June 8, 2007

Eng. Victor Domínguez
PBS&J Caribe Engineering Inc.
268 Muñoz Rivera Avenue
Suite 1602
San Juan, PR 00918

RE: Preliminary Subsurface Utility Engineering Study for the Proposed Carolina Tranvía Stations, Carolina, Puerto Rico

Dear Eng. Domínguez:

On May 21th, 2007 PBS&J Caribe Engineering, Inc. renders the services of Geoenvirotech Inc. to perform a Preliminary Subsurface Utility Survey at proposed Carolina Tranvía Stations, in Carolina, Puerto Rico. A total of ten (10) locations were surveyed using a Noggin® Ground Penetrating Radar (GPR) equipped with 250 MHz and 500 MHz antennas, and a Rigid Seek-Tech® SR-20 Pipe and Cable Line Locator (PL) to locate and mark out the approximate horizontal position of subsurface utilities. Surveyed areas were designated by PBS&J.

Activities were performed following the description of our proposal **GETP-07-633**, dated May 21th, 2007. The worked consisted of the following specific tasks:

- Preliminary location of underground utilities at selected areas
- Surveyed areas consisted of a cross-section perpendicular to the proposed Tranvía pathway
- Preparation of site diagrams showing underground utilities and reference landmarks such as sidewalks and avenues/streets.

Figures 1 to **10** shows the designated/surveyed areas.

Through an antenna the GPR emits a very short bust of radio-frequency energy which detects discontinuities, voids, contact between soil and rock, filled areas, and buried object such as pipes, drums, etc. Using different frequency penetration and resolution varies, in general the higher the frequency the less the penetration and higher resolution.

EQUIPMENT DESCRIPTION AND LIMITATIONS

PL detects the electromagnetic fields generated by underground objects. For example electrified power lines will emit a frequency of 60 Hz, which can easily be detected with the PL. Telephone lines can also emit different frequency that can also be detected by changing the PL settings. Metal pipes and lines can be also be detected by energizing them using an "active" signal produce by a transmitter, so that the underground utility can be trace with the PL.

Although in the majorities of the cases the GPR and the PL are very useful equipments to find utilities, subsurface conditions such as groundwater table, type of soils, size and depth of the buried objects could limit the performance of both the GPR and PL, and some utilities can not be detected. Geoenvirotech Inc. followed the best practices during the course of the work to minimize these limitations, but Geoenvirotech Inc. can not guarantee that all utilities can be found.

Please note that reported depths are approximate depths inferred from the geophysical instrumentation. Actual depth must be verified using none-destructive excavation such as the air knife technology.

SUMMARY OF FINDINGS

Figure 11 to figure **20** shows evaluated locations with the utilities identified.

At **Location 1: PR-26 West of Embassy Suites** (**Figure 11**) the following utilities were identified:

1. Using the channel as reference point, at nine feet from the eastern side of the channel, approximately at two feet deep, an electric line that probably powers the light poles.
2. At three feet from the channel, about three feet deep from the road railing an unknown pipe.*
3. At fifty-six feet, about three to four feet deep an unknown pipe.*

* Either of these two unknown pipes possibly can be sewer, stormwater, or a pressurize fuel line.
* See description of **Location 2** at the end of this document.

At Location **3: PR-26 and Monserrate Ave.** (**Figure 12**) the following utilities were identified:

1. Approximately five feet from the northern sidewalk, approximately at three feet deep an electric line that powers the light poles.
2. Approximately forty feet from the curb, at two feet deep, three unknown pipes.
3. At the center of the median, at approximately two feet deep, the lines that control and power the traffic lights.
4. At approximately fifteen feet from the median curb, two feet deep, two unknown pipes.
5. At twenty feet from the south sidewalk, two feet deep, an electric line.

At Location **4: PR-190 and Entrance to Universidad del Este** (**Figure 13**) the following utilities were found:

1. At twenty-four feet from the University fence, one foot deep and electric line.
2. At twenty six feet from the University fence, two feet deep a potable water pipe.
3. At five feet before the eastern sidewalk, two feet deep, a sewer line.
4. At eight feet after the eastern sidewalk, at a foot deep, an unknown pipe.

At **Location 5: Garcilaso and Riviera St. Crossing San Fernando**, just east of Channel (**Figure 14**) the following utilities were found:

1. At four feet from the eastern sidewalk, two feet deep, a fire line.
2. At ten feet from the eastern sidewalk, two feet deep, an unknown pipe.

At **Location 5: Garcilaso and Riviera St. Crossing San Fernando**, west of the Channel (**Figure 15**) the following utilities were found:

1. At three feet west of the channel, two feet deep, an unknown line.
2. At ten feet from the channel, three feet deep, one unknown line.
3. At twelve feet from the channel, three feet deep, one unknown line.

At **Location 6: PR-3 and De Diego Ave.** (**Figure 16**), the following utilities were found:

1. About two feet before where our cross-section line starts (adjacent to Alberic Ford) there is a Sewer line more than seven feet deep.
2. At five feet from the beginning of the northern side walk, one foot deep, a potable water pipe.
3. At forty-five feet from the Alberic fence, two feet deep, one unknown pipe.
4. At fifty feet from the Alberic fence, two feet deep, one unknown pipe.
5. At the center of the median, at one foot deep, the line that controls the traffic lights.
6. Three feet from the southern road border, two feet deep, an electric line.

At **Location 7: Campo Rico Ave. and B ST.** (**Figure 17**), the following utilities were found:

1. One foot from the El Amal parking lot, one foot deep, various pipes including electricity and potable water.
2. One foot from the sidewalk curb, one foot deep an unknown pipe probably sewer or storm water.
3. At the center of the median, at a foot deep, an electric line.
4. One foot before the south sidewalk, two feet deep, an unknown pipe, probably sewer or storm water.
5. The is a 24 inch diameter pipe that cross the bridge at its south side (adjacent to the gas station) with a 90 degree bend that apparently turns to the south, did not show in the GPR nor the PL.

At **Location 8: PR-26 and Fragoso Ave.** (**Figure 18**), the following utilities were found:

1. Eight feet from where the eastern sidewalk, two feet deep, a storm water pipe.
2. One foot before the eastern road border, one foot deep, an unknown pipe.
3. Eight feet from where the eastern road border, two feet deep, possible sewer or storm water pipe.
4. Eight feet after the retaining wall, two feet deep, a storm water pipe.

At **Location 9: Monserrate and Fidalgo Ave.** (**Figure 19**). the following utilities were found:

1. Three feet from the fence, two feet deep, an electric line.
2. Four feet from the fence, one foot deep, traffic light control lines.
3. Eight feet from the fence, two feet deep, an unknown pipe.
4. Ten feet from the fence, three feet deep, an unknown, pipe.
5. Seventeen feet from the curb, two feet deep, an unknown pipe.

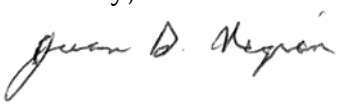
At **Location 10: Ignazio Arzuaga and Antonio Jimenez Landrau St.** (**Figure 20**), the following utilities were found:

1. One foot inside the southern sidewalk, three feet deep, an electric line that powers light poles.
2. Eight foot from the curb, three feet deep, an unknown pipe.
3. Ten feet from the curb, three feet deep, two unknown pipes.
4. Fourteen feet from the curb, three feet deep, an unknown pipe.
5. Two feet before the north sidewalk, an unknown pipe.
6. Four feet after the north sidewalk curb, seven feet deep, a thirteen KV, electric line.
7. The electric line comes from the electric manhole perpendicular to the road, and seems to merge with item number three (see above).

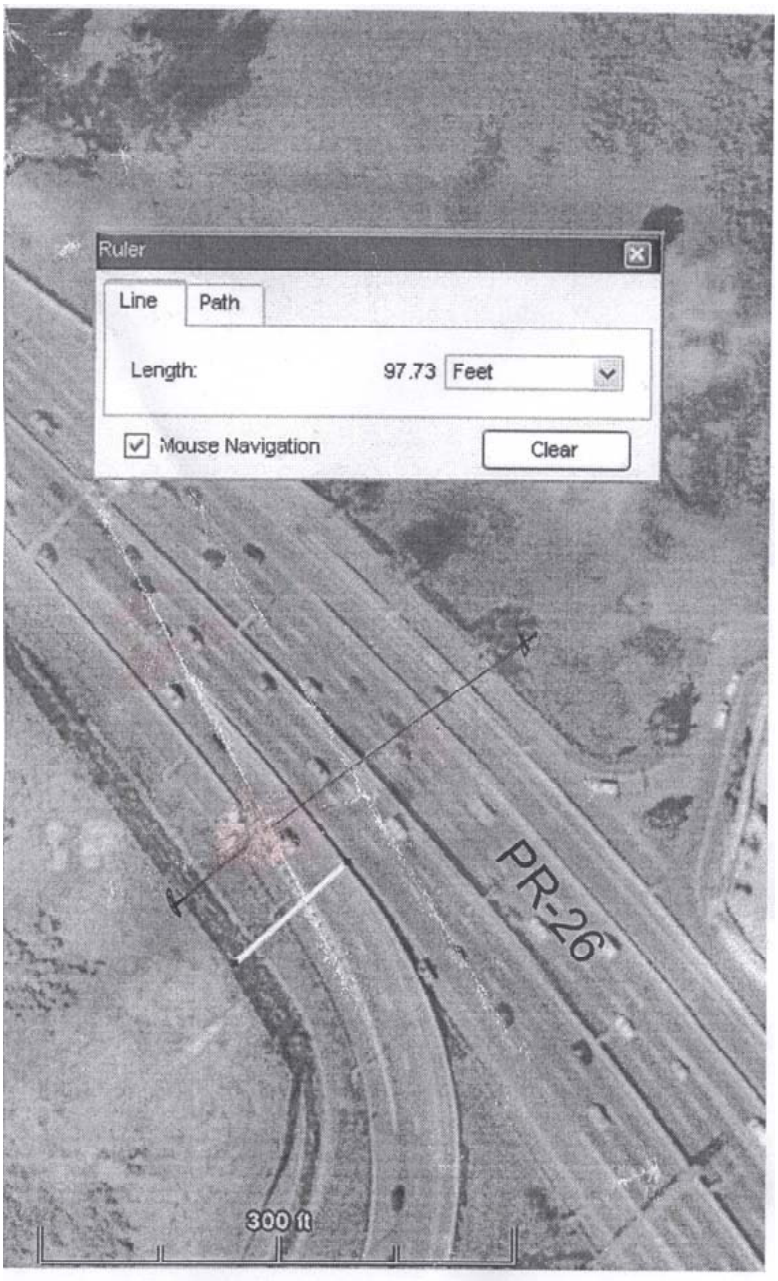
At Location 2: Under N span of Moscoso Bridge (Figure 10) due to the fact that the terrain conditions at this location did not allow using the GPR or the PL, a visual inspection was performed. Two manholes more that ten feet deep were found. These manholes appear to be inlets of waters that come from two stormwater channels that run at both sides of the north span of the bridge. Although the manholes appear to be connected, this could not be affirmed because at the time of the inspection they were full of water.

