MAPC
METROPOLITAN AREA PLANNING COUNCIL

SMART GROWTH AND REGIONAL COLLABORATION

Mr. Saurabh Vasudeva
U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration
Office of Acquisition Services, PHA-30
1200 New Jersey Avenue, SE, E22-305
Washington, D.C. 20590

Ms. Karen Lynch
U.S. Department of Transportation
Pipeline and Hazardous Materials Safety Administration
Office of Pipeline Safety (PHP-20)
1200 New Jersey Avenue, SE, E22-230
Washington, D.C. 20590

Mid-Term Report for 2015 Technical Assistance Grant to MAPC

Mr. Vasudeva and Ms. Lynch,

Enclosed please find the Metropolitan Area Planning Council's (MAPC) Mid-Term Report and mid-term Federal Financial Report for the 2015 Technical Assistance grant. MAPC appreciates the opportunity to work on this impactful project with the help of the grant, and we look forward to completing all project objectives by the end of the grant period. If you have any questions, please do not hesitate to contact me.

Best, Patrick Roche

Patrick Roche
Principal Investigator

Lynn Duncan, President | **Keith Bergman**, Vice President | **Taber Keally**, Treasurer | **Shirronda Almeida**, Secretary | **Marc Draisen**, Executive Director
Metropolitan Area Planning Council | 60 Temple Place | Boston, Massachusetts 02111 | 617–933–0700 | 617–482–7185 fax | **mapc.org**

Mid-Term Report for 2015 Technical Assistance Grant to MAPC

April 29, 2016

Introduction

The Pipeline and Hazardous Materials Safety Administration (PHMSA) has awarded the Metropolitan Area Planning Council (MAPC) a 2015 Technical Assistance Grant (TAG) for a one-year term, beginning on September 24, 2015. As stated in the Grant Agreement, MAPC's program consists of the following:

"[The] grant will fund the Metropolitan Area Planning Council (MAPC) and the Home Energy Efficiency Team (HEET) to measure leakage in natural gas distribution pipelines in the Greater Boston region in order to 1) accurately identify leakage locations and concentrations and 2) enhance the capacity for municipalities to collaborate with gas utilities on leak repair. The goal is to accelerate the repair of natural gas leaks by providing data to more comprehensively scope the problem and to support mitigation and engagement strategies.

Goals:

- Improve the understanding of the extent of natural gas leaks in eastern-Massachusetts so that response efforts can more appropriately target risk
- Facilitate the efficient repair of aging, leaking pipeline infrastructure by providing data to support best practices for municipal collaboration with utilities to repair leaks
- Generate productive dialogue between stakeholders that will endure throughout the long-term process of reducing natural gas leaks
- Overall, support efforts to protect public and environmental health, reduce the risk of injury, and minimize contributions to global climate change by mitigating natural gas leaks."[1]

The overall purpose of the PHMSA TAG program is to "allow communities and groups of individuals to obtain funding for technical assistance in the form of engineering or other scientific analysis of pipeline safety issues and help promote public participation in official proceedings."[1] MAPC's implementation of the TAG program will directly address both of those purposes. First, the leak surveys and interviews with participating municipalities about coordination practices will produce quantitative and qualitative data about pipeline safety issues. Second, MAPC will participate on and present findings to the Special Utility Commission, convened by the Massachusetts Department of Public Utilities, to address utility-municipality coordination.

[1] PHMSA & MAPC Grant Agreement

Expected Program Outputs and Progress to Date

Objective 1

- Within the first 3 months of the program (e.g. 12/31/2015), MAPC and HEET will have recruited the participation of 15 to 25 municipalities and designed a survey methodology best suited for the project.

MAPC, assisted by HEET, has recruited 25 municipalities to participate in the program, as listed in Table 1, and has finalized the gas leak survey methodology (See **Appendix 1**).

Table 1. Recruited Municipalities & Characteristics

Municipality	Gas Distribution Utility	Municipality	Gas Distribution Utility
ACTON	National Grid	LITTLETON	National Grid
ARLINGTON	National Grid	MALDEN	National Grid
BEDFORD	National Grid	MARLBOROUGH	Eversource
BELLINGHAM	Columbia Gas	MELROSE	National Grid
BOSTON	Eversource/Ngrid	MEDFIELD	Columbia Gas
BROOKLINE	National Grid	MILFORD	Eversource
CAMBRIDGE	Eversource	MILLIS	Columbia Gas
CHELSEA	National Grid	NEWTON	National Grid
CONCORD	National Grid	RANDOLPH	Columbia Gas
GLOUCESTER	National Grid	SALEM	National Grid
HOPKINTON	Eversource	SWAMPSCOTT	National Grid
LEXINGTON	National Grid	WALPOLE	Columbia Gas
LINCOLN	National Grid		

Part of the survey methodology includes the criteria used to target and select municipalities for participation in the program. MAPC identified three characteristics of a municipality most relevant to the study:

1) Natural gas distribution utility;
2) Median income of the municipality; and
3) Community type[2]

MAPC determined that the program should strive to achieve participation that will reflect the relative distribution of the three investor-owned natural gas utilities ("gas utilities") within the study area, the MAPC region, which covers 101 cities and towns in greater Boston. For median income and community type, MAPC determined that each quartile of median income and each of the four community types should be as equally represented as possible among the participating municipalities.

[2] *Going to add a reference in to define this*

MAPC then assembled the characteristic data for all 101 municipalities in the MAPC region and conducted targeted outreach to achieve the desired recruitment. HEET assisted with recruitment. Distributions of the characteristics of the recruited municipalities are shown in Tables 2, 3 and 4.

Table 1. Natural Gas Distribution Utility

Natural Gas Distribution Utility	# Municipalities in MAPC Region	% of Total	# Municipalities in Project	% of Total in Project
National Grid	57	57%	15	60%
Eversource	18	18%	4	16%
Both National Grid and Eversource	4	4%	1	4%
Both Eversource and Columbia Gas	1	1%	0	0%
Columbia Gas	20	20%	5	20%
Total	**100**	**100%**	**25**	**100%**

Table 2. Municipal Median Household Income

Quartile	MAPC Region Median Income Range	# Municipalities in Project	% of Total in Project
Below Q1	<$75,298	8	32%
Q1 to Median	$75,298 to <$95,465	6	24%
Median to Q3	$95,465 to <116,875	4	16%
Above Q3	>$116,875	7	28%
Total		**25**	**100%**

Table 3. Community Type

Type	# Municipalities in Project	% of Total in Project
Developing Suburbs	5	20%
Inner Core	8	32%
Maturing Suburbs	8	32%
Regional Urban Centers	4	16%
Total	**25**	**100%**

In order to achieve the goals of the project, MAPC determined that the surveys must collect two sources of data:

1) Qualitative: municipal experience collaborating with the gas utility on natural gas leak repairs and gas main replacements
2) Quantitative: natural gas leak locations and other measureable gas leak characteristics

When recruiting municipalities, MAPC required that each municipality provide the qualitative, experiential data by performing a 1-hour interview with the program. Participation in the quantitative, gas leak data collection was encouraged, but optional.

