Tech Memo Approval Form

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Project: 338884

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Floodplain Evaluation Bounding Analysis for the Levy Nuclear Power Plant Site

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0	Initial Submittal	08/10/2009	All
1	Revised Tables 4, 5, and 6 and related text	09/30/2009	All

Document Review and Approval

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Floodplain Evaluation Bounding Analysis

For the

Levy Nuclear Power Plant Units 1 and 2

September 2009

Prepared for

Progress Energy Florida

Prepared by

CH2MHILL

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Attachments

References

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1.0 Purpose

In consultation with the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Army Corps of Engineers (USACE), additional information has been requested to complete a floodplain bounding analysis associated with Progress Energy Florida, Inc.'s (PEF's) proposed site development, the Levy Nuclear Project (LNP). This *bounding analysis* is an evaluation of the maximum potential need for additional compensating volume resulting from placing LNP construction fill in regulated floodplains as defined in this document. An additional assessment related to the off-site transmission corridor's effects on floodplains is also generally addressed.

This bounding analysis is based on 1-foot contour data, wetland indicators, and geotechnical data already available for the LNP site, the current site plan, as well as a Geographic Information System (GIS) evaluation of the transmission alignment to identify potential floodplain fill locations and potential compensation areas.

The purpose of this technical memorandum is to provide the NRC and USACE with a sensitivity analysis to show that, although floodplain compensation ultimately may not be required, sufficient on-site compensation is available.

2.0 Introduction

Progress Energy Florida, Inc. (PEF) has identified a location in southwestern Levy County, Florida, for the construction of a new nuclear power plant. This proposed facility, the Levy Nuclear Project (LNP), will require fill within the 100-year floodplain (Zone A) as mapped by the Federal Emergency Management Agency (FEMA). Using the latest proposed site development plan and GIS analysis, it is estimated that approximately 257.9 acre-feet of fill will be placed at the plant site (including the on-site portion of the transmission corridor), within FEMA-mapped floodplains. The proposed off-site transmission corridor that was used in this analysis extends south from the LNP site. The portion of the off-site transmission corridor/line within the floodplain (Zone A or Zone AE) comprises only a small portion of the entire length.

For the plant site, potential upland compensation areas were determined with potential compensation volume available to identify where compensation could be provided, if needed. Most of the upland areas on-site are degraded by long-term silviculture activities. With more than 700 acre-feet of potential compensation storage identified in this analysis to be available, there are ample on-site locations to provide floodplain compensation required without adversely affecting wetlands or high-quality upland habitat, including protected species habitat.

Background

The FEMA-adopted floodplains on the LNP development location and within the on-site transmission corridor are mapped as Zone A on the 1984 Flood Insurance Rate Maps (FIRMs) for Levy County - Community Panel Numbers 120145 0640 D, 120145 0625 D, and 120145 0650 D.

FEMA defines Zone A as "areas of 100-year flood; base flood elevations and flood hazard factors not determined". The FIRM Zone A line appears to have been set primarily by using soils data and USGS Quadrangle maps to identify areas of probable flooding. The mapped Zone A areas correspond fairly well with the wetland land use mapping for the overall project site. Since the FIRMs are the adopted maps of the 100-year floodplain, even if they were not evaluated in detail previously, the mapped Zone A must be used as the basis of on-site floodplains for regulatory purposes.

These Zone A map units are located within or adjacent to the proposed limits of construction for the LNP site and contain both small, isolated floodplains and portions of a large, forested wetland along the western half of the property extending off-site. Figure 1 is a location map of the overall plant site with the FEMA-mapped floodplains shown. Note the Inglis Lock Bypass Channel, Lake Rousseau/Withlacoochee River, and Cross Florida Barge Canal have floodplains with Zone A1 and Zone A12 designations. FEMA defines Zone A1-A30 as "areas of 100-year flood; base flood elevations and flood hazard factors determined"; therefore, these off-site areas are shown on Figure 1 as Zone AE.

An assessment of floodplain fill is required as part of the Environmental Resource Permit (ERP) process included in the state site certification process. The Florida Department of Environmental Protection (FDEP) will evaluate the assessment against Southwest Florida Water Management District (SWFWMD) rules. These rules state that no adverse effect of either conveyance, storage, water quality or adjacent lands are allowed. Any required compensating storage shall be equivalently provided between the seasonal high water level and the 100-year flood level to allow storage function during all lesser flood events. Since these are Zone A map units (no elevation set), the estimate of "adverse effect" on storage is typically limited to whether off-site impacts occur.

If off-site effects are determined by FDEP to be insignificant, no floodplain compensation is required. Floodplain storage compensation may be required if site development is expected to adversely affect off-site properties.

The proposed transmission lines extend more than 180 miles within over 148 miles of corridor (multiple lines in some corridors). Most of the transmission lines are co-located with existing facilities. The existing and proposed transmission cross Zone A and Zone AE floodplains as defined above.


19
40
Lake Rousseau
Inglis Lock Bypass Channel
Cross Florida Barge Canal
LEGEND
Property Boundary
Limits of Construction
FEMA Zone A
FEMA Zone AE
N
W
E
S
0 300 600
Meters
0 1,000 2,000
1" = 2000'
Progress Energy Florida
Levy Nuclear Plant
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Floodplain Evaluation Bounding
Analysis Technical Memorandum
Site and Floodplain Location
Figure 1

3.0 Floodplain Fill Analysis

The planning-level process used to estimate the filled area and flood volume for each Zone A mapping unit associated with the proposed site development (including the on-site portion of the transmission corridor) is described in the following steps. A separate generalized assessment associated with the off-site transmission corridors/lines is also included in this section.

LNP Plant Site

The following process was used to assess the plant site.

1. **Determine the area of floodplain affected using the intersection of the limits of LNP construction and the floodplain as mapped by FEMA.**

   The average 100-year floodplain elevation was determined by using Light Detection and Ranging (LiDAR) mapping accurate to the 1-foot contour and the FIRM boundaries which were converted to digital format in 1996. The LiDAR DTM data was produced to meet FEMA floodplain mapping specifications. A copy of the accuracy statement prepared for Sargent & Lundy is included as Attachment A. The affected area within each intersection polygon was calculated using GIS. These areas are identified in Table 1 and shown on Figure 2. Attachment B presents a detailed map book of the potential floodplain fill areas.

2. **Estimate the normal pool and seasonal high groundwater elevation by using on-site wetland, soil, and hydrology data and observations.**

   The normal pool elevation or seasonal high groundwater elevation constitutes the base elevation to determine the filled volume at each intersection polygon. The term "normal pool" is used here to describe the elevation of standing water in wetlands for several weeks duration during the wet season. This elevation is often estimated by using a combination of ecological indicators such as the inflection point of buttresses in cypress and the elevation of moss collars on cypress. For the purposes of this analysis, based on site knowledge and using elevations from LiDAR mapping, the normal pool elevation was assumed to be 1-foot above the average base (bottom of basin) of cypress wetlands. This flooding depth is considered generally consistent with site observations by field ecologists. The soil survey data reported by NRCS and recent groundwater monitoring results, as referenced in Tables 2 through 4, summarize the soils and wetland indicators used to estimate the normal high wetland pool (refer to Figures 3 and 4). The groundwater contours determined from the highest quarterly monitoring results (March 2007) were also used (refer to Figure 5). The groundwater monitoring results were previously documented in the *Levy Nuclear Plant Units 1 and 2 – Part 3, Environmental Report Rev 0, Chapter 2* (June 2008).

TABLE 1
FEMA-Mapped Floodplain Polygons affected by Construction

Map Unit Identification	Location Description	Area (acres)	Estimated Floodplain Elevation[1] (ft NAVD)	Connectivity of Location
A1	North US 19 Access Road	3.23	41	Connected
B1	North US 19 Access Road	7.46	42	Connected
C1	Building 118, 136	0.96	43	Connected
D1	North US 19 Access Road	0.04	42	Connected
E1	Building 186	13.62	43	Connected
F1	Access Road	0.08	42	Connected
G1	Building 122	3.12	42	Connected
H1	North US 19 Access Road	2.61	44	Connected
I1	Building 102, 103, 105, 106, 111, 117, 119, and 132	47.80	43	Connected
J1	Building 180	1.37	48	Isolated
K1	Building 180	2.04	45	Isolated
L1	Building 180	4.75	45	Isolated
M1	Stormwater Pond A, Building 196A, 197A	67.04	43	Connected
N1	South US 19 Access Road	9.28	42	Connected
O1	Units 1 & 2, Stormwater Pond B	128.82	43	Connected
P1	Stormwater Pond C	0.85	47	Isolated
Q1	Building 131	7.41	43	Isolated
R1	South US 19 Access Road	0.53	40	Isolated
S1	Stormwater Pond B	3.46	43	Isolated
T1	Access Road	10.53	42	Connected
U1	Heavy Haul Road	3.36	41	Connected
V1	Building 137	0.56	43	Isolated
W1	Heavy Haul Road	3.37	43	Connected
X1	Heavy Haul Road	1.69	44	Connected
Y1	Heavy Haul Road	1.36	43	Connected
Z1	Heavy Haul Road	8.23	43	Connected
A2	Heavy Haul Road	10.08	42	Connected
B2	Heavy Haul Road	0.79	36	Isolated
C2	Heavy Haul Road	0.25	37	Isolated
D2	Heavy Haul Road	1.25	36	Connected
E2	Heavy Haul Road	0.77	37	Connected
F2	Heavy Haul Road	6.68	34	Connected

Notes:
1. Overlay with 1-ft LiDAR contours. FEMA mapping is based on 1996 digital representation of FIRMs available through GIS.

LEGEND

- Property Boundary
- Limits of Construction
- Floodplain Fill Areas
- FEMA Zone A
- FEMA Zone AE

Reference:
Attachment B Map Book - Potential Fill Areas within FEMA-Mapped Floodplain

N
W E
S

0 300 600
Meters

0 1,000 2,000
1" = 2000'

Progress Energy Florida
Levy Nuclear Plant Units 1 and 2
Floodplain Evaluation Bounding Analysis Technical Memorandum

Potential Fill Areas within FEMA-Mapped Floodplain

Figure 2

TABLE 2
NRCS Soils and Observed Groundwater Information Used to Estimate Seasonal High Groundwater Level for Each Location

Map Unit Identification	NRCS Soil Unit Type	Average Ground Elevation (ft)	NRCS Reported Depth to Seasonal High Groundwater (ft)	NRCS Estimated Water Table (ft NAVD)	Average Groundwater Monitoring Elevation (ft)	Seasonal High Groundwater Estimate (ft)
A1	17 - Adamsville	40.09	2.76	37.33	<41.50	<41.50
B1	17 - Adamsville	41.76	2.76	39.01	<41.50	<41.50
C1	18 - Wauchula	43.28	1.02	42.26	41.75	41.75
D1	17 - Adamsville	42.31	2.76	39.55	41.50	41.50
E1	18 - Wauchula	43.44	1.02	42.42	42.00	42.00
F1	17 - Adamsville	41.58	2.76	38.83	<41.50	<41.50
G1	17 - Adamsville	42.25	2.76	39.49	44.00	44.00
H1	18 - Wauchula	43.49	1.02	42.47	41.75	41.75
I1	16 - Chobee	42.72	0.26	42.46	43.00	43.00
M1	9 - Pomona	41.97	1.02	40.95	41.50	41.50
N1	9 - Pomona	42.07	1.02	41.05	<42.00	<42.00
O1	17 - Adamsville	41.99	2.76	39.24	42.00	42.00
T1	17 - Adamsville	41.68	2.76	38.92	41.00	41.00
U1	17 - Adamsville	41.13	2.76	38.38	42.50	42.50
W1	17 - Adamsville	41.42	2.76	38.66	43.00	43.00
X1	17 - Adamsville	43.06	2.76	40.31	N.A.	40.31
Y1	11 - Placid	42.23	0.26	41.97	N.A.	41.97
Z1	17 - Adamsville	40.87	2.76	38.12	N.A.	38.12
A2	17 - Adamsville	38.77	2.76	36.01	N.A.	36.01
D2	17 - Adamsville	35.64	2.76	32.88	N.A.	32.88
E2	23 - Zolfo	36.49	2.76	33.74	N.A.	33.74
F2	34 - Cassia	31.40	2.53	28.88	N.A.	28.88

Notes

1. Isolated floodplain units (J1, K1, L1, P1, Q1, R1, S1, V1, B2, and C2) not evaluated. Any increase in flood stage will be contained on-site.

2. Average ground elevation within each area is based on GIS analysis.

N.A. = Not Available

TABLE 3
Wetland Indicators based on LiDAR Data Bottom of Wetland

Map Unit Identification	Associated Wetland	Wetland Type	Estimated "Normal Pool" (ft NAVD)
A1	LNP - 019	621 Cypress	40.0
B1	LNP - 020, Primarily Upland	621 Cypress	41.0
C1	LNP - 019	621 Cypress	42.5
D1	LNP - 019	621 Cypress	43.0
E1	LNP - 016	617 Mixed Wetland Hardwoods	43.0
F1	LNP - 019	621 Cypress	42.0
G1	LNP - 016	617 Mixed Wetland Hardwoods	42.0
H1	LNP - 019	621 Cypress	43.0
I1	LNP - 016	617 Mixed Wetland Hardwoods	43.0
M1	LNP - 015 & 019	621 Cypress	42.0
N1	LNP - 015 & 019	621 Cypress	42.0
O1	LNP - 015 & 019	621 Cypress	42.0
T1	LNP - 011	621 Cypress	41.0
U1	LNP - 015 & 019	621 Cypress	41.0
W1	LNP - 013	621 Cypress	41.0
X1	LNP - 013 and Upland	621 Cypress	43.0
Y1	LNP - 011 and Upland	621 Cypress	42.0
Z1	LNP - 011 and Upland	621 Cypress (617?)	41.0
A2	LNP - 011 & 012 and Upland	621 Cypress	41.0
D2	LNP - 010	621 Cypress	35.0
E2	Upland		N/A
F2	Minor LNP - 005, Upland		N/A

Notes

1. Isolated floodplain units (J1, K1, L1, P1, Q1, R1, S1, V1, B2, and C2) not evaluated. Any increase in flood stage will be contained on-site.
2. Normal pool estimate is 1-ft above average bottom of wetland.

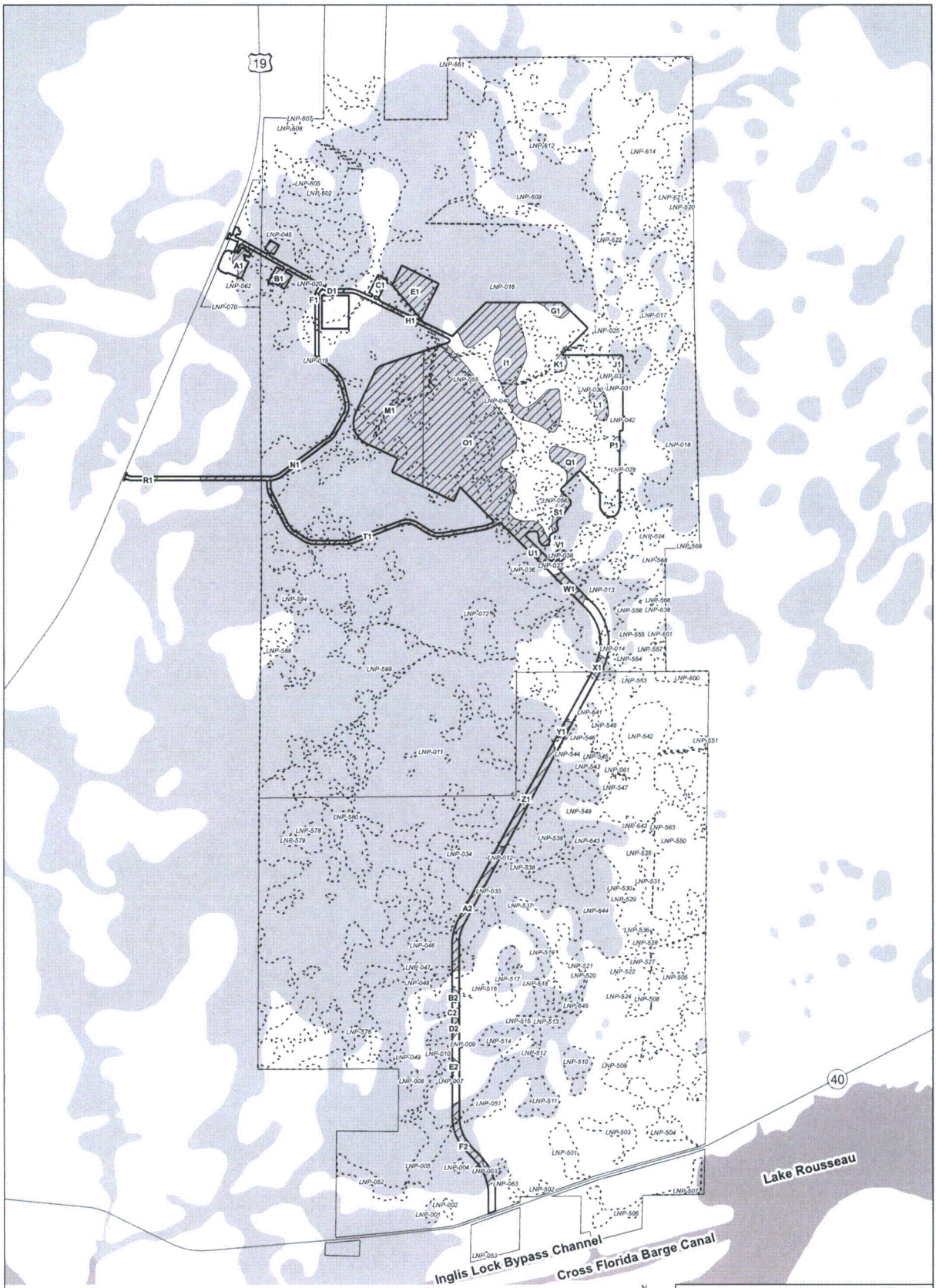
TABLE 4
Estimated Bottom of Storage for Computations

Map Unit Identification	Average Ground Elevation (ft)	NRCS Seasonal High Groundwater Estimate (ft)	Estimated "Normal Pool" (ft NAVD)	Bottom of Floodplain Storage Value Used (ft)	Source	Depth of Fill in Historic Basin Storage (ft)
A1	40.1	<41.5	40.0	40.1	Average Ground	--
B1	41.8	<41.5	41.0	41.8	Average Ground	--
C1	43.3	41.8	42.5	43.3	Average Ground	0.5
D1	42.3	41.5	43.0	43.0	Normal Pool	0.5
E1	43.4	42.0	43.0	43.4	Average Ground	0.5
F1	41.6	<41.5	42.0	42.0	Normal Pool	0.5
G1	42.3	44.0	42.0	42.3	Average Ground	0.5
H1	43.5	41.8	43.0	43.5	Average Ground	--
I1	42.7	43.0	43.0	43.0	Normal Pool	0.5
M1	42.0	41.5	42.0	42.0	Average Ground & Normal Pool	--
N1	42.1	<42.0	42.0	42.1	Average Ground	0.5
O1	42.0	42.0	42.0	42.0	Average Ground & Normal Pool	--
T1	41.7	41.0	41.0	41.7	Average Ground	--
U1	41.1	42.5	41.0	41.1	Average Ground	0.5
W1	41.4	43.0	41.0	41.4	Average Ground	--
X1	43.1 *	40.3	43.0	43.1	Average Ground	--
Y1	42.2 *	42.0	42.0	42.2	Average Ground	--
Z1	40.9 *	38.1	41.0	41.0	Normal Pool	0.1
A2	38.8 *	36.0	41.0	41.0	Normal Pool	2.2
D2	35.6 *	32.9	35.0	35.6	Average Ground	--
E2	36.5 *	33.7	N/A	36.5	Average Ground	--
F2	31.4 *	28.9	N/A	31.4	Average Ground	--

Notes:

1. Isolated floodplain units (J1, K1, L1, P1, Q1, R1, S1, V1, B2, and C2) not evaluated. Any increase in flood stage will be contained on-site.
2. Normal pool estimate is 1-ft above average bottom of wetland.
3. Historic basin storage is estimated as the difference in the bottom of floodplain storage and the average ground elevation. A value of 6-inches is used when the average ground elevation is at or above the floodplain elevation (Table 1).