All the utilities found during the field work were marked with paint at the site.

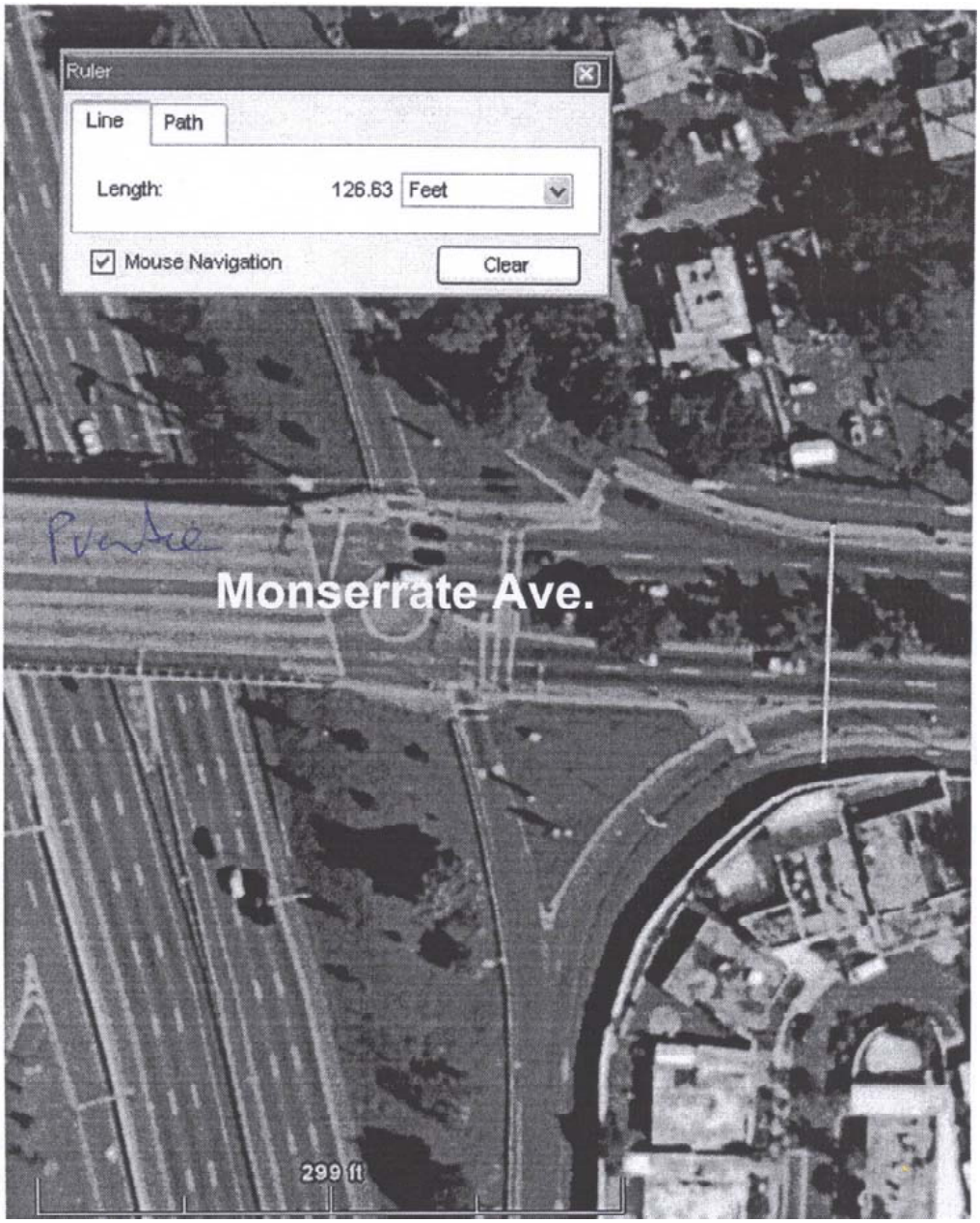
Sincerely,



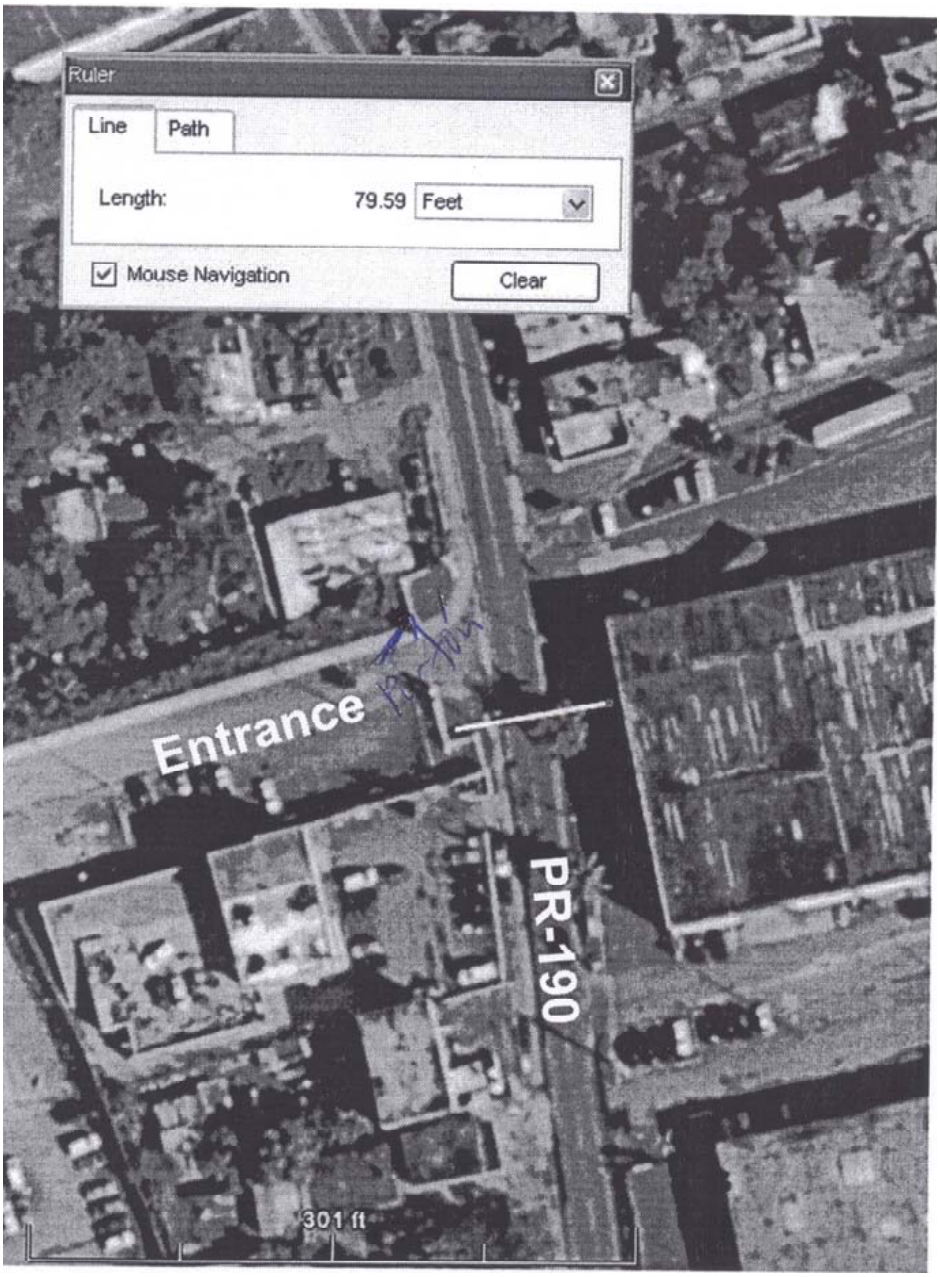
Juan D. Negrón, P.G., R.E.M
President



Location 1: PR-26 West of Embassy Suites Subsurface Utility Survey, Tranvía, Carolina Puerto Rico Figure 1	N	Prepared By: *L. Addarich* Date Created: *7 Jun, 2007*	GeoEnviroTech, Inc. Applied Environmental Sciences