MAPC chose to collect the qualitative data through a one-hour interview with each municipality, and MAPC developed a series of questions intended to guide the discussions (the list of questions is available in **Appendix 1**). Any member of the municipality's staff could participate in the interview. Typically, the Director of Public Works and the Town or City Engineer participated. Occasionally, a representative from the Fire Department, Police Department, or City Administration attended as well. HEET conducted the majority of the interviews. Most were done in person, as HEET and MAPC found this generated better conversation and discussion.

To develop the gas leak survey procedures, MAPC referenced the procedures published by gas utilities in official filings to the Department of Public Utilities. The procedures cover the method of surveying for leaks and the method of classifying them as Grade 1, 2 or 3. MAPC also worked with the leak survey contractor identified in the grant proposal, Gas Safety Inc., to ensure that the contractor had the proper certifications and equipment to perform the leak surveys to a standard comparable to that of the gas utilities.

In the fall of 2015, MAPC contacted the Department of Public Utilities to notify them of the grant and to invite their participation, such as providing input on the methodology and preliminary results. The Department appreciated the notification but asked not to be involved due to on-going regulatory matters relating to gas leaks. In January 2016, MAPC contacted the gas utilities to inform them of the grant. During these conversations, MAPC offered to share the draft gas leak survey methodology in order to invite their input. In late March 2016, MAPC circulated the methodology, and it resulted in productive dialogue with each of the utilities. In response to their comments, MAPC made some adjustments and clarifications to its methodology. MAPC finalized the methodology on April 19, 2016. Please see **Appendix 1** for full details of the methodology.

Objective 2

- Within the first 7 months of the program (e.g. 4/30/2016), Gas Safety Inc. will have performed natural gas leak surveys in each of the participating municipalities according to the methodology, covering roughly 10 to 15 miles of below-street natural gas distribution system in each municipality.

Of the 25 recruited municipalities, 24 have completed the interview. All 25 have indicated willingness to participate in the gas leak surveys; three municipalities have completed the gas leak surveys, and a fourth is in progress. The gas leak surveys have so far covered the maximum 15 miles in each municipality. The surveys have taken longer than expected per municipality, in large part due to the prevalence of leaks; each leak requires a walking inspection to collect the

appropriate data. In order to stay on schedule for Objective 3 (due 6/30/2016), MAPC plans to reduce the number of miles surveyed per municipality closer to 10 miles. Gas Safety Inc. believes this will allow them to meet, and potentially exceed, the minimum project objective of surveying 15 municipalities. MAPC will begin analyzing data for each municipality in mid-May. This rolling process will minimize delay in producing the final analysis and report.

Maps showing the surveyed routes are available in **Appendix 2**. MAPC selects the survey routes in order to cover streets with below-street natural gas infrastructure, including both leak-prone (i.e. cast-iron and non-protected steel) and non-leak prone (i.e. plastic) infrastructure. These locations are determined through a combination of:

- Spatial analysis of gas leak location data reported to the Department of Public Utilities by gas utilities in their Annual Service Quality Reports for calendar year 2015; and
- Records from local staff on recent natural gas infrastructure projects and local knowledge of gas service locations

During discussions about the methodology, the gas utilities expressed to MAPC that it would be helpful for them to know where MAPC plans to survey, in order to plan to allocate response resources if leaks are found. As a result, MAPC has volunteered to send each utility the maps of our planned survey area as a courtesy at least 24 hours prior to beginning surveys. Further, one of the gas utilities indicated to MAPC that it would prefer that Gas Safety Inc. only notify them of Grade 1 leaks, those that constitute an immediate safety hazard. The gas utility felt that this would avoid unnecessary use of their gas leak response resources. MAPC ensured that our methodology reflected that request across utilities.

Objectives 3, 4 and 5

Deadlines for Objectives 3, 4 and 5 range from June 30 to October 1, 2016. Nevertheless, MAPC has already begun making progress in part on Objective 5:

- Within 1 year of the program (e.g. 10/31/2016), MAPC and HEET will have 1) conveyed feedback to the municipal-utility coordinating commission…

In late April, the municipal-utility coordinating commission, officially called the Special Utility Commission, held its first meeting. MAPC attended this meeting as a formal representative on the Commission. The DPU also convened the first meeting of municipal and utility stakeholders, intended to identify synergies between both groups. MAPC attended this meeting as well. MAPC looks forward to continuing engagement with the Commission, including delivering the findings of the program when ready.

Quantification of Program Outputs

The two outputs that may be quantified at this time are:

1) Recruiting program participation
2) Conducting qualitative interviews

The program has recruited 25 municipalities, and interviews have been conducted with 24 municipalities.

When computing the costs per unit, the rates for MAPC staff equal the sum of personnel, indirect, and fringe. All personnel rates for MAPC staff used in the computation below match the rates submitted in MAPC's TAG application in April 2015. However, the indirect and fringe rates have been updated to reflect MAPC's new overhead rate that was approved in June 2015. See **Appendix 3** for the approval letter. The rates for HEET matches the rate submitted in MAPC's TAG application in April 2015.

To recruit each municipality costs approximately: $124.89

- Recruitment includes:
  - MAPC collected all of the relevant characteristics (utility, community type, and median income) about each of the 101 MAPC municipalities.
  - MAPC staff drafted a press release and a short, explanatory flyer to accompany any recruitment communications
  - MAPC drafted an invitation to participate and conducted general outreach through two of our monthly newsletters
  - MAPC and HEET conducted follow up email and phone communication with interested municipalities.
  - After the general outreach, MAPC drafted email text and phone scripts for targeted outreach to individual municipalities.
  - MAPC led the targeted outreach and was supported by HEET

Table 5. Cost to Recruit One Municipality

Task	MAPC Hours	MAPC Rate	HEET Hours	HEET Rate	Total Cost
Data Collection for Municipal Characteristics	3	$63.06			$189.18
Draft Press Release & Flyer	9	$68.61			$617.49
Draft & Send General Invite to Participate	2	$63.06			$126.12
Follow Up on General Invite	10	$63.06	5	$55.00	$905.60
Draft Targeted Invite to Participate	1	$63.06			$63.06
Conduct Targeted Invites	15	$63.06	5	$55.00	$1,220.90
Total Cost					**$3,122.35**
Number of Municipalities					**25**
Cost per Municipality					**$124.89**

To conduct each qualitative interview costs approximately: $182.02

- Interview includes
  - Scheduling interview
  - Conducting interview:
    - 1.5 hours: Round drive time to drive to and from meeting
    - 1 hour: Interview time
    - 0.5 hour: Time to review and clean up notes post-interview
- HEET conducted 21 interviews and MAPC Principal Investigator Patrick Roche conducted 3 interviews

Table 6. Cost to Interview One Municipality

	MAPC Hours	Municip-alities	MAPC Rate	HEET Hours	Municip-alities	HEET Rate	Total Cost
Schedule Interview	0.25	3	$63.06	0.25	21	$55.00	$336.05
Travel and Conduct Interview	3	3	$63.06	3	21	$55.00	$4,032.54
Total Cost							**$4,368.59**
Municipalities							**24**
Cost per Municipality							**$182.02**

Discussion of Timing & Deadlines

The project is currently behind schedule for Objective 2: completing the gas leak surveys. By the Objective's deadline, April 30, 2016, MAPC will only have fully completed three of the minimum of 15 gas leak surveys. In large part, this was due to a misunderstanding between MAPC and Gas Safety Inc. When MAPC compiled the application for the Technical Assistance Grant, MAPC believed that our deadline of April 30, 2016 conservatively accommodated for winter weather and rain. However, after receiving the award, Gas Safety informed us that much more time would be needed.

