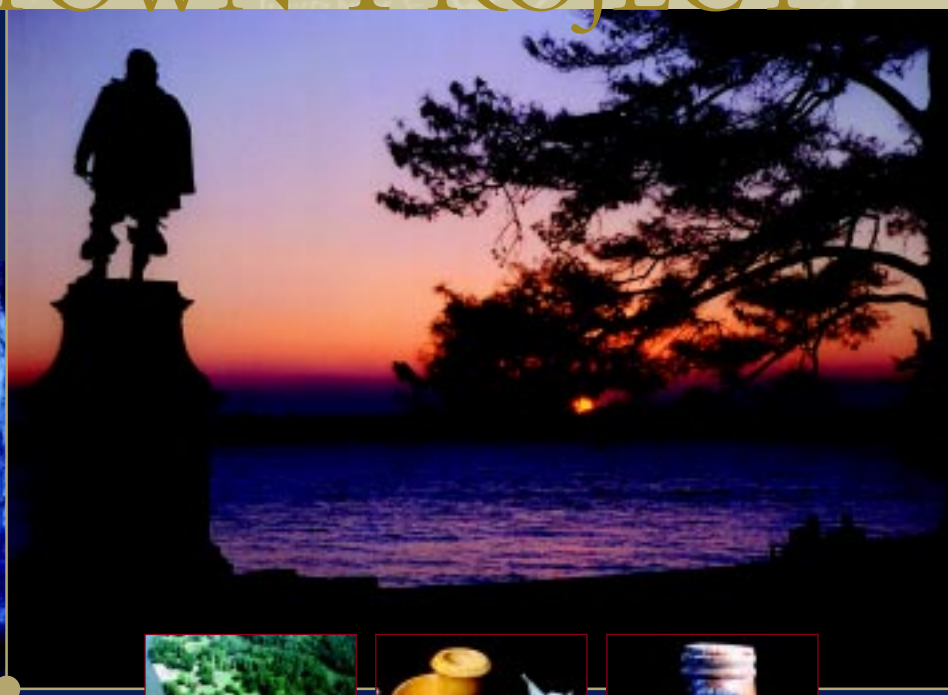
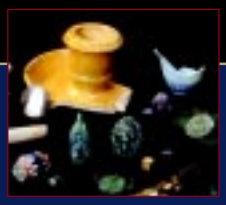
Final Development Concept Plan/Environmental Impact Statement

THE JAMESTOWN PROJECT











JAMESTOWN, VIRGINIA

National Park Service
Colonial National Historical Park, Jamestown Unit

Association for the Preservation of Virginia Antiquities
Jamestown National Historic Site

Volume 3
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Appendix A:
APVA/NPS Agreements

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A AVPA/NPS Agreements

THIS AGREEMENT, Made and entered into this_____day of _____, 1940, by and between the United States of America, acting in this behalf by Harold L. lckes, Secretary of the Interior, and hereinafter referred to as the "Secretary," and the Association for the Preservation of Virginia Antiquities, a corporation organized and existing under the laws of the State of Virginia, acting by and through the Board of Directors and duly authorized officials, hereinafter referred to as the "Association,"

WITNESSETH:

WHEREAS, the historic structures and approximately twenty-two acres of land, located on the upper end of Jamestown Island, James City County, Virginia, owned by the Association for the Preservation-of Virginia Antiquities, are recognized as possessing national significance as a portion of the site of Jamestown, first permanent English Settlement in North America; and

WHEREAS, it is the desire of the Association and the Secretary to cooperate in a unified program of 'development and administration for the whole Jamestown Island area, including in such program the planning and location of parkways, causeways, and a National Park Service museum, and to supplement the de facto national recognition of this particular area by adding thereto the legal designation of the said historic structures and surrounding grounds as a National Historic Site and to preserve them for public use for the inspiration and benefit of the people of the United States:

NOW, THEREFORE, in consideration of the foregoing and pursuant to the authority contained in the Act of Congress approved August 21,1935 (49 Slat, 666) entitled "An Act to provide for the preservation of historic American sites, buildings, objects', and antiquities of national significance, and for other purposes'," the said parties have covenanted and agreed, and by these presents do covenant and agree to and with each other and in consideration of the mutual promises herein expressed, as follows: entitled "An Act to provide for the preservation of historic American sites, buildings, objects', and antiquities of national significance, and for other purposes'," the said parties have covenanted and agreed, and by these presents do covenant and agree to and with each other and in consideration of the mutual promises herein expressed, as follows:

ARTICLE 1. The Secretary agrees, on behalf-of the United States,

(a) To designate as a national historic site the historic structures and grounds held by the Association on Jamestown Island.

(b) To give suitable space to the historic site in such government publications, and circulars as may be printed and issued for informing the public of the Jamestown-Williamsburg-Yorktown area.

(c) To cooperate with the Association in the preservation and use of the lands and historic structures constituting the national historic site, and to provide technical assistance in planning and executing measures for such preservation and use, within the limits of available appropriations.

(d) In the discretion of the said Secretary, to expend such funds as may be made available by appropriation or donation, for the purpose of assisting the Association in the appropriate development and restoration of its historic structures and their surroundings as a national historic site.

(e) That such artifacts as may be recovered by the National Park Service during archeological investigation of land owned by the Association shall remain the property of the Association, and may be stored temporarily in the National Park Service archeological laboratory.

(f) To consult with the Association in planning for and in locating parkways, causeways, and a National Park Service museum, whether on Jamestown Island or on the adjacent mainland, for the purpose of avoiding any development of the government property which would be disadvantageous to the Association.

ARTICLE II. The Association hereby agrees, for itself, its successors and assigns, '

(a) That the Association will retain and preserve in perpetuity, insofar as it is reasonably able to do so, the grounds and historic ancient structures which it now owns on Jamestown Island.

b) The Association will permit the National Park Service to undertake archeological work, including excavation, and other forms of developmental work on the above area belonging to the Association, provided the plans for such work are satisfactory to the Association.

(c) The Association will permit National Park Service personnel to enter the holdings of the Association free of charge for the purpose of historical and archeological study or for the performance of their official duties.

(d) The Association will permit the National Park Service to study and measure such structures and objects as may be uncovered by archeological investigations undertaken by the National Park Service on the Association's lands and will grant to the National Park Service the first right to scientific publication of the results of such archeological investigations and studies. This shall in no way restrict the right of the Association to issue purely factual press releases.

ARTICLE III. It c. further understood and agreed,

(a) That the said historic structures and lands now owned by the Association, subject to the covenants above set forth, shall remain the property of the Association to be used by it for the purposes for which the Association was formed,

(b) The National Park Service will not excavate any area belonging to the Association except after receiving the written consent of the Association, accompanied by a map showing the exact limits of the area to be studied.

(c) The National Park Service will. preserve any trees affected and will backfill, cover up, re-sod, or replant any trenches which it may make in pursuance of such excavations. It will make complete photographic and archeological-engineering record of conditions prior to archeological trenching, and will restore the area to its original appearance on completion of the work,

(d) No trees on the property of the Association shall be cut without prior consent of the Association,

(e) The disposition of any human remains which may be unearthed on the property of the Association shall be subject to the prior approval of the Association, except as otherwise provided by State law,

(f) The National Park Service may from time to time request the temporary loan, for the purpose of display by the National Park Service in its present laboratory or any future museum at Jamestown, of such artifacts as may be discovered during archeological excavation of the Association's lands on Jamestown Island,

(g) In any museum which may hereafter be erected and maintained by the National Park Service, whether on Jamestown Island or on the adjacent mainland, if the Association should deposit as a loan in such museum all or a part of its collection of portraits, artifacts, and other historical material concerning Jamestown then a fireproof gallery or galleries shall be allocated and designated for the display of such objects belonging to the association, and fireproof storage space for that part of the collection loaned but not displayed, and any such objects displayed shall be labeled as the property of the Association. Employees of the Association shall be permitted to carry out such duties within such gallery or galleries as may be assigned to them by the Association,

(h) As soon as practicable after the execution of this agreement, a joint fee shall be charged for admission to the grounds owned by the Association and to the grounds and museum owned by the United States. Such joint fee may be collected by the National Park Service for the United States and for the Association, or by the Association for itself and for the United States, and it is mutually agreed that reciprocal accounts of the funds collected shall be rendered at such intervals as may be agreed upon between the Secretary and the Association, The amount of such fee shall be subject to mutual agreement by the contracting parties, but the share of the association shall not in any event be less than 20 cents per person without the further consent of the Association, Pending the establishment of such joint fee, the Association shall be entitled to continue to collect fees for entrance to the property owned by it. Members of the Association, and groups of school children 18 years of age or under, shall be exempt from payment of any of the admission fees contemplated by this paragraph. The Association shall have the right to admit the general public without charge to its property on Jamestown Island for. the annual services on May 13 and for such other purposes and on such other occasions as the officers of the association deem proper. The Secretary shall have the right, in his discretion, to admit the general public without charge to the government property on special occasions,

(i) The National Park Service shell not grant or continue beyond December 31, 1940, any concession for the sale of souvenirs, post cards, etc., whether at or near the museum or on Jamestown Island, except to the Association, without the consent of the Association; and the Association shall grant no concession for the sale of refreshments on its own property without the consent of the National Park Service,

(j) Neither any employee of the National Park Service, nor any concessionaire under the National Park Service, other than the Association, shall be permitted by the National Park Service to maintain a United States Post Office on its property at Jamestown Island or on the mainland immediately adjacent thereto, without the consent of the Association. At the request of the Association, the Secretary will recommend to the Postmaster General that the Association or its agent be permitted to continue to operate the Post Office at or near Jamestown Island.

(k) Wherever in this contract the Secretary is referred to, the term shall include his duly authorized representative.

(l) No member or delegate to Congress or Resident Commissioner shall be admitted to any share or part of this contract or to any benefit that may arise therefrom, but his restriction shall not be construed to extend to this contract if made with a corporation or company for its general benefit.

(m)This agreement may be terminated by either party upon the expiration of one year's notice in writing to the other.

IN WITNESS WHEREOF, The said parties have hereunto subscribed their names and affixed their seals (in quintuple) the day, month and year aforesaid.



MEMORANDUM OF AGREEMENT OF SEPTEMBER 1, 1956
BETWEEN THE DEPARMENT OF THE INTERIOR AND
THE ASSOCIATION FOR THE PRESERVATION OF VIRGINIA ANTIQUITIES
RELATING TO THE DEVELOPMENT AND ADMINISTRATION OF
JAMESTOWN ISLAND, JAMES CITY COUNTY, VIRGINIA

THIS AGREEMENT, Made and entered into this 1st day of September 1956, by and between the United States of America, acting in this behalf by the Secretary of the Interior, and hereinafter referred to as the "Secretary", and the Association for the Preservation of Virginia Antiquities, a corporation organized and existing under the laws of the State of Virginia, acting by and through the Board of Directors and duly authorized officials, hereinafter referred to as the "Association",

WITNESSETH:

WHEREAS, the historic structures and approximately twenty acres of land, located on the upper end of Jamestown Island, James City County, Virginia, owned by the Association for the Preservation of Virginia Antiquities, are recognized as possessing national significance as a portion of the site of Jamestown, first permanent English Settlement in North America, and such properties were designated as Jamestown National Historic Site by Secretarial Order of December 18, 1940 (5 F.R. 5282), and

WHEREAS, it is the desire of the Association and the Secretary to cooperate in a unified program of development, interpretation, and administration for the whole Jamestown Island area.

NOW, THEREFORE, in consideration of the foregoing and pursuant to the authority contained in the Act of Congress approved August 21, 1935 (49 Stat. 666) entitled "An act to provide for the preservation of historic American sites, buildings, objects, and antiquities of national significance, and for other purposes", the said parties have covenanted and agreed, and by these presents do covenant and agree to and with each other and in consideration of the mutual promises herein expressed, as follows:

ARTICLE I. The Secretary agrees, on behalf of the United States,

a. To give suitable space to the historic site in such government publications and circulars as may be printed and issued for informing the public of the Jamestown-Williamsburg-Yorktown area.

b. To cooperate with the Association in the preservation and use of the lands and historic structures constituting the national historic site, and to provide technical assistance in planning and executing measures for such preservation and use, within the limits of available appropriations.

c. In the discretion of the said Secretary, to expend such funds as may be made available by appropriation or donation, for the purpose of assisting the Association in the appropriate development and restoration of its historic structures and their surroundings as a national historic site.

d. That such artifacts as may be recovered by the National Park Service during archeological investigation of land owned by the Association shall remain the property of the Association, and may be stored in National Park Service facilities.

e. To consult with the Association in planning for future developments, whether on Jamestown Island or on the adjacent mainland, for the purpose of avoiding any development of the government property which would be disadvantageous to the Association.

ARTICLE II. The Association hereby agrees, for itself, its successors and assigns,

a. That the Association will retain and preserve in perpetuity, insofar as it is reasonably able to do so, the grounds and historic ancient structures which it now owns on Jamestown Island.

b. The Association will permit the National Park Service to undertake archeological work, including excavation, and other forms of developmental work on the above area belonging to the Association, provided the plans for such work are satisfactory to the Association.

c. The Association will permit the National Park Service personnel to enter the holdings of the Association free of charge for the purposes of historical and archeological study or for the performance of their official duties.

d. The Association will permit the National Park Service to study and measure such structures and objects as may be uncovered by archeological investigations undertaken by the National Park Service on the Association's lands and will grant to the National Park Service the first right to scientific publication of the results of such archeological investigations and studies. This shall in no way restrict the right of the Association to issue purely factual press releases.

e. The Association will give suitable space in its pertinent publications to that part of the site of Jamestown that exists outside of the Association grounds and the National Park Service will do likewise as regards the grounds and historic sites of the Association.

f. The Association will consult the National Park Service in planning future developments for the purpose of avoiding any development of the Association's property which would be disadvantageous to the National Park Service.

ARTICLE III. It is further understood and agreed,

a. That the said historic structures and lands now owned by the Association, subject to the covenants above set forth, shall remain the property of the Association to be used by it for the purpose for which the Association was formed.

b. The National Park Service will not excavate any area belonging to the Association, except after receiving the written consent of the Association, accompanied by a map showing the exact limits of the area to be studied.

c. The National Park Service will preserve any trees affected and will backfill, cover up, re-sod, or replant any trenches which it may make in pursuance of such excavations. It will make complete photographic and archeological engineering record of conditions prior to archeological trenching, and will restore the area to its original appearance on completion of the work.

d. No trees on the property of the Association shall be cut without prior consent of the Association.

e. The disposition of any human remains which may be unearthed on the property of the Association shall be subject to the prior approval of the Association, except as otherwise provided by State law.

f. When the Association deposits as a loan in the Visitor Center on Jamestown Island all, or parts, of its collection of portraits, artifacts, and other historical material concerning Jamestown, the National Park Service agrees to treat this material (whether displayed or stored) in the same manner that it treats its own.

g. Employees of the Association shall be permitted to perform such duties in the Visitor Center as may be assigned to them by the Association for the purpose of carrying out the terms of the agreement.

h. The National Park Service, as long as the Association deems it necessary and desirable, agrees to keep open a roadway to the present memorial gate, passing east of the Monument and generally paralleling the Association's east boundary.

i. The National Park Service shall make adequate arrangements to the end that the entrance gates at Glasshouse Point shall be available for ingress and egress at all times, both day and night, to the personnel of the Association and their guests, as well as to the officers and members of the Association when in residence at Jamestown.

ARTICLE IV. Fees.

a. A joint fee mutually agreeable to the contracting parties, the proceeds from which shall be divided equally between the Association and the United States shall be charged for admission to the Grounds owned by the Association and the grounds and exhibits owned by the National Park Service, such joint fee to be collected by the National Park Service for the United States and the Association. The collection of fees will be made at the Jamestown Entrance Station located on Colonial Parkway on Glasshouse Point. The Entrance Station will be operated by National Park Service uniformed personnel on a daily basis with hours to be agreed upon.

ARTICLE V. Free admissions.

a. The policy governing free admissions shall be as follows:

(1) All children 11 years or younger shall be admitted free.

(2) Organized educational groups, 18 years and younger, when accompanied by adults assuming responsibility for their safety and orderly conduct, shall be admitted free.

(3) Military personnel, when in organized educational tours, shall be admitted free.

(4) Holders of Membership Admission cards of the Association as well as holders of Official Complimentary passes of either party will be admitted free.

(5) The Association shall have the right to admit the general public without charge to its property on Jamestown Island for the annual services on May 13 and for such other purposes and on such other occasions as the officers of the Association deem proper. The Secretary shall have the right, in his discretion, to admit the general public without charge to the government property on special occasions.

(6) Deviations from the policy of free admissions as expressed herein may be made only when mutually agreeable to both parties.

ARTICLE VI. Operating costs

a. Operating costs of the fee collection station consisting of salaries of direct operating personnel (exclusive of supervision), heat, electricity, tickets, office machines necessary, shall be borne equally by the parties hereto. The entrance station building shall be constructed and maintained by the Government at no cost to the Association.

b. In the building known as the Jamestown Visitor Center, constructed by the Government on Jamestown Island, the Association shall be allotted approximately 1,225 square feet of floor space for the sale of souvenirs and the operation of a Post Office that meet Service, Association and Post Office Department standards. Heat, electricity, and janitorial services shall be provided by the Government but the costs of these services shall be borne on a pro rata basis of the floor space occupied by each party.

ARTICLE VII, Cash settlements

a. Money due the Association for its share of the entrance fees shall be paid monthly.

b. The operating costs chargeable to the Association, referred to in Article VI, shall be paid quarterly on the basis of bills rendered by the National Park Service.

ARTICLE VIII.

a. The National Park Service shall not grant or continue beyond the date of this agreement, any concession for the sale of souvenirs, post cards, etc., except (if desirable) for its own publications relating specifically to Colonial National Historical Park whether at or near the Visitor Center, except to the Association, without the consent of the Association; and the Association shall grant no concession for the sale of refreshments on its own property without the consent of the National Park Service.

b. Neither any employee of the National Park Service, nor any concessionaire under the National Park Service, other than the Association, shall be permitted by the National Park Service to maintain a United States Post Office on its property at Jamestown Island or on the mainland immediately adjacent thereto, without the consent of the Association. At the request of the Association, the Secretary will recommend to the Postmaster General that the Association or its agent be permitted to continue to operate the Post Office at or near Jamestown Island.

c. Wherever in this contract the Secretary is referred to, the term shall include his duly authorized representative.

d. No member of or delegate to Congress or resident commissioner shall be admitted to any share or part of this contract or to any benefit that may arise therefrom, but this restriction shall not be construed to extend to this contract if made with a corporation or company for its general benefit.

e. This agreement may be terminated by either party upon the expiration of one year's notice in writing to the other.

f. This agreement cancels and supersedes Contract No. I-1p-17165 dated September 6, 1940, except that the applicability of the "order designating the Jamestown National Historic Site, Virginia" by the Secretary of the Interior, Harold L. Ickes, dated December 18, 1940, shall be continued.

IN WITNESS WHEREOF, The said parties have hereunto subscribed their names and affixed their seals this the 19th Day of September 1956.

UNITED STATES OF AMERICA

By (SGD) HATFIELD CHILSON
Assistant Secretary of the Interior

ASSOCIATION FOR THE PRESERVATION OF VIRGINIA ANTIQUITIES

By (SGD) JANIE B. LAMB
President

Attest: (SGD) WARFIELD C. HAW
Secretary

STATE OF VIRGINIA
CITY OF RICHMOND, to-wit:

I, Mozelle B. Gunn, a Notary Public in and for the City and State aforesaid, do hereby certify that Janie B. Lamb, President, and Warfield C. Haw, Secretary, of the Association for the Preservation of Virginia Antiquities, whose names are signed to foregoing agreement dated September 1, 1956, in accordance with a resolution of said Association, have acknowledged the same before me in my City and State aforesaid.

Given under my hand this 19th day of September 1956.

My Commission expires 4-19-58.

(SGD) MOZELLE B. GUNN
Notary Public

MEMORANDUM OF AGREEMENT

BETWEEN

THE UNITED STATES DEPARTMENT OF THE INTERIOR

NATIONAL PARK SERVICE

AND

THE ASSOCIATION FOR THE PRESERVATION OF VIRGINIA ANTIQUITIES

This Amendment Number 1 incorporates the following changes into Memorandum of Agreement Number MOA 4290-97-006, dated February 4, 1997, between the Association for the Preservation of Virginia Antiquities (hereinafter APVA), and the United States of America, U.S. Department of the Interior, National Park Service (hereinafter Service) this 25th day of August, 1997.

Under “ARTICLE II: STATEMENT OF WORK", after paragraph I, add the following paragraph:

“a. The Jamestown/Yorktown Joint Admission, which admits visitors to both the Yorktown and Jamestown fee areas of the Colonial National Historical Park, shall be $7.00 per adult, ages 17 and above. The fee shall be split as follows:

(1) Jamestown/Yorktown Joint Admissions sold at Jamestown; $2.50 goes to APVA, and $4.50 goes to the Service.

(2) Jamestown/Yorktown Joint Admissions sold at Yorktown; $2.00 goes to APVA, and $5.00 goes to the Service."

Under “ARTICLE V: PAYMENT AND BILLS", paragraph A, change the paragraph to read as follows:

“A. The Service shall deduct fifty (50%) percent of the total cost of fee collection including but not limited to collection, depositing, accounting, utilities, and housekeeping of the entrance station from the APVA's share of the fees. The APVA may pay up to 50% for the cost of improvements to the entrance station and related entrance station expenses such as purchases of new cash registers and credit card machines. The Service shall consult with the APVA prior to making any such obligations."

AUTHORIZING SIGNATURES

IN WITNESS WHEREOF, the parties hereto have caused this Agreement Amendment to be executed by their respective duly authorized officers or representatives the day and year written below.

THE ASSOCIATION FOR THE PRESERVATION FOR VIRGINIA ANTIQUITIES

_____

Peter Dun Grover, Executive Director Date

APVA/NPS AGREEMENT FOR JAMESTOWN

The Association for the Preservation of Virginia Antiquities (APVA) and the National Park Service (NPS) met on July 22. 1999, at the Cosmos Club, Washington, D.C., and agreed on the goals, principles and statements described below.

The following persons were in attendance: Carlton Abbott, Michael Adlerstein, Alee Gould, Peter Grover, Joe Gutierrez, Heather Huyck, Martin King, Linda Neal, Marie Rust, Alan Voorhees, Michael Westfall, Andy Williams.

Physical infrastructure:

- Develop gateway at Neck of Land.
- Remove existing Visitor Center.
- Continue to keep and use Yeardly House & Dale House (specific possible uses discussed; not determined. Yeardly House probably used as part of research campus).
- No additional parking/facilities there; look to remove APVA maintenance building later.
- Research campus: 2 sites (I probably Yeardly House) linked by pedestrian walkway; Yeardly House could have conference space, offices, library; building adjoining Visitor Center would house both APVA and NPS collections; same building, different storage spaces. Or could do archeology staging out of Yeardly House.
- Preserve sanctity of land; new buildings should not intrude.
- Townsite should have town grid on it and landscape should reflect "bustling town, not a meadow."
- Need to convey the size and scale and change over time of the town.
- Townsite will not have permanent structures or reconstructions, although "suggestions" okay.
- Interpretive tour must include townsite as well as earlier areas.
- Develop multi-modal integrated transportation system: bike, car, boat & electric tram (shuttle system).
- Facilities and programs will be developed ONLY if they fit into the overall master plan for Jamestown.
- Do joint (APVA-NPS-JYF) transportation study.
- Develop seamless exhibit areas [visitors should not see what's NPS/ what's APVA].
- Be careful not to introduce landscape materials that aren't indigenous; use native species.
- Statehouse will not be reconstructed, but site will be interpreted—representative government.

Interpretation:

- Interpretive program should reflect the principle: "Everybody is relevant to Jamestown; Jamestown is relevant to everybody."
- Present "sweep of history": Jamestown as 100 years, 1607-1699. (Jamestown Settlement planning to take a more anthropological approach of the interaction/lifeways of the different cultural groups.)
- Present a sense of "ongoing discovery" —future research needs to be easily incorporated into interpretation.
- Interpretive Plan: research, landscape, "peopling", flexibility, use of technology (i.e., handheld computers—Little Bighorn Battlefield National Memorial example).
- Do joint interpretive plan with a multidisciplinary team, and coordinate with JYF.
- Needs to be compelling story.
- Needs to make emotional connection for the visitor —NOT boring —with triumph, tragedy, diversity, commerce, religion, etc.
- Interpretive story needs to include slavery, representative government's development, interaction of all kinds of people.
- Consider a model: 92 years in 90 seconds; layering of history and evolution of townsite.
- Need consistent interpretive format (preferably shared with Jamestown Settlement as well); esthetics should be same.
- Present why APVA/NPS on Jamestown Island and the history of their preservation efforts.

Research:
- Open question is how much public access to research, but agreement that there should be some public access (i.e., open storage as at Santa Fe museum, where secure drawers used to store objects in museum collection visitors could more directly see).
- Do joint (APVA, NPS, JYF) Scholars Committee.
- Types of Research = history, archeology, science (drought study, hydrology of river study).
- Keep museum collections on the Island.
- Co-locate but don't co-mingle collections of NPS/APVA: researchers should be able to study items from both collections in a convenient way (but maintain respective provenance).

Visitors:
- Have one (APVA-NPS-JYF) marketing voice/ one positioning slogan.
- Work together on joint commercial services with Settlement as much as possible.
- APVA/NPS to continue sharing gift shop, splitting the profits 50-50 and avoiding offensive items.
- Encourage visitors to go both places (Settlement/Island); convey the sense that the experience is not complete without both.
- Coordinate transportation and circulation with the Settlement as much as possible —look at joint bus parking (Settlement/Island).
- Use parking/shuttle to encourage visitors to go both places easily.
- Provide "triangle" of refreshments; consider having shared concessioner with Jamestown Settlement.
- Food services should be simple, such as box lunches - easily brought in/disposed, no cooking on site, not high end.
- Explore with Jamestown-Yorktown Foundation the option of selling a combined ticket to both Island and Settlement in addition to offering separate tickets.

Management:
- Goal is maximum practicable cooperation between NPS/APVA.
- Programs will be developed/designed first; these will inform the development of a NPS-APVA management structure, responsibilities and legal agreements.

Policies for Partnership:
- No surprises.
- Decisions will be made jointly by NPS, APVA (and JYF as applicable).
- Once group decisions are made, individuals need to support decisions.
- Key decisions will be in the form of written agreements and circulated to all relevant parties.
- No individual lobbying.
- Agreements will be signed and carried out by COLO Superintendent and APVA Executive Director (some agreements may also have NPS Regional Director and APVA President's signatures as deemed necessary).

The undersigned agree to these goals, principles and statements.

Peter Grover Date
Executive Director
Association for the Preservation of
Virginia Antiquities

Alec Gould 9/9/99 Date
Superintendent
Colonial National Historical Park

Martin King Date
President
Association for the Preservation of
Virginia Antiquities

Marie Rust 9/14/99 Date
Regional Director
National Park Service, Northeast Region

COOPERATIVE AGREEMENT
CA4560A0021
between the
UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
and the
ASSOCIATION FOR THE PRESERVATION OF VIRGINIA ANTIQUITIES

Project Title: Jamestown Redevelopment-Planning, Design and Construction Agreement

THIS AGREEMENT is made and entered into between The Association for the Preservation of Virginia Antiquities, hereinafter also called APVA, and the United States Department of the Interior, National Park Service, hereinafter also called NPS.

ARTICLE I, BACKGROUND AND OBJECTIVES

WHEREAS, Colonial National Historical Park (the Park) was established pursuant to the Act of July 3, 1930,46 Stat. 855, 16 U,S,C, § 81, ct seq., for the purpose of preserving the historic structures and remains within the Park and for the benefit and enjoyment of the people; and

WHEREAS, The Park consists of several major elements; Jamestown Island; including the townsite of Jamestown; Yorktown and the Yorktown Battlefield; and Colonial Parkway, as well as other properties such as the Green Spring plantation site, Cape Henry and Swann's Point; and,

WHEREAS, The National Park Service identified in its 1993 General Management Plan the need to continue and strengthen the “joint management of Jamestown" with the Association for the Preservation of Virginia Antiquities and to do joint management planning for the future of Jamestown; and,

WHEREAS, the APVA is a private, non-profit membership organization, was established m 1889, and is incorporated and doing business under the laws of Commonwealth of Virginia: and,

WHEREAS, APVA's mission is to preserve, interpret and promote significant Virginia landmarks for future generations including that portion of Jamestown Island which is owned in fee by the APVA; and,

WHEREAS, NPS and APVA developed a draft Master Plan in October 1999 which describes the goals, principles, and concepts for 2007 and beyond; and,

WHEREAS, the Historic Sites Act of 1935 provides that the Secretary of the Interior may contract and make cooperative agreements with associations and others to protect, preserve, maintain, or operate historic sites for public use and may cooperate with and accept the assistance of associations and others; and,

WHEREAS, on December 18, 1940 the Secretary of the Interior, under The Historic Sites Act of 1935, issued an "Order Designating the Jamestown National Historic Site" for APVA property and referenced the 1940 cooperative agreement between NPS and APVA which called for "a unified program of development and administration for the whole of Jamestown Island;" and,

WHEREAS, subsequent agreements between NPS and APVA in 1956 and 1999 called for a "unified program of development, interpretation, and administration" and pledged maximum practical cooperation between NPS and APVA for resource preservation, visitor service, research, development, and cooperation with neighbors; and,

WHEREAS, 16 lLS.C, § If, Challenge Cost-Share Agreement Authority, gives the Secretary of the Interior authority to enter into agreements with any cooperator for the purpose of sharing costs or services in carrying out authorized functions and responsibilities of the Secretary with respect to any unit or program of the National Park System and any affiliated area; and

WHEREAS, pursuant to 16 U.S.C. § lg, the National Park Service may in fiscal year 1997 and thereafter enter into cooperative agreement that involve the transfer of National Park Service appropriated funds to State, local and tribal governments, other public entities, educational institutions, and private nonprofit organizations for the public purpose of carrying out National Park Service programs pursuant to 31 U.S.C. 6305 to carry out public purposes of National Park Service programs.

NOW, THEREFORE, in consideration of the mutual covenants hereinafter contained, the parties hereto agree to collaborate and cooperate with each other to better protect the cultural and natural resources of Jamestown Island and to enhance the education and interpretive programs for the public by engaging the services of professional firms with expertise in architectural and engineering, interpretation and exhibits, and related fields, to assist APVA and NPS in planning, designing, monitoring construction of and preparing environmental analyses for resources, facilities, transportation and programs for all of Jamestown Island and the surrounding area. The products of this work will include but not be limited to a Development Concept Plan, an Environmental Impact Statement, an Interpretation and Exhibit Plan, pro-design and design services, construction documents preparation and provision of design services related to construction and construction monitoring.

ARTICLE IL STATEMENT OF WORK

A- NPS agrees to:

1. Collaborate with APVA in the selection of firms to perform the work, contract negotiations including hiring of firms, reviewing materials, attending work sessions, providing staff and expertise to further the work effort, and in all ways to assist the furtherance of the project

2. Actively participate in all phases of the planning, design and NEPA processes. Collaborate with APVA in the development, review and approval of each element of each consultant's work. Be receptive to using the best of APVA ways of doing business in combination with NPS planning, design, and review processes to achieve high quality results.

3. Provide the APVA with all necessary information concerning NPS policies and procedures that must be followed for this Project.

4. Provide APVA with NPS technical expertise as necessary and appropriate.

5. Identify four (4) NPS representatives to consistently participate with the APVA on all matters covered by this Agreement.

B. APVA agrees to:

1. Collaborate with NPS in the selection of firms to perform the work, contract negotiations including hiring of firms, reviewing materials, attending work sessions, providing staffed expertise to further the work effort, and in all ways to assist the furtherance of the project

2. Actively participate in all phases of the planning, design, construction and NEPA processes. Collaborate with NPS in the development, review and approval of each element of the consultant’s work. Be receptive to combining the best of NPS planning, design and review processes with APVA ways of doing business to achieve high quality results

3. Provide NPS will all necessary information concerning APVA policies and procedures that must be followed for this Project.

4. Identify four (4) APVA representatives to consistently participate with NPS on all matters covered by this Agreement.

C. APVA and NPS both agree to:

1. Develop a team of NPS and APVA representatives who will direct and manage the work described in this Cooperative Agreement, develop a schedule and budget for the completion of the work and communicate on a regular basis to carry out the work.

2. Jointly prepare a scope of work for each phase of this project. This description of tasks to be accomplished, broken down into appropriate divisions for the sake of review and approval, will be jointly prepared and agreed upon in a timely fashion, (with the assistance, as appropriate, of the consultant firms) to expedite the work,

ARTICLE III**.** TERMS OF AGREEMENT

Unless earlier terminated by operation of the terms of this agreement or by agreement of the parties in writing, this Agreement shall remain in force through December 31,2008,

ARTICLE IV. KEY OFFICIALS

The personnel specified below are considered to be essential to ensure maximum coordination and communication between the APVA and NPS and the work being performed hereunder. Either APVA or NPS, on notice to the other party, may designate another person or persons to act in his/her place in an emergency or otherwise. Permanent changes of key personnel must be made in writing to all parties signatory to this agreement,

A.

The key officials for the

National Park Service are:

Mr. Alee Gould .
Superintendent
Colonial National Historical Park
Post Office Box 210
Yorktown, VA 23690

Tel: (757) 898-3400

Dr, Heather Huyck
Jamestown 400th Project Director •
Colonial National Historical Park
Post Office Box 210
Yorktown, VA 23690
Tel: (757) 564-0896

Ms. Linda Maiden
Contracting Officer
Philadelphia Support Office
U.S. Custom House ,
200 Chestnut Street

B.

The key officials for the APVA are:

Mr. Peter Grover
Executive Director
APVA
204 West Franklin Street
Richmond, VA 23220
Tel: (804)648-1889

Ms. Elizabeth Kostehy
Director of Operations and Finance
204 West Franklin Street
Richmond, VA 23220
Tel: 804-648-1889

Mr. Peter LC. Kaowles 11
President of the Board of Trustees
204 West Franklin Street
Richmond, VA 23220

ARTICLE V. AWARD, PAYMENT ~INVOICES

For the initial phase of this work, NPS will provide funding not to exceed $100,000 through account number 4290-2016-CMZ, Object Class 412A.; and APVA will provide $300,000. The commitment of additional funds in furtherance of this Agreement shall be authorized by individual amendments. When the work to be accomplished and the work program .are mutually agreed upon by both parties, an appropriate amendment shall be consummated, obligating funds. '

In accordance with OMB Circular A-102 or A-110, as appropriate, invoices and other required supporting statements or certificates (all properly identified with the agreement number, the name of the National Park Service Key Official and, where applicable, the amendment number) will be submitted by the APVA to the NPS Contracting Officer at the address shown on the signature page of this agreement.

These provisions include the following:

> Reimbursement claims 'should be submitted on Standard Form 270 (Request for Advance or Reimbursement) or other format as approved by the Contracting Officer, in an original and one copy.
>
> Advances of actual funds shall be requested by submittal of a Standard Form 270, (Request for Advance or Reimbursement), in an original and one copy.
>
> The disposition of advanced funds shall be reported quarterly by submittal of Standard Form 272, Federal Transaction Report. This form must be submitted within 15 days after the end of each calendar quarter in which funds remain outstanding.

Travel: (Not applicable to this Agreement)

ARTICLE VI. PRIOR APPROVAL

Prior to diverting any specified key official to other programs, the APVA and/or National Park Service shall notify the signatories reasonably in advance and shall submit a justification (including proposed substitutions) in sufficient detail to permit evaluation of the impact on the program. No substitution will be made without the written consent of the signatories. Such approval will not be unreasonably withheld.

In accordance with 0MB Circular A-102 or A-l10 and the "Common Rule", 43 CFR Part 12., Subpart C, Paragraph 12.70:

> Partners are permitted to re-budget within the approved direct cost budget to meet unanticipated requirements and may make limited program changes to the approved project. However, certain types of post-award changes in budgets and projects shall require the prior written approval of the signatories as follows:
>
> (a) Budget changes-non-construction: (1) Any revision which would result in the need for additional funding; (2) Cumulative transfers among direct cost categories, which exceed or are expected to exceed ten percent of the current total approved budget; or (3) any transfer of funds allotted for training allowances,
>
> (b) Programmatic Changes: (1) Any revision of the scope or objectives of the project (regardless of whether there is an associated budget revision which requires prior approval); (2) Need to extend the period of availability of funds; (3) Changes to key personnel (see above); and (4) Contracting out or otherwise obtaining the services of a third party to perform activities which are central to the purpose of the award and are not included in the Scope of Work.

ARTICLE VII. REPORTS AND/OR DELIVERABLES

As the performing organization under this Agreement, APVA shall follow the procedures set forth in OMB Circular A-102 or A-110, as appropriate. Reports shall be submitted to the NPS Contracting Officer.

Performance Reports: APVA and NPS shall submit a joint annual performance report to the signatories. For multi-year projects, a final performance report shall be submitted 90 days after the expiration or termination of the agreement.

Financial Reports: (1) APVA shall submit to the NPS Contracting Officer Standard Form 269 or 269A, Financial Status Report, which details program outlays and program income, on an annual basis; and (2) for agreements which are paid in advance, APVA shall submit Standard Form 272, Federal Cash Transactions Report no later than 15 working days following the end of each quarter.

ARTICLE VIII. PROPERTY UTILIZATION AND DISPOSITION

It is not anticipated that the National Park Service will provide equipment or that equipment will be purchases as this agreement.

ARTICLE IX. TERMINATION

While it is the express intent of both parties that the activities described under this agreement continue uninterrupted, this agreement may be terminated in accordance with the provisions set forth with 43 C.F.R. Part 12 which provides as follows:

Awards to Institutions of Higher Education, Hospitals and Other Non-Profit Organizations may be terminated in whole or in part only if paragraph (1), (2), or (3) of this section applies.

(1) By the Federal awarding agency, if a recipient materially fails to comply with the terms and conditions or an award.
(2) By the Federal awarding agency with the consent of the recipient, in which case the two parties shall agree upon the termination conditions including the effective date and, in the case of partial termination, the portion of be terminated.
(3) By the recipient upon sending to the Federal awarding agency written notification setting forth the reasons for such termination, the effective date, and in the case of partial termination, the portion to be terminated. However, if the Federal awarding agency determines in the case of partial termination that the reduced or modified portion of the grant will not accomplish the purposes for which the grant was made, it may terminate the grant in its entirety under either paragraph (a) (1) or (2) of this section.

ARTICLE X. GENERAL AND SPECIAL PROVISIONS

A. GENERAL PROVISIONS

1. This agreement shall be subject to the following provisions which are incorporated herein by reference:

(a) If the cooperator is an institution of higher education, hospital and/or other nonprofit organization:

i. OMB Circular A-110, "Grants and Agreements with Institutions of Higher Education, Hospitals, and other Nonprofit Organizations" and

ii. OMB Circular A-133, "Audits of States, Local Governments and Non-Profit Organizations. And

iii. Not applicable to this Agreement. Or

iv. OMB Circular A-122, "Cost Principles for Nonprofit Organizations".

2. Additional Provisions which apply to all cooperators include:

a. 43 CFR Part 12 including

(1) Applicability of various OMB circulars

(2) Administrative requirements

(3) Government Debarment and Suspension

(4) Drug-Free Workplace Requirements

(5) Buy American Requirements for Assistance Programs

b. 43 CFR Part 18, Restrictions on Lobbying Disclosure Requirements

c. MBE/WBE Utilization Under Federal Grants, Cooperative Agreements, and other Federal Assistance Agreements, 505 DM 3.1-3.5C(1)(A) or 5.1-5.6E(1), as appropriate.

d. Limitations on Payments to Influence Certain Federal Transactions, FAR 52.203-12

e. Non-discrimination Requirements. All activities pursuant to this Agreement and the provisions of Executive Order No. 11246, 3 CFR 339 (1964-65) shall be in compliance with the requirements of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42

USC Section 2000 et seq.); Title V, Section 544 of the Rehabilitation Act of 1973 (87 Stat, 394; 29 USC Section 794); the Age Discrimination ACT of 1975 (89 Stat 728; 42 USC Section 6101 et seq.): and with all other Federal laws and regulations prohibiting discrimination on the grounds of race, color, national origin, handicap religious or sex in providing for facilities and service to the public,

3. The following certifications are required in accordance with the above provisions and are attached hereto and made a part of this agreement (the blue pages must be filled out, signed as appropriate, and returned with the signed agreement):

a- Certifications Regarding Debarment, Suspension and Other Responsibility Matters, Drug-Free Workplace Requirements and Lobbying (Attachment A, Dl-2010, 3 pages). Note various segments and alternatives: Part A should be prepared by each partner plus Part B by any "Lower Tiered Party" (sub-contractors, sub-consultants; NOT employees) to this agreement; Part C, if other than an individual or .Part D, if an individual; plus "Part E for all agreements which will exceed $100,000 Federal assistance.

b. Disclosure of Lobbying Activities (Attachment B, Standard Forms LLL and LLL-A, 3 pages) for all partners completing Attachment A, Part B,

B. SPECIAL PROVISIONS

1. Availability of Funding

This agreement and the obligations of the NPS hereunder shall be subject to the availability of funding,

and
nothing herein contained shall be construed as binding the NPS to expend in one fiscal year any sum in excess of appropriations made by Congress or administratively allocated for the purpose of the agreement for the fiscal year, or to involve the NPS in any contract or other obligation for the further expenditure of money in excess of such appropriations or allocations.

2. Public Information

a. Promotions

The APVA shall not publicize, or otherwise circulate, promotional material (such as advertisements, sales brochures, press releases, speeches, still and motion pictures, articles, manuscripts or other publications) which states or implies Federal Governmental, Departmental, Service or Federal Government employee endorsement of a product, service, or position which the APVA represents. No release of information relating to this agreement may state or imply that the Government endorses the APVA's work product as superior to other products or services.

b. Federal Disclaimer

The APVA will ensure that all information submitted for publication or other public releases of information regarding This project shall carry the following disclaimer. The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the U.S. Government

c. Public Information Releases

APVA must obtain prior approval from a National Park Service Key Official for any public information releases which refer to the Department of the Interior, the National Park Service, any sub-unit or employee thereof (by name or title), or this agreement The specific text, layout, photographs, etc., of the proposed release must be submitted, with a request for approval, to the person designated as a key official for the NPS in Article IV of this agreement.

d. Publication of Study Results

No party shall unilaterally publish a joint publication without consulting the other party. This restriction does not apply to popular publication of previously published technical matter. Publications pursuant to this Agreement may be produced independently or in collaboration with others, however, in all cases proper credit will be given to the efforts of those parties contributing to the publication. In the event no Agreement is reached concerning the manner of publication or interpretation of results, either parry may publish data after due notice and submission of the proposed manuscripts to the other. In such instances, the party publishing the data will give due credit to the cooperation but assume full responsibility for any statements on which there is a difference of opinion.

3. Direct Benefit Clause

No Member of. Delegate to, or Resident Commissioner in, Congress shall be admitted to any share or part of this Agreement or to any benefit to arise therefrom, unless the share or part or benefit is for the general benefit of a corporation or company.

4. Lobbying Prohibition: The parties will abide by the provisions of 18 U.S.C. 1913 (Lobbying with Appropriated Moneys), which states:

> No part of the money appropriated by any enactment of Congress shall, in the absence of express authorization by the Congress, be used directly or indirectly to pay for any personal service, advertisement, telegram, telephone, letter, printed or written matter, or other device, intended or designed to influence in any manner a Member of Congress, to favor or oppose, by vote or otherwise, any legislation or appropriation by Congress, whether before or after the introduction of any bill or resolution proposing such legislation or appropriation, but this shall not prevent offices of employees of the United States or of its departments or agencies from communicating to Members of Congress on the request of any Member or to Congress, through the proper channels, requests for legislation or Appropriations which they deem necessary for the efficient conduct of the public business,
>
> Whoever, being an officer or employee of the United States or of any department or agency thereof, violates or attempts to violate this section shall be fined not more than $500 or imprisoned not more than one year, or both; and after notice and hearing by the superior officer vested with the power of removing him, shall be removed from office or employment.

5. Indemnification

This Agreement is in consideration of and upon the express condition that the United States of America, its agents and employees shall be free from all liabilities and claims for damages and/or suits for or by reason of any injury to any person or property of any kind whatsoever, whether to the person or property of APVA or third parties, from any cause(s) whatsoever arising from any act or omission performed by or attributable to employees or representatives of the APVA undertaken pursuant to this Agreement, and that APVA hereby covenants and agrees to release, indemnify, defend, save and hold harmless the United States, its agents and employees from all such liabilities, expenses and costs on account of or by reason of any injuries, deaths, liabilities, claims, suits or losses however occurring or damages arising out of the same.

6. Insurance and Related Liability

The APVA shall be fully responsible for the acts and omissions of its representatives, employees, contractors and subcontractors connected with the performance of this agreement and shall:

a. Procure and maintain during the term of the agreement, insurance in a form satisfactory to the NPS Contracting Officer and by an insurance company acceptable to the NPS Contracting Officer. The policies shall name the United States as an additional insured, shall specie that the primary insured shall have no right of subrogation against the United States for payments of any premiums or deductibles due thereunder, and shall specie that the insurance shall be assumed by, be for the account of, and be at the primary insured's sole risk. The amounts of the insurance shall not be less than as follows:

(1) Workman's Compensation and Employer's Liability Insurance: Compliance with applicable Federal and State worker's compensation and occupational disease statutes shall be required. Employer's liability coverage in the minimum amount established by state law.

(2) General Liability Insurance: General liability insurance in the minimum amount of one million dollars ($1,000,000) per person for any one claim and an aggregate limitation of three million dollars ($3,000,000) for any number of claims arising from any one incident.

(3) Automobile Liability Insurance: This insurance shall be required on the comprehensive form of the policy and shall provide for bodily injury and property damage liability covering the operation of all licensed motor vehicles used in connection with performing the agreement. The minimum limits of two hundred thousand dollars (S200,000) per person and five hundred thousand dollars ($500,000) per occurrence for bodily injury and twenty thousand dollars ($20,000) per occurrence of property damage shall be required.

b. Pay the United States the full value for all damages to the lands or other property of the United States caused by such person or organization, its representatives, or employees.

7. Consistency with Public Laws

This agreement is subject to all laws, regulations and policies governing the NPS whether now in effect or hereafter adopted.

8. Volunteers in the Park (Not applicable to this Agreement)

ARTICLE XI. ATTACHMENTS AND APPENDICES

This agreement shall be subject to the following appendices which are attached hereto and incorporated herewith by reference, except as amended or waived by joint agreement:

1. Attachment A - Certification Regarding Debarment, Suspension, and Other Responsibility Matters, Drug-Free Workplace Requirements and Lobbying, Dl-2010.
2. Attachment B - Disclosure of Lobbying Activities, SF-LLL and SF-LLL-A.

ARTICLE XII. DISPUTE RESOLUTION

APVA and NPS agree to collaboratively carry out the work described in this Agreement and to resolve any issues that could adversely affect the achievement of Agreement goals. To carry out the terms of this Agreement, APVA and NPS have named Key Officials (see Article IV), In addition, APVA and NPS will each appoint additional representatives to participate in the selection, hiring, contract negotiation and subsequent management of planning, design and construction consultants. These representatives will have the responsibility for reaching group consensus on a variety of issues and obtaining approvals from the others at APVA and NPS when necessary. Disputes will be resolved among these representatives whenever possible. If a resolution cannot be reached at this level, the issue will be resolved through non-binding mediation.

ARTICLE XIII. AUTHORIZING SIGNATURES

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed by their respective duly authorized officers or representatives the day and year written below.

ASSOCIATION FOR THE PRESERVATION OF VIRGINIA ANTIQUITIES

By: _____ Date
Mr. Peter Grover
Executive Director
204 West Franklin Street
Richmond, VA 23220
Tel: 804-648-1889

By: _____ 6/1/00 Date
Ms. Elizabeth Kostelny
Director of Operations and Finance
204 West Franklin Street
Richmond, VA 23220
Tel: 804-648-1889

By: _____ 6/5/00 Date
Peter I.C. Knowles II
President of the Board of Trustees
204 West Franklin Street
Richmond, VA 23220
Tel: 804-648-1889

NATIONAL PARK SERVICE

By: _____ 6/20/00 Date
Mr. Alec Gould
Superintendent
Colonial National Historical Park
P.O. Box 210
Yorktown, VA 23690
Tel: 757-898-3400

By: _____ 6/20/00 Date
Dr. Heather Huyck
Jamestown 400th Project Director
Colonial National Historical Park
P.O. Box 210
Yorktown, VA 23690
Tel: 757-564-0896

By: _____ 6/22/00 Date
Ms. Linda Malden
Contracting Officer
Philadelphia Support Office
U.S. Custom House
200 Chestnut Street
Philadelphia, PA 19106
Tel: 215-597-0055

B

Appendix B:
Legislation, Regulations, and Guidelines

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Legislation, Regulations, and Guidelines

SEVENTY-FIRST CONGRESS. Sess. II. Chs. 836, 837. 1930.

July 3, 1930.
[H. R. 12235.1]
[Public No. 510.]

CHAP. 837 –An Act To provide for the creation of the Colonial National Monument in the State of Virginia, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of American in Congress assembled, That upon proclamation of the President, as herein provided, sufficient of the areas hereinafter specified for the purposes of this Act shall be established and set apart as the Colonial National Monument for the preservation of the historical structures and remains thereon and for the benefit and enjoyment of the people.

Colonial National Monument, Va.
Lands set apart for.
Post, p. 3041.

SEC. 2. That the Secretary of the Interior be, and he is hereby, authorized and directed to make an examination of Jamestown Island, parts of the city of Williamsburg, and the Yorktown battle field, all in the State of Virginia, and areas for highways to connect said island, city, and battle field with a view to determining the area or areas thereof desirable for inclusion in the said Colonial National Monument, not to exceed two thousand five hundred acres of the said battle field or five hundred feet in width as to such connecting areas, and upon completion thereof he shall make appropriate recommendations to the President, who shall establish the boundaries of said national monument by proclamation: *Provided,* That the boundaries so established may be enlarged or diminished by subsequent proclamation or proclamations of the President upon the recommendations of the Secretary of Interior, any such enlargement only to include lands donated to the United States or purchased by the United States without resort to condemnation.

Examination of designated areas for inclusion.

Boundaries established by proclamation.
Post, p. 1669.
Proviso.
Are may be increased, etc.

SEC 3. That the Secretary of the Interior be, and he is hereby authorized to accept donations of land, interest in land, buildings, structures, and other property within the boundaries of said monument as determined and fixed hereunder and donations of funds for the purchase and/or maintenance thereof, the evidence of title to such lands to be satisfactory to the Secretary of the Interior: *Provided,* That he may acquire on behalf of the United States by purchase when purchasable at prices deemed by him reasonable, otherwise by condemnation under the provisions of the Act of August 1, 1888 (U.S.C., title 40, secs. 257, 258; 25 Stat. 357), such tracts of land within the said monument as may be necessary for the completion thereof: *Provided further,* That condemnation proceedings herein provided for shall not be had, exercised, or resorted to as to lands belonging to the Association for the Preservation of Virginia Antiquities, a corporation chartered under the laws of Virginia, or to the city of Williamsburg, Virginia, or to any other lands in said city except such lands as may be required for a

Procisos.
Acquisition of land within monument.
Vol 25, p. 357.
U.S.C., p. 1302

Lands exempt from condemnation proceedings.

right of way not exceeding two hundred feet in width through the city of Williamsburg to connect with highways or parkways leading from Williamsburg to Jamestown and to Yorktown.

Sum authorized.
Post, p.1490, amended.
Purposes

SEC 4. That there is hereby authorized to appropriated, out of any money in the Treasury not otherwise appropriated, such sums not exceeding $500,000 as may be necessary to carry out the provisions of this Act, to be available for all expenses incident to the examination and establishment of the said Colonial National Monument and the protection and maintenance of lands and of buildings as acquired and/or constructed, as well as for the acquisition of lands needed for the completion of the monument, including the securing of options and other incidental expenses.

Adminstration, etc.

SEC 5. That the administration, protection, and development of the aforesaid national monument shall be exercised under the direction of the Secretary of the Interior by the National Park Service, subject to the provisions of the Act of August 25, 1916, entitled "An Act to establish a National Park Service (U.S. C., title 16, secs. 1-4; 39 Stat. 535), and for other purposes," as amended.

Vol. 39, p. 535.
U.S.C., pg. 389

Jurisdiction, etc., of Virginia in monument.

SEC 6. That nothing in this Act shall be held to deprive the State of Virginia, or any political subdivision thereof, of its civil and criminal jurisdiction in and over the areas included in said national monument, nor shall this Act in any way impair or affect the rights of citizenship of any resident therein; and save and except as the consent of the State of Virginia may be hereafter given, the legislative authority of said State in and over all areas included within said national monument shall not be diminished or affected by the creation of said national monument, nor by the terms and provisions of this Act: *Provided,* That any rules and regulations authorized in section 5, and in the Act therein referred to, shall not apply to any property of a public nature in the city of Williamsburg, other than property of the United States.

Prociso.
Rules, etc., authorized herein, not applicable to property of Williamsburg.

Revenues from lands, etc., donated by, to accrue in part to.

SEC 7. In the event that lands and/or buildings, structures, and so forth, within the city of Williamsburg are donated to the United States and are thereafter revenue producing, the United States shall pay in the treasury of the city of Williamsburg 25 per centum of any rental included in said revenues, and 25 per centum of the net proceeds of any commercial enterprise there conducted by the United States, such payment into the treasury of the city of Williamsburg not to exceed $20,000 in any year.

Limit

Approved, July 3, 1930.

[PUBLIC-No. 666-74th CONGRESS]

[H.R. 5722]

AN ACT

To provide for the addition or additions of certain lands to the Colonial National Monument in the State of Virginia.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Interior be, and he is hereby, authorized, in his discretion to acquire by purchase and/or accept by donation, in behalf of the United States, such lands, easements, and buildings comprising the former Governor Berkeley's mansion and homestead in James City County and Carter's Grove mansion and homestead in the same county, and the Rosewell mansion and homestead in Gloucester County as are desirable for the proper rounding out of the boundaries and for the administrative control of the Colonial National Monument, and such lands as are necessary for parkways, not to exceed five hundred feet wide, to connect said mansions to the said Colonial National Monument, the title and evidence of title to lands acquired to be satisfactory to the Secretary of the Interior: Provided, That the said acquisition of lands and/or improvements shall be made only from such funds as may be appropriated pursuant to the authorization of the Act of March 3, 1931 (46 Stat. 1490).

SEC. 2. That the area now within the Colonial National Monument, together with such additions as may hereafter be made thereto, pursuant to section I hereof, shall be known as the "Colonial National Historical Park", under which name the aforesaid national park shall be entitled to receive and to use all moneys heretofore or hereafter appropriated for the Colonial National Monument.

SEC. 3. All Acts or parts of Acts inconsistent with the provisions of this Act are hereby repealed to the extent of such inconsistency.

Approved, June 5, 1936.

Public Law 448 – 84th Congress
Chapter 105- 2nd Session
H.R. 5280

AN ACT

To authorize land exchanges for purposes of Colonial National Historical Park in the State of Virginia; to authorize the transfer of certain lands of Colonial National Historical Park, in he State of Virginia, to the Commonwealth of Virginia; and for other purposes.

Colonial National Historical Park, VA Land exchanges.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled. That for the purpose of preserving more effectively for he public benefit the historic properties within Colonial National Historical Park, Virginia, the Secretary of the Interior is authorized to consummate desirable land exchanges, as hereafter prescribed, and thereby to reduce and adjust the boundaries of the park. Any lands eliminated from the park hereunder shall not subsequently be added to the park except by Act of Congress.

In furtherance of these purposes, the Secretary is authorized on behalf of the United States to accept from grantors title to non-Federal land and interests in land, together with the improvements thereon, situated within the authorized park boundaries, and in exchange therefore, to convey to deed on behalf of the United States to the aforesaid grantors land or interests therein, together with the improvements thereon, situated within Colonial National Historical Park that may be used advantageously for exchange purposes. The aforesaid exchanges are authorized to be made without additional compensation by either party to the exchange when the properties to be exchanged are of approximately equal value. When, however, the properties are not of approximately equal values, as may be determined by the Secretary, an additional payment of funds shall be required by the Secretary or by the grantor of non-Federal properties, as the case maybe in order to make an equal exchange. The Secretary is authorized to use any land acquisition funds relating to the National Park System for such purposes. The Secretary may consummate land exchanges herein authorized upon such terms, conditions, and procedures as he may find to be necessary or desirable in carrying out the purposes of this Act: an in evaluating non-Federal properties to be acquired hereunder he is authorized to make such allowance as he may find to be equitable for the value of any residential properties that may be situated upon land to be acquired pursuant to this Act. If expedient and in the public interest to do so, he may assist in the removal of structures from property to be acquired hereunder through the exchange procedures, and he may cooperate with public or private agencies and persons in the securing of housing for the aforesaid grantors who may require new housing accommodations or facilities as a result of the land exchanges herein authorized.

70 Sat. 61.
70 Stat. 62.

SEC. 2. The Secretary is further authorized to transfer without compensation up to fifteen acres of the Colonial National Historical Park, Virginia, to the Commonwealth of Virginia for use by agencies of the Commonwealth in the establishment of a State Park in furtherance of the purposes of the Colonial National Historical Park.

Transfer.

Approved March 29, 1956.

LAND EXCHANGES FOR COLONIAL NATIONAL HISTORICAL PARK 3

The bill is explicit in providing that lands of the United States presently within the exterior boundaries will, upon exchange, be excluded from the parks, with a resultant boundary reduction. Moreover, lands thus eliminated from the park may not subsequently be added to the park except by act of Congress.

In addition to the foregoing grants of substantive authority, and conditions thereof, the bill gives to the Secretary procedural authority as to terms and conditions for effecting the land exchanges authorized.

As indicated in the next paragraph, the committee has amended the printed bill to strike out the last paragraph, which proposed to authorize the Secretary to sell Federal in park lands presently surplus to park needs, with amounts realized by such sales to be applied toward purchase of non-Federal in park lands.

COMMITTEE RECOMMENDED AMENDMENTS

Elimination of land sale authority

The committee has stricken the last paragraph of the bill as introduced in view of the policy questions raised by the authority it would create in the Secretary of the Interior. This provision would have vested authority in the Secretary to sell Federal lands presently within the exterior boundaries of the park and surplus to park needs, as a method of creating a fund for purchase on non-Federal lands also within the park boundaries. Committee judgment in its elimination in the instant case is not intended to be construed as precluding future consideration of the desirability of such a departure from established procedure; rather, it represents a committee conclusion that the proposed policy change deserves further study.

Land Grant to State of Virginia

The committee has adopted an amendment which authorizes transfer to the Commonwealth of Virginia, without reimbursement to the United States, of not more than 15 acres of Colonial National Historical Park Land.

Testimony before the Public Lands Subcommittee established these facts in support of such transfer: The State of Virginia has created a 350th anniversary commission to develop plans for the proposed Jamestown festival of 1957. To that end, the State has agreed to transfer from 15 t 20 acres of State land at Glass House Point, above Jamestown, for development by the commission as the Jamestown Festival Park. The commission intends to develop in Jamestown Festival Park, on a nonprofit basis, certain exhibits and facilities for the 1957 festival.

Festival development will be carried out with private and State funds, with much of it assertedly be of a permanent nature and of permanent supporting value to the Colonial National Historical Park. The commission recognized that it would be difficult to attract private funds without insuring permanency of the entire park; the responsible

Dec 23, 2000
(H.R. 4907)

To establish the Jamestown 400th Commemoration Commission, and for other purposes.

Be it enacted by the Senate and House of Representatives of Jamestown 400th ***the United States of America in Congress assembled,*** Commemoration Commission Act

Jamestown 400th Commemoration Commission Act of 2000. Virginia
16 USC 81 note.

SECTION 1. SHORT TITLE.

This Act may be cited as the "Jamestown 400th Commemoration Commission Act of 2000".

16 USC 81 note

SEC. 2. FINDINGS AND PURPOSE.

(a) FINDINGS.—-Congress finds that—

(1) the founding of the colony at Jamestown, Virginia in 1607, the first permanent English colony in the New World, and the capital of Virginia for 92 years, has major significance in the history of the United States;

(2) the settlement brought people from throughout the Atlantic Basin together to form a multicultural society, including English, other Europeans, Native Americans, and Africans;

(3) the economic, political, religious, and social institutions that developed during the first 9 decades of the existence of Jamestown continue to have profound effects on the United States, particularly in English common law and language, cross cultural relationships, and economic structure and status;

(4) the National Park Service, the Association for the Preservation of Virginia Antiquities, and the Jamestown-Yorktown Foundation of the Commonwealth of Virginia collectively own and operate significant resources related to the early history of Jamestown; and

(5) in 1996—

(A) the Commonwealth of Virginia designated the Jamestown-Yorktown Foundation as the State agency responsible for planning and implementing the Commonwealth's portion of the commemoration of the 400th anniversary of the founding of the Jamestown settlement;

(B) the Foundation created the Celebration 2007 Steering Committee, known as the Jamestown 2007 Steering Committee; and

(C) planning for the commemoration began.

(b) PURPOSE.—The purpose of this Act is to establish the Jamestown 400th Commemoration Commission to—

(1) ensure a suitable national observance of the Jamestown 2007 anniversary by complementing the programs and activities of the State of Virginia;

(2) cooperate with and assist the programs and activities of the State in observance of the Jamestown 2007 anniversary;

(3) assist in ensuring that Jamestown 2007 observances provide an excellent visitor experience and beneficial interaction between visitors and the natural and cultural resources of the Jamestown sites;

(4) assist in ensuring that the Jamestown 2007 observances are inclusive and appropriately recognize the experiences of all people present in 17th century Jamestown;

(5) provide assistance to the development of Jamestown related programs and activities;

(6) facilitate international involvement in the Jamestown 2007 observances;

(7) support and facilitate marketing efforts for a commemorative coin, stamp, and

16 USC 81 note.

related activities for the Jamestown 2007 observances; and

(8) assist in the appropriate development of heritage tourism and economic benefits to

the United States.

SEC. 3. DEFINITIONS.

In this Act:

(1) COMMEMORATION.—The term "commemoration" means the commemoration of the 400th anniversary of the founding of the Jamestown settlement.

(2) COMMISSION.—The term ((Co***m***mission means the Jamestown 400th Commemoration Commission established by section 4(a).

(3) GOVERNOR.—The term "Governor" means the Governor of the State.

(4) SECRETARY.—The term "Secretary" means the Secretary of the Interior.

16 USC 8l note.
Establishment

(5) STATE.-—

(A) IN GENERAL.-—The term "State" means the State of Virginia.

(B) INCLUSIONS.—-The term "State" includes agencies and entities of the State.

SEC. 4. JAMESTOWN 400TH COMMEMORATION COMMISSION.

(a) IN GENERAL.—There is established a commission to be known as the "Jamestown 400th Commemoration Commission".

(b) MEMBERSHIP.—

(1) IN GENERAL.—The Commission shall be composed of 16 members, of whom—

(A) four members shall be appointed by the Secretary, taking into consideration the recommendations of the Chairperson of the Jamestown 2007 Steering Committee;

(B) four members shall be appointed by the Secretary, taking into consideration the recommendations of the Governor;

(C) two members shall be employees of the National Park Service, of which—

(i) one shall be the Director of the National Park Service (or a designee); and

(ii) one shall be an employee of the National Park Service having experience relevant to the commemoration, to be appointed by the Secretary; and

(D) five members shall be individuals that have an interest in, support for,

and expertise appropriate to, the commemoration, to be appointed by the

Secretary.

(2) TERM; VACANCIES.—

(A) TERM.—A member of the Commission shall be appointed for the life of the Commission.

(B) VACANCIES—

(i) IN GENERAL.—A vacancy on the Commission shall be filled in the same manner in which the original appointment was made.

(ii) PARTIAL TERM.—A member appointed to fill a vacancy on the Commission shall serve for the remainder of the term for which the predecessor of the member was appointed.

3. MEETINGS.—
   (A) In GENERAL – The Commission shall meet
      (i) at least twice each year; or
      (ii) at the call of the Chairperson or the majority of the members of the Commission.
   (B) INITIAL MEETING.—Not later than 30 days after the date on which all members of the Commission have been appointed, the Commission shall hold the initial meeting of the Commission.
4. VOTING.—
   (A) IN GENERAL.—The Commission shall act only on an affirmative vote of a majority of the members of the Commission.
   (B) QUORUM.—A majority of the Commission shall constitute a quorum.
   CHAIRPERSON.—The Secretary shall appoint a Chairperson of the Commission, taking into consideration any recommendations of the Governor.

(C) DUTIES.—
   (1) IN GENERAL.—The Commission shall—
      (A) plan, develop, and execute programs and activities appropriate to commemorate the 400th anniversary of the founding of Jamestown;
      (B) generally facilitate Jamestown-related activities throughout the United States;
      (C) encourage civic, patriotic, historical, educational, religious, economic, and other organizations throughout the United States to organize and participate in anniversary activities to expand the understanding and appreciation of the significance of the founding and early history of Jamestown;
      (D) coordinate and facilitate for the public scholarly research on, publication about, and interpretation of, Jamestown; and
      (E) ensure that the 400th anniversary of Jamestown provides a lasting legacy and long-term public benefit by assisting in the development of appropriate programs and facilities.
   (2) PLANS; REPORTS.—
      (A) STRATEGIC PLAN; ANNUAL PERFORMANCE PLANS.—
   In accordance with the Government Performance and Results Act of 1993 (Public Law 103-62; 107 Stat. 285), the Commission shall prepare a strategic plan and annual performance plans for the activities of the Commission carried out under this Act.
      (B) FINAL REPORT.—Not later than September 30, 2008, the Commission shall complete a final report that contains—
         (i) a summary of the activities of the Commission;
         (ii) a final accounting of funds received and expended by the Commission; and
         (iii) the findings and recommendations of the Commission.

(d) POWERS OF THE COMMISSION.—The Commission may—
   (1) accept donations and make dispersions of money, personal services, and real and personal property related to Jamestown and of the significance of Jamestown in the history of the United States;
   (2) appoint such advisory committees as the Commission determines to be necessary to carry out this Act;
   (3) authorize any member or employee of the Commission to take any action that the Commission is authorized to take by this Act;

   (4) procure supplies, services, and property, and make or enter into contracts, leases or other legal agreements, to carry out this Act (except that any contracts, leases or other legal agreements made or entered into by the Commission shall not extend beyond the date of termination of the Commission);
   (5) use the United States mails in the same manner and under the same conditions as other Federal agencies;
   (6) subject to approval by the Commission, make grants in amounts not to exceed $10,000 to communities and nonprofit organizations to develop programs to assist in the commemoration;

(7) make grants to research and scholarly organizations to research, publish, or distribute information relating to the early history of Jamestown; and

(8) provide technical assistance to States, localities, and nonprofit organizations to further the commemoration.

(e) COMMISSION PERSONNEL MATTERS.—

(1) COMPENSATION OF MEMBERS OF THE COMMISSION -

(A) IN GENERAL.—Except as provided in subparagraph (B), a member of the Commission shall serve without compensation.

(B) FEDERAL EMPLOYEES.—A member of the Commission who is an officer or employee of the Federal Government shall serve without compensation in addition to the compensation received for the services of the member as an officer or employee of the Federal Government.

(C) TRAVEL EXPENSES.—-A member of the Commission shall be allowed travel expenses, including per diem in lieu of subsistence, at rates authorized for an employee of an agency under subchapter I of chapter 57 of title 5, United States Code, while away from the home or regular place of business of the member in the performance of the duties of the Commission.

(2) STAFF—

(A) IN GENERAL.—The Chairperson of the Commission may, without regard to the civil service laws (including regulations), appoint and terminate an executive director and such other additional personnel as are necessary to enable the Commission to perform the duties of the Commission.

(B) CONFIRMATION OF EXECUTIVE DIRECTOR.—The employment of an executive director shall be subject to confirmation by the Commission.

(3) COMPENSATION—

(A) IN GENERAL.—Except as provided in subparagraph (B), the Chairperson of the Commission may fix the compensation of the executive director and other personnel without regard to the provisions of chapter 51 and subchapter III of chapter 53 of title 5, United States Code,

relating to classification of positions and General Schedule pay rates.

(B) MAXIMUM RATE OF PAY.—The rate of pay for the executive director and other personnel shall not exceed the rate payable for level V of the Executive Schedule under section 5316 of title 5, United States Code.

(4) DETAIL OF GOVERNMENT EMPLOYEES.—

(A) FEDERAL EMPLOYEES.—

(i) IN GENERAL.—On the request of the Commission, the head of any Federal agency may detail, on a reimbursable or non-reimbursable basis, any of the personnel of the agency to the Commission to assist the Commission in carrying out the duties of the Commission under this Act.

(ii) CIVIL SERVICE STATUS.—The detail of an employee under clause (i) shall be without interruption or loss of civil service status or privilege.

(B) STATE EMPLOYEES.—The Commission may—-

(i) accept the services of personnel detailed from States (including subdivisions of States); and

(ii) reimburse States for services of detailed personnel.

(5) VOLUNTEER AND UNCOMPENSATED SERVICES.—Notwithstanding section 1342 of title 31, United States Code, the Commission may accept and use voluntary and uncompensated services as the Commission determines necessary.

(6) SUPPORT SERVICES.—The Director of the National Park Service shall provide to the Commission, on a reimbursable basis, such administrative support services as the Commission may request.

(f) PROCUREMENT OF TEMPORARY AND INTERMITTENT SERVICES.—The Chairperson of the Commission may procure temporary and intermittent services in accordance with section

3109(b) of title 5, United States Code, at rates for individuals that do not exceed the daily equivalent of the annual rate of basic pay prescribed for level V of the Executive Schedule under section 5316 of that title.

(g) FACA NONAPPLICABILITY.—Section 14(b) of the Federal Advisory Committee Act (5 U.S.C. App.) shall not apply to the Commission.

(h) NO EFFECT ON AUTHORITY.—Nothing in this section supersedes the authority of the State, the National Park Service, or the Association for the Preservation of Virginia Antiquities, concerning the commemoration.

(i) TERMINATION.—The Commission shall terminate on December 31,2008.

SEC. 5. AUTHORIZATION OF APPROPRIATIONS

There are authorized to be appropriated such sums as are necessary to carry out this Act.

Approved December 23,2000.

Table B-1: Regulation Matrix – Federal Mandates		
Federal Mandates	**Reference**	**Purpose**
Administrative Procedures Act of 1979, as amended	5 U.S.C. 551, et seq.	Outlines the forms of administrative proceedings (hearings, adjudication, etc.) and prescribes procedural and substantive limitations thereon. Provides for judicial review of federal decision making actions.
Alternative Fuels – General	42 U.S.C .13211-13212	Directs the purchase of light duty alternate fueled vehicles
Antiquities Act of 1906, as amended	16 U.S.C. 431-433	Authorized the President "to declare by public proclamation (as national monuments) historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest".
Archaeological and Historic Preservation Act of 1974, as amended	16 U.S.C. 469-469c	Requires survey, recovery and preservation of significant scientific, prehistorical, historical, archaeological or paleontological data when such data may be destroyed due to a federal project. Directs federal agencies to notify the Secretary of the Interior whenever they find that such a project may cause loss or damage.
Archaeological Resources Protection Act of 1979, as amended	16 U.S.C. 470aa-mm	Strengthens and expands the protective provisions of the Antiquities Act of 1906 with respect to archaeological resources. Replaces the Antiquities Act's permitting procedures for archaeological research.
Architectural Barriers Act of 1969; Rehabilitation Act of 1973; Americans with Disabilities Act of 1990	42 U.S.C. 4151, et seq.; 29 U.S.C. 701, et seq.; P.L. 101-336, 104 Stat. 327	Provides access to all public places for persons with disabilities and ensures that all facilities and programs are accessible to visitors with disabilities.
Bald and Golden Eagle Protection Act	16 U.S.C. 668-668d	Establishes that activities to import, export, or take bald or golden eagles, or to sell, purchase, or barter their parts, or products made from them, including their nests or eggs, are illegal.
Clean Air Act Amendments of 1990, as amended; Sec. 118	42 U.S.C. 7401, et seq. 42 U.S.C. 7609	Establishes standards to protect and improve air quality and delegates authority for air quality to the states. Requires project conformity with State Implementation Plan concerning air quality. Sec. 118 requires federal land managers to protect air quality on federal land.
Clean Water Act of 1977, as amended, Sec. 401, 402 and 404(b)(1)	33 U.S.C. 1251, et seq.	Protects the state's water resources
Coastal Zone Management Act of 1972	PI 92-583, 86 STAT 1280, 16 USC 1451 et seq., as amended	States national policy to preserve, protect, develop and restore or enhance resources of the nation's coastal zones. Requires federal agencies to comply with applicable, approved state coastal zone management programs.
Coastal Barrier Resources Act of 1982	PL 97-348, 96 STAT 1653m 16 USC 3501 et seq.	Established a "Coastal Barrier Resources System" and restricts certain federal actions within the system. Areas managed by NPS are not in the system, however, listed areas maybe adjacent to NPS units.
Council on Environmental Quality Regulation, as amended	40 CFR 1500-1508	Implements NEPA and provides guidance to federal agencies in the preparation of environmental documents identified under NEPA.

Table B-1: Regulation Matrix – Federal Mandates		
Federal Mandates	**Reference**	**Purpose**
Curation of Federally-owned and Administered Archeological Collections	36 CFR 79	Government-wide regulations for the curation and care of federal archeological collections. Also includes terms and conditions for federal agencies to include in contracts and Memorandums of Agreement with non-federal repositories.
Endangered Species Act of 1973, as amended	16 U.S.C. 1531-1543	Establishes a policy to protect and restore federally listed threatened and endangered species of flora and fauna.
Farmland Protection Policy Act of 1980 and 1995	P.L. 97-98, Sec. 1539-1549; 7 U.S.C. 4201, et seq.; 7 CFR Part 658	Minimizes the extent to which federal programs contribute to the unnecessary conversion of farmland to non-agricultural uses. Also stipulates that federal programs be compatible with state local and private efforts to protect farmland and that federal agencies coordinate with the Dept. of Agriculture's Natural Resources Conservation Service whenever prime and unique farmlands are involved in federal action s that will affect such resources.
Federal Advisory Committee Act	5 USC (Appendix)	Creates a formal process for federal agencies to seek advice and assistance from citizens. Any council, panel, conference, task force, or similar group used by federal officials to obtain consensus advice or recommendations on issues or policies falls under the purview of this Act.
Federal Water Pollution Control Act of 1972, as amended	33 U.S.C. 1251-1376, et seq.	Establishes criteria and performance standards for the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters through prevention, reduction and elimination of pollution.
Fish and Wildlife Coordination Act of 1934, as amended	16 U.S.C. 661-666	Requires early coordination with the U.S. Fish & Wildlife Service whenever water resources are involved.
National Park System General Authorities Act of 1970	16 U.S.C. 1	Affirmed that all national park areas, including historic sites, while acknowledged to be "distinct in character," were "united through their interrelated purposes and resources into one national park system, as cumulative expressions of a single national heritage.
Historic Sites, Buildings and Antiquities Act of 1935, as amended	16 U.S.C. 461-467	Declares a national policy to preserve historic sites and objects of national significance for public use. Establishes an Advisory Board.
Land and Water Conservation Fund Act of 1965, as amended	16 U.S.C. 1271, et seq.	Provides for Congress to appropriate funds (on a matching basis) for planning, acquiring land and water areas for outdoor recreational use, and construction of outdoor recreation facilities. Fund was established to assist state and Federal agencies in meeting present and future outdoor recreation demands, primarily in planning; acquisition of land, water, or interests in land or waters; or development..
Mining Activity within National Park Service Areas Act of 1976	P.L. 94-429, 90 Stat. 1342, 16 U.S.C. 1901 et seq.	Authorizes NPS to regulate mining activities associated with valid claims in order to protect park activities. Section 9 requires NPS to submit a report to the Advisory Council on Historic Preservation when a national natural or historic landmark is threatened by surface mining activities and as the Council's advice on measures that would mitigate the activity.
Museum Properties Management Act of 1955, as amended	16 U.S.C., Sec. 18(f)	Addresses procedures for managing museum property and collections.

Table B-1: Regulation Matrix – Federal Mandates		
Federal Mandates	**Reference**	**Purpose**
National Environmental Policy Act of 1969	42 U.S.C. 4321-4347	Requires all federal agencies to analyze alternatives and to document impacts resulting from proposed actions that could potentially affect the natural and human environment.
National Historic Preservation Act of 1966, as amended; Sec. 106 and 110	16 U.S.C. 470 36 CFR 800	To protect and preserve districts, sites and structures and architectural, archaeological and cultural resources. Sec. 106 requires consultation with the State Historic Preservation Office. Sec. 110 requires that NPS identify and nominate all eligible resources under its jurisdiction to the National Register of Historic Places
National Park Service Organic Act of 1916	16 U.S.C. 1-4, et seq.	To promote and regulate the use of national parks, monuments and reservations by such means and measures as to conserve the scenery and the natural and historic objects and the wildlife therein and to provide for the enjoyment of the land in such manner as will leave them unimpaired for the enjoyment of future generations.
National Parks and Recreation Act of 1978	P.L. 95-625	Requires the identification of and implementation commitments for visitor carrying capacity for all areas of national park units; measures for the preservation of an area's resources; indication of types and general intensities of development (including visitor circulation and transportation patterns, systems and modes) associated with public enjoyment and use of the area, including general locations, timing of implementation, and anticipated costs; and indications of potential modifications to the external boundaries of the unit, and the reasons therefore.
Native American Graves Protection and Repatriation Act of 1990	P.L. 101-601; 104 Stat. 3049	Assigns ownership of control of American Indian human remains, funerary and sacred objects and objects of cultural patrimony that are discovered on federal lands or tribal lands to lineal descendants of affiliated Indian tribes or Native Hawaiian organizations; establishes criminal penalties for trafficking in human remains or cultural objects; and requires federal agencies and museums that receive federal funding to inventory American Indian human remains and related funerary objects in their control and identify their cultural and geographic affiliations within five years and prepare summaries of information about other American Indian Cultural resources.
National Park Omnibus Management Act of 1998	16 U.S.C. 5901 et seq.	States that the Secretary of the Interior shall take such measures as are necessary to assure the full and proper utilization of the results of scientific study for park management decisions.
Occupational Safety and Health Act of 1970	PL 91-596, 84 Stat 1590, 5 USC 5108	Establishes national safety and health standards for worker environments and establishes the Occupational Safety and Health Administration (OSHA)
Rivers and Harbors Act of 1899		Establishes Army Corps of Engineers' regulatory authority over U.S. navigable waters. Establishes permit requirements for construction of bridges, causeways, dams, or dikes within or over navigable waters of the U.S. Bridge and causeway construction is regulated by the Transportation Secretary, while dam and dike permits are reviewed by the Corps. Sec. 10 requires a Corps permit for construction of any "obstruction of navigable waters" of the U.S., and for any excavation, fill, or other modification to various types of navigable waters. Sec. 13 requires a Corps

Table B-1: Regulation Matrix – Federal Mandates		
Federal Mandates	**Reference**	**Purpose**
		permit for discharge of refuse of any kind (except liquid from sewers or urban runoff) from land or vessel, into the navigable waters of the U.S. or into their tributaries. Similarly, discharge of refuse is prohibited upon the banks of navigable waters of their tributaries where the refuse could be washed into the water.
Water Resources Planning Act of 1965 and Water Resource Council's Principles and Standards		States a national policy "to encourage the conservation, development, and utilization of water and related land resources on a comprehensive and coordinated basis by the federal government, states, localities, and private enterprises with the cooperation of all affected federal agencies, states, local governments, individuals, corporations, business enterprises, and others concerned". Establishes the Water Resources Council with responsibility for assessing the adequacy of water supplies, studying the administration of water resources, and developing principles, standards, and procedures for federal participants in the preparation of comprehensive regional or river basin plans. Establishes the framework for state and federal cooperation through a series of river basin commissions.
Wild and Scenic Rivers Act of 1968, as amended	16 U.S.C. 1271 et seq.	Identifies and designates rivers within the United States as wild, scenic and/or recreational. Provides protection and management guidelines for rivers designated as such.
U.S. Department of Transportation Act of 1966, Sec. 4(f)	49 U.S.C. 303, Subtitle I	Preserves publicly owned parkland, waterfowl and wildlife refuges and significant historic sites. Requires the Secretary of Transportation to consider all prudent and feasible alternatives to impacting such lands.

Table B-1: Regulation Matrix – Federal Executive Orders		
Federal Executive Orders	**Reference**	**Purpose**
Analysis of Impacts on Prime and Unique Agricultural Lands in Implementing NEPA	45 CFR 59189	Requires federal agencies to analyze the impacts of federal actions on agricultural lands in accordance with NEPA.
Energy Efficiency and Water Conservation at Federal Facilities	Executive Order 12902	Directs federal agencies to conduct comprehensive facility audits, reduce energy use, increase energy efficiency, minimize use of petroleum based energy, increase use of solar or renewable energy sources, the use of innovative financing and contractual mechanisms, and to purchase energy efficient products Agencies are encouraged to seek technical assistance from the DOE.
Energy Efficient Computer Equipment	Executive Order 12845	Requires agencies to purchase energy efficient computer equipment.

Table B-1: Regulation Matrix – Federal Executive Orders		
Federal Executive Orders	**Reference**	**Purpose**
Federal Alternative Fueled Vehicle Leadership	Executive Order 13031	Requires agencies to purchase energy efficient equipment 12845 Sets requirements for agencies regarding the purchase of AFV
Federal Compliance with Pollution Control Standards	Executive Order 12088	Establishes procedures and responsibilities to ensure that all necessary actions are taken to prevent, control, and abate environmental pollution with respect to federal facilities.
Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	Executive Order 12898	Directs federal agencies to avoid federal actions that cause disproportionately high and adverse impacts on minority and low-income populations with respect to human health and environment.
Floodplain Management	Executive Order 11988	Directs federal agencies to avoid the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to restore and preserve the natural and beneficial values served by floodplains.
Greening the Government through Leadership in Environmental Management		Establishes that environmental management considerations must be a fundamental and integral part of federal government policies, operations, planning and management. Establishes guidelines for federal agencies in order to accomplish this.
Indian Sacred Sites	Executive Order 13007	Directs federal agencies to avoid potential impacts to Native American sacred sites and to avoid potential land use conflicts with local or state interests or interests of Native American tribes. Also must avoid impacts to Indian Trust Resources.
Intergovernmental Review of Federal Programs	Executive Order 12372	Establishes clearinghouse coordination required with state and local agencies concerning impacts of federal projects.
Invasive Species	Executive Order 13112	Directs federal agencies to prevent the introduction of invasive species and provide for their control and establishes the Invasive Species Council
Protection and Enhancement of Cultural Environment	Executive Order 11593	Directs federal agencies to protect and enhance the cultural environment.
Protection and Enhancement of Environmental Quality	Executive Order 11514, as amended by E.O. 11991	Provides federal government leadership in protecting and enhancing the quality of the nation's environment to sustain and enrich human life.
Protection of Wetlands	Executive Order 11990	Requires federal agencies to consider all practicable alternatives to impacting wetlands.

Table B-1: Regulation Matrix – NPS Policies and Guidelines		
NPS Policies and Guidelines	**Reference**	**Purpose**
Agreement of Federal Agencies on Ecosystem Management in the Chesapeake Bay (1994), and Federal		Commits NPS to cooperate with states, federal agencies, and other Chesapeake Bay Program partners to manage the Chesapeake Bay watershed as a cohesive ecosystem, outlining a series of specific goals in areas such as watershed

Table B-1: Regulation Matrix – NPS Policies and Guidelines		
NPS Policies and Guidelines	**Reference**	**Purpose**
Agencies Chesapeake Bay Ecosystem Unified Plan (1998)		protection, living resources and habitat stewardship, nutrient and toxics prevention and reduction, and sustainability.
Chesapeake Bay Riparian Buffer Plan (1999)		Commits NPS to help conserve existing forests along streams and shorelines within its Chesapeake Bay parks and to restore riparian forests on 35 miles of streams and shorelines in the watershed by 2010.
Cultural Resource Management Guidelines	Director's Order 28	Describes NPS policy in regard to the preservation and treatment of archaeological, cultural and historic properties and ethnographic resources included within a park.
Interpreting the National Park Service Organic Act	Director's Order 55	Interprets NPS policy regarding the National Park Service Organic Act and the National Park Service General Authorities Act as stating the laws prohibit the impairment of park resources and values.
National Environmental Policy Act Guidelines	Director's Order 12	Provides bureau guidance on NEPA compliance consistent with CEQ regulations and on approaches to environmental documentation.
Natural Resources Management Guidelines	Director's Order 77	Provides bureau guidance on addressing and managing natural resources within park boundaries.
Park Planning	Director's Order 2	Directs the decision making processes that result in the goals and actions specific to each unit of the national park system and those units of the national trails system administered by NPS.
Wetland Protection	Director's Order 77-1	Directs NPS to avoid adverse impacts to wetlands if undertaking new development or land use activities and provides guidelines to meet requirements of Executive Order 11990, Protection of Wetlands.

