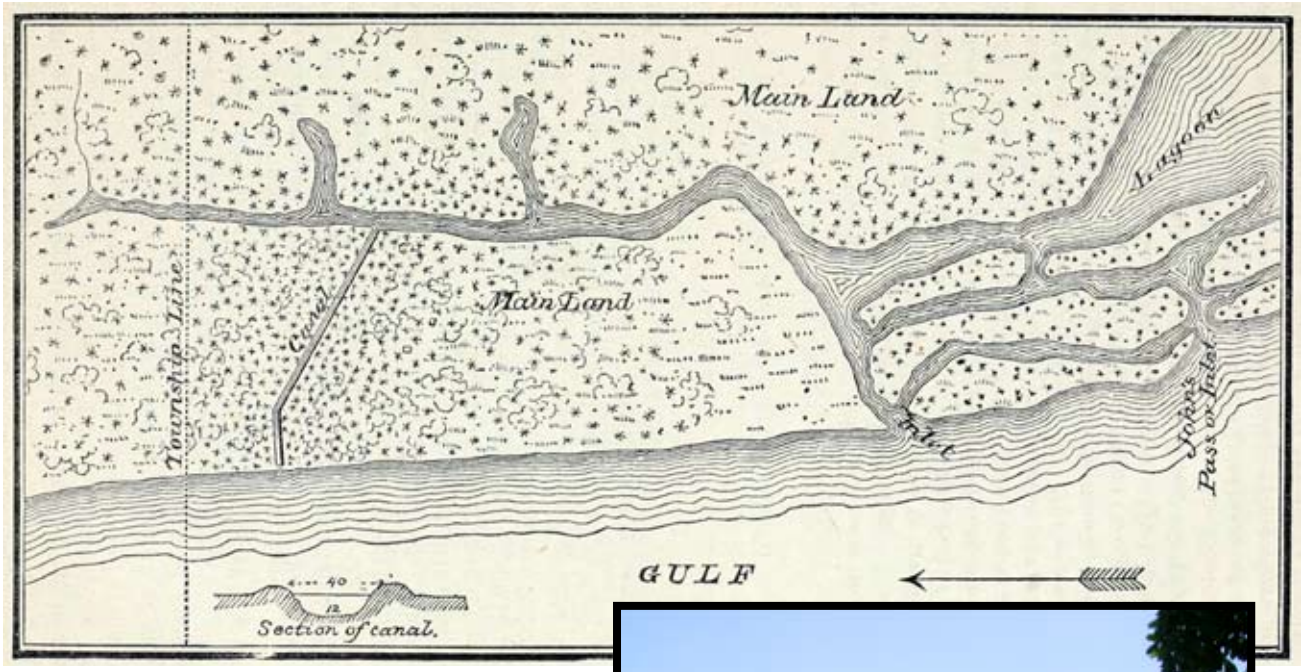
A GPR ASSESSMENT OF THE NAPLES CANAL 8CR59: PHASE II NAPLES, FLORIDA

ARCHAEOLOGICAL AND HISTORICAL CONSERVANCY, INC.



AHC TECNICAL REPORT NO. 1023
JUNE 2014

A GPR ASSESSMENT OF THE NAPLES CANAL 8CR59: PHASE II NAPLES, FLORIDA

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For:
NAPLES BACKYARD HISTORY INC.

AHC PROJECT NO. 2014.65
AHC TECHNICAL REPORT NO. 1023
JUNE 2014

TABLE OF CONTENTS

LIST OF FIGURES ii

CONSULTANT SUMMARY iii

APPENDIX I: GPR SURVEY TECHNICAL REPORT x

APPENDIX II: FLORIDA SITE FORM – 8CR59, 8CR60, 8CR61 xi

CONSULTANT SUMMARY

In May, 2014, the Archaeological and Historical Conservancy, Inc. (AHC) conducted a Phase II GPR assessment of the Naples Canal for Naples Backyard History Inc. The site (8CR59) is in Township 50S, Range 25E, Sections 9 and 10 (Figure 1). Known since the 1870s but now completely filled, the site extends approximately one mile from the Gulf of Mexico east to Naples Bay.

Ground Penetrating Radar (GPR) was used to remotely locate and assess anomalous below-ground features likely associated with the canal.