Additionally, the start of the gas leak surveys was delayed slightly to facilitate gas distribution utility review and input. MAPC sent the draft methodology to the utilities on March 28, 2016 and requested feedback within a week, April 4. We anticipated that this schedule would allow MAPC to incorporate feedback and begin no later than April 11. Feedback from and discussions with the natural gas distribution utilities took longer than expected, and the start was delayed by a week and a half, to April 20. During that time, an additional 3 communities may have been completed.

MAPC is confident that the project will return to schedule by the deadline for Objective 3, June 30, 2016. By that time, MAPC is committed to producing an internal summary report of the

findings. Gas Safety Inc. reports that it expects to have completed surveys for the minimum number of 15 municipalities by June 17. In order to ensure that data analysis is completed by June 30, MAPC will begin this process in mid-May. This will include analysis of the qualitative interview data across all municipalities and analysis of the gas leak surveys that have been completed. MAPC will then continue to analyze the gas leak survey data for each municipality as it is completed. Our anticipation is that this process should minimize the amount of analysis needed once all data has been collected.

In Summary

MAPC would like to thank PHMSA and the TAG program for the grant award. In 2016, natural gas leaks are a major topic among the Massachusetts environmental community, state regulators, and, increasingly, the mainstream media. The TAG program provides critical funding to address this vital issue. Efforts thus far have been very well received by the participating municipalities. Municipalities have expressed appreciation for the opportunity to participate in the interviews and share their experiences, solutions, and on-going challenges. The project has also allowed MAPC to continue to build stronger relationships with the gas utilities in the region. MAPC is confident that those relationships will benefit the broader mission of reducing natural gas leaks and improving infrastructure safety long past the end of the grant period. MAPC has made significant progress on the project to date and looks forward to completing all of the grant objectives by the end of the grant period on October 1, 2016.

Appendix 1

Methodology for MAPC's PHMSA Technical Assistance Grant Project

***Final Draft**, as of April 19, 2016*

Overview

The Metropolitan Area Planning Council (MAPC) is the regional planning agency for the 101 cities and towns of greater Boston and works on a broad range of initiatives designed to promote smart growth, equity, and regional collaboration. Within this context, MAPC's Clean Energy department helps the region's municipalities plan for and implement strategies to reduce greenhouse gas emissions. As a result, MAPC is interested in helping to efficiently reduce methane leakage from natural gas distribution pipes. In fall 2015, the Clean Energy department received a Technical Assistance Grant from the U.S. Department of Transportation's Pipeline and Hazardous Materials Safety Administration to study natural gas leaks in the region. MAPC is collaborating with HEET (Home Energy Efficiency Team) on the project. A press release on the grant is available here.

The grant funds a one-year project to perform independent surveys of gas leaks and collect municipal roadway repair planning and utility collaboration practices from cities and towns in the MAPC region. Through analysis and dissemination of the results, the project will:

- Augment the understanding of the extent of leaks to educate communities and partners more comprehensively on risk mitigation;
- Facilitate and expedite the efficient replacement of aging, leak-prone pipeline infrastructure by providing data to support best practices for municipal collaboration with utilities to mitigate leaks; and
- Share best practices and lessons learned to encourage and facilitate improved municipal-utility coordination for mutual benefit.

MAPC has interviewed over 25 municipalities this winter and spring to collect information on utility coordination practices, on-going challenges, and innovative solutions (See Exhibit B for a list of interview questions). Currently, MAPC is recruiting municipal participation for the independent surveys of gas leaks. 15-25 municipalities will be selected for the survey of roughly 10-15 miles of roadway each. The surveys are expected to take place from April to June 2016. MAPC will then analyze the data as well as the best practices collected.

MAPC will engage with each of the natural gas distribution utilities to discuss our preliminary findings and provide them an opportunity for feedback. MAPC will produce a report in the summer of 2016, accompanied by three workshops throughout the region, in order to disseminate and discuss the results. The objectives of the report will be to 1) present the survey and interview results, 2) assess the results in the context of publically reported gas leak data, 3) recommend best practices for municipal-utility collaboration toward gas leaks mitigation, 4) identify remaining challenges to be addressed, and 5) make recommendations for further research and next steps to improve practices, particularly around municipal-utility coordination in the replacement of leak-prone pipeline.

As described in this methodology, MAPC aims to conduct gas leak surveys in a comparable manner to that utilized by the natural gas distribution utilities. In this, MAPC recognizes that many factors will impact our ability to make comparisons between the leakage data reported by the natural gas distribution utilities and MAPC's surveys. For instance, several months will have elapsed between the time when the utilities collected data and MAPC did. As a result, MAPC's analysis will not attempt to draw causational conclusions between these sets of data, but will prioritize providing insights that may inform the improvement of leak-prone pipe repair and replacement practices for municipalities and utilities alike.

Throughout the process, MAPC hopes to generate and support productive dialogue among stakeholders that can lead to long-term success in efficiently combating natural gas leaks in Massachusetts, a goal shared by all parties.

Municipal Participation

MAPC endeavors to achieve municipal participation that reflects a mix of median-income levels, community types, and natural gas distribution utilities from within the MAPC region. MAPC will include up to 25 municipalities in the gas leak surveys. Final participation is in the process of being determined. The following represents the likely enrollment based on current interest:

Table 1. Natural Gas Distribution Utility

Natural Gas Distribution Utility	# Municipalities in MAPC Region	% of Total	# Municipalities in Project	% of Total in Project
National Grid	57	56%	15	60%
Eversource	18	18%	4	16%
Both National Grid and Eversource	4	4%	1	4%
Both Eversource and Columbia Gas	1	1%	0	0%
Columbia Gas	20	20%	5	20%
Total	**100^**	**100%**	**25**	**100%**

^Not including Wakefield which has its own gas distribution utility

Table 2. Municipal Median Household Income

Quartile	MAPC Region Median Income Range	# Municipalities in Project	% of Total in Project
Below Q1	<$75,298	7	28%
Q1 to Median	$75,298 to <$95,465	6	24%
Median to Q3	$95,465 to <116,875	5	20%
Above Q3	>$116,875	7	28%
Total		**25**	**100%**

Table 3. Community Type

Quartile	# Municipalities in Grant	% of Total
Developing Suburbs	5	20%
Inner Core	9	36%

Maturing Suburbs	6	24%
Regional Urban Centers	5	20%
Total	**25**	**100%**

Gas Leak Survey Data Collection Procedures

Scope

- 15-25 Municipalities
- Per municipality, survey roughly 10-15 miles of roadway

Timing

Surveys will occur beginning in April, after the ground has fully thawed and snow has fully melted, in order to allow the methane to escape to the surface where it can be detected. Data on tree health will likely not be collected until later in the spring when most trees have produced clearly visible leaves.