Table B-1: Regulation Matrix – Virginia Statutes		
Virginia Statutes	**Reference**	**Purpose**
Agricultural and Forestal District Act	Code of Virginia: Title 15.2-4400	Defines prime and unique farmland and establishes districts throughout the state. Requires analysis of impacts from federally-assisted actions on prime and unique farmlands.
Agricultural, Horticulture and Food	Code of Virginia: Title 3.1-18-8	To protect and enhance agricultural and forestal land as….an economic and environmental resource.
Chesapeake Bay Preservation Act; Chesapeake Bay Preservation Area Designation and Management Regulations	VR 173-02-01, 9VAC10-20 et seq.	Mandates Tidewater area governments to amend their land use plans and ordinances to meet state standards for water quality protection through provisions for sedimentation and erosion control, protection of open space and storm water runoff controls; designates Chesapeake Bay Preservation (RPAs) and Management Areas (RMAa).
Environmental Impact Review of Major State Facilities	Code of Virginia: Title 10.1-1188(a), Chapter 11, Art. 2	Requires state agencies to submit environmental impact reports on major projects. Sets forth procedures for environmental impact reports of state agencies.

Table B-1: Regulation Matrix – Virginia Statutes		
Virginia Statutes	**Reference**	**Purpose**
Preservation of Virginia Historic Resources	Code of Virginia: Title 15.2-2306	Local ordinance may be adopted setting forth historic landmark, as established by the Virginia Board of Historic Resources, and any other structures and areas of unique architectural value having important historic, architectural, archaeological or cultural interest.
State Environmental Review Process	Code of Virginia: Title 10.1-1188(b), Chapter 11, Art. 2	Provides guidance on the state environmental review process, including coordination with federal agencies.
Tidal Wetlands Act	Code of Virginia: 28.2-1300	Establishes procedures and law by which localities regulate development in tidal wetlands.
Virginia Air Quality Regulations	Code of Virginia: Title 10.1-1308	Sets forth regulations for Virginia air quality conformity.
Virginia Antiquities Act	Code of Virginia: Title 10.1, Chapter 23	Avowal to identify, evaluate, preserve, and protect sites and objects of antiquity which have historic, scientific, archeological or educational value and are located on state-controlled land.
Virginia Cultural Resources	Code of Virginia: Title 10.1-2200, Chapter 22, Art. 1	Avowal to preserve and protect state cultural, historic and archaeological resources.
Virginia Endangered Plant and Insect Act	Code of Virginia: Sec. 3.1-1020-1030	Authorizes Virginia Dept. of Agriculture and Consumer Services to regulate and protect Virginia's endangered plants and insects.
Virginia Endangered Species Act, 1987, as amended	Code of Virginia: Sec. 29.1-564-568, Chapter 5, Art. 1	Authorizes Virginia Dept. of Game and Inland Fisheries to regulate endangered or threatened species in Virginia and to prohibit the taking, transportation, processing, sale, or offer for sale within the Commonwealth of Virginia, any threatened or endangered species of fish or wildlife.
Virginia Erosion and Sediment Control Law, 1973, as amended	Code of Virginia: Title 10.1, Chapter 5, Art. 4	Establishes regulations controlling soil erosion, sediment deposition, and runoff to prevent the unreasonable degradation of properties, stream channels, waters and other natural resources.
Virginia Natural Area Preserves Act	Code of Virginia: Title 10.1-209, Chapter 2, Art. 3	Establishes and protects areas of special concern that the state has designated as Natural Area Preserves.
Virginia Natural Heritage Program, 1986	Code of Virginia: Title 10.1-212	Establishes a natural heritage program that identifies significant natural resources.
Virginia Solid Waste Management Act, Article 1	Code of Virginia: Title 10.1, Chapter 14, Art. 2	Establishes the regulations for solid waste disposal and management in Virginia.
Virginia Water Quality Improvement Act of 1997, Article 1	Code of Virginia: Title 10.1, Chapter 21.1	Establishes the state's water quality and defines point source and nonpoint source pollution programs in Virginia.
Virginia Water Protection Act	Code of Virginia: 62.1-44.3; 62.1-44.5; 62.1-44.15:5; and 62.1-44.29	Establishes the regulation to protect and enhance the commonwealth's wetland resources. Designed to achieve a no net loss of existing wetland acreage and function.

C

Appendix C:
Scoping Analysis





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Scoping Analysis

The National Environmental Policy Act (NEPA) requires federal agencies preparing Environmental Impact Statements to consult with stakeholders early in the planning process to identify issues and concerns. Stakeholders include the general public, interested individuals and organizations, and any agencies having jurisdiction by law or expertise. These consultations are collectively referred to as "scoping."

A full list of issues identified during project scoping is sorted below into categories according to why they would or would not be addressed by this plan. The categories are:

1. Those actions that must be taken because they are mandated by laws and policies.

2. Those actions that are inconsistent with laws and policies or beyond the scope of this plan.

3. Those interests and concerns raised that are appropriately addressed by the DCP/EIS.

4. Potential elements of the alternatives and ideas for consideration by planning team members.

Comments are presented as they were received; they have not been edited.

1. Actions mandated by service-wide laws and policies

Issues raised that must be addressed:

a. Effects on wetlands

b. Impacts to wetlands and water avoided or mitigated when not avoidable

c. Exceeding minimum guidelines for challenged visitors

d. Marine resources – which plan requires the most permitting?

2. Actions that cannot be taken because they are inconsistent with law or policy or are beyond the scope of this plan

Issues raised that cannot be addressed in this plan:

Events of 2007

a. Consider VIP visits, terrorism, etc.

b. Safety, security

c. Any thought about holding the celebration somewhere where there is water access?

d. Timing of celebration? When begin and when end in 2007?

e. Extensive plans – intensive – dramatic – "400 years only comes once"

f. Playwright commissioned to develop script for outdoor reenactment of first landing

g. Terrorism, parking issues, wayfinding, signage, facility and event security, VIP security

h. Who exactly is expected to come to 2007?

i. Number of visitors and accommodations

j. Security and parking – also: offer personal assistance

k. Relationship between nation and local for celebration

l. Develop meeting matrix of and for all 2007 groups; 1 Jamestown

m. Goal by 2007, book of essays derived from scholarly conference

n. Not necessarily a celebration to ethnic groups; maybe better coined as commemoration

o. How do we move, accommodate, satisfy millions of people? Will Williamsburg and Yorktown be included in festivities?

p. What will make it 1 Jamestown?

Marketing

a. How to provide info to press

b. Promo material all looks alike; consistency between visual props

c. Marketing is not far reaching enough

d. Is there published information for public?

e. Jamestown can't compete with Busch Gardens or Colonial Williamsburg

f. Video could be sold and become a revenue source

g. Use other professional productions like National Geographic, Discovery Channel, etc.

Miscellaneous

a. Be sure AED (defrib) for Island heart attacks

b. Exploitation by special interests

c. Emergency services / helicopter operations / helipad – these services / access are needed

d. Helipad for emergency medical

e. Public safety, fire, medical. Power plant evac, flood, terrorism, emergency access.

f. Local examination of what Jamestown means to locals

g. Bridge across James….NOT!!!

h. Modifications considered for Greenspring Road

i. Parking issues at Settlement and Route 359 relocation

j. Financial contributions to support infrastructure (transportation systems, etc.)

k. Childrens / teens should be considered as stakeholders

l. Schedule meetings on weekends versus weekday / workday

m. New Zealand Antarctica Museum Christ Church

3. Issues and concerns raised that are appropriately addressed by the DCP/EIS
Grouped topically in no particular order:

Partnerships

a. That rivalry will permeate effective planning

b. Visitor confusion between sites

c. Coordination with Settlement needs to be improved

d. Existing businesses need some priority or role in process

e. More coordination with Settlement

f. Imperative to interact with Jamestown-Yorktown Foundation

g. Must deal with the confusion between the two Jamestowns

h. Confusion over Jamestown (Island) vs Settlement

i. Green Spring subset of Jamestown

j. Coordination with other local factions (William & Mary, Mother's Day, etc.)

k. Are there NPS mandates and goals influencing APVA?

l. Confusion over 2 Jamestowns; no living history; duplicates Settlement

m. Partnership with Settlement of parking and transportation needs

n. Boat dock on Powhatan Creek would be unnecessary with continuing partnership with Jamestown Marina

o. St. Marys was not contacted

Resources and Environment (includes Physical and Natural Resources, Cultural Resources, and Socioeconomic Resources)

a. Island is in our backyard; overall County growth

b. Environmental protection from crowds

c. Viewshed south of James River; landscapes and images "on the way" to Jamestown are impressionable; excessive traffic (air, land, and water)

d. Viewshed has no 20th century intrusion (Surry side at Chippokes)

e. Rising water levels and erosion

f. What kinds of facilities needed to house artifacts?

g. Opening of Green Spring as part of Jamestown; no disturbance to APVA section of Island; is [Green Spring] in the plan now?

h. Erosion of Black Point

i. Fragility of resources; keep visitor impact in mind

j. Preservation of Island as tranquil environ; similar to what was found by English

k. Impact of heavy visitation on site

l. Use alternative transportation on Island for preservation

m. Impacts of weather and environment

n. Natural processes and features versus hardening of natural components

o. Extensive tree cutting

p. Protection of fragile resources

q. The remains of an insignificant Civil War fortification will not be allowed to block the search for much more important and interesting relics from the 17th century

r. Most important visual resources to protect are the Island and Parkway

s. Enlarging present Visitor Center building puts too heavy a burden on resources

t. Don't know whether the Treasure House will really work – visual blows – will this mean cutting trees down?

u. Land disturbance and tree removal on Neck O Land are to be avoided

v. Beautiful setting as is

w. Slower boat speeds sometimes cause more erosion

x. Large parking lot – potential visual impact on Parkway

y. Boat traffic increase will affect clarity of creek otter or other water creatures

z. Likes idea of walkway but is worried about bridge affecting river (damage to environment or riverbed)

aa. Wants the least environmentally damaging option

bb. No pilings in creek

cc. Acreage of impervious cover

dd. Ecology of old road trace – don't disturb

ee. Don't ruin the view of the Parkway

ff. Don't mess up the cat-fishing

gg. Likes avoiding bulk of NOL marsh

hh. A Watershed Management Plan for Powhatan Creek – should be included in this EIS, Feds should make use of community resources such as

ii. Preserve and ensure the scenic quality of the Parkway since facility / parking will be adjacent – concern

jj. Wildlife helps us to understand what Island was historic (so minimum development impact is important)

kk. Removes and disturbs any buffering quality will be cut dramatically

Research and Education

a. Educational site

b. Literature and materials from culturally diverse points of view

c. Timing of arrival of Africans needs more research

d. Use Settlement's film, Jamestown needs a logo – the TRIANGLE

e. Alter understanding of facts; Plymouth vs. Jamestown

f. Racially divisive American communities

g. Project manager for website, Virtual Jamestown

h. Low frequency radio headphones

i. National diversity is virtually unknown

j. Does new film include Church?

k. Focus on past, present, and future

l. Keep education and history the focus

m. Doesn't care for pseudohistory

n. Emotional connections to time periods

o. Success vulnerable to economic shifts; populations shifts (demographics) bring fewer school groups; diminished interest in English influence

p. Schools and universities have fallen regarding history and education; this group can't solve the problem, but we can as citizens

q. People like to talk about the glory and gold but not about God

r. Documents, films, photos of 1957 commemoration

s. English Common law system; ownership of private property by common man; It's not America's success; it's Great Britain's success

t. Seasonal school bus – school groups and where they should go

u. Proximity of collections is important to research

v. Continuing archaeological dig and perpetuating interest, public participation

Visitor Experience

a. Questions asked by visitors – where are the restrooms? Where's the ship?

b. Particularly liked costumed interpreters. Liked presentations given by John Rolfe and rangers.

c. Island hasn't enough to hold small children's interests

d. Outreach to all; accommodation of many visitors vs preservation of features; well-rounded interpretation

e. Need more culturally personal exhibits and programs; Educational advances

f. Visitors need structured organized experience versus wandering without learning; include interpretation / programming re: lasting legacies / make teaching relevant

g. Highlight role of Black farmers

h. Like sense of arrival at NOL – transition from 21st century to the past happens here

i. Prevention of commercial development (like Mt. Vernon)

j. What about reloading school groups?

k. Colonial Parkway provides nice transition from 21st century to 17th century conditions

l. Desultory experience ending up in parking lot after driving beautiful parkway

m. More appeal of substantial building in parking lot

n. Perception of Jamestown is "whites only"

o. Like the trail from Neck O Land to the Island over the old road

p. Good radio information for parking conditions, etc (better than 610 AM)

q. Family focus first

r. When do you expect people to start coming?

s. Restrooms left open until dusk, in addition to Glasshouse facilities

t. Brick outlines intrude on landscape – Visitor Center actually is not all that intrusive

u. Island is favorite place to go in the area

v. Island is boring but beautiful

w. Odors and complaints; climate is hot and people need drinks

x. Offer some type of food and beverage; at least bottled water; small café

y. Current film is in poor condition

z. Visitor input is minimal

aa. If I were running the show, 1 class form each of 50 states; no adults admitted without children

bb. People will still go to the Island to save time / effort

Operations

a. Long term effect on Jamestown

b. Existing fence is ragged and embarrassing

c. Funding matching visitation needs

d. Jamestown is part of larger COLO park; typically underfunded by Congress

e. Maintenance of development features; cleaning glass, leaking buildings

f. County support for events (glad to support)

g. Inefficient tour group scheduling

h. Lots of good ideas, albeit not new; inadequate staffing is why most ideas never are initiated; be realistic and consider resources

i. Volunteer, possibly in period costume, or other areas in which you may need assistance

j. Superintendent is authorized to evaluate his / her own site

k. Fear of unqualified / insensitive supervisors and leaders; suggestion box would help; more staff involvement in process

l. No requirement for permanent people out of season?

Buildings and Utilities

a. Over development

b. Reservation facilities need maintenance

c. Building designs should reflect period (1600)

d. Financial support, replica buildings, keep public informed

e. When will construction start?

f. New Visitor Center – has to be well done

g. Clearance on bridges

h. Prefer not to have a new building

i. Present buildings need to be spruced up

j. Bigger sandbags

k. Seasonal visitation is key – Visitor Center plus large parking lot off Island not viable in winter

Transportation and Site Access

a. Transportation / parking

b. Questions about median on Parkway

c. Increased boat traffic concerns

d. Traffic control / encouraging entry from Colonial Parkway

e. Transportation keep public informed

f. Concerns about parking quantity / enough?

g. Bringing in people from Neck of Land by boat – sounds like people would like it

h. Bus tourism is growing so prepare for lots of tour busses

i. Jamestown is perceived as a good place to hike and not very high percent of hikers integrated in Jamestown per se

j. Show need before building bike paths

k. "Scared to death" of impact on Rt. 31

l. Boat traffic increased numbers

m. Slow the boats down – good

n. Too cold in winter to walk / bike / boat to the Island

o. Transportation

p. Transportation, roadways, signage, funding

q. No bikes on Neck-O-Land Road

r. Partying in the parking lot

s. Boat traffic – narrow channel

t. Transportation, Yorktown importance and positioning, historic triangle emphasis in 1957

u. Increased boat traffic; information dissemination regarding ferry hazards and limitations; will incorporate project needs to future planning

v. Less cars on Island

w. Transit

x. Hike / bike path should use best materials to accommodate riders – spacing between boards or boardwalks, for example

y. Modal transportation change

z. Will boat docks allow for access of canoes / kayaks?

aa. How will you address from of traffic from Rt. 31 – make NOL an overflow spot – what happens during slow season if you add leg as 2nd crossing on Rt. 31?

bb. Concerns about speed on Parkway

cc. No through bike or vehicular traffic on Neck-O-Land Road

dd. Concerns about turn out at NOL

ee. Temporary parking lots (transition area, cutting / replanting / cutting / replanting)

ff. 1957 shuttle boats

gg. Boats out of Richmond? Access from west?

hh. Historical Triangle Bicycle Advisory Committee. Three members from James City County, York County, and Williamsburg

ii. Control growth and traffic

jj. Transportation impact on residents and businesses

kk. Boat traffic

ll. Rural and surrounding areas will have transportation issues to contend with

mm. Need to determine impact on local residents of using Parkway to access Ferry – "community concerns" – (traffic study needed)

nn. Water transportation? What kind of craft(s)?

4. Potential elements of alternatives and ideas for consideration by planning team members

The following specific suggestions, ideas, and solutions are appropriate types of actions that could be considered in designing action alternatives.

Neck of Land

a. Residents of Neck of Land don't want parking on Neck of Land

b. Resident of Neck of Land prefers no disturbance at all there

c. Proposal doesn't have a significant impact on Neck of Land residents

d. Do not move Visitor Center to Neck of Land

e. Likes idea of pulling Visitor Center off the Island

f. Likes idea of moving Treasure House to Neck of Land

g. Likes facilities on Neck of Land – connection to Island on old road trace

h. Move Treasure House to Neck O Land

i. Like Gateway to all parts

j. Do not want to see parking lot first

k. Good – reduces parking on Island

l. Keeping NOL activities seasonal as temporary facilities are not always utilized

m. Seasonal shutdown at Neck of Land

Jamestown Island

a. Could cantilever Visitor Center outside the footprints to increase size if necessary

b. Move Island facilities closer to Settlement

c. Build new Visitor Center – old one isn't able to handle the crowds

d. Visitor Center should remain on the Island

e. Keep all interpretation – historic sites – and facilities together on the Island

f. Potential to use outer Island for primitive camping during winter should be considered

g. No parking too close to Powhatan Creek

h. In the area by the Settlement should use Yacht Basin not build new facility in creek (too narrow)

i. Parking should be removed from the Island

j. Take off Island – reduce impact – parking in maintenance area

k. Likes all parking off Island – bring people in via transit – city planner

l. Parking reduced on Island – good idea

m. Alternative means of getting to the Island – good as well

n. I like having parking off Island instead of on Island

o. Expand Visitor Center

p. Why not get rid of APVA Dale House

q. Junction of Visitor Center and 1907 monument doesn't work now – this doesn't help it

Collections

a. Storage space for collections

b. Would like collections to be kept on Island and together with APVA

c. Keep collections together

d. Collections should remain on the Island

e. Collections (APVA&NPS) together is better

f. Consider off-site facility for storage of artifacts

g. Does not like Visitor Center / collections separate from Island

h. Remove Civil War fortification

Visitor Experience

a. Archeology on weekends; period costumes; reorganize tour configurations; reasonable and do-able number of people per hour

b. Thinks interpretive things should stay together on Island

c. Survey visitors / stakeholders at other sites; ask Island not visited and address in plan

d. People wander aimlessly; Trails and maps to self guide people on various length and depth trails

e. Like to encourage a timeframe flow of early-late period through the site interpretively, it would make it clearer to understand history

f. Mainland farm interpretation

g. An elevated structure for viewing Island (townsite)

h. Confederate earthwork interpretation

i. Need refreshment improvements

j. Needs picnic area for group picnics

k. Need places for people to lock up their bikes

l. Where are the food and refreshment?

m. Water / bathrooms for visitors

Transportation

a. Like keeping the Island Loop and possible interpretive bus tour

b. More families would use separate bike path

c. Remaining parking space designated for handicap

d. Bikers / hikers should not have access to marsh

e. Like the old road trail – feel for the naturalness

f. Pursue no wake zones

g. Shuttle on Loop Road – how will it affect vehicular traffic?

h. Trail connection to the Settlement

i. Separate bike trail from Parkway

j. Concern with placement and construction of boat docks

k. Bridge elevated same as Parkway Bridge? 12 feet at high tide

l. Use of materials in parking lot that allow permeability

m. Direct route over road trace seems more usable by bikers – no diversion

n. Bike rental

o. Existing parking lot not attractive as preview to Visitor Center / Park

p. Parking at Neck of Land without parking on Island would be good

q. Don't restrict height of bridges – want 12-foot clearance

r. Bike trails in general "good idea"

s. Issues related to boat dock at Powhatan Creek – area is too shallow and narrow

t. Good idea to use shuttle on Loop Road during peak times – should stay on the old road trace for bike / hike – fewer impacts to undisturbed habitat

u. Consider boat anchorage maybe with connecting boat service or dock somewhere away from ferry wake and historic area – dock at Vermillion-Anchorage

v. Bike trail should be parallel to Parkway

w. Transportation and linking all parks and amenities

x. Make bridges friendlier to bikers

y. Hopes alternatives will slow / eliminate boat traffic – can't this be enforced?

z. Bike route concept a "good idea"

aa. Wants tram to connect original site, Green Spring, and Settlement

bb. Likes new parking – but doesn't want too much activity – shuttle bus to Island

cc. Boat tour would be a great experience and would hopefully slow down boat traffic

dd. Have boats able to handle bikes

ee. Already have boats and water facility – use existing facilities

ff. Have trail for bikes on long road – no cars

gg. Use grid blocks or other permeable surface for parking (can be cost effective because don't have costs for drainage piping, etc.)

hh. Loop Road is often too busy with motor traffic in summer for cyclists – should remove cars in peak season or cyclists won't be able to use more

ii. Boat tour should include stops to Settlement, if there is going to be a boat tour

jj. Shuttle bus only on Loop Road

kk. Bikers / hikers should not have access to marsh

ll. Need places for people to lock up their bikes

mm. Signage at Route 31 saying "No Outlet" on Neck of Land

nn. Keep the Loop road open – shuttles?

oo. Tree "buffer" for parking key

General

a. D is my preference as opposed to status quo

b. Favors Alternative B – keep vehicles on the Island to a minimum

c. Try to accomplish objectives without construction impact

d. Since Settlement is adding new parking – why not park both APVA / NPS and Settlement visitors there instead of building new parking

e. Coordinate parking and joint ticketing with Jamestown Settlement

f. Consider camping

g. Building too many buildings

h. B is good because it spreads out the activity plus gives bike, walk opportunity to see Island from those perspectives

i. C is favorite

j. Combination of B and D would be good

k. Like Alts. B and D

l. D not as good as Alternative B

m. Alt. D means "Don't Come!" – uninviting to visitors

n. Likes this except put parking off Island and use busses – makes Island special and more historical. Do it right – D doesn't – we have one chance

o. D keeps Island special (except more parking)

p. Likes Alternative D because low impact

q. I like the Island as is; however, what's good for 2001, 2002, or 2003 won't work for 2007

r. There are positive things to say about the no action alternative

s. Love this Alternative! D is Good!

t. Alt. E is too restrictive – boat tour should continue around – bike / hike trail should go straight to the Island along the road trail

u. C separates – does not bring together – likes B

v. Like the ideas expressed in Master Plan

w. No to No. 1

x. Number 1 leaves a scar on the landscape

y. Visitor liked Alternative C best – removes parking from Island and bike trail

z. Doesn't like parking – does not think C is better

aa. Alternative D is good – need to add alternative (bus transportation), shared parking with Colonial Williamsburg and Jamestown Settlement

D

Appendix D:
Cost Estimates

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Cost Estimates

Square footage figures are based on preliminary assessments of programmatic needs.

This table does not include exhibit design, cultural landscape rehabilitation, operations, or mitigation. Table 2-3 : Cost Comparison (Combined APVA and NPS) contains this information.

Table D-1: Projected Capital and Other Improvement Costs –Alternative B

Proposed Action	Costs	Net	Gross*
Visitor Facilities and Support			
Intermodal Transportation Terminal	2,000 sf @ $200/sf	$400,000	$594,000
Replacement Visitor Center/Educational Facility	19,000 sf @ $250/sf	$4,750,000	$7,053,750
Expanded Rediscovery Center for Joint APVA/NPS Collections and Research	8,000 sf @ $325/sf**	$2,600,000	$3,861,000
Observation Building	5,000 sf @ $250/sf	$1,250,000	$1,856,250
Pedestrian Bridge to Observation Building (+ $300,000 access + staging)	15,500 sf @ $120/sf	$2,160,000	$3,207,600
Ludwell Exhibit Facility	7,500 sf @ $200/sf	$1,500,000	$2,227,500
Restrooms (Water/Sewer at Ancient Planter)	2 toilets @ $37,125/each	$74,250	$110,261
Visitor Facilities and Support Total			**$18,910,361**
Historic Structures and Sites			
Agricultural Exhibit Area		$75,000	$111,375
Ambler House Stabilization		$30,000	$44,550
Ambler House Observation Platform		$50,000	$74,250
Dale House Renovation (Interior for Food Service)		$125,000	$185,625
Modification to 1907 Monument Site		$115,000	$170,775
Historic Structures and Sites Total			**$586,575**
Transportation and Site Access			
Parking at Neck of Land – Phase I – 150 Car Spaces, 15 Buses	250 car/$1,800 15 bus/$5,433	$531,500	$789,278
Modification of Island Parking (existing spaces reconfigured)	100 car, 25 buses	$50,000	$74,250
Boat Dock: Neck of Land		$145,000	$215,325
Boat Dock: Jamestown Island (on southern Back River)		$145,000	$215,325
Boat Dock: Powhatan Creek at the Overlook		$157,300	$233,591
Modal Transfer on Jamestown Island		$250,000	$371,250
Modal Transfer at Powhatan Creek Overlook		$250,000	$371,250
Modal Transfer at Neck of Land		$715,000	$1,061,775
Modification of Glasshouse Parking		$75,000	$111,375
Electronic Security Gate		$40,000	$59,400

Table D-1: Projected Capital and Other Improvement Costs –Alternative B (Cont'd.)			
Proposed Action	**Costs**	**Net**	**Gross***
Transportation and Site Access (Cont'd.)			
Hike/Bike Path on Neck of Land (on asphalt road trace) and new - 2,750 lf; 12 ft wide	33,000 sf/$6 sf	$198,000	$294,030
Hike/Bike Path on Marsh Boardwalk – 2,125 lf; 12 ft wide	25,500 sf/$80 sf	$2,040,000	$3,029,400
Hike/Bike Bridge across Back River - 400 lf; 12 ft wide	4,800 sf/$150 sf	$720,000	$1,069,200
Walkway from Boat Dock - Neck of Land - 375 lf; 8 ft wide	3,000 sf/$8 sf	$24,000	$35,640
Walkway from Boat Dock – Jamestown Island - 375 lf; 8 ft wide	3,000 sf/$8 sf	$24,000	$35,640
Walkway from Boat Dock – Powhatan Creek Overlook - 550 lf; 8 ft wide	4,400 sf/$10 sf	$44,000	$65,340
Separate Hike/Bike Path from Glasshouse to Settlement - 500 lf; 8 ft wide	4,000 sf/$8 sf	$32,000	$47,520
Modification of Parkway (Neck of Land)		$350,000	$519,750
Transportation and Site Access Total			**$8,599,339**
Infrastructure			
Utilities Island		$400,000	$594,000
Utilities Neck of Land		$600,000	$891,000
Fiber Optics		$100,000	$148,500
Hazardous Materials		$220,000	$326,700
Demolition/Site Restoration		$300,000	$445,500
Erosion and Sediment Control		$100,000	$148,500
Infrastructure Total			**$2,554,200**
ALTERNATIVE B TOTAL			**$30,650,475**

*Gross is 10% of net, plus the net, x 1.35.

**A nominal cost will be assessed by the APVA and NPS for the property easement for this facility. This cost is yet to be determined.

Square footage figures are based on preliminary assessments of programmatic needs.

This table does not include exhibit design, cultural landscape rehabilitation, operations, or mitigation. Table 2-3 : Cost Comparison (Combined APVA and NPS) contains this information.

Table D-2: Projected Capital and Other Improvement Costs –Alternative C

Proposed Action	Costs	Net	Gross*
Visitor Facilities and Support			
New Visitor Center/Educational Facility/NPS Collections/Intermodal Transportation Terminal	18,000 sf @ $250/sf 2,000 sf @ $200/sf 8,000 sf @ $325/sf	$7,500,000	$11,137,500
Observation Building	5,000 sf @ $250/sf	$1,250,000	$1,856,250
Pedestrian Bridge to Observation Building (+ $300,000 access and staging)	15,500 sf @ $120/sf	$2,160,000	$3,207,600
Ludwell Exhibit Facility	7,500 sf @ $200/sf	$1,500,000	$2,227,500
Restrooms (Water/Sewer at Ancient Planter)	2 toilets @ $37,125/each	$74,250	$110,261
Ticketing Facility on the Island	1000 sf @ $250/sf	$250,000	$371,250
Visitor Facilities and Support Total			**$18,910,361**
Historic Structures and Sites			
Ancient Planter Exhibit Area		$75,000	$111,375
Ambler House Stabilization		$30,000	$44,550
Ambler House Observation Platform		$50,000	$74,250
Dale House Renovation (Interior for Food Service)		$125,000	$185,625
Modification to 1907 Monument Site		$115,000	$170,775
Historic Structures and Sites Total			**$586,575**
Transportation and Site Access			
Parking at Neck of Land – Phase I – 200 cars	300 car/$1,800 20 bus/$5,433	$648,660	$963,260
Modification of Island Parking (Majority of lot designated for pedestrian use)	50 car, 25 buses	$30,000	$44,550
Boat Dock: Neck of Land		$145,000	$215,325
Boat Dock: Jamestown Island (on southern Back River)		$145,000	$215,325
Boat Dock: Powhatan Creek at the Overlook		$157,300	$233,591
Modal Transfer on Jamestown Island		$250,000	$371,250
Modal Transfer at Powhatan Creek Overlook		$250,000	$371,250
Modal Transfer at Neck of Land		$850,000	$1,262,250

Table D-2: Projected Capital and Other Improvement Costs –Alternative C			
Proposed Action	**Costs**	**Net**	**Gross***
Transportation and Site Access (Cont.'d)			
Modification of Glasshouse Parking		$75,000	$111,375
Walkway from Boat Dock – Neck of Land – 375 lf, 8-ft. wide	3,000 sf @ $10/sf	$30,000	$44,550
Walkway from Boat Dock – Jamestown Island – 375 lf, 8-ft. wide	3,000 sf @ $10/sf	$30,000	$44,550
Walkway from Boat Dock – Powhatan Creek Overlook - 550 lf; 8-ft wide	4,400 sf/$12/sf	$52,800	$78,408
Separate Hike/Bike Path from Glasshouse to Settlement - 500 lf; 8-ft wide	4,000 sf/$10/sf	$40,000	$59,400
Modification of Parkway (Neck of Land)		$350,000	$519,750
Transportation and Site Access Total			**$4,534,834**
Infrastructure			
Utilities Island		$400,000	$594,000
Utilities Neck of Land		$800,000	$1,188,000
Fiber Optics		$100,000	$148,500
Hazardous Materials		$220,000	$326,700
Demolition/Site Restoration		$300,000	$445,500
Erosion and Sediment Control		$200,000	$297,000
Infrastructure Total			**$2,999,700**
ALTERNATIVE C TOTAL			**$27,031,470**

* Gross is 10% of net, plus the net, x 1.35.

Square footage figures are based on preliminary assessments of programmatic needs.

This table does not include exhibit design, cultural landscape rehabilitation, operations, or mitigation. Table 2-3 : Cost Comparison (Combined APVA and NPS) contains this information.

Table D-3: Projected Capital and Other Improvement Costs –Alternative D

Proposed Action	Costs	Net	Gross*
Visitor Facilities and Support			
Renovated Visitor Center/NPS Collections/Observation Building	24,000 sf @ $250/sf 8,000 sf @ $325/sf	$8,600,000	$12,771,000
Pedestrian Bridge to Observation Building (+ $300,000 access + staging)	15,500 sf @ $120/sf	$2,160,000	$3,207,600
Ludwell Exhibit Facility	7,500 sf @ $200/sf	$1,500,000	$2,227,500
Low Impact Restrooms at Ancient Planter	2 toilets @ $22,483/each	$44,966	$66,775
Visitor Facilities and Support Total			**$18,272,875**
Historic Structures and Sites			
Ancient Planter Exhibit Area		$75,000	$111,375
Ambler House Stabilization		$30,000	$44,550
Ambler House Observation Platform		$50,000	$74,250
Modification to 1907 Monument Site		$115,000	$170,775
Historic Structures and Sites Total			**$400,950**
Transportation and Site Access			
Modal Transfer on Jamestown Island		$250,000	$371,250
Modal Transfer at Powhatan Creek Overlook		$250,000	$371,250
Modification of Glasshouse Parking		$75,000	$111,375
Separate Hike/Bike Path from Glasshouse to Settlement – 500 lf; 8 ft. wide	4,000 sf/$10 sf	$40,000	$59,400
Transportation and Site Access Total			**$913,275**

Table D-3: Projected Capital and Other Improvement Costs – Action Alternative D (Cont'd.)			
Proposed Action	**Costs**	**Net**	**Gross***
Infrastructure			
Utilities Island		$400,000	$594,000
Fiber Optics		$100,000	$148,500
Hazardous Materials		$220,000	$326,700
Demolition/Site Restoration		$300,000	$445,500
Erosion and Sediment Control		$100,000	$148,500
Infrastructure Total			**$1,663,200**
ALTERNATIVE D TOTAL			**$21,250,300**

* Gross is 10% of net, plus the net, x 1.35.

Square footage figures are based on preliminary assessments of programmatic needs.

This table does not include exhibit design, cultural landscape rehabilitation, operations, or mitigation. Table 2-3 : Cost Comparison (Combined APVA and NPS) contains this information.

Table D-4: Projected Capital and Other Improvement Costs –Alternative E

Proposed Action	Costs	Net	Gross*
Visitor Facilities and Support			
Intermodal Transportation Terminal	2,000 sf @ $200/sf	$400,000	$594,000
Replacement Visitor Center/Educational Facility	19,000 sf @ $250/sf	$4,750,000	$7,053,750
Observation Building	2,500 sf @ $250/sf	$625,000	$928,125
Pedestrian Bridge to Observation Building (+ $300,000 access + staging)	15,500 sf @ $120/sf	$2,160,000	$3,207,600
Ludwell Exhibit Facility	7,500 sf @ $200/sf	$1,500,000	$2,227,500
Low Impact Restrooms	2 toilets @ $15,100/each	$30,200	$44,847
NPS Collections Off-site	Cost of bldg: 8,000 sf @ $325 Cost of land purchase	$2,600,000	$3,861,000 $78,900 $3,939,900
Visitor Facilities and Support Total			**$17,995,722**
Historic Structures and Sites			
Ancient Planter Exhibit Area		$75,000	$111,375
Ambler House Stabilization		$30,000	$44,550
Ambler House Observation Platform		$50,000	$74,250
Dale House Renovation (Interior for Lounge)		$125,000	$185,625
Modification to 1907 Monument Site		$115,000	$170,775
Historic Structures and Sites Total			**$586,575**
Transportation and Site Access			
Parking at Neck of Land – Phase I – 50 Car Spaces	100 car/$1,800 8 bus/$5,433	$223,464	$331,844
Modification of Island Parking (Existing Spaces Reconfigured)	200 car, 17 buses remain	$50,000	$74,250
Boat Dock: Neck of Land		$145,000	$215,325
Boat Dock: Jamestown Island (on southern Back River)		$145,000	$215,325
Modal Transfer on Jamestown Island		$250,000	$371,250
Modal Transfer at Powhatan Creek Overlook		$157,300	$233,591
Modal Transfer at Neck of Land		$715,000	$1,061,775
Modification of Glasshouse Parking		$75,000	$111,375

Table D-4: Projected Capital and Other Improvement Costs –Alternative E (Cont'd.)			
Proposed Action	**Costs**	**Net**	**Gross***
Transportation and Site Access (Cont'd.)			
Electronic Security Gate		$40,000	$59,400
Hike/Bike Path on Neck of Land – 2,500 lf; 12 ft. wide	40,000 sf @ $10/sf	$300,000	$445,500
Hike/Bike Path on Marsh Boardwalk – 1,500 lf, 12 ft. wide	18,000 sf @ $80/sf	$1,440,000	$2,138,400
Hike/Bike Bridge across Powhatan Creek – 200 lf, 12 ft. wide	2,400 sf @ $150/sf	$360,000	$534,600
Walkway from Boat Dock – Neck of Land – 375 lf, 8 ft. wide	3,000 sf @ $10/sf	$30,000	$44,550
Walkway from Boat Dock – Jamestown Island – 375 lf, 8 ft. wide	3,000 sf @ $10/sf	$30,000	$44,550
Walkway from Boat Dock – Powhatan Creek Overlook - 550 lf; 8-ft wide	4,400 sf/$12/sf	$52,800	$78,408
Separate Hike/Bike Path from Glasshouse to Settlement - 500 lf; 8-ft wide	4,000 sf/$10/sf	$40,000	$59,400
Modification of Parkway (Neck of Land)		$350,000	$519,750
Transportation and Site Access Total			**$6,539,293**
Infrastructure			
Utilities Island		$400,000	$594,000
Utilities Neck of Land		$600,000	$891,000
Fiber Optics		$100,000	$148,500
Hazardous Materials		$220,000	$326,700
Demolition/Site Restoration		$300,000	$445,500
Erosion and Sediment Control		$100,000	$148,500
Infrastructure Total			**$2,554,200**
ALTERNATIVE E TOTAL			**$27,675,790**

* Gross is 10% of net, plus the net, x 1.35.

E

Appendix E:
Partner Organizations





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Partner Organizations

Environment-related Nonprofits

Chesapeake Bay Foundation, Annapolis, Maryland
Ducks Unlimited, Memphis Tennessee
Friends of Powhatan Creek, Williamsburg, Virginia
National Audubon Society, New York, New York
Nature Conservancy, Arlington, Virginia
National Fish and Wildlife Foundation, Washington, D.C.
National Geographic Society, Washington, D.C.
National Parks Conservation Association, Washington, D.C.
James River Association, Richmond, Virginia
Powhatan Creek Watershed Association, Williamsburg, Virginia
Sierra Club, San Francisco, California
Tidewater Environmental Council
Virginia Environmental Endowment, Richmond, Virginia
Williamsburg Bird Club, Williamsburg, Virginia

Federal Agencies

Environmental Protection Agency
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service

Foundations

Chippokes Plantation Farm Foundation, Richmond, Virginia
Colonial Williamsburg Foundation, Williamsburg, Virginia
Flowerdew Hundred Foundation, Hopewell, Virginia
Friends of Green Spring, Williamsburg, Virginia
Henricus Foundation, Chesterfield, Virginia
Jamestown-Yorktown Foundation, Williamsburg, Virginia
National Park Foundation, Washington, D.C.

Historical Societies / Commissions

Colonial Dames of America
Colonial Daughters of the 17th Century
Daughters of the American Revolution Garden History Society of Williamsburg, Williamsburg, Virginia
Daughters of Colonial Wars
Daughters of Founders and Patriots of America
General Society Sons of the Revolution, New York, New York
Huguenot Society of the Founders of Manakin in the Colony of Virginia, Richmond, Virginia
James City County Historical Commission, Williamsburg, Virginia
Jamestowne Society, Richmond, Virginia
Sons of the American Revolution, Williamsburg, Virginia
Sons of Colonial Wars
St. Andrews Society, Williamsburg, Virginia
Surry Historical Society, Surry, Virginia
York County Historical Society, Yorktown, Virginia

Local / County Governments

City of Williamsburg, Virginia
James City County, Virginia
Surry County, Virginia
York County, Virginia

Museums

Black History Museum, Richmond, Virginia
British Museum, London, England
Museum of the American Frontier, Staunton, Virginia
Museum of Early Southern Decorative Arts, Winston-Salem, North Carolina
Museum of London, London, England
National Museum of the American Indian, Smithsonian Institution, New York, New York
Omohundro Institute of Early American History and Culture, Williamsburg, Virginia
Virginia Museum of Fine Arts, Richmond, Virginia
Watermen's Museum, Yorktown, Virginia

Other Early Sites

Bacon's Castle, Surry, Virginia
Cape Henry Lighthouse, Virginia Beach, Virginia
James River Plantations, Charles City County, Virginia
Smith's Fort Plantation, Surry, Virginia

Other Interested Parties

American Indian Center, Chicago, Illinois
Christopher Wren Society
Elderhostel
Gospel Spreading Farm, Jamestown, Virginia
Historic Triangle Bicycle Advisory Committee, Williamsburg, Virginia
Peninsula Bicycle Association, Norfolk, Virginia
Peninsula Pathfinders, Williamsburg, Virginia
Virginia Council on Indians, Richmond, Virginia
United Indians of Virginia

Preservation-related Nonprofits

Association for the Preservation of Technology, Washington, D.C.
Eastern National, Ft. Washington, Pennsylvania
Preservation Alliance of Virginia, Richmond, Virginia
Williamsburg Land Conservancy, Williamsburg, Virginia

Professional Organizations

American Association of Museums
American Association for State and Local History
American Historical Association
American Institute of Architects
American Society of Landscape Architects
Archeological Society of Virginia
Organization of American Historians
Society for Historical Archaeology
Virginia Historical Society

State Agencies / Universities

Chesapeake Bay Local Assistance Department
College of William and Mary, Williamsburg, Virginia
Hampton Roads Planning District Commission, Chesapeake, Virginia
Hampton Roads Transit, Hampton, Virginia
Hampton University, Hampton, Virginia
Library of Virginia, Richmond, Virginia
Old Dominion University, Norfolk, Virginia
University of Virginia, Charlottesville, Virginia
Virginia Department of Conservation and Recreation
Virginia Department of Environmental Quality
Virginia Department of Game and Inland Fisheries
Virginia Department of Historic Resources
Virginia Marine Resources Commission
Virginia Polytechnic Institute and State University, Blacksburg, Virginia

F

Appendix F:
Relevant Agency Correspondence

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Relevant Agency Correspondence

RECEIVED
MAR 22 2001
VHB - VA

J. Carlton Courter, III
Commissioner

COMMONWEALTH of VIRGINIA

Department of Agriculture and Consumer Services
Division of Consumer Protection
Office of Plant & Pest Services
PO Box 1163, Richmond, Virginia 23218
Phone: 804/786-3515 • Fax: 804/371-7793 • Hearing Impaired: 800/828-1120
www.vdacs.state.va.us

March 12, 2001

Tricia Wingard
Transportation Land Development Services
477 McLaws Circle
Suite 1
Williamsburg, VA 23185

RE: Jamestown Re-development Concept Plan, James City County, VA

This letter is in response to your request concerning threatened or endangered plant or insects species in the vicinity of the proposed re-development concept plan at Jamestown Island, VA. Virginia Department of Agriculture and Consumer Services records indicate that sensitive joint-vetch, *Aeschynomene virginica*, has been documented in the area indicated in maps you provided. Sensitive joint-vetch is listed as threatened on the federal list of endangered and threatened plant species. The U.S. Fish and Wildlife Service in Gloucester, VA, should be contacted for review of this project for its potential impact on this plant.

The Virginia Department of Agriculture and Consumer Services has jurisdiction only over plant and insect species listed as threatened or endangered by the Commonwealth of Virginia. To better serve citizens and agencies of the Commonwealth, the Virginia Departments of Agriculture and Consumer Services and Conservation and Recreation have entered into an agreement for the review of projects within Virginia. **Future requests for information concerning endangered and threatened plants and insects should be directed to the Natural Heritage Division of the Department of Conservation and Recreation for initial evaluation.** Projects found to demonstrate potential impact on these species will be referred to the Department of Agriculture and Consumer Services for further review and possible mitigation. Additional information on unique geologic formations, rare or critical habitat, and rare and candidate species can be obtained from VDCR/NH. The Virginia Department of Game and Inland Fisheries has jurisdiction over similarly listed endangered and threatened animal species.

Sincerely,

Keith R. Tignor
Endangered Species Coordinator

-Equal Opportunity Empolyer-

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
6669 Short Lane
Gloucester, VA 23061



March 13, 2001

Ms. Elizabeth S. Kostelny, Executive Director
Association for the Preservation of Virginia Antiquities
204 West Franklin Street
Richmond, Virginia 23220-5012

Re: Association for the Preservation of Virginia Antiquities activities on Jamestown Island, James City County, Virginia

Dear Ms. Kostelny:

The U.S. Fish and Wildlife Service (FWS) has received the Association for the Preservation of Virginia Antiquities' (APVA) March 12, 2001 letter concerning the protection of bald eagles, *Haliaeetus leucocephalus*, around Jamestown Island in James City County, Virginia. This letter is submitted under provisions of the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

As you are aware, the bald eagle is a federally listed threatened species. It is also listed by the Commonwealth of Virginia. Together, the FWS and the Virginia Department of Game and Inland Fisheries (VDGIF) are responsible for the recovery of the eagle in Virginia. Public and private activities that may affect the eagle need to be coordinated with the two agencies. Enclosed are guidelines that the two agencies have adopted. These guidelines provide guidance to land owners and land managers to help determine which activities may affect eagles. Eagles are particularly sensitive during the breeding season, which is December 15 to July 15 in Virginia. Some eagles are more tolerant than others, and the eagles on Jamestown Island have demonstrated some tolerance to human activity in the vicinity of their nests.

During routine fly-overs in March of 2001, new eagle nests were discovered on Jamestown Island. FWS and the National Park Service (NPS) are consulting to ensure that federal activities do not jeopardize the continued existence of the bald eagle. As part of the effort to protect the eagles, FWS is trying to identify all potential impacts to the eagles, public and private. We thank you for participating in the consultation with NPS and look forward to your continued interest in eagle conservation on Jamestown Island.

APVA maintains a landing pad for helicopters on Jamestown Island that is located approximately 1,300 feet from the new eagle nest. According to the enclosed guidelines, helicopters are to remain at least 1,320 linear feet and 1,000 vertical feet from the base of the tree with active eagle

nests during the breeding season to avoid impacting the eagles. FWS understands that you have contacted the pilot to show him where the nests are. As you know, helicopters generate a lot of noise, and loud noises during the breeding season can cause eagles to abandon nests. FWS asks that you provide a copy of the letter from the pilot stating that he will abide by these restrictions. Since he is landing on APVA property, FWS will consider his route to the pad an action of the APVA. The pilot should be informed that there is another eagle nest across the James River from Jamestown Island. The helicopter needs to stay at least 1,320 linear feet and 1,000 vertical feet from that nest as well.

Your letter outlined continuing activities that occur on APVA land on Jamestown Island. Activities outside the 1,320 feet radius can occur without further consultation with FWS. Most activities on APVA land occur outside the 1,320 feet radius of the nest tree, and almost all activities occur out of sight of the eagles. Since these eagles are clearly accustomed to some human activity, FWS believes that most of your proposed activities can continue to occur. Some activities, however, should not occur during the breeding season (December 15 to July 15). The staging for the sewer line can occur around the bend of the road, out of sight of the eagles. The construction, however, should be delayed until after the breeding season. Similarly, tree cutting within 1,320 feet of the nest should be delayed until after the breeding season.

If APVA is able to observe the time of year and overflight restrictions, FWS concurs that APVA's activities are not likely to adversely affect the bald eagle. If APVA is unable to observe the restrictions, further consultation with this office will be required.

If you have any questions or if we can be of further assistance, please call Mr. Eric Davis at (804) 693-6694, extension 104.

Sincerely,

Karen L. Mayne

Karen L. Mayne
Supervisor
Virginia Field Office

Enclosure

cc: NPS, CNHP (Alec Gould)
VDGIF (Don Schwab)

BALD EAGLE PROTECTION GUIDELINES FOR VIRGINIA

Prepared by

Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, VA 23061
804-693-6694

Virginia Department of Game and Inland Fisheries
P.O. Box 11104
Richmond, VA 23230
804-367-1000

Last Updated: 5/15/2000

INTRODUCTION

The Virginia Department of Game and Inland Fisheries (VDGIF) and the U.S. Fish and Wildlife Service (USFWS) are responsible for the conservation and management of the bald eagle (*Haliaeetus leucocephalus)* throughout Virginia. To provide consistent management of the bald eagle in Virginia, the VDGIF and USFWS have developed the following general guidelines. These guidelines indicate the zones around eagle nests, night roosts, and shoreline use areas in which the provisions of various laws and their implementing regulations may apply. All proposed activities that may affect or result in the take of a bald eagle in Virginia will be evaluated by the VDGIF and USFWS on a case-by-case basis, using site-specific information. The recommendations given in these guidelines may be modified as necessary in individual cases, based on a number of factors such as topography, existing forest canopy, and observed reactions of eagles to disturbance at a particular site.

In Virginia, adult bald eagles typically remain on or near their breeding territories year round. Nest building and repair begins as early as November and peaks in mid-winter, but may occur during any month of the year. Courtship flights and related mating behavior are most frequently observed during January and February, and eggs are usually laid between mid-January and late March. Most eggs hatch between early March and early May and eaglets stay in the nest for 11 to 12 weeks after hatching. Most young are capable of sustained flight by mid July, but remain

dependent on the parents and stay in the general vicinity of the nest for several more weeks. Eagles are most sensitive to disturbance from mid-December to early July, the period when they are building their nests, incubating eggs, raising young, and while the young are learning to fly.

Virginia also has several areas along the major tidal river systems where non-breeding eagles are known to concentrate for roosting and feeding. Some of these areas are used by eagles in the summer and some are used in the winter. These eagle concentration areas are extremely important, because they are used by eagles from throughout the East Coast, as well as resident eagles.

FEDERAL LAWS PROTECTING THE BALD EAGLE

Endangered Species Act (ESA) (87 Stat. 884; 16 U.S.C. 1531 et seq.; 50 CFR Part 17) – Section 7(a)(2) requires federal agencies to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any federally listed threatened or endangered species. If a federal agency determines that its action "may affect" a listed threatened or endangered species, the agency is required to consult with the USFWS regarding the degree of impact and measures available to avoid or minimize the adverse effects.

Section 9 of the ESA makes it illegal for any person subject to the jurisdiction of the United States to "take" any federally listed endangered or threatened species of fish or wildlife without a special exemption. "Person" is defined under the ESA to include individuals, corporations, partnerships, trusts, associations, or any other private entity; local, state, and federal agencies; or any other entity subject to the jurisdiction of the United States. Under the ESA, "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or to attempt to engage in any such conduct. Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavior patterns such as breeding, feeding, or sheltering. Harass is defined as actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding, or sheltering.

Section 10(a)(1)(B) of the ESA establishes an incidental take permit provision that authorizes the USFWS, under some circumstances, to permit the taking of federally listed wildlife by private individuals if such taking is "incidental to, and not the purpose of carrying out otherwise lawful activities."

Bald and Golden Eagle Protection Act (54 Stat. 250, as amended; 16 U.S.C. 668; 50 CFR Part 22) – This 1940 Act prohibits the taking of bald and golden eagles or their nests and eggs. Under this Act, taking is defined as "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb."

Migratory Bird Treaty Act (MBTA) (40 Stat. 755, as amended; 16 U.S.C. 701 et seq.; 50 CFR

Parts 10, 20, 21) – This Act, passed into law in 1918, was established to protect migratory birds and prohibits the taking of any migratory bird, nest, egg, or part, except as permitted by the USFWS. The prohibitions under this law and its implementing regulations generally include activities or attempted activities that pursue, hunt, shoot, wound, kill, trap, capture, possess, or collect any migratory bird species and their nests and eggs.

VIRGINIA LAWS AND REGULATIONS PROTECTING THE BALD EAGLE

Virginia's Endangered Species Act (§29.1-563 - §29.1-570) – This law provides that VDGIF is the state regulatory authority over federally or state listed endangered or threatened fish and wildlife in the Commonwealth, defining *fish or wildlife* as "*. . . any member of the animal kingdom, vertebrate or invertebrate, except for the class Insecta, and includes any part, products, egg, or the dead body or parts thereof.*" It prohibits the taking, transportation, processing, sale, or offer for sale within the Commonwealth of any fish or wildlife listed as a federally endangered or threatened species, except as permitted by the Board of Game and Inland Fisheries for zoological, educational, scientific, or captive propagation for preservation purposes.

The Act further authorizes the Board to adopt the federal list of endangered and threatened species, to declare by regulation that species not listed by the federal government are endangered or threatened in Virginia, and to prohibit by regulation the taking, transportation, processing, sale, or offer for sale of those species. Implementing regulations passed pursuant to this authority (4 VAC 15-20-130 through 140) further define "take" and other terms similarly to the federal Endangered Species Act.

Federal Endangered Species Act Cooperative Agreement – Federally listed endangered or threatened species also are placed under VDGIF jurisdiction via a cooperative agreement signed in 1976 with the USFWS pursuant to Section 6 of the ESA. This Cooperative Agreement recognizes VDGIF as the Virginia agency with regulatory and management authority over federally listed or threatened animals excluding insects, and provides for federal/state cooperation regarding the protection and management of those species.

State Protection of Wildlife Species – In addition to these endangered species laws, regulations, and cooperative agreement, the Code of Virginia (§29.1-521) and VDGIF regulations (4 VAC 15-30-10) provide legal protection to all native birds and to their nests, eggs, and young.

GENERAL CONSERVATION RECOMMENDATIONS

The following recommendations are *generally* appropriate to avoid take of bald eagles, and thus avoid the need for any state or federal permits or Section 7 consultation (if a federal action is involved). Activities and projects that do not conform with these recommendations will likely

require some form of approval or permit from the VDGIF and/or USFWS, and should always be coordinated with these agencies to ensure compliance with state and federal laws.

Guidelines for Eagle Nests

Primary Management Zone – This is defined as the area 750 feet (229 meters) in radius around an occupied nest. The precise size of this zone should depend on site conditions and the individual eagles' tolerance for human activity. The following activities should not occur at any time within this zone:

- land clearing, clear cutting, mining, and other habitat modification activities;
- development of residential, recreational, agricultural, commercial, or industrial structures, power lines, roads, trails, or any other construction activity;
- use of chemicals toxic to wildlife, such as pesticides and herbicides.

The following activities should not occur during the breeding/nesting season (December 15 - July 15), unless the nest is determined to be unoccupied in a particular year (VDGIF usually has this information after March 31):

- maintenance of existing buildings and roads;
- use of motorized vehicles and heavy equipment;
- aircraft flyovers within 1000 vertical feet of the ground;
- human entry and activities, including recreation, such as hiking, camping, picnicking, hunting, fishing, boating, jet skiing, etc.;
- loud noise generating activities, including blasting.

Limited selective timber harvest to within 300 feet (91 meters) of the nest tree, after consultation with the VDGIF/USFWS biologists, may be possible *outside* the breeding/nesting season, if a forest canopy is maintained.

Secondary Management Zone – This is defined as the area from 750 feet (229 meters) to 1,320 feet (400 meters) in radius around an occupied nest. The precise size of this zone should depend on site conditions and the individual eagles' tolerance for human activity. Restrictions in this zone are necessary to minimize disturbance that could compromise eagle use of the nest. Most activities within this zone should be restricted during the breeding/nesting season, and allowable activities should be determined by VDGIF/USFWS on a case-by-case basis. Development and vegetation clearing should be minimized and line-of-sight vegetation buffers to the nest should

be maintained. The following activities generally should not occur at any time within this zone:

- development of multi-story buildings; high density housing (construction of single story, low density residential houses may be acceptable); large commercial, industrial, or agricultural facilities; high traffic roads; and facilities that would generate loud noise;
- use of chemicals toxic to wildlife, such as pesticides and herbicides.

The following activities should not occur during the breeding/nesting season (December 15 - July 15), unless the nest is determined to be unoccupied in a particular year (VDGIF usually has this information after March 31):

- aircraft flyovers within 1000 vertical feet of the ground;
- construction activities;
- recreational activities that generate loud noise, such as motorized boats, jet skis, etc.;
- other loud noise generating activities, including blasting.

Outside of the breeding/nesting season, most other activities can be conducted within the secondary management zone as determined on a case-by-case basis by VDGIF/USFWS.

Nest/Nest Tree Removal – The eagle nest and the tree/structure in which it is located cannot be removed as long as any portion of the nest remains in the tree/structure.

Abandoned Nest – For three consecutive nesting seasons after the last season in which the nest was occupied (and any portion of the nest is present), the primary and secondary management zone guidelines described above should be followed. In April of the third year after the nest was last occupied, a determination of nest abandonment should be made by VDGIF/USFWS before restricted activities within these zones are undertaken.

Guidelines for Eagle Concentration Areas

Management zones for communal night roosting sites and documented high use shoreline foraging areas generally should be applied the same as for nests. Seasonal occupation varies depending on the specific roost or shoreline area, but is generally defined as summer (May 1 - September 30) and winter (November 1 - February 28). Appropriate human use and building/land disturbance restrictions should be determined on a case-by-case basis by VDGIF/USFWS.

DEFINITIONS

Active nest – A nest that is seen to have an adult eagle in incubating or brooding position, or that contains eggs or young.

Breeding/nesting season – December 15 through July 15 in Virginia. This period includes courtship, nest building/repairs, breeding, incubation, raising young, late nesting, and fledgling use of the nest.

Fledgling – Young bird capable of flight.

Occupied nest – A nest where there is evidence that a pair of adult eagles was present during the breeding season, even if there is no evidence that eggs were laid.

Productive/successful nest – An eagle nest that fledges young.

REFERENCES

Cline, K. 1985. Bald eagles in the Chesapeake A management guide for landowners. National Wildlife Federation, Washington, D.C.

Therres, G. D., M. A. Byrd, and D. S. Bradshaw. 1993. Effects of development on nesting bald eagles: Case studies from Chesapeake Bay. Transactions of the 58th North American Wildlife and Natural Resources Conference. Pg. 62-69.

U.S. Fish and Wildlife Service. 1987. Habitat management guidelines for the bald eagle in the southeast region. Third revision. Atlanta, GA.

Watts, B.D., K.W. Cline, and M.A. Byrd. 1994. The bald eagle in Virginia: An information booklet for land planners. Center for Conservation Biology, College of William and Mary, Williamsburg, VA.

James S. Gilmore, III
Governor

John Paul Woodley, Jr.
Secretary of Natural Resources

David G. Brickley
Director

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

217 Governor Street, 3rd Floor

TDD (804) 786-2121 Richmond, Virginia 23219 (804) 786-7951 FAX (804) 371-2674

http://www.state.va.us/~dcr/vaher.html

Tricia Wingard
VHB
477 McLaws Circle, Suite 1
Williamsburg, VA 23185

26 March 2001

Re: Jamestown Re-development Concept Plan

Dear Ms. Wingard:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biological and Conservation Data System (BCD) for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, the following natural heritage resources have been documented in the area outlined on the map: a Bald Eagle nest site (*Haliaeetus leucocephalus*, G4/S2/LT/LT), the Least Bittern (*Ixobrychus exilis*, G5/S2/NF/NS), sensitive joint-vetch (*Aeschynomene virginica*, G2/S2/LT/NS), and gaping panic grass (*Steinchisma hians*, G5/SH/NF/NS). Parker's pipewort (*Eriocaulon parkeri*, G3/S2S3/NF/NS) has also been documented just outside this delineated area and may occur on site if suitable habitat is present.

Bald Eagle nest sites are often found in the midst of large wooded areas near marshes or other bodies of water (Byrd, 1991). Threats to this species include human disturbance of nest sites and human development in feeding and breeding areas (Byrd, 1991). Please note that this species is currently classified as threatened by the United States Fish and Wildlife Service (USFWS) and the Virginia Department of Game and Inland Fisheries (VDGIF). For this reason, DCR recommends coordination with the USFWS and the VDGIF to ensure compliance with protected species legislation.

A member of the Heron family (Ardeidae), the Least Bittern nests on the ground in a thick cover of emergent vegetation in both freshwater and, occasionally, coastal brackish marshes. Vertical streaks of brown and yellow feathers mimic the vegetation in the Least Bittern's habitat, providing excellent camouflage for this secretive bird. The Least Bittern has been widely reported as declining across its range (Ehrlich et al. 1988).

Sensitive joint-vetch is a single-stemmed annual legume reaching up to 2 meters in height. The characteristic pinnately divided leaves are gland-dotted and somewhat sensitive and may fold slightly if touched. The pea-shaped flowers are yellow streaked with orange-red (TNC et. al., 1999). This bristly-stemmed legume occurs primarily in specialized, relatively pristine wetland habitats in the intertidal regions of freshwater tidal rivers. This habitat type often supports a high diversity of both rare and common plant species. This annual herbaceous plant is classified as federally threatened by the United States Fish and Wildlife Service (USFWS) and, in Virginia, is considered extremely rare. To thrive, sensitive joint-vetch may require minimal competition from other plants. For this reason, plants are frequently found on accreting point bars and levees that have not yet been colonized by perennial species. Sensitive joint-vetch populations however, may be found within marsh interiors. Researchers believe that these plants may be able to thrive there because of harsh soil and nutrient conditions that inhibit growth of potential competitors. An additional theory for the sensitive joint-vetch occurring at those locations is that grazing herbivores, such as muskrat (*Ondatra zebethicus*), eat large areas of vegetation ("muskrat eat-outs") leaving behind exposed soils which are more easily colonized by annuals.

Populations face many potential on-site and off-site threats, including activities that alter natural river currents and sediment cycling and, thereby, prevent the development of accreting point-bar habitats for the species and/or cause erosion of that habitat. Other potential threats include activities which result in increased salinity levels, water pollution, displacement by aggressive species, and activities which result in excessive sediment loading which could inhibit germination of seeds or smother seedlings (USFWS, 1995). Sensitive joint-vetch is currently known from fourteen locations in Virginia's coastal plain. Please note that this species is listed as threatened with the USFWS.

Parker's pipewort is classified as very rare to uncommon in Virginia. This diminutive pipewort species displays a greyish-white button flower and often occurs with other rare mudwort species in the intertidal zone of tidal regions from Maine to North Carolina. Potential threats include activities which alter natural river currents causing sedimentation, which could inhibit germination of seeds or smother seedlings, and/or erosion of the habitat. Other potential threats include activities which result in increased salinity levels, water pollution, and displacement by aggressive species (J. C. Ludwig, 1996).

Gaping panic grass, a state rare plant species, inhabits stream, pond and lake shores, low woods, cypress-gum ponds, alluvial bottomlands, marshes, ditches and seepage slopes. This species is primarily located in Virginia's piedmont region but can be found in the coastal plain as well. This plant blooms from May to October (Weakley, in prep.). Gaping panic grass has not been seen in Virginia since 1983.

Due to the potential for this site to support populations of natural heritage resources, DCR recommends coordination with DCR-DNH staff. With early coordination we can more accurately evaluate potential impacts to natural heritage resources and offer specific protection recommendations for minimizing impacts to the documented resources. DCR also recommends coordination with the USFWS and the VDGIF regarding the Bald eagle and sensitive joint-vetch to ensure compliance with protected species legislation.

There was a reference to digital data for this site in your letter, please contact Rene' Hypes, Project Review Coordinator, to discuss obtaining this information. She can be contacted at 804-371-2708.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the Virginia Department of Conservation and Recreation (DCR), DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

Any absence of data may indicate that the project area has not been surveyed, rather than confirm that the area lacks additional natural heritage resources. New and updated information is continually added to BCD. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized.

A fee of $85.00 has been assessed for the service of providing this information. Please find enclosed an invoice for that amount. Please return one copy of the invoice along with your remittance made payable to the Treasurer of Virginia, Department of Conservation and Recreation, 203 Governor Street, Suite 402, Richmond, VA 23219, ATTN: Cashier. Payment is due within thirty days of the invoice date.

Should you have any questions or concerns, feel free to contact me at 804-692-0984. Thank you for the opportunity to comment on this project.

Sincerely,

Robbie Barbuto
Locality Liaison

Cc: Kim Marbain, USFWS
Ray Fernald, VDGIF

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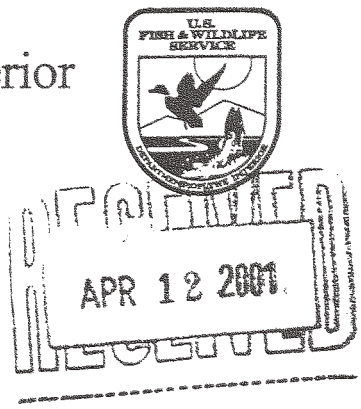
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United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
6669 Short Lane
Gloucester, VA 23061



April 11, 2001

Mr. Alec Gould, Superintendent
National Park Service
Colonial National Historical Park
P.O. Box 210
Yorktown, Virginia 23690

Re: Current National Park Service Operations at Jamestown Island, James City County, Virginia

Dear Mr. Gould:

This document transmits the U.S. Fish and Wildlife Service's (FWS) biological opinion based on our review of the National Park Service's (NPS) current operations at Jamestown Island in James City County, Virginia and its effects on the bald eagle, *Haliaeetus leucocephalus*, in accordance with section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.). Your March 9, 2001 request for formal consultation was received on March 12, 2001.

This biological opinion is based on information provided in the March 5, 2001 on-site meeting, electronic mail, telephone conversations, field investigations, and other sources of information. A complete administrative record of this consultation is on file in this office.

I. CONSULTATION HISTORY

03-01-01 NPS's Colonial National Historical Park notifies FWS's Virginia Field Office about new eagle nests on Jamestown Island.

03-02-01 FWS recommends an immediate meeting to discuss the new eagle nest at the entrance to Jamestown Island.

03-05-01 FWS, NPS, the Virginia Department of Game and Inland Fisheries (VDGIF), and the Association for the Preservation of Virginia Antiquities (APVA) meet on site.

03-09-01 NPS requests formal consultation.

II. BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

NPS proposes to continue the current operations at Jamestown Island. Specifically, NPS proposes to continue to allow vehicular access and to maintain NPS facilities on the Island. The enclosed map shows the location of the new eagle nest numbered VAJC-0101 (Figure 1).

NPS will delay mowing the grass within 1,320 feet of the nest, except for the road shoulder, until July 15 of each year or until FWS and VDGIF determine that the eaglets have fledged or that the nest is not active for that year.

NPS proposes to continue trash pick-up, storm debris clean-up, snow and ice prevention and removal, leaf removal, and other routine maintenance activities.

NPS will allow vehicular traffic and pedestrian visitation to the Island, as it has in the past. NPS will allow full use of the parking lot, though efforts will be made to keep vehicles as far from the nest as possible. This eagle nest is approximately 600 feet from the only road onto Jamestown Island, with a clear line of sight to the road. Furthermore, the nest is approximately 600 feet from the visitors parking lot, with a limited line of sight view of traffic in the parking lot. Even though there is not much vegetation to block the eagles' view of the traffic, a marsh does separate the nest tree from the road and the parking lot. This marsh will serve to prevent access on foot any closer than approximately 400 feet. The nest is approximately 200 feet from Back River, the waterway that separates Jamestown Island from the mainland. The Visitors Center is approximately 1,400 feet from the nest.

Table 1 details the numbers of visitors and buses that visited Jamestown Island from March 2000 through February 2001. According to NPS, approximately 50% of the bus traffic in April and May visit other areas of the Park but do not enter Jamestown Island. During the rest of the year, approximately 30% of the total bus traffic does not enter Jamestown Island. The numbers in the table do account for these estimations.

NPS proposes to perform the following planned construction activities during the spring of 2001 in preparation for tourist season. NPS proposes to complete the paving at the bridge and parking lot and to chip and seal the surface of the road between the bridge and parking lot. NPS proposes to stage timbers at the far end of the parking lot that will be used to repair/replace wooden bridges on Loop Road and the path to the Visitors Center. NPS also proposes to fill holes along the wooden sea wall at Isthmus Bridge.

The "action area" is defined as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action. FWS has determined that the action area for this project is the western tip of Jamestown Island from Isthmus Bridge to the Visitors

Center. The action area includes all land, water, and airspace within 1,320 feet of eagle nest VAJC-0101.

STATUS OF THE SPECIES RANGEWIDE

Species Description – The bald eagle is a large bird of prey with a wing span of 6½ feet. It is found primarily near the coasts, rivers, and lakes of North America. The Chesapeake Bay bald eagle population was listed as endangered in 1978. The Chesapeake Bay recovery region encompasses Virginia, Delaware, Maryland, the eastern half of Pennsylvania, the panhandle of West Virginia, and the southern two-thirds of New Jersey. The Chesapeake Bay Recovery Team prepared a Recovery Plan that is pertinent to this opinion (USFWS 1990).

On August 11, 1995, the bald eagle population in the Chesapeake Bay was reclassified from endangered to threatened due to increasing numbers and range expansion (50 CFR Part 17 36000-36010). In the Chesapeake Bay Recovery Region, delisting requires (1) a nesting population of 300 to 400 pairs with an average productivity of 1.1 eaglets per active nest, sustained over 5 years and (2) permanent protection of sufficient nesting habitat to support 300 to 400 bald eagle pairs. Additionally, enough roosting habitat to accommodate population levels commensurate with increases throughout the Atlantic region resulting from increased productivity (USFWS 1990). Since 1992, the criteria of the number of breeding pairs and productivity per nest (300, 1.1, respectively) have been met. However, there has been very little permanent protection of nesting or roosting habitat within the Chesapeake Bay region. Over 80% of the bald eagle nests in Virginia and Maryland are located on private and corporate lands.

In Virginia, the breeding population has steadily increased from an estimated low of approximately 32 pairs in the late 1960s to 310 nesting pairs in 2001. Habitat loss now poses a greater threat to the bald eagle since its preferred habitat is where most of the human population growth is occurring in the United States.

The Service announced a nation-wide "Intent to Delist" proposal in July 1999, followed by a notice for public comment in the Federal Register (Proposed Rule, Volume 64, No. 128; Tuesday, July 6, 1999). No further action has been taken, and the species is still listed as of the date of this Biological Opinion.

Life History/Populations Dynamics – Unless otherwise noted, the information in this section was taken from VDGIF (1994) and Watts *et al.* (1994).

Bald eagles breed at four to five years of age, the same time they develop their white head and tail. Adult birds mate for life, establishing nesting territories that they return to each year. Nesting pairs may remain near their territory year-round, particularly toward the southern range of the species. In addition to the resident breeding population, Virginia has five bald eagle "concentration areas" where sub-adults and non-breeding adults congregate. These areas are used for foraging, perching, and roosting during one or more seasons of the year. There are no

concentration areas near the action area.

During the day, eagles spend approximately 94% of their time perching (Gerrard *et al.* 1980, Watson *et al.* 1991). During the breeding season, 54% of that time is spent loafing, 23% scanning for food or eating, and 16% nesting (Watson *et al.* 1991). Eagles prefer high perches in trees that rise above the surrounding vegetation to provide a wide view that faces into the wind (Gerrard *et al.* 1980). In Maryland, eagles used shoreline that had more suitable perch trees, more forest cover, and fewer buildings than unused areas at all times of the year (Chandler *et al.* 1995). Chandler *et al.* (1995) found that distance from the water to the nearest suitable perch tree was shorter for areas used by bald eagles than areas that did not receive eagle use. In their study, eagles tended to perch within 164 feet of the shore. They recommended that shoreline trees greater than 7.87 inches in diameter at breast height and dead trees not be removed. Eagles often locate prey from a shoreline perch, and hunting forays from perches appear to be more successful than those initiated from flight (Jaffee 1980). Gerrard *et al.* (1980) found that after a successful fishing trip, eagles flew to a low perch to feed; these perches were less than 33 feet above the water and were well below the level of neighboring tree tops. Clark (1992) observed that, within the Powell Creek concentration area, eagles perched in shoreline trees, flew out to pick up fish, and then returned to the perch to eat.

Bald eagles are opportunistic foragers, preying on fish, birds, and small mammals, as well as scavenging carrion. In the summer, fish are the primary component of the diet. Eagles in Virginia feed on shad, catfish, carp, menhaden, perch, and eels depending on their seasonal availability. In the fall and winter, eagles shift their foraging to waterfowl and supplement their diet to a greater extent with carrion. Because the main diet of bald eagles inhabiting the Chesapeake Bay and its tributaries during the summer is fish, the majority of birds are likely to be present along the shoreline at any given time (Wallin and Byrd 1984). Foraging is a key behavior that influences daily and seasonal activity budgets (Watson *et al.* 1991). Foraging patterns may be strongly influenced by tidal fluctuations. Several studies have found that eagles foraged much more than expected during low tides and less than expected at high tides (McGarigal *et al.* 1991, Watson *et al.* 1991). In King George County, Virginia, overall bald eagle foraging frequency was highest from 4:35 to 6:00 a.m., with a small decline from 6:00 to 10:00 a.m. At 10:00 a.m. foraging decreased further and then remained the same until 6:00 p.m. when it decreased rapidly (Jaffee 1980).

Watts and Whalen (1997) conducted boat and eagle observations from three pier locations within the Powell Creek eagle concentration area on the James River during the summer of 1997. Peak eagle foraging began at dawn and continued until 8:30 a.m. After 8:30 a.m., eagle foraging activity declined and remained fairly stable until 11:00 a.m., when the amount of foraging decreased rapidly and remained low for the rest of the day. Between 6:00 and 8:30 a.m., 55% of morning foraging was documented. By 9:30 a.m., 70% of foraging had occurred. By 10:00 a.m., 79% of foraging had occurred, and 95% of all morning foraging activities had occurred by 11:00 a.m.

During the late afternoon/early evening, bald eagles fly inland to roost for the night. Most summer eagle roosts in the Chesapeake Bay region were found in greater than 100-acre forest blocks and were further from human development than random sites (Buehler *et al.* 1991b). Ninety-five percent of the roosts were within 2,362 feet of water and 50% were at least 2,231 feet from the nearest building (Buehler *et al.* 1991b). Trees used for roosting were larger in diameter, taller, and more accessible from the air than other available trees (Keister and Anthony 1983, Buehler *et al.* 1991b). Another important attribute of communal roosts is proximity to food sources (Keister and Anthony 1983). Because food for eagles occurs in the water, suitable habitat along rivers is important. Clark (1992) found that, within the Powell Creek concentration area, distance to the roost was the most important habitat factor that influenced eagle distribution along the shoreline. Buehler *et al.* (1991b) determined that on the Northern Chesapeake Bay ". . . fewer than 2% of the random trees met the minimum habitat values of roost trees, indicating that suitable roost trees are scarce relative to other trees. This relative scarcity suggests that if shoreline forest is removed indiscriminately, roost habitat could become limiting to the bald eagle population in the future."

Status and Distribution – Historically, bald eagles were plentiful along major river systems and coastal areas in the United States and Canada. However, habitat loss associated with human settlement, and later, the use of persistent pesticides (such as DDT) for crop management, resulted in a dramatic decline in eagle populations. By the late 1960s, most breeding populations had been decimated by eggshell thinning and associated low productivity. Since the nationwide ban on most persistent pesticides, bald eagle populations have experienced gradual recovery in both productivity and total numbers.

Although the bald eagle has rebounded over the past 15 to 20 years, current patterns of habitat loss in the Chesapeake Bay region threaten to halt or even reverse this recovery. Shoreline development throughout the Chesapeake Bay is reducing available habitat and poses the single greatest threat to the eagle population. Nesting, roosting, and foraging habitat is being lost to shoreline development for housing, business, industry, recreational facilities, public utilities, and transportation. Conversion of woodlands to agricultural fields and timber harvesting is also resulting in the loss of eagle habitat. As the human population along these shoreline areas continues to grow, more undisturbed wooded habitat used by bald eagles will be permanently altered. Between 1978 and 2020, the developed area of the Chesapeake Bay watershed is predicted to increase by 74% and 80% in Maryland and Virginia, respectively (Gray *et al.* 1988). In addition, water-based recreation in the Chesapeake Bay region has increased dramatically since the 1970s, resulting in disturbance to eagles in breeding, roosting, and foraging areas. Between 1992 and 1995, the population in Virginia increased 1.5% each year and boat registration increased 7% during that time (J.R. Davy, Virginia Department of Conservation and Recreation, pers. comm. 1996).

Buehler *et al.* (1991b) stated, "We assume there is an upper limit to the number of eagles that can be supported by any stretch of undeveloped shoreline. Thus, as shoreline continues to be modified, we believe that the length of remaining undeveloped shoreline may become the

limiting factor for some eagle populations, including the Chesapeake population." Bald eagles in Virginia will survive and maintain sustainable numbers only if there is adequate habitat for nesting, roosting, and foraging free from human disturbance. Management to preserve and protect these shoreline areas is essential to the continued growth and recovery of the Chesapeake Bay's nesting, summering, and wintering bald eagle population.

Chronic human activity may result in disuse of areas by eagles (USFWS 1989). Buehler *et al.* (1991b) found that bald eagle use of shoreline was inversely related to building density (magnitude of effect was greatest in summer) and directly related the development set back distance. Clark (1992) concluded that "increased numbers of waterfront buildings and decreased amounts of shoreline woodland . . . negatively affect eagle shoreline use." Clark (1992) found that eagle numbers decreased with increased numbers of buildings and amount of medium duty roads. Buehler *et al.* (1991a) found that in the northern Chesapeake Bay, 76% of shoreline areas may now be unsuitable for eagle use because of the presence of development within 1,640 feet of the shoreline. Up to an additional 10% of the shoreline was found to be unsuitable at times because of boat and pedestrian traffic. When shoreline is developed, it is irretrievably lost as eagle habitat (Buehler *et al.* 1991b). Human activity resulting in even temporary disruption of the bird's environment represents a major source of potential disturbance in many eagle populations (McGarigal *et al.* 1991, Stalmaster and Kaiser 1998). Human activity in perching areas can interrupt feeding and cause birds to relocate (Fraser 1988, Stalmaster and Kaiser 1998). Watts and Whalen (1997) examined eagle density as a function of human presence and their results suggest that the presence of people had a negative effect on shoreline use by eagles. Watts and Whalen (1997) stated that ". . . it is clear that eagles avoid shoreline segments that regularly have people within 100 m [328 feet] of the water." Buehler *et al.* (1991b) seldom observed eagles on the northern Chesapeake Bay within 1,640 feet of human activity and found that the birds rarely used developed areas or areas frequented by people on foot. During the summer, birds on the northern Chesapeake Bay flush, on average, when humans get within 577 feet (Buehler *et al.* 1991b). Once birds are disturbed, they do not return to the area until several hours after the disturbance has occurred and only when the disturbance no longer persists (Stalmaster and Newman 1978, Stalmaster and Kaiser 1998).

In addition to human activity, removal of shoreline vegetation results in disturbance to eagles and loss of habitat. Clark (1992) found that within the Powell Creek concentration area on the James River, eagle abundance increased with increases in woodland width (defined as maximum width of woodland in each sampling plot measured in meters inland from the shore), snags (defined as number of standing dead trees over five meters in height on the shore of each sampling plot), and woodland length (defined as maximum length of woodland in each sampling plot measured in meters along the shoreline), which are indicative of the amount of forest habitat available. These three variables indicated lack of development, presence of a vegetation screen from human activities, and the presence of perching habitat. Removal of tall, large diameter trees will decrease the amount of perching and roosting habitat available (Buehler *et al.* 1991b). Luukkonen *et al.* (1989) recommended maintaining shorelines with forested buffers at least 328 feet wide. In addition, the buffer should have a minimum of one tree per 820 feet of shoreline

that is at least 15.7 inches in diameter at breast height, is accessible to eagles, and contains suitable perching limbs. They also recommended conserving trees greater than or equal to 23.6 inches in diameter at breast height.

It has been documented that eagles are more tolerant of sounds when the sources were partially or totally concealed from their view (*e.g.*, Stalmaster and Newman 1978, Wallin and Byrd 1984). Strips of vegetation that reduce line-of-site will allow closer presence of humans and provide perching and roosting trees (Stalmaster and Newman 1978). Stalmaster (1980) recommended restricting land activities 820 feet from eagles perched in shoreline trees to protect 99% of the birds. He suggested that boundaries could be shortened to 246 to 328 feet in width if at least 164 feet of this zone contains dense, shielding vegetation.

Feeding behavior of bald eagles can be disrupted by the mere presence of humans (Stalmaster and Newman 1978, Stalmaster and Kaiser 1998). Early morning human activities are potentially the most disruptive to eagle foraging activity (McGarigal *et al.* 1991, Stalmaster and Kaiser 1998). Disturbance may result in increased energy expenditures due to avoidance flights and decreased energy intake due to interference with feeding activity (Knight and Knight 1984, McGarigal *et al.* 1991, Stalmaster and Kaiser 1998). "The difference between the presence of a species when food is available versus the ability of that species to utilize the food is important. Whereas scavengers might be present in an area and appear to be unaffected by human activity, closer inspection would be required to determine whether the individuals are actually able to feed on that food" (Knight *et al.* 1991). Camp *et al.* (1997) found that wildlife responds to disturbance physiologically before responding behaviorally. They stated that heart rate increases and attention is diverted to human activities at a distance greater than that which actually causes the wildlife to flush. Knight *et al.* (1991) examined winter bald eagle concentration areas in Washington and found that when anglers (not in boats) were present, fewer bald eagles were feeding and the eagles shifted their foraging from early morning to late afternoon. ". . . The presence of anglers disrupted feeding, which reduced energy intake and increased energy expenditure through avoidance flights. The ultimate effect of such disturbances on energy budgets and individual fitness is unknown" (Knight *et al.* 1991).

Clark (1992) found that within the Powell Creek eagle concentration area, eagle abundance decreased with increased numbers of "boat landings." Boat landings were defined as ". . . piers, boat ramps, and sites where boats are regularly landed or anchored on the shore . . ." Wallin and Byrd (1984) had similar findings within the Caledon concentration area on the Potomac River. Clark (1992) recommended that additional boat landings within or adjacent to the Powell Creek concentration area be discouraged, including those on tributary creeks of the James River.

Boating activity is likely to adversely impact eagles because it disrupts feeding activity and affects large areas in short periods of time (Knight and Knight 1984). Activities of recreational boaters are not predictable and thus are especially disruptive to birds (Wallin and Byrd 1984). McGarigal *et al.* (1991) found that eagles usually avoided an area within 656 to 2,952 feet of a single stationary experimental boat, with an average avoidance distance of 1,300 feet. During

this time, eagles spent less time foraging and made fewer foraging attempts. McGarigal *et al.* (1991) recommend a 1,312 to 2,624 foot wide buffer around high-use foraging areas. Knight and Knight (1984) studied wintering eagles in Washington and found that a 1,148 foot wide buffer would protect 99% of birds perched in shoreline trees from a single canoe. However, eagles feeding on the ground were more sensitive to disturbance and required larger buffers. A buffer of at least 1,476 feet would be required to protect 99% of eagles feeding on the ground from a single canoe.

Moving boats, as well as stationary boats, disrupt eagles. Buehler *et al.* (1991b) found that on the northern Chesapeake Bay, eagles were flushed by an approaching boat at an average distance of 575 feet. M.A. Byrd (College of William and Mary's Center for Conservation Biology, pers. comm. 1989) has observed that when eagles are flushed by recreational boats from perch sites along the James River, they usually fly inland and cease foraging for at least several hours. Watts and Whalen (1997) studied boats and eagles on the James River. They found that nearly 25% of eagles perched on the shoreline flushed when their survey boat was within 656 feet of the shoreline. When the boat was within 328 feet of the shoreline, nearly 80% of the birds flushed. During shoreline surveys, they found that nearly 50% of all boats observed were within 656 feet of the shoreline and more than 35% were within 328 feet. Jon boats, jet skis, and bass boats tended to be closer to the shoreline than sport boats (defined as v-hull type boats). "The gener distribution of boats relative to the shoreline . . . in combination with the observed flushing probabilities . . . suggest that a large number of boats may directly influence shoreline use by eagles" (Watts and Whalen 1997). Their data analysis suggested that the presence of boats within 656 feet of the shoreline has a significant negative effect on shoreline use by bald eagles.

Stalmaster and Kaiser (1998) studied wintering eagles on the Skagit River in Washington and found that eagles foraging on the ground were intolerant of humans within 300 m, especially in the morning and that the ". . . manner in which eagles responded to motorboats demonstrated that this activity was extremely disruptive to the population, even though only a small number of human were involved." Luukkonen *et al.* (1989) studied non-breeding eagles in North Carolina and found "eagles and people tended to concentrate their activities on different portions of both lakes." They estimated that boat densities of more than 0.5 boats/km^2 altered eagle distribution patterns. "Disturbance by boaters or others may negatively affect eagle energy budgets by causing unnecessary eagle movements and by displacing eagles from foraging areas" (Luukkonen *et al.* 1989). Wood and Collopy (1995) studied breeding and non-breeding eagles on three lakes in Florida. They found a significant negative relationship between boat numbers and eagle numbers on one of the lakes. The other two lakes did not show this relationship, but did not receive as much boat traffic. Boat use was highest on weekends and eagle use was highest on weekdays. Moving boats seemed to be more disruptive than stationary boats. Boating activity reduced the number of eagles using the shoreline, increased the perching distance from the shoreline, and increased the flushing distance (mean flush distance was 174 feet).

Chemical poisoning and shooting are now less of a threat than in past years, but continue to cause loss of eagles. The Service, U.S. Environmental Protection Agency, and the states monitor

pesticide-related eagle mortalities; restrictions on some types of pesticides have resulted from eagle mortalities. With increased petrochemical transport activities in the Chesapeake Bay region, the potential exists for eagles to come into contact with oil resulting from spills. Eagle deaths occasionally occur throughout the species' range due to collisions with power lines or electrocutions at power poles. In Virginia, power companies have voluntarily agreed to place "perch guards" on power poles that have a high risk of eagle electrocution.

