



GREG "RUDI" RUDOLPH
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SPENCER ROGERS
CO- VICE CHAIR

ROBERT OUTTEN
CO-VICE CHAIR

CANDY BOHMERT

JOHN BRODMAN

JETT FEREBEE

DAVID KELLAM

SETH LAUGHLIN

JOHNNY MARTIN

BETH MIDGETT

J. MICHAEL MOORE

DAVID MOYE

KRIS NOBLE

KATHLEEN RIELY

TODD ROESSLER

DEBBIE SMITH

DAVE WEAVER

NC COASTAL RESOURCES ADVISORY COUNCIL

November 7, 2017
Hilton DoubleTree
Atlantic Beach, NC

- | | | |
|--------------|--|---------------------------|
| 10:00 | CALL TO ORDER <ul style="list-style-type: none">• Roll Call – Welcome New Members• Announcements• Approval of July 12, 2017 Meeting Minutes | Greg Rudolph, Chair |
| 10:10 | CRAC NOMINATIONS
(Memorandum attached) | Greg Rudolph, Chair |
| 10:25 | STORMWATER OUTFALLS | Cliff Ogburn
Nags Head |
| 10:45 | LOCAL GOVERNMENT TOP ISSUES
(Memorandum and Spreadsheet attached) | Greg Rudolph, Chair |
| 11:30 | OLD/NEW BUSINESS
Flood Insurance Rate Maps | Greg Rudolph, Chair |
| 11:50 | ADJOURN | |



N.C. Division of Coastal Management

www.nccoastalmanagement.net

Next Meeting: TBA

NC Coastal Resources Advisory Council
July 11, 2017
Holiday Inn
Greenville, NC
Meeting Summary

Attendance

Greg "rudi" Rudolph (Chair)	Spencer Rogers (Co-Vice Chair)
John Brodman	Kris Noble
Jett Ferebee	Robert Outten
Johnny Martin	Todd Roessler
Michael Moore	Dave Weaver
David Moye	Lee Wynns

Call to Order

Rudi Rudolph called the meeting to order with 12 members in attendance and the minutes were approved unanimously.

CRAC Nominations

Rudi Rudolph began discussing possible new members to the CRAC. Rudi explained that the CRAC consists of 20 at-large members and currently there are four vacancies and that the CRAC needs more representation from the inner banks. The CRAC unanimously approved recommending to the CRC the following nominations to the CRAC:

Seth Laughlin
Cindy Bohmert
Nancy White
David Kellum

Prioritizing Top Issues

The council began discussing the need to prioritize top issues that have been submitted by the local governments. The council agreed to create a subcommittee consisting of Johnny Martin, David Moye, Rudi Rudolph, and Robert Outten to help narrow the top issues for the council to discuss.

Adjourn

With no further business the Council adjourned and joined the CRC meeting.

North Carolina Coastal Resources Advisory Council



GREG "RUDI" RUDOLPH
CHAIRMAN

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DEBBIE SMITH

DAVE WEAVER

NANCY WHITE, PH.D

LEE WYNNS

Memorandum

From: Greg "rudi" Rudolph
Date: September 27, 2017
Re: **CRAC Nomination**

Subsequent to our July meeting, Frank Rush (Emerald Isle) elected to step down from the CRAC creating a vacancy on the Council. To this end, we just solicited nominations for CRAC membership earlier this year and selected four new members at our July meeting that were subsequently appointed by the CRC. Rather than starting a new search for nominations, it is recommended we revisit the nominations that were submitted to us previously and select a nomination for the CRC's consideration at our September 27th meeting. The list of nominations provided to us formerly (and one late submission) is below and the resumes for the individuals are attached. We currently have 19 sitting CRAC members out of the allotted 20.

NOMINATIONS

Name	By
Samuel Corbett, III	Pender County
Harvey M. (Skip) Lee	Town of Bayboro
Seth M. Laughlin	Beaufort County
Nancy White, Ph.D.	Town of Nags Head
Ann Keyes	Washington County
Candy Bohmert	Pamlico County
George E. Taylor, Jr., Ph.D.	City of Elizabeth City
Frank V. Tursi	Town of Swansboro
David Kellam	Figure Eight Homeowners' Association
Dallas O. Blackiston	City of New Bern

Willis, Angela

From: Town of Bayboro <townofbayboro@gmail.com>
Sent: Thursday, June 08, 2017 9:31 AM
To: Willis, Angela
Subject: CRAC Nomination

During the Bayboro Town Council meeting of June 6, 2017, the council nominated and approved Harvey M. (Skip) Lee as it's CRAC member. Skip is the Pamlico County Chief Building Inspector, CAMA LPO and serves as Zoning Administrator and CAMA/LPO for Bayboro.

Thank you,

--
Joan Spain Leary
Town Clerk/Finance Officer
Town of Bayboro
PO Box 519
301 Main Street
Bayboro, NC 28515
252-745-4238 Phone
252-745-6030 Fax

MAYOR
JOSEPH W. PEEL
MAYOR PRO-TEM
ANITA HUMMER
CITY MANAGER
RICHARD C. OLSON
CITY CLERK
VIVIAN WHITE, NCCMC



CITY COUNCIL MEMBERS
JEAN M. BAKER
MICHAEL E. BROOKS
RAYMOND T. DONNELLY
DARIUS J. HORTON
RICKEY E. KING
TONY STIMATZ
JOHNNIE B. WALTON

CITY OF ELIZABETH CITY

May 31, 2017

NC Division of Coastal Management
400 Commerce Avenue
Morehead City, NC 28557

Attn: Angela Willis (Angela.Willis@ncdenr.gov)

Dear Ms. Willis:

Pursuant to a letter received by the City of Elizabeth City dated April 19, 2017 from the North Carolina Coastal Resources Advisory Council, the City Council of the City of Elizabeth City voted unanimously to nominate for appointment Dr. George E. Taylor, Jr. to the Coastal Resources Advisory Council.

Dr. Taylor is a retired professor at George Mason University living in Pasquotank County. As you will see from his attached resume, his background lies in biogeography, the sciences and ecology. The Elizabeth City Council believes that his experience makes him uniquely qualified to serve on the CRAC.

If you require additional information regarding this matter, please feel free to let me know.

Sincerely,

Vivian D. White, CRC/NCCMC
City Clerk

/vdw

Attachment

Resume

GEORGE E. TAYLOR, JR.

Retired Professor
Department of Geography and Geoinformation Science
George Mason University
4400 University Drive
Fairfax, VA 22030-4444

gtaylor@gmu.edu

getaylornc@gmail.com

professortaylorGMU@gmail.com

EDUCATION

B.S., Randolph-Macon College, 1971
Ph.D., Emory University, 1976
Postdoctorate in Plant Physiology and Ecology, National Academy of
Sciences/National Research Council, 1977-1979

CIVIC ACTIVITIES

Coastal Wildlife Refuge Society, Alligator River NWR
Board member (2009-2014) and (2016-present)
President (2010-2014)
Elizabeth City Sunrise Rotary Club (2008-2010)
Fairfax City Rotary, 1998-2006
Vice-President, President-Elect and President (2001-2003)
Executive Committee
Paul Harris Fellow
President, Fairfax Rotary Foundation, 2003-2005
Reno Downtown Rotary Club, 1993-1998
Rotary Youth Exchange Program
Executive Committee

PROFESSIONAL ACADEMIC EXPERIENCE

George Mason University (1998-2016)
Retired - 2016
Professor, Department of Geography and Geoinformation Science
2001-2016
Senior Associate Dean, School of Computational Sciences, 2002-2007
Science Coordinator, Undergraduate Honor's Program, 2000-2007
Chair and Professor, Department of Biology, 1998-2000
University and Community College System of Nevada (1990-1998)
Assistant Dean, College of Agriculture at UNR, 1997-1998
Chair and Professor, Department of Environmental and Resource
Sciences at UNR, 1990-1997
Associate Director, Center for Environmental Sciences and
Engineering (UNR), 1994-1995
Director, Graduate Program in Environmental Sciences and Health
(UNR), 1994-1995
Oak Ridge National Laboratory (1979-1989)
R&D Group Leader in Physiological Ecology, Environmental Sciences
Division, 1985-1989

Research Staff Member, Environmental Sciences Division, 1983-1989
Research Associate, Environmental Sciences Division, 1980-1983
U.S. National Academy of Sciences-National Research Council Postdoctoral
Fellow in Plant Physiology, 1977-1979
Instructor, Agnes Scott College, 1975-1977

RESEARCH INTERESTS

Biogeography
Science and the Public Policy
Science and Mathematics Education and Training
Application of Remote Sensing and GIS to Ecology
Ecology, Physiology and Population Biology of Plants
Ecological Toxicology and Risk Assessment
Atmospheric Chemistry and Air Quality

BUSINESS ENDEAVORS

Scientific and Technical Editing (2015-present)
<http://www.professortayloredit.com/>

COURSES TAUGHT (Graduate and Undergraduate)

Guns, Germs and Steel (Honors Program)
Scientific Thought and Processes (Honors Program)
Astrobiology: Origin of Life in the Universe
Regional and Global Issues in Environmental Science
Biogeography: Distribution of Plants and Animals
Biology of Invasive Species
Plant Ecophysiology
Oral and Written Communication Skills for Scientists
Issues in Atmospheric Chemistry and Air Quality

PROFESSIONAL HONORS, ACTIVITIES, AND APPOINTMENTS

Coastal Wildlife Refuge Society, 2007-2012 and 2106-present
President, 2007-2012
Editor, Terrestrial Ecology and Plants, *Environmental Toxicology and
Chemistry*, Society for Environmental Toxicology and Chemistry, 2001-
2006
Scientific Advisory Committee, National Park Service, National Capitol
Region, 2002-2003
Science Advisory Panel, U.S. Environmental Protection Agency
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)
Committee, 2001-2005
Food Quality Protection Act Board, 2001-2005
Organizing Committee, International Conference on Ecotoxicogenomics,
September, 2002 (Pensacola, Florida)
American Chemistry Council, Environmental Technical Implementation Panel,
2000-2003
Invasive Species Advisory Committee, Risk Assessment and Management

Subcommittee, 2000-2003
 Science Advisory Committee, Department of Environmental Quality, State of Virginia, 2000-2003
 Science Advisory Board, U.S. Environmental Protection Agency
 Member, Ecological Risk Assessment Committee, Iron Smelters, 2000-2005
 Member, Clean Air Act Compliance Council, Physical Effects Review Subcommittee, 1994-2002
 Member, Health and Ecological Effects Subcommittee, 1997-2002
 Member, Residual Risk Subcommittee, 1998-2006
 Member, Clean Air Scientific Advisory Committee, 1986-1997 and 2001-2003
 ESCOP/ACOP Leadership Development Program, US Department of Agriculture, 1996-1997
 Editorial Board, *Journal of Environmental Quality*, 1988-1995
 Editorial Advisory Board, *Tree Physiology*, 1989-1998
 Editorial Board, *Society for Environmental Toxicology and Chemistry*, 1996-1998
 Scientific Planning Committee, "3rd Urals Symposium: Human Health and Radioecology of Contaminated Landscapes in the Ural Mountains", Ekaterinburg, Russia, May 1995
 5th International Conference on Acidic Deposition: Science and Policy, Gothenburg, Sweden, June 1995; Scientific Planning Committee, International Advisory Group, 1994-1995
 Organizer, "Symposium on Mercury Contamination in Arid and Semiarid Landscapes" November, 1994, Denver, Colorado
 Science Advisory Committee, University of California-Davis' Center of Excellence in Ecological Health, U.S. Environmental Protection Agency, 1992-1993
 Organizer, National/International Symposium "National Needs for Controlled Environments in the Ecological and Environmental Sciences" February, 1993, Lake Tahoe, Nevada
 Member, Coal Fuel Cycle Peer Review Panel, Secretary of Energy's Advisory Committee, 1992-1993
 Organizer, International Symposium "Ecological Genetics, Terrestrial Vegetation, and Anthropogenic Changes in the Physical and Chemical Properties of the Atmosphere" April, 1989, Phoenix, Arizona; proceedings published by Springer-Verlag, New York
 Natural Sources Task Group, U. S. Interagency Task Force on Acid Precipitation, 1982-1990
 Editor, Physiological Section Newsletter, Botanical Society of America, 1983-1985
 Executive Steering Committee, International Air Pollution Workshop, 1980-1983
 Society of Sigma Xi, 1974
 Phi Beta Kappa, 2001
 Who's Who in American Colleges and Universities, 1971
 Omicron Delta Kappa, Beta Beta Beta and Chi Beta Phi, 1970

PUBLICATIONS: Book

Taylor, G.E. Jr., L.F. Pitelka and M.K. Clegg (editors). 1991. *Plant Ecological Genetics and Air Pollution*. Springer-Verlag, New York, 354 pp.