Selection of Road Segments

MAPC will select roadways to cover a mix of plastic main and leak-prone (i.e. cast iron or unprotected steel) main, as well as roadways with various ages of pavements. MAPC will also take into account the recommendations of local officials for some roadway segments, if they have an interest in particular areas. To find the leak-prone main segments, MAPC has mapped the Gas Safety Enhancement Plans for 2016 and 2017-2020 for the participating municipalities as well as the location of existing (i.e. unrepaired) Grade 1, 2, and 3 leaks as reported by the natural gas distribution utilities in their Annual Service Quality Reports for calendar year 2015, submitted to Department of Public utilities on March 1, 2016. The community-level map will be shared with any municipality that requests it.

Additionally, MAPC will work with municipal Departments of Public Works (DPW) and/or Highway Department staff to gain local knowledge related to the type of main, such as roadway segments that have recently had pipe replacements. Local staff, when possible, will provide a list of roads that have been recently paved and the paving type (e.g. full depth reclamation). It will be helpful to include a mix of recently repaved and aging roadways in the surveys to explore 1) if the paving process has any impact on leakage, due to the compaction and other force generated by the paving equipment; and 2) if there is any relationship between the strength of municipal-utility coordination practices and leakage rates after paving, due, for instance, to advanced notice given to utility leak survey and repair crews.

Data Collection Methodology

Data will be collected by Robert Ackley of Gas Safety USA ("contractor"). The contractor is currently certified as Operator Qualified by the Northeast Gas Association through March of 2019, and a full listing of the contractor's qualifications is included in Exhibit D. Contractor will use the following procedure to collect data:

1. Contractor or another member of the Project team (i.e. MAPC or HEET) will notify both the municipality and the associated gas utility of the intent to survey that municipality's selected road segments at least 24 hours in advance of arrival at the site.
2. Contractor shall ensure all equipment is calibrated to manufacturer's specifications

3. In order to identify locations with potential sub-surface leaks:
    a. contractor will perform mobile data capture using a Picarro Analyzer mounted on a vehicle moving between 5 and 10 mph to capture the level of surface methane in parts per million (ppm) and the corresponding Geographic Positioning System units ("Picarro data");
    b. Contractor will drive both sides of each road to capture Picarro data, unless the location of the natural gas main in the street is clearly identifiable and can be driven precisely
    c. Prior to beginning the mobile Picarro data capture, contractor will:
        i. Confirm that wind and weather conditions allow for suitable data collection
        ii. Use the Picarro Analyzer while stationary to determine the baseline surface levels of methane.
4. In each location that the Picarro data shows surface methane that exceeds baseline surface methane levels, contractor will perform the following steps to determine whether the source of methane is a sub-surface gas leak or not. MAPC believes the following procedure conforms, to the degree possible, to the procedures identified by the natural gas distribution utilities for their mobile surveys of mains (See Exhibit A for details):
    a. Use a portable hydrogen flame ionization unit to determine the extent (i.e. boundaries) of fugitive methane emissions ("emissions") up to the boundaries of any private property. The distance from the unit to the ground will not exceed 3 inches. Once determined, the contractor will identify a suitable location within the emissions extent to take a sub-surface Combustion Gas Indicator (CGI) reading. This location may be:
        i. A sub-surface space that already exists, such as an opening in a manhole cover; or
        ii. A sub-surface space created by the use of 3/8 inch diameter bar, inserted into either an existing fissure or crack in the pavement or bare ground within the leak extent. This space will be located no closer than 20 inches perpendicular to the estimated source of the leak. The bar will be inserted no deeper than 6 inches below the surface of the pavement. This depth will be consistently achieved by affixing a measurement marker at 6 inches on the bar. The contractor will remove the bar and then insert the CGI into the space.
    b. The contractor does not anticipate creating any new holes in the pavement. If, for some reason, a hole is created in the pavement, the contractor will fill that hole.
    c. The contractor will measure the level of methane detected with the CGI as percent of gas in air to verify the presence of a sub-surface leak. A sub-surface CGI reading will constitute a leak for the purposes of the MAPC survey.
    d. In the event that a fissure or crack does not exist to create space for the CGI and no manhole opening exists, the contractor will assess whether the leak extent encompasses any potential surface-level sources of methane. If none exist, it will constitute a leak for the purposes of the MAPC survey.
5. For each leak, the contractor will perform the following data collection:
    a. Estimated area of extent of the leak and record a sketch;
    b. Classify the leak as Grade 1, 2, or 3, according to each natural gas distribution utility's written procedures, attached and incorporated herein as Exhibit A. If the extent of the leak trespasses onto private property, a sub-surface CGI reading cannot be taken, or the leak for other reasons cannot be assigned a Grade, the contractor will record it

as Unable to Classify;

c. Count the number of trees within the extent of the fugitive methane emissions and record pertinent information, including species, diameter at breast height, and a photo;
d. Record all of the aforementioned data from 4.a through 4.c in an electronic spreadsheet, along with the nearest street address or, if appropriate, street intersection; and
e. Immediately notify the appropriate gas distribution utility of any instance in which:
    i. A Grade 1 leak is identified; or
    ii. The extent of the gas leak moves onto private property and if the gas leak is not already identified in the natural gas distribution utility's Annual Service Quality Report for calendar year 2015

6. Later in the spring, when contractor and MAPC agree that trees have sufficiently leafed, contractor may return to leak locations that have trees within their extent and record their qualitative condition. [1]

Analysis of Data

MAPC expects to analyze the survey data (levels of methane from Combustion Gas Indicator readings, Grade, leak extent and tree data) from across the participating municipalities and to assess how these may correlate with any of the key municipal variables (the natural gas distribution utility, median income level, community type, leak-prone and plastic main, relative age of pavement, and current municipal-utility coordination practices).

The metrics that MAPC calculates from the collected data may include, but is not limited to:

- Quantities of leaks total and by Grade
- Rate of leaks per mile surveyed
- Distribution (i.e. range, median, average) of Combustion Gas Indicator readings (percent of gas in air) total and for each Grade of leak
- Distribution (i.e. range, median, average) of migration areas total and for each Grade of leak
- Frequency of trees showing qualitative damage total and for each Grade of leak

MAPC will reference the natural gas distribution utilities' reported data to calculate similar metrics when possible, such as quantity of leaks by Grade and rate of leaks per mile, in order to more fully populate the data landscape from which to glean insights. As previously mentioned, the assessment will take into account that many factors are at play and that each leak reading taken, whether as part of this project or by a utility, can only represent a snapshot in time. As a result, MAPC expects this analysis to identify potential questions for further investigation. Additionally, MAPC recognizes that tree damage and death can be attributed to causes other than natural gas and will incorporate this into the discussion of findings.