* Beyond extent of groundwater monitoring wells, estimated from contours (Figure 5).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Lake Rousseau
Inglis Lock Bypass Channel
Cross Florida Barge Canal
LEGEND
Property Boundary
Field Survey Wetlands
Limits of Construction
Floodplain Fill Areas
FEMA Zone A
FEMA Zone AE
Reference:
Attachment B Map Book - Potential
Fill Areas within FEMA-Mapped
Fill Areas within FEMA-Mapped Floodplain
N
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Meters
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1" = 2000'
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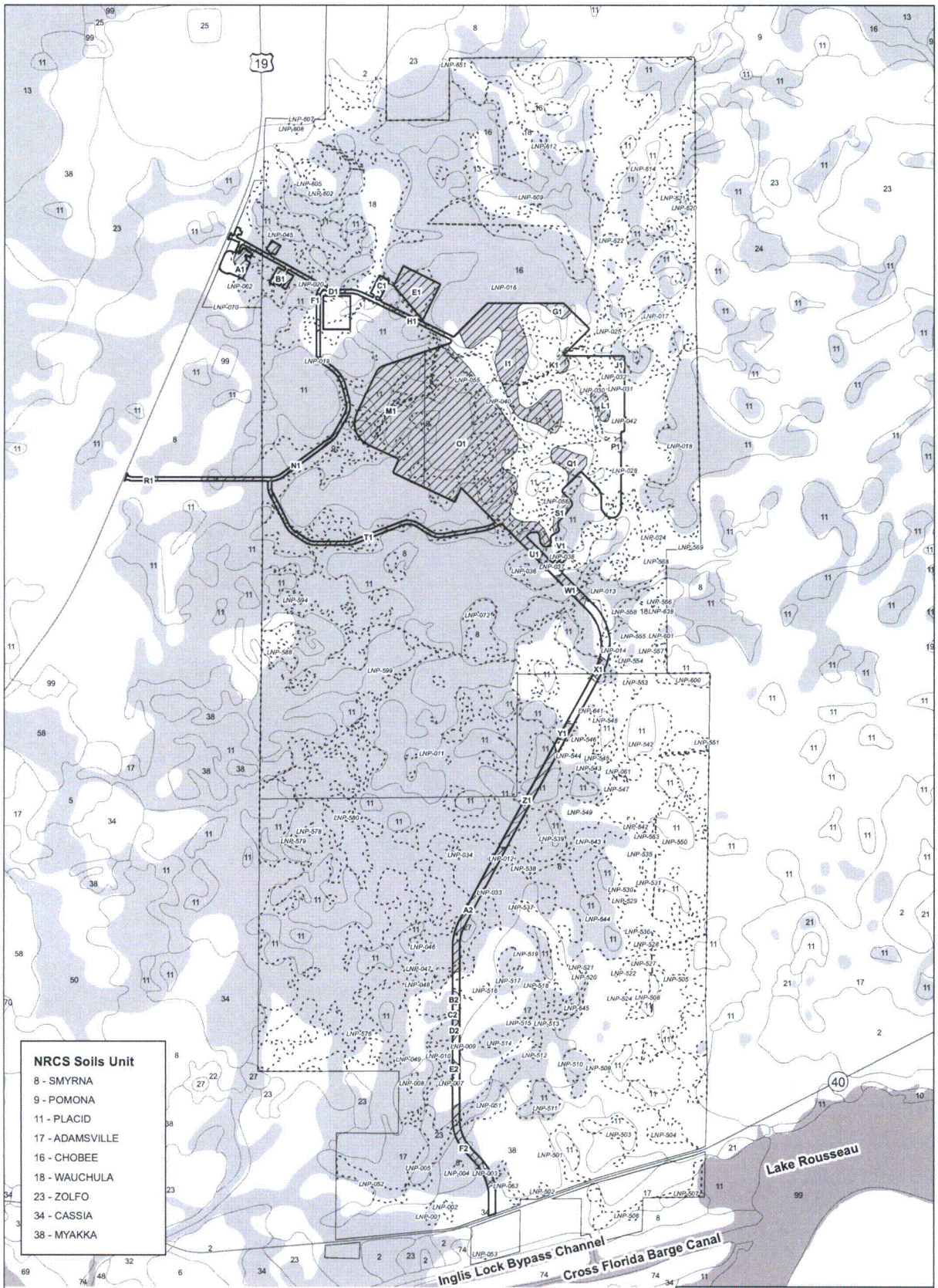
Normal Pool Wetland Indicators
Figure 3

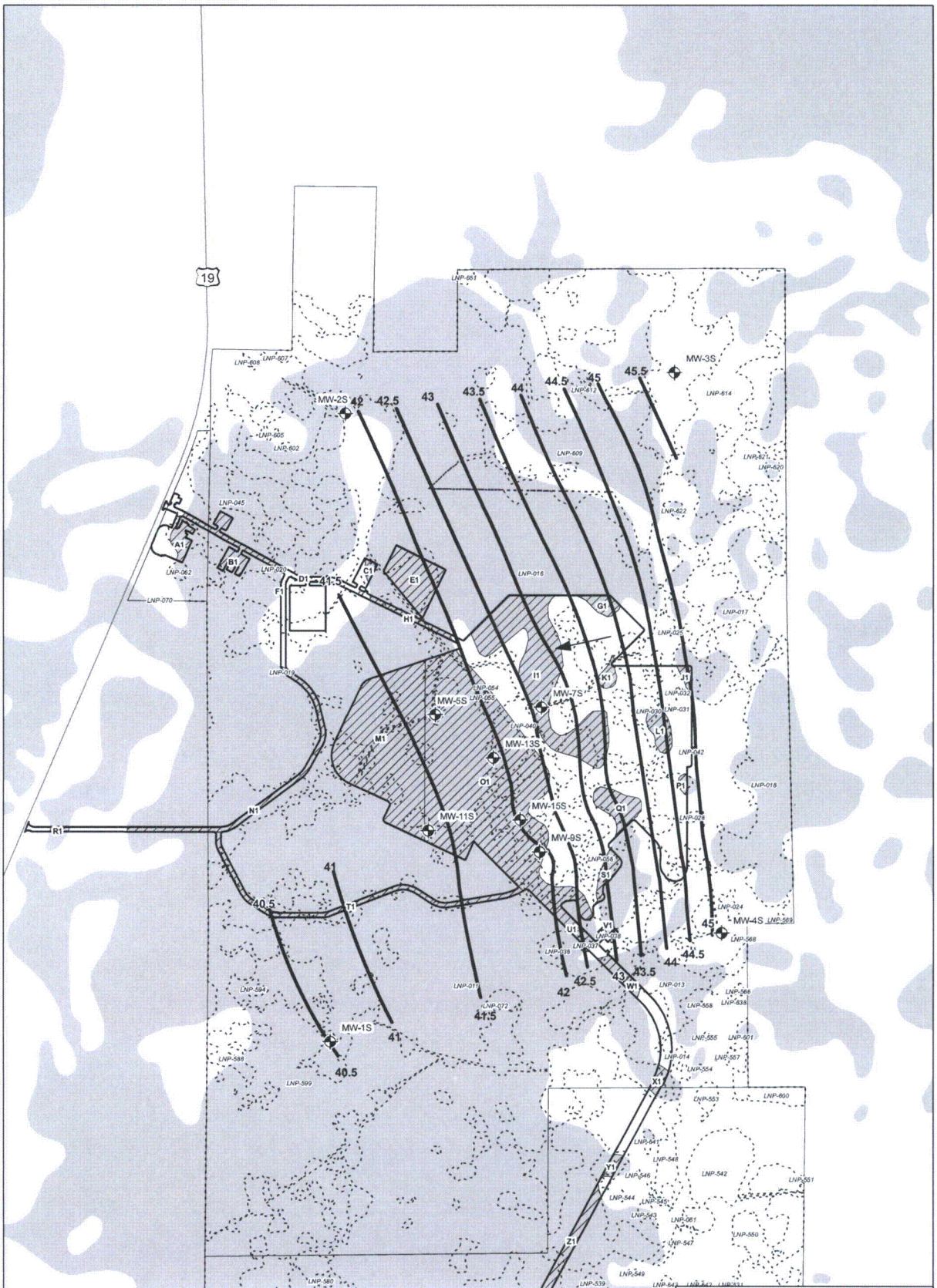


Progress Energy Florida

Levy Nuclear Plant
Units 1 and 2
Floodplain Evaluation Bounding Analysis Technical Memorandum

NRCS Soils Map

Figure 4



LEGEND

- Monitoring Well
- Potentiometric Contours
- Property Boundary
- Field Survey Wetlands
- Limits of Construction
- Floodplain Fill Areas
- FEMA Zone A

Reference:
Levy Nuclear Plant Units 1 and 2 – Part 3, Environmental Report Rev 0, Chapter 2, Figure 2.3-20 (June 2008)

N
W E
S

0 225 450
Meters

0 750 1,500
1" = 1500'

Progress Energy Florida
Levy Nuclear Plant Units 1 and 2
Floodplain Evaluation Bounding Analysis Technical Memorandum

Groundwater Monitoring Results (Highest Quarter)

Figure 5

3. **Use the data from steps 1 and 2 to determine the volume of fill within the affected floodplain at each location.**

   Table 5 presents the estimated volume of fill within FEMA-mapped floodplains. The depth of floodplain is determined by taking the difference between the average floodplain elevation (Table 1) and the estimated bottom of storage (Table 4) to determine the depth of fill. Six-inches was assumed as the minimum depth of fill in any given map unit. The depth of fill for each map unit is then multiplied by the total affected area (Table 1) to determine the floodplain fill volume.

4. **Add a conservative estimate for the on-site transmission corridor volume of fill within the floodplain map units.**

   The on-site transmission corridor also includes portions of the Zone A mapping; therefore, it is assumed that a portion of the transmission poles/foundations may be located within the existing FEMA-mapped floodplain. A conservative estimate of the potential fill volume was evaluated conservatively assuming that all poles/foundations are located within the floodplain. Assuming a 750-foot pole spacing along the 16,900-foot transmission corridor and a 20-foot by 20-foot maximum size pole foundation, the estimated area of on-site impact would total approximately 0.2 acres. Assuming a conservative 1-foot depth of floodplain for the poles/foundations, the resulting volume of fill is estimated at 0.2 ac-ft (refer to Table 5). This was added to the potential fill volume for purposes of this analysis.

5. **Determine the rise provided within the large floodplain system that extends off-site.**

   This step was conducted for the single large wetland along the western half of the site. Surface drainage is generally by overland flow, crossing the site from the higher topography to the north and east of the proposed LNP plant site toward the southwest. The wetlands on the property will temporarily store water for a longer duration than the rest of the site. Isolated on-site wetlands are not included in this analysis as fill in these map units will not affect off-site lands. The "Downstream Remainder Floodplain" is the portion of the connected FEMA-mapped floodplain located down-gradient of the LNP plant site, Heavy Haul Road and south of the US 19 Access Road. This downstream remainder of floodplain is approximately 1,453 acres as shown in Figure 6. Some of this FEMA-mapped connected floodplain is on Progress Energy property and some is off-site. However, the total potential rise computation shown below used the downstream wetland area on PEF's site. The computed potential on-site rise in the downstream remainder floodplain is shown below:

$$\text{Total Fill Volume} = 320.1 \text{ ac-ft}$$

$$\text{Downstream Remainder FEMA- Mapped Floodplain} = 1{,}452.9 \text{ ac}$$

$$\text{Estimated Rise} = \frac{\text{Total Fill Volume}}{\text{Downstream Remainder FEMA-Mapped Floodplain}}$$

$$= \frac{320.1 \text{ ac-ft}}{1{,}452.9 \text{ ac}}$$

$$= 0.22 \text{ ft} = 2.6 \text{ in}$$

TABLE 5
Summary of FEMA-Mapped Floodplain Evaluation at LNP Site

Map Unit Identification	Floodplain Area[1] (acres)	Floodplain Elevation[2] (ft)	Bottom Elevation[3] (ft)	Depth of Fill in Floodplain (ft)	Estimated Floodplain Fill Volume[4] (ac-ft)	Depth of Fill in Historic Basin Storage (ft)	Estimated Historic Basin Storage Volume (ac-ft)
A1	3.2	41	40.1	0.9	2.9	--	--
B1	7.5	42	41.8	0.2	1.5	--	--
C1	1.0	43	43.3	--	0.0	0.5	0.5
D1	0.0	42	43.0	--	0.0	0.5	0.0
E1	13.6	43	43.4	--	0.0	0.5	6.8
F1	0.1	42	42.0	--	0.0	0.5	0.1
G1	3.1	42	42.3	--	0.0	0.5	1.6
H1	2.6	44	43.5	0.5-	1.3	--	--
I1	47.8	43	43.0	--	0.0	0.5	23.9
M1	67.0	43	42.0	1.0	67.0	--	--
N1	9.3	42	42.1	--	0.0	0.5	4.7
O1	128.8	43	42.0	1.0	128.8	--	--
T1	10.5	42	41.7	0.3	3.4	--	--
U1	3.4	41	41.1	--	0.0	0.5	1.7
W1	3.4	43	41.4	1.6	5.4	--	--
X1	1.7	44	43.1	0.9	1.6	--	--
Y1	1.4	43	42.2	0.8	1.1	--	--
Z1	8.2	43	41.0	2.0	16.4	--	--
A2	10.1	42	41.0	1.0	10.1	0.1	0.8
D2	1.3	36	35.6	0.4	0.5	2.2	22.2
E2	0.8	37	36.5	0.5	0.4	--	--
F2	6.7	34	31.4	2.6	17.4	--	--
On-Site Transmission[5]	0.2	--	--	1.0	0.2	--	--
Total Area (ac)	**331.7**	**Total Estimated Fill Volume (ac-ft)**			**257.9**	**--**	**62.2**

Notes:
1. Area based on polygon of intersection between the FEMA mapping and the limits of construction using GIS.
2. Determined from 1-foot accuracy topography obtained with LiDAR.
3. From Table 4.
4. Volume determined by multiplying the area defined in Note 1 by the average depth of fill within the floodplain. The average depth of fill within the floodplain was determined by subtracting the bottom elevation from the average 100-year floodplain elevation.
5. Assuming a 750-foot pole spacing along the 16,900-foot transmission corridor and a 20-foot by 20-foot maximum size pole foundation, results in the 0.2 ac estimated potential affected area. Assuming a conservative 1-foot depth of floodplain and counting the entire number of poles/foundations, the resulting volume of fill is estimated at 0.2 ac-ft.


19
Remainder Floodplain =
1452.93 Ac.
40
Lake Rousseau
Inglis Lock Bypass Channel
Cross Florida Barge Canal
LEGEND
Downstream Remainder Floodplain
Property Boundary
Limits of Construction
FEMA Zone A
FEMA Zone AE
N
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1" = 2000'
Progress Energy Florida
Levy Nuclear Plant
Units 1 and 2
Floodplain Evaluation Bounding
Analysis Technical Memorandum
Downstream Remainder Floodplain
Figure 6

6. **Assess if compensating storage is required at each location.**

Floodplain areas wholly contained on the property do not require compensation if the areas drain to stormwater ponds designed for the 100-year, 24-hour event. As shown in step 5, the connected floodplain rise is 2.6-inches when considering just the on-site portion of the downstream FEMA-mapped floodplain. As this rise calculation is based on the volume of fill and area of undisturbed downstream floodplain, it does not account for the benefit of the on-site stormwater ponds. At this point, no determination has been made as to the "significance" relative to the need for compensating storage. If off-site effects are determined to be insignificant, no compensation is required.

7. **Identify upland compensation areas adjacent to the existing floodplain.**

This step was completed by estimating the seasonal high groundwater at each location, then determining an area and excavation depth to provide one-to-one storage volume compensation, if required. This additional step was conducted to determine the potential floodplain compensation areas that may be available on-site for this bounding analysis. This section describes the process used to identify these areas, while the next section provides the results.

A GIS spatial analysis was used to identify the location and area of land outside of estimated wetlands that are at least 100-foot from the outside property line (Attachment C) for review as potential compensation storage. Upland areas where by their use for compensation would potentially result in additional wetland impacts (through proximity or a need for access) or are isolated from the FEMA-mapped floodplain were eliminated from consideration.

Habitat assessments were conducted on the north and south properties, south along the proposed Heavy Haul Road to the intake area, and the blowdown corridor. Assessments were based on desktop analyses (using FLUCCS, FNAI, aerial photo-interpretation, and other available resources) for the entire north and south properties, with more detailed field evaluations in the potential project impact areas. The more detailed analyses included wetland delineations, functional analyses, and protected species surveys. Field surveys have been ongoing to some degree since fall 2006, and throughout the year to capture seasonal variations.

All areas identified as habitat for protected species will be avoided if floodplain compensation is required, and no adverse effects on protected species or their habitat are expected. If protected species are identified in the potential compensation area at the time of excavation, the area will either be avoided, or the species will be relocated or mitigated for in consultation with appropriate regulatory agencies.

Most of the on-site wetlands have been defined through field delineation, with boundaries field-verified by the USACE and the FDEP. Wetland boundaries in the potential compensation areas will be confirmed through field delineation if not already field-delineated. Should the final wetland configuration reduce the area available for floodplain compensation, there appears to be more than sufficient upland area available to provide on-site floodplain compensation.

Off-site Transmission Corridors/Transmission Lines

New off-site transmission lines will be required to integrate the electrical power generated at LNP site to the Florida electrical grid system. The proposed corridors will be primarily within or adjacent to PEF's existing high voltage transmission lines. The total transmission line length is over 180 miles located in over approximately 148 miles of corridor. Of the corridor length, almost 34 miles is located within mapped Zone A or Zone AE (A1 through A30) floodplains (refer to Attachment E). As shown in the following breakdown by county, the length of floodplain is very small compared to the overall transmission length.

- Citrus County – 7.7 miles, approximately 5.2 percent
- Lake County – Not applicable, does not cross floodplain
- Levy County - 2.0 miles, approximately 1.4 percent
- Marion County – 3.2 miles, approximately 2.2 percent
- Hernando County – Not applicable, does not cross floodplain
- Sumter County – 4.2 miles, approximately 2.8 percent
- Polk County – 2.0 miles, approximately 1.4 percent
- Hillsborough County – 14.8 miles, approximately 9.9 percent
- Pinellas County – substation only, does not cross floodplain

Transmission lines are in parallel and adjacent to existing facilities to the greatest extent possible. This co-location allows for the use of existing access roads and reduces the amount of new fill to the floodplains. New fill for access roads may require compensation storage. Typically, compensation storage immediately adjacent to the floodplain fill within the transmission right-of-way is used when required, which would mean no additional land-use change or off-site effects.

4.0 Compensation Results

The floodplain compensation evaluation process used at the LNP site and the transmission corridor for the *bounding analysis* are described in this section.

LNP Plant Site and On-Site Transmission Corridor

Approximately 257.9 acre-feet of floodplain fill at the LNP site was determined and presented in Table 5. This is considered a conservatively high value for the bounding analysis as not every area may be counted as fill such as wet detention ponds. Compensating storage, also referred to as cup-for-cup storage locally, was reviewed as summarized in Table 6. Compensation storage was only considered for fill affecting the single, large, contiguous floodplain. Cup-for-cup storage was not considered for the fully isolated floodplains (map units J1, K1, L1, P1, Q1, R1, S1, V1, B2, and C2) for two reasons. First, any increase in floodplain elevation is totally contained on-site; therefore, not reaching any adjacent off-site property owners. Second, the proposed development is routed to the on-site wet detention ponds, which were designed to accommodate the 100-year, 24-hour storm which reduces some runoff discharged off-site during storms.

Potential On-Site Compensation Locations

There are five potential on-site compensation locations that could yield up to 316.4 acre-feet of compensating storage as shown in Figure 7. Attachment D presents a detailed map book of these potential on-site compensation storage locations. With an estimated maximum of 257.9 acre-feet of compensating storage required, less than half the amount identified as potentially available, there is sufficient upland area on-site to provide cup-for-cup floodplain compensation if any is required. The floodplain compensation requirements will be updated after further detailed modeling of the conveyance is completed.

Based on the results of site ecological surveys, areas selected as potential compensation areas are low quality upland habitat areas disturbed through conversion to silviculture. No high quality or threatened and endangered species habitat will be adversely affected by floodplain compensation, if required. Each candidate compensation area will be re-evaluated prior to construction to ensure that only low-quality uplands are used for compensation.

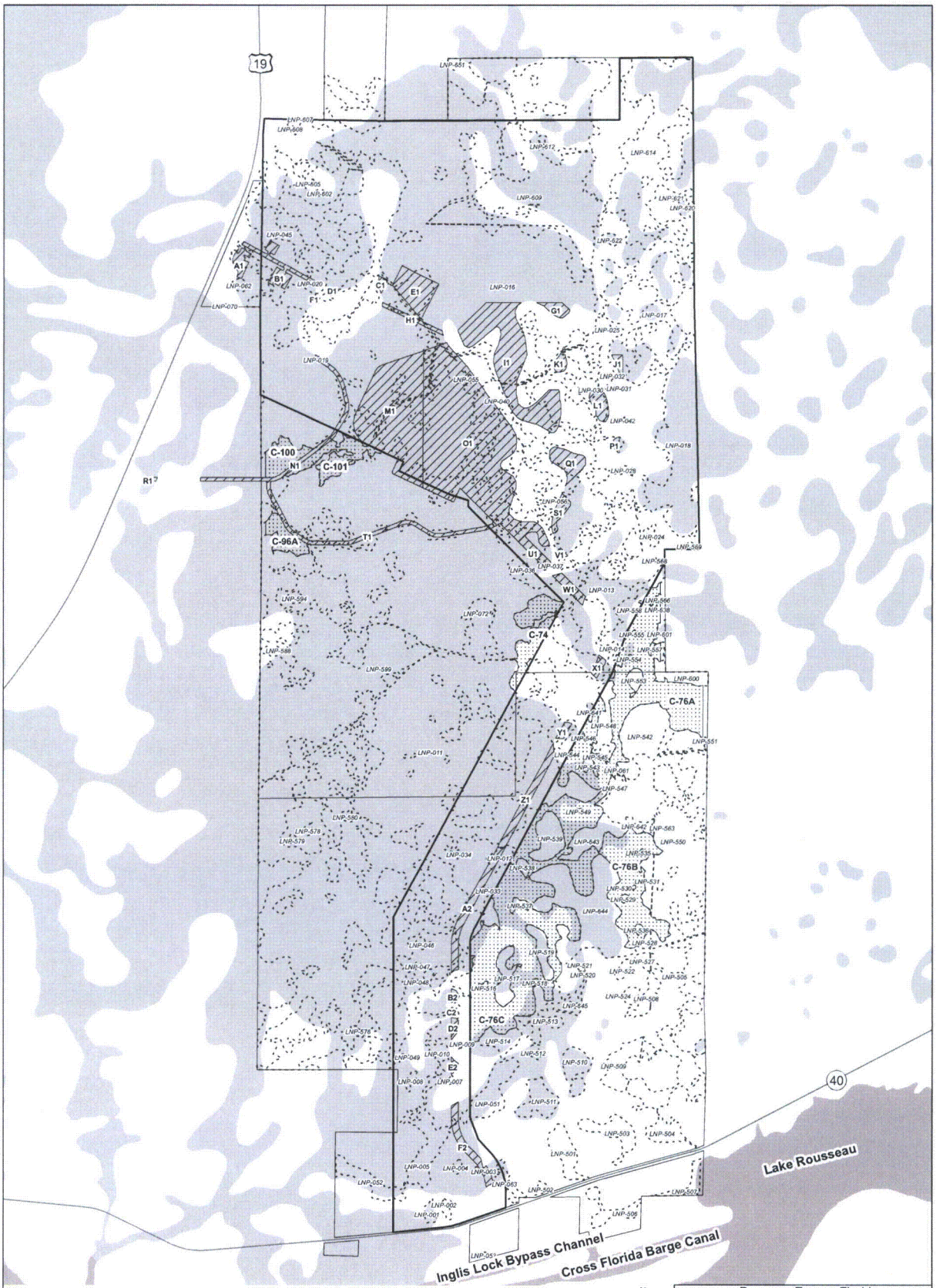
Since excavation for floodplain compensation is typically limited to the seasonal high groundwater level, no effects on nearby wetlands are anticipated. Hydrological assessments will be conducted to ensure that there is no resulting change in the hydroperiods of adjacent ecosystems. Where appropriate, some compensation areas may be incorporated into the wetland mitigation plan as wetland creation areas.

