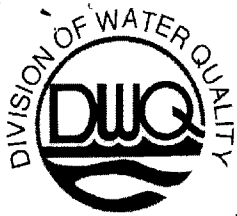




Appendix 1: NCDWQ 2004 Cumulative Impact Guidance




Michael F. Easley, Governor
William G. Ross Jr., Secretary
North Carolina Department of Environment and Natural Resources

Alan W. Klimek, P. E. Director
Division of Water Quality
Coleen H. Sullins, Deputy Director
Division of Water Quality

April 10, 2004

MEMO

TO: Coleen Sullins
FROM: John Dorney 
RE: Final version of DWQ Cumulative Impact Policy

Please see the attached final version (Version 2.1, dated April 10, 2004) of the Cumulative Impact Policy for the 401 and Isolated Wetland Permitting Programs. The policy was put out to public notice on October 3, 2002. We received comments from DOT, Charlotte-Mecklenburg Stormwater Services, the NC Wildlife Resources Commission, the Home Builders Association, and the US Environmental Protection Agency. I believe that this policy addresses the questions raised by these comments. The policy has also benefited from our work over the past year and one-half with DOT and various local governments.

Please advise as to the next step in getting final approval for this policy. I can be reached at 733-9646. Thankx

Cc: John Hennessy, Transportation Permitting
Dennis Ramsey



Cumulative impacts and the 401 Water Quality Certification and Isolated Wetland Permit Programs

Division of Water Quality Internal Policy NC Division of Water Quality

April 10, 2004
Version 2.1

Background

Existing rules for the 401 Water Quality Certification Program (15A NCAC 2H .0506(b)(4) and (c)(4)) as well as those for the Isolated Wetland Permit Program (15A NCAC 2H .1300) require that DWQ determine that a project “does not result in cumulative impacts, based upon past or reasonably anticipated future impacts, that cause or will cause a violation of downstream water quality standards.” This internal policy is meant to give direction to DWQ Central and Regional Office staff as well as the regulated public on how to implement this rule. Cumulative impact is defined as those “environmental impacts resulting from incremental effects of an activity when added to other past, present, and reasonably foreseeable future activities regardless of what entities undertake such other actions” (taken from 15A NCAC 1A which implement the State Environmental Policy Act) for the Department of Environment and Natural Resources.

It is important to note that the 401 Certification rules require an examination of cumulative impacts in terms of their impact on downstream water quality standards and their associated designated uses. This is a relatively narrow provision that requires DWQ staff to focus on downstream standards (narrative and numeric) rather than (for instance) the effect of the development on wildlife habitat. Therefore, only if that impact will cause a violation of downstream water quality standards is the project of concern in the context of cumulative impact for DWQ’s wetland permitting programs. However, water quality standards form the basis of all water quality regulation and permitting programs. This rule (although narrow in its scope since it focuses on downstream water quality) provides an essential tool for DWQ to use to manage cumulative impact. Water quality impairment is usually tied to stormwater runoff that can increase with road construction and urban development. This policy is intended to address this regulatory requirement.

Policy

I. DOT (and other public transportation) projects

The major types of DOT projects and their need for different levels of cumulative analysis are outlined below. The three types of cumulative impact analysis with respect to this policy are 1) Generic description, 2) Qualitative analysis, and 3) Quantitative analysis.

- A. **Generic description of water quality impacts:** Small-scale widening projects, bridge replacements projects and intersection improvement projects – These projects which include categorical exclusions (23 C.F.R. § 771.117) and minimum criteria (19A NCAC 2F .0102) normally have a low potential for cumulative impact since little (if any) new impervious surface is added and the projects are usually in already developed locales. DWQ believes that a generic description can be developed which addresses the cumulative impacts of the majority of these projects in the context of the 401 Certification and isolated wetland rules. However, if DWQ staff determines that any of these projects may have growth-stimulating effects and downstream impacts, then either a qualitative cumulative impact analysis (see B below) or (more rarely) a quantitative analysis (see C

below) should be required of the applicant. These projects which will require a more complex analysis often coincide with projects identified by the Pre-screening process of the Department of Transportation.

- B. **Qualitative Analysis of water quality impacts:** Projects such as widening with new locations: Most of these projects have a low potential for cumulative impacts since these locations tend to be near existing roads and already developed areas. Therefore, a narrative cumulative impact analysis prepared using the methodology outlined in the DOT/DENR NEPA/SEPA document (Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina. Volumes I and II. 2001, State of North Carolina Department of Transportation and Environmental and Natural Resources prepared by The Louis Berger Group, Inc., Cary, N.C. or their updates) should suffice for the 401 Certification and Isolated Wetland permitting programs.¹ If DWQ technical staff determines that any of these projects will have growth-stimulating effects and downstream impacts, then a quantitative analysis should be required of the applicant (see below).
- C. **Quantitative (i.e., Detailed) Analysis of water quality impacts:** Projects such as roads on new location: Many of these projects may have growth-stimulating effects (i.e., urban growth beyond that expected without the project) since new growth has the potential to occur on otherwise undeveloped property adjacent to the new road alignment. Therefore, these projects may result in cumulative impacts to water quality. The overall process as outlined below will be used to deal with new location projects or for any other project that will have growth-stimulating effects, including projects that would otherwise be categorized as "Generic Description" or "Qualitative Analysis" projects.

1. Sequential questions to address for quantitative analyses:

a. **Is growth likely to be induced by the project?** This may be indicated by projected land use changes or by the purpose and need of the project (i.e., if the project is specifically planned to stimulate growth). For instance, projects on new location near urban areas often have the greatest potential for cumulative impacts since they provide improved access to previously inaccessible sites. A narrative cumulative impact analysis prepared using the methodology outlined in the DOT/DENR NEPA/SEPA Cumulative Impacts Guidance document mentioned earlier should generally suffice to answer this question. If the answer to this question is "no", then no further analysis is needed and the narrative (qualitative) analysis should be sufficient.

b. **Are existing uses of the water (as reflected in the classification of the waters) likely to be impacted by the growth?** The following descriptions (categories 1, 2 and 3) should help clarify the answer to this question.

1. *Water Supply, HQW and ORW classifications* –DWQ has several existing regulatory programs that address cumulative impacts for these waters. Specifically, the Water Supply Protection Program as well as the watershed-specific management plans for ORW and HQW watersheds provides considerable protection from cumulative impact on downstream water quality. In addition, DWQ often relies on other state permitting programs such as the High Quality Waters Best Management Practices developed by the Division of Land Resources for protection of water quality. DOT reports for projects impacting these waters should describe and analyze these existing programs for a particular project. In most cases, a narrative analysis based on the DOT/DENR NEPA/SEPA report with clear reference to these existing DWQ permitting program as well as a description of the general effectiveness of these programs in protecting water quality should be sufficient. However, if DWQ staff determines that a project appears to have growth-stimulating effects and downstream impacts

¹ These documents will need to be revised to explicitly refer to water quality-related issues for the 401 Certification and Isolated Wetland Permitting Programs. In the interim, DWQ believes that the procedures outlined in these documents will normally suffice for cumulative impact analysis for these projects.

that are not addressed by existing regulatory programs, then a quantitative analysis may be required.

2. *Class C, B, SC and SB classifications* – The potential for cumulative analysis from these projects should be discussed utilizing the qualitative analysis described above for these stream classifications. If significant potential for cumulative impact is identified (for instance due to the presence of endangered aquatic species), then a quantitative analysis may be required.
3. *Impaired Waters (303 (d) listed Waters), SA (Commercial Shellfishing), and Trout classification* – These watersheds warrant special attention with respect to cumulative impact analysis since existing regulatory programs often have not adequately addressed pollution sources for these waters. With respect to the impaired waters, the reported parameter of concern and source (for instance, point versus non-point) of the contaminant should be examined to determine if the new location road and any induced development are likely to further impact these waters. For instance, if the impaired water is listed as impacted by dioxin from point sources, it is very unlikely that a new road and its associated development would exacerbate the situation. In this case, a qualitative analysis of cumulative impacts will usually suffice. However, for Trout and SA waters as well as impaired waters which are impaired by pollutants likely increased by development (such as bacteria, nutrients or sedimentation), then a detailed, quantitative analysis should be conducted by DOT to determine 1) if cumulative impacts are likely and then (if impacts are predicted to occur) as well as 2) what non-point source control measures will be needed and how they are to be implemented. This analysis will often require watershed-level modeling using export coefficients, estimated levels of treatment for BMP's and comparison to numerical water quality standards or numeric water quality goals. With respect to implementation, discussion with and commitment from local governments may be needed to address these cumulative impacts.

- c. Are additional regulatory measures needed? (i.e., are there existing regulatory programs which can address these impacts?)** For instance, the Phase II NPDES Stormwater Permit Program addresses stormwater runoff from development as do riparian buffer rules in place in several watersheds across the state. Finally in some cases, local governments already have land use control programs in place that adequately address stormwater runoff. In many cases, these programs should reduce or eliminate the need for additional regulatory measures. Modeling may be needed to determine the effect of these existing programs.

If the answers to all three questions of these questions are yes, then a quantitative analysis of cumulative impact would be needed for the 401 Water Quality Certification. The following information describes this process in more detail

2. Analytical considerations for quantitative analyses:

a. Impact or service area – The area chosen for detailed study should be selected by DWQ after consultation with local planning experts and the applicant. The area should be limited to the downstream location most likely affected by the growth induced as a result of the project. Boundaries such as major rivers, major physiographic constraints and already developed areas should be used as appropriate. For instance in some instances, a seven-mile distance from the road on new location has been used to put boundaries on the study area.

b. Modeling considerations – The selection of models and their study plan must be approved by DWQ before their use. The model must be in the public domain and include

water quality parameters of concern for the water body. An examination of the effectiveness of various land use control scenarios would also be helpful in evaluating the cumulative impact of a project on downstream water quality.

c. Time frame for analysis – DWQ’s approval of a time frame for analysis must hinge on what is “reasonably anticipated” as noted in the 401 Certification and Isolated Wetland rules. Local land use experts should be consulted for their expertise in the local area. The analysis should (if possible) consider several time frames including a) known proposed projects, b) 10 years, and c) 20 years. The final determination of the appropriate time frame should be done by DWQ staff based on the “reasonably anticipated” criteria.

d. Non-point source (i.e., stormwater) measures to consider – Management of the cumulative impacts of development on downstream water quality necessarily involves stormwater management since stormwater is often the major source of these pollutants. The local land use control measures to consider must be focused on the likely (or known) cause of water quality impairment or concern. For instance in watersheds with eutrophication issues, measures to manage inputs of nitrogen and phosphorus should be considered. In watersheds where sediment is the concern, the measures that address sediment from a) construction, b) developed landscapes, and c) streambank erosion must all be evaluated.

Measures which often need to be considered include a) enhanced sedimentation and erosion control BMPs and inspections, b) riparian buffers, and c) on-site stormwater management. Where appropriate, these measures should utilize the various DWQ design manuals or be patterned after other DWQ rules in order to ensure that the specific BMPs are adequately designed, implemented and maintained to protect downstream water quality.

II. Other publicly-funded development projects

Other publicly funded development projects may or may not result in cumulative impacts. For instance, the development of a regional, public park or a new library is unlikely to result in cumulative impacts. For these projects, a generic description similar to that described in step I A above should suffice. However, other projects will likely result in cumulative impacts and therefore, then either a qualitative cumulative impact analysis (see I B above) or (more rarely) a quantitative analysis (see I C above) should be required of the applicant. Examples of projects in this later category would be projects targeted to encourage development such as the Global TransPark.. DWQ staff should use their professional judgment to determine if a publicly funded project is likely to result in cumulative impacts and would then need a quantitative analysis of this impact.

III. Private development projects

Privately funded development projects are normally not subject to SEPA or NEPA and therefore, only rarely require formal environmental documentation. However, if these projects require 401 Water Quality Certification or an Isolated Wetland Permit, then the cumulative impact provisions of the Water Quality Certification and Isolated Wetland Permit rules are applicable.

Many private development projects are unlikely to cause cumulative impacts, including projects such as urban in-fill, most residential subdivisions, and small commercial developments as well as agricultural and silvicultural operations that may need permitting from DWQ. However, some private projects may cause significant cumulative impacts on water quality. In these cases if a 401 Water Quality Certification or Isolated Wetland Permit is required, then either a qualitative or quantitative analysis of cumulative impact would be needed.

Some private development projects can clearly result in cumulative impact. Recent examples of this effect include the Streets at South Point Mall in Durham and the Landfall development in

Wilmington. Often these developments are 1) relatively large, 2) involve commercial development, and 3) occur in otherwise relatively undeveloped landscapes with an impact on regional growth patterns. When these or similar characteristics are present with a private development project, then DWQ staff should use the guidance outlined in Section I.C. above to determine if a quantitative analysis of cumulative impacts is needed or whether a qualitative analysis will be sufficient.

IV. Decision making and Elevation Process

DWQ staff will use the three tiered system outlined above to decide what level of cumulative impact analysis is appropriate for a given project. This action will normally occur during a pre-application meeting or in the initial review of a project to help ensure that these analyses do not cause an undue delay in a project.

A. Elevation Process for DOT projects – If, after review of the information provided by DOT and the methodology used to produce it, DWQ technical staff disagrees with the analysis of growth-stimulating effects and downstream impacts contained in the narrative or qualitative analysis, then DOT and DWQ will implement (upon DOT's request) an elevation process to resolve the issue. A review panel will be established comprised of the Water Quality Section Chief, the Wetlands/401 Unit Supervisor and the DOT project coordinator from DWQ as well as the PDEA Branch Managers a representative from the Project Development Branch, a representative from the Office of Human Environment from DOT and consultants who prepared the report. This review panel will convene and review the available materials to determine whether the proper methodology and analysis were used or whether the correct conclusion was made regarding the growth-stimulating effects of the project. DWQ expects to work via consensus with these parties. However, the ultimate decision as to what type of analysis is needed must remain with DWQ.

B. Other applicants - If other private or public applicants do not concur with a decision made by DWQ staff with respect to the level of cumulative impact analysis, the applicant may request a meeting with the Wetlands/401 Unit Supervisor (or the appropriate Branch Chief if the initial decision was made by the Unit Supervisor) and other relevant DWQ staff as well as the applicant and all relevant consultants. DWQ expects to work via consensus with these parties. However, the ultimate decision as to what type of analysis is needed must remain with DWQ.

V. Implementation of Measures to Address Cumulative Impact

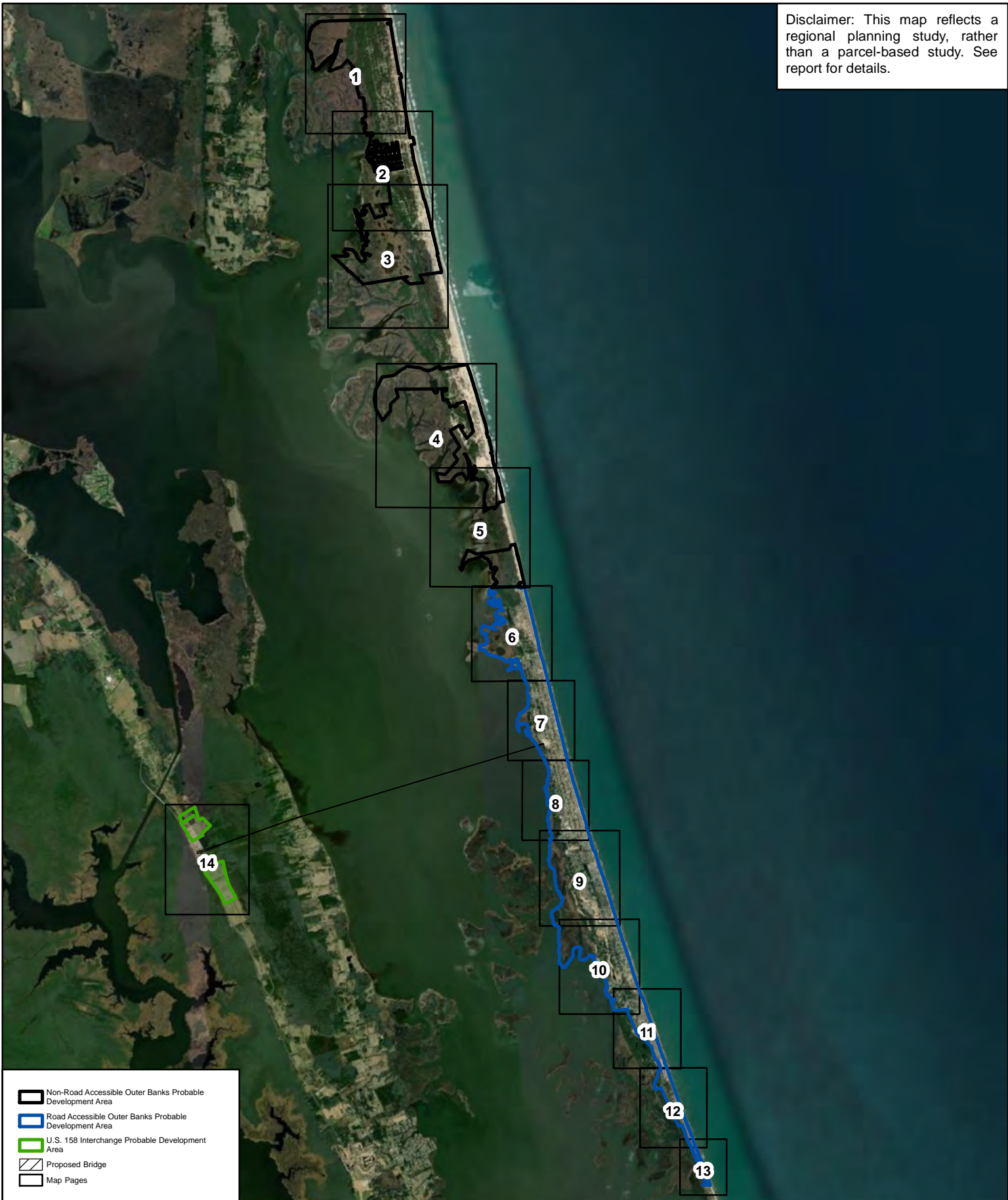
If the above analyses (especially the quantitative analysis) reveal that additional measures are needed within a specific geographic area in order to address downstream water quality impacts of the project and associated growth, the DWQ will work with the local municipalities to develop and implement local land use control measures which will address the water quality impacts. Based on DWQ's experience with the water supply watershed protection rules, NPDES Stormwater Permitting and riparian buffer protection rules, DWQ believes that these decisions are most efficiently made at the local level. DWQ staff will work actively with all interested local entities to help ensure the timely implementation of any needed ordinances. In the unlikely event that a local government is unable or unwilling to implement the needed protections, DWQ will examine its existing regulatory responsibilities (including, but not limited to, the 401 Certification Program and NPDES Stormwater Permitting Program) to determine what measures DWQ can undertake to provide the needed protection for downstream water quality.

Finally, DWQ believes that once the appropriate land use control measures are in place for a specific area, then these actions should adequately address cumulative impact concerns for that geographic area for future projects. Therefore, other development projects should be able to rely on the previous analysis and land use management actions rather than each project conducting their own, separate analyses as long as the basic conditions under which the land use management measures were designed and implemented have not changed.



