UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND – REGION 1
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DATE: May 25, 2011

SUBJ: Olin Chemical Superfund Site - Approval to perform an Engineering Evaluation/Cost Analysis for a Non-Time Critical Removal Action

FROM: James M. DiLorenzo, Remedial Project Manager JMD
MA Superfund Section

THRU: Larry Brill, Chief
Office of Site Remediation and Restoration - Branch I

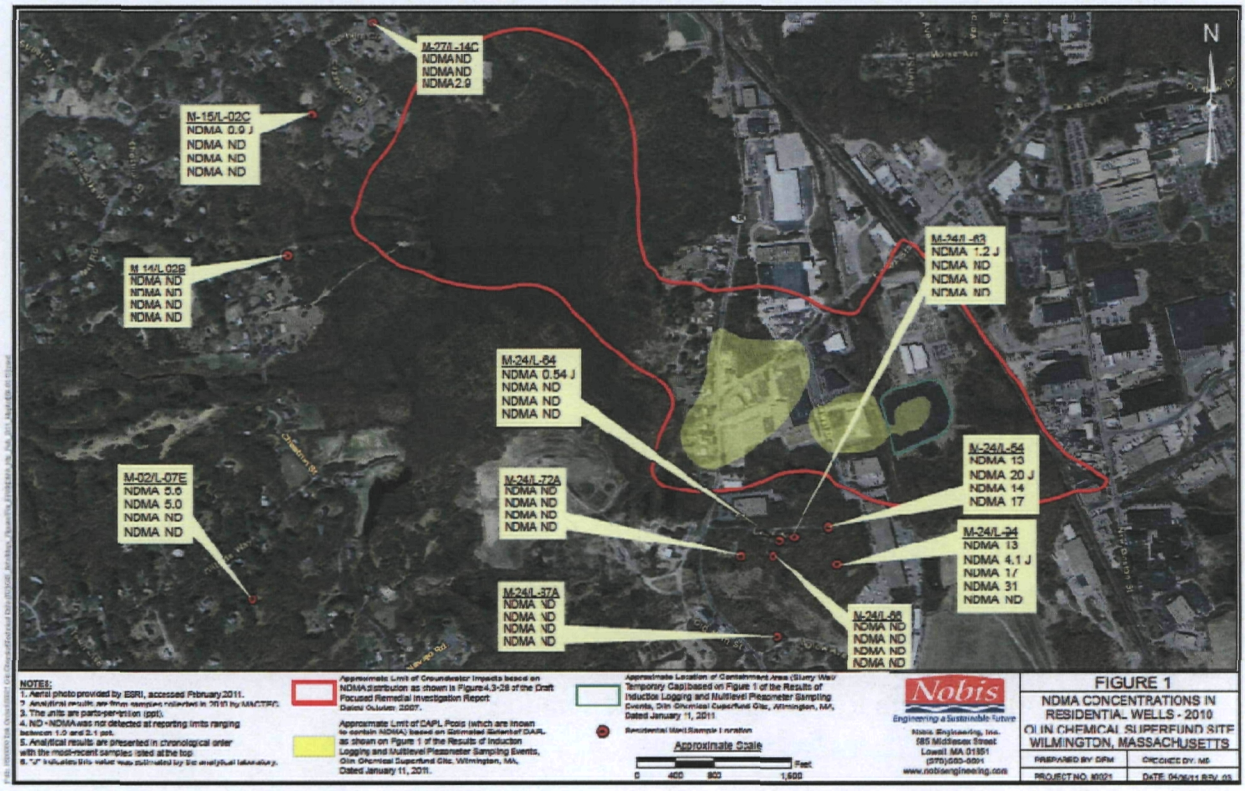
TO: James T. Owens III, Director
Office of Site Remediation and Restoration

I. Subject

Investigations by the United States Environmental Protection Agency ("EPA") and the Olin Chemical Corporation ("Olin" or "Olin Corp.") have determined that there has been a release of hazardous substances to the environment at the Olin Chemical Superfund Site ("Olin Site" or "Site") in Wilmington, Massachusetts. The Site was finalized on the National Priorities List ("NPL") on April 18, 2006. The potentially responsible parties ("PRPs"), lead by Olin Corp., are currently performing a remedial investigation and feasibility study ("RI/FS") under the terms of an Administrative Settlement Agreement and Order on Consent ("AOC").

This memorandum documents the decision to proceed with an Engineering Evaluation/Cost Analysis ("EE/CA") for a non-time critical removal action ("NTCRA") at the Site. The EE/CA will address several actual and potentially contaminated private supply wells located near the former Olin chemical facility (See Figure 1).

Figure 1



The former Olin chemical facility is located at 51 Eames Street in Wilmington, Middlesex County, Massachusetts, on a 53-acre parcel of land formerly occupied by a chemical manufacturing plant (the "Olin Property" or "facility"). Manufacturing activities were conducted at the Site from 1953 to 1986. The facility produced chemical products for use in the rubber and plastics industries. Such products are generally described as nitrogen blowing agents, blowing agent activators, polymerization initiators, antioxidants/stabilizers, retarders, processing aids, phthalate plasticizers, chemical intermediates, and phenol-formaldehyde resin. Many of the former facility structures have been removed (although foundations remain). Remaining structures include the former office and laboratory building, the east and west warehouses and the Plant B groundwater treatment system. The facility is bounded on the north by Eames Street, on the east by the Boston and Maine railroad tracks, on the south by the Woburn/Wilmington town line, and on the west by a low-use railroad spur. The perimeter of the facility is surrounded by an 8-foot high maintained chain link fence. The southern portion of the facility was largely unused during the former manufacturing operations and has recently been converted to a separate 20-acre parcel with a conservation easement. The remaining 33-acre parcel is zoned for commercial/industrial use.

The Site was first identified by the Massachusetts Department of Environmental Protection ("MassDEP") as Release Tracking Number 3-0471 on May 28, 1992. There is a long history of investigation and remedial activities at the Site dating back to the 1980s. Former lagoons, buried drums and other known primary source areas have been addressed. Groundwater investigations have determined that several pools of dense aqueous phase liquid ("DAPL") have collected in bedrock depressions beneath the Site. The DAPL has a specific gravity of 1.025 but is mixed with groundwater and is characterized by elevated concentrations of several compounds including n-nitrosodimethylamine ("NDMA"). In 2000 Olin Corp. constructed a slurry wall to contain a portion of the DAPL on Site; however, a significant volume of DAPL remains outside the slurry wall and acts as a continuing source of contamination to the broader dissolved groundwater plume (see Figure 1 insert). There is no record of NDMA having been used in former manufacturing operations at the Site. Prior investigations concluded that the use of precursor chemicals at the facility resulted in the formation of NDMA within the aquifer.