Archaeological work conducted near the western terminus of the Naples Canal (Carr et al. 2014) has shown that the 1923 Naples plat map created by surveyor James Bain to be highly accurate in depicting the footprint of the feature. An earlier phase employed remote sensing by GPR followed by mechanical trenching at intersection of Gulfshore Boulevard South and 10th Avenue South to assess the surviving below-ground components of the canal and to obtain radiocarbon dating samples.

The current work phase was conducted at seven locations using at least twenty-eight transects. The GPR work was done with a Ramac X3M manufactured by Maia Geoscience, operated by Robert M. Baker of RM Baker LLC Geology and Geophysics.

This assessment generated fifteen profile maps that coincide closely but not completely with the projected canal location based on the 1923 Bain plat. Seven locations along the route of the Naples Canal were examined by running linear transects across the projected path of the canal.

The six eastern locations produced GPR results indicating anomalous features likely associated with the Naples Canal. Two of these locations are excellent prospects for future excavations. It is recommended that future investigations consider these two locations because of their public access and potential for yielding important information.

This assessment included updating existing Florida site forms for the Naples Canal, 8CR59, and two prehistoric sites.

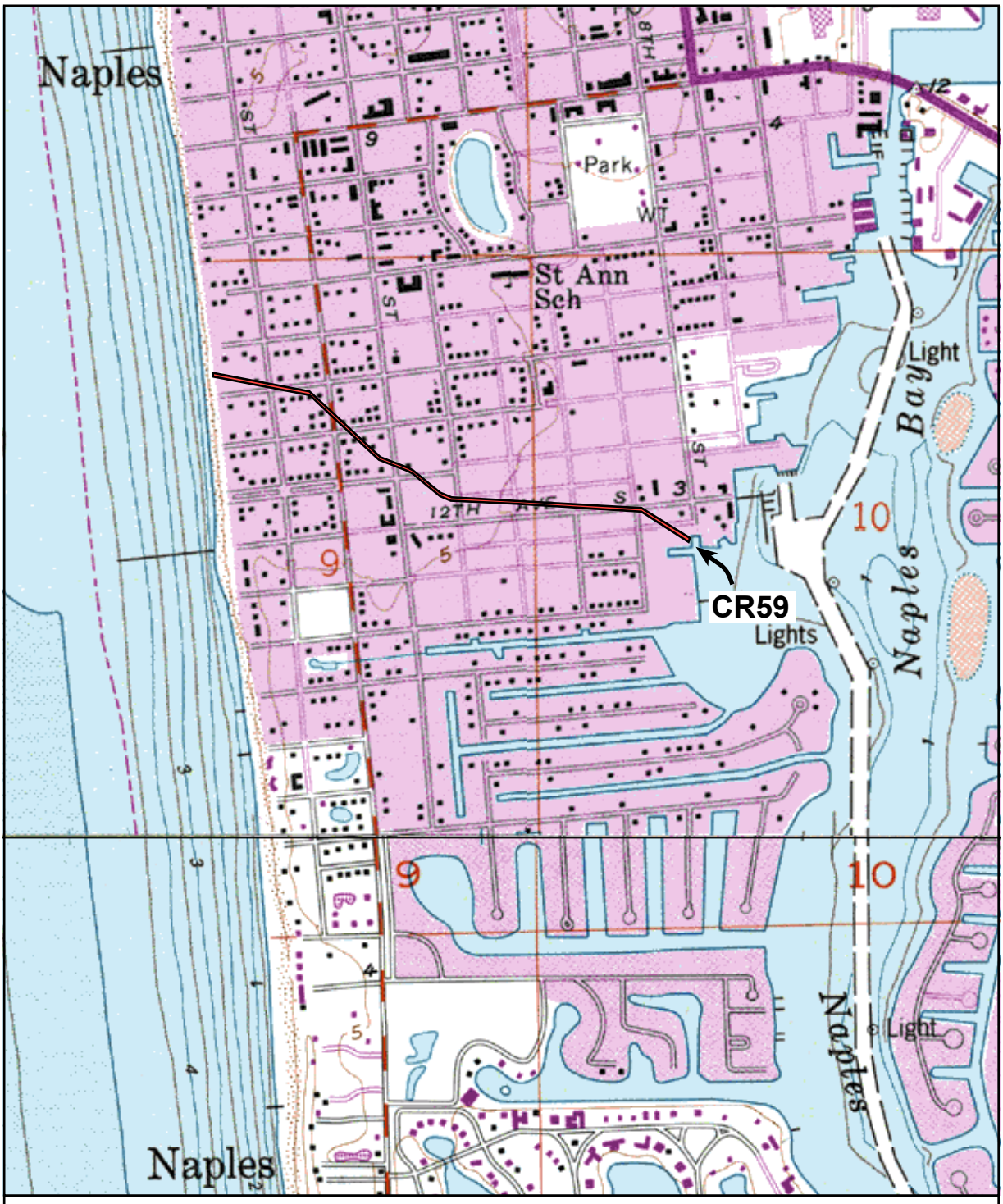


Figure 1. USGS Map of the Naples Canal, 8CR59.

N

TOWNSHIP 50S, RANGE 25E, SECTIONS 9 and 10

USGS Map: NAPLES NORTH, REV. 1991

0	1/8	1/4	1/2 Mile approx.
0	.2	.4	.8 Km. approx.

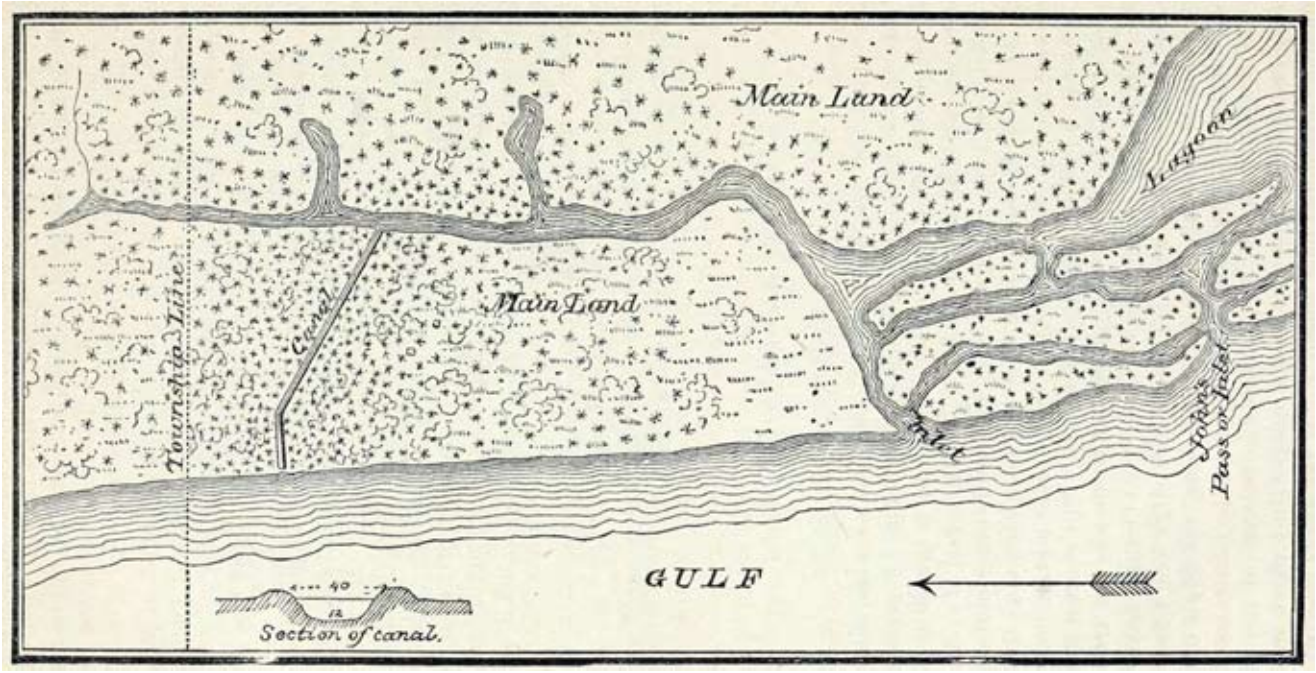


Figure 3. 1881 Kenworthy map showing the canal in section, depicting the surface width as 40 feet.

