Recommendations for a Comprehensive Massachusetts Underground Storage Tank Cleanup Policy

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ABSTRACT

After a 2012 oil spill in Marlborough, MA State Senator James Eldridge took on the task of ensuring compensation not only for the cleanup of abutting properties, but for restoration fees accrued. This project examines limitations in MA General Law 21J and 21E, analyzes cases of oil spills, and compares various underground storage tank (UST) polices throughout the United States. From the data collected, we present a series of findings and comprehensive recommendations for a new MA UST policy. These recommendations not only cover the need for specified funding for abutting properties, but how funding should be distributed, and the necessity of proactive communication about the spill with third parties. We believe these recommendations create a robust UST policy that serves Massachusetts.

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Next, we would like to thank Mr. Michael Buckley and Mrs. Karen Buckley for being so open and sharing your story (and home) with us. Your situation sparked the need for our project, and we hope we were able to assist you as much as possible.

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EXECUTIVE SUMMARY

State Senator James Eldridge became aware of the inadequacies in current Massachusetts underground storage tank (UST) law after a 2012 UST oil spill in Marlborough, Massachusetts, where over 2,000 gallons of gasoline was released from a Citgo gas station. The gasoline spread to the properties of four neighboring residents (third parties). One of the homeowners, the Chavezs, were selling their home before the spill occurred. As of 2015, they still are unable to sell their home due to the gasoline contamination. The Buckley family was also affected by the spill. Because of the spill, the Buckleys were forced to remove their pool, outdoor bar, and outdoor restroom (Senator Eldridge, personal communication, September 18, 2015). As of 2015, three years after the occurrence, the spill is still being cleaned up, and the third parties affected have not received compensation for property damages (Karen Buckley, personal communication, November 3, 2015).

Massachusetts policy and gasoline spill cleanups

In the Marlborough case and other occurrences involving gasoline spills, the Massachusetts Department of Environmental Protection (MADEP) is the first responder. The MADEP performs initial and final contamination testing, and determines if the site must undergo remediation. If it has to go through remediation, the potentially responsible party (PRP) is accountable for the cleanup. The PRP, usually the gas station owner, hires a Licensed Site Professional (LSP) to perform the actual cleanup. The LSP is licensed by the state to perform hazardous waste remediation, and works for an environmental consulting company.

The actual site remediation process is often expensive and a financial burden on the PRP. For this reason, Massachusetts has a fund set aside specifically for UST spills, the 21J fund. The fund

is created through M.G.L c. 21J, and is funded by an annual $250 tank ownership fee and gasoline tax of $0.24 per gallon. The PRP can be reimbursed for the cost of a tank spill from the 21J fund for up to $1.5 million per occurrence, leaving an additional $1 million aside for third party property damages. The PRP is responsible for the cleanup of abutting properties affected, but **not for restoration of property value**. Third parties must bring an action in court to receive financial compensation for property damages. If granted financial compensation, the PRP must pay for third party restoration, but then files to the 21J fund for reimbursement. The process for third parties to receive property loss damages is time consuming and expensive (Senator J.Eldridge, personal communication, Sept. 18, 2015).

Goal and objectives of our project

Our project aimed to provide Senator Eldridge with important components for a comprehensive new Massachusetts UST spill cleanup policy, specifically addressing funding and outreach for third parties affected. We completed five objectives in order to develop a robust UST policy; (1) We became well-versed on the current UST policies, M.G.L c. 21J and 21E; (2) We spoke with environmental consulting companies who gave us insight into states with comprehensive UST policies; (3) We conducted online content analysis of the laws in the states identified in the previous objective; (4) After becoming well-versed on UST policies from other states, we explored how these states implemented their policies; and (5) Finally, we comparatively analyzed states to define a comprehensive UST policy and recommend particular practices for Massachusetts to incorporate. We developed several findings from our research.

Findings

Finding 1: The funding available to the responsible and affected third parties varies between states based on several factors including: number of active USTs, population density, typical cost

of cleanup, and state budget. Within the states we researched, the common funding cap was at least $1.5 million dollars for the PRP, with additional amounts of funding for third party restoration. New York and New Jersey have the highest available compensation for third parties, and allow the affected families to have direct access to the funds.

Finding 2: Although state agencies are responsible for overseeing UST spills and distributing funds, LSPs are responsible for the physical cleanup process. The regulation of LSPs varies between states and severity of cases. Increased LSP proactive approaches may occur in cases where human health or natural resources are at risk.

Finding 3: State agency involvement in the cleanup process varies based on staffing, number of open cases, the contamination of natural resources, and the severity of the spill. The states with the highest environmental agency involvement are those that heavily rely on groundwater as their primary drinking water resource, such as Florida and New Hampshire. MADEP has limited involvement in the cleanup process, because they utilize a semi-privatized system to clean up spills. The Massachusetts UST cleanup system relies heavily on LSPs to clean up the contamination, with the MADEP involved only at the beginning and end of the process.

Finding 4: Public outreach about a spill is necessary to ensure the public's safety. The New Jersey Department of Environmental Protection (NJDEP) offers a detailed plan to notify the public of the spill. The responsible party and hired LSP must send a fact sheet containing information on the spill and cleanup process to the surrounding public within two weeks, and publicize the sheet in the local newspaper within 30 days. Massachusetts lacks a comprehensive outreach system, leaving the third parties confused about whom to go to for information.

Finding 5: We conducted case studies on the Marlborough, MA and Charlton, MA oil spills. The key findings from the 2012 Marlborough spill were a lack of communication to the Buckley family on the progress of the cleanup, and limited regulation of fund spending. Within three years of the spill, the 21J money was completely spent, with no funds left for restoration of the Buckley property. In the case of the Charlton spill of the early 1980s, the key finding was an overall lack of preventive measures taken. The spill represents the previously accepted belief that oil would disintegrate over time, and demonstrates how this practice can lead to further damages to human health and natural resources (Mark Baldi, personal communication, November 18, 2015). Without further regulation, two other spills occurred leaving widespread water contamination in Charlton with an estimated 50-70 private properties and wells compromised (Mark Baldi, personal communication, November 18, 2015).

Findings Conclusion: Based on the data collected, we defined a "comprehensive" UST policy as: (1) a policy that provides the necessary funds for both the remediation and restoration of all affected properties, (2) provides easy access to this fund for third parties, (3) lists necessary outreach to the community about the spill and cleanup process, and (4) assures an effective cleanup process with both the timeline and available finances taken into consideration. The states identified as having a partially or completely comprehensive policy include Florida, New Hampshire, New Jersey, and New York. We have provided several recommendations to move Massachusetts to a robust and comprehensive UST cleanup policy.

Recommendations

Recommendation 1: We recommend more efficient access to the 21J fund to cover third parties. Currently, there is no alternative method to taking legal action against the PRP for compensation or restoration. The third party should be able to work with the LSP to file directly to the

MADOR, and then only in the case of being denied, or partially accepted, should the third parties need to take legal action.

Recommendation 2: To help affected third parties, such as the Buckleys and Chavezs, learn about the oil spill cleanup process, we recommend a short and long term community outreach program. The short-term solution consists of an updated MADEP website where third parties, LSPs, and tank owners can look to find the proper contacts to answer their questions and report emergencies. The long-term solution consists of a third party communication program, similar to New Jersey's as discussed in finding 3. This program will satisfy third parties, and not require further manpower from the MADEP.

Recommendations 3 and 4: A future WPI student group should further research MADEPs involvement in specific cases where natural resources or drinking water is affected. From finding 3, increased MADEP involvement is needed in these cases; however increased manpower is not currently available. A case must be made for increased manpower of the MADEP, or an alternative solution found. Finally, in recommendation 4, we suggest further research be undertaken to identify potential challenges when passing a new bill, and to seek potential solutions.

Conclusion

We hope that these recommendations help the Office of State Senator James Eldridge propose a comprehensive UST cleanup policy that will aid families such as the Buckleys and Chavezs. A comprehensive policy will not only benefit families currently enduring the remediation process of their properties, but future families who will be unfairly impacted by UST spills.

AUTHORSHIP

Note: All group members edited each section.

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DEFINITIONS

Acronyms

ADR: Alternative Dispute Resolution
FLDEP: Florida Department of Environmental Protection
LSP: Licensed Site Professional
MADEP: Massachusetts Department of Environmental Protection
MADOR: Massachusetts Department of Revenue
M.G.L c.21E: Massachusetts General Law 21E
M.G.L c.21J: Massachusetts General Law 21J
MTBE: Methyl Tertiary-Butyl Ether
NHDES: New Hampshire Department of Environmental Services
NJDEP: New Jersey Department of Environmental Protection
NYSDEC: New York State Department of Environmental Conservation
PBC: Performance Based Cleanup
PRP: Potentially Responsible Party
USEPA: United States Environmental Protection Agency
UST: Underground Storage Tank
WPI: Worcester Polytechnic Institute

Definitions

Compensation: Financial reimbursement for property devaluation or damage; often sought after by third parties.

Court action: A legal case initiated under a specific cause of action. For the purposes of this report, when we refer to a *court action*, we are referring to a case brought by a third party against a potentially responsible party (PRP) in order to gain reimbursement for financial expenses brought about by the oil spill, often restoration or compensation costs.

Environmental consultant: A person who provides expert assessment and advisory services for clients on environmental cleanup, development and management issues.

Licensed Site Professional: An environmental consultant with additional certification from the state. Each state varies in certification requirements.

Remediation: The cleanup of land, as to restore it back to its previous state.

Responsible party: The person at fault for the oil spill who must cleanup all contaminated property; most often referring to the tank owner.

Restoration: The act of physically restoring the property to its original state. For the purposes of this report, a property's original state typically refers to the property's state prior to the oil spill.