ENVIRONMENTAL BASELINE

Status of the Species Within the Action Area – Bald eagles are proliferating in and around Jamestown Island. Nest VAJC-0101 is a new nest discovered during the annual nesting surveys in March 2001. During the fly-over, an adult eagle was observed sitting on the nest (Watts, College of William and Mary's Center for Conservation Biology, pers. comm. 2001). The eagle did not fly away when the aircraft flew over and was presumed to be incubating. While eggs themselves were not seen, there were probably eggs in the nest in March 2001 (Watts, pers. comm. 2001).

The eagles probably moved into this busy area during the late fall of 2000, when levels of human activity are relatively low. While the eagles are accustomed to some human disturbance, there will be a greater amount of disturbance in the vicinity of the nest during the spring and summer than when they arrived. According to the Bald Eagle Protection Guidelines for Virginia (USFWS & VDGIF 2000), eagles usually prefer much less nearby human activity than the level at Jamestown Island. The guidelines recommend a 1,320-foot protection zone with minimal human disturbance around nests. The guidelines warn of the negative effects of boat traffic and loud noises. This eagle nest is approximately 600 feet from the only road onto Jamestown Island, with a clear line of sight to the road. Furthermore, the nest is approximately 600 feet from the visitors parking lot, with a limited line of sight view of traffic in the parking lot. Even though there is not much vegetation to block the eagles' view of the traffic, a marsh does separate the nest tree from the road and the parking lot. This marsh will serve to prevent access on foot any closer than approximately 400 feet. The nest is approximately 200 feet from Back River, the waterway that separates Jamestown Island from the mainland. The visitors center is approximately 1,400 feet from the nest.

This particular pair of eagles appear to be used to some degree of human disturbance. In addition to the routine traffic, several NPS projects were completed during the winter of 2001. A water line replacement project was undertaken from September 2000 to February 2001, and equipment was staged in the parking lot approximately 600 feet from the nest. Many loud activities, such as the operation of dump trucks, excavators, backhoes, tractors, tampers, and jackhammers, were all used within 750 feet of the nest. Chain saws and payloaders were used to cut down and remove some trees around the parking lot in October 2000. Sewer lines were blown with an air compressor in October 2000. The Isthmus Bridge (approximately 1,400 feet from the nest but with a clear line of sight) was cleaned and painted during October and November 2000. Many trucks used to the road to complete other maintenance activities farther down the island

throughout the fall and winter of 2000-2001.

Factors Affecting Species Habitat Within the Action Area – NPS only removes trees in the action area that are a threat to humans (trees that lean over the parking lot or the road). The proposed action will have minimal effect on eagle habitat.

Plans for celebrating the 400th anniversary of the Jamestown settlement (1607-2007) are ongoing. Depending on the alternative selected, there may be impacts to eagle habitat in this action area in the future.

EFFECTS OF THE ACTION

Beneficial Effects – Beneficial effects are those effects that are wholly positive, without any adverse effects. As defined, there are no beneficial effects in the proposed action.

Direct Effects – High levels of human activities within the vicinity of an eagle nest may harass eagles to the point that the adults abandon the nest, or they may not spend enough time incubating eggs or chicks or feeding the young, causing the young to die. Young eaglets that cannot fly can be frightened to the point that they jump out of the nest and are injured or die.

A variety of human disturbances have occurred or will occur in the vicinity of nest VAJC-0101. Vehicles (cars, buses, and small trucks), boating activity, people, and helicopters will each add a level of disturbance. It is impossible to distinguish which, if any, of these activities may cause harassment of the eagles to the point of nest abandonment or injury/death to the eggs or young. Of the human activities within the vicinity of nest, boat activity will probably disturb the eagles the most (Watts, pers. comm. 2001).

First-year nesting pairs have a greater chance of abandoning a nest than pairs that have occupied a nest for several years (Watts, pers. comm. 2001). This pair was seen in the nest in late February 2001. Due to the investment already taken, it is unlikely that this pair will abandon the nest during the current nesting season. Based on the location of the nest, the Service does not believe that the current type and level of human disturbance will cause young eaglets to jump out of the nest. While it is possible that the increased level of human disturbance over the spring and summer may result in the adults choosing not to return to the nest site next winter, the Service believes that the proposed actions by NPS will not cause the eagles to abandon the nest.

Interrelated and Interdependent Actions – An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. No activities that are interrelated to or interdependent with the proposed action are known at this time.

Indirect Effects – Indirect effects are caused by or result from the proposed action, are later in time, and are reasonably certain to occur. There are no known indirect effects at this time.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

There are non-federal activities that affect the eagles nesting at VAJC-0101. There is private land on Jamestown Island owned by the Association for the Preservation of Virginia Antiquities (APVA). Almost all of APVA's land is outside the primary protective zone of 750 feet; their road connection to the main road is the only APVA land within the primary zone. As stated above, there is only one road onto Jamestown Island, and APVA traffic numbers are included in the NPS traffic numbers. Furthermore, the nest is concealed from view from almost all of the APVA land. Some activities, such as occasional individual tree clearing within 1,320 feet (but outside 750 feet) of the nest are prohibited during the nesting season, which runs from December 15 to July 15 in Virginia.

APVA maintains a helicopter pad approximately 1,300 feet from the nest. APVA estimates that helicopter flights occur about once a month. APVA has instructed the pilot to avoid coming any closer to the nest than the landing pad and to observe a 1,000-foot vertical clearance from the nest.

Boat traffic within the action area is expected to dramatically increase during the warmer months. Since the eagles probably established the nest in the late fall of 2000, there will be a marked increase in human disturbance to this new eagle nest, even though boat activity will probably be comparable to other summers. FWS has communicated with the owner of the *Jamestown Island Explorer*, a tour boat than circumnavigates the Island. The tour boat, which only operates from April to September/October, will be a source of disturbance to the eagles. In addition to the presence of the boat, the boat has a loudspeaker that points out historic and natural points of interest. The boat owner has agreed to refrain from using the loudspeaker within 500 feet of the nest. Since the eagles moved within 500 feet of the road, and the road does have year-round traffic, the eagles are tolerant of some human activity.

Other boat traffic on Back River and Sandy Bottom, most notably jet skis, will undoubtedly create noise and disturbances near the nest.

Plans for celebrating the 400th anniversary of the Jamestown settlement are ongoing. The "Jamestown 2007" proposals will likely result in formal consultation later this year, regarding this and other eagle nests and perhaps the sensitive joint-vetch, *Aeschynomene virginica*, as well.

CONCLUSION

After reviewing the status of the bald eagle, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is FWS's biological opinion that the current operations at Jamestown Island, as proposed, are not likely to jeopardize the continued existence of the bald eagle. No critical habitat has been designated for this species, therefore, none will be affected.

III. INCIDENTAL TAKE STATEMENT

Sections 9 of the ESA and federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by FWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by FWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

The measures described below are nondiscretionary, and must be undertaken by NPS so that they become binding conditions of any grant or permit issued to the applicant, as appropriate, for the exemption in action 7(o)(2) to apply. NPS has a continuing duty to regulate the activity covered by this incidental take statement. If NPS (1) fails to assume and implement the terms and conditions or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. To monitor the impact of incidental take, NPS must report the progress of the action and its impact on the species to FWS as specified in the incidental take statement.

AMOUNT OR EXTENT OF TAKE

FWS anticipates take associated with bald eagle nest VAJC-0101 as a result of this proposed action. The incidental take is expected to be in the form of harassment of the adult pair less than the level that would cause nest abandonment.

FWS will not refer the incidental take of the bald eagle for prosecution under the Migratory Bird Treaty Act of 1918, as amended (16 U.S.C. §§ 7 03-712), or the Bald Eagle Protection Act of

1940, as amended (16 U.S.C. §§ 668-668d), if such take is in compliance with the terms and conditions (including amount and/or number) specified herein.

EFFECT OF THE TAKE

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

REASONABLE AND PRUDENT MEASURES

FWS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of bald eagles:

- Minimize harassment of eagles by visitors.
- Do not encourage boat traffic near the nest.
- Establish a vegetative screen between the nest and the parking lot.

TERMS AND CONDITIONS

To be exempt from the prohibitions of section 9 of the ESA, NPS must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are nondiscretionary.

1. Do not allow picnics, parties, fireworks, or other loud sounds (other than traffic) within 750 feet of the nest during the breeding season (December 15 to July 15).

2. Patrol the area routinely during the breeding season to ensure that visitors are not harassing the eagles by making loud noises or by walking any closer to the nest than the edge of the parking lot or the edge of the road. All NPS employees should be briefed so that they can correct visitors on the spot if they see visitors harassing the eagles. As long as all NPS employees can identify improper activities and have the authority and confidence to correct visitors, no special patrols are required.

3. Do not allow boats to land on NPS property within 1,320 feet of the nest during the breeding season.

4. During the breeding season, do not cut timber within 750 feet of the nest (except for safety reasons).

5. Plant a vegetative screen to prevent line of sight between the nest and the parking lot.

IV. CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to utilize their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to further minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. FWS has no conservation recommendations.

V. REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the initiation request. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

For this Biological Opinion, the level of incidental take is harassment of the adult pair. Any take greater than that level requires reinitiation. Some examples include the death of any eagles from the nest, the adults leaving the nest prior to eaglet fledging, or the adults failing to return by December 15, 2001.

FWS appreciates this opportunity to work with NPS in fulfilling our mutual responsibilities under the ESA. If you have any questions, please contact Mr. Eric Davis of this office at (804) 693-6694, extension 104.

Sincerely,

Karen L. Mayne

Karen L. Mayne
Supervisor
Virginia Field Office

Enclosures

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COMMONWEALTH of VIRGINIA

James S. Gilmore, III
Governor
John Paul Woodley, Jr.
Secretary of Natural Resources

Department of Game and Inland Fisheries

William L. Woodfin, Jr.
Director

May 16, 2001

Tricia Wingard
Vanasse Hangen Brustlin, Inc.
477 McLaws Circle, Suite 1
Williamsburg, VA 23185

RE: ESSLOG 14565; Jamestown Re-development Concept Plan EIS

Dear Ms. Wingard:

This letter is in response to your request for information related to the presence of threatened or endangered species in the vicinity of the above referenced project.

Information about fish and wildlife species was generated from our agency's computerized Fish and Wildlife Information System, which describes animals that are known or may occur in a particular geographic area. Field surveys may be necessary to determine the presence or absence of some of these species on or near the proposed area. Also, additional sensitive animal species may be present, but their presence has not been documented in our information system.

The *federally threatened state endangered* bald eagle (*Haliaeetus leucocephalus*) has been documented in the project area. The applicant should coordinate with this Department and with the US Fish and Wildlife Service (USFWS) to evaluate potential impacts on this species.

Data provided by the Virginia Deparetment of Agriculuture and Consumer Services (VDACS) indicate that the *federally threatened* sensitive joint-vetch (*Aeschynomeme virginica*) has been documented in the project area. The applicant should coordinate with Keith Tignor, VDACS, Office of Plant Protection at (804)786-3515, and with the US Fish and Wildlife Service concerning potential impacts on these species.

The state special concern species' bridle shiner (*Notropis bifrenatus*), great egret (*Ardea alba egretta*), Northern harrier (*Circus cyaneus*), barn owl (*Tyto alba pratincola*), Caspian tern (*Sterna caspia*), and least tern (*Sterna antillarum*) have been documented in the project area. The classification of "state special concern species" is not a legal designation and does not require further coordination.

This project is located in the vicinity of a stream reach that contains a documented occurrence of striped bass (*Morone saxatilis*) and blueback herring (*Alosa aestivalis*). The applicant should coordinate with this Department regarding potential impacts to these species'.

This project lies within 0.5 mile of a documented waterbird colony containing great blue heron (*Ardea herodias*). Therefore, the applicant should coordinate with this Department

4010 WEST BROAD STREET, P.O. BOX 11104, RICHMOND, VA 23230-1104
(804) 367-1000 (V/TDD) *Equal Opportunity Employment, Programs and Facilities* FAX (804) 367-9147

and with the US Fish and Wildlife Service (USFWS) concerning potential impacts to the colony.

Endangered plants and insects are under the jurisdiction of the Virginia Department of Agriculture and Consumer Services, Bureau of Plant Protection. Questions concerning sensitive plant and insect species occurring at the project site should be directed to Keith Tignor at (804) 786-3515.

This letter summarizes the likelihood of the occurrence of endangered or threatened animal species at the project site. If you have additional questions in this regard, please contact me at (804) 367-2211. Please note that this response does not address any other environmental concerns; these issues are analyzed by our Environmental Services Section, in conjunction with interagency review of applications for state and federal permits. If you have any questions in this regard, please contact Ray Fernald or Tom Wilcox at (804) 367-8999.

There is a processing charge of $25.00 for our response. Please remit a check, made payable to **TREASURER OF VIRGINIA**, within 30 days to MaryBeth Murr at the address listed on the first page. Include a copy of this letter with your payment to ensure that your account is properly credited.

The Fish and Wildlife Information Service, the system of databases used to provide the information in this letter, can now be accessed via the Internet! The Service currently provides access to current and comprehensive information about all of Virginia's fish and wildlife resources, including those listed as threatened, endangered, or special concern; colonial birds; waterfowl; trout streams; and all wildlife. Users can choose a geographic location and generate a report of species known or likely to occur around that point. From our main web page, at www.dgif.state.va.us, choose the hyperlink to "Wildlife Information Online". For more information, please contact Amy Martin, Online Service Coordinator, at (804) 367-2211.

Thank you for your interest in the wildlife resources of Virginia.

Sincerely,

Amy Martin

Amy Martin
Online Services Coordinator

cc: R.T. Fernald, VDGIF
Karen Mayne, USFWS
Keith Tignor, VDACS

Transportation
Land Development
Environmental
Services

VHB imagination | innovation | energy Creating results for our clients and benefits for our communities

Vanasse Hangen Brustlin, Inc.

September 11, 2001

Ref: 31005

Mr. Mike Schwinn, Assignment Chief
Regulatory Branch
U.S. Army Corps of Engineers
803 Front St.
Norfolk, VA 23510-1096

Re: Wetland Jurisdictional Verification

Dear Mr. Schwinn:

First, we at Vanasse Hangen Brustlin, Inc. (VHB) welcome you to the Old Dominion, and look forward to meeting you. We hope you have settled in and things are going smoothly for you. Let us know if we can assist you in any way.

On behalf of the National Park Service (NPS) and the Association for the Preservation of Virginia Antiquities (APVA), VHB has performed a wetland delineation at various locations on Jamestown Island in James City County, Virginia. These two organizations are jointly proposing improvements to the facilities in preparation of the 400-year anniversary of the Jamestown settlement in 2007. As part of the necessary documentation required under the National Environmental Policy Act (NEPA), VHB has been asked to perform wetland studies on the property and define the limits of jurisdictional wetlands within the immediate project area. The wetland delineation work has been a piece-meal process over the years. Portions of the wetlands have previously been delineated by VHB and Environmental Concerns, and later confirmed by the Corps.

The need to look at different site planning alternatives requires additional delineation work. We are requesting confirmation of these additional lines. Enclosed for your review are a vicinity map, a wetland boundary map, soils map, and the associated data sheets. The wetland boundary map shows the portions of the lines previously confirmed and those portions just recently delineated which will need Corps' review. All lines have been GPS by National Park Service personnel and incorporated into their GIS system.

477 McLaws Circle, Suite 1
Williamsburg, Virginia 23185
757.220.0500 • FAX 757.220.8544
email: info@vhb.com
www.vhb.com

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Once assigned to the appropriate Corps personnel, we would like to have these boundaries confirmed at the earliest convenience. Please advise us of a time so that we can make arrangements to meet on-site to review the site boundary and answer any questions. We expect Mr. Chuck Rafkind, Natural Resource Manager with the NPS, to join us during the site visit.

Should you have any questions or require additional information, please do not hesitate to contact Aaron Sutton or me at 757-220-0500.

Very truly yours,

VANASSE HANGEN BRUSTLIN, INC.

R. Timothy Davis

R. Timothy Davis, PWS
Environmental Scientist

Enclosures

cc: Tricia Wingard, VHB
Chuck Rafkind, NPS

VHB

U.S. Army Corps of Engineers
Norfolk District, Eastern Virginia Regulatory Section

January 24.2002

Project Number: 01-R214:

Waterway: James River

1. Participant:
The National Park Service (NPS)
and
The Association for the Preservation of Virginia Antiquities (APVA)

2. Authorized Agent:
Transportation Land Development Environmental
477 McLaw Circle, Suite 1
Williamsburg, VA 23185

3. Address of Job Site:
Jamestown Island on Back River and the James River in James City County

4. Project Description:
Confirmation delineation, including two isolated wetlands of 0.03 acres and 0.2-0.3 acres in size

5. Findings

An on-site jurisdictional determination has found waters and/or wetlands regulated under Section 10 of the Rivers and Harbors Act (33 U.S.C. 403) and/or Section 404 of the Clean Water Act (33 U.S.C. 1344) on the project site listed above.

This letter shall serve to confirm the wetlands delineation by VHB, as surveyed and shown on the map titled, "National Park Service" dated August 23, 2001 (copy attached).

Our basis for this determination is the application of the Corps' 1987 Wetland Delineation Manual and the positive indicators of wetland hydrology, hydric soils, and hydrophytic vegetation. The wetland is a water of the United States and is part of a tributary system to interstate waters (33 CFR 3 2 8.3 (a)).

Two isolated wetlands were confirmed on the property of the National Park Service and The Association for the Preservation of Virginia, and are marked on the site map dated January 17, 2002, and stamped received at the Army Corps of Engineers on January 22, 2002. The isolated wetlands are approximately 0.03 acres and 0.2-0.3 acres in size. Any discharge of dredged and/or fill material into these isolated wetlands will not require a Department of the Army permit. However, a permit may be required from the Virginia Department of Environmental Quality (DEQ) and we are notifying them by copy of this letter.

Any work in these areas which is considered structure or fill under current regulation may require a Department of the Army permit and possibly authorization by state and local authorities. Your proposed work may require a Virginia Water Protection Permit from the Virginia Department of Environmental Quality (DEQ) and/or a permit from the Virginia Marine Resources Commission (VMRC). Please obtain all required permits before starting work in the delineated waters/wetland areas.

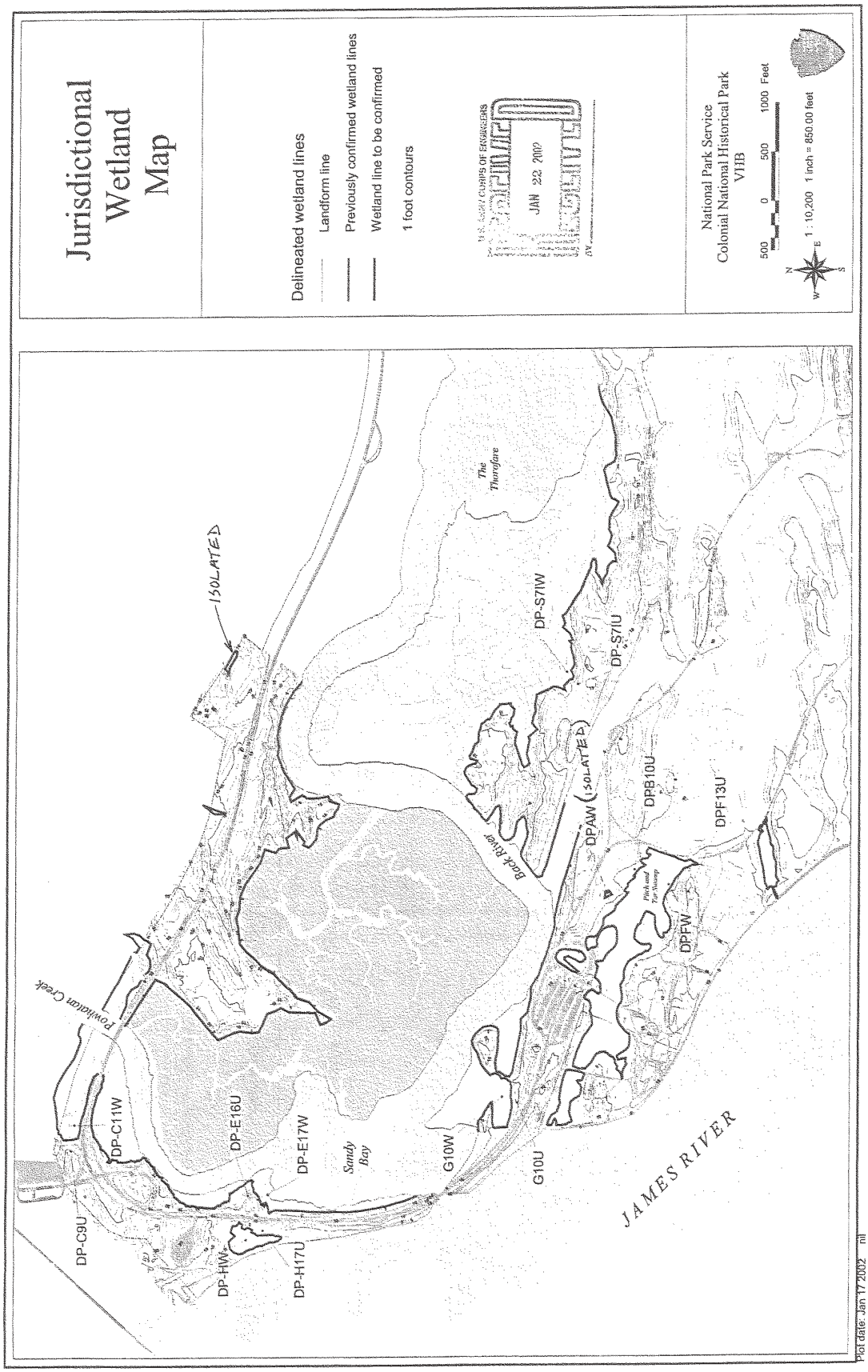
This jurisdictional determination is valid for a period of five years from the date of this letter. If you have any questions, please call your Corps contact at the phone number noted below. Thank you.

Copy Furnished: DEQ, James City County

6. Corps Contact: Tracy Dotolo(757)441-7122

Nicholas L. Konchuba
Chief, Eastern Virginia Regulatory Section

NAO FL 13 REVISED DEC 90


Jurisdictional Wetland Map
Delineated wetland lines
Landform line
Previously confirmed wetland lines
Wetland line to be confirmed
1 foot contours
JAN 22 2002
National Park Service
Colonial National Historical Park
VIIB
500 0 500 1000 Feet
1 : 10,200 1 inch = 850.00 feet
ISOLATED
Powhatan Creek
DP-C11W
DP-E16U
DP-E17W
Sandy Bay
G10W
G10U
DP-C9U
DP-H4W
DP-H17U
Back River
The Thoroughfare
DP-S7IW
DP-S7IU
DPAW (ISOLATED)
DPB10U
DPF13U
DPFW
Pitch and Tar Swamp
JAMES RIVER
Plot date: Jan 17 2002 mll

G

Appendix G:
Wetland Functional Assessment Data

mawald.checkin.31005.03.subdividers.p65

Wetland Functional Assessment Data

EVALUATION FOR PLANNED WETLANDS (EPW)
Cover Sheet

PROJECT TITLE:

ASSESSMENT DATE(S): *WAA:* *planned wetland:*

INDIVIDUAL(S) PERFORMING EVALUATION AND AFFILIATION:

LOCATION (e.g., City, County, State, Waterway/Watershed):

WAA:

planned wetland:

ASSESSMENT OBJECTIVES:
(note assumed point in time, e.g., peak of first growing season for planned wetland)

CHECK FUNCTIONS ASSESSED:	*WAA*	*planned wetland*
Shoreline Bank Erosion Control		
Sediment Stabilization		
Water Quality		
Wildlife		
Fish (Tidal)		
Fish (Non-tidal Stream/River)		
Fish (Non-tidal Pond/Lake)		
Uniqueness/Heritage		

DESCRIPTION OF PROJECT AREA:
Include information relevant to the assessment (e.g., NWI classification, description of hydrogeomorphic class(es), land use, climate).

WAA:

planned wetland:

...cover sheet continues on reverse

CHECK SEASONAL CONTEXT OF THE ASSESSMENT:

Average Dry Wet

In most situations, the wetland can be readily evaluated by considering average site conditions. However, in some regions (e.g., arid) it may be preferable to evaluate the wetland for different conditions. Please provide explanation if average conditions are not used.

EXPLANATION OF CHANGES OR MODIFICATIONS TO EPW:

	Yes	No
Were any changes, deletions, or additions to element conditions and/or assigned scores made? If so, explain below. Cite literature and/or document personal communication(s) with experts.		
Were any changes made to the FCI models? If so, explain.		
Is the planned wetland designed with the goal of removing specific nutrients? If so, explain. Note: modification of the Water Quality FCI model and elements may be required to insure a focus on the removal efficiency for specified nutrients. Refer to Chapter 6 and available literature.		

Explanations:

PLANNED WETLAND GOALS:

Target FCIs and Target FCUs are recorded in Table A. 1 and Table A. 2. Other pertinent information may be provided here.

Table A.1.
Comparison of WAA and planned wetland: calculations of FCIs and FCUs

Project Title:

Comparison between WAA # _____ and planned wetland # _____

	WAA			Goals for Planned Wetland**					Planned Wetland			
Function	FCI	AREA	FCUs*	Target FCI	R	Target FCUs	Predicted FCI	Minimum Area	FCI	AREA	FCUs*	Check if goals met
SB												
SS												
WQ												
WL												
FT												
FS												
FP												
UH												

*FCUs = FCI x AREA
**Target FCI = *goal* established by decision makers
R = multiplying factor established by decision makers
Target FCUs = $FCU_{WAA} \times R$ (i.e., planned wetland *goal*)
Predicted FCI = FCIs which designers presume planned wetland may achieve at a particular site (Note this may be greater than Target FCI).
Minimum Area = Target FCUs/Predicted FCI

Table A.2.
Comparison of FCIs and element scores

PROJECT TITLE:

Function	Functional Capacity Index		Elements with different scores for WAA and planned wetland		
	WAA	Planned Wetland	Element Number	Difference	Explanation
Shoreline Bank Erosion Control (SB)		Target:			
Sediment Stabilization (SS)		Target:			

Table A.2. (page 1 of 3)

Table A.2.
Comparison of FCIs and element scores

PROJECT TITLE:

Function	Functional Capacity Index		Elements with different scores for WAA and planned wetland		
	WAA	Planned Wetland	Element Number	Difference	Explanation
Water Quality (WQ)		Target			
Wildlife (WL)		Target			
*Reminder: Include elements 11d and/or 12e if there are differences in scores					

Table A.2. (page 2 of 3)

Table A.2.
Comparison of FCIs and element scores

PROJECT TITLE:

Function	Functional Capacity Index		Elements with different scores for WAA and planned wetland		
	WAA	Planned Wetland	Element Number	Difference	Explanation
Fish (FT, FS, FP)		Target:			
Uniqueness/Heritage (UH)		Target:			

Table A.2. (page 3 of 3)

PROJECT TITLE: _____

SHORELINE BANK EROSION CONTROL DATA SHEETS

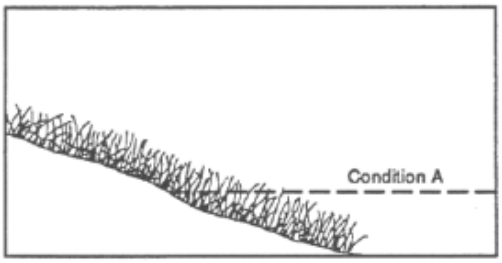
Function weighting area (AREA) = The shore, i.e., the vegetated or non-vegetated areas of the wetland located channelward of the bank (see Figure A.2).

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	For use in FCI Model: SELECTED SCORES FOR ELEMENTS — WAA	For use in FCI Model: SELECTED SCORES FOR ELEMENTS — Planned Wetland	For use in Table A.2 only: DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
Potential for erosion:				
1. Bank characteristics				Assume NA = 1.0
1a. Water contact with toe of bank (see Figure A.1)	[SB, WQ]*			
a. No shoreline bank.	NA			
b. Infrequent water contact at toe of bank, i.e., no undercutting of bank (e.g., contact once annually or less).	1.0			
c. Occasional water contact at toe of bank (e.g., contact once a month).	0.7			
d. Moderate water contact at toe of bank (moderate undercutting of bank).	0.5			
e. Frequent water contact at toe of bank (severe undercutting of bank).	0.1			

NOTE: If the score for element 1 = NA (no shoreline bank), there is no potential for providing the shoreline bank erosion control function; therefore the Shoreline Bank Erosion Control FCI is not applicable (NA). Continue only if score ≠ NA.

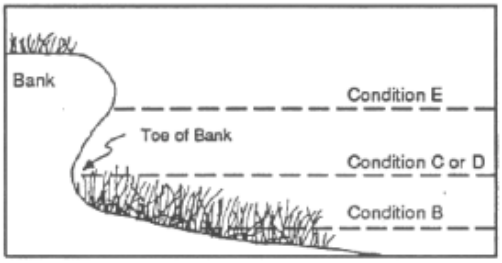
Site suitability for planned wetland (elements 2 and 14a):				
2. Fetch (Fetch = maximum distance over which wind can blow, unimpeded, across open water to generate waves)	[SB]			Assume NA = 1.0
a. < 1.6 km (1 mile).	1.0			
b. > 1.6 km (1 mile).	0.1			

* Denotes function(s) to which element applies: SB = Shoreline Bank Erosion Control; SS = Sediment Stabilization; WQ = Water Quality; WL = Wildlife; FT = Fish (Tidal); FS = Fish (Stream/River); FP = Fish (Pond/Lake); and UH = Uniqueness/Heritage



Bank Absent

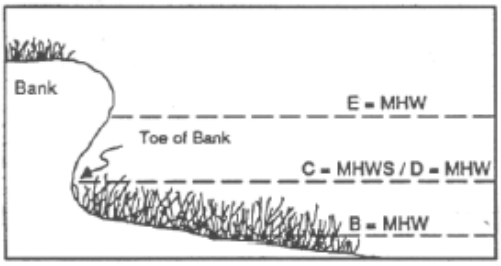
Condition A = No Shoreline Bank



Bank Present

Condition B = Infrequent water contact at toe of bank, i.e., no undercutting of bank (e.g., contact once annually or less).
Condition C = Occasional water contact at toe of bank (e.g., contact once a month).
Condition D = Moderate water contact at toe of bank (moderate undercutting of bank).
Condition E = Frequent water contact at toe of bank (severe undercutting of bank).

Example = Tidal System



Condition B = Mean High Water (MHW) below toe of bank
Condition C = Mean High Water Spring (MHWS)
Condition D = MHW at toe of bank
Condition E = MHW above toe of bank

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENC IN SCORE (Planned - W
		WAA	Planned Wetland	If both score are NA, record
14. Slope				
14a. Steepness of existing shore (Shore = vegetated or non-vegetated substrate located channelward of the bank; **See Figure A.2**)	[SB]			Assume NA =
a. Shore gradual (e.g., slope < 10:1).	1.0			
b. Shore steep (e.g., slope > 10:1).	0.1	NA		
If condition b, then record slope: _____				

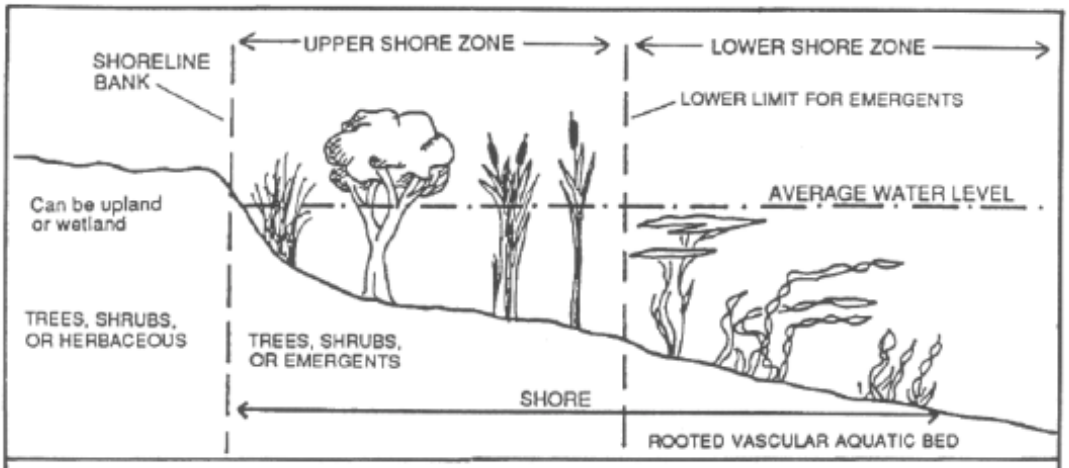
NOTE: For planned wetland only. If score for elements 2 and/or 14a is 0.1, then the site is UNSUITABLE. The Shoreline Bank Erosion Control FCI will be low. Continue with data sheet for the planned wetland, only if scores for both elements = 0.1.

Shoreline structures/obstacles:

3. Shoreline structures/obstacles	[SB]			Assume NA = 1
a. No shoreline structures present.	NA			
b. Structure/obstacle present. Shore erosion minimal.	NA			
c. Structure/obstacle present. Moderate shore erosion problem present.	0.5			
d. Structure/obstacle present. Substantial shore erosion problem present.	0.1			

If structure/obstacle present, check type(s):

Structure/Obstacle	WAA	Planned Wetland
Bulkhead		
Rubble		
Riprap		
Revetments (e.g., stone, concrete, gabion)		
Breakwater		
Groins		
Beach fill		
Bridge pier		
Boat dock		
Fallen trees		
Debris		
Potential for moving ice chunks		
Other: _____		



Shoreline Bank: Steep ascending slope of land of any height raised above the adjacent shore that can experience undercutting if it is in contact with water.

Shore: Vegetated or non-vegetated substrate located channelward of the bank.

Upper Shore Zone: Vegetated or non-vegetated portion of the shore located between the bank and the potential lower limit of emergent or woody vegetation as dictated by water depth or tide level.

Lower Shore Zone: Vegetated or non-vegetated portion of the shore located channelward of the potential lower limit of emergent or woody vegetation.

Entire Wetland: Includes wetland areas landward of the bank, the bank, the upper shore zone, and the lower shore zone.

Examples: Aerial View of Wetlands

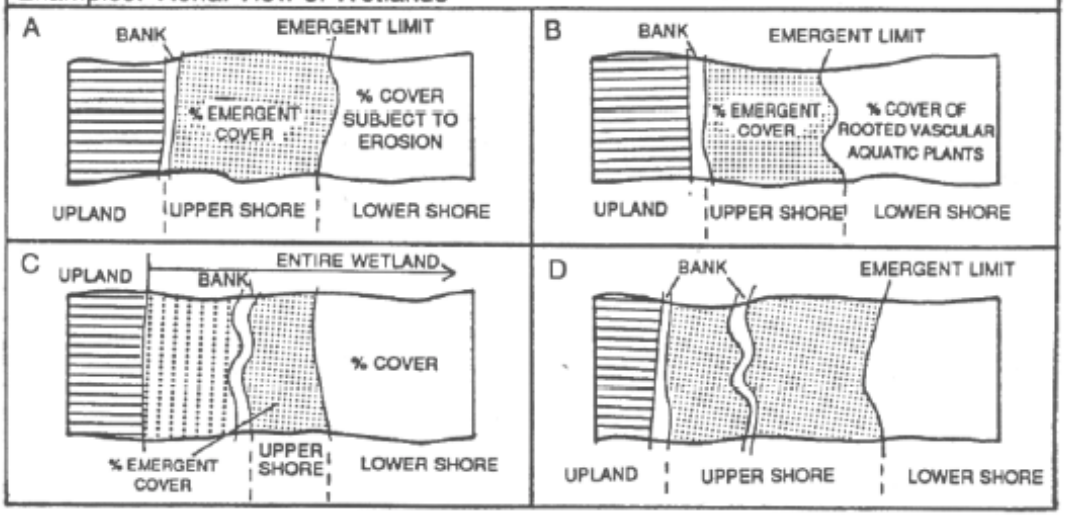


Figure A.2.
Definitions of shoreline bank, shore, upper shore zone, lower shore zone, and entire wetland (element 10)

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
Physical influences on rate of erosion (elements 2, 4a, 5a, 6, 7a, 8a, 9a, and 14b):				
2. Fetch (element already scored above)				
4. Disturbance				
4a. Disturbance at site (Sediment Stabilization)	[SB, SS, FT, FS, FP]			Assume NA = 1.0
(Do not include observations of debris)				
a. No or minimal disturbance.	NA			
b. Potential for periodic disturbance present, but preventative action taken (e.g., installation of enclosure fences for herbivores and/or human disturbance) -OR- if recently disturbed, soils sufficiently stabilized with mulch, seeding, or planting.	NA			
c. Moderate disturbance (e.g., disturbance of sediments only in portion of site; infrequent grazing by waterfowl).	0.5			
d. Evidence of substantial periodic disturbance which makes substrate unstable (e.g., muskrat eatouts, overgrazing by waterfowl, cattle grazing and trampling, nutria activity, human activity such as the use of off-road vehicles; wetland tilled, filled, logged, clear-cut or excavated and not stabilized by seeding or planting).	0.1			
5. Surface runoff from upslope areas (upland and/or wetland immediately adjacent to site).				
5a. Surface runoff from upslope areas (bank erosion)	[SB]			Assume NA = 1.0
a. Surface runoff from upslope areas not an apparent contributor to bank erosion at site (e.g., No or minimal evidence of surface erosion in upland areas, e.g., unstabilized gullies absent).	NA			
b. Surface runoff contribution to bank erosion minimal due to presence of effective infiltration and drainage controls in adjacent upslope areas (e.g., surface runoff through wetland conveyed by stabilized gullies; upslope surface cracks filled).	NA			
c. Surface runoff from upslope areas causes moderate bank erosion.	0.5			
d. Surface runoff from upslope areas causes substantial bank erosion.	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
6. Exposure to waves from heavy boat traffic	[SB]			Assume NA = 1.0
a. No or minimal boat traffic present.	NA			
b. Wetland protected from boat traffic by land form that intercepts waves (e.g., island, delta, spit, bar, peninsula, cove).	NA			
c. Wetland protected from boat traffic by structure (e.g., jetty, riprap).	NA			
d. Wetland exposed to waves caused by moderate boat traffic.	0.5			
e. Wetland exposed to waves caused by heavy boat traffic.	0.1			
7. Hydroperiod				
7a. Water level fluctuation	[SB,SS,WQ]			Assume NA = 1.0
a. Tidal wetland.	NA			
b. No fluctuating water level.	NA			
c. Fluctuating water level causing no or moderate erosion.	NA			
d. Fluctuation occasionally drastic causing sever erosion and/or preventing vegetation establishment (e.g., periodic release from upstream impoundment; reservoir drawdown).	0.1			
8. Sunlight				
8a. Hours of direct sunlight throughout shore (i.e., daylight hours without shade)	[SB]			Assume NA = 1.0
a. Hours of sunlight sufficient for vegetation (e.g., > 6 hrs per day).	NA			
b. Sunlight adequate (e.g., 3 - 6 hrs/day).	0.5			
c. Sunlight insufficient (e.g., < 3 hrs/day).	0.1			
9. Substrate				
9a. Suitability for vegetation establishment	[SB]			Assume NA = 1.0
a. Shoreline is stable with and/or without vegetation.	NA			
b. Shoreline is unstable. Substrate suitable for vegetation establishment (e.g., medium or fine grain materials).	NA			
c. Shoreline is unstable. Substrate unsuitable for vegetation establishment (e.g., gravel, cobble).	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS		SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
			WAA	Planned Wetland	If both scores are NA, record NA
14. Slope					
14b. Steepness of planned wetland shore **(See Figure A.2)**		[SB]			Assume NA = 1.0
a. Shore gradual (e.g., slope < 5:1).	NA				
b. Shore steep (e.g., slope > 5:1).	0.1		NA		
If condition b, then record slope: _____					
Vegetation influences on the rate of erosion (elements 10a, 10e, 10g, 10i, and 10k):					
10. Vegetation characteristics **during growing season** (Note differences in definitions for upper shore zone, lower shore zone, and entire wetland. **See Figure A.2**).					
10a. Percent plant (basal) cover in **upper shore zone**. (Consider only those parts of vegetation which have contact with water flow. **See Figure A.3**).		[SB]			
a. Cover > 75%.	1.0				
b. Cover 51 - 75%.	0.7				
c. Cover 25 - 50%.	0.3				
d. Cover < 25%.	0.1				
10e. Percent cover of rooted vascular aquatic beds in **lower shore zone** which is subject to bottom erosion.		[SB]			Assume NA = 1.0
a. No lower shore zone (e.g., no open water).	NA				
b. Lower shore zone not subject to bottom erosion (e.g., no evidence of scouring, i.e., no wave ripples).	NA				
c. Cover > 75%.	1.0				
d. Cover 51 - 75%.	0.7				
e. Cover 25 - 50%.	0.5				
f. Cover < 25%.	0.1				
10g. Plant height in **upper shore zone**.		[SB]			
a. Average plant height equal to or taller than average high water level.	1.0				
b. Intermediate condition, i.e., approximately equal proportions of plants equal to or taller -AND- plants shorter than average high water level.	0.8				
c. Average plant height shorter than average high water level.	0.5				
d. Vegetation absent.	0.1				

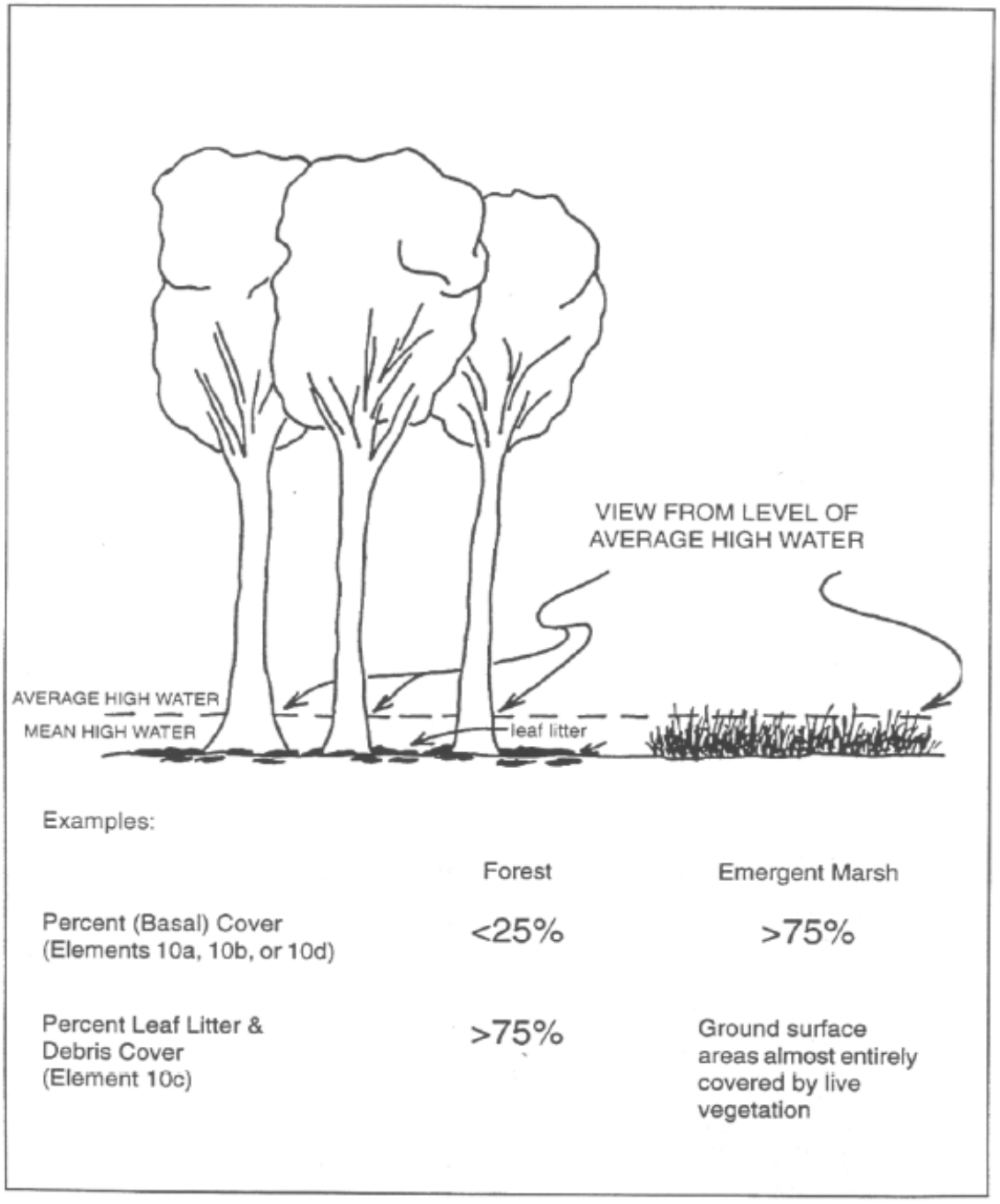


Figure A.3.
Percent plant cover (elements 10a, 10b, 10c, and 10d)

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
		WAA	Planned Wetland	
10i. Root structure in **upper shore zone**.	[SB]			
Wetland predominantly vegetated by:				
a. Herbaceous species that form a root mat (e.g., rhizome propagating species).	1.0			
b. Intermediate condition.	0.8			
c. Herbaceous species that do not form a root mat (bulb [*Peltandra virginica*], tuber [*Sagittaria latifolia*], or bunch [*Carex spp.*] species).	0.5			
d. Woody species.	0.5			
e. Vegetation absent. Belowground root system absent or dead.	0.1			
10k. Vegetation persistence in **upper shore zone**.	[SB]			
Dominant plant cover:				
a. Persistent vegetation.	1.0			
b. Approximately equal proportions of persistent and non-persistent vegetation.	0.8			
c. Non-persistent vegetation.	0.5			
d. Vegetation absent.	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
		WAA	Planned Wetland	
10i. Root structure in **upper shore zone**.	[SB]			
Wetland predominantly vegetated by:				
a. Herbaceous species that form a root mat (e.g., rhizome propagating species).	1.0			
b. Intermediate condition.	0.8			
c. Herbaceous species that do not form a root mat (bulb [*Peltandra virginica*], tuber [*Sagittaria latifolia*], or bunch [*Carex spp.*] species).	0.5			
d. Woody species.	0.5			
e. Vegetation absent. Belowground root system absent or dead.	0.1			
10k. Vegetation persistence in **upper shore zone**.	[SB]			
Dominant plant cover:				
a. Persistent vegetation.	1.0			
b. Approximately equal proportions of persistent and non-persistent vegetation.	0.8			
c. Non-persistent vegetation.	0.5			
d. Vegetation absent.	0.1			

PROJECT TITLE: _____

SEDIMENT STABILIZATION
DATA SHEETS

Function weighting area (AREA) = Entire wetland assessment area

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	For use in FCI Model: SELECTED SCORES FOR ELEMENTS — WAA	For use in FCI Model: SELECTED SCORES FOR ELEMENTS — Planned Wetland	For use in Table A.2 only: DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
Disturbance factors (elements 4a and 7a):				
4a. Disturbance (Sediment Stabilization)	[SB, SS, FT, FS, FP]*			Assume NA = 1.0
(Do not include observations of debris)				
a. No or minimal disturbance.	NA			
b. Potential for periodic disturbance present, but preventative action taken (e.g., installation of exclosure fences for herbivores and/or human disturbance). OR If recently disturbed, soils sufficiently stabilized with mulch, seeding, or planting.	NA			
c. Moderate disturbance (e.g., disturbance of sediments only in portion of site; infrequent grazing by waterfowl).	0.5			
d. Evidence of substantial periodic disturbance which makes substrate unstable (e.g., muskrat eatouts, overgrazing by waterfowl, cattle grazing and trampling, nutria activity, human activity such as the use of off-road vehicles; wetland tilled, filled, logged, clear-cut or excavated and not stabilized by seeding or planting).	0.1			

* Denotes function(s) to which element applies: SB = Shoreline Bank Erosion Control; SS = Sediment Stabilization; WQ = Water Quality; WL = Wildlife; FT = Fish (Tidal); FS = Fish (Stream/River); FP = Fish (Pond/Lake); and UH = Uniqueness/Heritage

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
7. Hydroperiod				
7a. Water level fluctuation	[SB,SS,WQ]			Assume NA = 1.0
a. Tidal wetland.	NA			
b. No fluctuating water level.	NA			
c. Fluctuating water level causing no or moderate erosion.	NA			
d. Fluctuation occasionally drastic causing sever erosion and/or preventing vegetation establishment (e.g., periodic release from upstream impoundment; reservoir drawdown).	0.1			
Vegetation characteristics affecting sediment stabilization (elements 10b, 10c, 10j, and 10l):				
10. Vegetation characteristics during growing season				
10b. Percent plant (basal) cover, including rooted vascular aquatic beds, in entire wetland. (Consider only those parts of vegetation which have contact with water flow. See Figure A.3)	[SS, WQ]			
a. Cover > 75%.	1.0			
b. Cover 51 - 75%.	0.7			
c. Cover 25 - 50%.	0.3			
d. Cover < 25%.	0.1			
10c. Percent cover provided by leaf litter and debris on ground surface areas not covered by live vegetation (Applicable to entire wetland. Include submerged surfaces)	[SS]			
a. Ground surface areas almost entirely covered by live vegetation (i.e., cover of live vegetation > 75%).	1.0			
b. Cover > 75% leaf litter and debris.	1.0			
c. Cover 51 - 75%.	0.7			
d. Cover 25 - 50%.	0.3			
e. Cover < 25%.	0.1			

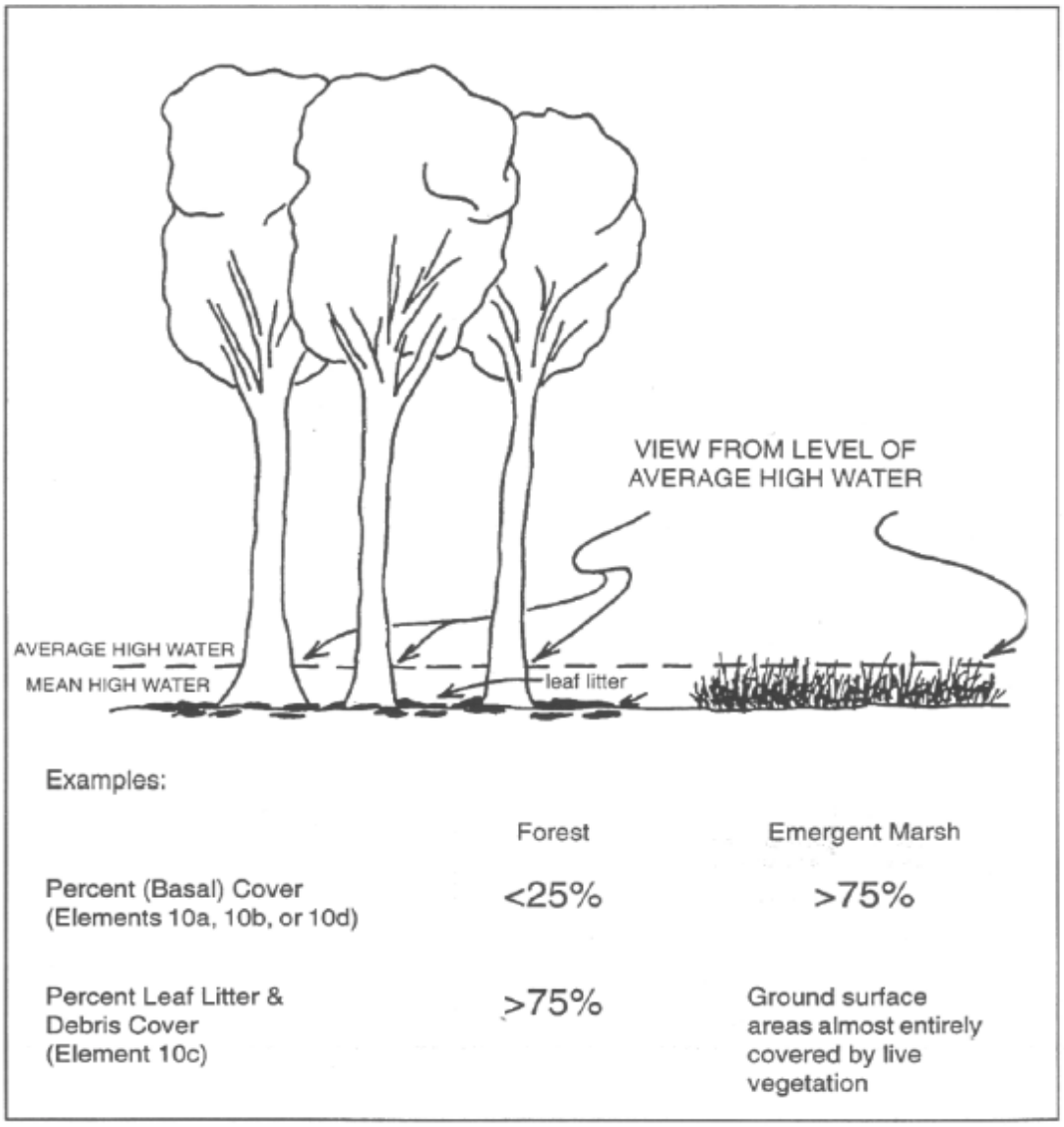


Figure A.3.
Percent plant cover (elements 10a, 10b, 10c, and 10d)

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
		WAA	Planned Wetland	
10j. Root structure in **entire wetland**. (Include rooted vascular aquatic beds)	[SS]			
Wetland predominantly vegetated by:				
a. Herbaceous species that form a root mat (e.g., rhizome propagating species).	1.0			
b. Intermediate condition.	0.8			
c. Herbaceous species that do not form a root mat (bulb (*Peltandra virginica*), tuber (*Sagittaria latifolia*), or bunch (*Carex spp.*) species).	0.5			
d. Woody species -OR- rooted aquatic vascular beds.	0.5			
e. Vegetation absent. Belowground root system absent or dead.	0.1			
10l. Vegetation persistence in **entire wetland**. (Include rooted vascular aquatic beds)	[SS, WQ]			
Dominant plant cover:				
a. Persistent vegetation.	1.0			
b. Approximately equal proportions of persistent and non-persistent vegetation.	0.8			
c. Non-persistent vegetation.	0.5			
d. Vegetation absent.	0.1			
The influence of slope on sediment stabilization (element 14c):				
14c. Vegetated or unvegetated wetland slope (**Entire wetland**)	[SS, WQ]			
a. Slope is stable with and/or without vegetation (e.g., a slope which is adjusted to the wave climate would be stable even in the absence of vegetation).	1.0			
b. Slope is stable. Erosion protection provided by leaf litter and debris.	1.0			
c. Slope is unstable (e.g., an unvegetated slope with gullies; evidence of a net loss of shore sediments beginning the development of a bank; evidence of scouring, i.e., wave ripples.)	0.1			

PROJECT TITLE: _____

WATER QUALITY
DATA SHEETS

Function weighting area (AREA) = Entire wetland assessment area

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	For use in FCI Model: SELECTED SCORES FOR ELEMENTS		For use in Table A.2 only: DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
Applicability of water quality function (element 15):				
15. Hydrologic condition (Define hydrologic condition of non-tidal wetland site by considering its position in the landscape) (**See Figure A.4** for non-tidal wetland conditions)	[WQ]*			Assume NA = 0
a. Non-tidal, Condition A.	NA			
b. Non-tidal, Condition B.	NA			
c. Non-tidal, Condition C.	1.0			
d. Non-tidal, Condition D.	0.8			
e. Non-tidal, Condition E.	0.3			
f. Non-tidal, Condition F.	0.3			
g. Non-tidal, Condition G.	0.1			
h. Non-tidal, Condition H.	0.1			
i. Tidal, site predominantly low marsh.	1.0			
j. Tidal, site approximately equal proportions of high and low marsh.	0.7			
k. Tidal, site predominantly high marsh.	0.5			

If the score for element 15 = NA, then the Water Quality FCI is considered not applicable (NA) because there is no outlet to convey surface water from the wetland downstream. Continue only if information on elements is required for comparison between wetlands.

* Denotes function(s) to which element applies: SB = Shoreline Bank Erosion Control; SS = Sediment Stabilization; WQ = Water Quality; WL = Wildlife; FT = Fish (Tidal); FS = Fish (Stream/River); FP = Fish (Pond/Lake); and UH = Uniqueness/Heritage

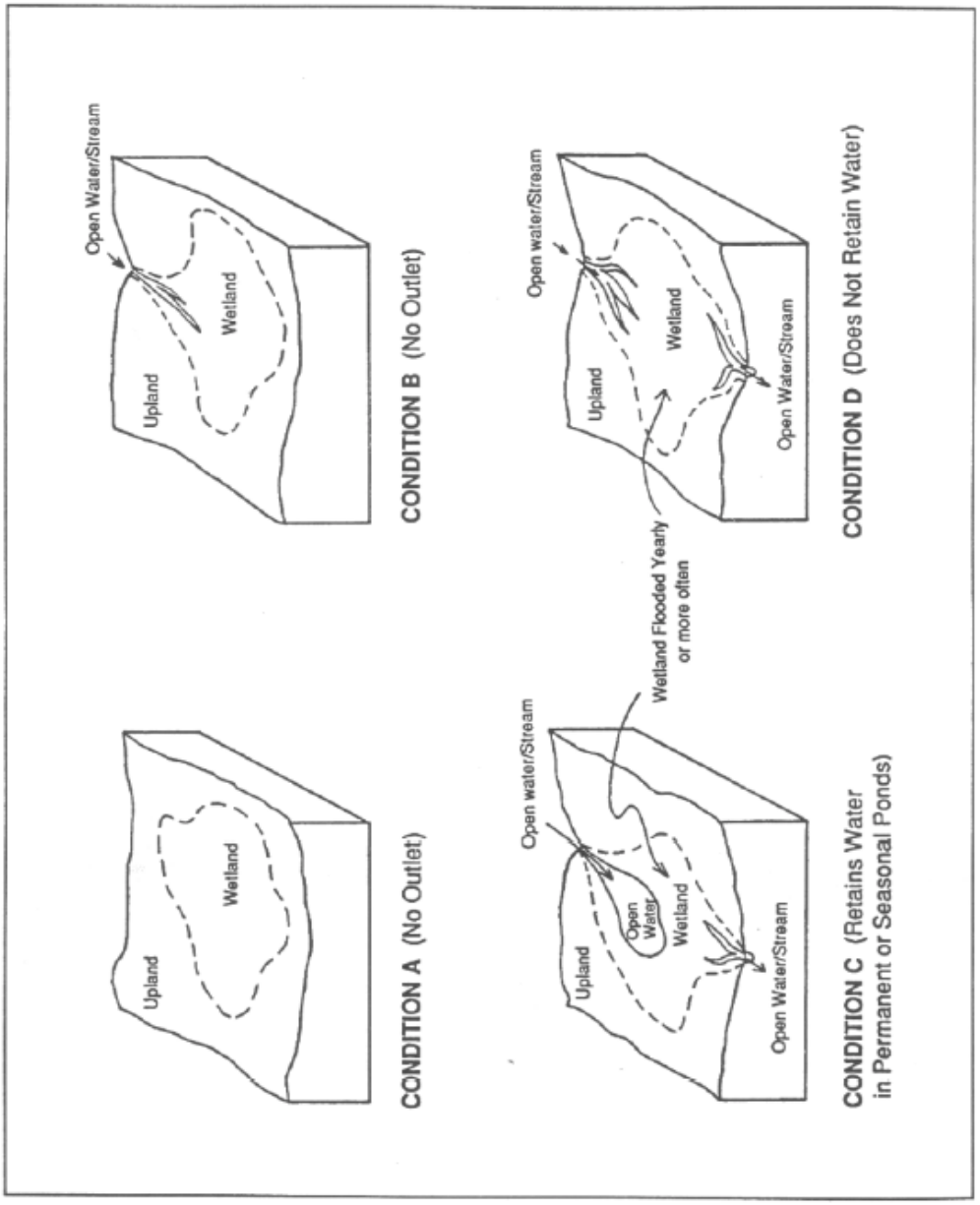


Figure A.4.
Non-tidal hydrologic condition (element 15; modified from Hollands and McGee 1986) — *con't on p. A 21*

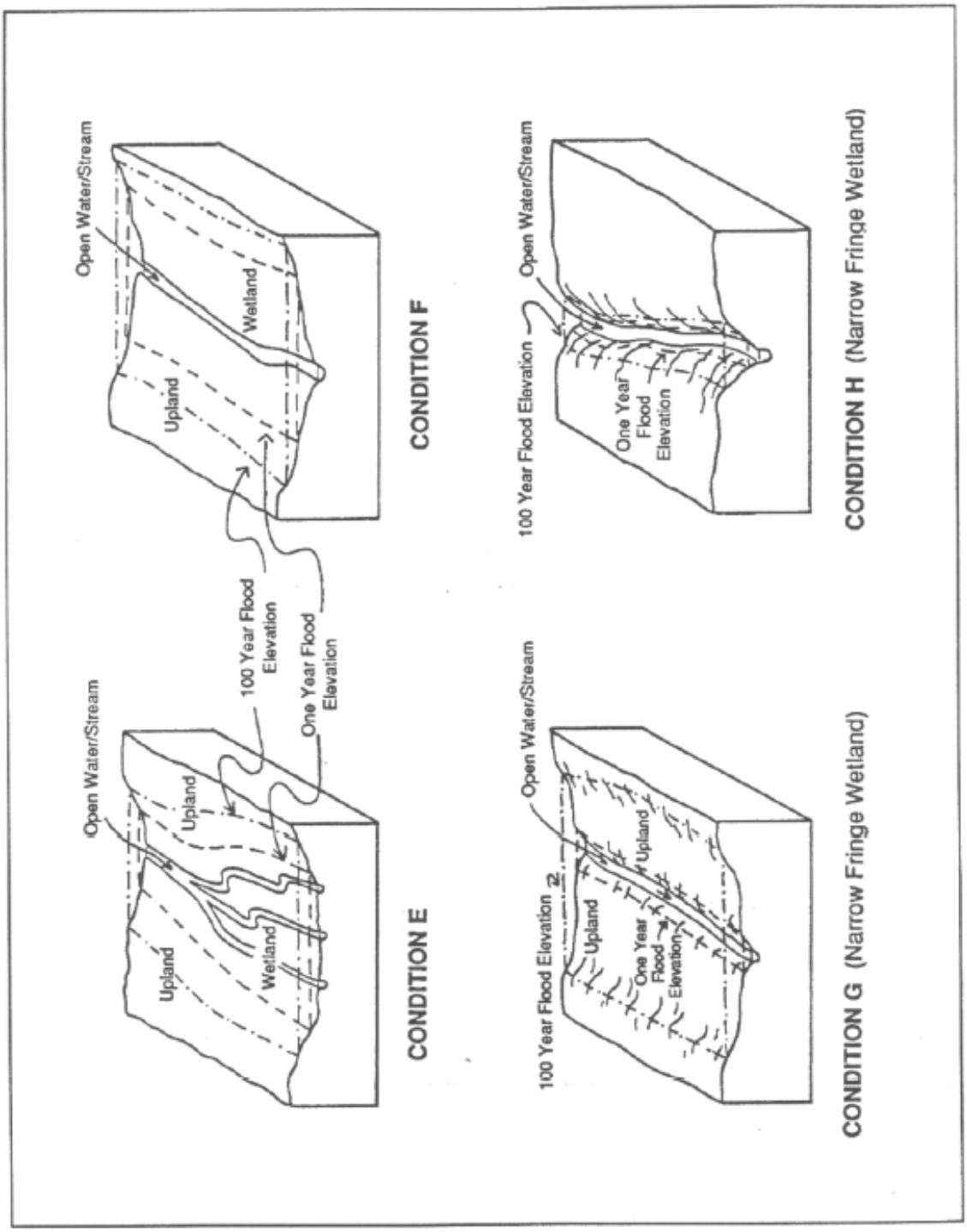
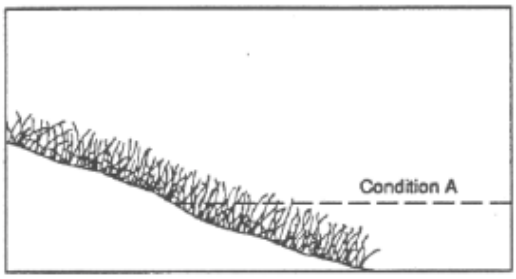


Figure A.4. *(con't from p. A 20)*
Non-tidal hydrologic condition (element 15; modified from Hollands and McGee 1986)

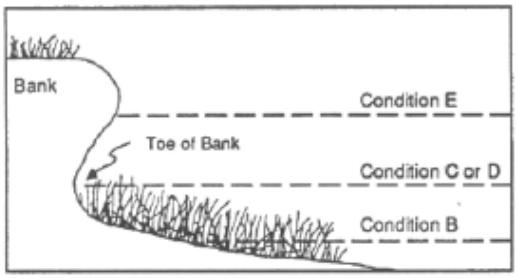
ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
Factors limiting the potential for water quality improvement (elements 4b, 7a, and 16a):				
4b. Disturbance at site (Water Quality)	[WQ]			Assume NA = 1.0
(Include observations of debris)				
a. No or minimal disturbance.	NA			
b. Potential for periodic disturbance present, but preventative action taken (e.g., installation of exclosure fences for herbivores and/or human disturbance) OR If recently disturbed, soils sufficiently stabilized with mulch, seeding, or planting.	NA			
c. Moderate disturbance (e.g., disturbance of sediments only in portion of site; infrequent grazing by waterfowl; **deposits of debris**).	0.5			
d. Evidence of substantial periodic disturbance which makes substrate unstable (e.g., muskrat eatouts, overgrazing by waterfowl, cattle grazing and trampling, nutria activity, human activity such as the use of off-road vehicles; wetland tilled, filled, logged, clear-cut or excavated and not stabilized by seeding or planting) -OR- **evidence of substantial dumping of debris (e.g., truckload of garbage)**.	0.1			
7. Hydroperiod				
7a. Water level fluctuation	[SB, SS, WQ]			Assume NA = 1.0
a. Tidal wetland.	NA			
b. No fluctuating water level.	NA			
c. Fluctuating water level causing no or moderate erosion.	NA			
d. Fluctuation occasionally drastic causing severe erosion and/or preventing vegetation establishment (e.g., periodic release from upstream impoundment; reservoir drawdown).	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
16. Size				
16a. Wetland width	[WQ]			Assume NA = 1.0
Is the site considered to have a low potential to improve water quality because of its narrow width (e.g., wetland < 2 feet wide)?				
a. No.	NA			
b. Yes.	0.1			
If yes explain: _____				
Substrate-slope characteristics affecting water quality (elements 1a, 5b, and 14c):				
1. Bank characteristics	[SB, WQ]			Assume NA = 1.0
1a. Water contact with toe of bank (**see Figure A.1**)				
a. No shoreline bank.	NA			
b. Infrequent water contact at toe of bank, i.e., no undercutting of bank (e.g., contact once annually or less).	1.0			
c. Occasional water contact at toe of bank (e.g., contact once a month).	0.7			
d. Moderate water contact at toe of bank (moderate undercutting of bank).	0.5			
e. Frequent water contact at toe of bank (severe undercutting of bank).	0.1			



Bank Absent

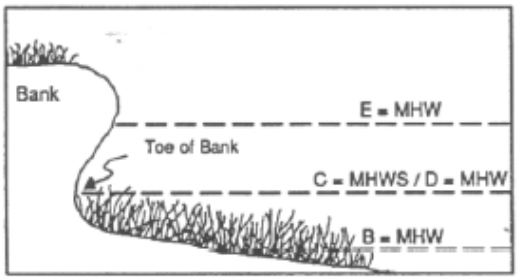
Condition A = No Shoreline Bank



Bank Present

Condition B = Infrequent water contact at toe of bank, i.e., no undercutting of bank (e.g., contact once annually or less).
Condition C = Occasional water contact at toe of bank (e.g., contact once a month).
Condition D = Moderate water contact at toe of bank (moderate undercutting of bank).
Condition E = Frequent water contact at toe of bank (severe undercutting of bank).

Example = Tidal System



Condition B = Mean High Water (MHW) below toe of bank
Condition C = Mean High Water Spring (MHWS)
Condition D = MHW at toe of bank
Condition E = MHW above toe of bank

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
		WAA	Planned Wetland	
5. Surface runoff from upslope areas				
5b. Surface runoff from upslope areas (erosion of bank and wetland proper)	[WQ]			Assume NA = 1.0
a. Surface runoff from upslope areas not an apparent contributor to erosion in the wetland (e.g., No or minimal evidence of surface erosion in upland areas, e.g., unstabilized gullies absent).	NA			
b. Surface runoff contribution to wetland erosion minimal due to presence of effective infiltration and drainage controls in adjacent upslope areas (e.g., surface runoff through wetland conveyed by stabilized gullies; upslope surface cracks filled).	NA			
c. Surface runoff from upslope areas causes moderate wetland erosion.	0.5			
d. Surface runoff from upslope areas causes substantial wetland erosion.	0.1			
14. Slope				
14c. Vegetated or unvegetated wetland slope (Entire wetland)	[SS, WQ]			
a. Slope is stable with and/or without vegetation (e.g., a slope which is adjusted to the wave climate would be stable even in the absence of vegetation)	1.0			
b. Slope is stable. Erosion protection provided by leaf litter and debris.	1.0			
c. Slope is unstable (e.g., an unvegetated slope with gullies; evidence of a net loss of shore sediments beginning the development of a bank; evidence of scouring, i.e., wave ripples.)	0.1			
Vegetation characteristics affecting water quality (elements 10b, 10h, and 10i):				
10. Vegetation characteristics during growing season				
10b. Percent plant (basal) cover, including rooted vascular aquatic beds, in entire wetland. (Consider only those parts of vegetation which have contact with water flow. See Figure A.3)	[SS, WQ]			
a. Cover > 75%.	1.0			
b. Cover 51 - 75%.	0.7			
c. Cover 25 - 50%.	0.3			
d. Cover < 25%.	0.1			

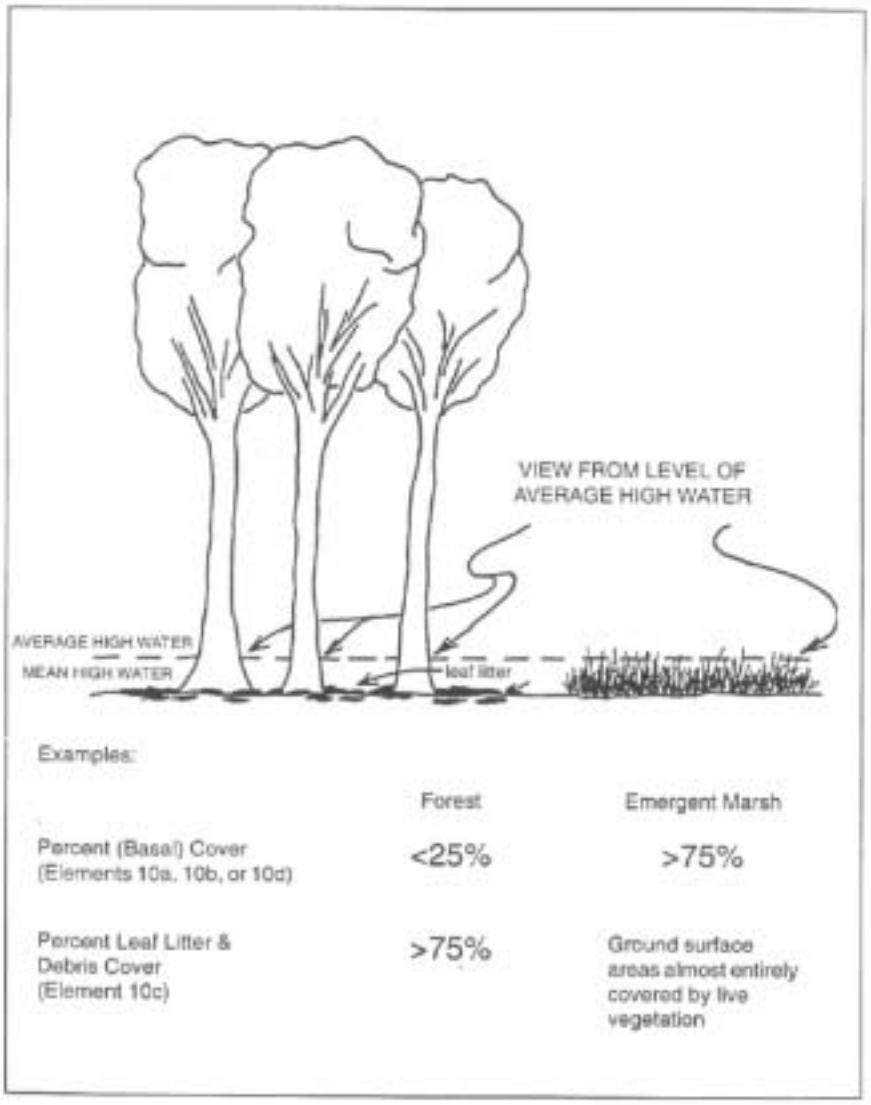


Figure A.3
Percent plant cover (elements 10a, 10b, 10c, and 10d)



ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
10h. Plant height in entire wetland. (Include rooted vascular aquatic beds)	[WQ]			Assume NA = 0
a. Average plant height equal to or taller than average high water level.	1.0			
b. Intermediate condition, i.e., approximately equal proportions of plants equal to or taller -AND- plants shorter than average high water level.	0.8			
c. Average plant height shorter than average high water level.	0.5			
d. Vegetation absent	0.1			
10i. Vegetation persistence in entire wetland (Include rooted vascular aquatic beds)	[SS, WQ]			
Dominant plant cover:				
a. Persistent vegetation.	1.0			
b. Approximately equal proportions of persistent and non-persistent vegetation	0.8			
c. Non-persistent vegetation.	0.5			
d. Vegetation absent	0.1			
Elements defining the extent of water contact with wetland surface (elements 9b, 15, 17, 18, and 19)				
9 Substrate				
9b. Dominant substrate type	[WQ]			
a. Fine mineral soils (e.g., alluvial, alfisol, loam, ferric, clay) -OR- soils with high organic content (> 20% by weight)	1.0			
b. Medium sized sand.	0.5			
c. Course sand, bedrock, rubble, or cobble.	0.1			
15. Hydrologic condition (element already assessed above)				

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
17. Detention time (Answer only if hydrologic calculations are available, e.g., site designed for stormwater management).	[WQ]			If NA and/or INA, record both scores.
a. Tidal wetland.	NA			
b. Information not available.	INA			
c. Data available to demonstrate wetland detention time adequate for effective nutrient removal. Explain: _____	1.0			
d. ≥ 24 hours for 1 year storms.	1.0			
e. 12 - 24 hours for 1 year storms.	0.5			
f. < 12 hours for 1 year storms.	0.1			
18. Sheet vs. channel flow	[WQ]			If one NA, record both scores.
a. Tidal wetland.	NA			
b. Water flow within or through wetland predominantly sheetflow (e.g., > 50% of the flow enters and passes through wetland as sheetflow).	1.0			
c. Water flow occasionally sheetflow (e.g., 10 - 50% of flow is sheetflow; extensively braided channel flow).	0.5			
d. Water flows primarily in channel and rarely spreads over adjacent wetland.	0.1			
19. Average water depth (during periods when surface water is present)	[WQ]			If one NA, record both scores.
a. Tidal wetland.	NA			
b. < 15 cm (< 6 in.).	1.0			
c. 15 - 30 cm (6 - 12 in.).	0.8			
d. 30 - 61 cm (12 - 24 in.).	0.6			
e. 61 - 91 cm (24 - 36 in.).	0.4			
f. > 91 cm (36 in.).	0.2			

PROJECT TITLE: _____

WILDLIFE
DATA SHEETS

Function weighting area (AREA) = Entire wetland assessment area

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	For use in FCI Model: SELECTED SCORES FOR ELEMENTS — WAA	For use in FCI Model: SELECTED SCORES FOR ELEMENTS — Planned Wetland	For use in Table A.2 only: DIFFERENCE IN SCORES (Planned - WAA) If both are NA, record NA
Features which reduce habitat value (elements 4c, 16b, and 20a):				
4. Disturbance				
4c. Disturbance of wildlife habitat	[WL]*			Assume NA = 1.0
a. No or moderate disturbance.	NA			
b. Periodic disturbance used as wildlife management practice (e.g., controlled burning).	NA			
c. Evidence of recent (e.g., within last year) substantial periodic disturbance which reduces habitat availability (e.g., wetland tilled, filled, excavated, burned, or mowed).	0.1			
16. Size				
16b. Wetland site size	[WL]			Assume NA = 1.0
Is the site considered to have a very low wildlife value because of its small size and poor conditions in or around the wetland (e.g., 1 ft. wide x 20 ft. long fringe marsh with access to other wetlands or upland wildlife habitat blocked by urban development)?				
a. No.	NA			
b. Yes.	0.1			
If yes, explain: _____				

* Denotes function(s) to which element applies: SB = Shoreline Bank Erosion Control; SS = Sediment Stabilization; WQ = Water Quality; WL = Wildlife; FT = Fish (Tidal); FS = Fish (Stream/River); FP = Fish (Pond/Lake); and UH = Uniqueness/Heritage

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both are NA, record NA
20. Water quality				
20a. Gross contamination	[WL]			Assume NA = 1.0
a. Minimal or no potential for contaminant input.	NA			
b. Potential for contaminant input present, but preventative measures taken (e.g., construction of swales and/or drainage ditches to direct highway runoff away from wetland).	NA			
c. Evidence of presence of highly toxic contaminants (e.g., stunted plant growth, excessive growth, and/or abnormal morphology; oil sheen on marsh surface) AND/OR known source(s) contributing highly toxic contaminants to the wetland (e.g., hazardous waste sites, superfund sites, landfills).	0.1			
Habitat complexity (elements 11a, 11b, 11c, 12a, 12b, 12c, 12d, 13a, 13b, 21a, 22a, and 23):				
11. Vegetation strata				
11a. Number of layers in wetland (Do not include layers in upland areas)	[WL]			
Choose from 6 possible layers:				
• **tree** vegetation ≥ 6 m (20 ft) canopy cover ≥ 5%				
• **stem bole** tree stems ≥ 25 cm (10 in) dbh ≥ 5 per ha (2/ac)				
• **midstory** woody vegetation 1 - 6 m (3 - 20 ft) canopy cover ≥ 5%				
• **groundcover** variety surface covering 0 - 1 m (0 - 3 ft)				
• **surface water** 0 - 25 cm (0 - 10 in) in depth				
• **water column** open water below 25 cm (10 in)				
a. 6 layers.	1.0			
b. 5 layers.	0.9			
c. 4 layers.	0.7			
d. 3 layers.	0.5			
e. 2 layers.	0.3			
f. 1 layer.	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA) If both are NA, record NA
		WAA	Planned Wetland	
11b. Condition of layer coverage (See Figure A.5). (Consider canopy cover of each of the three vegetation layers: tree, midstory and herbaceous groundcover)	[WL]			
a. Approximately equal proportions and high percent cover (e.g., > 40%) for each layer.	1.0			
b. Intermediate condition.	0.7			
c. Predominantly 1 layer.	0.3			
d. Low percent cover for each vegetation layer.	0.1			
e. Predominantly unvegetated layer (e.g., open water, mudflat, bare ground, rock outcrop, and/or aquatic bed).	0.1			
11c. Spatial pattern of shrubs and/or trees (See Figure A.6)	[WL]			If one NA, record both scores.
a. No woody species -OR- few individual plants of woody species present (e.g., spatial pattern irrelevant for 2 trees).	NA			
b. Irregular (e.g., random, aggregate, or clumped distribution).	1.0			
c. Regular (e.g., uniform distribution, row planting, orchard).	0.1			
11d. Difference in layers	[WL]			Record both scores.
a. Planned wetland contains same layers as WAA.	NA	NA		
b. Planned wetland does not contain same layers as WAA.	1.0			
If answer "b", explain: _____				

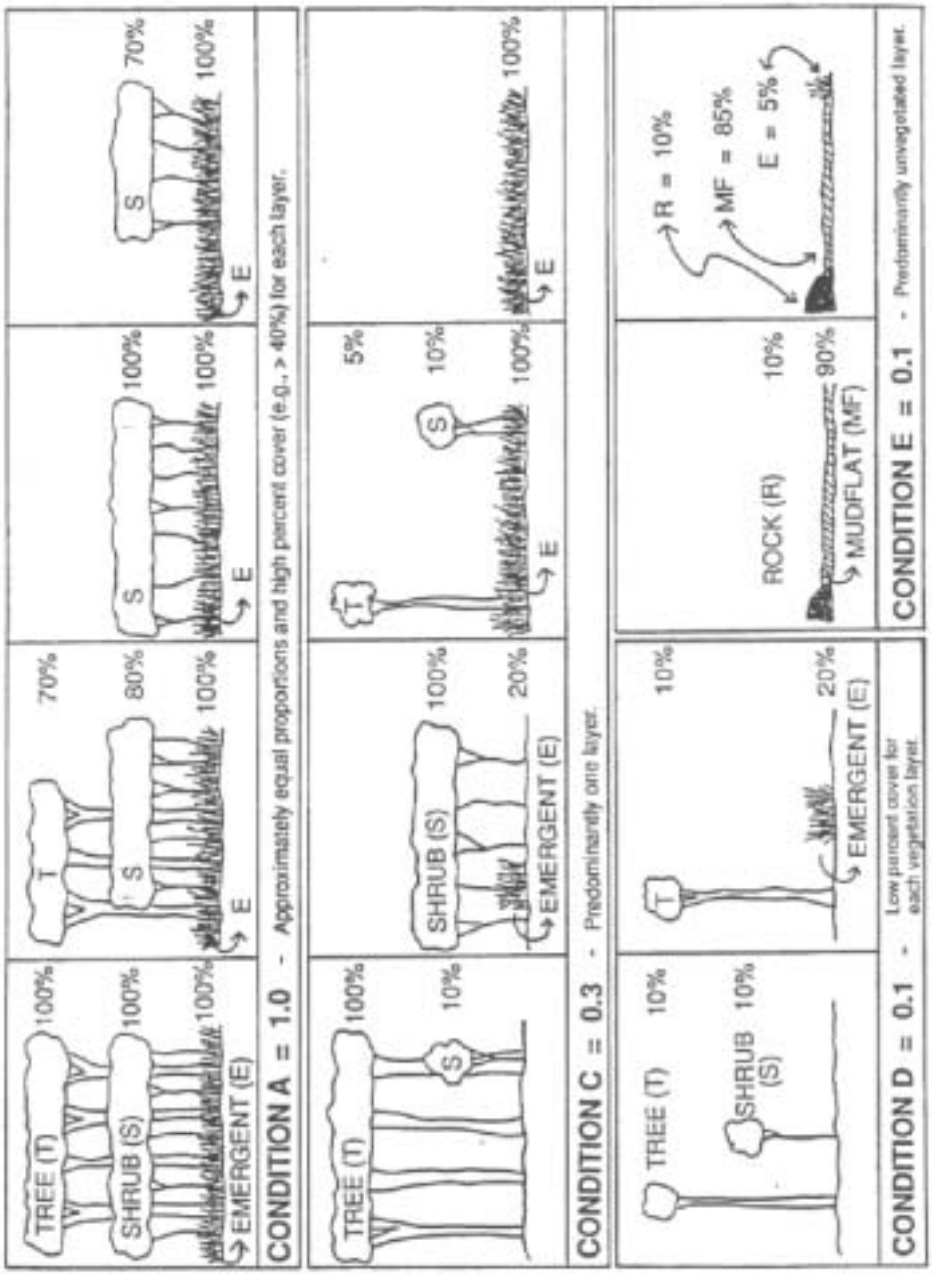


Figure A.5
Examples illustrating conditions of layer coverage (element 11b)

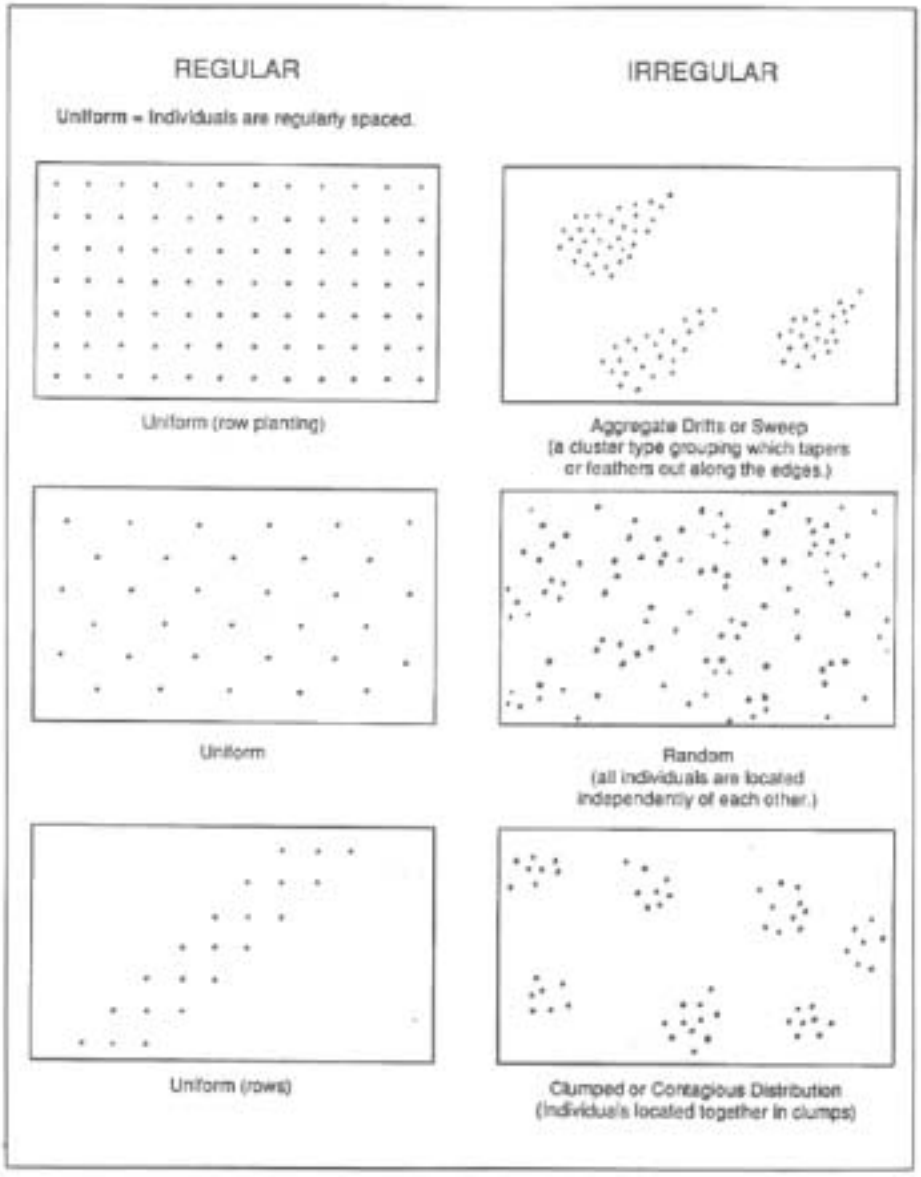


Figure A.6.
Examples of spatial patterns (element 11c)

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS: WAA	SELECTED SCORES FOR ELEMENTS: Planned Wetland	DIFFERENCE IN SCORES (Planned - WAA) If both are NA, record NA
12. Cover types (27 listed) (refer to Table A.3):				
Trees: Needle-leaved evergreen; Broad-leaved evergreen; Needle-leaved deciduous; Broad-leaved deciduous; Dead **Emergent:** Tall persistent; Short persistent; Tall nonpersistent; Short nonpersistent **Scrub-Shrub:** Tall evergreen; Bushy evergreen; Low compact evergreen; Tall deciduous; Bushy deciduous; Low compact deciduous; Dead **Moss-lichen:** Moss; Lichen **Non-vegetative:** Bedrock; Rubble; Cobble-gravel; Sand; Mud; Organic; Dead fallen trees/shrubs; Open Water **Aquatic-bed:** Rooted-vascular				
12a. Number of cover types in **each** layer at site Decide minimum coverage and use this minimum to determine which cover types at the site will be included in the evaluation: _____ 10% _____ 5% _____ Other Thus, an area must be at least _____ (e.g., 10%) of the wetland site size to be recognized as a separate cover type. Fill in the following information:	[WL]			
Wetland: # of cover types (e.g.) WAA : _____ (1) Planned : _____ (4) 2.	Calculation of Relative score: # of cover types / 27 _____ (example) (1/27=0.04) _____ (4/27=0.15)			
12b. Ratio of cover types (**See Figure A.7**). (Consider canopy cover of each cover type in each layer.) a. *Approximately equal proportions* 1.0 b. Intermediate condition. 0.5 c. Predominantly 1 cover type. 0.1	[WL]			
12c. Degree of cover type interspersion (**See Figure A.8**). a. High 1.0 b. Intermediate condition 0.5 c. Low -OR- no interspersion (1 cover type) 0.1	[WL]			

Table A.3.
Description of Cover Types

Cover types based upon classification schemes of Cowardin et al. (1979) and Golet and Larson (1974). Definitions taken directly from Cowardin et al. (1979), unless otherwise indicated.