Appendix 2: Developable Parcels in the Three PDAs

Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



- Non-Road Accessible Outer Banks Probable Development Area
- Road Accessible Outer Banks Probable Development Area
- U.S. 158 Interchange Probable Development Area
- Proposed Bridge
- Map Pages

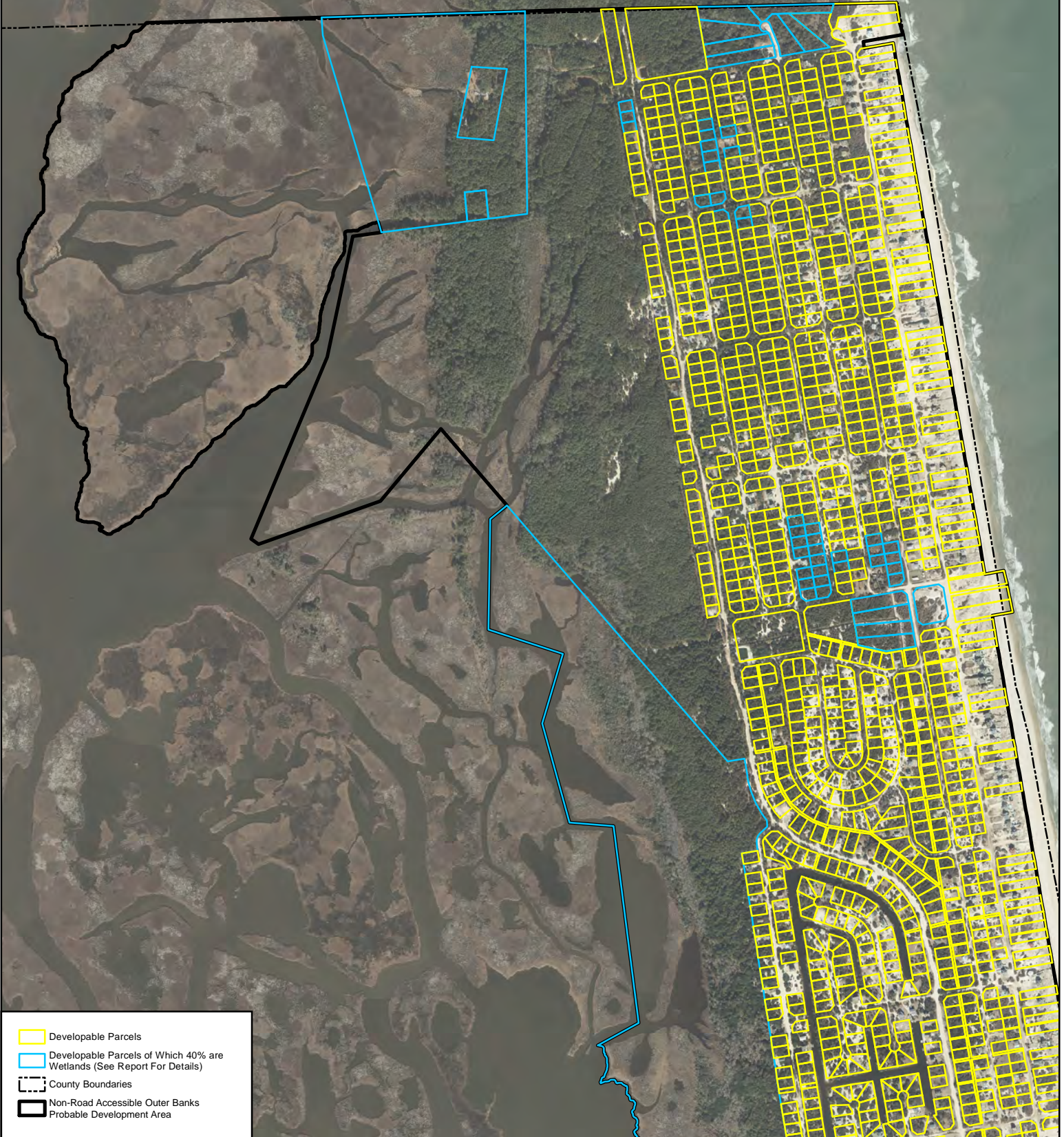


POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.

Virginia/North Carolina Border



- Developable Parcels
- Developable Parcels of Which 40% are Wetlands (See Report For Details)
- County Boundaries
- Non-Road Accessible Outer Banks Probable Development Area



POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



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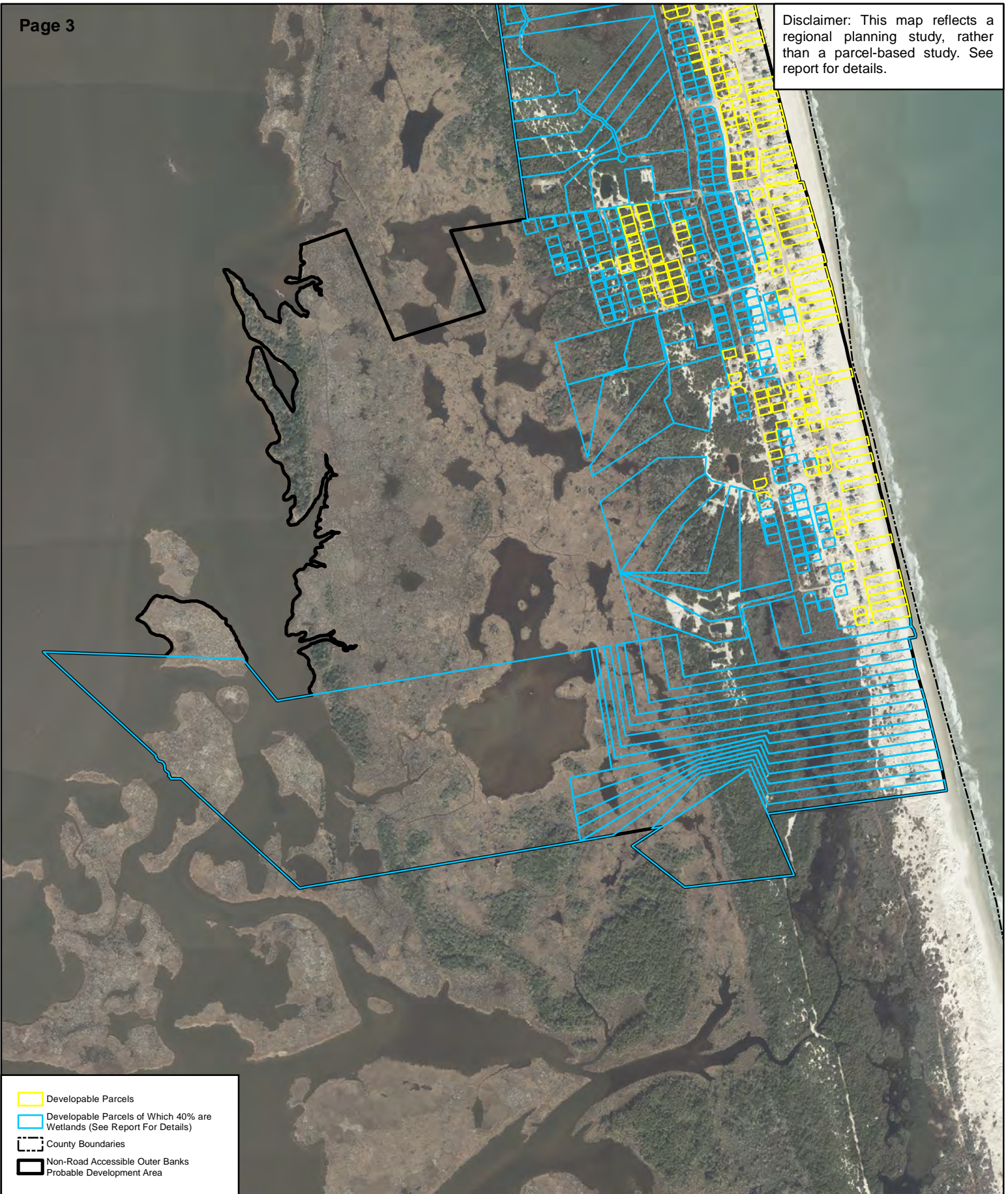
-  Developable Parcels
-  Developable Parcels of Which 40% are Wetlands (See Report For Details)
-  County Boundaries
-  Non-Road Accessible Outer Banks Probable Development Area



POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



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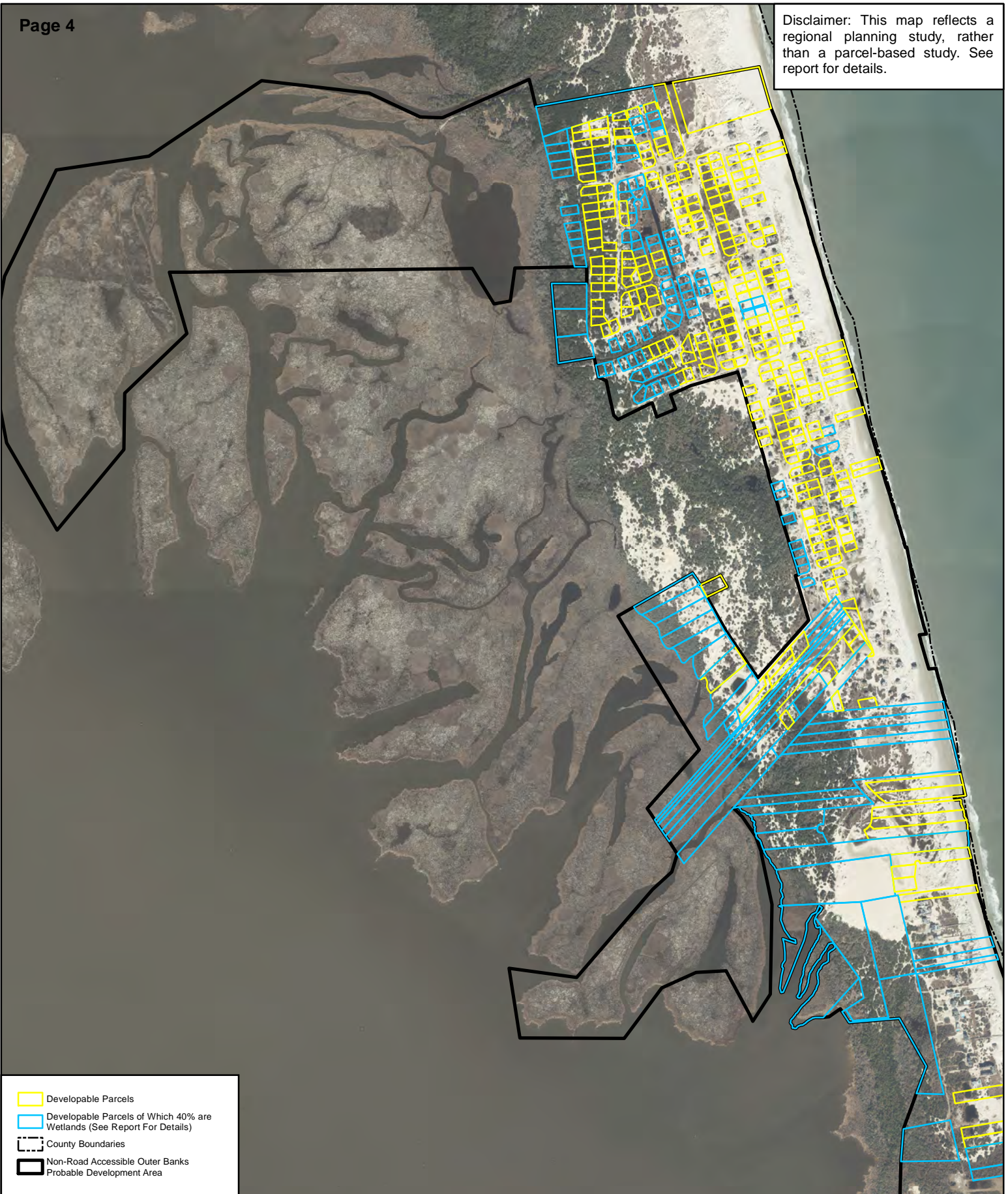
- Developable Parcels
- Developable Parcels of Which 40% are Wetlands (See Report For Details)
- County Boundaries
- Non-Road Accessible Outer Banks Probable Development Area



POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



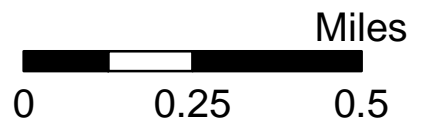
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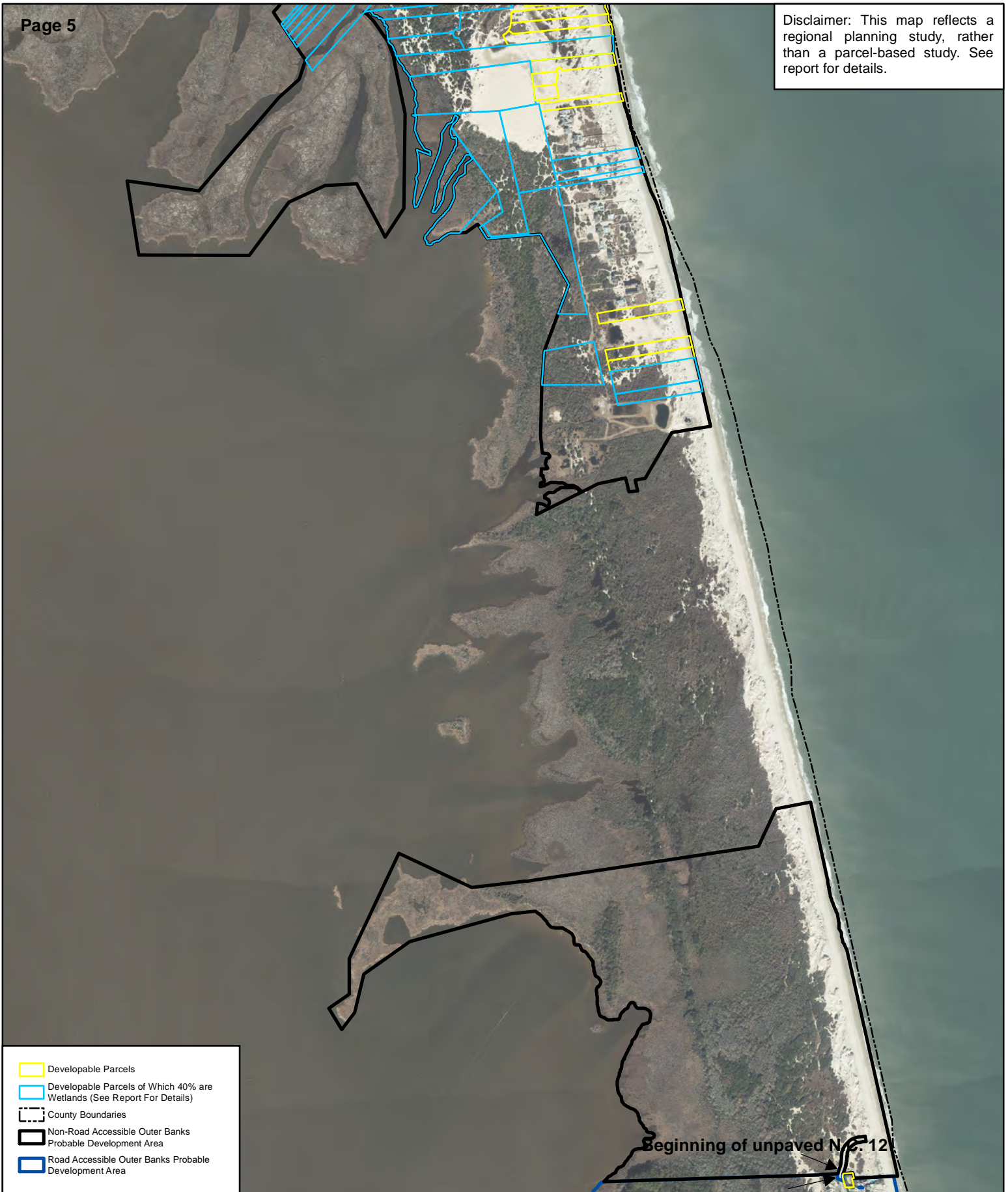
- Developable Parcels
- Developable Parcels of Which 40% are Wetlands (See Report For Details)
- County Boundaries
- Non-Road Accessible Outer Banks Probable Development Area



POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



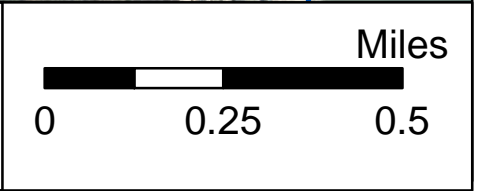
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- Developable Parcels
- Developable Parcels of Which 40% are Wetlands (See Report For Details)
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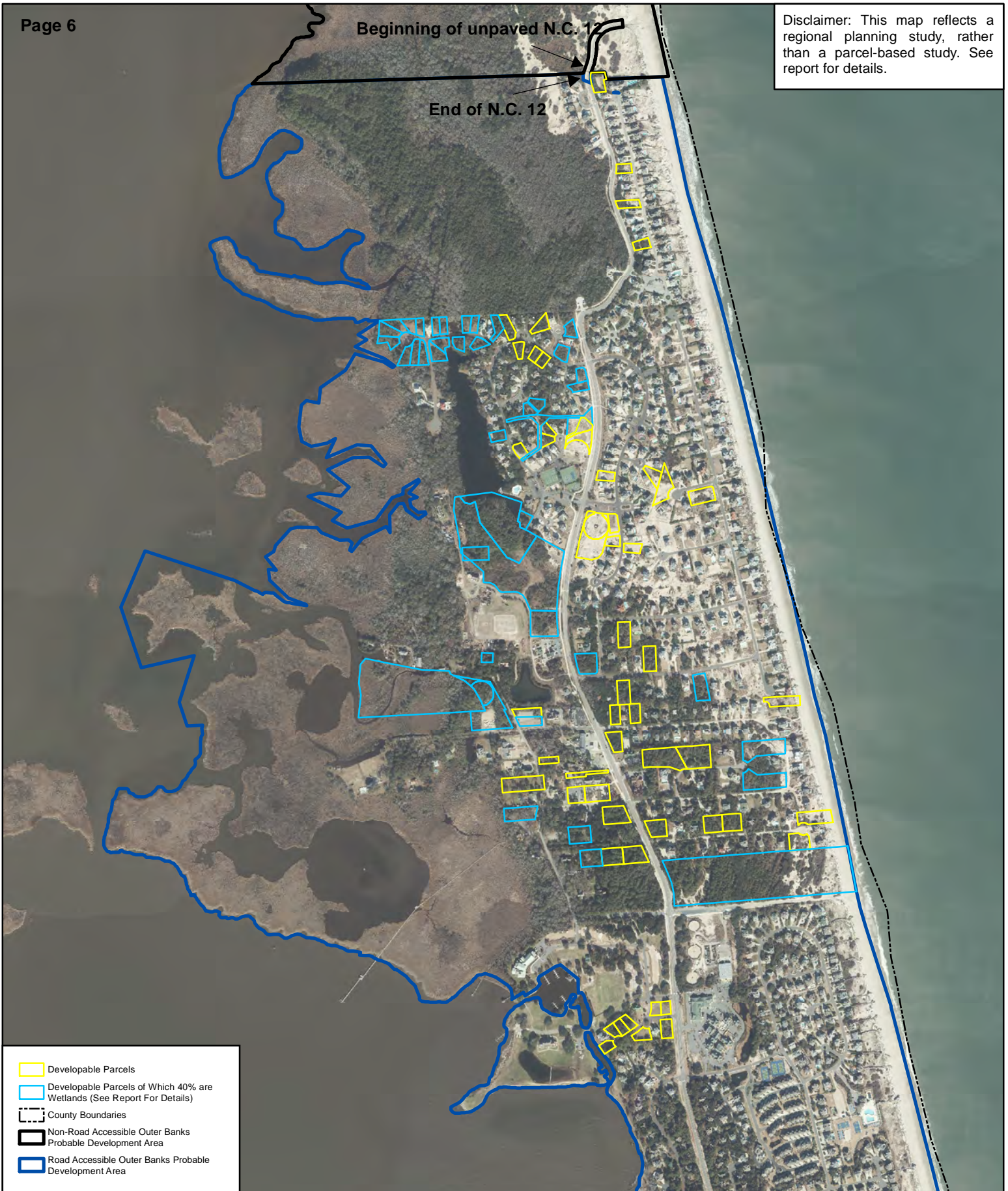
**POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC**