TABLE 6
Volume of Estimates for Potential Compensation Locations

Compensation Identification	Area (ac)	Average Ground Elevation (ft)	Soil Type	Depth to Water Table (ft)	Estimated from Soil (ft)	Adjacent to Affected Map Unit	Bottom of Value Used	Depth (ft)	Estimated Volume Available (ac-ft)
C-74	20.11	42.65	17 - Adamsville	2.76	39.89	Downgradient of W1 (41)	40	2.65	53.3
C-76A	84.88	43.49	17 - Adamsville	2.76	40.74	Upgradient of X1 (43)	42	1.49	126.5
C-76B	78.48	40.62	17 - Adamsville	2.76	37.86	Z1 & A2 (41)	40	0.62	48.7
C-76C	102.94	37.55	17 - Adamsville	2.76	34.80	Upgradient A2, B2, C2, D2	37	0.55	56.6
C-96A	9.34	42.00	17 - Adamsville	2.76	39.24	T1 (41)	40	2.00	18.7
C-100	10.74	42.65	9 - Pomona	1.02	41.63	N1 (42)	42	0.65	7.0
C-101	15.57	42.36	9 - Pomona	1.02	41.34	N1 (42)	42	0.36	5.6
Total Area (ac)	*322.06*								
Total Estimated Volume Available (ac-ft)									**316.4**

Notes:

1. Area C-76 was split into three viable areas due to its large size.
2. Areas and average ground elevations were computed using GIS.
3. Floodplain volume compensation is required to be above seasonal high groundwater, which requires more land area than historic basin storage replacement, if required.



Progress Energy Florida

Levy Nuclear Plant
Units 1 and 2
Floodplain Evaluation Bounding Analysis Technical Memorandum

Potential On-Site Compensation Storage Locations

Figure 7

Off-Site Transmission Corridors/Transmission Lines

Potential floodplain fill is being considered in the transmission right-of-way siting process. In this process, new facilities will be co-located within existing PEF right-of-way and facilities to the greatest extent possible. This co-location allows for the use of existing access roads and reduces the amount of new fill to the floodplains. Regardless of the minimization efforts, the state ERP rules will require floodplain fill to be addressed for transmission corridors as well. Typically, compensation storage immediately adjacent to the floodplain fill within the transmission right-of-way is used when required, which would mean no additional land-use change or off-site effects.

Summary and Path Forward

This *Floodplain Evaluation Bounding Analysis* provides a planning-level analysis of the potential floodplain impacts resulting from placing LNP construction fill in regulated floodplains, and a general assessment related to the off-site transmission corridor's effects on floodplains. The maximum potential need for additional compensating area has been estimated based on 1-foot contour data, wetland indicators, and geotechnical data already available for the LNP site. Geographic Information System (GIS) evaluation was performed for the transmission alignment to identify potential floodplain fill locations and potential compensation areas, as deemed necessary.

Floodplain compensation ultimately may not be required resulting from the small rise estimated. A 2.6-inch rise in the remainder of the FEMA-designated floodplain "downstream" of the project impacts and within the property boundary was determined using the volume of fill within the FEMA-designated floodplain. This rise was determined without considering the reduction in runoff and storage the on-site stormwater ponds will provide. No official determination has been made as to whether or not this estimated rise constitutes an insignificant effect; however this document serves as a sensitivity analysis to show that sufficient on-site, upland compensation storage is available if deemed necessary.

A separate modeling effort is currently underway to establish base flood elevations and to refine the extent of the floodplain based on the survey data that meets FEMA floodplain mapping specifications and site conditions. Modeling will also incorporate the site fill and stormwater improvements to determine the off-site rise, if any, and to develop a compensation plan. Any compensation plan, if required, will be closely coordinated with the wetland mitigation plan to develop compatible on-site locations.

Coordination with FDEP will be necessary to review and approve the model results and need for compensation, if any. If compensation is required, ecologists will evaluate all candidate upland areas for habitat quality and function to ensure that only lower-quality upland areas are considered. Most of the upland areas on-site have been degraded through silvicultural activities. No high quality or threatened and endangered species habitat will be adversely affected by floodplain compensation. Each candidate compensation area will be re-evaluated prior to construction to ensure that only low-quality uplands are used for compensation.

ATTACHMENT A

LIDAR ACCURACY STATEMENT

AERO-METRIC

PHOTOGRAMMETRY & GEOSPATIAL DATA SOLUTIONS

AERO-METRIC, INCORPORATED
4020 TECHNOLOGY PARKWAY - SHEBOYGAN, WI 53083
P.O. BOX 449 - SHEBOYGAN, WI 53082-0449
TEL: (920) 457-3631 FAX: (920) 457-0410

Office Locations
Anchorage, Alaska
Fort Collins, Colorado
Minneapolis, Minnesota
Kansas City, Missouri
Dallas, Texas
Dulles, Virginia
Virginia Beach, Virginia
Seattle, Washington
Chilton, Wisconsin
Sheboygan, Wisconsin

SARGENT & LUNDY, L.L.C.
Photogrammetric Mapping
(Florida Site)
Accuracy Statement

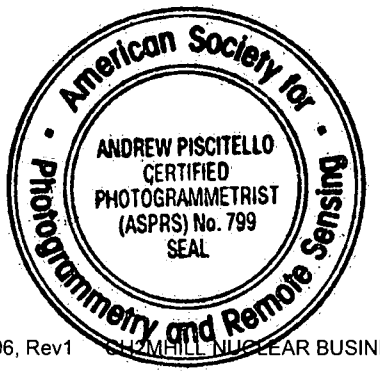
Sargent & Lundy Specification Number:	P-2800
Project Number:	11945-013
Contractor:	AERO-METRIC, Inc. 4020 Technology Parkway Sheboygan, Wisconsin 53083
Project Number:	1-061008
Photo Scale:	1"=660'
LiDAR Altitude:	3,609'
Planimetric Mapping:	1"=100'
Contour Interval:	1'
Digital Ortho Photo Pixel Resolution:	0.5' GSD
Units:	United States Survey Foot
Coordinate System:	Florida State Plane Coordinate System, West Zone
Horizontal Datum:	North American Datum 1983/1999 (NAD 83/99)
Vertical Datum:	North American Vertical Datum 1988 (NAVD 88)

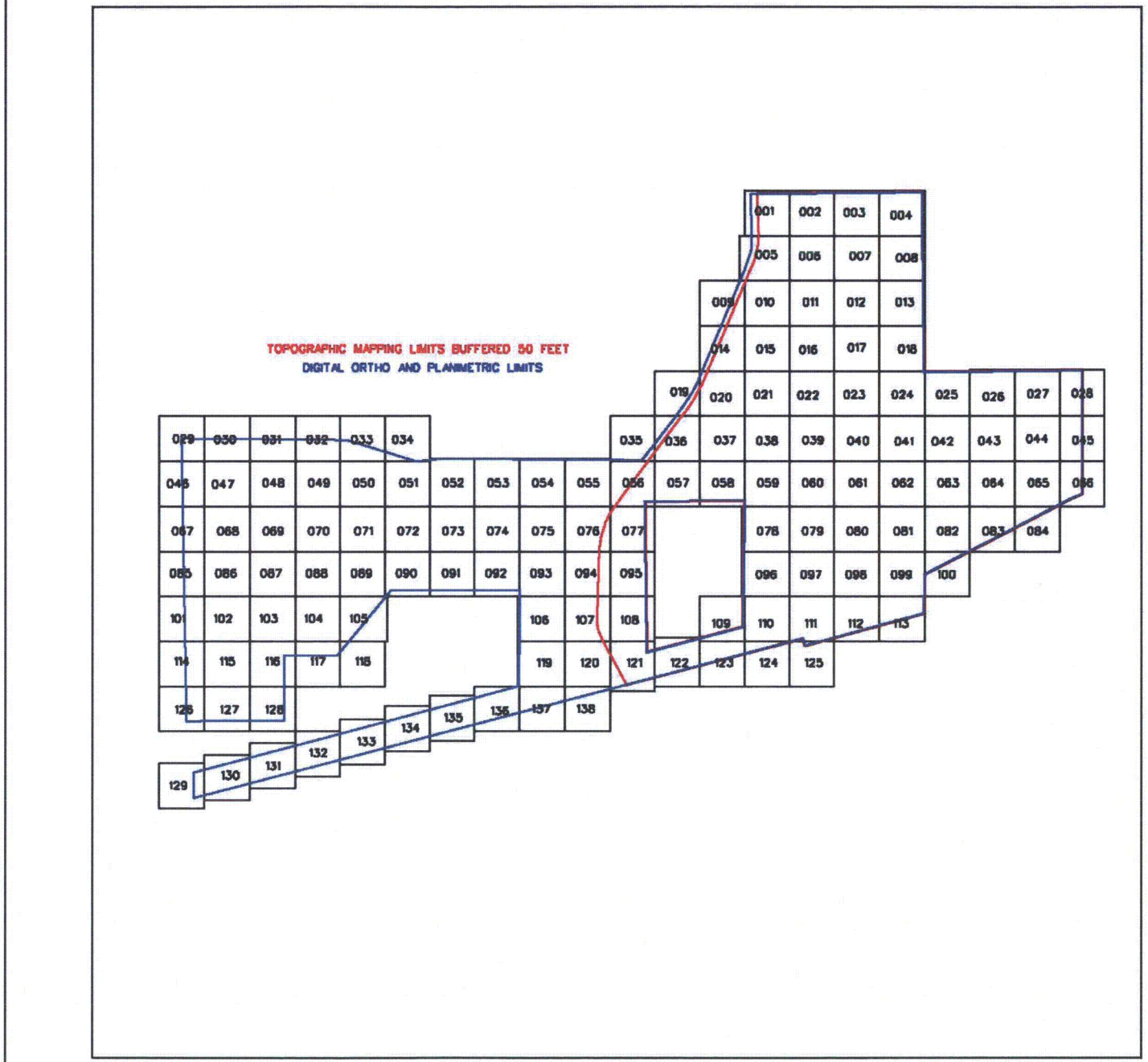
Photogrammetric Mapping Accuracy Statement:

The final project photogrammetric mapping deliverables included a combination of planimetric, LiDAR DTM, contours and digital orthophoto mapping. The mapping was produced according to procedures that have been demonstrated to comply with the United States National Map Accuracy Standards (NMAS) for a target horizontal scale of 1"=100' and a specified contour interval of one foot. The Lidar DTM data was produced to meet the Federal Emergency Management Agency (FEMA) floodplain mapping specifications.

Signed: _____ Date: 7 Mar '07

Andrew Piscitello, Vice President Production
ASPRS, Certified Photogrammetrist, #R799

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OF
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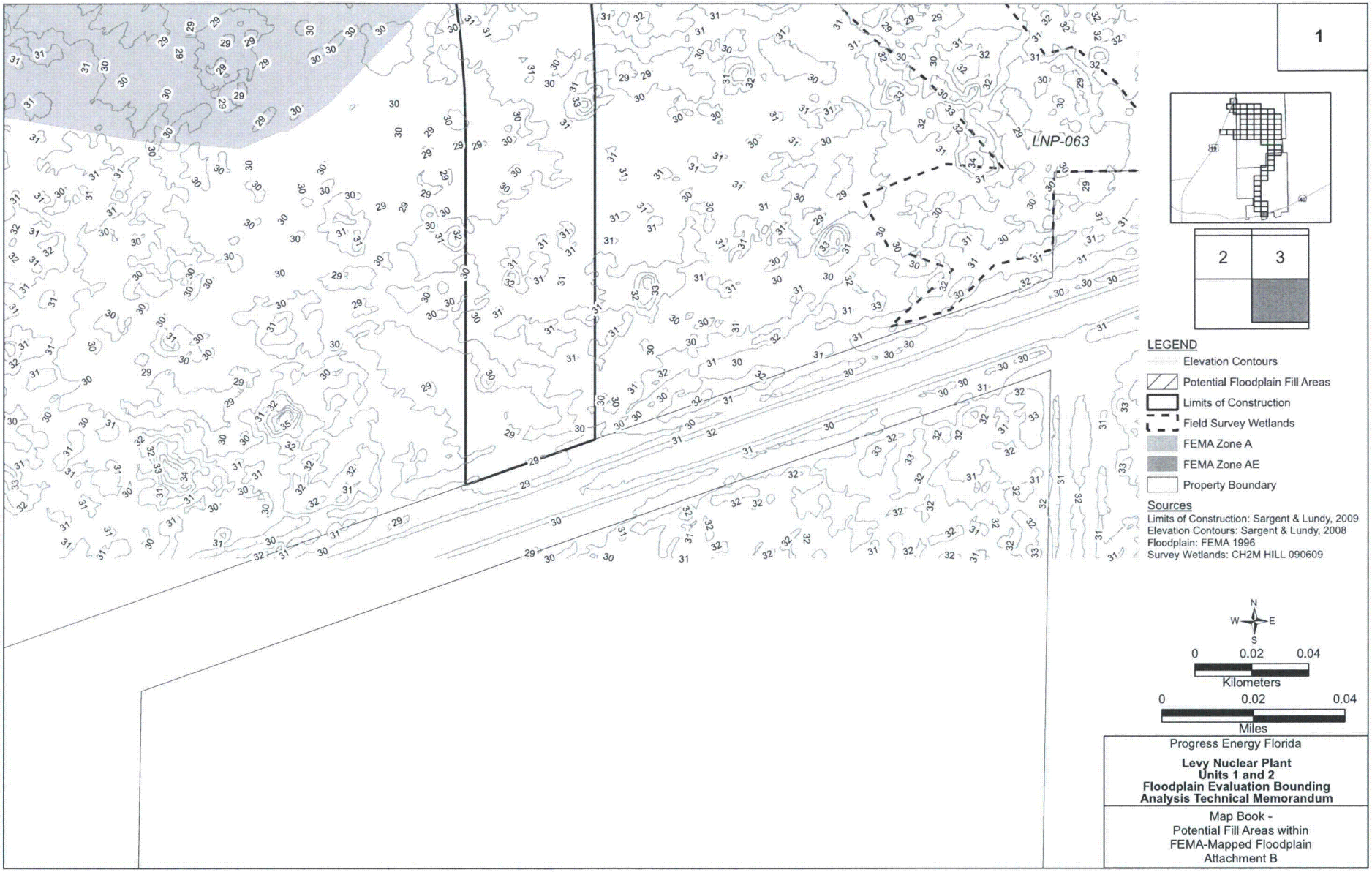
PREPARED FOR
SARGENT AND LUNDY LLC
PROGRESS ENERGY, FLORIDA
PREPARED BY
AERO-METRIC, INC.
SHEBOYGAN, WISCONSIN

ATTACHMENT B

MAP BOOK – POTENTIAL FILL AREAS WITHIN FEMA-MAPPED FLOODPLAIN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Potential Floodplain Fill Areas
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FEMA Zone AE
Property Boundary
Sources
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Floodplain: FEMA 1996
Survey Wetlands: CH2M HILL 090609
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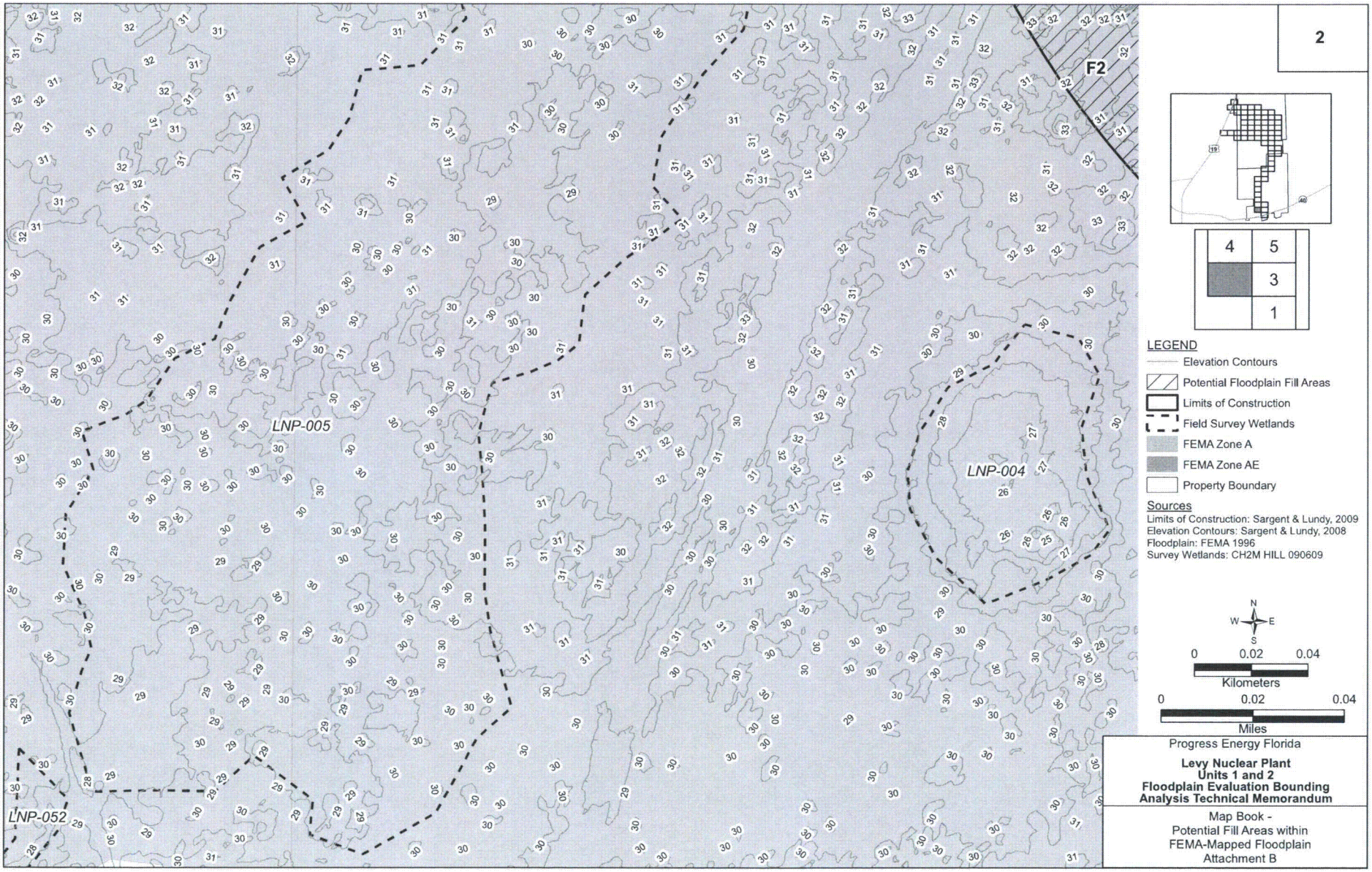
Levy Nuclear Plant
Units 1 and 2
Floodplain Evaluation Bounding
Analysis Technical Memorandum
Map Book -
Potential Fill Areas within
FEMA-Mapped Floodplain
Attachment B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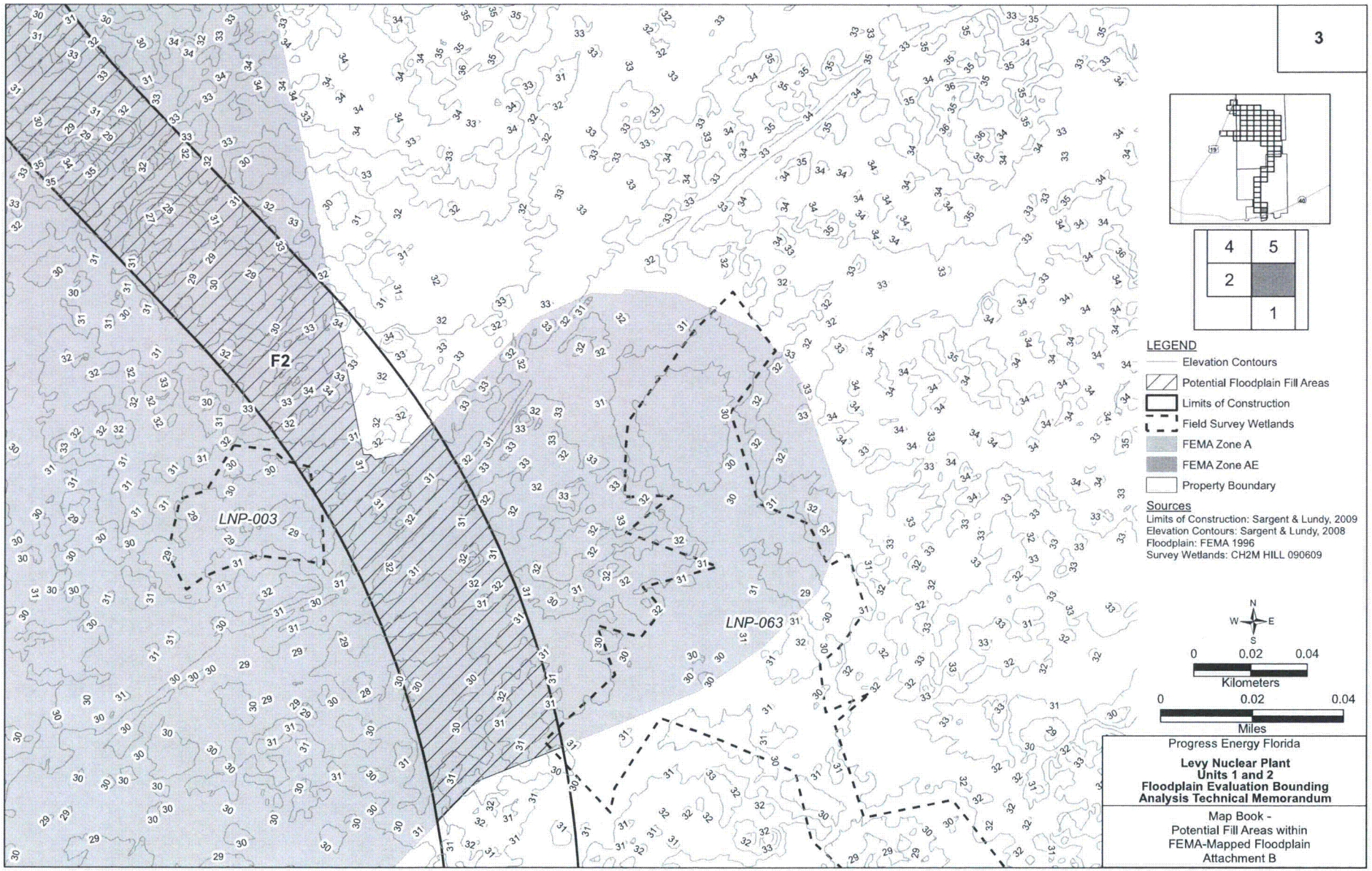