TREES. Woody vegetation that is 6 m (20 ft) or taller.

Needle-leaved evergreen. Areas dominated by woody gymnosperms with green, needle-shaped, or scale-like leaves that are retained by plants throughout the year. Examples:

black spruce	*Picea mariana*
Northern white cedar	*Thuja occidentalis*
Atlantic white cedar	*Chamaecyparis thyoides*

Broad-leaved evergreen. Areas dominated by woody angiosperms with relatively wide, flat leaves that generally remain green and are usually persistent for a year or more. Examples:

red mangrove	*Rhizophora mangle*
black mangrove	*Avicennia germinans*
white mangrove	*Laguncularia racemosa*
red bay	*Persea borbonia*
loblolly bay	*Gordonia lasianthus*
sweet bay	*Magnolia virginiana*

Needle-leaved deciduous. Areas dominated by woody gymnosperms with needle-shaped or scale-like leaves that are shed during the cold or dry season. Example:

bald cypress	*Taxodium distichum*

Broad-leaved deciduous. Areas dominated by woody angiosperms with relatively wide, flat leaves that are shed during cold or dry season. Examples:

black ash	*Fraxinus nigra*
red ash	*F. pennsylvanica*
American elm	*Ulmus americana*
black gum	*Nyssa sylvatica*
tupelo gum	*N. aquatica*
swamp white oak	*Quercus bicolor*
overcup oak	*Q. lyrata*
basket oak	*Q. michauxii*
red maple	*Acer rubrum*

Dead. Areas dominated by dead woody vegetation taller than 6 m (20 ft).

SCRUB-SHRUB. Area dominated by woody vegetation less than 6 m (20 ft) tall (including vines).

Tall evergreen.* Areas dominated by woody gymnosperms 3 to 6 m (10 to 20 ft) tall. Examples:

black spruce	*Picea mariana*
pond pine	*Pinus serotina*
young trees	(ex: *Rhizophora mangle* *Laguncularia racemosa* *Avicennia germinans*)

Bushy evergreen.* Areas dominated by woody gymnosperms 1.2 to 2 m (4 to 7 ft) tall. Examples:

sweet gale	*Myrica gale*
coastal sweetbells	*Leucothoe axillaris*
fetterbush	*Lyonia lucida*
inkberry	*Ilex glabra*

Low compact evergreen.* Areas dominated by woody gymnosperms less than 1.2 m (4 ft) tall. Examples:

sheep laurel	*Kalmia angustifolia*
bog laurel	*K. polifolia*
leatherleaf	*Chamaedaphne calyculata*
labrador tea	*Ledum groenlandicum*
bog rosemary	*Andromeda glaucophylla*
black-h	*Cyrilla racemiflora*



Table A.3.
Description of Cover Types

(continued)

Tall deciduous.* Areas dominated by woody angiosperms 3 to 6 m (10 to 20 ft) tall. Examples:

speckled alder	*Alnus rugosa*
highbush blueberry	*Vaccinium corymbosum*
young trees	(e.g., red maple - *Acer rubrum*)
willow	*Salix* spp.

Bushy deciduous.* Areas dominated by woody angiosperms 1.2 to 3 m (4 to 7 ft) tall. Examples:

sea-myrtle	*Baccharis halimifolia*
marsh elder	*Iva frutescens*
buttonbush	*Cephalanthus occidentalis*
silky dogwood	*Cornus amomum*
willow	*Salix* spp.
sweet pepperbush	*Clethra alnifolia*
bog birch	*Betula pumila*

Low compact deciduous.* Areas dominated by woody angiosperms less than 1.2 m (4 ft) tall. Examples:

marsh elder	*Iva frutescens*
silky dogwood	*Cornus amomum*

EMERGENT. Area dominated by erect, rooted, herbaceous angiosperms that may be temporarily to permanently flooded at the base but do not tolerate prolonged inundation of the entire plant.

Tall **persistent.*** Emergent hydrophytes over 1.5 m (5 ft) tall that normally remain standing at least until the beginning of the next growing season. Examples:

cattails	*Typha* spp.
reed	*Phragmites australis*
purple loosestrife	*Lythrum salicaria*
water willow	*Decodon verticillatus*
salt-marsh cordgrass (tall form)	*Spartina alterniflora*
big cordgrass	*S. cynosuroides*
southern wild rice	*Zizaniopsis miliacea*

Short **persistent.*** Emergent hydrophytes less than 1.5 m (5 ft) tall that normally remain standing at least until the beginning of the next growing season. Examples:

salt-marsh cordgrass (short form)	*Spartina alterniflora*
California cordgrass	*S. foliosa*
sedges	*Carex* spp.
needlerush	*Juncus roemerianus*
rice cutgrass	*Leersia oryzoides*
common pickerelweed	*Pontederia virginica*
bulrushes	*Scirpus* spp.
marine grasses	*Glyceria* spp.

Tall **nonpersistent.*** Emergent hydrophytes over 1.5 m (5 ft) tall whose leaves and stems break down at the end of the growing season so that most above-ground portions of the plants are easily transported by currents, waves, or ice. Example:

wild rice	*Zizania aquatica*

Short **nonpersistent.*** Emergent hydrophytes less than 1.5 m (5 ft) tall whose leaves and stems break down at the end of the growing season so that most above-ground portions of the plants are easily transported by currents, waves, or ice. Note: If waves, currents, or ice removes all traces of emergent vegetation, then classify as short nonpersistent. Examples:

arrow arum	*Peltandra virginica*
pickerelweed	*Pontederia cordata*
arrowheads	*Sagittaria* spp.

Table A.3.
Description of Cover Types

(continued)

MOSS-LICHEN. Areas where mosses or lichens cover substrates other than rock and where emergents, shrubs, or trees make up less than 30% of the areal cover.

Moss. Areas dominated by mosses. Examples:

peat mosses	*Sphagnum* spp.
moss	*Campylium stellatum*
moss	*Aulacomnium palustre*
moss	*Drepanocladus wahlenbergii*

Lichen. Areas dominated by lichens. Example:

reindeer moss	*Cladonian rangiferina*

AQUATIC-BED. Areas dominated by plants that grow principally on or below the surface of the water for most of the growing season in most years.

Rooted vascular. Areas dominated by rooted vascular plants that grow principally on or below the surface of the water for most of the growing season in most years. Examples:

turtle grass	*Thalassia testudinum*
shoalgrass	*Halodule wrightii*
widgeon grass	*Ruppia maritima*
wild celery	*Vallisneria americana*
eelgrass	*Zostera marina*
pondweed	*Potamogeton* spp.
naids	*Najas* spp.
water milfoil	*Myriophyllum* spp.
ditch grasses	*Ruppia* spp.
waterweed	*Elodea* spp.
yellow water lily	*Nuphar luteum*
water lilies	*Nymphaea* spp.
water smartweed	*Polygonum amphibium*

NON-VEGETATIVE.* Areas characterized by a lack of live vegetation cover.

Bedrock. Area characterized by a bedrock substrate covering 75% or more of the surface and less than 30% areal coverage of macrophytes.

Rubble. Area characterized by aerial cover with less than 75% bedrock, but stones and boulders alone, or in combination with bedrock, cover 75% or more of the surface.

Cobble-gravel. Area dominated by cobble and/or gravel. Cobbles are defined as rock fragments 7.6 cm (3 in) to 25.4 cm (10 in) in diameter. Gravel is a mixture composed primarily of rock fragments 2 mm (0.8 in) to 7.6 cm (3 in) in diameter; it usually contains sand.

Sand. Area dominated by sand. Sand is composed predominantly of coarse-grained mineral sediments with diameters larger than 0.074 mm and smaller than 2 mm.

Mud. Areas dominated by mud, i.e., wet soft earth composed predominantly of clay and silt-fine mineral sediments less than 0.074 mm in diameter.

Organic. Areas dominated by organic soil, i.e., soil composed of predominantly organic rather than mineral material.

Dead fallen trees/shrubs.* Area dominated by dead fallen trees and/or shrubs.

Open water. Water of any depth with no woody or emergent vegetation.

*Definitions modification of Cowardin et al. (1979) and Golet and Larson (1974).

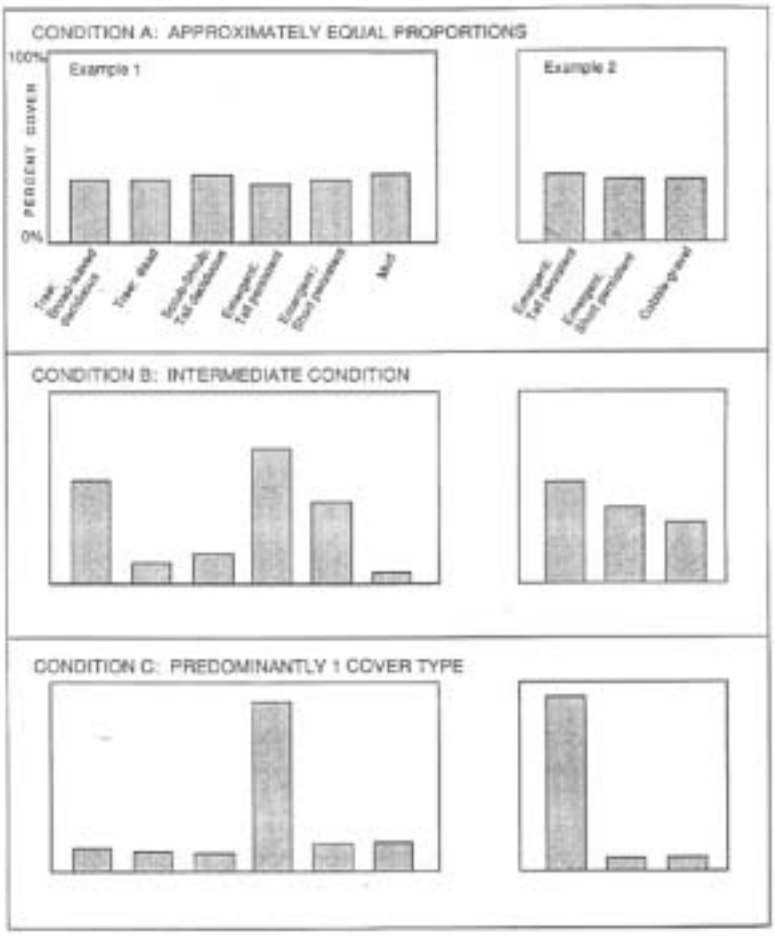


Figure A-7.
Examples illustrating conditions for ratio of cover types (element 12b)

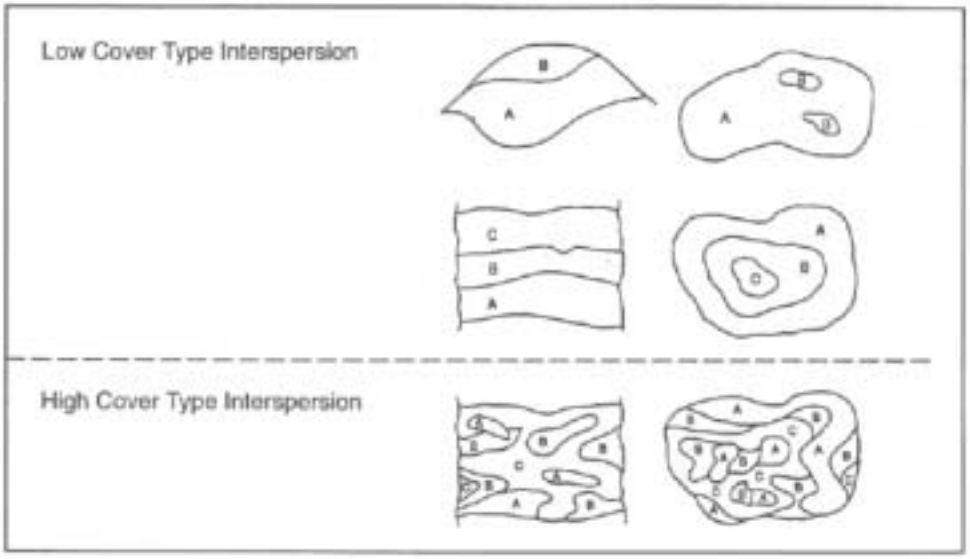


Figure A.8.
Cover type interspersion (element 12c)

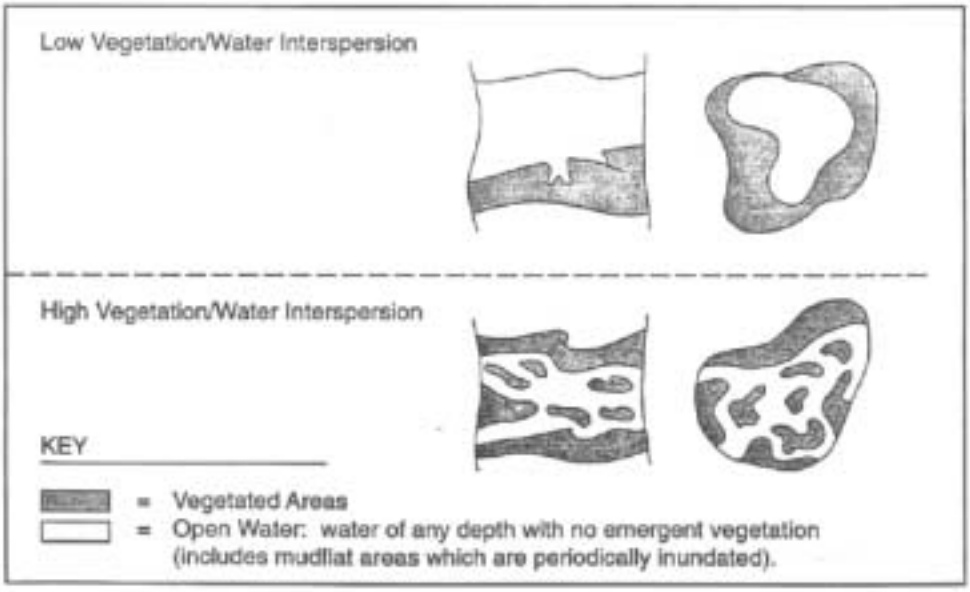
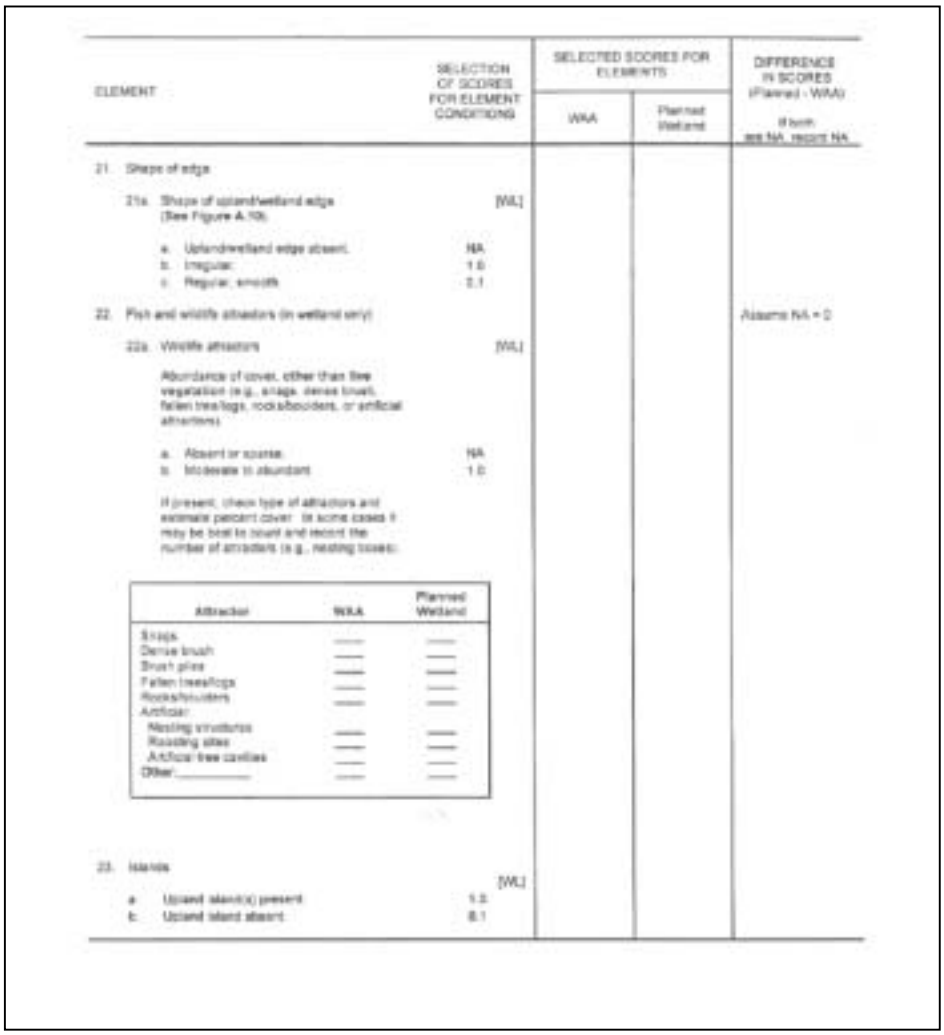


Figure A.9.
Vegetation/water interspersion (element 13b)

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both are NA, record NA
12d. Undesirable species	[WL]			Assume NA = 1.0
a. Vegetation species which are considered to have limited habitat value (e.g., *Phragmites australis*, *Lythrum salicaria*) are absent -OR- if present, do not dominate site.	NA			
b. Site dominated by vegetation species considered to have limited habitat value. If present, identify species: _____	0.1			
12e. Difference in cover types	[WL]			Record both scores.
a. Planned wetland contains same cover types as WAA.	NA	NA		
b. Planned wetland does not contain same cover types as WAA.	1.0			
If answer "b", explain: _____				
13. Vegetation/water proportions				
13a. Percent open water (Open water = water of any depth with no woody or emergent vegetation. Include mudflat areas which are periodically inundated. Note: In tidal systems estimate open water coverage at mid-tide.)	[WL]			If one NA, record both scores.
a. Approximately 50%.	1.0			
b. Intermediate condition (e.g. 10 - 30% or 70 - 90%).	0.5			
c. Open water absent or minimal coverage (e.g., < 10%) -OR- open water predominant cover (e.g., > 90%).	0.1			
13b. Degree of vegetation/water interspersion (See Figure A.9).	[WL]			If one NA, record both scores.
a. High.	1.0			
b. Intermediate condition.	0.5			
c. Low -OR- no interspersion (e.g., site all vegetation or all open water).	0.1			



ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS: WRA	SELECTED SCORES FOR ELEMENTS: Planned Wetland	DIFFERENCE IN SCORES (Planned - WRA) If both are NA, record NA
21. Shape of edge				
21a. Shape of upland/wetland edge (See Figure A-10)	[WL]			
a. Upland/wetland edge absent	NA			
b. Irregular	1.0			
c. Regular, smooth	0.1			
22. Fish and wildlife attractors (in wetland only)				Assume NA = 0
22a. Wildlife attractors	[WL]			
Abundance of cover, other than live vegetation (e.g., snags, dense brush, fallen trees/logs, rocks/boulders, or artificial attractors)				
a. Absent or scarce	NA			
b. Moderate to abundant	1.0			
If present, check type of attractors and estimate percent cover. In some cases it may be best to count and record the number of attractors (e.g., nesting boxes).				
Snags				
Dense brush				
Brush piles				
Fallen trees/logs				
Rocks/boulders				
Artificial:				
Nesting structures				
Roosting sites				
Artificial tree cavities				
Other:				
23. Islands				
	[WL]			
a. Upland island(s) present	1.0			
b. Upland island absent	0.1			

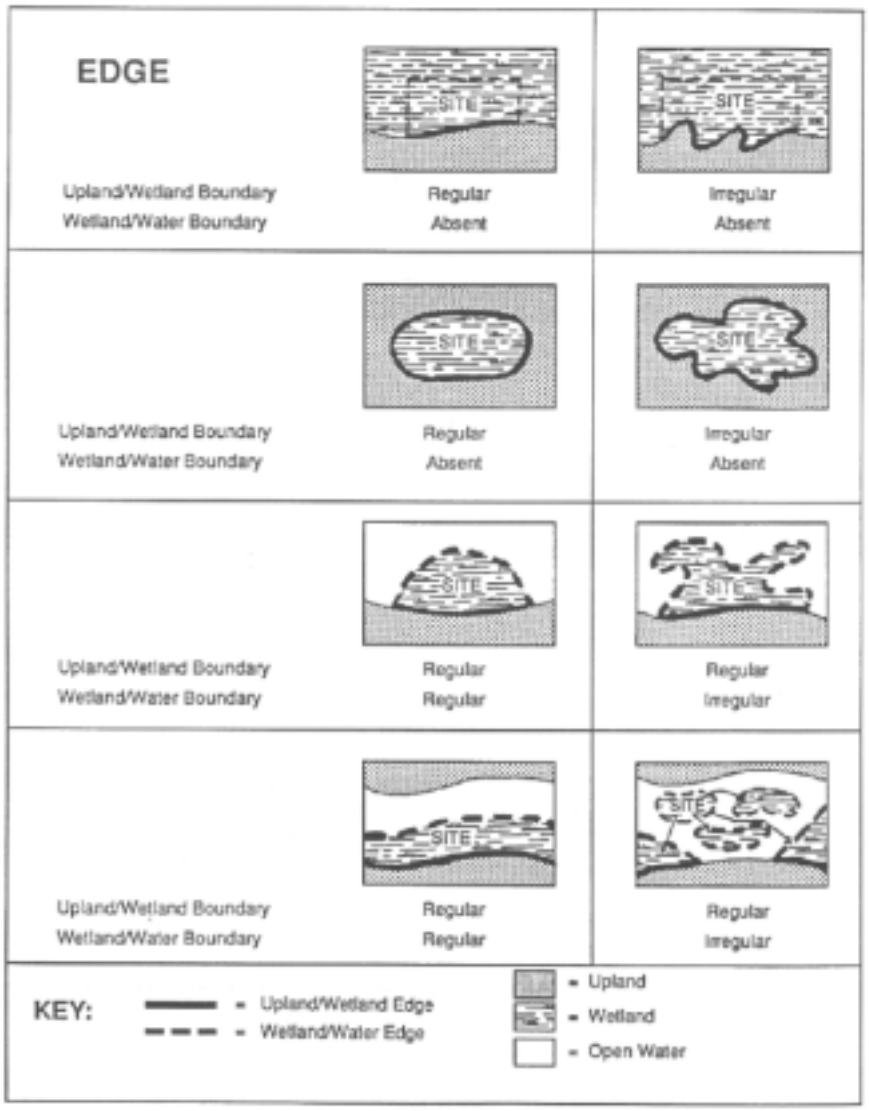


Figure A.10.
Examples of regular and irregular boundaries at the upland/wetland and wetland/water edges (element 21)

PROJECT TITLE: _____

FISH (Tidal)
DATA SHEETS

Function weighting area (AREA) = That portion of the assessment area which, based upon water regime, has the capacity to support tidal fish (e.g., tidally influenced areas up to line of spring high tides).

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	For use in FCI model: SELECTED SCORES FOR ELEMENTS — WAA	For use in FCI model: SELECTED SCORES FOR ELEMENTS — Planned Wetland	For use in Table A 2 only: DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
Suitability for tidal fish (element 24):				
24. Obstruction to on-site fish passage (obstruction can be on- or off-site)	[FT, FS, FP]*			Assume NA = 1.0
a. No barrier(s) present.	NA			
b. Barrier(s) present, but conditions modified to permit fish passage (e.g., fish ladder, installation of culverts in mosquito control impoundments to re-establish tidal exchange and fish passage).	NA			
c. Barriers present, and utilized for fish management practices.	NA			
d. Site isolated, but utilized by fish (e.g., pond).	NA			
e. Condition(s) present which curtail fish passage (e.g., impingement on industrial intakes) or interfere with migratory cycles (e.g., semi-impoundment control structures such as weirs, undersized culvert).	0.5			
f. Condition(s) present which imposes absolute physical (e.g., impoundment for mosquito control, tide gate, dam, waterfall, thermal plume), chemical (extreme in pH), or behavioral barriers to fish passage. **Fish access to the site and survival at site is precluded.**	0.1			

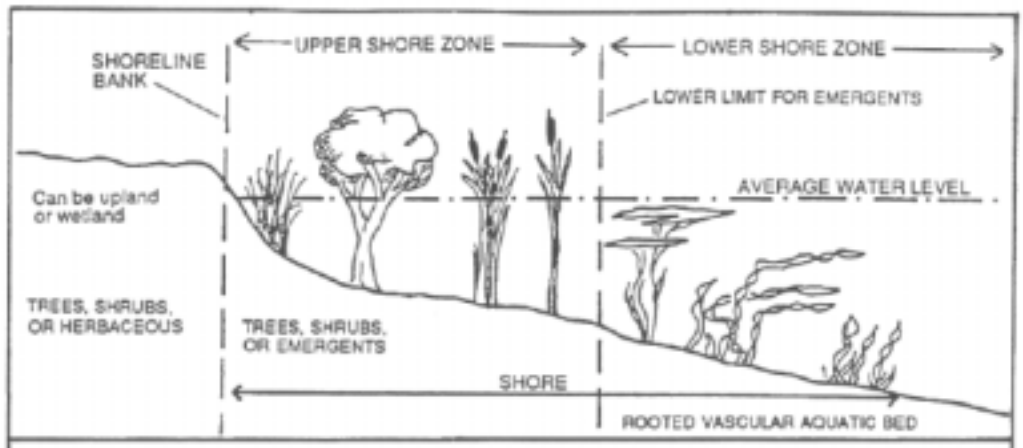
If score for element 24 = 0.1, then there is no potential for providing the tidal fish function; therefore, the Fish (Tidal) FCI is not applicable (NA). Continue if scores = NA or 0.5.

* Denotes function(s) to which element applies: SB = Shoreline Bank Erosion Control; SS = Sediment Stabilization; WQ = Water Quality; WL = Wildlife; FT = Fish (Tidal); FS = Fish (Stream/River); FP = Fish (Pond/Lake); and UH = Uniqueness/Heritage

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
		WAA	Planned Wetland	
Disturbance factors (elements 1b, 4a, 4d, 7b, and 24):				
1. Bank characteristics				
1b. Shoreline bank stability	[FT, FS, FP]			Assume NA = 1.0
a. No shoreline on-site.	NA			
b. Shoreline bank erosion is minimal (e.g., > 75% bank surface protected by vegetation, boulders/rubble/gravel, or other materials).	NA			
c. Shoreline bank erosion is moderate.	0.5			
d. Shoreline bank erosion is substantial (e.g., < 25% bank surface protected).	0.1			
4. Disturbance				
4a. Disturbance at site (Sediment Stabilization)	[SB, SS, FT, FS, FP]			Assume NA = 1.0
(Do not include observations of debris)				
a. No or minimal disturbance.	NA			
b. Potential for periodic disturbance present, but preventative action taken (e.g., installation of exclosure fences for herbivores and/or human disturbance) -OR- if recently disturbed, soils sufficiently stabilized with mulch, seeding, or planting.	NA			
c. Moderate disturbance (e.g., disturbance of sediments only in portion of site; infrequent grazing by waterfowl).	0.5			
d. Evidence of substantial periodic disturbance which makes substrate unstable (e.g., muskrat eatouts, overgrazing by waterfowl, cattle grazing and trampling, nutria activity, human activity such as the use of off-road vehicles; wetland tilled, filled, logged, clear-cut or excavated and not stabilized by seeding or planting).	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
4d. Disturbance of channel/open water bottom (Open water = water of any depth with no emergent vegetation)	[FT, FS, FP]			Assume NA = 1.0
a. Channel/open water absent.	NA			
b. No or minimal recent disturbance.	NA			
c. Channel/open water disturbed in the past (e.g., dredged, channelized), but has begun to recover some of the natural channel/open water and shoreline characteristics (e.g., return to near original depths; and re-establishment of aquatic and shoreline vegetation, fallen trees, woody debris, and rocks).	0.5			
d. Channel/open water recently disturbed (e.g., filled, confined to culvert, or dredged in past year) -OR- substantially altered to prevent recovery of natural characteristics (e.g., cement channel).	0.1			
7. Hydroperiod				
7b. Most permanent hydroperiod	[FT]			Assume NA = 1.0
a. Natural tidal hydroperiod. -OR- If the area is impounded, provisions have been made (e.g., culverts installed) so that hydroperiod mimics natural hydroperiod.	NA			
b. Hydroperiod usually follows natural tidal hydroperiod (e.g., hydroperiod periodically altered to manage for mosquito control).	0.5			
c. Hydroperiod does not or rarely follows natural tidal hydroperiod.	0.1			
24. Obstruction to on-site fish passage (Element already answered above.)				
Description of available food/cover (elements 7c, 9c, 10d, 10f, 21b, and 22b):				
7. Hydroperiod				
7c. Spatially dominant hydroperiod	[FT]			
a. Regularly flooded (e.g., low marsh).	1.0			
b. Both irregularly flooded and regularly flooded vegetated codominant (i.e., high and low marsh approximately equal proportions).	0.5			
c. Irregularly flooded (e.g., high marsh).	0.2			
d. Deep water (e.g., > 2 m at low tide).	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
9. Substrate				
9c. Substrate suitability for fish	[FT]			
a. > 75% mud.	1.0			
b. 25 - 75% mud.	0.5			
c. < 25% mud; composed predominantly of hard material (e.g., sand, rock, shell).	0.2			
d. All hard material (e.g., rock, shell).	0.1			
10. Vegetation, characteristics **during growing season** (Note definition of lower shore zone in **Figure A.2**)				
10d. Percent plant (basal) cover **excluding lower shore zone**. (Consider only those parts of vegetation which have contact with water flow. See **Figure A.3**.)	[FT]			If one NA, record both scores.
a. Assessment area is all lower shore zone.	NA			
b. > 75%.	1.0			
c. 51 - 75%.	0.7			
d. 25 - 50%.	0.3			
e. < 25%.	0.1			
10f. Percent cover of rooted vascular aquatic beds in **lower shore zone**. (**See Figure A.2.**)	[FT]			If one NA, record both scores.
a. No lower shore zone.	NA			
b. Cover > 75%.	1.0			
c. Cover 51 - 75%.	0.7			
d. Cover 25 - 50%.	0.3			
e. Cover < 25%.	0.1			
21. Shape of edge				
21b. Vegetated wetland/water edge (e.g., shape of tidal creek or channel) (**See Figure A.10.**)	[FT, FS, FP]			
a. Irregular.	1.0			
b. Regular, smooth.	0.5			
c. Edge absent or minimal (i.e., no channel in study wetland area).	0.1			



Shoreline Bank: Steep ascending slope of land of any height raised above the adjacent shore that can experience undercutting if it is in contact with water.

Shore: Vegetated or non-vegetated substrate located channelward of the bank.

Upper Shore Zone: Vegetated or non-vegetated portion of the shore located between the bank and the potential lower limit of emergent or woody vegetation as dictated by water depth or tide level.

Lower Shore Zone: Vegetated or non-vegetated portion of the shore located channelward of the potential lower limit of emergent or woody vegetation.

Entire Wetland: Includes wetland areas landward of the bank, the bank, the upper shore zone, and the lower shore zone.

Examples: Aerial View of Wetlands

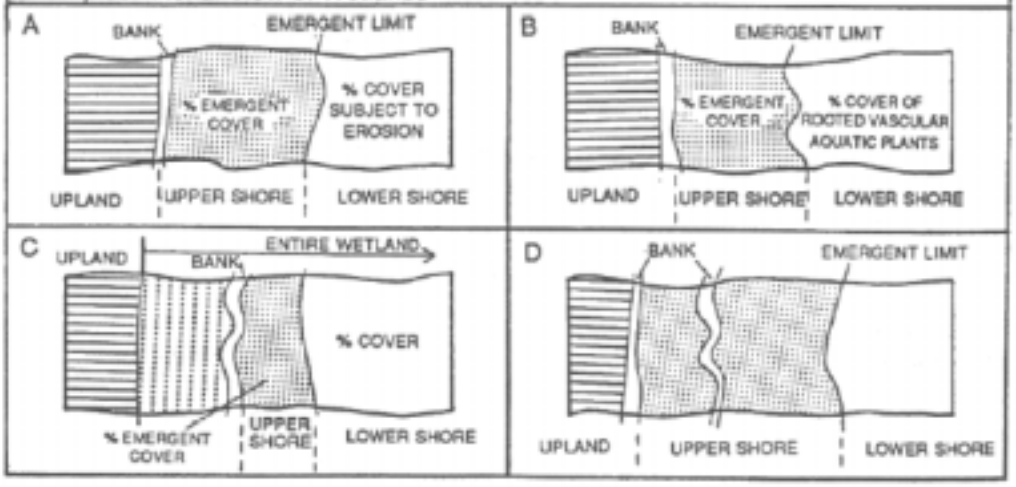


Figure A.2.
Definitions of shoreline bank, shore, upper shore zone, lower shore zone, and entire wetland (element 10)

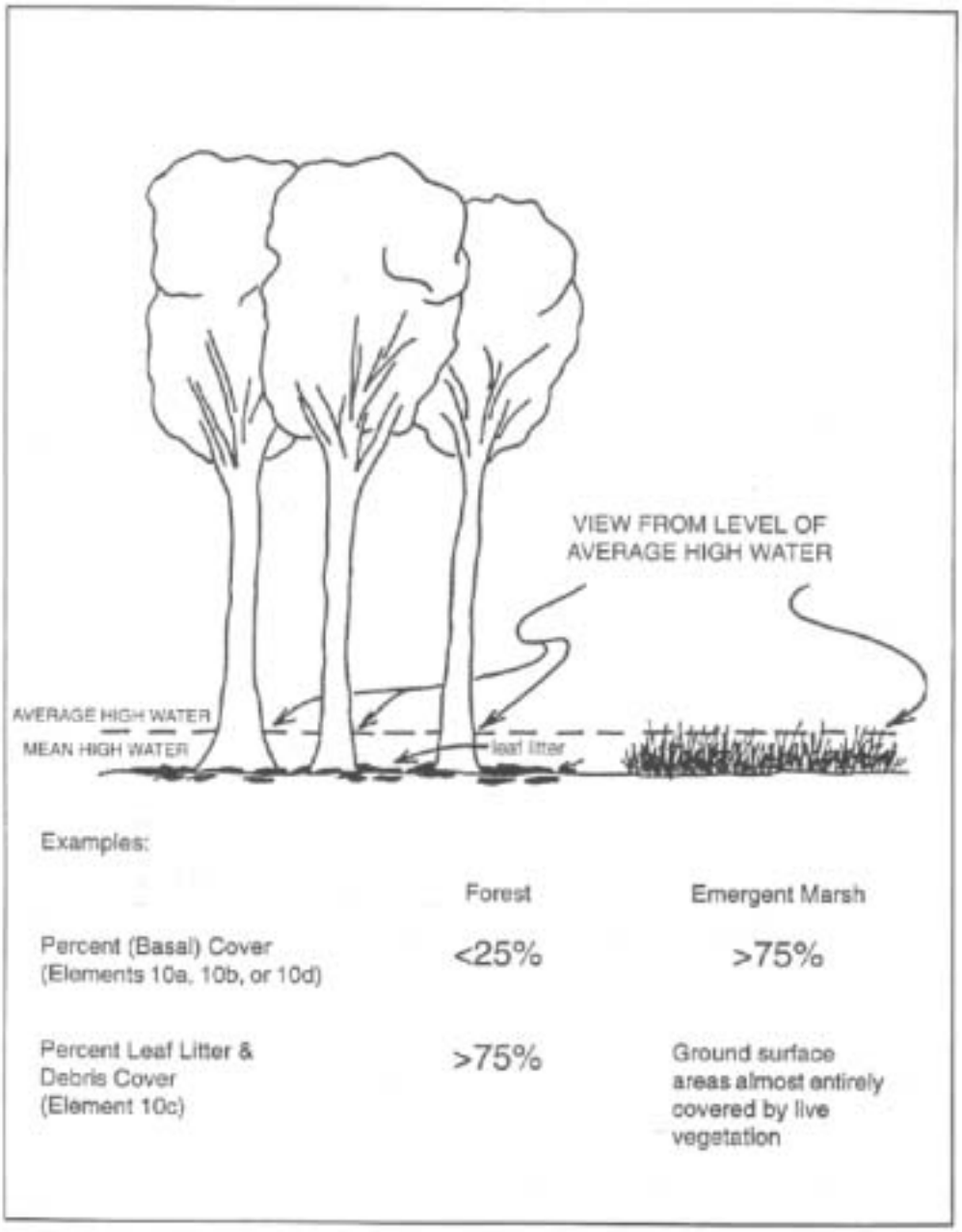


Figure A.3.
Percent plant cover (elements 10a, 10b, 10c, and 10d)

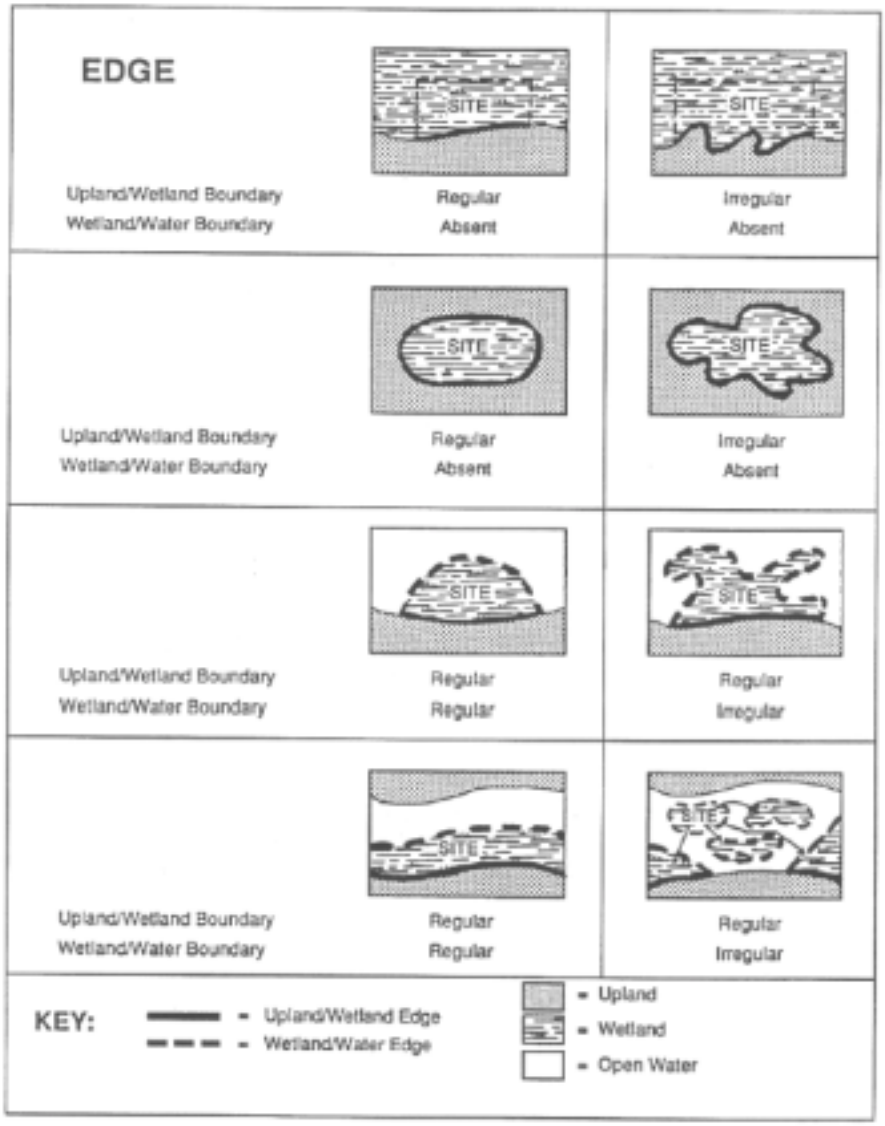
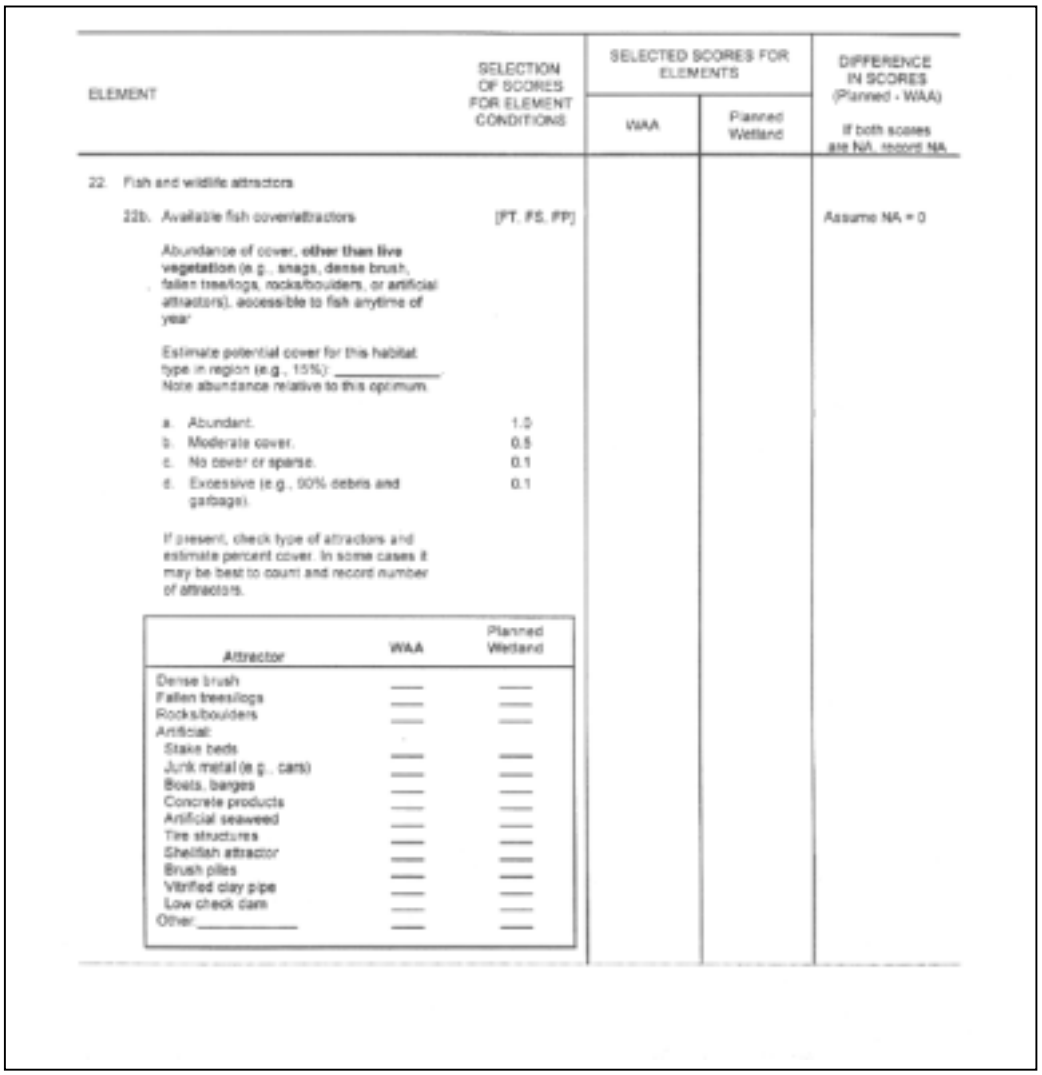


Figure A.10.
Examples of regular and irregular boundaries at the upland/wetland and wetland/water edges (element 21)



ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
22. Fish and wildlife attractors				
22b. Available fish cover/attractors	[FT, FS, FP]			Assume NA = 0
Abundance of cover, **other than live vegetation** (e.g., snags, dense brush, fallen trees/logs, rocks/boulders, or artificial attractors), accessible to fish anytime of year Estimate potential cover for this habitat type in region (e.g., 15%): _____ Note abundance relative to this optimum.				
a. Abundant.	1.0			
b. Moderate cover.	0.5			
c. No cover or sparse.	0.1			
d. Excessive (e.g., 90% debris and garbage).	0.1			
If present, check type of attractors and estimate percent cover. In some cases it may be best to count and record number of attractors.				

Attractor	WAA	Planned Wetland
Dense brush	___	___
Fallen trees/logs	___	___
Rocks/boulders	___	___
Artificial:		
Stake beds	___	___
Junk metal (e.g., cars)	___	___
Boats, barges	___	___
Concrete products	___	___
Artificial seaweed	___	___
Tire structures	___	___
Shellfish attractor	___	___
Brush piles	___	___
Vitrified clay pipe	___	___
Low check dam	___	___
Other: _____	___	___

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NS.
Factors describing water quality (elements 20b, 20c, 20d, and 20f):				
20 Water quality				
20b. Water quality ratings	[FT, FS, FP]			If one /NA, record both scores.
Define state water quality ratings and assign to following categories:				
High: _____				
(e.g., Class A = no or minimal pollution)				
Moderate: _____				
(e.g., Class B and C = moderate pollution)				
Low: _____				
(e.g., Class D = severe pollution)				
Water quality rating for waterway:				
a. Information not available	/NA			
b. High	1.0			
c. Moderate	0.5			
e. Low	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
20c. Evidence of nutrient, sediment, or contaminant sources (If more than one score applicable, record lowest score).	[FT, FS, FP]			If one INA, record both scores.
a. Information not available.	INA			
b. Little or no potential for nutrient, sediment, or contaminant input.	1.0			
c. Evidence of or potential for moderate nutrient, sediment, or contaminant input.	0.5			
d. Evidence of high nutrient concentration in the wetland/waterway (e.g., recurrent algal blooms) or known source(s) contributing nutrients to the wetland/waterway (e.g., sewage outfalls, mine tailings, landfills, septic fields, active pasturelands and croplands).	0.1			
e. Evidence of high inorganic sediment input (e.g., stormwater outfalls, irrigation return flows; direct observation of sediment inputs, i.e., sediment plumes of turbid water at inlet; predominant soils/slopes classified as eroding or erosion hazard by SCS).	0.1			
f. Evidence of presence of contaminants (e.g., stunted plant growth, excessive growth, and/or abnormal morphology; oil sheen on marsh surface -AND/OR- known source(s) contributing contaminants to the wetland/waterway (e.g., hazardous water sites, superfund sites, landfills).	0.1			
g. Evidence of conditions known to stress fish (e.g., low DO, high turbidity, extremes in temperature, thermal plume).	0.1			
20d. Dissolved oxygen (DO) during summer	[FT, FS, FP]			If one INA, record both scores.
a. Information not available.	INA			
b. Usually > 5 mg/l.	1.0			
c. Usually between 2 and 5 mg/l.	0.5			
d. Frequently < 2 mg/l.	0.1			
20f. Maximum mid-summer temperature within pools or littoral areas	[FT, FS, FP]			If one INA, record both scores.
a. Information not available.	INA			
b. 68 - 90° F (20 - 32° C).	1.0			
c. 41 - 68° F (5 - 20° C) -OR- 90 - 104° F (32 - 40° C).	0.5			
d. < 41° F -OR- > 104° F (< 5° C -OR- > 40° C).	0.1			

PROJECT TITLE: _____

FISH (Non-tidal Stream/River)
DATA SHEETS

Function weighting area (AREA) = That portion of the assessment area which, based upon water regime, has the capacity to support non-tidal stream/river fish. The period of inundation can vary throughout the site. Suitable wetland water regimes include permanently flooded, intermittently exposed, semipermanently flooded and seasonally flooded. Unsuitable water regimes may include saturated or intermittently flooded.

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	For use in FCI model: SELECTED SCORES FOR ELEMENTS — WAA	For use in FCI model: SELECTED SCORES FOR ELEMENTS — Planned Wetland	For use in Table A.2 only: DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
Suitability for non-tidal stream/river fish (element 24).				
24. Obstruction to on-site fish passage (obstruction can be on- or off-site)	[FT, FS, FP]*			Assume NA = 1.0
a. No barrier(s) present.	NA			
b. Barrier(s) present, but conditions modified to permit fish passage (e.g., fish ladder, installation of culverts in mosquito control impoundments to re-establish tidal exchange and fish passage).	NA			
c. Barrier(s) present and utilized for fish management practices.	NA			
d. Site isolated, but utilized by fish (e.g., pond).	NA			
e. Condition(s) present which curtail fish passage (e.g., impingement on industrial intakes) or interfere with migratory cycles (e.g., semi-impoundment control structures such as weirs, undersized culvert).	0.5			
f. Condition(s) present which imposes absolute physical (e.g., impoundment for mosquito control, tide gate, dam, waterfall, thermal plume), chemical (extreme in pH), or behavioral barriers to fish passage. Fish access to the site and survival at site is precluded.	0.1			

NOTE: If score for element 24 = 0.1, then there is no potential for providing the non-tidal fish function; therefore, the FISH (Non-tidal Stream/River) FCI is not applicable (NA). Continue if scores = NA or 0.5.

* Denotes function(s) to which element applies: SB = Shoreline Bank Erosion Control; SS = Sediment Stabilization; WQ = Water Quality; WL = Wildlife; FT = Fish (Tidal); FS = Fish (Stream/River); FP = Fish (Pond/Lake); and UH = Uniqueness/Heritage

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
Disturbance factors (elements 1b, 4a, 4d, 19c, and 24):				
1. Bank characteristics				
1b. Shoreline bank stability	[FT, FS, FP]			Assume NA = 1.0
a. No shoreline on site.	NA			
b. Shoreline bank erosion is minimal (e.g., > 75% bank surface protected by vegetation, boulders/rubble/gravel, or other materials).	NA			
c. Shoreline bank erosion is moderate.	0.5			
d. Shoreline bank erosion is substantial (e.g., < 25% bank surface protected).	0.1			
4. Disturbance				
4a. Disturbance at site (Sediment Stabilization)	[SB, SS, FT, FS, FP]			Assume NA = 1.0
(Do not include observations of debris)				
a. No or minimal disturbance.	NA			
b. Potential for periodic disturbance present, but preventative action taken (e.g., installation of enclosure fences for herbivores and/or human disturbance) -OR- if recently disturbed, soils sufficiently stabilized with mulch, seeding, or planting.	NA			
c. Moderate disturbance (e.g., disturbance of sediments only in portion of site, infrequent grazing by waterfowl).	0.5			
d. Evidence of substantial periodic disturbance which makes substrate unstable (e.g., muskrat eatouts, overgrazing by waterfowl, cattle grazing and trampling, nutria activity, human activity such as the use of off-road vehicles; wetland tilled, filled, logged, clear-cut or excavated and not stabilized by seeding or planting).	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA.
4d. Disturbance of channel/open water bottom (Open water = water of any depth with no emergent vegetation)	[FT, FS, FP]			Assume NA = 1.0
a. Channel/open water absent.	NA			
b. No or minimal recent disturbance.	NA			
c. Channel/open water disturbed in the past (e.g., dredged, channelized), but has begun to recover some of the natural channel/open water and shoreline characteristics (e.g., return to near original depths; and re-establishment of aquatic and shoreline vegetation, fallen trees, woody debris, and rocks).	0.5			
d. Channel/open water recently disturbed (e.g., filled, confined to culvert, or dredged in past year) -OR- substantially altered to prevent recovery of natural characteristics (e.g., cement channel).	0.1			
16. Size				
16c. Fish habitat size	[FS, FP]			Assume NA = 1.0
Does the assessment AREA have a very low fishery habitat value because of (1) its small size and surrounding landscape (e.g., < 0.1 acre and bordered by urban development) or (2) because it is ephemeral.				
a. No.	NA			
b. Yes.	0.1			
If yes, explain: _____				
24. Obstruction to on-site fish passage (Element already answered above.)				
Description of available food/cover (elements 10m, 16c, 21b, 22b, 25a, and 26):				
10. Vegetation characteristics during growing season				
10m. Vegetative overhang (within 30 cm (1 ft) of water surface)	[FS, FP]			If one NA, record both scores.
Estimate optimum % overhang for this habitat type in region (e.g., > 50%): _____. Note abundance relative to this optimum.				
a. No shoreline on-site.	NA			
b. Abundant (e.g., > 1 ft. on 50% of shoreline).	1.0			
c. Moderate (e.g., > 1 ft. on 30 - 45% of shoreline).	0.5			
d. Sparse (e.g., > 1 ft. on less than 20% of shoreline).	0.1			

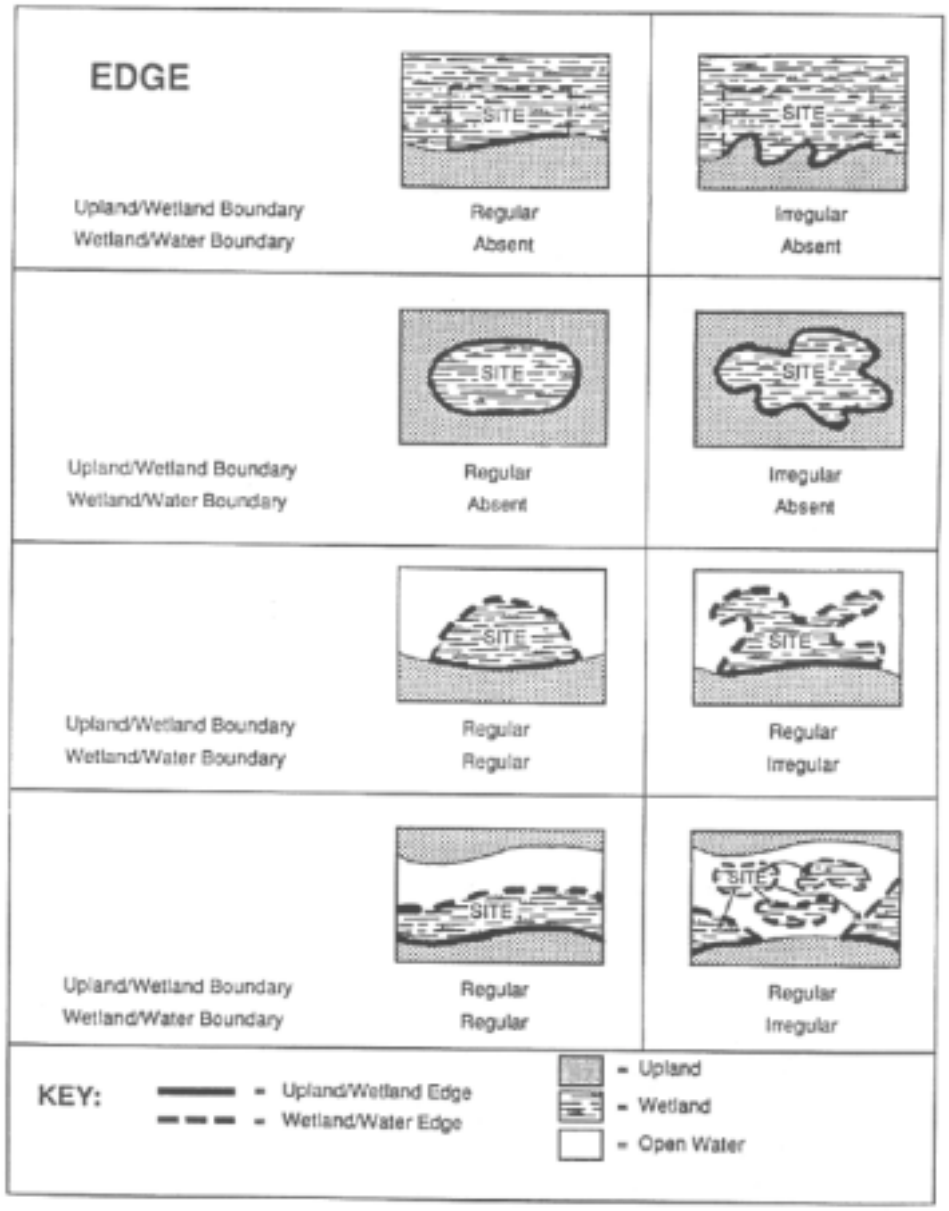


Figure A 10.
Examples of regular and irregular boundaries at the upland/wetland and wetland/water edges (element 21)

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
10c. Aboveground plant biomass in wetland, excluding lower shore zone	[FS, FP]			
a. Almost all potential aboveground plant biomass at present stage of development remains. Plant cover is close to that which would occur naturally without disturbance. If bare areas exist (e.g., bedrock), they are not a result of loss of vegetation from land uses.	1.0			
b. Plant biomass 50 - 75% of potential due to disturbance (e.g., grazing).	0.7			
c. Plant biomass 25 - 50%.	0.3			
d. Plant biomass < 25 (e.g., only root system and part of stems remain).	0.1			
21. Shape of edge				
21b. Vegetated wetland/water edge (e.g., shore of tidal creek or channel) (See Figure A.16).	[FT, FS, FP]			
a. Irregular.	1.0			
b. Regular, smooth.	0.1			
c. Edge absent or minimal (i.e., no channel in study wetland area).	0.1			
22. Fish and wildlife attractors				
22b. Available fish cover/attractors.	[FT, FS, FP]			
Abundance of cover (e.g., vegetation, dense brush, fallen tree/logs, rocks/boulders, or artificial attractors) in littoral areas, pools, and backwaters during summer.				
Estimate potential cover for this habitat type in region (e.g., 25 - 75%): _____ Note abundance relative to this optimum.				
Warmwater fisheries.				
a. Optimal (e.g., 25 - 75%).	1.0			
b. Near optimal (e.g., 15 - 25% or 75 - 95%).	0.8			
c. Adequate (e.g., 5 - 15%) or excessive (e.g., 95 - 100%).	0.3			
d. No cover or sparse (e.g., < 2%).	0.1			
Trout stream				
a. Optimal (e.g., 10 - 50%).	1.0			
b. Moderate (e.g., 2 - 10%).	0.9			
c. Excessive (e.g., > 50%).	0.1			
d. No cover or sparse (e.g., < 2%).	0.1			
(Element 22c continues on next page.)				

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS: WAA	SELECTED SCORES FOR ELEMENTS: Planned Wetland	DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
22b. Available fish cover/attractors *(cont'd)* If present, check type of attractors and estimate percent cover. In some cases it may be best to count and record the number of attractors.				
25. Pool/riffle				
25a. Percent pool area in stretch of stream (Note: may need to consider areas outside of small assessment areas to determine percentage which is representative of stream.)	[FS]			If one NA, record both scores.
Trout stream: Estimate pool area during late growing season, low-water periods:				
a. No stream on-site.	NA			
b. Approximately 50% (e.g., 35 - 65%).	1.0			
c. Low (e.g., 5 - 35%) or high (> 65%).	0.5			
d. Sparse (e.g., < 2%).	0.1			
Warmwater stream: Estimate pool area during average summer flow:				
a. No stream on-site.	NA			
b. Predominant (e.g., > 50%).	1.0			
c. Low (e.g., 20 - 40%).	0.5			
d. Sparse (e.g., < 5%).	0.1			

Attractor	WAA	Planned Wetland
Emergent vegetation	____	____
Submerged vegetation	____	____
Dense brush	____	____
Fallen trees/logs	____	____
Rocks/boulders	____	____
Artificial:		
Stake beds	____	____
Junk metal (e.g., cars)	____	____
Boats, barges	____	____
Concrete products	____	____
Artificial seaweed	____	____
Tire structures	____	____
Shellfish attractor	____	____
Brush piles	____	____
Vitrified clay pipe	____	____
Low check dam	____	____
Other: _____	____	____

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
26. Bank undercut	[FS]			If one NA, record both scores.
a. No shoreline on-site.	NA			
b. Bank undercut present and providing abundant cover for fish (e.g., undercut predominantly > 15 cm [> 6 inches]).	1.0			
c. Bank undercut present and providing moderate cover.	0.5			
d. Bank undercut minimal or absent (e.g., undercut predominantly < 15 cm [< 6 inches]).	0.1			
Factors affecting reproduction (elements 25b, 27a, and 27b):				
25b. Average current velocity over spawning areas during spawning and embryo development	[FS]			If NA and/or INA, record both scores.
Trout stream:				
a. Warmwater stream.	NA			
b. No stream on-site.	NA			
c. Information not available.	INA			
d. 30 to 70 cm/sec (12 to 28 in/sec).	1.0			
e. 15 to 30 cm/sec (6 to 12 in/sec) -OR- 70 to 85 cm/sec (28 to 34 in/sec).	0.5			
f. < 15 cm/sec (< 6 in/sec) -OR- > 85 cm/sec (> 34 in/sec).	0.1			
27. Spawning habitat				
27a. Spawning substrate, accessible during spawning periods. Select dominant substrate.	[FS, FP]			
a. Gravel/rubble.	1.0			
b. Sand.	0.5			
c. Boulders, bedrock, or fines (e.g., silt, mud, clay).	0.2			
d. Site not accessible during spawning.	0.1			
27b. Spawning structures	[FS,FP]			Assume NA = 0
a. Site not accessible during spawning.	NA			
b. Absent.	NA			
c. Present (e.g., gravel or rock spawning shoals, artificial reef, suspended platforms, spawning box).	1.0			
If present, describe: _____				

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA.
Factors describing water quality (elements 20b, 20c, 20d, 20e, 20f, and 20g):				
20. Water quality				
20b. Water quality ratings	[FT, FS, FP]			If one INA, record both scores.
Define state water quality ratings and assign to following categories:				
High: _____				
(e.g., Class A = no or minimal pollution)				
Moderate: _____				
(e.g., Class B and C = moderate pollution)				
Low: _____				
(e.g., Class D = severe pollution)				
Water quality rating for waterway:				
a. Information not available.	INA			
b. High.	1.0			
c. Moderate.	0.5			
e. Low.	0.1			
20c. Evidence of nutrient, sediment, or contaminant sources (if more than one answer applicable, record lowest score).	[FT, FS, FP]			If one INA, record both scores.
a. Information not available.	INA			
b. Little or no potential for nutrient, sediment, or contaminant input.	1.0			
c. Evidence of or potential for moderate nutrient, sediment, or contaminant input.	0.5			
d. Evidence of high nutrient concentration in the wetland/waterway (e.g., recurrent algal blooms) or known source(s) contributing nutrients to the wetland/waterway (e.g., sewage outfalls, mine tailings, landfills, septic fields, active pasturelands and croplands).	0.1			
e. Evidence of high inorganic sediment input (e.g., stormwater outfalls; irrigation return flows; direct observation of sediment inputs, i.e., sediment plumes of turbid water at inlet; predominant soils/slopes classified as eroding or erosion hazard by SCS).	0.1			
f. Evidence of presence of contaminants (e.g., stunted plant growth, excessive growth, and/or abnormal morphology; oil sheen on marsh surface -AND/OR- known source(s) contributing contaminants to the wetland/waterway (e.g., hazardous waste sites, superfund sites, landfills).	0.1			
g. Evidence of conditions known to stress fish (e.g., low DO, high turbidity, extremes in temperature, thermal plume).	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
		WAA	Planned Wetland	
20d. Dissolved oxygen (DO) during summer	[FT, FS, FP]			If one INA, record both scores.
Trout stream:				
a. Information not available.	INA			
b. Usually > 9 mg/l.	1.0			
c. Usually between 5 and 9 mg/l.	0.5			
d. Frequently < 5 mg/l.	0.1			
Warmwater stream:				
a. Information not available.	INA			
b. Usually > 5 mg/l.	1.0			
c. Usually between 2 and 5 mg/l.	0.5			
d. Frequently < 2 mg/l.	0.1			
20e. pH range	[FS, FP]			If one INA, record both scores.
Trout stream:				
a. Information not available.	INA			
b. 6.5 to 8.0.	1.0			
c. Between 5.5 and 6.5 -OR- 8.0 and 9.0.	0.5			
d. < 5.5 -OR- > 9.0.	0.1			
Warmwater stream:				
a. Information not available.	INA			
b. 6.5 to 8.5.	1.0			
c. Between 5.0 and 6.5 -OR- 8.5 and 9.5.	0.5			
d. < 5.0 -OR- > 9.5.	0.1			
20f. Maximum mid-summer temperature within pools or littoral areas	[FT, FS, FP]			If one INA, record both scores.
Trout stream:				
a. Information not available.	INA			
b. 54 - 66° F (12 - 19° C).	1.0			
c. 36 - 54° F (2 - 12° C) -OR- 66 - 77° F (19 - 25° C).	0.5			
d. < 36° F -OR- > 77° F (< 2° C -OR- > 25° C).	0.1			
Warmwater stream:				
a. Information not available.	INA			
b. 68 - 86° F (20 - 30° C).	1.0			
c. 59 - 68° F (15 - 20° C) -OR- 86 - 93° F (30 - 34° C).	0.5			
d. < 59° F -OR- > 93° F (< 15° C -OR- > 34° C).	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
		WAA	Planned Wetland	
20g. Maximum monthly average turbidity during summer	[FS, FP]			If one INA, record both scores.
a. Information not available.	INA			
b. Low (e.g., < 80 JTU, secchi depth > 2 m)	1.0			
c. Moderate (e.g., approx. 150 JTU)	0.5			
d. High (e.g., 200 JTU, secchi depth = 0 m)	0.1			

PROJECT TITLE: _____

FISH (Non-tidal Pond/Lake)
DATA SHEETS

Function weighting area (AREA) = That portion of the assessment area which, based upon water regime, has the capacity to support non-tidal pond/lake fish. The period of inundation can vary throughout the site. Suitable wetland water regimes include permanently flooded, intermittently exposed, semipermanently flooded and seasonally flooded. Unsuitable water regimes may include saturated or intermittently flooded.

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	For use in FCI model: SELECTED SCORES FOR ELEMENTS — WAA	For use in FCI model: SELECTED SCORES FOR ELEMENTS — Planned Wetland	For use in Table A.2 only: DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, report NA
Suitability for non-tidal pond/lake fish (elements 24 and 28):				
24. Obstruction to on-site fish passage (obstruction can be on- or off-site)	[FT, FS, FP]*			Assume NA = 1.0
a. No barrier(s) present.	NA			
b. Barrier(s) present, but conditions modified to permit fish passage (e.g., fish ladder, installation of culverts in mosquito control impoundments to re-establish tidal exchange and fish passage).	NA			
c. Barrier(s) present and utilized for fish management practices.	NA			
d. Site isolated, but utilized by fish (e.g., pond).	NA			
e. Condition(s) present which curtail fish passage (e.g., impingement on industrial intakes) or interfere with migratory cycles (e.g., semi-impoundment control structures such as weirs, undersized culvert).	0.5			
f. Condition(s) present which imposes absolute physical (e.g., impoundment for mosquito control, tide gate, dam, waterfall, thermal plume), chemical (extreme in pH), or behavioral barriers to fish passage. **Fish access to the site and survival at site is precluded.**	0.1			
28. Available refuge during drought and/or freeze Is there an accessible water body with areas of sufficient depth which will not dry up during a drought and/or freeze throughout the water column.	[FP]			Assume NA = 1.0
a. Yes.	NA			
b. No.	0.1			

NOTE: If score for element 24 and/or element 28 = 0.1, then there is no potential for providing the non-tidal fish function; therefore, the FISH (Non-tidal Pond/Lake) FCI is not applicable (NA). Continue if scores = NA or 0.5.

* Denotes function(s) to which element applies: SB = Shoreline Bank Erosion Control; SS = Sediment Stabilization; WQ = Water Quality; WL = Wildlife; FT = Fish (Tidal); FS = Fish (Stream/River); FP = Fish (Pond/lake); and UH = Uniqueness/Heritage

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
Disturbance factors (elements 1b, 4a, 4d, 16c, and 24):				
4. Disturbance				
1b. Shoreline bank stability	[FT,FS, FP]			Assume NA = 1.0
a. No shoreline on-site.	NA			
b. Shoreline bank erosion is minimal (< e.g., >75% bank surface protected by vegetation, boulders/rubble/gravel, or other materials).	NA			
c. Shoreline bank erosion is moderate.	0.5			
d. Shoreline bank erosion is substantial (e.g., < 25% bank surface protected).	0.1			
4a. Disturbance at site (Sediment Stabilization)	[SB, SS, FT, FS, FP]			Assume NA = 1.0
(Do not include observations of debris)				
a. No or minimal disturbance.	NA			
b. Potential for periodic disturbance present, but preventative action taken (e.g., installation of enclosure fences for herbivores and/or human disturbance) -OR- if recently disturbed, soils sufficiently stabilized with mulch, seeding, or planting.	NA			
c. Moderate disturbance (e.g., disturbance of sediments only in portion of site; infrequent grazing by waterfowl).	0.5			
d. Evidence of substantial periodic disturbance which makes substrate unstable (e.g., muskrat eatouts, overgrazing by waterfowl, cattle grazing and trampling, nutria activity, human activity such as the use of off-road vehicles; wetland tilled, filled, logged, clear-cut or excavated and not stabilized by seeding or planting).	0.1			



ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA.
4d. Disturbance of channel/open water bottom (Open water = water of any depth with no emergent vegetation)	[FT, FS, FP]			Assume NA = 1.0
a. Channel/open water absent. disturbance.	NA			
b. No or minimal evidence of recent disturbance.	NA			
c. Channel/open water disturbed in the past (e.g., dredged, channelized), but has begun to recover some of the natural channel/open water and shoreline characteristics (e.g., return to near original depths; and re-establishment of aquatic and shoreline vegetation, fallen trees, woody debris, and rocks).	0.5			
d. Channel/open water recently disturbed (e.g., filled, confined to culvert, or dredged in past year) -OR- substantially altered to prevent recovery of natural characteristics (e.g., cement channel).	0.1			
15. Size				
15c. Fish habitat size	[FS,FP]			Assume NA = 1.0
Does the assessment AREA have a very low fishery habitat value because of (1) its small size and surrounding landscape (e.g., < 0.1 acre and bordered by urban development) or (2) because it is ephemeral.				
a. No.	NA			
b. Yes.	0.1			
If yes, explain: _____				
24. Obstruction to on-site fish passage (Element already answered above.)				

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
Description of available food/cover (elements 10m, 10o, 21b, and 22b):				
10. Vegetation characteristics **during growing season**				
10m. Vegetative overhang (within 30 cm (1 ft) of water surface)	[FS,FP]			If one NA, record both scores.
Estimate optimum % overhang for this habitat type in region (e.g., > 75%:) _____. Note abundance relative to this optimum.				
a. No shoreline on-site.	NA			
b. Abundant (e.g., > 1 ft. on > 75% of shoreline).	1.0			
c. Moderate (e.g., > 1 ft. on 25 - 75% of shoreline).	0.5			
d. Sparse or absent (e.g., > 1 ft. on less than 25% of shoreline).	0.1			
10o. Aboveground plant biomass in wetland, **excluding lower shore zone**.	[FS,FP]			
a. Almost all potential aboveground plant biomass at present stage of development remains. Plant cover is close to that which would occur naturally without disturbance. If bare areas exist (e.g., bedrock), they are not a result of loss of vegetation from land uses.	1.0			
b. Plant biomass 50 - 75% of potential due to disturbance (e.g., grazing).	0.7			
c. Plant biomass 25 - 50%.	0.3			
d. Plant biomass < 25 (e.g., only root system and part of stems remain).	0.1			
21. Shape of edge				
21b. Vegetated wetland/water edge (e.g., shape of tidal creek or channel) (**See Figure A.10**).	[FT, FS, FP]			
a. Irregular.	1.0			
b. Regular, smooth.	0.5			
c. Edge absent or minimal (i.e., no channel in study wetland area).	0.1			

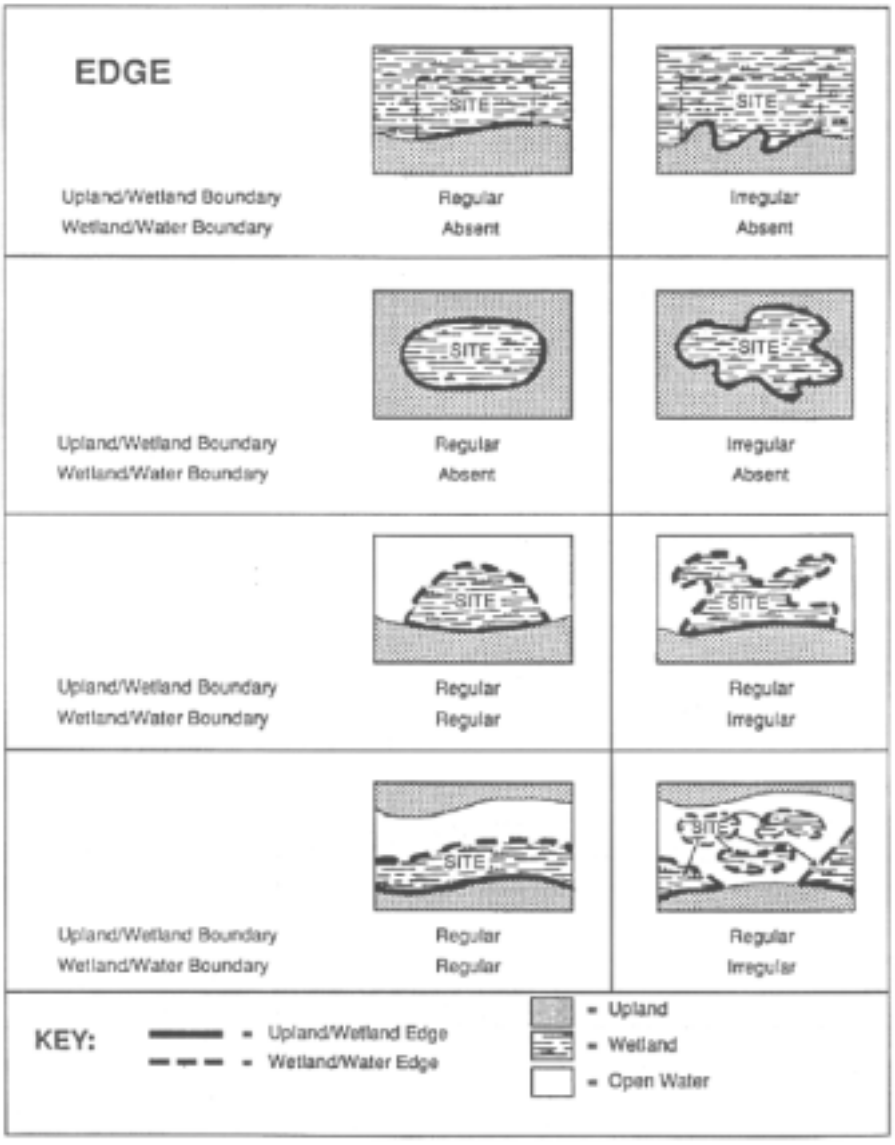


Figure A.10.
Examples of regular and irregular boundaries at the upland/wetland and wetland/water edges (element 21)

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
		WAA	Planned Wetland	
22. Fish and wildlife attractors				
22b. Available fish cover/attractors	[FT, FS, FP]			
Abundance of cover (e.g., vegetation, dense brush, fallen trees/logs, rocks/boulders, or artificial attractors) in littoral areas, pools, and backwaters during summer.				
Estimate potential cover for this habitat type in region (e.g., 25 - 75%): _____. Note abundance relative to this optimum.				
a. Optimal (e.g., 25 - 75%).	1.0			
b. Near optimal (e.g., 15 - 25% or 75 - 90%).	0.8			
c. Adequate (e.g., 3 - 15%) or excessive (e.g., 90 - 100%).	0.3			
d. No cover or sparse (e.g., < 3%).	0.1			
If present, check type of attractors and estimate percent cover. In some cases it may be best to count and record the number of attractors.				