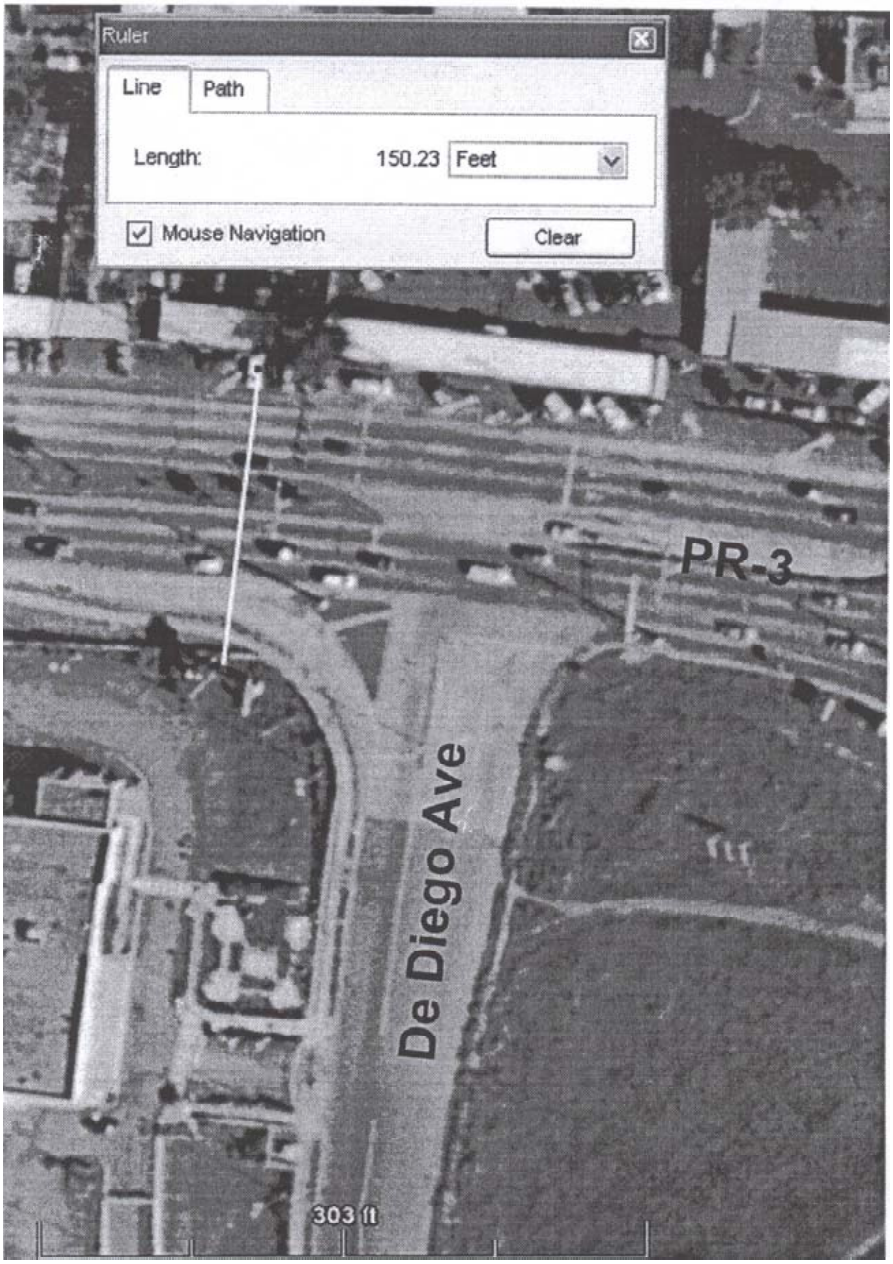


Location 3: PR-26 and Monserrate Ave. Subsurface Utility Survey, Tranvía, Carolina Puerto Rico Figure 2	N	Prepared By: *L. Addarich* Date Created: *7 Jun, 2007*	GeoEnviroTech, Inc. Applied Environmental Sciences



Location 4: PR-190 and entrance to Universidad del Este Subsurface Utility Survey, Tranvía, Carolina Puerto Rico Figure 3	N	Prepared By: *L. Addarich* Date Created: *7 Jun, 2007*	GeoEnviroTech, Inc. Applied Environmental Sciences

Location 5: At Garcilaso and Riviera St. crossing San Fernando, thru Channel Subsurface Utility Survey, Tranvía, Carolina Puerto Rico Figure 4	N	Prepared By: *L. Addarich* Date Created: *7 Jun, 2007*	GeoEnviroTech, Inc. Applied Environmental Sciences



Location 6: PR-3 and De Diego Ave.
Subsurface Utility Survey, Tranvía, Carolina
Puerto Rico
Figure 5

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L. Addarich
Date Created:
7 Jun, 2007

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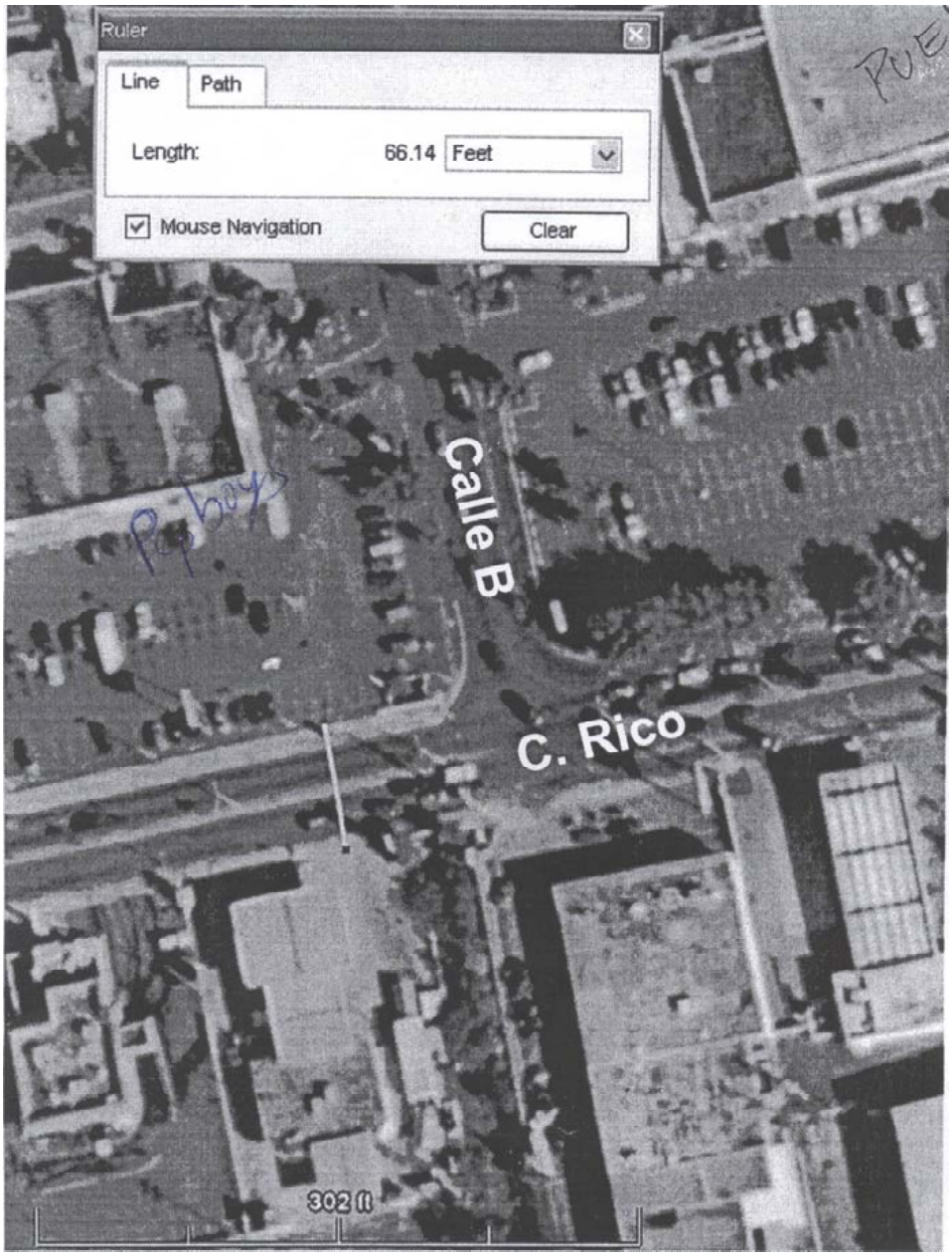
Applied Environmental Sciences



Location 7: Campo Rico Ave. and B St.
Subsurface Utility Survey, Tranvía, Carolina
Puerto Rico
Figure 6