PUBLICATIONS: Manuscripts (underlined co-authors are students)

Lostritto, P.L. and G.E Taylor Jr. Effects on Piping Plover (*Charadrius*

melodus Ord) Foraging Habitat from Sea-level Rise: A Geographic Information Systems Approach. Maryland Birding (in press)

- Garnet, K.N., L. Litchfield, P. Megonigal and G.E. Taylor, Jr. 2006. Methane emission from four aquatic macrophytes: variation among species and sites of physiological control. *Aquatic Botany* 81; 141-155.
- Tarnay, L, A. Gertler and G.E Taylor, Jr. 2002. An inferential model for HNO₃ deposition to semi-arid coniferous forests. *Atmospheric Environment* 36: 3277-3287
- Taylor, G.E., Jr. 2002. Ecological risk characterization of low dose, high potency herbicides. pp 129-158 IN S.A. Ferenc (ed) *Impact of Low Dose, High Potency Herbicides on Nontarget Plants*. Society for Environmental Toxicology and Chemistry Press, Pensacola, FL.
- Taylor, G.E., Jr. 2001. Invited review: Risk assessment of tropospheric ozone: human health, natural resources and ecology. *Human and Ecological Risk Assessment* 7:1183-1193.
- Tarnay, L., A.W. Gertler, R.R. Blank and G.E. Taylor, Jr. 2001. Preliminary measurements in the Lake Tahoe Basin air-shed: implications for dry deposition of atmospheric nitrogen. *Environmental Pollution* 113:145-153.
- Taylor, G.E., Jr. 2000. Invited plenary review: Fifty years of ozone research in the United States - a retrospective and prospective analysis. pp 1-11 IN W-J Weigel and M. Finck (editors) *Tropospharisches Ozon*. Kommission Reinhaltung der Luft (KRdL) Im VDI UND DIN - Normenausschuss, Dusseldorf, Germany.
- Taylor, G.E., Jr., K. Beck, L. Tarnay and M. Gustin. 1999. Dry deposition of trace pollutant gases to high elevation forests in the Southern Sierra Nevada Mountains: results from process-level modeling. Pp 555-564 in 5th National Watershed Conference; *Living in Your Watershed*. Reno, NV.
- Leonard, T.D., G.E. Taylor, Jr., M.S. Gustin and G.C. Fernandez. 1998. Mercury and plants in contaminated soils: 1. Uptake, partitioning and emission to the atmosphere. *Environmental Toxicology and Chemistry* 17: 2063-2071.
- Leonard, T.D., G.E. Taylor, Jr., M.S. Gustin and G.C. Fernandez. 1998. Mercury and plants in contaminated soils. 2. Environmental and physiological factors governing flux to the atmosphere. *Environmental Toxicology and Chemistry* 17: 2072-2079.
- Taylor, G.E., Jr. 1998. Forest ecosystems and air pollution: the importance of multiple stress interactions at a regional and global scale. pp. 23-39 IN J.J. Cech, B.W. Wilson and D.C. Crosby (eds.) *Effects of Multiple Impacts on Ecosystems*, Lewis Publishers, Chelsea, MI.
- Heath, R.L. and G.E. Taylor, Jr. 1997. Physiological processes affecting plant responses to ozone exposure. pp 317-368 IN H. Sandermann, Jr., A.R. Wellburn and R.L. Heath (eds.) *Forest Decline and Ozone: A Comparison of Controlled Chamber and Field Experiments*. Springer-Verlag, New York, NY.
- Constable, J.A. and G.E. Taylor, Jr. 1997. Modeling the effects of elevated tropospheric ozone on two varieties of *Pinus ponderosa*. *Canadian Journal of Forestry Research* 27:527-537.

- Gustin, M.S., G.E. Taylor, Jr. and R.A. Maxey. 1997. Effect of temperature and air movement on the flux of elemental mercury from substrate to the atmosphere. *Journal of Geophysical Research* 102: 3891-3898.
- Gustin, M.S., G.E. Taylor, Jr., T.L. Leonard, and R.E. Keisler. 1996. Atmospheric mercury concentrations associated with geologic and anthropogenic enriched sites in central western Nevada. *Environmental Science and Technology* 30: 2572-2579.
- Taylor, G.E., Jr., K. Beck, J. Geddes, M. Gustin and G. Lorson. 1996. Microbial ecology, toxicology and chemical fate of methylisothiocyanate in riparian soils of the upper Sacramento River. *Environmental Toxicology and Chemistry* 15: 1694-1701.
- Constable, J.A., G.E. Taylor, Jr., J.A. Laurence and J.A. Weber. 1996. Climate change effects on the physiology and growth of *Pinus ponderosa*: expectations from simulation modeling. *Canadian Journal of Forestry Research* 26: 1315-1325.
- Geddes, J., G. Miller and G.E. Taylor, Jr. 1995. Photolysis of methylisothiocyanate. *Environmental Science and Technology* 29: 2590-2594.
- Gustin, M.S., G.E. Taylor, Jr. and T. Leonard. 1995. Atmospheric mercury concentrations above mercury contaminated mill tailings in the Carson River Drainage Basin, NV. *Water, Air and Soil Pollution* 80: 217-220.
- Warwick, J.J., G. E. Taylor, Jr., D.M. Wayne, S.J. Hanes and W.B. Lyons. 1994. Understanding the transport and fate of mercury within the Carson River system, Nevada - a rational approach to remediation evaluation. IN C.R. Cothorn (ed.) *Trace Substances, Environment and Health*. Science Reviews, Norwood Press.
- Taylor, G.E., Jr., D.J. Johnson and C.P. Andersen. 1994. Commissioned review - Air pollution and forest ecosystems: a regional to global perspective. *Ecological Applications* 4: 662-689.
- Gustin, M.E., G.E. Taylor, Jr. and T. Leonard. 1994. High levels of mercury contamination in the Carson River Drainage Basin of Nevada: Implication for human health and ecological risk assessment. *Environmental Health Perspectives* 102: 772-778.
- Taylor, G.E., Jr. 1994. Controlled environment facilities in ecology and the environmental sciences.
Bulletin of the Ecological Society of America 75: 277-280.
Society of Environmental Toxicology and Chemistry News 14: 12-13.
- Taylor, G.E., Jr. and J.V.H. Constable. 1994. Modeling pollutant deposition to vegetation: scaling down from the canopy to the biochemical level. pp. 15-37 IN: K.E. Percy, J.N. Cape R. Garrels and C.J. Simpson (eds.) *Air Pollution and The Leaf Cuticle*, NATO ASI Series G; Ecological Sciences, Springer-Verlag, Heidelberg, Germany.
- Taylor, G.E., Jr. 1994. Role of genotype in the response of Loblolly Pine to tropospheric ozone: effects at the whole-tree, stand and regional level. *Journal of Environmental Quality* 23: 63-82.

- Kelly, J.M., G.E. Taylor, Jr., N.T. Edwards, M.B. Adams, G.S. Edwards and A.L. Friend. 1993. Growth, physiology and nutrition of Loblolly Pine seedlings as impacted by air pollution stress: the ROPIS-South results. *Water Air Soil Pollution* 69: 363-391.
- Taylor, G.E., Jr. 1993. An a priori screening methodology to identify air toxics of potential ecological concern: a methodology for quantitative risk assessment. pp. 220-234 IN: W. Chow and K.K. Connor (eds.) *Managing Hazardous Air Pollutants*. Lewis Publishers, Ann Arbor, MI.
- Taylor, G.E., Jr., J.G. Owens and T. Grizzard. 1993. Atmosphere-canopy interactions of nitric acid vapor generated during ozone exposure of loblolly pine (*Pinus taeda* L.) seedlings in open-top chambers. *Journal of Environmental Quality* 22: 70- 80.
- Taylor, G.E., Jr. and P.J. Hanson. 1992. Forest trees and tropospheric ozone: role of canopy deposition and leaf uptake in developing exposure-response relationships. *Agriculture Ecosystems and Environment* 42: 255-273.
- Lindberg, S.E., T.P. Meyers, G.E. Taylor, Jr., R.R. Turner and W.H. Schroeder. 1992. Atmosphere/surface exchange of mercury in a forest: results of modeling and gradient approaches. *Journal of Geophysical Research* 97: 2519-2528.
- Taylor, G.E., Jr. and L.F. Pitelka. 1992. Genetic diversity of plant populations and the role of air pollution stress. pp. 111-130 IN: (J. R. Barker and D. T. Tingey, eds.) *Air Pollution Effects on Biodiversity*, Van Nostrand Reinhold, New York.
- Friend, A.L., P.T. Tomlinson, R.E. Dickson, E.G. O'Neill, N.T. Edwards, and G.E. Taylor, Jr. 1992. Biochemical composition of loblolly pine reflects pollutant exposure. *Tree Physiology* 11: 35-47.
- Taylor, G.E., Jr. 1992. Application of the two-layer stagnant film model to atmosphere-leaf exchange of trace gases. pp. 1069-1080 IN: (S. E. Schwartz and W. G. N. Slinn, eds.) *Precipitation Scavenging and Atmosphere-Surface Exchange. Volume 2 - The Semonin Volume: Atmosphere-Surface Exchange Processes*, Hemisphere Publishing Corporation, Washington, D. C.
- Garten, C.T., Jr. and G.E. Taylor, Jr. 1992. Foliar $\delta^{13}C$ within a temperate deciduous forest: spatial, temporal, and species sources of variation. *Oecologia* 90: 1-7.
- Edwards, N.T., G.L. Edwards, J.M. Kelly and G. E. Taylor, Jr. 1992. Three-year growth responses of *Pinus taeda* L. seedlings to rain chemistry, soil magnesium status, and tropospheric ozone. *Water, Air, Soil Pollution* 63: 105-118.
- Edwards, N.T., G.L. Edwards, J.M. Kelly and G.E. Taylor, Jr. 1992. Three-year growth responses of *Pinus taeda* L. seedlings to rain chemistry, soil magnesium status, and tropospheric ozone. *Water, Air, Soil Pollution* 63: 105-118.
- Hanson, P.J. and G.E. Taylor, Jr. 1992. Experimental laboratory measurements