The dissolved plume extends into Maple Meadow Brook, which is a large wetland complex located approximately ½ mile to the northwest of the Olin Property. The Maple Meadow Brook aquifer was used as a source of municipal water by the Town of Wilmington until the detection of NDMA in several supply wells resulting in the cessation of pumping in 2002. While most of the Town of Wilmington continues to be served by a municipal water distribution system, approximately one dozen private residential supply wells have been identified and monitored within the Olin Site study area[1]. All but two of these private wells are in the nearby Cook Avenue neighborhood located 1,000 feet west of the Olin Property. Sporadic sampling of nearby private supply wells has been performed by Olin since the early 1990s. Prior to 2005, Olin voluntarily decommissioned about a dozen private supply wells located 1,500 feet west of the Olin Property along Main Street, presumably due to the detection of Site-related compounds. These homes were connected to the municipal water distribution system and deed restrictions were purportedly placed on these properties to prevent future use of groundwater.

EPA first required Olin to resume sampling of private wells located within the study area in the fall of 2008. NDMA was detected at low concentrations in two wells located on Cook Avenue. NDMA had not been detected in these two wells (or any private well to EPA's knowledge) in prior sampling events. Since 2008, several rounds of data have been collected on approximately a quarterly basis. NDMA has been consistently detected in these two private supply wells. In November 2010, Olin reported NDMA in one of the private wells at the highest detected concentration to date: 31 nanograms per liter ("ng/l"). EPA estimated the excess lifetime cancer risk resulting from ingestion of groundwater containing NDMA at 31ng/l to be 1.2×10^{-4}. In response, EPA sent a letter to Olin requesting that bottled water be provided to the two Cook Avenue property owners with detectable NDMA as an immediate and interim method of reducing exposure. Olin is providing bottled water as requested. In the more recent 2010 sample results, NDMA has been detected in five additional private wells at low concentrations. Two of

1 The Olin Site study area is variable and generally includes properties which have been or may be impacted by contamination believed to have originated from the Olin Property.

these wells are also located on Cook Avenue. The other three wells are located on Hillside Way, Butters Row, and Sachem Circle in the northwestern extent of the Olin study area, just beyond Maple Meadow Brook. These three wells are located nearly one mile from the Olin property. These results support EPA's belief that the dissolved plume of contaminants is spreading as a consequence of cessation of pumping from the former municipal wells in 2002. This finding is supported by the following facts:

- NDMA was not detected in any Cook Avenue private supply wells prior to 2008.
- NDMA was not detected in the Hillside Way, Butters Row, Sachem Circle and two of the Cook Avenue wells prior to 2010.
- The five former municipal supply wells (shut down in 2002) averaged a combined pumping rate of 2.0 million gallons per day, creating an induced gradient of flow.
- NDMA is a highly mobile compound and would be expected to be detected as a precursor to other less mobile compounds.
- The DAPL pools (outside the containment area) provide a significant ongoing source for the continued release of NDMA and other compounds to the aquifer.

Completion of an EE/CA is necessary to evaluate permanent and safe water supply options for the Cook Avenue neighborhood and other potentially impacted potable wells. This decision to proceed with an EE/CA is consistent with EPA guidance regarding the Superfund Accelerated Cleanup Model ("SACM") for early actions and the long-term remedial strategy for the Olin Site. This memorandum is not a final Agency decision regarding the selection of a response action for groundwater or other media at the Site.

Olin will be required to undertake this EE/CA as a PRP-lead action with EPA oversight under the terms of the AOC. Therefore, no federal funds for the performance of an EE/CA are requested at this time.

II. Background

A. Site Description and History

The Site includes the 53-acre former facility property at 51 Eames Street in Wilmington, Massachusetts (20 acres of which are now under a conservation easement), and adjacent areas that have been impacted from chemical releases from the former facility. The chemical manufacturing facility was constructed in 1953 and operated by National Polychemicals, Inc. ("NPI"). From 1953 to 1968, the business conducted by NPI was owned by three different corporations: American Biltrite Rubber Co., Fisons Limited, and Fisons Corporation, now known as NOR-AM Agro LLC. In 1968 Stepan Chemical Company purchased and continued to operate the facility. In 1980, Olin Corp. purchased the property and the business, and continued manufacturing operations at the facility until 1986.

The facility was used to manufacture chemical blowing agents, stabilizers, antioxidants and other specialty chemicals for the rubber and plastics industry. Between 1953 and approximately 1970, liquid wastes generated at the facility were disposed of in unlined pits on the northern half of the property and percolated into the soil or overflowed into drainage ditches. The former manufacturing processes generated liquid wastes that contained sulfuric acid, sodium chloride, sodium sulfate, ammonium chloride, ammonium sulfate, chromium sulfate and other compounds. Sodium dichromate was used in the Kempore® process and acidic wastes containing chromium were discharged until 1967. In the early 1970s a wastewater treatment plant was installed.

The liquid wastes had high concentrations of dissolved inorganic constituents with fluid densities greater than water allowing these dense liquids to migrate vertically to the bedrock surface, forming dense aqueous phase liquid ("DAPL") pools in bedrock depressions.

Numerous environmental investigations and remedial activities were conducted at the facility prior to inclusion of the Site on the NPL. These investigations and subsequent remedial actions have resulted in the excavation and off-site disposal of contaminated soil from Lake Poly (a former lagoon), two drum disposal areas and a buried debris area, and impacted sediment from the on-property West Ditch, the on-property West Ditch wetland, the South Ditch, and Central Pond. All removal actions were conducted in accordance with work plans approved by the MassDEP. An area of trimethylpentenes in soil and shallow groundwater located near Plant B was identified and remediated using an air sparge/soil vapor extraction system ("AS/SVE").