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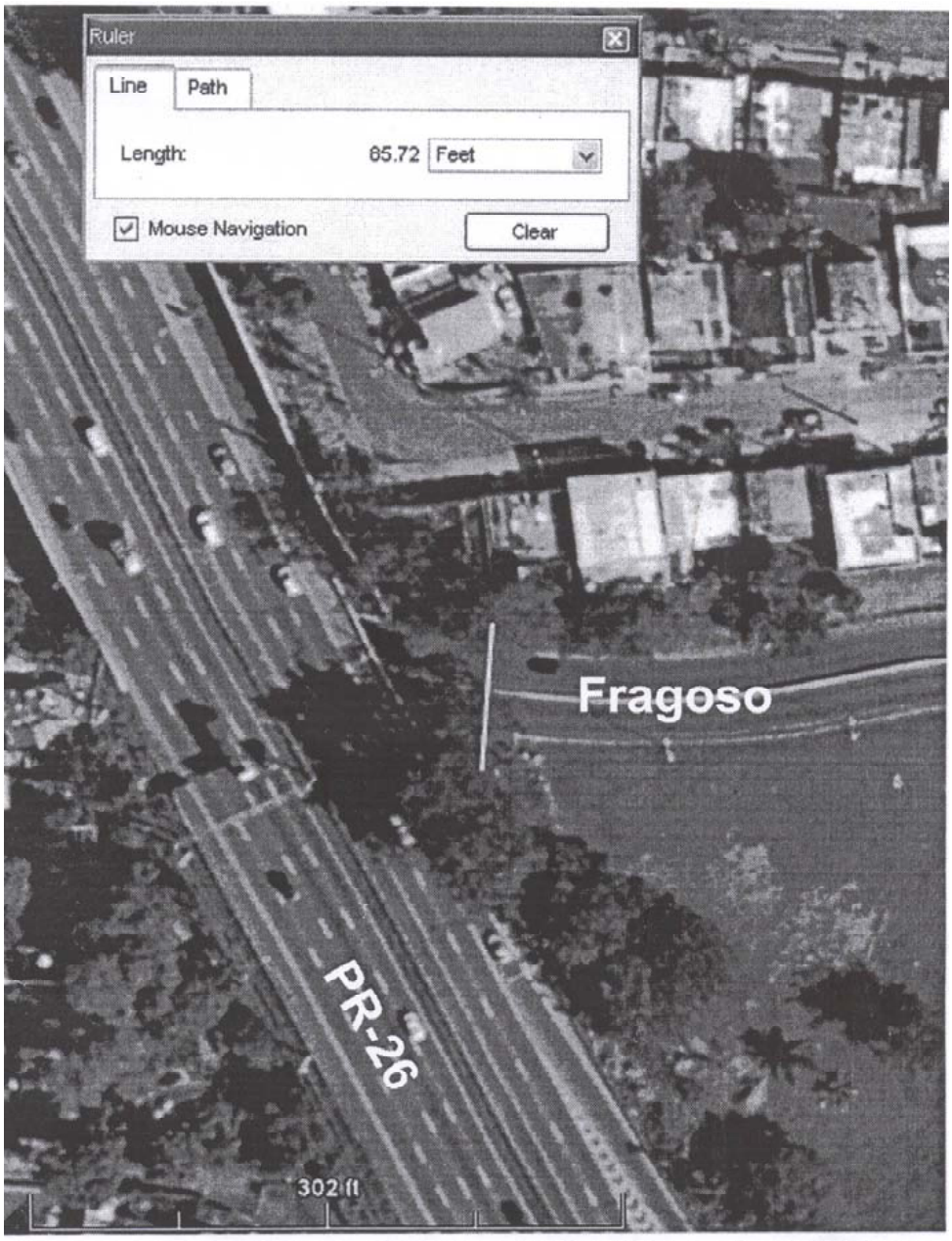

Location 8: PR-26 and Fragoso Ave.
Subsurface Utility Survey, Tranvía, Carolina
Puerto Rico
Figure 7

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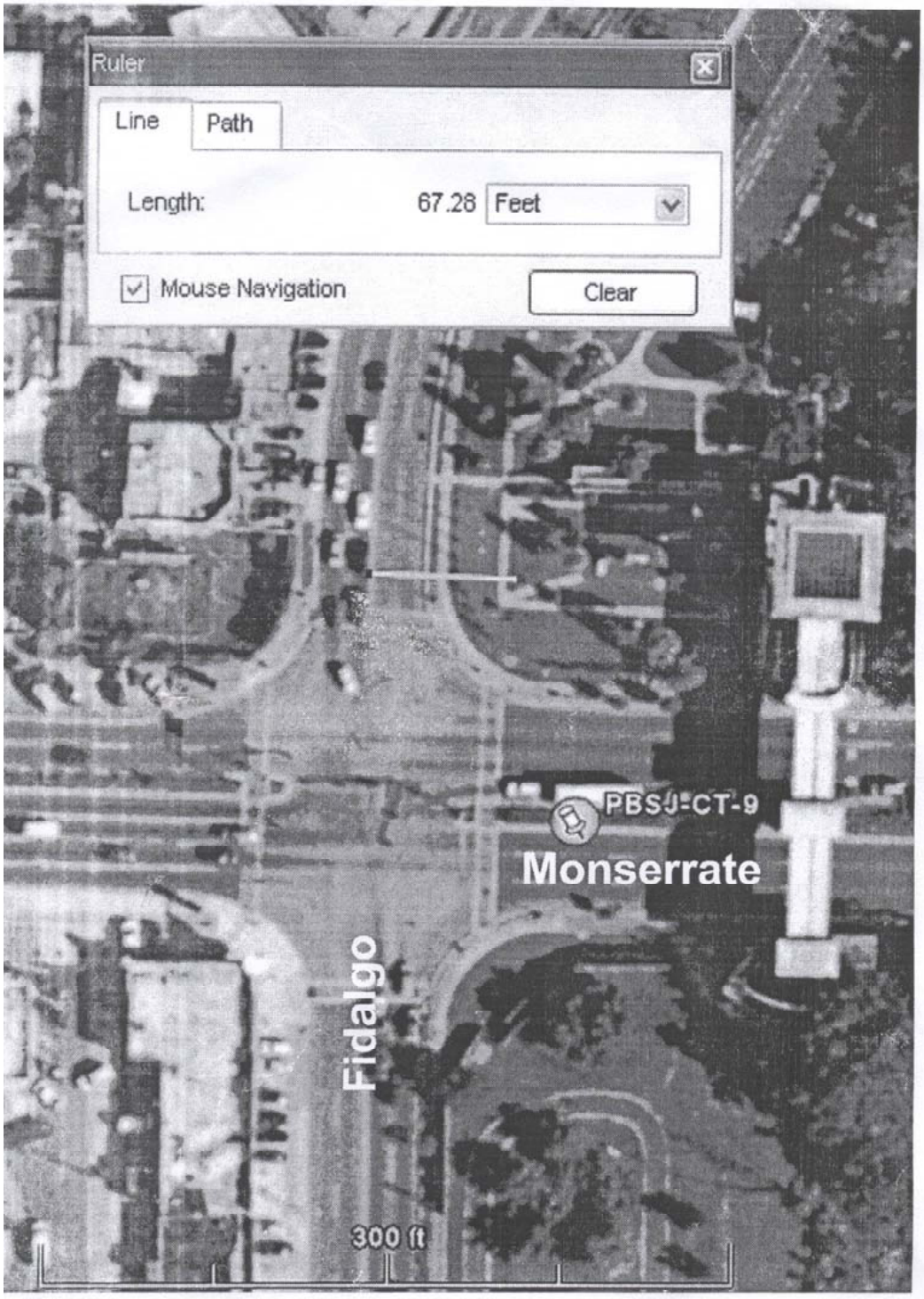

Location 9: Monserrate and Fidalgo Ave.
Subsurface Utility Survey, Tranvía, Carolina
Puerto Rico
Figure 8

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7 Jun, 2007

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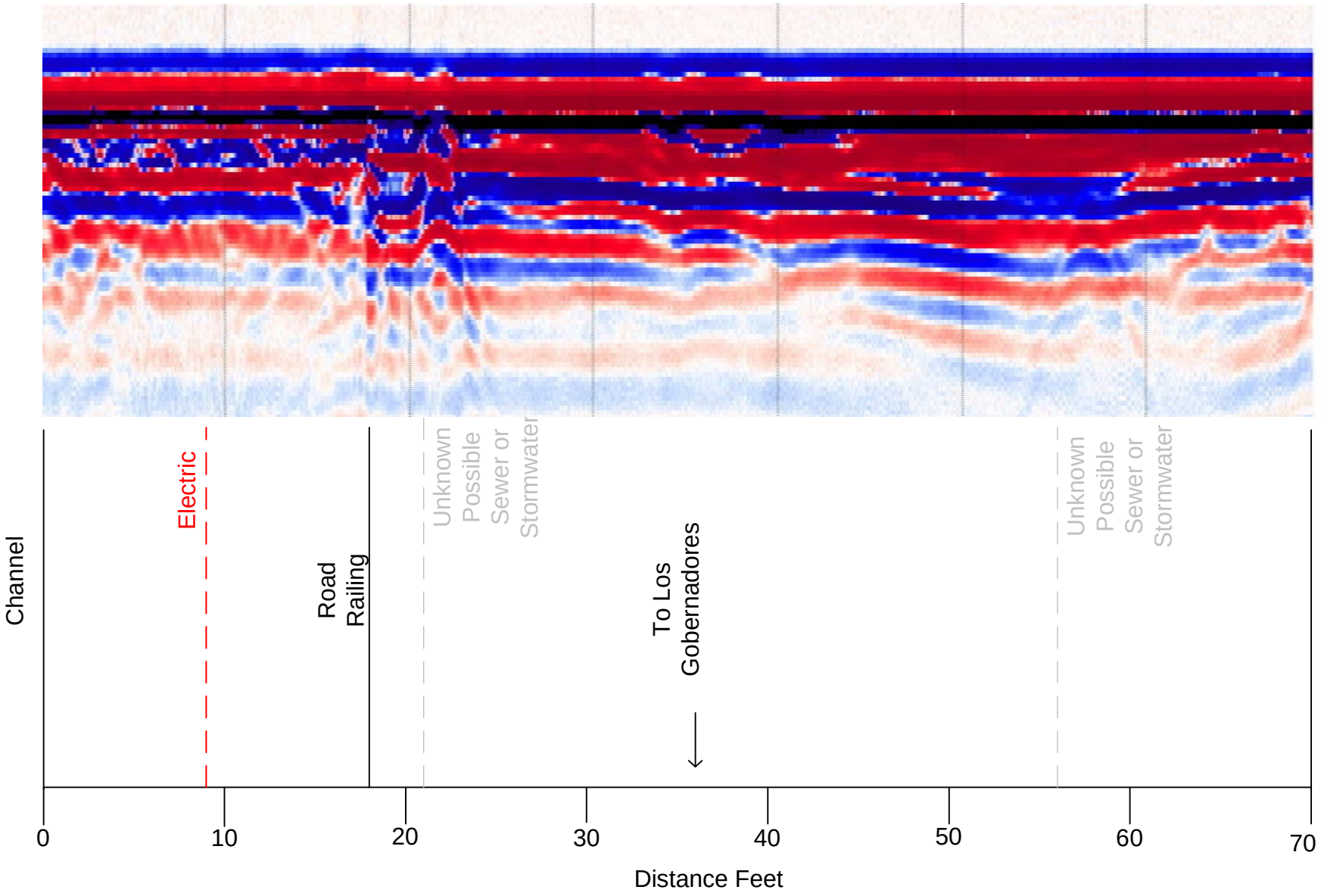
Location 10: Ignacio Arzuaga and Antonio Jimenez Subsurface Utility Survey, Tranvía, Carolina Puerto Rico Figure 9	N	Prepared By: *L. Addarich* Date Created: *7 Jun, 2007*	GeoEnviroTech, Inc. Applied Environmental Sciences

