primarily located in the saturated soils and bedrock in an area of the Site adjacent to Quiggle Brook. See Figures 2 and 3.

Complete groundwater remediation was not achieved through the operation of the pump-and-treat system from 1996 through 2000, and the implementation of three different innovative in-situ technologies (injection of permanganate from 1997 through 2000, injection of carbon sources from 2001 through 2002, and injection of hydrogen peroxide in 2005).

EPA's preferred cleanup approach to the remaining contamination would remove the groundwater pump-and-treat component of the remedy due to Site-specific hydrogeological and contaminant conditions that limit the availability of an advantageous remedial technology. Typical of most pump-and-treat systems, the system became increasingly inefficient, recovering only 30 pounds in the final year of operation versus 920 pounds in the first three years of operation. The low permeability of the soil and bedrock limits the diffusion of contaminants from the soil and bedrock into the groundwater. This in turn controls the effectiveness of both pump-and-treat and in-situ technologies. As a result, EPA has determined that the ability to restore the groundwater to drinking water quality through

Figure 2


concentrations in ug/L
Well ID | 1,1-DCA | TCE | CIS-1,2 DCE | DMF
B-5D-I | 203 | 5U | 5U | 10.1J
B-9A-I | 25U | 25U | 25U | 931J
B-12B-I | 1750 | 50U | 152 | 173U
P-20 | 50U | 97.5 | 1220 | 5.1U
Approximate Plume Extent
ROUTE 17
RES-18 DOT HASTINGS DUG WELL
RES-20 JOHNSON DUG WELL
RES-20-2 JOHNSON DRILLED WELL
FISH_POND
CULVERT
PROPERTY LINE
50' BUFFER ZONE
SLOPED PERIMETER OF WELL FIELD CAP
CRUSHED STONE
TREATMENT BUILDING
QUIGGLE BROOK
LEGEND
SURFACE WATER QUALITY MONITORING POINT
GROUNDWATER QUALITY MONITORING POINT
(D) WELL SET IN BEDROCK STRATIGRAPHIC ZONE
(I) WELL SET IN INTERMEDIATE STRATIGRAPHIC ZONE
(S) WELL SET IN SHALLOW STRATIGRAPHIC ZONE
NOT ALL SITE RELATED WELLS ARE SHOWN
SAMPLING DATES: November 2004
SITE SPECIFIC PERFORMANCE STANDARDS
5 – 1,1-DICHLOROETHANE (µg/L)
5 – TRICHLOROETHENE (µg/L)
70 – CIS 1,2-DICHLOROETHENE (µg/L)
390 – DIMETHYLFORMAMIDE (µg/L)
< or U – LESS THAN METHOD DETECTION LIMIT
– – – – – – INFERRED ISOCONCENTRATION CONTOUR (g/L)
J – ASSOCIATED NUMERICAL VALUE IS AN ESTIMATED QUANTITY
D – CONSTITUENT IDENTIFIED IN DILUTED SAMPLE
B – CONSTITUENT IDENTIFIED IN TRIP BLANK
( ) – CONCENTRATION NOT USED IN CONTOURING
NA – NOT ANALYZED
NS – NOT SAMPLED
STONE WALL
WETLAND
UTILITY POLE
FENCE
MAP SOURCE: 1) AUTOCAD SITE PLAN PREPARED FOR UNION CHEMICAL COMPANY RDRA TRUST BY MAINE COAST SURVEYING, ELM STREET, DAMARISCOTTA, MAINE, LAST REVISED NOVEMBER 4, 1992; 2) "MONITORING WELL AND PIEZOMETER LOCATION PLAN" PREPARED FOR UNION CHEMICAL TRUSTESS BY CANONIE ENVIRONMENTAL, FIGURE 4, 9/27/88.
ALL WELLS LOCATED IN ACCORDANCE WITH SURVEY CONDUCTED BY MAINE COAST SURVEYING NOV. 9, 1995 (EXCEPT WELLS GT-15 THROUGH GT-18; DP-1, DP-2, DP-3, B-5C-D, B-5D-I, B-5E-S, NBW-U, NBW-L).
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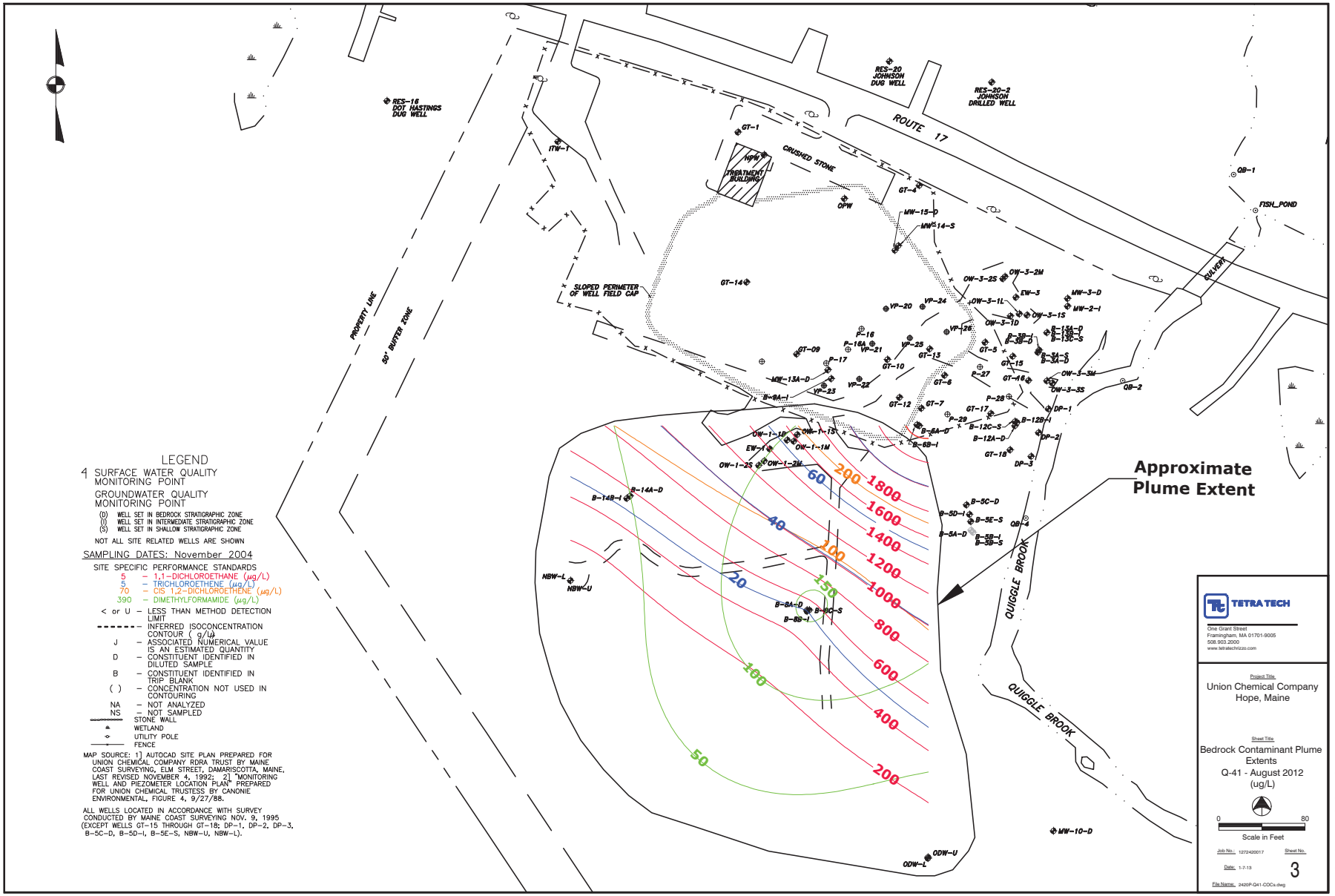
Project Title
Union Chemical Company
Hope, Maine
Sheet Title
Intermediate Overburden Contaminant Plume Extents
Q-41 - August 2012
(ug/L)
0 80
Scale in Feet
Job No. 127240017
Sheet No. 2
Date: 1-7-2013
File Name: 2420P-Q41-COCs.dwg
J:\Project\2420\Plot\Q41\2420P-Q41-COCs.dwg1/07/2013 10:27:02 AM EDT