Attractor	WAA	Planned Wetland
Emergent vegetation	___	___
Submerged vegetation	___	___
Dense brush	___	___
Fallen trees/logs	___	___
Rocks/boulders	___	___
Artificial:		
Stake beds	___	___
Junk metal (e.g., cars)	___	___
Boats, barges	___	___
Concrete products	___	___
Artificial seaweed	___	___
Tire structures	___	___
Shellfish attractor	___	___
Brush piles	___	___
Vitrified clay pipe	___	___
Low check dam	___	___
Other:_____	___	___

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
		WAA	Planned Wetland	
Factors affecting reproduction (elements 27a, 27b, and 27c).				
27. Spawning habitat				
27a. Spawning substrate, **accessible during spawning periods. Select dominant substrate.**	[FS,FP]			
a. Gravel and/or pebbles.	1.0			
b. Emergent and/or aquatic vegetation.	1.0			
c. Sand and/or fine sediments (e.g., silt, mud, clay).	0.5			
d. Bedrock and/or boulders.	0.2			
e. Site not accessible during spawning.	0.1			
27b. Spawning structures.	[FS,FP]			Assume NA = 0
a. Site not accessible during spawning.	NA			
b. Absent.	NA			
c. Present (e.g., gravel or rock spawning shoals, artificial reef, suspended platforms, spawning box).	1.0			
If present describe: _____				
27c. Drawdown of water during spawning and embryo development (under normal conditions)	[FP]			Assume NA = 1.0
a. No or minimal drawdown.	NA			
b. Moderate drawdown causing some loss of spawning habitat.	0.5			
c. Drawdown sufficient to expose spawning substrate thus causing substantial loss of spawning habitat.	0.1			
Examples of unsuitable drawdown levels:				
gizzard shad >0.5 m (>1.6 ft)				
green sunfish >1 m (>3.3 ft)				
northern pike >1 m (>3.3 ft)				
black bullhead >2 m (>6.6 ft)				
longnose dace >3 m (>9.8 ft)				
largemouth bass >7 m (>23 ft)				

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
		WAA	Planned Wetland	
Factors describing water quality (elements 20b, 20c, 20d, 20e, 20f, and 20g):				
20. Water quality				
20b. Water quality ratings	[FT, FS, FP]			If one INA, record both scores.
Define state water quality ratings and assign to following categories:				
High: _____				
(e.g., Class A = no or minimal pollution)				
Moderate: _____				
(e.g., Class B and C = moderate pollution)				
Low: _____				
(e.g., Class D = severe pollution)				
Water quality rating for waterway:				
a. Information not available.	INA			
b. High.	1.0			
c. Moderate.	0.5			
d. Low.	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA.
20c. Evidence of nutrient, sediment, or contaminant sources (If more than one score applicable, record lowest score).	[FT, FS, FP]			If one INA, record both scores.
a. Information not available.	INA			
b. Little or no potential for nutrient, sediment, or contaminant input.	1.0			
c. Evidence of or potential for moderate nutrient, sediment, or contaminant input.	0.5			
d. Evidence of high nutrient concentration in the wetland/waterway (e.g., recurrent algal blooms) or known source(s) contributing nutrients to the wetland/waterway (e.g., sewage outfalls, mine tailings, landfills, septic fields, active pasturelands and croplands).	0.1			
e. Evidence of high inorganic sediment input (e.g., stormwater outfalls, irrigation return flows, direct observation of sediment inputs, i.e., sediment plumes of turbid water at inlet; predominant soils/slopes classified as eroding or erosion hazard by SCS).	0.1			
f. Evidence of presence of contaminants (e.g., stunted plant growth, excessive growth, and/or abnormal morphology; oil sheen on marsh surface AND/OR known source(s) contributing contaminants to the wetland/waterway (e.g., hazardous water sites, superfund sites, landfills).	0.1			
g. Evidence of conditions known to stress fish (e.g., low DO, high turbidity, extremes in temperature, thermal plume).	0.1			
20d. Dissolved oxygen (DO) during summer	[FT, FS, FP]			If one INA, record both scores.
a. Information not available.	INA			
b. Usually > 5 mg/l.	1.0			
c. Usually between 2 and 5 mg/l.	0.5			
d. Frequently < 2 mg/l.	0.1			
20e. pH range	[FS, FP]			If one INA, record both scores.
a. Information not available.	INA			
b. 6.5 to 8.5.	1.0			
c. Between 5.0 and 6.5 -OR- 8.5 and 9.5.	0.5			
d. < 5.0 -OR- > 9.5.	0.1			

ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA.
20f. Maximum mid-summer temperature within pools or littoral areas	[FT, FS, FP]			If one INA, record both scores.
a. Information not available	INA			
b. 68 - 86° F (20 - 30° C)	1.0			
c. 59 - 68° F (15 - 20° C) -OR- 86 - 93° F (30 - 34° C)	0.5			
d. < 59° F -OR- > 93° F (< 15° C -OR- > 34° C)	0.1			
20g. Maximum monthly average turbidity during summer	[FS, FP]			If one INA, record both scores.
a. Information not available	INA			
b. Low (e.g., < 60 JTU, secchi depth > 2 m)	1.0			
c. Moderate (e.g., approx. 150 JTU)	0.5			
d. High (e.g., 200 JTU, secchi depth < 0 m)	0.1			

PROJECT TITLE: _____

UNIQUENESS/HERITAGE
DATA SHEETS

Function weighting area (AREA) = Entire wetland assessment area

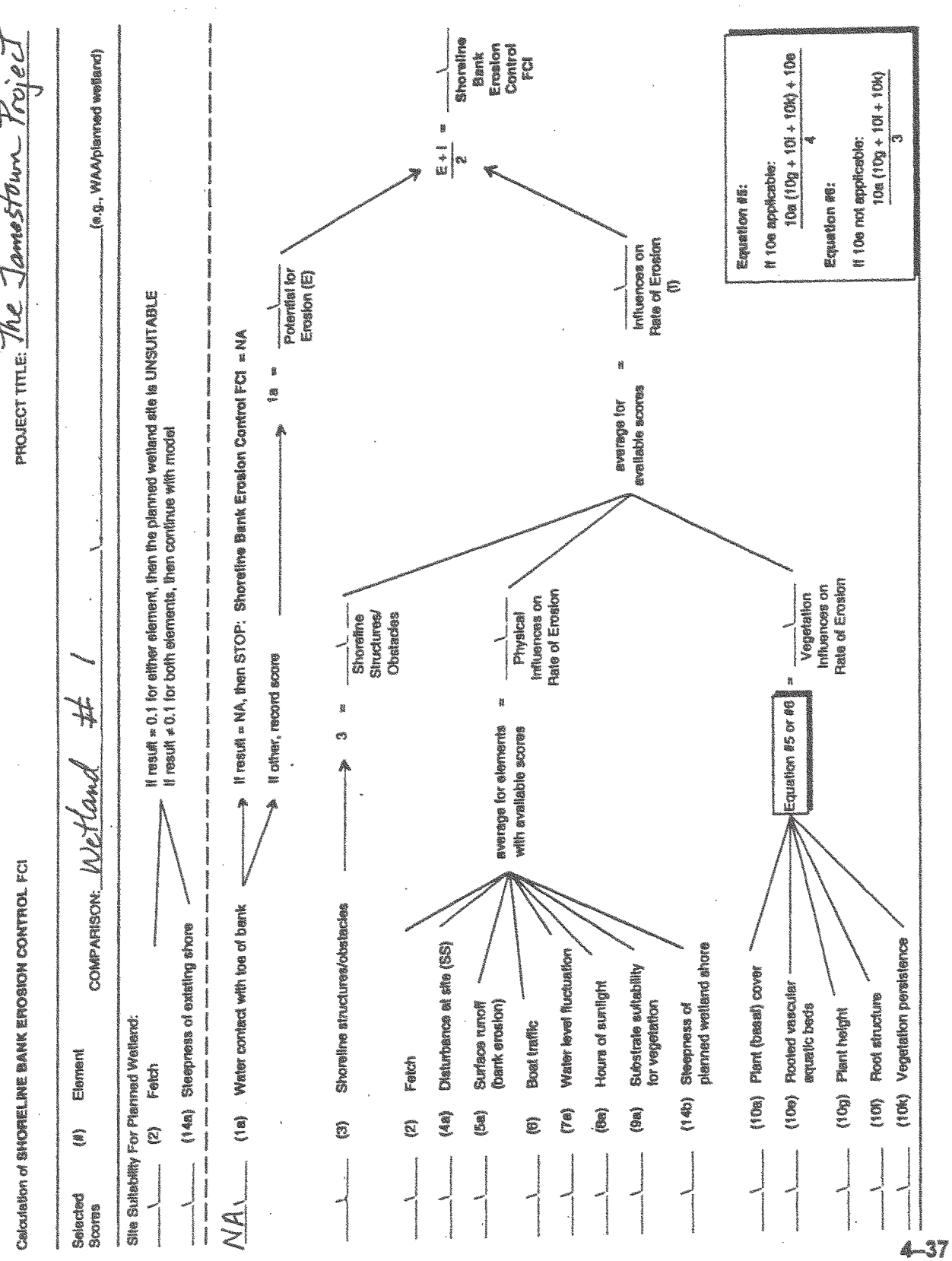
ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	For use in FCI Model: SELECTED SCORES FOR ELEMENTS — WAA	For use in FCI Model: SELECTED SCORES FOR ELEMENTS — Planned Wetland	For use in Table A.2 only: DIFFERENCE IN SCORES (Planned - WAA) If both scores are NA, record NA
29. Endangered species (state- or federally-listed)	[UH]*			Assume NA = 0
a. Wetland not within known range of any threatened or endangered species.	NA			
b. Wetland is known to be inhabited by threatened or endangered species.	1.0			
c. Wetland is considered critical habitat for threatened or endangered species.	1.0			
d. Wetland is within known range of threatened or endangered species; habitat suitable for these species.	0.9			
If answer b, c, or d selected, then note:				
Species name(s): _____				
30. Site contains or is part of a wetland which is considered rare or uncommon in the region. (e.g., a wetland unlike others in the area with respect to size or vegetation type).	[UH]			Assume NA = 0
a. No.	NA			
b. Yes.	1.0			
If yes, fill out the following:				
Wetland type: _____				
Region/context: _____				

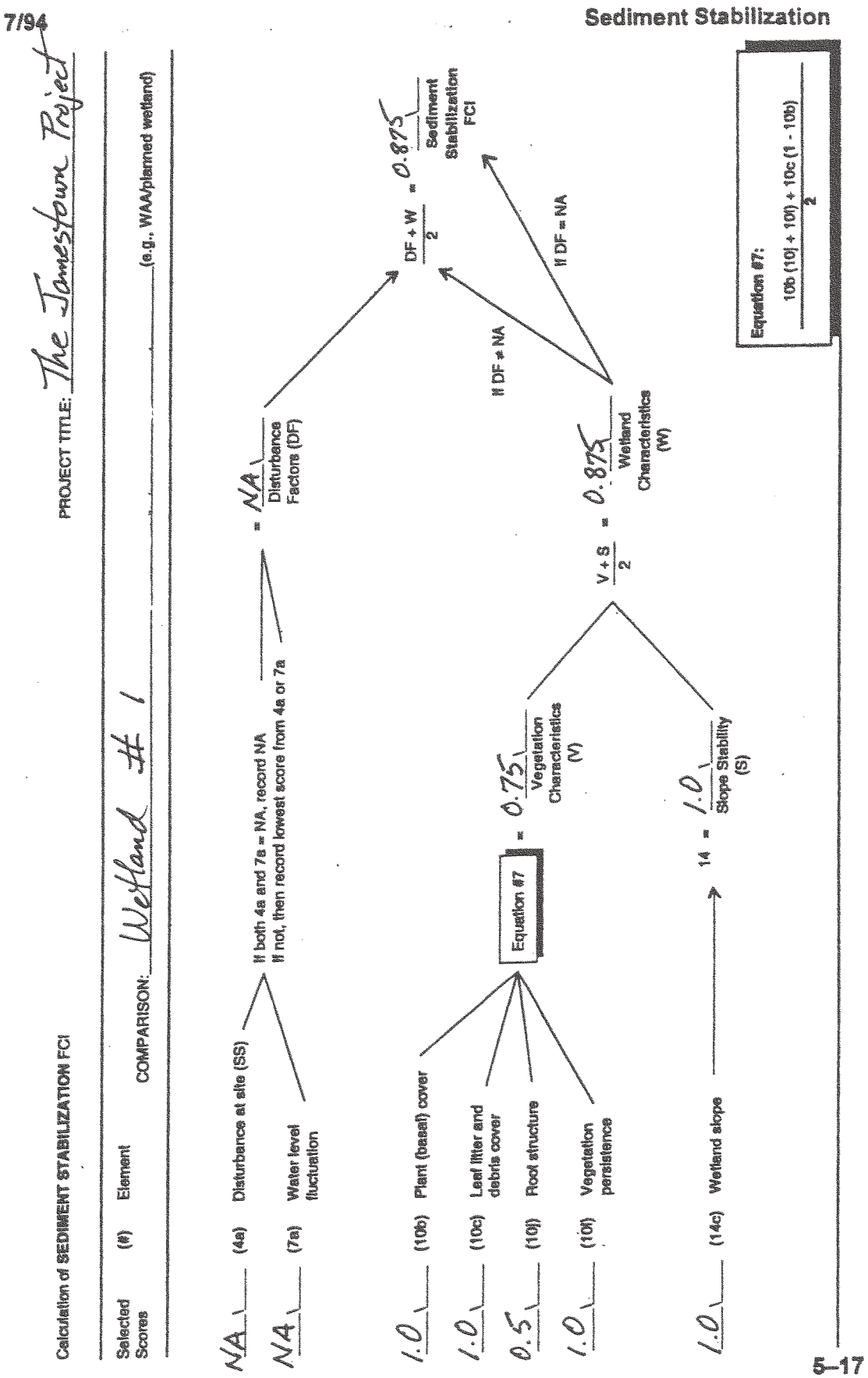
ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
31. Site has documented biological, geological, or other feature which is rare or unique in region.	[UH]			Assume NA = 0
a. No.	NA			
b. Yes.	1.0			
If yes, fill out the following:				
Feature: _____				
Region/context: _____				
32. Site contains any properties that are listed on or are eligible for inclusion on the National Register of Historic Places -OR- contains any properties included in the state listing of historical or archeological sites.	[UH]			Assume NA = 0
a. No.	NA			
b. Yes.	1.0			
If yes, explain: _____				
33. Site is included on a state or federal list of natural landmarks.	[UH]			Assume NA = 0
a. No.	NA			
b. Yes.	1.0			
Landmark: _____				
34. Site is hydrologically connected to a state or federally designated Wild and Scenic river.	[UH]			Assume NA = 0
a. No.	NA			
b. Yes.	1.0			
If yes, fill out the following:				
River: _____				



ELEMENT	SELECTION OF SCORES FOR ELEMENT CONDITIONS	SELECTED SCORES FOR ELEMENTS		DIFFERENCE IN SCORES (Planned - WAA)
		WAA	Planned Wetland	If both scores are NA, record NA
35. Site is owned by an organized conservation group or public agency for the primary purpose of preservation, ecological enhancement, or low-intensity recreation (e.g., park, scenic route, marine sanctuary).	[UH]			Assume NA = 0
a. No.	NA			
b. Yes.	1.0			
If yes, fill out the following:				
Group/Agency: _____				
Use: _____				
36. Site is known scientific research study site -OR- used for other educational purposes.	[UH]			Assume NA = 0
a. No.	NA			
b. Yes.	1.0			
If yes, explain: _____				

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Calculation of SHORELINE BANK EROSION CONTROL FCI
PROJECT TITLE: The Jamestown Project
Selected Scores
(#) Element
COMPARISON: Wetland #1
(e.g., WAA/planned wetland)
Site Suitability For Planned Wetland:
(2) Fetch
If result = 0.1 for either element, then the planned wetland site is UNSUITABLE
If result ≠ 0.1 for both elements, then continue with model
(14a) Steepness of existing shore
NA
(1a) Water contact with toe of bank
If result = NA, then STOP: Shoreline Bank Erosion Control FCI = NA
If other, record score
1a =
Potential for Erosion (E)
(3) Shoreline structures/obstacles
3 =
Shoreline Structures/ Obstacles
(2) Fetch
(4a) Disturbance at site (SS)
(5a) Surface runoff (bank erosion)
(6) Boat traffic
(7a) Water level fluctuation
(8a) Hours of sunlight
(9a) Substrate suitability for vegetation
(14b) Steepness of planned wetland shore
average for elements with available scores
=
Physical Influences on Rate of Erosion
average for available scores
=
Influences on Rate of Erosion (I)
E + I / 2 =
Shoreline Bank Erosion Control FCI
(10a) Plant (basal) cover
(10e) Rooted vascular aquatic beds
(10g) Plant height
(10f) Root structure
(10k) Vegetation persistence
Equation #5 or #6
=
Vegetation Influences on Rate of Erosion
Equation #5:
If 10e applicable:
10a (10g + 10f + 10k) + 10e
4
Equation #6:
If 10e not applicable:
10a (10g + 10f + 10k)
3
4–37


7/94
Sediment Stabilization
Calculation of SEDIMENT STABILIZATION FCI
PROJECT TITLE: The Jamestown Project
Selected Scores
(#) Element
COMPARISON: Wetland # 1
(e.g., WAA/planned wetland)
NA (4a) Disturbance at site (SS)
NA (7a) Water level fluctuation
If both 4a and 7a = NA, record NA
If not, then record lowest score from 4a or 7a
= NA Disturbance Factors (DF)
1.0 (10b) Plant (basal) cover
1.0 (10c) Leaf litter and debris cover
0.5 (10j) Root structure
1.0 (10l) Vegetation persistence
Equation #7
= 0.75 Vegetation Characteristics (V)
1.0 (14c) Wetland slope
14 = 1.0 Slope Stability (S)
V + S / 2 = 0.875 Wetland Characteristics (W)
DF + W / 2 = 0.875 Sediment Stabilization FCI
If DF = NA
If DF = NA
Equation #7:
10b (10j + 10l) + 10c (1 - 10b) / 2
5–17

Calculation of **WATER QUALITY FCI**

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 1 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
NA	(15)	Hydrologic condition	If result = NA, then STOP. Water Quality FCI is not applicable. If score selected, then continue with model.
	(4b)	Disturbance at site (WC)	If all results = NA, record NA If score(s) selected, then calculate average for elements with available scores
	(7a)	Water level fluctuation	
	(16a)	Wetland width	
	(1a)	Water contact with toe of bank	average for elements with available scores = Substrate-Slope Characteristics (SS)
	(5b)	Surface runoff (wetland erosion)	
	(14c)	Wetland slope	
	(10b)	Plant (basal) cover	Equation #8 = Vegetation Characteristics (V)
	(10h)	Plant height	
	(10f)	Vegetation persistence	
	(9b)	Dominant substrate	If scores different, include in average for WC If scores same, do not include in average.
	(15)	Hydrologic condition	
	(17)	Detention time	
	(18)	Sheet vs. channel flow	
	(19)	Average water depth	

Limiting Factors (LF) = $\frac{LF + W}{2}$ = Wetland Condition (C)

If LF ≠ NA

If LF = NA

SS + V / 2 = Wetland Characteristics (W)

average for elements with available scores = Water Contact (WC)

$\frac{C + WC}{2}$ = Water Quality FCI

Equation #8: $\frac{10b\ (10h + 10f)}{2}$

6–45

Calculation of WILDLIFE FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #1 / _____ (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(4c)	Disturbance of wildlife habitat
NA	(20a)	Gross contamination
NA	(16b)	Wetland size
0.9	(11a)	Layers
1.0	(11b)	Condition of layers
1.0	(11c)	Spatial pattern of shrubs/trees
0.259	(12a)	Cover types
0.5	(12b)	Ratio of cover types
1.0	(12c)	Cover type interspersion
NA	(12d)	Undesirable species
0.1	(13a)	% open water
0.5	(13b)	Vegetation/water interspersion
1.0	(21a)	Shape of upland/ wetland edge
1.0	(22a)	Wildlife attractors
0.1	(23)	Islands

If 4c, 16b, and 20a = NA, record NA

If any score = 0.1, record 0.1

average for elements with available scores = 0.47 Vegetation Strata

average for elements with available scores = 0.586 Vegetation Cover Types

average for elements with available scores = 0.3 Vegetation/ Water Proportions

average for elements with available scores = 0.7 Physical Features

average for available scores = 0.64 Habitat Complexity (HC)

= NA Features Which Reduce Habitat Value (F)

If F ≠ NA: $\frac{F + HC}{2}$ = 0.64 Wildlife FCI

If F = NA

7–65

7/94

Fish (Non-tidal Pond/Lake)

Calculation of FISH (Non-tidal Pond/Lake) FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #1 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
0.1	(24)	Obstruction to fish passage	If score = 0.1 for either element, STOP. There is no potential for providing pond/lake fish habitat.
	(28)	Refuge during drought/freeze	If score ≠ 0.1, then continue with model.
	(1b)	Shoreline bank stability	
	(4e)	Disturbance at site (SS)	
	(4d)	Disturbance in channel/open water	
	(16c)	Fish habitat size	
	(24)	Obstruction to fish passage	
		average for elements with available scores = Limiting Factors	
	(10m)	Vegetative overhang	
	(10o)	Plant biomass	
	(21b)	Shape of wetland/water edge	
	(22b)	Available fish cover/attractors	
		average for elements with available scores = Food/Cover	
	(27a)	Spawning substrate	
	(27b)	Spawning structures	
	(27c)	Drawdown	
		average for elements with available scores = Reproduction	
	(20b)	Water quality ratings	If score available, record score for WQ If information not available, continue.
	(20c)	Nutrient/sediment/contaminant sources	
	(20d)	Dissolved oxygen	
	(20e)	pH	
	(20f)	Maximum water temperature	
	(20g)	Turbidity	
		average for elements with available scores = Water Quality (WQ)	
		average for available scores = Fish (Non-tidal Pond/Lake) FCI	

8–91

Calculation of UNIQUENESS/HERITAGE FCI

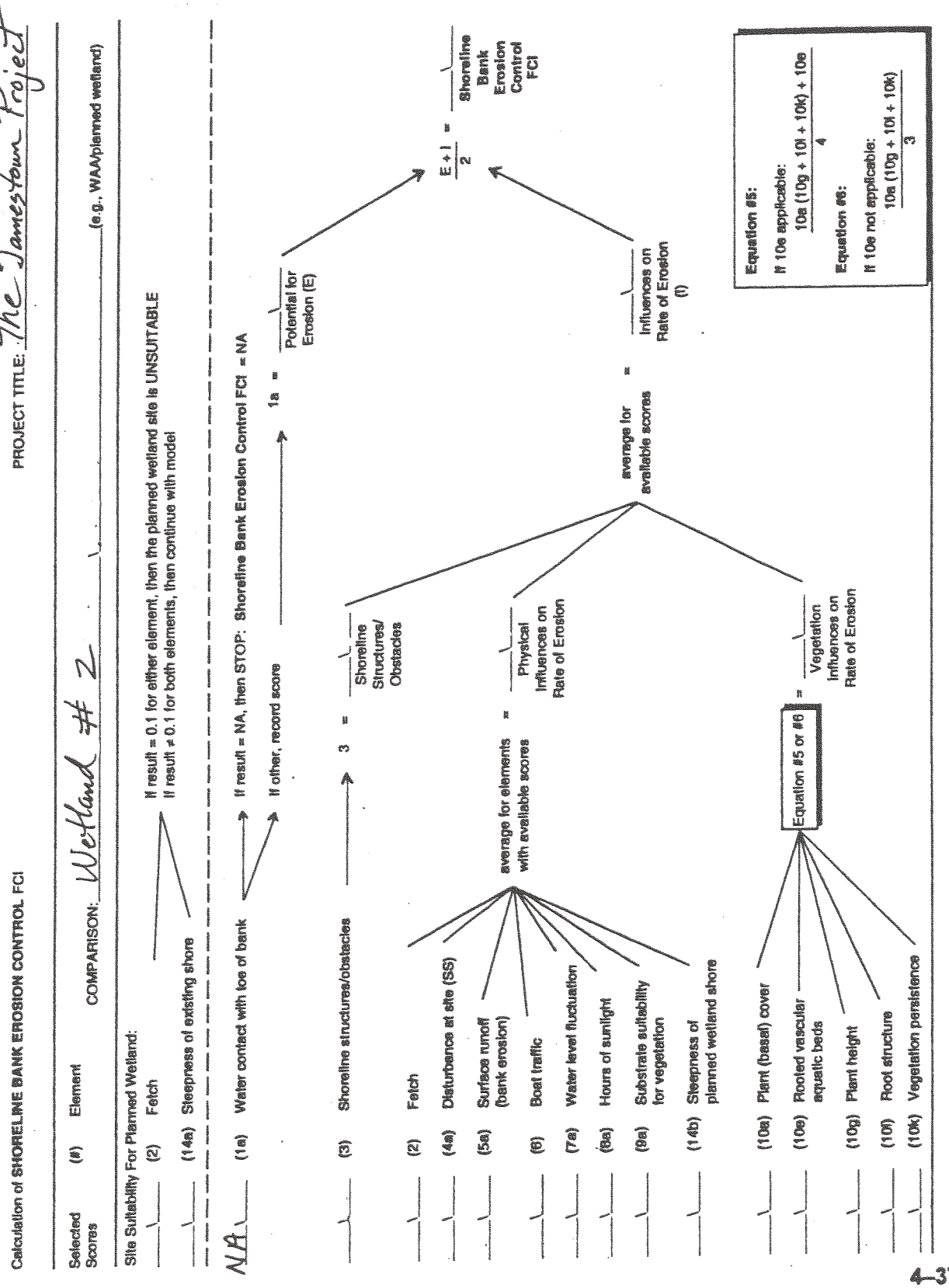
PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #1

Selected Scores	(#)	Element	(e.g., WAA/planned wetland)
NA	(29)	Endangered species	
NA	(30)	Rarity	
NA	(31)	Unique features	
NA	(32)	Historical or archaeological significance	
NA	(33)	Natural landmark	
NA	(34)	Connected to Wild and Scenic River	
1.0	(35)	Park, sanctuary, etc.	
NA	(36)	Scientific research site	

average for elements with available scores = 1.0 Uniqueness/ Heritage FCI

9-9


Calculation of SHORELINE BANK EROSION CONTROL FCI
PROJECT TITLE: The Jamestown Project
Selected Scores
(#) Element
COMPARISON: Wetland # 2 (e.g., WAA/planned wetland)
Site Suitability For Planned Wetland:
(2) Fetch
(14a) Steepness of existing shore
If result = 0.1 for either element, then the planned wetland site is UNSUITABLE
If result ≠ 0.1 for both elements, then continue with model
NA (1a) Water contact with toe of bank
If result = NA, then STOP: Shoreline Bank Erosion Control FCI = NA
If other, record score
1a = Potential for Erosion (E)
(3) Shoreline structures/obstacles
3 = Shoreline Structures/ Obstacles
(2) Fetch
(4a) Disturbance at site (SS)
(5a) Surface runoff (bank erosion)
(6) Boat traffic
(7a) Water level fluctuation
(8a) Hours of sunlight
(9a) Substrate suitability for vegetation
(14b) Steepness of planned wetland shore
average for elements with available scores = Physical Influences on Rate of Erosion
(10a) Plant (basal) cover
(10e) Rooted vascular aquatic beds
(10g) Plant height
(10f) Root structure
(10k) Vegetation persistence
Equation #5 or #6 = Vegetation Influences on Rate of Erosion
average for available scores = Influences on Rate of Erosion (I)
E + I / 2 = Shoreline Bank Erosion Control FCI
Equation #5:
If 10e applicable:
10a (10g + 10f + 10k) + 10e / 4
Equation #6:
If 10e not applicable:
10a (10g + 10f + 10k) / 3

7/94

Calculation of SEDIMENT STABILIZATION FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #2 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(4a)	Disturbance at site (SS)
NA	(7a)	Water level fluctuation
1.0	(10b)	Plant (basal) cover
1.0	(10c)	Leaf litter and debris cover
0.5	(10j)	Root structure
1.0	(10l)	Vegetation persistence
1.0	(14c)	Wetland slope

If both 4a and 7a = NA, record NA
If not, then record lowest score from 4a or 7a

= NA (Disturbance Factors (DF))

Equation #7 = 0.75 (Vegetation Characteristics (V))

14 = 1.0 (Slope Stability (S))

$\frac{V + S}{2}$ = 0.88 (Wetland Characteristics (W))

If DF = NA

If DF = NA

$\frac{DF + W}{2}$ = 0.88 (Sediment Stabilization FCI)

Equation #7:

$$\frac{10b\ (10j + 10l) + 10c\ (1 - 10b)}{2}$$

5–17

Calculation of **WATER QUALITY** FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #2 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
NA	(15)	Hydrologic condition	If result = NA, then STOP. Water Quality FCI is not applicable. If score selected, then continue with model.

Wetland determined to provide some water quality benefits based on professional judgement.

0.5	(4b)	Disturbance at site (WC)	If all results = NA, record NA If score(s) selected, then calculate average for elements with available scores
NA	(7a)	Water level fluctuation	
NA	(16a)	Wetland width	
NA	(1a)	Water contact with toe of bank	average for elements with available scores
NA	(5b)	Surface runoff (wetland erosion)	
1.0	(14c)	Wetland slope	
1.0	(10b)	Plant (basal) cover	Equation #8
1.0	(10h)	Plant height	
1.0	(10i)	Vegetation persistence	
1.0	(9b)	Dominant substrate	If scores different, include in average for WC If scores same, do not include in average.
1.0	(15)	Hydrologic condition	
NA	(17)	Detention time	
0.5	(18)	Sheet vs. channel flow	
1.0	(19)	Average water depth	

= 0.5 Limiting Factors (LF)

= 1.0 Substrate-Slope Characteristics (SS)

= 1.0 Vegetation Characteristics (V)

SS + V / 2 = 1.0 Wetland Characteristics (W)

LF + W / 2 = 0.75 Wetland Condition (C)

If LF ≠ NA

If LF = NA

average for elements with available scores = 0.875 Water Contact (WC)

C + WC / 2 = 0.81 Water Quality FCI

Equation #8: 10b (10h + 10i) / 2

6-45

Calculation of WILDLIFE FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #2 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
0.1	(4c)	Disturbance of wildlife habitat
NA	(20a)	Gross contamination
0.1	(16b)	Wetland size
0.3	(11a)	Layers
0.3	(11b)	Condition of layers
NA	(11c)	Spatial pattern of shrubs/trees
0.07	(12a)	Cover types
0.1	(12b)	Ratio of cover types
0.1	(12c)	Cover type interspersion
NA	(12d)	Undesirable species
0.1	(13a)	% open water
0.1	(13b)	Vegetation/water interspersion
0.1	(21a)	Shape of upland/ wetland edge
NA	(22a)	Wildlife attractors
0.1	(23)	Islands

If 4c, 16b, and 20a = NA, record NA

If any score = 0.1, record 0.1

average for elements with available scores = 0.3 Vegetation Strata

average for elements with available scores = 0.09 Vegetation Cover Types

average for elements with available scores = 0.1 Vegetation/ Water Proportions

average for elements with available scores = 0.1 Physical Features

average for available scores = 0.15 Habitat Complexity (HC)

= 0.1 Features Which Reduce Habitat Value (F)

If F = NA

If F = NA

$\frac{F + HC}{2}$ = 0.13 Wildlife FCI

7–65

7/94

Fish (Non-tidal Pond/Lake)

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #2 (e.g., WAA/planned wetland)

Calculation of FISH (Non-tidal Pond/Lake) FCI

Selected Scores	(#)	Element	
0.1	(24)	Obstruction to fish passage	If score = 0.1 for either element, STOP. There is no potential for providing pond/lake fish habitat.
	(28)	Refuge during drought/freeze	If score ≠ 0.1, then continue with model.
	(1b)	Shoreline bank stability	
	(4a)	Disturbance at site (SS)	
	(4d)	Disturbance in channel/open water	
	(16c)	Fish habitat size	
	(24)	Obstruction to fish passage	
	(10m)	Vegetative overhang	
	(10o)	Plant biomass	
	(21b)	Shape of wetland/water edge	
	(22b)	Available fish cover/attractors	
	(27a)	Spawning substrate	
	(27b)	Spawning structures	
	(27c)	Drawdown	
	(20b)	Water quality ratings	If score available, record score for WQ If information not available, continue.
	(20c)	Nutrient/sediment/contaminant sources	
	(20d)	Dissolved oxygen	
	(20e)	pH	
	(20f)	Maximum water temperature	
	(20g)	Turbidity	

average for elements with available scores = Limiting Factors

average for elements with available scores = Food/Cover

average for elements with available scores = Reproduction

average for elements with available scores = Water Quality (WQ)

average for available scores = Fish (Non-tidal Pond/Lake) FCI

8–91

PROJECT TITLE: The Jamestown Project

Calculation of UNIQUENESS/HERITAGE FCI

COMPARISON: Wetland # 2 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(29)	Endangered species
NA	(30)	Rarity
NA	(31)	Unique features
NA	(32)	Historical or archaeological significance
NA	(33)	Natural landmark
NA	(34)	Connected to Wild and Scenic River
1.0	(35)	Park, sanctuary, etc.
NA	(36)	Scientific research site

average for elements with available scores = 1.0 Uniqueness/ Heritage FCI

9-9

Wetland 3

Best professional judgement was used to determine that Wetland 3, a very small temporarily saturated, isolated depression, offers no meaningful wetland functions. Therefore, the functional values assessment was not applied for Wetland 3

Wetland 4

Wetland 4 was determined to have the same functions as Wetland A1. For reference, please see data for A1 in this appendix.

Wetland 5

Wetland 5 was determined to have the same functions as Wetland A1. For reference, please see data for A1 in this appendix.

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Calculation of SHORELINE BANK EROSION CONTROL FCI

PROJECT TITLE: The Jamestown Project

Selected Scores (#) Element COMPARISON: Wetland #6 (e.g., WAA/planned wetland)

Site Suitability For Planned Wetland:

___	(2)	Fetch	If result = 0.1 for either element, then the planned wetland site is UNSUITABLE
___	(14a)	Steepness of existing shore	If result ≠ 0.1 for both elements, then continue with model

NA (1a) Water contact with toe of bank → If result = NA, then STOP: Shoreline Bank Erosion Control FCI = NA

→ If other, record score → 1a = Potential for Erosion (E)

___ (3) Shoreline structures/obstacles → 3 = Shoreline Structures/ Obstacles

___ (2) Fetch
___ (4a) Disturbance at site (SS)
___ (5a) Surface runoff (bank erosion)
___ (6) Boat traffic
___ (7a) Water level fluctuation
___ (8a) Hours of sunlight
___ (9a) Substrate suitability for vegetation
___ (14b) Steepness of planned wetland shore

average for elements with available scores = Physical Influences on Rate of Erosion

___ (10a) Plant (basal) cover
___ (10e) Rooted vascular aquatic beds
___ (10g) Plant height
___ (10f) Root structure
___ (10k) Vegetation persistence

Equation #5 or #6 = Vegetation Influences on Rate of Erosion

average for available scores = Influences on Rate of Erosion (I)

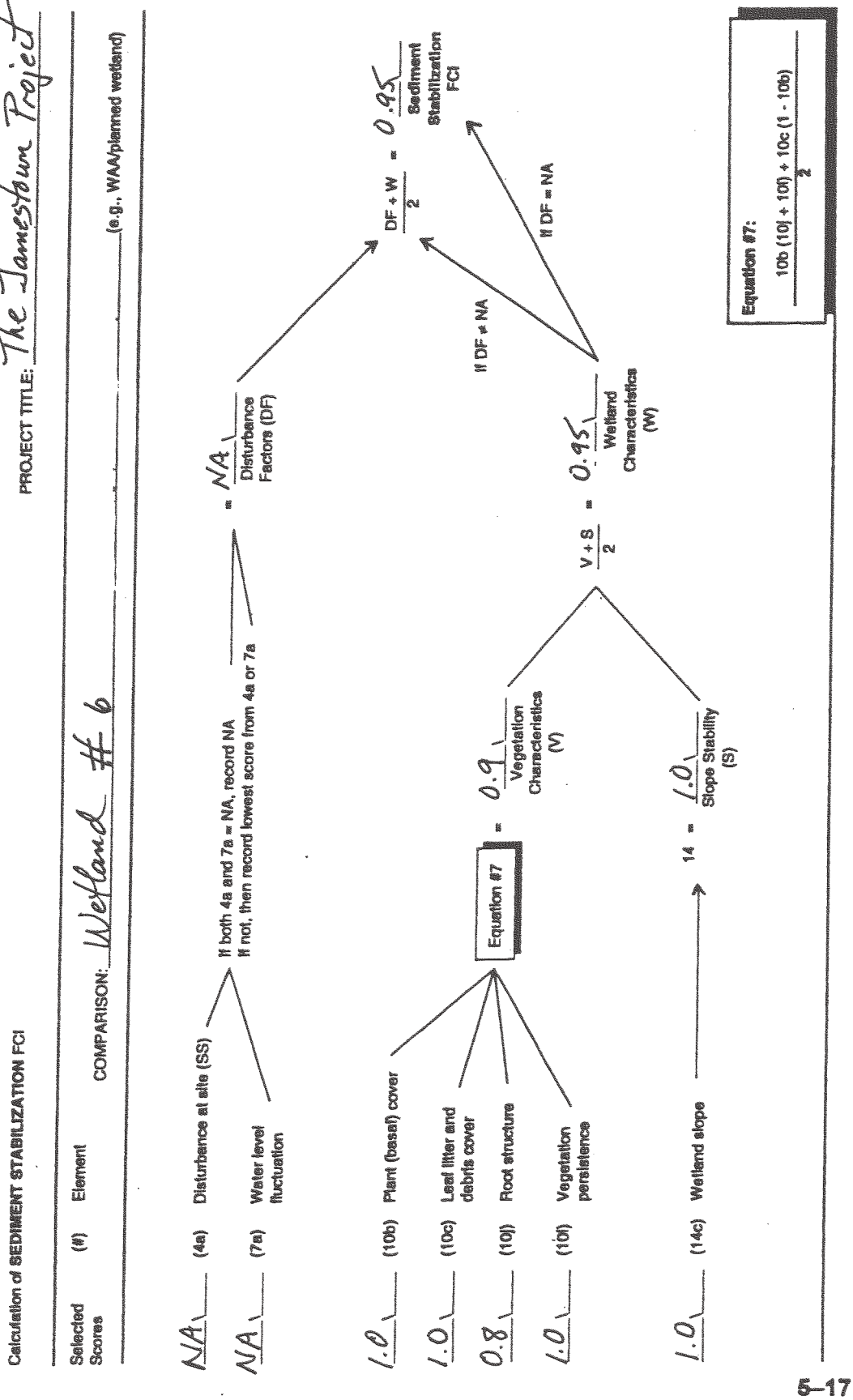
E + I / 2 = Shoreline Bank Erosion Control FCI

Equation #5:
If 10e applicable: 10a (10g + 10f + 10k) + 10e / 4
Equation #6:
If 10e not applicable: 10a (10g + 10f + 10k) / 3

4–37

7/94

Sediment Stabilization



Calculation of **WATER QUALITY FCI** PROJECT TITLE: The Jamestown Project

Selected Scores (#) Element COMPARISON: Wetland #6 (e.g., WAA/planned wetland)

0.8 (15) Hydrologic condition — If result = NA, then STOP. Water Quality FCI is not applicable. If score selected, then continue with model.

NA (4b) Disturbance at site (WQ)
NA (7a) Water level fluctuation
NA (16a) Wetland width
→ If all results = NA, record NA. If score(s) selected, then calculate average for elements with available scores = NA Limiting Factors (LF)

1.0 (1a) Water contact with toe of bank
NA (5b) Surface runoff (wetland erosion)
1.0 (14c) Wetland slope
→ average for elements with available scores = 1.0 Substrate-Slope Characteristics (SS)

1.0 (10b) Plant (basal) cover
1.0 (10h) Plant height
1.0 (10l) Vegetation persistence
→ Equation #8 = 1.0 Vegetation Characteristics (V)

SS + V / 2 = 1.0 Wetland Characteristics (W)

If LF ≠ NA → LF + W / 2 = 1.0 Wetland Condition (C)

If LF = NA →

C + WC / 2 = 0.88 Water Quality FCI

1.0 (9b) Dominant substrate — If scores different, include in average for WC. If scores same, do not include in average.
0.8 (15) Hydrologic condition
NA (17) Detention time
0.5 (18) Sheet vs. channel flow
0.8 (19) Average water depth
→ average for elements with available scores = 0.775 Water Contact (WC)

Equation #8: 10b (10h + 10l) / 2

Calculation of WILDLIFE FCI

PROJECT TITLE: The Jamestown Project

Selected Scores | (#) | Element

COMPARISON: Wetland #6 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(4c)	Disturbance of wildlife habitat
NA	(20a)	Gross contamination
NA	(16b)	Wetland size
1.0	(11a)	Layers
0.7	(11b)	Condition of layers
1.0	(11c)	Spatial pattern of shrubs/trees
0.37	(12a)	Cover types
0.5	(12b)	Ratio of cover types
0.5	(12c)	Cover type interspersion
NA	(12d)	Undesirable species
0.5	(13a)	% open water
0.5	(13b)	Vegetation/water interspersion
1.0	(21a)	Shape of upland/ wetland edge
1.0	(22a)	Wildlife attractors
1.0	(23)	Islands

If 4c, 16b, and 20a = NA, record NA

If any score = 0.1, record 0.1

= NA — Features Which Reduce Habitat Value (F)

average for elements with available scores = 0.9 — Vegetation Strata

average for elements with available scores = 0.46 — Vegetation Cover Types

average for elements with available scores = 0.5 — Vegetation/ Water Proportions

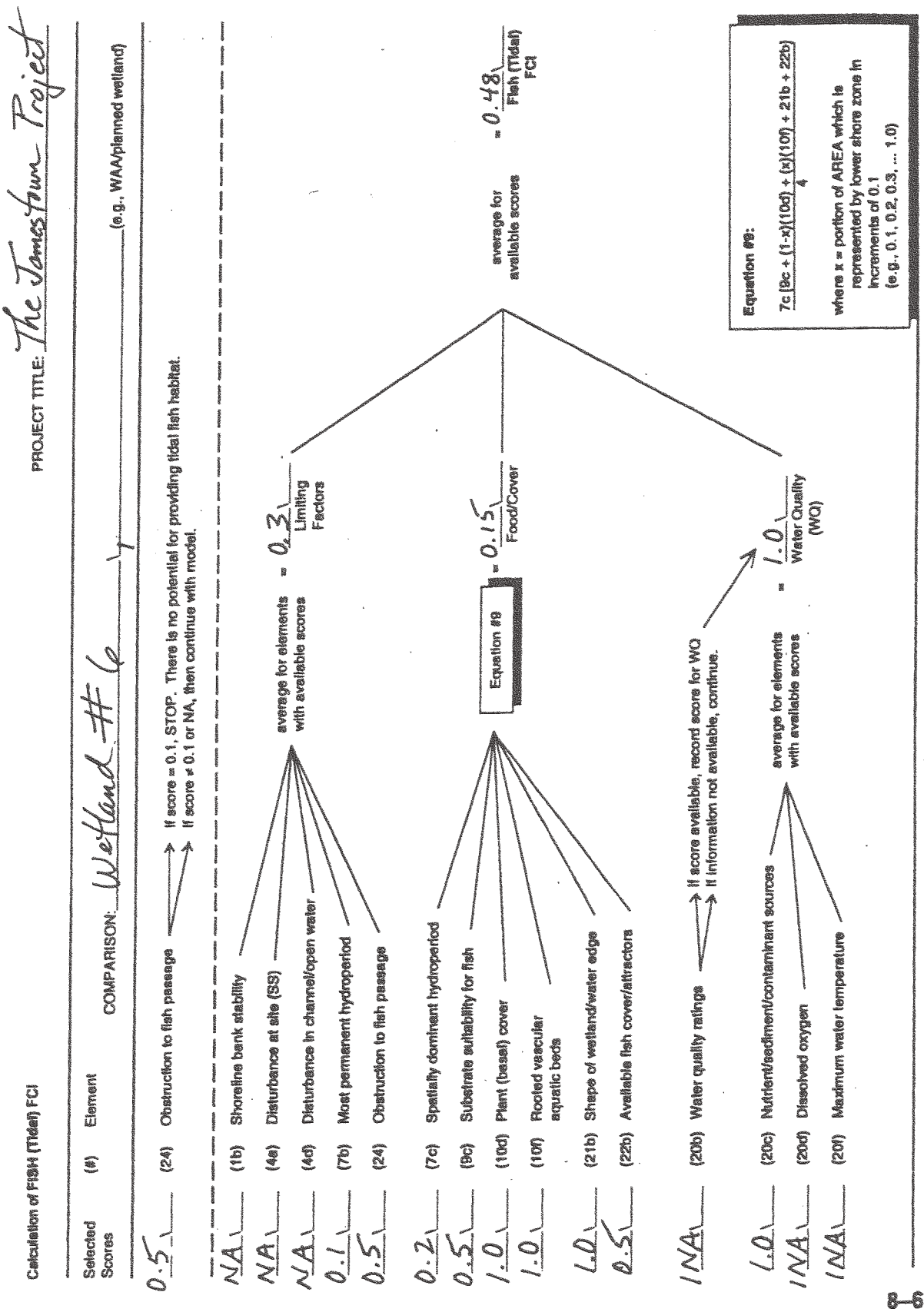
average for elements with available scores = 1.0 — Physical Features

average for available scores = 0.715 — Habitat Complexity (HC)

If F = NA

If F = NA

$\frac{F + HC}{2}$ = 0.71 — Wildlife FCI


Calculation of FISH (Tidal) FCI
PROJECT TITLE: The Jamestown Project
COMPARISON: Wetland #6 (e.g., WAA/planned wetland)
Selected Scores
(#)
Element
0.5 (24) Obstruction to fish passage → If score = 0.1, STOP. There is no potential for providing tidal fish habitat. If score ≠ 0.1 or NA, then continue with model.
NA (1b) Shoreline bank stability
NA (4a) Disturbance at site (SS)
NA (4d) Disturbance in channel/open water
0.1 (7b) Most permanent hydroperiod
0.5 (24) Obstruction to fish passage
average for elements with available scores = 0.3 Limiting Factors
0.2 (7c) Spatially dominant hydroperiod
0.5 (9c) Substrate suitability for fish
1.0 (10d) Plant (basal) cover
1.0 (10f) Rooted vascular aquatic beds
1.0 (21b) Shape of wetland/water edge
0.5 (22b) Available fish cover/attractors
Equation #9 = 0.15 Food/Cover
1 NA (20b) Water quality ratings → If score available, record score for WQ. If information not available, continue.
1.0 (20c) Nutrient/sediment/contaminant sources
1 NA (20d) Dissolved oxygen
1 NA (20f) Maximum water temperature
average for elements with available scores = 1.0 Water Quality (WQ)
average for available scores = 0.48 Fish (Tidal) FCI
Equation #9:
7c [9c + (1-x)(10d) + (x)(10f) + 21b + 22b] / 4
where x = portion of AREA which is represented by lower shore zone in increments of 0.1 (e.g., 0.1, 0.2, 0.3, ... 1.0)

Calculation of UNIQUENESS/HERITAGE FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #6 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(29)	Endangered species
NA	(30)	Rarity
NA	(31)	Unique features
1.0	(32)	Historical or archaeological significance
1.0	(33)	Natural landmark
NA	(34)	Connected to Wild and Scenic River
1.0	(35)	Park, sanctuary, etc.
NA	(36)	Scientific research site

average for elements with available scores = 1.0 Uniqueness/ Heritage FCI

9-9

7/94

PROJECT TITLE: The Jamestown Project

Calculation of SHORELINE BANK EROSION CONTROL FCI

COMPARISON: Wetland # 7 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
Site Suitability For Planned Wetland:			
___	(2)	Fetch	If result = 0.1 for either element, then the planned wetland site is UNSUITABLE
___	(14a)	Steepness of existing shore	If result ≠ 0.1 for both elements, then continue with model
0.1	(1a)	Water contact with ice of bank	If result = NA, then STOP: Shoreline Bank Erosion Control FCI = NA
			If other, record score → 1a = 0.1 Potential for Erosion (E)
0.1	(3)	Shoreline structures/obstacles	3 = 0.1 Shoreline Structures/ Obstacles
1.0	(2)	Fetch	
0.1	(4a)	Disturbance at site (SS)	
NA	(5a)	Surface runoff (bank erosion)	average for elements with available scores = 0.43 Physical Influences on Rate of Erosion
0.5	(6)	Boat traffic	
NA	(7a)	Water level fluctuation	
NA	(8a)	Hours of sunlight	
NA	(9a)	Substrate suitability for vegetation	average for available scores = 0.62 Influences on Rate of Erosion (I)
NA	(14b)	Steepness of planned wetland shore	
0.1	(10a)	Plant (basal) cover	
0.1	(10e)	Rooted vascular aquatic beds	Equation #5 or #6 = 0.09 Vegetation Influences on Rate of Erosion
1.0	(10g)	Plant height	
0.5	(10f)	Root structure	
1.0	(10k)	Vegetation persistence	

E + I / 2 = 0.36 Shoreline Bank Erosion Control FCI

Equation #5:
If 10e applicable: (10a + 10f + 10k) + 10e / 4
Equation #6:
If 10e not applicable: 10a (10g + 10f + 10k) / 3

7/94

Calculation of SEDIMENT STABILIZATION FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #7 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
0.1	(4a)	Disturbance at site (SS)
NA	(7a)	Water level fluctuation
0.1	(10b)	Plant (basal) cover
0.3	(10c)	Leaf litter and debris cover
0.5	(10j)	Root structure
1.0	(10l)	Vegetation persistence
0.1	(14c)	Wetland slope

If both 4a and 7a = NA, record NA
If not, then record lowest score from 4a or 7a

= 0.1 Disturbance Factors (DF)

Equation #7 = 0.21 Vegetation Characteristics (V)

14 = 0.1 Slope Stability (S)

$\frac{V+S}{2}$ = 0.16 Wetland Characteristics (W)

If DF = NA

If DF = NA

$\frac{DF+W}{2}$ = 0.13 Sediment Stabilization FCI

Equation #7:

$$\frac{10b\,(10j + 10l) + 10c\,(1 - 10b)}{2}$$

5–17

Calculation of WATER QUALITY FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #7 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
NA	(15)	Hydrologic condition	If result = NA, then STOP. Water Quality FCI is not applicable. If score selected, then continue with model.

Wetland determined to provide some water quality benefits based on professional judgement.

0.1	(4b)	Disturbance at site (WQ)	If all results = NA, record NA If score(s) selected, then calculate average for elements with available scores
NA	(7a)	Water level fluctuation	
NA	(16a)	Wetland width	
0.1	(1a)	Water contact with toe of bank	average for elements with available scores = 0.1 Substrate-Slope Characteristics (SS)
NA	(5b)	Surface runoff (wetland erosion)	
0.1	(14c)	Wetland slope	
0.1	(10b)	Plant (basal) cover	Equation #8 = 0.1 Vegetation Characteristics (V)
1.0	(10h)	Plant height	
1.0	(10f)	Vegetation persistence	
1.0	(9b)	Dominant substrate	If scores different, include in average for WC If scores same, do not include in average.
NA	(15)	Hydrologic condition	
NA	(17)	Detention time	
NA	(16)	Sheet vs. channel flow	
NA	(19)	Average water depth	

= 0.1 Limiting Factors (LF)

LF + W / 2 = 0.1 Wetland Condition (C)

If LF ≠ NA

If LF = NA

SS + V / 2 = 0.1 Wetland Characteristics (W)

average for elements with available scores = 1.0 Water Contact (WC)

C + WC / 2 = 0.55 Water Quality FCI

Equation #8: 10b (10h + 10f) / 2

6-45

Calculation of WILDLIFE FCI

PROJECT TITLE: The Jamestown Project

7/94

Selected Scores	(#)	Element
NA	(4c)	Disturbance of wildlife habitat
NA	(20a)	Gross contamination
NA	(16b)	Wetland size
0.5	(11a)	Layers
0.1	(11b)	Condition of layers
NA	(11c)	Spatial pattern of shrubs/trees
0.15	(12a)	Cover types
1.0	(12b)	Ratio of cover types
0.1	(12c)	Cover type interspersion
NA	(12d)	Undesirable species
0.5	(13a)	% open water
0.1	(13b)	Vegetation/water interspersion
0.1	(21a)	Shape of upland/ wetland edge
1.0	(22a)	Wildlife attractors
0.1	(23)	Islands

COMPARISON: Wetland #7 \ _____ (e.g., WAA/planned wetland)

If 4c, 16b, and 20a = NA, record NA

If any score = 0.1, record 0.1 = NA — Features Which Reduce Habitat Value (F)

average for elements with available scores = 0.3 — Vegetation Strata

average for elements with available scores = 0.42 — Vegetation Cover Types

average for elements with available scores = 0.3 — Vegetation/ Water Proportions

average for elements with available scores = 0.4 — Physical Features

average for available scores = 0.36 — Habitat Complexity (HC)

If F = NA

If F = NA

$\frac{F + HC}{2}$ = 0.36 — Wildlife FCI

7-95

7/94

Fish (Tidal)

Calculation of FISH (Tidal) FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #7 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
NA	(24)	Obstruction to fish passage	If score = 0.1, STOP. There is no potential for providing tidal fish habitat. If score ≠ 0.1 or NA, then continue with model.
0.1	(1b)	Shoreline bank stability	
0.1	(4a)	Disturbance at site (SS)	
NA	(4d)	Disturbance in channel/open water	average for elements with available scores = 0.1 Limiting Factors
NA	(7b)	Most permanent hydroperiod	
NA	(24)	Obstruction to fish passage	
0.1	(7c)	Spatially dominant hydroperiod	
1.0	(9c)	Substrate suitability for fish	
0.1	(10d)	Plant (basal) cover	Equation #9 = 0.06 Food/Cover
NA	(10f)	Rooted vascular aquatic beds	
0.5	(21b)	Shape of wetland/water edge	
1.0	(22b)	Available fish cover/attractors	
INA	(20b)	Water quality ratings	If score available, record score for WQ. If information not available, continue.
0.5	(20c)	Nutrient/sediment/contaminant sources	
INA	(20d)	Dissolved oxygen	average for elements with available scores = 0.75 Water Quality (WQ)
1.0	(20f)	Maximum water temperature	

average for available scores = 0.30 Fish (Tidal) FCI

Equation #9:

$$\frac{7c\,[9c + (1-x)(10d) + (x)(10f) + 21b + 22b]}{4}$$

where x = portion of AREA which is represented by lower shore zone in increments of 0.1 (e.g., 0.1, 0.2, 0.3, ... 1.0)

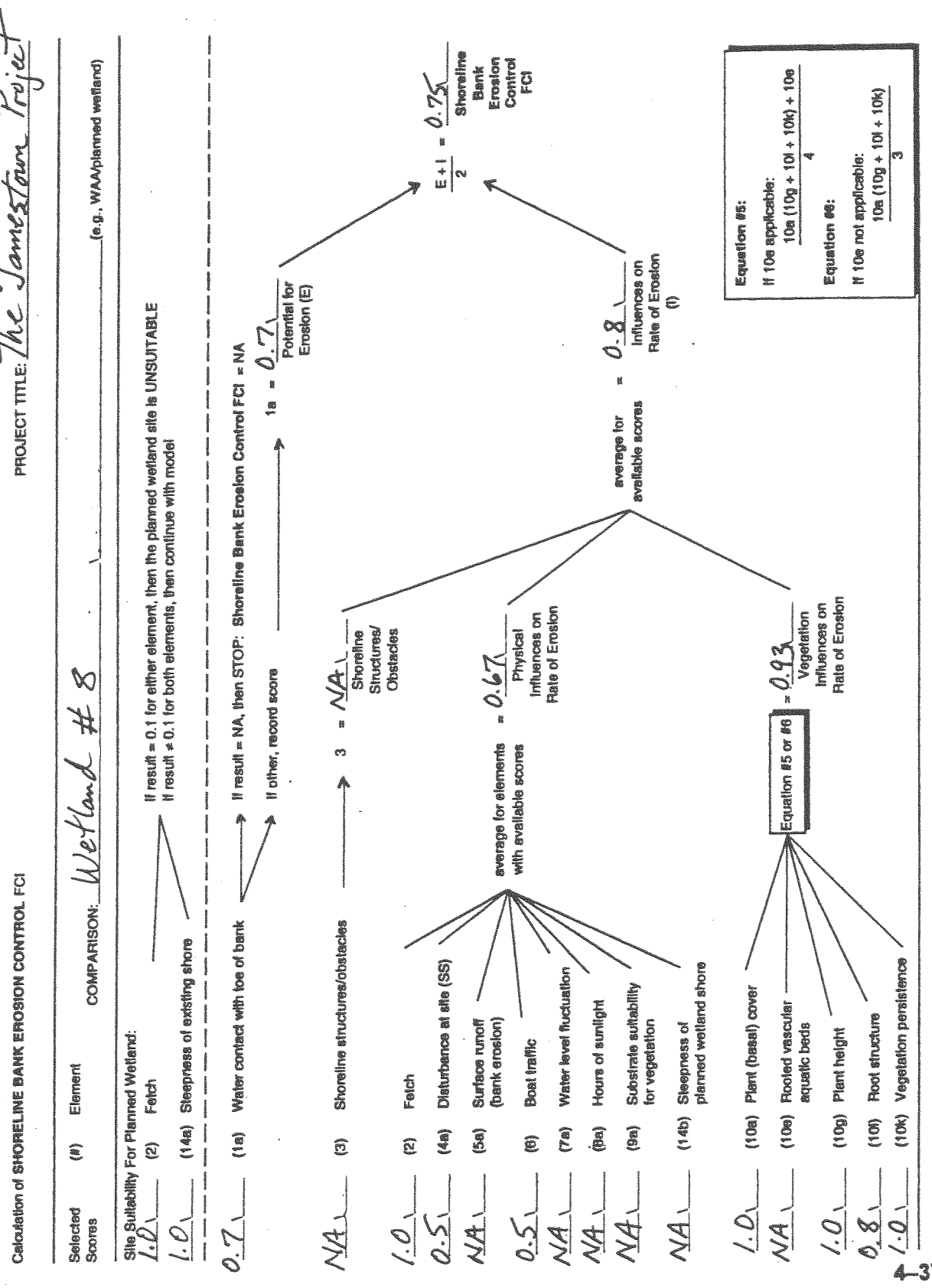
8–67

PROJECT TITLE: The Jamestown Project

Calculation of UNIQUENESS/HERITAGE FCI

Selected Scores	(#)	Element	COMPARISON: Wetland #7 (e.g., WAA/planned wetland)
NA	(29)	Endangered species	
NA	(30)	Rarity	
NA	(31)	Unique features	
1.0	(32)	Historical or archaeological significance	average for elements with available scores = 1.0 Uniqueness/ Heritage FCI
1.0	(33)	Natural landmark	
NA	(34)	Connected to Wild and Scenic River	
1.0	(35)	Park, sanctuary, etc.	
NA	(36)	Scientific research site	

9-9


Calculation of SHORELINE BANK EROSION CONTROL FCI
PROJECT TITLE: The Jamestown Project
Selected Scores
(#)
Element
COMPARISON: Wetland #8
(e.g., WAA/planned wetland)
Site Suitability For Planned Wetland:
1.0 (2) Fetch
1.0 (14a) Steepness of existing shore
If result = 0.1 for either element, then the planned wetland site is UNSUITABLE
If result ≠ 0.1 for both elements, then continue with model
0.7 (1a) Water contact with toe of bank
If result = NA, then STOP: Shoreline Bank Erosion Control FCI = NA
If other, record score
1a = 0.7
Potential for Erosion (E)
NA (3) Shoreline structures/obstacles
3 = NA
Shoreline Structures/ Obstacles
1.0 (2) Fetch
0.5 (4a) Disturbance at site (SS)
NA (5a) Surface runoff (bank erosion)
average for elements with available scores
= 0.67
Physical Influences on Rate of Erosion
0.5 (6) Boat traffic
NA (7a) Water level fluctuation
NA (8a) Hours of sunlight
NA (9a) Substrate suitability for vegetation
NA (14b) Steepness of planned wetland shore
average for available scores
= 0.8
Influences on Rate of Erosion (I)
E + I / 2 = 0.75
Shoreline Bank Erosion Control FCI
1.0 (10a) Plant (basal) cover
NA (10e) Rooted vascular aquatic beds
Equation #5 or #6
= 0.93
Vegetation Influences on Rate of Erosion
1.0 (10g) Plant height
0.8 (10i) Root structure
1.0 (10k) Vegetation persistence
Equation #5:
If 10e applicable:
10a (10g + 10i + 10k) + 10e / 4
Equation #6:
If 10e not applicable:
10a (10g + 10i + 10k) / 3

7/94

PROJECT TITLE: The Jamestown Project

Calculation of SEDIMENT STABILIZATION FCI

Selected Scores	(#)	Element	COMPARISON: Wetland # 8 (e.g., WAA/planned wetland)
0.5	(4a)	Disturbance at site (SS)	If both 4a and 7a = NA, record NA If not, then record lowest score from 4a or 7a
NA	(7a)	Water level fluctuation	
1.0	(10b)	Plant (basal) cover	Equation #7 = 0.9 Vegetation Characteristics (V)
1.0	(10c)	Leaf litter and debris cover	
0.8	(10j)	Root structure	
1.0	(10l)	Vegetation persistence	
1.0	(14c)	Wetland slope	14 = 1.0 Slope Stability (S)

0.5 Disturbance Factors (DF) = If both 4a and 7a = NA, record NA; If not, then record lowest score from 4a or 7a

DF + W / 2 = 0.73 Sediment Stabilization FCI

If DF ≠ NA

If DF = NA

V + S / 2 = 0.95 Wetland Characteristics (W)

Equation #7:

$$\frac{10b\,(10j + 10l) + 10c\,(1 - 10b)}{2}$$

5–17

Calculation of **WATER QUALITY FCI**

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #8 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
1.0	(15)	Hydrologic condition
0.5	(4b)	Disturbance at site (WQ)
NA	(7a)	Water level fluctuation
NA	(16a)	Wetland width
0.7	(1a)	Water contact with toe of bank
NA	(5b)	Surface runoff (wetland erosion)
1.0	(14c)	Wetland slope
1.0	(10b)	Plant (basal) cover
1.0	(10h)	Plant height
1.0	(10l)	Vegetation persistence
1.0	(9b)	Dominant substrate
1.0	(15)	Hydrologic condition
NA	(17)	Detention time
NA	(18)	Sheet vs. channel flow
NA	(19)	Average water depth

If result = NA, then STOP. **Water Quality FCI** is not applicable.
If score selected, then continue with model.

If all results = NA, record NA
If score(s) selected, then calculate average for elements with available scores

= 0.5 Limiting Factors (LF)

average for elements with available scores = 0.85 Substrate-Slope Characteristics (SS)

Equation #8 = 1.0 Vegetation Characteristics (V)

SS + V / 2 = 0.93 Wetland Characteristics (W)

If LF ≠ NA

If LF = NA

LF + W / 2 = 0.74 Wetland Condition (C)

If scores different, include in average for WC
If scores same, do not include in average.

average for elements with available scores = 1.0 Water Contact (WC)

C + WC / 2 = 0.86 Water Quality FCI

Equation #8:

$$\frac{10b\ (10h + 10l)}{2}$$

Calculation of WILDLIFE FCI

PROJECT TITLE: The Jamestown Project

7/94

COMPARISON: Wetland #8 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(4c)	Disturbance of wildlife habitat
NA	(20a)	Gross contamination
NA	(16b)	Wetland size
0.7	(11a)	Layers
0.3	(11b)	Condition of layers
NA	(11c)	Spatial pattern of shrubs/trees
0.19	(12a)	Cover types
0.5	(12b)	Ratio of cover types
0.5	(12c)	Cover type interspersion
NA	(12d)	Undesirable species
0.5	(13a)	% open water
0.1	(13b)	Vegetation/water interspersion
0.1	(21a)	Shape of upland/ wetland edge
NA	(22a)	Wildlife attractors
0.1	(23)	Islands

If 4c, 16b, and 20a = NA, record NA

If any score = 0.1, record 0.1

= NA — Features Which Reduce Habitat Value (F)

average for elements with available scores = 0.5 — Vegetation Strata

average for elements with available scores = 0.4 — Vegetation Cover Types

average for elements with available scores = 0.3 — Vegetation/ Water Proportions

average for elements with available scores = 0.1 — Physical Features

average for available scores = 0.33 — Habitat Complexity (HC)

If F ≠ NA

If F = NA

$\frac{F + HC}{2}$ = 0.33 — Wildlife FCI

7/94

Fish (Tidal)

Calculation of FISH (Tidal) FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #8 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
NA	(24)	Obstruction to fish passage	If score = 0.1, STOP. There is no potential for providing tidal fish habitat. If score ≠ 0.1 or NA, then continue with model.
NA	(1b)	Shoreline bank stability	
0.5	(4a)	Disturbance at site (SS)	
NA	(4d)	Disturbance in channel/open water	
NA	(7b)	Most permanent hydroperiod	
NA	(24)	Obstruction to fish passage	
0.5	(7c)	Spatially dominant hydroperiod	
1.0	(8c)	Substrate suitability for fish	
1.0	(10d)	Plant (basal) cover	
NA	(10f)	Rooted vascular aquatic beds	
0.5	(21b)	Shape of wetland/water edge	
0.1	(22b)	Available fish cover/attractors	
INA	(20b)	Water quality ratings	If score available, record score for WQ If information not available, continue.
1.0	(20c)	Nutrient/sediment/contaminant sources	
INA	(20d)	Dissolved oxygen	
1.0	(20f)	Maximum water temperature	

average for elements with available scores = 0.5 Limiting Factors

Equation #9 = 0.24 Food/Cover

average for elements with available scores = 1.0 Water Quality (WQ)

average for available scores = 0.58 Fish (Tidal) FCI

Equation #9:

$$\frac{7c\,[8c + (1-x)(10d) + (x)(10f) + 21b + 22b)}{4}$$

where x = portion of AREA which is represented by lower shore zone in increments of 0.1 (e.g., 0.1, 0.2, 0.3, ... 1.0)

8–67

Calculation of UNIQUENESS/HERITAGE FCI

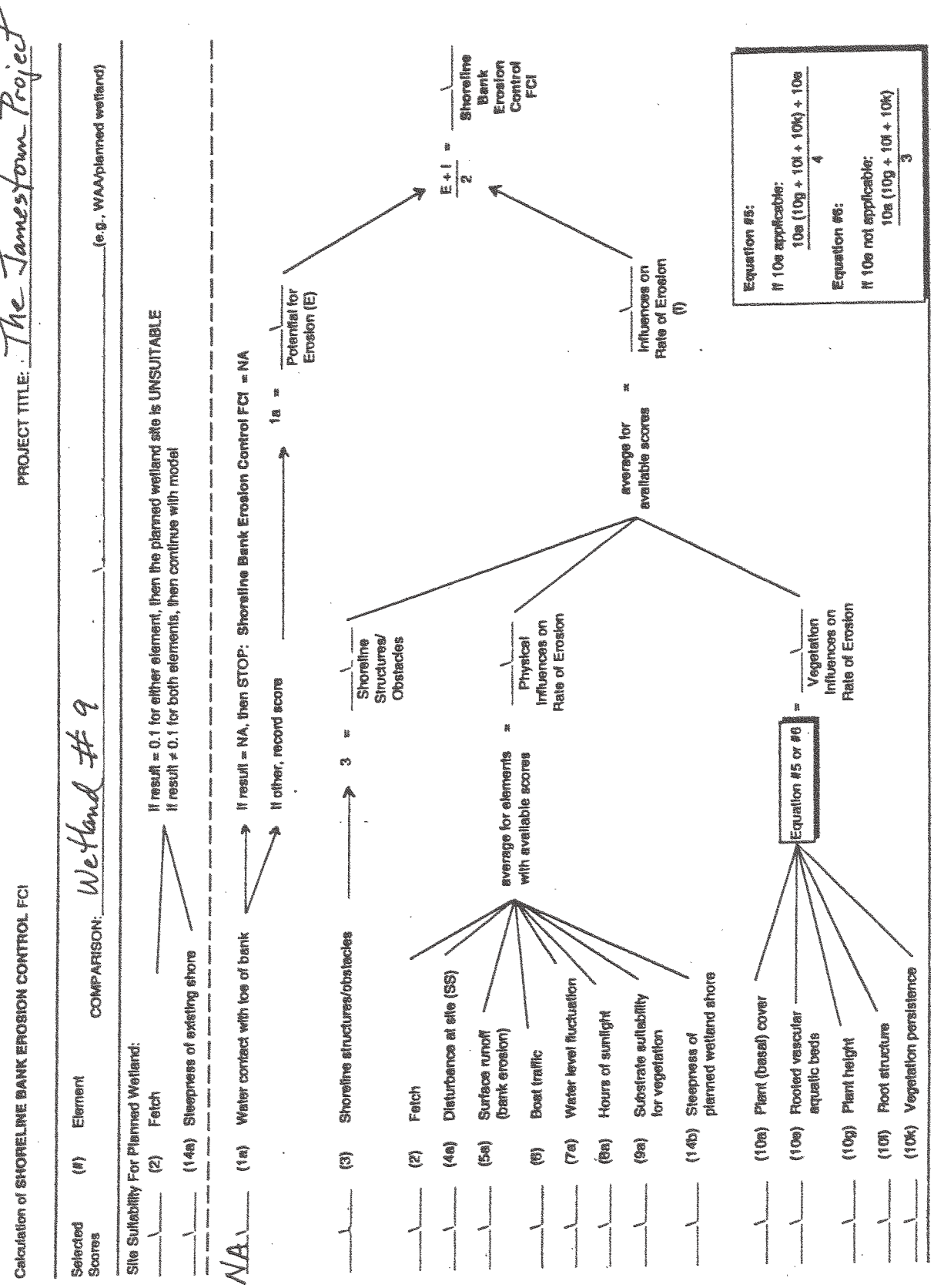
PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 8 (e.g., WAA/planned wetland)

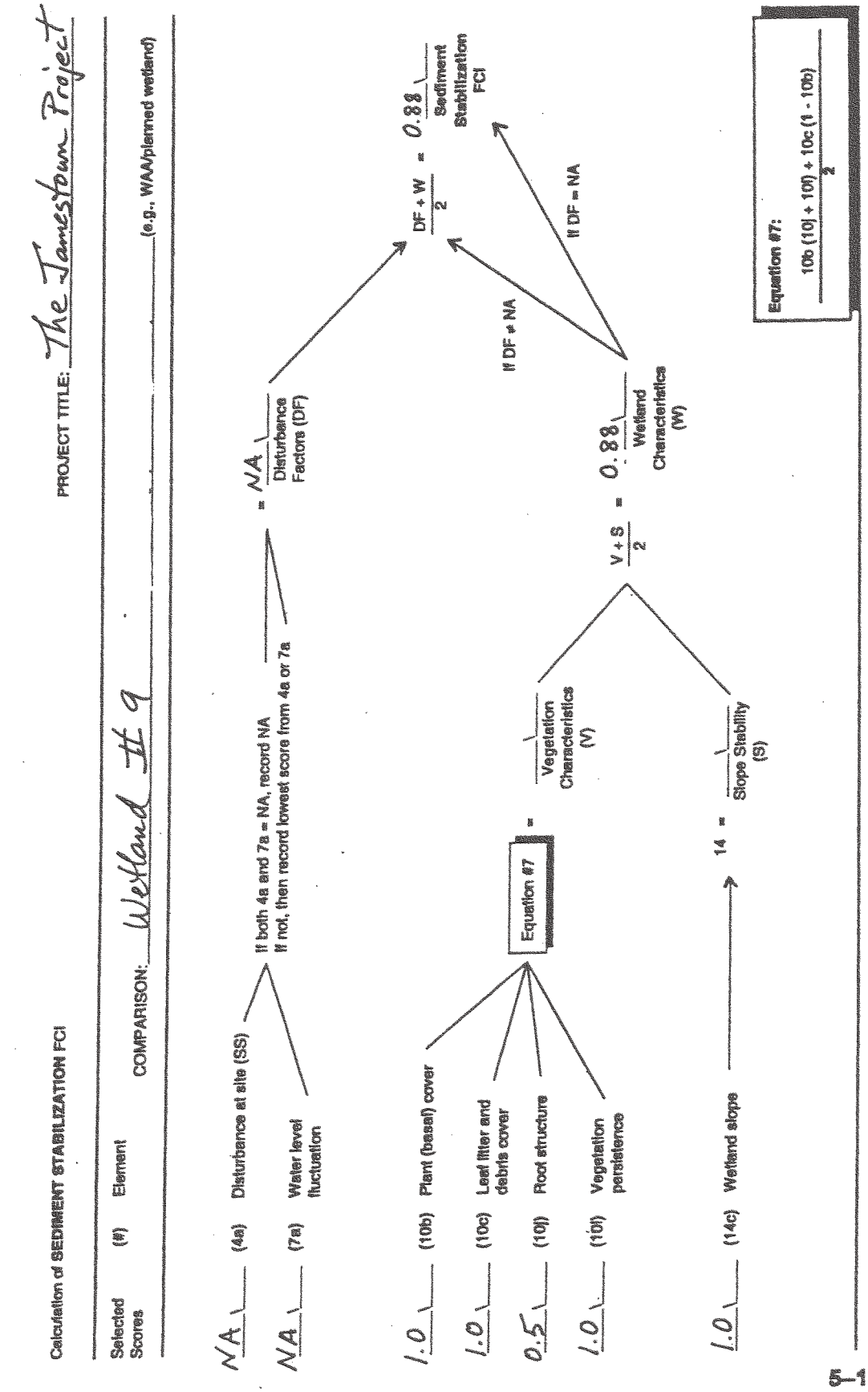
Selected Scores	(#)	Element
1.0	(29)	Endangered species
NA	(30)	Rarity
NA	(31)	Unique features
1.0	(32)	Historical or archaeological significance
1.0	(33)	Natural landmark
NA	(34)	Connected to Wild and Scenic River
1.0	(35)	Park, sanctuary, etc.
NA	(36)	Scientific research site

average for elements with available scores = 1.0 Uniqueness/ Heritage FCI

9–9


Calculation of SHORELINE BANK EROSION CONTROL FCI
PROJECT TITLE: The Jamestown Project
Selected Scores
(#)
Element
COMPARISON: Wetland #9
(e.g., WAA/planned wetland)
Site Suitability For Planned Wetland:
(2) Fetch
(14a) Steepness of existing shore
If result = 0.1 for either element, then the planned wetland site is UNSUITABLE
If result ≠ 0.1 for both elements, then continue with model
NA
(1a) Water contact with toe of bank
If result = NA, then STOP: Shoreline Bank Erosion Control FCI = NA
If other, record score
1a =
Potential for Erosion (E)
(3) Shoreline structures/obstacles
3 =
Shoreline Structures/ Obstacles
(2) Fetch
(4a) Disturbance at site (SS)
(5a) Surface runoff (bank erosion)
(6) Boat traffic
(7a) Water level fluctuation
(8a) Hours of sunlight
(9a) Substrate suitability for vegetation
(14b) Steepness of planned wetland shore
average for elements with available scores
=
Physical Influences on Rate of Erosion
average for available scores
=
Influences on Rate of Erosion (I)
E + I / 2 =
Shoreline Bank Erosion Control FCI
(10e) Plant (basal) cover
(10e) Rooted vascular aquatic beds
(10g) Plant height
(10i) Root structure
(10k) Vegetation persistence
Equation #5 or #6
=
Vegetation Influences on Rate of Erosion
Equation #5:
If 10e applicable:
10e (10g + 10i + 10k) + 10e / 4
Equation #6:
If 10e not applicable:
10e (10g + 10i + 10k) / 3

7/94


Calculation of SEDIMENT STABILIZATION FCI
PROJECT TITLE: The Jamestown Project
COMPARISON: Wetland #9 (e.g., WAA/planned wetland)
Selected Scores
(#) Element
NA (4a) Disturbance at site (SS)
NA (7a) Water level fluctuation
If both 4a and 7a = NA, record NA
If not, then record lowest score from 4a or 7a
= NA Disturbance Factors (DF)
1.0 (10b) Plant (basal) cover
1.0 (10c) Leaf litter and debris cover
0.5 (10j) Root structure
1.0 (10l) Vegetation persistence
Equation #7
= Vegetation Characteristics (V)
1.0 (14c) Wetland slope
14 = Slope Stability (S)
V + S / 2 = 0.88 Wetland Characteristics (W)
DF + W / 2 = 0.88 Sediment Stabilization FCI
If DF ≠ NA
If DF = NA
Equation #7:
10b (10l) + 10l) + 10c (1 - 10b) / 2

Calculation of WATER QUALITY FCI

PROJECT TITLE: The Jamestown Project

Selected Scores	(#)	Element	COMPARISON: Wetland #9 (e.g., WAA/planned wetland)
NA	(15)	Hydrologic condition	If result = NA, then STOP. Water Quality FCI is not applicable. If score selected, then continue with model.
	(4b)	Disturbance at site (WQ)	If all results = NA, record NA
	(7a)	Water level fluctuation	If score(s) selected, then calculate average for elements with available scores
	(18a)	Wetland width	
	(1a)	Water contact with toe of bank	average for elements with available scores = Substrate-Slope Characteristics (SS)
	(5b)	Surface runoff (wetland erosion)	
	(14c)	Wetland slope	
	(10b)	Plant (basal) cover	Equation #6 = Vegetation Characteristics (V)
	(10h)	Plant height	
	(10i)	Vegetation persistence	
	(9b)	Dominant substrate	If scores different, include in average for WC. If scores same, do not include in average.
	(15)	Hydrologic condition	
	(17)	Detention time	
	(18)	Sheet vs. channel flow	
	(19)	Average water depth	

= Limiting Factors (LF)

$\frac{LF + W}{2}$ = Wetland Condition (C)

If LF ≠ NA

If LF = NA

SS + V / 2 = Wetland Characteristics (W)

average for elements with available scores = Water Contact (WC)

$\frac{C + WC}{2}$ = Water Quality FCI

Equation #6: $\frac{10b\ (10h + 10i)}{2}$

7/94

Wildlife

Calculation of WILDLIFE FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 9 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(4c)	Disturbance of wildlife habitat
NA	(20a)	Gross contamination
NA	(16b)	Wetland size
0.9	(11a)	Layers
1.0	(11b)	Condition of layers
1.0	(11c)	Spatial pattern of shrubs/trees
0.22	(12a)	Cover types
1.0	(12b)	Ratio of cover types
1.0	(12c)	Cover type interspersion
0.1	(12d)	Undesirable species
0.1	(13a)	% open water
0.1	(13b)	Vegetation/water interspersion
1.0	(21a)	Shape of upland/ wetland edge
NA	(22a)	Wildlife attractors
0.1	(23)	Islands

If 4c, 16b, and 20a = NA, record NA

If any score = 0.1, record 0.1

average for elements with available scores = 0.97 Vegetation Strata

average for elements with available scores = 0.58 Vegetation Cover Types

average for elements with available scores = 0.1 Vegetation/ Water Proportions

average for elements with available scores = 0.55 Physical Features

average for available scores = 0.55 Habitat Complexity (HC)

= NA Features Which Reduce Habitat Value (F)

If F = NA

If F = NA

$\frac{F + HC}{2}$ = 0.55 Wildlife FCI

7–65

7/94

Fish (Non-tidal Pond/Lake)

Calculation of FISH (Non-tidal Pond/Lake) FCI

PROJECT TITLE: The Jamestown Project

Selected Scores	(#)	Element	COMPARISON: Wetland #9 (e.g., WAA/planned wetland)
0.1	(24)	Obstruction to fish passage	If score = 0.1 for either element, STOP. There is no potential for providing pond/lake fish habitat.
	(28)	Refuge during drought/freeze	If score ≠ 0.1, then continue with model.
	(1b)	Shoreline bank stability	
	(4a)	Disturbance at site (SS)	
	(4d)	Disturbance in channel/open water	
	(16c)	Fish habitat size	
	(24)	Obstruction to fish passage	
	(10m)	Vegetative overhang	
	(10o)	Plant biomass	
	(21b)	Shape of wetland/water edge	
	(22b)	Available fish cover/attractors	
	(27a)	Spawning substrate	
	(27b)	Spawning structures	
	(27c)	Drawdown	
	(20b)	Water quality ratings	If score available, record score for WQ If information not available, continue.
	(20c)	Nutrient/sediment/contaminant sources	
	(20d)	Dissolved oxygen	
	(20e)	pH	
	(20f)	Maximum water temperature	
	(20g)	Turbidity	

average for elements with available scores = Limiting Factors

average for elements with available scores = Food/Cover

average for elements with available scores = Reproduction

average for elements with available scores = Water Quality (WQ)

average for available scores = Fish (Non-tidal Pond/Lake) FCI

8–91

Calculation of UNIQUENESS/HERITAGE FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #9

Selected Scores	(#)	Element	(e.g., WAM/planned wetland)
NA	(29)	Endangered species	
NA	(30)	Rarity	
NA	(31)	Unique features	
1.0	(32)	Historical or archaeological significance	
1.0	(33)	Natural landmark	
NA	(34)	Connected to Wild and Scenic River	
1.0	(35)	Park, sanctuary, etc.	
NA	(36)	Scientific research site	

average for elements with available scores = 1.0 Uniqueness/ Heritage FCI

9

7/94

Shoreline Bank Erosion Control

Calculation of SHORELINE BANK EROSION CONTROL FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 10 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
Site Suitability For Planned Wetland:		
1.0	(2)	Fetch
1.0	(14a)	Steepness of existing shore
0.7	(1a)	Water contact with toe of bank
NA	(3)	Shoreline structures/obstacles
1.0	(2)	Fetch
0.5	(4a)	Disturbance at site (SS)
NA	(5a)	Surface runoff (bank erosion)
0.5	(6)	Boat traffic
NA	(7a)	Water level fluctuation
NA	(8a)	Hours of sunlight
NA	(9a)	Substrate suitability for vegetation
NA	(14b)	Steepness of planned wetland shore
1.0	(10a)	Plant (basal) cover
NA	(10e)	Rooted vascular aquatic beds
1.0	(10g)	Plant height
0.8	(10l)	Root structure
1.0	(10k)	Vegetation persistence

If result = 0.1 for either element, then the planned wetland site is UNSUITABLE
If result ≠ 0.1 for both elements, then continue with model

If result = NA, then STOP: Shoreline Bank Erosion Control FCI = NA

If other, record score → 1a = 0.7 (Potential for Erosion (E))

3 = NA (Shoreline Structures/Obstacles)

average for elements with available scores = 0.67 (Physical Influences on Rate of Erosion)

Equation #5 or #6 = 0.93 (Vegetation Influences on Rate of Erosion)

average for available scores = 0.8 (Influences on Rate of Erosion (I))

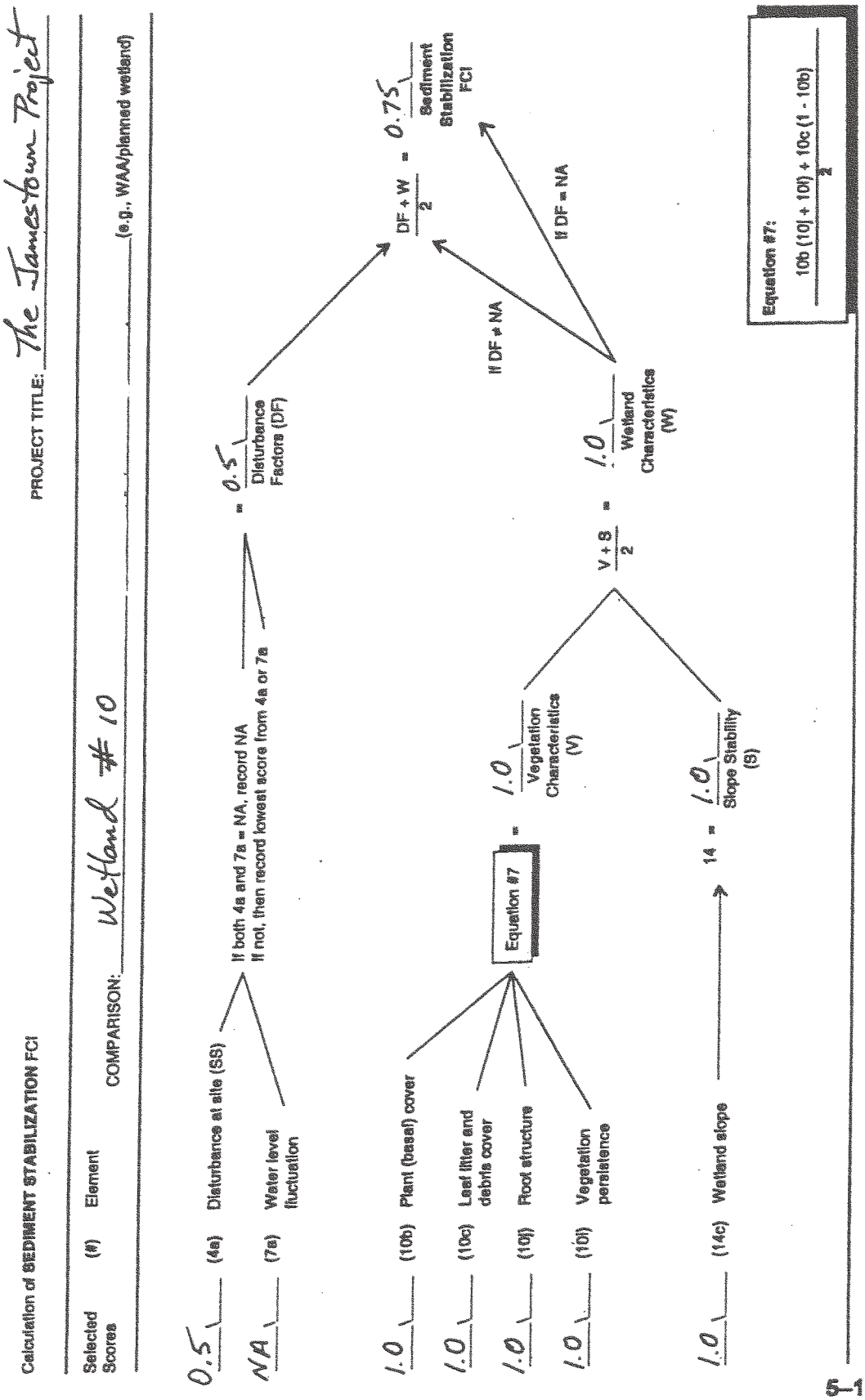
$\frac{E + I}{2}$ = 0.75 (Shoreline Bank Erosion Control FCI)

Equation #5:
If 10e applicable:
$\frac{10a\ (10g + 10l + 10k) + 10e}{4}$

Equation #6:
If 10e not applicable:
$\frac{10a\ (10g + 10l + 10k)}{3}$

7/94

Sediment Stabilization



Calculation of **WATER QUALITY FCI**

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 10 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
1.0	(15)	Hydrologic condition
0.5	(4b)	Disturbance at site (WQ)
NA	(7a)	Water level fluctuation
NA	(16a)	Wetland width
NA	(1a)	Water contact with toe of bank
NA	(5b)	Surface runoff (wetland erosion)
1.0	(14c)	Wetland slope
1.0	(10b)	Plant (basal) cover
1.0	(10h)	Plant height
1.0	(10l)	Vegetation persistence
1.0	(9b)	Dominant substrate
1.0	(15)	Hydrologic condition
NA	(17)	Detention time
NA	(18)	Sheet vs. channel flow
NA	(19)	Average water depth

If result = NA, then STOP. Water Quality FCI is not applicable.
If score selected, then continue with model.