- of reactive N gas deposition to forest landscape surfaces: biological and environmental controls. pp. 166-177 IN: (D. W. Johnson and S. E. Lindberg, eds.) Atmospheric Deposition and Forest Nutrient Cycling, Springer-Verlag, New York.
- Taylor, G.E., Jr. and M.M. Ross-Todd. 1992. Patterns of tropospheric ozone in forested landscapes of the Integrated Forest Study. pp. 50-71 IN: (D. W. Johnson and S. E. Lindberg, eds.) Atmospheric Deposition and Forest Nutrient Cycling, Springer-Verlag, New York.
- Taylor, G.E. Jr., L.F. Pitelka, and M.K. Clegg. 1991. Introduction. pp. 1-16 IN: Taylor, G.E. Jr., L.F. Pitelka, and M.K. Clegg (eds.). Plant Ecological Genetics and Air Pollution. Springer-Verlag, New York.
- Lindberg, S.E., R.R. Turner, R.R. Myers, G.E. Taylor, Jr. and W.H. Schroeder. 1991. Atmospheric concentrations and deposition of airborne Hg to a deciduous forest at Walker Branch Watershed. Water, Air, Soil Pollution 56: 577-594.
- Gunderson, C.A. and G.E. Taylor, Jr. 1991. Direct effects of ethylene on foliar gas exchange in Glycine max L. Plant Physiology 95: 337-339.
- Adams, M.B., J.M. Kelly, G.E. Taylor, Jr. and N.T. Edwards. 1990. Growth of five families of Pinus taeda L. during three years of ozone exposure. New Phytologist 116: 689-694.
- Taylor, G.E., Jr., P.J. Hanson and S.E. Lindberg. 1990. Deposition of trace gases in controlled environments: a conceptual model, experimental methodologies, and application of results to the disciplines of physiological ecology and biogeochemistry. pp 194-215 IN: (H. D. Payer, ed.) Environmental Research with Plants in Closed Chambers (Air Pollution Research Report 26, Commission of the European Communities), Brussels.
- Adams, M.B., N.T. Edwards, G.E. Taylor, Jr. and B.L. Skaggs. 1990. Whole-plant ¹⁴C-photosynthate allocation in loblolly pine (Pinus taeda L.): Seasonal patterns at ambient and elevated ozone levels. Canadian Journal of Forestry Research 20: 152-158.
- Edwards, N.T., G.E. Taylor, Jr., M.B. Adams, G.L. Simmons and J.M. Kelly. 1990. Ozone, acidic rainfall, and soil magnesium effects on growth and foliar pigments of Pinus taeda L. Tree Physiology 6: 95-104.
- Hanson, P.J. and G.E. Taylor, Jr. 1990. Modeling pollutant gas uptake by leaves: an approach based on physiocochemical properties. pp. 351-356, IN: Forest Growth: Process Modeling of Responses to Environmental Stress, TimberPress/Auburn University, Auburn, Alabama.
- Adams, M.B. and G.E. Taylor, Jr. 1990. Effects of ozone on forests in the northeastern United States. pp. 145-168 IN: E. Calabrese (ed.). Proceedings of Conference on Ozone Risk Communication. Lewis Publishers, Chelsea, Michigan.
- Trivelpiece, A.W., P.D. Fairchild, W. Fulkerson, A.E. Green, A.M. Perry, J. D. Regan, G.E. Taylor, Jr., and R.I. Van Hook. 1989. Environmental, health, and CFC substitution aspects of the ozone depletion issue. ORNL/TM -6552, Oak Ridge National Laboratory, Oak Ridge, TN 37831.

- Johnson, D.W. and G.E. Taylor, Jr. 1989. The role of air pollution in forest decline in eastern North America. *Water, Air and Soil Pollution* 48: 21-43.
- Hanson, P.J., K. Rott, G.E. Taylor, Jr., C.A. Gunderson, and S.E. Lindberg. 1989. NO₂ deposition to elements of a forest landscape. *Atmospheric Environment* 23: 1783-1794.
- Lindberg, S.E., D.J. Johnson, G.M. Lovett, H. Van Miegroet, G.E. Taylor, Jr., and J.G. Owens. 1989. Sampling and Analysis Protocols for the Integrated Forest Study. ORNL/TM -11214, Oak Ridge National Laboratory, Oak Ridge, TN 37831.
- Taylor, G.E., S.E. Lindberg, P.J. Hanson, and C.T. Garten. 1989. Research on atmosphere-canopy exchange in forests. IN: C. R. Richmond (ed). *Life Sciences Review*, Oak Ridge National Laboratory, Oak Ridge, Tennessee.
- Gunderson, C.A. and G.E. Taylor, Jr. 1988. Kinetics of inhibition of foliar gas exchange by exogenously applied ethylene: an ultrasensitive response. *New Phytologist* 110: 517-524.
- Taylor, G.E., Jr., B.M. Ross-Todd and C.A. Gunderson. 1988. Action of ozone on foliar gas exchange in *Glycine max* L. Merr: a potential role for endogenous stress ethylene. *New Phytologist* 110: 301-307.
- Taylor, G.E., Jr., P.J. Hanson and D.D. Baldocchi. 1988. Pollutant deposition to individual leaves and plant canopies: sites of regulation and relationship to injury. pp. 227-257, IN: W. W. Heck, D. T. Tingey, and O. C. Taylor (eds.). *Assessment of Crop Loss From Air Pollutants*. Elsevier Publishers, New York.
- Taylor, G.E., Jr. and C.A. Gunderson. 1988. Physiological site of ethylene effects on carbon dioxide assimilation in *Glycine max* L. Merr. *Plant Physiology* 86: 85-92.
- Hogsett, W.E., D. Olszyk, D.P. Ormrod, G.E. Taylor, Jr. and D.T. Tingey. 1987. Air pollutant exposure systems and experimental protocols: A review and evaluation of performance. Vol. 1 and II. EPA 600/3-87/037a. U.S. Environmental Protection Agency, Office of Research and Development. Corvallis, OR 97330.
- Taylor, G.E., Jr., R.J. Norby, S.B. McLaughlin, A.H. Johnson, and R.S. Turner. 1986. Carbon dioxide assimilation and growth of red spruce (*Picea rubens*) seedlings in response to ozone, precipitation chemistry, and soil type. *Oecologia* 70: 163-171.
- Taylor, G.E., Jr. and C.A. Gunderson. 1986. The response of foliar gas-exchange processes to exogenously applied ethylene. *Plant Physiology* 82: 653-657.
- Norby, R.J., G.E. Taylor, Jr., S.B. McLaughlin, and C.A. Gunderson. 1986. Drought sensitivity of red spruce seedlings affected by precipitation chemistry. pp. 34-41. IN: C.G. Tauer and T.C. Hennessey (eds.) *Proceedings Ninth North American Forest Biology Workshop*.
- Taylor, G.E., Jr., D.T. Tingey, and C.A. Gunderson. 1986. Photosynthesis,

carbon allocation, and growth of sulfur dioxide ecotypes of *Geranium carolinianum*. *Oecologia* 68: 350-357.

- McLaughlin, S.B. and G.E. Taylor, Jr. 1985. Effect of SO₂ on dicot crops: Some issues, mechanisms, and indicators. pp. 227-249. IN: W.E. Winner, H.A. Mooney, and R.A. Goldstein (eds.) *Sulfur Dioxide and Vegetation*, Stanford University Press, Stanford, California.
- Squier, S.A., G.E. Taylor, Jr., W.J. Selvidge, and C.A. Gunderson. 1985. Effect of ethylene and related hydrocarbons on carbon assimilation and transpiration in herbaceous and woody species. *Environmental Science and Technology* 19: 432-437.
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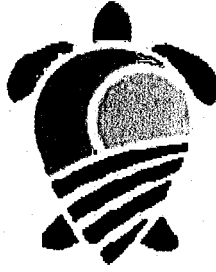
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**PENDER
COUNTY NC**

Board of Commissioners
George R. Brown, Jr., Chairman
Archibald "Fred" McCoy, Vice Chairman
Jacqueline A. Newton
David A. Plepmeyer
J. David Williams, Jr.

County Manager
Randell K. Woodruff

County Attorney
Carl W. "Trey" Thuman

September 6, 2017

Ms. Angela Willis
Division of Coastal Management
400 Commerce Avenue
Morehead City, NC 28557

Dear Ms. Willis:

This letter is to inform you that at the September 5, 2017 meeting of the Pender County Board of Commissioners, the Board voted to recommend Samuel Corbett to serve on the Coastal Resources Advisory Council (CRAC). Mr. Corbett's application to Pender County is attached for your review.

If you have any questions or concerns on this matter, please call me directly at (910) 259-1200.

Respectfully,

Melissa Long
Clerk to the Board





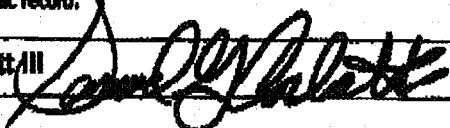
PENDER COUNTY

Application for Appointment to Boards/Commissions/Committees

Appointees to Pender County Boards/Commissions/Committees must be a Pender County resident and must be at least 18 years of age. Please complete this application and return to: Pender County Manager's Office, PO Box 5, Burgaw, NC 28425.

Last Name Corbett, III		First Samuel		N.I. J	Date 8/2/17
Physical Address 891 Washington Acres Road				Apartment/Unit #	
City Hampstead		State NC		ZIP 28443	
Mailing Address (if different from above)					
City		State		ZIP	
Home Phone		Work Phone 910-820-1804		E-mail Address 1 samjcorbett3@gmail	
Fax Number		E-mail Address 2			
Board Interest(s) Coastal Resource Advisory Committee					
How long have you been a resident of Pender County? 17 years					
High School Hoggard High School			Location Wilmington NC		
From	78	To	78	Did you graduate?	YES <input checked="" type="checkbox"/> NO <input type="checkbox"/>
College			Location		
From		To		Did you graduate?	YES <input type="checkbox"/> NO <input type="checkbox"/> Degree
Other			Location		
From		To		Did you graduate?	YES <input type="checkbox"/> NO <input type="checkbox"/> Degree
Current Employment		self employed		Job Title commercial fisherman	
Responsibilities					
Previous Employment		Old Fort and Duck Haven Golf		Job Title General Manager, Head Pro and Sup	
Previous Employment		Job Title			
Previous Employment		Job Title			
Please list current and past memberships in civic or other organizations and offices held: 16 years of service on Marine Fisheries Advisory Committees Chairman of NC Marine Fisheries Commission from 2014 to current					

Pender County
Application for Appointment to Boards/Commissions/Committees
Revised 12/2010

Have you ever served or are you currently a member of any Pender County or other local government board/commission/committee?			
YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>	If yes, explain (including length of service).	
<p>State reasons why you feel qualified for this appointment(s): Growing up on Wrightsville Beach and commercial fishing off of New Hanover and Pender Counties for over forty years, I have seen many changes in the estuaries and beach front communities. As chairman of the Marine Fisheries Commission I handle many cases that are dock related, inlet dredging and beach renourishment related, as well as sediment encroachment in our estuaries. Having oyster leases in the sound, I have interaction with the Army Corp of Engineers and have some knowledge of their rules involving oyster leases. I have worked closely with Braxton Davis, Director of Division of Coastal Management and NC Division of Marine Fisheries.</p>			
Branch		From	To
Rank at Discharge		Type of Discharge (optional)	
Are you aware of any legal, ethical or personal conflict of interest by serving as a member of this Pender County board/commission/committee?			
YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>	If yes, explain.	
Are you or any member of your family employed by Pender County, or currently serving on any Boards/Commissions/Commission appointed by or affiliated with Pender County?			
YES <input type="checkbox"/>	NO <input checked="" type="checkbox"/>	If yes, list family member name(s) and position/board or committee(s).	
Please add any additional information you would like to share supporting your interest and qualifications for this appointment.			
<p>NOTE: This information will be used by the Pender County Board of Commissioners in making appointments to Pender County Boards/Commissions/Committees. In the event you are appointed, it may be used as a news release to identify you to the community. This application is considered a public record.</p>			
Signature Samuel J Corbett/III			
		Date 8/2/17	

Willis, Angela

From: Scott Chase <schase@ci.swansboro.nc.us>
Sent: Monday, May 08, 2017 9:52 AM
To: Paula Webb; Willis, Angela
Cc: Andrea Correll
Subject: RE: CRAC Nomination - Swansboro and coastal issues response

Angela

Thank you for taking our nomination. As part of the letter you requested: *What are your local community's two (or more) top coastal issues the CRAC/CRC may be of assistance in coordination with the administrative staff at the N.C. Division of Coastal Management (DCM)? While regulations and permitting are the backbone of the Coastal Management Program, the CRAC and CRC wants to be proactive with respect to your more policy-centric issues.*

1. Land Use Plan (updates). The grant money available most recently is not enough to do updates to our local plans. Our town has seen significant growth since our last update. We have requested grant funding this year however concerned that the amount will not be enough to cover the expenses.
2. CRC/DCM proactive in local planning. When this funding was available, the CRC/DCM used to be more proactive regarding land use. I believe it essential that more resources be given to local governments in the CAMA counties (i.e. follow up from planners at DCM, checking in on local partners on our planning implementation, etc. Would help identify need/shortcomings in local government implementation. Local governments in CAMA counties seeing significant growth and need help with management

Thanks!