Figure 3


LEGEND
4 SURFACE WATER QUALITY MONITORING POINT
GROUNDWATER QUALITY MONITORING POINT
(D) WELL SET IN BEDROCK STRATIGRAPHIC ZONE
(I) WELL SET IN INTERMEDIATE STRATIGRAPHIC ZONE
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WETLAND
UTILITY POLE
FENCE
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RES-16 DOT HASTINGS DUG WELL
RES-20 JOHNSON DUG WELL
RES-20-2 JOHNSON DRILLED WELL
ROUTE 17
ITW-1
GT-1
HPW
TREATMENT BUILDING
CRUSHED STONE
OPW
GT-4
MW-15-D
MW-14-S
GT-14
SLOPED PERIMETER OF WELL FIELD CAP
PROPERTY LINE
50' BUFFER ZONE
CULVERT
QB-1
FISH_POND
QB-2
QB-4
OW-3-25
OW-3-2M
EW-3
MW-3-D
MW-2-I
OW-3-1L
OW-3-1S
OW-3-1D
VP-20
VP-24
VP-26
VP-25
VP-21
VP-22
VP-23
P-16
P-16A
P-17
GT-09
GT-10
GT-13
GT-5
GT-15
GT-16
GT-6
GT-12
GT-7
GT-17
GT-18
P-27
P-28
P-29
MW-13A-D
B-9A-I
B-6A-D
B-6B-I
B-12C-S
B-12A-D
B-12B-I
DP-1
DP-2
DP-3
OW-3-3M
OW-3-3S
OW-1-1S
OW-1-1M
OW-1-2M
OW-1-2S
EW-1
B-14B-I
B-14A-D
B-5C-D
B-5D-I
B-5E-S
B-5A-D
B-5B-I
B-5B-S
NBW-L
NBW-U
B-8A-D
B-8C-S
B-8B-I
MW-10-D
ODW-U
ODW-L
QUIGGLE BROOK
QUIGGLE BROOK
Approximate Plume Extent
60
200
1800
1600
1400
1200
1000
800
600
400
200
40
100
20
150
100
50
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One Grant Street
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Project Title
Union Chemical Company
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Sheet Title
Bedrock Contaminant Plume Extents
Q-41 - August 2012
(ug/L)
0
80
Scale in Feet
Job No. 127240017
Sheet No. 3
Date 1-7-13
File Name 2420P-Q41-COCs.dwg
Project\2420□lot\Q41\2420P-Q41-COCs.dwg1/07/2013 10:27:02 AM EDT

available pump-and-treat and in-situ technologies is technically impracticable.