Since 1997 Olin Corp. and its predecessors have operated the Plant B groundwater recovery/treatment system. The system was installed in response to the seepage of a light non aqueous phase liquid ("LNAPL") into the East Ditch. The LNAPL is process oil that contains bis(2-ethylhexyl)phthalate, n-nitrosodi-n-propylamine, and trimethylpentenes. The system was designed to create a groundwater cone of depression to prevent migration and allow for mechanical removal of the LNAPL. Groundwater extracted during operation of the Plant B system is treated to remove iron and ammonia as well as dissolved organic compounds. The treated groundwater is discharged to surface water in the on-property upper West Ditch under an EPA-issued Remediation General Permit ("RGP").

In 2000 Olin constructed a slurry wall/cap containment structure around the on-property portion of the upper DAPL pool. The intent of this source control action was to eliminate, to the extent feasible, the on-property DAPL material as a source of dissolved constituents to groundwater. A significant volume of DAPL remains outside the containment structure. The containment structure is comprised of a perimeter slurry wall keyed into bedrock and a temporary cap to minimize infiltration of precipitation into the containment area.

B. Nature and Extent of Contamination

EPA and several of the PRPs (Olin Corp., American Biltrite, Inc., and Stepan, Co.) entered into an AOC to perform a PRP-lead RI/FS on July 3, 2007. On August 14, 2009, EPA accepted a PRP Work Plan to perform the RI/FS. Field work for the RI is ongoing. Due to the extent of previous investigations and recognition of the technically complex nature of cross-media impacts, the RI/FS has been divided into three operable units ("OUs") as follows:

- **Operable Unit 1 ("OU1"):** Defined as the 53-acre Olin Property, including the former facility area, established conservation area, on-property ditch system, calcium sulfate landfill, and slurry wall/capped area. *OU1 addresses source control concerns and includes soil, sediment, surface water, and potential vapor issues.*

- **Operable Unit 2 ("OU2"):** Defined as off-property surface water and sediment areas including, at a minimum, the off-property East Ditch, South Ditch and Landfill Ditch; Sawmill Brook and Maple Meadow Brook; and North Pond. *OU2 addresses source control and management of migration concerns, and includes surface water and sediment issues.*

- **Operable Unit 3 ("OU3"):** Defined as all on- and off-property groundwater areas including the Maple Meadow Brook aquifer, groundwater beneath the Olin property and groundwater plumes located south and east of the Olin Property. *OU3 addresses management of migration concerns and includes groundwater and potential vapor issues.*

Therefore, the nature and extent of contamination is summarized by operable unit.

Operable Unit 1 – Olin Property

The on-property area has been the focus of numerous pre-NPL investigations. A mix of organic and inorganic compounds have been detected in soil, surface water or sediment including but not limited to chromium, ammonia, sulfate, formaldehyde, hydrazine, trimethylpentenes, bis(2-ehtylhexyl)phthalate, benzo(a)pyrene, n-nitrosodiphenylamine, and n-nitrosodimethylamine. Known source areas were removed or remediated including former drum storage areas A and B, Lake Poly, the east and west disposal pits, the acid pits, and a buried debris area. Sediments from South Ditch were excavated and replaced. A groundwater extraction and treatment system continues to operate near the northeast corner of the former facility area at Plant B to address residual LNAPL. A slurry wall containment system was installed near the southwest corner of the former facility area to contain a portion of the DAPL. The remedial investigation underway for OU1 includes comprehensive sampling of surface and subsurface soils across the property to the top of groundwater, and sampling of surface water and sediment from the South Ditch and the remaining West Ditch drainage systems.

Operable Unit 2 – Off Property Sediment and Surface Water

The remedial investigation underway for OU2 includes comprehensive sampling of surface water and sediment from various small streams and a drainage pond near the property. The East Ditch flows in a southerly direction along the east boundary of the property. The East Ditch is a draining ditch for an active rail system and is dredged periodically by the rail road. LNAPL from the property had previously seeped into the East Ditch. The on-property South Ditch continues off the southeast corner of the property and drains into the East Ditch, which turns into the Upper New Boston Street Drainage Way just south of the property. North Pond is located to the east of the East Ditch. While it is unclear if North Pond remains hydraulically connected to drainage from the former facility, at least one historic photograph shows what appears to be an active connection through an open channel located just south of the confluence of the South and East Ditches, presumably flowing to North Pond. The Landfill Ditch is located south of the property and flows in an easterly direction into the Upper New Boston Drainage Way. Metals and inorganics, and in particular ammonia, have been detected with the highest frequency in the South and East Ditches. Sawmill and Maple Meadow Brooks are located in the Maple Meadow Brook wetland area and are not directly connected to drainage from the former facility. However, impacted groundwater may be discharging into these shallow water bodies as indicated by previously detected low concentrations of NDMA.

Operable Unit 3 - Groundwater

The former facility property is located across a groundwater divide. Groundwater flows from the facility to both the Ipswich and Aberjona water sheds. Numerous organic and inorganic compounds associated with former facility operations have been detected in groundwater and have migrated off the Olin Property. The furthest extent of these compounds have been detected to the north and west in the Maple Meadow Brook aquifer in monitoring wells about ¾ to 1 mile from the Olin Property. Compounds are significantly concentrated within the deepest zone of the overburden aquifer where DAPL has pooled. Concentrations generally decrease significantly in shallow groundwater. Groundwater within bedrock fractures has been largely uncharacterized, but Site-related compounds have been detected in wells screens within bedrock fractures. The DAPL material migrated to the west and northwest within a sloping bedrock valley ("the Western Bedrock Valley") and remains pooled within bedrock depressions. The migration of DAPL was accompanied by mixing with groundwater and an extensive area of dissolved DAPL constituents resulted in the deeper sections of the overburden aquifer. The DAPL, while generally stable, remains as an active source of dissolved constituents to groundwater primarily through chemical diffusion. The primary chemicals detected in dissolved groundwater include NDMA and inorganic compounds. The DAPL is characterized by high concentrations of NDMA and total dissolved solids, high conductivity, low pH, and its principal inorganic constituents, which include sodium, calcium, chloride, iron, manganese, sulfate, ammonia, aluminum, and chromium. The DAPL pools have an estimated combined volume of 25 million gallons. Later this year the PRPs will undertake a field-scale pilot study to evaluate the effectiveness of DAPL removal through the installation of an extraction well.