Beginning of unpaved N.C. 12

End of N.C. 12

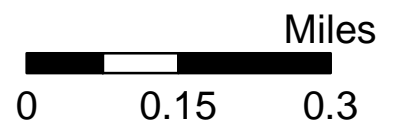
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




POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



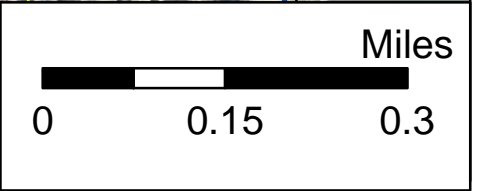
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-  Developable Parcels
-  Developable Parcels of Which 40% are Wetlands (See Report For Details)
-  Proposed Bridge
-  County Boundaries
-  Road Accessible Outer Banks Probable Development Area



POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



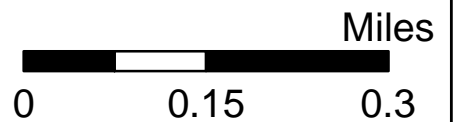
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- Developable Parcels
- Developable Parcels of Which 40% are Wetlands (See Report For Details)
- County Boundaries
- Road Accessible Outer Banks Probable Development Area



POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



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-  Developable Parcels
-  Developable Parcels of Which 40% are Wetlands (See Report For Details)
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-  Road Accessible Outer Banks Probable Development Area



POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



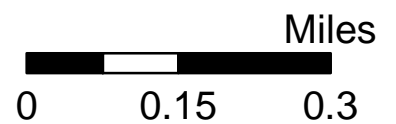
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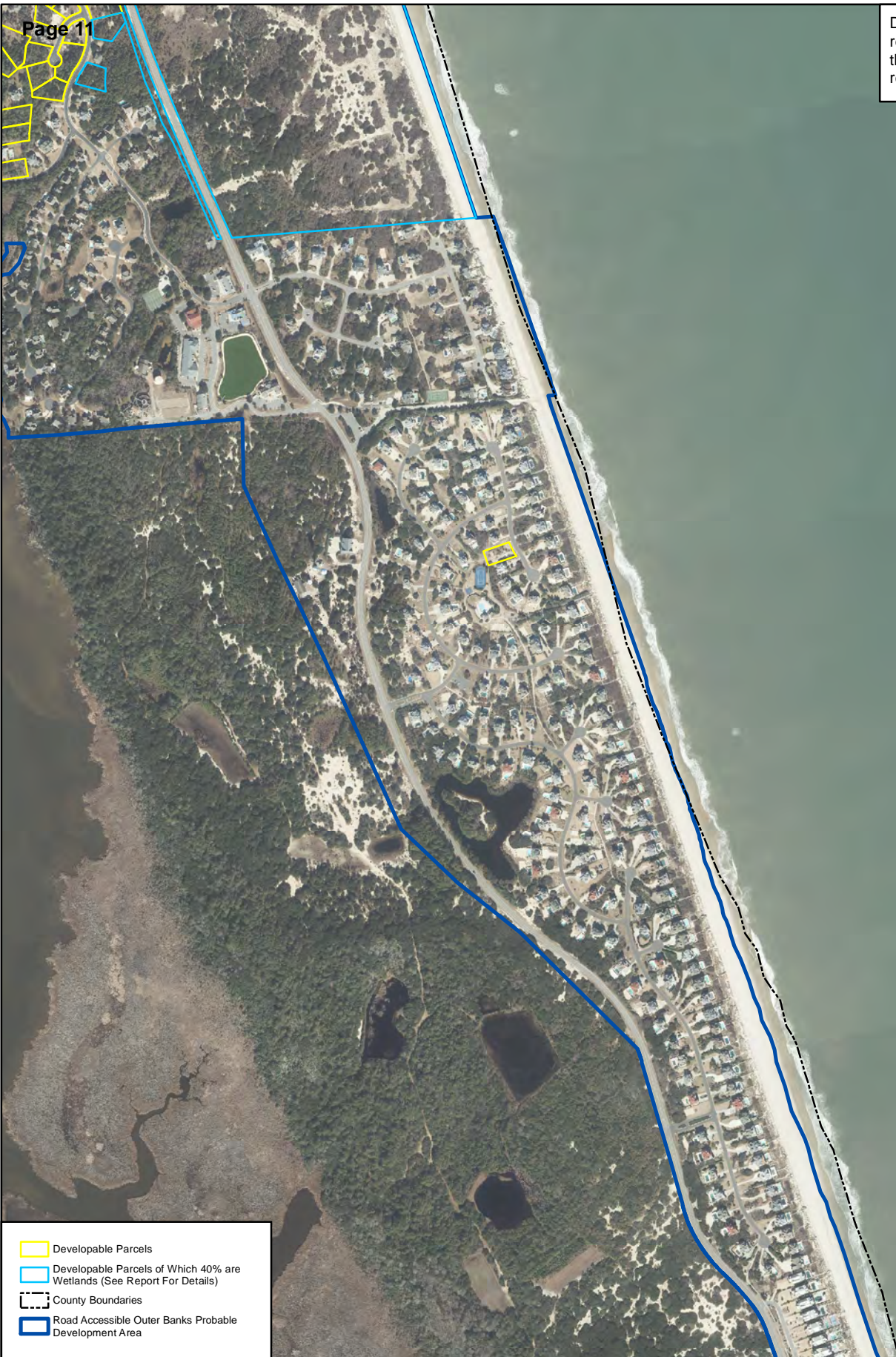
- Developable Parcels
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- County Boundaries
- Road Accessible Outer Banks Probable Development Area



POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



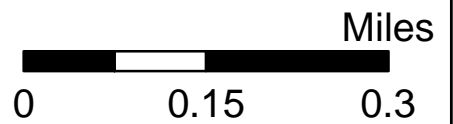
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-  Developable Parcels of Which 40% are Wetlands (See Report For Details)
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PARCELS MAP
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CURRITUCK COUNTY, NC



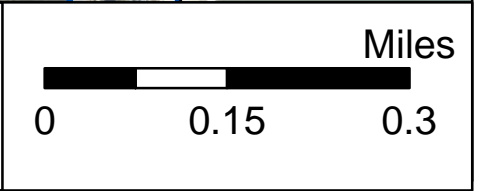
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-  Developable Parcels
-  County Boundaries
-  Road Accessible Outer Banks Probable Development Area



POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC






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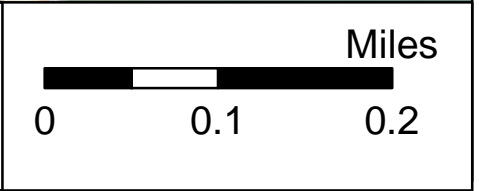
Currituck County

Dare County

-  Developable Parcels
-  County Boundaries
-  Road Accessible Outer Banks Probable Development Area







POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



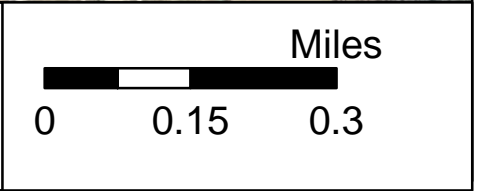
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-  Developable Parcels
-  Proposed Bridge
-  County Boundaries
-  U.S. 158 Interchange Probable Development Area



POTENTIAL DEVELOPABLE
PARCELS MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



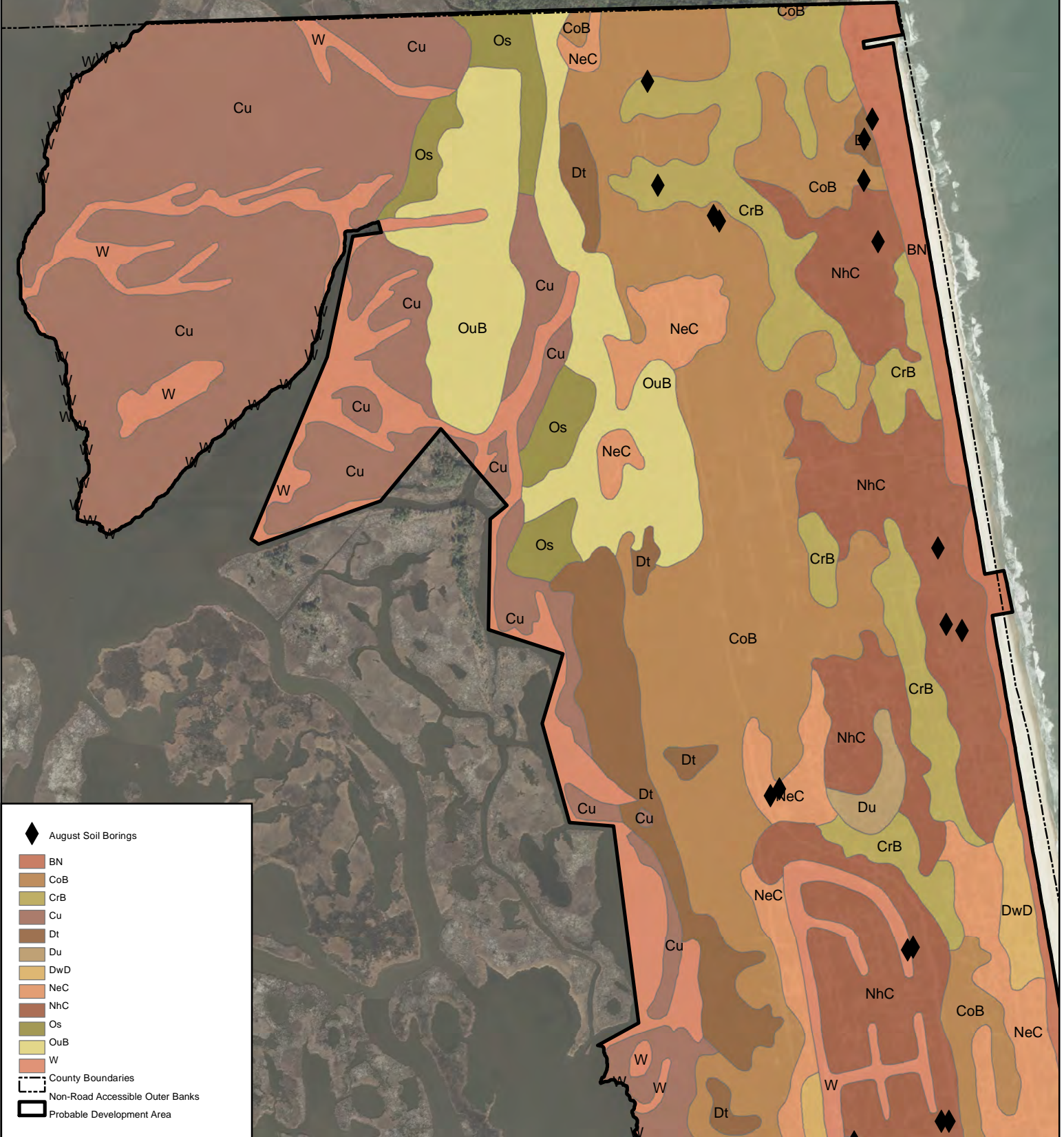


Appendix 3:

Soil Series Map for the Three PDAs with Field- Based Soil Samples

Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.

Virginia/North Carolina Border



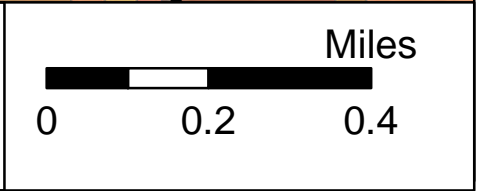
◆ August Soil Borings

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- CoB
- CrB
- Cu
- Dt
- Du
- DwD
- NeC
- NhC
- Os
- OuB
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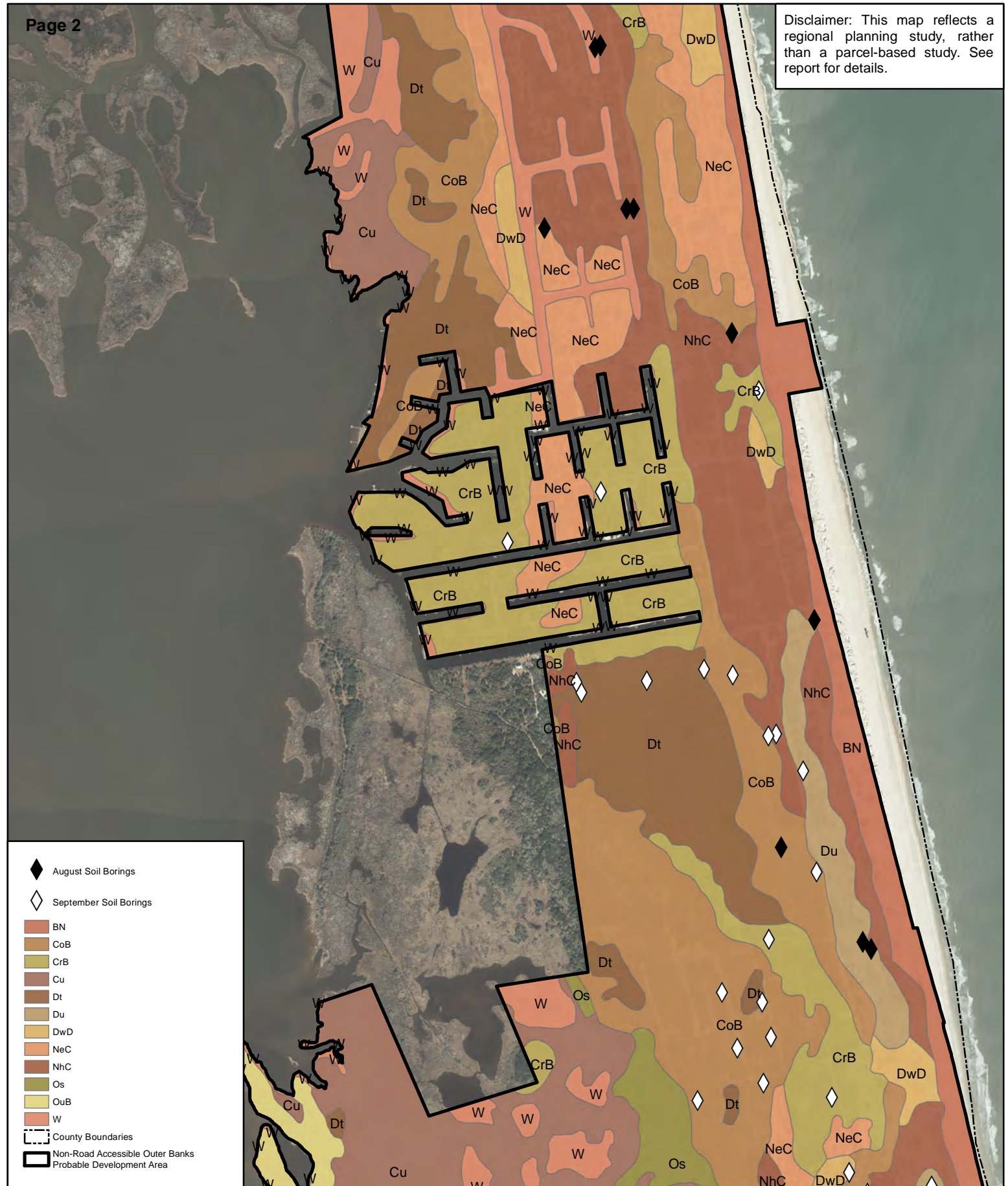
--- County Boundaries
 - - - Non-Road Accessible Outer Banks
 [Thick Black Line] Probable Development Area