Based on its evaluation of the three cleanup alternatives considered in the Technical Impracticability Evaluation Report and a No Further Action alternative, required to be evaluated under Superfund law regulations, EPA is proposing to amend its cleanup approach by discontinuing active groundwater remediation through pump-and-treat and in-situ technologies, and waiving federal and state drinking water standards for a portion of the Site where groundwater contamination remains because of the technical impracticability of restoring the groundwater to these standards within a reasonable timeframe. It is projected that more than 300 years will be necessary to fully achieve drinking water quality at the Site, irrespective of which technically feasible cleanup alternative is used, including EPA's preferred alternative, which lacks active treatment.

Under EPA's preferred cleanup approach, the Agency would use multiple measures to ensure that the remedy remains protective of human health and the environment. First, EPA would use long-term monitoring to confirm that levels of contamination are decreasing and contamination is not migrating from the Site.

Second, EPA is proposing to place institutional controls in the form of an environmental deed restriction on the Site property. Since 1986, MEDEP has held the Site property in receivership by order of the Maine Superior Court. EPA would require the recording of an environmental deed restriction that runs with the land at the Knox County Registry of Deeds before the property is transferred to a new owner. The deed restriction would help ensure the protectiveness of the remedy from the remaining contamination at the Site by (1) prohibiting the use of groundwater, (2) ensuring access for monitoring and oversight, (3) prohibiting activities that interfere with the remedy and monitoring equipment on-site, and (4) requiring the application of appropriate vapor barrier or remediation technology in any future buildings on the Site.

Third, EPA would conduct reviews every five years to assess the long-term and short-term protectiveness of the remedy to public health and the environment. Five-Year Reviews include, as necessary, recommendations to maintain the ongoing protectiveness of the remedy.

EPA's preferred cleanup approach is discussed in greater detail in the Technical Impracticability Evaluation Report under Alternative GW-2. The estimated total present value cost for this preferred cleanup approach is $322,370 over a 30-year period.

POTENTIAL COMMUNITY IMPACTS:

The proposed cleanup approach to the remaining contamination is not expected to impact the surrounding community. The preferred approach will generally consist of only groundwater monitoring on and near the Site to ensure that contaminated groundwater is not migrating from the Site, and periodic visits to ensure compliance with the environmental deed restrictions. EPA and MEDEP will work with the Town and any future Site property owner to ensure that activities are consistent with the restrictions that will be placed on the Site property.

SITE DESCRIPTION:

The Site consists of the former Union Chemical Company property, an approximately 12-acre parcel located on the south side of Route 17 in Hope, Maine. The topography slopes downward to the south and southeast to Quiggle Brook. North of Route 17, across from the Site, there are residences and a seasonal business. The adjacent properties to east, south, and west are undeveloped. The area is not served by public water or sewer systems. Groundwater flows through the saturated soils generally from northwest to southeast consistent with the topography. Groundwater flow direction in the bedrock is similar with a secondary flow direction to the southwest that is constrained by fractures and bedding structures within the bedrock. Historically, the bedrock has been the primary drinking water source for residential water wells in the area surrounding the Site.

Long-term monitoring data collected since the late 1980s has been used to identify the extent of groundwater contamination beneath the Site. The location of remaining contaminated groundwater in the saturated soils is between the former operation area and Quiggle Brook. The location of the remaining contaminated groundwater in the bedrock is similar to the location of the contaminated groundwater in saturated soils, and also extends southerly toward the property line.

LAND USE AND REMEDIATION HISTORY:

The Union Chemical Company began operations in 1967 as a paint stripping and solvent manufacturing business. Initially, the company manufactured and used patented solvents on the premises. The company later expanded its operations to include the recycling of used stripping compounds and solvents from other businesses. In 1982, the company further expanded operations with an incinerator to treat waste solvents and other compounds. Process water for these operations was provided by two bedrock wells, one located near Route 17 and the other located near the southern boundary of the property.

Soil and groundwater contamination beneath the Site and surface water contamination in Quiggle Brook were first discovered by MEDEP in late 1979. VOCs, similar to those processed by the facility, were the principal contaminants observed in the groundwater and in Quiggle Brook. In June 1984, MEDEP required the company to close its hazardous waste treatment operations. By the end of November 1984, MEDEP and EPA removed approximately 2,000 2,500 55 gallon drums and 30 liquid storage tanks. In 1986, Maine Superior Court evicted the company from the Site property and appointed MEDEP as the receiver of the property. In October 1989, EPA formally included the Site on the National Priorities List. In 1990, EPA issued a ROD selecting the initial cleanup remedy for the Site. The cleanup remedy was performed as follows:

1993-1994: Decontamination of facilities, and demolition and off-site disposal of the debris.

1994-1996: Collection of on-site meteorological data and soil samples from nearby properties.

1996-1998: Operation of soil vapor extraction supplemented with hot air injection.

1996-2000: Operation of groundwater pump-and-treat system, with discharge of treated groundwater to Quiggle Brook.

1997-2000: Application of in-situ technology to add permanganate to groundwater.

2001-2002: Application of in-situ technology to add molasses and sodium lactate as carbon sources to groundwater.

2005: Application of in-situ technology to add hydrogen peroxide to groundwater.

2005-2009: Further investigation of bedrock, and refinement of the Conceptual Site Model.