III. Threat to Public Health, Welfare, or the Environment

Section 300.415(b)(2) of the National Contingency Plan ("NCP") lists a number of factors for EPA to consider in determining whether a removal action is appropriate, including:

> (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants;
>
> (ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems;
>
> (iii) Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release;
>
> (iv) High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate;
>
> (v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released;
>
> (vi) Threat of fire or explosion;
>
> (vii) The availability of other appropriate federal or state response mechanisms to respond to the release; and
>
> (viii) Other situations or factors that may pose threats to public health or welfare or the environment.

An evaluation of conditions at the Olin Chemical Superfund Site concludes that factors (i), (ii), and (vii) are applicable as described below.

(i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances or pollutants or contaminants -

Detectable concentrations of NDMA have been repeatedly documented in two private wells since 2008 (see Table 1 insert below). For purposes of this memorandum, these two residences are referred to as Well "A" and Well "B". Both wells provide sole-source potable water. Two adults and two children are believed to reside in the single family home serviced by Well "A." A single adult is believed to reside in the single family home serviced by Well "B." There are no federal drinking water standards for NDMA, however NDMA has been listed on EPA's Drinking Water Contaminant Candidate List ("CCL") 3 under the Safe Drinking Water Act for possible future regulation. See 74 Fed. Reg. 51850, 51852 (October 8, 2009). There are no applicable

state drinking water standards, although the Commonwealth of Massachusetts has established a reporting limit of 10 nanograms per liter ("ng/l") for NDMA. This reporting limit applies to operators of public water distribution systems who must inform the Commonwealth of Massachusetts if NDMA is detected at a concentration of 10 ng/l or higher.

NDMA is classified as a B2 carcinogen and may also cause liver damage. Ingestion of groundwater provides a primary exposure pathway. In August 2010, the highest concentration detected to date of 31 ng/l was detected in Well B. EPA Region 1 determined that the Excess Lifetime Cancer Risk ("ELCR") associated with the detected concentrations of NDMA in Wells A and B range from 2×10^{-5} (6.3 ng/l) to 1.2×10^{-4} (31 ng/l). (See Attachment A for statement from EPA Region 1 risk assessor and ELCR calculation.) The detected concentrations are all above EPA's 1×10^{-6} minimum threshold for taking action. The private wells have been sampled for a limited set of analytical parameters. Additional Site-related compounds, if co-located with the NDMA, could increase the estimated ELCR in these wells.

(As discussed below, NDMA has now been detected in five more wells in addition to Wells A and B.)

Table 1 - NDMA Results for Wells A and B (Post 2008 Results)

Date Sampled	Well "A"	Well "B"
October 2008	9.4 ng/l	14 ng/l
March 2009	19 ng/l	not detected
November 2009	17 ng/l	6.3 ng/l
March 2010	17 ng/l	no sample
July 2010	no sample	1.9UJ[2] ng/l
August 2010	14 ng/l	31 ng/l
September 2010	no sample	17 ng/l
October 2010	20J ng/l	4.1 ng/l
December 2010	13 ng/l	13 ng/l

(ii) Actual or potential contamination of drinking water supplies or sensitive ecosystems -

Wells A and B are active drinking water supplies for single family homes. While the Town of Wilmington maintains a municipal water distribution system, these two homes are both located on a street not serviced by the municipal system. Since actual contamination has been detected in these two drinking water wells, and an alternative supply source is not available, at EPA's request, Olin Corporation agreed[3] to provide bottled water to the residents of these two homes as

[2] UJ indicates this concentration is an estimated non-detect. However, the validation report concluded that the holding time for this sample was exceeded by eight days.

[3] While Olin agreed to provide bottled water, Olin asserted in a letter dated November 8, 2010 that they do not agree that such service is necessary.

an interim measure.

Nine additional private wells are actively being monitored. Recent data from private well sampling efforts that were completed between July and December 2010 indicate the presence of NDMA in five wells in addition to Wells A and B; referred to as wells C, D, E, F and G. Wells C and D are located on the same street as Wells A and B. Wells E, F and G are located in a different neighborhood north and west of the former Olin facility. Well G is an irrigation well. The rest are active drinking water supply wells. NDMA has now been detected in seven of eleven currently monitored private wells. While detected concentrations in wells C, D, E, F and G are relatively low ranging from 0.5 to 5.6 ng/l, these levels are all above EPA's 1×10^{-6} threshold for taking action and raise concern that the dissolved contaminants are actively migrating. This conclusion is based on the fact that these five private wells were previously sampled and NDMA was not detected. Migration of dissolved contaminants is not unexpected since cessation of pumping from five former municipal supply wells in late 2002. These overburden supply wells had a combined pumping rate in excess of 2.0 million gallons per day and likely provided containment of dissolved contaminants. These wells were shut down due to the detection of NDMA at concentrations ranging from 32 to 166 ng/l. NDMA is highly mobile and would be expected to be a precursor to other Site-related compounds present in groundwater. According to recent information provided by the Wilmington Board of Health, approximately 22 additional private supply wells and 24 irrigation wells are located in the area of wells E, F and G. Additional private drinking water supply wells may also be located in the City of Woburn, just south of Wells A, B, C and D. Table 2 below identifies Wells A, B, C, D, E, F and G by municipal map and lot numbers, which can then be used to identify well locations in Figure 1.

Table 2 – Well Identity by Map and Lot Numbers

WELL	MAP and LOT
A	M-24/L-54
B	M-24/L-94
C	M-24/L-63
D	M-24/L-64
E	M-02/L-07E
F	M-15/L-02C
G	M-27/L-14C

(vii) <u>The availability of other appropriate federal or state response mechanisms to respond to the release</u> -

Due to the potential high costs associated with this NTCRA, there are likely no state or local response mechanisms available with sufficient funding to perform a non-time critical removal action. Thus, CERCLA authority appears to be the only appropriate available mechanism to respond to this release. Pursuant to an Administrative Agreement and Order by Consent ("AOC") entered between the United States and three potentially responsible parties ("PRPs") on June 28, 2007, the PRPs are required to perform an EE/CA deemed necessary by EPA.

Consequently, EPA does not expect to expend federal funds in performance of this EE/CA.