Progress Energy Florida

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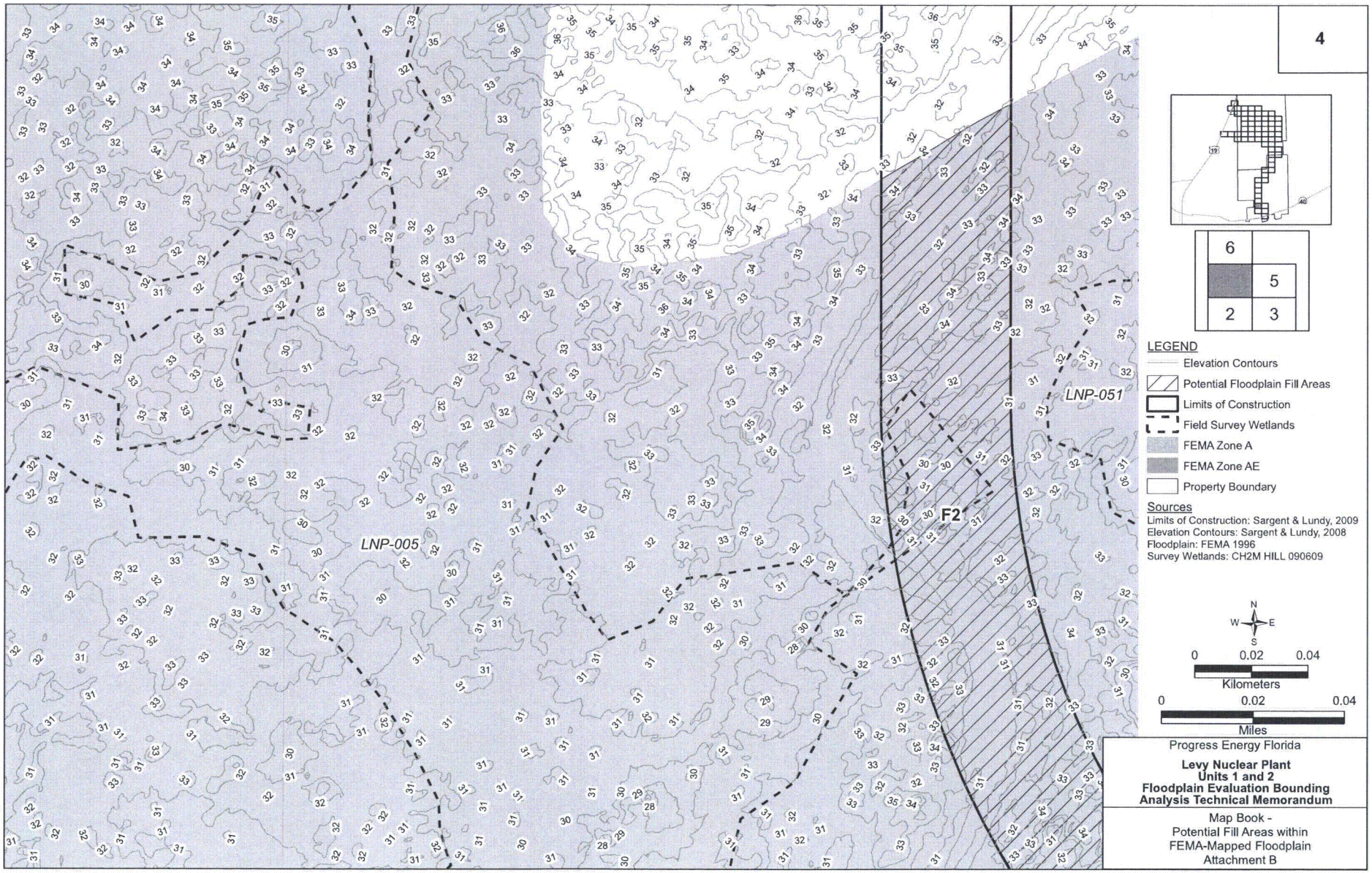
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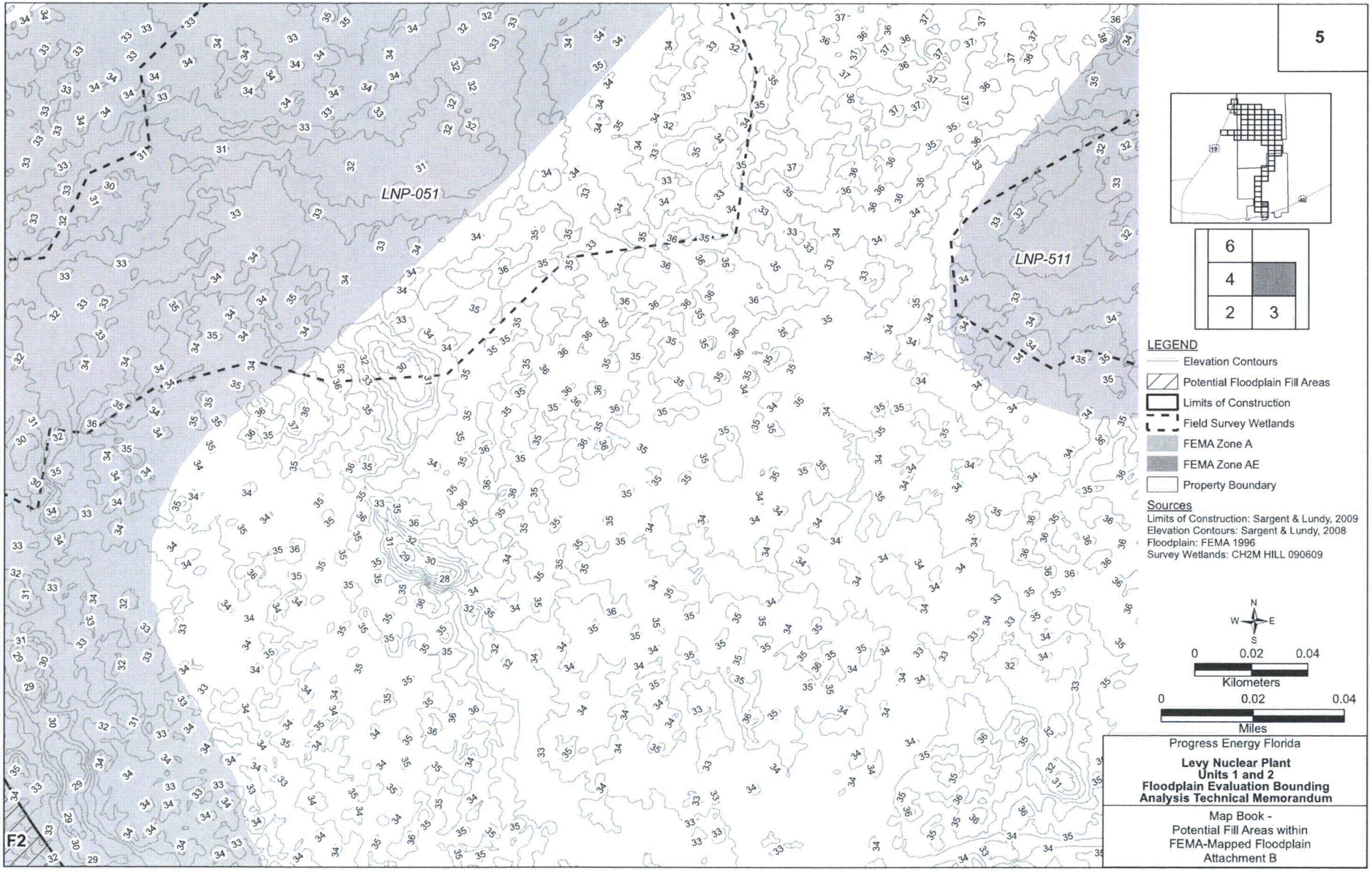
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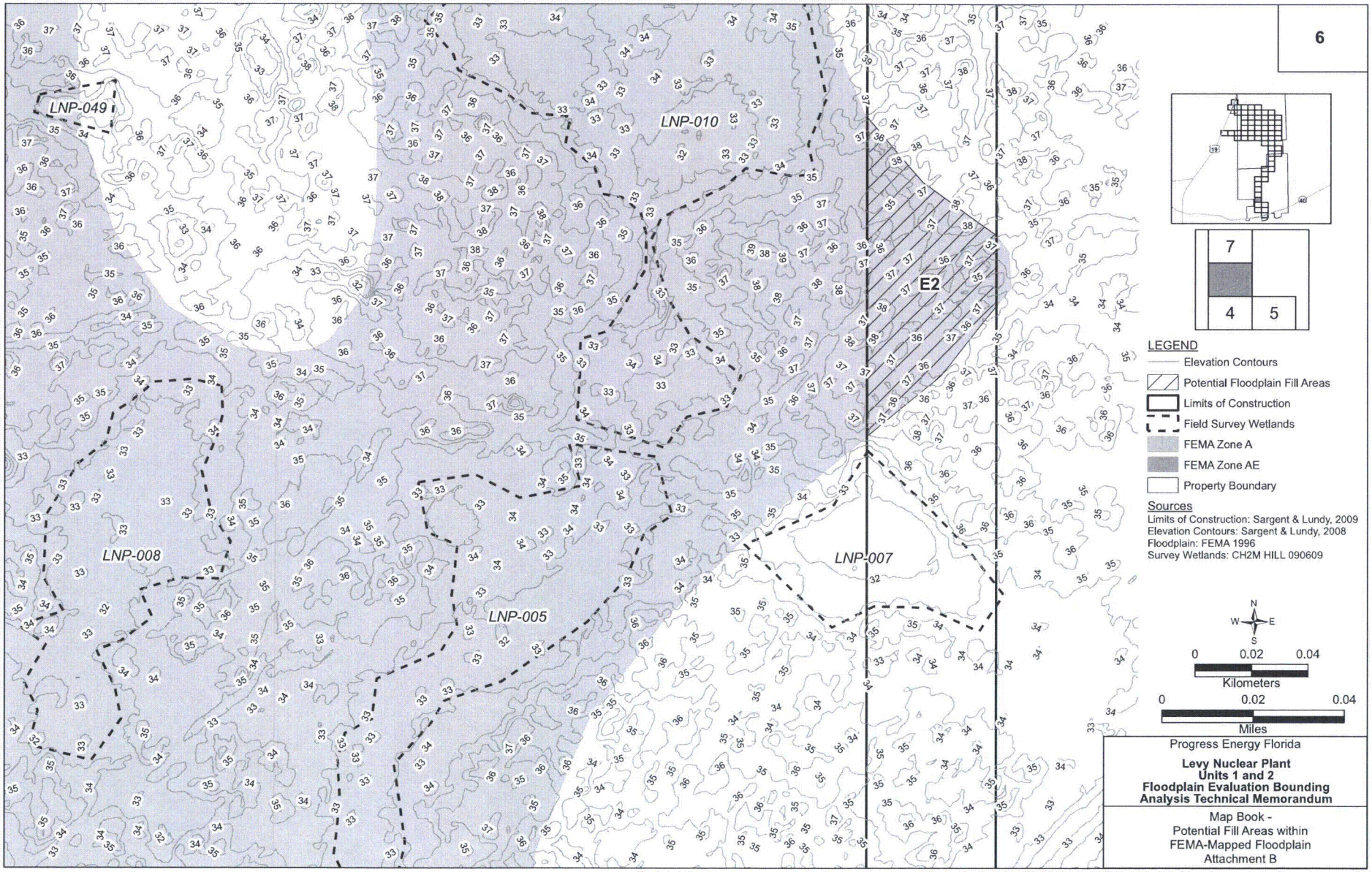
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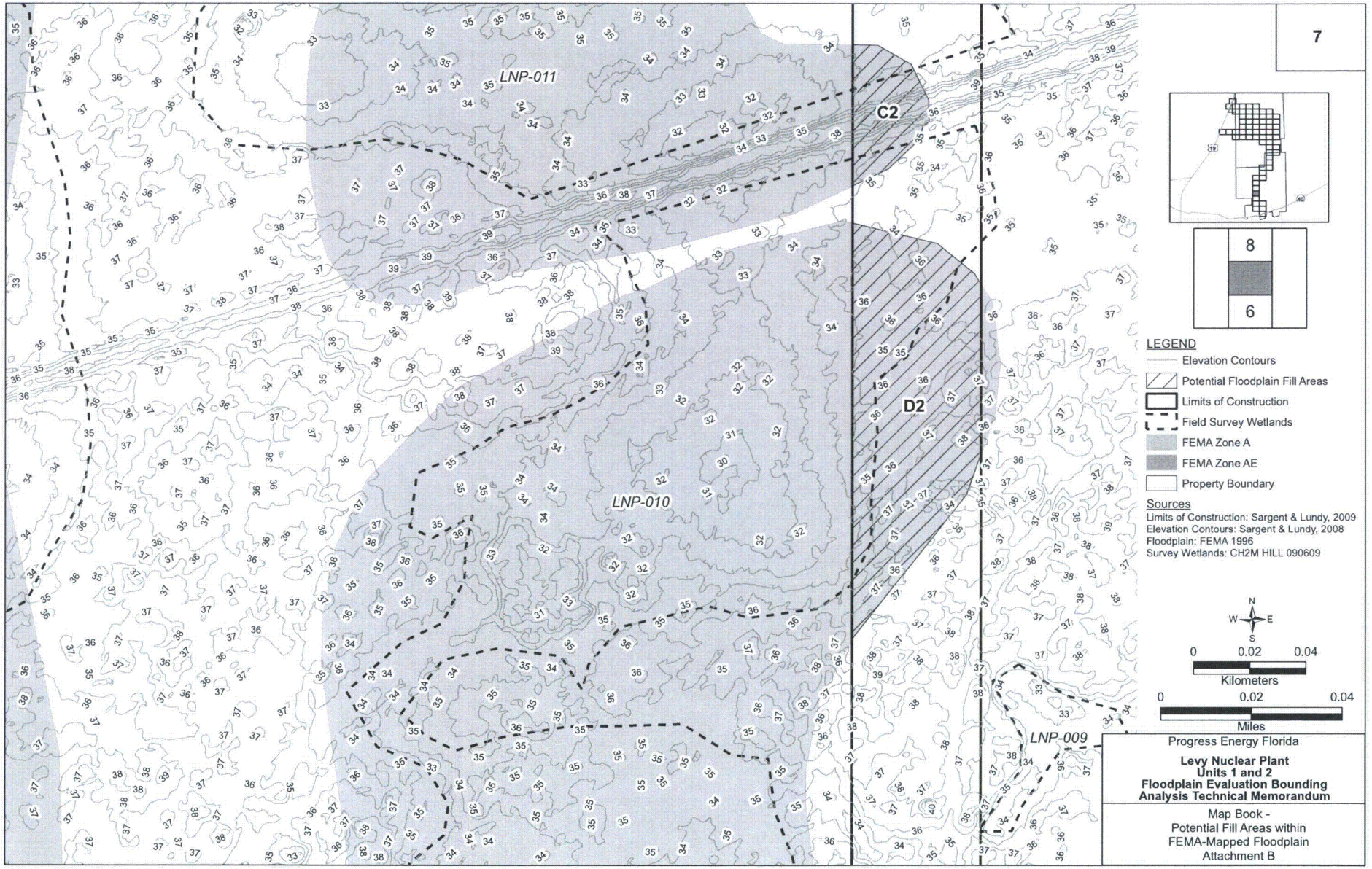
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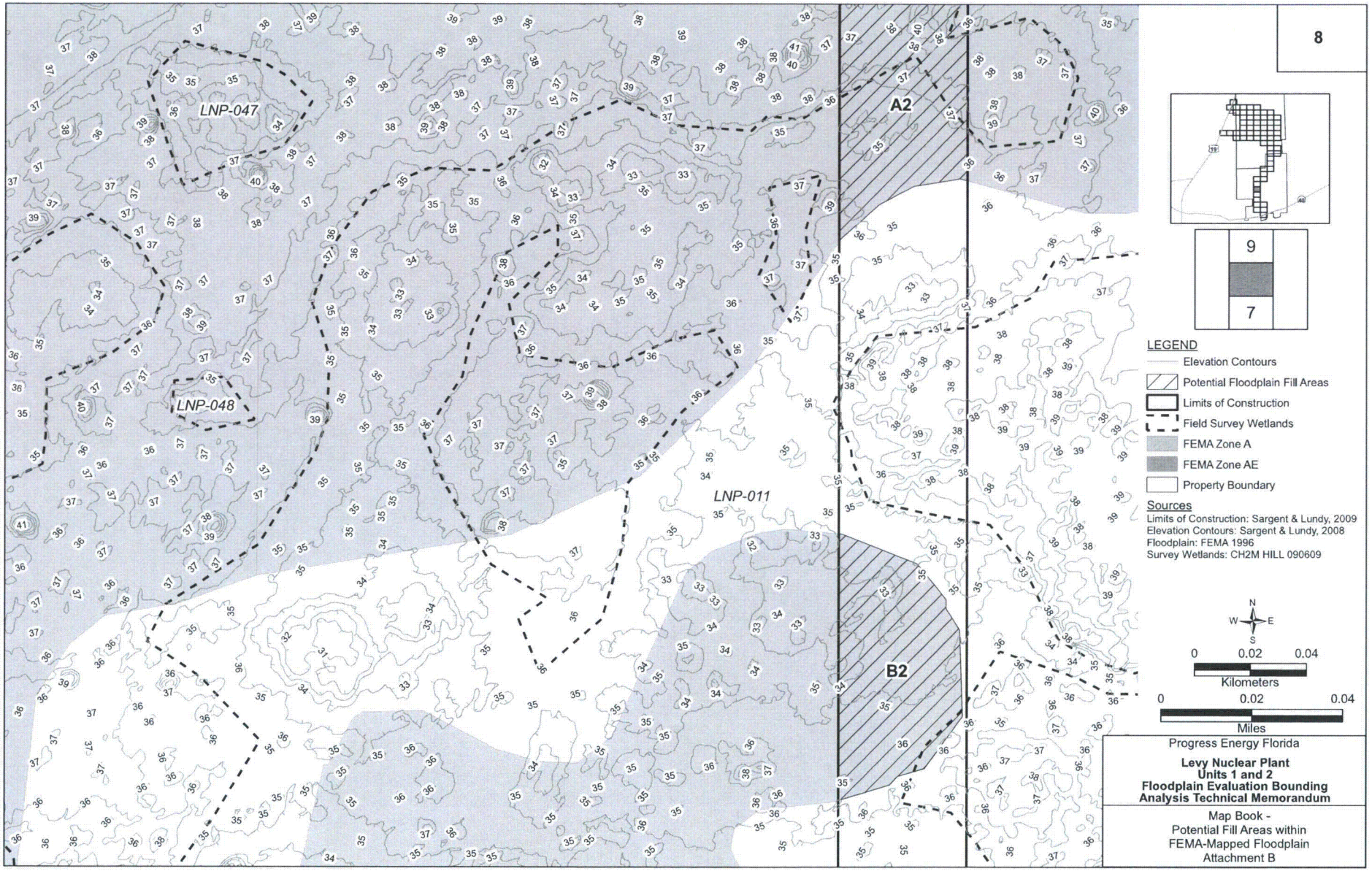
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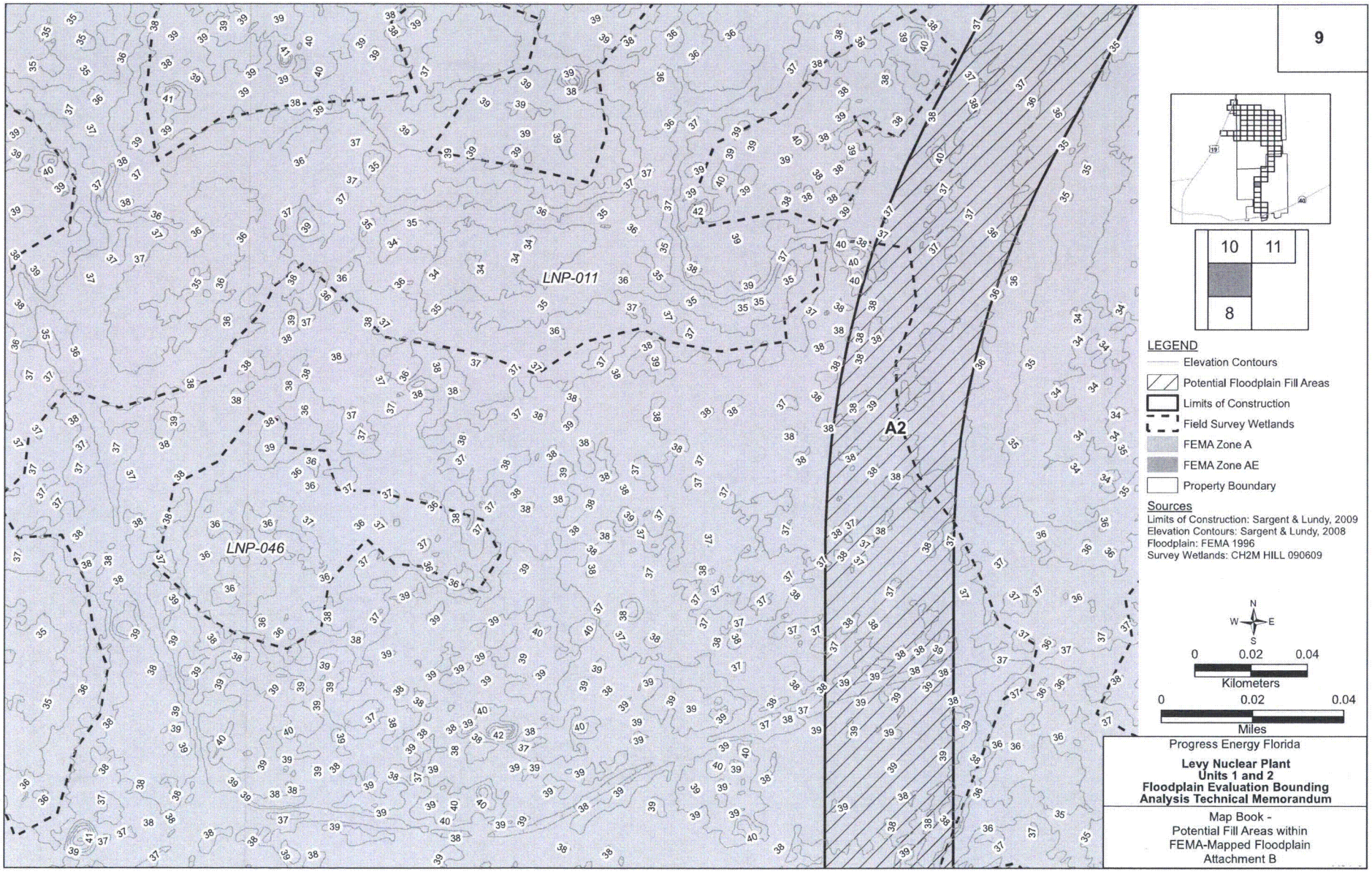
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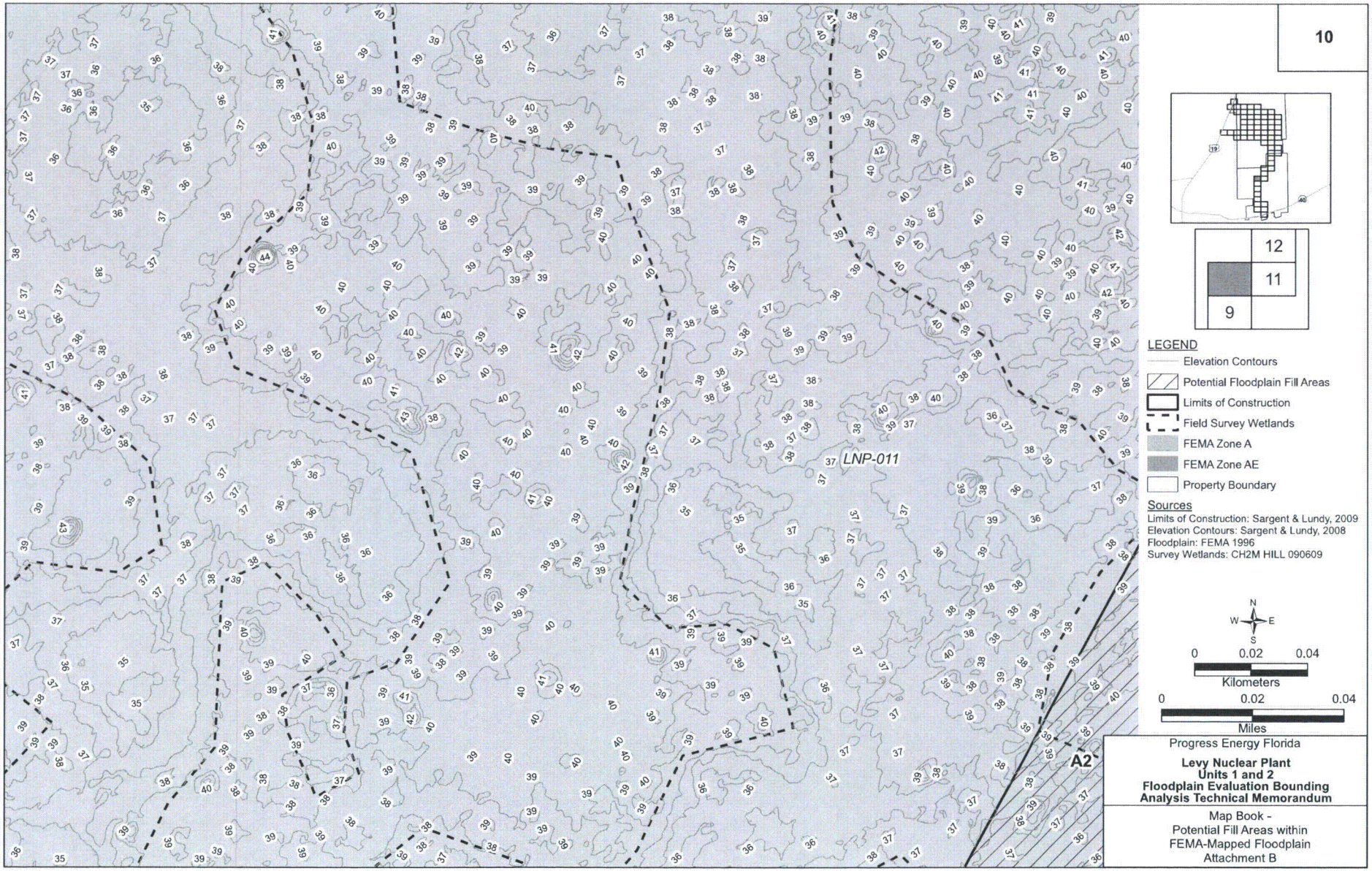
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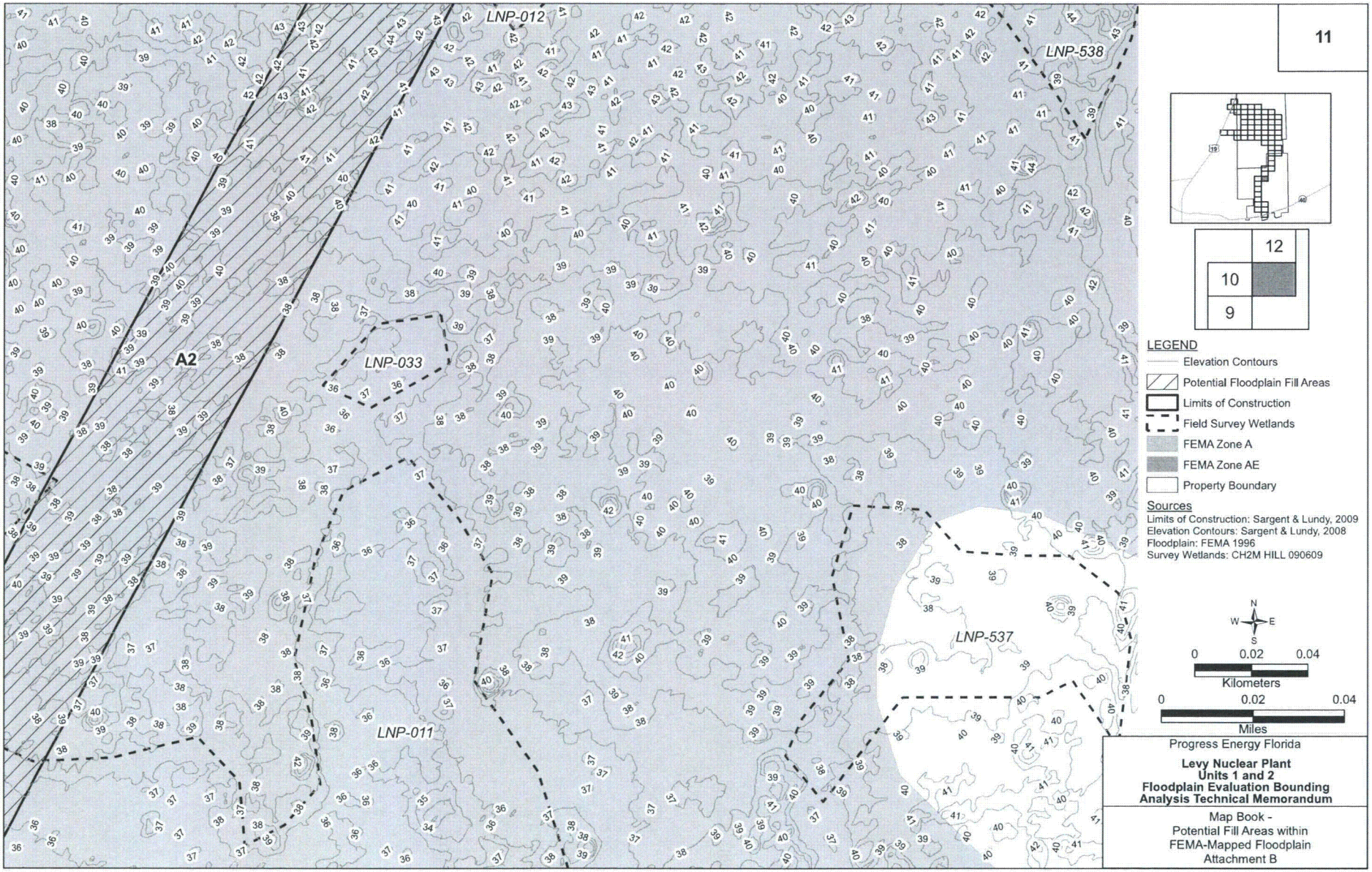
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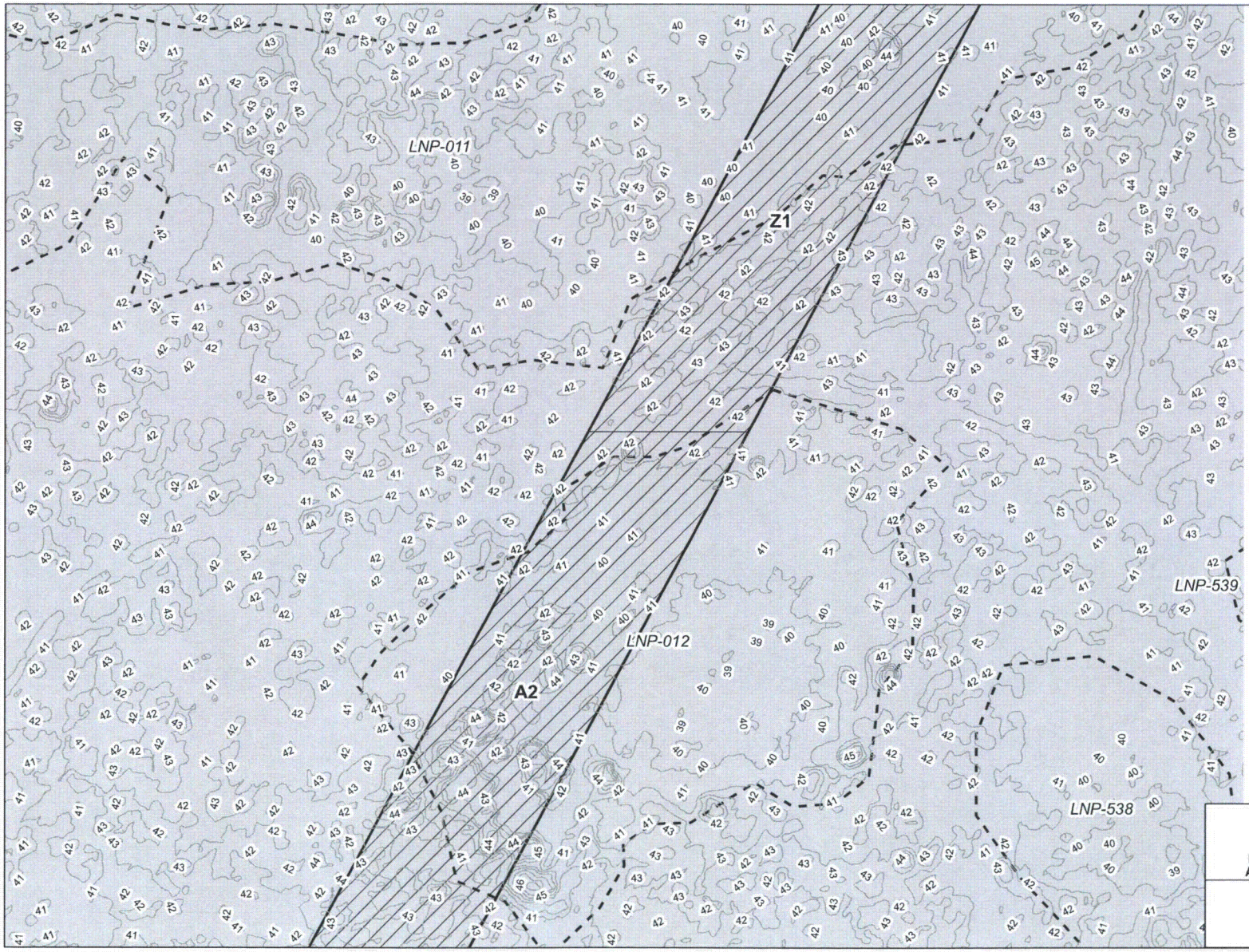