At the time of the 1990 ROD, the ability to restore groundwater through a pump-and-treat system was coming into question. EPA stated in the ROD that it anticipated implementation of the pump-and-treat system would achieve cleanup levels within 15 to 30 years, but EPA also acknowledged the possibility that groundwater contaminant levels might eventually cease to decline and remain above the cleanup levels. EPA consequently stated in the ROD that the groundwater pump-and-treat system, chosen performance standards, and/or the initially selected approach to addressing contaminated groundwater might require reevaluation at a later point in time.

Recognizing technological and hydrogeological limitations, the Settling Defendants implemented, upon EPA and MEDEP approval, three types of in-situ technologies to enhance the groundwater pump-and-treat system. First, between 1997 and 2000, the Settling Defendants injected permanganate into groundwater in an effort to push the subsurface environment to aerobic conditions and aid the breakdown of contaminants to water and chlorine. During this period, concentrations of tetrachloroethylene, trichloroethylene and dichloroethene significantly decreased, but concentrations of dichloroethane did not. At the end of 2000, the pump-and-treat system was shut down due to its decreased effectiveness. In 2001 and 2002 the Settling Defendants implemented a second in-situ technology, the introduction of molasses and sodium lactate solutions (as carbon sources) to groundwater in an effort to create anaerobic conditions and aid the breakdown of the remaining dichloroethane. Unfortunately, this in-situ carbon introduction effort did not result in significant decreases in contaminant concentrations. Lastly, in 2005, the Settling Defendants implemented a third in-situ technology, the addition of hydrogen peroxide to the groundwater in an effort to create aerobic conditions and aid the breakdown of remaining contaminants. Similar to previous in-situ efforts, data indicated only a minimal decrease of contaminant concentrations, which generally remained above cleanup levels.

TECHNICAL IMPRACTICABILITY WAIVER

Technical Impracticability is one of the six statutory and regulatory waivers of applicable or relevant and appropriate requirements (ARARs). 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 otherwise be provided. It is the expectation of the law that EPA will return usable ground waters to their beneficial uses wherever practicable within a timeframe that is reasonable given the particular circumstances of the site. The pertinent chemical-specific ARAR for remaining SVOCs and VOCs in this case are the federal Maximum Contaminant Levels promulgated pursuant to the Safe Drinking Water Act, and when more stringent, the State of Maine Maximum Exposure Guidelines limits.

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 a contaminant's potential to become either sorbed into, or lodged within, the soil or rock comprising the aquifer. When these conditions exist, EPA may waive groundwater cleanup standard ARARs through a Technical Impracticability Waiver when selecting a cleanup alternative if site-specific hydrogeologic and contaminant conditions limit the availability of remedial technologies, provided that the chosen alternative is protective of human health and the environment and attains all other ARARs.

Long-term monitoring data since the 1980s and during the operation of the pump-and-treat system and application of the innovative in-situ technologies indicate the existence of conditions that make it technically impracticable to restore the groundwater to drinking water standards within a reasonable timeframe.

CURRENT & FUTURE LAND USE:

The Site is located on Route 17 in a rural residential area of Hope Maine. As noted above, public water and sewer service are not available in the area surrounding the Site. Zoning allows for some commercial use and there is a full-year business to the east of the Site and a seasonal business on the north side of Route 17. A fence encloses a portion of the Site, primarily the portion abutting Route 17. The contaminant source area, where the facility's activities occurred, is covered by the two-foot thick clay and gravel cap. The contaminant source area also contains numerous decommissioned wells, which are cut off below grade, as well as the groundwater treatment plant discharge pipe, which has been plugged at both ends.

In 2006, EPA hosted public meetings in the community on possible future uses of the Site. Meeting participants identified several possible

reuse approaches, but reached no consensus on a preferred option. Subsequent to these EPA-hosted events, the Town established committees to further explore reuse options. Following a January 2013 Site update by EPA and MEDEP to the Town of Hope Board of Selectmen, the Town notified MEDEP of the Town's interest in obtaining the Site property. Given the remaining contamination in the saturated soils and bedrock, an environmental deed restriction will be recorded on the Site property deed to (1) prohibit the use of groundwater, (2) ensure access for monitoring and oversight, (3) prohibit activities that interfere with the remedy and monitoring equipment on-site, and (4) require the application of appropriate vapor barrier or remediation technology in any future buildings on the Site. EPA and MEDEP will work with the Town to accommodate reuse of the property within the context of these restrictions.

STATUS OF CLEANUP:

Past operations at the Site resulted in the release of solvents, which contaminated unsaturated and saturated soils and groundwater. To date, approximately 96% of the soil and groundwater contamination has been cleaned up. The groundwater pump-and-treat system, operated from 1996 to 2000, and the in-situ technologies, implemented from 1997 to 2000, 2001 to 2002, and in 2005, have removed most of the contamination from the groundwater. As a result, the area of remaining contamination at the Site has been reduced down to an area located on the eastern part of the Site. Because the remaining contamination is in bedrock and soil with low permeability, it acts as a source of contamination slowly releasing solvents into the groundwater. Sampling also indicates that the remaining contamination could be a source of solvent vapors that could create an exposure pathway if buildings are ever constructed on the Site. Long-term sampling data indicate that contaminant concentrations are slowly decreasing. Extrapolations of this data indicate contaminants in bedrock groundwater will require more than 300 years to attenuate to drinking water standards.

ENVIRONMENTAL INVESTIGATIONS AND CLEANUP ACTIONS TO DATE

1967: Union Chemical Company began paint stripping and solvent manufacturing operations. Waste acids and chlorinated solvents were discharged to a permitted septic system and there were spills onto the ground surface.