MAPC may choose to map the Picarro data and/or other leak data. MAPC will ensure that any maps displaying information about individual leaks also display leak Grade information. This is important to ensure that maps clearly convey safety information. Maps will also clearly distinguish between data that is collected by the MAPC project and any data reported by the natural gas distribution utilities.

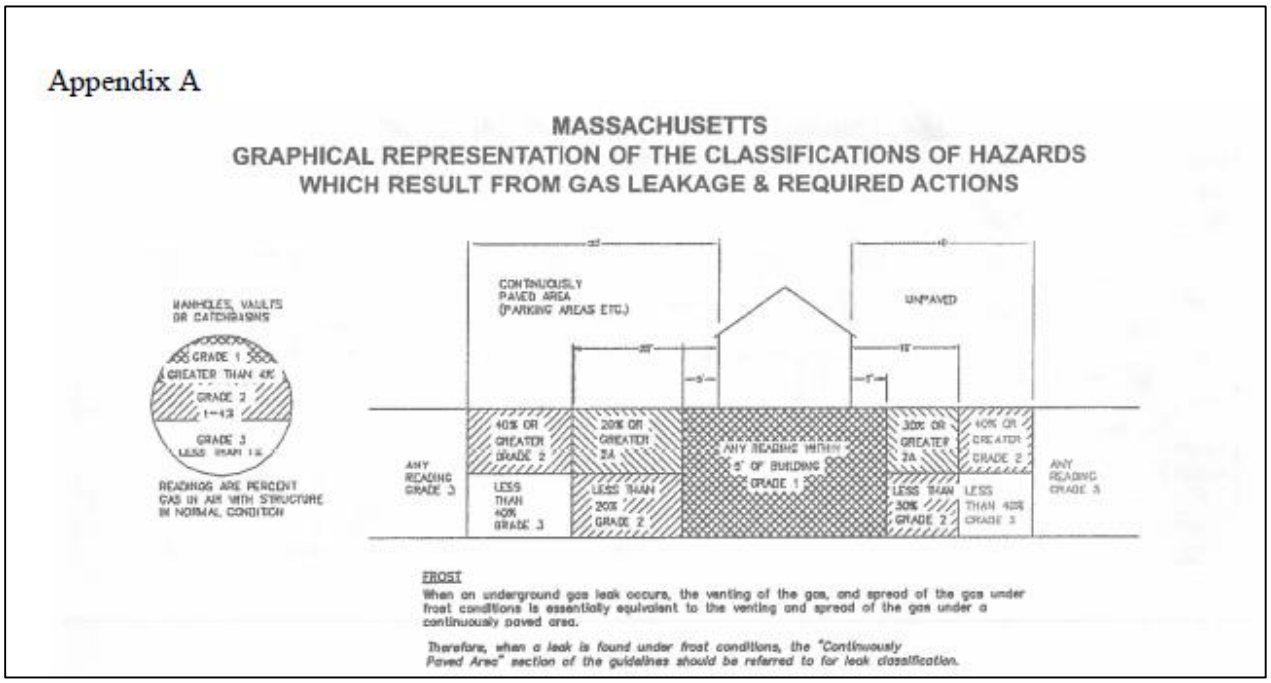
[1] MAPC is currently engaging with arborists to identify an acceptable methodology for qualitatively categorizing the health of trees. Input is welcome.

Exhibit A: Natural Gas Leak Survey Procedures & Classification Criteria

National Grid

To develop MAPC's leak survey methodology, MAPC consulted National Grid's procedure for mobile surveys on mains, found in the "Attachment DPU 1-1-D – LSUR-5010: Mobile Surveys" from the "First Set of Information Requests" submitted in response to D.P.U. 15-GLR-01 on May 18, 2015 by Camal O. Robinson. The attachment was submitted in response to DPU's information request DPU-1-1 "Please explain in detail how the Company detects natural gas leaks on its gas distribution system."

Classification will be done according to the criteria from "Attachment DPU 1-1-B – LEAK-5030: Leak Receipt and Classification" from the "First Set of Information Requests" submitted in response to D.P.U. 15-GLR-01 on May 18, 2015 by Camal O. Robinson. This attachment was submitted in response to DPU's information request DPU-1-2 "Please explain in detail how the company categorizes natural gas leaks as a Grade 1, Grade 2 or Grade 3 leak." Note that the chart on page 5 of 5 is difficult to read and the same chart is produced on page 32 of 32 in "Appendix A of Attachment DPU 1-1-A – LEAK-5010" and reproduced below.



Eversource

To develop MAPC's leak survey methodology, MAPC consulted pages 7-10 out of 10 of "Attachment DPU 1-2" from the "First Set of Information Requests" submitted in response to D.P.U. 15-GLR-01 on May 18, 2015 by John K. Habib.

Classification will be done according to the criteria from pages 3-4 out of 10 of "Attachment DPU 1-2" from the "First Set of Information Requests" submitted in response to D.P.U. 15-GLR-01 on May 18, 2015 by John K. Habib. The attachment was submitted in response to DPU's information request

DPU-1-2 “Please explain in detail how the company categorizes natural gas leaks as a Grade 1, Grade 2 or Grade 3 leak.”

Columbia Gas

To develop MAPC’s leak survey methodology, MAPC consulted Columbia Gas’ procedure for mobile surveys on mains, found in the “Attachment DP-CMA-1-1(f) Leakage Survey and Test Methods” from the “First Set of Information Requests” submitted in response to D.P.U. 15-GLR-01 on May 18, 2015 by Danielle C. Winter. The attachment was submitted in response to DPU’s information request DPU-1-1 “Please explain in detail how the Company detects natural gas leaks on its gas distribution system.”

Classification will be done according to the criteria from pages 1-6 out of 10 of “Attachment DPU – CMA-1-1(n)” from the “First Set of Information Requests” submitted in response to D.P.U. 15-GLR-01 on May 18, 2015 by Danielle C. Winter. The attachment was submitted in response to DPU’s information request DPU-1-2 “Please explain in detail how the company categorizes natural gas leaks as a Grade 1, Grade 2 or Grade 3 leak.”

Exhibit B: Interview Questions

The Following questions served as a guide for interviews with municipal Department of Public Works (DPW).

Street/Sidewalk Reconstruction Planning

- What % of streets are repaved per year?
- Does the City/Town have a formal, multi-year street and/or sidewalk reconstruction plan (repaving a street or street segment, rather than fixing potholes) that identifies streets and/or sidewalks to be reconstructed?
    - If Yes
        - When did the City/Town begin using a plan?
        - How many years does the plan cover?
        - Are funds appropriated for the entire plan period? (E.g. The estimated funding for all work is appropriated for a 3-year plan once it's approved).
        - Is there an annual review / update of the plan?
        - Are there metrics to track progress (i.e. % of streets per year)? What are they?
        - Is the plan published publically? Where? Can we have a copy?
    - If No
        - Has the City/Town considered developing a multi-year plan?
        - Are there any specific challenges or barriers that have prevented you?