Semi-privatized oil spill cleanup process: Refers to the cleanup process of an oil spill, where a private environmental consulting agency is hired to clean the spill, while the state environmental agency monitors the cleanup progress.

Third party: For the purposes of this report, a property owner directly impacted by an oil spill, who is not a potentially responsible party.

INTRODUCTION

Numerous oil spills from underground storage tanks (USTs) at gas stations have caused environmental devastation for many properties that lie adjacent to such tanks. These incidents motivated Senator James Eldridge (Democrat, Massachusetts of the Middlesex and Worcester District) to propose a new Massachusetts UST oil spill cleanup policy that protects all third party residents impacted.

Oil and gasoline are everyday necessities, needed to fuel transportation vehicles and heat buildings. The widespread usage of this resource requires its proper storage to prevent spills. According to Emily Atkin of *ClimateProgress*, in 2013, there was a reported average of 20 spills per day, totaling 7,662 spills throughout the United States in that year (Atkin, 2014). While many of these spills were small, the combined volume added up to more than 26 million gallons of oil and gasoline (Atkin, 2014). The gasoline from USTs not only causes damage to the gas station's property, but can also spread to nearby properties, contaminate drinking water, and devastate property values (Homeowner Oil Spill Cleanup Guide, 2004).

In Massachusetts, when a UST spill occurs from a gas station and spreads to a residential neighborhood, the tank owner is responsible for the cleanup of all properties affected. The owner files directly to a fund set up by the state to pay for the UST spill remediation process. However, the third parties do not have direct access to this fund for compensation or restoration of their damaged property. These neighboring property owners must seek property loss damages through the lengthy and costly process of taking a legal action.

This process is common for third parties affected by UST spills to their property. For example, in 2012, at a Citgo gas station in Marlborough, Massachusetts, a UST leaked onto four neighboring landowner's properties. As of 2015, the impacted neighbors have not received financial compensation for property damages (Senator J.Eldridge, personal communication, Sept. 18, 2015). This incident was brought to the attention of Senator Eldridge. In response, Senator Eldridge wishes to propose a new UST bill that provides the necessary resources to all Massachusetts residents affected by a UST spill.

As of 2015, Massachusetts UST law M.G.L c. 21J only provides cleanup reimbursement for the UST tank owner or operator in the case of a spill. The Marlborough spill case is one of many spills from UST tanks throughout Massachusetts that have spread to neighboring homes. Senator Eldridge believes all Massachusetts residents affected by a UST oil spill should have direct access to reimbursement funds and knowledge of the cleanup process occurring on their property (Senator J.Eldridge, personal communication, Sept. 18, 2015).

The goal of this project was to work in collaboration with Senator Eldridge's Office to identify components of a new comprehensive Massachusetts UST policy that assists adjacent landowners impacted by a UST spill. The Senator asked us to investigate states with comprehensive laws protecting these property owners, and develop recommendations for Massachusetts. Our recommended components included direct access to cleanup funds for third parties, increased LSP oversight, and increased communication with third parties.

This report contains five chapters. In chapter 2, we explore background research on UST spills and UST cleanup laws. In chapter 3, we describe the methodology we used to complete our project goal. In chapter 4, we discuss our findings, and in chapter 5, we conclude with our recommendations.

BACKGROUND

2.0 Introduction

In this chapter, we describe the impact of underground storage tank (UST) spills, as well as the policies governing their cleanup. In section 2.1, we highlight the 2012 UST spill in Marlborough, Massachusetts, as well as similar UST spills throughout Massachusetts. In section 2.2, we discuss the usage of oil throughout Massachusetts, the potential hazards that arise from an UST spill, and the need for funding, specifically looking at the distribution of funds between affected parties. In section 2.3, we provide an explanation of federal agencies that govern the federal regulations of USTs. In section 2.4, we discuss out of state cleanup processes, emphasizing the backlogs in specific states and the potential contamination of drinking water. Lastly, in section 2.5, we detail the 2015 UST laws in Massachusetts, and in 2.6 we describe the need for a new comprehensive bill in Massachusetts.

2.1 Spills throughout Massachusetts

In April of 2012, over 2,000 gallons of gasoline leaked from an underground storage tank at a Citgo gas station in Marlborough, Massachusetts. The gasoline traveled through the ground to nearby properties and affected the land of four different families. As a result of the spill, the Chavezs and Buckleys faced severe environmental and financial consequences, including thousands of dollars in legal fees. The Chavez's were in the process of selling their home for retirement, but the gasoline contamination resulted in their land being classified as hazardous. Three years later they still cannot sell their home (Ash, 2015). Meanwhile, the Buckley family was forced to remove their pool, outdoor restroom, and outdoor bar. As homeowner Michael Buckley explains, "the gasoline that was in the ground was eating away at the lining of the pool…I got out of the water and it literally smelled like gasoline" (Ash, 2015). Although the

Buckley's pool has been removed and surrounding soil excavated, they have not received compensation to have it replaced. The Buckley's property is currently being tested quarterly for oil remnants in the soil, and to check that the decontamination is moving forward. The estimated end date of the cleanup is in 2018, six years after the spill occurred (Ash, 2015). This UST spill is one example of many that have occurred throughout Massachusetts.

Numerous similar cases to that of the Marlborough spill demonstrate a lack of restoration finances and cleanup information provided to neighboring property owners within Massachusetts. In Westborough, Massachusetts, a spill occurred in 1982 at an Exxon Mobile station, and leaked onto the Zwicker's property on Belknap St. "Since the steel tanks leaked 26 years ago, the noxious fluid has spread down an embankment and onto the properties on Belknap Street" (Dayal, 2008). The family has put nearly $60,000 of personal money towards the cleanup, and even though the spill occurred in 1982, the water was still deemed undrinkable in 2008 (Dayal, 2008). Another case occurred in Westford, Massachusetts in 1998, when gasoline spilled in the process of replacing the USTs at a Getty gas station nearby. The town board was not informed of the spill until 2006, when it was brought to its attention due to the remnant of methyl tert-butyl ether (MTBE) found in nearby drinking water wells. MTBE is an additive to gasoline that acts as oxygenate and spreads easily underground due to its water solubility. The American Cancer Society has noted MTBE as a potential carcinogenic substance; as of 2007, MBTE was removed from gasoline as a result of carcinogenic hazards (MTBE, 2014). In 2002, "Tyree Corp., an environmental consulting and construction firm, found MTBE levels next to a home directly across the street from the gas station to be 100 parts per billion," a number above the accepted value for drinking water (Boutselis, 2006).

There are also cases of spills that affect not only a single neighbor, but an entire town. In Northborough, Massachusetts, a 12,000-gallon tanker truck spilled approximately 100 gallons of gasoline while making a delivery to Lowe's Mobil in 2002. The spill spread to the local Cold Water Brook where firefighters intervened (Reis, 2002). Without sufficient protection or emergency respondents, similar spills to those discussed can quickly lead to widespread damage. They will continue to be a problem as the United States continues to consume large amounts of gasoline and oil products.

2.2 Widespread usage of oil in Massachusetts and underground storage tank oil spill hazards

With everyday use of oil by-products comes the inevitable associated hazards, including oil spills. In Massachusetts, the Massachusetts Department of Environmental Protection (MADEP) is the agency responsible for dealing with oil spills.

Massachusetts residents consume large amounts of oil products each year, and is one of the top consumers of heating oil in the United States. In 2014, 31% of Massachusetts residents used oil as their main source of heating fuel, which is five times higher than the national average (U.S. Energy Information Administration, 2015). In 2013, motor gasoline was the second highest consumed fuel source in Massachusetts (U.S. Energy Information Administration, 2015). Figure 1, below, presents the top sources of energy consumed by Americans in 2013. It displays that over 300 trillion BTU's of motor gasoline, a crude oil byproduct, were bought that year (Figure 1). Only 19 gallons of gasoline are produced from one barrel, or 42 gallons of crude oil (U.S. Energy Information Administration, 2015). Gas stations typically own two to three underground storage tanks that house 8,000 to 10,000 gallons of oil product each (Hunter, 2012). The United

States Environmental Protection Agency (USEPA) reports that nationwide there are approximately 569,000 USTs (Underground Storage Tanks, 2015), with over 11,000 existing in Massachusetts (MADEP, 2014). Those who own and operate USTs, such as gas station owners, have a legal obligation to be aware of the hazards that can occur from storing thousands of gallons of oil products.