1979: Groundwater contamination beneath the Site and in Quiggle Brook discovered by MEDEP.

1984: Closure of Union Chemical Company's hazardous waste treatment operations required by MEDEP.

1986: Union Chemical Company evicted from the Site and MEDEP appointed as receiver by Maine Superior Court.

1990: Record of Decision, selecting initial cleanup remedy, issued by EPA. This initial cleanup approach included removal of the buildings, active remediation of the Site soils and groundwater, and investigation of off-site soils.

1994: Building demolition completed and on-site soil cleanup initiated.

1995-1996: Groundwater and vapor extraction systems constructed and operations started.

1997: Off-site soils were addressed; sampling did not find any Site-related contaminants.

1999: On-site soil cleanup completed.

1997-2000: First in-situ technology, introduction of permanganate to groundwater, was implemented.

2000: Groundwater pump-and-treat system was shut down after reaching its point of limited effectiveness.

2001-2002: Second in-situ technology, introduction of molasses and sodium lactate solutions as carbon sources to groundwater, was implemented.

2001-present: Vapor extraction system, groundwater pump-and-treat system, and redundant monitoring wells decommissioned.

2005: Third in-situ technology, introduction of hydrogen peroxide, in lieu of pump-and-treat system, was implemented.

2006: Potential vapor intrusion pathway evaluation was completed.

2006-present: Long-term monitoring of groundwater and updates to site documents completed in preparation for next phase at Site.

2012: Five-Year Review of Site was completed by EPA as required by the Superfund law. This review concluded that the remedy was protective of human health and the environment in the short-term because contamination had not moved beyond the Site property and the Site was held in receivership by MEDEP. The review also concluded that resolution of property ownership and implementation of institutional controls was necessary to ensure remedy was protective in long-term.

EXPOSURE PATHWAYS & POTENTIAL RISK:

The existence of contamination at a particular site does not mean the environment or people are currently at risk. Risk is created only if there can be exposure to the contamination. Exposure can occur when people or other living organisms eat, drink, breathe or have direct skin contact with a hazardous substance, pollutant 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. These assessments use different contamination exposure scenarios to determine if and where there are current or potential future unacceptable risks.

Human health and ecological risk assessments were prepared for the Site during EPA's initial investigation. The human health risk assessment considered risks associated with contaminants detected in groundwater, surface and subsurface soils and surface water. Both carcinogenic and non-carcinogenic risks were evaluated. At the time of the initial investigation, residential consumption of groundwater at the Site was the only exposure pathway that represented a risk above EPA target levels. Important contributors to this risk included the solvents trichloroethylene, 1,1-dicloroethylene, and 1,1-dichloroethane. Cleanup goals were established in the 1990 ROD for all contaminants based upon federal and state drinking water standards.

During three separate Five-Year Reviews (2002, 2007, and 2012) since EPA's selection and implementation of the cleanup selected in the ROD, EPA has reevaluated its human health and ecological risk assessments. During each review EPA concluded that these assessments remain valid.

In 2002, EPA published guidance on evaluating the vapor intrusion pathway from the volatilization of solvents adsorbed onto soil or dissolved in groundwater. In 2006, EPA's laboratory completed an analysis of shallow groundwater samples. Using the 2002 guidance, EPA could not rule out the potential for a vapor intrusion pathway and the 2007 Five-Year Review stated that prior to the property being redeveloped, the potential vapor intrusion pathway would need to be addressed.

Human Health:
People may potentially be exposed to Site contaminants by either drinking contaminated groundwater or breathing vapors that enter any future buildings. Use of the contaminated groundwater for drinking water would pose an unacceptable risk to human health. In 2006, computer modeling was completed to assess the risk from vapors if buildings are constructed on the Site. The modeling indicated that groundwater contaminant concentrations would not pose an unacceptable risk to workers, but could pose an unacceptable risk to people living on the Site. In 2012, EPA determined that trichloroethylene is more toxic than previously thought, and published new, stricter toxicity values for the chemical. Consequently, potential risk associated from vapor intrusion into future buildings at the Site is even greater than the 2006 model indicates.

Site Exposure Assumptions:
EPA used the following standard exposure assumptions to estimate the potential human health risks posed by the Site:

- For using groundwater as drinking water, assumed that residents would consume 2 liters per day for 350 days a year for a total of 30 years;
- For workers inhaling contaminated vapors, it was assumed that they would be exposed for 8 hours per day for 250 days per year over 20 years; and
- For residents inhaling contaminated vapors, it was assumed that they would be exposed for 24 hours per day for 360 days per year for 30 years.

Threats to the Environment:
EPA's initial ecological risk assessment focused on potential environmental receptors associated with the wetland area (west of the groundwater treatment building) and Quiggle Brook. In the risk assessment, EPA did not find a significant hazard, but did find that wildlife populations could be potentially harmed from direct contact with the contaminated soils and facilities at the Site. Since the risk assessment, the unsaturated soils have been cleaned to the performance standards established in the ROD. In addition, a two-foot clay and gravel cap has been constructed over the former active operation area, thereby further limiting exposure to Site soils. Long-term monitoring data indicates that Quiggle Brook has not been impacted by contamination from the Site.

CLEANUP ALTERNATIVES:

After possible exposure pathways and potential risks have been identified at a site, cleanup alternatives are developed to address the identified risks and to achieve site-specific remedial action objectives. These remedial action objectives are consistent with statutory requirements and preferences established by Congress. A short synopsis of each alternative considered is outlined below.

