

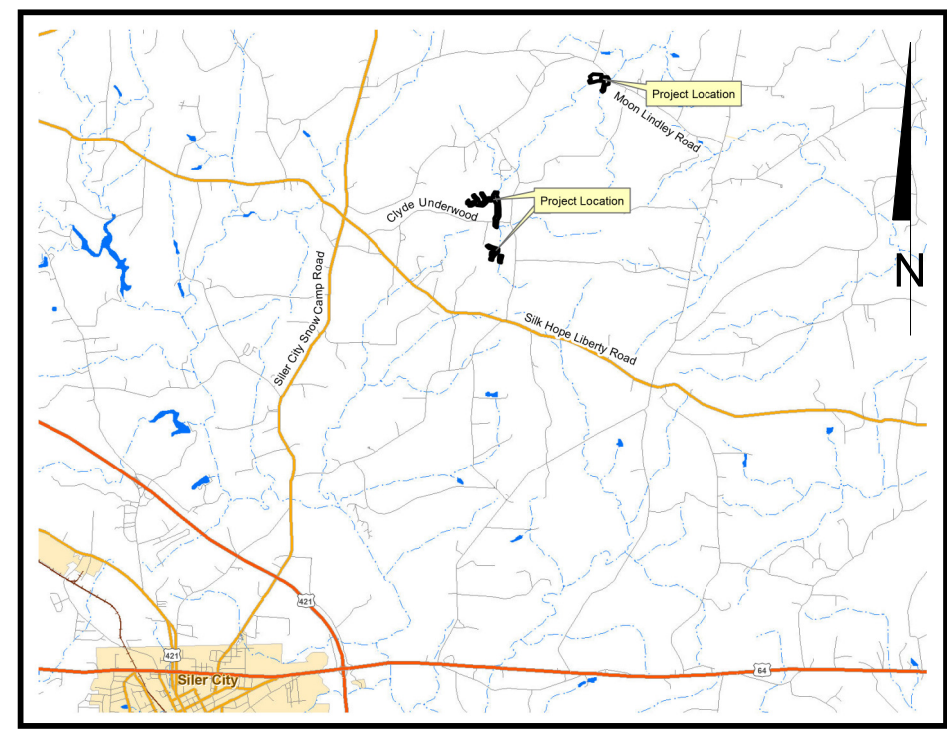
Underwood Mitigation Site

Chatham County, NC

Cape Fear River Basin Cataloging Unit

03030002050050

for North Carolina Ecosystem Enhancement Program



Vicinity Map
Not to Scale



**BASELINE DRAWING
ISSUED MAY 6, 2013**

To Clyde Underwood Road access:

From the intersection of US 64 and Arthur Teague Rd, travel north approximately 3.25 miles to the intersection of Silk Hope Rd. Turn right on Silk Hope Road. After going north approximately 0.3 miles, turn left onto Silk Hope Liberty Rd. Travel west approximately 1.8 miles and turn right on Plainfield Church Rd. Travel north approximately 1.1 miles and turn right onto Clyde Underwood Rd. The temporary construction entrances will be located approximately 0.15 miles on the right and 0.25 miles on the left of Clyde Underwood Road.

To Moon Lindley Road Access:

Leaving the intersection of Plainfield Church Rd and Clyde Underwood Rd, travel north on Plainfield Church Rd. approximately 0.5 miles and turn right on Johnny Lindley Rd. At the intersection of Johnny Lindley Rd and Moon Lindley Rd, turn left. The construction entrance will be on the left in approximately 0.25 miles.

REACH ORIGINS		
Reach	Latitude	Longitude
UT 2	N 35° 48' 03.53"	W 79° 24' 03.73"
SF 1	N 35° 48' 05.05"	W 79° 24' 10.08"
SF 1A	N 35° 48' 08.81"	W 79° 24' 09.90"
SF 2	N 35° 48' 24.94"	W 79° 24' 06.04"
SF 3	N 35° 48' 27.95"	W 79° 24' 06.91"
UT 1	N 35° 48' 37.68"	W 79° 24' 26.44"
UT 1A	N 35° 48' 44.41"	W 79° 24' 17.20"
UT 1B	N 35° 48' 43.07"	W 79° 24' 23.09"
SF 4	N 35° 49' 50.67"	W 79° 22' 59.63"
SF 4A	N 35° 49' 45.25"	W 79° 22' 50.37"

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Wetland Baselin Overview	2.0-2.1
Wetland Baseline Plans	2.2-2.8
Planting Tables	3.0
Baseline Planting	3.1-3.3

Project Directory	
<p>Engineering: Wildlands Engineering, Inc License No. F-0831 5605 Chapel Hill Road Suite 122 Raleigh, NC 27607 Nicole Macaluso, PE 919-851-9986</p>	<p>Owner: Ecosystem Enhancement Program NC Department of Environment and Natural Resources 1652 Mail Service Center Raleigh, NC 27699-1652 Guy Pearce 919-715-1157</p>
<p>Surveying: Stewart Proctor Engineering and Surveying, PLLC 322 Chapanoke Road, Suite 100 Raleigh, NC 27603 Herbert Proctor Jr., PLS 919-779-1855</p>	<p>Contractor: Land Mechanic Designs, Inc 126 Circle G Lane Willow Springs, NC 27592 919-639-6132</p>
<p>DENR Contract No. 003268 EEP Project No. 94641</p>	

Final Baseline Drawing

Underwood Mitigation Site
Chatham County, NC

Cover Sheet

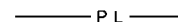


Date:	May 6, 2013
Job Number:	005-02125
Project Engineer:	NMM
Drawn By:	JTL
Checked By:	JWH

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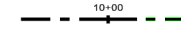

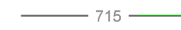













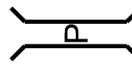
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SHEET**








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0.1

-  Existing Property Line
-  Existing Power Pole
-  Conservation Easement

LEGEND

-  As-Built Channel Centerline (Restoration)
-  As-Built Channel Centerline (Enhancement I)
-  As-Built Channel Centerline (Enhancement II)
-  As-Built Channel Centerline (No Credit)
-  As-Built Bankfull
-  As-Built Contour
-  Permanent Cross Section (XS)
-  Monitoring Gage (CG, GWG)
-  PP #6 Photo Point
-  Vegetation Plot
-  As-Built Constructed Riffle
-  As-Built Log Vane
-  As-Built Log Sill
-  As-Built Rock Vane
-  As-Built Root Wads
-  As-Built J-Hook
-  As-Built Brush Toe
-  As-Built Sod Mat
-  As-Built Rip Rap
-  As-Built Ford Crossing

-  Zone 1 - Streambank Planting Zone
-  Wetland Restoration
-  Zone 2 - Floodplain Planting Zone
-  Wetland Enhancement
-  Zone 3 - Wetland Planting
-  Wetland Creation
-  Zone 4 - Permanent Seeding Outside Easement

WILDLANDS
ENGINEERING, INC.
Ecological Restoration
Services
5605 Chapel Hill Road, Suite 122
Raleigh, NC 27607
Tel: 919.851.9986
Fax: 919.851.9987
Firm License No. F-0831

Underwood Mitigation Site
Chatham County, NC

Legend

Date: May 6, 2013
Job Number: 005-02125
Project Engineer: NMM
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LEGEND

Sheet

0.2

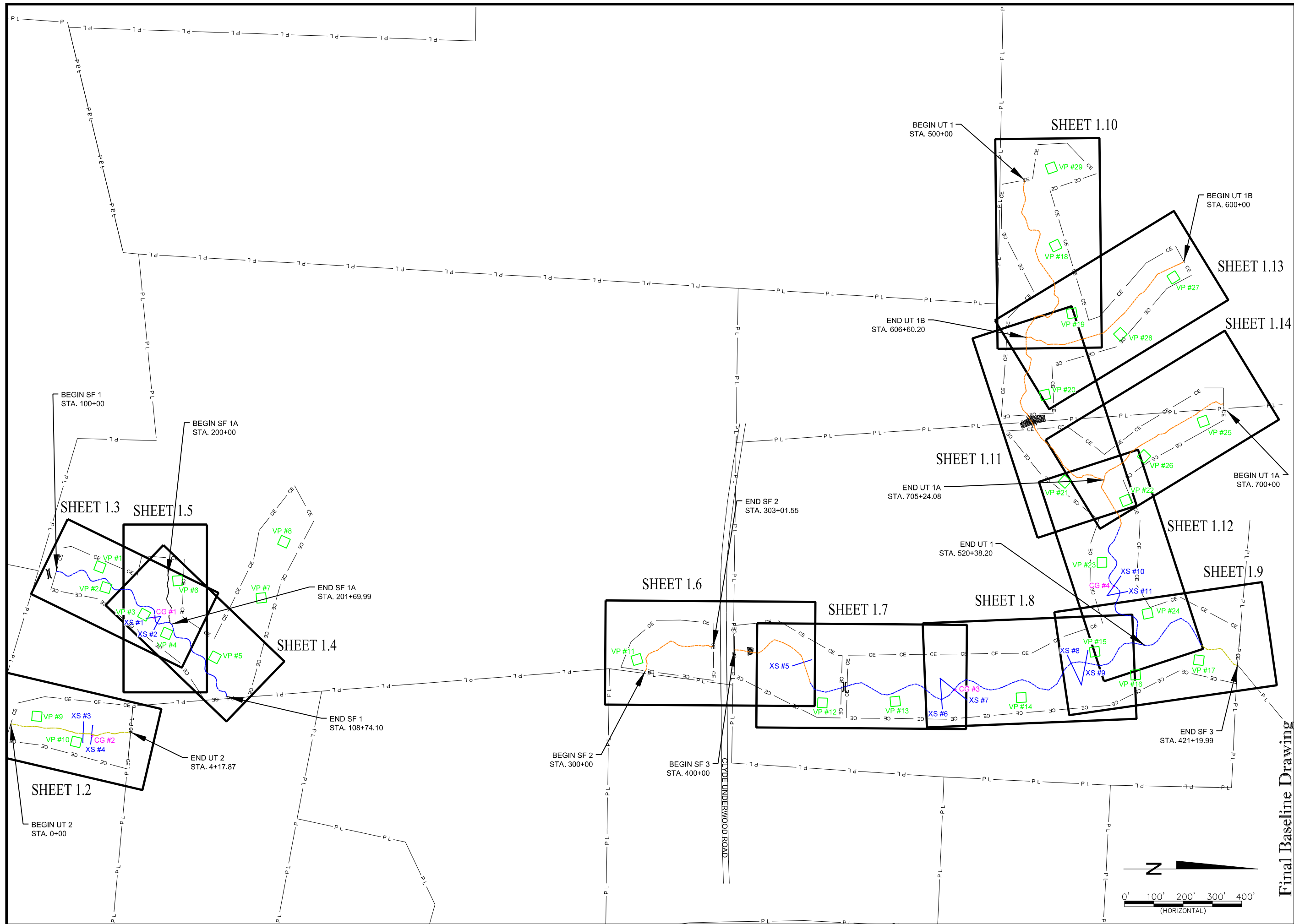
Final Baseline Drawing

Underwood Mitigation Site
Chatham County, NC
Stream Baseline Overview

Date:	May 6, 2013
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STREAM
BASELINE
OVERVIEW



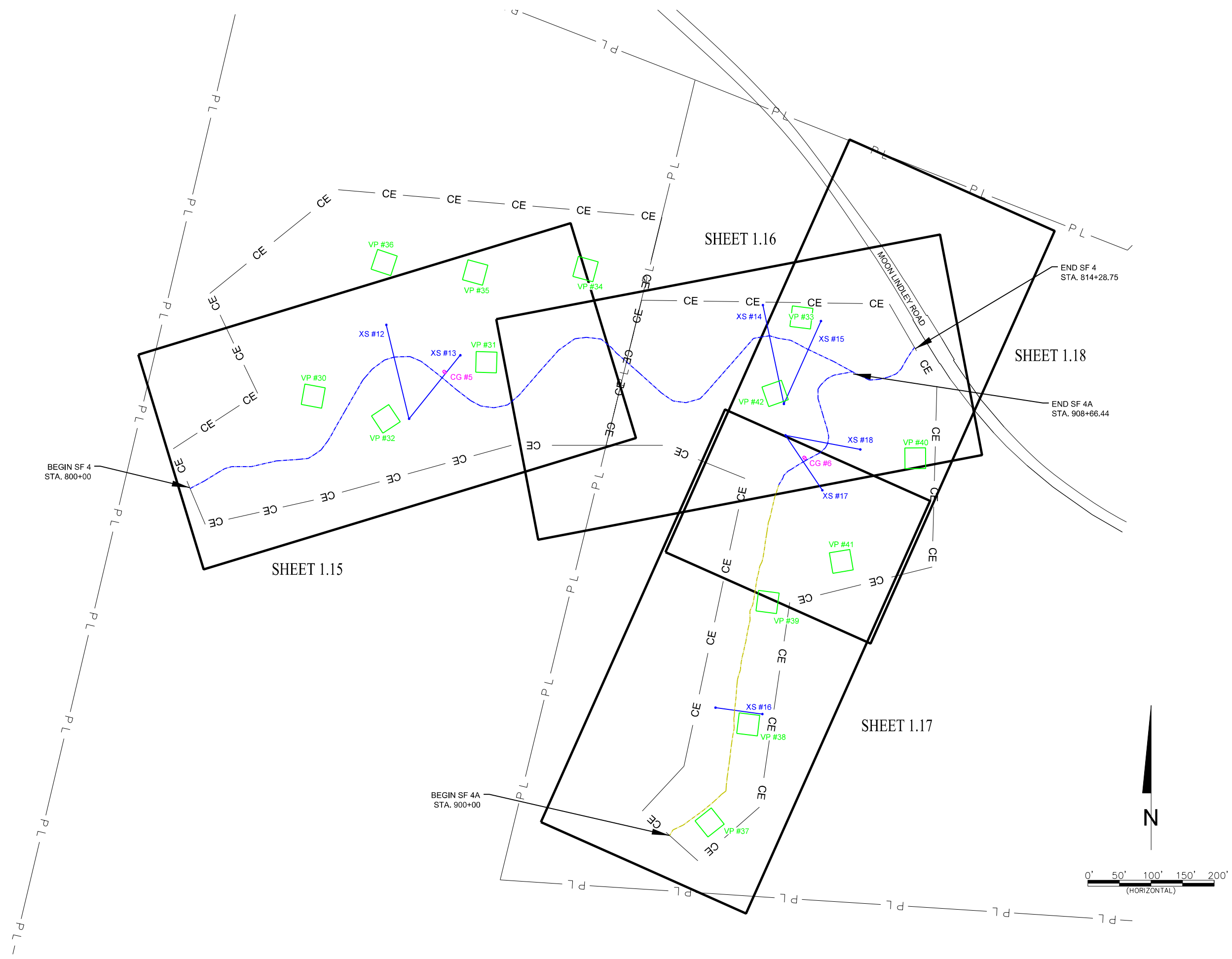
Final Baseline Drawing

Underwood Mitigation Site
Chatham County, NC
Stream Baseline Overview

Final Baseline Drawing

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STREAM
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OVERVIEW

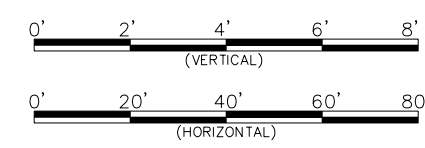
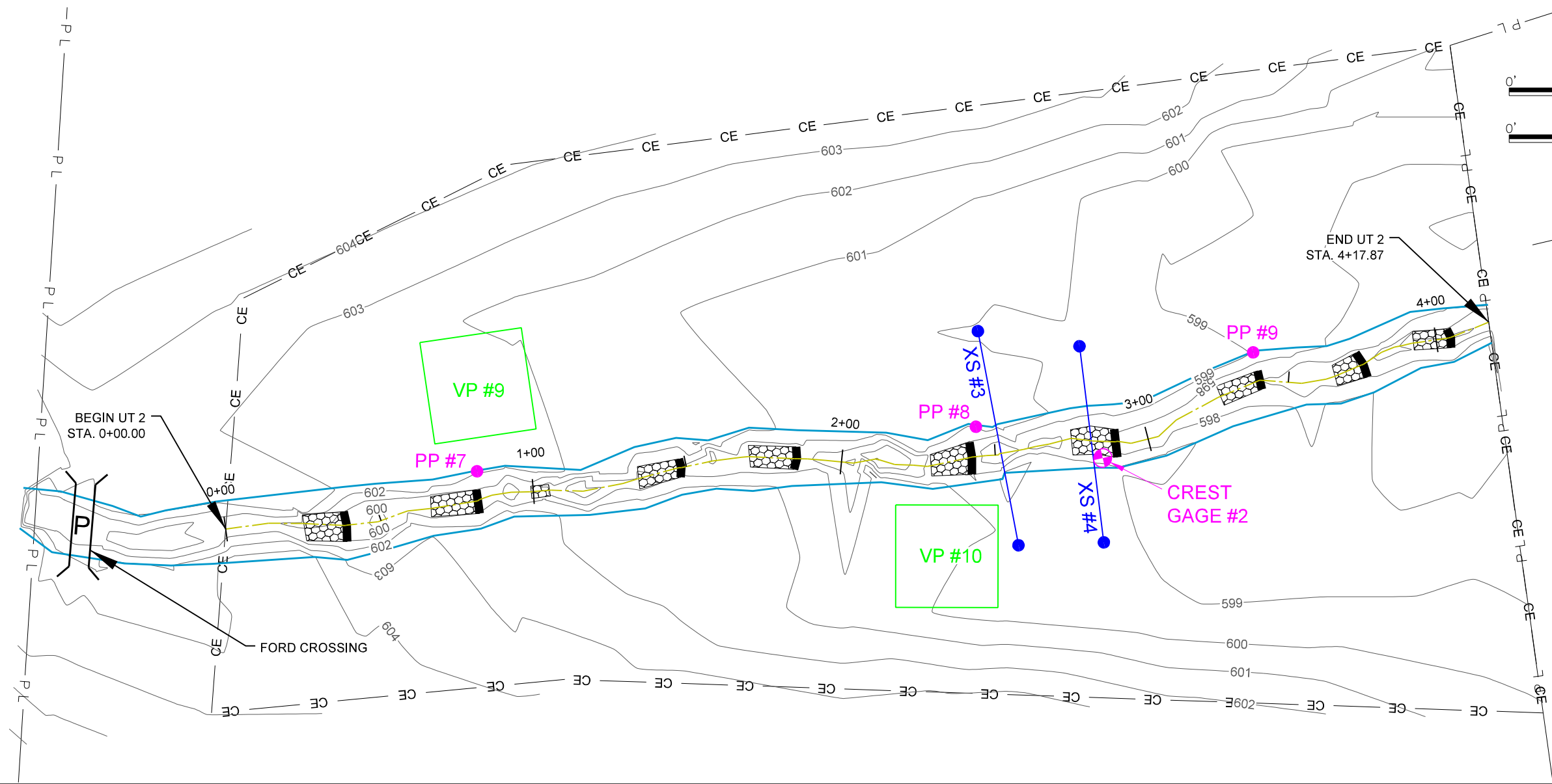
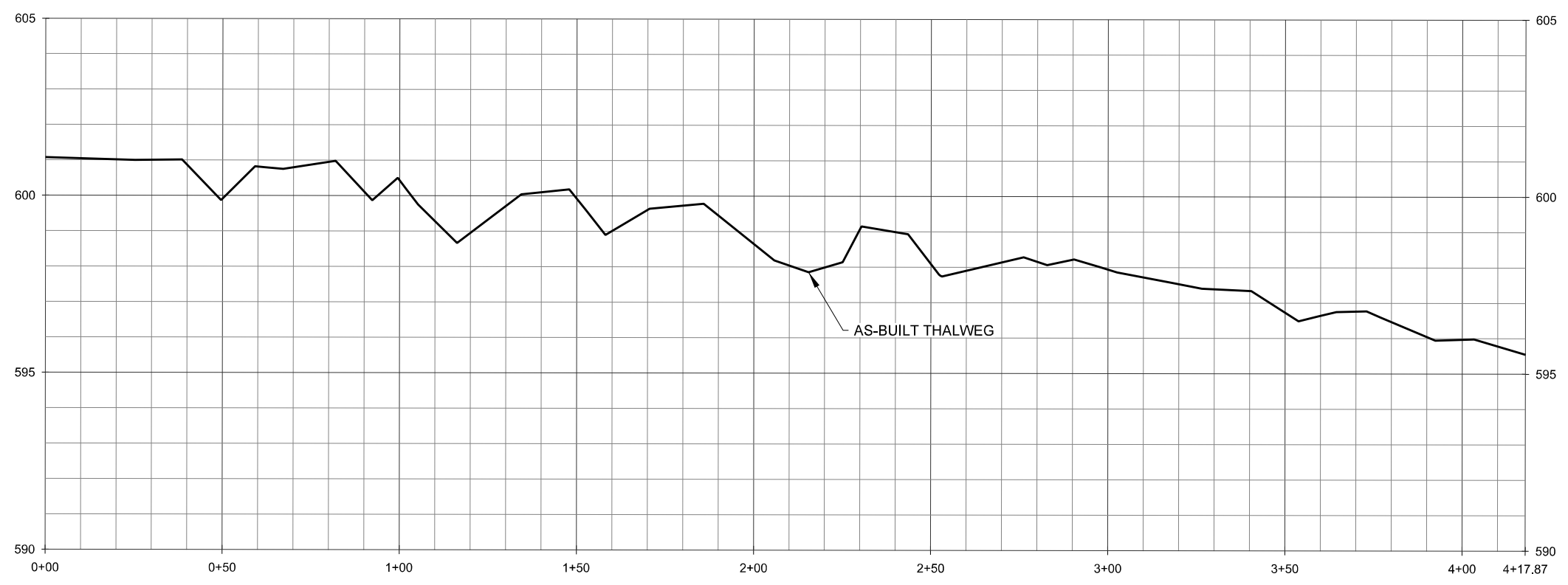