Scott

From: Paula Webb
Sent: Monday, May 01, 2017 11:47 AM
To: Angela.Willis@ncdenr.gov
Cc: Scott Chase <schase@ci.swansboro.nc.us>
Subject: CRAC Nomination - Swansboro

Angela – please find attached resume for Commissioner Frank Tursi for consideration as a member of the CRAC. Should you have any questions, please don't hesitate to contact me.

Paula W. Webb, MMC-NCCMC
Town Clerk/Administrative Services Director
601 W. Corbett Avenue
Swansboro, NC 28584
pwebb@ci.swansboro.nc.us
(910) 326-4428 phone
(910) 326-3101 fax
.....<(((*)>.....<(((*)>.....<(((*)>

Frank V. Tursi

270 River Reach Dr., Swansboro, N.C.

252-241-3505

EXPERIENCE

Swansboro Town Commissioner, 2015-present

Founding Editor, Coastal Review Online, North Carolina Coastal Federation, 2011-2016 (retired)

- Conceived the online news service and responsible for its launch in February 2011
- Responsible for the budget and daily content of news service
- Manages a staff of two and about a dozen freelance writers

Coastkeeper, North Carolina Coastal Federation, 2001-2011

- Responsible for directing NCCF's Coastkeeper Program, including policies, plans, budgets and equipment purchases.
- Implement effective programs to improve enforcement of environmental regulations.
- Liaison with Board of Directors' Coastkeeper Committee.

Reporter and Editor, The Winston-Salem Journal, Winston-Salem, N.C., 1978-2001

- Special projects/environmental reporter, June 1988-December 2001. I was the senior environmental reporter in the state. My duties included reporting on CRC meetings and on the N.C. Division of Coastal Management.
- Science/medical reporter, October 1985-June 1988
- Copy editor/Sunday news editor, May 1981-October 1985
- Sports writer, sports copy editor, August 1978-May 1981

Reporter and Editor, The Miami Herald, Miami Fla., 1977-1978

- Suburban sports editor and writer, January 1977-May 1978

News Editor, The Coral Gables Times Guide, Coral Gables, Fla. 1975-1977

- Responsible for the news content of the twice weekly newspaper and managing an editorial staff of five reporters and two photographers.

Reporter, The Key Biscayne Islander News, Key Biscayne, Fla, 1974-1975

Reporter, The Clemmons Courier, Clemmons, N.C, 1973-1974

RELATED EXPERIENCE

BOOKS

- Author, *Lost Empire: The Fall of R.J. Reynolds Tobacco Co.*, John F. Blair, Publisher, 2000
- Author, *The Winston-Salem Journal: Magnolia Trees and Pulitzer Prizes*, John F. Blair, Publisher, 1996
- Author, *Winston-Salem: A History*, John F. Blair, Publisher, 1994
- Author, *Where the Land Meets the Sea*, N.C. Department of Environment, Health and Natural Resources, 1990

AWARDS

- Numerous writing awards from the N.C. Press Association, including four Public Service Awards.
- Directed the staff of Coastal Review Online that won 40 press association awards over two years, including a General Excellence Award.
- Books have won the History Book Award by the N.C. Society of Professional Historians and the Special Commendation Medal of the Society for State and Local History.

EDUCATION

- Bachelor of Science, English and Geology, East Carolina University, Greenville, N.C., 1973

PROFESSIONAL AFFILIATIONS

- Board Member, East Carolina Council
- Former Board Member, N.C. Conservation Network
- Former Member, National Advisory Board, Institute for Journalism and Natural Resources
- Former Member, Waterkeepers' Alliance
- Former Member, Coastal Caucus

COUNTY OF WASHINGTON
BOARD OF COMMISSIONERS

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TRACEY A. JOHNSON, VICE-CHAIR
D. COLE PHELPS
JENNIFER C. RIDDICK
WILLIAM 'BILL' R. SEXTON, JR.



ADMINISTRATION STAFF:
CURTIS S. POTTER
INTERIM COUNTY MANAGER/
COUNTY ATTORNEY
cpotter@washconc.org

JULIE J. BENNETT, CMC, NCCCC
CLERK TO THE BOARD
jbennett@washconc.org

POST OFFICE BOX 1007
PLYMOUTH, NORTH CAROLINA 27962
OFFICE (252) 793-5823 FAX (252) 793-1183

May 8, 2017

Mr. Greg Rudolph, CRAC Chair
Carteret County Shore Protection Office
P.O. Box 4297
Emerald Isle, NC 28594

Dear Mr. Rudolph:

At their regular meeting on May 1, 2017, the Washington County Board of Commissioners nominated Ms. Ann Keyes, Washington County's Planning/Safety and Emergency Management Director, to be a member of the Coastal Resources Advisory Board. Ms. Keyes has worked with the County for over 40 years in these roles and is well-qualified to be on this Board.

Her contact information is below:
Ms. Ann Keys, Director of Planning/Safety and Emergency Management
P.O. Box 1007
Plymouth, NC 27962
252-793-4114
akeyes@washconc.org

Washington County's two top coastal issues are flooding and drainage. We do hope that CRAC could coordinate assistance with these issues.

Please don't hesitate to contact me if you need further assistance.

Sincerely,

A handwritten signature in cursive script that reads "Julie J. Bennett".

Julie J. Bennett, CMC, NCCCC
Clerk to the Board

Cc: A. Keyes, Director, Planning/Safety and Emergency Management
Mr. Curtis Potter, Washington County Interim County Manager

**North Carolina
Coastal Resources Advisory Council**



Memorandum

From: Greg "rudi" Rudolph
Date: September 27, 2017
Re: **Top Issues – Hierarchy/Prioritization**

At our last meeting in July, we discussed the top coastal issues local governments submitted in response to our request. Subsequent to an initial screening by the CRAC; a committee comprised of members Martin, Moye, Outten, and Rudolph were appointed to group and prioritize the issues – the manifestation of this effort is included in the attached spreadsheet.

The issues were first divided into broad categories such as "Oceanfront", "Permit/Regulatory", "Public Access", etc. and provided a perceived difficulty ranking. Each issue was also assessed to whether or not General Assembly assistance could be required, if the issue would need to heavily involve other Department of Environmental Quality agencies, if the issue is already being addressed by the Coastal Resources Commission, and/or if the issue will require N.C. Division of Coastal Management (NCDQM) assistance (all of the issues do). The "x's" and "o's" in the spreadsheet are very much subjective and it should be a goal of our September meeting to come to a general consensus on the issues to the effects presented in the spread sheet. Moreover, we should be able to identify the top two, three, or four issues (or sub-issues) that we and NCDQM staff can start working upon with respect to rules, policy, or just education.

GREG "RUDI" RUDOLPH
CHAIRMAN

SPENCER ROGERS
CO- VICE CHAIR

ROBERT OUTTEN
CO-VICE CHAIR

CANDY BOHMERT

JOHN BRODMAN

JETT FEREBEE

DAVID KELLAM

SETH M. LAUGHLIN

JOHNNY MARTIN

BETH MIDGETT

J. MICHAEL MOORE

DAVID MOYE

Kris Noble

KATHLEEN RIELY

TODD ROESSLER

DEBBIE SMITH

DAVE WEAVER

NANCY WHITE, PH.D

LEE WYNNS



County of Dare

Office of the Board of Commissioners

P.O. Box 1000 | Manteo, North Carolina 27954 | 252.475.5700

Robert Woodard
Chairman

Wally Overman
Vice Chairman

Jack Shea

Steve House

Rob Ross

Jim Tobin

Danny Couch

Robert L. Outten

County Manager / Attorney

Gary Lee Gross

Clerk to the Board

August 11, 2017

Mr. John K. Dorman, Program Director
NCFMP
4105 Reedy Creek Road
Raleigh, NC 27607

Luis Rodriguez, Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration
FEMA
500 C Street SW Room 423
Washington, DC 20472

Dear Gentlemen:

For the past several months, local officials have been reviewing the Dare County preliminary flood maps released by FEMA. At the August 7, 2017 Board of Commissioners meeting, the Board voted to submit comments about some concerns that have been identified locally. These concerns are as follows:

Street Addresses on the FRIS webpage

The Flood Risk Information System (FRIS) webpage has deficiencies in the address search function resulting in inaccurate identification of property locations. In some instances, the search feature identifies addresses that are off by several numbers and in other cases, the addresses identified do not even exist in the Dare County street address system. The Dare County staff uses the Dare GIS system to locate the property and then works from this location to identify the property on the FRIS. The inability to use the FRIS address system is frustrating for county staff, property owners and other users such as insurance agents and mortgage professionals who must contact Dare County for a letter certifying the correct address due to the inaccuracies of the FRIS webpage. The street address issue should be adjusted to function accurately.

Map Legends

The legends on the maps created by the FRIS webpage use the technical description of the Shaded X zone -- 0.2% of the annual flood hazard -- with no accompanying label of Shaded X included on the final product. The X zones do not include any label. Individuals not familiar with flood map terminology find this to be confusing since the legend does not convey the appropriate information. We request the legend options on the map output be revised to include the Shaded X label and the X zone label. This revision would result in a product that fully conveys all of the appropriate information for end users of the map output feature.

Local Government Involvement

The preliminary flood maps for Dare County include the unincorporated areas of the county and the six municipal areas of Manteo, Nags Head, Kill Devil Hills, Kitty Hawk, Southern Shores and Duck. The Dare County staff often serves as the liaison with the towns during the map development and review process. In an effort to better facilitate input from all local governments, Dare County requests that staff from all local governments be fully engaged during the initial stages of any future map development process. Such engagement would enable firsthand accounts of areas of concern. Periodic updates from the State to the local governments during map development would also be beneficial by ensuring property owners and officials are apprised of any future changes that may be forthcoming.

Update FEMA coastal flood model

In February 2017, Spencer Rogers of the NC SeaGrant program presented information on the preliminary flood maps to the Dare County Board of Commissioners. He discussed the changes in the various flood zones on the Dare preliminary maps and how these areas were impacted during Tropical Storm Hermine and Hurricane Matthew. Mr. Rogers indicated the FEMA coastal flood models are somewhat outdated and other models exist that reflect flood risks more accurately than the FEMA coastal flood model. He also stated that FEMA protocols require the State to use the FEMA models despite better models being available. We encourage FEMA to update their coastal flood models and to review their protocols to ensure any models used in the development of FIRMs provide the best available analysis of flood risks.