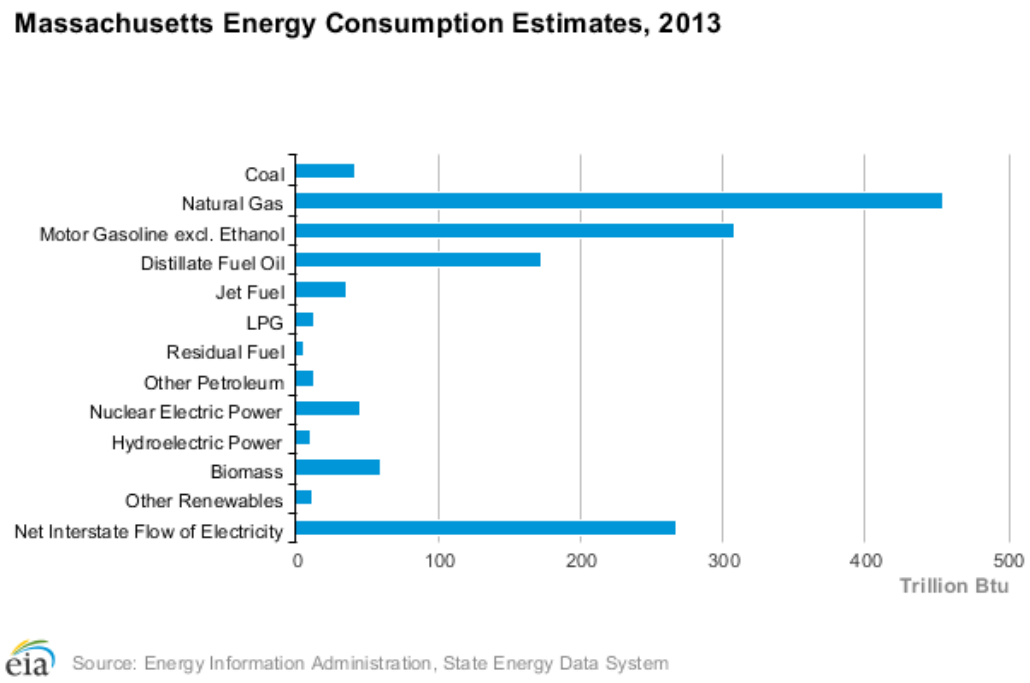

Figure 1: Consumption of various energy sources in Massachusetts

Spills from USTs are important to clean up for the safety of the surrounding area. In *The Dangers of Leaking Underground Storage Tanks*, New York Attorney General Eric T. Schneirderman argues how "despite guidelines to prevent releases from USTs and innovations in leak detection methods, leaks, spills, and overfills still occur which may lead to environmental contamination" (Schneirderman, 2015). In fact, spills from USTs at homes and gas stations are "the largest single threat to groundwater quality in the United States today" (Schneirderman, 2015). Schneirderman explains how many USTs currently in the United States were installed prior to 1988. Underground storage tanks installed before 1988 are at increased risk of spills

from corrosion, improper installation, spills during delivery, and piping failure due to corrosion. Because these older tanks have a greater potential to cause spills, the USEPA passed stricter prevention requirements. Furthermore, USTs hold carcinogenic compounds, such as benzene, toluene, and heavy metals that may enter the drinking water of millions of people (Cope, 2006). Underground storage tanks spills pose a threat to the environment and human health. They must be closely regulated and expediently cleaned up if a spill does occur. However, not all spills receive immediate response, and all yield various levels of contamination.

Not all UST spills require notifying the Massachusetts Department of Environmental Protection. In cases where negligible amounts of gasoline leaks from a car or low amounts of animal, or plant based oils spill, a report does not have to be filed in cases where the owner can contain and clean the spill (USEPA, 2015). Spills that cannot be contained or sufficiently cleaned by the owner fall into three categories of notifications to the MADEP: two hours in cases of emergency where ten or more gallons of oil spill, 72 hours, and finally 120 days in smaller spill cases where oil is left to degrade (MADEP, 2015). The most frequent trigger for notification is a spill of more than ten gallons of petroleum product (WSC-402-96). While the MADEP acknowledges that oil spills can devastate the property on which the tank is located, there is the added risk of damaging nearby properties. Adjacent properties affected by an UST spill depreciate in value up to 17% of the original value (Sementelli and Simons, 1997).

Residents who are impacted by an oil spill from a UST on their property or a neighbor's property must follow the *Underground Storage Tank Closure Assessment Manual (publication WSC-402-96)* provided by the MADEP. The booklet provides information on what qualifies as an oil spill,

and who is responsible for the cleanup process. Those involved in the cleanup process include the UST owner, MADEP official, fire department, and Licensed Site Professionals (LSP) (WEC-402-96). Massachusetts has a semi privatized system where LSPs are contracted by the MADEP to oversee the cleanup process. According to the UST handbook, the MADEP places a series of responsibilities for the cleanup process on the responsible resident. These responsibilities include finding an LSP, providing funding, and reporting potential hazards to an official who can come to test drinking water resources (WEC-402-96). The process has been reported to be overwhelming without direct assistance.

In 2014 alone, the Bureau of Waste Site Cleanup, a subset of the MADEP, provided cleanup assistance to at least 44,000 locations deemed hazardous in Massachusetts. Of those sites, around 1,500 were "environmental emergencies" including chemical fires and oil spills (Mass.Gov). In Massachusetts, funding for UST spill cleanup is provided by a special fund composed of a $250 annual tank ownership fee and a $0.24 per gallon gas tax placed throughout Massachusetts (M.G.L.c 21J, 2015; MADOR, 2015). However, this fund does not provide sufficient reimbursement for neighboring property owners, as demonstrated by the 2012 UST spill in Marlborough, Massachusetts.

2.2.1 The need for funding

The scope, time, expertise, and resources required to cleanup a UST spill are necessary for all affected parties having direct access to the cleanup funds. A 2001 survey conducted by the MADEP of 510 homeowners who experienced an oil spill or tank leak revealed that cleanups cost between $20,000 and $50,000 when only soil was contaminated. When water pollution occurred, the cleanup cost jumped to $90,000 on average, with a maximum of $300,000

(Homeowner Oil Spill Cleanup Guide, 2004). The development of current Massachusetts law regarding the cleanup of properties damaged by oil spills is based on longstanding federal policy.

2.3 Federal policy concerning oil spills

The nation first took interest in a comprehensive oil spill policy after the Torrey Canyon Spill off the coast of Italy. Occurring in 1967, no infrastructure was in place to contain and clean the catastrophe. Detergent was heavily used to disperse the slick- without understanding of the impact the detergent would have on the wildlife (Western Morning News, 2008). In response, the United States created the 1968 National Pollution Contingency Plan, that would provide the basis for reporting a spill and the subsequent cleanup process (Nichols, 2001). Today, legislators have expanded beyond this plan to create a web of federal and state agencies charged with monitoring oil spill prevention and cleanup. Below we discuss the United States Environmental Protection Agency (USEPA) in more detail, since they govern federal UST policies.

2.3.1 United States Environmental Protection Agency

Multiple federal agencies are aware of oil spill dangers, and work to both prevent them and to improve the cleanup process. The USEPA is one of the federal agencies charged with monitoring underground oil spill cleanup. The USEPA's mission is "to protect human health and the environment" (About EPA, 2015). In addition to running the Superfund, a program that cleans up the most contaminated and hazardous land in the nation, the USEPA provides information for people involved in spills, and has many models, tools, and databases available to the public. Furthermore, the USEPA has two oil spill specific rules. The first, "Spill Prevention, Control, and Countermeasure Rule," helps companies prevent large spills into the ocean or along shorelines. The second rule is the "Facility Response Plan Rule", and it requires that companies

have a pre-existing response plan so that they are prepared in the case of a spill (USEPA, 2015). These rules allow tank owners to act in a timely fashion, and to minimize the impact of the spill.

In 1988, the USEPA passed regulations for the usage of USTs to monitor existing tanks and prevent future spills (1988 Underground Storage Tanks, 2015). The regulations require owners to meet strict standards by updating or removing their tanks. According to the 2000 Environmental Research Institute report from the University of Connecticut, *Non-Uniform Regulations of Underground Storage Tanks in the United States*, the 1988 policy was not strict enough for the proper housing of USTs. The authors believed holes still existed in the policy, and there needed to be more robust regulations. These holes included piping failures, corrosion, and the lack of reliable overfill alarms. In order to fix these problems, the authors recommend UST owners install double wall pipes, and limit number of joints used. Additionally, although corrosion is the primary cause of leaking USTs, many tanks did not have complete corrosion protection. Lastly, a single alarm is insufficient for complete overfill protection. If that alarm fails, there is no backup to alert the tank owner. The authors suggested that owners use an automatic shutoff device, in addition to the alarm (Nadim, Zack, Hoag, Liu, Carley, 2000). The USEPA revised several shortcomings in the 1988 policy, as described above, and made stricter regulations in 2015.

In 2015, the USEPA passed new requirements regarding USTs to further increase spill prevention. Thirty-eight states, including Massachusetts, have adopted the new regulations, which require owners to use: (1) a spill bucket, (2) corrosion protection, and (3) overfill protection (Preventing UST Releases, 2015).

Spill buckets collect the gasoline that drips from a fill hose after it is disconnected from the delivery hose. They are limited in size and usually hold around 25 gallons. Disconnection occurs when resupplying the UST tanks. *Corrosion protection* prevents the degradation of the metal UST tanks. There are several methods of corrosion protection, including an inner lining of a non-corrodible material, and the use of an electrochemical system referred to as cathodic protection. Lastly, *overfill protection* requires the use of automatic devices that protect against overflow while the tanks are filled. They alert the operator that the tank is close to full, and automatically shut off the flow of gasoline (Preventing UST Releases, 2015).

Although the USEPA has instituted these new regulations in an effort to prevent spills, there are still problems involving the cleanups of UST spills, with 74,000 contaminated sites remaining nationwide in 2015 (EPA Semiannual Report of UST Performance Measure, 2015). The new regulations may decrease the amount of future spills, but state and federal environmental agencies need to clean the already contaminated sites. The time of cleanup projects can be several years, and increases when groundwater becomes contaminated. The Association of State and Territorial Solid Waste Management, a non-profit national organization supporting environmental protection, spent 1.3 billion in 2013 for UST cleanups alone. Whether or not the USEPA's new regulations are effective in the future, there are a vast number of sites that remain contaminated.

2.4 Out of state cleanup information

Although the USEPA has passed federal UST cleanup and spill prevention regulations, they provide only the minimum of what UST owners must do. States are free to pass more comprehensive laws to address each state's particular needs. State needs differ based on types of

soil and bedrock, and the potential to spread and contaminate groundwater. In the following section, we demonstrate the need for individualized and comprehensive policies within each state. The section includes UST spill data for cleanup backlogs and the hazardous effects on drinking water, as well as trends in cleanup sites from 2004-2015.