**Underwood Mitigation Site
Chatham County, NC**
Stream Baseline Plans
UT 2 Plan and Profile

Date:	May 6, 2013
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**STREAM
BASELINE
PLANS**



Final Baseline Drawing

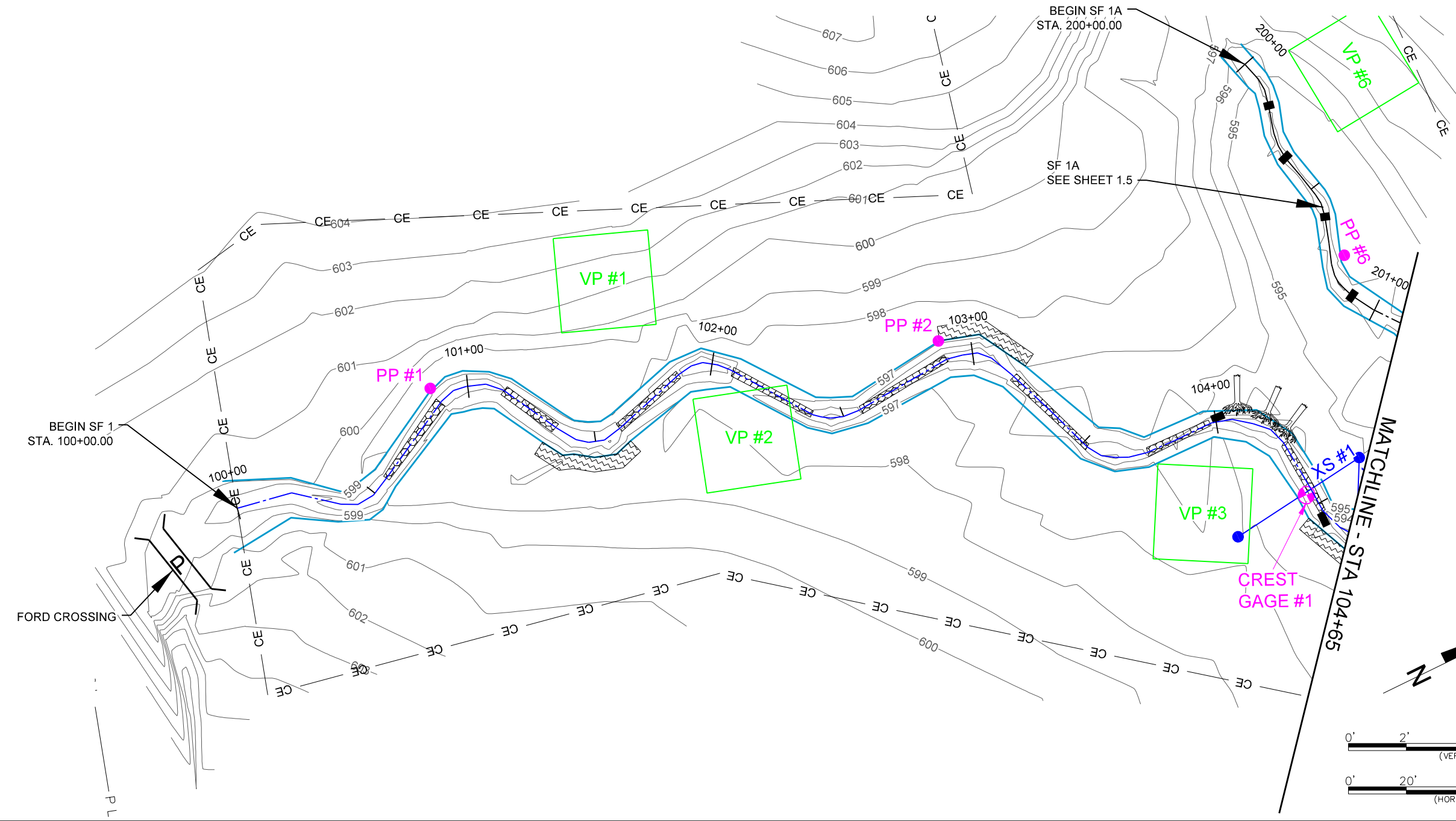
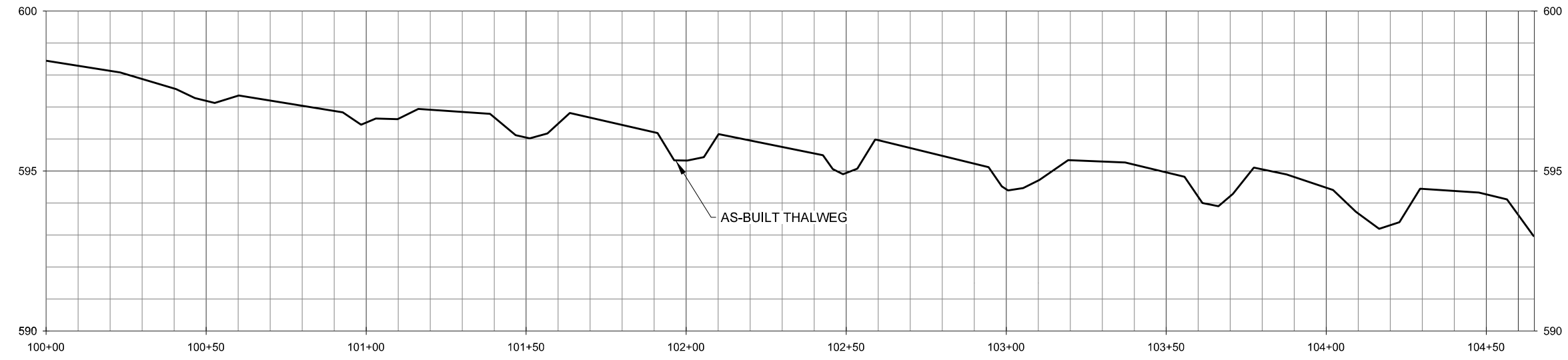
Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
SF 1 Plan and Profile

Final Baseline Drawing

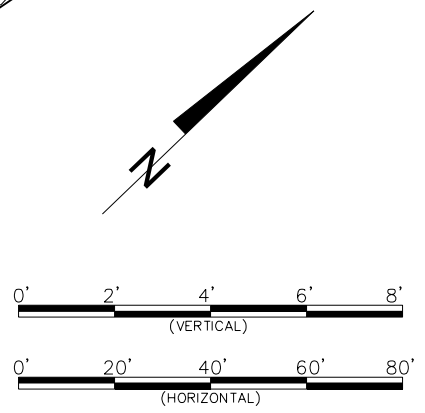
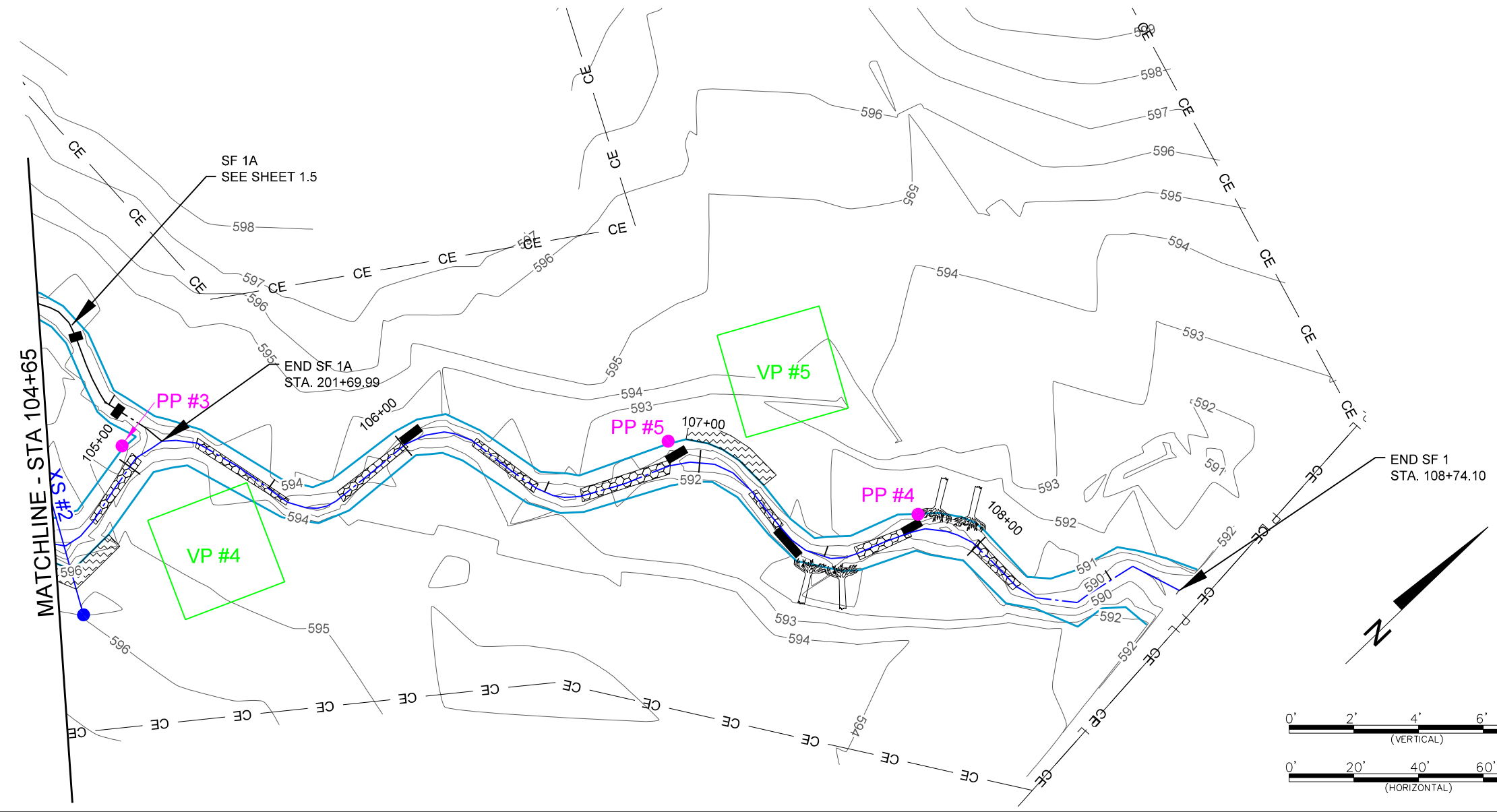
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STREAM
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PLANS



Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
SF 1 Plan and Profile



Final Baseline Drawing

Date:	May 6, 2013
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STREAM
BASELINE
PLANS

Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
SF 1A Plan and Profile

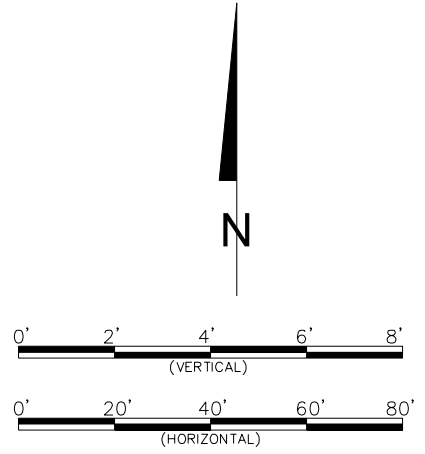
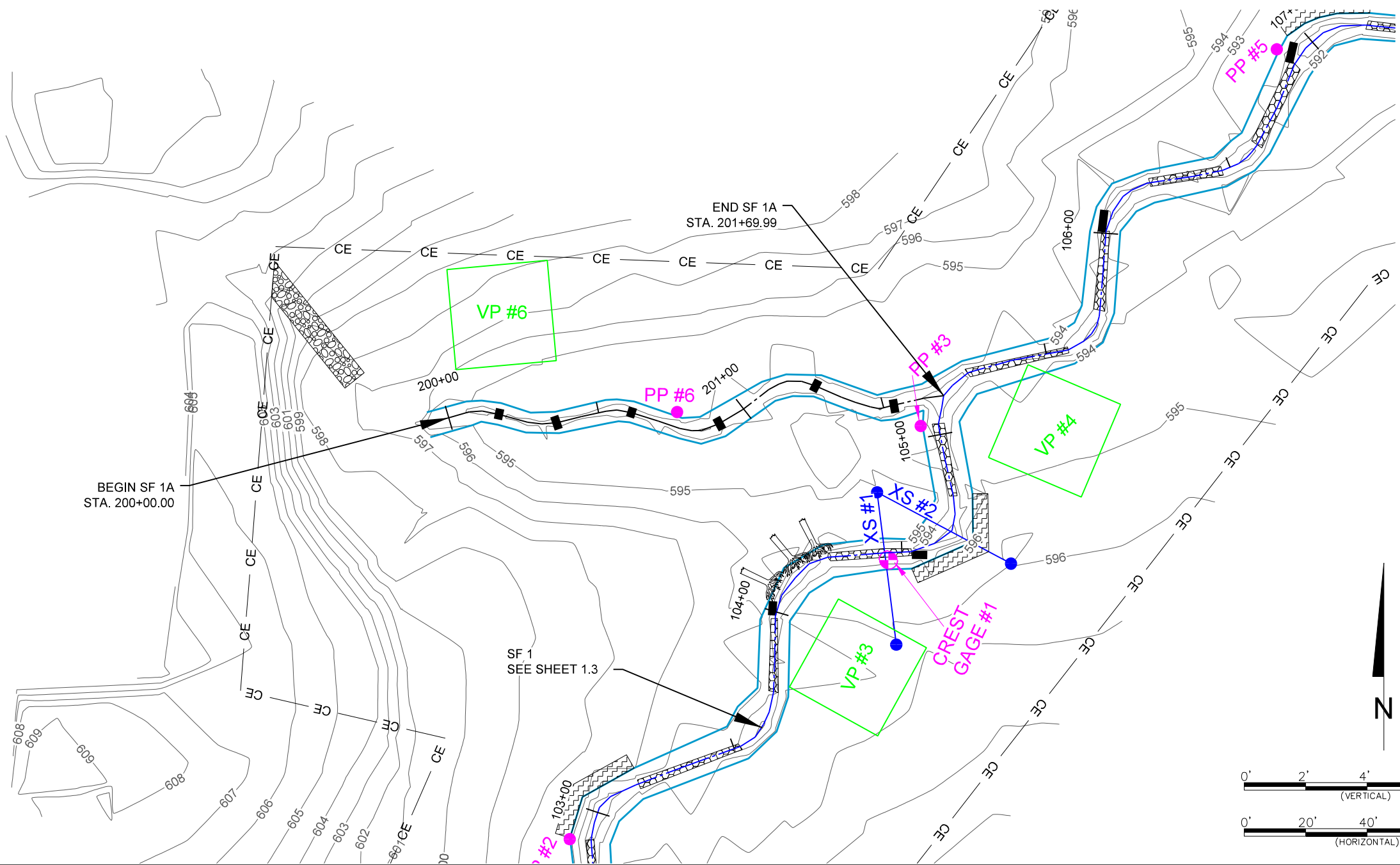
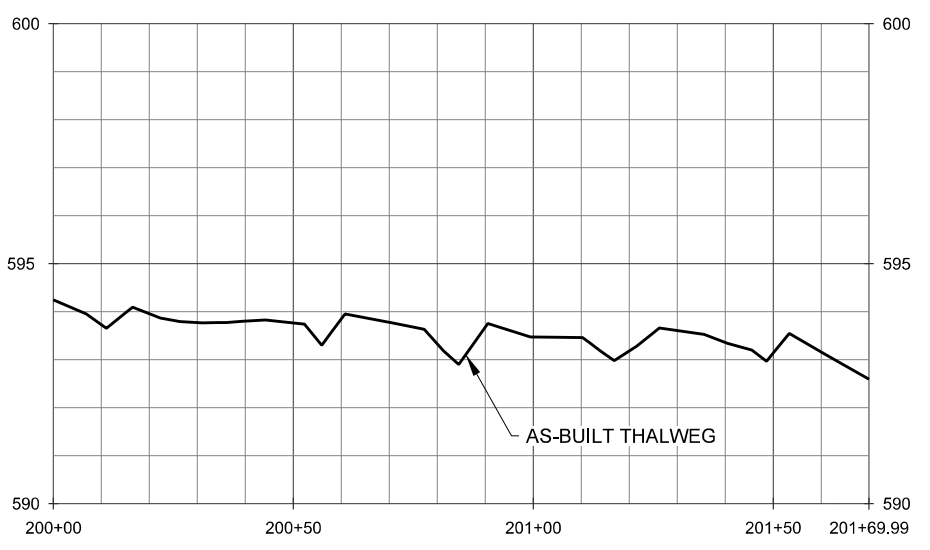
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PLANS