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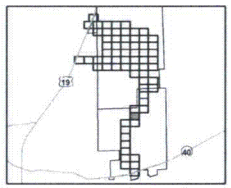

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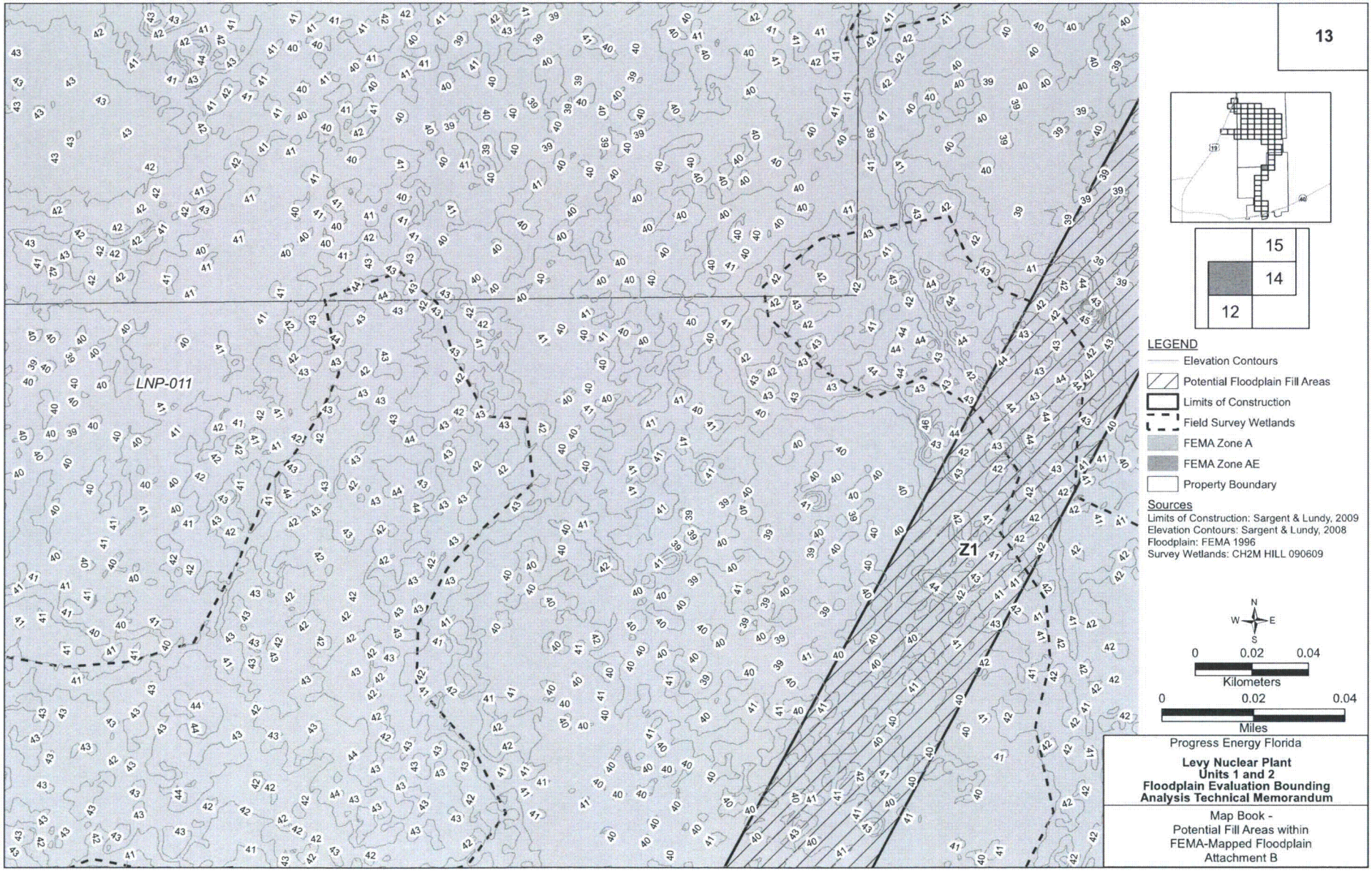
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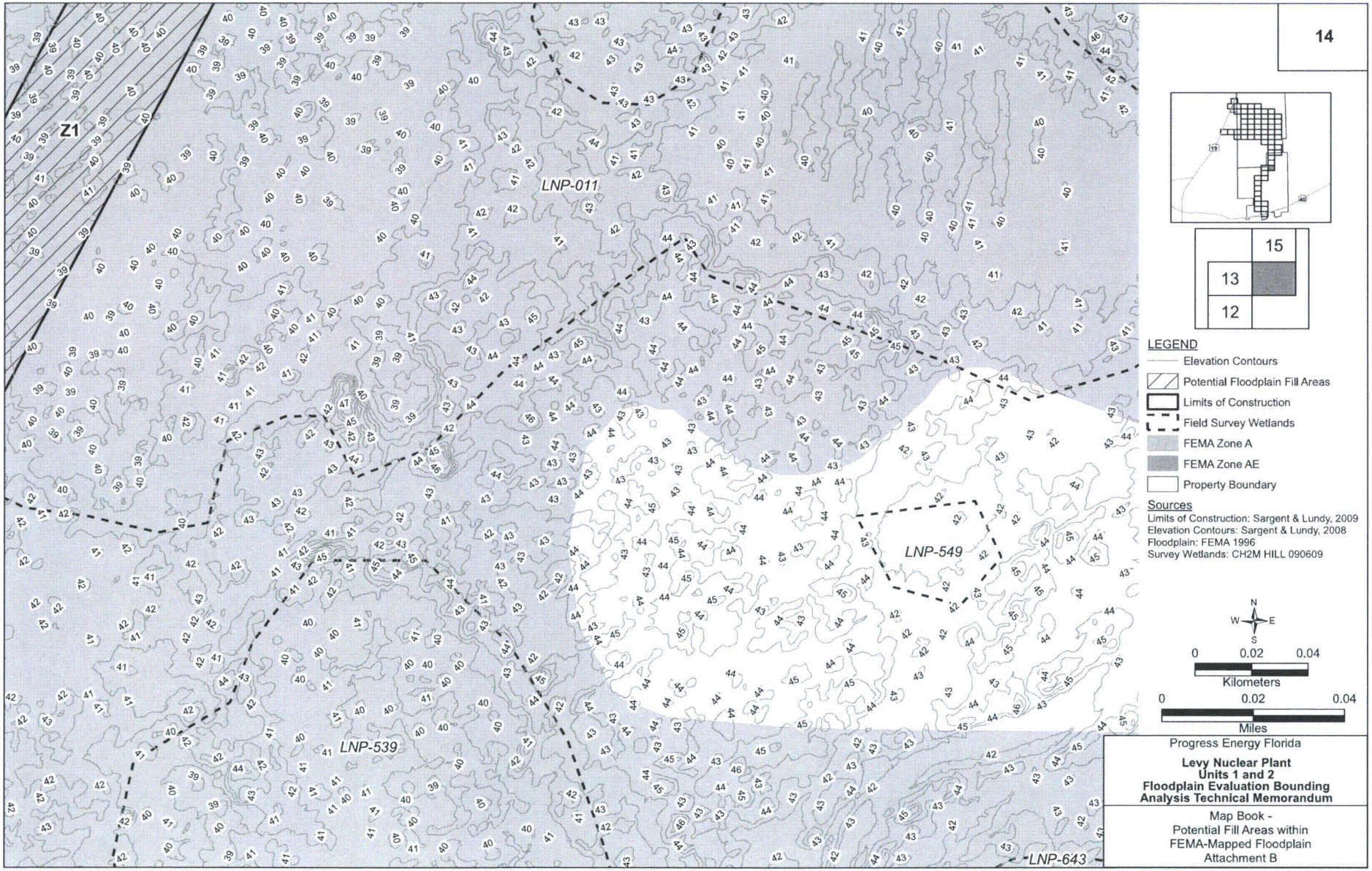
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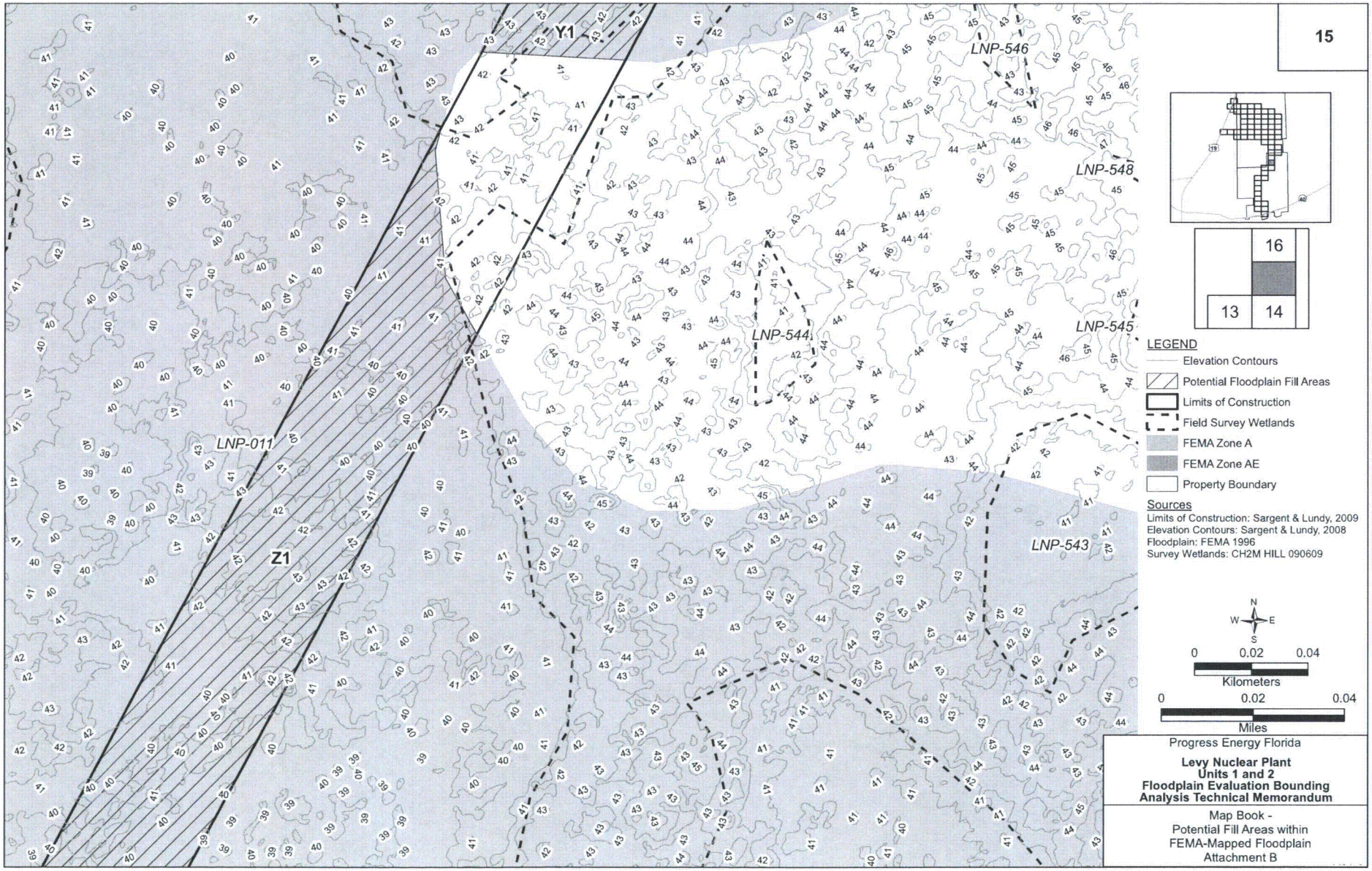
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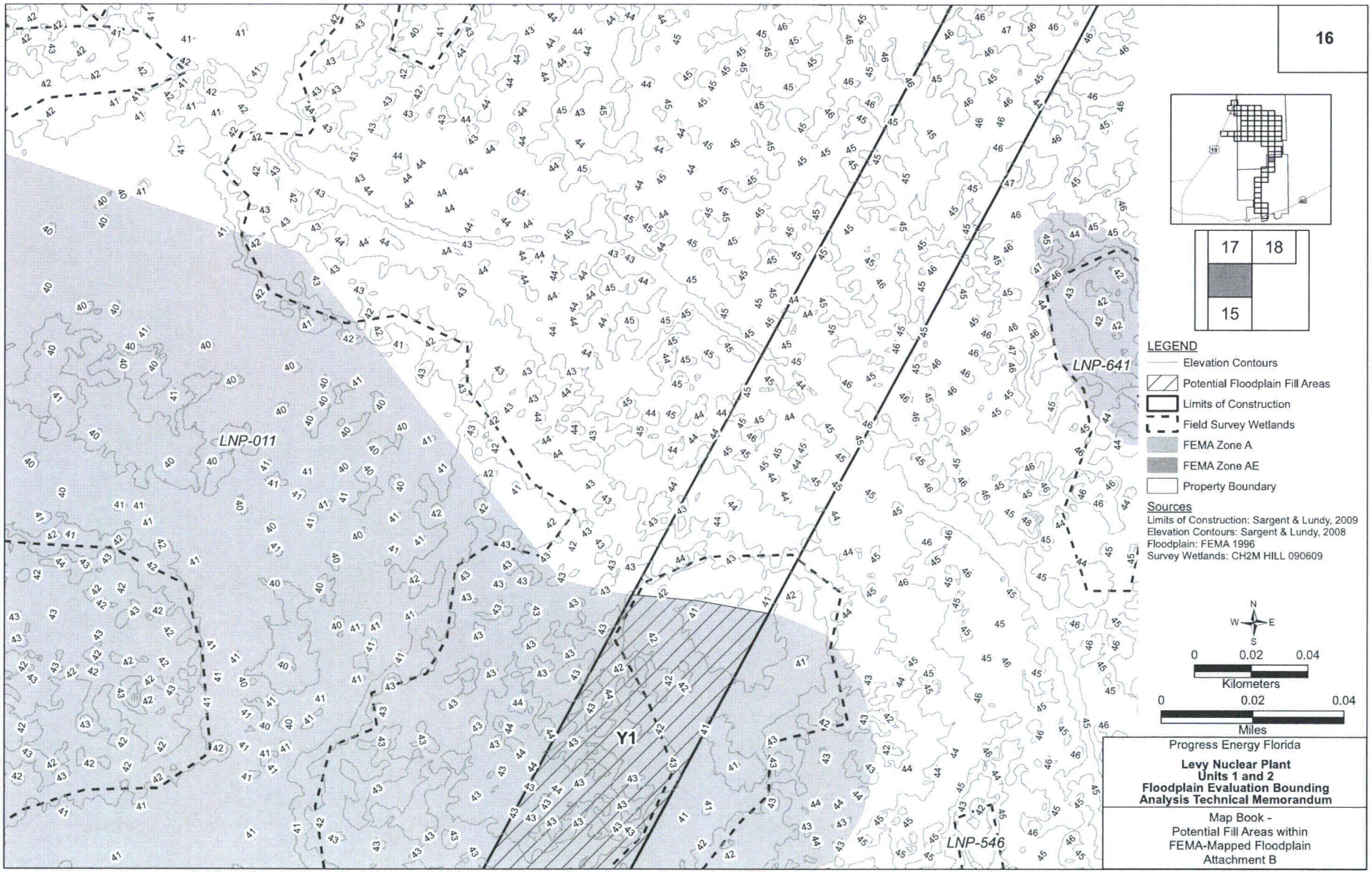
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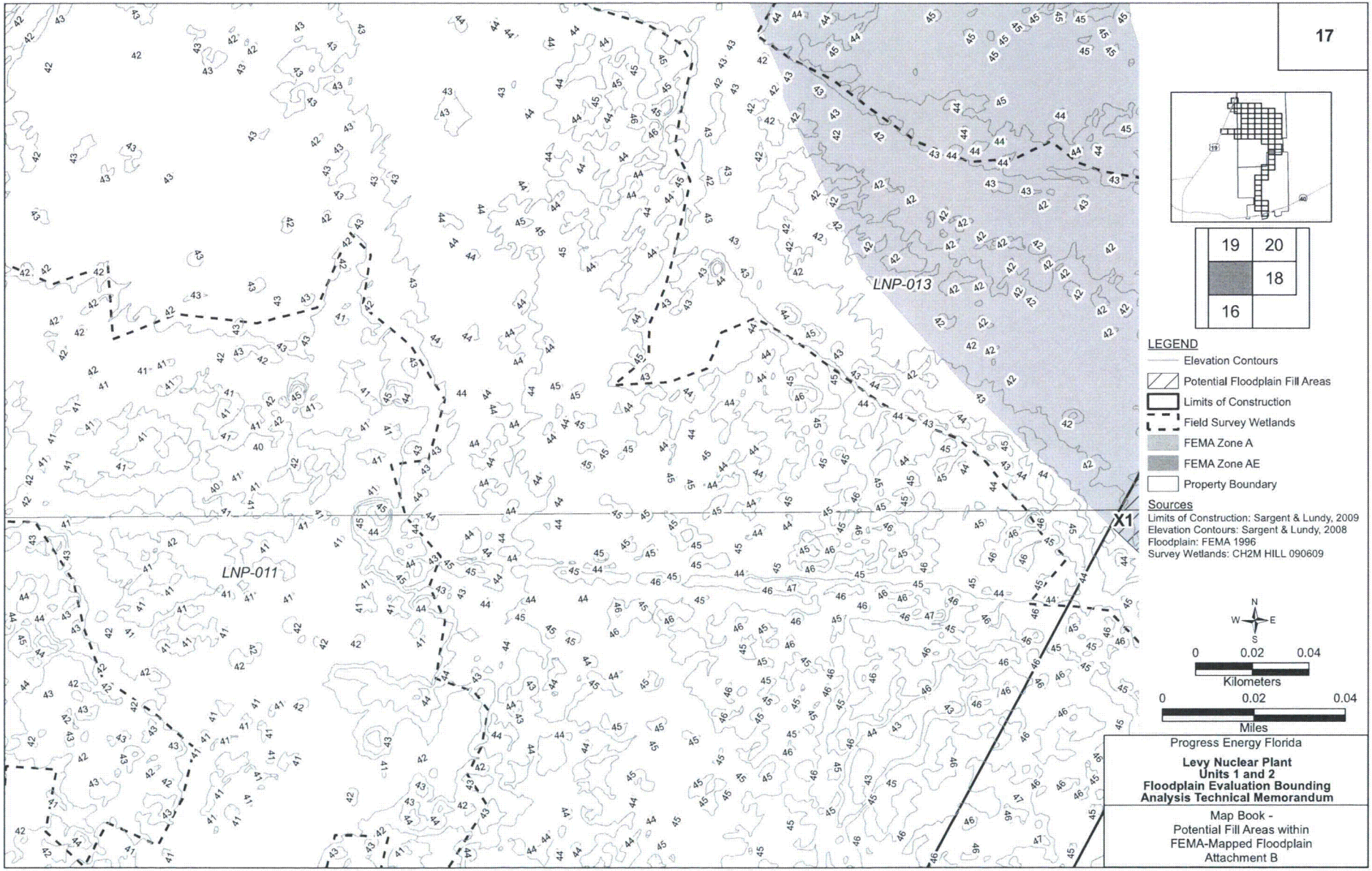
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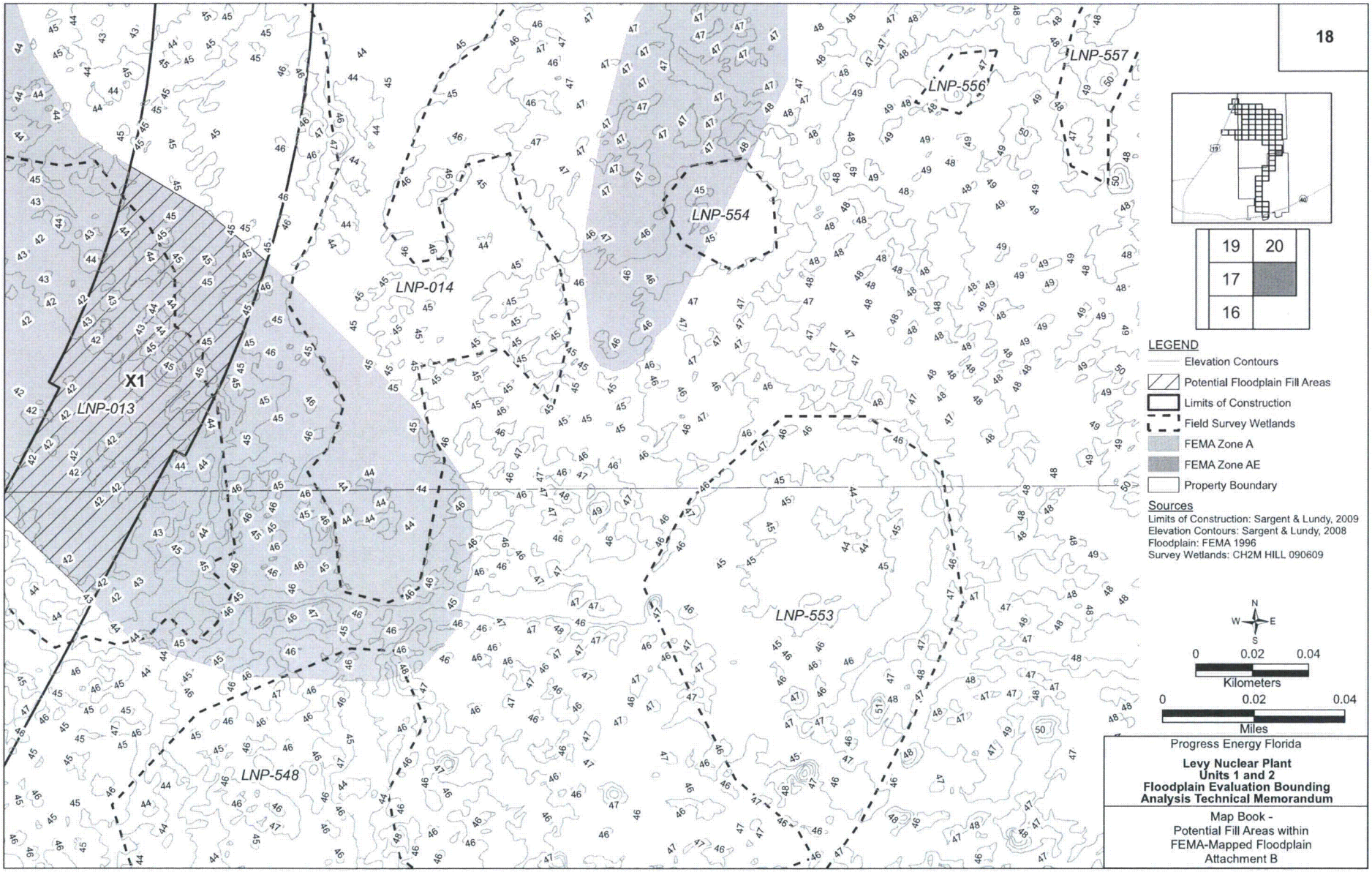

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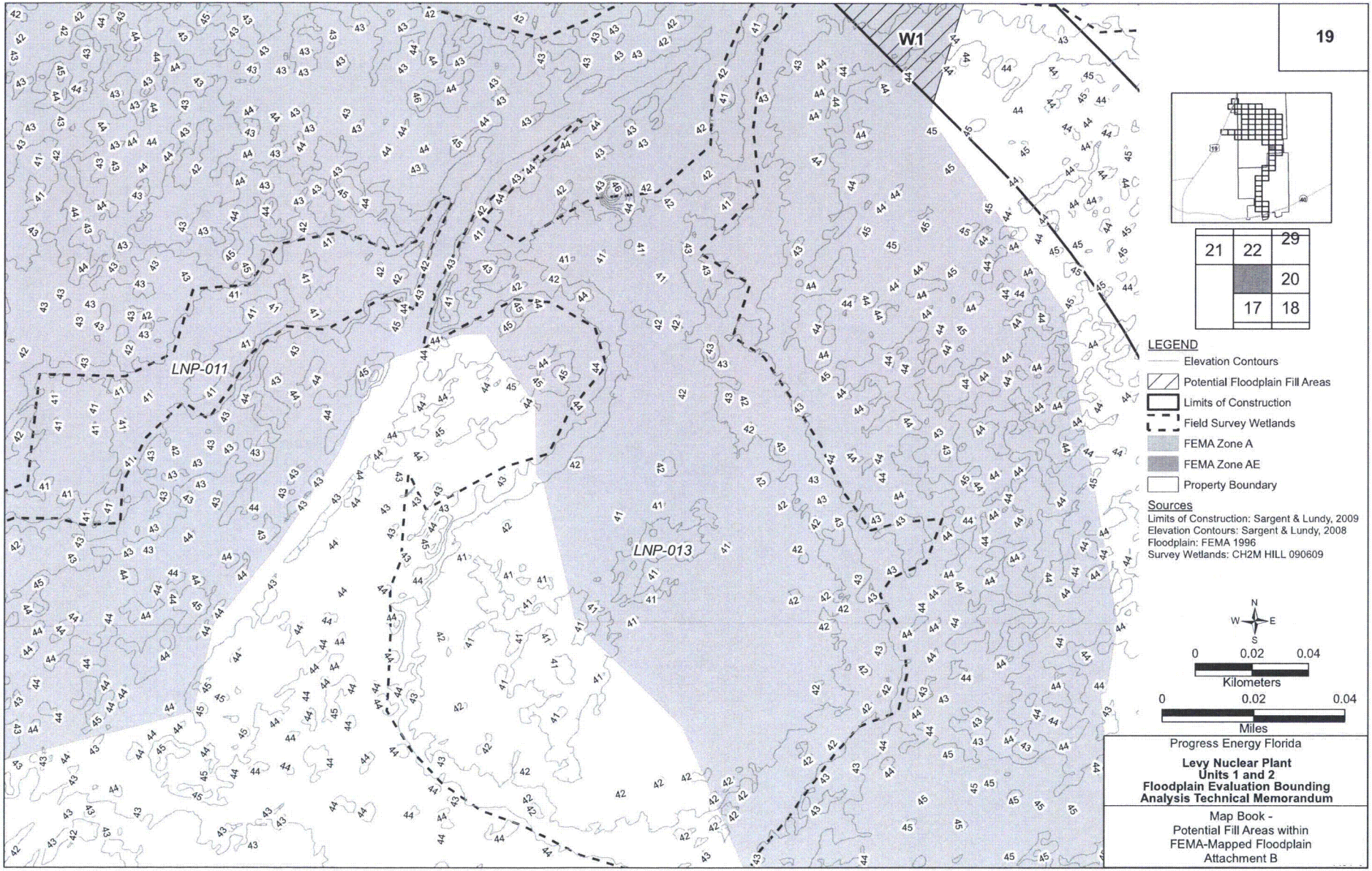
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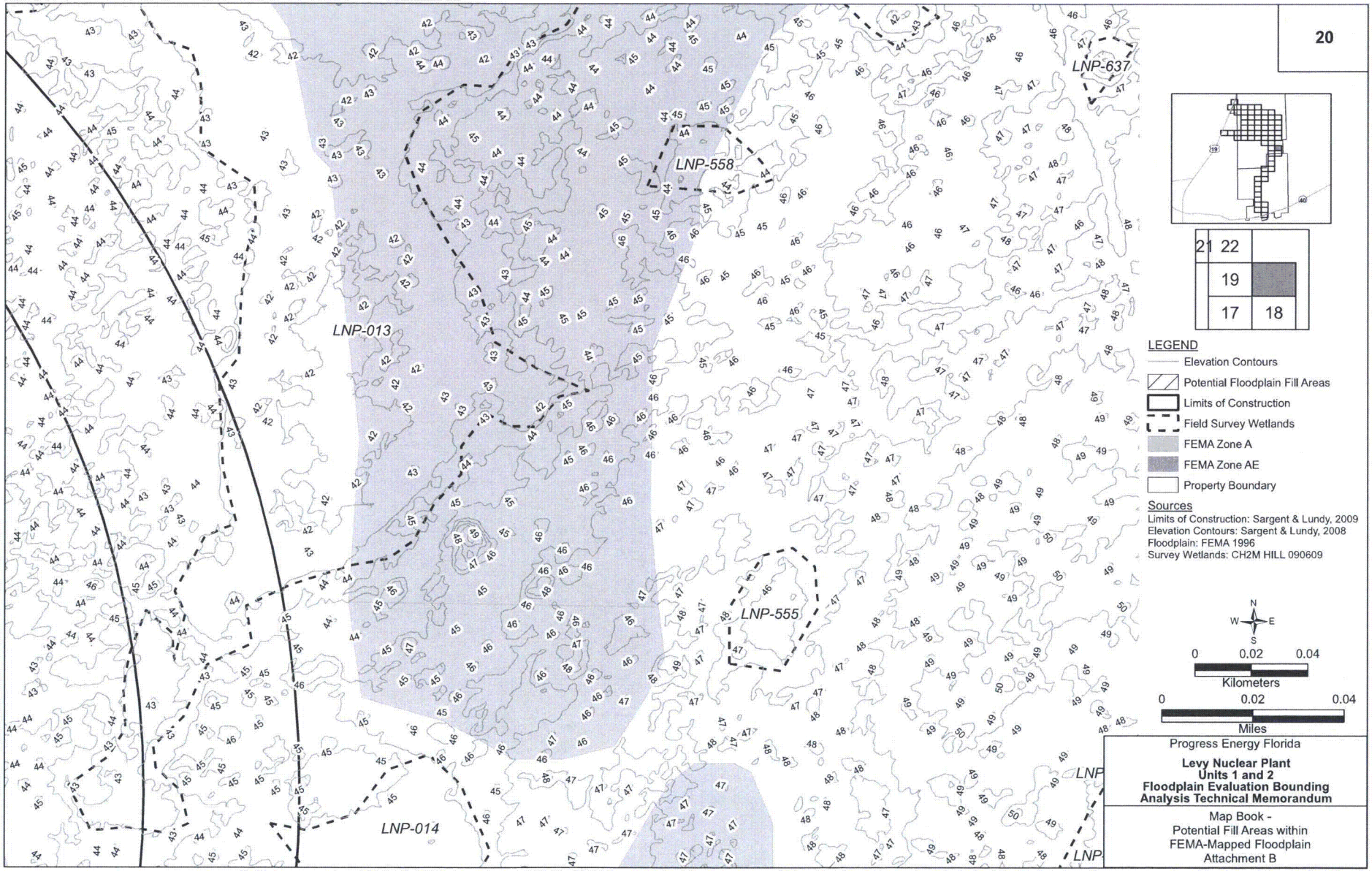
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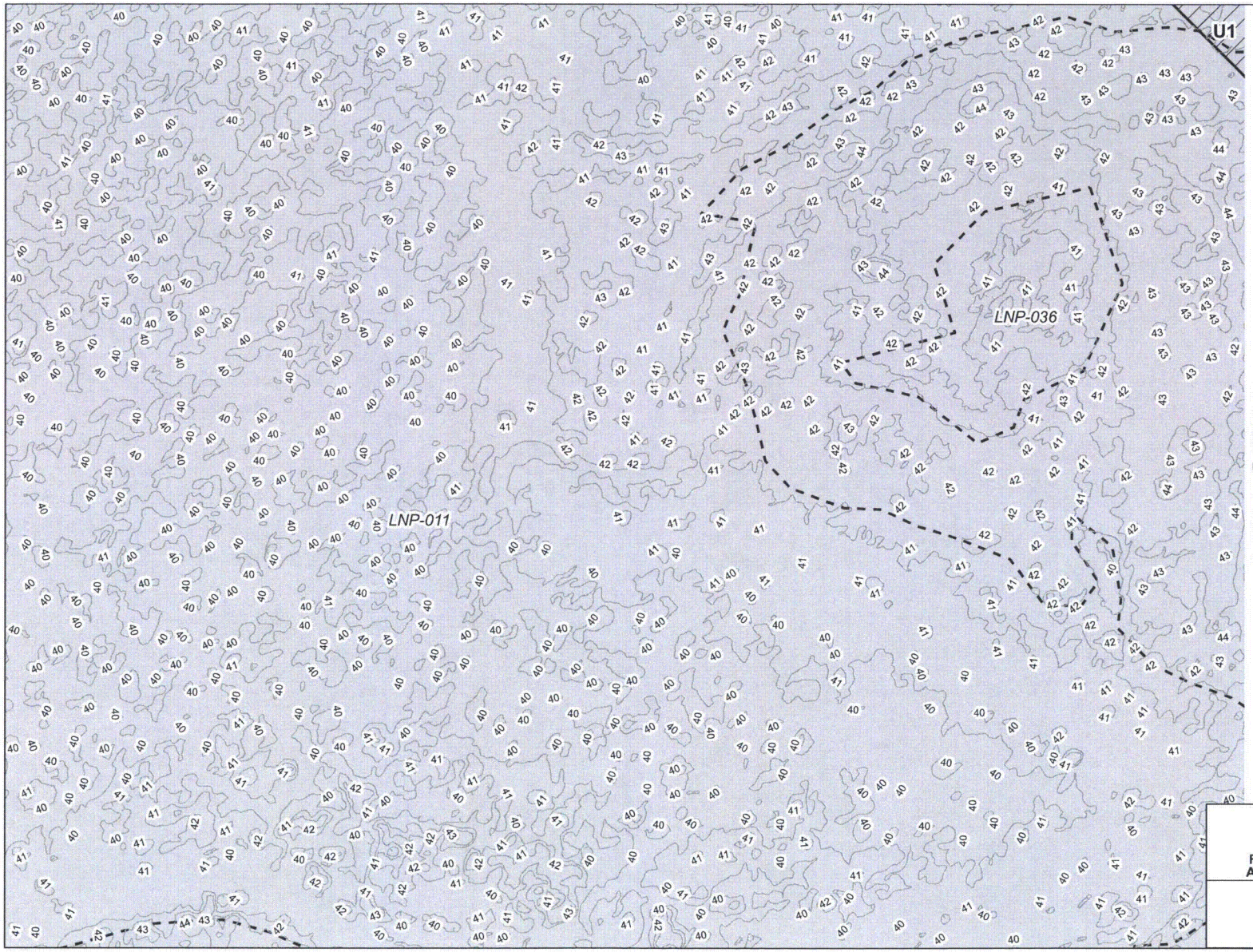