The 1990 ROD included eight remedial action objectives and seven have been achieved through the demolition of the facilities, implementation of the soil vapor extraction system, monitoring of off-site soils, and active remediation of the groundwater (thereby preventing migration of contaminants to Quiggle Brook). The remedial action objective not achieved was the rapid restoration of the contaminated groundwater throughout the Site. Because of the technical impracticability of restoring the groundwater, EPA has developed two new objectives for the proposed change in the remedy to address the remaining possible exposure pathways. These are as follows:

- Prevent ingestion of contaminated groundwater from the saturated soils and bedrock; and
- Prevent exposure to contaminants that could pose an inhalation risk to future users of the Site.

The December 2009 Conceptual Site Model Report identifies and provides an initial evaluation of the feasibility of in-situ and ex-situ technologies to address remaining contamination at the Site in light of Site-specific conditions. The January 2011 Technical Impracticability Evalua-

tion Report provides a more detailed description and analysis of three alternatives to reduce risks from exposure to contaminated groundwater and vapor intrusion.

EPA believes that the preferred alternative presented in this Proposed Plan will meet the remedial action objectives described above, and protect public health and the environment. Below is a summary of the alternatives and how they will, or will not, meet the remedial action objectives. Alternatives 2, 3, and 4 were evaluated in the Technical Impracticability Evaluation. Alternative 1, required under Superfund law to be evaluated for comparison purposes, is added here in the Proposed Plan.

Alternative 1: No Further Action

No Further Action is used as a baseline for comparison to other cleanup alternatives. Under this alternative, no further active cleanup activities, periodic monitoring, environmental deed restriction, or Five-Year Reviews would be required. It would be unknown if, or when, cleanup objectives would be met under this alternative. The estimated total present value cost of this alternative is $0.

Alternative 2: Long-Term Monitoring and Institutional Controls

EPA's preferred method for addressing the remaining contamination in groundwater requires:

1. A Technical Impracticability Waiver (See explanatory box) of the requirement to meet federal and state groundwater standards because Site-specific hydrogeological and contaminant conditions limit the availability of an advantageous remedial technology. This waiver would be for the portion of the Site that remains contaminated;

2. Measures to ensure that this amended cleanup approach continues to be protective of human health and the environment, including:

- Long-term monitoring of the remaining contaminants in groundwater;
- An environmental deed restriction on the Site property to (1) prohibit the use of groundwater, (2) ensure access for monitoring and oversight, and (3) prohibit activities that interfere with the remedy and on-site monitoring equipment;
- Five-Year Reviews to assure that the amended cleanup approach remains effective.

In addition, in the deed restriction MEDEP will require the application of appropriate vapor barrier or remediation technology in any future buildings on the Site. Groundwater and surface water would be monitored at locations that would adequately represent saturated soils and bedrock and Quiggle Brook. The monitoring will enable EPA and MEDEP to track contaminant concentrations within the plume and along the plume boundary. Such tracking will help EPA and MEDEP to ensure the plume is not expanding, and to monitor the primary ecological receptor, Quiggle Brook, for evidence of impacts from the plume.

Although this alternative waives groundwater cleanup standards, it is expected that natural processes in the soils and bedrock will reduce concentrations of contaminants to cleanup levels over time. Because it is projected that it will take more than 300 years for the bedrock to achieve the cleanup levels, environmental deed restrictions will be required to ensure that human health is protected.

The estimated total present value cost of implementing this alternative over 30 years is $322,370.

Alternative 3: In-situ Chemical Oxidation with Soil Mixing

In-situ chemical oxidation (ISCO) would be used to reduce the remaining contamination in four areas of the saturated soils and bedrock where contaminant concentrations are at least one order of magnitude greater than adjacent areas. A chemical oxidant, such as permanganate, would be introduced into the soils using soil mixing techniques. While previous in-situ oxidation attempts between 1997 and 2000 significantly decreased contamination levels, the efforts were unable to reduce contaminant concentrations down to cleanup levels in these areas because of the sorptive properties of the contaminants and the limited permeability and transmissivity of the soils and bedrock. To help overcome the limited permeability and transmissivity, soil mixing techniques would be used in the saturated soils to more effectively distribute the chemical oxidant. This soil mixing technique, however, is limited in that it cannot be applied to contaminated groundwater in the bedrock.

Because this alternative would not shorten the 300 plus year timeframe to restore the groundwater in bedrock to cleanup levels, this alternative would also require a technical impracticability waiver of groundwater cleanup standards and institutional controls to ensure that human health is protected. Five-Year Reviews would also be a required component of this alternative.

The estimated total present value cost of implementing this alternative over 30 years is $9,340,000.

Alternative 4: Electric Resistance Heating

Electric resistance heating (ERH) would be used to reduce the remaining contamination in the saturated soils. ERH consists of placing electrodes in the contaminated areas of the saturated soils and then applying an electric current to the electrodes to heat the soils to a temperature above the boiling points of the contaminants. Operation of the electrodes would promote evaporation, transformation via hydrolysis, and potential destruction of the volatilized contaminants. The volatilized contaminants and steam would be brought to the surface for treatment via a soil vapor extraction system, such as the one used previously at the Site from 1996 to 1998, to attain the cleanup levels in the unsaturated soils.

This technology is effective in any type of soil, but is not effective in the metamorphic and igneous bedrock present at the Site. Consequently, as with Alternative 3, ERH would not shorten the 300 plus year timeframe to restore the groundwater in bedrock to cleanup levels, and therefore this alternative would also require a technical impracticability waiver of groundwater cleanup

standards and require institutional controls to ensure that human health is protected. Five-Year Reviews would be a required component of this alternative.