State underground storage tank spills and cleanups differ drastically depending on location, funding, number of tanks and spills, and regulations (Cope, 2006). The 2004 article, *Leaking Underground Storage Tanks*, by author Grant Cope of the Sierra Club, which is a non-profit organization promoting environmental awareness, provides data on oil spill sites remained uncleaned throughout the United States. In 2004, Florida and California had the highest backup of uncleaned sites, with 17,544 and 15,049, respectively (Id.). Missouri, Illinois, and North Carolina followed on the heels of Florida and California with the next highest number of sites waiting to be cleaned (Id.). States like Montana and Nevada had the lowest backlogs (Id.). Massachusetts had the 25th highest backup count out all 50 states with 1,294 sites remaining (Id.). Although Massachusetts had fewer sites awaiting cleanup than half of the United States, it was ranked 7th for short term funding debt in funding spill cleanups (Id.).

The need for funding is exacerbated when UST spills affect groundwater. Florida had the highest percentage of people relying on groundwater as a primary drinking source at 93% (Id.). Therefore, Florida has stricter UST cleanup and prevention policies than other states who are not as concerned about this effect. Comparatively, in 2004, Massachusetts had 46% of people using groundwater for drinking (Id.). The UST spill cleanup backlog represents the overwhelming

number of sites that remain for cleaning, the potential contamination of drinking water affecting residents, and the need for funding to clean these spills.

In addition to the 2004 data, Figure 2 below displays the number of UST spill sites that remain uncleaned between 2004 and 2015. The data from Figure 2 shows that less spills are occurring across the United States each year from 2004 to 2015, but thousands of unclean sites still remain (EPA Semiannual Report of UST Performance Measure, 2015).

Fiscal Year	Confirmed Releases		Cleanups Remaining	Percent Of Confirmed Releases Pending Cleanup Completion*
	Each Year	Cumulative		
Mid 2015	3,378	525,095	72,248	13.8%
2014	6,847	521,270	73,947	14.2%
2013	6,128	514,123	77,717	15.1%
2012	5,674	507,540	82,903	16.3%
2011	5,998	501,723	87,983	17.5%
2010	6,328	494,997	93,123	18.8%
2009	7,168	488,496	100,165	20.5%
↓	↓	↓	↓	↓
2004	7,850	447,233	129,827	29%

*Divide cleanups remaining by cumulative confirmed releases

Figure 2: Trends of cleanups nationwide 2004-mid 2015

The USEPA's stricter regulations passed in 2015 may help to further decrease spills in years to come. As mentioned in section 2.3, the USEPA's federal regulations are a minimum for state interpretation. In fact, several states are beginning to adopt cleanup incentives for a more expedient process of cleaning UST sites on backlog, which will be further discussed in the Findings section (Musgrave, 2013). In the following section, we present Massachusetts UST spill policies, highlighting two Massachusetts' laws.

2.5 Massachusetts oil spill regulations and policies

As of 2015, the laws regulating underground storage tanks in Massachusetts are Massachusetts General Law, chapters 21E and 21J (2015). Chapter 21E addresses "oil and hazardous material release prevention and response". This law mandates the cleanup of hazardous spills, and provides regulations that the MADEP and Licensed Site Professionals (LSP) must follow. In the event of a spill, the MADEP and LSP must address the characteristics of the spill, such as the source and the extent of spreading. They also must assess the potential danger to public health and safety, and how to effectively contain or remove the hazardous waste. Chapter 21E section 4 requires the MADEP to take necessary "response actions" whenever they have reason to believe that oil has or will spill. In addition, the Chapter 21J law states that a fund, known as the *Underground Storage Tank Petroleum Cleanup Fund* (Cleanup Fund), will be available for storage tank owners or operators in case of a leak or spill, and will be accrued by a fee as discussed in section 2.2 (MADOR, 2015). In the case of a spill, 21J states that the tank owners/operators are required to clean up the oil in a timely fashion using their own funds. The UST owners are then able to file for reimbursement, and can receive up to $1.5 million from the Cleanup Fund (M.G.L.c 21J § 5A, 2015). However, 21J lacks a way for affected people who do not own or operate the tank to directly apply for reimbursement of property loss damages from the 21J fund. The third parties must bring an action in court to receive compensation for damages. This process of bringing an action in court is not only long, but has the potential to be extremely costly for affected property owners (M.G.L.c 21J, 2015).

2.6 Proposing a comprehensive underground storage tank spill policy for Massachusetts

Third party property owners impacted by a UST leak or spill, like the Buckleys and Chavezs of the Marlborough spill described, are not fully protected or provided for under M.G.L.c 21E and

21J. They do not have input to the cleanup process (M.G.L.c 21E, 2015), or direct access to the same funding that property owners utilize for property damages (M.G.L.c 21J, 2015).

In addition to expanding access to the UST cleanup fund as to provide for restoration of abutting properties, we researched ways to improve communication between the state officials responsible for overseeing the cleanup (such as the MADEP), and the property owners impacted by the spill. This communication will better relay to residents how to protect their properties, what funding is available to them, and how to apply for the funds. As such, this type of communication is an important component of an effective UST policy.

In collaboration with the office of Massachusetts State Senator James Eldridge, we conducted research in order to recommend components of a comprehensive UST cleanup and recovery model policy for all parties impacted by UST oil spills, paying specific attention to abutting property owners. In order to complete this model, we analyzed legislation in other states not only for its inclusive nature of funding, but also for how it is implemented within the state. Lastly, we analyzed how town officials and MADEP employees should react to spills, and provided knowledge of UST cleanup provisions to Massachusetts communities. In the proceeding section, we will discuss our methods for completing this task.

METHODOLOGY

3.0 Introduction

Massachusetts General Law, Chapter 21J does not provide landowners impacted by UST spills from adjacent properties direct access to funding. The sponsor of this project, State Senator James Eldridge, believed MGLc.21J was insufficient and reached out to WPI's Worcester Community Project Center to identify ways to improve Massachusetts UST policies. In particular, we analyzed the ease of reimbursement and expediency of cleanup for adjacent landowners impacted by a UST spill. Additionally, Senator Eldridge noticed that in multiple cases there was a delayed response time by government officials in reaching out to the affected community members. Senator Eldridge saw this lack of response as another problem which we investigated during the course of our research. We compiled our research and created a proposal which details methods that could be used in a new policy for Massachusetts that protects neighboring property owners. We discuss our objectives and the methodology we used to complete them in the following sections.

Objectives:

Objective 1: Became well-versed on MGL c. 21E and 21J

Objective 2: Identified states with effective and progressive underground storage tank spill cleanup policies to research.

Objective 3: Gathered and organized information concerning underground storage tank policies in the states identified in Objective 2.

Objective 4: Explored on-the-ground relevant agency underground storage tank practices in Massachusetts, as well as the states identified in Objective 2.

Objective 5: Comparatively analyzed the data found in Objectives 1-4, and developed recommendations for a comprehensive underground storage tank policy to assist adjacent landowners affected by an underground storage tank spill.

3.1 Objective 1: Became well-versed on M.G.L c.21E and 21J

We became well-versed on Massachusetts General Laws chapters 21E and 21J. These laws describe environmentally hazardous material spill prevention and cleanup, as well as the specific funds available for UST spill cleanup. We studied 21E and 21J, and then interviewed environmental lawyers to gain a complete understanding of the policy's scope and application. After analyzing 21E and 21J, we conducted semi-structured interviews with experts. These experts included environmental lawyers and legislators, because they have experience enforcing and developing these laws. We utilized a semi-structured interview format, where we had predetermined questions, but also asked impromptu questions based on the information brought up during the interview. According to *Qualitative Research Methods for the Social Sciences* by professionals Bruce L. Berg and Howard Lune, semi-structured interviews allow researchers to ask structured questions, but also lets the interviewers cover topics spontaneously (Berg and Lune, 2012). In addition, we asked experts what holes they saw in the language of 21J specifically, and what improvements they felt were necessary. Interview questions can be found in Appendix A.

3.2 Objective 2: Identified states with effective and progressive underground storage tank spill cleanup policies to research

In Objective 2, we identified states with effective and progressive UST policies that provide resources for adjacent landowners impacted by UST spills. These resources include a plan of action for impacted homeowners, government involvement, and direct access to funding. We developed the characteristics above for a comprehensive policy after interviewing our sponsor,

Senator James Eldridge. We then identified states by performing semi-structured interviews with stakeholders and conducting online content analysis.

We conducted semi-structured interviews with two environmental consulting firms, Vertex and New England Environmental (NEE). We used a contact through WPI faculty to speak with the Vice President, Greg Sampson. We independently contacted NEE because the consultants work across New England and may know states with strong UST policies. We spoke with Jack Jemsek, Vice President of Site Assessment and Remediation. Vertex advised us to research Florida, New Jersey, New York, and Pennsylvania, while NEE suggested New Hampshire, and Connecticut. We used the semi-structured interview format to ask predetermined and spontaneous questions, as described by Berg and Lune. See Appendix B for interview questions for this stakeholder.

In addition to environmental consultant interviews, we identified states with strong UST policies by online content analysis of discussions about UST policies. We utilized online content analysis to access information from scholarly articles, such as LexisNexis, and the federal environmental protection agency (EPA) website. We used this research method, according to Berg and Lune, as a means of acquiring expert perspectives, and conducting a blend of qualitative and quantitative analysis (Berg and Lune, 2012). We decided to look more closely at states that rely heavily on groundwater for drinking purposes, and have highly urbanized areas. The rationale was that states using groundwater for drinking would have stricter UST policies, because a spill would be a greater threat to public health. Also, urbanized states have more USTs, which means there is a higher potential for spills to occur. We found Florida and California have the most USTs of all

other states and Florida had the highest percentage number of residents relying on groundwater for drinking. To sum up, we decided to perform online content analysis of California, Connecticut, Florida, New Hampshire, New Jersey, New York, and Pennsylvania.