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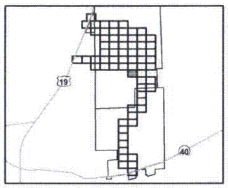

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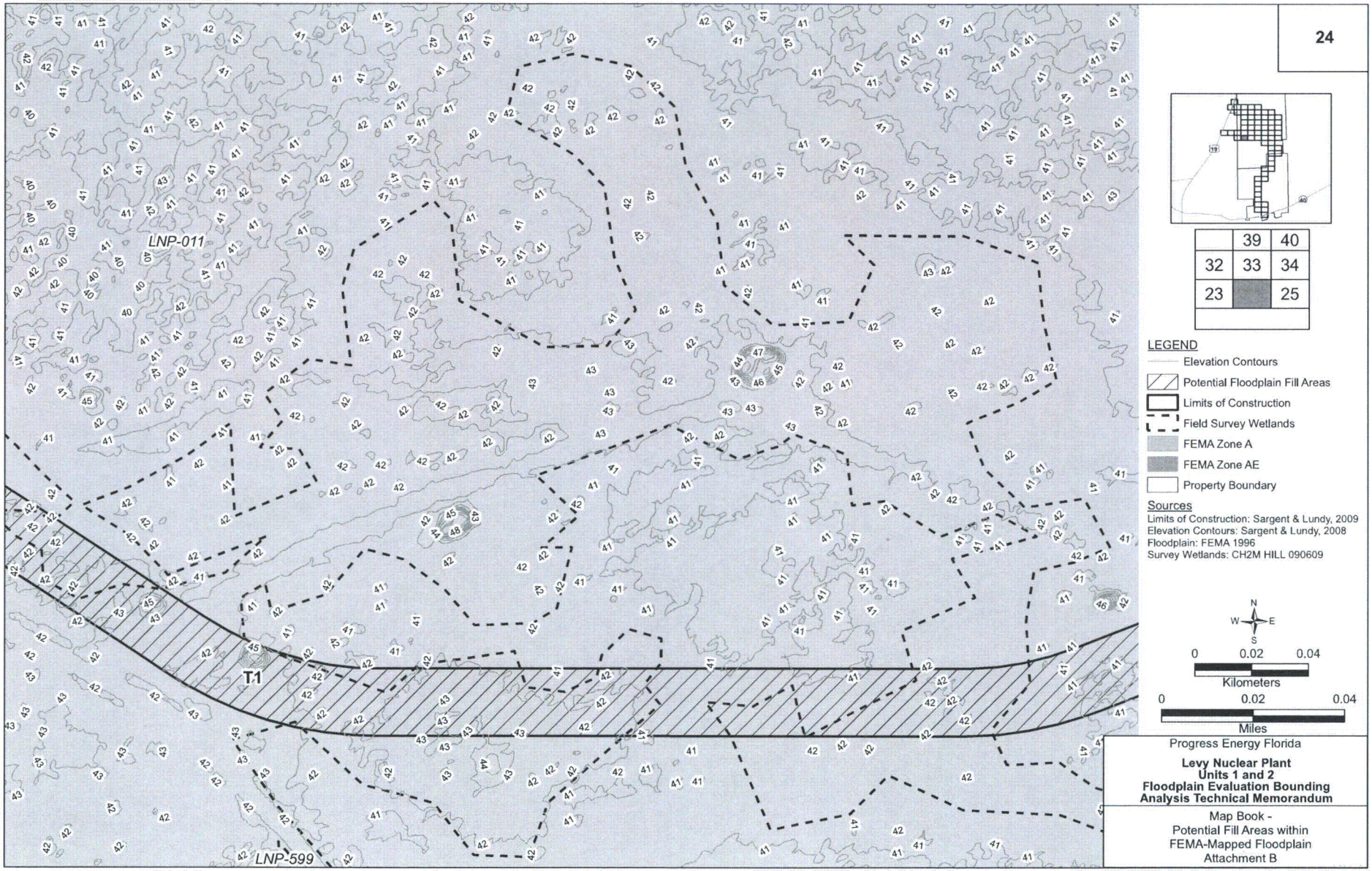
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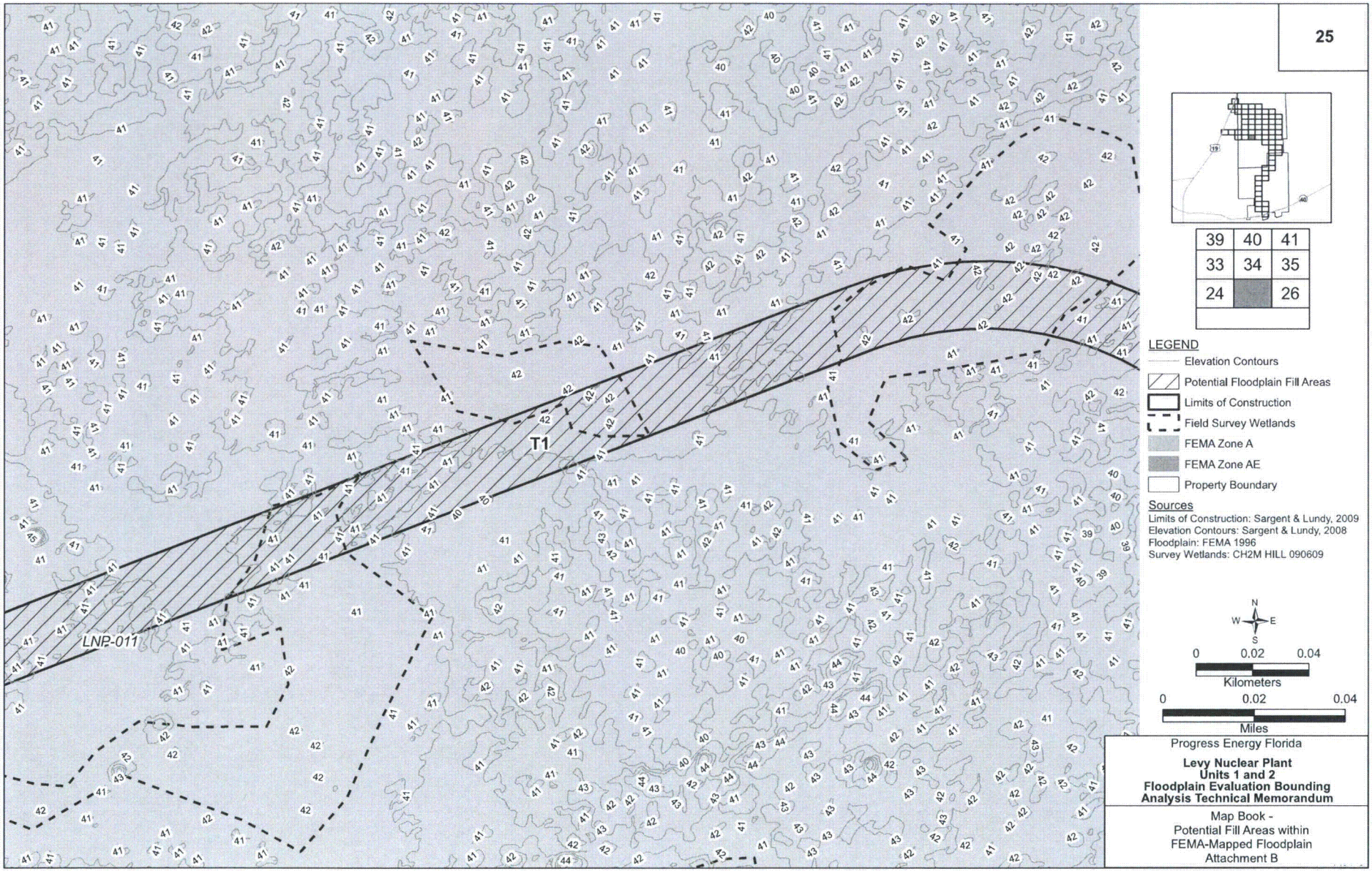
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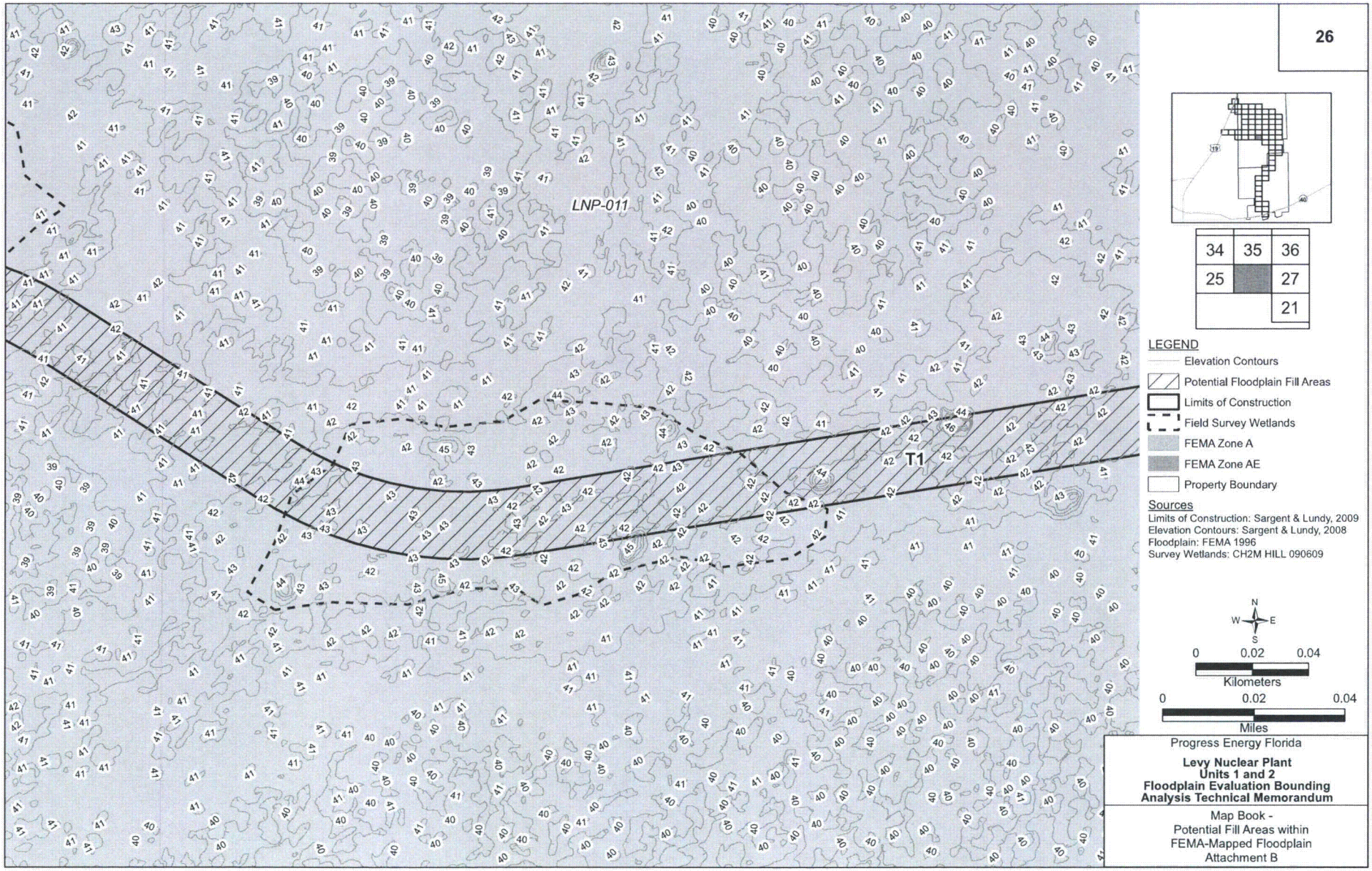
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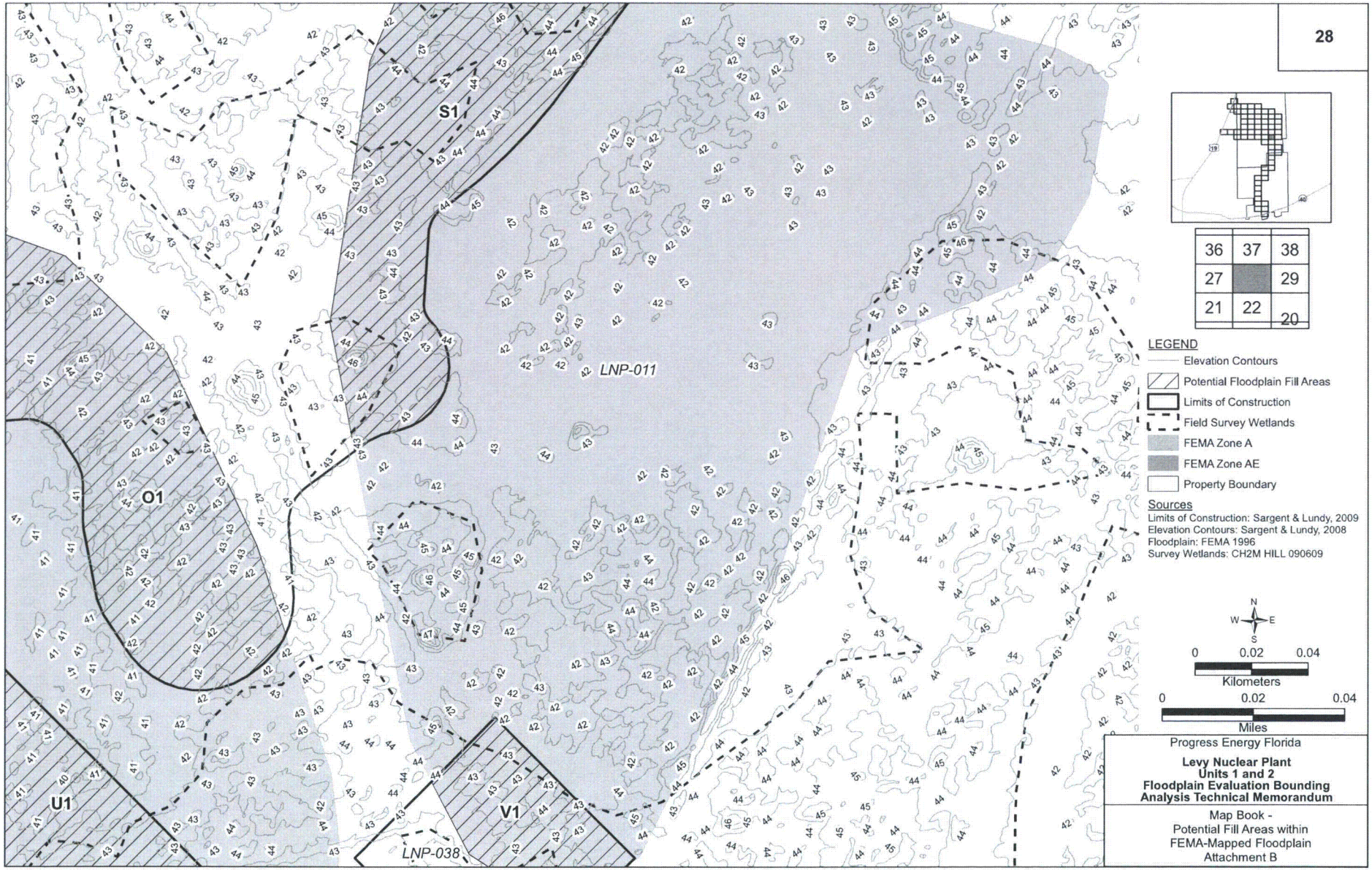