If all results = NA, record NA
If score(s) selected, then calculate average for elements with available scores

= 0.5 Limiting Factors (LF)

average for elements with available scores = 1.0 Substrate-Slope Characteristics (SS)

Equation #8 = 1.0 Vegetation Characteristics (V)

$\frac{SS + V}{2}$ = 1.0 Wetland Characteristics (W)

If LF ≠ NA

If LF = NA

$\frac{LF + W}{2}$ = 0.75 Wetland Condition (C)

$\frac{C + WC}{2}$ = 0.88 Water Quality FCI

If scores different, include in average for WC
If scores same, do not include in average.

average for elements with available scores = 1.0 Water Contact (WC)

Equation #8:

$$\frac{10b\ (10h + 10l)}{2}$$

7/94

Wildlife

Calculation of WILDLIFE FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #10 1 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(4c)	Disturbance of wildlife habitat
NA	(20a)	Gross contamination
NA	(16b)	Wetland size
0.5	(11a)	Layers
1.0	(11b)	Condition of layers
NA	(11c)	Spatial pattern of shrubs/trees
0.15	(12a)	Cover types
0.1	(12b)	Ratio of cover types
0.1	(12c)	Cover type interspersion
NA	(12d)	Undesirable species
0.5	(13a)	% open water
0.1	(13b)	Vegetation/water interspersion
0.1	(21a)	Shape of upland/ wetland edge
NA	(22a)	Wildlife attractors
1.0	(23)	Islands

If 4c, 16b, and 20a = NA, record NA

If any score = 0.1, record 0.1

average for elements with available scores = 0.75 Vegetation Strata

average for elements with available scores = 0.72 Vegetation Cover Types

average for elements with available scores = 0.3 Vegetation/ Water Proportions

average for elements with available scores = 0.55 Physical Features

average for available scores = 0.43 Habitat Complexity (HC)

= NA Features Which Reduce Habitat Value (F)

If F ≠ NA

If F = NA

$\frac{F + HC}{2}$ = 0.43 Wildlife FCI

7–65

Calculation of FISH (Tidal) FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 10 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
NA	(24)	Obstruction to fish passage	If score = 0.1, STOP. There is no potential for providing tidal fish habitat. If score ≠ 0.1 or NA, then continue with model.
NA	(1b)	Shoreline bank stability	
0.5	(4a)	Disturbance at site (SS)	
NA	(4d)	Disturbance in channel/open water	
NA	(7b)	Most permanent hydroperiod	
NA	(24)	Obstruction to fish passage	
0.5	(7c)	Spatially dominant hydroperiod	
1.0	(9c)	Substrate suitability for fish	
1.0	(10d)	Plant (basal) cover	
NA	(10f)	Rooted vascular aquatic beds	
0.5	(21b)	Shape of wetland/water edge	
0.1	(22b)	Available fish cover/attractors	
1NA	(20b)	Water quality ratings	If score available, record score for WQ. If information not available, continue.
1.0	(20c)	Nutrient/sediment/contaminant sources	
1NA	(20d)	Dissolved oxygen	
1.0	(20f)	Maximum water temperature	

average for elements with available scores = 0.5 (Limiting Factors)

Equation #9 = 0.32 (Food/Cover)

average for elements with available scores = 1.0 (Water Quality (WQ))

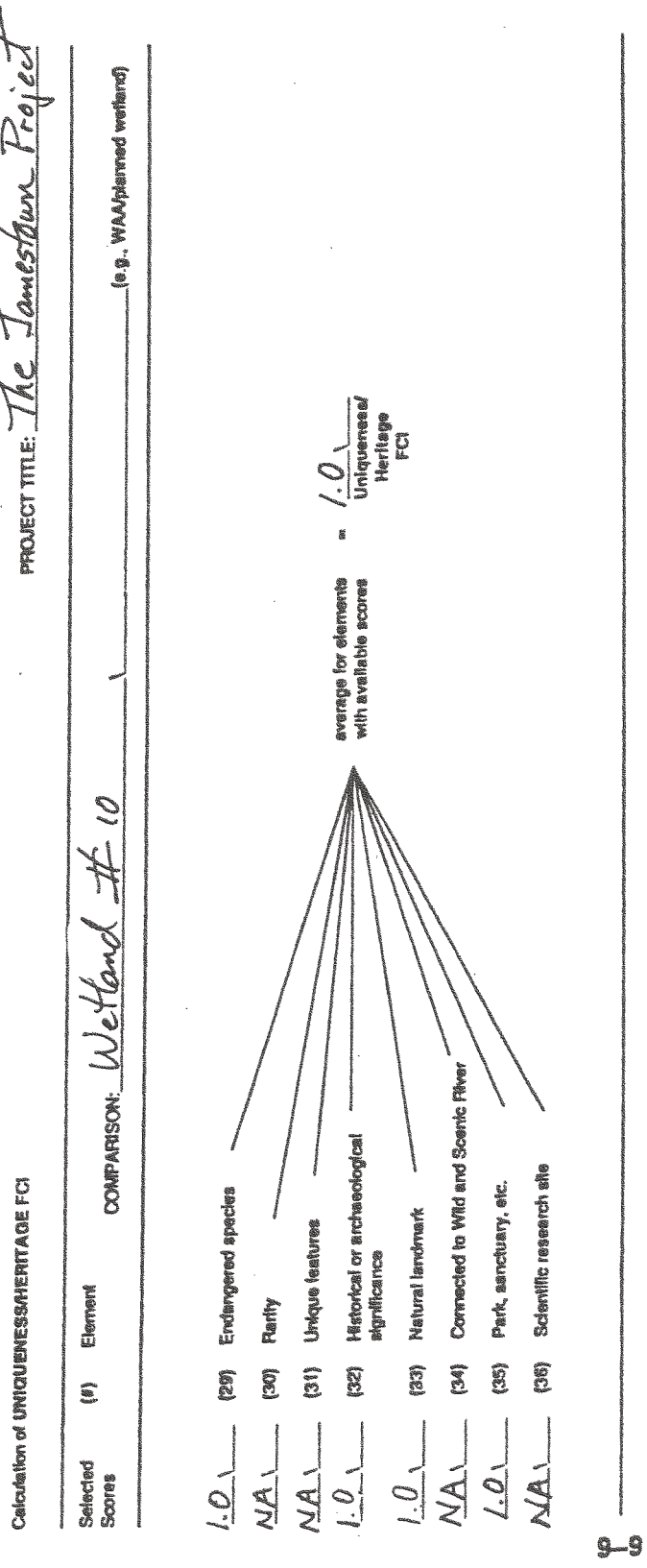
average for available scores = 0.68 (Fish (Tidal) FCI)

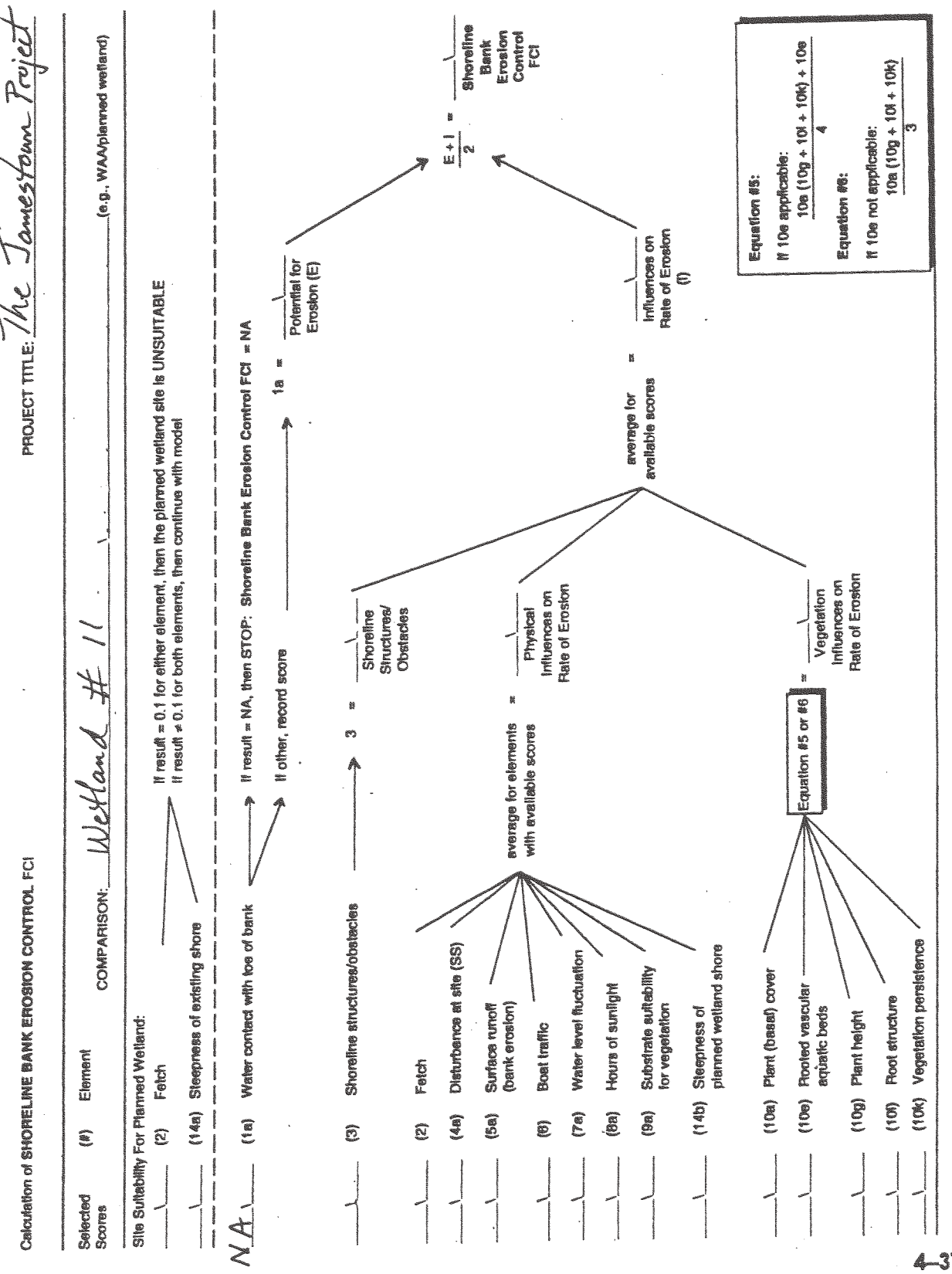
Equation #9:

$$\frac{7c\,[8c + (1-x)(10d) + (x)(10f) + 21b + 22b]}{4}$$

where x = portion of AREA which is represented by lower shore zone in increments of 0.1 (e.g., 0.1, 0.2, 0.3, ... 1.0)

8–67


Calculation of UNIQUENESS/HERITAGE FCI
PROJECT TITLE: The Jamestown Project
Selected Scores
(#) Element
COMPARISON: Wetland #10
(e.g., WAA/planned wetland)
1.0 (29) Endangered species
NA (30) Rarity
NA (31) Unique features
1.0 (32) Historical or archaeological significance
1.0 (33) Natural landmark
NA (34) Connected to Wild and Scenic River
1.0 (35) Park, sanctuary, etc.
NA (36) Scientific research site
average for elements with available scores
= 1.0
Uniqueness/ Heritage FCI


Calculation of SHORELINE BANK EROSION CONTROL FCI
PROJECT TITLE: The Jamestown Project
Selected Scores
(#) Element
COMPARISON: Wetland # 11 (e.g., WAA/planned wetland)
Site Suitability For Planned Wetland:
(2) Fetch
(14a) Steepness of existing shore
If result = 0.1 for either element, then the planned wetland site is UNSUITABLE
If result ≠ 0.1 for both elements, then continue with model
NA (1a) Water contact with toe of bank
If result = NA, then STOP: Shoreline Bank Erosion Control FCI = NA
If other, record score
1a = Potential for Erosion (E)
(3) Shoreline structures/obstacles
3 = Shoreline Structures/ Obstacles
(2) Fetch
(4a) Disturbance at site (SS)
(5a) Surface runoff (bank erosion)
average for elements with available scores = Physical Influences on Rate of Erosion
(6) Boat traffic
(7a) Water level fluctuation
(8a) Hours of sunlight
(9a) Substrate suitability for vegetation
(14b) Steepness of planned wetland shore
average for available scores = Influences on Rate of Erosion (I)
(10a) Plant (basal) cover
(10e) Rooted vascular aquatic beds
(10g) Plant height
(10f) Root structure
(10k) Vegetation persistence
Equation #5 or #6 = Vegetation Influences on Rate of Erosion
E + I / 2 = Shoreline Bank Erosion Control FCI
Equation #5:
If 10e applicable:
10e (10g + 10I + 10k) + 10e / 4
Equation #6:
If 10e not applicable:
10e (10g + 10I + 10k) / 3

7/94

PROJECT TITLE: The Jamestown Project

Calculation of SEDIMENT STABILIZATION FCI

COMPARISON: Wetland # 11 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(4a)	Disturbance at site (SS)
NA	(7a)	Water level fluctuation
1.0	(10b)	Plant (basal) cover
1.0	(10c)	Leaf litter and debris cover
0.8	(10l)	Root structure
1.0	(10f)	Vegetation persistence
1.0	(14c)	Wetland slope

If both 4a and 7a = NA, record NA
If not, then record lowest score from 4a or 7a

= NA (Disturbance Factors (DF))

Equation #7 = 0.9 (Vegetation Characteristics (V))

14 = 1.0 (Slope Stability (S))

V + S / 2 = 0.95 (Wetland Characteristics (W))

If DF = NA

If DF = NA

DF + W / 2 = 0.47 (Sediment Stabilization FCI)

Equation #7:

$$\frac{10b\,(10l + 10f) + 10c\,(1 - 10b)}{2}$$

Calculation of WATER QUALITY FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 11 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
NA	(15)	Hydrologic condition	If result = NA, then STOP. Water Quality FCI is not applicable. If score selected, then continue with model.
NA	(4b)	Disturbance at site (WC)	If all results = NA, record NA
NA	(7a)	Water level fluctuation	If score(s) selected, then calculate average for elements with available scores
NA	(18a)	Wetland width	
NA	(1a)	Water contact with toe of bank	
NA	(5b)	Surface runoff (wetland erosion)	average for elements with available scores = 1.0 Substrate-Slope Characteristics (SS)
1.0	(14c)	Wetland slope	
1.0	(10b)	Plant (basal) cover	
1.0	(10h)	Plant height	Equation #8 = 1.0 Vegetation Characteristics (V)
1.0	(10f)	Vegetation persistence	
1.0	(9b)	Dominant substrate	If scores different, include in average for WC. If scores same, do not include in average.
0.8	(15)	Hydrologic condition	
NA	(17)	Detention time	
1.0	(16)	Sheet vs. channel flow	
0.8	(19)	Average water depth	

= NA Limiting Factors (LF)

$\frac{SS + V}{2}$ = 1.0 Wetland Characteristics (W)

$\frac{LF + W}{2}$ = 1.0 Wetland Condition (C)

If LF ≠ NA

If LF = NA

average for elements with available scores = 0.9 Water Contact (WC)

$\frac{C + WC}{2}$ = 0.95 Water Quality FCI

Equation #8: $\frac{10b\,(10h + 10f)}{2}$

6-45

7/94

Wildlif

Calculation of WILDLIFE FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 11 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(4c)	Disturbance of wildlife habitat
NA	(20a)	Gross contamination
NA	(16b)	Wetland size
0.9	(11a)	Layers
1.0	(11b)	Condition of layers
1.0	(11c)	Spatial pattern of shrubs/trees
0.22	(12a)	Cover types
1.0	(12b)	Ratio of cover types
1.0	(12c)	Cover type interspersion
NA	(12d)	Undesirable species
0.1	(13a)	% open water
0.1	(13b)	Vegetation/water interspersion
0.1	(21a)	Shape of upland/ wetland edge
1.0	(22a)	Wildlife attractors
0.1	(23)	Islands

If 4c, 16b, and 20a = NA, record NA

If any score = 0.1, record 0.1

average for elements with available scores = 0.97 Vegetation Strata

average for elements with available scores = 0.74 Vegetation Cover Types

average for elements with available scores = 0.1 Vegetation/ Water Proportions

average for elements with available scores = 0.4 Physical Features

average for available scores = 0.55 Habitat Complexity (HC)

= NA Features Which Reduce Habitat Value (F)

If F ≠ NA: $\frac{F + HC}{2}$ = 0.55 Wildlife FCI

If F = NA

7–65

7/94

Fish (Tidal)

Calculation of FISH (Tidal) FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #11 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
0.1	(24)	Obstruction to fish passage	→ If score = 0.1, STOP. There is no potential for providing tidal fish habitat. If score ≠ 0.1 or NA, then continue with model.
	(1b)	Shoreline bank stability	
	(4e)	Disturbance at site (SS)	
	(4d)	Disturbance in channel/open water	
	(7b)	Most permanent hydroperiod	
	(24)	Obstruction to fish passage	
	(7c)	Spatially dominant hydroperiod	
	(9c)	Substrate suitability for fish	
	(10d)	Plant (basal) cover	
	(10f)	Rooted vascular aquatic beds	
	(21b)	Shape of wetland/water edge	
	(22b)	Available fish cover/attractors	
	(20b)	Water quality ratings	→ If score available, record score for WQ If information not available, continue.
	(20c)	Nutrient/sediment/contaminant sources	
	(20d)	Dissolved oxygen	
	(20f)	Maximum water temperature	

average for elements with available scores = Limiting Factors

Equation #9 = Food/Cover

average for elements with available scores = Water Quality (WQ)

average for available scores = Fish (Tidal) FCI

Equation #9:

$$\frac{7c\,[9c + (1-x)(10d) + (x)(10f) + 21b + 22b)}{4}$$

where x = portion of AREA which is represented by lower shore zone in increments of 0.1 (e.g., 0.1, 0.2, 0.3, ... 1.0)

8–67

Calculation of UNIQUENESS/HERITAGE FCI

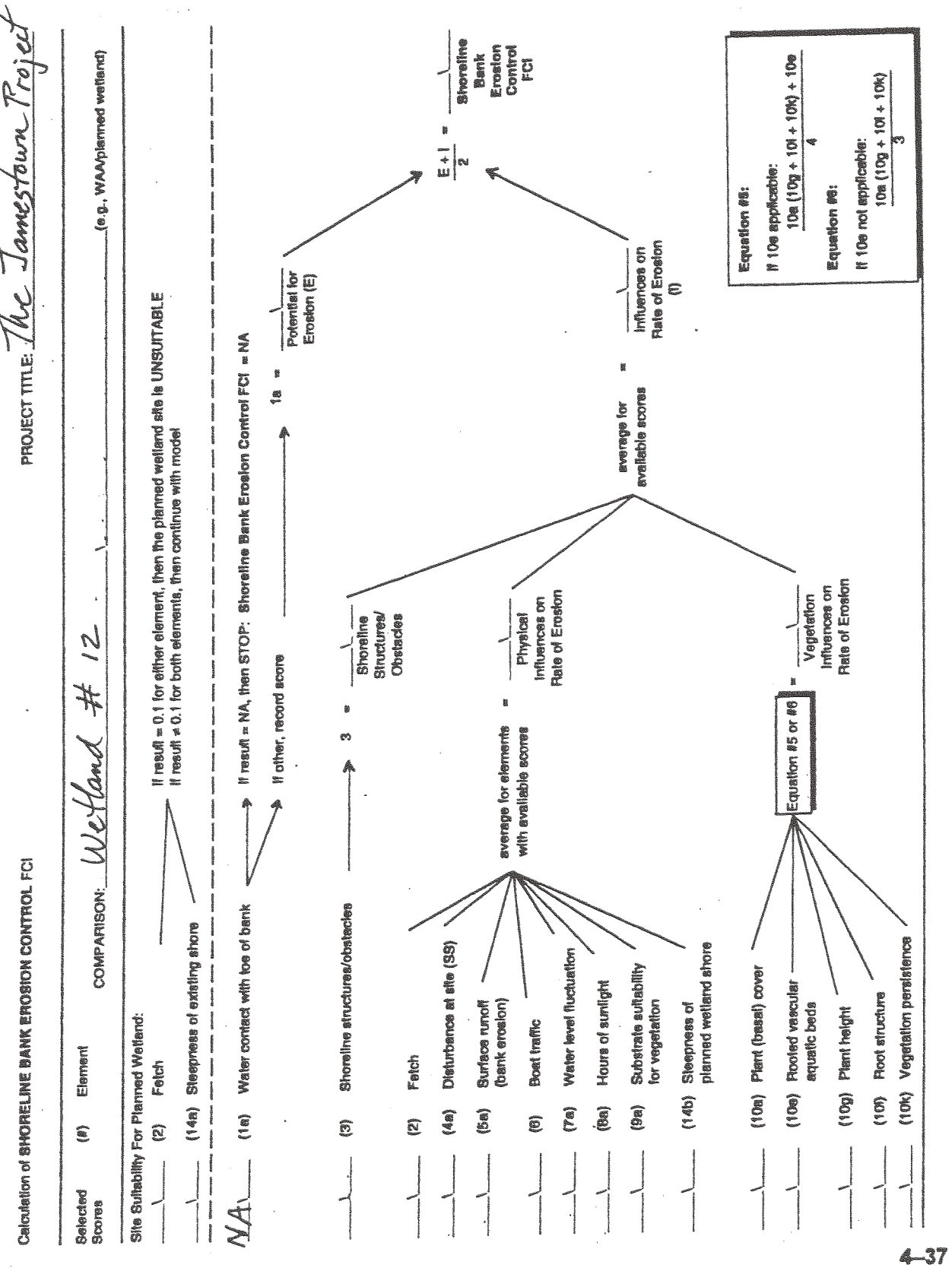
PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 11 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(29)	Endangered species
NA	(30)	Rarity
NA	(31)	Unique features
1.0	(32)	Historical or archaeological significance
1.0	(33)	Natural landmark
NA	(34)	Connected to Wild and Scenic River
1.0	(35)	Park, sanctuary, etc.
NA	(36)	Scientific research site

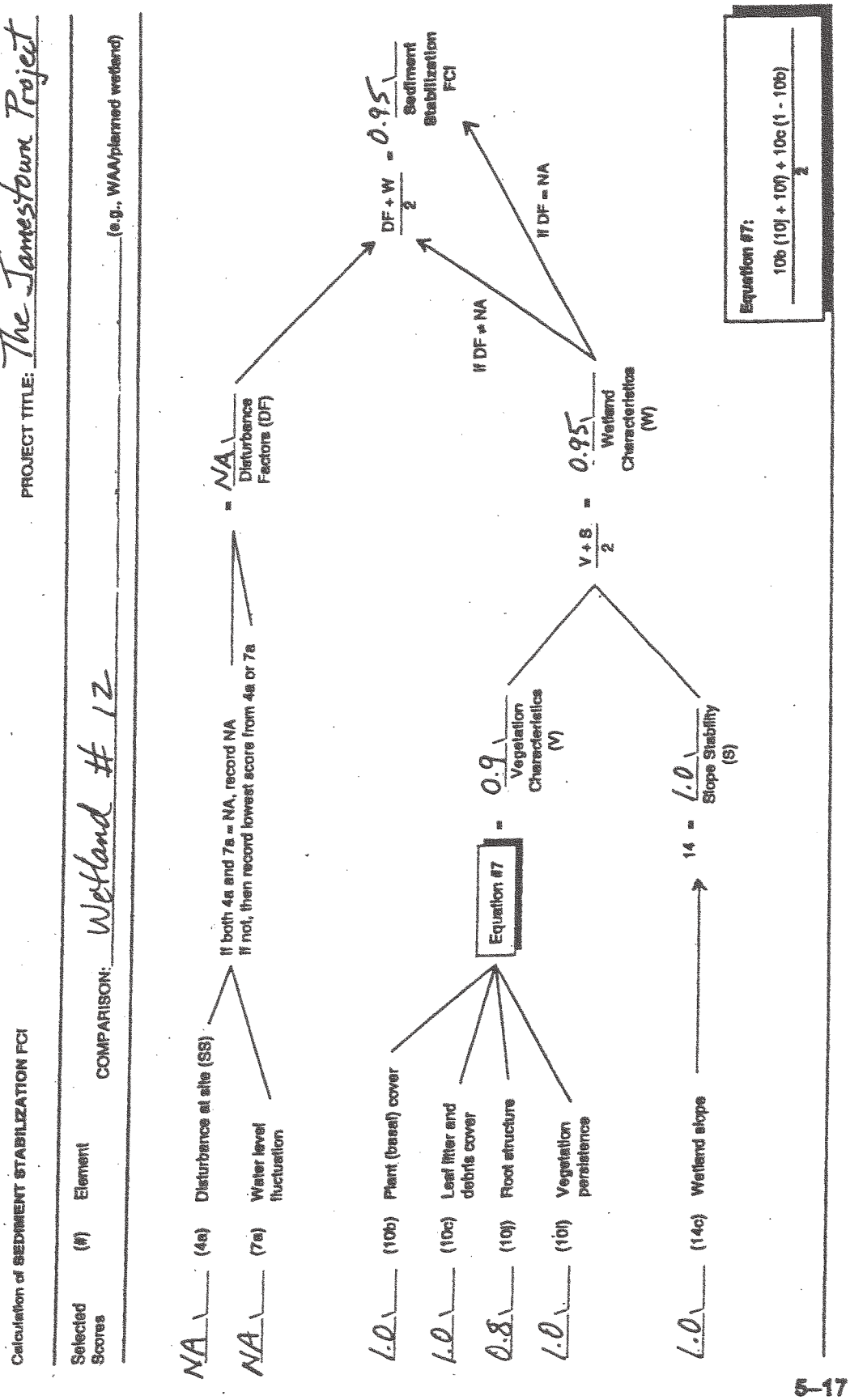
average for elements with available scores = 1.0 Uniqueness/ Heritage FCI

9-9


Calculation of SHORELINE BANK EROSION CONTROL FCI
PROJECT TITLE: The Jamestown Project
COMPARISON: Wetland # 12 (e.g., WAA/planned wetland)
Selected Scores
(#)
Element
Site Suitability For Planned Wetland:
(2) Fetch
(14a) Steepness of existing shore
If result = 0.1 for either element, then the planned wetland site is UNSUITABLE
If result ≠ 0.1 for both elements, then continue with model
NA (1a) Water contact with toe of bank
If result = NA, then STOP: Shoreline Bank Erosion Control FCI = NA
If other, record score
1a = Potential for Erosion (E)
(3) Shoreline structures/obstacles
3 = Shoreline Structures/ Obstacles
(2) Fetch
(4a) Disturbance at site (SS)
(5a) Surface runoff (bank erosion)
(6) Boat traffic
(7a) Water level fluctuation
(8a) Hours of sunlight
(9a) Substrate suitability for vegetation
(14b) Steepness of planned wetland shore
average for elements with available scores = Physical Influences on Rate of Erosion
(10a) Plant (basal) cover
(10e) Rooted vascular aquatic beds
(10g) Plant height
(10i) Root structure
(10k) Vegetation persistence
Equation #5 or #6 = Vegetation Influences on Rate of Erosion
average for available scores = Influences on Rate of Erosion (I)
E + I / 2 = Shoreline Bank Erosion Control FCI
Equation #5:
If 10e applicable: 10a (10g + 10i + 10k) + 10e / 4
Equation #6:
If 10e not applicable: 10a (10g + 10i + 10k) / 3

7/94

Sediment Stabilization



Calculation of WATER QUALITY FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 12 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
0.5	(15)	Hydrologic condition	If result = NA, then STOP. Water Quality FCI is not applicable. If score selected, then continue with model.
NA	(4b)	Disturbance at site (WCI)	If all results = NA, record NA If score(s) selected, then calculate average for elements with available scores
NA	(7a)	Water level fluctuation	
NA	(18a)	Wetland width	
NA	(1a)	Water contact with toe of bank	average for elements with available scores = 1.0 Substrate-Slope Characteristics (SS)
NA	(5b)	Surface runoff (wetland erosion)	
1.0	(14c)	Wetland slope	
1.0	(10b)	Plant (basal) cover	Equation #8 = 1.0 Vegetation Characteristics (V)
1.0	(10h)	Plant height	
1.0	(10i)	Vegetation persistence	
1.0	(9b)	Dominant substrate	If scores different, include in average for WC If scores same, do not include in average.
0.5	(15)	Hydrologic condition	
NA	(17)	Detention time	
NA	(18)	Sheet vs. channel flow	
NA	(19)	Average water depth	

SS + V / 2 = 1.0 Wetland Characteristics (W)

If LF ≠ NA

If LF = NA

= NA Limiting Factors (LF)

LF + W / 2 = 1.0 Wetland Condition (C)

average for elements with available scores = 0.75 Water Contact (WC)

C + WC / 2 = 0.88 Water Quality FCI

Equation #8:

$$\frac{10b\,(10h + 10i)}{2}$$

6-45

7/94

Wildlif

Calculation of WILDLIFE FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #12 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(4c)	Disturbance of wildlife habitat
NA	(20a)	Gross contamination
NA	(16b)	Wetland size
0.9	(11a)	Layers
0.7	(11b)	Condition of layers
1.0	(11c)	Spatial pattern of shrubs/trees
0.22	(12a)	Cover types
0.5	(12b)	Ratio of cover types
1.0	(12c)	Cover type interspersion
NA	(12d)	Undesirable species
0.1	(13a)	% open water
0.1	(13b)	Vegetation/water interspersion
1.0	(21a)	Shape of upland/ wetland edge
1.0	(22a)	Wildlife attractors
0.1	(23)	Islands

If 4c, 16b, and 20a = NA, record NA

If any score = 0.1, record 0.1

average for elements with available scores = 0.37 Vegetation Strata

average for elements with available scores = 0.57 Vegetation Cover Types

average for elements with available scores = 0.1 Vegetation/ Water Proportions

average for elements with available scores = 0.7 Physical Features

average for available scores = 0.56 Habitat Complexity (HC)

= NA Features Which Reduce Habitat Value (F)

If F ≠ NA: $\frac{F + HC}{2}$

If F = NA

= 0.56 Wildlife FCI

7–65

7/94

Fish (Tidal)

Calculation of FISH (Tidal) FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #12 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
0.5	(24)	Obstruction to fish passage	If score = 0.1, STOP. There is no potential for providing tidal fish habitat. If score ≠ 0.1 or NA, then continue with model.
NA	(1b)	Shoreline bank stability	
NA	(4a)	Disturbance at site (SS)	
NA	(4d)	Disturbance in channel/open water	
NA	(7b)	Most permanent hydroperiod	
0.5	(24)	Obstruction to fish passage	
0.2	(7c)	Spatially dominant hydroperiod	
1.0	(9c)	Substrate suitability for fish	
1.0	(10d)	Plant (basal) cover	
NA	(10f)	Rooted vascular aquatic beds	
0.1	(21b)	Shape of wetland/water edge	
1.0	(22b)	Available fish cover/attractors	
1.0	(20b)	Water quality ratings	If score available, record score for WQ. If information not available, continue.
1.0	(20c)	Nutrient/sediment/contaminant sources	
NA	(20d)	Dissolved oxygen	
NA	(20f)	Maximum water temperature	

average for elements with available scores = 0.5 Limiting Factors

Equation #9 = 0.155 Food/Cover

average for elements with available scores = 1.0 Water Quality (WQ)

average for available scores = 0.55 Fish (Tidal) FCI

Equation #9:

$$\frac{7c\,[9c + (1-x)(10d) + (x)(10f) + 21b + 22b)}{4}$$

where x = portion of AREA which is represented by lower shore zone in increments of 0.1 (e.g., 0.1, 0.2, 0.3, ... 1.0)

8-67

7/94

Uniqueness/Heritage

PROJECT TITLE: The Jamestown Project

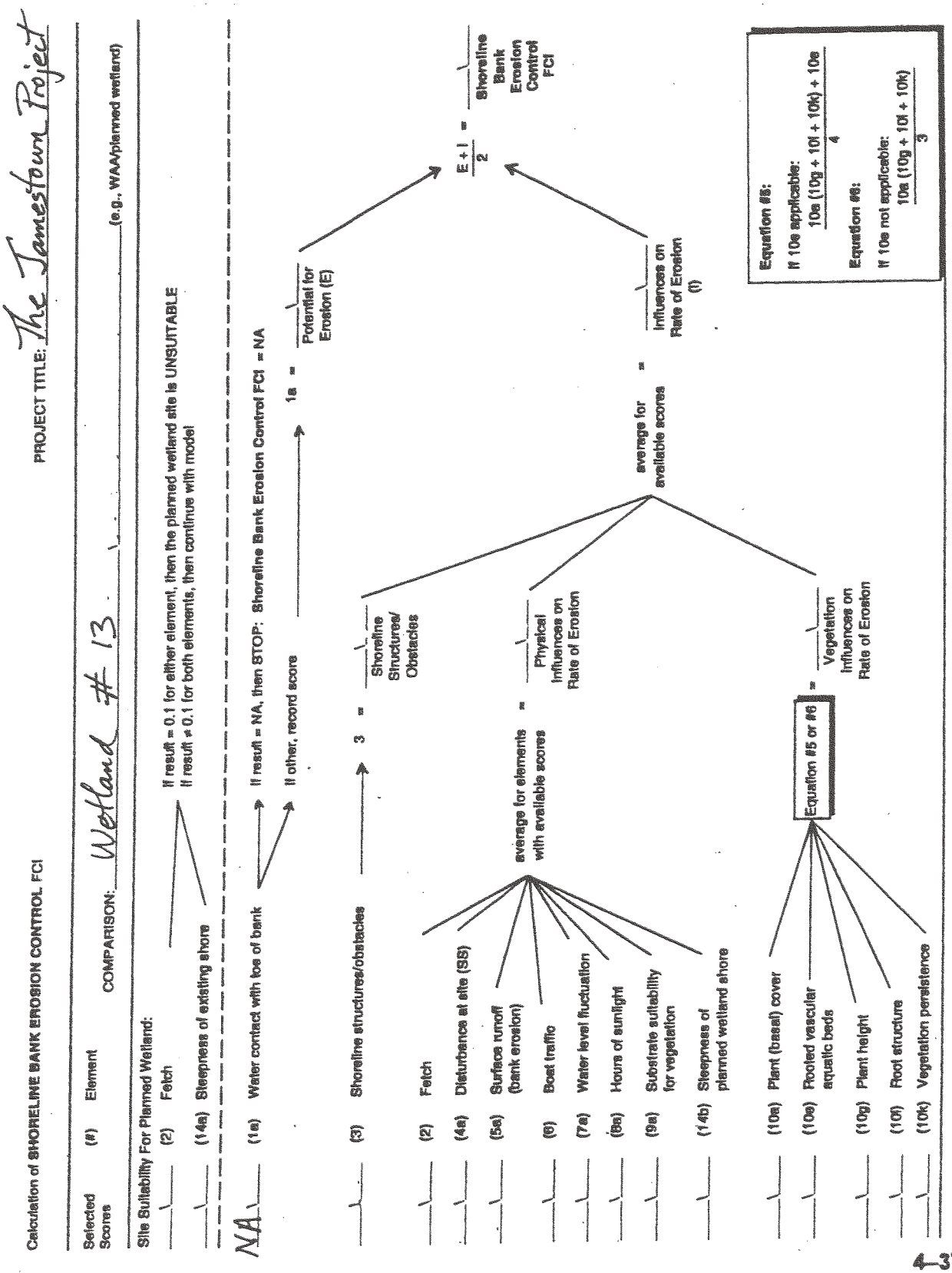
Calculation of UNIQUENESS/HERITAGE FCI

COMPARISON: Wetland # 12

Selected Scores	(#)	Element	(e.g. WAA/planned wetland)
1.0	(29)	Endangered species	
NA	(30)	Rarity	
NA	(31)	Unique features	
1.0	(32)	Historical or archaeological significance	
1.0	(33)	Natural landmark	
NA	(34)	Connected to Wild and Scenic River	
1.0	(35)	Park, sanctuary, etc.	
NA	(36)	Scientific research site	

average for elements with available scores = 1.0 Uniqueness/ Heritage FCI

9-9


Calculation of SHORELINE BANK EROSION CONTROL FCI
PROJECT TITLE: The Jamestown Project
Selected Scores
(#)
Element
COMPARISON: Wetland # 13
(e.g., WAA/planned wetland)
Site Suitability For Planned Wetland:
(2) Fetch
(14a) Steepness of existing shore
If result = 0.1 for either element, then the planned wetland site is UNSUITABLE
If result ≠ 0.1 for both elements, then continue with model
NA (1a) Water contact with toe of bank
If result = NA, then STOP: Shoreline Bank Erosion Control FCI = NA
If other, record score
1a = Potential for Erosion (E)
(3) Shoreline structures/obstacles
3 = Shoreline Structures/ Obstacles
(2) Fetch
(4a) Disturbance at site (SS)
(5a) Surface runoff (bank erosion)
average for elements with available scores = Physical Influences on Rate of Erosion
(6) Boat traffic
(7a) Water level fluctuation
(8a) Hours of sunlight
(9a) Substrate suitability for vegetation
(14b) Steepness of planned wetland shore
average for available scores = Influences on Rate of Erosion (I)
E + I / 2 = Shoreline Bank Erosion Control FCI
(10a) Plant (basal) cover
(10e) Rooted vascular aquatic beds
Equation #5 or #6 = Vegetation Influences on Rate of Erosion
(10g) Plant height
(10f) Root structure
(10k) Vegetation persistence
Equation #5:
If 10e applicable:
10a (10g + 10f + 10k) + 10e / 4
Equation #6:
If 10e not applicable:
10a (10g + 10f + 10k) / 3

7/94

Sediment Stabilization

Calculation of SEDIMENT STABILIZATION FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 13 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(4a)	Disturbance at site (SS)
NA	(7a)	Water level fluctuation
0.1	(10b)	Plant (basal) cover
1.0	(10c)	Leaf litter and debris cover
0.1	(10j)	Root structure
0.1	(10k)	Vegetation persistence
1.0	(14c)	Wetland slope

If both 4a and 7a = NA, record NA
If not, then record lowest score from 4a or 7a

= NA Disturbance Factors (DF)

Equation #7 = 0.46 Vegetation Characteristics (V)

14 = 1.0 Slope Stability (S)

V + S / 2 = 0.73 Wetland Characteristics (W)

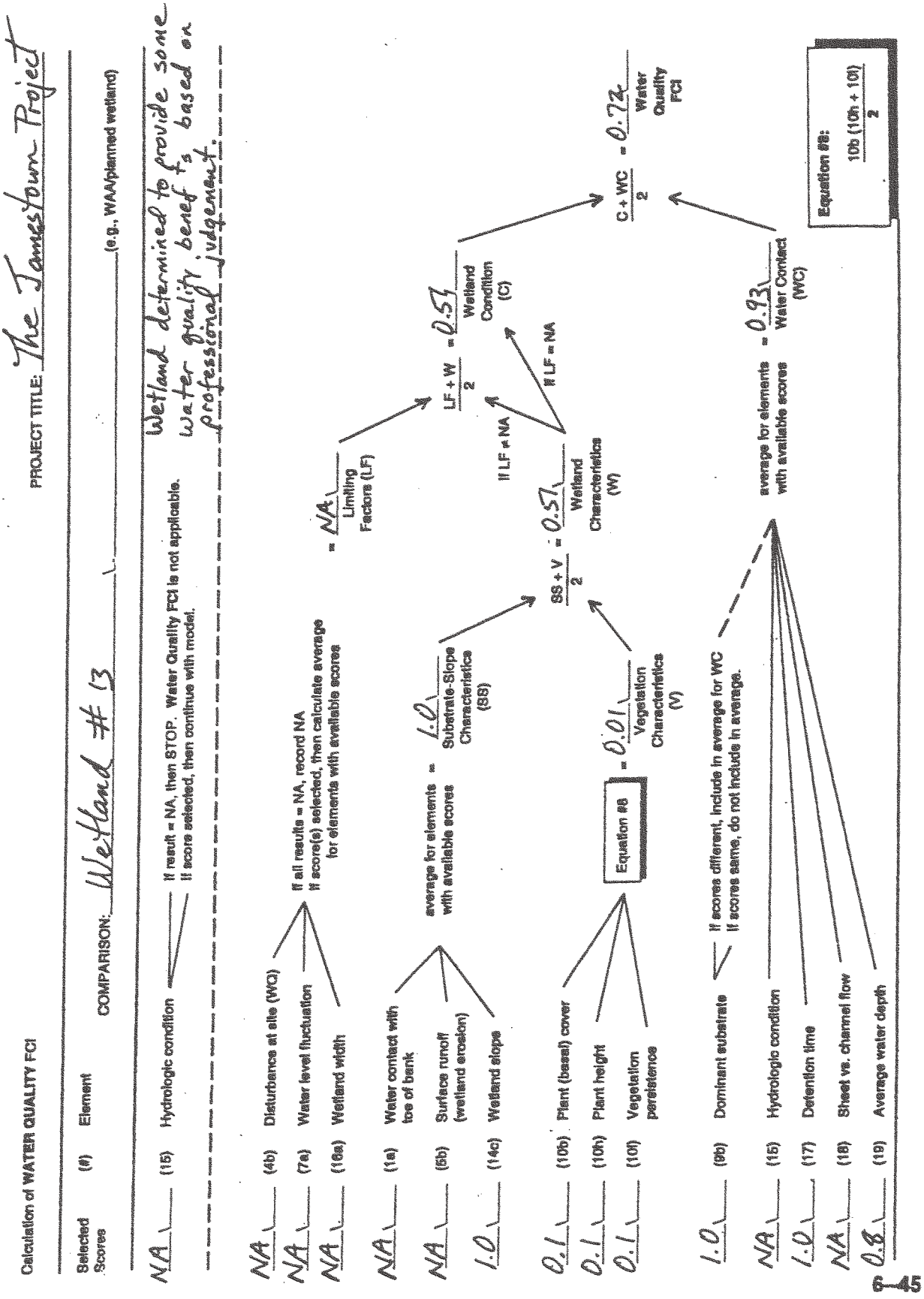
If DF ≠ NA: DF + W / 2 = 0.73 Sediment Stabilization FCI

If DF = NA: 0.73 Sediment Stabilization FCI

Equation #7:

$$\frac{10b\,(10j + 10k) + 10c\,(1 - 10b)}{2}$$

5–17


Calculation of WATER QUALITY FCI
PROJECT TITLE: The Jamestown Project
Selected Scores
(#)
Element
COMPARISON: Wetland #13
(e.g., WAA/planned wetland)
NA (15) Hydrologic condition
If result = NA, then STOP. Water Quality FCI is not applicable.
If score selected, then continue with model.
Wetland determined to provide some water quality benef ts based on professional judgement.
NA (4b) Disturbance at site (WC)
NA (7a) Water level fluctuation
NA (16a) Wetland width
If all results = NA, record NA
If score(s) selected, then calculate average for elements with available scores
= NA Limiting Factors (LF)
NA (1a) Water contact with toe of bank
NA (5b) Surface runoff (wetland erosion)
1.0 (14c) Wetland slope
average for elements with available scores = 1.0 Substrate-Slope Characteristics (SS)
0.1 (10b) Plant (basal) cover
0.1 (10h) Plant height
0.1 (10f) Vegetation persistence
Equation #8 = 0.01 Vegetation Characteristics (V)
SS + V / 2 = 0.57 Wetland Characteristics (W)
LF + W / 2 = 0.57 Wetland Condition (C)
If LF = NA
If LF = NA
C + WC / 2 = 0.72 Water Quality FCI
1.0 (9b) Dominant substrate
If scores different, include in average for WC
If scores same, do not include in average.
NA (15) Hydrologic condition
1.0 (17) Detention time
NA (18) Sheet vs. channel flow
0.8 (19) Average water depth
average for elements with available scores = 0.93 Water Contact (WC)
Equation #8: 10b (10h + 10f) / 2

Calculation of WILDLIFE FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 13 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element
NA	(4c)	Disturbance of wildlife habitat
NA	(20a)	Gross contamination
NA	(16b)	Wetland size
0.5	(11a)	Layers
0.3	(11b)	Condition of layers
NA	(11c)	Spatial pattern of shrubs/trees
0.04	(12a)	Cover types
0.1	(12b)	Ratio of cover types
0.1	(12c)	Cover type interspersion
NA	(12d)	Undesirable species
0.1	(13a)	% open water
0.1	(13b)	Vegetation/water interspersion
0.1	(21a)	Shape of upland/ wetland edge
NA	(22a)	Wildlife attractors
0.1	(23)	Islands

If 4c, 16b, and 20a = NA, record NA

If any score = 0.1, record 0.1

average for elements with available scores = 0.4 Vegetation Strata

average for elements with available scores = 0.008 Vegetation Cover Types

average for elements with available scores = 0.1 Vegetation/ Water Proportions

average for elements with available scores = 0.1 Physical Features

average for available scores = 0.17 Habitat Complexity (HC)

= NA Features Which Reduce Habitat Value (F)

If F = NA

If F = NA

$\frac{F + HC}{2}$ = 0.17 Wildlife FCI

7-65

Calculation of FISH (Tidal) FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland # 13 \ 4 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
0.5 \	(24)	Obstruction to fish passage	→ If score = 0.1, STOP. There is no potential for providing tidal fish habitat. → If score ≠ 0.1 or NA, then continue with model.

Selected Scores	(#)	Element
NA \	(1b)	Shoreline bank stability
NA \	(4a)	Disturbance at site (SS)
NA \	(4d)	Disturbance in channel/open water
0.1 \	(7b)	Most permanent hydroperiod
0.5 \	(24)	Obstruction to fish passage

average for elements with available scores = 0.3 \ Limiting Factors

Selected Scores	(#)	Element
1.0 \	(7c)	Spatially dominant hydroperiod
1.0 \	(9c)	Substrate suitability for fish
0.1 \	(10d)	Plant (basal) cover
NA \	(10f)	Rooted vascular aquatic beds
0.5 \	(21b)	Shape of wetland/water edge
0.1 \	(22b)	Available fish cover/attractors

Equation #9 = 0.42 \ Food/Cover

Selected Scores	(#)	Element	
INA \	(20b)	Water quality ratings	→ If score available, record score for WQ → If information not available, continue.
0.5 \	(20c)	Nutrient/sediment/contaminant sources	
INA \	(20d)	Dissolved oxygen	
1.0 \	(20f)	Maximum water temperature	

average for elements with available scores = 0.75 \ Water Quality (WQ)

average for available scores = 0.49 \ Fish (Tidal) FCI

Equation #9:

$$7c\,\frac{[9c + (1-x)(10d) + (x)(10f) + 21b + 22b]}{4}$$

where x = portion of AREA which is represented by lower shore zone in increments of 0.1 (e.g., 0.1, 0.2, 0.3, ... 1.0)

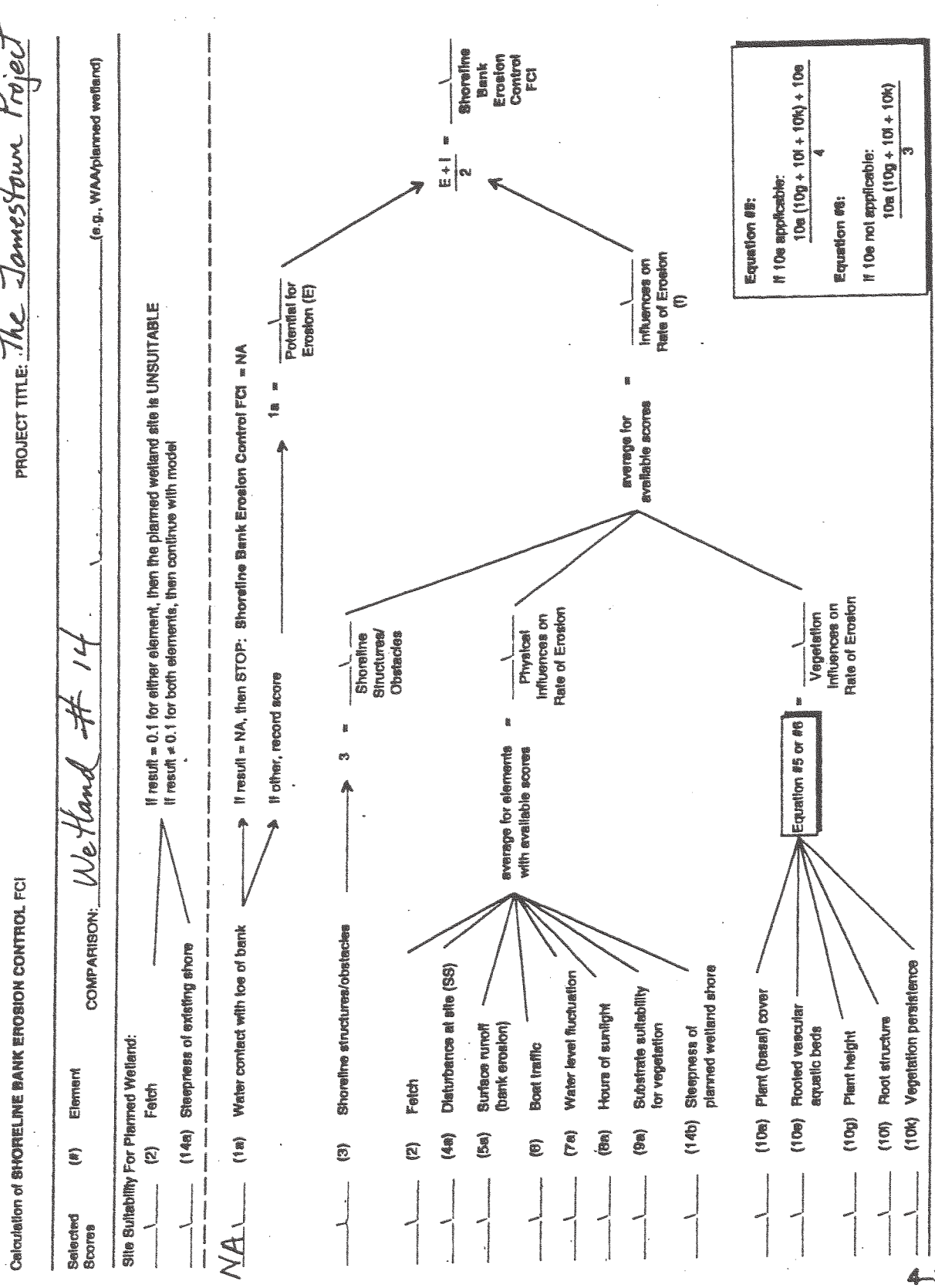
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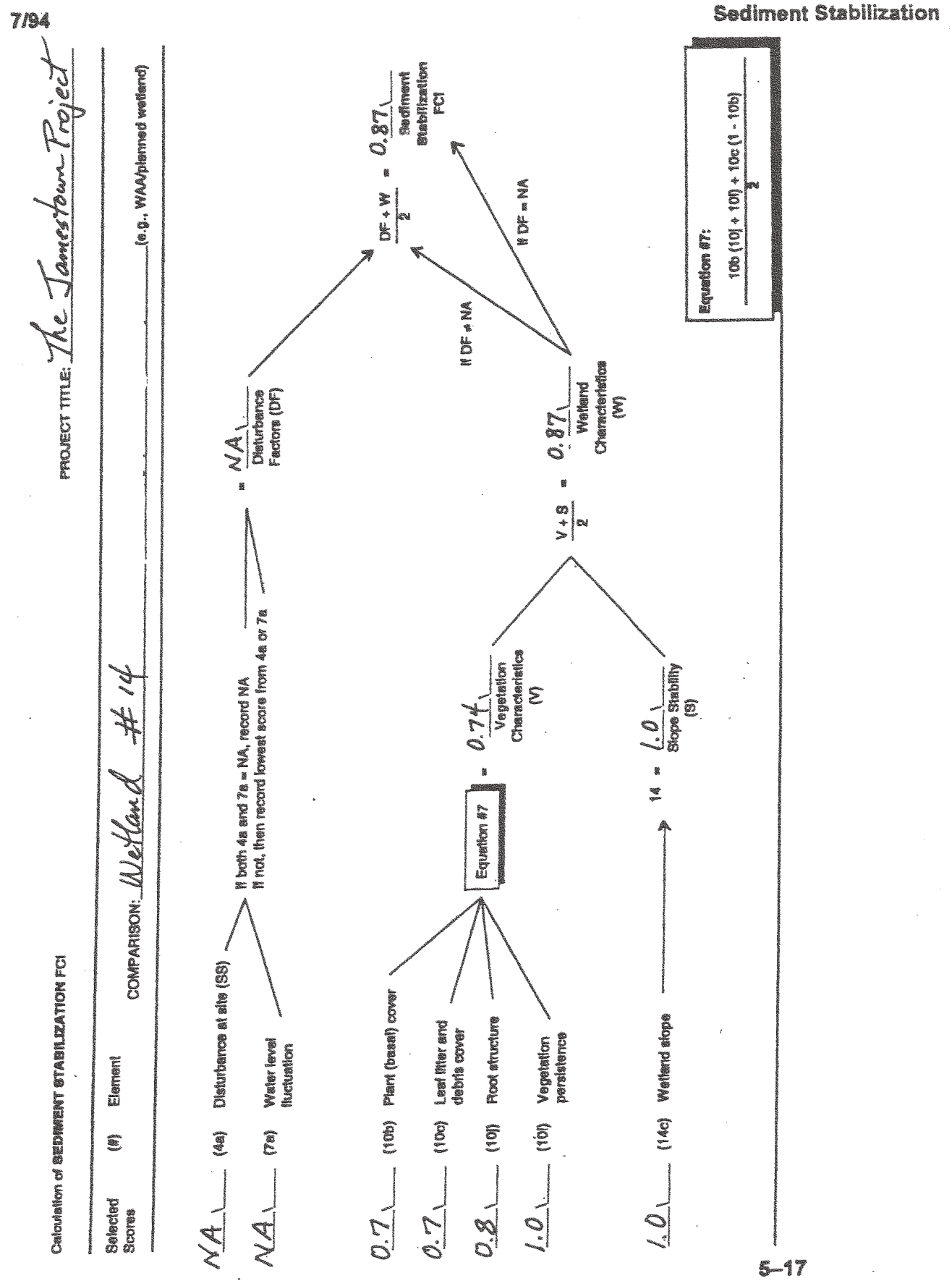
PROJECT TITLE: The Jamestown Project

Calculation of UNIQUENESS/HERITAGE FCI

Selected Scores	(#)	Element	COMPARISON: Wetland #13 (e.g., WAN/planned wetland)
NA	(29)	Endangered species	
NA	(30)	Rarity	
NA	(31)	Unique features	average for elements with available scores = 1.0 Uniqueness/ Heritage FCI
NA	(32)	Historical or archaeological significance	
1.0	(33)	Natural landmark	
NA	(34)	Connected to Wild and Scenic River	
1.0	(35)	Park, sanctuary, etc.	
NA	(36)	Scientific research site	

pg


Calculation of SHORELINE BANK EROSION CONTROL FCI
PROJECT TITLE: The Jamestown Project
Selected Scores
(#)
Element
COMPARISON: Wetland # 14
(e.g., WAA/planned wetland)
Site Suitability For Planned Wetland:
(2) Fetch
(14a) Steepness of existing shore
If result = 0.1 for either element, then the planned wetland site is UNSUITABLE
If result ≠ 0.1 for both elements, then continue with model
NA (1a) Water contact with toe of bank
If result = NA, then STOP: Shoreline Bank Erosion Control FCI = NA
If other, record score
1a = Potential for Erosion (E)
(3) Shoreline structures/obstacles
3 = Shoreline Structures/ Obstacles
(2) Fetch
(4a) Disturbance at site (SS)
(5a) Surface runoff (bank erosion)
average for elements with available scores = Physical Influences on Rate of Erosion
(6) Boat traffic
(7a) Water level fluctuation
(8a) Hours of sunlight
(9a) Substrate suitability for vegetation
(14b) Steepness of planned wetland shore
average for available scores = Influences on Rate of Erosion (I)
(10a) Plant (basal) cover
(10e) Rooted vascular aquatic beds
Equation #5 or #6 = Vegetation Influences on Rate of Erosion
(10g) Plant height
(10l) Root structure
(10k) Vegetation persistence
E + I / 2 = Shoreline Bank Erosion Control FCI
Equation #5:
If 10e applicable:
10a (10g + 10l + 10k) + 10e / 4
Equation #6:
If 10e not applicable:
10a (10g + 10l + 10k) / 3


7/94
PROJECT TITLE: The Jamestown Project
COMPARISON: Wetland #14 (e.g., WAA/planned wetland)
Calculation of SEDIMENT STABILIZATION FCI
Selected Scores
(#) Element
NA (4a) Disturbance at site (SS)
NA (7a) Water level fluctuation
If both 4a and 7a = NA, record NA
If not, then record lowest score from 4a or 7a
= NA Disturbance Factors (DF)
0.7 (10b) Plant (basal) cover
0.7 (10c) Leaf litter and debris cover
0.8 (10j) Root structure
1.0 (10l) Vegetation persistence
Equation #7
= 0.74 Vegetation Characteristics (V)
1.0 (14c) Wetland slope
14 = 1.0 Slope Stability (S)
V + S / 2 = 0.87 Wetland Characteristics (W)
If DF ≠ NA
If DF = NA
DF + W / 2 = 0.87 Sediment Stabilization FCI
Equation #7:
10b (10j + 10l) + 10c (1 - 10b) / 2
5–17

Calculation of WATER QUALITY FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #14 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
NA	(15)	Hydrologic condition	If result = NA, then STOP. Water Quality FCI is not applicable. If score selected, then continue with model.

Wetland determined to provide some water quality benefits based on professional judgement.

NA	(4b)	Disturbance at site (WQ)	If all results = NA, record NA
NA	(7a)	Water level fluctuation	If score(s) selected, then calculate average for elements with available scores
NA	(16a)	Wetland width	
NA	(1a)	Water contact with toe of bank	
NA	(5b)	Surface runoff (wetland erosion)	average for elements with available scores = 1.0 Substrate-Slope Characteristics (SS)
1.0	(14c)	Wetland slope	
0.7	(10b)	Plant (basal) cover	
1.0	(10h)	Plant height	Equation #8 = 0.7 Vegetation Characteristics (V)
1.0	(10i)	Vegetation persistence	
1.0	(9b)	Dominant substrate	If scores different, include in average for WC. If scores same, do not include in average.
1.0	(15)	Hydrologic condition	
NA	(17)	Detention time	
NA	(18)	Sheet vs. channel flow	
NA	(19)	Average water depth	

SS + V / 2 = 0.85 Wetland Characteristics (W)

= NA Limiting Factors (LF)

If LF ≠ NA: LF + W / 2 = 0.85 Wetland Condition (C)

If LF = NA

average for elements with available scores = 1.0 Water Contact (WC)

C + WC / 2 = 0.93 Water Quality FCI

Equation #8: 10b (10h + 10i) / 2

6-45

Calculation of WILDLIFE FCI

PROJECT TITLE: The Jamestown Project

Selected Scores	(#)	Element	COMPARISON: Wetland #14 (e.g., WAA/planned wetland)
NA	(4c)	Disturbance of wildlife habitat	If 4c, 16b, and 20a = NA, record NA
NA	(20a)	Gross contamination	If any score = 0.1, record 0.1
NA	(16b)	Wetland size	
0.9	(11a)	Layers	average for elements with available scores = 0.97 Vegetation Strata
1.0	(11b)	Condition of layers	
1.0	(11c)	Spatial pattern of shrubs/trees	
0.19	(12a)	Cover types	average for elements with available scores = 0.73 Vegetation Cover Types
1.0	(12b)	Ratio of cover types	
1.0	(12c)	Cover type interspersion	
NA	(12d)	Undesirable species	
0.1	(13a)	% open water	average for elements with available scores = 0.1 Vegetation/ Water Proportions
0.1	(13b)	Vegetation/water interspersion	
0.1	(21a)	Shape of upland/ wetland edge	average for elements with available scores = 0.4 Physical Features
1.0	(22a)	Wildlife attractors	
0.1	(23)	Islands	

average for available scores = 0.55 Habitat Complexity (HC)

If F = NA

If F = NA

NA Features Which Reduce Habitat Value (F)

$\frac{F + HC}{2}$ = 0.55 Wildlife FCI

7/94

Fish (Tidal)

Calculation of FISH (Tidal) FCI

PROJECT TITLE: The Jamestown Project

COMPARISON: Wetland #14 (e.g., WAA/planned wetland)

Selected Scores	(#)	Element	
0.5	(24)	Obstruction to fish passage	If score = 0.1, STOP. There is no potential for providing tidal fish habitat. If score ≠ 0.1 or NA, then continue with model.
NA	(1b)	Shoreline bank stability	
NA	(4a)	Disturbance at site (SS)	
NA	(4d)	Disturbance in channel/open water	
NA	(7b)	Most permanent hydroperiod	
0.5	(24)	Obstruction to fish passage	
0.2	(7c)	Spatially dominant hydroperiod	
1.0	(8c)	Substrate suitability for fish	
0.7	(10d)	Plant (basal) cover	
NA	(10f)	Rooted vascular aquatic beds	
0.1	(21b)	Shape of wetland/water edge	
0.5	(22b)	Available fish cover/attractors	
INA	(20b)	Water quality ratings	If score available, record score for WQ. If information not available, continue.
0.5	(20c)	Nutrient/sediment/contaminant sources	
INA	(20d)	Dissolved oxygen	
1.0	(20f)	Maximum water temperature	

average for elements with available scores = 0.5 Limiting Factors

Equation #9 = 0.11 Food/Cover

average for elements with available scores = 0.75 Water Quality (WQ)

average for available scores = 0.45 Fish (Tidal) FCI

Equation #9:

$$\frac{7c\,[8c + (1-x)(10d) + (x)(10f) + 21b + 22b]}{4}$$

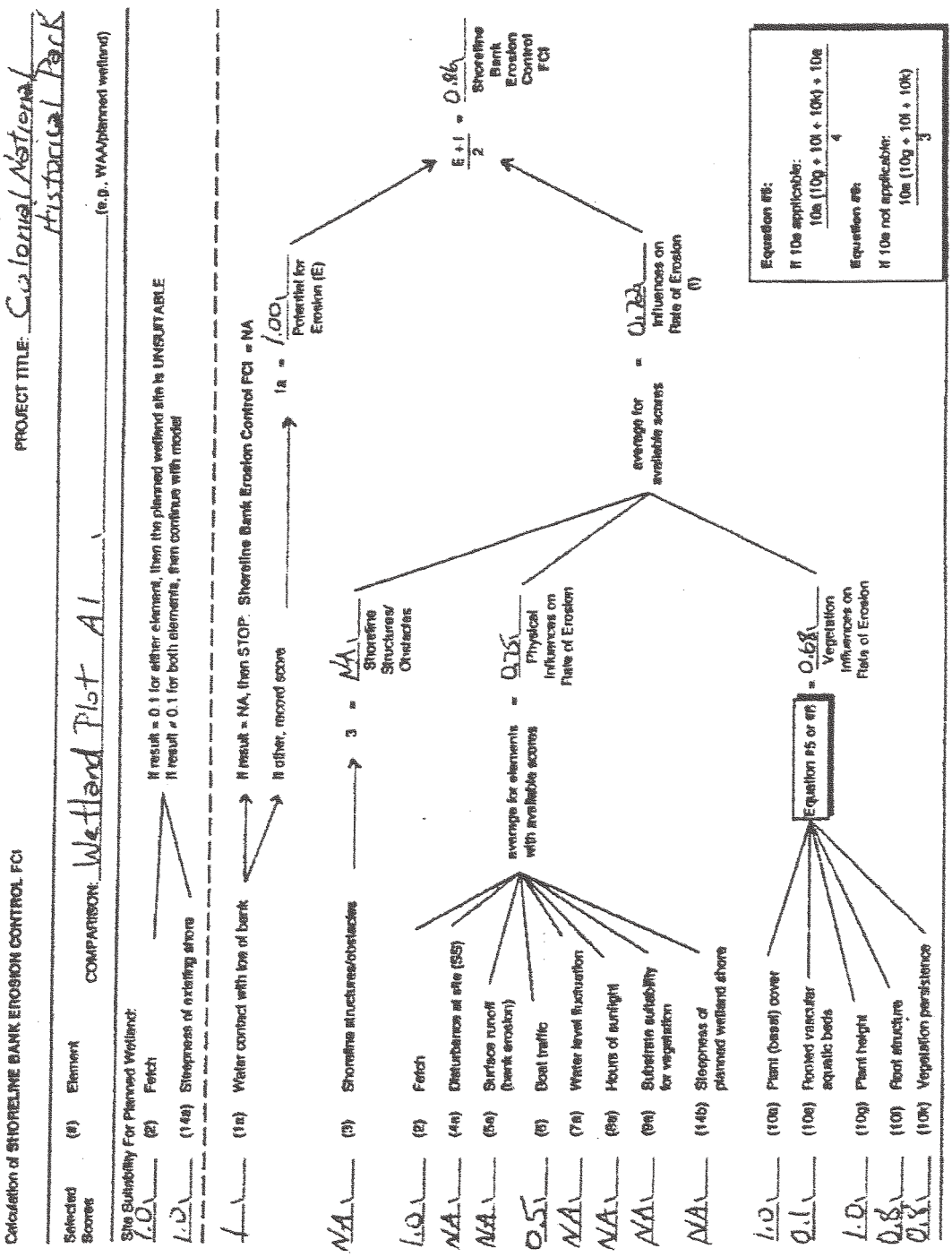
where x = portion of AREA which is represented by lower shore zone in increments of 0.1 (e.g., 0.1, 0.2, 0.3, ... 1.0)

8–67

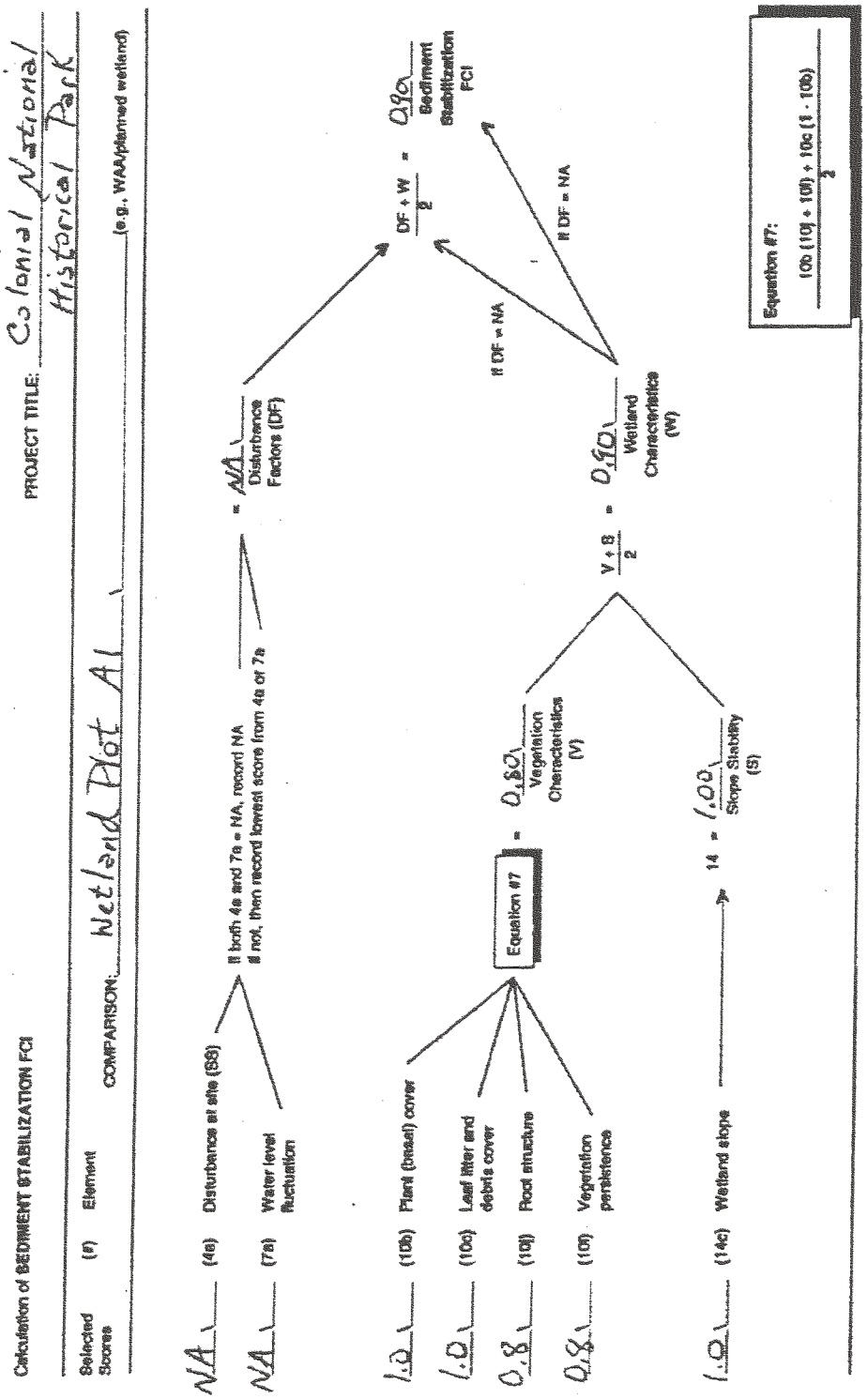
PROJECT TITLE: The Jamestown Project

Calculation of UNIQUENESS/HERITAGE FCI

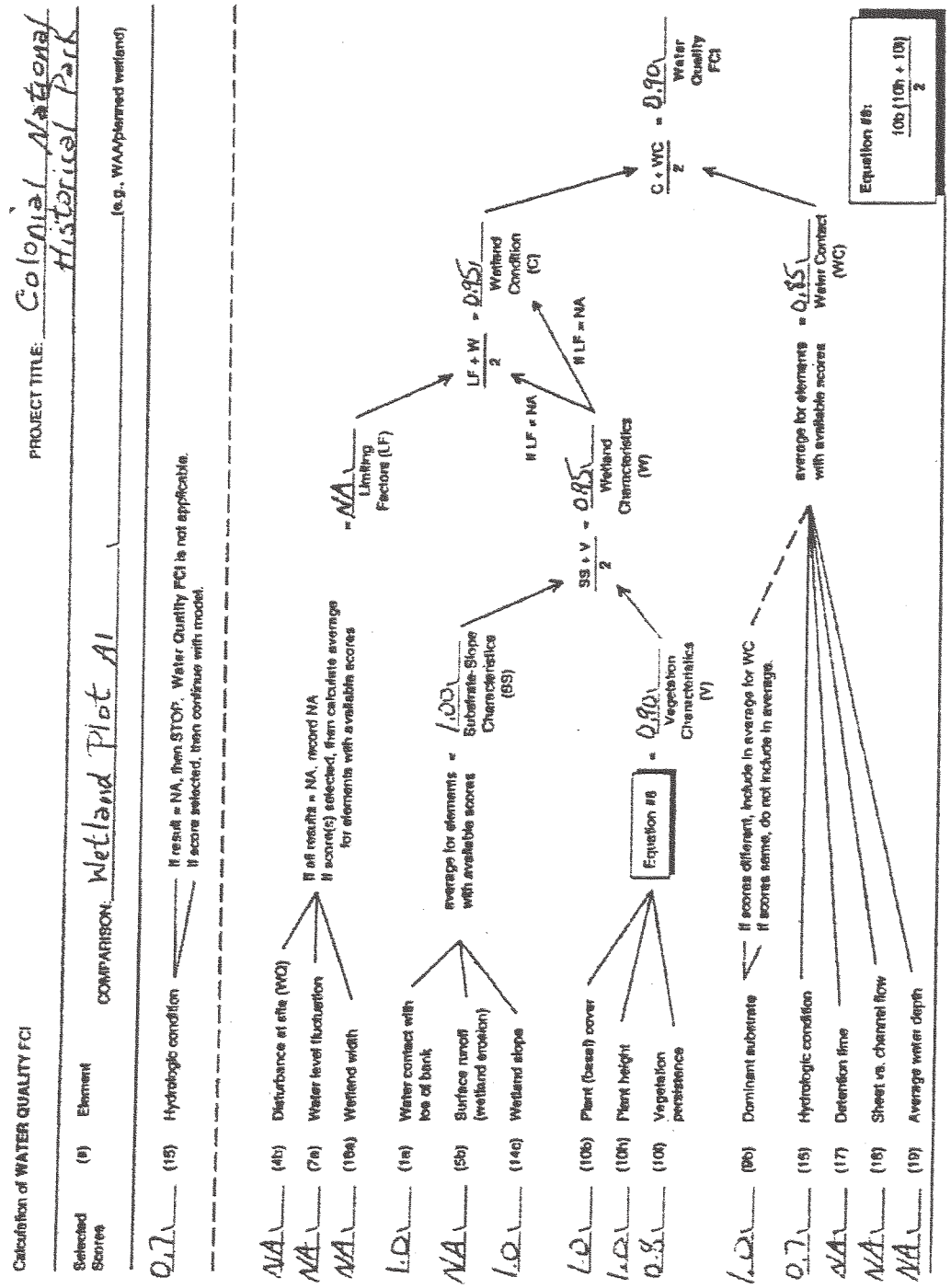
Selected Scores	(#)	Element	COMPARISON: Wetland # 14 (e.g., WAA/planned wetland)
NA	(29)	Endangered species	
NA	(30)	Rarity	
NA	(31)	Unique features	
1.0	(32)	Historical or archaeological significance	average for elements with available scores = 1.0 Uniqueness/ Heritage FCI
1.0	(33)	Natural landmark	
NA	(34)	Connected to Wild and Scenic River	
1.0	(35)	Park, sanctuary, etc.	
NA	(36)	Scientific research site	