3.3 Objective 3: Gathered and organized information concerning underground storage tank policies in the states identified in Objective 2

Once we identified states in Objective 2, we collected information regarding the UST laws of these states. Gathering information gave insight into the different methods employed by states for UST spill cleanups, and gave us the ability to begin to identify which methods Massachusetts could utilize. We performed online content analysis and conducted semi-structured interviews to collect individual state information.

We began with online content analysis of state environmental agency websites and literature databases for information regarding each state's UST policies. We looked specifically for a funding cap, restoration and compensation for third parties, and government oversight in the cleanup process. When we needed clarification, we interviewed state environmental agency officials from the hazardous waste cleanup division about their state's UST regulations. These interviews were semi-structured, because we had a few specific questions to ask, but then asked further questions based on responses. The interviews were primarily conducted over the phone, because it was difficult to travel to other states. Common questions for state officials can be found in Appendix C. After gathering the individual state information, we created a matrix to visually compare state practices. See Appendix F for the matrix.

3.4 Objective 4: Explored on-the-ground relevant agency underground storage tank practices within Massachusetts, as well as the states identified in Objective 2

After gathering and organizing UST policies, we explored the practical law, or the way in which laws are implemented in these states. We first conducted semi-structured interviews with stakeholders in Massachusetts who are involved in the cleanup of UST spills. After Massachusetts, we interviewed stakeholders from the states identified in Objective 2. The semi-structured interview format allowed us to ask specific questions about unique parts of each law, but also allowed the interviewees to share their experiences.

First, in Massachusetts, we interviewed MADEP employees, environmental consultants, town officials, and affected residents. We wanted to gain insight on the spill cleanup, town involvement in UST spill cleanup, and how information is provided to residents. The MADEP is the agency responsible for responding to UST spills, and ultimately for declaring a site clean. They outsource the physical cleanup to environmental consultants, who we also interviewed for information concerning services given to neighboring property owners. These environmental consultants are also hired by towns in the case of widespread spills, so we interviewed town managers, the people who oversee the cleanup of these cases, as well. See Appendix D for interview questions. Lastly, we interviewed the adjacent residents affected by UST spills. We took particular interest in two cases, conducting case studies on the 2012 Marlborough spill, and the Charlton, MA spills in the 1980s. Berg and Lune state that case studies are able to attain "extremely rich, detailed, and in depth information", which allowed us to deeply analyze the cases (Berg and Lune, 2012). We focused on the Marlborough spill, and spoke with the two families who had the most damage to their properties, as this was the original case presented to

us by Senator Eldridge, and the event that spawned the need for this project. The Marlborough families were also asked questions located in Appendix D.

After we researched Massachusetts, we investigated how UST laws are implemented on-the-ground in the states we identified in Objective 2. We conducted semi-structured interviews with state officials and environmental consultants from other states. These interviews were conducted both in person whenever possible and on the phone for out of state interviewees. The state agencies had information on the spill cleanup process specific to their state, as it related to abutting homeowners affected. In addition, we interviewed environmental consultants, because they are responsible for the actual cleanup of UST spill sites and are often well-versed on UST cleanup policy implementation. See Appendix E for interview questions. The on-the-ground information we collected regarding UST laws allowed us to compare Massachusetts to the other states we researched.

3.5 Objective 5: Comparatively analyzed the data found in Objective 1-4, and developed recommendations for a comprehensive underground storage tank cleanup policy to assist adjacent landowners affected by an underground storage tank spill

Using data collected through Objectives 1-4, we compared and analyzed the various state UST recovery, cleanup and reimbursement policies. From the findings, we developed recommendations for a new comprehensive UST policy in Massachusetts. We organized data visually to make connections between our findings, and the critical points could quickly be found and assessed. The final product delivered under this objective was easy for readers to understand, and it expressed the necessary additions to UST spill cleanup legislation in Massachusetts.

In order to quickly process the data from objective 1-4, as discussed, we utilized a qualitative approach. We implemented a table such as the one shown in Appendix F to make quick connections between UST practices in various states. The rows represent the states we analyzed, while each column is a variable in the cleanup of UST spills that may vary state to state. We wrote a brief 1-3 sentences in the corresponding boxes. After we completed the chart, we assessed the different components of each state's UST policy that would be effective for Massachusetts to incorporate into their own laws. We looked explicitly for restoration and compensation funding for third parties, and government involvement in the cleanup process.

3.6 Conclusion

These research methods assisted us in reaching our project goal of recommending a comprehensive UST cleanup policy for abutting property owners in Massachusetts. The following section displays our finding based on the research methods.

FINDINGS

4.0 Introduction

In the following section we discuss four findings from research into underground storage tank (UST) cleanup policies. We provide tables for visual comparison of findings concerning differences in state policies. Following is a list of our findings, and a table that includes states we researched, the corresponding state environmental protection agency, and the relevant UST laws.

Finding 1: State funding amounts for underground storage tank spill cleanup and property restoration vary by state

Finding 2: Licensed Site Professional proactive cleanup approaches vary on a by state and by case basis

Finding 3: State agency involvement in the spill cleanup process varies between states and cases

Finding 4: Public outreach policies and practices vary between states and by the severity of cases

Finding 5: Underground storage tank spills in Massachusetts would be cleaned up more efficiently with a more comprehensive underground storage tank policy

Table 1: States Researched and UST Law

State	UST Law	State Agency	State	UST Law	State Agency
Massachusetts	M.G.L c.21E and J	Department of Environmental Protection (DEP)	**New Hampshire**	RSA 146-D 146-E 146-F RSA 146-G	Department of Environmental Services (DES)
California	California Health and Safety Code, Chapter 6.75	Environmental Protection Agency (EPA)	**New Jersey**	New Jersey Admin Code 7-14b	Department of Environmental Protection (DEP)
Connecticut	Sections 22a-449(d)-1, and Sections 22a-449(d) 101-113	Department of Energy & Environmental Protection (DEEP)	**New York**	Navigation Law, Article 12	Department of Environmental Conservation (DEC)
Florida	Title XXVIII, Chapter 376	Department of Environmental Protection (DEP)	**Pennsylvania**	PL 169, No. 32	Department of Environmental Protection (DEP)

4.1 Finding 1: State funding amounts for underground storage tank spill cleanup and property restoration vary by state

A comprehensive UST cleanup policy must include enough funding for both the actual cleanup and reimbursement for third party property damage. Third parties include those who are affected by the spill, but not responsible, such as the Buckleys and Chavezs in the 2012 Marlborough spill. State funding allotments are influenced by the number of active USTs, population density, typical cleanup cost, and state budgets. Specified funding is established by a law, and can include funds for the responsible party to clean all land damaged, and specific funds for third party cleanup and third party property damage restitution. Therefore, each state has different funding availability.

In the states we researched, we found funding caps of $1.5 million and above to be the most common. These caps are sufficient to cover the majority of spill cleanups, but some cases require more than the maximum funding amount, such as in the 2012 Marlborough spill. The typical cost of cleanup in Massachusetts for a UST spill ranges between $20,000 and $50,000 when only involving soil contact, and $90,000 to $300,000 when water pollution occurs (Homeowner Oil Spill Cleanup Guide, 2004). Since the cost for UST cleanups range significantly, some states will have a cap range, or remove the cap altogether. In New Jersey, the fund limit varies from $2-3 million with an increased funding for locations of higher population density. Areas of higher population density have a greater number of people potentially affected, and have busier usage of gas stations (New Jersey Department of Environmental Protection, 2015). Furthermore, Florida and New York do not have a funding limit. These states fund on a per spill basis. In Massachusetts, as of November 2015, the maximum funding available for a UST spill cleanup

increased from $1.5 million to $2.5 million. The extra $1 million is set aside specifically for third party damages (Senator Eldridge, personal communication, November 20, 2015).

In addition to the funding cap, a comprehensive UST policy allows third parties to receive funds for property restoration or compensation for property damages. Massachusetts became more comprehensive, as of November 2015, with money set aside for third parties affected by UST spills. To receive compensation, or funds for restorations, the abutting property owners must bring an action in court against the potentially responsible party (PRP), who is usually the gas station owner. The PRP then pays for the property loss dictated in court and then files directly to the 21J fund for reimbursement. Many states adopted a similar system, however bringing an action in court is time consuming and expensive. A progressive UST policy not only provides property damages for third parties, but allows the third parties direct access without first bringing an action in court. New York and New Jersey both offer direct access to the UST cleanup fund for abutting property owners. In New York, the homeowner files a claim to the Oil Spill Fund, which is then reviewed by the Comptroller's Office. If the Comptroller does not grant the third party reimbursement, the party can then bring an action in court (Office of the New York State Comptroller, 2015). This system is similar in New Jersey, where the homeowners submit pictures of their properties directly to the fund for restoration or compensation (New Jersey Department of Environmental Protection, 2015). Even though Massachusetts has $1 million set aside for the restoration of abutting properties, these homeowners have to bring an action in court to gain access to the 21J fund. A fully comprehensive UST policy will allow the third party direct access to the fund.

Table 2 displays a comparison of the funding options available to UST cleanups and third parties per state. In the left column we list the states we researched, and across the top row we list components of a robust UST policy.