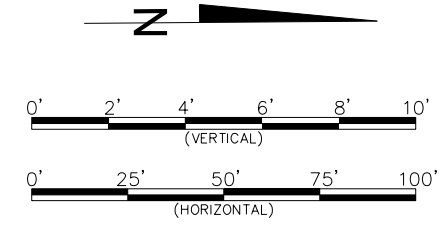
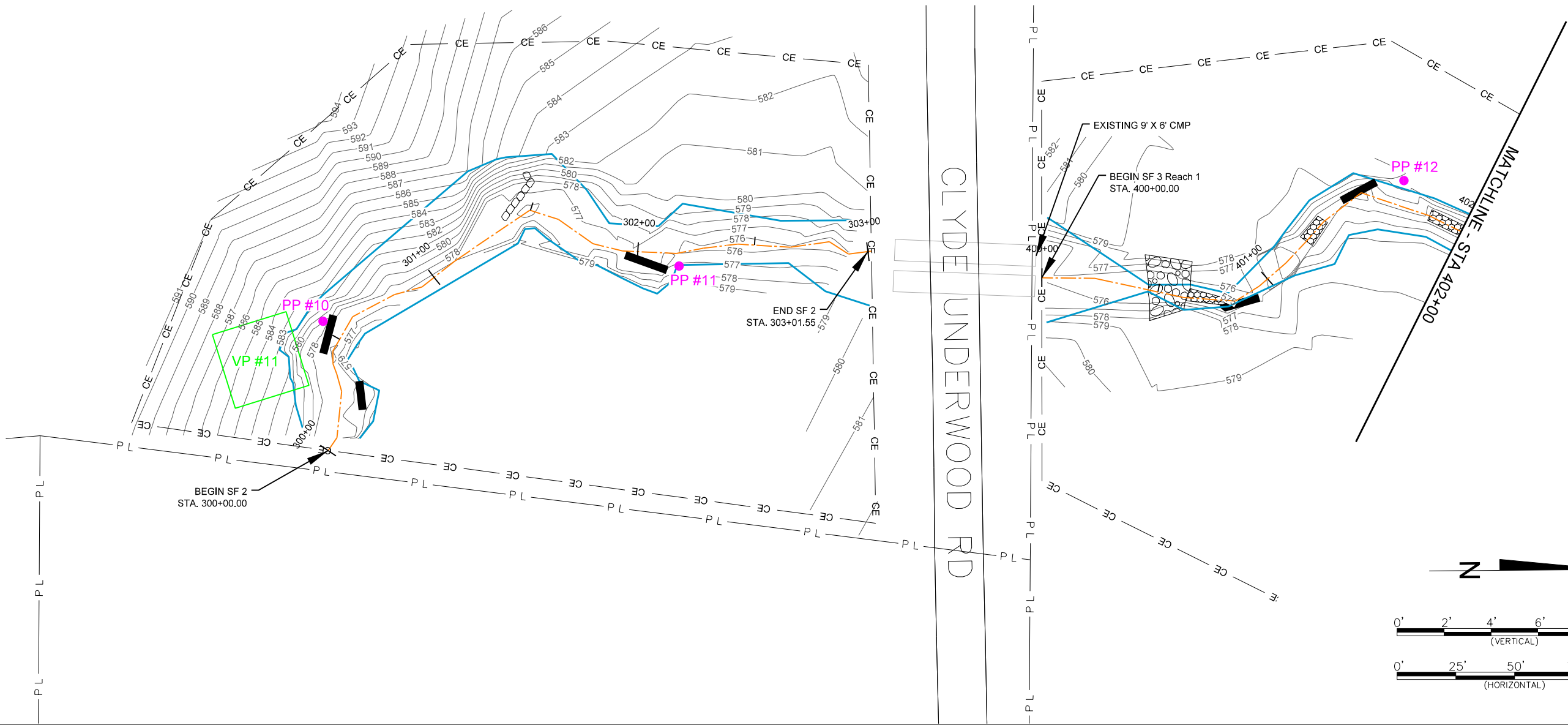
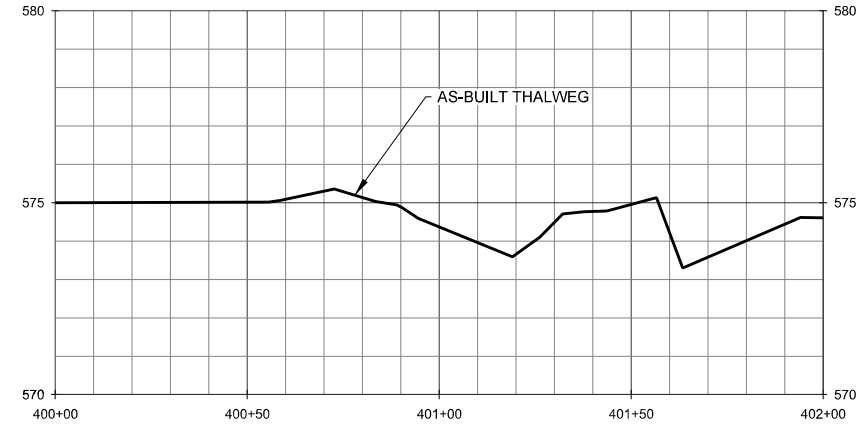
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Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
SF 2 & SF 3 Reach 1 Plan and Profile

Date:	May 6, 2013
Job Number:	005-02125
Project Engineer:	NMM
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PLANS



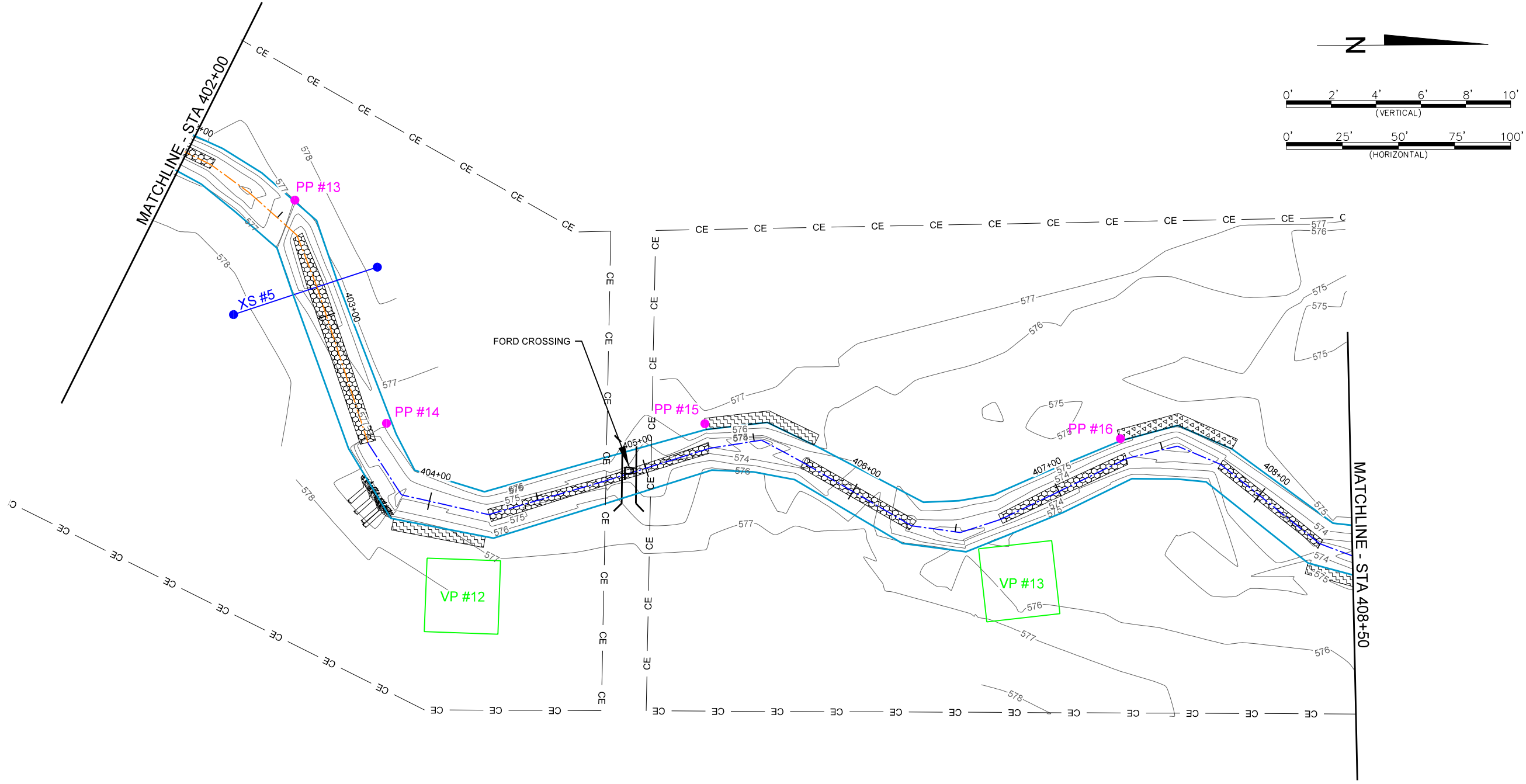
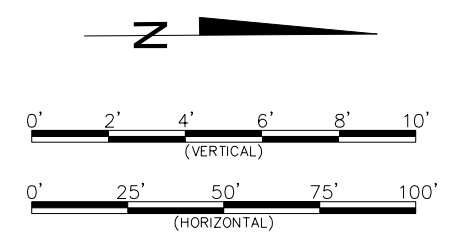
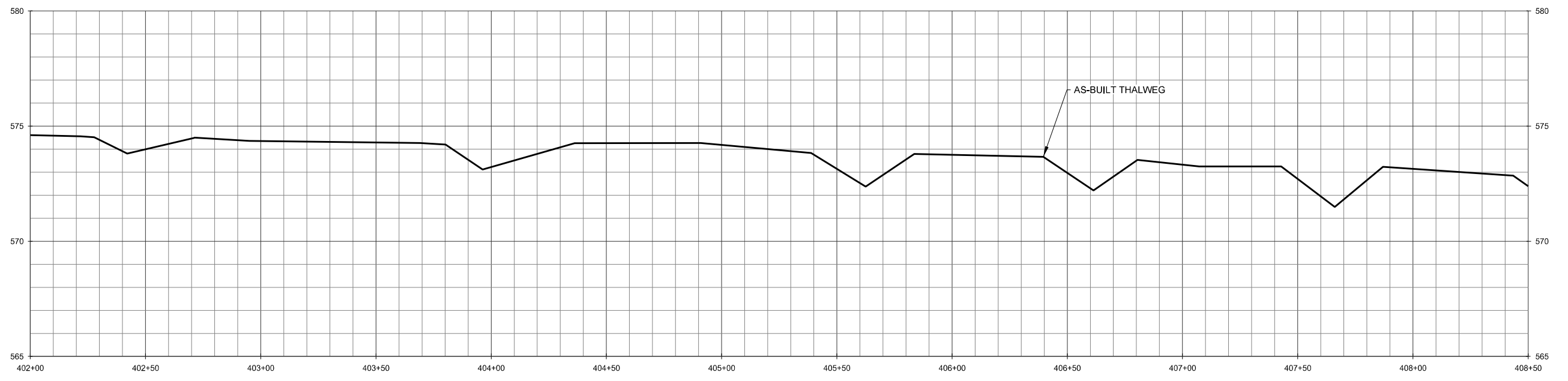
Final Baseline Drawing

Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
SF 3 Reach 1 Plan and Profile

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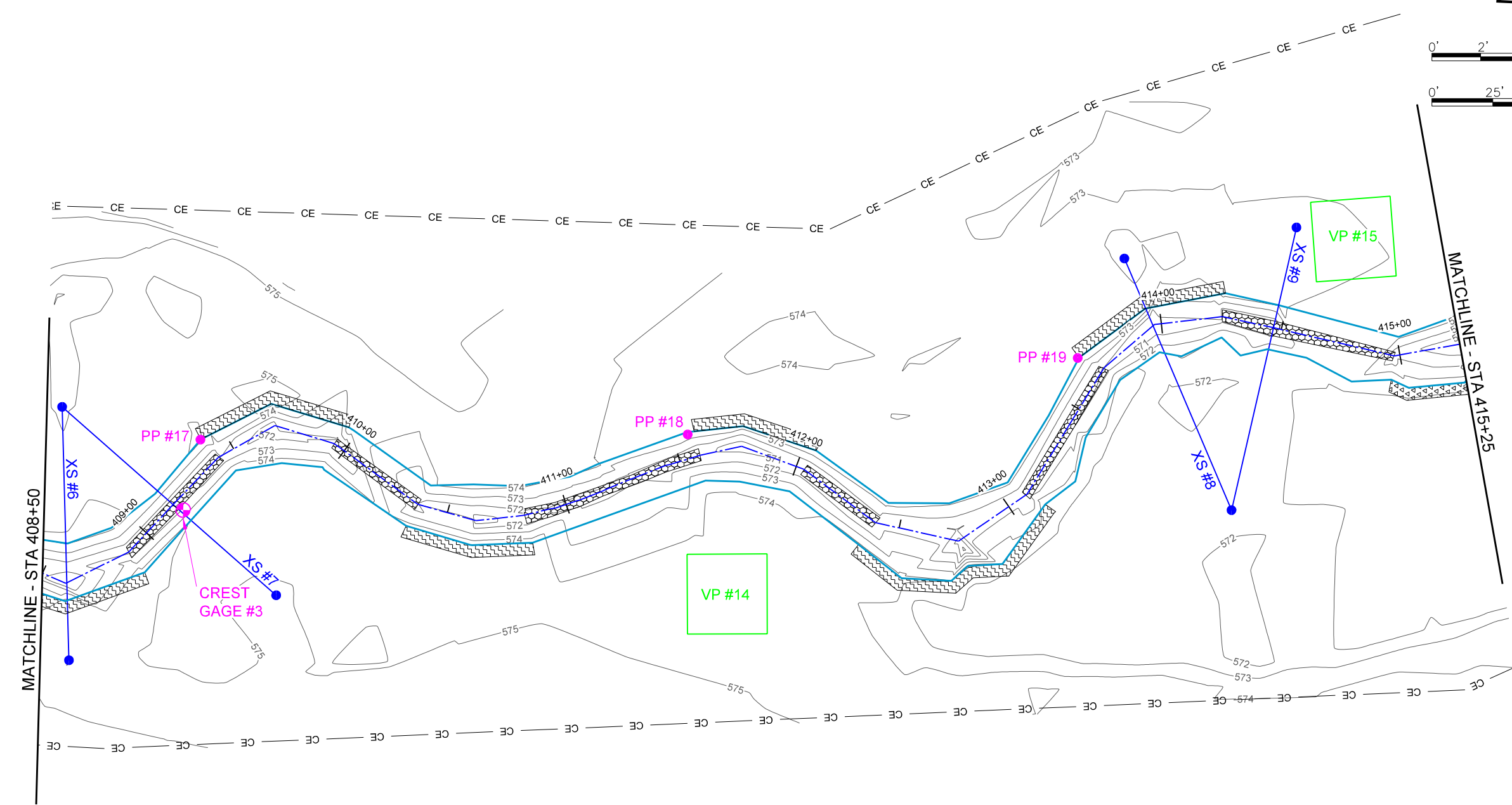
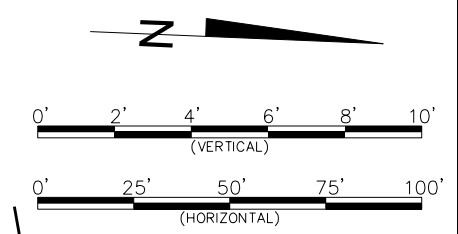
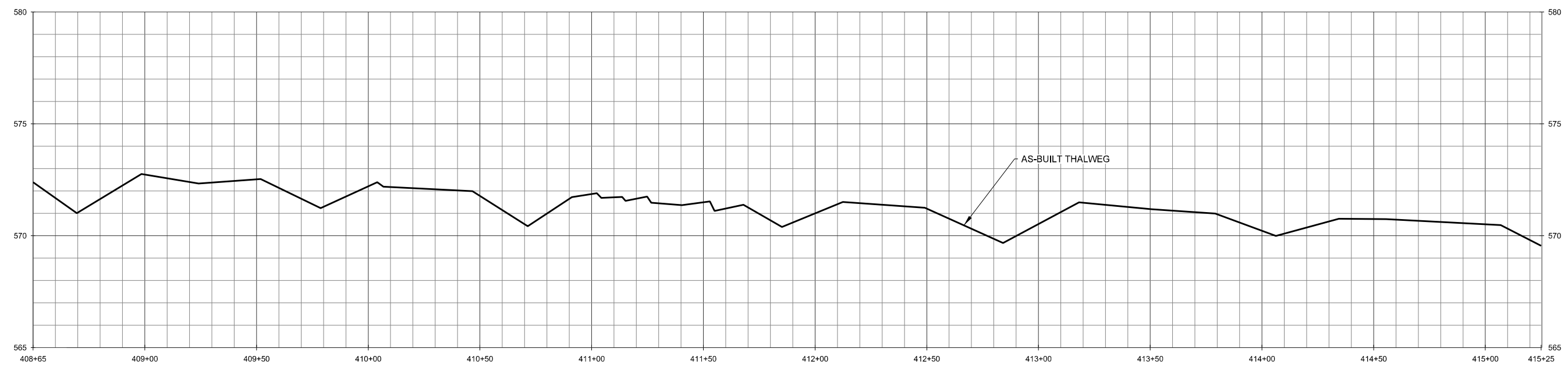


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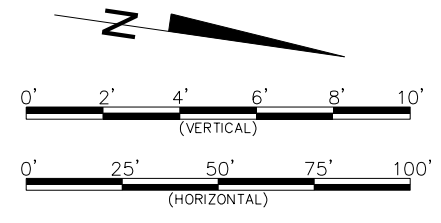
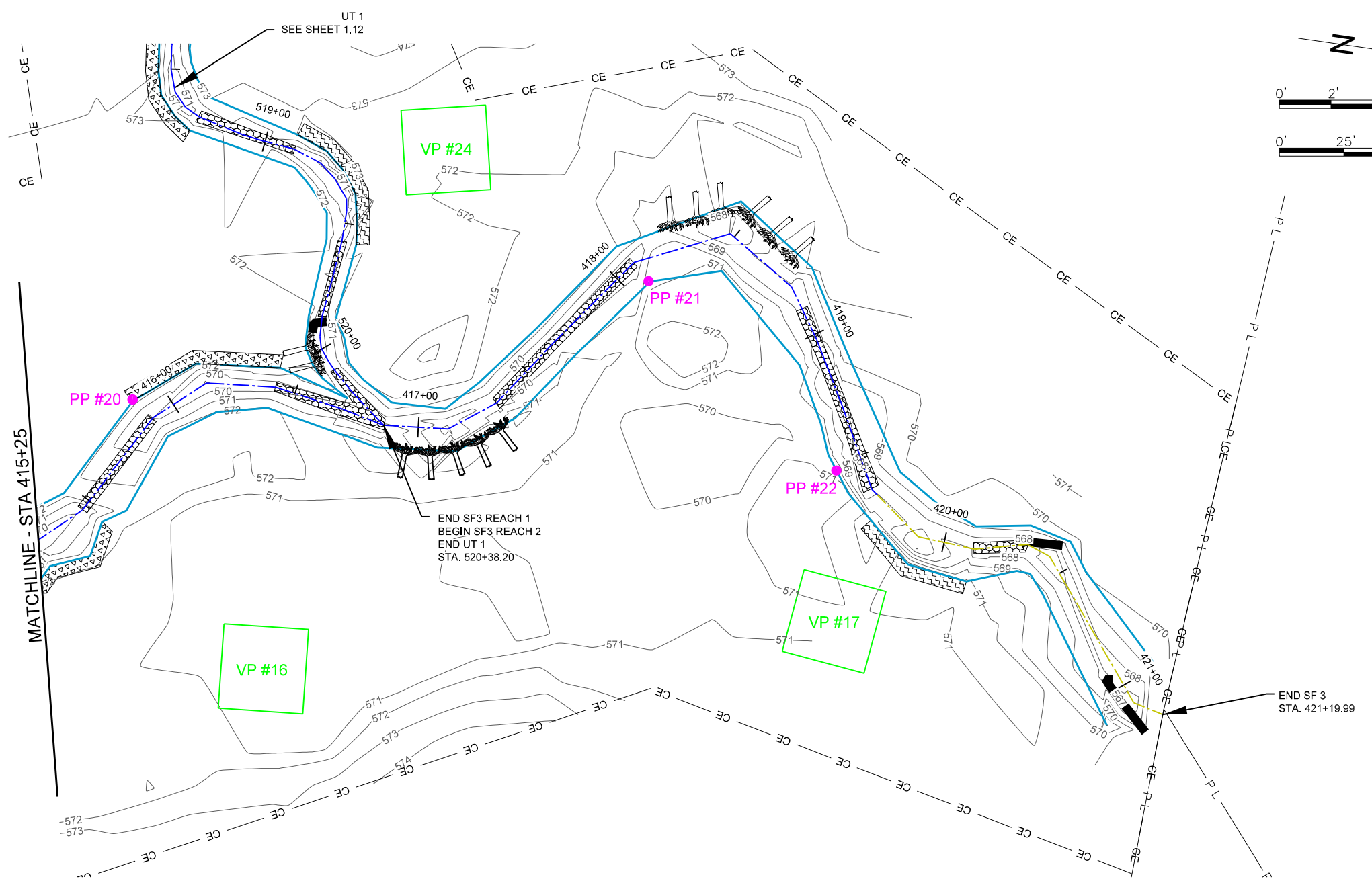
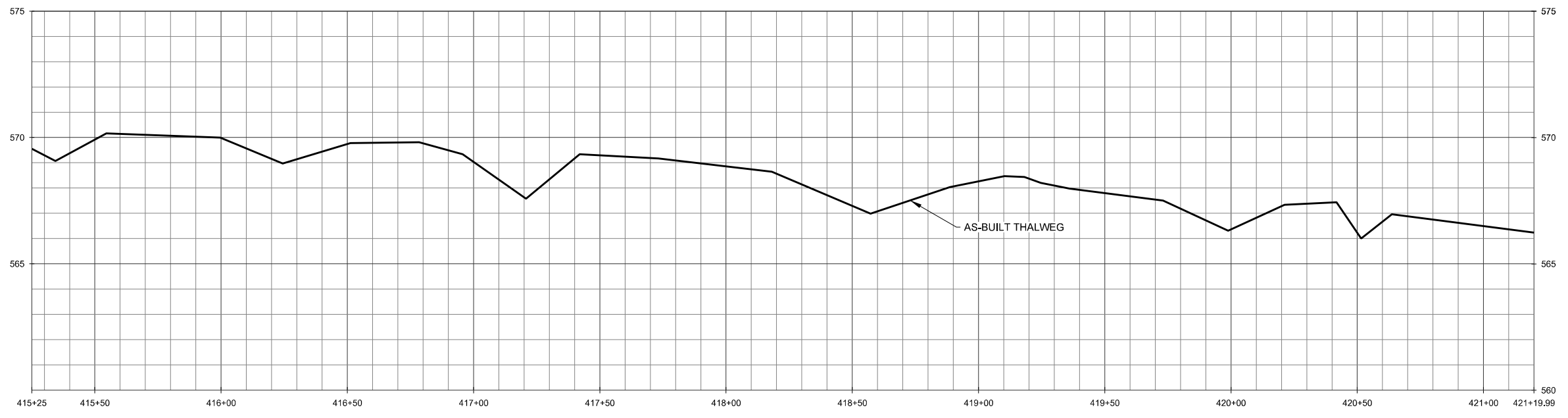
Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
SF 3 Reach 1 Plan and Profile