For Both Formal Plans and Otherwise

- How are reconstruction needs identified?
    - Formal survey of roads and sidewalks (how frequently)? Resident reports? DPW worker reports?
- How are reconstruction needs prioritized and selected?
    - Sewer separation needs; Buffer zones of sensitive areas, like park, library, school, youth center, elderly housing, senior center, public transit stop
    - Major thoroughfares that receive heavy traffic; Commission for Persons with Disabilities priority areas; Areas with lack of bicycle facilities
    - Gas leak prevalence
    - Other?
- How are reconstruction efforts tracked? (i.e. how do you track those that need reconstruction, those selected, and where reconstruction finished)
    - Geographic Information Systems (GIS), spreadsheet or other software

Street Reconstruction Activities & Trees

- What does reconstruction entail?
    - Repaving and re-striping; bicycle lanes; curb cuts reconstructed; Medians evaluated for accessible pedestrian crossing; Planting street trees
- Does the City/Town check for gas leaks when planting new trees?
    - If a gas leak is suspected or identified, does planting proceed? If so, are any measures taken to protect tree from damage by gas?

City/Town communication with Gas Utility

- Does the City/Town send its reconstruction or other roadwork plans to the gas distribution utility? If so, at what time of the year or how frequently?
- Do you meet regularly w/ the utility? How often?
- Who is at the meeting? What is their name, job title and responsibilities? Anyone else you communicate with (name, title and responsibilities)?

Utility communication w/ city

- Do you receive construction plans from the gas distribution utility?
    - If so, at what time of year do you receive it?
    - Does it cover one year or more?
    - Are specific addresses mentioned and dates?
    - Other information on it?
    - Is there other info you'd want on it?
- What other forms of communication and collaboration do you have with the gas distribution utility? What frequency do these occur on?

Impact

- Does your communication or collaboration with the gas distribution utility influence either your own road construction plans or their construction plans? Please describe.
- Are there any policies (carrots or sticks) to encourage utilities to coordinate repair work with your road reconstruction schedule? Provide detail and length of time in use.
- Do you feel that the City/Town is generally successful in coordinating gas utility repairs with road reconstruction? Why or why not? If you want more coordination, what would it be (on the city or utility side)?

- What is the permitting process for a gas distribution utility to do repair work? How long does it take? What are their suggestions and/or complaints?
- Do you help/hinder the utility in any other way with their work: traffic control? Work day restrictions? Police details? Restoration?
- Would you want to partner with the utility to provide a pipeline of job seekers? Perhaps by connecting them with a vocational school or work training program?

Pipeline Map

- Do you have a map of the gas distribution pipes in the municipality?
    - If yes, when is it from, and do you receive this on any regular basis?

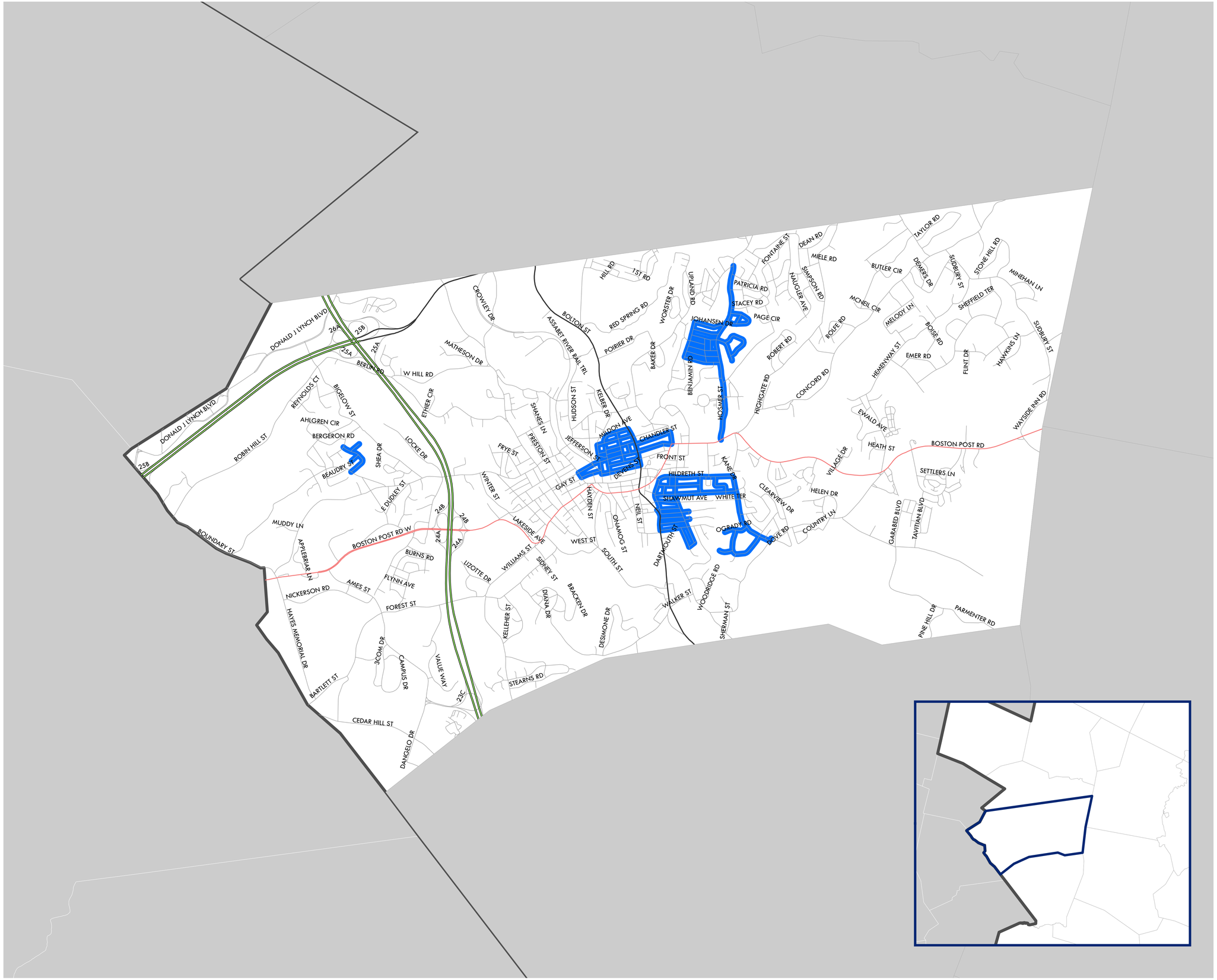
Exhibit C: Contractor Qualifications

See separate attachment

Appendix 2

Roads to Survey MAPC-HEET Gas Leaks Project

Marlborough, MA



Roads to Survey - Marlborough

Interstate Highway

U.S. Route

State Highway

Other Road

0 0.15 0.3 0.6 Miles

NOTE:

The information depicted on this map is for planning purposes only. It is not adequate for legal boundary definition, regulatory interpretation, or parcel-level analyses.