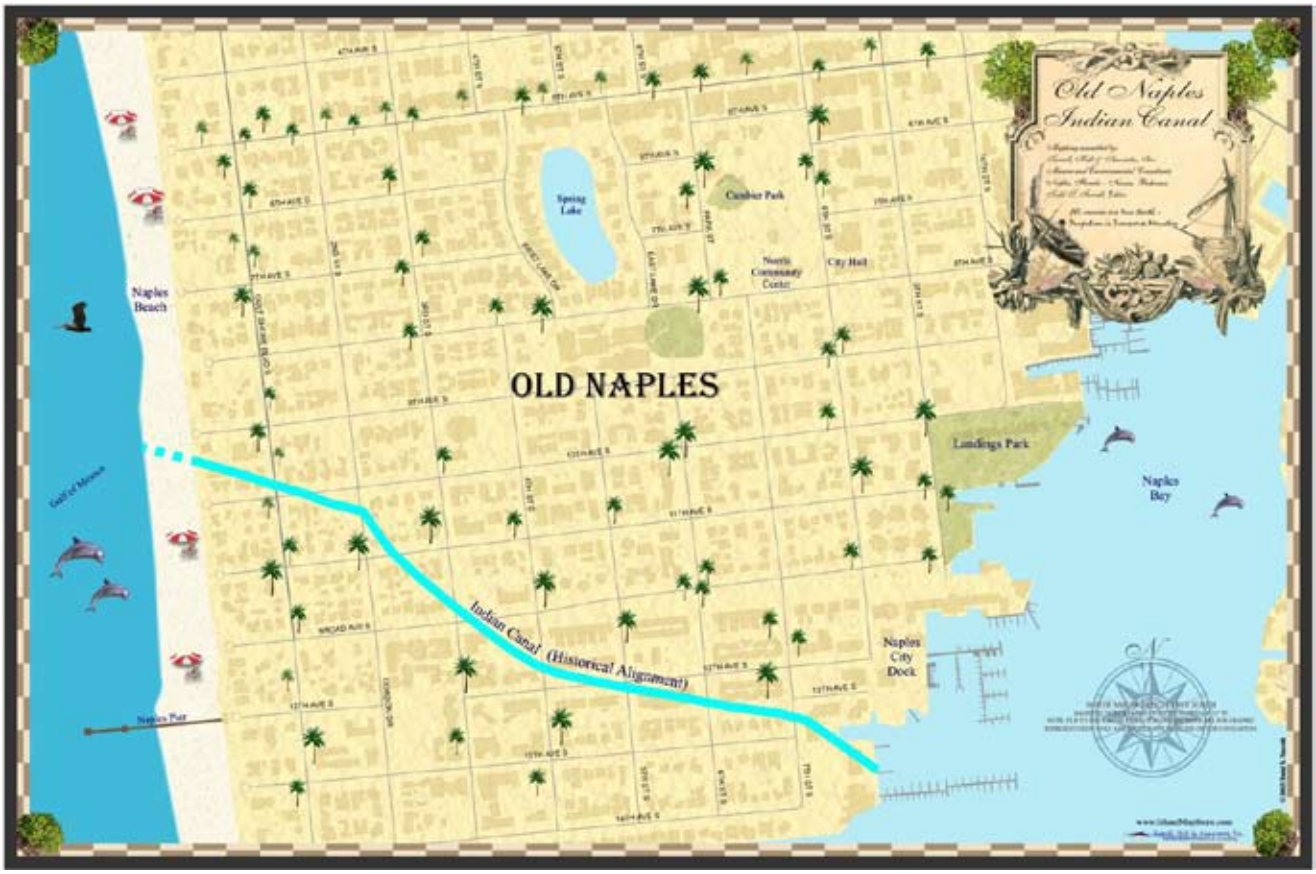


Figure 4. Modern map depicting the historical alignment of the Indian Canal (Turrell Hall & Associates).

Figure 7. GPR scanning conducted at Location 1, east end of canal.

Figure 8. GPR scanning conducted at Location 7, west end of canal.