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Project Engineer:	NMM
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Checked By:	JWH

STREAM
BASELINE
PLANS



Final Baseline Drawing



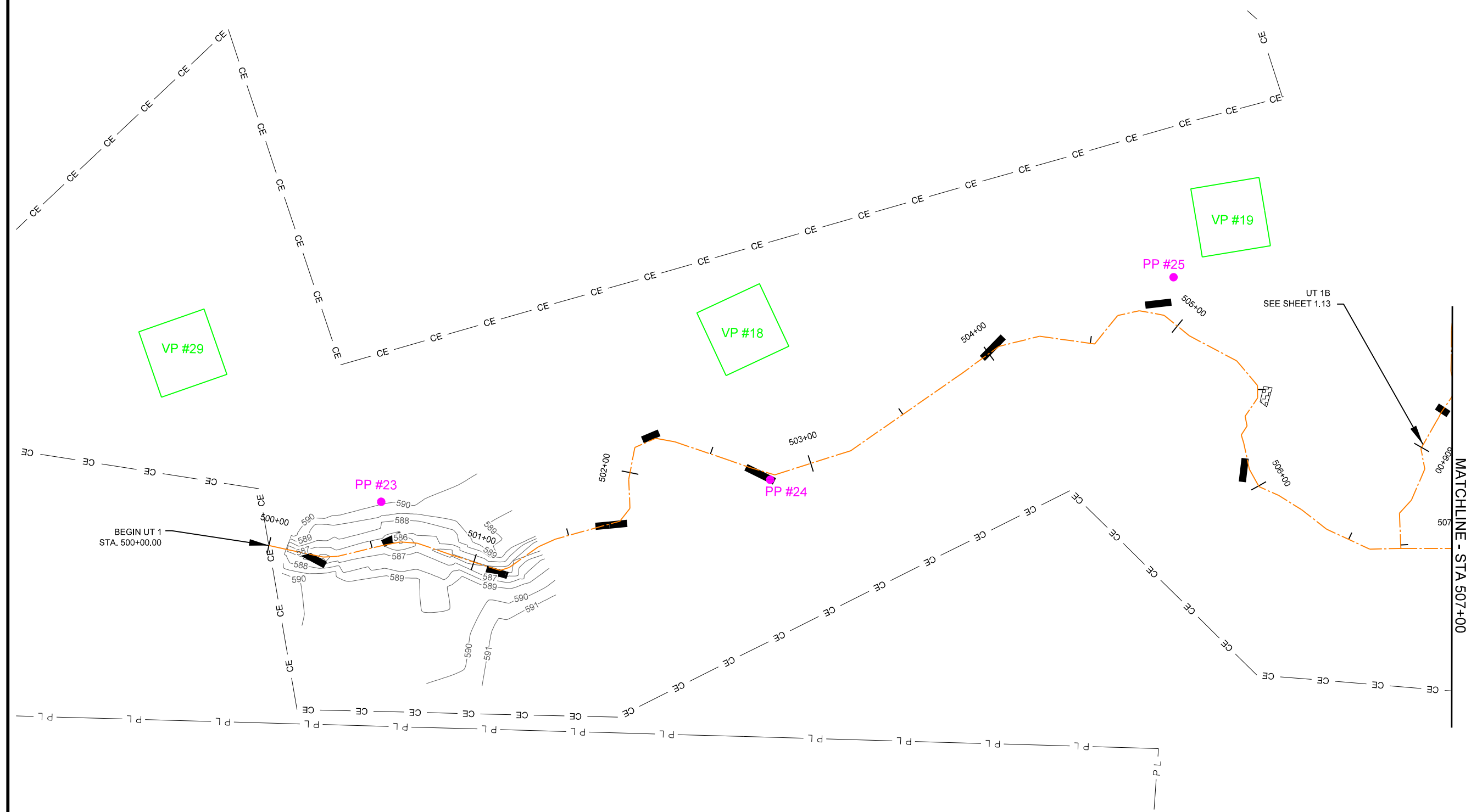
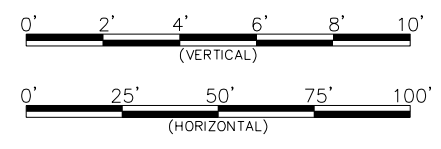
Final Baseline Drawing

Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
SF 3 Reachs 1 & 2 Plan and Profile

Date:	May 6, 2013
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Project Engineer:	NMM
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PLANS



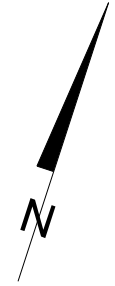
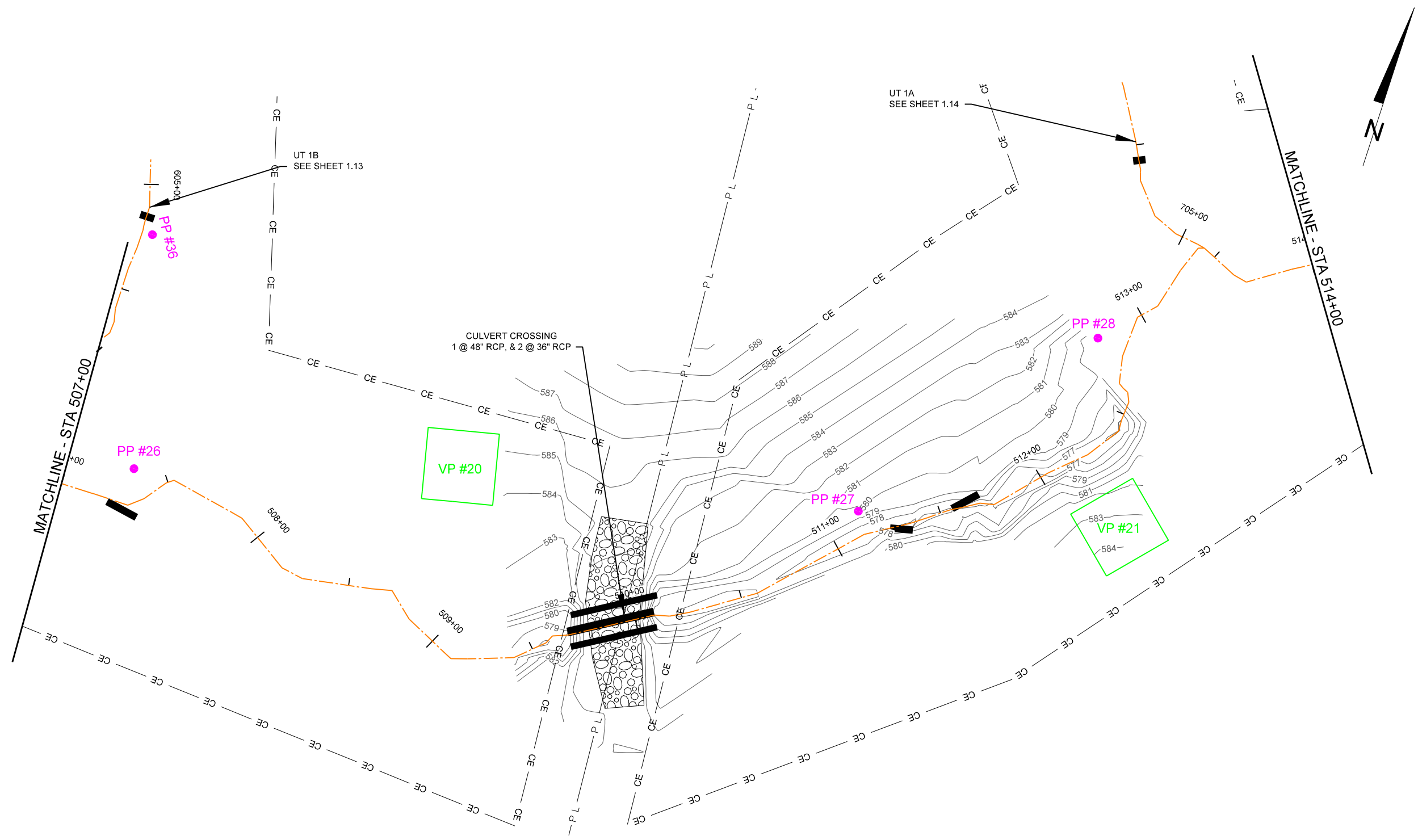
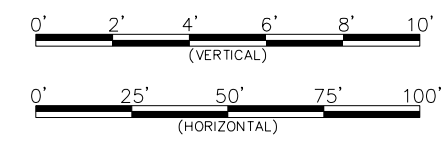
Final Baseline Drawing

Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
UT 1 Plan and Profile

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PLANS



Final Baseline Drawing

Underwood Mitigation Site
Chatham County, NC
 Stream Baseline Plans
 UT 1 Plan and Profile

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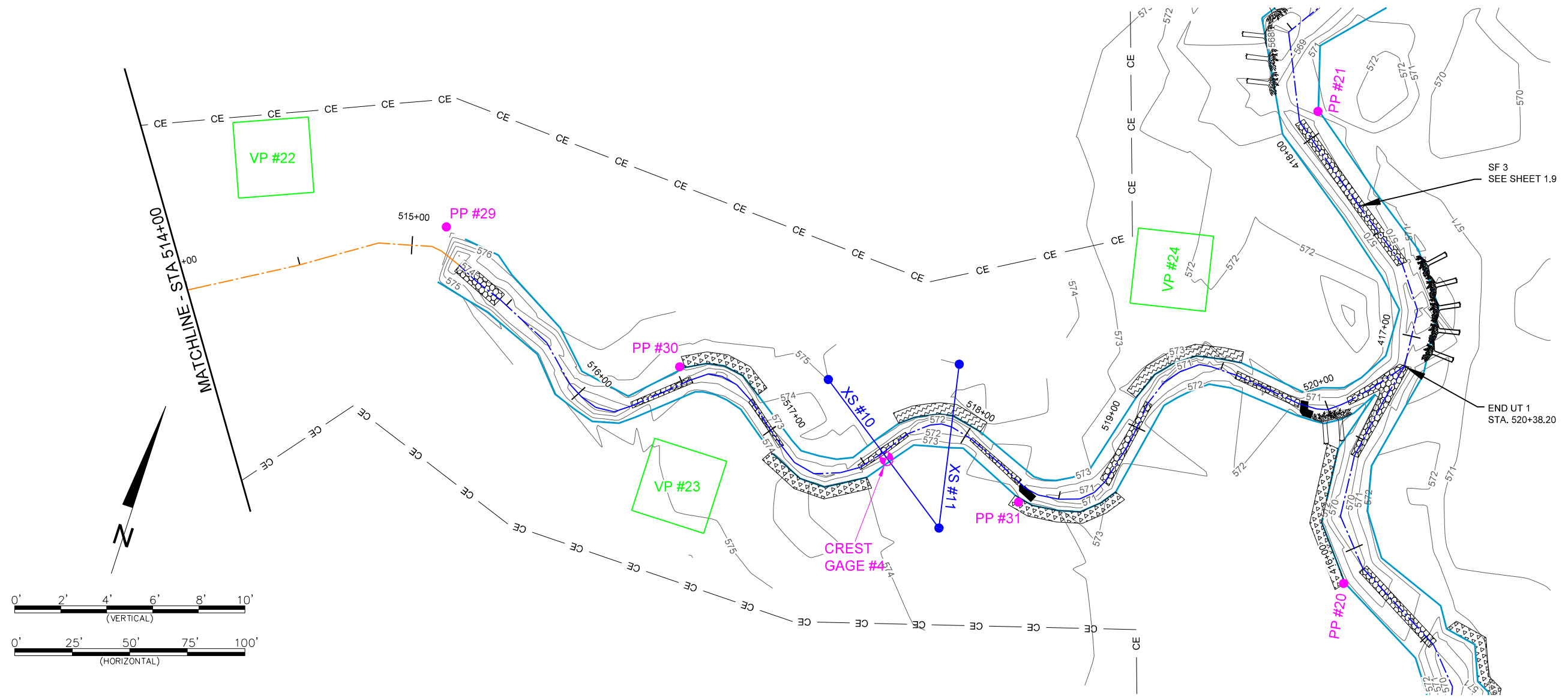
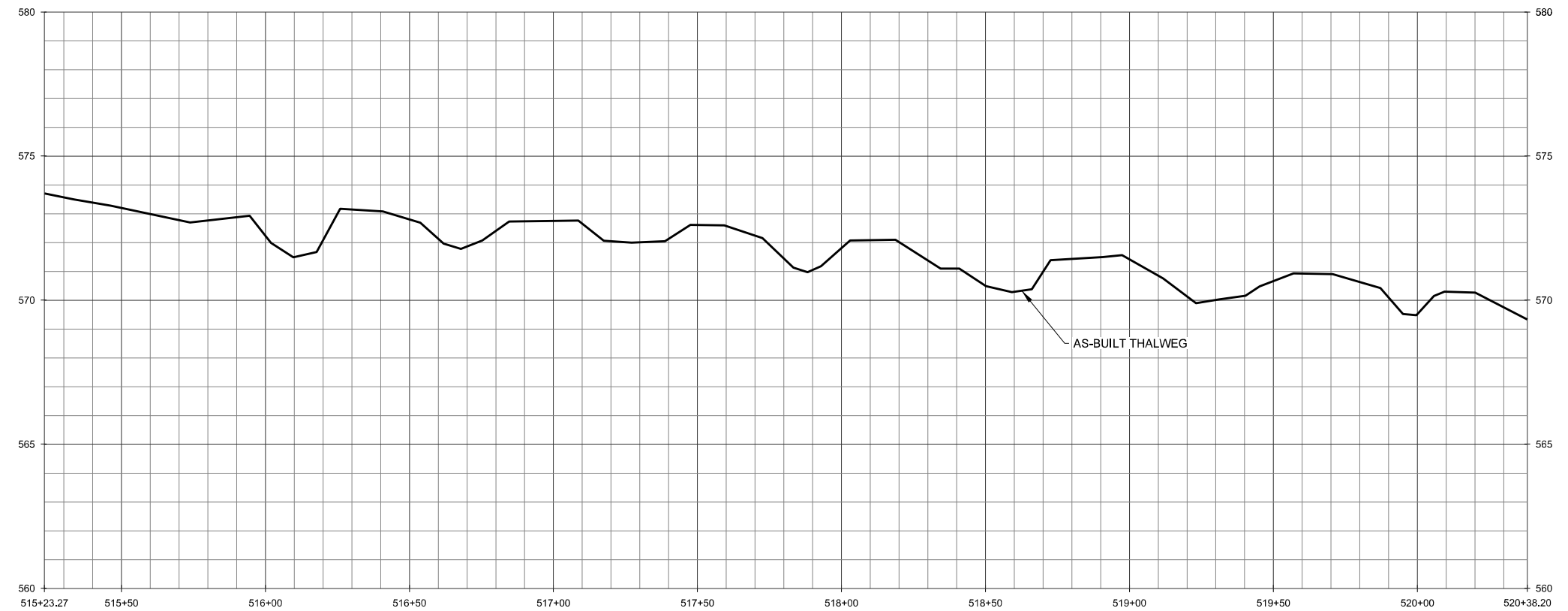
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PLANS

Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
UT 1 Plan and Profile

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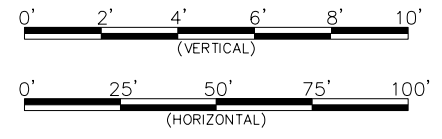
STREAM
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PLANS

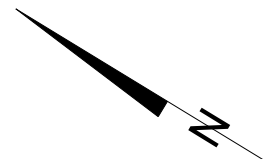
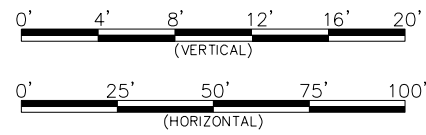