Shallow Flooding

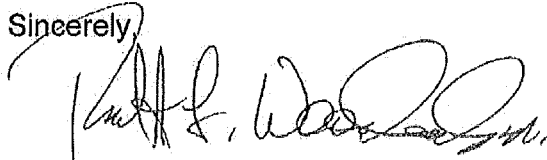
The preliminary flood maps for Dare County include AO zones along some portions of the oceanfront of Dare County. These AO zones reflect shallow flooding resulting from overtopping of the primary dunes along the oceanfront. In 2016, Dare County experienced flooding from Tropical Storm Hermine in September and Hurricane Matthew in October. Although some of the flooding during these events was from rising sound tides, many areas flooded from extreme rainfall associated with these storms. Some of the flooded areas are currently designated Shaded X and X zones on the 2006 FIRMs including areas along NC 12 Highway that experienced significant flooding from the torrential rains of Hermine and Matthew. Future FIRMs should address shallow flooding from rainfall in addition to those areas that may experience shallow flooding from the overtopping of primary dunes.

BFEs and X zones on preliminary maps

The preliminary maps feature widespread changes in the boundaries of the special flood hazard areas with a significant number of properties being removed from the SFHAs into Shaded X or X zones. For those properties remaining in the SFHA, BFEs are decreasing as much as four feet. These changes, as explained by the NCFMP staff, are the result of more precise flood modeling of the potential flood risks for Dare County. Some of the areas with lower BFEs and Shaded X/X zone properties are areas for which there is empirical knowledge of flooding from Hurricane Irene, TS Hermine and Hurricane Matthew. Although the preliminary maps should positively affect insurance rates for many property owners in Dare County, locally we are concerned that many property owners may cancel flood insurance coverage on their homes and businesses. Then, years from now when the FIRMs are updated again, these property owners may face costly insurance rates if their property reverts back to a SFHA or higher BFE. Dare County is considering the implementation of local elevation standards to be used in conjunction with the preliminary maps and we sincerely hope our local efforts will account for any future flood insurance maps. We encourage the State and FEMA to undertake outreach activities to educate property owners on the flooding conditions depicted on FIRMS and more importantly what flood hazards are not addressed by the FIRMs. Property owners and citizens may not understand that only some hazards are addressed by the flood maps for any given area and they should be advised to act accordingly to protect their property.

On behalf of the Dare County Board of Commissioners, I respectfully submit these comments outlining the issues and concerns that have been identified. We in Dare County have direct experience of the destructive nature of flooding and the importance of mitigating flood hazards. We look forward to your response to these comments on the preliminary flood maps.

Sincerely,

A handwritten signature in black ink, appearing to read "Robert L. Woodard". The signature is fluid and cursive, with the first name being the most prominent.

Robert L. Woodard, Chairman
Dare County Board of Commissioners

Cc: Dare County Board of Commissioners
Robert Outten, County Manager
Donna Creef, Planning Director
Chris Layton, Town of Duck
Peter Rascoe, Town of Southern Shores
Andy Stewart, Town of Kitty Hawk
Debbi Diaz, Town of Kill Devil Hills
Cliff Ogburn, Town of Nags Head
Kermit Skinner, Town of Manteo



Robert C. Edwards
Mayor

Susie Walters
Mayor Pro Tem

Cliff Ogburn
Town Manager

Town of Nags Head

Post Office Box 99
Nags Head, North Carolina 27959
Telephone 252-441-5508
Fax 252-441-0776
www.nagsheadnc.gov

M. Renée Cahoon
Commissioner

John Ratzenberger
Commissioner

Marvin Demers
Commissioner

October 4, 2017

Mr. John K. Dorman
Program Director
North Carolina Floodplain Mapping Program
4105 Reedy Creek Road
Raleigh, North Carolina 27607

Luis Rodriguez, Chief
Engineering Management Branch
Federal Insurance and Mitigation Administration
FEMA
500 C Street SW Room 423
Washington, DC 20472

RE: Comments on the Preliminary Flood Maps for the Town of Nags Head

Dear Mr. Dorman,

The Town of Nags Head has reviewed the Preliminary Flood Insurance Rate Maps that were released for Dare County in June of 2016. As you are aware, many areas of the town have been proposed to be removed from the Special Flood Hazard Area. Additionally, the Base Flood Elevations have been significantly reduced in areas remaining in the Special Flood Hazard Area. The town has compared the preliminary Special Flood Hazard Areas and Base Flood Elevations to our historical records of storm surge and rainfall flooding as well as flood damage. Based on this comparison, the Nags Head Board of Commissioners believes that these maps underrepresent the actual flood risk observed during previous flood events for certain parts of the town. If adopted "as is" (i.e. without the addition of higher regulatory standards) construction will occur in the town that will be subject to routine flooding. Those property owners who choose to forego flood insurance in these areas will be unprotected.

The Town of Nags Head strongly believes that the National Flood Insurance Program, through the use of Flood Insurance Rate Maps and associated regulations, has been one of the primary and most effective ways to minimize flood damage to properties within the town and communicate flood risk to the general public. The flood maps are often the primary source of information people use to evaluate risk when making real estate purchases or

planning property improvements. To date, the National Flood Insurance Program has served to limit significant damage that would have otherwise occurred without these preventative measures. This has largely been due to gradual improvements in the floodplain mapping program. The preliminary maps represent a departure from previous map revisions, particularly with respect to the current maps which were adopted in 2006. This is a policy decision that will reintroduce risk into the town and represents a step backwards in our collective efforts to protect property. As a town and regulatory agency, we believe it is our responsibility to protect property owners from these risks, particularly since many property owners are from other areas of the country and may not be familiar with local conditions. Therefore, we provide the following comments for your consideration:

1. On March 1, 2017, the town adopted a resolution outlining our initial concerns with the flood maps and the modeling process used to develop the maps. Please incorporate the attached resolution as part of the town's official comments.

2. Reduction of Special Flood Hazard Areas (SFHA) and Base Flood Elevations (BFE)

The preliminary maps rezone large areas of the town from the AE and VE flood zones to unregulated Shaded X zones. In addition to the reduction in overall acreage of the Special Flood Hazard Area, Base Flood Elevations (BFE's) in all flood zones are reduced significantly. In AE flood zones, BFE's will be reduced from a range of 9-11 feet on the 2006 Flood Maps to 4-5 feet on the preliminary flood maps. In some cases, VE flood zones from the 2006 flood maps will become AO flood zones or Shaded X flood zones on the preliminary maps.

During Hurricane Irene, the town documented soundside flooding with flood heights reaching properties as high as seven feet above mean sea level. Many structures along the sound were damaged, and post-storm inspections revealed flood heights within structures between one and three feet. The average ground elevation in these same areas ranges between four and six feet above mean sea level. Fortunately, in most cases only ground floor unheated enclosures were flooded due to the fact that these homes were constructed in accordance with existing or previous flood damage regulations. The preliminary flood maps place these areas either in an AE flood zone with a BFE of four feet or within a Shaded X flood zone. Since many of these areas would no longer be regulated under the new maps, new structures could be positioned at existing grade and existing enclosures could be converted to heated space. (See Maps 1-5).

Further, in the northern portion of town, flooding associated with rainfall from hurricane Matthew was documented up to 3.5 feet within structures. This area is currently in the AE flood zone with a BFE of 10 feet. The extent of the floodwater surface elevations were documented between 10.0' msl and 11.5' msl (See Map 6). Topographic grades in this area generally range between five and eight feet. On the preliminary flood maps, this entire area will now be in a Shaded X flood zone. Many of the structures in this area are elevated with limited unheated storage beneath the structure. If the preliminary maps are adopted, enclosures could be converted to heated space. If this occurs on a widespread basis, the damage estimates from future storms such as Matthew will be exponentially higher. Please

note in section 4 below that Matthew is not the only historic event to cause flooding in this area.

3. Natural Topography

The natural topography of the barrier island creates a low-lying “trough” between the maritime forest zone west of US 158 and the primary beach and foredunes in the vicinity of NC 12. In general, the maritime ridge serves as the breakpoint for overland surface runoff and subsurface groundwater flow between the Atlantic Ocean and the Roanoke Sound. A majority of the developed properties exist east of the maritime ridge and are concentrated in the lower lying areas between the beach and maritime forest zones. With the general eastern direction of flow, runoff tends to accumulate in the lower elevations in the developed areas, creating a “bowl” like effect which leads to localized flooding by way of elevated groundwater conditions, surface runoff, or a combination of the two. When the town experiences frequent, intense and prolonged rainfall events, as observed during Hurricane Matthew in 2016 and during the summer of 2017, the ground becomes saturated, prohibiting any further infiltration from occurring. This exacerbates flooding in these low lying areas resulting in widespread impacts to structures, roadways, and septic systems.

As mentioned above, frequent, intense and prolonged rainfall events can elevate the surrounding shallow surficial aquifer, saturating the sandy soils and restricting infiltration, the town’s primary means of managing flooding and runoff. Where available, what does not infiltrate is conveyed through 55 miles of the town’s network of open channels and storm pipes to five ocean outfall discharge points and twelve soundside discharge points. The outfall discharges, which are strategically located at low elevations within the town’s drainage basins, are maintained by the North Carolina Department of Transportation (NCDOT) and were installed in the early 1960’s in response to the Ash Wednesday Storm. The outfalls were originally constructed to provide a mechanism for draining ocean overwash events when the storm surge from the ocean overtopped the dunes.

According to the document “Guidance for Flood Risk Analysis and Mapping, Shallow Flooding Analyses and Mapping, November 2016” published by FEMA, “Shallow flooding can occur as the result of several meteorological and watershed conditions. However, there are two broad classifications of shallow flooding into which almost all individual cases can be assigned — ponding and sheet runoff. Ponding is the result of runoff or flows collecting in a depression that may have no outlet, subterranean outlets, rim outlets or manmade outlets such as culverts or pumping stations. Impoundments behind manmade obstructions (e.g., levees, road fill, railroad grades, canal banks, or similar structures) are included in this type of shallow flooding as long as they are not backwater from a defined channel or do not exceed 3.0 feet in depth.” The town understands that shallow flooding studies are not typically completed as part of the coastal floodplain mapping process. Since it is clear that our local conditions reveal problems associated with shallow flooding, the town would request a shallow flooding study be conducted in areas where this “bowl” like effect is occurring as part of the mapping process (See Map 6).

4. Chronic Flooding

The town has seen an increase in chronic flooding. The increase in occurrences of “extreme” rainfall events has led to extended periods of inundation in developed low-lying areas beyond what could be considered nuisance flooding. This has been evidenced by recent rainfall events. Flooding in the coastal environment is not only caused by soundside and ocean surge events, but also from frequent, intense and prolonged rainfall events.

The following is a list of the most notable, recent storms that have impacted Nags Head with varying levels of surge and rainfall flooding. Of the 17 documented events causing significant damage in the town, eight flooding events were caused by excessive amounts of rainfall both related to a storm event as well as extended periods of intense rainfall. Of the nine remaining flooding events, seven events were ocean surge, and two were soundside surge events.