Based upon these three NCP factors, a current or potential threat exists to public health or welfare or the environment due to the release or threat of release of hazardous substances. A NTCRA is therefore appropriate to abate, prevent, minimize, stabilize, mitigate, or eliminate such threats. In particular a NTCRA is necessary to remove, control or contain the risk from the potential exposure to the release of hazardous substances from the Site. The NTCRA will remove, control or contain the risk of potential exposure to contaminated materials within, and releasing from, the facility.

This removal is designated as non-time critical removal action or NTCRA because more than six months planning time is available before on-Site activities must be initiated. In the interim, bottled water will be provided as deemed necessary by EPA based on the continued evaluation of groundwater data from active private wells. Prior to the actual performance of a non-time critical removal at this Site, Section 300.415(b)(4) of the NCP requires that an engineering evaluation/cost analysis or EE/CA be performed in order to weigh different response options.

IV. Endangerment Determination

There may be an imminent and substantial endangerment to the public health or welfare or the environment because of an actual or threatened release of a hazardous substance from the Site.

V. Scope of the EE/CA

The purpose of this EE/CA will be to evaluate alternatives that will provide safe, potable water to area residents who have private wells that have been, or could be, impacted by the detection of Site-related compounds, most notably NDMA. The EE/CA will consider alternatives that meet the following general removal action objective:

- For the protection of potential human receptors, prevent exposure from direct ingestion, inhalation, and/or dermal contact, as appropriate, to groundwater impacted by Site-related contaminants at concentrations that exceed State or Federal drinking water standards (MMCLs or MCLs). For contaminants where no State or Federal drinking water standard has been established, prevent exposure from direct ingestion, inhalation, and/or dermal contact, as appropriate, to concentrations of Site-related contaminants that exceed a carcinogenic risk of 1×10^{-5} and/or a non-carcinogenic target organ Hazard Index of 1.

Pursuant to EPA guidance on EE/CAs, alternatives will be evaluated based upon effectiveness, implementability, cost; and compliance with Applicable or Relevant and Appropriate Requirements ("ARARs"), to the extent practicable. The Final EE/CA will also be subject to a formal public review process. It is anticipated that a range of alternatives, which include both treatment and alternative water supply options, and options for continued private well

monitoring, will be developed in this EE/CA. A remedial investigation for Operable Unit 3 (groundwater) is ongoing and a final remedial action decision is not anticipated until 2014 or later. The EE/CA alternatives will therefore be evaluated to determine their consistency with future remedial actions to be taken at the Site. It is important to note that the DAPL pools continue to act as a source material for dissolved-phased constituents in groundwater and, if not addressed under a NTCRA, provisions to provide safe potable water would be anticipated as part of the final remedial action for the Site. Further information regarding the consistency of the NTCRA with future remedial actions at the Site is discussed in Section VIII below.

In developing the range of alternatives to be evaluated in the EE/CA, EPA will consider Section 300.415(d) of the NCP as well as relevant guidance. The EE/CA shall contain a sampling and analysis plan.

VI. Enforcement Strategy

As indicated above, the EE/CA will be performed by the PRPs pursuant to the AOC for performance of an RI/FS, which became effective on July 3, 2007. This is a PRP-lead Site and RI/FS activities are ongoing. The AOC does not require the PRPs to perform the NTCRA. See Attachment B (Confidential) for the enforcement strategy.

VII. Estimated Costs

The EE/CA will be performed and funded by the PRPs under terms of the AOC. The total estimated cost the PRPs are expected to incur for performing the EE/CA is approximately $300,000. EPA's oversight costs -- including without limitation review of the EE/CA, community relations activities and development of an Administrative Record -- will be recovered from the PRPs under terms of the AOC. Costs for various alternatives to implement the NTCRA will be developed in the EE/CA.

Therefore, federal funds for performance of an EE/CA are not requested at this time.

VIII. Other Considerations

The proposed NTCRA will be consistent with the anticipated remedial actions to minimize exposure to and migration of contaminants. The data collected to date by the PRPs for the RI/FS indicates that the nature of the threat at the Site is anticipated to require a remedial response consistent with the proposed NTCRA. This removal action is necessary because of the current and potential threat to actual water supplies posed by contaminated groundwater. The RI/FS and the remedial decision for OU3 are not expected until 2014 or later. Accordingly, waiting for remedial action would present an unacceptable delay in providing a permanent source of potable water to area residents already impacted by Site-related compounds. Providing bottled water is an acceptable measure, but only in the immediate short term.

The proposed NTCRA is one part of a phased approach to address concerns at the Olin Chemical Superfund Site. The other components are; (1) several removal actions previously performed by the PRPs under MassDEP oversight to remove buried drums and other storage containers; to excavate wastes from former disposal pits; to excavate contaminated sediments; to install and operate an LNAPL recovery groundwater pump and treatment system; and to install a slurry wall containment system for the on-property portion of the DAPL; (2) pre-NPL Site characterization activities performed by the PRPs under MassDEP oversight to determine the extent of DAPL and dissolved-phase contaminated groundwater originating from the Olin Property including sampling of the former municipal supply wells; sampling of former commercial supply wells; sampling of active private supply wells; and the installation and sampling of about 120 monitoring wells across the study area; and (3) the five to eight year multi-operable unit RI/FS that will fully characterize the nature and extent of remaining contamination associated with the Site, followed by the anticipated implementation of the selected remedies.

In addition, taking action to ensure safe potable water at these private wells due to the presence of NDMA and other Site-related compounds is consistent with previous actions taken by the PRPs to address potable water concerns as follows; (1) Prior to 2005, Olin voluntarily decommissioned about a dozen private supply wells located about ¼ mile west of the Olin Property along Main Street, presumably due to the detection of Site-related compounds; (2) in 2002, the Town of Wilmington decommissioned five municipal supply wells due to the detection of NDMA in four of the five wells, and Olin subsequently entered into an agreement with the Town of Wilmington to construct a new connection to the Massachusetts Water Resources Authority ("MWRA") distribution system to ensure an adequate supply of drinking water for the town; and (3) in 2010 in response to a request by EPA, the PRPs began to provide bottled water to two families on Cook Avenue due to the detection of NDMA in Wells A and B.

The Massachusetts Department of Environmental Protection and the Town of Wilmington support this EE/CA for the Site (see Attachment C for letters of support).

IX. Headquarters Consultation

EPA Region 1 has consulted with headquarters through the Office of Superfund Remediation and Technology Innovation ("OSRTI") and the Office of Emergency Management ("OEM"). Both offices concur with the planned EE/CA.