The estimated total present value cost of implementing this alternative over 30 years is $15,960,000.

CLEANUP ALTERNATIVES COMPARISON:

The four cleanup alternatives described in this Proposed Plan were compared with each other to identify how well each alternative meets EPA's evaluation criteria. The following discussion and table presents a general comparison summary of the alternatives. More detailed evaluations and comparisons of Alternatives 2, 3, and 4 are included in the Technical Impracticability Evaluation report.

1. Overall Protection of Human Health and the Environment

The No Further Action alternative would not be protective as no monitoring or evaluation of the contamination that remains in the saturated soils and bedrock would occur and no environmental deed restriction would be implemented to prevent exposure to groundwater and potential vapor intrusion risks. The other three alternatives would be protective as they would require an environmental deed restriction to prevent exposure to groundwater and potential vapor intrusion. Monitoring and evaluation of the remedial progress every five years through Five-Year Reviews would help ensure that the remedy remains protective of human health and the environment over the long-term.

2. Compliance with ARARs

The No Further Action alternative would not comply with chemical-specific ARAR requirements related to groundwater or EPA guidance on vapor intrusion. Chemical-specific ARARs related to groundwater would be waived for the other three alternatives. Chemical-specific ARARs related to surface water would be met by all of the alternatives. Additionally, Alternatives 2, 3, and 4 would comply with location-specific and action-specific ARARs as well as EPA's guidance on vapor intrusion.

3. Long-Term Effectiveness and Permanence

Because there is no evaluation of conditions under the No Further Action alternative, attainment of cleanup levels would not be ascertained and the magnitude of the remaining residual risk would therefore also be unknown. In addition, under the No Further Action alternative, the lack of an environmental deed restriction to prevent exposure to contaminants creates the potential of future unacceptable risk.

Alternatives 3 and 4 offer the greatest potential of achieving long-term effectiveness most rapidly by using active remediation to address contaminated groundwater within saturated soils. The active remediation technologies are limited, however, from addressing contamination within bedrock groundwater because of the unique hydrogeological and geochemical properties of the Site and contaminants. Alternatives 3 and 4 therefore would not appreciably shorten the

THE NINE CRITERIA FOR CHOOSING A CLEANUP PLAN

EPA uses the nine criteria identified below to evaluate cleanup alternatives and select a final cleanup plan or cleanup plan amendment. Alternatives 2, 3 and 4 have already been evaluated under the first seven criteria in the Technical Impracticability Evaluation Report. 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 the cleanup alternative protect human health 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 alternative must meet this criterion or provide a waiver.

3. Long-term effectiveness and permanence: Will the effects of the cleanup alternative 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 alternative cause short-term hazards to workers, residents or the environment?

6. Implementability: Is the alternative technically feasible? Are the right goods and services (e.g., 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?

timeframe necessary to restore the groundwater as a whole to drinking water quality standards in comparison to Alternative 2. Alternatives 2, 3, and 4 achieve long-term effectiveness and permanence through the implementation and monitoring of an environmental deed restriction. The environmental deed restriction would help prevent potential future unacceptable risks from exposure to the contaminated groundwater and vapor intrusion. EPA will use Five-Year Reviews to help monitor, maintain and enforce the environmental deed restriction. For all three of these alternatives, the timeframe for restoration of groundwater in the bedrock is estimated to be over 300 years.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

All four alternatives would gradually reduce the toxicity and volume of contamination through natural processes. Alternative 3 would actively reduce the toxicity, mobility and volume of remaining groundwater contaminants in saturated soils through treatment by ISCO while relying on natural processes to reduce the toxicity, mobility, and volume of the contaminants in the bedrock. Similarly, Alternative 4 would actively reduce the toxicity, mobility and volume of remaining groundwater contaminants in the saturated soils through treatment by ERH heating while relying on natural processes to reduce the toxicity, mobility, and volume of the contaminants in the bedrock.

5. Short-Term Effectiveness

As no action would be taken under Alternative 1, there would be no short-term impacts to the community, workers, or the environment. No risk reduction would occur in the short term.

For Alternative 2, there would be minimal short-term risk to workers as the only site activities would be the long-term monitoring and inspections necessary to ensure that the environmental deed restriction has been implemented and are being followed. No risks to community members or the environment are expected with Alternative 2.

For Alternatives 3 and 4, there would be minimal short-term risk to workers, the community, and the environment as the only site construction activities would be the soil mixing and the installation of soil borings or groundwater monitoring wells. Standard engineering precautions would be followed to minimize short-term risks related to the handling and distribution of chemical oxidants during the ISCO work and the electrical hazards related to the operation and maintenance of the ERH system for the duration of its implementation.

From the groundwater modeling extrapolations, the timeframe for Alternatives 2, 3, and 4 for achieving groundwater drinking water standards in the bedrock is 345 years.

6. Implementability

The No Further Action alternative requires no implementation. For Alternative 2, there are no significant technical issues associated with groundwater monitoring and enforcement of the environmental deed restriction. The groundwater monitoring would continue the program that began in 1992. The environmental deed restriction would be created using a standardized model document that has been implemented state-wide and with the review of the Maine Attorney General's office.