SOIL SERIES MAP
 MID-CURRITUCK BRIDGE
 CURRITUCK COUNTY, NC



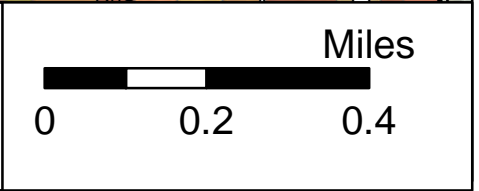
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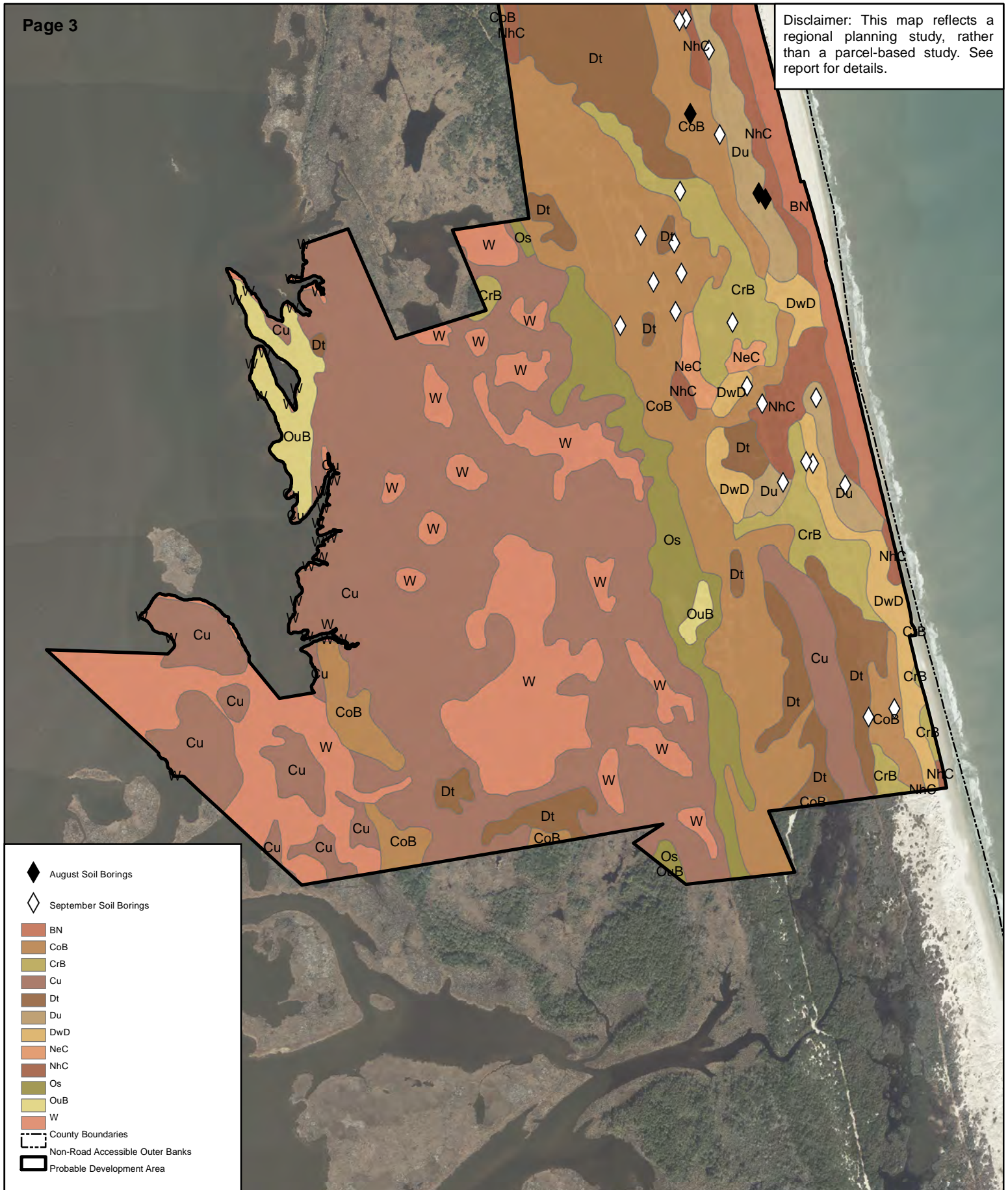
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- County Boundaries
- ▭ Non-Road Accessible Outer Banks
Probable Development Area



SOIL SERIES MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



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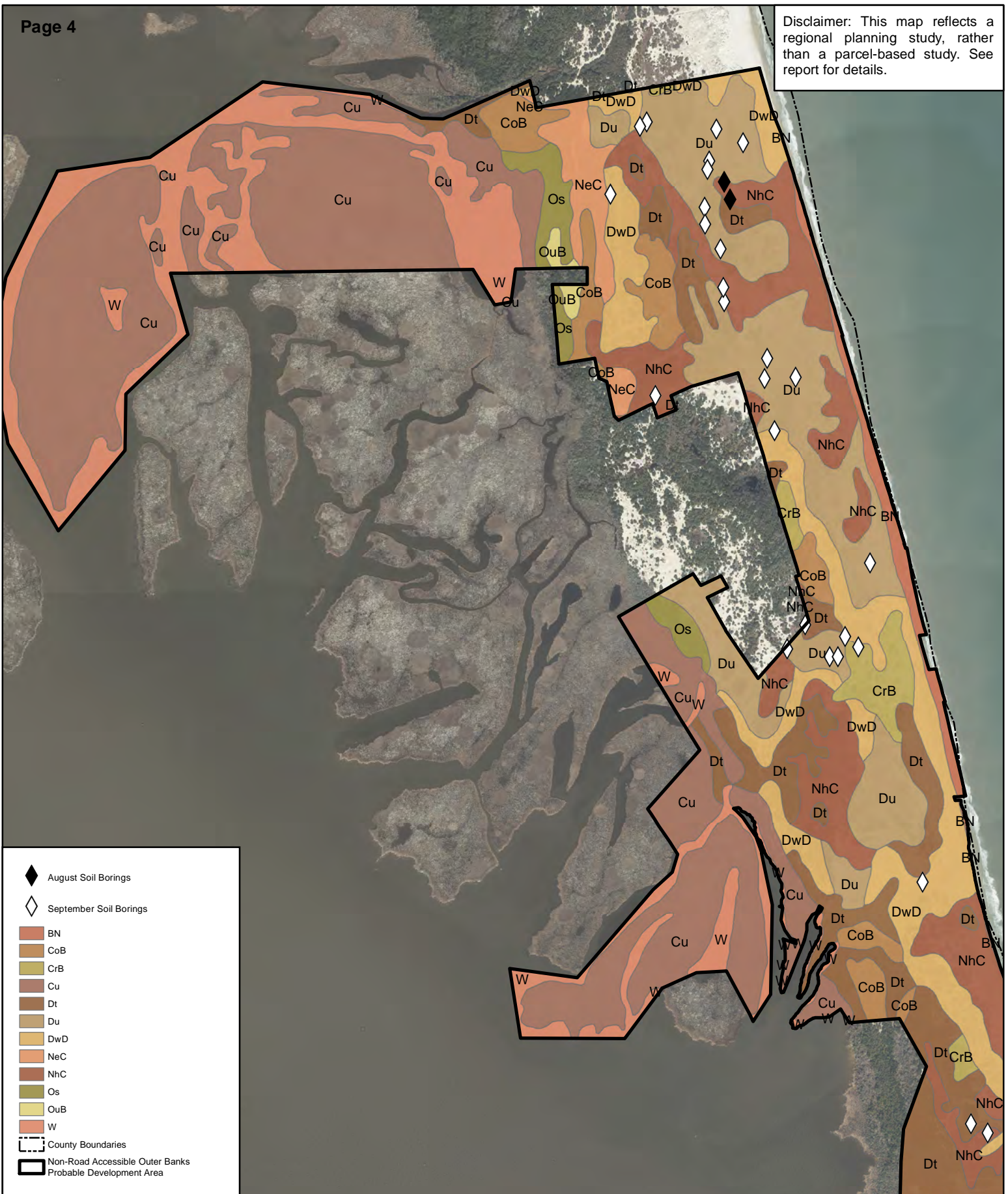
- ◆ August Soil Borings
- ◇ September Soil Borings
- BN
- CoB
- CrB
- Cu
- Dt
- Du
- DwD
- NeC
- NhC
- Os
- OuB
- W
- County Boundaries
- ⋯ Non-Road Accessible Outer Banks
- ▭ Probable Development Area



SOIL SERIES MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



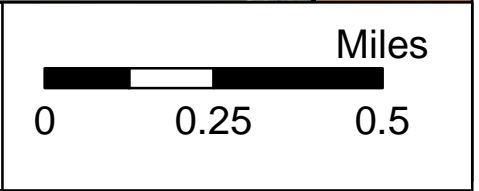
Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



◆ August Soil Borings
 ◇ September Soil Borings
 BN
 CoB
 CrB
 Cu
 Dt
 Du
 DwD
 NeC
 NhC
 Os
 OuB
 W
 --- County Boundaries
 ... Non-Road Accessible Outer Banks
 ... Probable Development Area



SOIL SERIES MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



◆ September Soil Borings

- BN
- CoB
- CrB
- Cu
- Dt
- Du
- DwD
- NeC
- NhC
- Os
- OuB
- W

--- County Boundaries

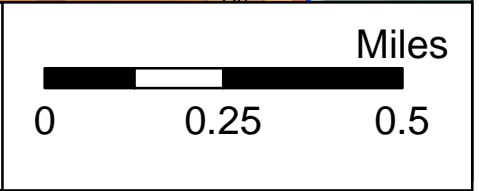
▭ Non-Road Accessible Outer Banks Probable Development Area

▭ Road Accessible Outer Banks Probable Development Area



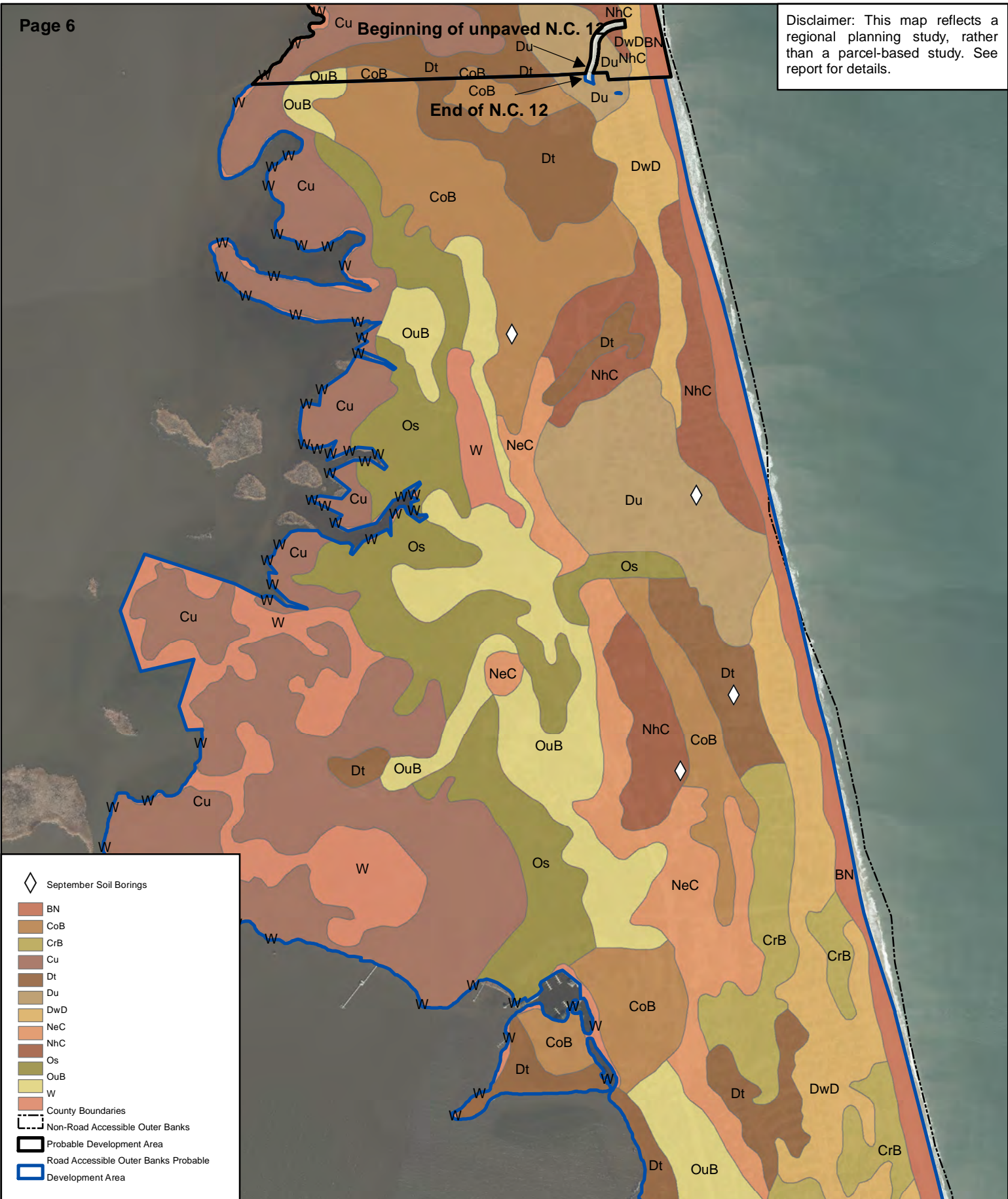
N

SOIL SERIES MAP MID-CURRITUCK BRIDGE CURRITUCK COUNTY, NC



Beginning of unpaved N.C. 12
End of N.C. 12

Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.

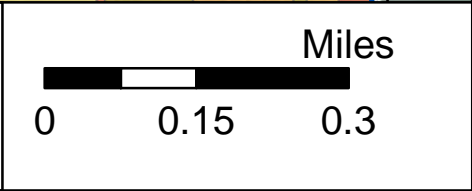


◇ September Soil Borings

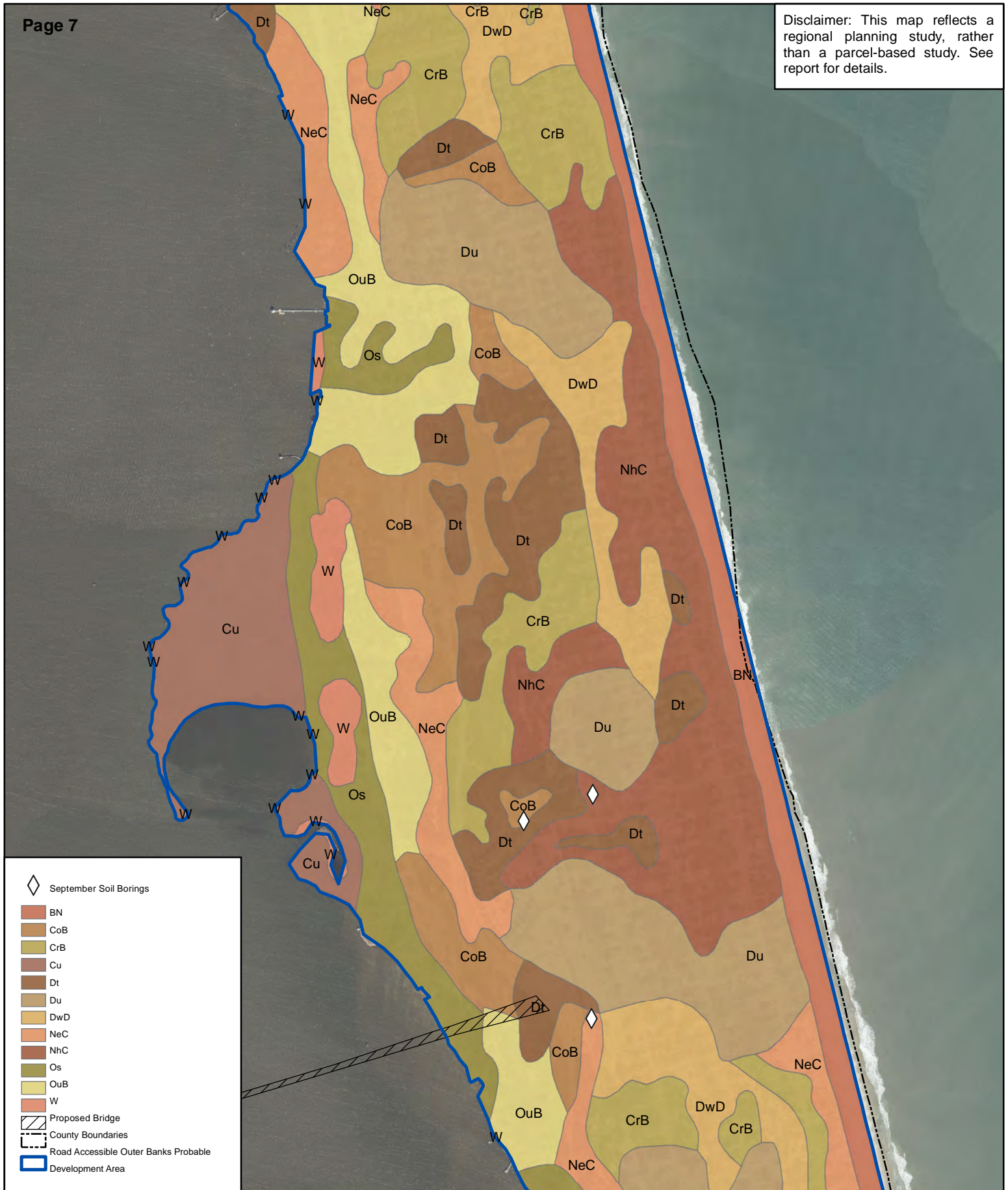
- BN
- CoB
- CrB
- Cu
- Dt
- Du
- DwD
- NeC
- NhC
- Os
- OuB
- W
- County Boundaries
- Non-Road Accessible Outer Banks
- Probable Development Area
- Road Accessible Outer Banks Probable
- Development Area



SOIL SERIES MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.

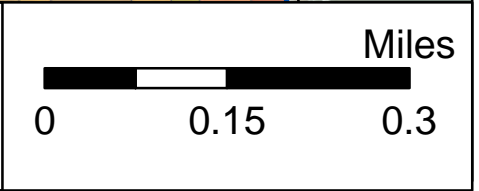


- ◇ September Soil Borings
- BN
- CoB
- CrB
- Cu
- Dt
- Du
- DwD
- NeC
- NhC
- Os
- OuB
- W
- Proposed Bridge
- County Boundaries
- Road Accessible Outer Banks Probable
- Development Area