Location 11: Under N span of Moscoso Bridge. Water and Sewer Main Pipe Subsurface Utility Survey, Tranvía, Carolina Puerto Rico Figure 10	N	Prepared By: *L. Addarich* Date Created: *7 Jun, 2007*	GeoEnviroTech, Inc. Applied Environmental Sciences



Location 1: PR-26 West of Embassy Suites
Subsurface Utility Survey, Tranvía Carolina
Puerto Rico
Figure 11

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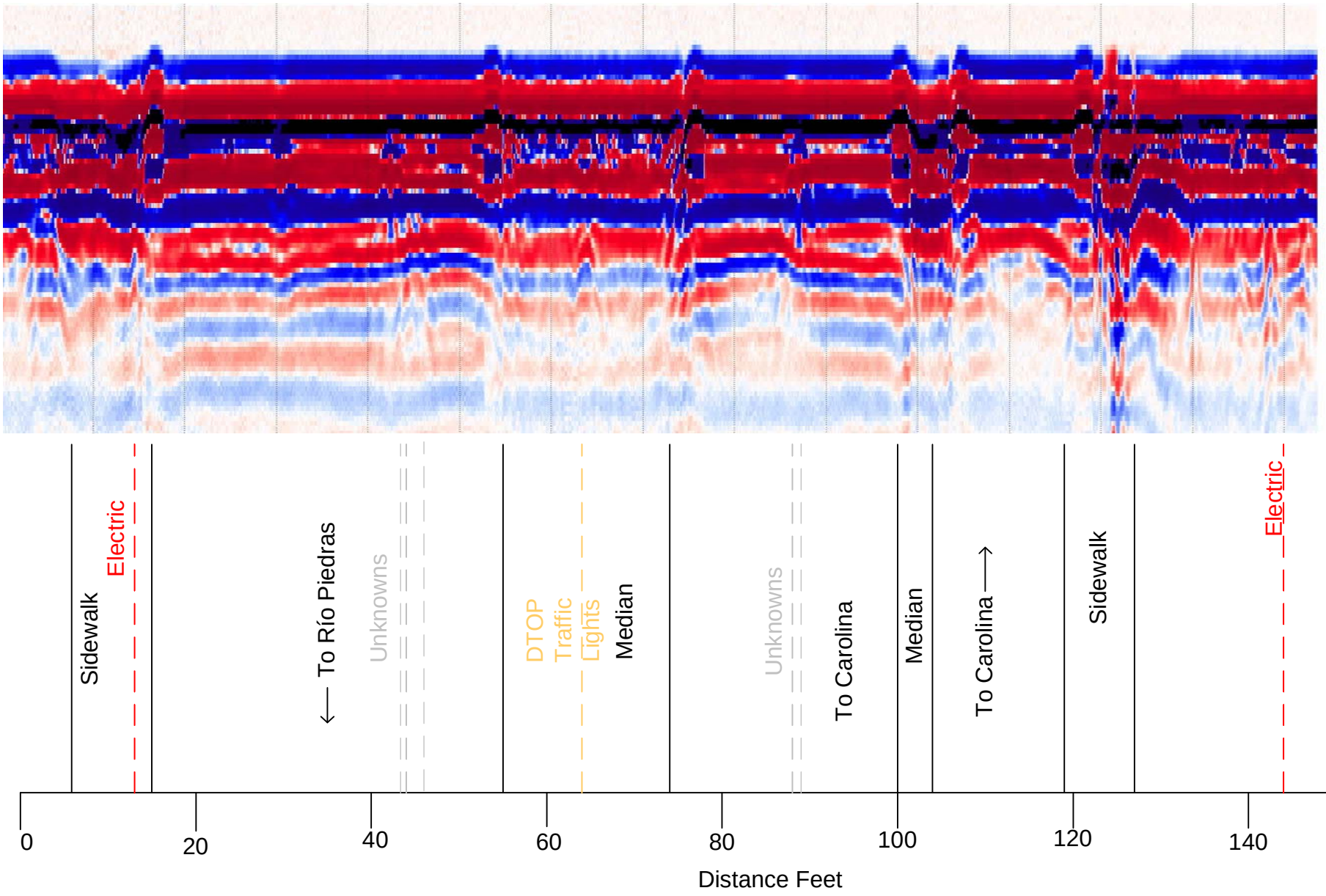

Location 3: PR-26 and Monserrate Ave.
Subsurface Utility Survey, Tranvía Carolina
Puerto Rico
Figure 12

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Leandro Addarich
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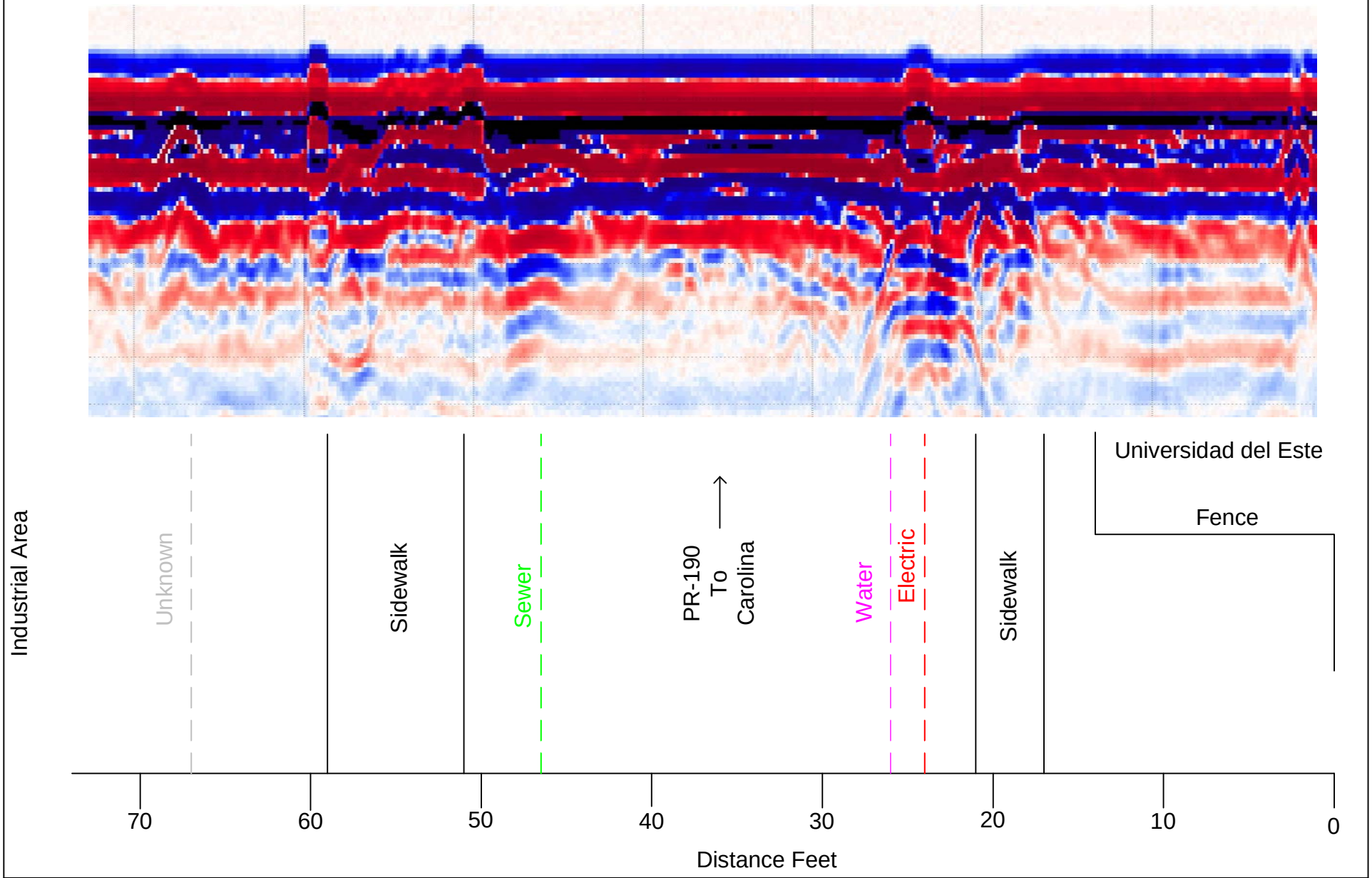

Location 4: PR-190 and Entrance to Universal del Este.
Subsurface Utility Survey, Tranvía Carolina
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Figure 13