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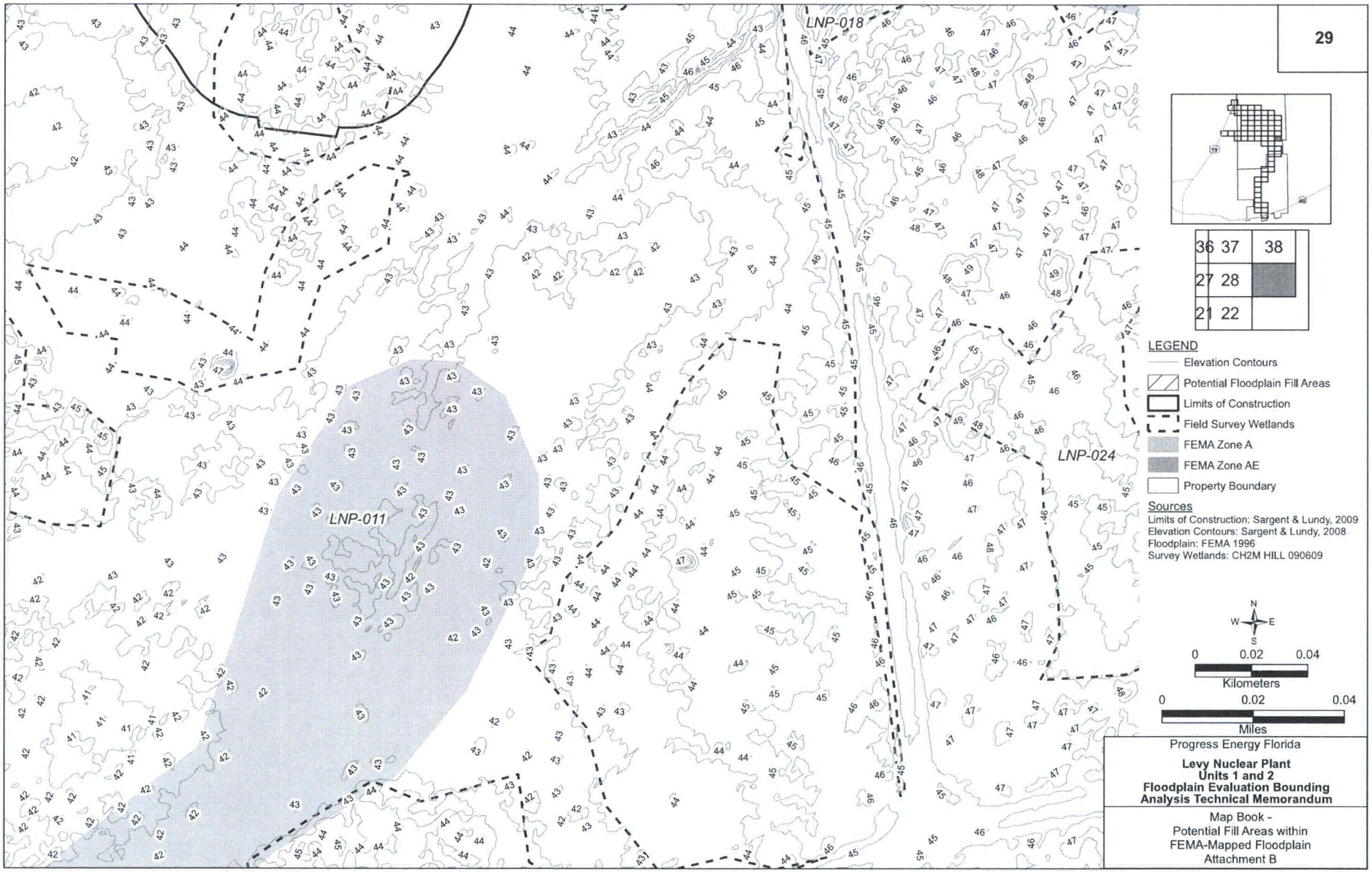
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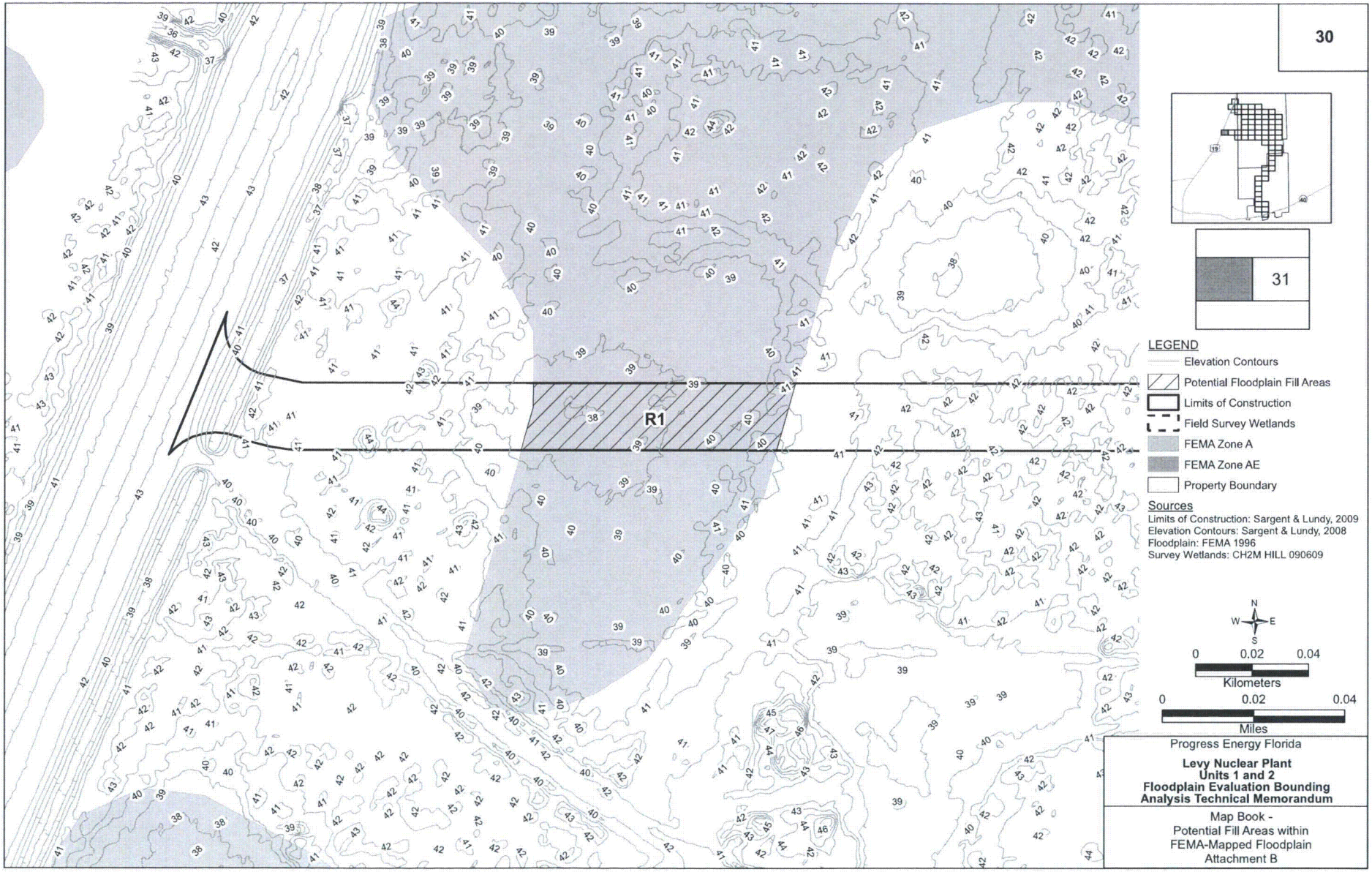
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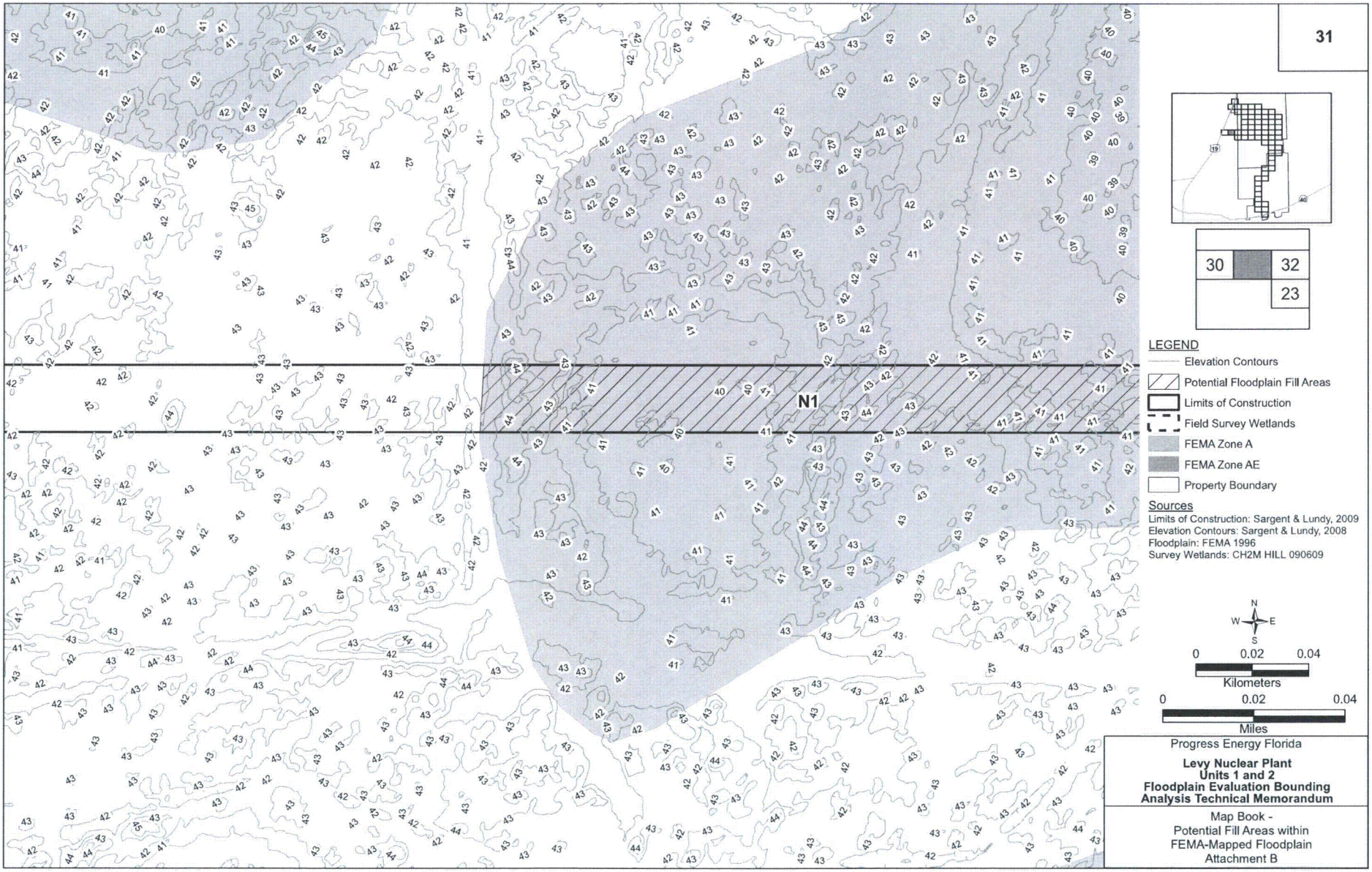
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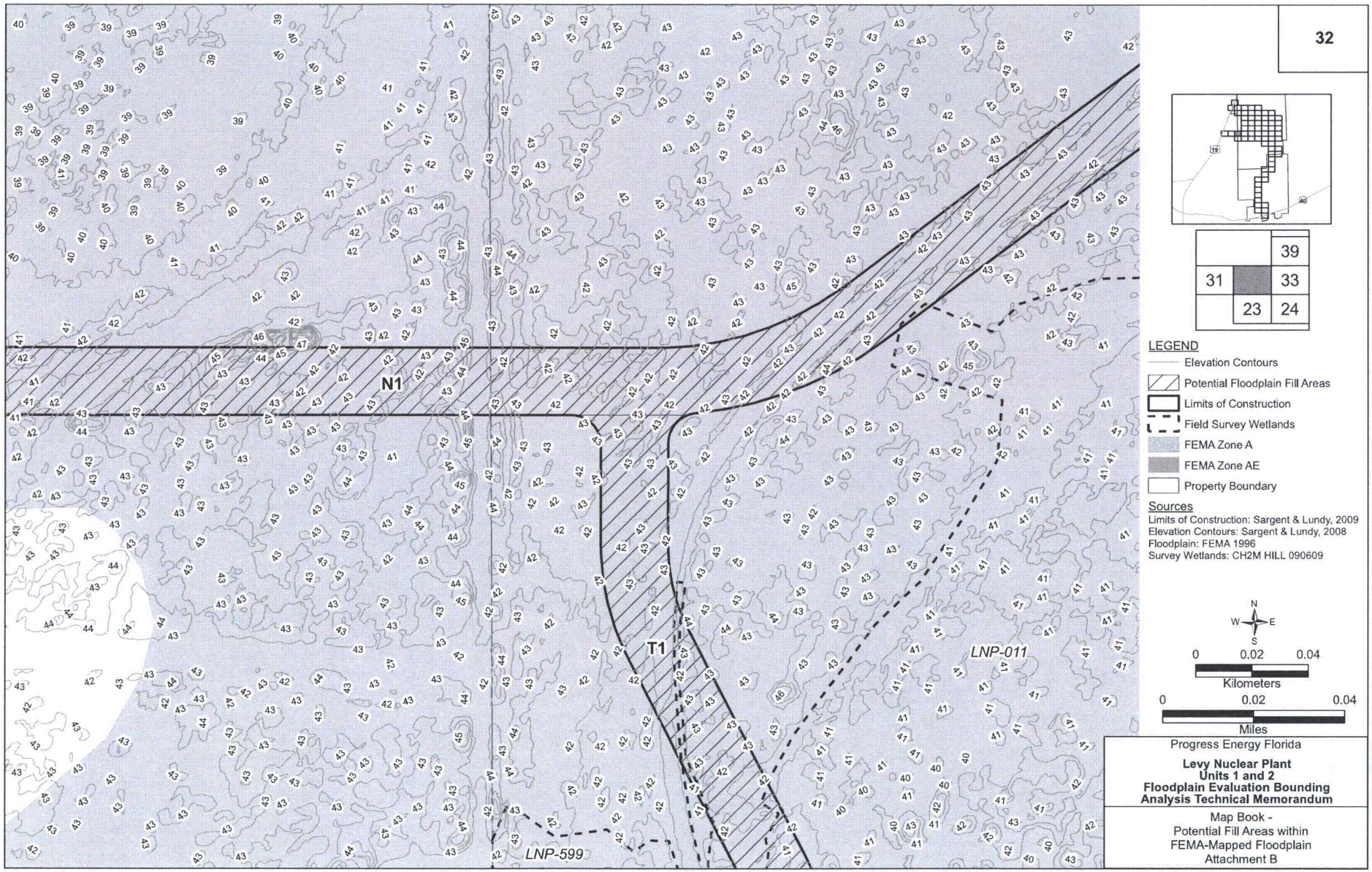
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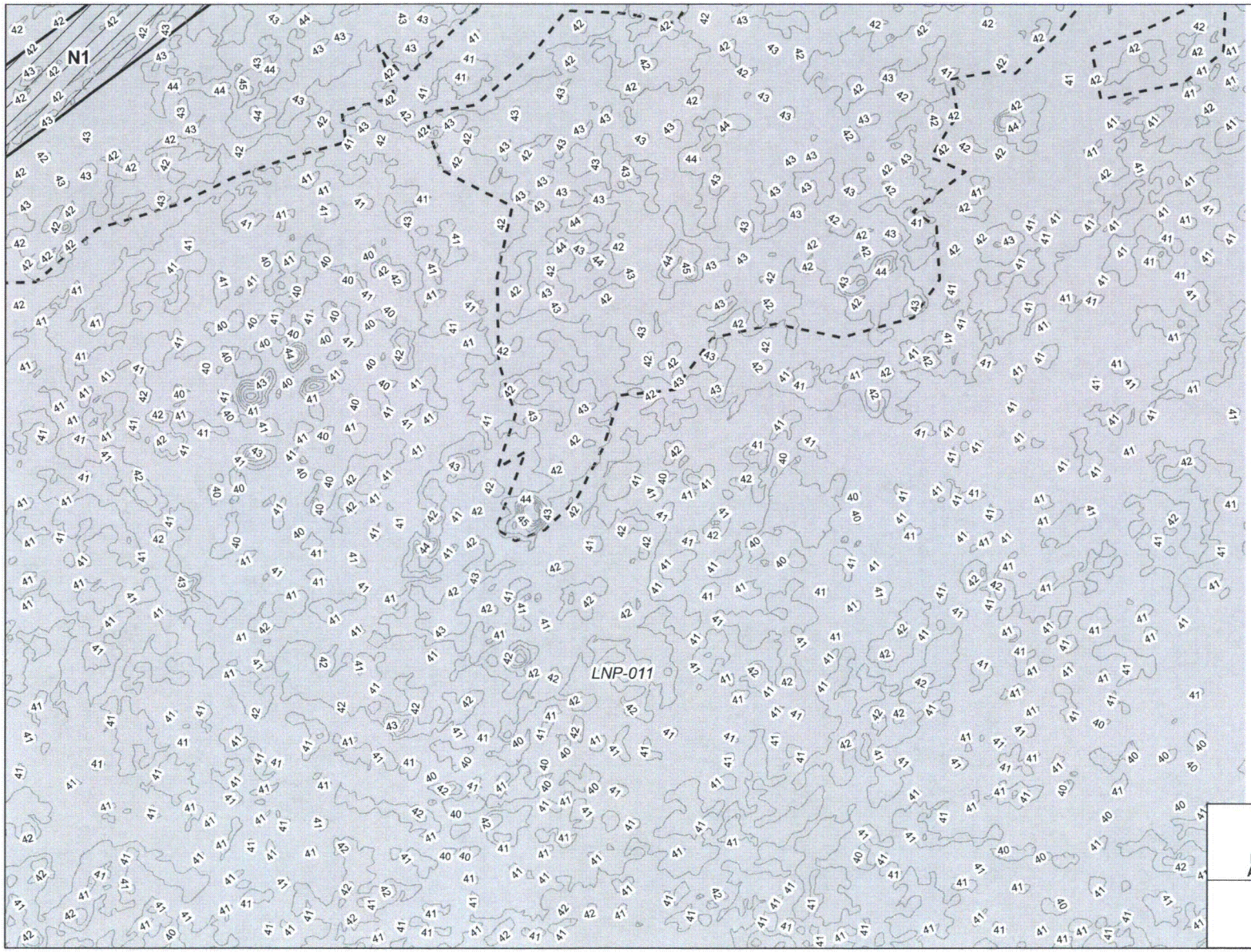