Table 2: Funding Organized Per State

State	Funding Cap	3rd Parties Covered by Fund	3rd Party File Directly to Fund	Funding for 3rd Party Damages
MA	$2.5 million, with $1 million set aside for third party damages	Yes	No	Only after an action in court
CA	$2.5 million, with $1 million set aside for third part cleanup. Fund can increase.	Yes	Yes, only when no PRP exists	Only after an action in court
FL	Depends on the program. Generally, no cap.	Yes	No	Only after an action in court
NH	$2 million	Yes	No	Only after an action in court, but with restoration practices
NJ	$2-3 million based on population density	Yes	Yes, but at the discretion of the LSP	Yes, with money set aside specifically for restoration
NY	No funding cap	Yes	Yes	Yes. If denied, then can bring an action in court and resubmit claim

4.2 <u>Finding 2:</u> Licensed Site Professional proactive cleanup approaches vary on a by state and by case basis

Funding is offered by the eight of the states we researched for UST cleanups, as mentioned in the previous finding. The PRP has direct access to the fund to clean up the UST spill. The PRP delegates the actual cleanup process to Licensed Site Professionals (LSPs) in all states researched. LSPs are licensed by the state to assess and remediate contaminated sites (Greg

Sampson, personal communication, November 3, 2015). Various state environmental protection agencies will oversee the LSP to different degrees.

The Florida Department of Environmental Protection (FLDEP) has comprehensive state agency approach to monitoring the LSP cleanup and spending. The FLDEP and LSP enter a performance based cleanup (PBC) where both parties discuss the site cleanup, including costs and cleanup milestones. This system maximizes efficiency in spending costs and cleanup time, while protecting public health (State of Florida Petroleum Cleanup Summary, n.d.). According to MAS Environmental, an environmental consulting company in Florida, the performance based cleanup "allows [the responsible party] to quantify any potential risks or exposures and ensures that they will have an expedited cleanup" (Performance Based Cleanup, 2015).

Similar to Florida, but not as comprehensive, New York and Pennsylvania have programs where the state environmental agency closely monitors the LSPs. The New York State Department of Environmental Conservation (NYSDEC) issues a Stipulation Agreement to the PRP. The agreement legally binds the party responsible for the spill, and discusses the proper site remediation for the UST spill (Spill Response and Remediation, 2015). According to Mark Baldi of the MADEP, in Massachusetts no program exists where the MADEP oversees the LSP cleanup (Mark Baldi, personal communication, November 18, 2015).

Table 3, below, shows a visual comparison of state involvement in cleanup and monitoring LSPs. The left column shows noteworthy states, while the top row displays the topics we

compare. The column titled “LSP privatization in cleanup process” refers to if the responsibly party hires an LSP to perform the cleanup.

Table 3: LSP Cleanup Oversight

State	LSP Privatization in Cleanup Process	Cost Estimation by LSP Prior to Cleanup
MA	Yes	No
CA	Yes	Further research needed
FL	Yes	Yes, in a program called Performance Based Cleanup (PBC)
NH	Yes	No
NJ	Yes	Series of loans/grants issued to the responsible party for the cleanup process
NY	Yes	Yes, the PRP/LSP and DEC enter a Stipulation Agreement
PA	Yes	Suggested

4.3 Finding 3: State agency involvement in the spill cleanup process varies between states and cases

Within each of the studied states, the level of involvement of state agencies with affected third parties varies based on a multitude of factors including staffing, number of open cases, the contamination of natural resources, and the severity of the spill.

The Massachusetts Department of Environmental Protection (MADEP) lacks the necessary manpower to oversee all oil spill cases in Massachusetts (Mark Baldi, personal communication, November 18, 2015). Massachusetts has a semi-privatized system, where it is uncommon to find an individual MADEP employee assigned to a case (Mark Baldi, personal communication, November 18, 2015). Semi-privatization, in the case of an oil spill, refers to the separation between the LSP in charge of the cleanup process and the environmental agency employee who collects cleanup information and officially deems the site clean. One of the few examples of a MADEP employee assigned to oversee a spill site is Mark Baldi. Mr. Baldi joined the MADEP in 1992 and was immediately assigned to the Charlton, Massachusetts oil spill (Mark Baldi, personal communication, November 18, 2015). When the system became semi-privatized in 1993, officials were no longer assigned to smaller cases. However, Mr. Baldi was kept on the Charlton case because it was declared of high importance due to widespread drinking water contamination (Mark Baldi, personal communication, November 18, 2015).

States, such as New Hampshire, have higher numbers of staff and are able to oversee more cases of increased importance, such as in the case of drinking water contamination (NHDES Supervisor, personal communication, November 12th, 2015). Increased staffing also allows for more communication between the environmental agency and affected third parties. From speaking with the MADEP officials, including Deputy Regional Director Andrea Briggs, state environmental agencies are limited in their cleanup oversight and outreach to affected third parties based on their staff. Instead, state agencies that act under a semi-privatized system rely on the LSP to clean up the spill and to communicate with affected third parties (Andrea Briggs, personal communication, October 29, 2015).

As mentioned, contamination of natural resources is one prominent factor that determines an agency's outreach to the community. In New Hampshire, water contamination is treated as a third party damage and a New Hampshire Department of Environmental Services (NHDES) agency employee is assigned to oversee the cleanup process (NHDES Supervisor, personal communication, November 12th, 2015). The Petroleum Fund Section of New Hampshire Law requires public notification to drinking water well owners that are within 500 feet of the outermost sampling points within the contaminated area (Overview, 2014). In Florida, due to the high number of residents that rely on groundwater as their primary drinking source and the bedrock which the state rests on, the FLDEP has heightened involvement in oil spill cases. The potential irreversible damage of natural resources drives states such as Florida and New Hampshire to play an increased role in the cleanup process.

4.4 Finding 4: Public outreach policies and practices vary between states and by the severity of the cases

Discovered in the interview with Ms. Karen Buckley, one of the residents affected by the 2012 Marlborough spill, there has not been the needed outreach to the public. When trying to obtain a fact sheet from the MADEP about the spill cleanup, they were informed that one could not be provided (Karen Buckley, personal communication, November 3, 2015). The Buckleys have also had trouble contacting Mr. Brown, the gas station owner, who was only present at one town meeting to discuss the spill (Karen Buckley, personal communication, November 3, 2015). The Buckley's hired Reggie Achilles, a LSP from EnTact Solutions, to review the case and walk through the cleanup process with them, including interpreting the data on the MADEP website.

The cleanup progress found on the MADEP website is difficult to understand unless one has prior knowledge of the well and air testing processes used by LSPs. Figure 3 below shows the links to the data from the wells tested on the Buckley's property.

2-18560	BWSC102 Release Amendment Form- 141	5/17/2012 3:23:37 PM
2-18560	BWSC102 Release Amendment Form- 141	5/17/2012 3:31:20 PM
2-18560	BWSC102 Release Amendment Form- 141	5/17/2012 3:44:45 PM
2-18560	BWSC102 Release Amendment Form- 141	5/17/2012 4:03:09 PM
2-18560	BWSC102 Release Amendment Form- 141	5/17/2012 4:07:18 PM
2-18560	BWSC102 Release Amendment Form- 141	5/17/2012 4:10:00 PM
2-18560	BWSC102 Release Amendment Form- 141	5/17/2012 4:37:41 PM
2-18560	BWSC102 Release Amendment Form- 141	5/25/2012 10:14:52 AM
2-18560	BWSC102 Release Amendment Form- 141	6/14/2012 11:22:05 AM
2-18560	BWSC102 Release Amendment Form- 141	6/25/2012 1:30:29 PM
2-18560	BWSC102 Release Amendment Form- 141	6/25/2012 2:35:26 PM
2-18560	BWSC102 Release Amendment Form- 141	7/25/2012 4:35:59 PM
2-18560	BWSC126 Miscellaneous Document Transmittal Form- 470	7/25/2012 10:48:47 PM
2-18560	BWSC126 Miscellaneous Document Transmittal Form- 470	7/27/2012 7:00:46 PM
2-18560	BWSC126 Miscellaneous Document Transmittal Form- 470	7/30/2012 1:07:28 PM
2-18560	BWSC102 Release Amendment Form- 141	7/31/2012 2:40:04 PM
2-18560	BWSC102 Release Amendment Form- 141	7/31/2012 2:49:13 PM
2-18560	BWSC102 Release Amendment Form- 141	7/31/2012 2:55:39 PM
2-18560	BWSC102 Release Amendment Form- 141	7/31/2012 3:03:35 PM

Figure 3 Test Data from the MADEP Website

Other states, such as New Jersey, have strict deadlines regarding communication and outreach to third parties. New Jersey's deadlines include distributing a fact sheet with site and contamination information within two weeks of spill identification, and publishing a fact sheet in the newspaper within 30 days of spill identification. These requirements allow the surrounding area to be notified of the spill, and to be aware that there is the possibility of personal property damage and drinking water contamination (Summary of Regulatory and Mandatory Timeframes for Remediation, 2015). Massachusetts also has response actions that require the responsible party to notify third parties of the cleanup. However, this process differs from New Jersey, because third parties must take the initiative to become involved in Massachusetts. If the third party chooses to become involved, they must comment in writing to the MADEP and the LSP within one year. The third parties will receive information about the cleanup progress after each phase is

completed. After one year, in order for the third parties to become involved, they must sign a petition with at least ten different addresses of homeowners potentially affected by the spill. These residents will enter a Public Involvement Plan (PIP) where they can comment on the cleanup progress at a public meeting (Public Involvement in Site Cleanup, 2004). Table 4 shows the public outreach plan in Massachusetts compared to New Jersey.