Year	Event	Source of Flooding
1962	Ash Wednesday Storm	ocean overwash event
1991	Halloween Storm	ocean overwash event
1992	July/August	extended rainfall pattern created flooding
1993	March storm	ocean overwash event
2000	July/August	extended rainfall pattern created flooding
2003	Hurricane Isabel	ocean overwash event
2004	July/August	extended rainfall pattern created flooding
2006 (September)	Tropical Storm Ernesto	ocean surge event
2009 (November)	Veteran’s Day Storm (Nor’easter)	ocean overwash event
2011	Hurricane Irene	soundside storm surge event created extensive flooding town wide for properties adjacent to the sound

Year	Event	Source of Flooding
2012	July/August	extended rainfall pattern created flooding
2012 (October)	Hurricane Sandy	ocean overwash event
2014	Hurricane Arthur	soundside storm surge event
2015	Tropical Storm Joaquin	rainfall associated with the storm resulted in flooding throughout the town
2016 (September)	Tropical Storm Hermine	rainfall associated with the storm resulted in flooding throughout the town
2016 (October)	Hurricane Matthew	rainfall associated with the storm resulted in flooding throughout the town
2017	July to September	extended rainfall pattern created flooding

More recently, Hurricane Matthew delivered record amounts of rainfall throughout Nags Head in October 2016. Rainfall measurements recorded range between 11.7 inches to 13.7 inches across the Town of Nags Head, most of which occurred during a six hour period between 10 pm on October 8, 2016 and 4 am October 9, 2016. Peak flood water levels measured in the low-lying areas were documented as much as 3.5 feet deep. Significant portions of NC 12, and to a smaller extent US 158, were flooded creating conditions where public health and safety were endangered. Flood depths ranging between one and three feet remained for several days. Approximately 600 homes were impacted with a significant number of impacted properties residing within an area that will be converted from an AE flood zone to an unregulated Shaded X flood zone on the preliminary maps. Floodwater moved through the town’s stormwater infrastructure system but could not flow out of the NCDOT outfall pipes because of the exceptionally elevated tailwater conditions associated with storm surge and higher than normal tide. This situation prevented floodwater from being transported to the ocean and sound via the outfall pipes and created extensive town wide flooding.

Between July 2017 and August 2017, an exceptional amount of rainfall occurred and the time interval can derived from the North Ridge Weather station located in the north section of the Town of Nags Head. For the Period between July 2, 2017 and July 16, 2017, three separate significant rainfall events occurred; a 25-yr rainfall event, a 50-yr rainfall, and a 200-yr event (see attached tabular rainfall records and associative recurrence interval, North Ridge July Rainfall Totals). Cumulatively, when combined with other rainfall occurrences and extended over a 47-day time period, this equates to an approximate 200-yr recurrence interval. The

rainfall amount during this period accounts for approximately one-half of the annual average rainfall for the town. These circumstances were similar to conditions experienced in the Fall of 2016 when approximately one-half of the annual average rainfall occurred over the course of a 45-day period. Again, flood depths ranged between one and three feet and approximately 300 homes were impacted, with a significant number of impacted properties being removed from the Special Flood Hazard Area on the preliminary maps.

The town would request that a more comprehensive approach be employed by the state and through FEMA modeling in determining flood risk when creating flood maps. The Town of Nags Head and other coastal communities are impacted by flooding from rainfall as frequently as surge type events. FEMA models and the state mapping process should better account for these rainfall events coupled with the high groundwater table.

5. Updates to FEMA Model

Spencer Rogers, with NC Sea Grant, made a presentation to the town in February of 2017. Based on his presentation and research, the town believes that the coastal model used by FEMA to develop Flood Insurance Rate Maps has inherent flaws which are reflected in the Special Flood Hazard Areas and Base Flood Elevations shown on the preliminary maps. Mr. Rogers explained that the modeling process is highly quantitative and dependent on simulations. This reduces the ability to make inferences from historical storm and storm gauge records. The key to improving coastal flood maps lies in revising the coastal flood models that are used to calculate the areas subject to flood inundation as well as Base Flood Elevations. The modeling process also needs to better address estimates of storm return period and consider areas of shallow flooding. Mr. Rogers indicated that these concerns are further noted in the document, "Mapping the Zone: Improving Flood Map Accuracy" produced by the Committee on FEMA Flood Maps and National Research Council of the National Academies. The town would request that the FEMA models be updated based on the research of Spencer Rogers and the documentation provided in Mapping the Zone: Improving Flood Map accuracy.

6. Storm Selection

In September of 2017, Dr. Rick Luetlich, Director of the UNC Center for Natural Hazards Resilience, made a presentation to the Nags Head Board of Commissioners describing the modeling process used to develop the preliminary flood maps. Dr. Luetlich has completed further analysis of the preliminary flood maps using data from a new gauge that was installed in Hatteras in 2011. Based on his research and analysis, Dr. Luetlich is concerned that the selection of historical storms utilized in the first phase of the preliminary mapping process does not adequately describe what communities in the northern beaches (Hatteras north) are likely to encounter, especially along the soundside. Dr. Luetlich indicated that this has resulted in the low BFE's and reduced Special Flood Hazard Area acreage as shown on the preliminary flood maps. The town would request that additional storms be included in the mapping process to reflect recent storm tracks, such as Hurricane Irene, that have caused damage along soundside portions of our community.

7. Other Issues

- Street addressing on the FRIS webpage - The Flood Risk Information System (FRIS) webpage is not able to correctly locate addresses. Some searches yield addresses that are off by several numbers. In other cases, the addresses identified do not exist in the town's addressing system. Because the addressing does not work on the FRIS site, it is difficult and often impossible for users to find an address. Users often call town staff to help them locate properties. Town staff are having to use a combination of the Dare County GIS site as well as the FRIS webpage to provide information. The town requests that this function be fixed.
- Map Legend - The legend on the maps, created by the FRIS webpage, uses the technical description of the Shaded X Zone - 0.2% of the annual flood hazard, but with no accompanying label of the Shaded X Zone on the final product. The X Zones are not labeled. Individuals not familiar with flood map terminology find this confusing since the legend does not convey the appropriate information. The town requests that the legend options on the map output be revised to include the Shaded X and X Zone labels.
- Local Government Involvement- The preliminary flood maps for Dare County include the unincorporated areas of the county and the six municipal areas of Manteo, Nags Head, Kill Devil Hills, Kitty Hawk, Southern Shores, and Duck. Dare County staff often serves as the liaison with the towns during the map development and review process. In an effort to better facilitate input from all localities, the town requests that staff and elected officials of all Dare County government agencies be engaged prior to and during the initial stages of future mapping processes. Such engagement would enable local officials to share recent issues related to flooding and clearly identify problem flooding areas. Additionally, more frequent updates early on in the mapping process could prevent the omission of relevant flooding data.

8. Conclusion

As a small barrier beach municipality, we are vulnerable to flooding both from storm surge and rainfall. The effects of sea-level rise and climate change further complicate and exacerbate the effects of flooding. The town is committed to developing policies as well as completing planning and infrastructure projects to proactively mitigate the effects of flooding. This is evidenced by the adoption of a Comprehensive Plan (July 2017) that will implement policies on flooding and coastal resiliency as well as the commitment of funding for a Stormwater Masterplan and Decentralized Wastewater Management Plan update. Further, the town is working with Dare County and other municipalities to develop higher regulatory flood damage prevention standards for future development in conjunction with the preliminary maps.

Based on the town's historical, first-hand knowledge of repetitive flooding events, it is difficult for the town to support the preliminary maps that would allow future construction that is more vulnerable to flooding than what exists presently. After consultation with NCEM staff, NC Sea Grant, and the UNC Center for Natural Hazards Research, the town would like the North Carolina Floodplain Mapping Program and FEMA to address mapping issues associated with the modeling process including the evaluation of storms utilized as the basis for subsequent phases of the mapping process. The town would also request that consideration be given to a shallow flooding study as suggested in this letter.

Again, if the preliminary maps are adopted, this would allow new development to be constructed in areas subject to known flood risk without the benefit of construction techniques designed to mitigate flood damage. Although the preliminary maps should positively affect insurance rates for many property owners in the town, there is a concern that property owners may cancel flood insurance coverage because they are no longer in a flood zone. Then, if flood maps are updated in the future to reflect expanded Special Flood Hazard Areas or higher BFE's, these property owners may become non-conforming and subsequently face costly insurance rate increases.

On behalf of the Town of Nags Head Board of Commissioners, please accept the above comments and concerns. The town has direct experience with the destructive nature of flooding and to the importance of mitigating flood hazards. We look forward to your response to these comments on the preliminary flood maps.

Sincerely,

Robert Edwards, Mayor
Town of Nags Head

Attachments:

- Resolution adopted by Nags Head Board of Commissioners – March 1, 2017
- Maps 1 - 6
- Tabular rainfall records and associative recurrence interval, North Ridge

cc: Cliff Ogburn, Town Manager
Dare County Board of Commissioners
Robert Outten, Dare County
Chris Layton, Town of Duck
Peter Rascoe, Town of Southern Shores
Andy Stewart, Town of Kitty Hawk
Debbi Diaz, Town of Kill Devil Hills
Kermit Skinner, Town of Manteo



**RESOLUTION REQUESTING THAT THE FEDERAL EMERGENCY MANAGEMENT AGENCY
REVISE THE COASTAL FLOODPLAIN MAPPING MODEL AND CONSIDER SHALLOW FLOODING
AND OTHER SOURCES OF FLOOD RISK AS PART OF THE PROCESS TO UPDATE
FLOOD INSURANCE RATE MAPS**

WHEREAS, the Town of Nags Head has been a member of the National Flood Insurance Program since 1972; AND

WHEREAS, the Town of Nags Head strongly believes that the National Flood Insurance Program, through the use of Flood Insurance Rate Maps and associated regulations, has been one of the primary and most effective ways to minimize flood damage to properties within the Town and communicate flood risk to the general public; AND

WHEREAS, the Town of Nags Head received preliminary Flood Insurance Rate Maps on June 30, 2016 as part of the North Carolina Floodplain Mapping Program's most recent effort to update flood maps in partnership with the Federal Emergency Management Agency (FEMA); AND

WHEREAS, the Town has compared the proposed Special Flood Hazard Areas and associated Base Flood Elevations to previous maps as well as local historical storm records and documented flooding; AND

WHEREAS, a large portion of the Town has been removed from the Special Flood Hazard Area and the remaining non-VE zone Special Flood Hazard Areas have a Base Flood Elevation of 4 feet above mean sea level, which is generally lower than the land surface elevations in much of the Town; AND

WHEREAS, based on this analysis, the Town has determined that the preliminary Flood Insurance Rate Maps underrepresent the flood risk for a significant portion of the Town, including areas flooded and/or damaged in Hurricanes Isabel, Irene, Matthew as well as Tropical Storm Beryl; AND

WHEREAS, the preliminary maps, if adopted without modification, would allow new construction and/or improvements to existing buildings that would be at risk of flooding from storms of similar intensity and/or duration as the aforementioned events; AND

WHEREAS, buildings constructed outside of the Special Flood Hazard Area are not grandfathered for flood insurance purposes and, if later mapped into a flood zone, may realize significant flood insurance premium increases if not constructed in compliance with new flood damage prevention regulations; AND

WHEREAS, the Town has consulted with North Carolina Emergency Management, the North Carolina Floodplain Mapping Program, NC Sea Grant and conducted other research to collect information on how the maps were developed including the models and analyses used to develop Special Flood Hazard Areas and associated Base Flood Elevations; AND


WHEREAS, the Town believes that the coastal models used by FEMA to develop Flood Insurance Rate Maps has inherent flaws which are reflected in the Special Flood Hazard Areas and Base Flood Elevations shown on the preliminary maps; AND

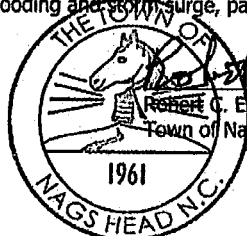
WHEREAS, the modeling process is highly quantitative and dependent on simulations which reduces the ability to make inferences from historical storm and storm surge records; AND


WHEREAS, the key to improving coastal flood maps lies in improving the coastal flood models that are used to calculate the areas subject to flood inundation, Base Flood Elevations, as well as improving estimates of storm return period and consideration of areas of shallow flooding.

NOW, THEREFORE BE IT RESOLVED that the Nags Head Board of Commissioners calls upon our Federal and State representatives to request that the Federal Emergency Management Agency revise the models used to generate the Flood Insurance Rate Maps and consider all appropriate sources of flooding to better and more accurately reflect the risk from flooding and storm surge, particularly in coastal communities.