APPENDIX I: GROUND PENETRATING RADAR SURVEY

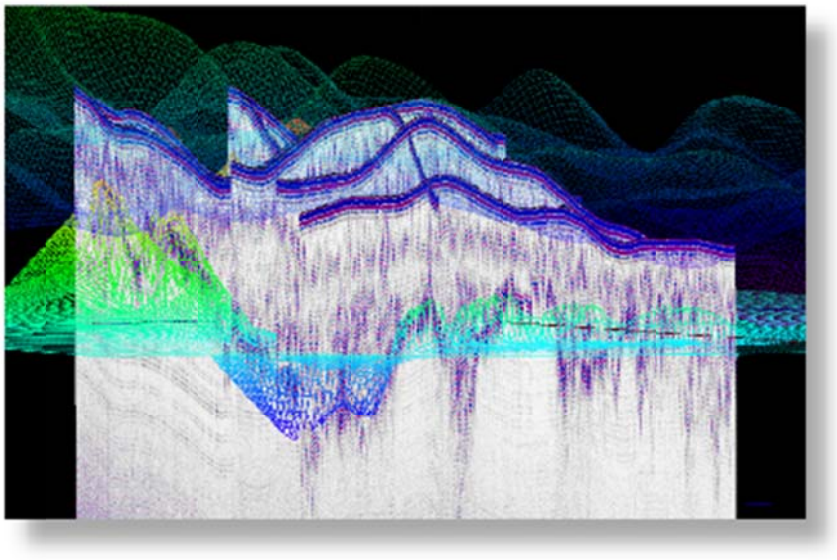
RMBAKER LLC
Geology and Geophysics

GROUND PENETRATING RADAR SURVEY

NAPLES CANAL 8CR59
Naples, Florida

RMBAKER LLC Job No. 14-1632

Prepared For



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REPORT OF FINDINGS

Ground Penetrating Radar Survey

Scope of Work

RMBAKER LLC was retained by AHC to perform a ground penetrating radar (GPR) survey of selected areas and properties in Naples, Collier County, Florida.

The purpose of the geophysical survey was to assemble data that would enable interpretations of subsurface cultural conditions potentially associated with a known buried canal (8CR59). In particular, the objective was to locate and map the canal wherever possible.

Historical maps of the 1923 canal survey were provided by AHC.

The GPR survey field work was performed on May 22, 2014.

Methods

RMBAKER LLC GPR surveys are performed in accordance with ASTM D 6432-99, "Standard Guide for Using the Surface Penetrating Radar Method for Sub-surface Investigation." The GPR survey is designed to explore the shallow subsurface conditions and to identify possible geologic or cultural features. Geologic features may include sediment distinctions such as erosion surfaces, bedding surfaces, soil composition, soil density, soil and rock cementation, soil moisture content and void spaces. Cultural features may include underground utilities, drain fields, buried debris, petroleum contamination, soil backfill, and disturbed soils.

The equipment for a GPR survey consists of an antenna, which both transmits and receives, and a profiling recorder that digitally processes the received signal and produces a graphic display of the data. The antenna transmits short-duration electromagnetic waves into the ground, which are then reflected back to the receiver at different velocities and amplitudes, depending on the nature of the reflector and the surrounding medium. The profiling recorder produces a two dimensional subsurface profile along the traverse taken. RMBAKER LLC utilizes a Ramac X3M manufactured by Mala Geoscience AB. The Ramac X3M is used with a 250 MHz and/or a 500 MHz antenna.

The maximum depth of the GPR survey is limited by the soil and groundwater conditions at the site. The effective depth is recorded as a function of time (i.e. the time for the signal to penetrate into the soil and return to the receiver), and can be converted to an approximate depth

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measurement using known signal velocities. The signal velocities generally vary depending on the soil type and its moisture content.

With GPR systems, geological artifacts can appear when the ground surface has topographic relief. This occurs because the GPR system follows the contour of the ground surface and imposes that relief upon the subsurface reflections. Our interpretations of the GPR geophysical data took into account the changing topography.