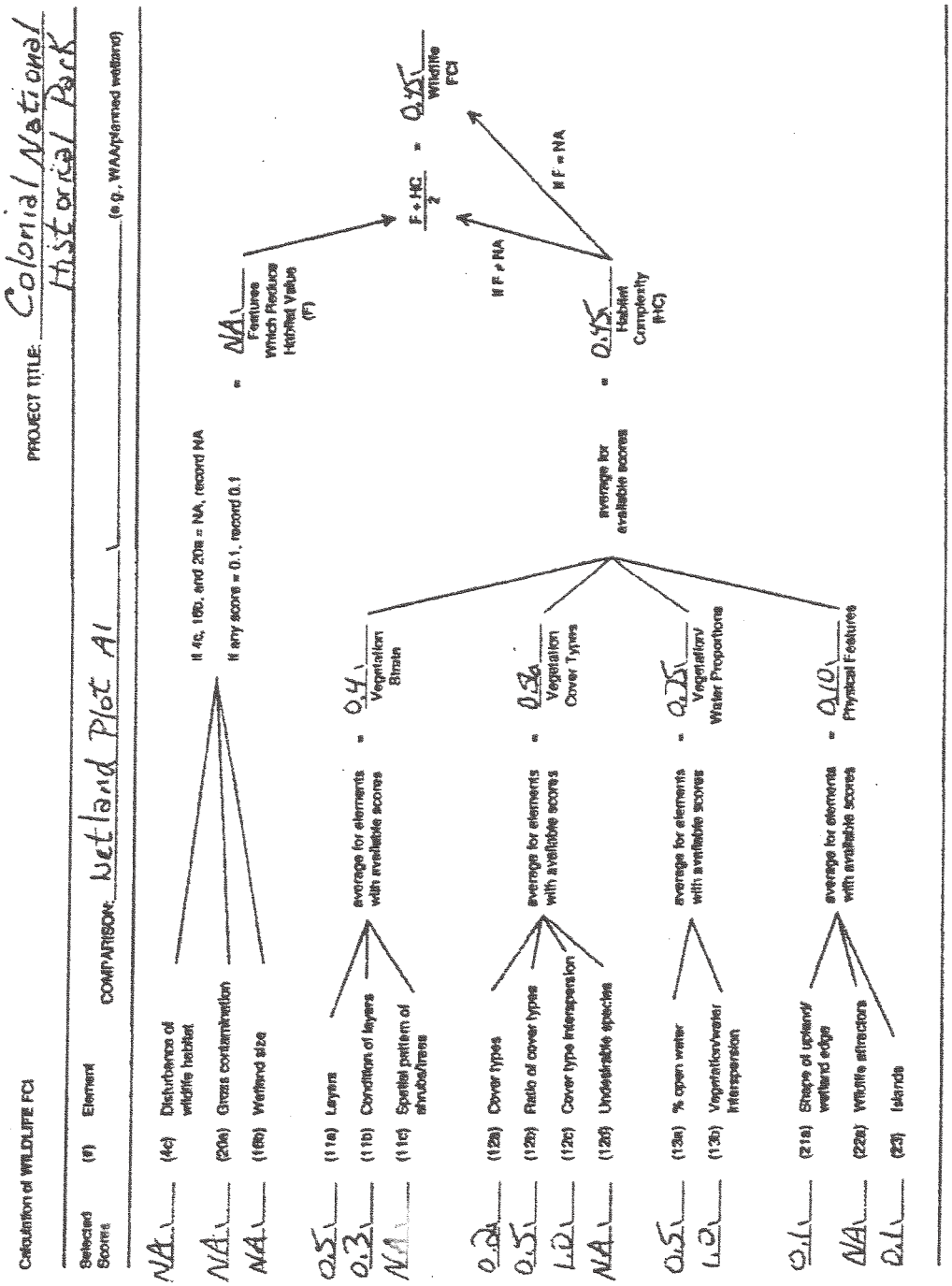
Colonial Historical Park Page 30



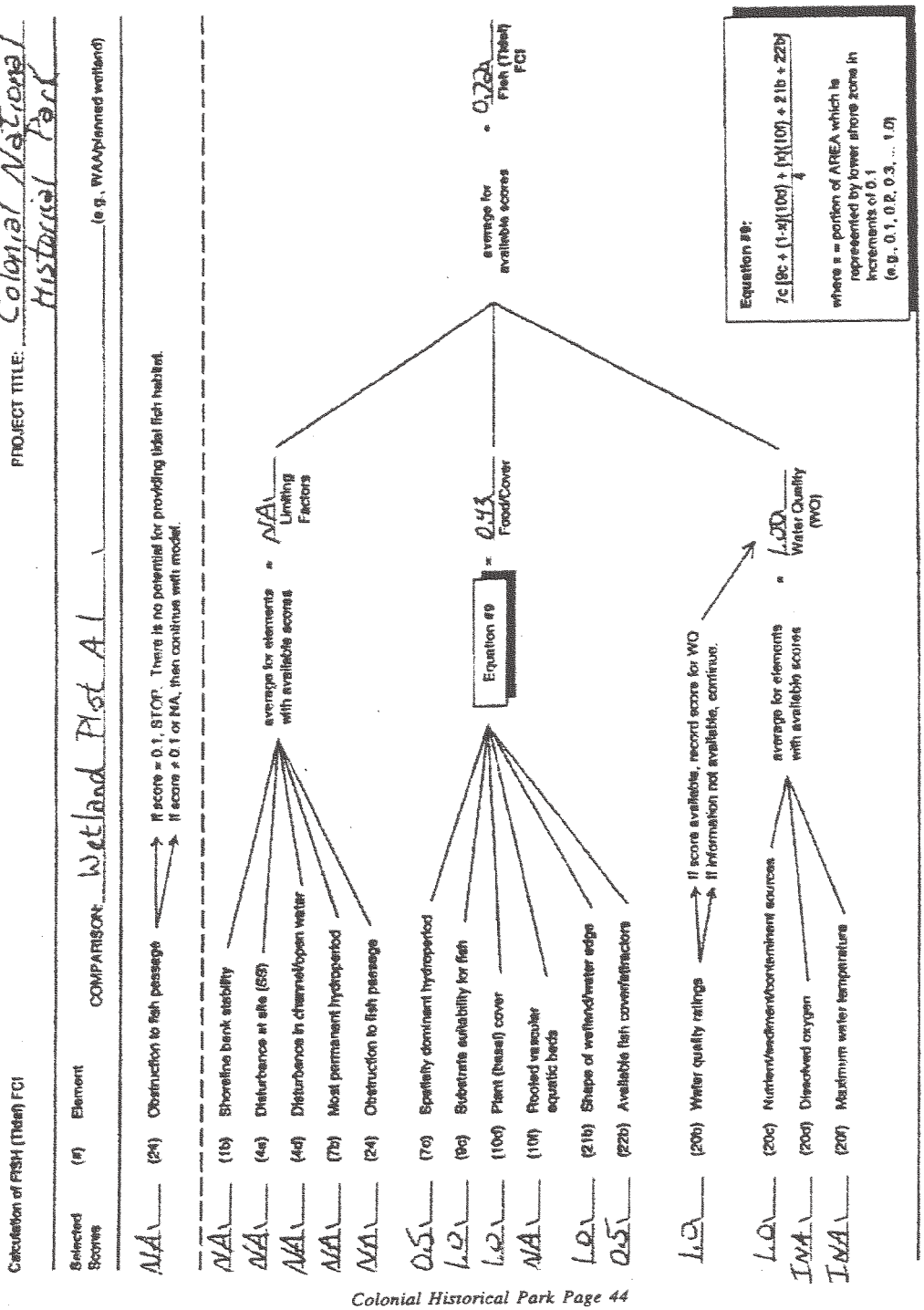
Colonial Historical Park Page 32



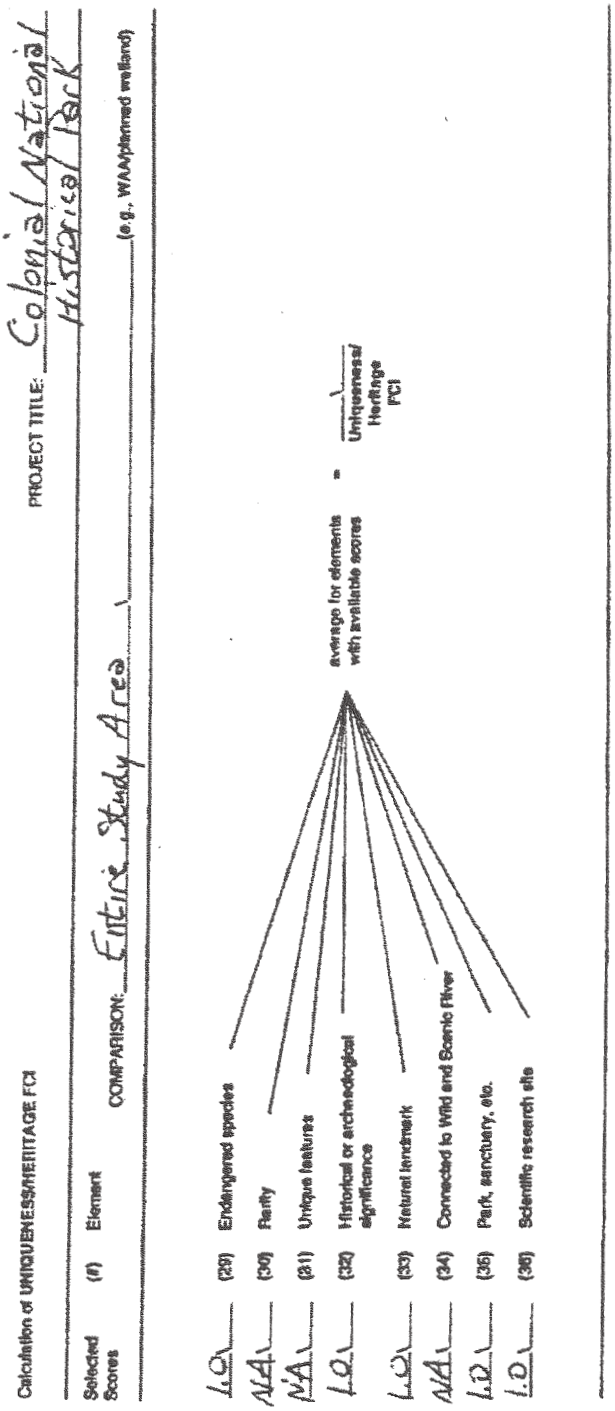
Colonial Historical Park Page 36



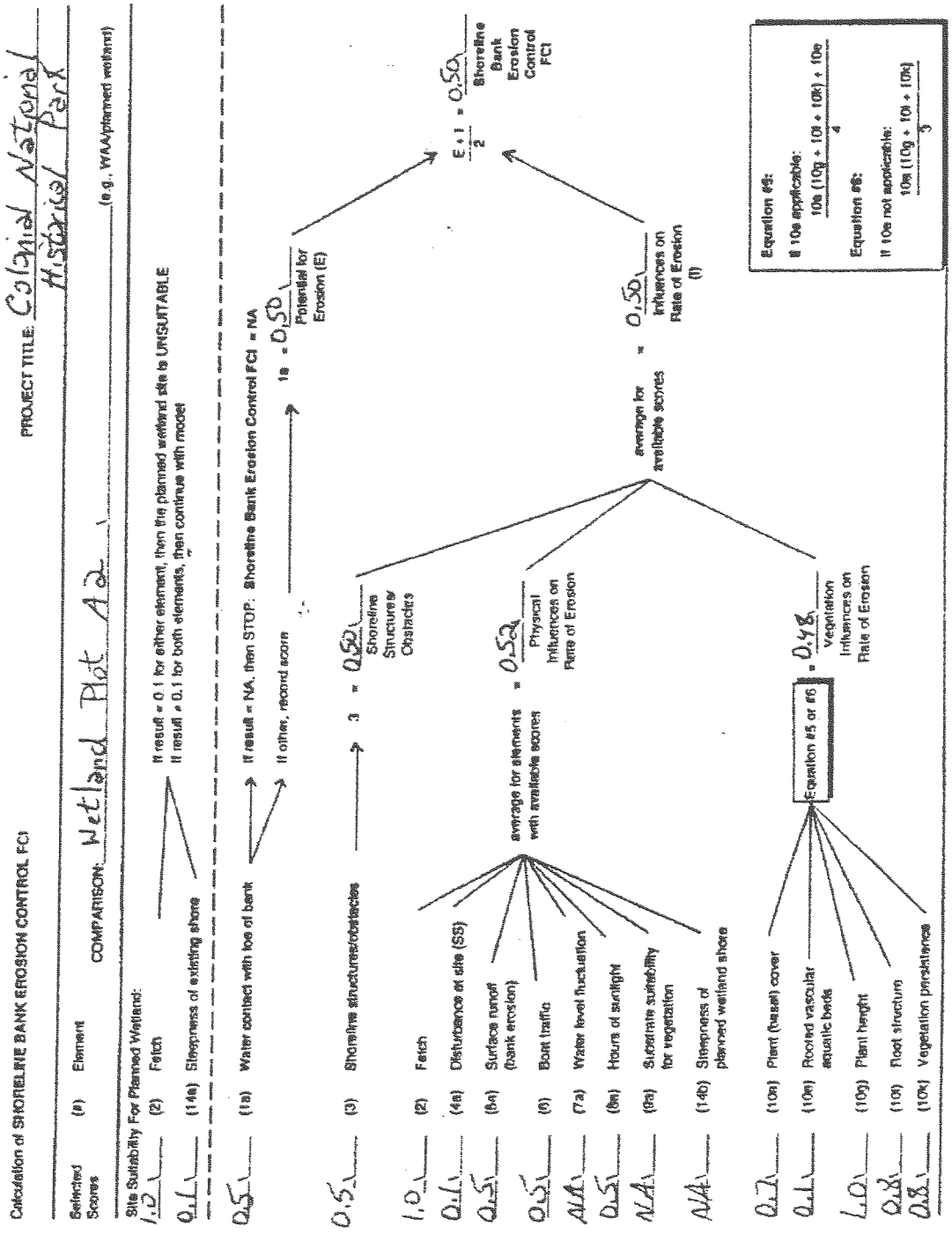
Colonial Historical Park Page 40



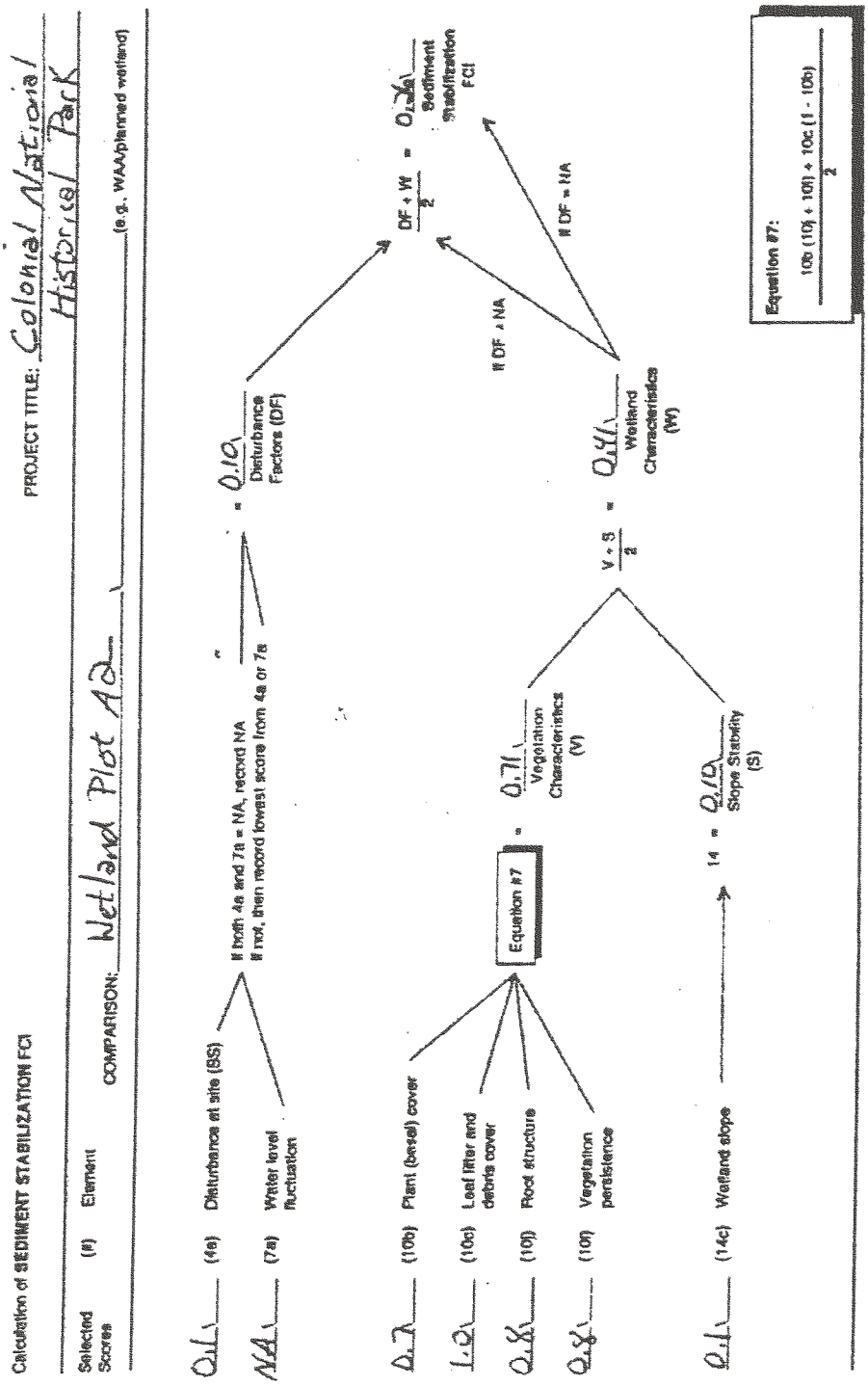
Colonial Historical Park Page 44



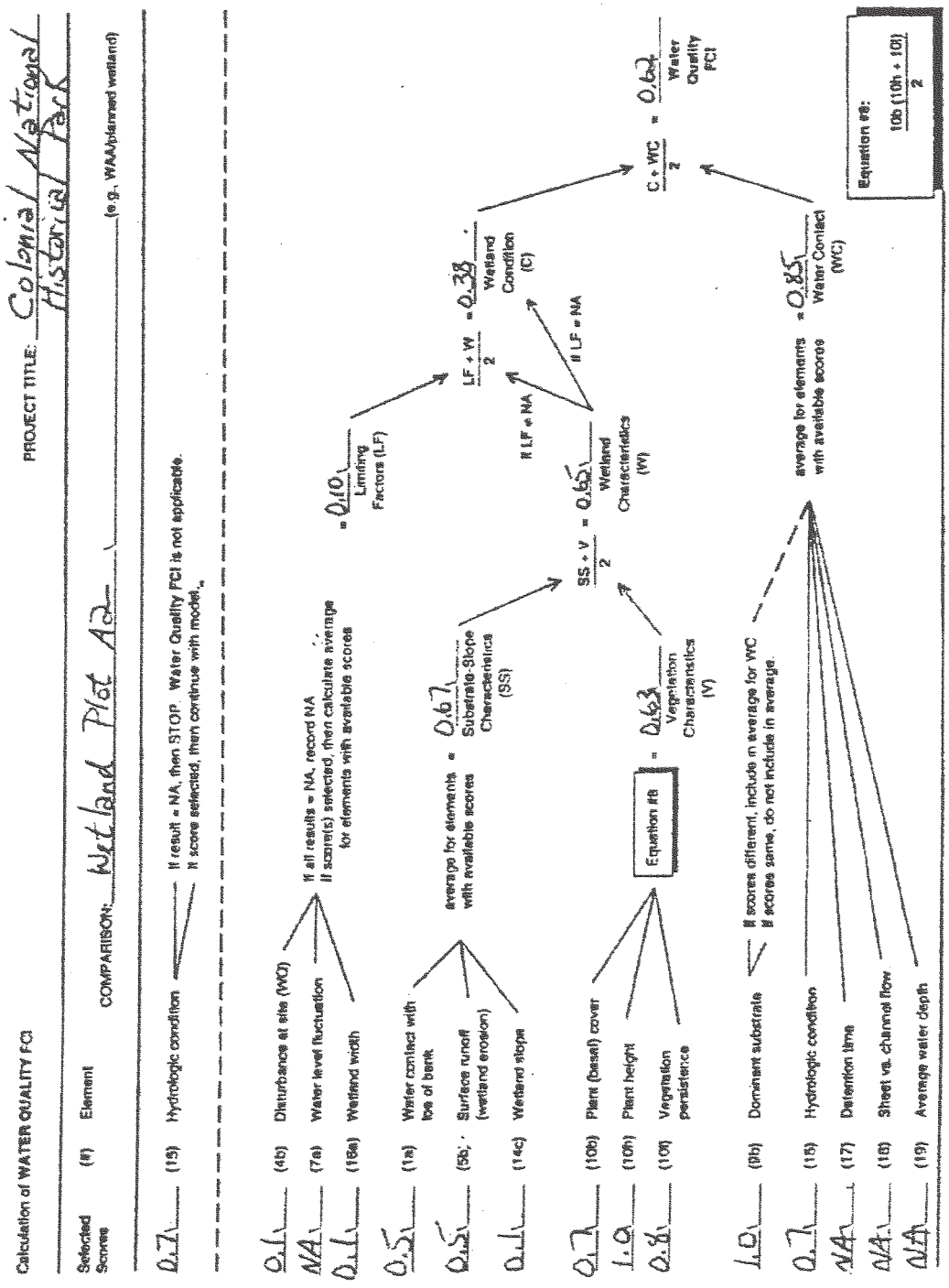
Colonial Historical Park Page 46



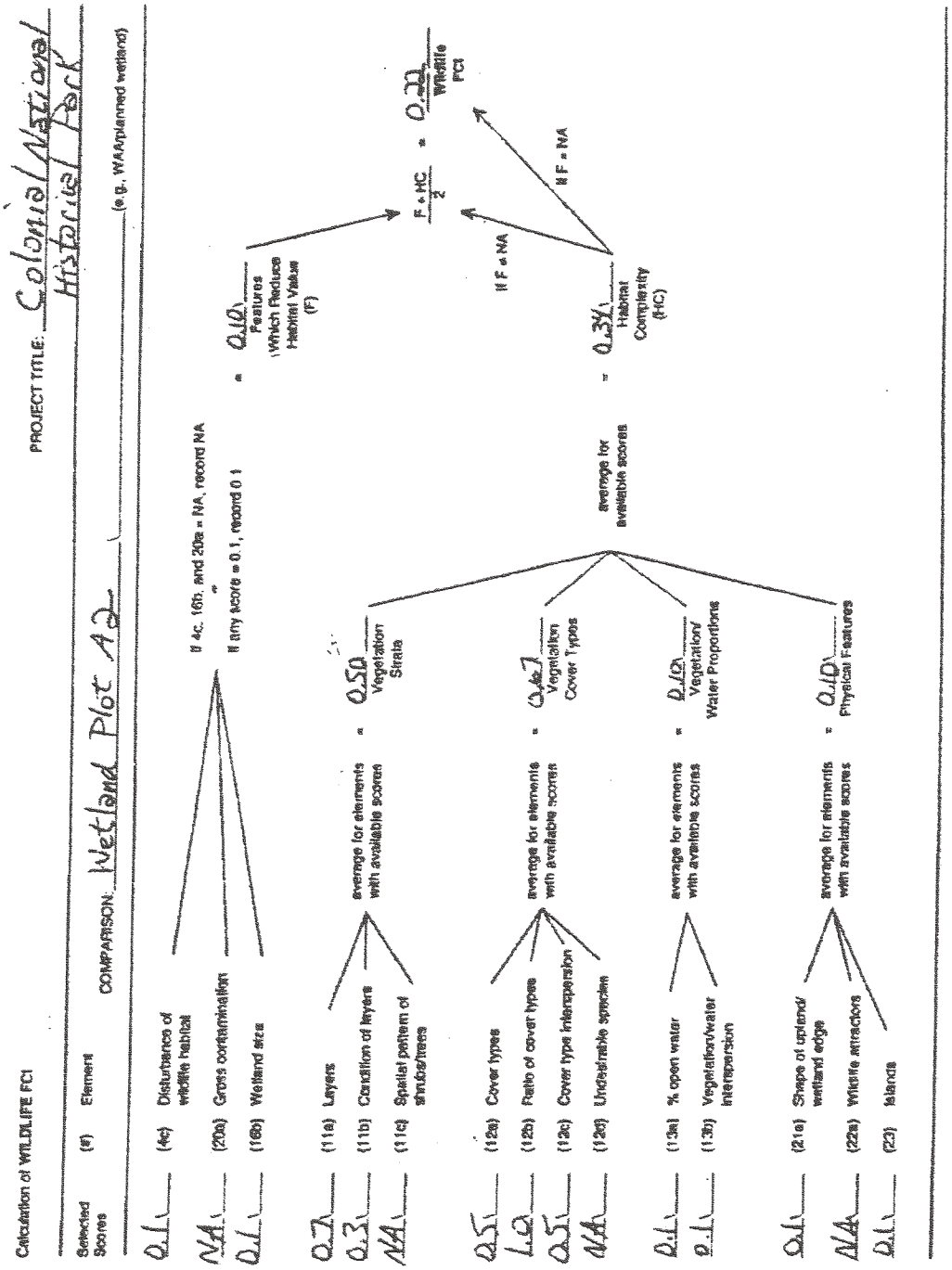
Colonial Historical Park Page 31



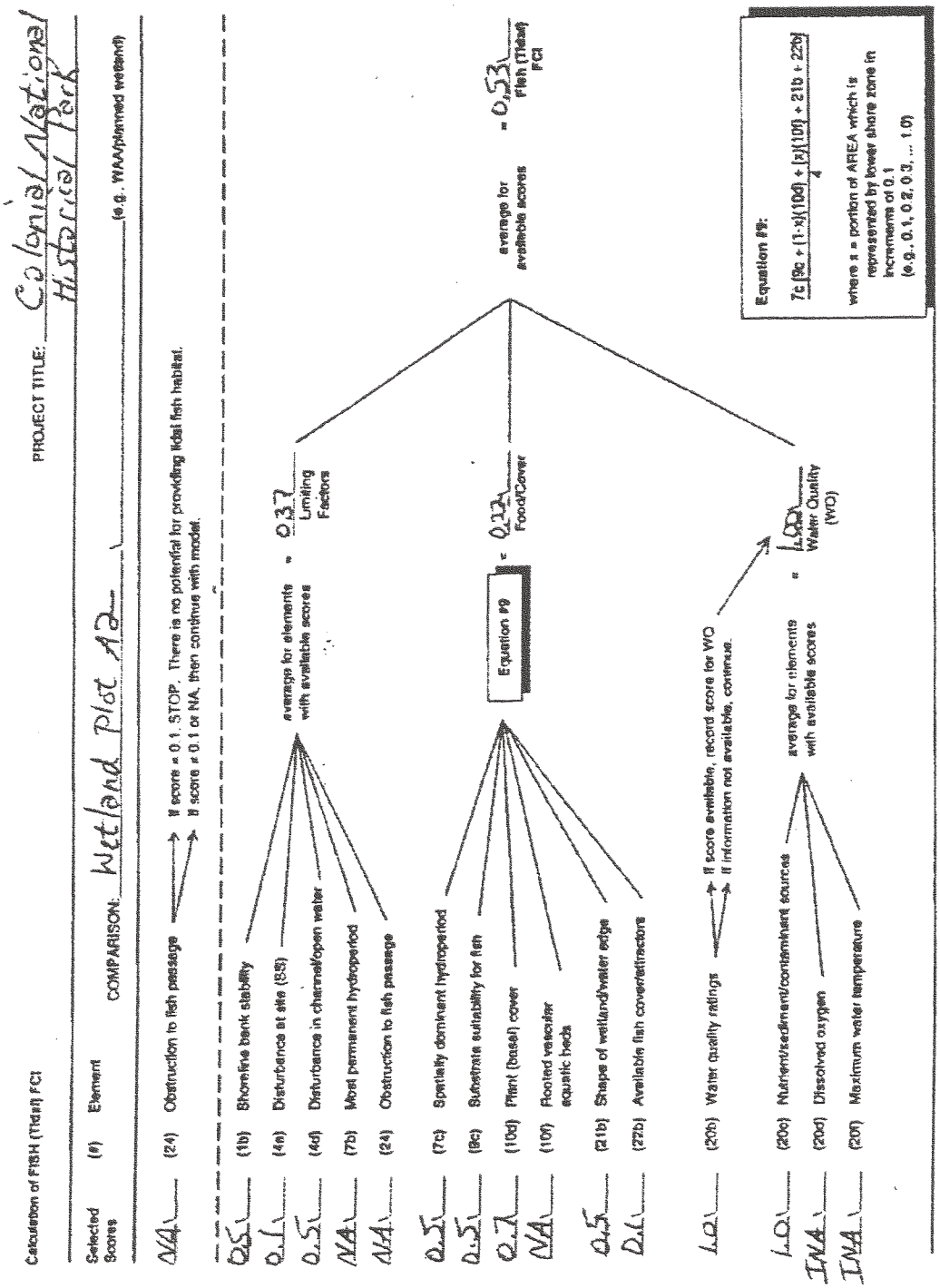
Colonial Historical Park Page 33



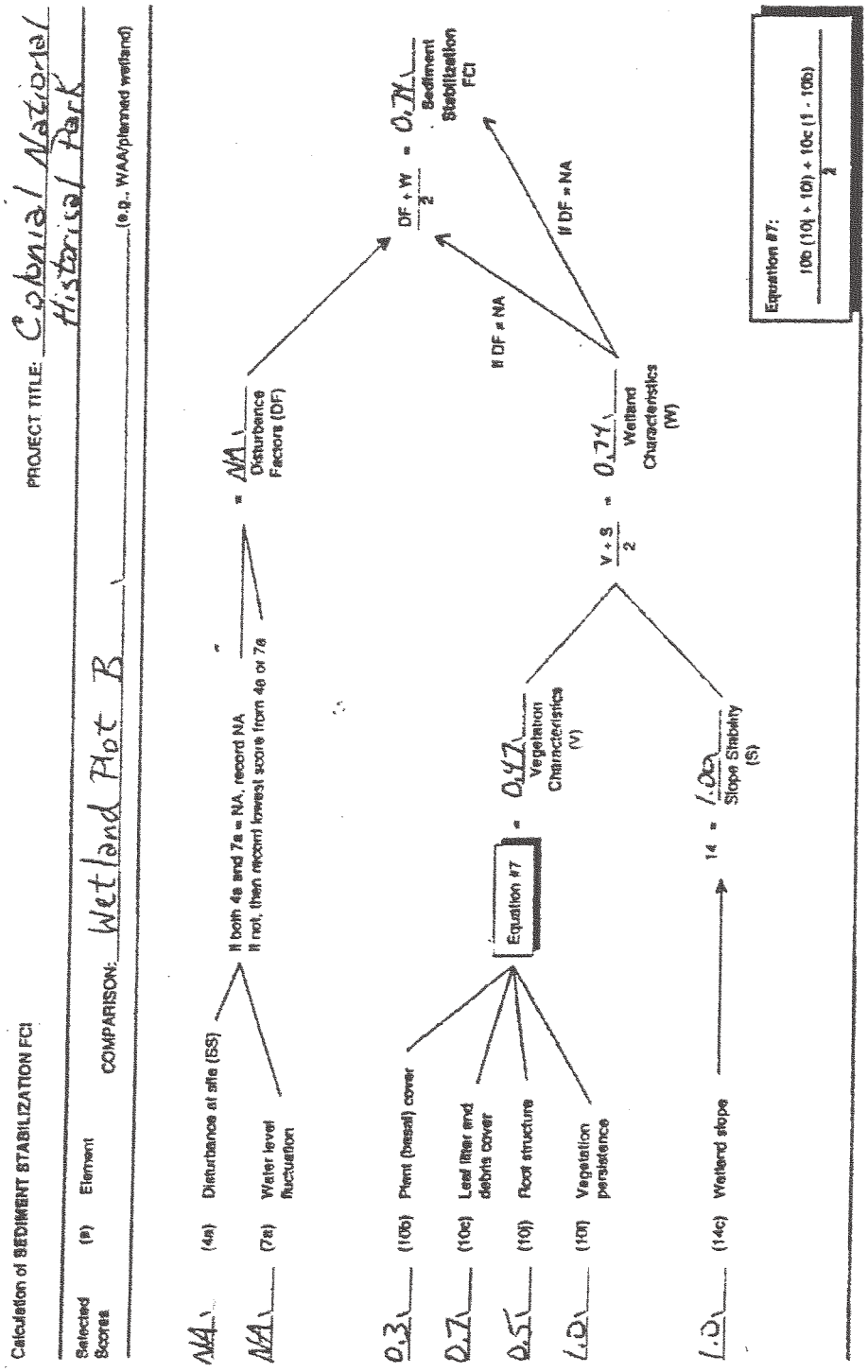
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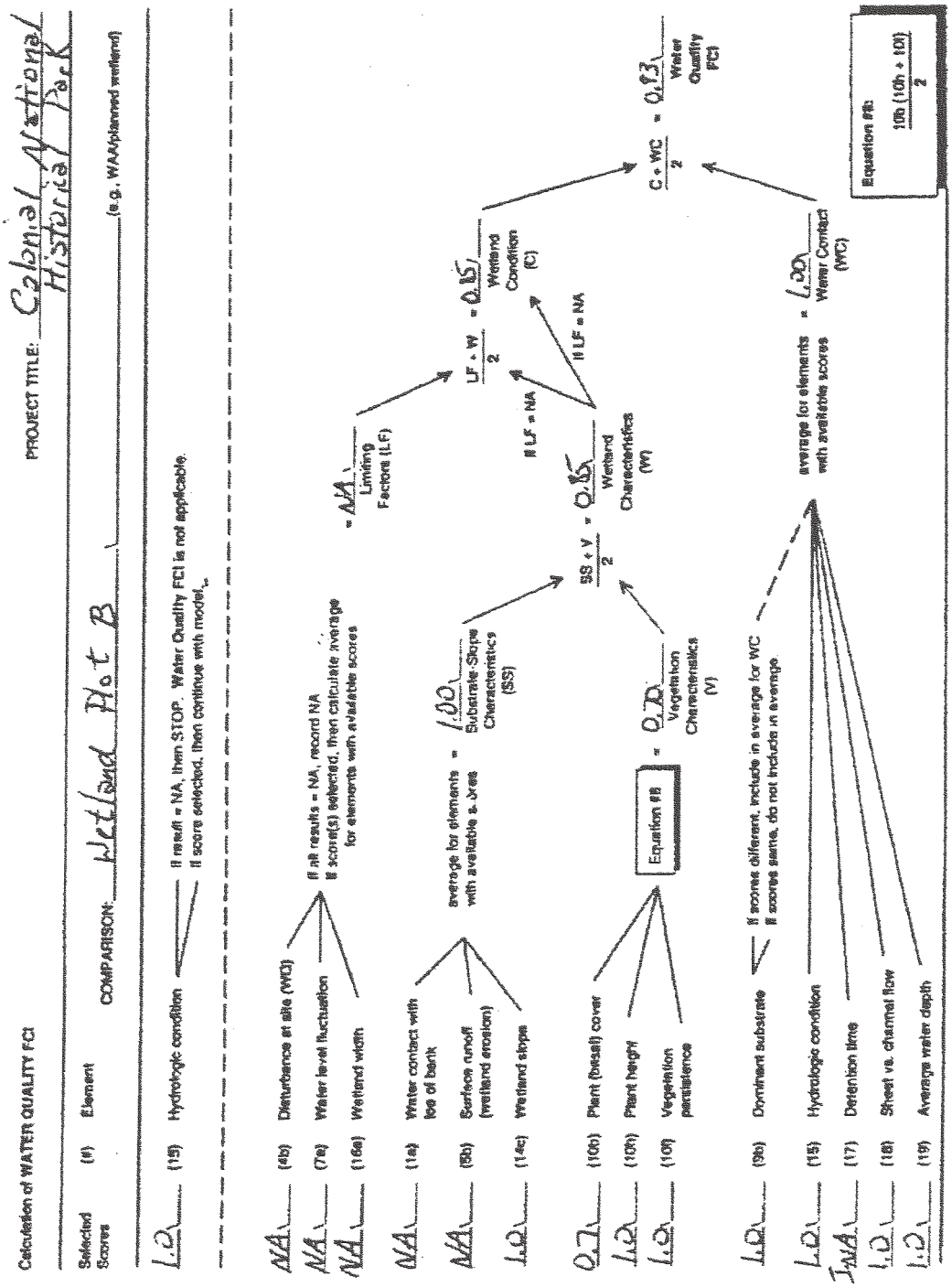
Colonial Historical Park Page 41

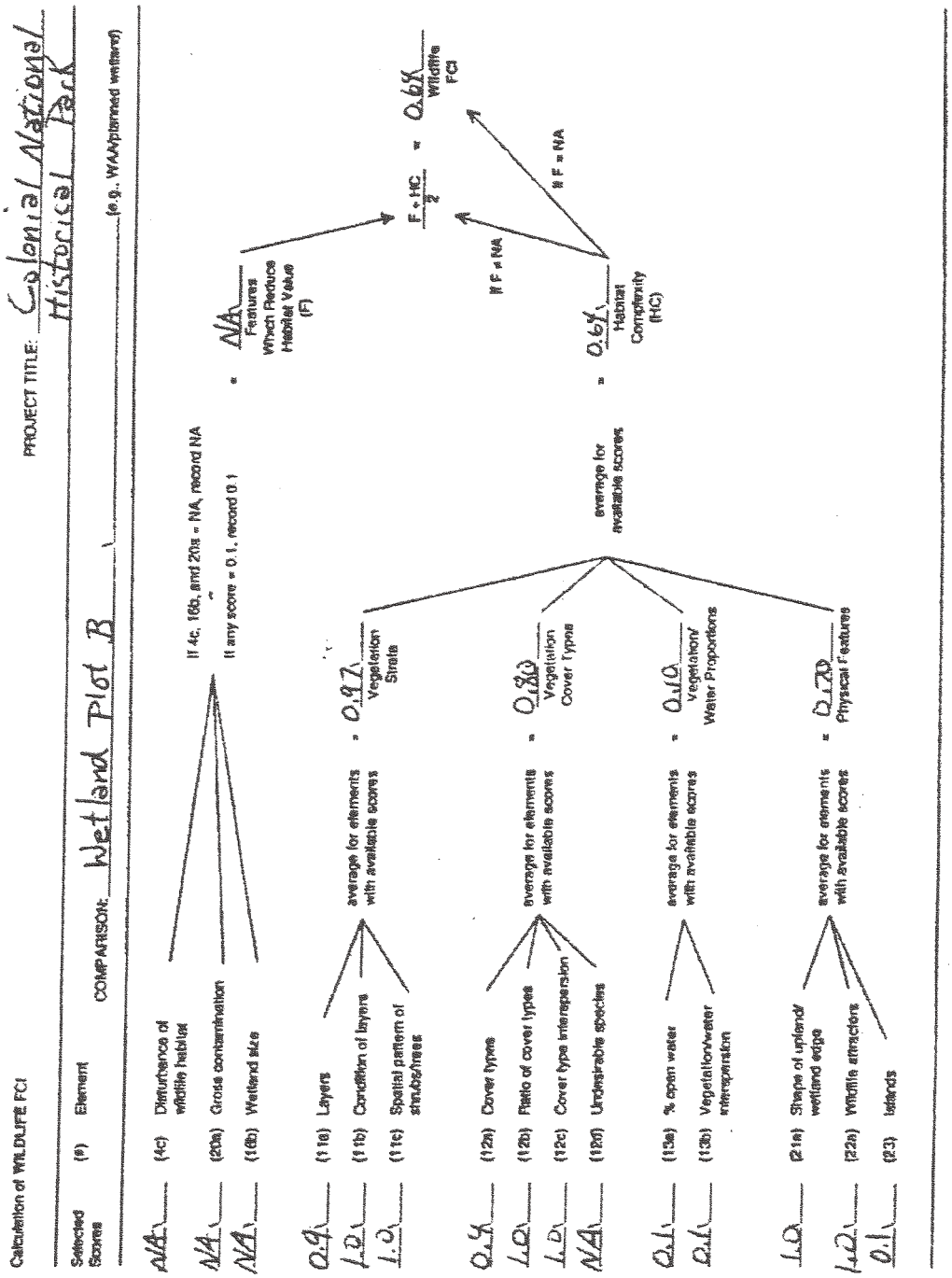


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Colonial Historical Park Page 34


Calculation of WATER QUALITY FCI
PROJECT TITLE: Colonial Historical Park
Selected Scores
(#) Element
COMPARISON: Wetland Plot B
(e.g. WAA/planned wetland)
1.0 (15) Hydrologic condition
If result = NA, then STOP. Water Quality FCI is not applicable.
If score selected, then continue with model.
NA (4b) Disturbance at site (WC)
NA (7a) Water level fluctuation
NA (16a) Wetland width
If all results = NA, record NA
If score(s) selected, then calculate average for elements with available scores
= NA Limiting Factors (LF)
NA (1a) Water contact with toe of bank
NA (5b) Surface runoff (wetland erosion)
1.0 (14c) Wetland slope
average for elements with available scores = 1.00 Substrate-Slope Characteristics (SS)
0.7 (10b) Plant (basal) cover
1.0 (10h) Plant height
1.0 (10f) Vegetation persistence
Equation #8 = 0.70 Vegetation Characteristics (V)
SS + V / 2 = 0.85 Wetland Characteristics (W)
LF + W / 2 = 0.85 Wetland Condition (C)
If LF = NA
If LF = NA
C + WC / 2 = 0.93 Water Quality FCI
1.0 (9b) Dominant substrate
If scores different, include in average for WC
If scores same, do not include in average
1.0 (15) Hydrologic condition
1.0 (17) Detention time
1.0 (18) Sheet vs. channel flow
1.0 (19) Average water depth
average for elements with available scores = 1.00 Water Contact (WC)
Equation #8: 10b (10h + 10f) / 2



Colonial Historical Park Page 42

H

Appendix H:
Air Quality Data

mawald.checkin.31005.03.subdividers.p65

A Air Quality Data

- MOBILE5b Input Files
- MOBILE5b Output Summary
- Microscale Link Maps
- CAL3QHC Input Files
- CAL3QHC Output Files
- Microscale Results Summary
- Mesoscale Results – NOx
- Mesoscale Results - VOC

MOBILE5b Input Files

```
1    PROMPT
James City County - 2001 CO EMISSIONS, RFG, AND NLEV
1    TAMFLG
1    SPDFLG
2    VMFLAG    BASED ON 1990 DATA
3    MYMRFG    BASED ON 1999 DATA
2    NEWFLG
1    IMFLAG
1    ALHFLG
1    ATPFLG
1    RLFLAG
1    LOCFLG
2    TEMFLG
4    OUTFMT
2    PRTFLG
1    IDLFLG
1    NMHFLG
1    HCFLAG
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roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 21.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 22.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 23.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
```

```
.674.208.094.010.002.001.010.001
4 01 24.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 25.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 26.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 27.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 28.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 29.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 30.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 31.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 31.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 32.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 33.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 34.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 35.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 36.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 37.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 38.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 39.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
```

```
.674.208.094.010.002.001.010.001
4 01 40.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 41.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 42.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 43.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 44.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 45.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 46.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 47.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 48.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 49.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 50.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 51.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 52.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 53.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 54.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 55.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 56.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
```

```
.674.208.094.010.002.001.010.001
4 01 57.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 58.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 59.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 60.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 61.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 62.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 63.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 64.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 65.0 30.0 50.0 10.0 50.0 1
```

```
1    PROMPT
James City County - 2020 CO EMISSIONS, RFG, AND NLEV
1    TAMFLG
1    SPDFLG
2    VMFLAG    BASED ON 1990 DATA
3    MYMRFG    BASED ON 1999 DATA
2    NEWFLG
1    IMFLAG
1    ALHFLG
1    ATPFLG
1    RLFLAG
1    LOCFLG
2    TEMFLG
4    OUTFMT
2    PRTFLG
1    IDLFLG
1    NMHFLG
1    HCFLAG
0.0700.0660.0700.0630.0780.0700.0680.0590.0560.055
0.0540.0500.0490.0450.0330.0260.0160.0090.0080.007
0.0070.0060.0050.0030.028
0.0840.0960.0940.0840.0880.0850.0710.0540.0450.043
0.0480.0450.0330.0330.0200.0170.0100.0060.0050.005
0.0050.0040.0030.0020.022
0.1360.0940.0810.0620.0710.0640.0390.0310.0200.030
0.0380.0360.0280.0310.0230.0190.0130.0060.0060.008
0.0240.0320.0210.0110.077
0.1160.0720.0820.0550.0810.0550.0390.0310.0190.036
0.0540.0440.0340.0530.0380.0300.0180.0120.0120.014
0.0130.0110.0090.0050.070
0.0700.0660.0700.0630.0780.0700.0680.0590.0560.055
0.0540.0500.0490.0450.0330.0260.0160.0090.0080.007
0.0070.0060.0050.0030.028
0.0840.0960.0940.0840.0880.0850.0710.0540.0450.043
0.0480.0450.0330.0330.0200.0170.0100.0060.0050.005
0.0050.0040.0030.0020.022
0.0720.0960.0290.1200.0140.0770.0480.0910.1060.087
0.0720.0340.0530.0240.0100.0050.0100.0000.0050.010
0.0050.0100.0050.0000.019
0.1200.0710.0710.0600.0410.0530.0440.0230.0250.012
0.0320.4470.0000.0000.0000.0000.0000.0000.0000.000
0.0000.0000.0000.0000.000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
4 20 02.5 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 03.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 04.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 05.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 06.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
```

```
.674.208.094.010.002.001.010.001
4 20 07.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 08.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 09.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 10.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 20 11.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 12.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 13.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 14.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 15.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 16.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 17.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 18.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 19.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 20.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 20 21.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 22.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 23.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
```

```
.674.208.094.010.002.001.010.001
4 20 24.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 25.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 26.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 27.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 28.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 29.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 30.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 20 31.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 20 31.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 32.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 33.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 34.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 35.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 36.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 37.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 38.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 39.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
```

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.674.208.094.010.002.001.010.001
4 20 40.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 20 41.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 42.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 43.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 44.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 45.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 46.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 47.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 48.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 49.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 50.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 20 51.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 52.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 53.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 54.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 55.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 56.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
```

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.674.208.094.010.002.001.010.001
4 20 57.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 58.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 59.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 60.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 170      B  30.  30.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 20 61.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 62.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 63.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 64.0 30.0 50.0 10.0 50.0 1
99 1
roadscc 150      B  30.  30.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 65.0 30.0 50.0 10.0 50.0 1
```

```
5    PROMPT
James City County - 2001 OZONE, RFG, AND NLEV
1    TAMFLG
1    SPDFLG
2    VMFLAG    BASED ON 1990 DATA
3    MYMRFG    BASED ON 1999 DATA
2    NEWFLG
1    IMFLAG
1    ALHFLG
1    ATPFLG
1    RLFLAG
1    LOCFLG
1    TEMFLG
4    OUTFMT
4    PRTFLG
1    IDLFLG
3    NMHFLG
1    HCFLAG
0.0700.0660.0700.0630.0780.0700.0680.0590.0560.055
0.0540.0500.0490.0450.0330.0260.0160.0090.0080.007
0.0070.0060.0050.0030.028
0.0840.0960.0940.0840.0880.0850.0710.0540.0450.043
0.0480.0450.0330.0330.0200.0170.0100.0060.0050.005
0.0050.0040.0030.0020.022
0.1360.0940.0810.0620.0710.0640.0390.0310.0200.030
0.0380.0360.0280.0310.0230.0190.0130.0060.0060.008
0.0240.0320.0210.0110.077
0.1160.0720.0820.0550.0810.0550.0390.0310.0190.036
0.0540.0440.0340.0530.0380.0300.0180.0120.0120.014
0.0130.0110.0090.0050.070
0.0700.0660.0700.0630.0780.0700.0680.0590.0560.055
0.0540.0500.0490.0450.0330.0260.0160.0090.0080.007
0.0070.0060.0050.0030.028
0.0840.0960.0940.0840.0880.0850.0710.0540.0450.043
0.0480.0450.0330.0330.0200.0170.0100.0060.0050.005
0.0050.0040.0030.0020.022
0.0720.0960.0290.1200.0140.0770.0480.0910.1060.087
0.0720.0340.0530.0240.0100.0050.0100.0000.0050.010
0.0050.0100.0050.0000.019
0.1200.0710.0710.0600.0410.0530.0440.0230.0250.012
0.0320.4470.0000.0000.0000.0000.0000.0000.0000.000
0.0000.0000.0000.0000.000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
4 01 02.5 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 03.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 04.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 05.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 06.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
```

```
.674.208.094.010.002.001.010.001
4 01 07.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 08.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 09.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 10.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 11.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 12.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 13.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 14.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 15.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 16.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 17.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 18.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 19.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 20.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 21.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 22.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 23.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
```

```
.674.208.094.010.002.001.010.001
4 01 24.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 25.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 26.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 27.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 28.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 29.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 30.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 31.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 31.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 32.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 33.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 34.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 35.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 36.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 37.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 38.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 39.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
```

```
.674.208.094.010.002.001.010.001
4 01 40.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 41.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 42.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 43.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 44.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 45.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 46.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 47.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 48.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 49.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 50.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 51.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 52.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 53.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 54.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 55.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 56.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
```

```
.674.208.094.010.002.001.010.001
4 01 57.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 58.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 59.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 60.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 01 61.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 62.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 63.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 64.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 01 65.0 84.9 20.6 27.3 20.6 7
```

```
5    PROMPT
James City County - 2020 OZONE, RFG, AND NLEV
1    TAMFLG
1    SPDFLG
2    VMFLAG    BASED ON 1990 DATA
3    MYMRFG    BASED ON 1999 DATA
2    NEWFLG
1    IMFLAG
1    ALHFLG
1    ATPFLG
1    RLFLAG
1    LOCFLG
1    TEMFLG
4    OUTFMT
4    PRTFLG
1    IDLFLG
3    NMHFLG
1    HCFLAG
0.0700.0660.0700.0630.0780.0700.0680.0590.0560.055
0.0540.0500.0490.0450.0330.0260.0160.0090.0080.007
0.0070.0060.0050.0030.028
0.0840.0960.0940.0840.0880.0850.0710.0540.0450.043
0.0480.0450.0330.0330.0200.0170.0100.0060.0050.005
0.0050.0040.0030.0020.022
0.1360.0940.0810.0620.0710.0640.0390.0310.0200.030
0.0380.0360.0280.0310.0230.0190.0130.0060.0060.008
0.0240.0320.0210.0110.077
0.1160.0720.0820.0550.0810.0550.0390.0310.0190.036
0.0540.0440.0340.0530.0380.0300.0180.0120.0120.014
0.0130.0110.0090.0050.070
0.0700.0660.0700.0630.0780.0700.0680.0590.0560.055
0.0540.0500.0490.0450.0330.0260.0160.0090.0080.007
0.0070.0060.0050.0030.028
0.0840.0960.0940.0840.0880.0850.0710.0540.0450.043
0.0480.0450.0330.0330.0200.0170.0100.0060.0050.005
0.0050.0040.0030.0020.022
0.0720.0960.0290.1200.0140.0770.0480.0910.1060.087
0.0720.0340.0530.0240.0100.0050.0100.0000.0050.010
0.0050.0100.0050.0000.019
0.1200.0710.0710.0600.0410.0530.0440.0230.0250.012
0.0320.4470.0000.0000.0000.0000.0000.0000.0000.000
0.0000.0000.0000.0000.000
004
1 7 3 90 90 05.639 00.000
1 7 3 91 97 04.598 00.000
1 7 3 98 03 03.679 00.000
1 7 3 04 20 01.840 00.000
4 20 02.5 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 03.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 04.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 05.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 06.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
```

```
.674.208.094.010.002.001.010.001
4 20 07.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 08.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 09.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 10.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 20 11.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 12.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 13.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 14.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 15.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 16.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 17.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 18.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 19.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 20.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 20 21.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 22.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 23.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
```

```
.674.208.094.010.002.001.010.001
4 20 24.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 25.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 26.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 27.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 28.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 29.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 30.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 20 31.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 32.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 33.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 34.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 35.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 36.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 37.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 38.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 39.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 40.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
```

```
.643.198.090.027.001.001.037.003
4 20 41.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 42.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 43.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 44.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 45.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 46.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 47.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 48.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 49.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 50.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 20 51.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 52.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 53.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 54.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 55.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 56.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 57.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
```

```
.674.208.094.010.002.001.010.001
4 20 58.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 59.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 60.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 170      B  74.  95.  7.8  7.8 92 1 1 2
.643.198.090.027.001.001.037.003
4 20 61.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 62.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 63.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 64.0 84.9 20.6 27.3 20.6 7
99 1
roadscc 150      B  74.  95.  7.8  7.8 92 1 1 2
.674.208.094.010.002.001.010.001
4 20 65.0 84.9 20.6 27.3 20.6 7
```

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MOBILE5b Output Summary

James City County Virginia

2001 Microscale Analysis

Carbon Monoxide Emission Factors

Vehicle Speed (mph)	Emission Factor (g/veh-mile)
2.5	198.53
3	168.95
4	131.58
5	108.90
6	93.69
7	82.77
8	74.57
9	68.19
10	61.97
11	58.92
12	55.45
13	52.51
14	50.00
15	47.82
16	45.92
17	44.23
18	42.74
19	41.40
20	38.87
21	37.77
22	35.96
23	34.30
24	32.77
25	31.37
26	30.07
27	28.87
28	27.75
29	26.71
30	25.16
31	24.28
32	24.83
33	23.98
34	23.18
35	22.43
36	21.72
37	21.05
38	20.42
39	19.82
40	19.26
41	18.35
42	18.22
43	17.74
44	17.29
45	16.85
46	16.44
47	16.05
48	15.67
49	15.32
50	15.32
51	15.09
52	15.32
53	15.33
54	15.33
55	15.33
56	15.34
57	17.14
58	18.94
59	20.75
60	22.55
61	23.85
62	26.17
63	27.97
64	29.78
65	31.59

NOTE: Emission factors were calculated by MOBILE5b and represent a composite vehicle type during winter conditions.

James City County

2020 Microscale Analysis

Carbon Monoxide Emission Factors

Vehicle Speed (mph)	Emission Factor (g/veh-mile)
2.5	131.53
3	112.50
4	88.68
5	74.35
6	64.78
7	57.93
8	52.78
9	48.77
10	44.85
11	42.92
12	40.73
13	38.86
14	37.27
15	35.88
16	34.67
17	33.60
18	32.65
19	31.80
20	29.83
21	28.81
22	27.28
23	25.88
24	24.59
25	23.41
26	22.32
27	21.31
28	20.37
29	19.50
30	18.30
31	17.56
32	17.92
33	17.21
34	16.54
35	15.91
36	15.31
37	14.75
38	14.22
39	13.72
40	13.24
41	12.58
42	12.36
43	11.95
44	11.56
45	11.19
46	10.83
47	10.49
48	10.17
49	9.86
50	9.86
51	9.77
52	9.86
53	9.86
54	9.87
55	9.87
56	9.87
57	10.70
58	11.53
59	12.36
60	13.19
61	13.84
62	14.85
63	15.68
64	16.51
65	17.34

NOTE: Emission factors were calculated by MOBILE5b and represent a composite vehicle type during winter conditions.

James City County

2001 Mesoscale Analysis
Emission Factors

Vehicle Speed (mph)	Volatile Organics (g/veh-mile)	Nitrogen Oxides (g/veh-mile)
2.5	11.02	2.23
3	8.91	2.10
4	6.51	1.93
5	5.20	1.83
6	4.38	1.76
7	3.82	1.71
8	3.47	1.67
9	3.20	1.64
10	3.04	1.95
11	2.80	1.59
12	2.64	1.58
13	2.51	1.56
14	2.40	1.55
15	2.30	1.54
16	2.22	1.53
17	2.14	1.52
18	2.07	1.51
19	2.01	1.50
20	1.98	1.76
21	1.87	1.50
22	1.81	1.51
23	1.76	1.51
24	1.71	1.52
25	1.66	1.52
26	1.62	1.52
27	1.57	1.53
28	1.54	1.53
29	1.50	1.54
30	1.50	1.78
31	1.47	1.78
32	1.44	1.54
33	1.41	1.55
34	1.38	1.55
35	1.35	1.55
36	1.33	1.55
37	1.30	1.56
38	1.28	1.56
39	1.26	1.56
40	1.24	1.57
41	1.25	1.82
42	1.20	1.57
43	1.19	1.58
44	1.17	1.58
45	1.15	1.58
46	1.14	1.59
47	1.12	1.59
48	1.11	1.60
49	1.10	1.60
50	1.09	1.65
51	1.11	1.99
52	1.09	1.76
53	1.08	1.81
54	1.08	1.86
55	1.08	1.92
56	1.08	1.97
57	1.10	2.03
58	1.13	2.08
59	1.15	2.14
60	1.18	2.19
61	1.22	2.61
62	1.23	2.30
63	1.25	2.36
64	1.28	2.41
65	1.30	2.47

NOTE: Emission factors were calculated by MOBILE5b and represent a composite vehicle type during summer conditions.

2020 Mesoscale Analysis
Emission Factors

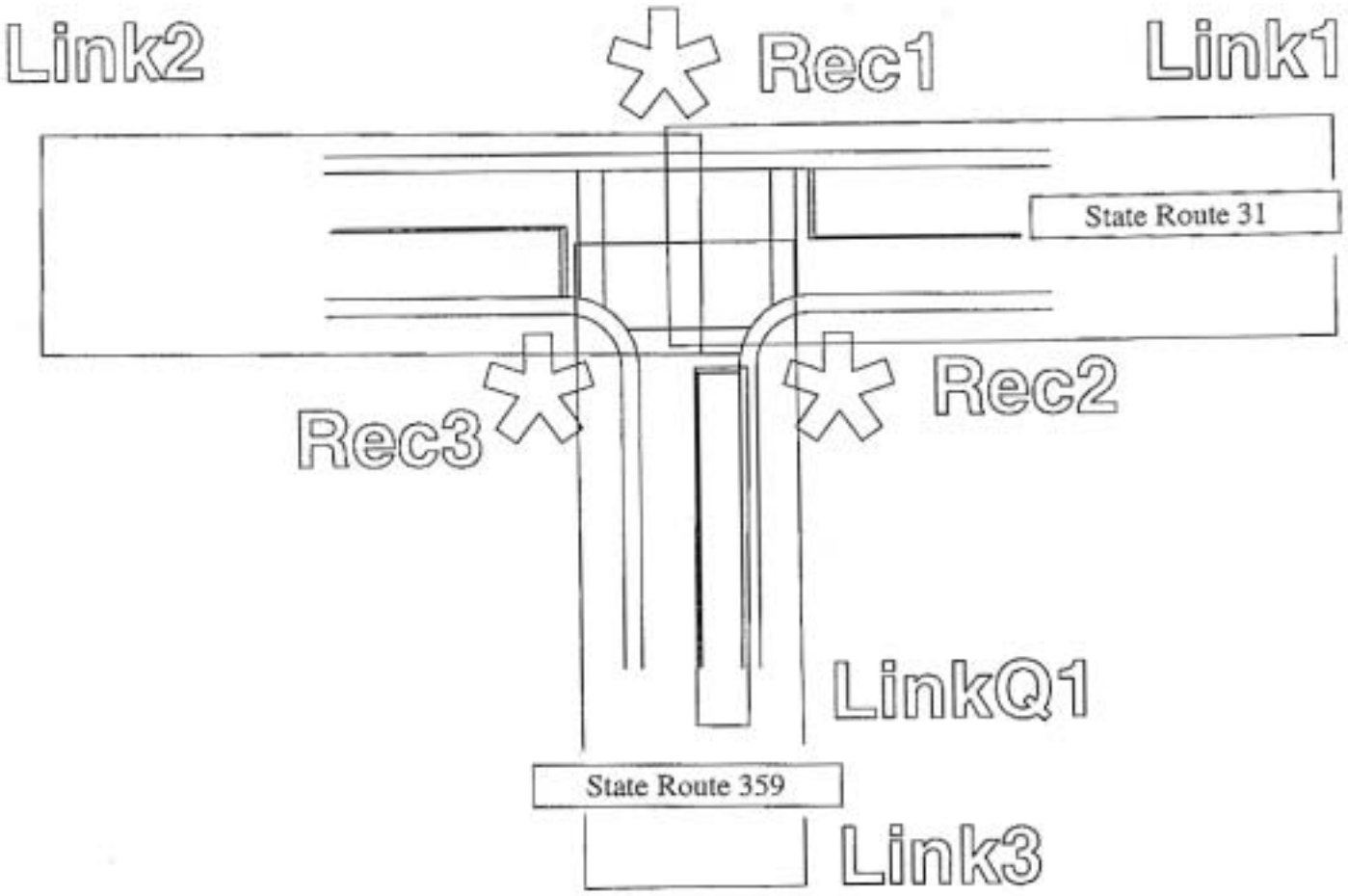
Vehicle Speed (mph)	Volatile Organics (g/veh-mile)	Nitrogen Oxides (g/veh-mile)
2.5	8.05	1.89
3	6.48	1.78
4	4.72	1.63
5	3.77	1.54
6	3.18	1.48
7	2.78	1.44
8	2.52	1.40
9	2.33	1.38
10	2.24	1.49
11	2.04	1.34
12	1.93	1.33
13	1.84	1.31
14	1.76	1.30
15	1.69	1.29
16	1.63	1.29
17	1.57	1.28
18	1.52	1.27
19	1.48	1.27
20	1.47	1.37
21	1.37	1.27
22	1.32	1.28
23	1.27	1.28
24	1.23	1.28
25	1.19	1.29
26	1.15	1.29
27	1.12	1.29
28	1.09	1.30
29	1.06	1.30
30	1.07	1.40
31	1.01	1.31
32	0.98	1.31
33	0.96	1.31
34	0.94	1.31
35	0.92	1.31
36	0.90	1.32
37	0.88	1.32
38	0.86	1.32
39	0.85	1.32
40	0.86	1.43
41	0.82	1.33
42	0.80	1.33
43	0.79	1.33
44	0.78	1.33
45	0.77	1.34
46	0.75	1.34
47	0.74	1.34
48	0.73	1.34
49	0.73	1.38
50	0.76	1.55
51	0.73	1.46
52	0.72	1.51
53	0.72	1.55
54	0.72	1.59
55	0.72	1.63
56	0.73	1.67
57	0.75	1.71
58	0.76	1.75
59	0.78	1.79
60	0.82	1.99
61	0.81	1.88
62	0.83	1.92
63	0.84	1.96
64	0.86	2.01
65	0.88	2.11

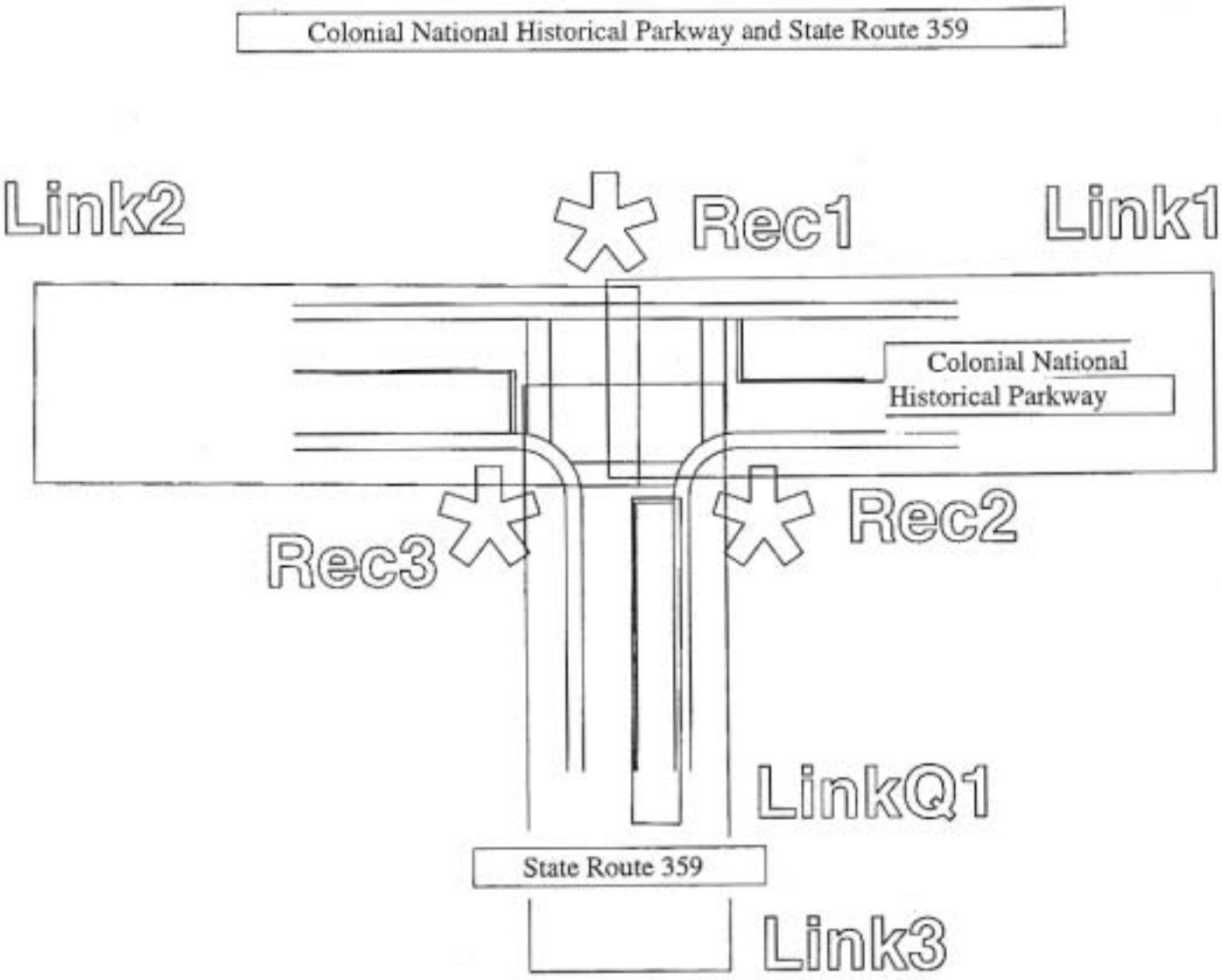
NOTE: Emission factors were calculated by MOBILE5b and represent a composite vehicle type during summer conditions.

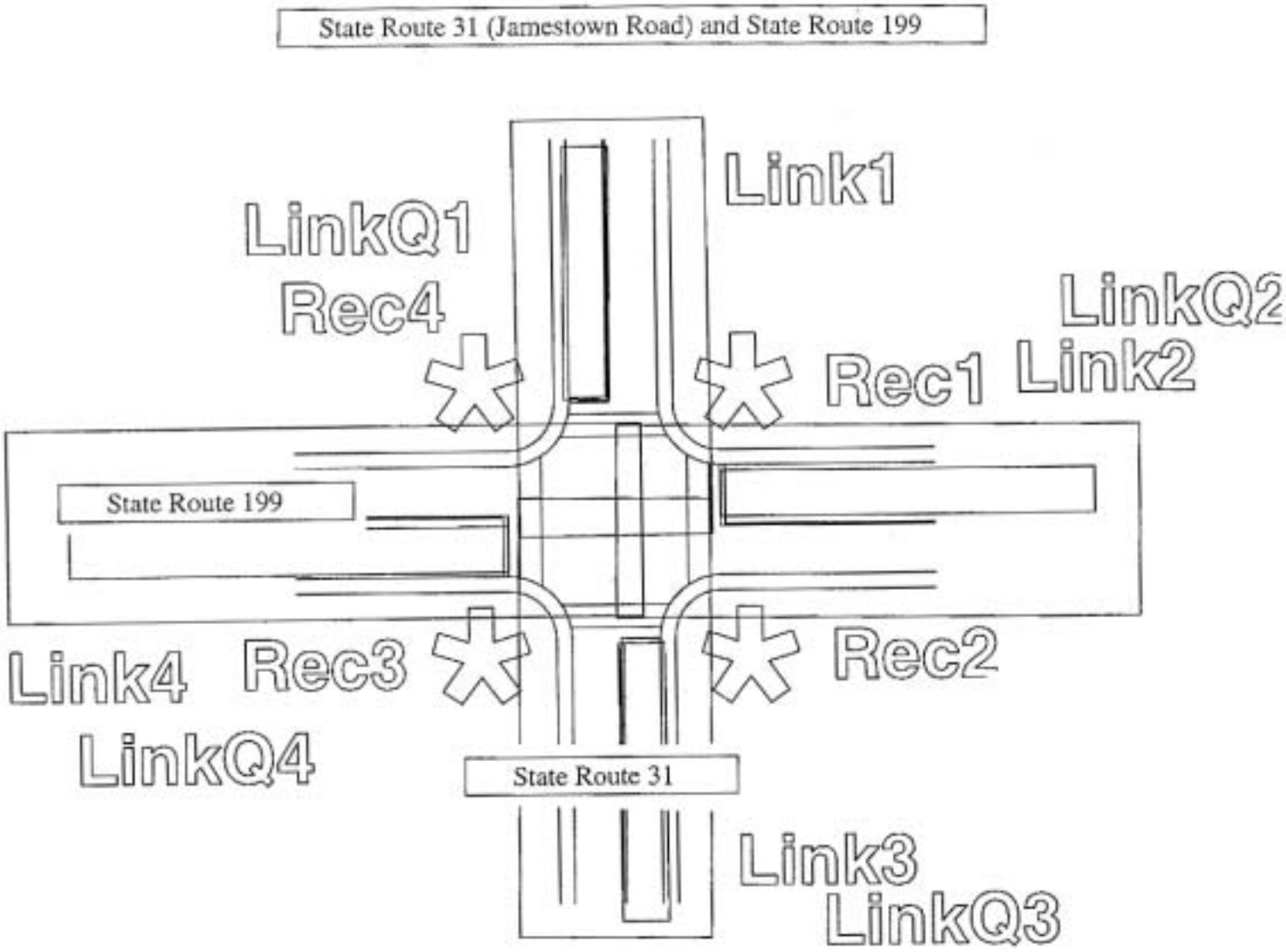
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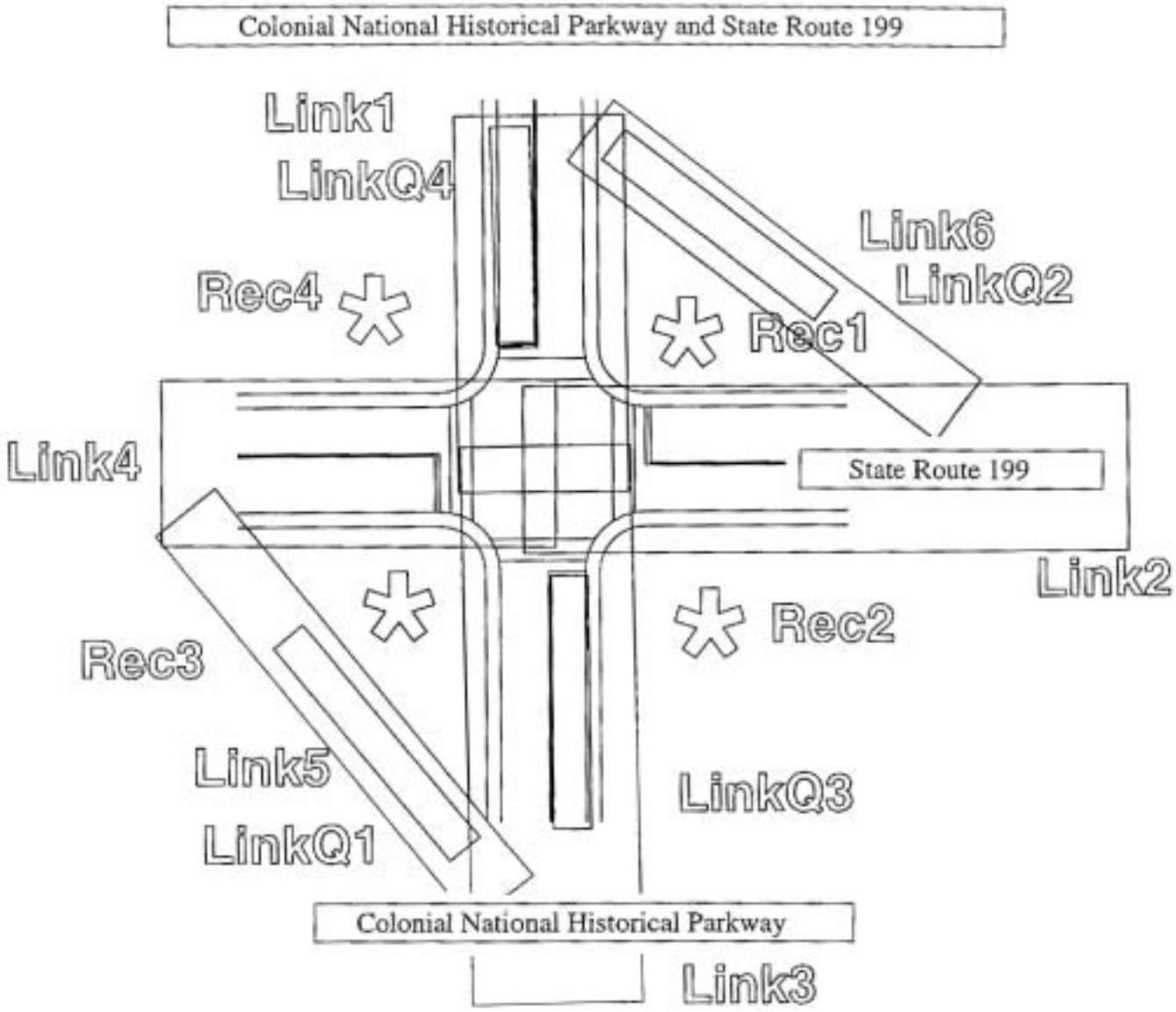
Microscale Link Maps

State Route 31 (Jamestown Road) and State Route 359




Colonial National Historical Parkway and State Route 359
Link2
Rec1
Link1
Colonial National
Historical Parkway
Rec3
Rec2
LinkQ1
State Route 359
Link3


State Route 31 (Jamestown Road) and State Route 199
Link1
LinkQ1
Rec4
LinkQ2
Rec1
Link2
State Route 199
Link4
Rec3
Rec2
LinkQ4
State Route 31
Link3
LinkQ3


Colonial National Historical Parkway and State Route 199
Link1
LinkQ4
Link6
LinkQ2
Rec4
Rec1
Link4
State Route 199
Link2
Rec2
Rec3
Link5
LinkQ3
LinkQ1
Colonial National Historical Parkway
Link3

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CAL3QHC Input Files

ExTint1.inp

```
'2001 Existing Conditions T Inters 1'      60. 108. 0.   0.    3  0.3048 1 1
'Rec1'                 86.       199.      6.
'Rec2'                 118.      137.      6.
'Rec3'                 61.       138.      6.
'Colonial Parkway at Route 359'                    4  1   1  'C'
  1
'Link1'          'AG' 86.    166.   214.   167.   180.   31.4 0.  42.
  1
'Link2'          'AG' 92.    165.   -34.   166.   380.   31.4 0.  42.
  1
'Link3'          'AG'  89.    165.   90.    41.   200.   62.0  0.  42.
  2
'LinkQ1'         'AG' 96.    141.   96.    72.    0.      10.    1
       100         70     3.0   120  496.3   1600 1 3
1. 0.  4 1000.  3. 'Y'  10  0 36
```

20Int1A.inp

```
'2020 Build Alt.A     INTER1'        60. 108. 0.   0.    4 0.3048  1  1
'Rec1'               119.      169.      6.
'Rec2'               120.      109.      6.
'Rec3'               61.       110.      6.
'Rec4'               60.       169.      6.
'ColoParkway and Route 359'                   8  1   1 'C'
  1
'Link1'           'AG' 90.    136.   90.    226.    10.   44.9  0.  42.
  1
'Link2'           'AG' 90.    139.   204.   138.    168.  23.4  0.  42.
  1
'Link3'           'AG' 90.    144.   89.    48.     285.  44.9  0.  42.
  1
'Link4'           'AG' 96.    139.   -42.   139.    289.  23.4  0.  42.
  2
'LinkQ1'          'AG' 84.    165.   85.    220.   0.      10.    1
        95        65     3.0    10  328.8   1600 1 3
  2
'LinkQ2'          'AG' 113.   145.   195.   145.   0.      10.    1
        95        50     3.0   104  328.8   1600 1 3
  2
'LinkQ3'          'AG' 96.    112.   96.    51.    0.      10.    1
        95        65     3.0   178  328.8   1600 1 3
  2
'LinkQ4'          'AG' 67.    133.   -28.   132.   0.      10.    1
        95        60     3.0    85  328.8   1600 1 3
1. 0.  4 1000.  3.0 'Y' 10  0 36
```

20Int1B.inp

```
'2020 Build Alt.B     INTER1'        60. 108. 0.   0.    4 0.3048  1  1
'Rec1'                119.      169.      6.
'Rec2'                120.      109.      6.
'Rec3'                61.       110.      6.
'Rec4'                60.       169.      6.
'ColoParkway and Route 359'                   8  1   1 'C'
  1
'Link1'           'AG' 90.    136.   90.    226.    16.   44.9  0.  42.
  1
'Link2'           'AG' 90.    139.   204.   138.    145.  23.4  0.  42.
  1
'Link3'           'AG' 90.    144.   89.    48.     310.  44.9  0.  42.
  1
'Link4'           'AG' 96.    139.   -42.   139.    291.  23.4  0.  42.
  2
'LinkQ1'          'AG' 84.    165.   85.    220.   0.      10.    1
        95        65     3.0    13  328.8   1600 1 3
  2
'LinkQ2'          'AG' 113.   145.   195.   145.   0.      10.    1
        95        50     3.0    80  328.8   1600 1 3
  2
'LinkQ3'          'AG' 96.    112.   96.    51.    0.      10.    1
        95        65     3.0   193  328.8   1600 1 3
  2
'LinkQ4'          'AG' 67.    133.   -28.   132.   0.      10.    1
        95        60     3.0    94  328.8   1600 1 3
1. 0.  4 1000.  3.0 'Y' 10  0 36
```

20Int1C.inp

```
'2020 Build Alt.C     INTER1'        60. 108. 0.   0.    4 0.3048  1  1
'Rec1'               119.      169.      6.
'Rec2'               120.      109.      6.
'Rec3'               61.       110.      6.
'Rec4'               60.       169.      6.
'ColoParkway and Route 359'                   8  1   1 'C'
  1
'Link1'           'AG' 90.    136.   90.    226.    14.   44.9  0.  42.
  1
'Link2'           'AG' 90.    139.   204.   138.     60.  23.4  0.  42.
  1
'Link3'           'AG' 90.    144.   89.    48.     310.  44.9  0.  42.
  1
'Link4'           'AG' 96.    139.   -42.   139.    304.  23.4  0.  42.
  2
'LinkQ1'          'AG' 84.    165.   85.    220.   0.      10.    1
       95        65     3.0    13  328.8   1600 1 3
  2
'LinkQ2'          'AG' 113.   145.   195.   145.   0.      10.    1
       95        50     3.0    30  328.8   1600 1 3
  2
'LinkQ3'          'AG' 96.    112.   96.    51.    0.      10.    1
       95        65     3.0   193  328.8   1600 1 3
  2
'LinkQ4'          'AG' 67.    133.   -28.   132.   0.      10.    1
       95        60     3.0   108  328.8   1600 1 3
1. 0.  4 1000.  3.0 'Y' 10  0 36
```

20Int1DE.inp

```
'2020 Build Alts D & E     INTER1'        60. 108. 0.   0.    4 0.3048  1  1
'Rec1'               119.      169.      6.
'Rec2'               120.      109.      6.
'Rec3'               61.       110.      6.
'Rec4'               60.       169.      6.
'ColoParkway and Route 359'                    8  1   1 'C'
  1
'Link1'           'AG' 90.    136.   90.    226.    13.   44.9  0.  42.
  1
'Link2'           'AG' 90.    139.   204.   138.    218.  23.4  0.  42.
  1
'Link3'           'AG' 90.    144.   89.    48.     310.  44.9  0.  42.
  1
'Link4'           'AG' 96.    139.   -42.   139.    314.  23.4  0.  42.
  2
'LinkQ1'          'AG' 84.    165.   85.    220.   0.      10.    1
       95        65     3.0    13  328.8   1600 1 3
  2
'LinkQ2'          'AG' 113.   145.   195.   145.   0.      10.    1
       95        50     3.0   123  328.8   1600 1 3
  2
'LinkQ3'          'AG' 96.    112.   96.    51.    0.      10.    1
       95        65     3.0   193  328.8   1600 1 3
  2
'LinkQ4'          'AG' 67.    133.   -28.   132.   0.      10.    1
       95        60     3.0    99  328.8   1600 1 3
1. 0.  4 1000.  3.0 'Y' 10  0 36
```

ExTInt2.inp

```
'2001 Existing Conditions T Inters 2'    60. 108. 0.   0.    3  0.3048 1 1
'Rec1'                 86.       199.      6.
'Rec2'                 118.      137.      6.
'Rec3'                 61.       138.      6.
'Route 31 at Route 359'                    4  1   1  'C'
  1
'Link1'          'AG' 86.    166.   214.   167.   1340.  38.9 0.  42.
  1
'Link2'          'AG' 92.    165.   -34.   166.   230.   38.9 0.  42.
  1
'Link3'          'AG'  89.    165.   90.    41.    200.  62.0  0.  42.
  2
'LinkQ1'         'AG' 96.    141.   96.    72.    0.      10.    1
       100        70     3.0   120  496.3   1600 1 3
1. 0.  4 1000.  3. 'Y'  10  0 36
```

20Int2A.inp

```
'2020 Build Alt.A     INTER2'        60. 108. 0.   0.    4 0.3048  1  1
'Rec1'                119.      169.      6.
'Rec2'                120.      109.      6.
'Rec3'                61.       110.      6.
'Rec4'                60.       169.      6.
'Route 31 and Route 359'                  8  1   1 'C'
  1
'Link1'           'AG' 90.    136.   90.    226.   112.   44.9  0.  42.
  1
'Link2'           'AG' 90.    139.   204.   138.    435.  29.8  0.  42.
  1
'Link3'           'AG' 90.    144.   89.    48.     327.  44.9  0.  42.
  1
'Link4'           'AG' 96.    139.   -42.   139.    286.  29.8  0.  42.
  2
'LinkQ1'          'AG' 84.    165.   85.    220.   0.      10.    1
        95        65     3.0    76  328.8   1600 1 3
  2
'LinkQ2'          'AG' 113.   145.   195.   145.   0.      10.    1
        95        50     3.0   209  328.8   1600 1 3
  2
'LinkQ3'          'AG' 96.    112.   96.    51.    0.      10.    1
        95        65     3.0   127  328.8   1600 1 3
  2
'LinkQ4'          'AG' 67.    133.   -28.   132.   0.      10.    1
        95        60     3.0   168  328.8   1600 1 3
1. 0.  4 1000.  3.0 'Y' 10  0 36
```

20Int2BCDE.inp

```
'2020 Build Alt.B     INTER2'        60. 108. 0.   0.    4 0.3048  1  1
'Rec1'                119.      169.      6.
'Rec2'                120.      109.      6.
'Rec3'                61.       110.      6.
'Rec4'                60.       169.      6.
'Route 31 and Route 359'                  8  1   1 'C'
  1
'Link1'           'AG' 90.    136.   90.    226.   114.   44.9  0.  42.
  1
'Link2'           'AG' 90.    139.   204.   138.    450.  29.8  0.  42.
  1
'Link3'           'AG' 90.    144.   89.    48.     344.  44.9  0.  42.
  1
'Link4'           'AG' 96.    139.   -42.   139.    286.  29.8  0.  42.
  2
'LinkQ1'          'AG' 84.    165.   85.    220.   0.      10.    1
        95        65     3.0    76  328.8   1600 1 3
  2
'LinkQ2'          'AG' 113.   145.   195.   145.   0.      10.    1
        95        50     3.0   216  328.8   1600 1 3
  2
'LinkQ3'          'AG' 96.    112.   96.    51.    0.      10.    1
        95        65     3.0   137  328.8   1600 1 3
  2
'LinkQ4'          'AG' 67.    133.   -28.   132.   0.      10.    1
        95        60     3.0   168  328.8   1600 1 3
1. 0.  4 1000.  3.0 'Y' 10  0 36
```

exXINT3.inp

```
'2001 ExistConditions INTER3'        60. 108. 0.   0.    4 0.3048  1  1
'Rec1'               119.      169.      6.
'Rec2'               120.      109.      6.
'Rec3'               61.       110.      6.
'Rec4'               60.       169.      6.
'Route 31 and Route 199'                  8  1   1 'C'
  1
'Link1'           'AG' 90.    136.   90.    226.   817.   38.9  0.  42.
  1
'Link2'           'AG' 90.    139.   204.   138.   2173.  25.2  0.  42.
  1
'Link3'           'AG' 90.    144.   89.    48.    1340.  38.9  0.  42.
  1
'Link4'           'AG' 96.    139.   -42.   139.   1459.  25.2  0.  42.
  2
'LinkQ1'          'AG' 84.    165.   85.    220.   0.      10.    1
        95        65     3.0   490  496.3   1600 1 3
  2
'LinkQ2'          'AG' 113.   145.   195.   145.   0.      10.    1
        95        50     3.0  1300  496.3   1600 1 3
  2
'LinkQ3'          'AG' 96.    112.   96.    51.    0.      10.    1
        95        65     3.0   804  496.3   1600 1 3
  2
'LinkQ4'          'AG' 67.    133.   -28.   132.   0.      10.    1
        95        60     3.0   875  496.3   1600 1 3
1. 0.  4 1000.  3.0 'Y' 10  0 36
```

20Int3A.inp

```
'2020 Alt A No Build INTER3'        60. 108. 0.   0.    4 0.3048  1  1
'Rec1'                119.      169.      6.
'Rec2'                120.      109.      6.
'Rec3'                61.       110.      6.
'Rec4'                60.       169.      6.
'Route 31 and Route 199'                  8  1   1 'C'
  1
'Link1'           'AG' 90.    136.   90.    226.  1238.   29.8  0.  42.
  1
'Link2'           'AG' 90.    139.   204.   138.   3358.  18.3  0.  42.
  1
'Link3'           'AG' 90.    144.   89.    48.    2031.  29.8  0.  42.
  1
'Link4'           'AG' 96.    139.   -42.   139.   2255.  18.3  0.  42.
  2
'LinkQ1'          'AG' 84.    165.   85.    220.   0.      10.    1
        95        65     3.0   743  328.8   1600 1 3
  2
'LinkQ2'          'AG' 113.   145.   195.   145.   0.      10.    1
        95        50     3.0  2009  328.8   1600 1 3
  2
'LinkQ3'          'AG' 96.    112.   96.    51.    0.      10.    1
        95        65     3.0  1218  328.8   1600 1 3
  2
'LinkQ4'          'AG' 67.    133.   -28.   132.   0.      10.    1
        95        60     3.0  1352  328.8   1600 1 3
1. 0.  4 1000.  3.0 'Y' 10  0 36
```

20Int3BC.inp

```
'2020 Alts B and C   INTER3'        60. 108. 0.   0.    4 0.3048  1  1
'Rec1'                119.      169.      6.
'Rec2'                120.      109.      6.
'Rec3'                61.       110.      6.
'Rec4'                60.       169.      6.
'Route 31 and Route 199'                  8  1   1 'C'
  1
'Link1'           'AG' 90.    136.   90.    226.  1430.   29.8  0.  42.
  1
'Link2'           'AG' 90.    139.   204.   138.   3879.  18.3  0.  42.
  1
'Link3'           'AG' 90.    144.   89.    48.    2346.  29.8  0.  42.
  1
'Link4'           'AG' 96.    139.   -42.   139.   2605.  18.3  0.  42.
  2
'LinkQ1'          'AG' 84.    165.   85.    220.   0.      10.    1
        95        65     3.0   858  328.8   1600 1 3
  2
'LinkQ2'          'AG' 113.   145.   195.   145.   0.      10.    1
        95        50     3.0  2320  328.8   1600 1 3
  2
'LinkQ3'          'AG' 96.    112.   96.    51.    0.      10.    1
        95        65     3.0  1407  328.8   1600 1 3
  2
'LinkQ4'          'AG' 67.    133.   -28.   132.   0.      10.    1
        95        60     3.0  1562  328.8   1600 1 3
1. 0.  4 1000.  3.0 'Y' 10  0 36
```

20Int3D.inp

```
'2020 Alt D          INTER3'        60. 108. 0.   0.    4 0.3048  1  1
'Rec1'               119.      169.      6.
'Rec2'               120.      109.      6.
'Rec3'               61.       110.      6.
'Rec4'               60.       169.      6.
'Route 31 and Route 199'                  8  1   1 'C'
  1
'Link1'           'AG' 90.    136.   90.    226.  1323.   29.8  0.  42.
  1
'Link2'           'AG' 90.    139.   204.   138.   3590.  18.3  0.  42.
  1
'Link3'           'AG' 90.    144.   89.    48.    2171.  29.8  0.  42.
  1
'Link4'           'AG' 96.    139.   -42.   139.   2411.  18.3  0.  42.
  2
'LinkQ1'          'AG' 84.    165.   85.    220.   0.      10.    1
        95        65     3.0   794  328.8   1600 1 3
  2
'LinkQ2'          'AG' 113.   145.   195.   145.   0.      10.    1
        95        50     3.0  2148  328.8   1600 1 3
  2
'LinkQ3'          'AG' 96.    112.   96.    51.    0.      10.    1
        95        65     3.0  1302  328.8   1600 1 3
  2
'LinkQ4'          'AG' 67.    133.   -28.   132.   0.      10.    1
        95        60     3.0  1445  328.8   1600 1 3
1. 0.  4 1000.  3.0 'Y' 10  0 36
```

20Int3E.inp

```
'2020 Alt E          INTER3'        60. 108. 0.   0.    4 0.3048  1  1
'Rec1'               119.      169.      6.
'Rec2'               120.      109.      6.
'Rec3'               61.       110.      6.
'Rec4'               60.       169.      6.
'Route 31 and Route 199'                  8  1   1 'C'
  1
'Link1'           'AG' 90.    136.   90.    226.  1348.   29.8  0.  42.
  1
'Link2'           'AG' 90.    139.   204.   138.   3657.  18.3  0.  42.
  1
'Link3'           'AG' 90.    144.   89.    48.    2212.  29.8  0.  42.
  1
'Link4'           'AG' 96.    139.   -42.   139.   2456.  18.3  0.  42.
  2
'LinkQ1'          'AG' 84.    165.   85.    220.   0.      10.    1
        95        65     3.0   809  328.8   1600 1 3
  2
'LinkQ2'          'AG' 113.   145.   195.   145.   0.      10.    1
        95        50     3.0  2188  328.8   1600 1 3
  2
'LinkQ3'          'AG' 96.    112.   96.    51.    0.      10.    1
        95        65     3.0  1326  328.8   1600 1 3
  2
'LinkQ4'          'AG' 67.    133.   -28.   132.   0.      10.    1
        95        60     3.0  1472  328.8   1600 1 3
1. 0.  4 1000.  3.0 'Y' 10  0 36
```

Xinter4.inp

```
'2001 existconditions int4'          60. 108. 0.   0.  4 0.3048 1 1
'Rec1'               141.      193.     26.
'Rec2'               147.      116.      6.
'Rec3'               66.       121.      6.
'Rec4'               60.       199.     26.
'colnatlhistparkway and Route199'       10  1   1   'C'
  1
'Link1'             'AG' 104.   151.   103.   250.    380.   31.3  0.  44.
  1
'Link2'             'FL' 98.    157.   258.   157.   2700.   31.3  21. 44.
  1
'Link3'             'AG' 104.   163.   107.   15.     380.   31.3  0.  44.
  1
'Link4'             'FL' 107.   158.   -50.   159.   2173.   31.3  21. 44.
  1
'Link5'             'AG' 10.    146.   92.    43.     217.   38.9  0.  20.
  1
'Link6'             'AG' 116.   246.   213.   172.    270.   38.9  0.  20.
  2
'LinkQ1'            'AG' 83.    56.    36.    113.   0.      10.    2
        95        65     3.0   217 496.3   1600 1 3
  2
'LinkQ2'            'AG' 122.   242.   178.   200.   0.      10.    2
        95        65     3.0   270 496.3   1600 1 3
  2
'LinkQ3'            'AG' 110.   129.   111.   62.    0.      10.    2
       95        50     3.0   228  496.3   1600 1 3
  2
'LinkQ4'            'AG' 97.    190.   96.    247.   0.      10.    2
        95       50      3.0  228  496.3    1600 1 3
1. 0.  4 1000. 3.0 'Y' 10  0 36
```

20Int4A.inp

```
'2020 Alt A No Build int4'          60. 108. 0.   0.  4 0.3048 1 1
'Rec1'                141.      193.     26.
'Rec2'                147.      116.      6.
'Rec3'                66.       121.      6.
'Rec4'                60.       199.     26.
'colnatlhistparkway and Route199'       10  1   1   'C'
  1
'Link1'             'AG' 104.   151.   103.   250.    565.   23.4  0.  44.
  1
'Link2'             'FL' 98.    157.   258.   157.   4172.   23.4  21. 44.
  1
'Link3'             'AG' 104.   163.   107.   15.     565.   23.4  0.  44.
  1
'Link4'             'FL' 107.   158.   -50.   159.   3358.   23.4  21. 44.
  1
'Link5'             'AG' 10.    146.   92.    43.     335.   29.8  0.  20.
  1
'Link6'             'AG' 116.   246.   213.   172.    417.   29.8  0.  20.
  2
'LinkQ1'            'AG' 83.    56.    36.    113.   0.      10.    2
        95        65     3.0   335 328.8   1600 1 3
  2
'LinkQ2'            'AG' 122.   242.   178.   200.   0.      10.    2
        95        65     3.0   417 328.8   1600 1 3
  2
'LinkQ3'            'AG' 110.   129.   111.   62.    0.      10.    2
       95        50     3.0   339  328.8   1600 1 3
  2
'LinkQ4'            'AG' 97.    190.   96.    247.   0.      10.    2
        95       50      3.0  339  328.8    1600 1 3
1. 0.  4 1000. 3.0 'Y' 10  0 36
```

20Int4BC.inp

```
'2020 Alts B and C int4'          60. 108. 0.   0.  4 0.3048 1 1
'Rec1'               141.      193.     26.
'Rec2'               147.      116.      6.
'Rec3'               66.       121.      6.
'Rec4'               60.       199.     26.
'colnatlhistparkway and Route199'       10  1   1   'C'
  1
'Link1'             'AG' 104.   151.   103.   250.    653.   23.4  0.  44.
  1
'Link2'             'FL' 98.    157.   258.   157.   4819.   23.4  21. 44.
  1
'Link3'             'AG' 104.   163.   107.   15.     653.   23.4  0.  44.
  1
'Link4'             'FL' 107.   158.   -50.   159.   3879.   23.4  21. 44.
  1
'Link5'             'AG' 10.    146.   92.    43.     387.   29.8  0.  20.
  1
'Link6'             'AG' 116.   246.   213.   172.    482.   29.8  0.  20.
  2
'LinkQ1'            'AG' 83.    56.    36.    113.   0.      10.    2
        95        65     3.0   387 328.8   1600 1 3
  2
'LinkQ2'            'AG' 122.   242.   178.   200.   0.      10.    2
        95        65     3.0   482 328.8   1600 1 3
  2
'LinkQ3'            'AG' 110.   129.   111.   62.    0.      10.    2
       95        50     3.0   392  328.8   1600 1 3
  2
'LinkQ4'            'AG' 97.    190.   96.    247.   0.      10.    2
        95       50      3.0  392  328.8    1600 1 3
1. 0.  4 1000. 3.0 'Y' 10  0 36
```

20Int4D.inp

```
'2020 Alt D        int4'          60. 108. 0.   0.  4 0.3048 1 1
'Rec1'               141.      193.     26.
'Rec2'               147.      116.      6.
'Rec3'               66.       121.      6.
'Rec4'               60.       199.     26.
'colnatlhistparkway and Route199'       10  1   1   'C'
  1
'Link1'             'AG' 104.   151.   103.   250.    604.   23.4  0.  44.
  1
'Link2'             'FL' 98.    157.   258.   157.   4460.   23.4  21. 44.
  1
'Link3'             'AG' 104.   163.   107.   15.     604.   23.4  0.  44.
  1
'Link4'             'FL' 107.   158.   -50.   159.   3590.   23.4  21. 44.
  1
'Link5'             'AG' 10.    146.   92.    43.     358.   29.8  0.  20.
  1
'Link6'             'AG' 116.   246.   213.   172.    446.   29.8  0.  20.
  2
'LinkQ1'            'AG' 83.    56.    36.    113.   0.      10.    2
       95        65     3.0   358 328.8   1600 1 3
  2
'LinkQ2'            'AG' 122.   242.   178.   200.   0.      10.    2
       95        65     3.0   446 328.8   1600 1 3
  2
'LinkQ3'            'AG' 110.   129.   111.   62.    0.      10.    2
      95        50     3.0   362  328.8   1600 1 3
  2
'LinkQ4'            'AG' 97.    190.   96.    247.   0.      10.    2
       95       50      3.0  362  328.8    1600 1 3
1. 0.  4 1000. 3.0 'Y' 10  0 36
```

20Int4E.inp

```
'2020 Alt E        int4'          60. 108. 0.   0.  4 0.3048 1 1
'Rec1'               141.      193.     26.
'Rec2'               147.      116.      6.
'Rec3'               66.       121.      6.
'Rec4'               60.       199.     26.
'colnatlhistparkway and Route199'       10  1   1   'C'
  1
'Link1'             'AG' 104.   151.   103.   250.    615.   23.4  0.  44.
  1
'Link2'             'FL' 98.    157.   258.   157.   4543.   23.4  21. 44.
  1
'Link3'             'AG' 104.   163.   107.   15.     615.   23.4  0.  44.
  1
'Link4'             'FL' 107.   158.   -50.   159.   3657.   23.4  21. 44.
  1
'Link5'             'AG' 10.    146.   92.    43.     365.   29.8  0.  20.
  1
'Link6'             'AG' 116.   246.   213.   172.    454.   29.8  0.  20.
  2
'LinkQ1'            'AG' 83.    56.    36.    113.   0.      10.    2
       95        65     3.0   365 328.8   1600 1 3
  2
'LinkQ2'            'AG' 122.   242.   178.   200.   0.      10.    2
       95        65     3.0   454 328.8   1600 1 3
  2
'LinkQ3'            'AG' 110.   129.   111.   62.    0.      10.    2
      95        50     3.0   369  328.8   1600 1 3
  2
'LinkQ4'            'AG' 97.    190.   96.    247.   0.      10.    2
       95       50      3.0  369  328.8    1600 1 3
1. 0.  4 1000. 3.0 'Y' 10  0 36
```

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CAL3QHC Output Files

```
HC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221                    PAGE  1

 JOB: 2001 Existing Conditions T Inters 1              RUN: Colonial Parkway at Route 359

 DATE :  6/ 4/ 1
 TIME : 15: 0:50

    The MODE flag has been set to C for calculating CO averages.

  SITE & METEOROLOGICAL VARIABLES
  ------------------------------
  VS =    .0 CM/S       VD =    .0 CM/S       Z0 = 108. CM
   U =  1.0 M/S         CLAS =   4  (D)     ATIM =  60. MINUTES     MIXH =  1000. M   AMB =  3.0 PPM

  LINK VARIABLES
  --------------
    LINK DESCRIPTION     *         LINK COORDINATES (FT)          *    LENGTH  BRG TYPE   VPH    EF      H   W    V/C QUEUE
                         *   X1        Y1        X2        Y2     *     (FT)  (DEG)            (G/MI)  (FT) (FT)       (VEH)
------------------------*----------------------------------------*-------------------------------------------------------------
 1. Link1                *     86.0     166.0     214.0     167.0 *     128.    90. AG    180.  31.4    .0 42.0
 2. Link2                *     92.0     165.0     -34.0     166.0 *     126.   270. AG    380.  31.4    .0 42.0
 3. Link3                *     89.0     165.0      90.0      41.0 *     124.   180. AG    200.  62.0    .0 42.0
 4. LinkQ1               *     96.0     141.0      96.0      95.1 *      46.   180. AG    932. 100.0    .0 10.0  .30   2.3

  ADDITIONAL QUEUE LINK PARAMETERS
  --------------------------------
    LINK DESCRIPTION     *    CYCLE    RED     CLEARANCE  APPROACH  SATURATION   IDLE   SIGNAL   ARRIVAL
                         *    LENGTH   TIME    LOST TIME    VOL     FLOW RATE   EM FAC   TYPE     RATE
                         *     (SEC)   (SEC)     (SEC)     (VPH)     (VPH)     (gm/hr)
------------------------*-----------------------------------------------------------------------------
 4. LinkQ1               *     100       70       3.0       120       1600     496.30      1        3

  RECEPTOR LOCATIONS
  ------------------
                         *           COORDINATES (FT)          *
    RECEPTOR             *      X          Y          Z        *
------------------------*-----------------------------------*
 1. Rec1                 *       86.0      199.0        6.0   *
 2. Rec2                 *      118.0      137.0        6.0   *
 3. Rec3                 *       61.0      138.0        6.0   *

 RESULTS
  -------------
KS : In search of the angle corresponding to
           the maximum concentration, only the first
           angle, of the angles with same maximum
           concentrations, is indicated as maximum.

 ANGLE RANGE:   0.-360.

  * CONCENTRATION
E *      (PPM)
R)* REC1  REC2  REC3
--*------------------
  *   3.0   3.2   3.4
  *   3.0   3.2   3.5
  *   3.0   3.2   3.4
  *   3.0   3.2   3.6
  *   3.0   3.2   3.6
  *   3.0   3.2   3.6
  *   3.0   3.2   3.8
  *   3.0   3.2   3.9
  *   3.0   3.1   4.1
  *   3.1   3.1   4.4
  *   3.1   3.0   4.6
  *   3.2   3.0   4.7
  *   3.2   3.0   4.8
  *   3.2   3.0   4.7
  *   3.4   3.0   4.3
  *   3.7   3.0   3.9
  *   4.1   3.0   3.6
  *   4.5   3.1   3.3
  *   4.4   3.2   3.1
  *   4.0   3.7   3.1
  *   3.6   4.2   3.0
  *   3.4   4.8   3.0
  *   3.4   5.2   3.0
  *   3.4   5.4   3.0
  *   3.4   5.3   3.0
  *   3.3   5.1   3.0
  *   3.2   5.2   3.1
  *   3.1   5.0   3.2
  *   3.0   4.7   3.3
  *   3.0   4.4   3.4
  *   3.0   3.9   3.4
  *   3.0   3.7   3.4
  *   3.0   3.5   3.4
  *   3.0   3.4   3.4
  *   3.0   3.3   3.3
  *   3.0   3.3   3.3
  *   3.0   3.2   3.4
--*------------------
  *   4.5   5.4   4.8
. *  170   230   120

HIGHEST CONCENTRATION OF    5.40 PPM OCCURRED AT RECEPTOR REC2 .
```

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Build Alt.A INTER1 RUN: ColoParkway and Route 359

DATE : 8/15/ 1
TIME : 10: 0: 9

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	90.0	136.0	90.0	226.0	90.	360.	AG	10.	44.9	.0	42.0		
2. Link2	90.0	139.0	204.0	138.0	114.	91.	AG	168.	23.4	.0	42.0		
3. Link3	90.0	144.0	89.0	48.0	96.	181.	AG	285.	44.9	.0	42.0		
4. Link4	96.0	139.0	-42.0	139.0	138.	270.	AG	289.	23.4	.0	42.0		
5. LinkQ1	84.0	165.0	84.1	168.6	4.	1.	AG	603.	100.0	.0	10.0	.02	.2
6. LinkQ2	113.0	145.0	141.4	145.0	28.	90.	AG	464.	100.0	.0	10.0	.15	1.4
7. LinkQ3	96.0	112.0	96.0	48.7	63.	180.	AG	603.	100.0	.0	10.0	.42	3.2
8. LinkQ4	67.0	133.0	39.1	132.7	28.	269.	AG	557.	100.0	.0	10.0	.17	1.4

PAGE 2

JOB: 2020 Build Alt.A INTER1 RUN: ColoParkway and Route 359

DATE : 8/15/ 1
TIME : 10: 0: 9

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
5. LinkQ1	95	65	3.0	10	1600	328.80	1	3
6. LinkQ2	95	50	3.0	104	1600	328.80	1	3
7. LinkQ3	95	65	3.0	178	1600	328.80	1	3
8. LinkQ4	95	60	3.0	85	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	119.0	169.0	6.0
2. Rec2	120.0	109.0	6.0
3. Rec3	61.0	110.0	6.0
4. Rec4	60.0	169.0	6.0

PAGE 3

JOB: 2020 Build Alt.A INTER1 RUN: ColoParkway and Route 359

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	3.0	3.6	4.1	3.0
10.	3.0	3.7	4.0	3.0
20.	3.0	3.6	3.8	3.0
30.	3.0	3.5	3.7	3.0
40.	3.0	3.3	3.7	3.0
50.	3.0	3.2	3.7	3.0
60.	3.0	3.1	3.8	3.0
70.	3.0	3.1	3.9	3.1
80.	3.0	3.1	3.9	3.2
90.	3.0	3.0	4.1	3.4
100.	3.1	3.0	4.2	3.5
110.	3.2	3.0	4.3	3.8
120.	3.3	3.0	4.4	3.6
130.	3.5	3.0	4.4	3.6
140.	3.7	3.0	4.3	3.8
150.	3.8	3.0	4.0	4.1
160.	3.9	3.0	3.6	4.3
170.	4.1	3.0	3.3	4.4
180.	4.4	3.2	3.1	4.2
190.	4.5	3.6	3.0	4.0
200.	4.3	4.1	3.0	3.8
210.	4.1	4.4	3.0	3.7
220.	3.9	4.7	3.0	3.4
230.	3.7	4.7	3.0	3.3
240.	3.6	4.6	3.0	3.2

250.	*	3.7	4.4	3.0	3.2
260.	*	3.4	4.4	3.0	3.1
270.	*	3.2	4.5	3.1	3.1
280.	*	3.1	4.4	3.2	3.0
290.	*	3.0	4.1	3.3	3.0
300.	*	3.0	3.9	3.4	3.0
310.	*	3.0	3.6	3.7	3.0
320.	*	3.0	3.4	3.9	3.0
330.	*	3.0	3.6	4.1	3.0
340.	*	3.0	3.4	4.2	3.0
350.	*	3.0	3.6	4.2	3.0
360.	*	3.0	3.6	4.1	3.0
MAX	*	4.5	4.7	4.4	4.4
DEGR.	*	190	220	120	170

THE HIGHEST CONCENTRATION OF 4.70 PPM OCCURRED AT RECEPTOR REC2 .