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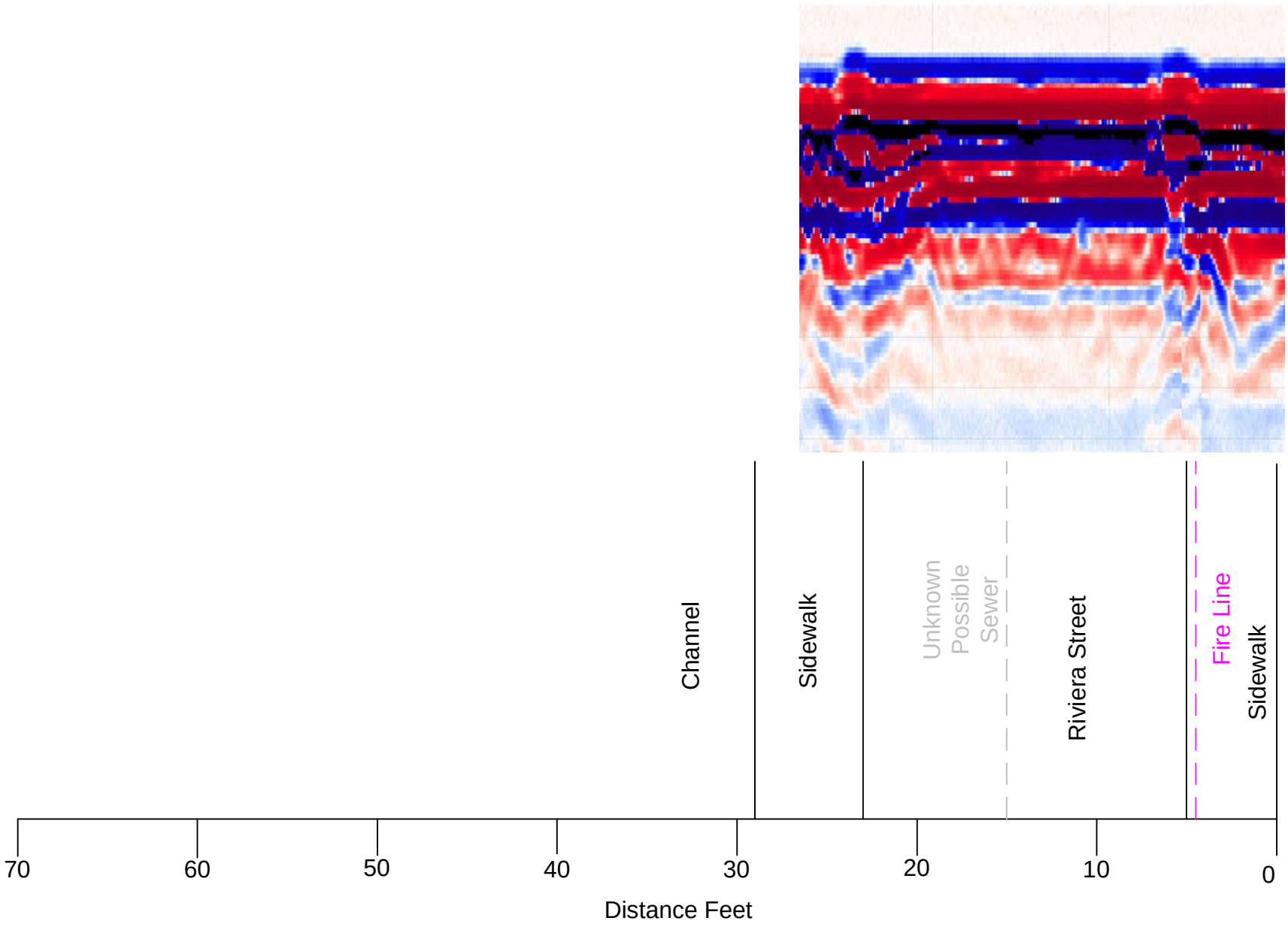
Applied Environmental Sciences



Location 5: Garcilaso and Riviera St. Crossing San Fernando, thru Channel
Subsurface Utility Survey, Tranvía Carolina
Puerto Rico
Figure 14

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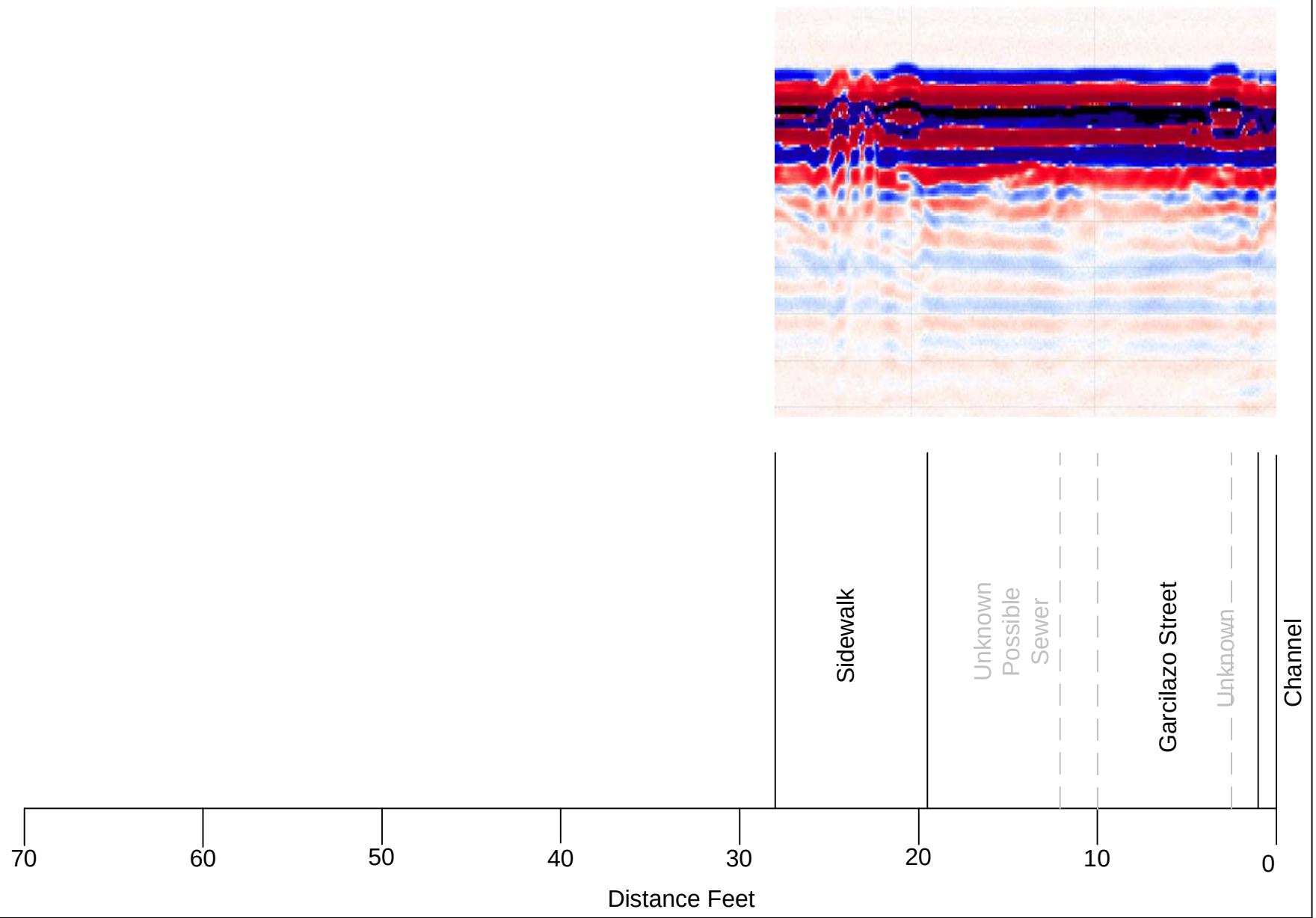

Location 5: Garcilaso and Riviera St. Crossing San Fernando, thru Channel
Subsurface Utility Survey, Tranvía Carolina
Puerto Rico
Figure 15

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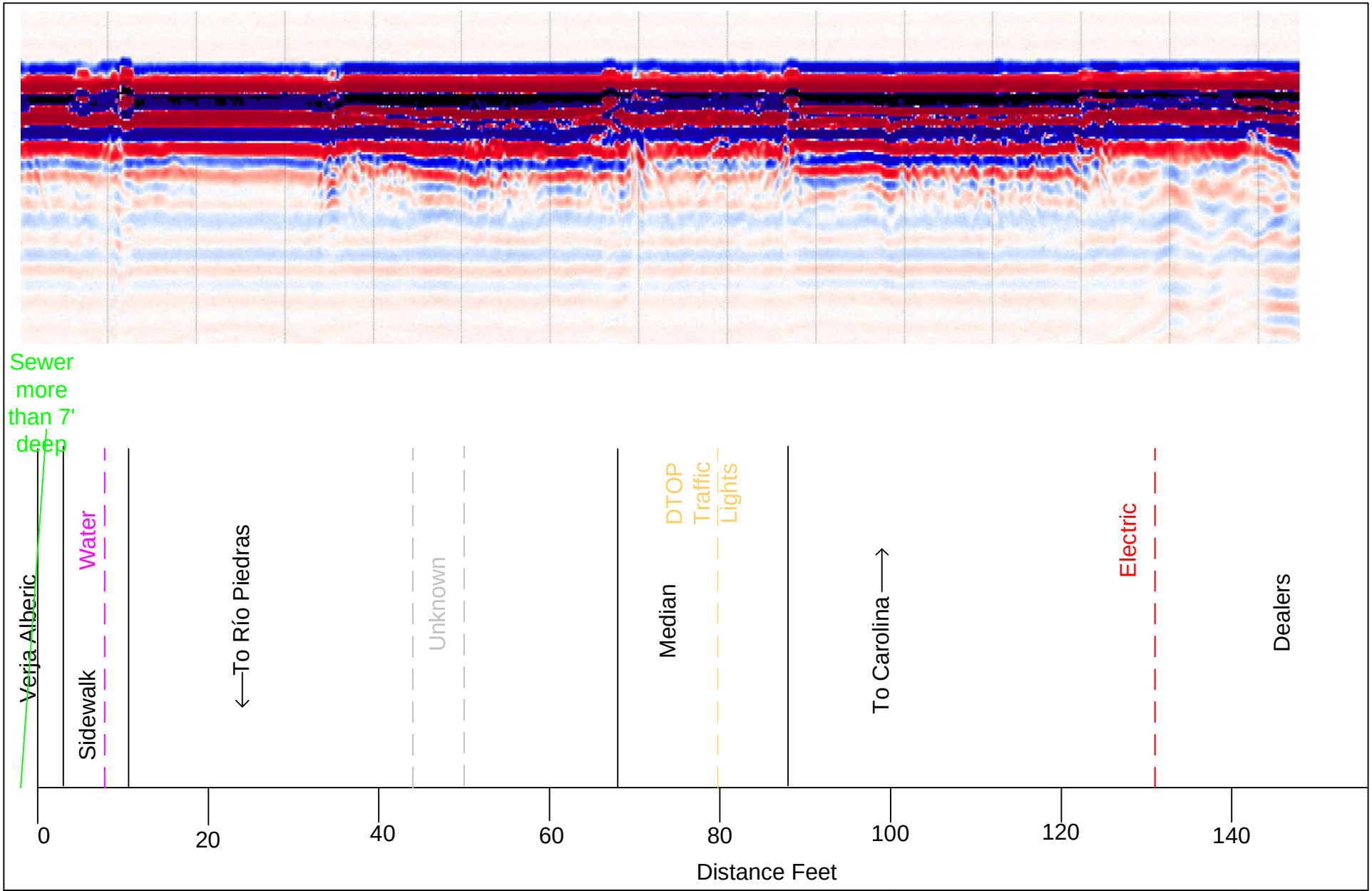