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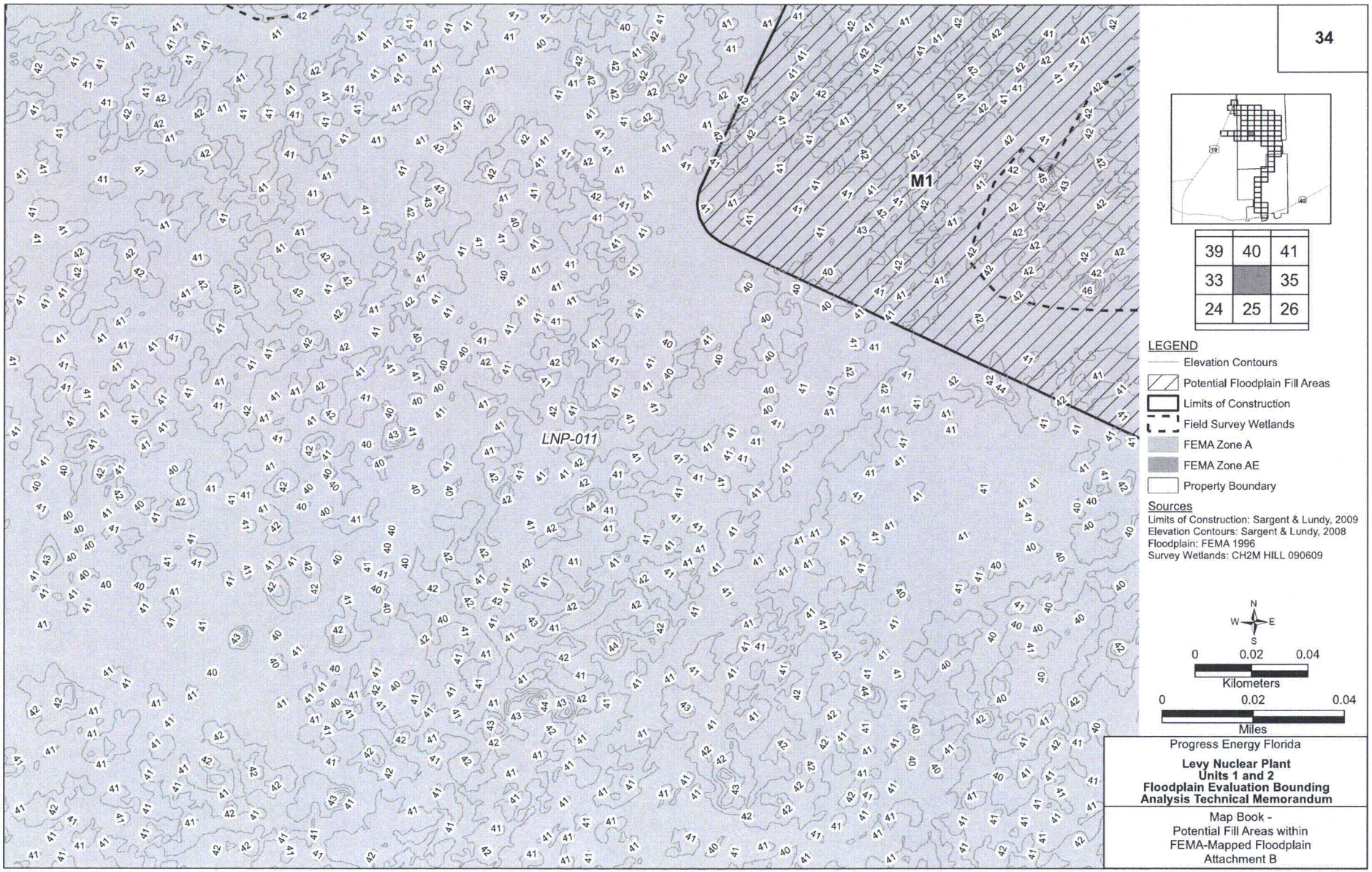
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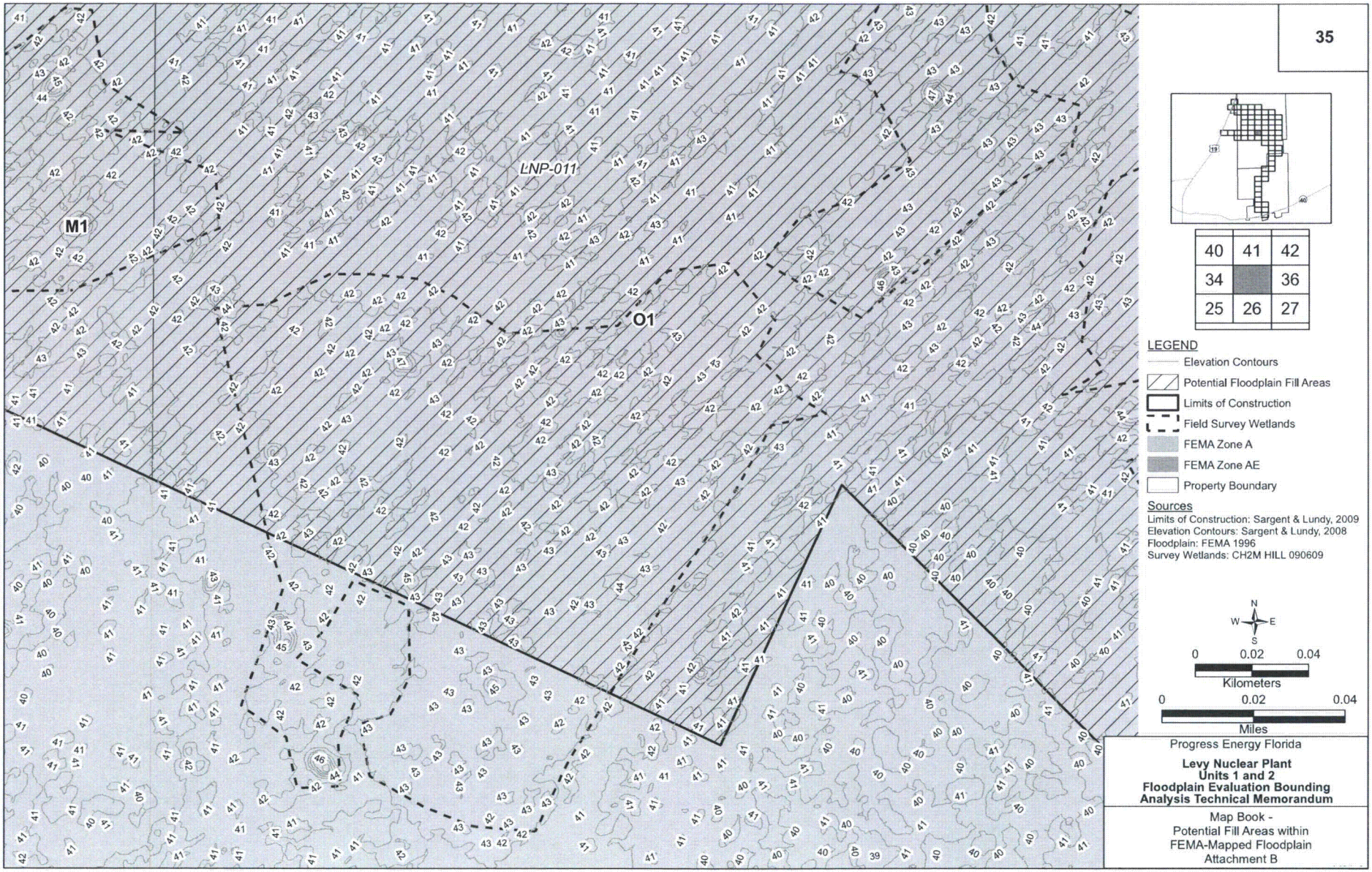
35
M1
LNP-011
O1
40 41 42
34 36
25 26 27
LEGEND
Elevation Contours
Potential Floodplain Fill Areas
Limits of Construction
Field Survey Wetlands
FEMA Zone A
FEMA Zone AE
Property Boundary
Sources
Limits of Construction: Sargent & Lundy, 2009
Elevation Contours: Sargent & Lundy, 2008
Floodplain: FEMA 1996
Survey Wetlands: CH2M HILL 090609
N
W E
S
0 0.02 0.04
Kilometers
0 0.02 0.04
Miles
Progress Energy Florida
Levy Nuclear Plant
Units 1 and 2
Floodplain Evaluation Bounding
Analysis Technical Memorandum
Map Book -
Potential Fill Areas within
FEMA-Mapped Floodplain
Attachment B