X. Recommendation

Ongoing investigations have determined that there has been a release of hazardous substances to the environment. Additionally, the conditions at the Site meet the NCP Section 300.415(b) criteria for a removal. Consistent with Section 104(b) of CERCLA and NCP Section 300.415(b)(4), further investigation is necessary to plan and direct the future removal action. We recommend your approval of this request to perform an EE/CA at the Olin Chemical Superfund Site. The total estimated cost the PRPs will incur for performing the EE/CA is $300,000.

APPROVED:

MAY 26 2011
Date

James T. Owens III, Director
Office of Site Remediation and Restoration

ATTACHMENT A

Statement from EPA Region 1 risk assessor and ELCR calculations.

REDACTED

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
NEW ENGLAND – REGION 1
5 Post Office Square, Suite 100
Mail Code OSRR07-4
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DATE: April 12, 2011

SUBJ: Evaluation of Excess Lifetime Cancer Risk in Private Wells at the Olin Chemical Support Site - Engineering Evaluation/Cost Analysis

FROM: Richard Sugatt, Risk Assessor
Technical Support Section

TO: James M. DiLorenzo, Remedial Project Manager
MA Superfund Section

The purpose of this memorandum is to document the methods used for calculating the excess lifetime cancer risk (ELCR) of n-nitrosodimethylamine (NDMA) detected in private wells near the Olin Superfund site. The results are presented in the attached tables.

NDMA is classified as a class B2 carcinogen (probable human carcinogen based on carcinogenicity in animals). There is no Federal Safe Drinking Water Act Maximum Contaminant Level (MCL) or promulgated state standard under the Massachusetts Contingency Plan. EPA has issued an oral cancer slope factor and a cancer inhalation unit risk for NDMA on the Integrated Risk Information System (IRIS), on-line at http://www.epa.gov/IRIS/. The IRIS database does not have toxicity values for non-carcinogenic effects of NDMA. Using these cancer toxicity factors, the EPA Regional Screening Level (RSL) for tap water is calculated to be 4.2E-04 ug/l (0.42 ng/l), which represents the concentration in tapwater associated with a cancer risk of 1E-06 for residential use of drinking water by an adult and child. The EPA RSLs are available at http://www.epa.gov/region9/superfund/prg/.

EPA Region I used these cancer toxicity factors and national and regional risk assessment guidance to calculate the cancer risks associated with the reported concentrations of NDMA in private wells near the Olin Chemical Superfund site (see attached). These calculations followed the procedures and exposure assumptions identified in EPA (1989) "Risk Assessment Guidance for Superfund", EPA (2005) "Supplemental Supplemental Guidance for Assessing Susceptibility from Early Life Exposure to Carcinogens, and EPA Region 1 (1994)"Risk Updates No. 2", as detailed below:

To estimate the exposure point concentration for these calculations, the maximum measured or estimated (J qualified) concentration in a well is used as the exposure point concentration for the Reasonable Maximum Exposure (RME) condition. For groundwater, EPA Region I guidance (EPA Region 1, 1994) is to use the maximum concentration in any well, or the highest average concentration of each contaminant across several rounds in the same well, as the RME exposure point concentration. As described in Section 6.1.2 of RAGS A (USEPA, 1989), actions at Superfund sites should be based on an estimate of the reasonable maximum exposure (RME) expected to occur under both current and future land-use conditions. The RME is defined as the highest exposure that is reasonably expected to occur at a site.

According to EPA (2005), NDMA is identified as a carcinogen that is carcinogenic by a mutagenic mode of action; therefore, the cancer risks should be calculated for different human life stages using so-called Age Dependent Adjustment Factors (ADAFs) early life stages are more susceptible to this type of carcinogen. ADAFs are weighting factors which result in a 10-fold protective factor for children from birth to 2 years old and a 3-fold protective factor for children from ages 2 to 16. As shown in the attached tables, the assumed drinking water ingestion rates vary with age based on the 95th percentile per capita ingestion from Table 3-1 of EPA (2008) "Child-Specific Exposure Factors Handbook". Similarly, the body weight is assumed to be the mean weight for different age groups according to Table 8-1 of EPA (2008). The total exposure duration (ED) is 70 years, as the averaging time. In other words, the exposure assessment assumes that a person ingests private well water at the same residence for 350 days per year at an age appropriate ingestion rate and body weight, from birth to age 70. Inhalation of NDMA during household water uses other than drinking (i.e. bathing, dish washing) was not calculated because NDMA is not volatile. Dermal exposure during household water use was not calculated because dermal absorption rates of NDMA are unknown and dermal cancer toxicity factors have not been issued by U. S. EPA. It is expected that dermal absorption would have much less contribution to total cancer risk than ingestion. The formulas for exposure and risk are provided in the attached tables. As shown in the tables, the dose, expressed as a lifetime average daily dose (LADD) for each age grouping is calculated by multiplying the concentration in water (CW) by the ingestion rate (IR), exposure frequency (EF), and exposure duration (ED), and then dividing this result by the body weight (BW) and the averaging time (AT-c). The cancer risk for each age group is calculated by multiplying the LADD for that group by the oral cancer slope factor and the appropriate ADAF. The total cancer risk is then calculated by adding the ELCR for each age group.

As shown in the tables below, a concentration of NDMA measured at 25ng/l is calculated to have an ELCR of 1E-04. The second summary table below shows the ELCR for the maximum detected concentration of NDMA at 31ng/l. The third table shows the ELCR for the minimum detected concentration of NDMA at 0.54ng/l. These calculations support the conclusion that the ELCR is estimated to be greater than 1E-06 in the seven private wells located near the Olin Chemical Superfund Site based solely on the NDMA results.

References

U. S. EPA. 1989. Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A) Interim Final. EPA/540/1-89/002.

U. S. EPA. 2005. Supplemental Guidance for Assessing Susceptibility from Early Life Exposure to Carcinogens. EPA/630/R-03/003F.