Location 6: PR-3 and De Diego Ave.
Subsurface Utility Survey, Tranvía Carolina
Puerto Rico
Figure 16

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Leandro Addarich
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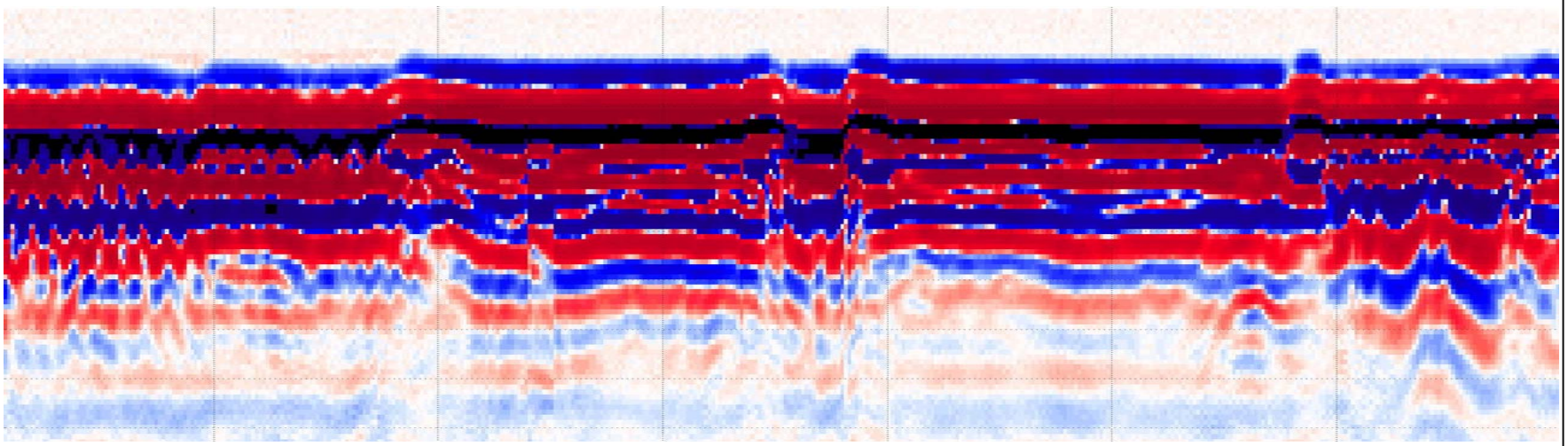

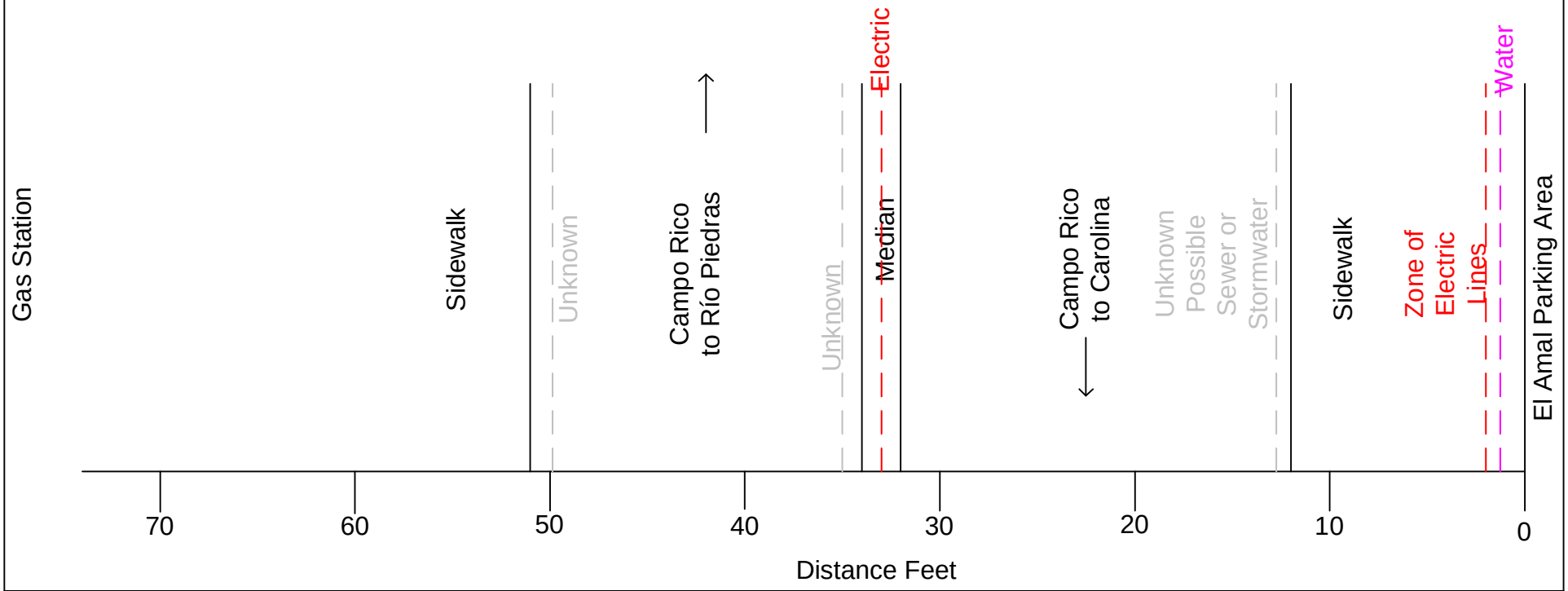

Location 7: Campo Rico Ave. and B St.
Subsurface Utility Survey, Tranvía Carolina
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Figure 17

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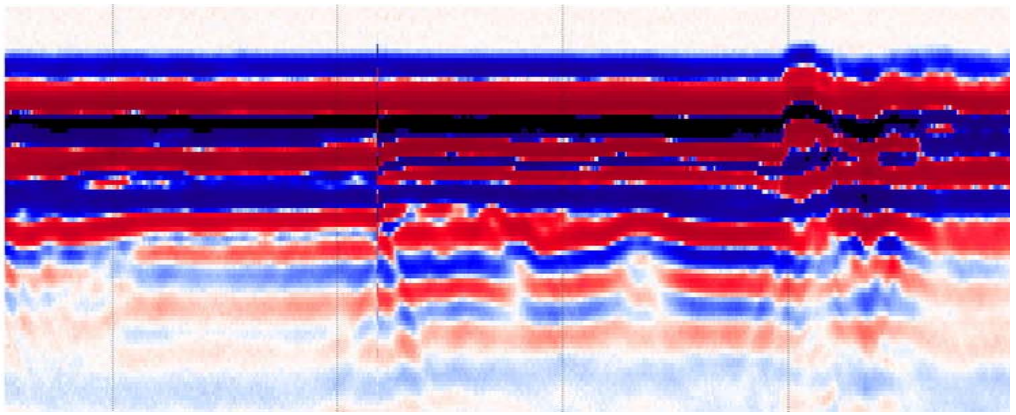