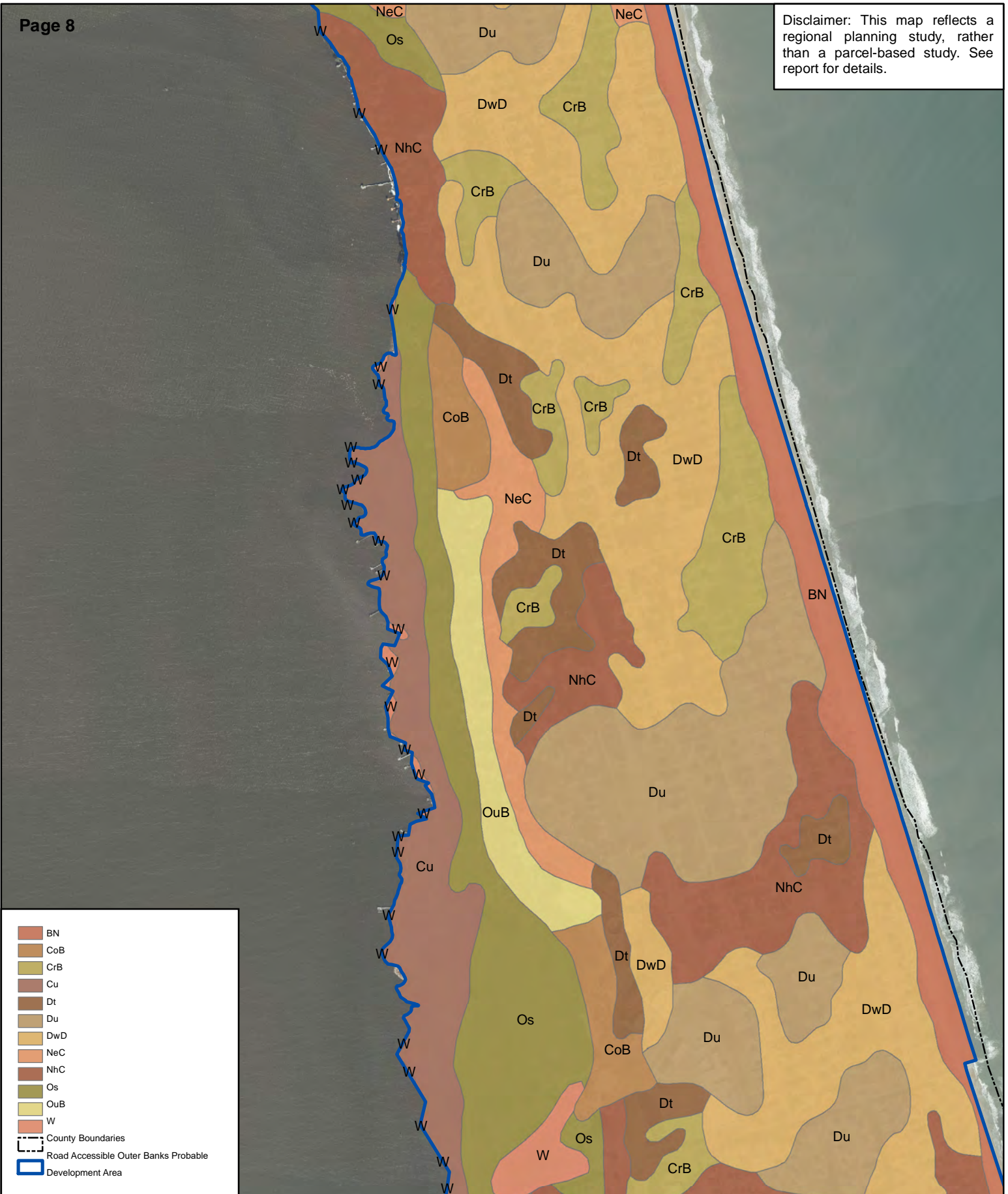


N

SOIL SERIES MAP MID-CURRITUCK BRIDGE CURRITUCK COUNTY, NC



Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



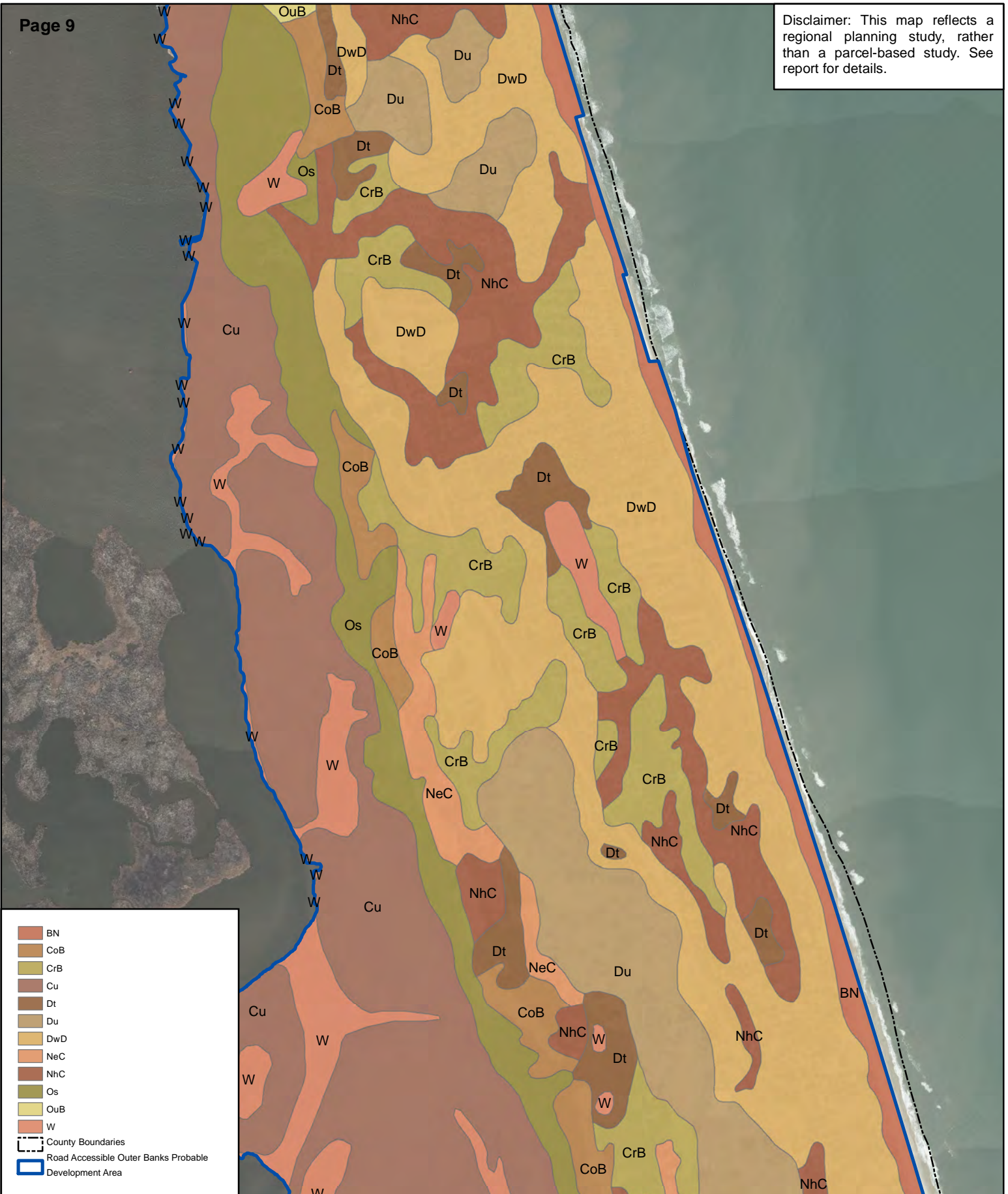
	BN
	CoB
	CrB
	Cu
	Dt
	Du
	DwD
	NeC
	NhC
	Os
	OuB
	W
	County Boundaries
	Road Accessible Outer Banks Probable
	Development Area



SOIL SERIES MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



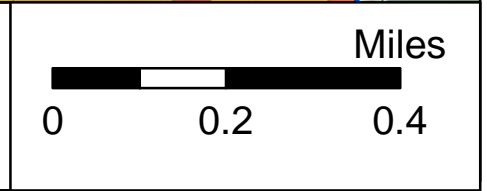
Legend:

- BN
- CoB
- CrB
- Cu
- Dt
- Du
- DwD
- NeC
- NhC
- Os
- OuB
- W
- County Boundaries
- Road Accessible Outer Banks Probable
- Development Area

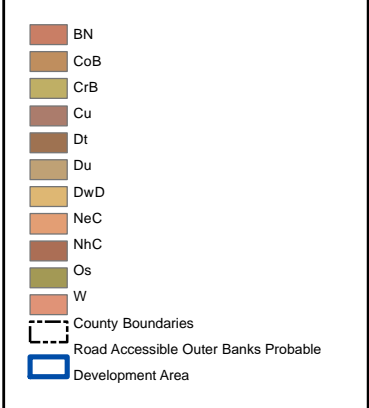
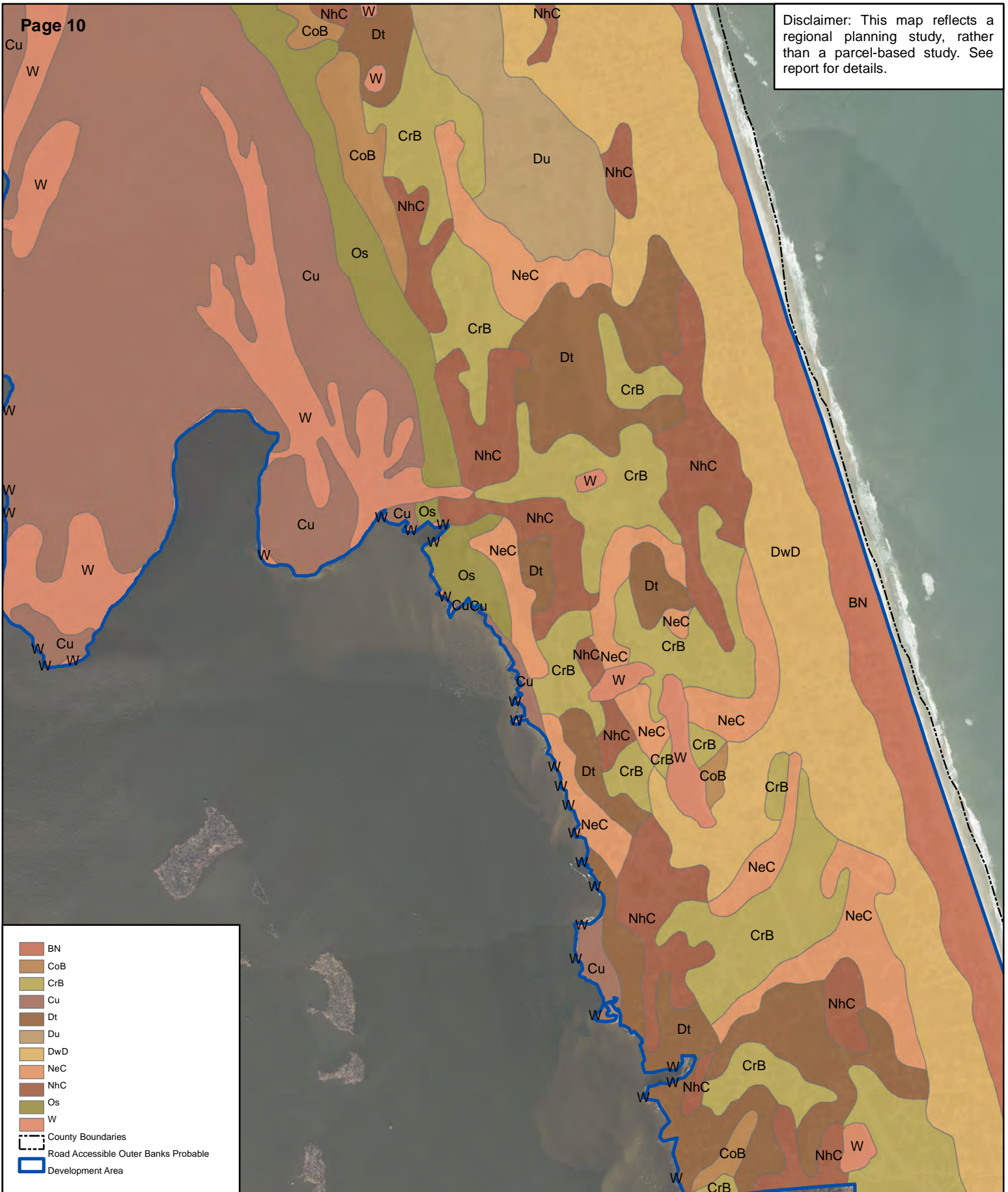


N

SOIL SERIES MAP MID-CURRITUCK BRIDGE CURRITUCK COUNTY, NC



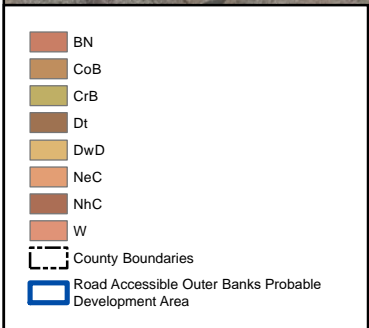
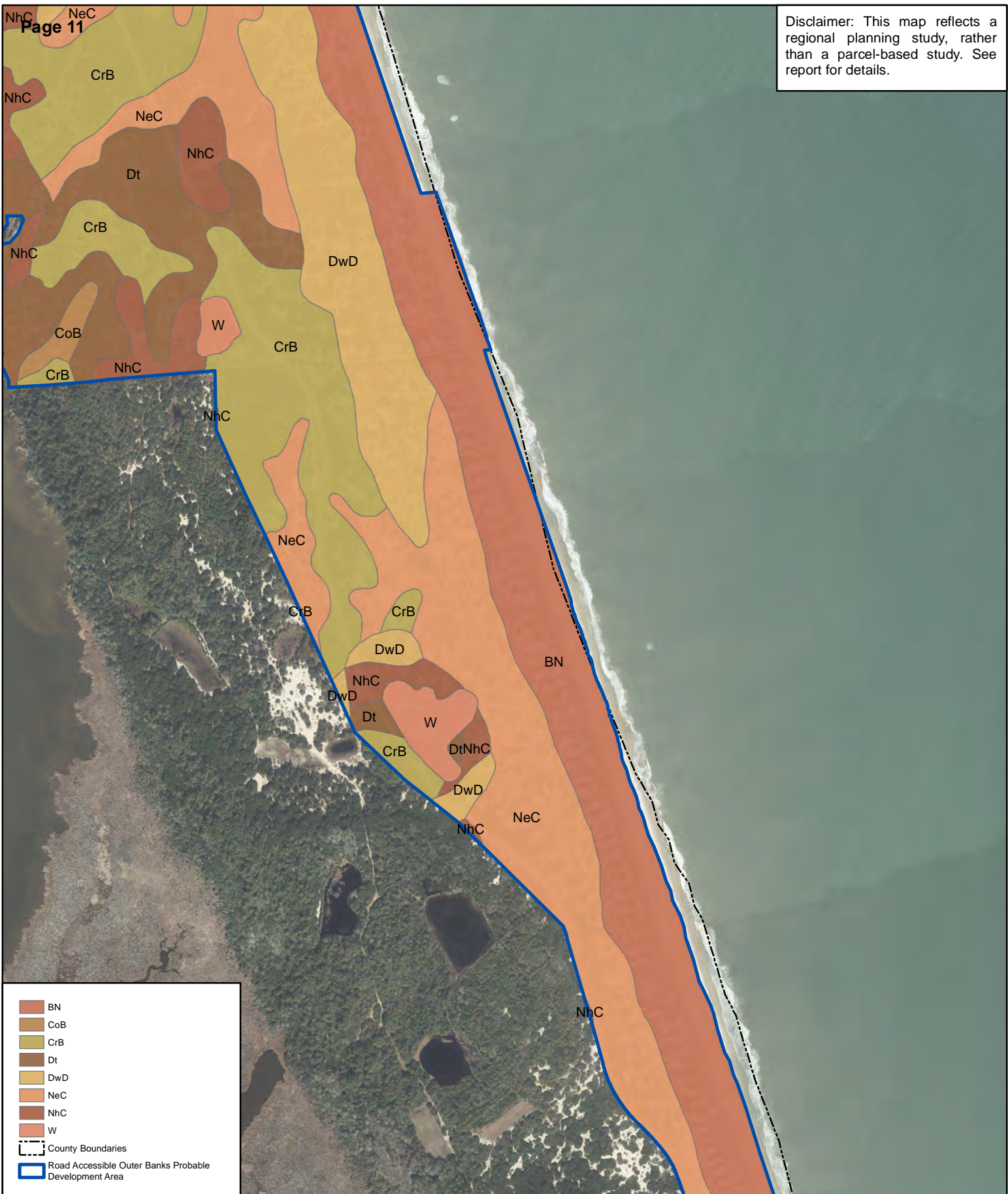
Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



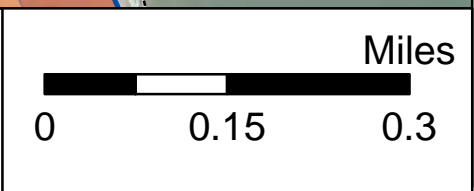
SOIL SERIES MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



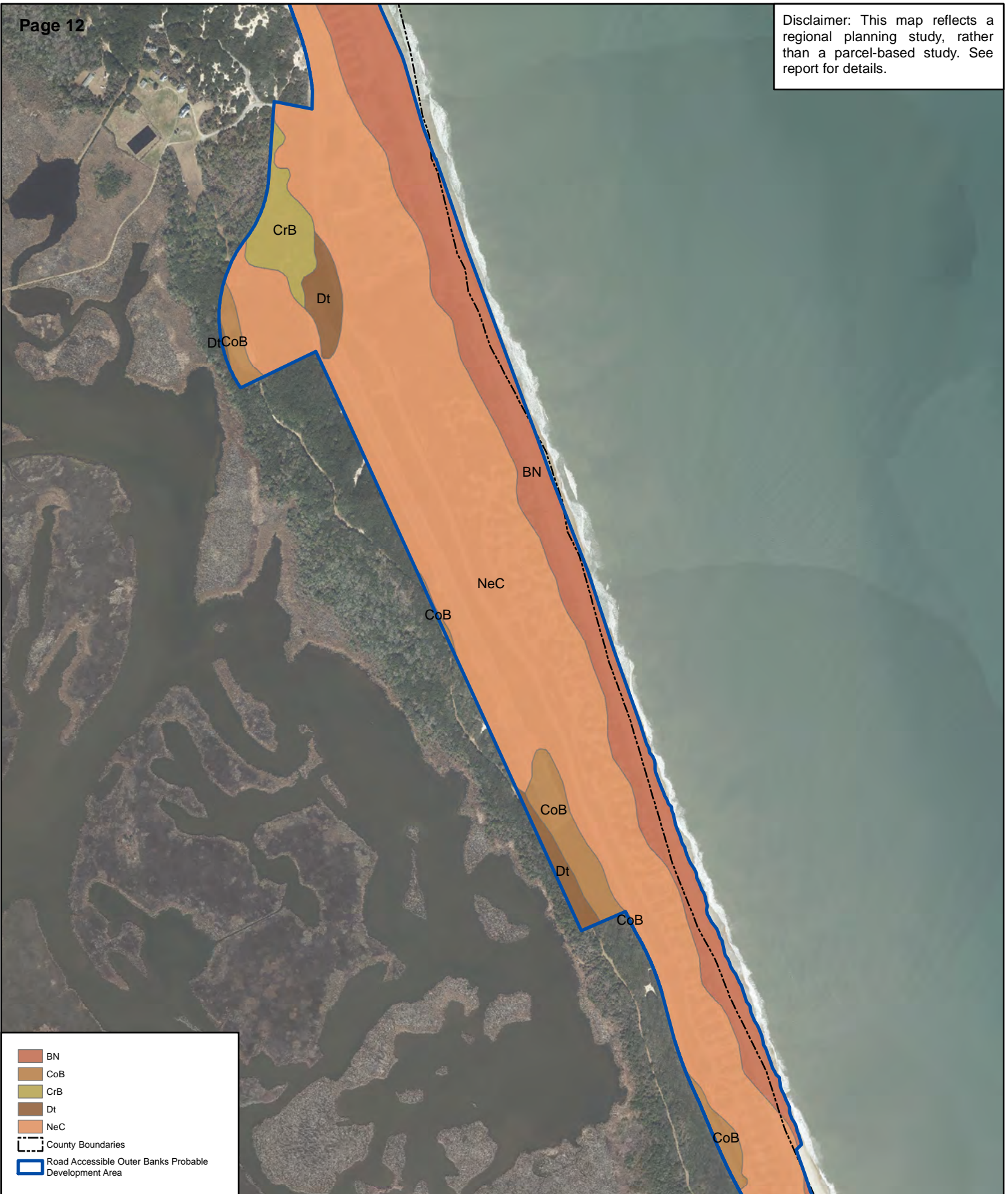
Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



**SOIL SERIES MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC**



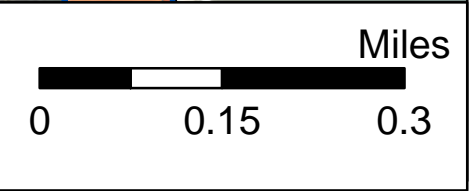
Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



- BN
- CoB
- CrB
- Dt
- NeC
- County Boundaries
- Road Accessible Outer Banks Probable Development Area



SOIL SERIES MAP MID-CURRITUCK BRIDGE CURRITUCK COUNTY, NC



Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.