This the 1st day of March 2017.

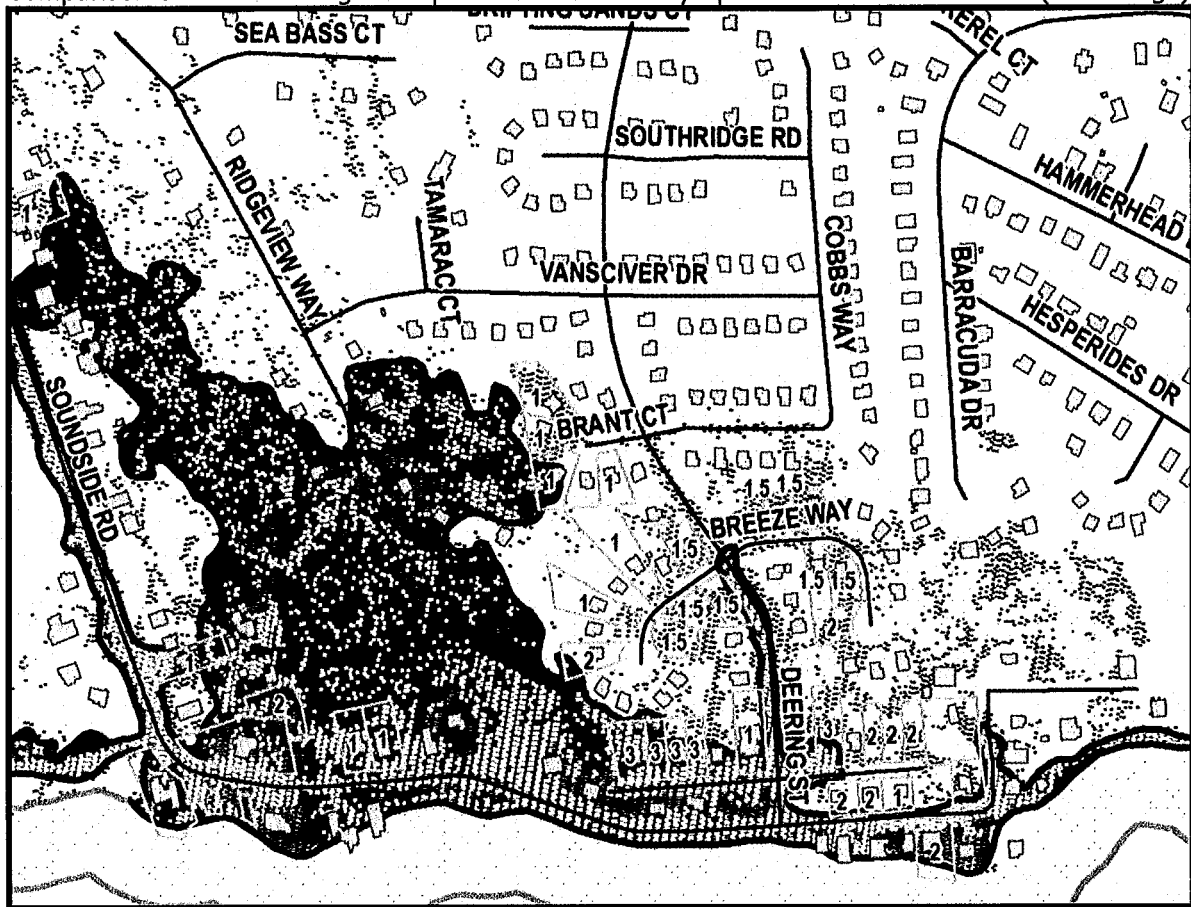
ATTEST:

Carolyn F. Morris, Town Clerk










Robert C. Edwards, Mayor
Town of Nags Head

Map 1

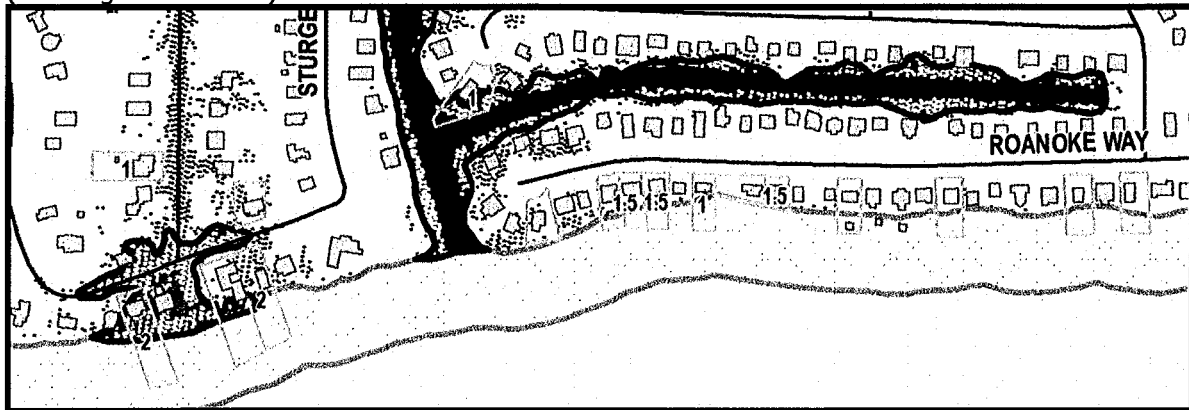
Comparison of Irene Damaged Properties to Preliminary Special Flood Hazard Areas (Southridge)



- Damaged Property (Irene) (Number indicates documented flood height in building)
-  AE, BFE 4
 -  AE, BFE 5
 -  AO
 -  VE
 -  4-5' msl
 -  Below 4' msl

Map 2

Comparison of Irene Damaged Properties to Preliminary Special Flood Hazard Areas
(Old Nags Head Cove)



Damaged Property (Irene) (Number indicates documented flood height in building)

■ AE, BFE 4

□ AE, BFE 5

■ AO

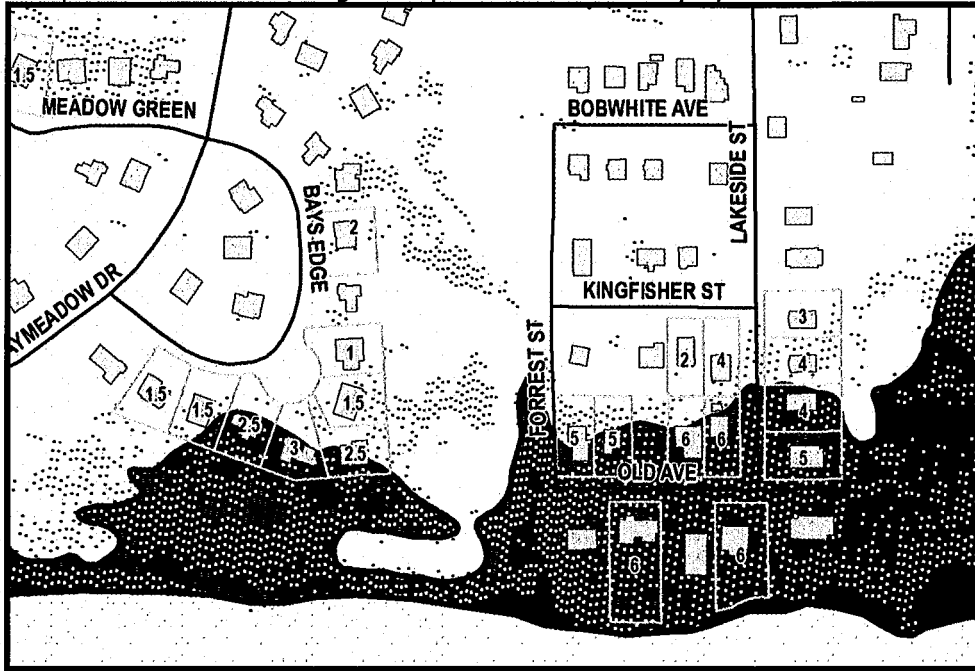
■ VE

• 4-5' msl

Below 4' msl

Map 3

Comparison of Irene Damaged Properties to Preliminary Special Flood Hazard Areas (Roanoke Shores)



Damaged Property (Irene) (Number indicates documented flood height in building)

■ AE, BFE 4

▨ AE, BFE 5

■ AO

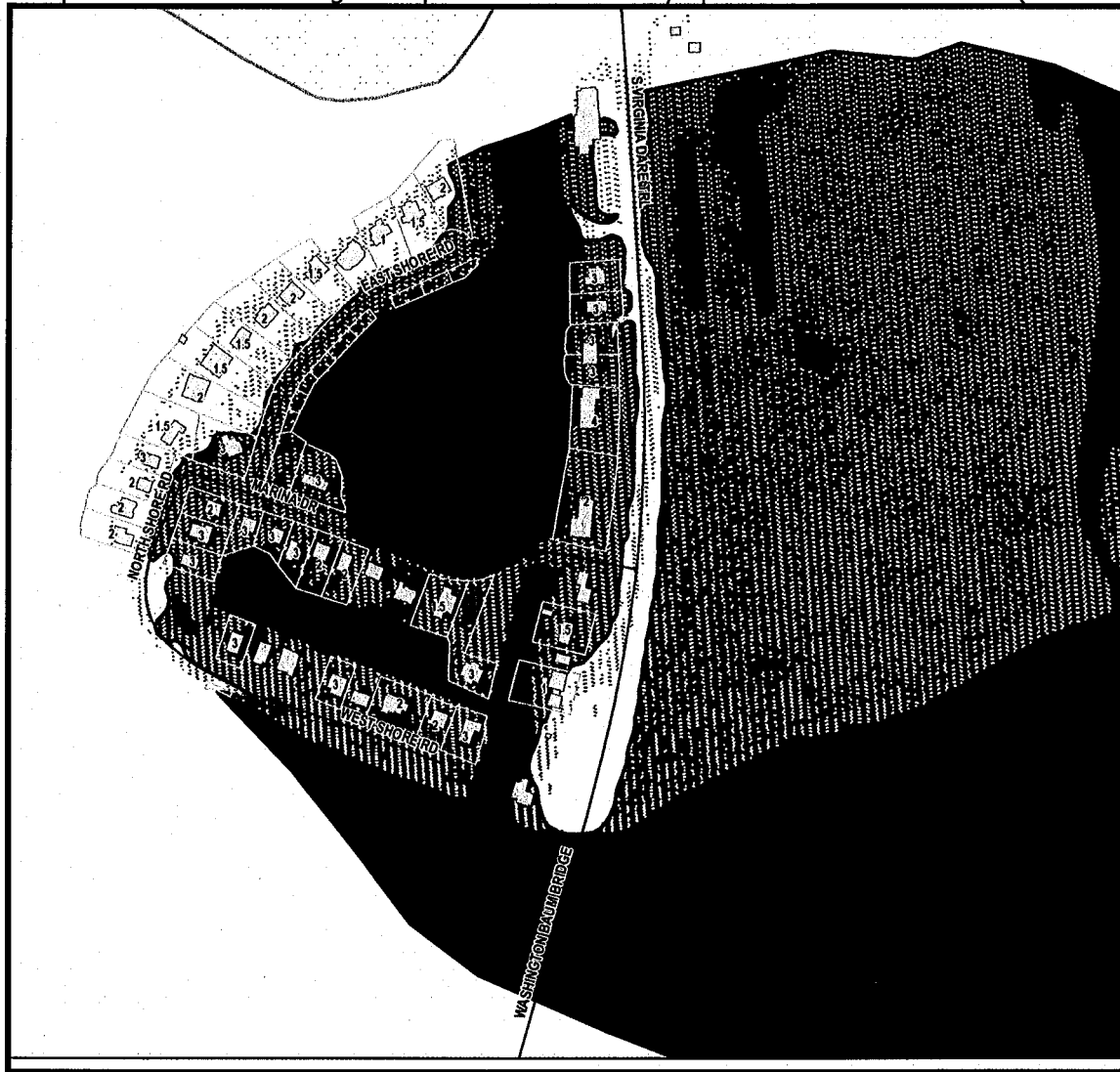
■ VE

• 4-5' msl

Below 4' msl

Map 4

Comparison of Irene Damaged Properties to Preliminary Special Flood Hazard Areas (Pond Island)