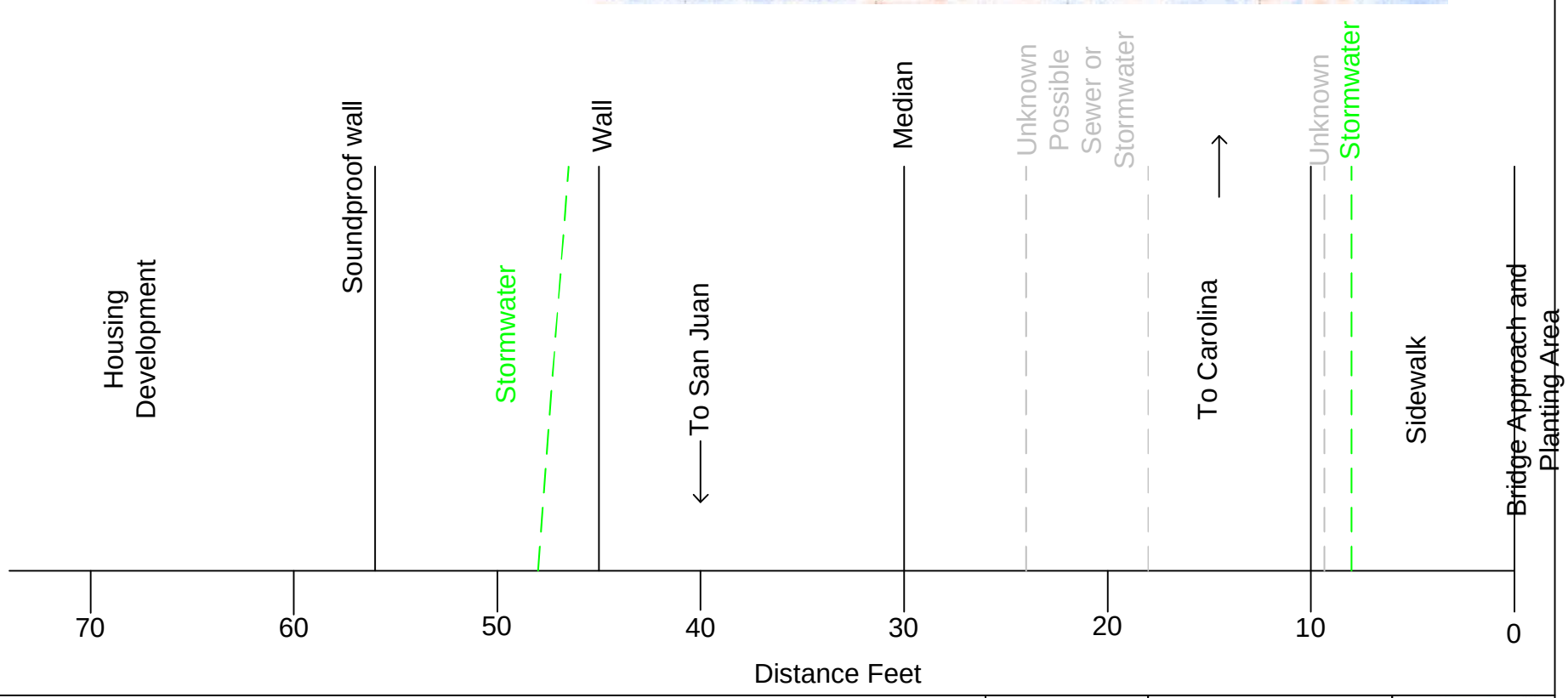

Location 8: PR-26 and Fragoso Ave.
Subsurface Utility Survey, Tranvía Carolina
Puerto Rico
Figure 18

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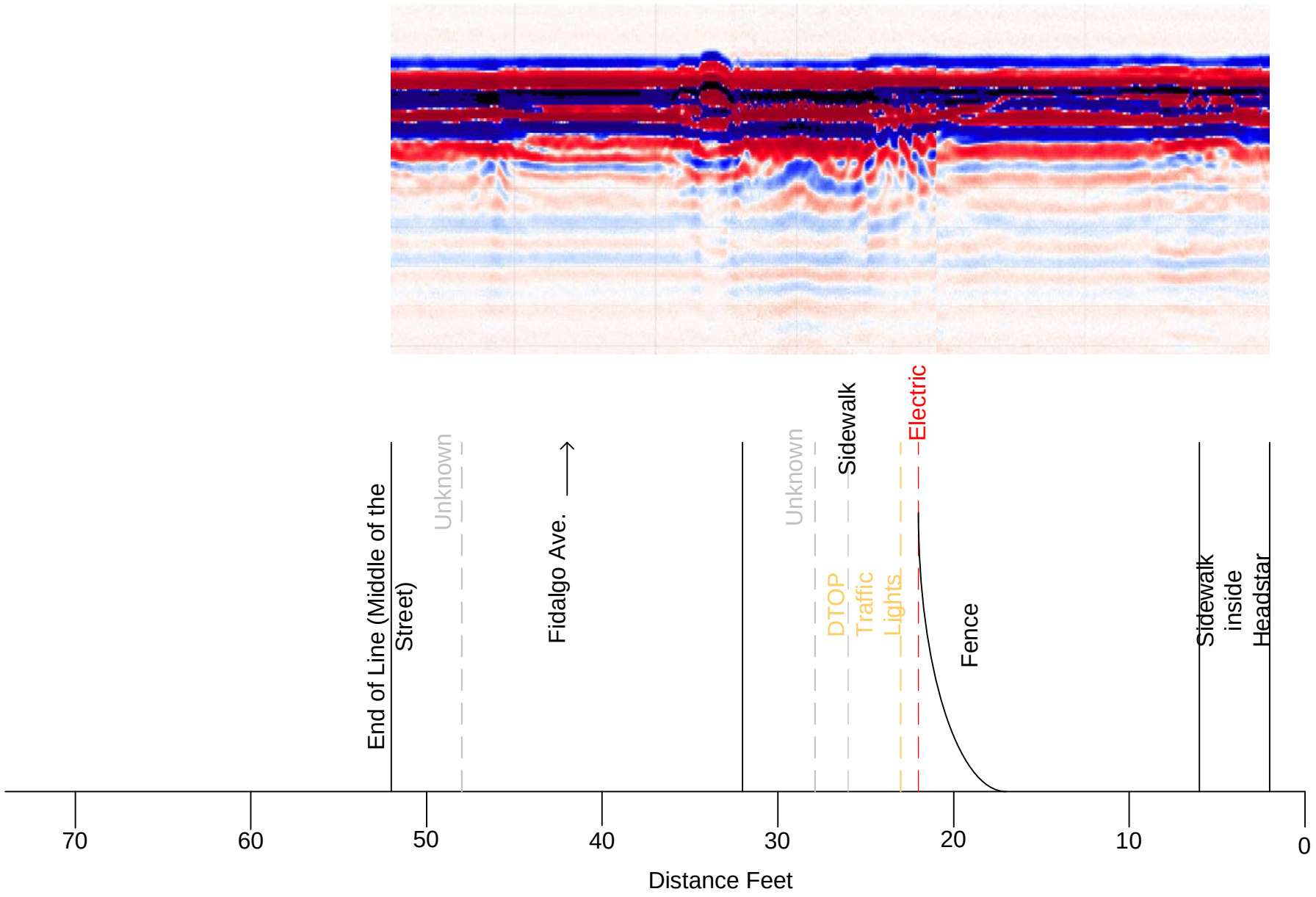

Location 9: Monserrate and Fidalgo Ave.
Subsurface Utility Survey, Tranvía Carolina
Puerto Rico
Figure 19

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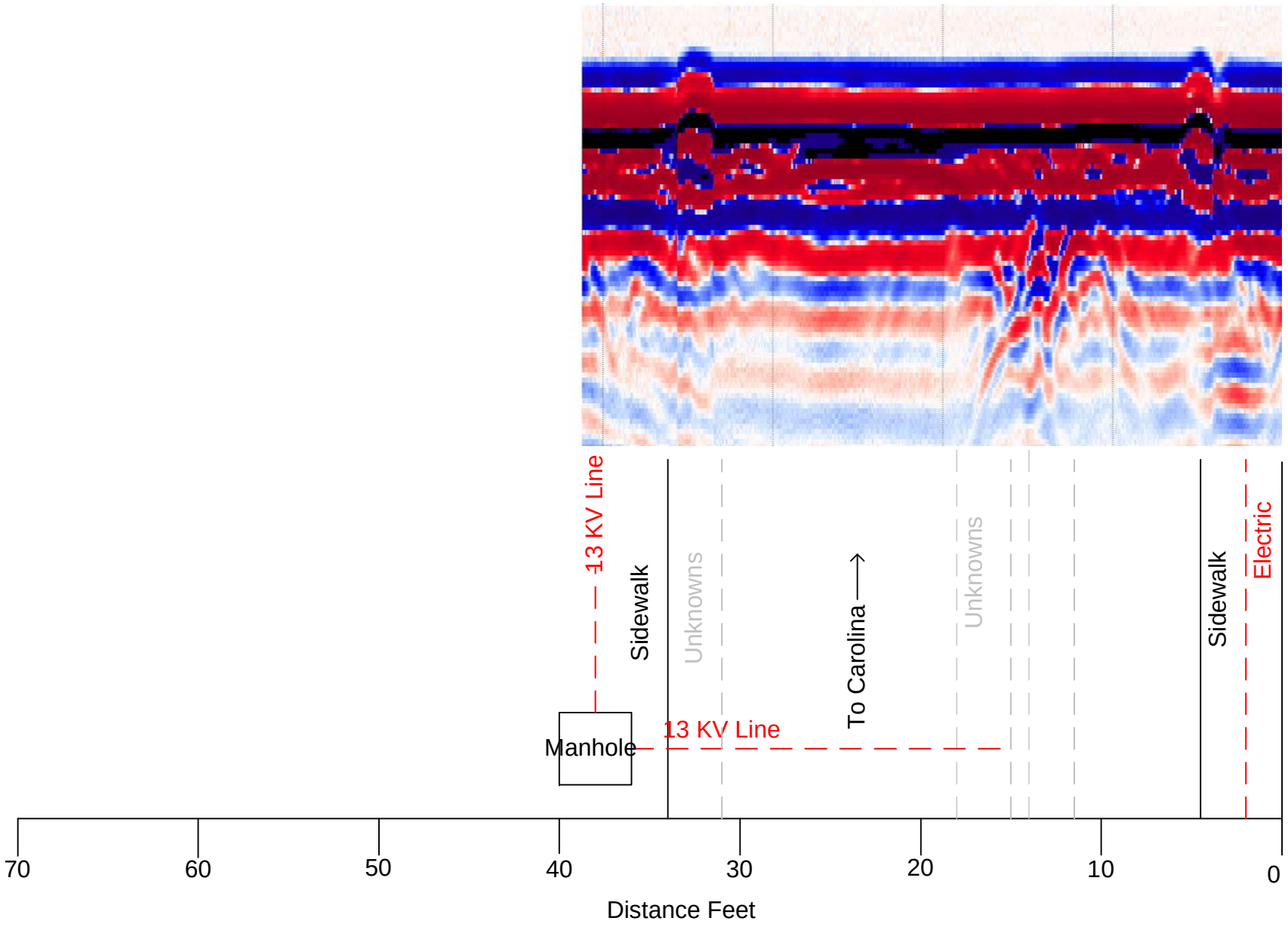

Location 10: Ignazio Arzuaga and Antonio Jimenez Landrau St.
Subsurface Utility Survey, Tranvía Carolina
Puerto Rico
Figure 20

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