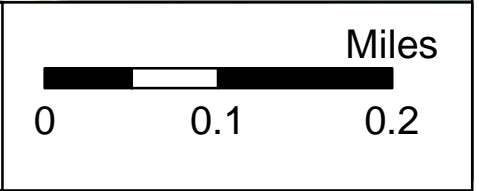


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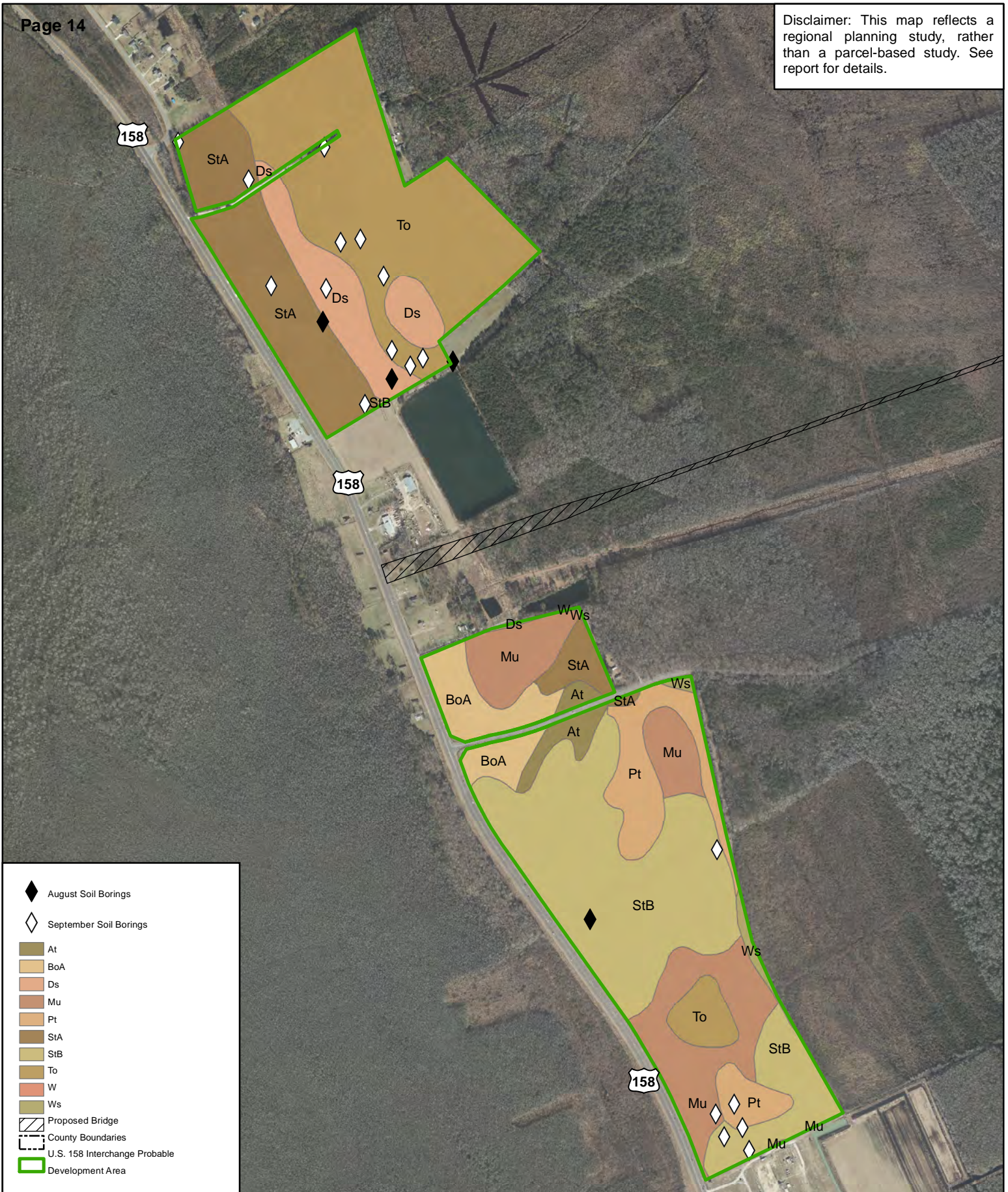
- BN
- BnD
- CoB
- DwE
- NeC
- County Boundaries
- Road Accessible Outer Banks Probable Development Area



SOIL SERIES MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



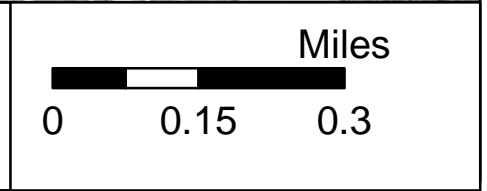
Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



- August Soil Borings
- September Soil Borings
- At
- BoA
- Ds
- Mu
- Pt
- StA
- StB
- To
- W
- Ws
- Proposed Bridge
- County Boundaries
- U.S. 158 Interchange Probable
- Development Area



SOIL SERIES MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC

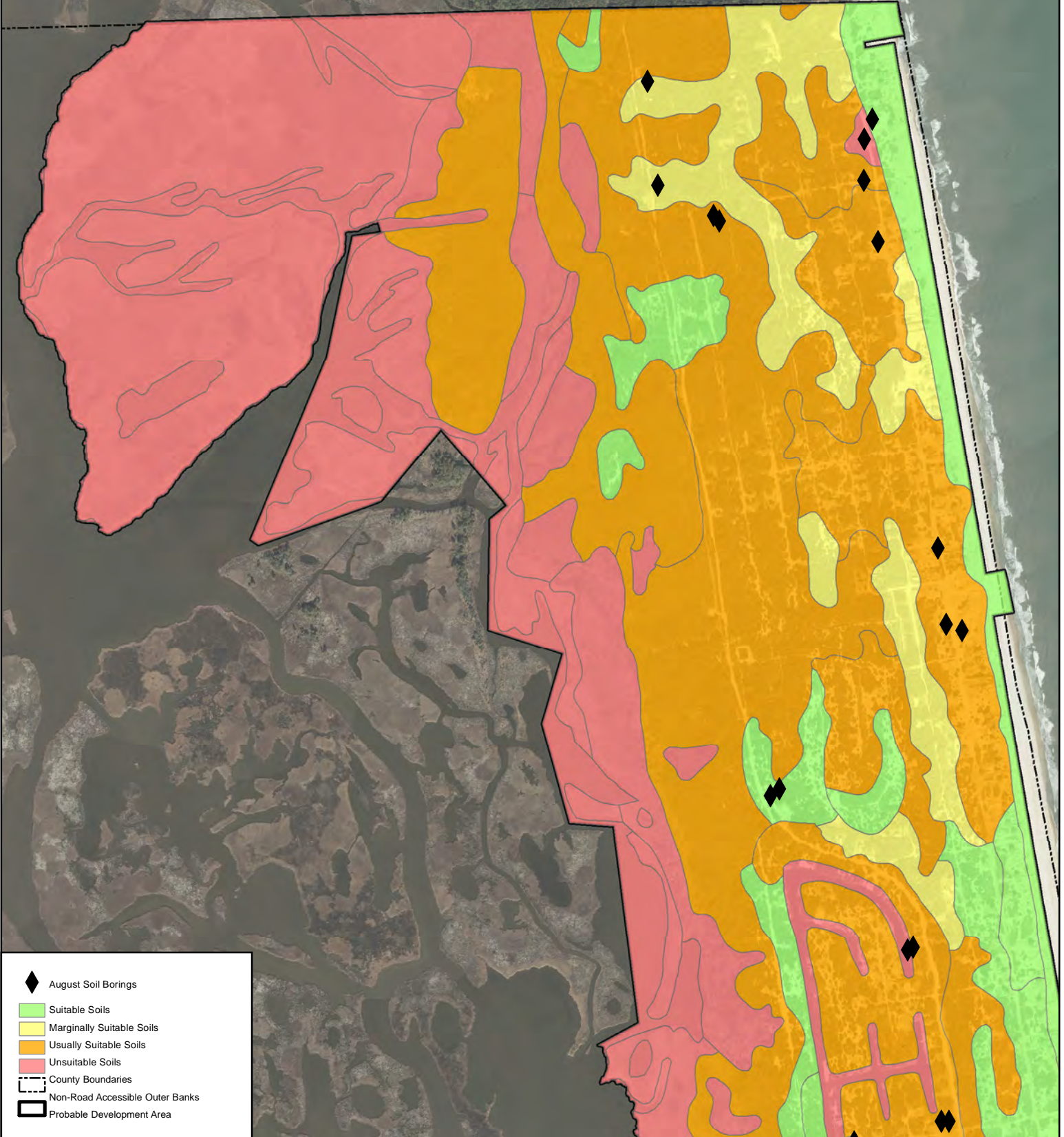




Appendix 4:
Soil Suitability Map for the
Three PDAs with Field-
Based Soil Samples

Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.

Virginia/North Carolina Border



◆ August Soil Borings

■ Suitable Soils

■ Marginally Suitable Soils

■ Usually Suitable Soils

■ Unsuitable Soils

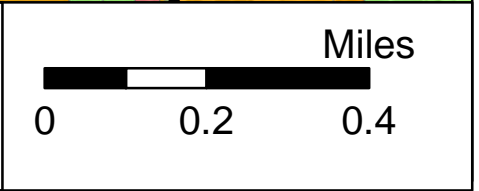
- - - County Boundaries

⋯ Non-Road Accessible Outer Banks

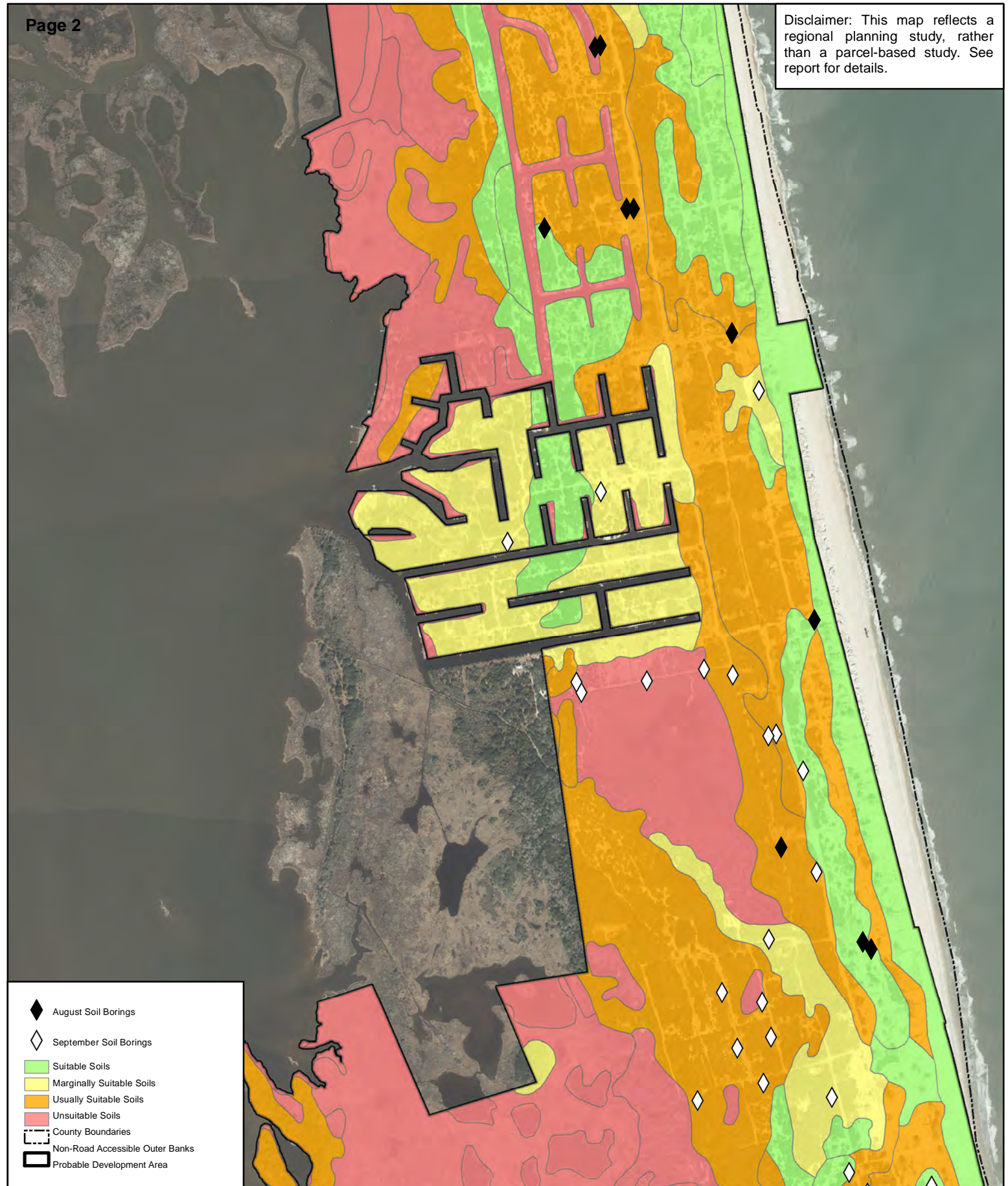
▬ Probable Development Area



SOIL SUITABILITY MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



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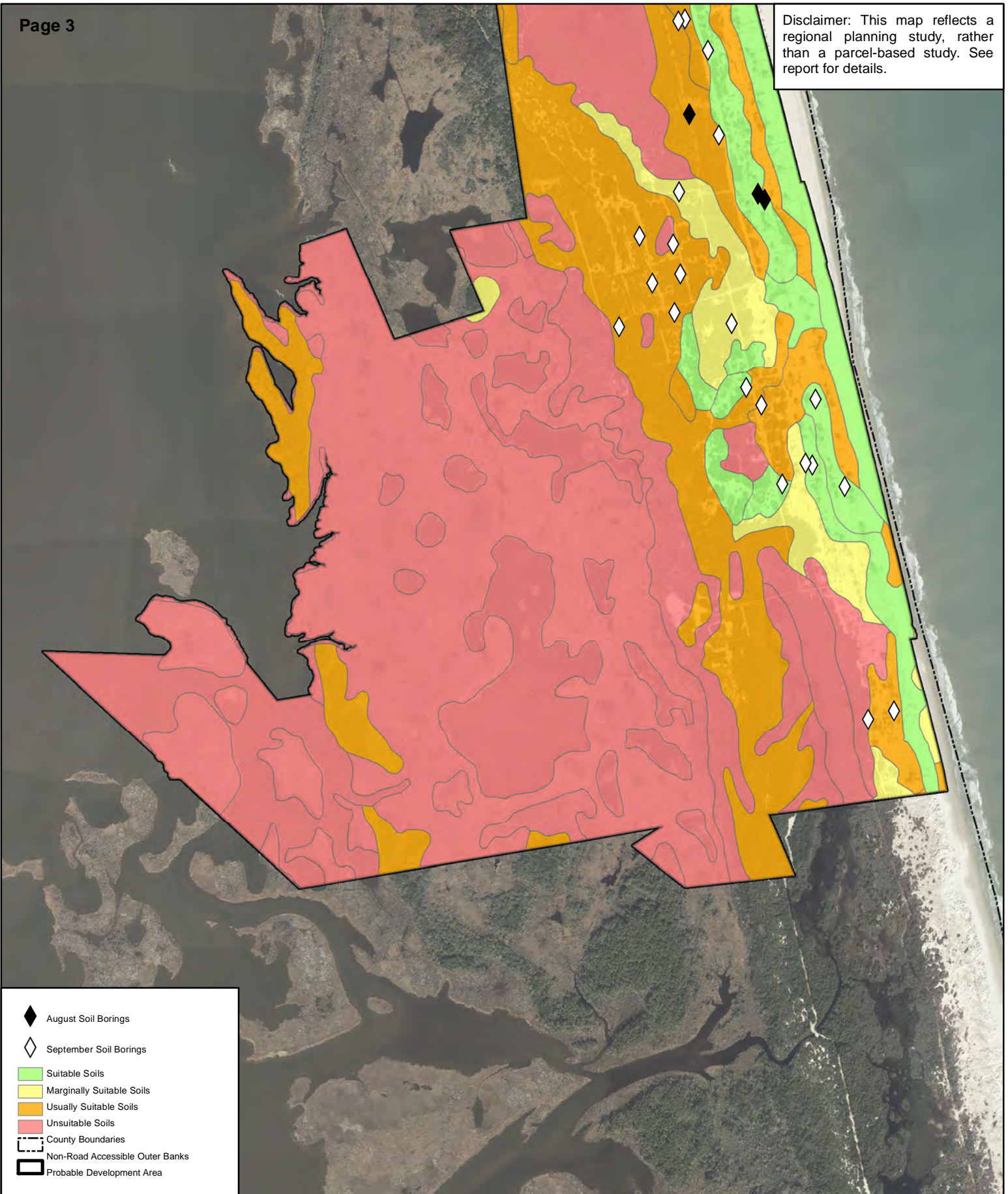
- ◆ August Soil Borings
- ◇ September Soil Borings
- Suitable Soils
- Marginally Suitable Soils
- Usually Suitable Soils
- Unsuitable Soils
- - - County Boundaries
- - - Non-Road Accessible Outer Banks
- ▭ Probable Development Area



SOIL SUITABILITY MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



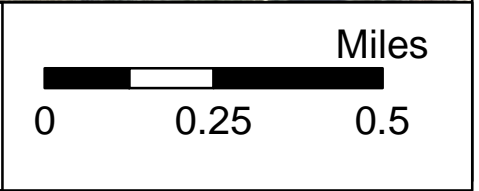
Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