MATCHLINE - STA 514+00

SF 3
SEE SHEET 1.9

END UT 1
STA. 520+38.20



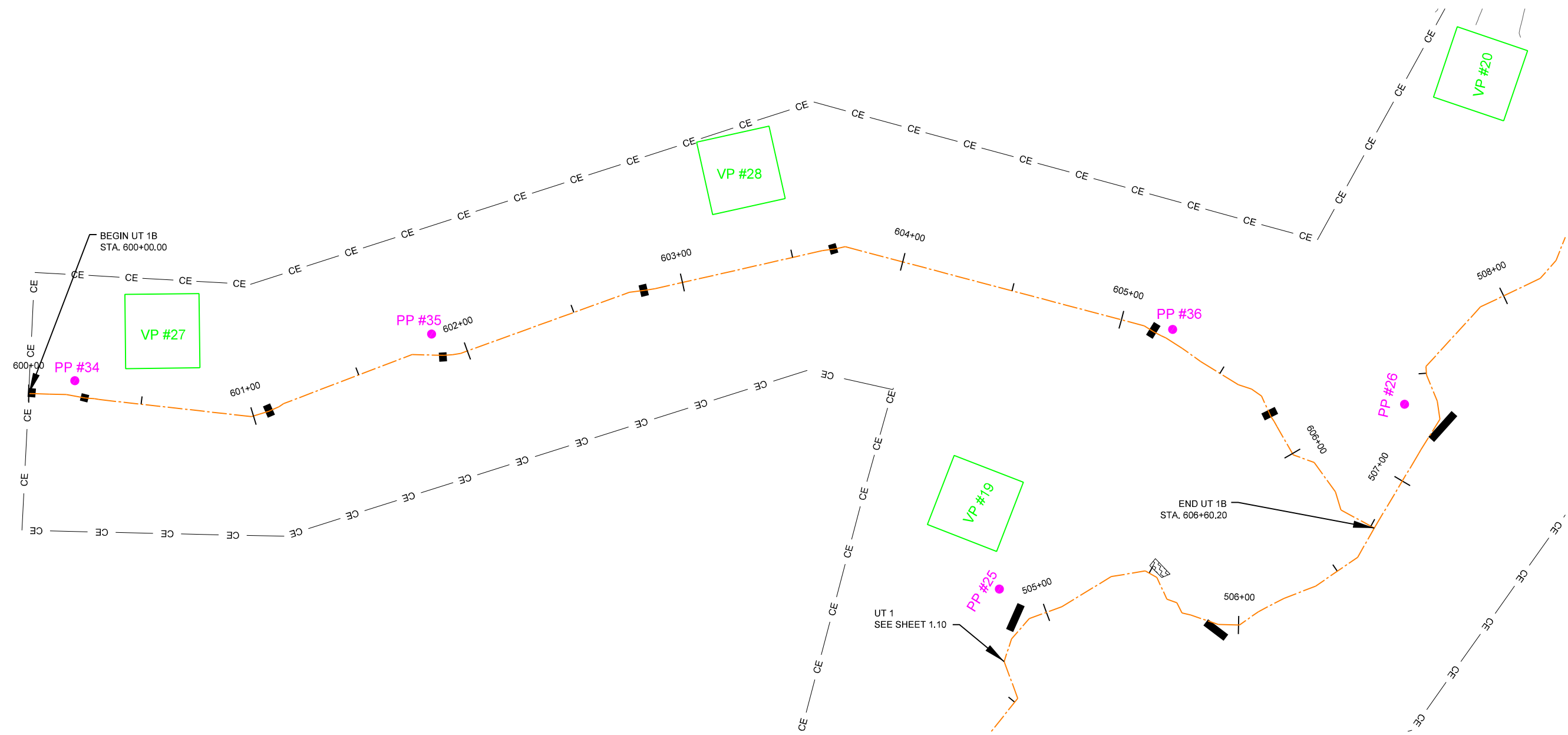


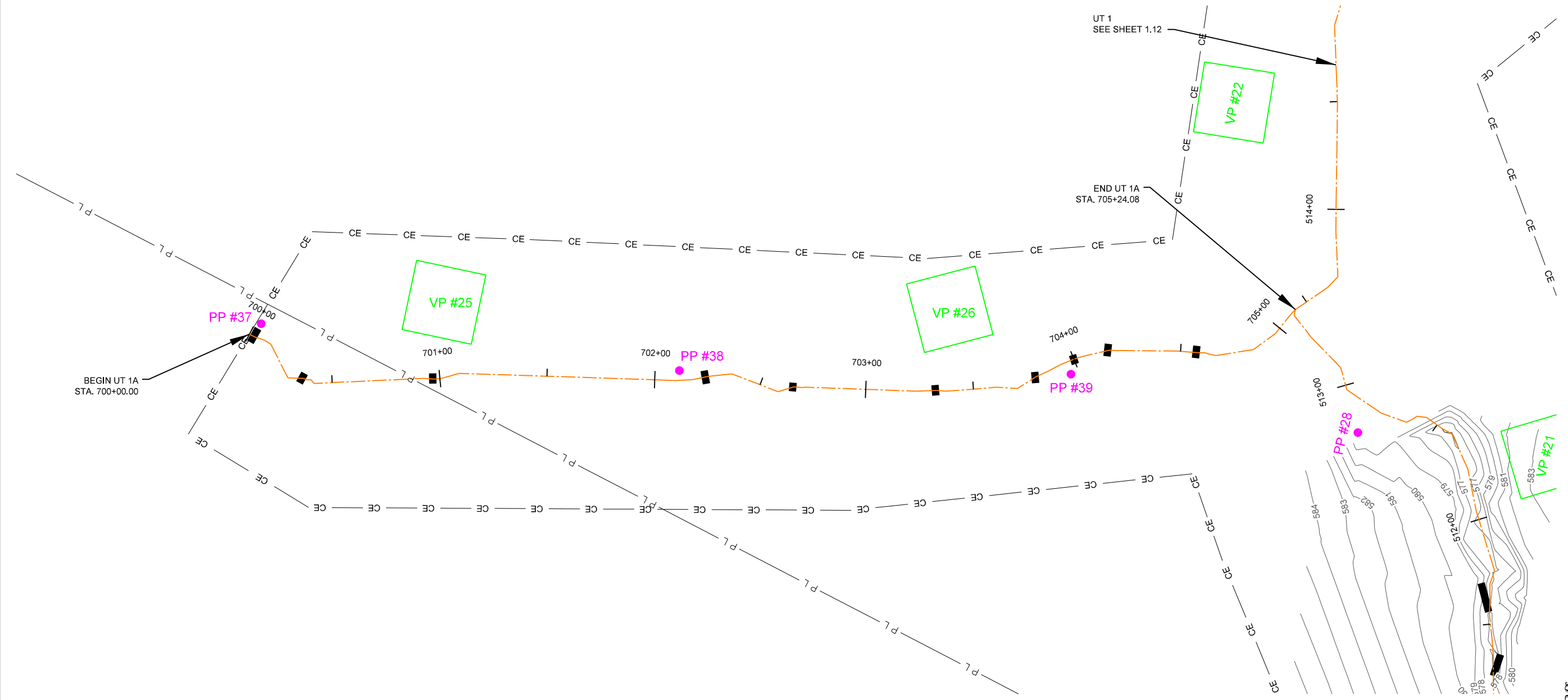
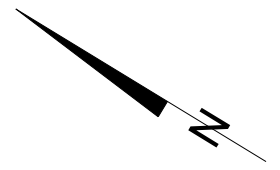
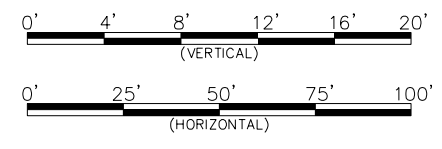
Underwood Mitigation Site
Chatham County, NC
 Stream Baseline Plans
 UT 1B Plan and Profile

Final Baseline Drawing

Date:	May 6, 2013
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Project Engineer:	NMM
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STREAM
BASELINE
PLANS





Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
UT 1A Plan and Profile

Final Baseline Drawing

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STREAM
BASELINE
PLANS

Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
SF 4 Plan and Profile

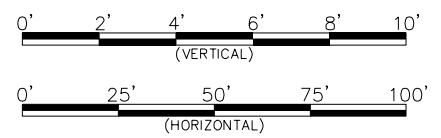
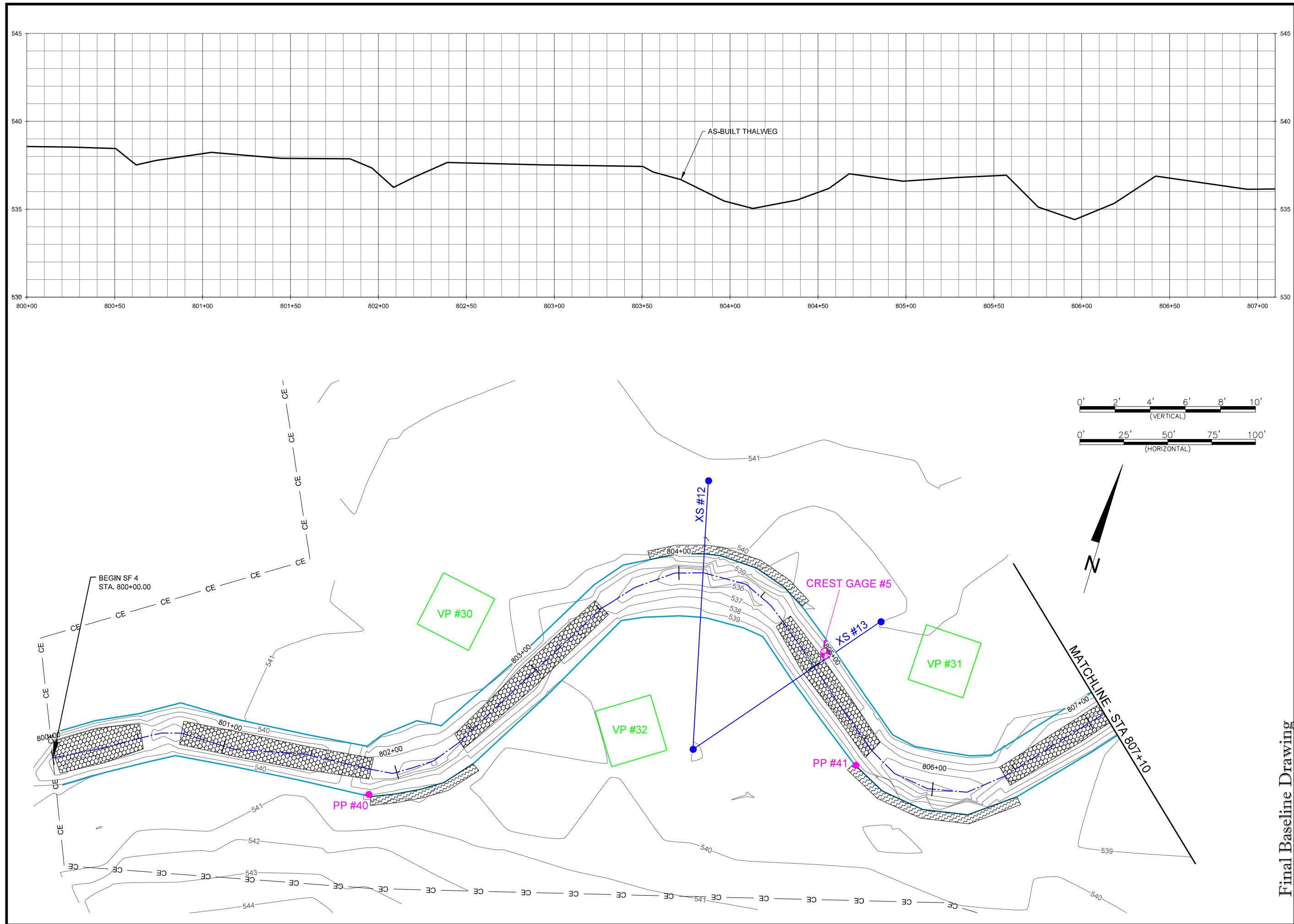
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Revisions

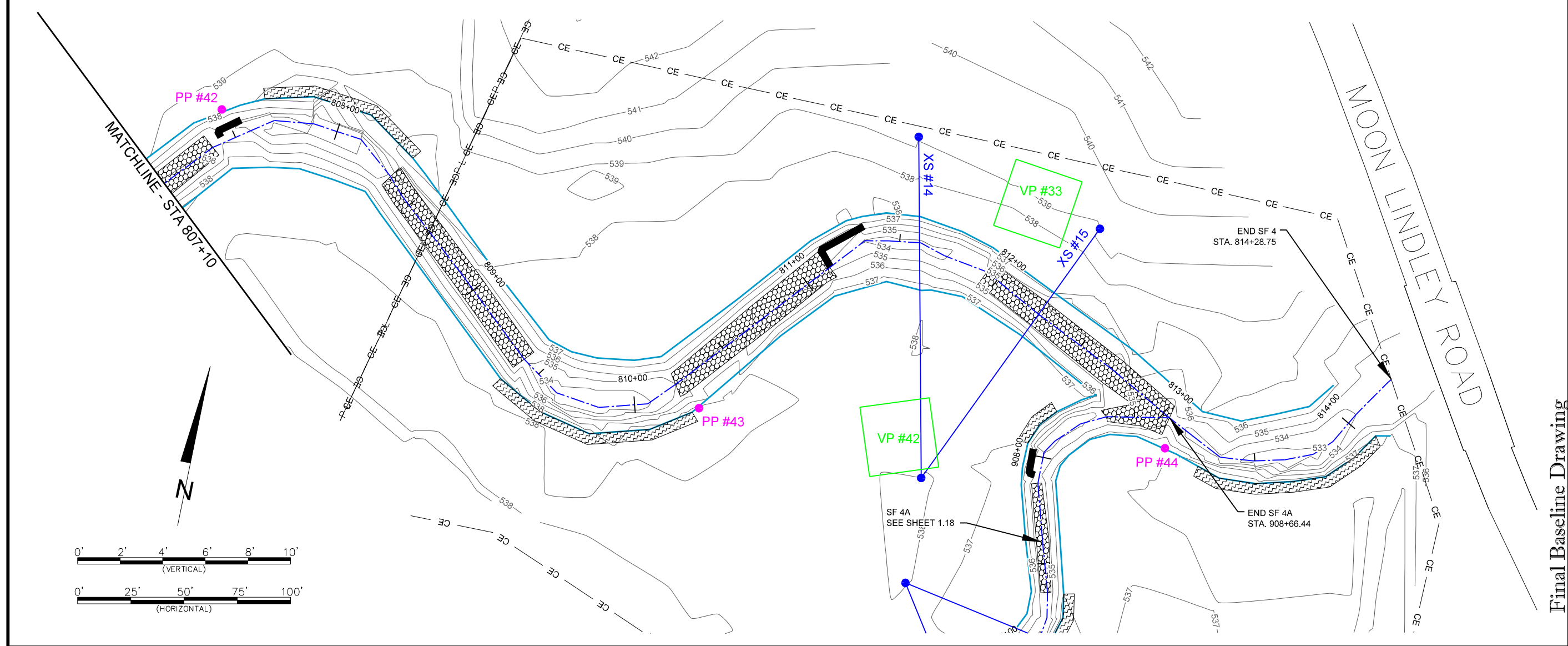
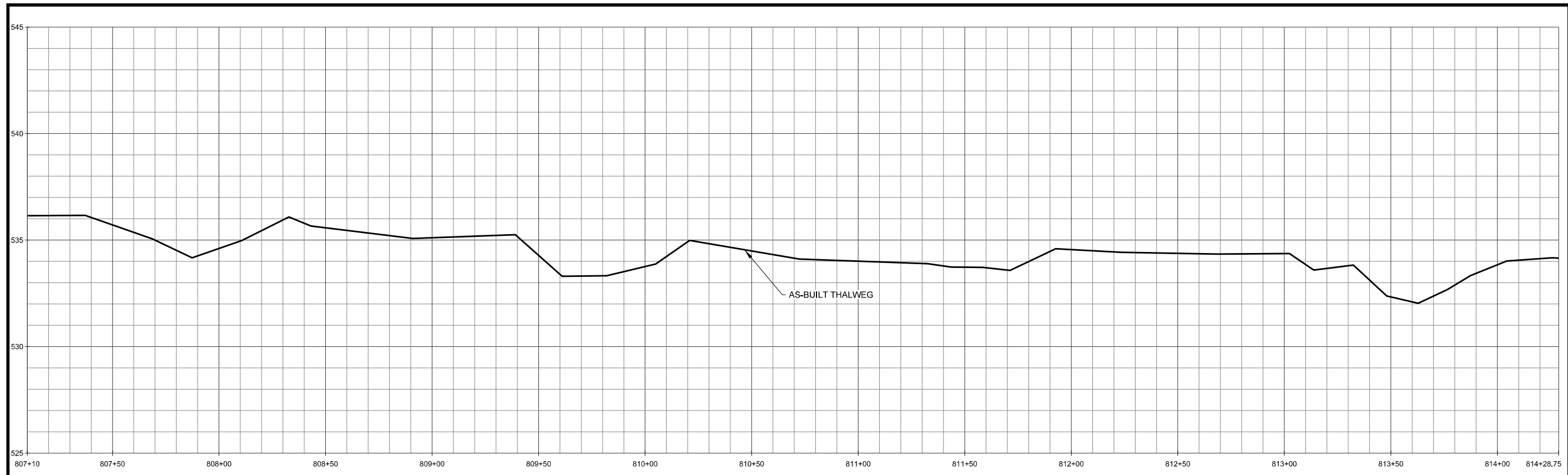
STREAM
BASELINE
PLANS

Sheet
1.15



Final Baseline Drawing

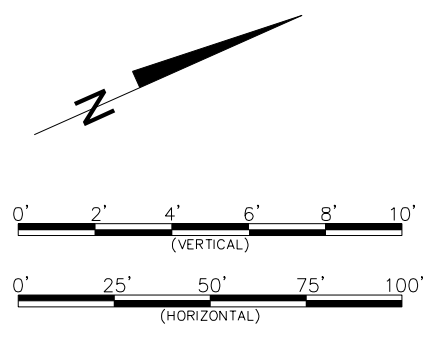
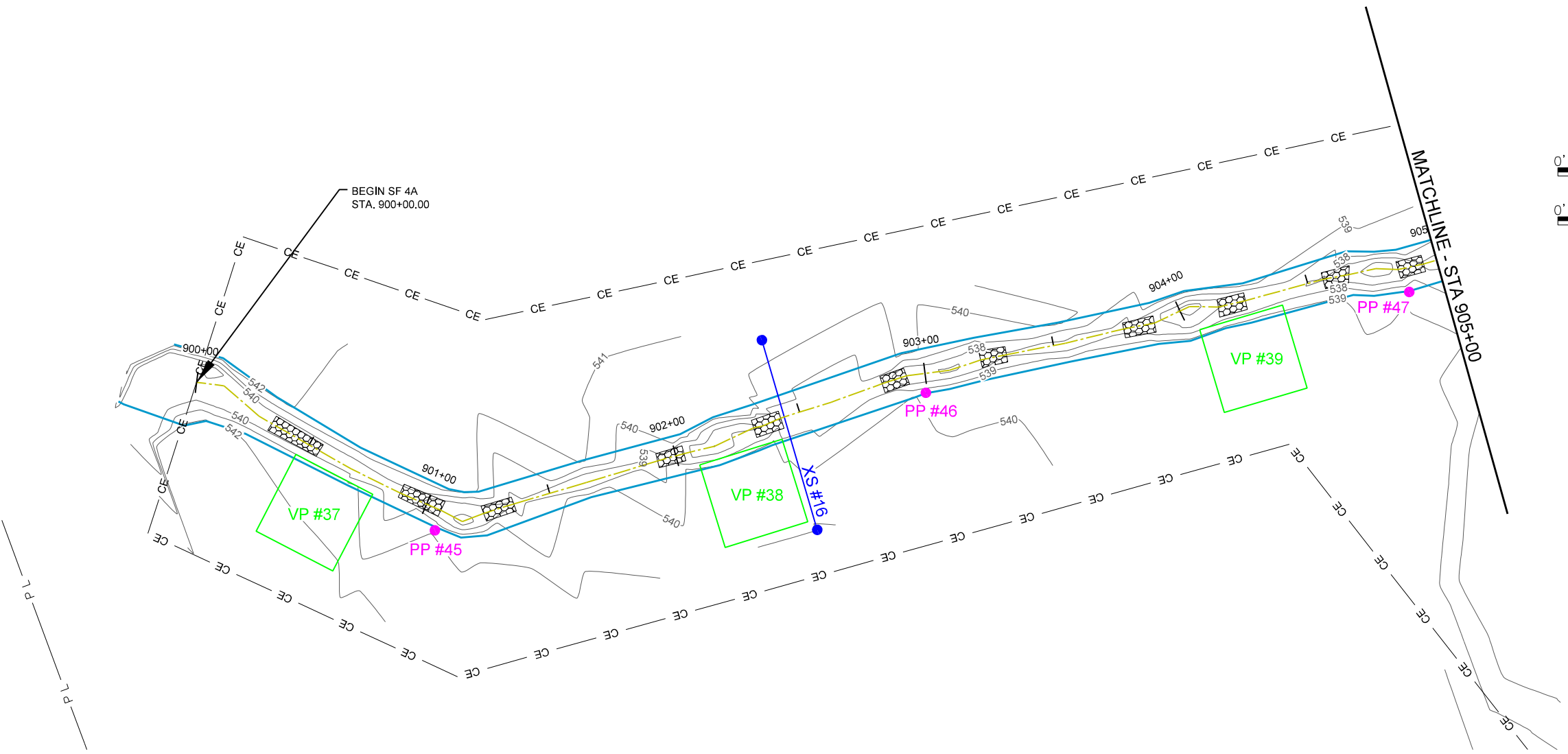
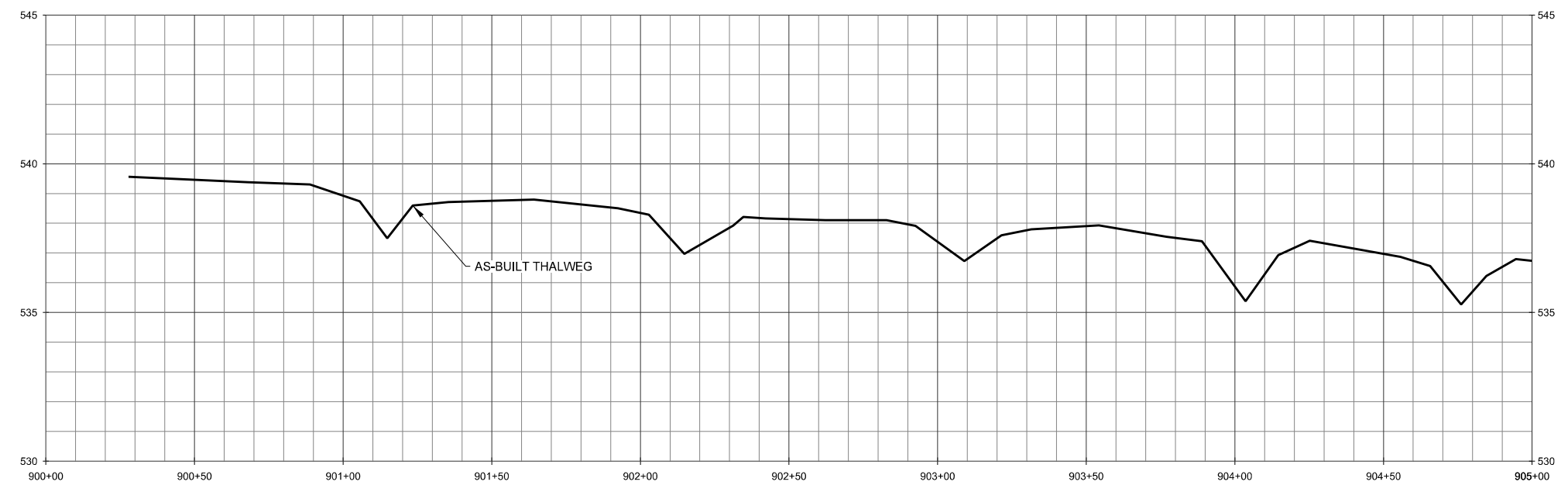
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Revisions:	



Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
SF 4A Plan and Profile

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Revisions:	

STREAM
BASELINE
PLANS



Final Baseline Drawing

Underwood Mitigation Site
Chatham County, NC
Stream Baseline Plans
SF 4A Plan and Profile

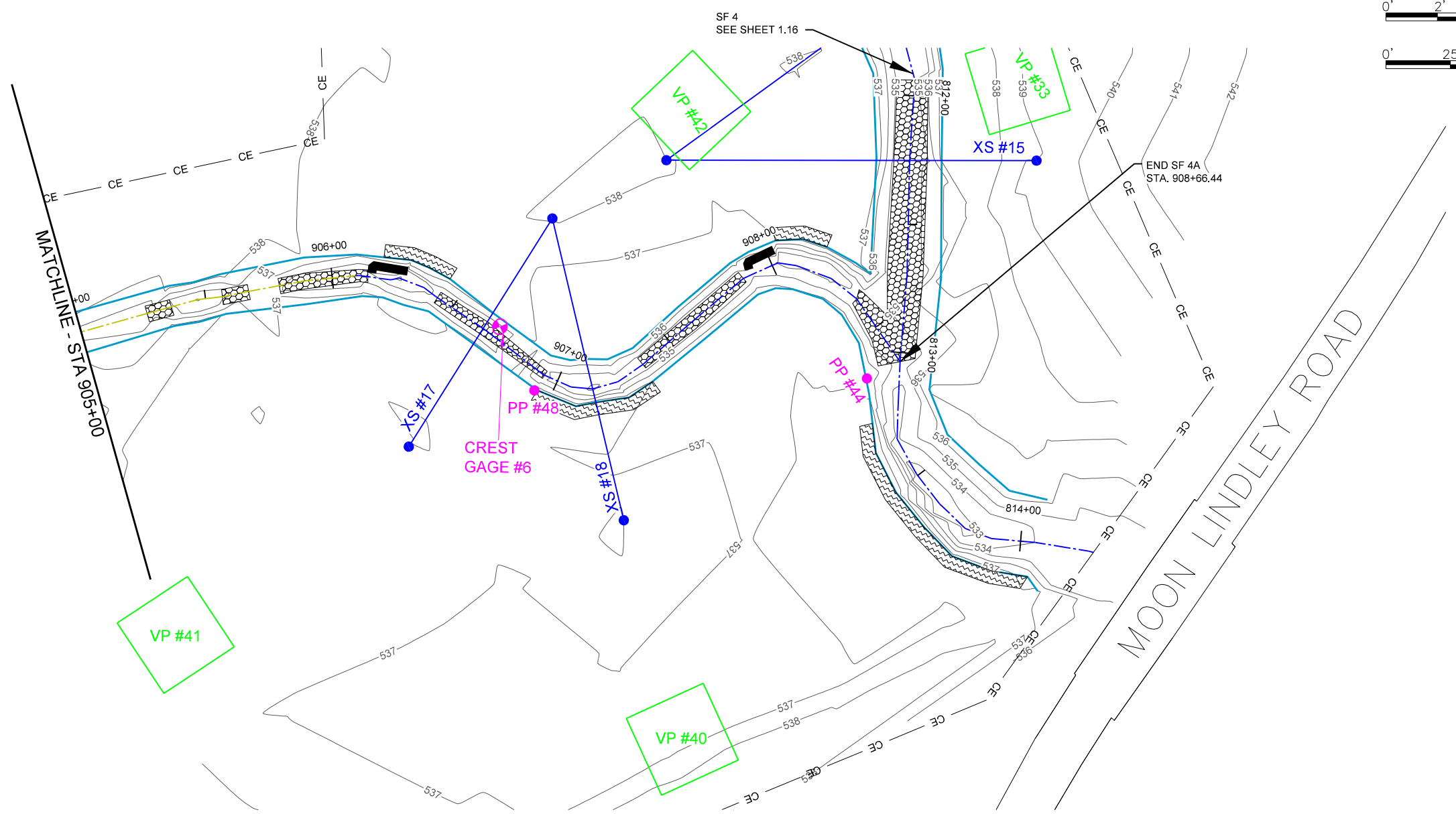
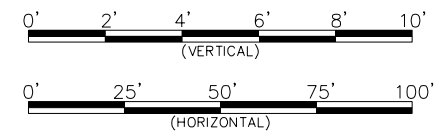
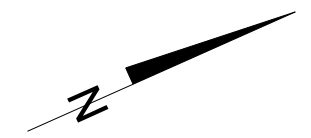
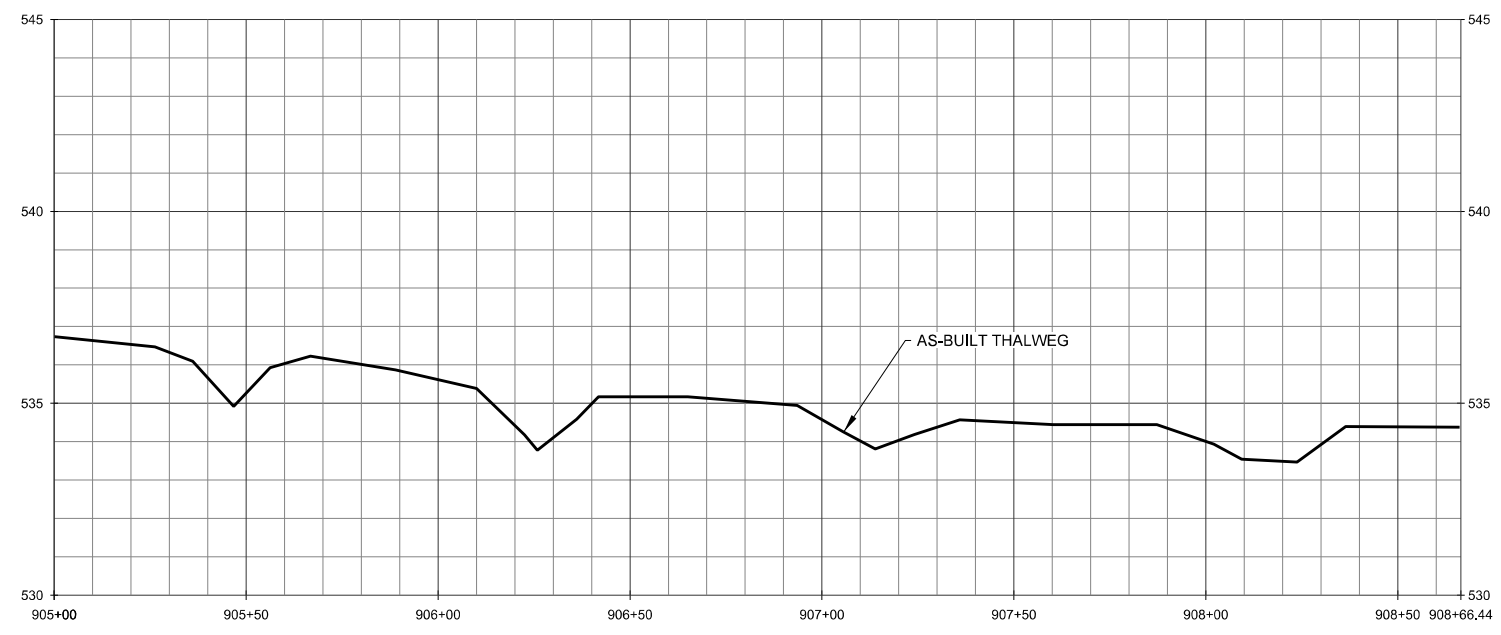
Final Baseline Drawing

Date:	May 6, 2013
Job Number:	005-02125
Project Engineer:	NMM
Drawn By:	JTL
Checked By:	JWH

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STREAM
BASELINE
PLANS

Sheet
1.18



**Underwood Mitigation Site
Chatham County, NC**
Wetland Baseline Overview

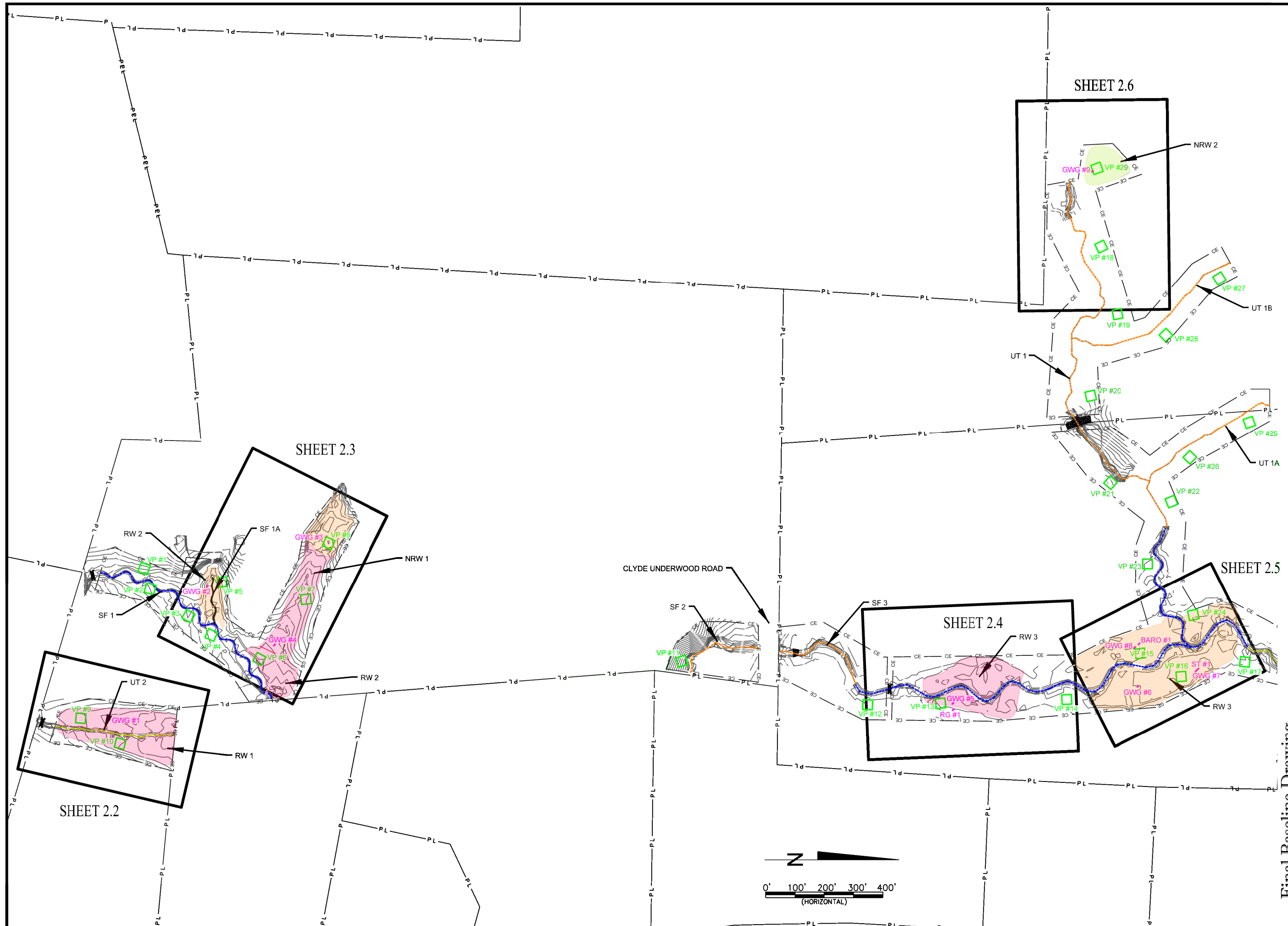
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BASELINE
OVERVIEW**

Sheet
2.0



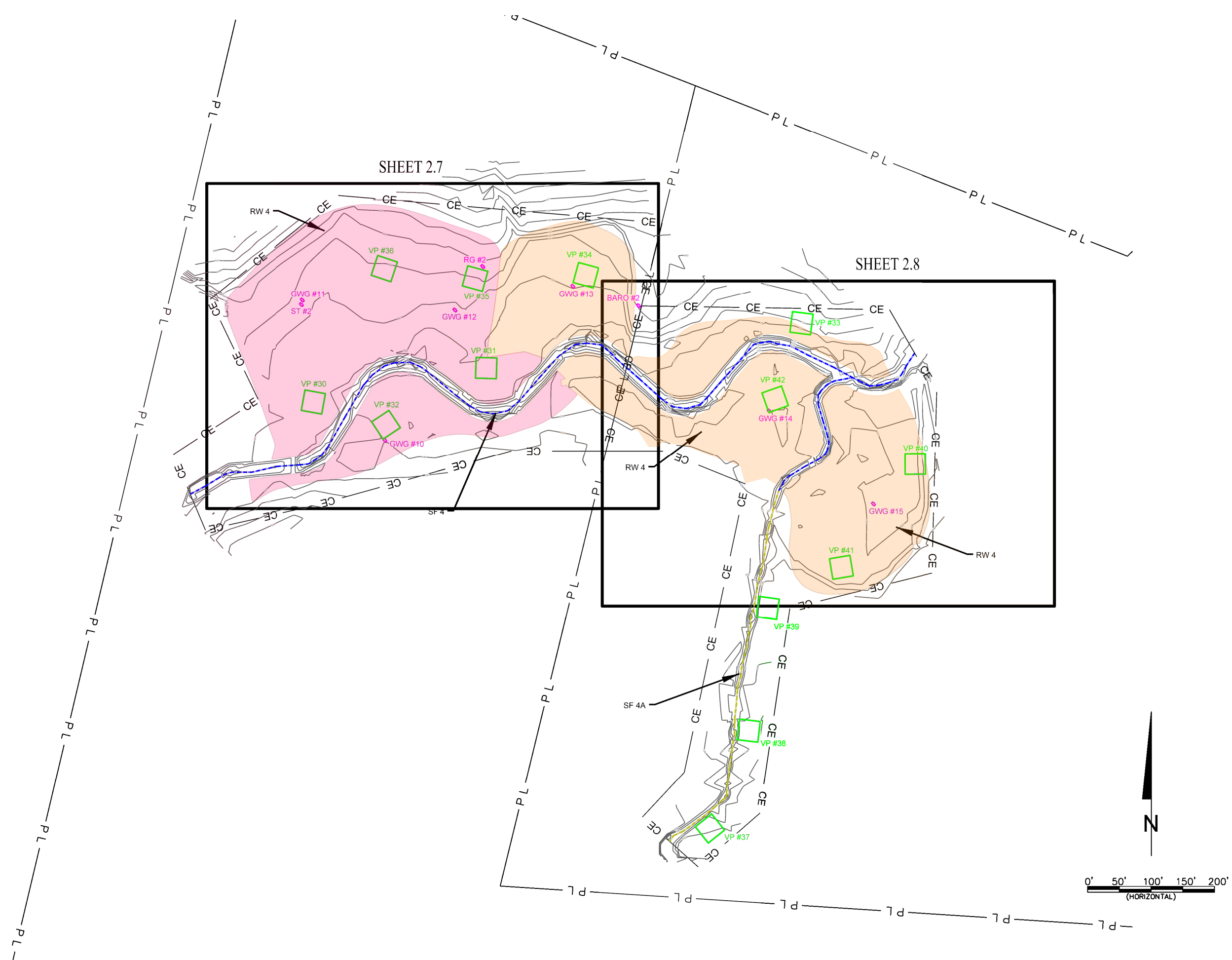
**Underwood Mitigation Site
Chatham County, NC
Wetland Baseline Overview**

Date: May 6, 2013
Job Number: 005-02125
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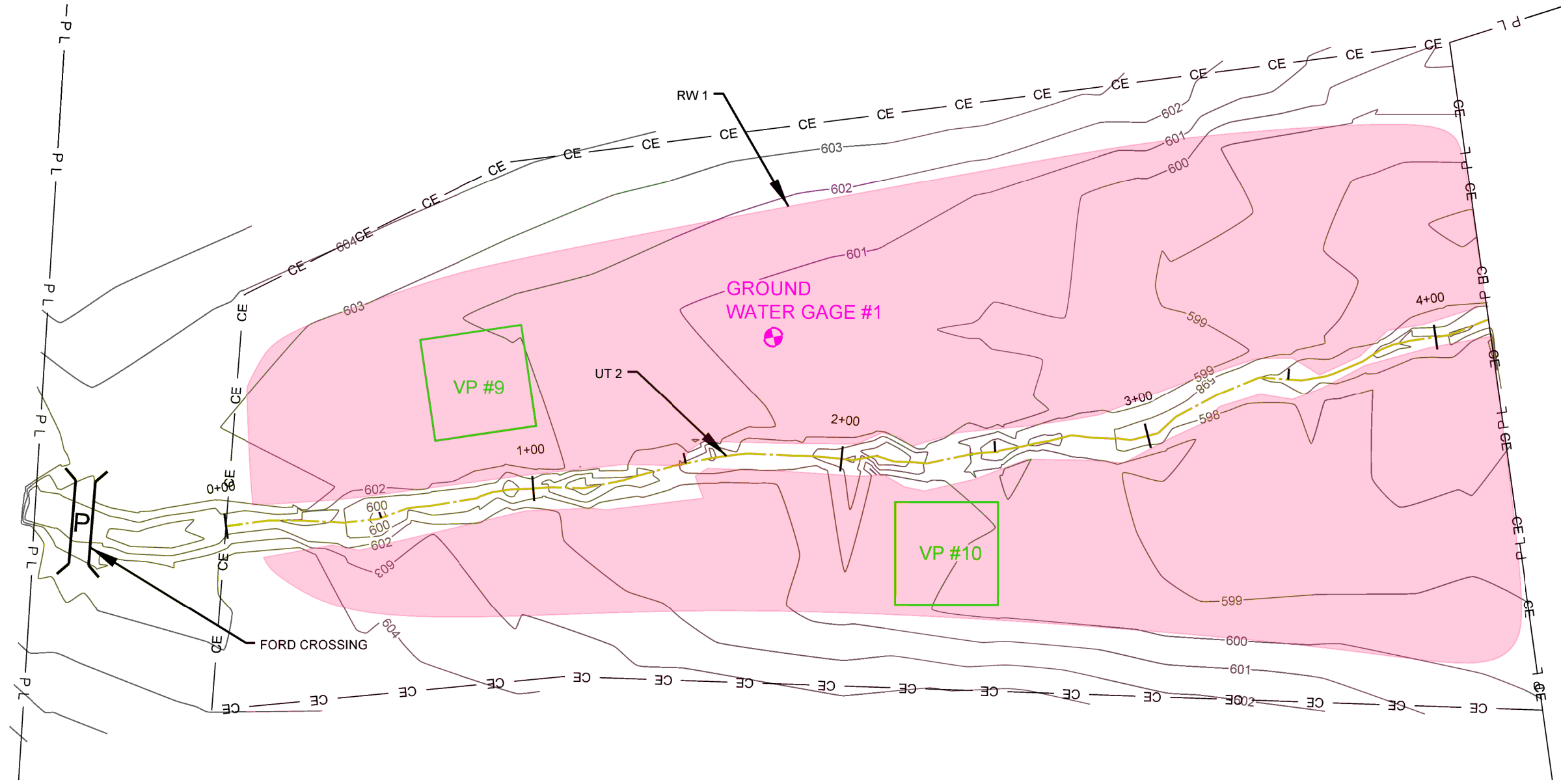
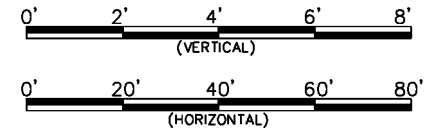
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**WETLAND
BASELINE
OVERVIEW**