Damaged Property (Irene) (Number indicates documented flood height in building)

AE, BFE 4

AE, BFE 5

AO

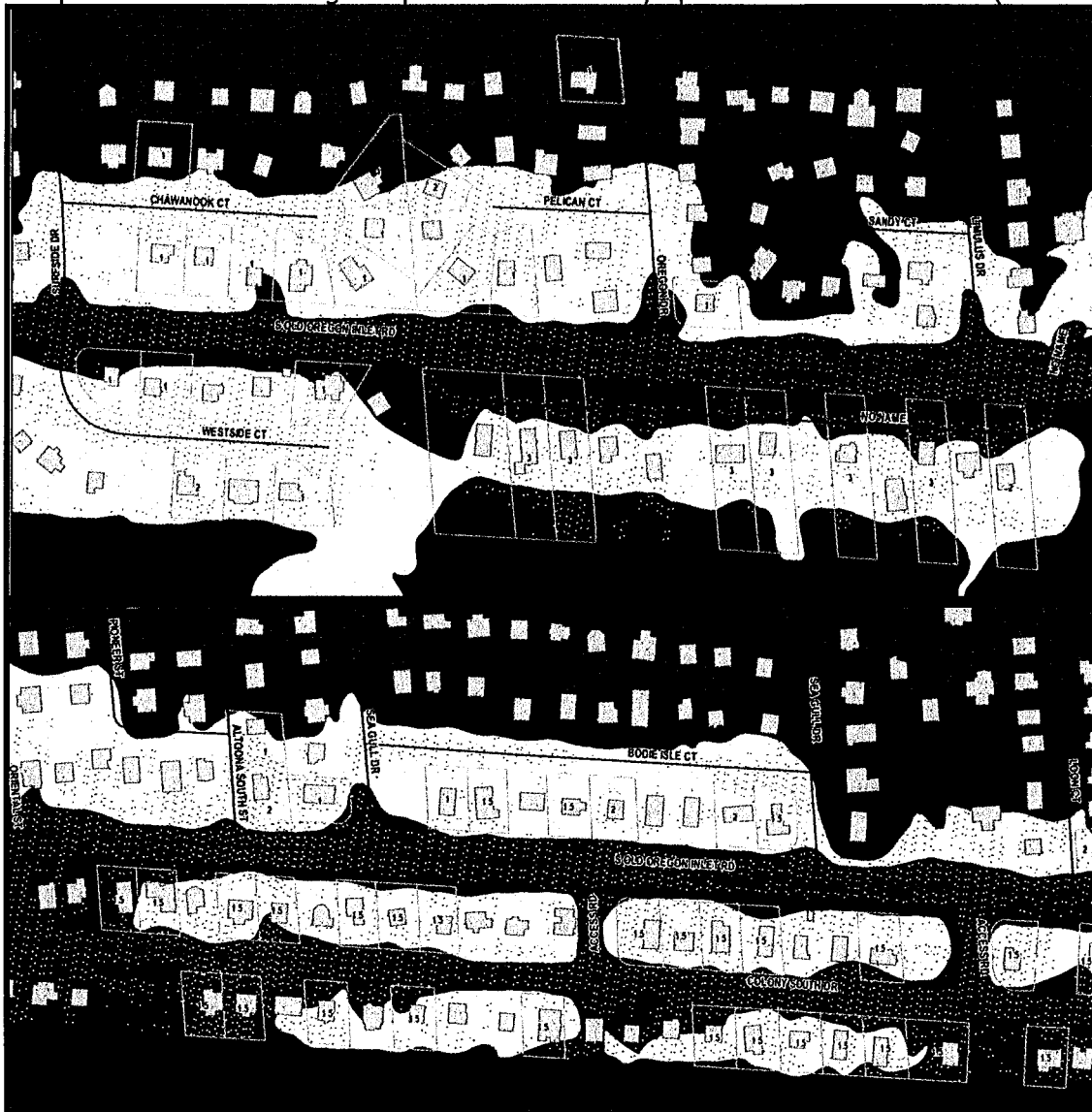
VE

• 4-5' msl

Below 4' msl

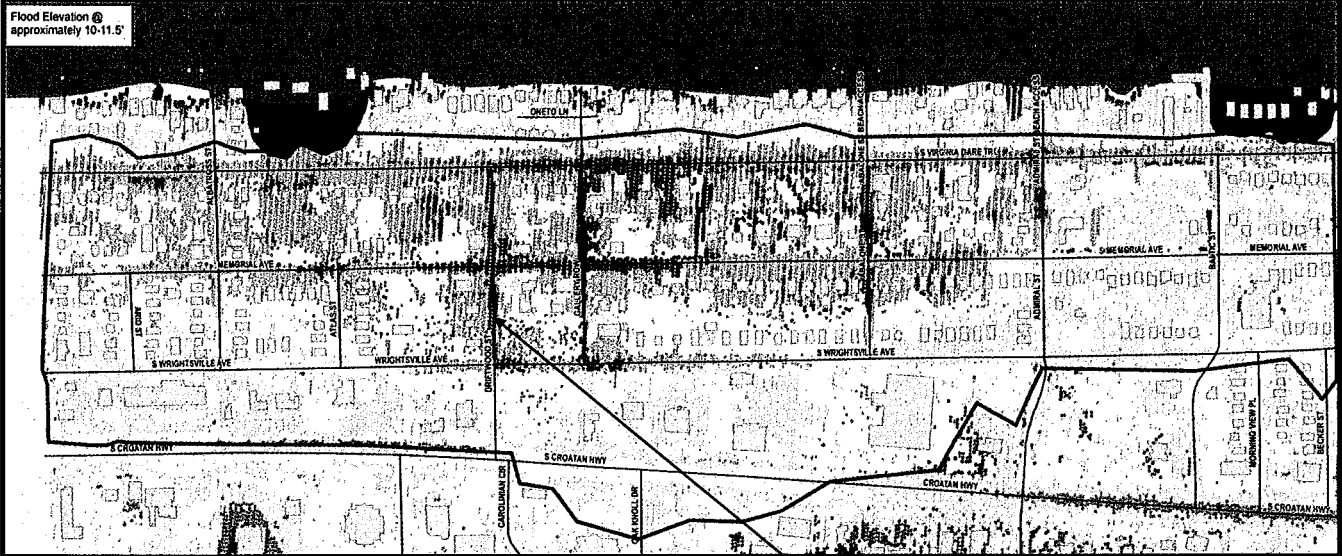
Map 5

Comparison of Irene Damage Properties to Preliminary Special Flood Hazard Areas (South Nags Head)



- Damaged Property (Irene) (Number indicates documented flood height in building)
- AE, BFE 4
- AE, BFE 5
- AO
- VE
- 4-5' msl
- Below 4' msl

Map 6
Hurricane Matthew Inundation Area – North Nags Head



Elevation above msl

- 12.000001 - 13.000000
- 11.000001 - 12.000000
- 10.000001 - 11.000000
- 9.000001 - 10.000000
- 8.000001 - 9.000000
- 7.000001 - 8.000000
- 6.000001 - 7.000000
- 5.000001 - 6.000000
- -4.510000 - 5.000000



Nags Head Water Plant July Rainfall Totals				North Ridge July Rainfall Totals				Town Hall July Rainfall Totals			
July	Rainfall (in.)	Duration (min.)	Recurrence	July	Rainfall (in.)	Duration (min.)	Recurrence	July	Rainfall (in.)	Duration (min.)	Recurrence
1	0.51			1	0.51	450	<1-yr	1	0.54		135 <1-yr
2	3.5		60 -25-yr	2	2.68		45 -25-yr	2	0.96		20 -1-yr
3				3				3	0.01		
4	0.06			4	0.06			4	0.03		
5				5				5	0.01		
6	0.65		150 <1-yr	6	0.65		150 <1-yr	6	0.18		55 <1-yr
7				7				7	0		
8	2.1		300 <1-yr	8	1.57		300 <1-yr	8	1.78		300 <1-yr
9	1.1		30 <1-yr	9	0.48		30 <1-yr	9	0.21		30 <1-yr
10				10	3		45 -50-yr	10	3.97		60 -100-yr
11				11				11			
12				12				12	0.03		10 <1-yr
13				13				13	0		
14				14				14	0		
15	0.8			15	0.82		315 <1-yr	15	0.82		300 <1-yr
16	3.8		150 -50-yr	16	6.47		150 -200-yr	16	6.22		150 -100-yr
17	0.9		300 <1-yr	17	0.64		300 <1-yr	17	0.48		360 <1-yr
18	0.7		30 <1-yr	18	1.07		30 <1-yr	18	0.28		30 <1-yr
19				19				19	0		
20				20				20	0		
21				21				21	0		
22				22				22	0		
23	1		60 <1-yr	23	1.72		45 -2-yr	23	1.25		60 <1-yr
24				24				24	0		
25				25				25	0		
26				26				26	0		
27				27				27	0		
28	1.8		300 <1-yr	28	0.8		300 <1-yr	28	0.29		300 <1-yr
29	0.2		300 <1-yr	29	0.45		300 <1-yr	29	0.38		360 <1-yr
30				30				30	0		
31				31				31	0		
Total	17.12		-25-yr	Total	20.92		-100-yr	Total	16.44		-25-yr

Nags Head Water Plant August Rainfall Totals				North Ridge August Rainfall Totals				Town Hall August Rainfall Totals			
August	Rainfall (in.)	Duration (min.)	Recurrence	August	Rainfall (in.)	Duration (min.)	Recurrence	August	Rainfall (in.)	Duration (min.)	Recurrence
1	0			1	0			1	0		
2	0			2	0			2	0		
3	0			3	0			3	0		
4	0.1		<1-yr	4	0.03		<1-yr	4	0.15		150 <1-yr
5	0			5	0			5	0		
6	0			6	0			6	0		
7	1.5		<1-yr	7	0.85		<1-yr	7	0.87		30 <1-yr
8	1.2		<1-yr	8	2		<1-yr	8	1.75		330 <1-yr
9	0			9	0			9	0		
10	0			10	0			10	0		
11	0.2		<1-yr	11	0.22		150 <1-yr	11	0.18		140 <1-yr
12	1.5		<1-yr	12	0.41		90 <1-yr	12	0.6		300 <1-yr
13	0.5		<1-yr	13	1.58		120 -1-yr	13	0.38		20 <1-yr
14	0.7		<1-yr	14	1.78		90 -1-yr	14	2.99		135 -10-yr
15	0.7		<1-yr	15	0.41		30 <1-yr	15	0.17		30 <1-yr
16	0			16	0			16	0		0
Total	6.4			Total	7.28			Total	7.09		
47-day Total	23.82		50-yr	47-day Total	28.2		-200-yr	47-day Total	23.53		-50-yr

The recurrence interval is referenced from NOAA PDS-based Point Precipitation Frequency estimates with 90% confidence intervals for Nags Head North Carolina Latitude 35.9784, Longitude -75.638, Elevation 9.18 ft. It should be noted that based upon that interpolation between the event duration intervals was required to estimate the average recurrence interval (years)