Table 4: New Jersey and Massachusetts Community Outreach

New Jersey		Massachusetts	
LSP Action	**Deadline**	**LSP Action**	**Deadline**
Post sign or send letters for public notification and submit documentation to local government entities	Within 14 days after a discharge is discovered or initiation of remediation	Public legal notice	After cleanup phases completed
If letters are used, distribute updated notification letters and submit documentation to local government entities	Every 2 years until final remediation document is filed or issued	Draft cleanup plan for public	Within 60 days of PIP implementation
Prepare and distribute a fact sheet with includes site and contamination information	Within 14 days after off-site contamination is identified	Allow public to comment on plan at meeting	20 days after draft
Publish fact sheet in newspaper, submit documentation	Within 30 days after off-site contamination identified	Finalize plan	30 days after meeting
Update, redistribute and replenish fact sheet	Within 90 days after complete		

4.5 <u>Finding 5</u>: Underground storage tank spills in Massachusetts would be cleaned up more efficiently with a more comprehensive underground storage tank policy

As discussed in the Background Chapter, the primary case we researched was the Marlborough, Massachusetts oil spill that occurred in 2012 from a Citgo gas station. The two families who

faced the most severe damage from the spill were the Chavezs and Buckleys. Through our interviews with the Buckley family, we learned that the Chavez's property was the first to be investigated, and that the Buckley's property was not tested until Mr. Buckley went swimming in the pool and found himself covered in oil residue (Karen Buckley, personal communication, November 3, 2015). After constant complaints from the Buckleys to the MADEP and local fire department over a series of two months, the MADEP forced the LSP, Chuck Klingler, to test the property for contamination (Michael Buckley, personal communication, November 3, 2015). From our research, we found that the LSP does not have a required testing area set by the MADEP to test for oil contamination. (Greg Sampson, personal communication, November 2, 2015). Greg Sampson, a Vice President at Vertex, an environmental consulting agency, described that LSPs traditionally test within the radius they believe to be affected (Greg Sampson, personal communication, November 2, 2015). However, as there is no set regulation, each LSP can present a bias in the area they test for oil. Families such as the Buckleys whose property does not fall into the region of potential contamination must request the MADEP to test their property for the presence of oil.

In Massachusetts, the cleanup process is left to the discretion of the LSP, which in the case of the Buckleys led to several months of undetected oil on their property, and their land still contaminated as of 2015 (Reggie Achilles, personal communication, November 11, 2015). As mentioned in Finding 4, the Buckley's hired Mr. Achilles to help review the cleanup process for them. Once the Buckley's property was determined to be contaminated, Mr. Klingler, the LSP hired by the Citgo gas station owner, began cleanup of the property. He initiated removal of the Buckley's pool and excavated the surrounding area to remove as much of the contaminated soil

as possible, as shown in figure 4. Mr. Klingler also installed 17 testing wells on the Buckley's property, in addition to several air ventilation systems (Reggie Achilles, personal communication, November 11, 2015).

Figure 4: Removal of the Buckley's pool

Although the land is being cleaned, there is no restitution for the property value lost in the process. The Buckleys had their pool, outdoor bar and bathroom, horseshoe pit, and bocce ball courts removed, and, as of November 2015, have not received restoration or compensation for these losses (Michael Buckley, personal communication, November 3, 2015). Karen Buckley explained that in order to have the pool removed, they had to file for a court ordered judgment, meaning the Buckleys sued Mr. Brown to have the pool removed (Karen Buckley, personal communication, November 3, 2015). Pursuant to law 21J, in Massachusetts, restoration funding for property damage can only be received through a court ordered judgment. Even as of November, 2015 with an added $1 million dollars set aside for restoration funding, there is still an issue with the ease of access to the 21J fund by third parties such as the Buckleys. Currently, there is no manner for third parties to directly file to the 21J fund without going through the responsible party.

In the Marlborough spill, we were unable to determine why all funding provided by the 21J fund ($1.5 million dollars) was spent in a period of three years. LSPs from the environmental consulting agencies New England Environmental, Vertex, and EnTact Solutions were not able to provide an explanation of where the funds could have been spent by Mr. Klingler. Despite numerous attempts we were unable to secure an interview with Mr. Klingler. Most oil spills in Massachusetts cost at most $300,000 to cleanup. Mr. Reggie Achilles of EnTact Solutions, who is also the Buckley's personal LSP, explained that the high number of wells, and high cost of testing, roughly $1,000 per well per test, could be the explanation. He also explained that Mr. Klingler increased the amount of cleanup practices, including the testing of monitoring wells to quickly cleanup the properties, and the cleanup may have been done in excess (Reggie Achilles, personal communication, November 11, 2015). Based on this information, we have found that there is no regulation or policy regarding how the 21J fund is spent and no timeline for the distribution of the funds, meaning the spending of the 21J fund is spent at the discretion of the LSPs as long as they have the proper documentation. However, we did not have the opportunity to speak directly with the MADOR about this process.

The second UST oil spill case we examined took place in Charlton, Massachusetts. We spoke to the Town Manager, Ms. Robin Craver. The widespread damage was caused by three separate spills from three different gas stations, the most prominent being an ExxonMobil spill in the early 1980s. The Charlton case is unique because of the high level of drinking water contamination (Robin Craver, personal communication, November 9, 2015). The town's ground is composed of bedrock that allows for the quick and random spreading of oil. Mark Baldi, the

MADEP official responsible for overseeing the case, estimates that 50-70 households have had their wells compromised by the oil (Mark Baldi, personal communication, November 18, 2015).

The plume, or spread of the spill, is not stagnant, and currently is spreading to the locations of three public schools. Ms. Craver explained that the town has no public source for drinking water, and is currently sharing water from Oxford, Massachusetts. The lack of available drinking water has restricted business growth and expansion of private properties in the town (Robin Craver, personal communication, November 9, 2015). The Charlton oil spill demonstrates that Massachusetts does not have an external plan in cases where drinking water is compromised. The Charlton case is on a far larger scale then the Marlborough spill, and demonstrates the number of potential parties at risk for a single spill.

4.6 Conclusion

Through our research, which included two individual case studies and research into the UST cleanup policies of eight states identified by environmental consultants, state environmental agency employees and articles on UST cleanup practices, we identified components of a "comprehensive UST policy". A comprehensive policy must: (1) provide the necessary funds for both the remediation and restoration of all affected properties, (2) provide easy access to these funds for third parties, (3) incorporate consistent and appropriate outreach to the community about the spill and cleanup process; and (4) assure an effective cleanup process with both the timeline and available finances taken into consideration.

In November 2013, Massachusetts addressed the first component (1) and passed a bill to increase the 21J cap to $2.5 million, leaving the additional $1 million specifically for third party

restoration. However, the policy still does not resolve the second component (2) in allowing third parties direct access to the 21J fund. Furthermore, Massachusetts lacks the necessary outreach to the public about UST spills and the cleanup process (3). As in the Marlborough case, the current Massachusetts UST policy does not always assure an effective cleanup process (4). Massachusetts has an emerging UST policy, but further language must be included to incorporate all components (2), (3), and (4) above and to establish the comprehensive policy needed to protect Massachusetts residents and natural resources. In the subsequent section, we recommend adding several components to achieve a fully progressive and robust UST policy for Massachusetts.

RECOMMENDATIONS

We developed four recommendations after analyzing eight state underground storage tank (UST) policies. We presented these recommendations to our sponsor, the Office of Senator Eldridge, to incorporate in a new UST cleanup policy proposal for Massachusetts.

5.1 Recommendation 1: Third parties should have direct access to the 21J fund for property loss damages

As described in the Background Chapter, homeowners in Massachusetts must bring an action to court pursuant to M.G.L. c. 21E, § 4A and sue the responsible party for damages and restoration funding. The responsible party then files for reimbursement from the 21J fund, which is reviewed by the Massachusetts Department of Revenue (MADOR). This process of taking legal action takes time and is costly for third parties. As a result, we recommend Massachusetts institute a policy where impacted homeowners could submit a claim directly to the MADOR. This claim would include multiple cost estimates of property restoration. Only if the third party did not receive sufficient compensation would they need to embark on the costly and lengthy process of bringing the potentially responsible party (PRP) to court under 21E.

We base this recommendation on the policies of New York and New Jersey. Both states offer a model for a comprehensive reimbursement program, particularly in the case of third party restitution as discussed in Finding 1. New York law states,

> "The fund shall be strictly liable […] for all direct and indirect damages (N.Y. NAV. LAW § 181)." This includes "the cost of restoring, repairing, or replacing any real or personal property damaged (Id.)." Also, the fund covers "any reduction in value of such property (Id.)."

In addition, New Jersey law states

> "Site restoration costs are limited to the actual area of the remediation of the leaking underground storage tank. Eligible costs for certain site restoration categories are capped at $5,000 each (Instructions for the petroleum underground storage tank remediation, upgrade, and closure fund, 2011)."

These categories include, but are not limited to landscaping, hardscaping decking costs, and pool costs (Id.). In Massachusetts, no restoration funding exists without third parties having to bring an action in court. We recommend modeling a new policy after New York and New Jersey.

5.2 Recommendation 2: The Massachusetts Department of Environmental Protection needs to impose a series of requirements on the Licensed Site Professional for necessary public outreach after an underground storage tank spill occurs

In order to educate residents affected by an oil spill on matters such as the cleanup process, expected timeline, and filing for restoration funding, we recommend both short-term and long-term community outreach. As a short-term solution, we recommend a contacts page on the MADEP website that would allow tank owners, LSPs, and affected third parties to quickly find contacts for spill cleanup questions. Specifically, we recommend (1) information on all emergency services to contact in the case of a spill; (2) information on specific contacts to answer questions on the 21J fund; (3) information on how and when to contract an LSP; (4) actions third parties should and should not take, and (5) professional oil spill cleanup practices. The webpage would allow affected third parties to educate themselves on what steps to take without the use of a personal environmental consultant or environmental lawyer. While it was out of the scope of our project to research the MADEP website in depth, we have heard from third parties that the website is currently confusing to navigate (Karen Buckley, personal communication, November 3, 2015).