Produced by:
Metropolitan Area Planning Council
60 Temple Place, Boston, MA 02111 | (617) 933-0700

Data Sources:
Metropolitan Area Planning Council (MAPC)
Massachusetts Geographic Information System (MassGIS)
Massachusetts Department of Transportation (MassDOT)

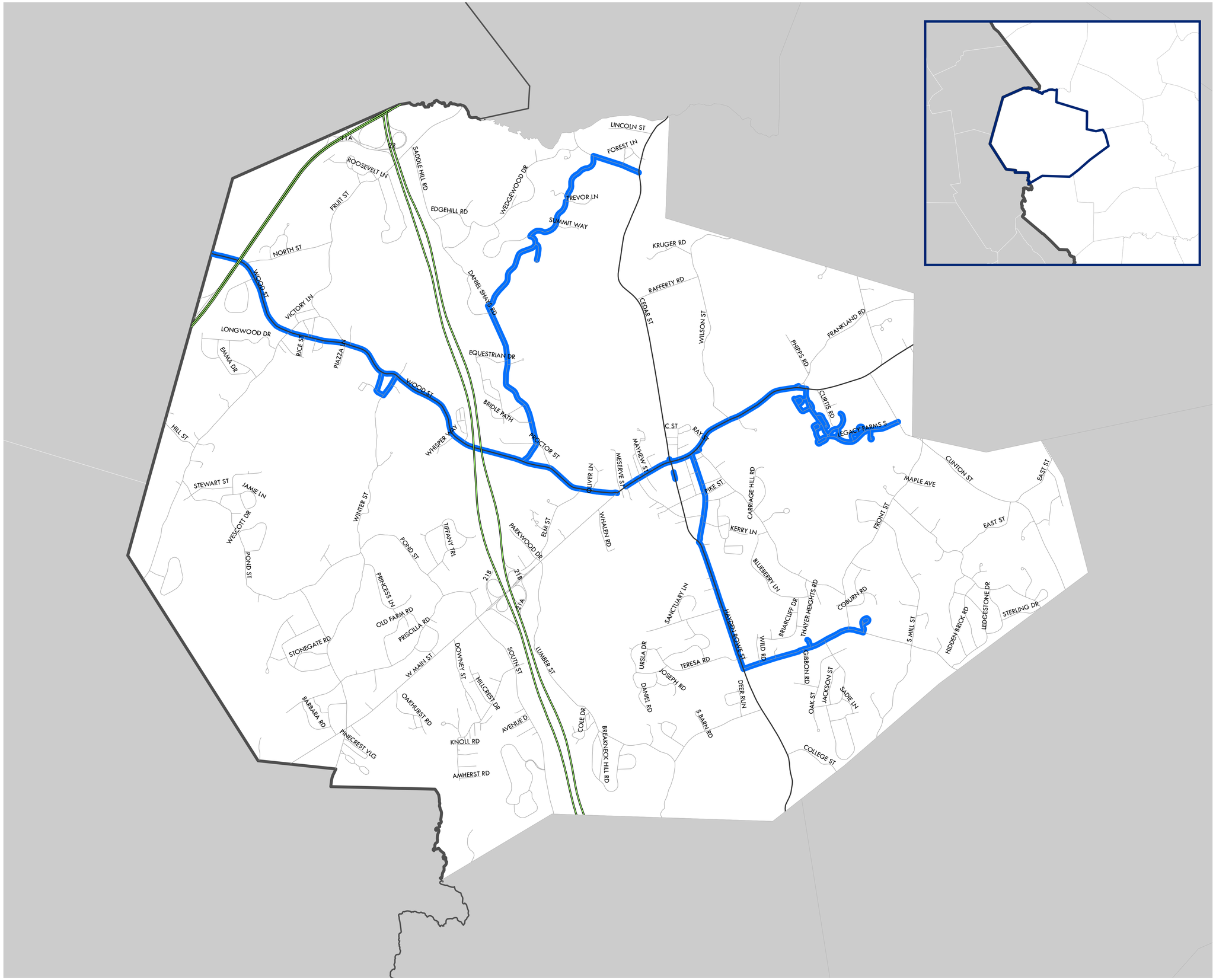
March, 2016

MAPC

Document Path: K:\DataServices\Projects\Current_Projects\Gas_Leaks\Project_Files\Eversource_Leaks - Copy for Patrick.mxd

Roads to Survey MAPC-HEET Gas Leaks Project

Hopkinton, MA



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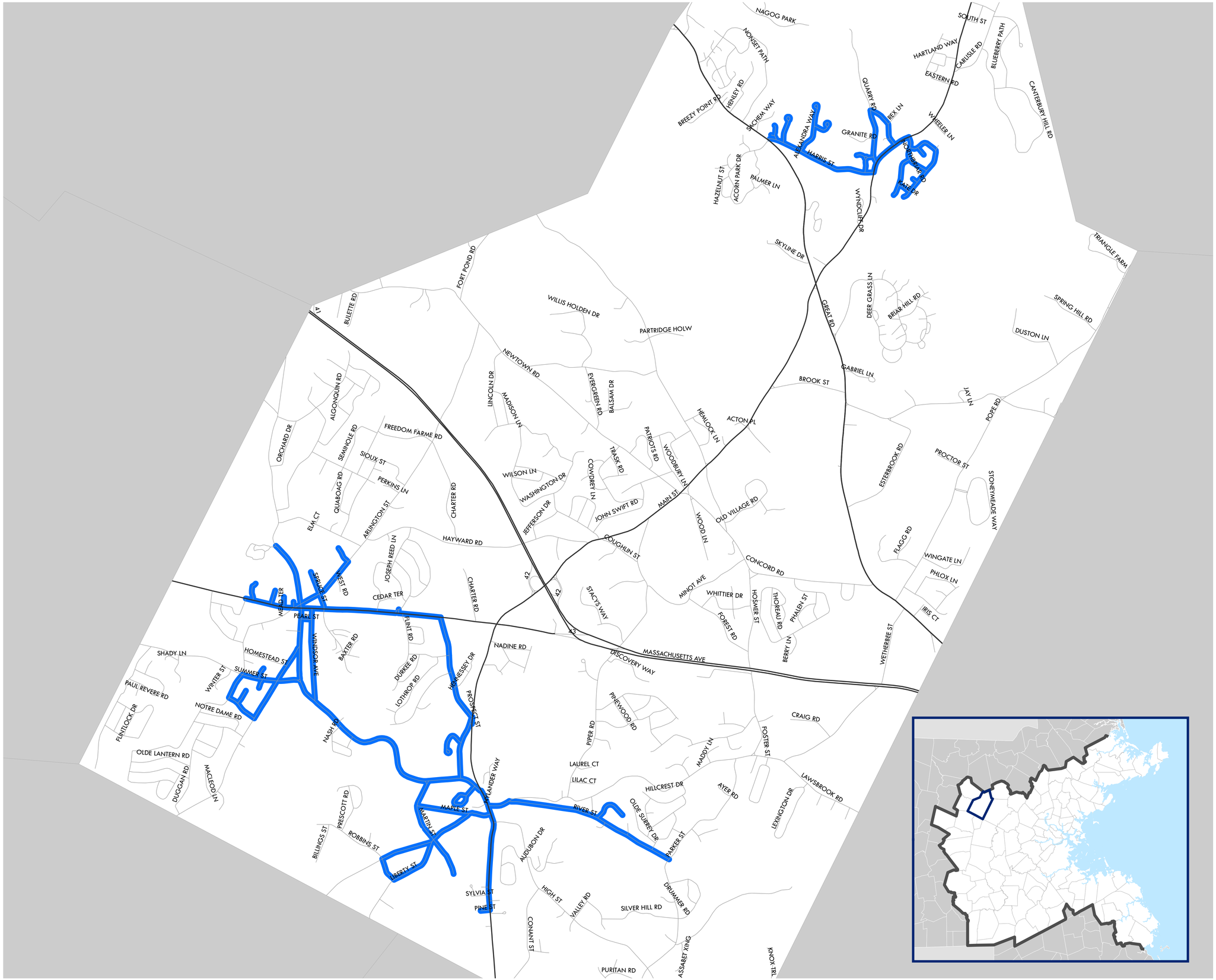
March, 2016