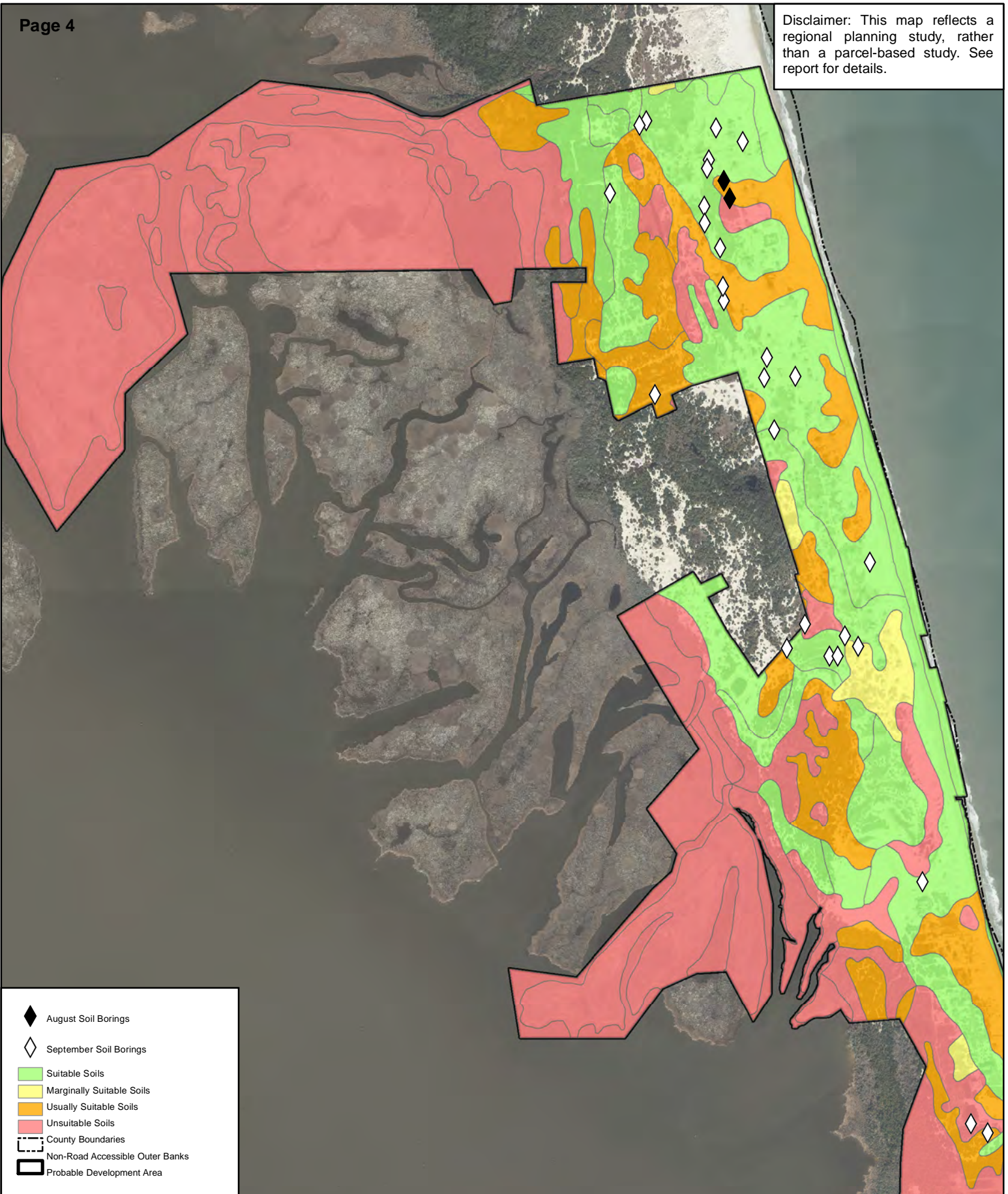
- ◆ August Soil Borings
- ◇ September Soil Borings
- Suitable Soils
- Marginally Suitable Soils
- Usually Suitable Soils
- Unsuitable Soils
- - - County Boundaries
- - - Non-Road Accessible Outer Banks
- ▭ Probable Development Area



SOIL SUITABILITY MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



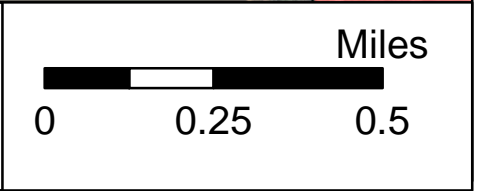
Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



- ◆ August Soil Borings
- ◇ September Soil Borings
- Suitable Soils
- Marginally Suitable Soils
- Usually Suitable Soils
- Unsuitable Soils
- - - County Boundaries
- ⋯ Non-Road Accessible Outer Banks
- ▬ Probable Development Area











SOIL SUITABILITY MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



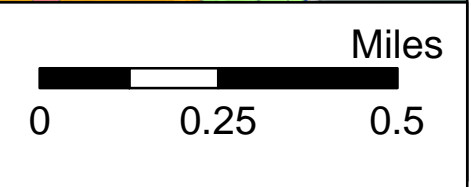
Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



-  September Soil Borings
-  Suitable Soils
-  Marginally Suitable Soils
-  Usually Suitable Soils
-  Unsuitable Soils
-  County Boundaries
-  Non-Road Accessible Outer Banks Probable Development Area
-  Road Accessible Outer Banks Probable Development Area



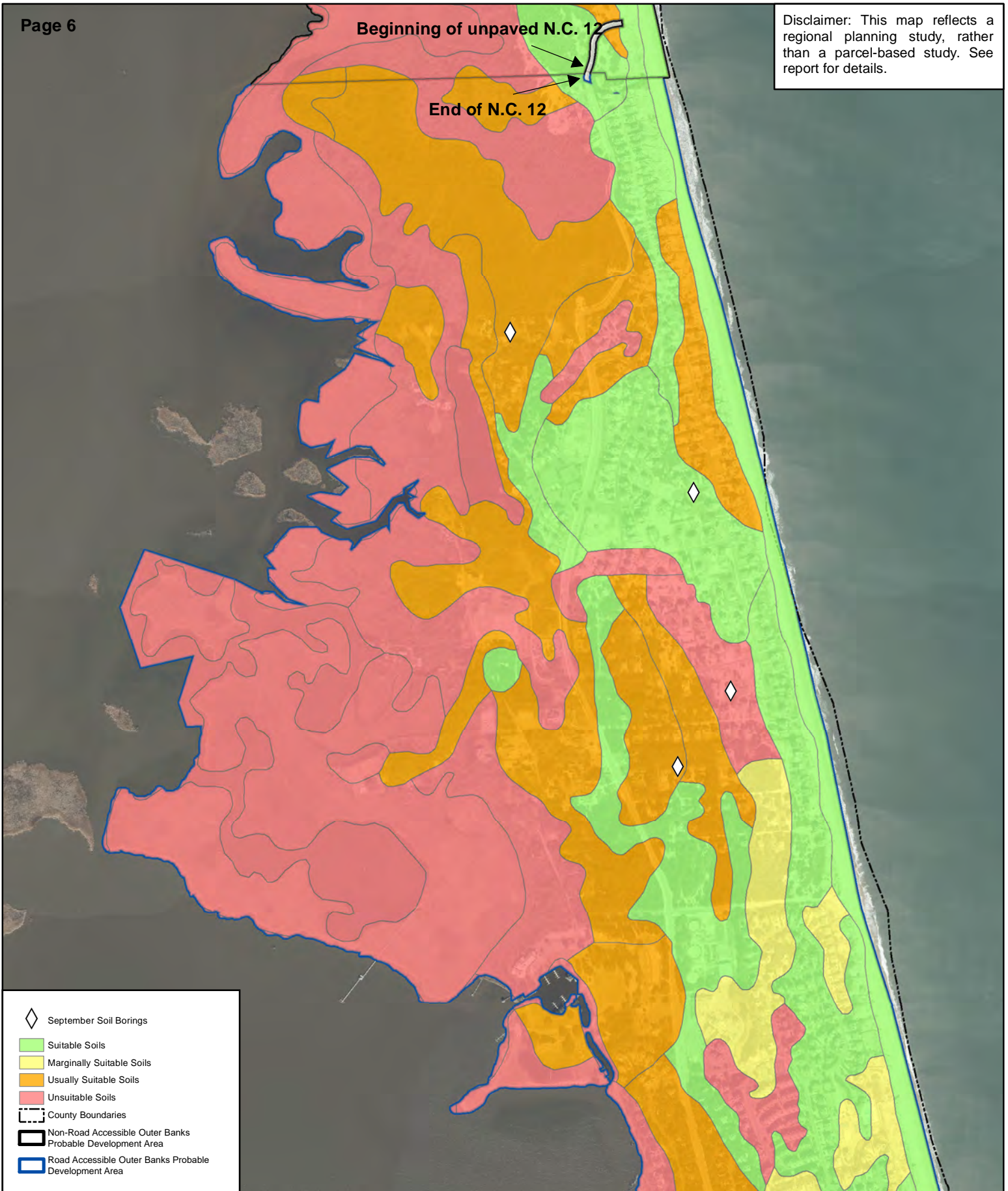
SOIL SUITABILITY MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



Beginning of unpaved N.C. 12

End of N.C. 12

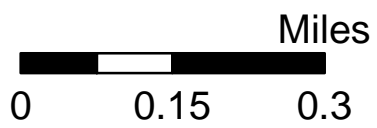
Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



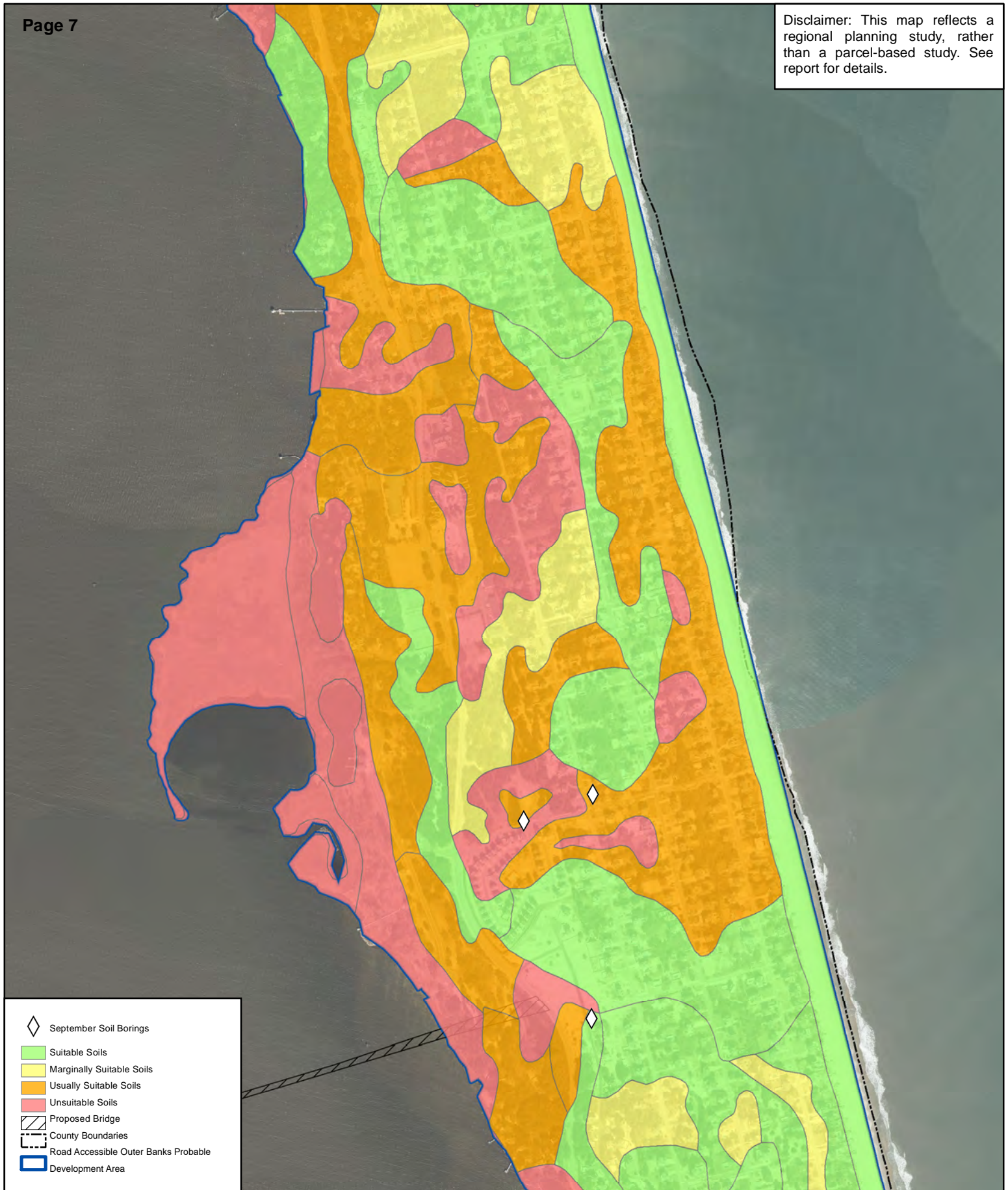
- ◇ September Soil Borings
- Light Green Suitable Soils
- Yellow Marginally Suitable Soils
- Orange Usually Suitable Soils
- Red/Pink Unsuitable Soils
- - - County Boundaries
- Black outline Non-Road Accessible Outer Banks Probable Development Area
- Blue outline Road Accessible Outer Banks Probable Development Area












SOIL SUITABILITY MAP MID-CURRITUCK BRIDGE CURRITUCK COUNTY, NC



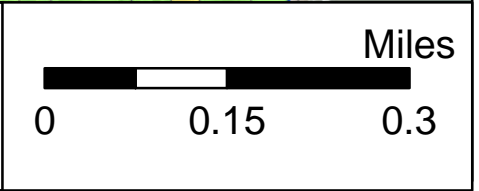
Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



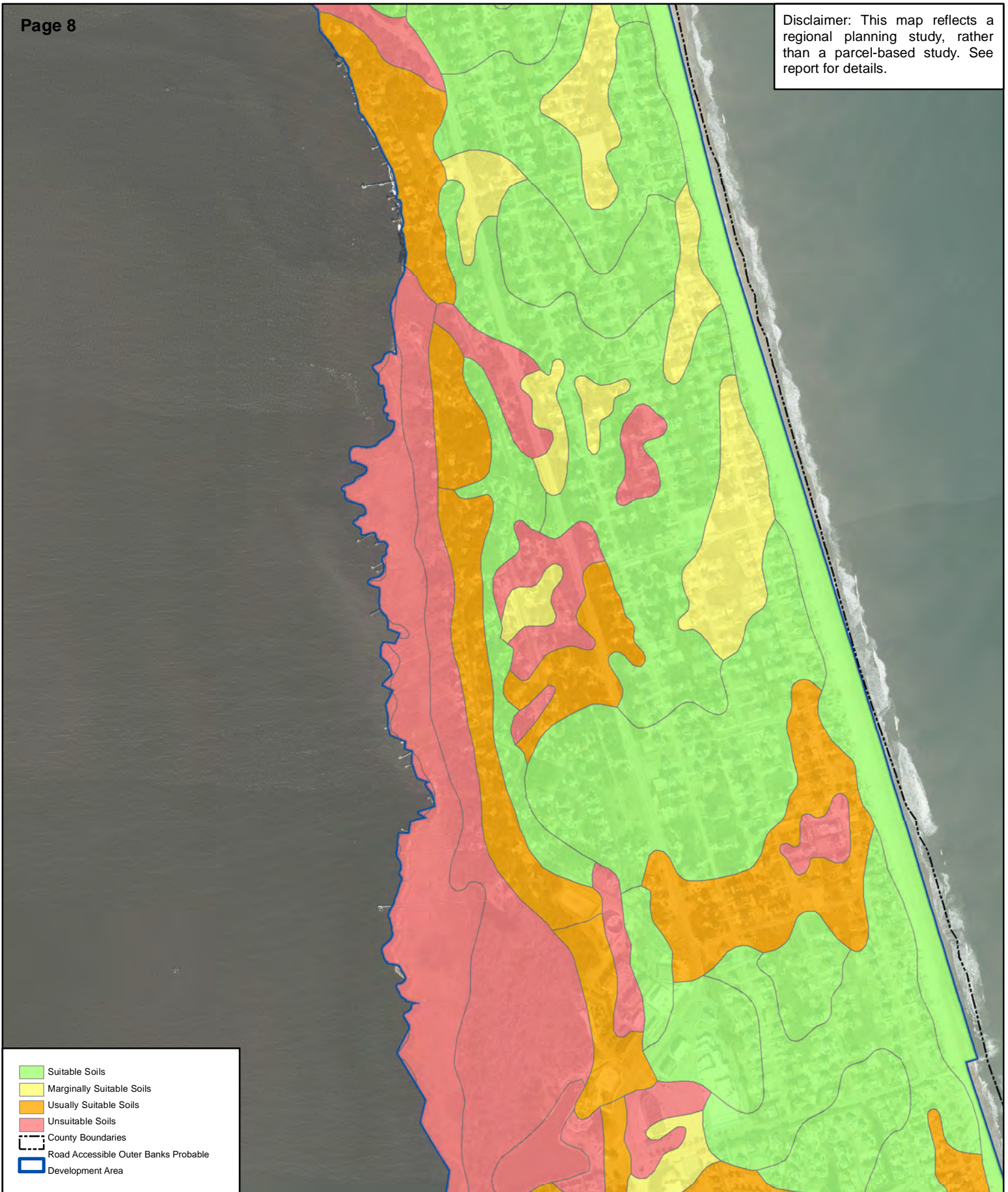
-  September Soil Borings
-  Suitable Soils
-  Marginally Suitable Soils
-  Usually Suitable Soils
-  Unsuitable Soils
-  Proposed Bridge
-  County Boundaries
-  Road Accessible Outer Banks Probable
-  Development Area



**SOIL SUITABILITY MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC**



Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



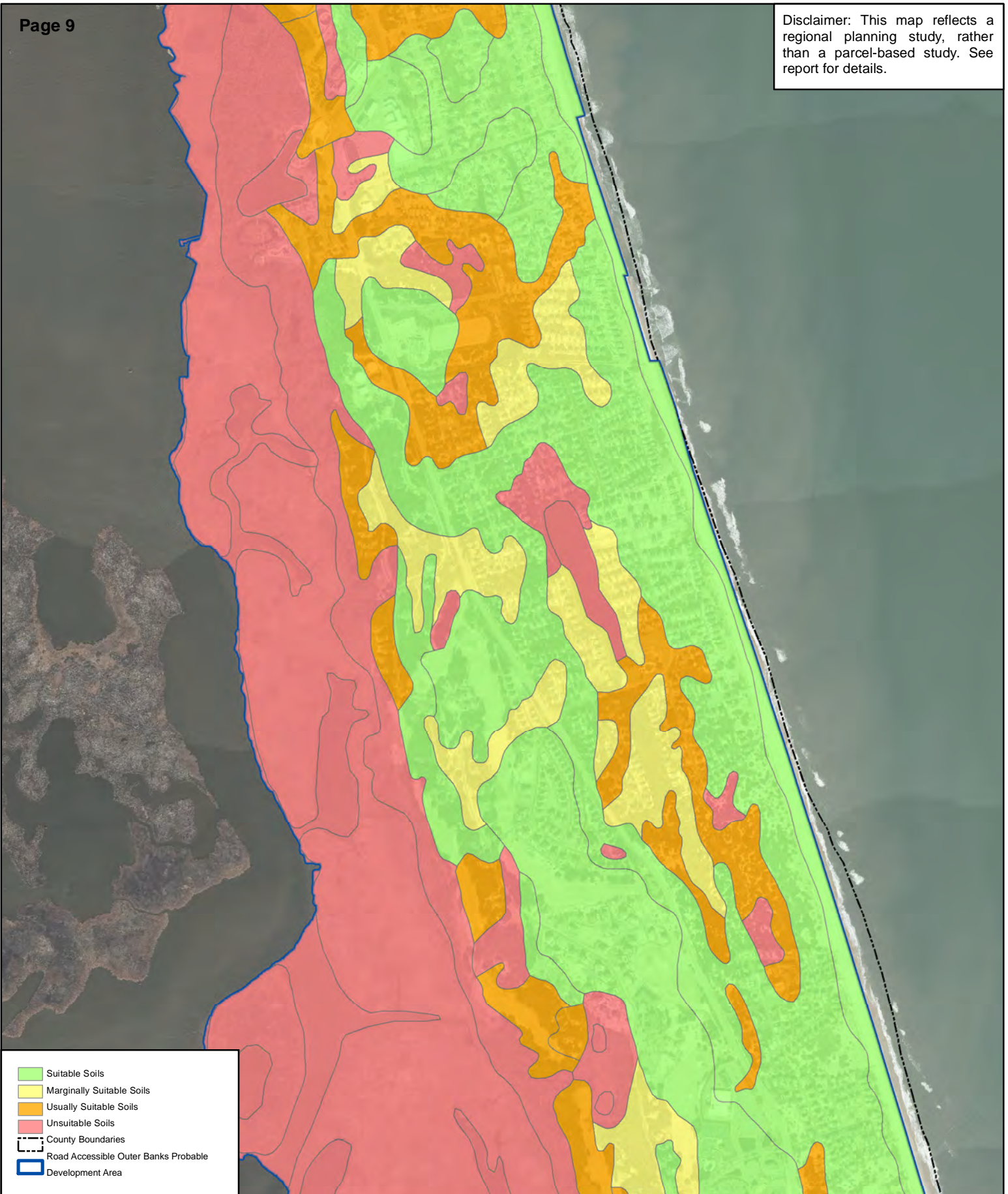
- Suitable Soils
- Marginally Suitable Soils
- Usually Suitable Soils
- Unsuitable Soils
- County Boundaries
- Road Accessible Outer Banks Probable
- Development Area