Sheet



Final Baseline Drawing



Underwood Mitigation Site
Chatham County, NC
Wetland Baseline Plans
RW 1

Date: May 6, 2013
Job Number: 005-02125
Project Engineer: NMM
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WETLAND
BASELINE
PLANS

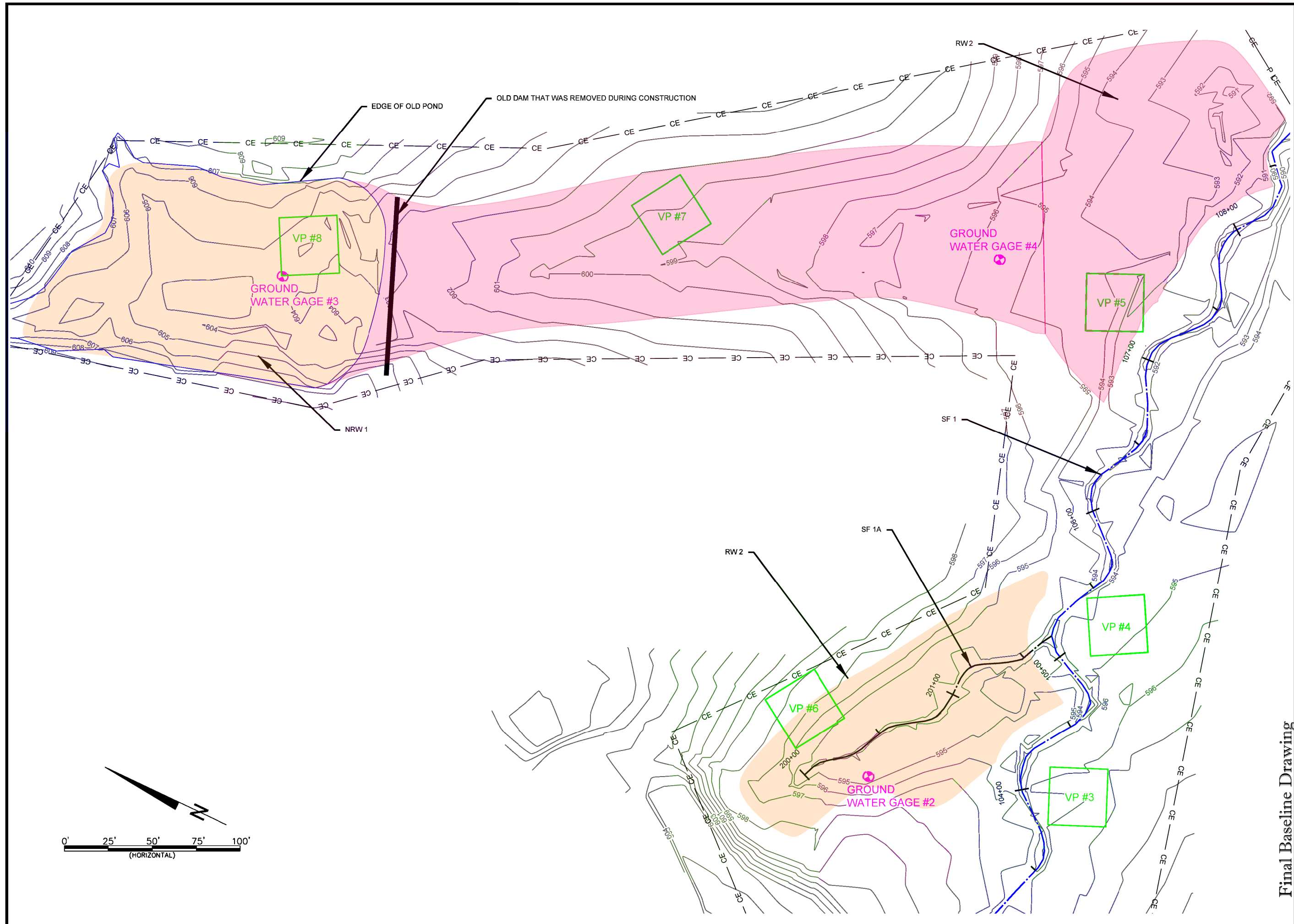
Final Baseline Drawing

Underwood Mitigation Site
Chatham County, NC
Wetland Baseline Plans
RW 2 & NRW 1

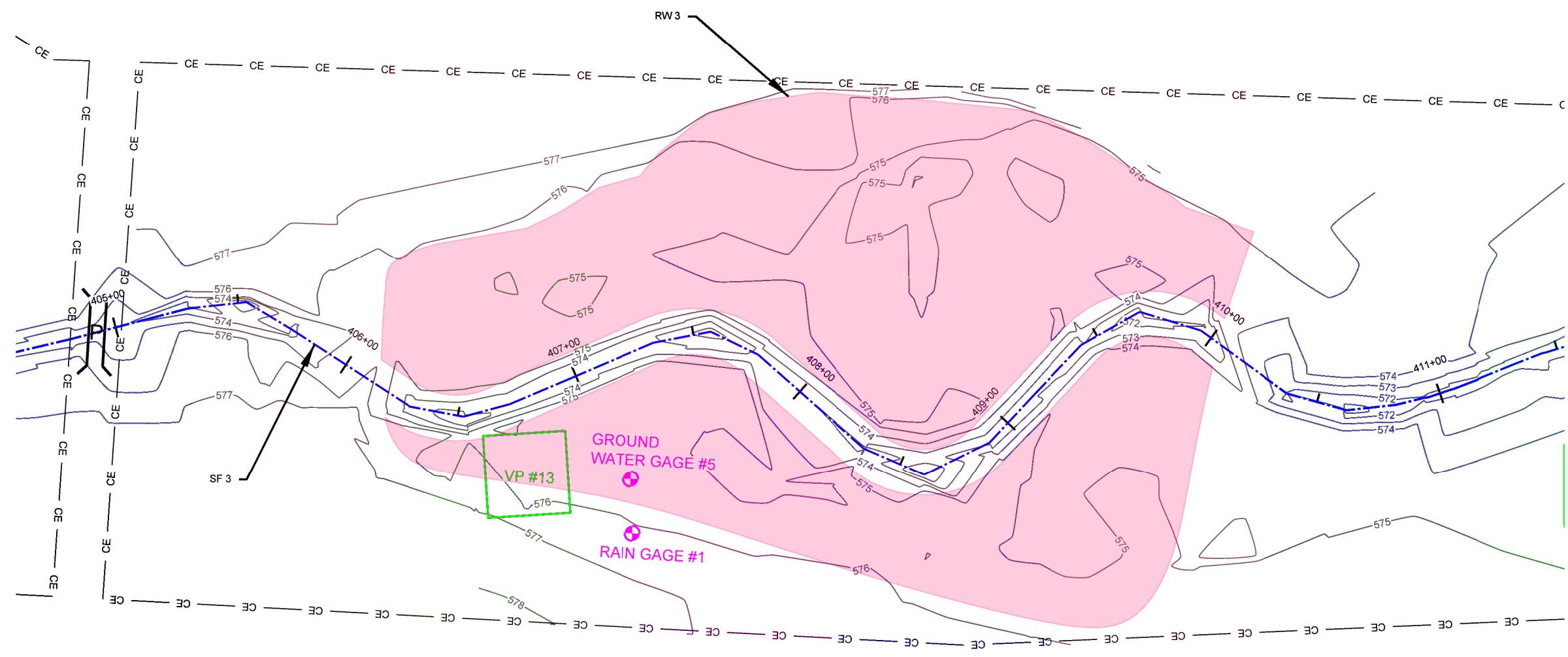
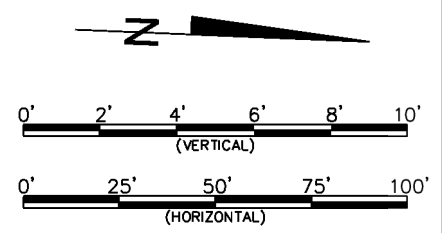
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BASELINE
PLANS



Final Baseline Drawing



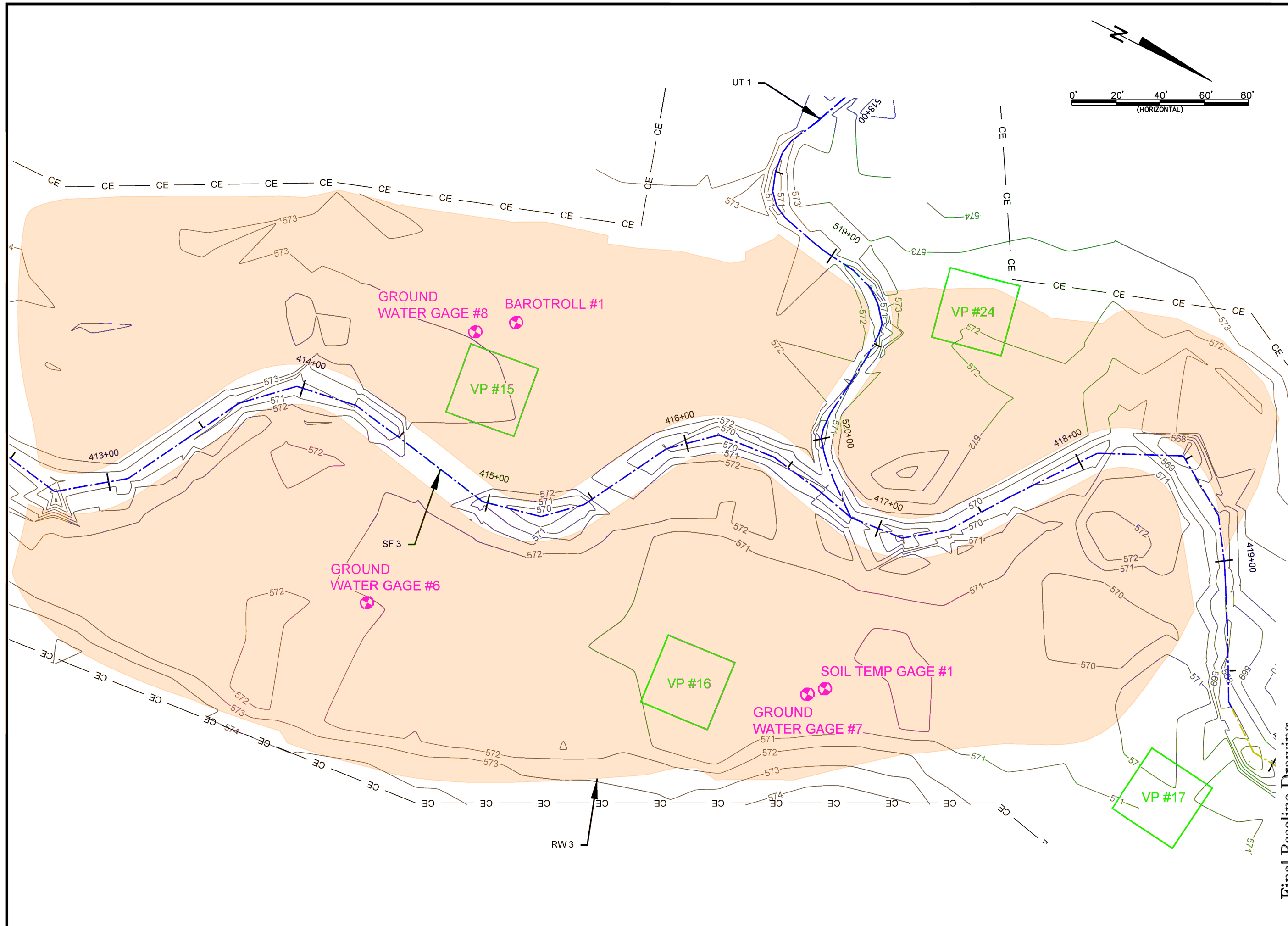
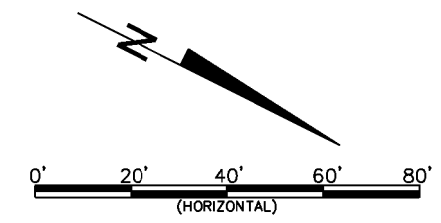
Final Baseline Drawing

Underwood Mitigation Site
Chatham County, NC
Wetland Baseline Plans
RW 3

Date: May 6, 2013
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PLANS



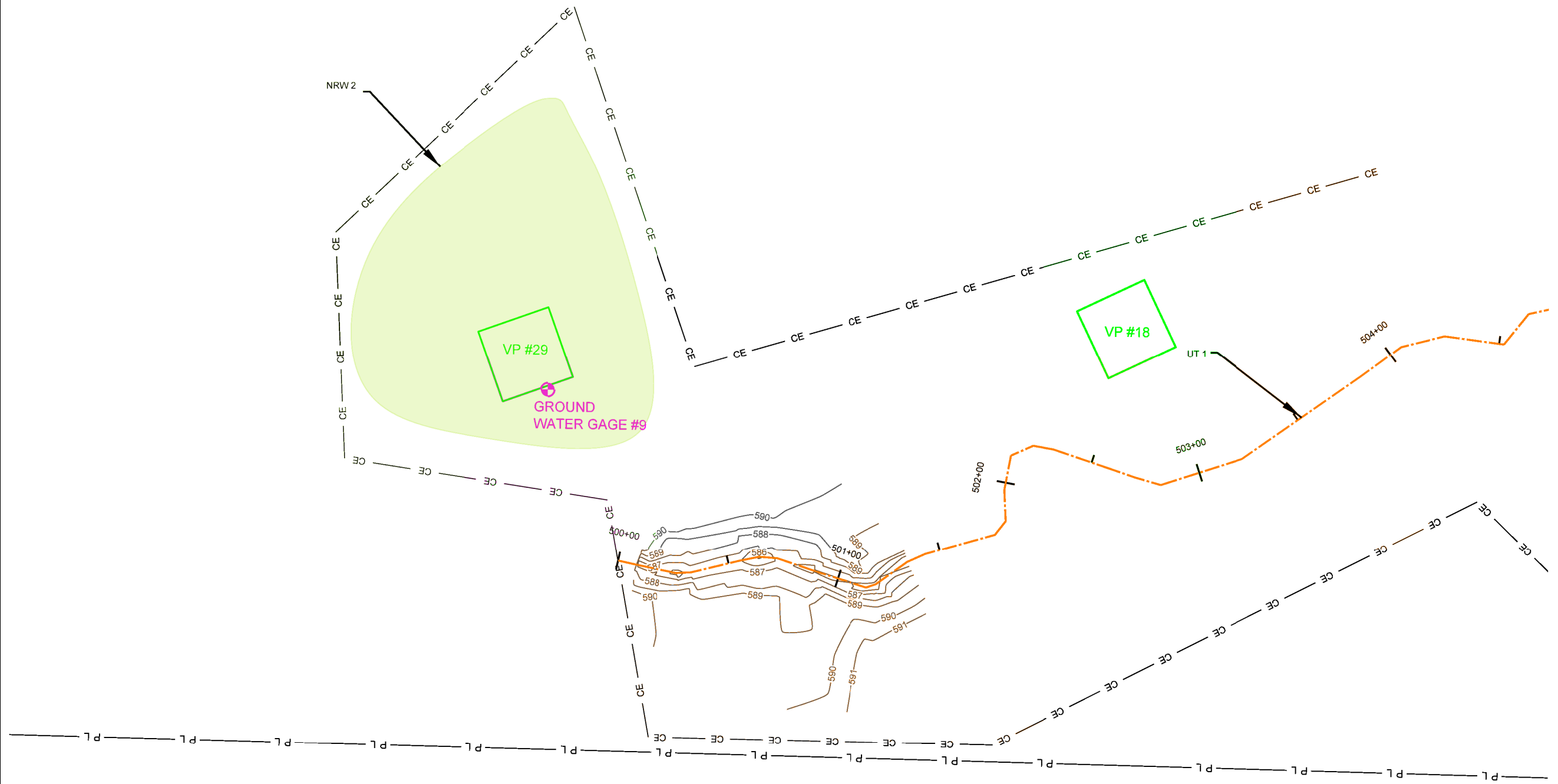
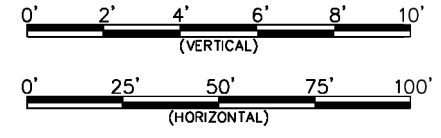
Underwood Mitigation Site
Chatham County, NC
Wetland Baseline Plans
RW 3

Final Baseline Drawing

Date:	May 6, 2013
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Project Engineer:	NMM
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BASELINE
PLANS



Final Baseline Drawing

Underwood Mitigation Site
Chatham County, NC
Wetland Baseline Plans
NRW 2

Date:	May 6, 2013
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BASELINE
PLANS