Discussion and Analysis

- The maps and profiles are provided in the Florida State Plane East (NAD 1983) coordinate system in units of feet. The easting and northing units are shown in feet. Horizontal coordinates on the geophysical profiles are shown in feet, and depths are shown in feet. We utilized a global positioning system (GPS) with submeter accuracy (50 cm +/-) to map the locations of all GPR transects.
- When viewing the profiles, the horizontal axes are in feet and State Plane coordinates. State Plane coordinates are Cartesian in the sense that they increase to the east and to the north. All of the profiles in the attachments to this report have west or south on the left side and east or north on the right side.
- Each GPR transect is composed of a series of vertical traces or soundings. Consider a trace to be a vertical data package. When these tightly spaced vertical data packages are combined, and colors are assigned based on amplitude, then a profile image in a bitmap format is created.
- We resampled each GPS polyline to contain the exact number of XY points as traces in the associated GPR data. When the GPS data is merged into the GPR data, we are able to digitize features from the GPR profiles and map them in a precise location along the GPS polyline. By merging the GPS location data into the GPR data after the field data is collected, we are able to post-process and clean the GPS data and remove common irregularities.

Ground Penetrating Radar Survey

- The GPR transect naming convention follows the file naming convention of the field computer used to collect and store the profile data. The recorded file names for this project began with the number “2”. Transect 1 was a trial and was not mapped.
- The following table indicates the survey equipment settings and total lineal footage:

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Antenna Frequency (MHz)	Sampling Range (ns)	Velocity (ft/ns)	Maximum Depth (ft)	Maximum Effective Depth (ft)	No. of Transects	Lineal Length of Profiling (ft)
500 MHz/Medium=7	109.0	0.33	18.0	9.5	28	5216.8

NOTE: Sampling range does not account for the direct wave.

- The entire GPR survey consisted of 28 individual transects along 5216.8 lineal feet (0.99 miles) of traverses.
- The depth of the GPR survey was calibrated using published soil velocities, assuming a sandy soil throughout the effective soil profile and using an assumed average signal velocity of 0.33 feet per nanosecond. This velocity may vary across the studied areas, and so the "depth" axis should be considered an approximation.
- We detected GPR patterns consistent with the likely presence of a buried canal all along the 1923 canal alignment (mapped approximately based on a visual review of hardcopy maps). We labeled the areas of recognizable canal patterns according to the numerical sequence provided by AHC.
- We digitized each GPR anomaly and coded the points to represent; 1) the entire anomaly and the "strong edge" of the anomaly. We mapped only those points representing the edge of the anomaly feature, although many of the GPR profiles show the entire digitized shape of the anomaly.
- Difficulty in observing the canal using GPR in some locations likely arose from; 1) presence of salts in the sandy soils associated with seawater flooding of the barrier island, 2) similar soils used to fill the canal as compared to those outside the canal, 3) masking of the canal by soils or hardscape at the ground surface, 4) reworking of the soils during modern utility installations, and 5) generally limited dielectric contrast in the soils.
- Examples of our interpretation approach are contained in the attachments. We have provided each GPR transect that indicated an anomaly consistent with the presence of the canal. Transects that did not yield an anomaly are on file and can be provided as bitmaps if requested.
- The attachments also include a series of maps showing the locations of the transects, the anomalies, and our GPR anomaly alignment compared to the 1923 expected canal alignment.

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Limitations

While due care has been exercised in the performance of these measurements and observations, in accordance with methodologies utilized by the general practitioner, **RMBAKER LLC can make no representations, warranties, or guarantees with respect to latent or concealed conditions that may exist, which may be beyond the detection capabilities of the methodologies used, or that may extend beyond the area and depths surveyed.** The analyses and conclusions contained in our report are based on site conditions as they existed at the time of our survey. If, at any time, different subsurface conditions from those interpreted herein are observed to be present, we reserve the right to modify our analyses and conclusions as warranted by the new information.