U. S. EPA. 2008. Child-Specific Exposure Factors Handbook. EPA/600/R-06/096F.

U. S. EPA Region 1. 1994. Risk Updates Number 2.

Excess Lifetime Cancer Risk Tables

Table 1. Residential Drinking Water Ingestion Risk-Based Concentration of NDMA for 1E-06 Cancer Risk

Age	CW (mg/L)	IR [1] (L/day)	EF (days/yr)	ED (yr)	BW [2] (kg)	AT-c (days)	LADD (mg/kg-day)	SF (mg/kg-day)$^{-1}$	ADAF	ELCR
Birth to < 1 month	2.5E-07	0.839	350	0.08	4.8	25550	5.0E-11	5.1E+01	10	2.5E-08
1 to <3 months	2.5E-07	0.898	350	0.17	5.6	25550	9.1E-11	5.1E+01	10	4.7E-08
3 to < 6 months	2.5E-07	1.056	350	0.25	7.4	25550	1.2E-10	5.1E+01	10	6.2E-08
6 to < 12 months	2.5E-07	1.055	350	0.5	9.2	25550	2.0E-10	5.1E+01	10	1.0E-07
1 to < 2 years	2.5E-07	0.837	350	1	11.4	25550	2.5E-10	5.1E+01	10	1.3E-07
2 to < 3 years	2.5E-07	0.877	350	1	13.8	25550	2.2E-10	5.1E+01	3	3.3E-08
3 to <6 years	2.5E-07	1.078	350	3	18.6	25550	6.0E-10	5.1E+01	3	9.1E-08
6 to < 11 years	2.5E-07	1.235	350	5	31.8	25550	6.7E-10	5.1E+01	3	1.0E-07
11 to < 16 years	2.5E-07	1.727	350	5	56.8	25550	5.2E-10	5.1E+01	3	8.0E-08
16 to < 18 years	2.5E-07	1.983	350	2	71.6	25550	1.9E-10	5.1E+01	1	9.7E-09
18 to < 21 years	2.5E-07	2.54	350	3	71.6	25550	3.6E-10	5.1E+01	1	1.9E-08
21 to < 70 years	2.5E-07	2.54	350	49	71.6	25550	6.0E-09	5.1E+01	1	3.0E-07
									Total ELCR:	1.000E-06

Assumes mutagenic mode of carcinogenesis and lifetime (70 years) exposure
Risk-based concentration for 1E-06 cancer risk is 2.5 E-07 mg/L, or 0.25 ng/L.
[1] 95th percentile per capita ingestion from Table 3-1 CSEFH
[2] mean weight from Table 8-1 CSEFH
CW = Concentration in Water
IR = Ingestion Rate
EF = Exposure Frequency
ED = Exposure Duration
BW = Body Weight
AT-c = Averaging Time, cancer
LADD = Lifetime Average Daily Dose
SF = Oral Slope Factor
ELCR = Excess Lifetime Cancer Risk
ADAF = Age Dependent Adjustment Factor
CSEFH = Child-Specific Exposure Factors Handbook EPA/600/R-06/096F September 2008

$LADD = CW * IR * EF * ED * 1/BW * 1/AT\text{-}c$

$ILCR = \sum (LADD * SF * ADAF)$

Table 2. Residential Drinking Water Ingestion Risk of 0.54 ng/L (0.00000054 mg/L) of n-nitrosodimethylamine

Age	CW (mg/L)	IR [1] (L/day)	EF (days/yr)	ED (yr)	BW [2] (kg)	AT-c (days)	LADD (mg/kg-day)	SF (mg/kg-day)$^{-1}$	ADAF	ELCR
Birth to < 1 month	5.4E-07	0.839	350	0.08	4.8	25550	1.1E-10	5.1E+01	10	5.5E-08
1 to <3 months	5.4E-07	0.896	350	0.17	5.6	25550	2.0E-10	5.1E+01	10	1.0E-07
3 to < 6 months	5.4E-07	1.056	350	0.25	7.4	25550	2.6E-10	5.1E+01	10	1.3E-07
6 to <.12 months	5.4E-07	1.055	350	0.5	9.2	25550	4.2E-10	5.1E+01	10	2.2E-07
1 to < 2 years	5.4E-07	0.837	350	1	11.4	25550	5.4E-10	5.1E+01	10	2.8E-07
2 to < 3 years	5.4E-07	0.877	350	1	13.8	25550	4.7E-10	5.1E+01	3	7.2E-08
3 to <6 years	5.4E-07	1.078	350	3	18.6	25550	1.3E-09	5.1E+01	3	2.0E-07
6 to < 11 years	5.4E-07	1.235	350	5	31.8	25550	1.4E-09	5.1E+01	3	2.2E-07
11 to < 16 years	5.4E-07	1.727	350	5	56.8	25550	1.1E-09	5.1E+01	3	1.7E-07
16 to < 18 years	5.4E-07	1.983	350	2	71.6	25550	4.1E-10	5.1E+01	1	2.1E-08
18 to < 21 years	5.4E-07	2.54	350	3	71.6	25550	7.9E-10	5.1E+01	1	4.0E-08
21 to < 70 years	5.4E-07	2.54	350	49	71.6	25550	1.3E-08	5.1E+01	1	6.6E-07
									Total ELCR:	2.2E-06

Assumes mutagenic mode of carcinogenesis and lifetime (70 years) exposure

[1] 95th percentile per capita ingestion from Table 3-1 CSEFH

[2] mean weight from Table 8-1 CSEFH

CW = Concentration in Water

IR = Ingestion Rate

EF = Exposure Frequency

ED = Exposure Duration

BW = Body Weight

AT-c = Averaging Time, cancer

LADD = Lifetime Average Daily Dose

SF = Oral Slope Factor

ELCR = Excess Lifetime Cancer Risk

ADAF = Age Dependent Adjustment Factor

CSEFH = Child-Specific Exposure Factors Handbook EPA/600/R-06/096F September 2008

$LADD = CW * IR * EF * ED * 1/BW * 1/AT\text{-}c$

$ILCR = \sum(LADD * SF * ADAF)$

Table 3. Residential Drinking Water Ingestion Risk of 31 ng/L (0.0000031 mg/L) of n-nitrosodimethylamine