We also recommend a long-term community outreach solution. From finding 3, we noted that states defined as having a comprehensive UST policy have a detailed plan for community outreach in the case of a UST spill. The state we researched with the most comprehensive policy regarding public outreach is New Jersey. The New Jersey Department of Environmental Protection (NJDEP) sets a detailed schedule, also listed under finding 3, to promote public outreach by the LSP. Incorporating New Jersey's outreach practices into Massachusetts would allow for families, such as the Buckleys and Chavezs, to have a direct contact who could answer questions on the tests results and general cleanup process. Also, little to no extra manpower would be expended by the MADEP since the responsible party and contracted LSP would be responsible for the public outreach process.

5.3 Recommendation 3: A future Interactive Qualifying Project group or legislative aide should continue research regarding Massachusetts Department of Environmental Protection involvement in underground storage tank spill cleanups

There is a need for increased involvement of the MADEP in severe oil spills where human health or natural resources are at risk. The most prevalent issue that the MADEP faces based on interviews with four employees is the lack of staffing. As discussed in finding 3, only specific older cases, such as the Charlton, Massachusetts oil spill, still have an individual employee overseeing the cleanup process. Noted by Mark Baldi from the MADEP, after the transition to a semi-privatized system in 1993, only a select few cases were overseen by an individual employee (Mark Baldi, personal communication, November 18, 2015).

Although we do not have specific numbers due to time constraints, we found that states with higher staffing and increased cleanup involvement have more comprehensive UST policies. We recommend more research be completed on the relationship between LSPs and environmental

agency employees in states such as New Jersey and Florida, and how their relationship affects the cleanup process. Based on these findings a case can be made for increased staffing, or an alternative solution can be sought. Further research can also lead to increased involvement in particular cases, such as drinking water contamination. Based on current findings, we believe that increased staffing is necessary for the MADEP, however a strong case cannot be made without further research.

5.4 Recommendation 4: A legislative aide should continue research into challenges faced when passing comprehensive underground storage tank cleanup policies in various states

Due to time and resource restrictions, we were unable to thoroughly research potential challenges faced when passing stricter UST policies. Understanding obstacles is especially important when proposing more funding or more state environmental protection agency involvement. We recommend contacting legislators or legislative aides in states with components of a comprehensive UST policy. These states are Florida, New Hampshire, New Jersey, and New York.

5.5 Conclusion

We present these recommendations with the belief that they will help define Massachusetts as having a comprehensive underground storage tank cleanup policy. We believe all parties impacted by a UST spill deserve support, and we hope that these recommendations will aid in providing that support.

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APPENDICES

Appendix A

We are a group of students from Worcester Polytechnic Institute in Massachusetts. We are conducting an interview with experts in environmental law to learn more about Massachusetts General Law chapter 21J (underground storage tank policy). We strongly believe this kind of research will ultimately allow us to suggest changes for a more comprehensive underground oil tank spill policy for the state of Massachusetts. Your participation is completely voluntary and you may withdraw at any time. Please remember that while this is not anonymous, you may ask to have your name/position be kept confidential in the final results. This is a collaborative project between State Senator Eldridge's Office and WPI, and your participation is greatly appreciated. If interested, a copy of our results can be provided at the conclusion of the study.

<u>Interview questions for environmental law experts (Objective 1):</u>

1. Could you explain the overall concept of Mass law 21E and 21J?
2. Do you feel 21J is an effective policy?
3. What do you think would make 21J a more comprehensive policy?
4. How does 21E relate to USTs?
5. Do you feel 21E has an effective policy for USTs?

Appendix B

We are a group of students from Worcester Polytechnic Institute in Massachusetts. We are conducting interviews with environmental consultants to learn more about underground storage tank policies in other states. We strongly believe this kind of research will ultimately allow us to suggest changes for a more comprehensive underground oil tank spill policy for the state of Massachusetts. Your participation is completely voluntary and you may withdraw at any time. Please remember that while this is not anonymous, you may ask to have your name/position be kept confidential in the final results. This is a collaborative project between State Senator Eldridge's Office and WPI, and your participation is greatly appreciated. If interested, a copy of our results can be provided at the conclusion of the study.

Interview questions for environmental consultants (Objective 2)

1. Could you please tell us about your position at ____ and your role in UST spill cleanup?
2. What states do you typically work in?
3. What states have you done UST cleanups in, or have knowledge of UST cleanup practices?
4. We know a lot about the cleanup procedure in MA, so we were hoping you could tell us about the cleanup process in _____ (dependent on #2).
5. Within the states you have completed UST spill cleanups, which have UST policies that can be considered strict/comprehensive?
6. Further define strict/comprehensive as necessary. Looking for policies that protect affected property owners and abutting properties.
7. Note: Follow up with why as to not receive an opinion. Looking for raw data.

8. What happens when residents of these states are impacted by a UST spill on an adjacent property?
9. Do you work often with adjacent property owners?
10. Are you aware of any states that allow impacted residents direct access to cleanup funding?
    a. If yes, what is the amount?
    b. If yes, does the funding cover property restoration costs?
11. Could you recommend anyone else whom you feel would be beneficial for us to contact, or any specific things we should research?
12. Perhaps employees from the states discussed/those involved in a particular case?
13. Do you know of other environmental consulting firms that might be beneficial for us to contact?

Appendix C

We are a group of students from Worcester Polytechnic Institute in Massachusetts. We are conducting interviews with state environmental protection agencies to learn more about state laws concerning underground storage tank spills. We strongly believe this kind of research will ultimately allow us to suggest changes for a more comprehensive underground oil tank spill policy for the state of Massachusetts. Your participation is completely voluntary and you may withdraw at any time. Please remember that while this is not anonymous, you may ask to have your name/position be kept confidential in the final results. This is a collaborative project between State Senator Eldridge's Office and WPI, and your participation is greatly appreciated. If interested, a copy of our results can be provided at the conclusion of the study.

<u>Interview questions for state officials identified (Objective 3)</u>

1. In (STATE), what is the law concerning USTs and their spills?
2. Do you know of any cases where oil from a UST spill impacted a neighboring property?
3. How do neighboring landowners receive assistance (if any) in cleaning up their properties?
4. Do these third parties have direct access to cleanup funding?
5. Do you have any contacts we could communicate with for more information?
6. Are there any sources you think we should look at for more information?

Appendix D

We are a group of students from Worcester Polytechnic Institute in Massachusetts. We are conducting interviews with homeowners and town officials affected and involved in UST oil spills to learn more about the oil spill cleanup process on residential properties. We strongly believe this kind of research will ultimately allow us to suggest changes for a more comprehensive underground oil tank spill policy for the state of Massachusetts. Your participation is completely voluntary and you may withdraw at any time. Please remember that while this is not anonymous, you may ask to have your name/position be kept confidential in the final results. This is a collaborative project between State Senator Eldridge's Office and WPI, and your participation is greatly appreciated. If interested, a copy of our results can be provided at the conclusion of the study.

<u>Interview questions for residents and town officials (Objective 4)</u>

1. When did the spill occur?
2. Have there been any residual effects due to the spill?
    a. Contaminated water?
3. Has your property been completely deemed clean by a MADEP official?
4. If the process is complete- How long did it take?
5. If the process is not complete- When will it be finished/ how long have you been undergoing the process?
6. What state officials/town officials have been involved in the cleanup process? Have you had access to the funding needed for your cleanup?
    a. Did you file a lawsuit against the responsible party?

7. Have you felt as though you were guided through the cleanup process by an official, or was much of the work left to yourself?

Interview questions for state environmental agency employees (Objective 4)

We are a group of students from Worcester Polytechnic Institute in Massachusetts. We are conducting interviews with employees of state environmental agencies to learn more about the government role in underground storage tank oil spill cleanup process. We strongly believe this kind of research will ultimately allow us to suggest changes for a more comprehensive underground oil tank spill policy for the state of Massachusetts. Your participation is completely voluntary and you may withdraw at any time. Please remember that while this is not anonymous, you may ask to have your name/position be kept confidential in the final results. This is a collaborative project between State Senator Eldridge's Office and WPI, and your participation is greatly appreciated. If interested, a copy of our results can be provided at the conclusion of the study.

1. How does the department find out about UST spills?
2. What is the necessary paperwork to be filled out by homeowners and how long does it take to process?
3. How are officials assigned to the cleanup of these spills?
4. How would you best describe the role the MADEP plays in cleanup of UST spills?
5. Currently, what is the best method for citizens to find information on how to begin the cleanup process?
6. How many UST spill cases does the department take in on average per year?
7. What is the scale of a typical UST spill reported?

Interview questions for environmental consultants (objective 4)

We are a group of students from Worcester Polytechnic Institute in Massachusetts. We are conducting interviews with environmental consultants and state environmental protection agencies to learn more about the implementation of underground storage tank laws in other states. We strongly believe this kind of research will ultimately allow us to suggest changes for a more comprehensive underground oil tank spill policy for the state of Massachusetts. Your participation is completely voluntary and you may withdraw at any time. Please remember that while this is not anonymous, you may ask to have your name/position be kept confidential in the final results. This is a collaborative project between State Senator Eldridge's Office and WPI, and your participation is greatly appreciated. If interested, a copy of our results can be provided at the conclusion of the study.

1. Are you familiar with the UST spill cleanup process in (state) for spills affecting neighboring residents?
2. Who oversees the implementation of these laws in (state)?
3. How are these laws implemented in (state)?
4. What funding is available? Is it available to third parties?
5. Is there anyone else we should contact for more information?

Appendix E

Tables and Charts

	ID2050	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Objective 1	****	****						
Objective 2		****	****	****	****			
Objective 3		****	****	****	****	****		
Objective 4			****	****				
Objective 5			****	****	****			
Objective 6					****	****	****	****

Figure 5 Gantt Chart for IQP

State	Average Response Time	Direct Access to Funding?	Is there an Appointed Official?	Average Cost of Cleanup	Average Spill Size
Massachusetts					
New Hampshire					
Maine					
Etc.					

Table 5 State Policy Organization Chart (example)