SOIL SUITABILITY MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



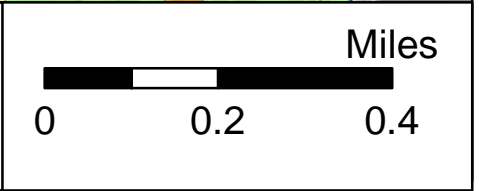
Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



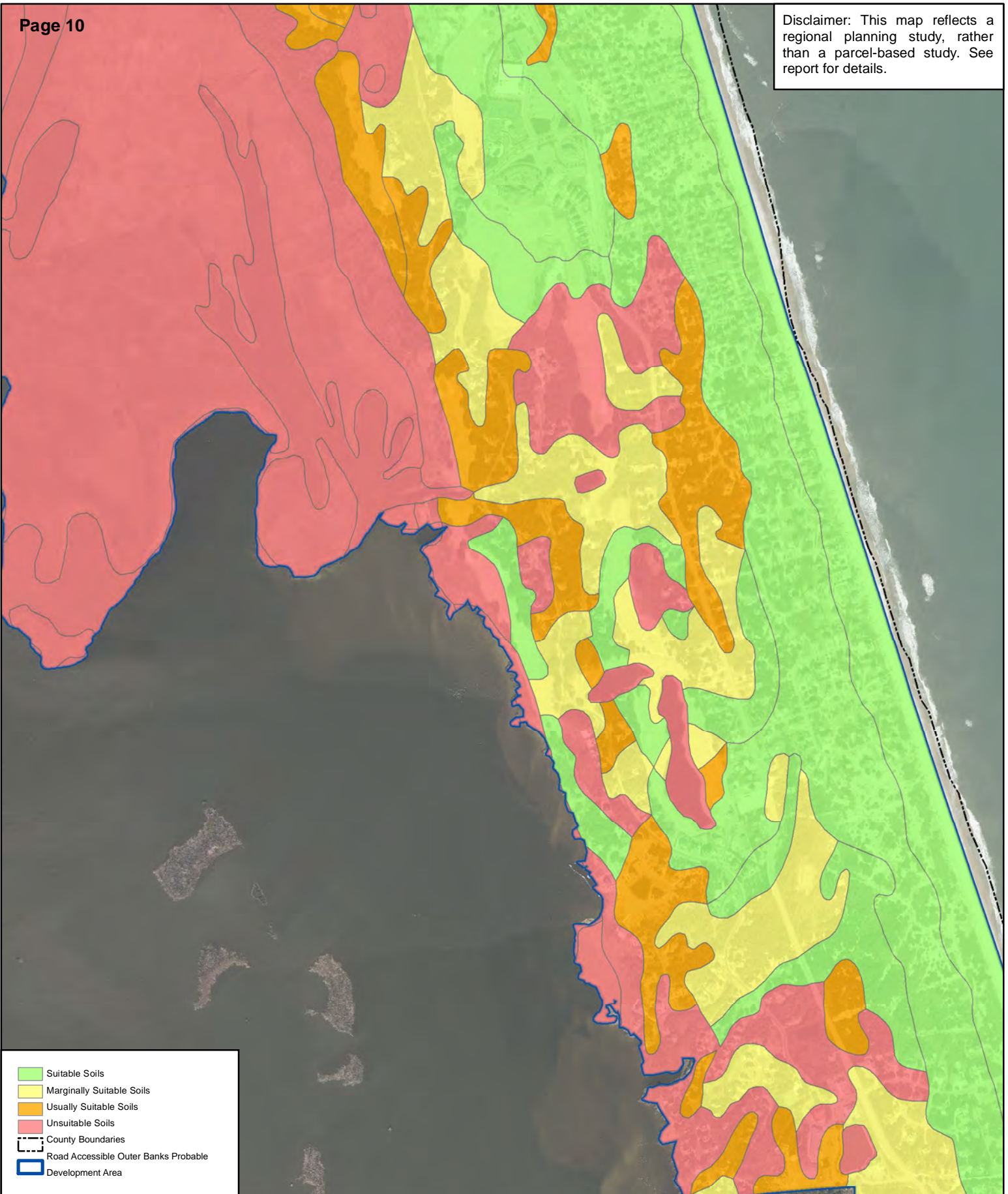
- Suitable Soils
- Marginally Suitable Soils
- Usually Suitable Soils
- Unsuitable Soils
- County Boundaries
- Road Accessible Outer Banks Probable
- Development Area



SOIL SUITABILITY MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



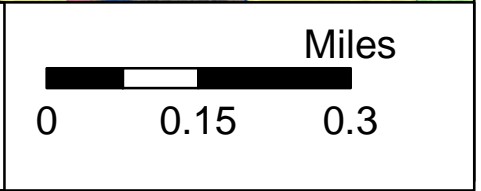
Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



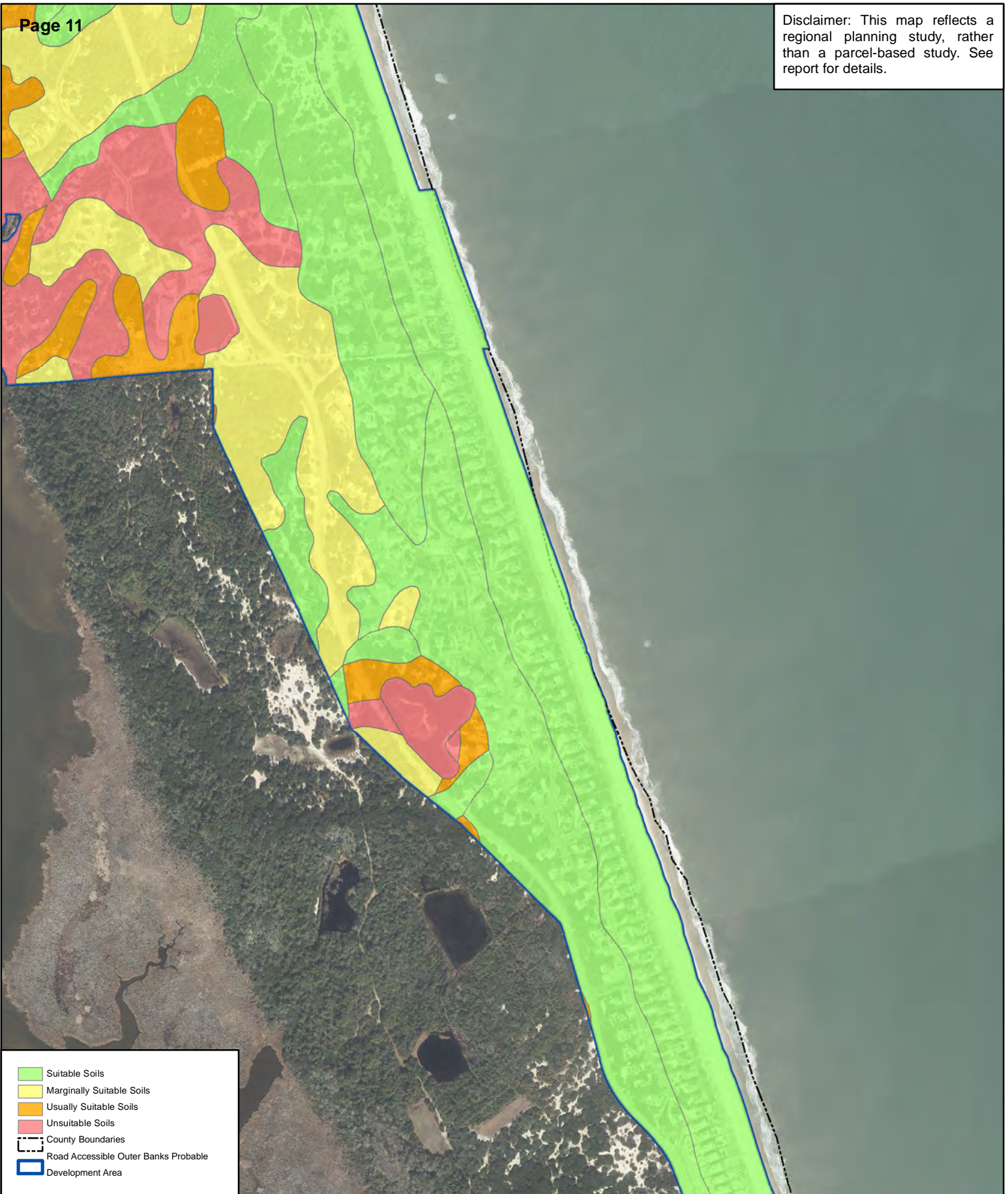
- Suitable Soils
- Marginally Suitable Soils
- Usually Suitable Soils
- Unsuitable Soils
- County Boundaries
- Road Accessible Outer Banks Probable
- Development Area



SOIL SUITABILITY MAP MID-CURRITUCK BRIDGE CURRITUCK COUNTY, NC



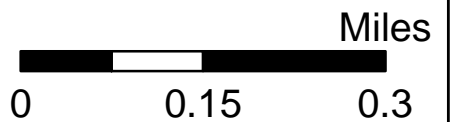
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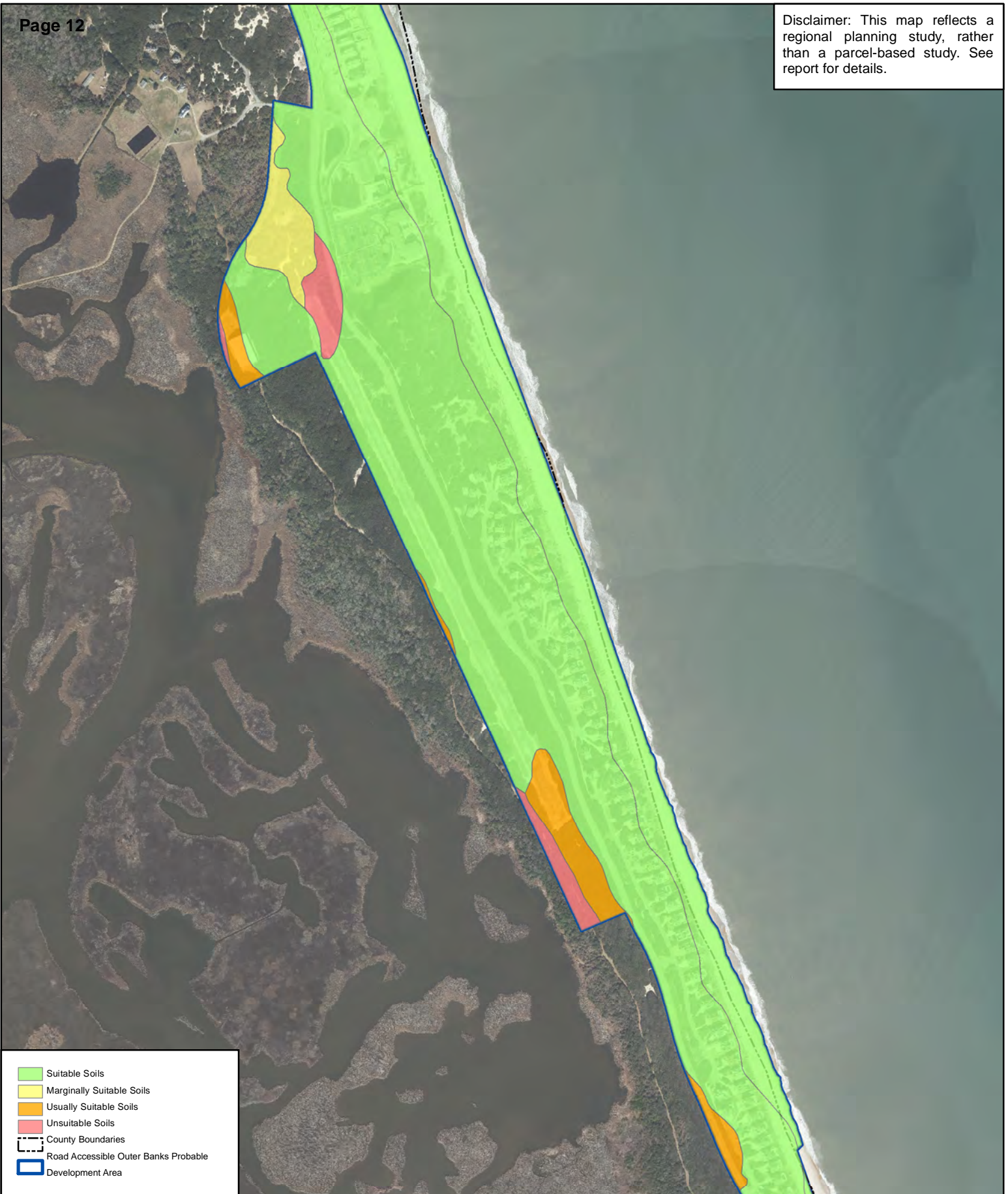
- Suitable Soils
- Marginally Suitable Soils
- Usually Suitable Soils
- Unsuitable Soils
- County Boundaries
- Road Accessible Outer Banks Probable
- Development Area



SOIL SUITABILITY MAP MID-CURRITUCK BRIDGE CURRITUCK COUNTY, NC



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-  Suitable Soils
-  Marginally Suitable Soils
-  Usually Suitable Soils
-  Unsuitable Soils
-  County Boundaries
-  Road Accessible Outer Banks Probable
-  Development Area



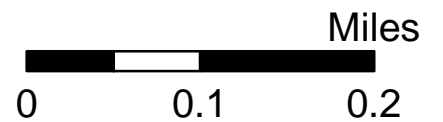
SOIL SUITABILITY MAP MID-CURRITUCK BRIDGE CURRITUCK COUNTY, NC



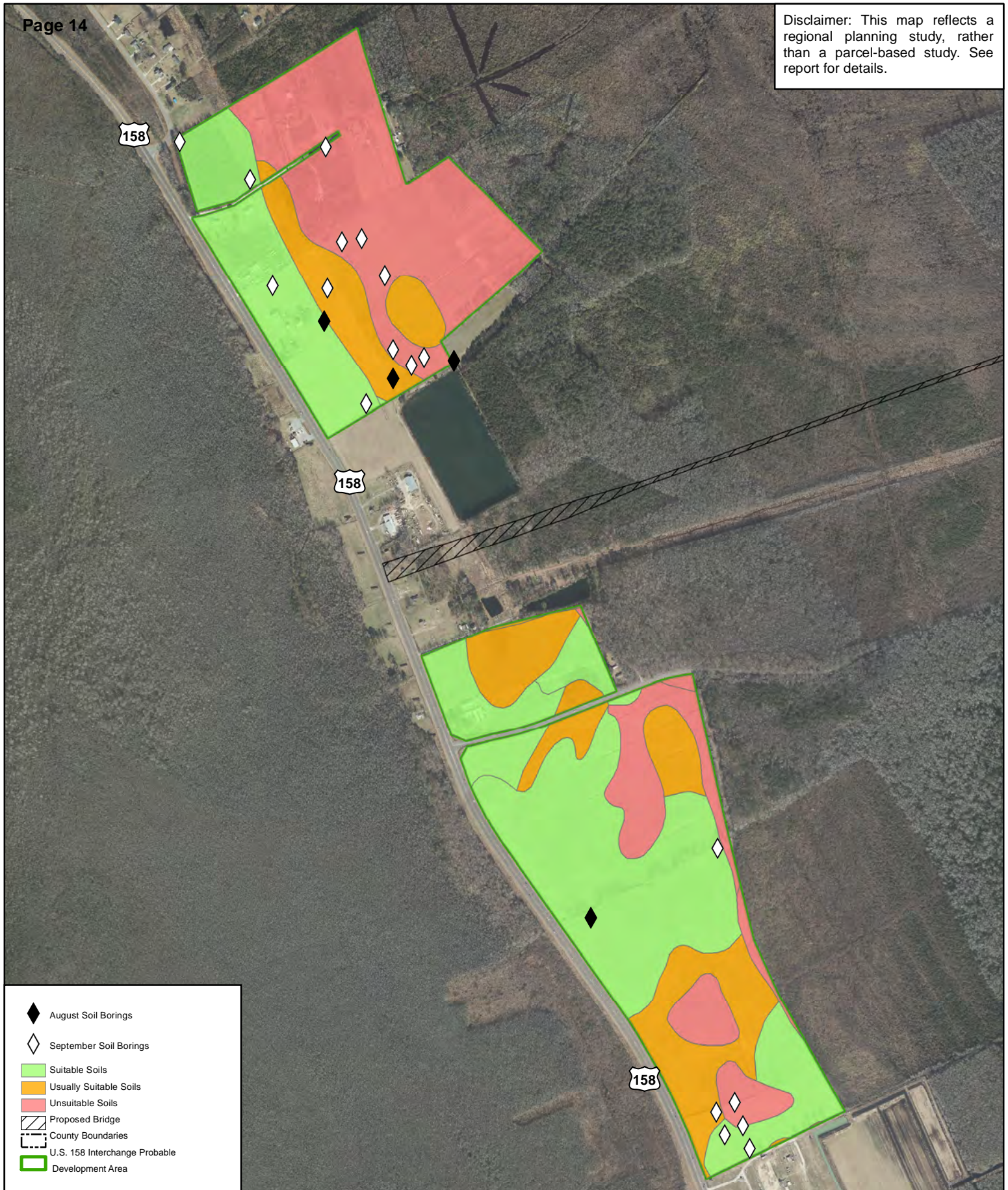
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SOIL SUITABILITY MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC



Disclaimer: This map reflects a regional planning study, rather than a parcel-based study. See report for details.



- ◆ August Soil Borings
- ◇ September Soil Borings
- Suitable Soils
- Usually Suitable Soils
- Unsuitable Soils
- ▨ Proposed Bridge
- - - County Boundaries
- - - U.S. 158 Interchange Probable
- Development Area



SOIL SUITABILITY MAP
MID-CURRITUCK BRIDGE
CURRITUCK COUNTY, NC