Age	CW (mg/L)	IR [1] (L/day)	EF (days/yr)	ED (yr)	BW [2] (kg)	AT-c (days)	LADD (mg/kg-day)	SF (mg/kg-day)$^{-1}$	ADAF	ELCR
Birth to < 1 month	3.1E-05	0.839	350	0.08	4.8	25550	6.2E-09	5.1E+01	10	3.2E-06
1 to <3 months	3.1E-05	0.896	350	0.17	5.6	25550	1.1E-08	5.1E+01	10	5.8E-06
3 to < 6 months	3.1E-05	1.056	350	0.25	7.4	25550	1.5E-08	5.1E+01	10	7.7E-06
6 to < 12 months	3.1E-05	1.055	350	0.5	9.2	25550	2.4E-08	5.1E+01	10	1.2E-05
1 to < 2 years	3.1E-05	0.837	350	1	11.4	25550	3.1E-08	5.1E+01	10	1.6E-05
2 to < 3 years	3.1E-05	0.877	350	1	13.8	25550	2.7E-08	5.1E+01	3	4.1E-06
3 to <6 years	3.1E-05	1.078	350	3	18.6	25550	7.4E-08	5.1E+01	3	1.1E-05
6 to < 11 years	3.1E-05	1.235	350	5	31.8	25550	8.2E-08	5.1E+01	3	1.3E-05
11 to < 16 years	3.1E-05	1.727	350	5	56.8	25550	6.5E-08	5.1E+01	3	9.9E-06
16 to < 18 years	3.1E-05	1.983	350	2	71.6	25550	2.4E-08	5.1E+01	1	1.2E-06
18 to < 21 years	3.1E-05	2.54	350	3	71.6	25550	4.5E-08	5.1E+01	1	2.3E-06
21 to < 70 years	3.1E-05	2.54	350	49	71.6	25550	7.4E-07	5.1E+01	1	3.8E-05
									Total ELCR:	1.2E-04

Assumes mutagenic mode of carcinogenesis and lifetime (70 years) exposure

[1] 95th percentile per capita ingestion from Table 3-1 CSEFH

[2] mean weight from Table 8-1 CSEFH

CW = Concentration in Water

IR = Ingestion Rate

EF = Exposure Frequency

ED = Exposure Duration

BW = Body Weight

AT-c = Averaging Time, cancer

LADD = Lifetime Average Daily Dose

SF = Oral Slope Factor

ELCR = Excess Lifetime Cancer Risk

ADAF = Age Dependent Adjustment Factor

CSEFH = Child-Specific Exposure Factors Handbook EPA/600/R-06/096F September 2008

$LADD = CW * IR * EF * ED * 1/BW * 1/AT\text{-}c$

$ILCR = \sum(LADD * SF * ADAF)$

ATTACHMENT B

ENFORCEMENT STRATEGY
Confidential Document – Do Not Release or Cite

REDACTED

ATTACHMENT C

Letters of Support for Addressing Private Wells

I. Letter from Massachusetts Department of Environmental Protection, April 20, 2011

II. Letter from Town of Wilmington, MA, October 22, 2010

REDACTED

MassDEP
Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
One Winter Street Boston, MA 02108 • 617-292-5500

DEVAL L. PATRICK
Governor

TIMOTHY P. MURRAY
Lieutenant Governor

RICHARD K. SULLIVAN JR.
Secretary

KENNETH L. KIMMELL
Commissioner

April 20, 2011

Mr. Larry Brill, Branch Chief
Office of Site Remediation and Restoration
U.S. EPA Region I
5 Post Office Square
Suite 100 (OSRR07-4)
Boston, MA 02109

RE: Olin Chemical Superfund Site Action Memorandum
MassDEP Support Letter

Dear Mr. Brill:

The Massachusetts Department of Environmental Protection (MassDEP) has received and reviewed the US Environmental Protection Agency's (EPA) Action Memorandum for the Olin Chemical Superfund Site (Site) in Wilmington, Massachusetts dated April 12, 2011.

This Action memorandum describes a non-time critical removal action (NTCRA) which will address the migration of contamination in groundwater from the Site to nearby private wells. The NTCRA will evaluate a wide range of options for mitigating contamination in private wells from treatment options to alternative water supplies. Additionally, monitoring of private wells in the area will be conducted as necessary to monitor contamination levels.

MassDEP supports this NTCRA because it will remove exposure potential of site contamination to the private wells in the area of the Site. However, this NTCRA should not constitute the complete and final cleanup plan for the Site.

REDACTED

We look forward to continued coordination with EPA during the NTCRA, as well as during the Remedial Investigation/Feasibility Study to evaluate the full nature and extent of contamination, and in the development of the subsequent Record of Decision for the Site.

Sincerely,

Jay Naparstek

Jay Naparstek,
Deputy Division Director
Bureau of Waste Site Cleanup

cc: Joe Coyne, MassDEP
Jim Dilorenzo, EPA

Efile: 20110420_NTCRA_Support_Letter

TOWN OF WILMINGTON
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October 22, 2010

Mr. James M. DiLorenzo
USEPA – New England
Suite 100 (OSRR07-4)
5 Post Office Square
Boston, MA 02109-3912

Dear Mr. DiLorenzo:

I am writing with respect to the recent sampling activities that have been undertaken on two private wells located on Cook Avenue in Wilmington. As we have discussed, there have been consistent detections of NDMA over the past two years at wells located on private property at [redacted] Avenue. Based upon the initial results from the August 2010 sampling as reported by Olin to EPA, it is the Town's position that the detected levels of NDMA warrant discontinuation of the use of these private wells as a source for drinking water. Although we recognize that there are no established standards for NDMA as it pertains to safe levels of drinking water, we believe it best to err on the side of caution by taking this necessary action to avoid any potential risk to the public health.

The Town of Wilmington urges EPA to direct Olin to provide bottled water to at least the owners of both affected properties and to consider providing same to all residences on Cook Avenue. We believe that the provision of bottled water is an important interim step to addressing the health concerns in this neighborhood and that EPA should give strong consideration to directing Olin to provide a more permanent solution to the problem, including the construction and installation of a water line that would enable all property owners in the affected area the opportunity to tie into the municipal water system.

Thank you for your consideration of the Town's request.

Sincerely,

Michael A. Caira
Town Manager

MAC/bjd

cc: Board of Selectmen
Shelly Newhouse, Health Director
Michael J. Woods, Water & Sewer Superintendent
Jeffrey M. Hull, Assistant Town Manager
Michael J. Webster, GeoInsight
Daniel R. Deutsch, Deutsch/Williams
John C. Foskett, Town Counsel

REDACTED