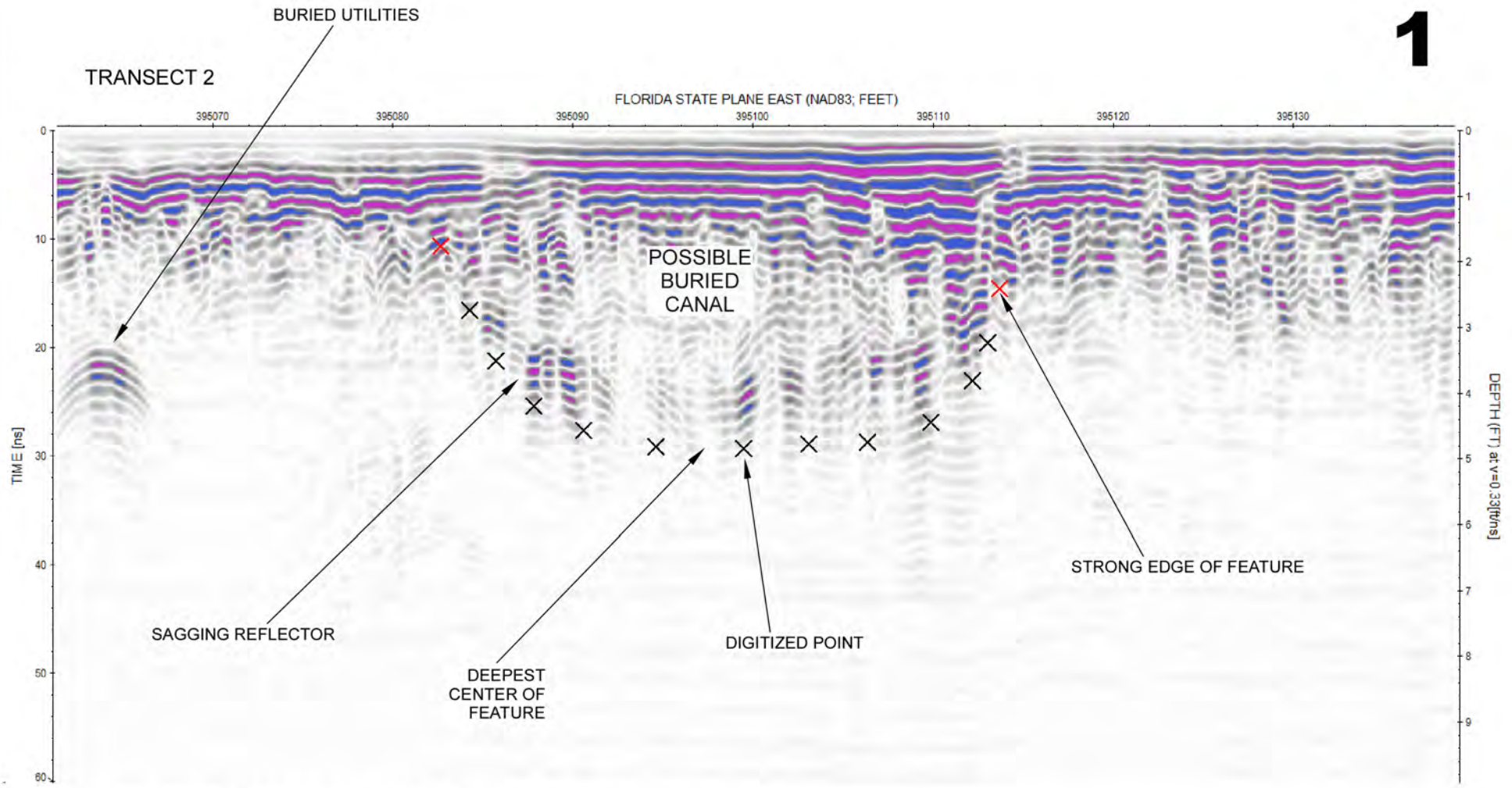
ELECTRONIC VERSION

SIGNED AND SEALED
HARDCOPY ON FILE

RMBAKER LLC
Robert M. Baker, CPG, PG
Managing Member
Fla. Reg. Geologist No. 2186

Attachments included (maps and imagery)

1



WEST - TO - EAST OR SOUTH - TO - NORTH →

NOTE: The transects are referenced to State Plane coordinates. This coordinate system increases to the east and to the north.

NOTE:
-Drawings are not surveyed, but are based on rough field measurements
-Scales are approximate, and should be used for general referencing only
-Profiles are shown in feet starting at the labeled end of the mapped transect

FILE NAMING PROTOCOL
DAT_TRANSECT NO_PROCESSING STEP
e.g. DAT_222.04T => TRANSECT 222

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GEOPHYSICAL EXPLORATION

INTERPRETATION EXAMPLES

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Date: 6-1-2014
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