MAPC

Document Path: K:\DataServices\Projects\Current_Projects\Gas_Leaks\Project_Files\Eversource_Leaks - Copy for Patrick.mxd

Roads to Survey
MAPC-HEET
Gas Leaks Project

Acton, MA



Roads to Survey - Acton

Interstate Highway

U.S. Route

State Highway

Other Road

0 0.175 0.35 0.7 Miles

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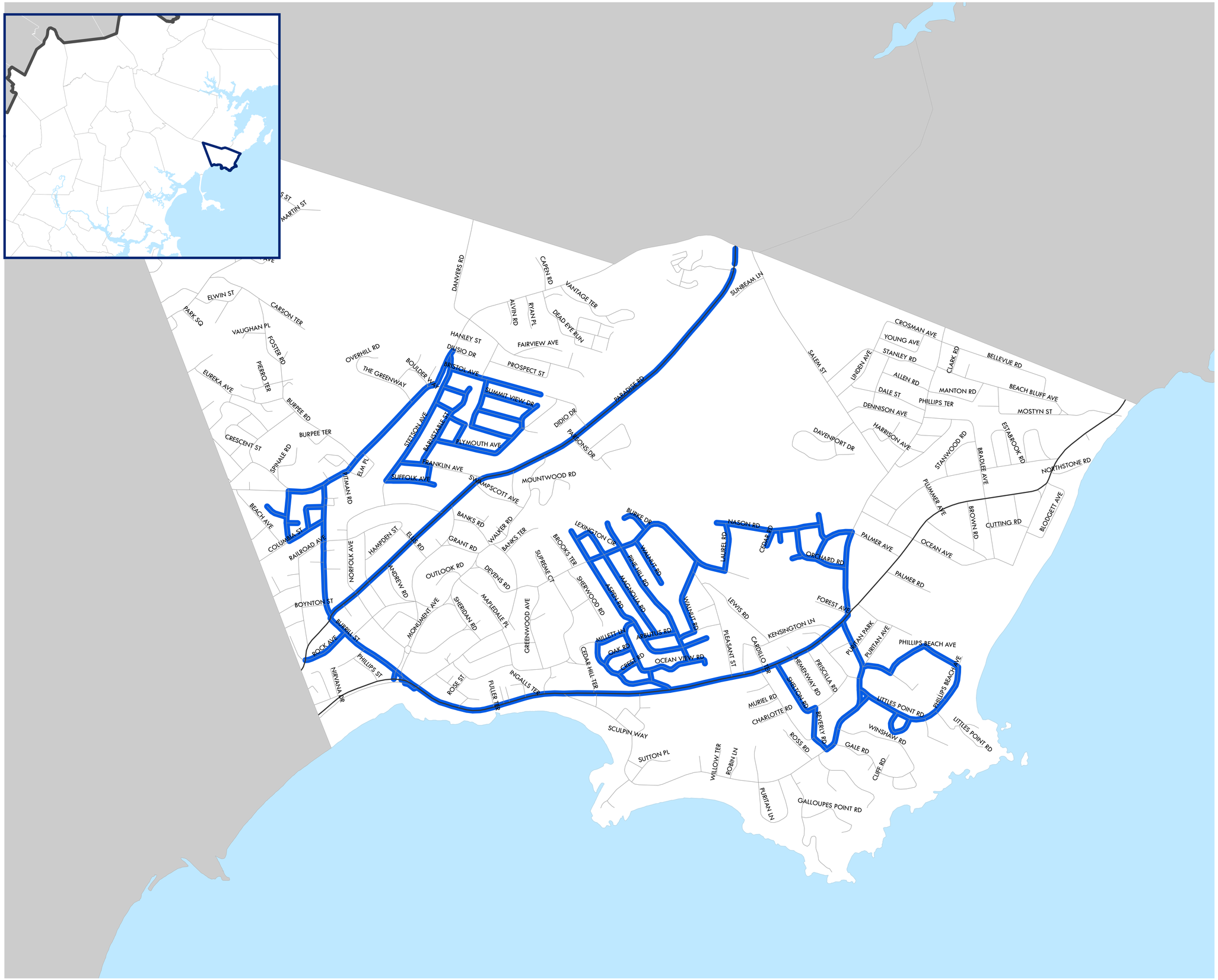
Massachusetts Department of Transportation (MassDOT)

April, 2016

MAPC

Document Path: K:\DataServices\Projects\Current_Projects\Gas_Leaks\Project_Files\Ngrid_Leak_Prone - Copy for Patrick.mxd

Roads to Survey
MAPC-HEET
Gas Leaks Project
Swampscott, MA



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April, 2016

MAPC

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Appendix 3

Charlie Baker, Governor
Karyn Polito, Lt. Governor
Stephanie Pollack, MassDOT Secretary & CEO

massDOT
Massachusetts Department of Transportation

UPWP Overhead Rate Adjustment

Please fill out all fields in the follow form, and send original signed form along with all documentation. The request will not be accepted for review if incomplete in any way. Please refer to your contract's special provisions, Attachment J, Article 1(c) for detailed requirements.

Date: June 22, 2015 From: Name: Rebecca Davis

To: David J. Mohler, Executive Director
Office of Transportation Planning Title: Deputy Director

Attention: RPA: MAPC

Contract #: All State and Federal Contrac

Reason for adjustment:

See attached letter

Existing rate: 118% Amount changed: 3%

Proposed rate: 121% ■ Most recent audit report summary attached

RPA notes:

Authorized signature

Your request is: ☑ approved ☐ disapproved ☐ approved with qualifications Date: 06/22/15

Notes:

Signature: David Mohler, Executive Director

Ten Park Plaza, Suite 4160, Boston, MA 02116
Tel: 857-368-4636, TTY: 857-368-0655
www.mass.gov/massdot