Past application of ISCO at the Site demonstrates that Alternative 3 can be implemented. The materials and equipment needed for designing and constructing an oxidant addition system are readily available. The electrical service necessary for Alternative 4, ERH, is available at the Site. Because of the hydrogeological and geochemical conditions at the Site, before the implementation of ERH is begun, a pilot study would be needed in order to design the correct spacing of the electrodes in the soil. Equipment and supplies needed for ERH are readily available.

7. Costs

Net present value costs based on a 30-year time period were developed for each of the alternatives. As noted previously, because of the hydrogeological properties of the saturated soils and bedrock and the geochemical properties of the contaminants, it is estimated that Alternatives 2, 3, and 4 will require more than 300 years to achieve drinking water cleanup standards for groundwater in the bedrock at the Site.

The costs for Alternatives 3 and 4 include predesign fieldwork, design, installation, and operation for 30 years.

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

Alternative 1, No Further Action: $0
Alternative 2, LTM and ICs: $322,370
Alternative 3, ISCO and ICs: $9,340,000
Alternative 4, ERH and ICs: $15, 960,000

8. State Acceptance

MEDEP has been actively involved with the review of the Conceptual Site Model and Technical Impracticability Evaluation and has had substantive discussions with EPA regarding the Site and EPA's preferred cleanup approach.

9. Community Acceptance

Community acceptance will be evaluated based on the feedback received during the public hearing and the public comment period.

WHY EPA RECOMMENDS THIS CLEANUP PROPOSAL:

EPA's proposed change to the cleanup remedy addresses the remaining groundwater contamination at the Site following more than six years of active cleanup efforts that removed approximately 9,500 pounds of contaminants. The remaining contamination consists of approximately 420 pounds of solvents that remain adsorbed in the soil and bedrock or dissolved in the groundwater.

EPA is proposing to waive groundwater cleanup standards under a Technical Impracticability Waiver for the Site because (1) the original remedy selected for the Site had reached the limits of its effectiveness, (2) three innovative in-situ technologies have proven unsuccessful, and (3) an evaluation of cleanup alternatives indicates that no technology is available for achieving groundwater cleanup standards in a reasonable timeframe.

Comparison of Alternatives				
Nine Criteria	Union Chemical Company Remedial Alternatives			
	Alt 1	Alt 2	Alt 3	Alt 4
Protects Human Health & Environment	N	Y	Y	Y
Meets Federal & State Requirements	N	Y, with a T1 waiver for groundwater	Y, with a T1 waiver for groundwater	Y, with a T1 waiver for groundwater
Provides Long-Term Protection	N	Y	Y	Y
Reduces Mobility, Toxicity & Volume through Treatment	N	°	°	°
Provides Short-Term Protection	N	Y	Y	Y
Implementable	Y	Y	Y	Y
Cost	0	$ 322,370	$ 9,340,000	$ 15,960,000
State Agency Acceptance	To be determined after the public comment period			
Community Acceptance	To be determined after the public comment period			

~ EPA's preferred alternative
Y Meets or exceeds criterion
N Does NOT meet criterion

Exposure to the remaining contamination will be prevented by an environmental deed restriction that (1) prohibits the use of groundwater, (2) ensures access for monitoring and oversight, (3) prohibits activities that interfere with the remedy and on-site monitoring equipment, and (4) requires the application of appropriate vapor barrier or remediation technology in any future on-site buildings.

The proposed cleanup approach was selected over the other alternatives because it will achieve long-term risk reduction in a similar timeframe to the other alternatives evaluated and in a cost-effective manner. Based on information available at this time, EPA believes its proposed cleanup alternative provides the best balance of tradeoffs among the other alternatives and satisfies the requirements of the Superfund law. The proposed cleanup alternative will (1) be protective of human health and the environment; (2) comply with state and federal environmental laws and regulations, with the exception of chemical-specific ARARs for groundwater due to a Technical Impracticability Waiver; and (3) be cost-effective.

FOR MORE INFORMATION:

The Administrative Record, which includes all documents that EPA has considered or relied upon in proposing this cleanup plan for the 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

Hope Town Office
441 Camden Road
Hope, Maine 04847
207 763-4199

Information is also available for review online at: www.epa.gov/region1/superfund/sites/union.

SEND US YOUR COMMENTS:

Provide EPA with your written comments about the Proposed Plan for the Union Chemical Company Superfund Site. Please email (Connelly.terry@epa.gov), fax (617-918-0373) or mail comments, postmarked no later than July 12, 2013 to:

Terrence Connelly
ME/VT/CT Superfund Section
U.S. EPA Region 1
5 Post Office Square, Suite 100
Mail Code OSRR07-1
Boston, MA 02109-3912

WHAT IS A FORMAL COMMENT?

This Proposed Plan has been prepared in accordance with EPA's statutory and regulatory responsibilities. See 40 CFR 300.430(f}(2). This Proposed Plan meets the public participation requirements under CERCLA delineated in the National Contingency Plan (NCP). See 40 CFR 300.43S(c)(2)(ii)

EPA will accept public comments during a 3O-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 June 20, 2013 during which a stenographer will record all offered comments during the hearing. EPA will not respond to your comments at the formal Public Hearing.

EPA will hold a brief informational meeting prior to the start of the formal Public Hearing on insert date. EPA will review the transcript of all formal comments received at the hearing, and all written comments received during the formal comment period, before making a final cleanup decision. 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 when EPA releases the final cleanup decision, in a document referred to as the Amended Record of Decision. The Responsiveness Summary and Amended Record of Decision will be made available to the public on-line, at the Hope Town Office and at the EPA Records Center. EPA will announce the final decision on the cleanup plan through the local media and via EPA's website.