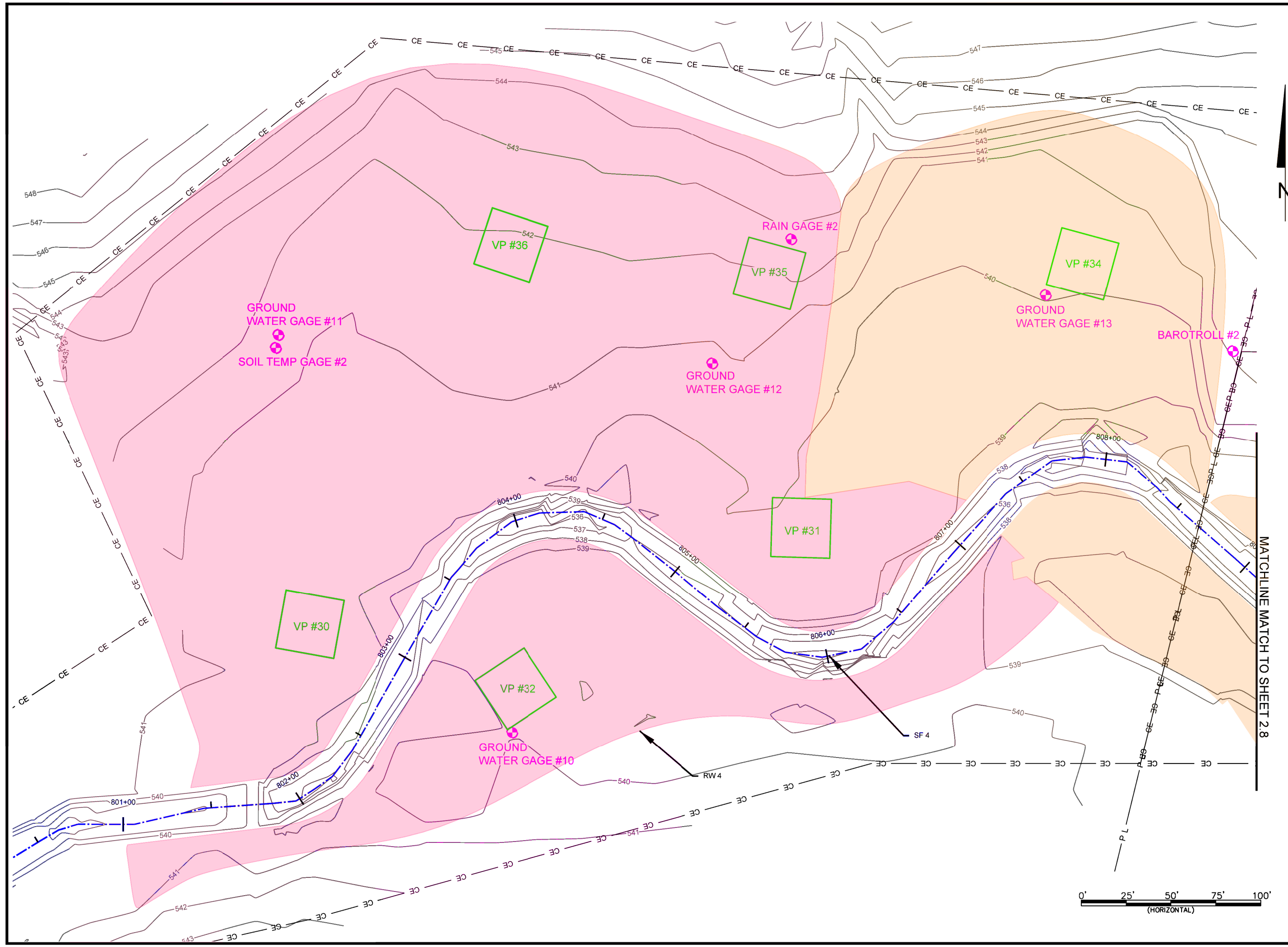
Underwood Mitigation Site
Chatham County, NC
Wetland Baseline Plans
RW 4

Final Baseline Drawing

Date:	May 6, 2013
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WETLAND
BASELINE
PLANS

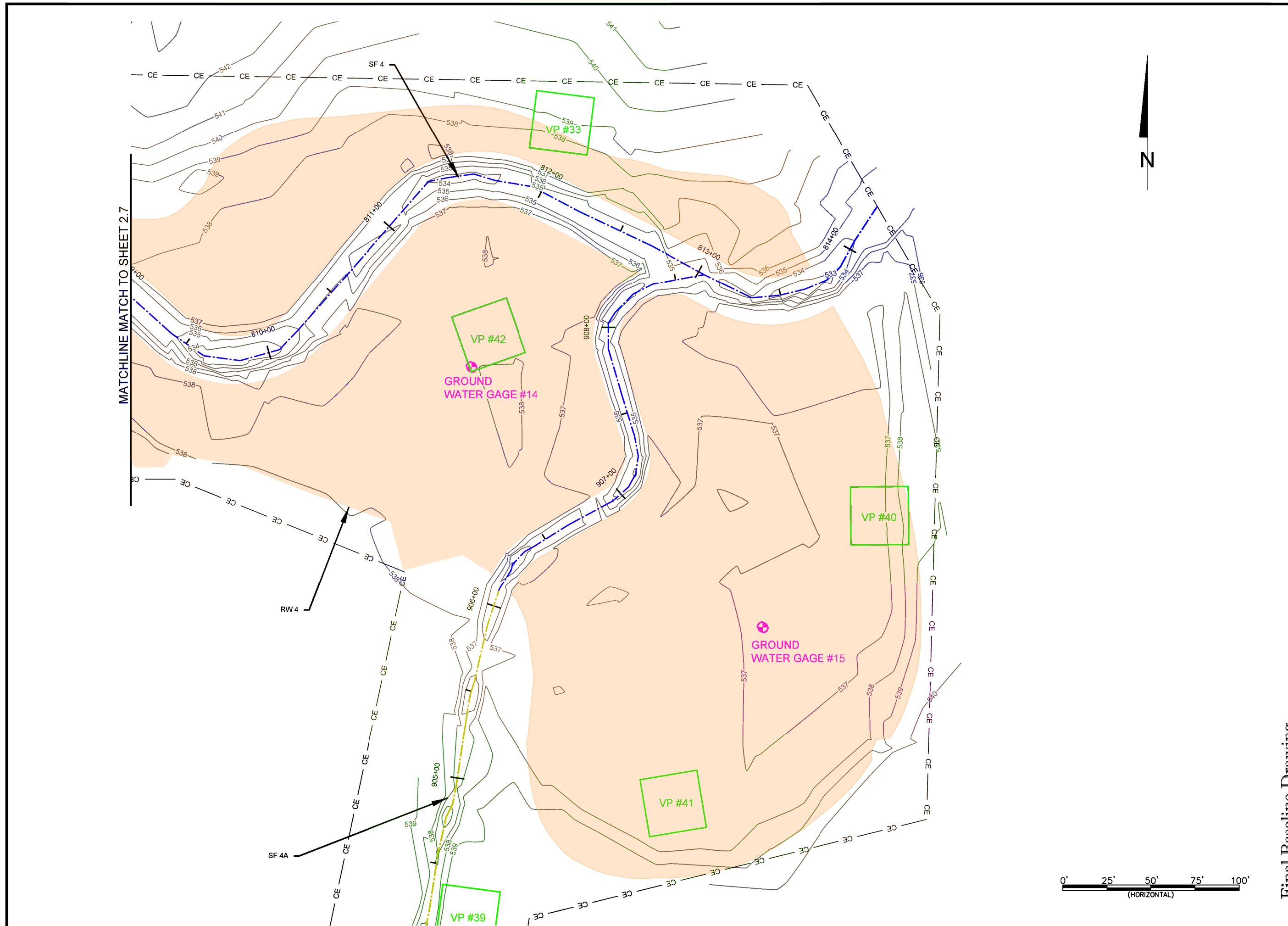


Underwood Mitigation Site
Chatham County, NC
Wetland Baseline Plans
RW 4





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WETLAND
BASELINE
PLANS



PLANTING ZONES:

-  Zone 1 - Streambank Planting Zone
-  Zone 2 - Floodplain Planting Zone
-  Zone 3 - Wetland Planting Zone
-  Zone 4 - Permanent Seeding Outside Easement

VEGETATION TABLES

Planting Summary Table									
Streambank Planting - Zone 1								Acres	1.9
Species	Common Name	Max Spacing	Unit Type*	Min. Size	Stratum	Indiv. Spacing	# of Stems	Total lbs	
<i>Salix nigra</i>	Black Willow	8 ft.	L	0.5"-1.0" cal.	Shrub	2-8 ft.	662		
<i>Cornus amomum</i>	Silky Dogwood	8 ft.	L	0.5"-1.0" cal.	Shrub	2-8 ft.	1324		
<i>Salix sericea</i>	Silky Willow	8 ft.	L	0.5"-1.0" cal.	Shrub	2-8 ft.	1324		
<i>Juncus effusus</i>	Soft Rush**	5 ft.	P	1.0"-2.0" cal.	Herb	5 ft.	2720		
Subtotal								6,030	0

* L = Live Stake; P = Herbaceous Plug; R = Bare Root
** Soft Rush shall be installed at the toe of streambank only on all restoration reaches

Planting Summary Table										
Wetland Planting - Zone 3									Acres	20.1
Species	Common Name	Max Spacing	Unit Type*	Min. Caliper Size	Stratum	Indiv. Spacing	# of Stems	Total lbs		
<i>Salix sericea</i>	Silky Willow	8 ft.	L	0.25"-1.0"	Canopy	6-8 ft.	1100			
<i>Cornus amomum</i>	Silky Dogwood	8 ft.	L	0.25"-1.0"	Shrub	6-8 ft.	1100			
<i>Quercus phellos</i>	Willow Oak	8 ft.	R	0.25"-1.0"	Canopy	6-8 ft.	1200			
<i>Plantus occidentalis</i>	Sycamore	8 ft.	R	0.25"-1.0"	Canopy	6-8 ft.	1900			
<i>Betula nigra</i>	River Birch	8 ft.	R	0.25"-1.0"	Canopy	6-8 ft.	1500			
<i>Quercus michauxii</i>	Swamp Chestnut Oak	8 ft.	R	0.25"-1.0"	Canopy	6-8 ft.	1300			
<i>Fraxinus pennsylvanica</i>	Green Ash	8 ft.	R	0.25"-1.0"	Canopy	6-8 ft.	1500			
Subtotal									9,600	0

* L = Live Stake; P = Herbaceous Plug; R = Bare Root

Permanent Seeding - Zone 1, 2, & 3					
Approved Date	Species Name	Stratum	Common Name	Density (lbs/acre)	Acres
All Year	<i>Panicum virgatum</i>	Herb	Swithgrass	7	37.8
All Year	<i>Carex vulpinoidea</i>	Herb	Fox sedge	6	
All Year	<i>Elymus virginicus</i>	Herb	Virginia Wild Rye	4.5	
All Year	<i>Bidens aristosa</i>	Herb	Showy Tickseed	4.5	
Subtotal				22	

Planting Summary Table									
Floodplain Planting - Zone 2								Acres	15.8
Species	Common Name	Max Spacing	Unit Type*	Min. Caliper Size	Stratum	Indiv. Spacing	# of Stems	Total lbs	
<i>Quercus pagoda</i>	Cherrybark Oak	12 ft.	R	0.25"-1.0"	Canopy	6-12 ft.	1700		
<i>Liriodendron tulipifera</i>	Tulip Poplar	12 ft.	R	0.25"-1.0"	Canopy	6-12 ft.	1300		
<i>Quercus phellos</i>	Willow Oak	12 ft.	R	0.25"-1.0"	Canopy	6-12 ft.	1300		
<i>Plantus occidentalis</i>	Sycamore	12 ft.	R	0.25"-1.0"	Canopy	6-12 ft.	2200		
<i>Betula nigra</i>	River Birch	12 ft.	R	0.25"-1.0"	Canopy	6-12 ft.	1600		
<i>Quercus michauxii</i>	Swamp Chestnut Oak	12 ft.	R	0.25"-1.0"	Canopy	6-12 ft.	1300		
<i>Fraxinus pennsylvanica</i>	Green Ash	12 ft.	R	0.25"-1.0"	Canopy	6-12 ft.	1400		
Subtotal								10,800	0

* L = Live Stake; P = Herbaceous Plug; R = Bare Root

Permanent Seeding Outside Easement - Zone 4				
Approved Date	Species Name	Stratum	Common Name	Density (lbs/acre)
All Year	<i>Festuca arundinacea</i>	Herb	Tall Fescue	40

Temporary Seeding - Zone 1, 2, & 3					
Approved Date	Species Name	Stratum	Common Name	Density (lbs/acre)	Acres
Aug 15 - May 1	<i>Secale cereale</i>	Herb	Rye Grain	140	4.6
May 1 - Aug 15	<i>Setaria italica</i>	Herb	German Millet	50	

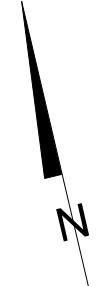
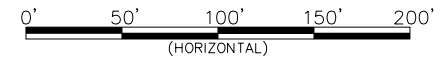
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PLANTING TABLES

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Underwood Mitigation Site
Chatham County, NC
UT 2, SF 1, SF 1A, RW 1, RW 2, & NRW 1
Planting

Final Baseline Drawing

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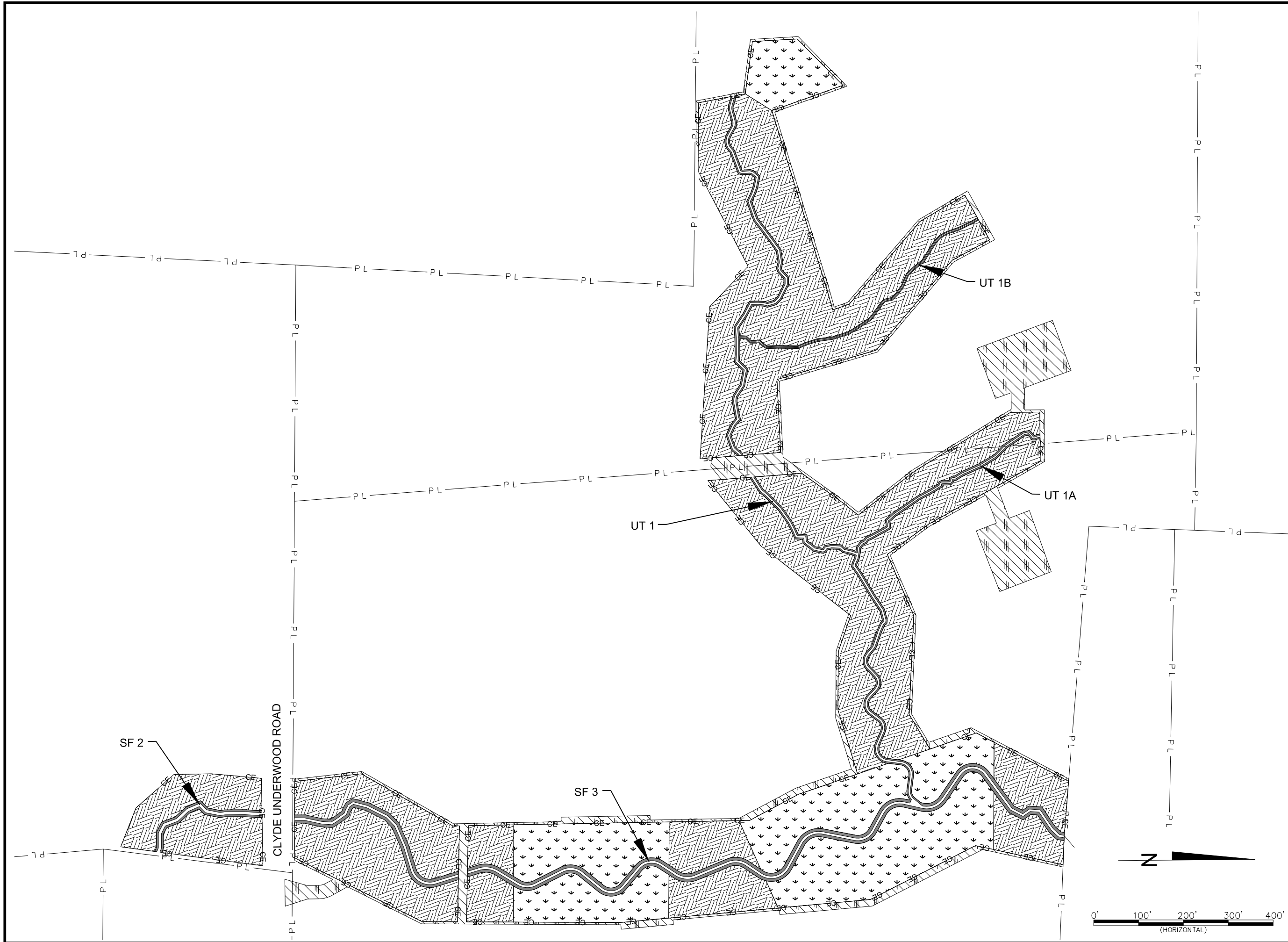
PLANTING

Underwood Mitigation Site
Chatham County, NC
SF 2, SF 3, UT 1, UT 1A, UT 1B, RW 3, & NRW 2
Planting

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PLANTING



Final Baseline Drawing

Underwood Mitigation Site

Chatham County, NC

 SF 4, SF 4A, & RW 4

 Planting

Date: May 6, 2013

 Job Number: 005-02125

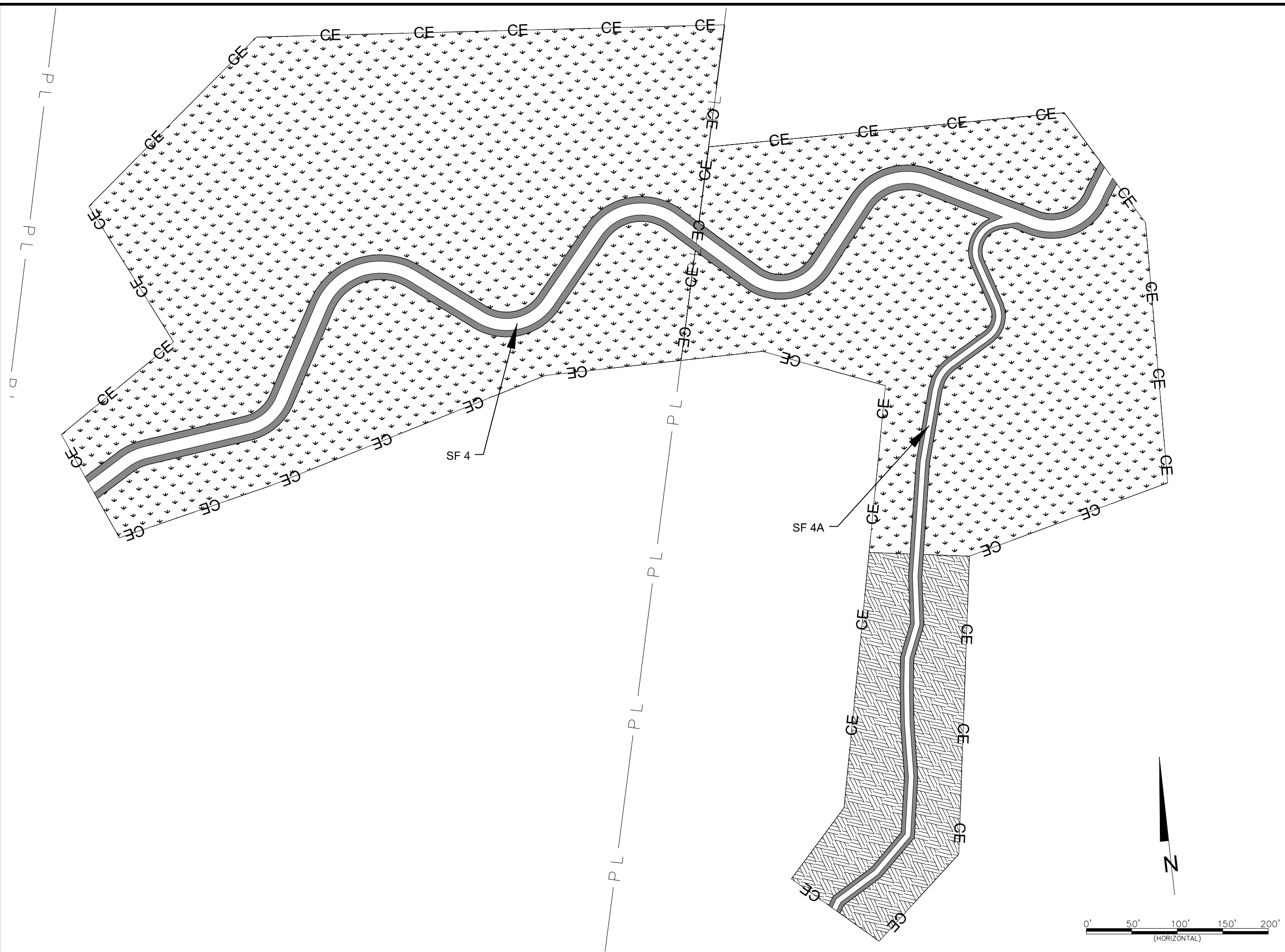
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Final Baseline Drawing