JOB: 2020 Build Alt.A INTER1 RUN: ColoParkway and Route 359

DATE : 8/15/ 1
TIME : 10: 0: 9

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
LINK #	*	REC1 190	REC2 220	REC3 120	REC4 170
1	*	.0	.0	.0	.0
2	*	.1	.0	.0	.0
3	*	.3	.4	.4	.3
4	*	.0	.0	.0	.2
5	*	.0	.0	.0	.0
6	*	.5	.0	.0	.0
7	*	.6	1.3	1.0	.4
8	*	.0	.0	.0	.5

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Build Alt.B INTER1 RUN: ColoParkway and Route 359

DATE : 8/15/ 1
TIME : 10: 2:43

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG TYPE (DEG)	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	90.0	136.0	90.0	226.0	90.	360. AG	16.	44.9	.0	42.0		
2. Link2	90.0	139.0	204.0	138.0	114.	91. AG	145.	23.4	.0	42.0		
3. Link3	90.0	144.0	89.0	48.0	96.	181. AG	310.	44.9	.0	42.0		
4. Link4	96.0	139.0	-42.0	139.0	138.	270. AG	291.	23.4	.0	42.0		
5. LinkQ1	84.0	165.0	84.1	169.6	5.	1. AG	603.	100.0	.0	10.0	.03	.2
6. LinkQ2	113.0	145.0	134.9	145.0	22.	90. AG	464.	100.0	.0	10.0	.12	1.1
7. LinkQ3	96.0	112.0	96.0	43.4	69.	180. AG	603.	100.0	.0	10.0	.46	3.5
8. LinkQ4	67.0	133.0	36.2	132.7	31.	269. AG	557.	100.0	.0	10.0	.19	1.6

PAGE 2

JOB: 2020 Build Alt.B INTER1 RUN: ColoParkway and Route 359

DATE : 8/15/ 1
TIME : 10: 2:43

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
5. LinkQ1	95	65	3.0	13	1600	328.80	1	3
6. LinkQ2	95	50	3.0	80	1600	328.80	1	3
7. LinkQ3	95	65	3.0	193	1600	328.80	1	3
8. LinkQ4	95	60	3.0	94	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	119.0	169.0	6.0
2. Rec2	120.0	109.0	6.0
3. Rec3	61.0	110.0	6.0
4. Rec4	60.0	169.0	6.0

PAGE 3

JOB: 2020 Build Alt.B INTER1 RUN: ColoParkway and Route 359

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	3.0	3.6	4.1	3.0
10.	3.0	3.6	4.1	3.0
20.	3.0	3.5	3.9	3.0
30.	3.0	3.3	3.7	3.0
40.	3.0	3.2	3.7	3.0
50.	3.0	3.1	3.7	3.0
60.	3.0	3.1	3.8	3.0
70.	3.0	3.1	3.9	3.1
80.	3.0	3.1	3.9	3.2
90.	3.0	3.0	4.0	3.4
100.	3.1	3.0	4.2	3.6
110.	3.1	3.0	4.3	3.7
120.	3.2	3.0	4.4	3.6
130.	3.3	3.0	4.4	3.6
140.	3.4	3.0	4.3	3.8
150.	3.7	3.0	4.1	4.1
160.	3.8	3.0	3.7	4.4
170.	4.1	3.0	3.3	4.4
180.	4.4	3.3	3.1	4.2
190.	4.5	3.7	3.0	4.0
200.	4.4	4.1	3.0	3.9
210.	4.1	4.6	3.0	3.7
220.	3.9	4.7	3.0	3.5
230.	3.8	4.7	3.0	3.3
240.	3.6	4.6	3.0	3.2
250.	3.7	4.5	3.0	3.2
260.	3.6	4.4	3.0	3.1
270.	3.4	4.5	3.1	3.1
280.	3.1	4.4	3.2	3.0

290.	*	3.1	4.3	3.3	3.0
300.	*	3.0	4.0	3.5	3.0
310.	*	3.0	3.7	3.8	3.0
320.	*	3.0	3.6	4.0	3.0
330.	*	3.0	3.6	4.2	3.0
340.	*	3.0	3.5	4.3	3.0
350.	*	3.0	3.6	4.2	3.0
360.	*	3.0	3.6	4.1	3.0
MAX	*	4.5	4.7	4.4	4.4
DEGR.	*	190	220	120	160

THE HIGHEST CONCENTRATION OF 4.70 PPM OCCURRED AT RECEPTOR REC2 .

JOB: 2020 Build Alt.B INTER1 RUN: ColoParkway and Route 359

DATE : 8/15/ 1
TIME : 10: 2:43

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
LINK #	*	REC1 190	REC2 220	REC3 120	REC4 160
1	*	.0	.0	.0	.0
2	*	.1	.0	.0	.0
3	*	.3	.4	.4	.3
4	*	.0	.0	.0	.2
5	*	.0	.0	.0	.0
6	*	.5	.0	.0	.0
7	*	.6	1.3	1.0	.6
8	*	.0	.0	.0	.3

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Build Alt.C INTER1 RUN: ColoParkway and Route 359

DATE : 8/15/ 1
TIME : 10: 8:52

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG TYPE (DEG)	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	90.0	136.0	90.0	226.0	90.	360. AG	14.	44.9	.0	42.0		
2. Link2	90.0	139.0	204.0	138.0	114.	91. AG	60.	23.4	.0	42.0		
3. Link3	90.0	144.0	89.0	48.0	96.	181. AG	310.	44.9	.0	42.0		
4. Link4	96.0	139.0	-42.0	139.0	138.	270. AG	304.	23.4	.0	42.0		
5. LinkQ1	84.0	165.0	84.1	169.6	5.	1. AG	603.	100.0	.0	10.0	.03	.2
6. LinkQ2	113.0	145.0	121.2	145.0	8.	90. AG	464.	100.0	.0	10.0	.04	.4
7. LinkQ3	96.0	112.0	96.0	43.4	69.	180. AG	603.	100.0	.0	10.0	.46	3.5
8. LinkQ4	67.0	133.0	31.6	132.6	35.	269. AG	557.	100.0	.0	10.0	.21	1.8

PAGE 2

JOB: 2020 Build Alt.C INTER1 RUN: ColoParkway and Route 359

DATE : 8/15/ 1
TIME : 10: 8:52

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
5. LinkQ1	95	65	3.0	13	1600	328.80	1	3
6. LinkQ2	95	50	3.0	30	1600	328.80	1	3
7. LinkQ3	95	65	3.0	193	1600	328.80	1	3
8. LinkQ4	95	60	3.0	108	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	119.0	169.0	6.0
2. Rec2	120.0	109.0	6.0
3. Rec3	61.0	110.0	6.0
4. Rec4	60.0	169.0	6.0

PAGE 3

JOB: 2020 Build Alt.C INTER1 RUN: ColoParkway and Route 359

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	3.0	3.2	4.1	3.0
10.	3.0	3.2	4.1	3.0
20.	3.0	3.1	3.9	3.0
30.	3.0	3.0	3.7	3.0
40.	3.0	3.0	3.6	3.0
50.	3.0	3.0	3.5	3.0
60.	3.0	3.0	3.6	3.0
70.	3.0	3.0	3.7	3.1
80.	3.0	3.0	3.8	3.2
90.	3.0	3.0	4.0	3.3
100.	3.0	3.0	4.2	3.4
110.	3.0	3.0	4.3	3.5
120.	3.0	3.0	4.4	3.4
130.	3.0	3.0	4.4	3.5
140.	3.0	3.0	4.3	3.8
150.	3.1	3.0	4.1	4.1
160.	3.2	3.0	3.7	4.4
170.	3.5	3.0	3.3	4.4
180.	4.0	3.3	3.1	4.2
190.	4.3	3.7	3.0	4.1
200.	4.3	4.1	3.0	4.0
210.	4.0	4.6	3.0	3.8
220.	3.8	4.7	3.0	3.6
230.	3.7	4.7	3.0	3.4
240.	3.7	4.6	3.0	3.3
250.	3.7	4.5	3.0	3.2
260.	3.6	4.5	3.0	3.2
270.	3.4	4.5	3.1	3.1
280.	3.1	4.5	3.3	3.0

290.	*	3.1	4.3	3.4	3.0
300.	*	3.0	4.0	3.7	3.0
310.	*	3.0	3.7	3.9	3.0
320.	*	3.0	3.6	4.1	3.0
330.	*	3.0	3.5	4.3	3.0
340.	*	3.0	3.4	4.3	3.0
350.	*	3.0	3.3	4.2	3.0
360.	*	3.0	3.2	4.1	3.0
MAX	*	4.3	4.7	4.4	4.4
DEGR.	*	190	220	120	160

THE HIGHEST CONCENTRATION OF 4.70 PPM OCCURRED AT RECEPTOR REC2 .

JOB: 2020 Build Alt.C INTER1 RUN: ColoParkway and Route 359

DATE : 8/15/ 1
TIME : 10: 8:52

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
		REC1	REC2	REC3	REC4
LINK #	*	190	220	120	160
1	*	.0	.0	.0	.0
2	*	.0	.0	.0	.0
3	*	.3	.4	.4	.3
4	*	.0	.0	.0	.2
5	*	.0	.0	.0	.0
6	*	.4	.0	.0	.0
7	*	.6	1.3	1.0	.6
8	*	.0	.0	.0	.3

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Build Alt.D INTER1 RUN: ColoParkway and Route 359

DATE : 8/15/ 1
TIME : 10:11: 0

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG TYPE (DEG)	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	90.0	136.0	90.0	226.0	90.	360. AG	13.	44.9	.0	42.0		
2. Link2	90.0	139.0	204.0	138.0	114.	91. AG	218.	23.4	.0	42.0		
3. Link3	90.0	144.0	89.0	48.0	96.	181. AG	310.	44.9	.0	42.0		
4. Link4	96.0	139.0	-42.0	139.0	138.	270. AG	314.	23.4	.0	42.0		
5. LinkQ1	84.0	165.0	84.1	169.6	5.	1. AG	603.	100.0	.0	10.0	.03	.2
6. LinkQ2	113.0	145.0	146.6	145.0	34.	90. AG	464.	100.0	.0	10.0	.18	1.7
7. LinkQ3	96.0	112.0	96.0	43.4	69.	180. AG	603.	100.0	.0	10.0	.46	3.5
8. LinkQ4	67.0	133.0	34.5	132.7	32.	269. AG	557.	100.0	.0	10.0	.20	1.6

PAGE 2

JOB: 2020 Build Alt.D INTER1 RUN: ColoParkway and Route 359

DATE : 8/15/ 1
TIME : 10:11: 0

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
5. LinkQ1	95	65	3.0	13	1600	328.80	1	3
6. LinkQ2	95	50	3.0	123	1600	328.80	1	3
7. LinkQ3	95	65	3.0	193	1600	328.80	1	3
8. LinkQ4	95	60	3.0	99	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	119.0	169.0	6.0
2. Rec2	120.0	109.0	6.0
3. Rec3	61.0	110.0	6.0
4. Rec4	60.0	169.0	6.0

PAGE 3

JOB: 2020 Build Alt.D INTER1 RUN: ColoParkway and Route 359

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	3.0	3.6	4.1	3.0
10.	3.0	3.7	4.1	3.0
20.	3.0	3.7	3.9	3.0
30.	3.0	3.7	3.7	3.0
40.	3.0	3.5	3.8	3.0
50.	3.0	3.4	3.7	3.0
60.	3.0	3.3	3.9	3.0
70.	3.0	3.1	4.0	3.1
80.	3.0	3.1	4.1	3.2
90.	3.0	3.0	4.2	3.5
100.	3.1	3.0	4.2	3.7
110.	3.2	3.0	4.3	3.8
120.	3.5	3.0	4.4	3.7
130.	3.7	3.0	4.4	3.6
140.	3.9	3.0	4.3	3.9
150.	4.0	3.0	4.1	4.1
160.	4.0	3.0	3.7	4.4
170.	4.1	3.0	3.3	4.4
180.	4.4	3.3	3.1	4.2
190.	4.5	3.7	3.0	4.0
200.	4.4	4.1	3.0	3.9
210.	4.1	4.6	3.0	3.8
220.	3.9	4.7	3.0	3.6
230.	3.8	4.7	3.0	3.4
240.	3.8	4.6	3.0	3.3
250.	3.7	4.5	3.0	3.2
260.	3.6	4.5	3.0	3.2
270.	3.4	4.5	3.1	3.1
280.	3.1	4.4	3.2	3.0

290.	*	3.1	4.3	3.4	3.0
300.	*	3.0	4.1	3.7	3.0
310.	*	3.0	3.8	3.8	3.0
320.	*	3.0	3.6	4.1	3.0
330.	*	3.0	3.6	4.2	3.0
340.	*	3.0	3.5	4.3	3.0
350.	*	3.0	3.6	4.2	3.0
360.	*	3.0	3.6	4.1	3.0
MAX	*	4.5	4.7	4.4	4.4
DEGR.	*	190	220	120	160

THE HIGHEST CONCENTRATION OF 4.70 PPM OCCURRED AT RECEPTOR REC2 .

JOB: 2020 Build Alt.D INTER1 RUN: ColoParkway and Route 359

DATE : 8/15/ 1
TIME : 10:11: 0

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
		REC1	REC2	REC3	REC4
LINK #	*	190	220	120	160
1	*	.0	.0	.0	.0
2	*	.1	.0	.0	.0
3	*	.3	.4	.4	.3
4	*	.0	.0	.0	.2
5	*	.0	.0	.0	.0
6	*	.5	.0	.0	.0
7	*	.6	1.3	1.0	.6
8	*	.0	.0	.0	.3

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2001 Existing Conditions T Inters 2 RUN: Route 31 at Route 359

DATE : 6/ 4/ 1
TIME : 15: 8: 0

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT) X1	Y1	X2	Y2	*	LENGTH (FT)	BRG TYPE (DEG)	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	*	86.0	166.0	214.0	167.0	*	128.	90. AG	1340.	38.9	.0	42.0		
2. Link2	*	92.0	165.0	-34.0	166.0	*	126.	270. AG	230.	38.9	.0	42.0		
3. Link3	*	89.0	165.0	90.0	41.0	*	124.	180. AG	200.	62.0	.0	42.0		
4. LinkQ1	*	96.0	141.0	96.0	95.1	*	46.	180. AG	932.	100.0	.0	10.0	.30	2.3

PAGE 2

JOB: 2001 Existing Conditions T Inters 2 RUN: Route 31 at Route 359

DATE : 6/ 4/ 1
TIME : 15: 8: 0

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
4. LinkQ1	*	100	70	3.0	120	1600	496.30	1	3

RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (FT) X	Y	Z	*
1. Rec1	*	86.0	199.0	6.0	*
2. Rec2	*	118.0	137.0	6.0	*
3. Rec3	*	61.0	138.0	6.0	*

PAGE 3

JOB: 2001 Existing Conditions T Inters 2 RUN: Route 31 at Route 359

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3
0.	3.0	4.5	3.3
10.	3.0	4.5	3.4
20.	3.0	4.5	3.6
30.	3.0	4.6	3.9
40.	3.0	4.7	4.2
50.	3.0	4.8	4.6
60.	3.0	4.7	4.9
70.	3.0	4.6	5.3
80.	3.2	4.1	5.3
90.	3.5	3.5	5.1
100.	4.1	3.2	4.9
110.	4.6	3.1	4.8
120.	4.7	3.0	4.8
130.	4.7	3.0	4.7
140.	4.7	3.0	4.3
150.	4.8	3.0	3.9
160.	5.2	3.0	3.6
170.	5.3	3.1	3.3
180.	5.0	3.2	3.1
190.	4.3	3.7	3.1
200.	3.7	4.2	3.0
210.	3.4	4.8	3.0
220.	3.3	5.2	3.0
230.	3.3	5.4	3.0
240.	3.3	5.3	3.0
250.	3.2	5.1	3.0
260.	3.2	5.2	3.0
270.	3.1	5.0	3.1
280.	3.0	4.9	3.2
290.	3.0	4.7	3.3
300.	3.0	4.4	3.3
310.	3.0	4.6	3.3
320.	3.0	4.5	3.3
330.	3.0	4.6	3.3
340.	3.0	4.5	3.3
350.	3.0	4.6	3.3
360.	3.0	4.5	3.3

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------*------------------
MAX   *   5.3   5.4   5.3
DEGR. *  170   230    70

THE HIGHEST CONCENTRATION OF    5.40 PPM OCCURRED AT RECEPTOR REC2 .
```


JOB: 2001 Existing Conditions T Inters 2 RUN: Route 31 at Route 359

DATE : 6/ 4/ 1
TIME : 15: 8: 0

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	* CO/LINK (PPM) ANGLE (DEGREES)		
LINK #	REC1 170	REC2 230	REC3 70
1	1.0	.0	1.6
2	.1	.0	.1
3	.4	.4	.3
4	.8	2.0	.3

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Build Alt.A INTER2 RUN: Route 31 and Route 359

DATE : 8/15/ 1
TIME : 9:50:18

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG TYPE (DEG)	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	90.0	136.0	90.0	226.0	90.	360. AG	112.	44.9	.0	42.0		
2. Link2	90.0	139.0	204.0	138.0	114.	91. AG	435.	29.8	.0	42.0		
3. Link3	90.0	144.0	89.0	48.0	96.	181. AG	327.	44.9	.0	42.0		
4. Link4	96.0	139.0	-42.0	139.0	138.	270. AG	286.	29.8	.0	42.0		
5. LinkQ1	84.0	165.0	84.5	192.0	27.	1. AG	603.	100.0	.0	10.0	.18	1.4
6. LinkQ2	113.0	145.0	170.1	145.0	57.	90. AG	464.	100.0	.0	10.0	.31	2.9
7. LinkQ3	96.0	112.0	96.0	66.9	45.	180. AG	603.	100.0	.0	10.0	.30	2.3
8. LinkQ4	67.0	133.0	11.9	132.4	55.	269. AG	557.	100.0	.0	10.0	.33	2.8

PAGE 2

JOB: 2020 Build Alt.A INTER2 RUN: Route 31 and Route 359

DATE : 8/15/ 1
TIME : 9:50:18

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
5. LinkQ1	95	65	3.0	76	1600	328.80	1	3
6. LinkQ2	95	50	3.0	209	1600	328.80	1	3
7. LinkQ3	95	65	3.0	127	1600	328.80	1	3
8. LinkQ4	95	60	3.0	168	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	119.0	169.0	6.0
2. Rec2	120.0	109.0	6.0
3. Rec3	61.0	110.0	6.0
4. Rec4	60.0	169.0	6.0

PAGE 3

JOB: 2020 Build Alt.A INTER2 RUN: Route 31 and Route 359

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	3.0	4.1	4.5	3.0
10.	3.0	4.1	4.4	3.1
20.	3.0	4.1	4.3	3.2
30.	3.0	4.1	4.1	3.3
40.	3.0	4.1	4.1	3.6
50.	3.0	3.9	4.2	4.0
60.	3.0	3.7	4.2	4.1
70.	3.0	3.5	4.3	4.2
80.	3.0	3.2	4.4	4.3
90.	3.2	3.1	4.3	4.3
100.	3.4	3.0	4.3	4.5
110.	3.8	3.0	4.3	4.4
120.	4.1	3.0	4.3	4.0
130.	4.3	3.0	4.3	4.0
140.	4.4	3.0	4.1	4.1
150.	4.3	3.0	3.7	4.3
160.	4.3	3.0	3.4	4.2
170.	4.4	3.0	3.2	4.2
180.	4.6	3.1	3.1	4.2
190.	4.7	3.4	3.0	4.1
200.	4.6	3.7	3.0	4.1
210.	4.4	4.2	3.0	4.2
220.	4.3	4.4	3.0	4.1
230.	4.0	4.6	3.0	3.9
240.	4.1	4.6	3.0	3.6
250.	4.3	4.5	3.0	3.4
260.	4.0	4.5	3.0	3.2
270.	3.9	4.6	3.2	3.1
280.	3.9	4.7	3.5	3.0

290.	*	3.8	4.6	3.9	3.0
300.	*	3.7	4.3	4.2	3.0
310.	*	3.6	4.1	4.4	3.0
320.	*	3.3	4.1	4.5	3.0
330.	*	3.1	4.1	4.4	3.0
340.	*	3.1	4.1	4.3	3.0
350.	*	3.1	4.2	4.3	3.0
360.	*	3.0	4.1	4.5	3.0
MAX	*	4.7	4.7	4.5	4.5
DEGR.	*	190	280	0	100

THE HIGHEST CONCENTRATION OF 4.70 PPM OCCURRED AT RECEPTOR REC1 .

JOB: 2020 Build Alt.A INTER2 RUN: Route 31 and Route 359

DATE : 8/15/ 1
TIME : 9:50:18

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
		REC1	REC2	REC3	REC4
LINK #	*	190	280	0	100
1	*	.0	.0	.1	.1
2	*	.4	.1	.0	.3
3	*	.3	.4	.0	.0
4	*	.0	.2	.3	.1
5	*	.0	.0	.2	.6
6	*	.5	.0	.0	.4
7	*	.5	.5	.0	.0
8	*	.0	.5	.9	.0

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Build Alt.B INTER2 RUN: Route 31 and Route 359

DATE : 8/15/ 1
TIME : 9:50: 7

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	90.0	136.0	90.0	226.0	90.	360.	AG	114.	44.9	.0	42.0		
2. Link2	90.0	139.0	204.0	138.0	114.	91.	AG	450.	29.8	.0	42.0		
3. Link3	90.0	144.0	89.0	48.0	96.	181.	AG	344.	44.9	.0	42.0		
4. Link4	96.0	139.0	-42.0	139.0	138.	270.	AG	286.	29.8	.0	42.0		
5. LinkQ1	84.0	165.0	84.5	192.0	27.	1.	AG	603.	100.0	.0	10.0	.18	1.4
6. LinkQ2	113.0	145.0	172.1	145.0	59.	90.	AG	464.	100.0	.0	10.0	.32	3.0
7. LinkQ3	96.0	112.0	96.0	63.3	49.	180.	AG	603.	100.0	.0	10.0	.33	2.5
8. LinkQ4	67.0	133.0	11.9	132.4	55.	269.	AG	557.	100.0	.0	10.0	.33	2.8

PAGE 2

JOB: 2020 Build Alt.B INTER2 RUN: Route 31 and Route 359

DATE : 8/15/ 1
TIME : 9:50: 7

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
5. LinkQ1	95	65	3.0	76	1600	328.80	1	3
6. LinkQ2	95	50	3.0	216	1600	328.80	1	3
7. LinkQ3	95	65	3.0	137	1600	328.80	1	3
8. LinkQ4	95	60	3.0	168	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	119.0	169.0	6.0
2. Rec2	120.0	109.0	6.0
3. Rec3	61.0	110.0	6.0
4. Rec4	60.0	169.0	6.0

PAGE 3

JOB: 2020 Build Alt.B INTER2 RUN: Route 31 and Route 359

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	3.0	4.1	4.5	3.0
10.	3.0	4.1	4.4	3.1
20.	3.0	4.1	4.3	3.2
30.	3.0	4.1	4.1	3.3
40.	3.0	4.1	4.1	3.6
50.	3.0	3.9	4.2	4.0
60.	3.0	3.7	4.2	4.1
70.	3.0	3.6	4.4	4.2
80.	3.0	3.3	4.4	4.3
90.	3.2	3.1	4.4	4.4
100.	3.4	3.0	4.3	4.5
110.	3.9	3.0	4.3	4.5
120.	4.2	3.0	4.4	4.0
130.	4.3	3.0	4.4	4.0
140.	4.4	3.0	4.2	4.1
150.	4.3	3.0	3.8	4.3
160.	4.3	3.0	3.6	4.3
170.	4.4	3.0	3.2	4.2
180.	4.6	3.2	3.1	4.2
190.	4.7	3.4	3.0	4.1
200.	4.7	3.8	3.0	4.1
210.	4.5	4.2	3.0	4.2
220.	4.3	4.6	3.0	4.1
230.	4.0	4.7	3.0	3.9
240.	4.2	4.6	3.0	3.6
250.	4.3	4.5	3.0	3.4
260.	4.1	4.5	3.0	3.2
270.	4.0	4.6	3.2	3.1
280.	3.9	4.7	3.5	3.0

290.	*	3.8	4.6	3.9	3.0
300.	*	3.8	4.3	4.2	3.0
310.	*	3.6	4.2	4.4	3.0
320.	*	3.4	4.1	4.5	3.0
330.	*	3.1	4.1	4.4	3.0
340.	*	3.1	4.2	4.3	3.0
350.	*	3.1	4.2	4.3	3.0
360.	*	3.0	4.1	4.5	3.0
MAX	*	4.7	4.7	4.5	4.5
DEGR.	*	190	230	0	100

THE HIGHEST CONCENTRATION OF 4.70 PPM OCCURRED AT RECEPTOR REC1 .

JOB: 2020 Build Alt.B INTER2 RUN: Route 31 and Route 359

DATE : 8/15/ 1
TIME : 9:50: 7

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
		REC1	REC2	REC3	REC4
LINK #	*	190	230	0	100
1	*	.0	.0	.1	.1
2	*	.4	.0	.0	.3
3	*	.3	.5	.0	.0
4	*	.0	.0	.3	.1
5	*	.0	.0	.2	.6
6	*	.5	.0	.0	.4
7	*	.5	1.2	.0	.0
8	*	.0	.0	.9	.0

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2001 ExistConditions XINTER1 RUN: Route 31 and Route 199

DATE : 6/ 4/ 1
TIME : 15:36:44

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	90.0	136.0	90.0	226.0	90.	360.	AG	817.	38.9	.0	42.0		
2. Link2	90.0	139.0	204.0	138.0	114.	91.	AG	2173.	25.2	.0	42.0		
3. Link3	90.0	144.0	89.0	48.0	96.	181.	AG	1340.	38.9	.0	42.0		
4. Link4	96.0	139.0	-42.0	139.0	138.	270.	AG	1459.	25.2	.0	42.0		
5. LinkQ1	84.0	165.0	101.6	1134.6	970.	1.	AG	911.	100.0	.0	10.0	1.16	49.3
6. LinkQ2	113.0	145.0	6884.1	145.0	6771.	90.	AG	701.	100.0	.0	10.0	1.93	344.0
7. LinkQ3	96.0	112.0	96.0	-4134.5	4246.	180.	AG	911.	100.0	.0	10.0	1.91	215.7
8. LinkQ4	67.0	133.0	-4051.4	89.7	4119.	269.	AG	841.	100.0	.0	10.0	1.73	209.2

PAGE 2

JOB: 2001 ExistConditions XINTER1 RUN: Route 31 and Route 199

DATE : 6/ 4/ 1
TIME : 15:36:44

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
5. LinkQ1	95	65	3.0	490	1600	496.30	1	3
6. LinkQ2	95	50	3.0	1300	1600	496.30	1	3
7. LinkQ3	95	65	3.0	804	1600	496.30	1	3
8. LinkQ4	95	60	3.0	875	1600	496.30	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	119.0	169.0	6.0
2. Rec2	120.0	109.0	6.0
3. Rec3	61.0	110.0	6.0
4. Rec4	60.0	169.0	6.0

PAGE 3

JOB: 2001 ExistConditions XINTER1 RUN: Route 31 and Route 199

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	4.8	7.4	8.0	5.2
10.	3.8	6.3	8.4	6.2
20.	3.1	5.7	7.9	6.3
30.	3.0	5.7	7.3	6.2
40.	3.0	5.9	6.8	6.1
50.	3.0	6.1	7.0	6.0
60.	3.0	6.2	7.6	5.8
70.	3.2	6.2	8.0	5.9
80.	4.0	5.9	8.5	6.7
90.	5.5	5.1	7.8	8.0
100.	6.4	3.9	6.6	8.3
110.	6.5	3.1	6.0	7.8
120.	6.5	3.0	6.0	7.2
130.	6.5	3.0	6.2	6.8
140.	6.2	3.0	6.3	7.0
150.	6.0	3.0	6.4	7.4
160.	6.1	3.2	6.4	7.9
170.	7.2	4.3	6.3	8.3
180.	8.9	5.8	5.4	7.7
190.	9.2	6.7	3.9	6.2
200.	8.4	6.7	3.1	5.4
210.	7.6	6.7	3.0	5.5
220.	7.0	6.7	3.0	5.7
230.	6.8	6.6	3.0	5.8
240.	7.1	6.4	3.0	6.0
250.	7.7	6.4	3.3	6.1
260.	7.8	7.2	4.4	6.0
270.	7.2	8.7	5.9	5.2
280.	6.0	8.8	6.8	3.8

290.	*	5.4	8.1	6.8	3.1
300.	*	5.4	7.4	6.6	3.0
310.	*	5.6	6.8	6.3	3.0
320.	*	5.6	7.0	6.1	3.0
330.	*	5.7	7.4	5.9	3.0
340.	*	5.8	8.0	5.8	3.2
350.	*	5.6	8.0	6.6	3.8
360.	*	4.8	7.4	8.0	5.2
MAX	*	9.2	8.8	8.5	8.3
DEGR.	*	190	280	80	170

THE HIGHEST CONCENTRATION OF 9.20 PPM OCCURRED AT RECEPTOR REC1 .

JOB: 2001 ExistConditions XINTER1 RUN: Route 31 and Route 199

DATE : 6/ 4/ 1
TIME : 15:36:44

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
		REC1	REC2	REC3	REC4
LINK #	*	190	280	80	170
1	*	.2	.0	.0	.2
2	*	1.5	.2	1.3	.0
3	*	1.1	1.5	1.5	1.1
4	*	.0	.9	.3	1.0
5	*	.0	.0	.0	.0
6	*	.8	.0	1.9	.0
7	*	2.6	.8	.5	2.3
8	*	.0	2.4	.0	.7

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Alt A No Build INTER3 RUN: Route 31 and Route 199

DATE : 10/ 3/ 1
TIME : 9: 6:48

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT) X1	Y1	X2	Y2	*	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	*	90.0	136.0	90.0	226.0	*	90.	360.	AG	1238.	29.8	.0	42.0		
2. Link2	*	90.0	139.0	204.0	138.0	*	114.	91.	AG	3358.	18.3	.0	42.0		
3. Link3	*	90.0	144.0	89.0	48.0	*	96.	181.	AG	2031.	29.8	.0	42.0		
4. Link4	*	96.0	139.0	-42.0	139.0	*	138.	270.	AG	2255.	18.3	.0	42.0		
5. LinkQ1	*	84.0	165.0	149.6	3774.3	*	3610.	1.	AG	603.	100.0	.0	10.0	1.76	183.4
6. LinkQ2	*	113.0	145.0	14189.5	145.0	*	*****	90.	AG	464.	100.0	.0	10.0	2.99	715.1
7. LinkQ3	*	96.0	112.0	96.0	-8454.8	*	8567.	180.	AG	603.	100.0	.0	10.0	2.89	435.2
8. LinkQ4	*	67.0	133.0	-9006.0	37.5	*	9073.	269.	AG	557.	100.0	.0	10.0	2.68	460.9

PAGE 2

JOB: 2020 Alt A No Build INTER3 RUN: Route 31 and Route 199

DATE : 10/ 3/ 1
TIME : 9: 6:48

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
5. LinkQ1	*	95	65	3.0	743	1600	328.80	1	3
6. LinkQ2	*	95	50	3.0	2009	1600	328.80	1	3
7. LinkQ3	*	95	65	3.0	1218	1600	328.80	1	3
8. LinkQ4	*	95	60	3.0	1352	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (FT) X	Y	Z	*
1. Rec1	*	119.0	169.0	6.0	*
2. Rec2	*	120.0	109.0	6.0	*
3. Rec3	*	61.0	110.0	6.0	*
4. Rec4	*	60.0	169.0	6.0	*

PAGE 3

JOB: 2020 Alt A No Build INTER3 RUN: Route 31 and Route 199

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	4.6	7.1	7.2	4.8
10.	3.7	6.1	7.8	5.4
20.	3.1	5.5	7.5	5.6
30.	3.0	5.6	7.2	5.5
40.	3.0	5.8	7.1	5.5
50.	3.0	5.9	7.2	5.4
60.	3.0	5.9	7.7	5.3
70.	3.1	5.8	7.9	5.4
80.	3.8	5.5	8.0	5.9
90.	4.9	4.7	7.5	7.2
100.	5.7	3.7	6.3	7.7
110.	6.0	3.2	5.8	7.5
120.	6.1	3.0	5.8	7.2
130.	6.1	3.0	6.0	6.9
140.	6.0	3.0	6.0	7.2
150.	5.8	3.0	6.0	7.3
160.	5.9	3.2	5.9	7.6
170.	6.6	3.9	5.6	7.6
180.	8.0	5.1	4.9	7.0
190.	8.5	5.8	3.8	5.8
200.	8.2	6.0	3.2	5.2
210.	7.6	6.1	3.0	5.1
220.	7.3	6.2	3.0	5.3
230.	7.1	6.1	3.0	5.4
240.	7.3	6.0	3.0	5.6
250.	7.3	6.0	3.3	5.6
260.	7.2	6.7	4.0	5.4
270.	6.6	7.8	5.3	4.7
280.	5.5	8.1	6.0	3.6

290.	*	5.1	7.8	6.0	3.1
300.	*	5.1	7.5	5.9	3.0
310.	*	5.1	7.1	5.7	3.0
320.	*	5.2	7.4	5.5	3.0
330.	*	5.3	7.5	5.4	3.0
340.	*	5.2	7.6	5.4	3.1
350.	*	5.1	7.6	6.1	3.8
360.	*	4.6	7.1	7.2	4.8
MAX	*	8.5	8.1	8.0	7.7
DEGR.	*	190	280	80	100

THE HIGHEST CONCENTRATION OF 8.50 PPM OCCURRED AT RECEPTOR REC1 .

JOB: 2020 Alt A No Build INTER3 RUN: Route 31 and Route 199

DATE : 10/ 3/ 1
TIME : 9: 6:48

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
		REC1	REC2	REC3	REC4
LINK #	*	190	280	80	100
1	*	.2	.0	.0	1.0
2	*	1.7	.3	1.4	1.3
3	*	1.3	1.7	1.7	.1
4	*	.1	1.0	.3	.3
5	*	.0	.0	.0	.6
6	*	.5	.0	1.3	1.4
7	*	1.7	.5	.3	.0
8	*	.0	1.6	.0	.0

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Alts B and C INTER3 RUN: Route 31 and Route 199

DATE : 10/ 3/ 1
TIME : 9:10:52

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	90.0	136.0	90.0	226.0	90.	360.	AG	1430.	29.8	.0	42.0		
2. Link2	90.0	139.0	204.0	138.0	114.	91.	AG	3879.	18.3	.0	42.0		
3. Link3	90.0	144.0	89.0	48.0	96.	181.	AG	2346.	29.8	.0	42.0		
4. Link4	96.0	139.0	-42.0	139.0	138.	270.	AG	2605.	18.3	.0	42.0		
5. LinkQ1	84.0	165.0	171.4	4974.2	4810.	1.	AG	603.	100.0	.0	10.0	2.04	244.3
6. LinkQ2	113.0	145.0	17394.0	145.0	*****	90.	AG	464.	100.0	.0	10.0	3.45	877.9
7. LinkQ3	96.0	112.0	96.0	-10427.1	*****	180.	AG	603.	100.0	.0	10.0	3.34	535.4
8. LinkQ4	67.0	133.0	-11187.2	14.6	*****	269.	AG	557.	100.0	.0	10.0	3.09	571.7

PAGE 2

JOB: 2020 Alts B and C INTER3 RUN: Route 31 and Route 199

DATE : 10/ 3/ 1
TIME : 9:10:52

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
5. LinkQ1	95	65	3.0	858	1600	328.80	1	3
6. LinkQ2	95	50	3.0	2320	1600	328.80	1	3
7. LinkQ3	95	65	3.0	1407	1600	328.80	1	3
8. LinkQ4	95	60	3.0	1562	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	119.0	169.0	6.0
2. Rec2	120.0	109.0	6.0
3. Rec3	61.0	110.0	6.0
4. Rec4	60.0	169.0	6.0

PAGE 3

JOB: 2020 Alts B and C INTER3 RUN: Route 31 and Route 199

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	4.7	7.6	7.6	4.8
10.	3.7	6.5	8.3	5.6
20.	3.1	5.8	7.9	5.7
30.	3.0	5.9	7.7	5.7
40.	3.0	6.1	7.6	5.6
50.	3.0	6.2	8.0	5.6
60.	3.0	6.2	8.4	5.4
70.	3.2	6.0	8.6	5.6
80.	3.8	5.6	8.5	6.1
90.	5.0	4.7	7.9	7.4
100.	5.8	3.7	6.7	8.1
110.	6.3	3.2	6.0	8.0
120.	6.4	3.0	6.1	7.8
130.	6.4	3.0	6.3	7.5
140.	6.3	3.0	6.3	7.7
150.	6.1	3.0	6.3	7.8
160.	6.2	3.2	6.1	8.1
170.	6.9	3.9	5.8	7.9
180.	8.3	5.1	4.9	7.4
190.	9.0	5.9	3.8	6.0
200.	8.9	6.2	3.2	5.4
210.	8.2	6.4	3.0	5.3
220.	7.9	6.4	3.0	5.5
230.	7.8	6.4	3.0	5.6
240.	7.8	6.2	3.0	5.8
250.	7.8	6.2	3.3	5.8
260.	7.7	7.0	4.0	5.5
270.	7.0	8.2	5.4	4.8
280.	5.8	8.6	6.1	3.7

290.	*	5.3	8.4	6.2	3.2
300.	*	5.3	8.1	6.1	3.0
310.	*	5.3	7.7	5.9	3.0
320.	*	5.4	7.9	5.8	3.0
330.	*	5.4	8.0	5.6	3.0
340.	*	5.3	8.1	5.5	3.1
350.	*	5.2	8.2	6.2	3.8
360.	*	4.7	7.6	7.6	4.8
MAX	*	9.0	8.6	8.6	8.1
DEGR.	*	190	280	70	100

THE HIGHEST CONCENTRATION OF 9.00 PPM OCCURRED AT RECEPTOR REC1 .

JOB: 2020 Alts B and C INTER3 RUN: Route 31 and Route 199

DATE : 10/ 3/ 1
TIME : 9:10:52

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
		REC1	REC2	REC3	REC4
LINK #	*	190	280	70	100
1	*	.3	.0	.1	1.2
2	*	2.0	.3	1.9	1.5
3	*	1.4	2.0	1.9	.1
4	*	.1	1.2	.6	.3
5	*	.0	.0	.0	.6
6	*	.5	.0	1.0	1.4
7	*	1.7	.5	.1	.0
8	*	.0	1.6	.0	.0

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Alt D INTER3 RUN: Route 31 and Route 199

DATE : 10/ 3/ 1
TIME : 9:13:31

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	90.0	136.0	90.0	226.0	90.	360.	AG	1323.	29.8	.0	42.0		
2. Link2	90.0	139.0	204.0	138.0	114.	91.	AG	3590.	18.3	.0	42.0		
3. Link3	90.0	144.0	89.0	48.0	96.	181.	AG	2171.	29.8	.0	42.0		
4. Link4	96.0	139.0	-42.0	139.0	138.	270.	AG	2411.	18.3	.0	42.0		
5. LinkQ1	84.0	165.0	159.3	4306.4	4142.	1.	AG	603.	100.0	.0	10.0	1.89	210.4
6. LinkQ2	113.0	145.0	15621.8	145.0	*****	90.	AG	464.	100.0	.0	10.0	3.19	787.8
7. LinkQ3	96.0	112.0	96.0	-9331.4	9443.	180.	AG	603.	100.0	.0	10.0	3.09	479.7
8. LinkQ4	67.0	133.0	-9972.0	27.4	*****	269.	AG	557.	100.0	.0	10.0	2.86	510.0

PAGE 2

JOB: 2020 Alt D INTER3 RUN: Route 31 and Route 199

DATE : 10/ 3/ 1
TIME : 9:13:31

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
5. LinkQ1	95	65	3.0	794	1600	328.80	1	3
6. LinkQ2	95	50	3.0	2148	1600	328.80	1	3
7. LinkQ3	95	65	3.0	1302	1600	328.80	1	3
8. LinkQ4	95	60	3.0	1445	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	119.0	169.0	6.0
2. Rec2	120.0	109.0	6.0
3. Rec3	61.0	110.0	6.0
4. Rec4	60.0	169.0	6.0

PAGE 3

JOB: 2020 Alt D INTER3 RUN: Route 31 and Route 199

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	4.6	7.2	7.4	4.8
10.	3.7	6.3	8.0	5.5
20.	3.1	5.6	7.8	5.7
30.	3.0	5.7	7.4	5.6
40.	3.0	5.9	7.4	5.5
50.	3.0	6.1	7.6	5.5
60.	3.0	6.1	7.9	5.3
70.	3.1	5.9	8.1	5.5
80.	3.8	5.5	8.2	6.0
90.	4.9	4.7	7.6	7.2
100.	5.7	3.7	6.5	7.9
110.	6.1	3.2	5.9	7.8
120.	6.2	3.0	5.9	7.5
130.	6.2	3.0	6.1	7.3
140.	6.1	3.0	6.1	7.3
150.	6.0	3.0	6.1	7.6
160.	6.0	3.2	6.0	7.8
170.	6.7	3.9	5.7	7.7
180.	8.2	5.1	4.9	7.3
190.	8.7	5.9	3.8	5.9
200.	8.4	6.1	3.2	5.3
210.	7.9	6.2	3.0	5.2
220.	7.6	6.3	3.0	5.4
230.	7.4	6.3	3.0	5.5
240.	7.4	6.1	3.0	5.7
250.	7.6	6.1	3.3	5.7
260.	7.5	6.9	4.0	5.4
270.	6.8	8.1	5.3	4.8
280.	5.7	8.3	6.0	3.7

290.	*	5.2	8.1	6.1	3.2
300.	*	5.2	7.7	6.0	3.0
310.	*	5.2	7.5	5.8	3.0
320.	*	5.3	7.6	5.6	3.0
330.	*	5.3	7.7	5.5	3.0
340.	*	5.2	7.8	5.4	3.1
350.	*	5.1	7.9	6.1	3.8
360.	*	4.6	7.2	7.4	4.8
MAX	*	8.7	8.3	8.2	7.9
DEGR.	*	190	280	80	100

THE HIGHEST CONCENTRATION OF 8.70 PPM OCCURRED AT RECEPTOR REC1 .

JOB: 2020 Alt D INTER3 RUN: Route 31 and Route 199

DATE : 10/ 3/ 1
TIME : 9:13:31

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
		REC1	REC2	REC3	REC4
LINK #	*	190	280	80	100
1	*	.3	.0	.0	1.1
2	*	1.8	.3	1.5	1.4
3	*	1.3	1.8	1.8	.1
4	*	.1	1.1	.3	.3
5	*	.0	.0	.0	.6
6	*	.5	.0	1.3	1.4
7	*	1.7	.5	.3	.0
8	*	.0	1.6	.0	.0

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Alt E INTER3 RUN: Route 31 and Route 199

DATE : 10/ 3/ 1
TIME : 9:16:10

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	90.0	136.0	90.0	226.0	90.	360.	AG	1348.	29.8	.0	42.0		
2. Link2	90.0	139.0	204.0	138.0	114.	91.	AG	3657.	18.3	.0	42.0		
3. Link3	90.0	144.0	89.0	48.0	96.	181.	AG	2212.	29.8	.0	42.0		
4. Link4	96.0	139.0	-42.0	139.0	138.	270.	AG	2456.	18.3	.0	42.0		
5. LinkQ1	84.0	165.0	162.1	4463.0	4299.	1.	AG	603.	100.0	.0	10.0	1.92	218.4
6. LinkQ2	113.0	145.0	16033.9	145.0	*****	90.	AG	464.	100.0	.0	10.0	3.25	808.8
7. LinkQ3	96.0	112.0	96.0	-9581.8	9694.	180.	AG	603.	100.0	.0	10.0	3.15	492.4
8. LinkQ4	67.0	133.0	-10252.4	24.4	*****	269.	AG	557.	100.0	.0	10.0	2.91	524.3

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JOB: 2020 Alt E INTER3 RUN: Route 31 and Route 199

DATE : 10/ 3/ 1
TIME : 9:16:10

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
5. LinkQ1	95	65	3.0	809	1600	328.80	1	3
6. LinkQ2	95	50	3.0	2188	1600	328.80	1	3
7. LinkQ3	95	65	3.0	1326	1600	328.80	1	3
8. LinkQ4	95	60	3.0	1472	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	119.0	169.0	6.0
2. Rec2	120.0	109.0	6.0
3. Rec3	61.0	110.0	6.0
4. Rec4	60.0	169.0	6.0

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JOB: 2020 Alt E INTER3 RUN: Route 31 and Route 199

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	4.6	7.2	7.4	4.8
10.	3.7	6.4	8.1	5.5
20.	3.1	5.6	7.8	5.7
30.	3.0	5.8	7.5	5.6
40.	3.0	5.9	7.4	5.5
50.	3.0	6.1	7.7	5.5
60.	3.0	6.1	8.1	5.4
70.	3.1	5.9	8.3	5.5
80.	3.8	5.6	8.3	6.0
90.	4.9	4.7	7.8	7.4
100.	5.8	3.7	6.6	8.0
110.	6.2	3.2	5.9	7.9
120.	6.3	3.0	5.9	7.5
130.	6.3	3.0	6.2	7.3
140.	6.1	3.0	6.1	7.5
150.	6.0	3.0	6.2	7.7
160.	6.0	3.2	6.0	7.9
170.	6.8	3.9	5.7	7.8
180.	8.2	5.1	4.9	7.3
190.	8.9	5.9	3.8	6.0
200.	8.5	6.1	3.2	5.3
210.	8.0	6.3	3.0	5.2
220.	7.8	6.3	3.0	5.4
230.	7.4	6.3	3.0	5.5
240.	7.5	6.1	3.0	5.7
250.	7.6	6.1	3.3	5.7
260.	7.5	6.9	4.0	5.5
270.	6.9	8.1	5.3	4.8
280.	5.7	8.3	6.0	3.7

290.	*	5.2	8.2	6.1	3.2
300.	*	5.2	7.7	6.0	3.0
310.	*	5.2	7.5	5.8	3.0
320.	*	5.3	7.7	5.7	3.0
330.	*	5.3	7.8	5.6	3.0
340.	*	5.2	8.0	5.5	3.1
350.	*	5.1	8.0	6.2	3.8
360.	*	4.6	7.2	7.4	4.8
MAX	*	8.9	8.3	8.3	8.0
DEGR.	*	190	280	80	100

THE HIGHEST CONCENTRATION OF 8.90 PPM OCCURRED AT RECEPTOR REC1 .

JOB: 2020 Alt E INTER3 RUN: Route 31 and Route 199

DATE : 10/ 3/ 1
TIME : 9:16:10

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
LINK #	*	REC1 190	REC2 280	REC3 80	REC4 100
1	*	.3	.0	.0	1.1
2	*	1.9	.3	1.5	1.5
3	*	1.4	1.8	1.9	.1
4	*	.1	1.1	.3	.3
5	*	.0	.0	.0	.6
6	*	.5	.0	1.3	1.4
7	*	1.7	.5	.3	.0
8	*	.0	1.6	.0	.0

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2001 existconditions int4 RUN: colnatlhistparkway and Route199

DATE : 8/14/ 1
TIME : 13:51:10

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	104.0	151.0	103.0	250.0	99.	359.	AG	380.	31.3	.0	44.0		
2. Link2	98.0	157.0	258.0	157.0	160.	90.	FL	2700.	31.3	21.0	44.0		
3. Link3	104.0	163.0	107.0	15.0	148.	179.	AG	380.	31.3	.0	44.0		
4. Link4	107.0	158.0	-50.0	159.0	157.	270.	FL	2173.	31.3	21.0	44.0		
5. Link5	10.0	146.0	92.0	43.0	132.	141.	AG	217.	38.9	.0	20.0		
6. Link6	116.0	246.0	213.0	172.0	122.	127.	AG	270.	38.9	.0	20.0		
7. LinkQ1	83.0	56.0	58.6	85.6	38.	320.	AG	1822.	100.0	.0	10.0	.26	1.9
8. LinkQ2	122.0	242.0	160.4	213.2	48.	127.	AG	1822.	100.0	.0	10.0	.32	2.4
9. LinkQ3	110.0	129.0	110.1	123.8	5.	179.	AG	1401.	100.0	.0	10.0	.03	.3
10. LinkQ4	97.0	190.0	96.9	195.2	5.	359.	AG	1401.	100.0	.0	10.0	.03	.3

PAGE 2

JOB: 2001 existconditions int4 RUN: colnatlhistparkway and Route199

DATE : 8/14/ 1
TIME : 13:51:10

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
7. LinkQ1	95	65	3.0	217	1600	496.30	1	3
8. LinkQ2	95	65	3.0	270	1600	496.30	1	3
9. LinkQ3	95	50	3.0	38	1600	496.30	1	3
10. LinkQ4	95	50	3.0	38	1600	496.30	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	141.0	193.0	26.0
2. Rec2	147.0	116.0	6.0
3. Rec3	66.0	121.0	6.0
4. Rec4	60.0	199.0	26.0

PAGE 3

JOB: 2001 existconditions int4 RUN: colnatlhistparkway and Route199

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	5.0	6.3	4.8	3.0
10.	4.9	5.9	5.1	3.0
20.	4.7	5.5	5.8	3.0
30.	4.4	5.4	6.4	3.0
40.	4.0	5.4	6.6	3.3
50.	3.6	5.4	6.6	3.7
60.	3.3	5.1	6.6	4.1
70.	3.2	4.7	6.2	4.3
80.	3.3	3.9	5.6	4.4
90.	3.6	3.4	4.6	4.6
100.	4.3	3.1	3.8	5.1
110.	4.9	3.0	3.5	5.3
120.	5.1	3.0	3.3	5.3
130.	5.1	3.0	3.3	5.3
140.	5.0	3.0	3.5	5.1
150.	4.8	3.0	4.1	4.9
160.	4.7	3.0	4.8	4.9
170.	4.6	3.0	5.6	4.9
180.	4.8	3.0	5.5	4.9
190.	5.1	3.1	5.0	4.5
200.	5.4	3.2	4.3	4.4
210.	5.9	3.5	3.7	4.4
220.	5.8	3.9	3.3	4.4
230.	5.8	4.3	3.2	4.4
240.	5.6	4.4	3.2	4.3
250.	5.4	4.2	3.2	4.1
260.	4.9	4.1	3.3	3.6

270.	*	4.1	4.4	3.6	3.2
280.	*	3.6	5.2	4.2	3.1
290.	*	3.3	5.8	4.8	3.0
300.	*	3.1	6.2	5.0	3.0
310.	*	3.2	6.0	4.9	3.0
320.	*	3.4	6.0	4.9	3.0
330.	*	4.0	6.0	4.8	3.0
340.	*	4.4	6.0	4.7	3.0
350.	*	4.8	6.2	4.6	3.0
360.	*	5.0	6.3	4.8	3.0
MAX	*	5.9	6.3	6.6	5.3
DEGR.	*	210	0	40	110

THE HIGHEST CONCENTRATION OF 6.60 PPM OCCURRED AT RECEPTOR REC3 .

JOB: 2001 existconditions int4 RUN: colnatlhistparkway and Route199

DATE : 8/14/ 1
TIME : 13:51:10

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
		REC1	REC2	REC3	REC4
LINK #	*	210	0	40	110
1	*	.0	.1	.2	.1
2	*	1.6	2.1	1.0	1.7
3	*	.2	.0	.2	.0
4	*	.4	.0	1.3	.3
5	*	.1	.0	.0	.0
6	*	.0	.1	.1	.0
7	*	.5	.0	.0	.0
8	*	.0	1.0	.7	.0
9	*	.1	.0	.0	.0
10	*	.0	.0	.1	.2

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Alt A No Build int4 RUN: colnatlhistparkway and Route199

DATE : 10/ 3/ 1
TIME : 10:21:51

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	*	LINK COORDINATES (FT) X1	Y1	X2	Y2	*	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	*	104.0	151.0	103.0	250.0	*	99.	359.	AG	565.	23.4	.0	44.0		
2. Link2	*	98.0	157.0	258.0	157.0	*	160.	90.	FL	4172.	23.4	21.0	44.0		
3. Link3	*	104.0	163.0	107.0	15.0	*	148.	179.	AG	565.	23.4	.0	44.0		
4. Link4	*	107.0	158.0	-50.0	159.0	*	157.	270.	FL	3358.	23.4	21.0	44.0		
5. Link5	*	10.0	146.0	92.0	43.0	*	132.	141.	AG	335.	29.8	.0	20.0		
6. Link6	*	116.0	246.0	213.0	172.0	*	122.	127.	AG	417.	29.8	.0	20.0		
7. LinkQ1	*	83.0	56.0	45.2	101.8	*	59.	320.	AG	1207.	100.0	.0	10.0	.40	3.0
8. LinkQ2	*	122.0	242.0	181.1	197.6	*	74.	127.	AG	1207.	100.0	.0	10.0	.49	3.8
9. LinkQ3	*	110.0	129.0	110.7	82.8	*	46.	179.	AG	928.	100.0	.0	10.0	.25	2.3
10. LinkQ4	*	97.0	190.0	96.2	236.2	*	46.	359.	AG	928.	100.0	.0	10.0	.25	2.3

PAGE 2

JOB: 2020 Alt A No Build int4 RUN: colnatlhistparkway and Route199

DATE : 10/ 3/ 1
TIME : 10:21:51

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	*	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
7. LinkQ1	*	95	65	3.0	335	1600	328.80	1	3
8. LinkQ2	*	95	65	3.0	417	1600	328.80	1	3
9. LinkQ3	*	95	50	3.0	339	1600	328.80	1	3
10. LinkQ4	*	95	50	3.0	339	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	*	COORDINATES (FT) X	Y	Z	*
1. Rec1	*	141.0	193.0	26.0	*
2. Rec2	*	147.0	116.0	6.0	*
3. Rec3	*	66.0	121.0	6.0	*
4. Rec4	*	60.0	199.0	26.0	*

PAGE 3

JOB: 2020 Alt A No Build int4 RUN: colnatlhistparkway and Route199

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	* CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	4.3	6.6	5.4	3.0
10.	4.3	6.4	5.8	3.0
20.	4.2	6.2	6.5	3.1
30.	4.2	6.0	7.1	3.2
40.	4.2	5.9	7.1	3.6
50.	4.2	5.8	7.3	4.3
60.	4.2	5.5	7.1	4.7
70.	4.1	4.9	6.9	4.9
80.	4.1	4.1	6.2	5.1
90.	4.2	3.4	5.5	5.4
100.	4.6	3.1	4.8	5.7
110.	5.3	3.0	4.6	5.8
120.	5.4	3.0	4.4	5.7
130.	5.4	3.0	4.1	5.7
140.	5.3	3.0	3.9	5.6
150.	5.1	3.0	4.0	5.6
160.	4.9	3.0	4.6	5.4
170.	5.0	3.0	5.0	5.2
180.	5.2	3.0	5.6	5.2
190.	5.7	3.1	5.6	4.9
200.	6.1	3.3	5.3	4.6
210.	6.4	3.6	5.1	4.7
220.	6.4	4.3	4.6	4.7
230.	6.3	5.1	4.1	4.6
240.	6.0	5.5	3.7	4.6
250.	5.7	5.6	3.4	4.2
260.	5.2	5.6	3.3	3.7

270.	*	4.6	5.7	3.7	3.3
280.	*	4.1	6.1	4.3	3.1
290.	*	4.0	6.4	5.0	3.0
300.	*	3.9	6.7	5.3	3.0
310.	*	3.7	6.8	5.3	3.0
320.	*	3.7	6.7	5.2	3.0
330.	*	3.9	6.7	5.1	3.0
340.	*	4.0	6.6	4.9	3.0
350.	*	4.2	6.6	5.0	3.0
360.	*	4.3	6.6	5.4	3.0
MAX	*	6.4	6.8	7.3	5.8
DEGR.	*	210	310	50	110

THE HIGHEST CONCENTRATION OF 7.30 PPM OCCURRED AT RECEPTOR REC3 .

JOB: 2020 Alt A No Build int4 RUN: colnatlhistparkway and Route199

DATE : 10/ 3/ 1
TIME : 10:21:51

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
		REC1	REC2	REC3	REC4
LINK #	*	210	310	50	110
1	*	.0	.2	.2	.1
2	*	1.8	1.7	1.8	2.0
3	*	.2	.3	.3	.0
4	*	.4	1.3	1.2	.3
5	*	.1	.0	.0	.0
6	*	.0	.0	.1	.0
7	*	.5	.0	.0	.0
8	*	.0	.0	.6	.1
9	*	.4	.1	.0	.0
10	*	.0	.2	.1	.3

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Alts B and C int4 RUN: colnatlhistparkway and Route199

DATE : 10/ 3/ 1
TIME : 10:24:38

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	104.0	151.0	103.0	250.0	99.	359.	AG	653.	23.4	.0	44.0		
2. Link2	98.0	157.0	258.0	157.0	160.	90.	FL	4819.	23.4	21.0	44.0		
3. Link3	104.0	163.0	107.0	15.0	148.	179.	AG	653.	23.4	.0	44.0		
4. Link4	107.0	158.0	-50.0	159.0	157.	270.	FL	3879.	23.4	21.0	44.0		
5. Link5	10.0	146.0	92.0	43.0	132.	141.	AG	387.	29.8	.0	20.0		
6. Link6	116.0	246.0	213.0	172.0	122.	127.	AG	482.	29.8	.0	20.0		
7. LinkQ1	83.0	56.0	39.4	108.9	69.	320.	AG	1207.	100.0	.0	10.0	.46	3.5
8. LinkQ2	122.0	242.0	190.5	190.6	86.	127.	AG	1207.	100.0	.0	10.0	.57	4.4
9. LinkQ3	110.0	129.0	110.8	75.4	54.	179.	AG	928.	100.0	.0	10.0	.29	2.7
10. LinkQ4	97.0	190.0	96.1	243.6	54.	359.	AG	928.	100.0	.0	10.0	.29	2.7

PAGE 2

JOB: 2020 Alts B and C int4 RUN: colnatlhistparkway and Route199

DATE : 10/ 3/ 1
TIME : 10:24:38

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
7. LinkQ1	95	65	3.0	387	1600	328.80	1	3
8. LinkQ2	95	65	3.0	482	1600	328.80	1	3
9. LinkQ3	95	50	3.0	392	1600	328.80	1	3
10. LinkQ4	95	50	3.0	392	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	141.0	193.0	26.0
2. Rec2	147.0	116.0	6.0
3. Rec3	66.0	121.0	6.0
4. Rec4	60.0	199.0	26.0

PAGE 3

JOB: 2020 Alts B and C int4 RUN: colnatlhistparkway and Route199

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	4.3	7.2	5.7	3.0
10.	4.3	6.9	6.2	3.0
20.	4.2	6.9	7.0	3.1
30.	4.2	6.7	7.5	3.3
40.	4.2	6.5	7.7	3.8
50.	4.2	6.3	7.9	4.4
60.	4.2	5.8	7.8	4.8
70.	4.3	5.2	7.6	5.0
80.	4.4	4.2	6.7	5.4
90.	4.8	3.5	5.8	5.6
100.	5.3	3.1	5.0	6.0
110.	5.7	3.0	4.7	6.2
120.	6.0	3.0	4.6	6.2
130.	5.8	3.0	4.3	6.0
140.	5.7	3.0	4.1	6.0
150.	5.5	3.0	4.3	5.9
160.	5.2	3.0	4.7	5.6
170.	5.3	3.0	5.2	5.6
180.	5.6	3.1	5.6	5.5
190.	6.0	3.1	5.6	5.2
200.	6.5	3.4	5.5	4.9
210.	6.9	3.9	5.5	4.9
220.	6.9	4.6	5.3	4.9
230.	6.8	5.3	5.1	4.9
240.	6.5	5.7	4.6	4.8

250.	*	6.1	5.9	4.2	4.4
260.	*	5.6	5.9	3.8	3.8
270.	*	4.7	6.1	4.0	3.3
280.	*	4.2	6.5	4.6	3.1
290.	*	4.0	6.9	5.3	3.0
300.	*	4.0	7.1	5.6	3.0
310.	*	3.8	7.2	5.7	3.0
320.	*	3.8	7.2	5.5	3.0
330.	*	3.9	7.3	5.4	3.0
340.	*	4.1	7.2	5.2	3.0
350.	*	4.2	7.0	5.3	3.0
360.	*	4.3	7.2	5.7	3.0
MAX	*	6.9	7.3	7.9	6.2
DEGR.	*	210	330	50	110

THE HIGHEST CONCENTRATION OF 7.90 PPM OCCURRED AT RECEPTOR REC3 .

JOB: 2020 Alts B and C int4 RUN: colnatlhistparkway and Route199

DATE : 10/ 3/ 1
TIME : 10:24:38

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
		REC1	REC2	REC3	REC4
LINK #	*	210	330	50	110
1	*	.0	.3	.2	.1
2	*	2.1	2.6	2.1	2.3
3	*	.2	.2	.3	.0
4	*	.5	.5	1.4	.3
5	*	.1	.0	.0	.0
6	*	.0	.0	.1	.0
7	*	.5	.0	.0	.0
8	*	.0	.1	.7	.2
9	*	.5	.0	.0	.0
10	*	.0	.6	.1	.3

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Alt D int4 RUN: colnatlhistparkway and Route199

DATE : 10/ 3/ 1
TIME : 10:28:27

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	104.0	151.0	103.0	250.0	99.	359.	AG	604.	23.4	.0	44.0		
2. Link2	98.0	157.0	258.0	157.0	160.	90.	FL	4460.	23.4	21.0	44.0		
3. Link3	104.0	163.0	107.0	15.0	148.	179.	AG	604.	23.4	.0	44.0		
4. Link4	107.0	158.0	-50.0	159.0	157.	270.	FL	3590.	23.4	21.0	44.0		
5. Link5	10.0	146.0	92.0	43.0	132.	141.	AG	358.	29.8	.0	20.0		
6. Link6	116.0	246.0	213.0	172.0	122.	127.	AG	446.	29.8	.0	20.0		
7. LinkQ1	83.0	56.0	42.5	105.1	64.	320.	AG	1207.	100.0	.0	10.0	.43	3.2
8. LinkQ2	122.0	242.0	185.4	194.4	79.	127.	AG	1207.	100.0	.0	10.0	.53	4.0
9. LinkQ3	110.0	129.0	110.7	79.5	49.	179.	AG	928.	100.0	.0	10.0	.27	2.5
10. LinkQ4	97.0	190.0	96.1	239.5	49.	359.	AG	928.	100.0	.0	10.0	.27	2.5

PAGE 2

JOB: 2020 Alt D int4 RUN: colnatlhistparkway and Route199

DATE : 10/ 3/ 1
TIME : 10:28:27

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
7. LinkQ1	95	65	3.0	358	1600	328.80	1	3
8. LinkQ2	95	65	3.0	446	1600	328.80	1	3
9. LinkQ3	95	50	3.0	362	1600	328.80	1	3
10. LinkQ4	95	50	3.0	362	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	141.0	193.0	26.0
2. Rec2	147.0	116.0	6.0
3. Rec3	66.0	121.0	6.0
4. Rec4	60.0	199.0	26.0

PAGE 3

JOB: 2020 Alt D int4 RUN: colnatlhistparkway and Route199

MODEL RESULTS

REMARKS : In search of the angle corresponding to
the maximum concentration, only the first
angle, of the angles with same maximum
concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	4.3	6.9	5.5	3.0
10.	4.3	6.7	6.0	3.0
20.	4.2	6.6	6.7	3.1
30.	4.2	6.2	7.4	3.3
40.	4.2	6.1	7.4	3.7
50.	4.2	6.0	7.5	4.3
60.	4.2	5.6	7.4	4.7
70.	4.2	5.0	7.3	4.9
80.	4.3	4.1	6.5	5.1
90.	4.5	3.4	5.7	5.4
100.	4.9	3.1	4.8	5.9
110.	5.4	3.0	4.7	6.0
120.	5.7	3.0	4.5	5.9
130.	5.6	3.0	4.2	5.9
140.	5.5	3.0	4.0	5.8
150.	5.3	3.0	4.2	5.7
160.	5.1	3.0	4.6	5.5
170.	5.1	3.0	5.1	5.4
180.	5.4	3.1	5.6	5.4
190.	5.8	3.1	5.6	5.0
200.	6.3	3.3	5.5	4.8
210.	6.8	3.7	5.4	4.8
220.	6.6	4.5	5.1	4.8
230.	6.5	5.2	4.6	4.8
240.	6.2	5.7	4.1	4.7
250.	5.8	5.7	3.7	4.3
260.	5.4	5.7	3.5	3.8

270.	*	4.6	5.8	3.8	3.3
280.	*	4.2	6.2	4.4	3.1
290.	*	4.0	6.7	5.1	3.0
300.	*	3.9	6.8	5.4	3.0
310.	*	3.8	7.0	5.5	3.0
320.	*	3.7	6.9	5.3	3.0
330.	*	3.9	6.9	5.2	3.0
340.	*	4.1	7.0	5.0	3.0
350.	*	4.2	6.8	5.1	3.0
360.	*	4.3	6.9	5.5	3.0
MAX	*	6.8	7.0	7.5	6.0
DEGR.	*	210	310	50	110

THE HIGHEST CONCENTRATION OF 7.50 PPM OCCURRED AT RECEPTOR REC3 .

JOB: 2020 Alt D int4 RUN: colnatlhistparkway and Route199

DATE : 10/ 3/ 1
TIME : 10:28:27

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

		CO/LINK (PPM) ANGLE (DEGREES)			
		REC1	REC2	REC3	REC4
LINK #	*	210	310	50	110
1	*	.0	.2	.2	.1
2	*	2.0	1.8	1.9	2.2
3	*	.2	.3	.3	.0
4	*	.5	1.4	1.3	.3
5	*	.1	.0	.0	.0
6	*	.0	.0	.1	.0
7	*	.5	.0	.0	.0
8	*	.0	.0	.6	.1
9	*	.5	.1	.0	.0
10	*	.0	.2	.1	.3

CAL3QHC: LINE SOURCE DISPERSION MODEL - VERSION 2.0 Dated 95221 PAGE 1

JOB: 2020 Alt E int4 RUN: colnatlhistparkway and Route199

DATE : 10/ 3/ 1
TIME : 10:30:41

The MODE flag has been set to C for calculating CO averages.

SITE & METEOROLOGICAL VARIABLES

VS = .0 CM/S VD = .0 CM/S Z0 = 108. CM
U = 1.0 M/S CLAS = 4 (D) ATIM = 60. MINUTES MIXH = 1000. M AMB = 3.0 PPM

LINK VARIABLES

LINK DESCRIPTION	LINK COORDINATES (FT) X1	Y1	X2	Y2	LENGTH (FT)	BRG (DEG)	TYPE	VPH	EF (G/MI)	H (FT)	W (FT)	V/C	QUEUE (VEH)
1. Link1	104.0	151.0	103.0	250.0	99.	359.	AG	615.	23.4	.0	44.0		
2. Link2	98.0	157.0	258.0	157.0	160.	90.	FL	4543.	23.4	21.0	44.0		
3. Link3	104.0	163.0	107.0	15.0	148.	179.	AG	615.	23.4	.0	44.0		
4. Link4	107.0	158.0	-50.0	159.0	157.	270.	FL	3657.	23.4	21.0	44.0		
5. Link5	10.0	146.0	92.0	43.0	132.	141.	AG	365.	29.8	.0	20.0		
6. Link6	116.0	246.0	213.0	172.0	122.	127.	AG	454.	29.8	.0	20.0		
7. LinkQ1	83.0	56.0	41.8	105.9	65.	320.	AG	1207.	100.0	.0	10.0	.43	3.3
8. LinkQ2	122.0	242.0	186.5	193.6	81.	127.	AG	1207.	100.0	.0	10.0	.54	4.1
9. LinkQ3	110.0	129.0	110.8	78.7	50.	179.	AG	928.	100.0	.0	10.0	.27	2.6
10. LinkQ4	97.0	190.0	96.1	240.3	50.	359.	AG	928.	100.0	.0	10.0	.27	2.6

PAGE 2

JOB: 2020 Alt E int4 RUN: colnatlhistparkway and Route199

DATE : 10/ 3/ 1
TIME : 10:30:41

ADDITIONAL QUEUE LINK PARAMETERS

LINK DESCRIPTION	CYCLE LENGTH (SEC)	RED TIME (SEC)	CLEARANCE LOST TIME (SEC)	APPROACH VOL (VPH)	SATURATION FLOW RATE (VPH)	IDLE EM FAC (gm/hr)	SIGNAL TYPE	ARRIVAL RATE
7. LinkQ1	95	65	3.0	365	1600	328.80	1	3
8. LinkQ2	95	65	3.0	454	1600	328.80	1	3
9. LinkQ3	95	50	3.0	369	1600	328.80	1	3
10. LinkQ4	95	50	3.0	369	1600	328.80	1	3

RECEPTOR LOCATIONS

RECEPTOR	COORDINATES (FT) X	Y	Z
1. Rec1	141.0	193.0	26.0
2. Rec2	147.0	116.0	6.0
3. Rec3	66.0	121.0	6.0
4. Rec4	60.0	199.0	26.0

PAGE 3

JOB: 2020 Alt E int4 RUN: colnatlhistparkway and Route199

MODEL RESULTS

REMARKS : In search of the angle corresponding to the maximum concentration, only the first angle, of the angles with same maximum concentrations, is indicated as maximum.

WIND ANGLE RANGE: 0.-360.

WIND ANGLE (DEGR)	CONCENTRATION (PPM) REC1	REC2	REC3	REC4
0.	4.3	7.0	5.5	3.0
10.	4.3	6.8	6.1	3.0
20.	4.2	6.6	6.8	3.1
30.	4.2	6.4	7.4	3.3
40.	4.2	6.2	7.5	3.7
50.	4.2	6.1	7.5	4.3
60.	4.2	5.7	7.5	4.8
70.	4.2	5.1	7.4	4.9
80.	4.3	4.2	6.5	5.2
90.	4.6	3.4	5.7	5.5
100.	5.0	3.1	4.9	5.9
110.	5.5	3.0	4.7	6.0
120.	5.7	3.0	4.5	5.9
130.	5.7	3.0	4.2	5.9
140.	5.5	3.0	4.0	5.8
150.	5.3	3.0	4.2	5.7
160.	5.1	3.0	4.6	5.5
170.	5.1	3.0	5.1	5.4
180.	5.4	3.1	5.6	5.4
190.	5.8	3.1	5.6	5.1
200.	6.3	3.4	5.5	4.9
210.	6.8	3.7	5.4	4.8
220.	6.7	4.5	5.2	4.8
230.	6.7	5.2	4.8	4.8
240.	6.4	5.7	4.3	4.7
250.	6.0	5.7	3.8	4.3
260.	5.5	5.7	3.6	3.8

270.	*	4.6	5.9	3.8	3.3
280.	*	4.2	6.3	4.4	3.1
290.	*	4.0	6.7	5.2	3.0
300.	*	3.9	7.0	5.5	3.0
310.	*	3.8	7.0	5.6	3.0
320.	*	3.7	7.0	5.4	3.0
330.	*	3.9	7.0	5.2	3.0
340.	*	4.1	7.0	5.1	3.0
350.	*	4.2	6.9	5.2	3.0
360.	*	4.3	7.0	5.5	3.0
MAX	*	6.8	7.0	7.5	6.0
DEGR.	*	210	0	40	110

THE HIGHEST CONCENTRATION OF 7.50 PPM OCCURRED AT RECEPTOR REC3 .

JOB: 2020 Alt E int4 RUN: colnatlhistparkway and Route199

DATE : 10/ 3/ 1
TIME : 10:30:41

RECEPTOR - LINK MATRIX FOR THE ANGLE PRODUCING
THE MAXIMUM CONCENTRATION FOR EACH RECEPTOR

	CO/LINK (PPM) ANGLE (DEGREES)			
LINK #	REC1 210	REC2 0	REC3 40	REC4 110
1	.0	.1	.3	.1
2	2.0	2.7	1.3	2.2
3	.2	.0	.2	.0
4	.5	.0	1.7	.3
5	.1	.0	.0	.0
6	.0	.1	.1	.0
7	.5	.0	.0	.0
8	.0	1.0	.7	.1
9	.5	.0	.0	.0
10	.0	.1	.2	.3

Microscale Results Summary

Predicted Maximum 1 Hour CO Concentrations

Jamestown Virginia

Colonial Historic Parkway at Route 359

Int 1	Receptor		2001	2020 Alt A/No Build	2020 Alt B	2020 Alt C	2020 Alt D	2020 Alt E
	East Side of Colonial Parkway	**1**	4.5	4.5	4.5	4.3	4.5	4.5
	Jamestown Settlement Parking Lot (East side)	**2**	5.4	4.7	4.7	4.7	4.7	4.7
	Jamestown Settlement Visitor's Center (East side)	**3**	4.8	4.4	4.4	4.4	4.4	4.4

Route 31 at Route 359

Int 2	Receptor		2001	2020 Alt A/No Build	2020 Alt B	2020 Alt C	2020 Alt D	2020 Alt E
	West side of Route 31	**1**	5.3	4.7	4.7	4.7	4.7	4.7
	Jamestown Settlement Parking Lot (West side)	**2**	5.4	4.7	4.7	4.7	4.7	4.7
	Jamestown Settlement Visitor's Center (West side)	**3**	5.3	4.5	4.5	4.5	4.5	4.5

Route 31 at Route 199

Int 3	Receptor		2001	2020 Alt A/No Build	2020 Alt B	2020 Alt C	2020 Alt D	2020 Alt E
	Prudential Realty Office	**1**	9.2	8.5	9.0	9.0	8.7	8.9
	CVS Convenience Store	**2**	8.8	8.1	8.6	8.6	8.3	8.3
	Sun Trust Bank and Office Park	**3**	8.5	8.0	8.6	8.6	8.2	8.3
	711 Convenience Store	**4**	8.3	7.7	8.1	8.1	7.9	8.0

Colonial Historic Parkway at Route 199

Int 4	Receptor		2001	2020 Alt A/No Build	2020 Alt B	2020 Alt C	2020 Alt D	2020 Alt E
	Open Space Northeast Quadrant	**1**	5.9	6.4	6.9	6.9	6.8	6.8
	Open Space Southeast Quadrant	**2**	6.3	6.8	7.3	7.3	7.0	7.0
	Open Space Southwest Quadrant	**3**	6.6	7.3	7.9	7.9	7.5	7.5
	Open Space Northwest Quadrant	**4**	5.3	5.8	6.2	6.2	6.0	6.0

The Highest Values Presented in AQ Analysis are Bolded

Predicted Maximum 8 Hour CO Concentrations

Colonial Historic Parkway at Route 359

Int 1	Receptor		2001	200x NB	200x B	2020 Alt A/No Build	2020 Alt B	2020 Alt C	2020 Alt D
	East Side of Colonial Parkway	**1**	3.2	0.0	0.0	3.2	3.2	3.0	3.2
	Jamestown Settlement Parking Lot (East side)	**2**	3.8	0.0	0.0	3.3	3.3	3.3	3.3
	Jamestown Settlement Visitor's Center (East side)	**3**	3.4	0.0	0.0	3.1	3.1	3.1	3.1

Route 31 at Route 359

Int 2	Receptor		2001	200x NB	200x B	2020 Alt A/No Build	2020 Alt B	2020 Alt C	2020 Alt D
	West side of Route 31	**1**	3.7	0.0	0.0	3.3	3.3	3.3	3.3
	Jamestown Settlement Parking Lot (West side)	**2**	3.8	0.0	0.0	3.3	3.3	3.3	3.3
	Jamestown Settlement Visitor's Center (West side)	**3**	3.7	0.0	0.0	3.2	3.2	3.2	3.2

Route 31 at Route 199

Int 3	Receptor		2001	200x NB	200x B	2020 Alt A/No Build	2020 Alt B	2020 Alt C	2020 Alt D
	Prudential Realty Office	**1**	6.4	0.0	0.0	6.0	6.3	6.3	6.1
	CVS Convenience Store	**2**	6.2	0.0	0.0	5.7	6.0	6.0	5.8
	Sun Trust Bank and Office Park	**3**	6.0	0.0	0.0	5.6	6.0	6.0	5.7
	711 Convenience Store	**4**	5.8	0.0	0.0	5.4	5.7	5.7	5.5

Colonial Historic Parkway at Route 199

Int 4	Receptor		2001	200x NB	200x B	2020 Alt A/No Build	2020 Alt B	2020 Alt C	2020 Alt D
	Open Space Northeast Quadrant	**1**	4.1	0.0	0.0	4.5	4.8	4.8	4.8
	Open Space Southeast Quadrant	**2**	4.4	0.0	0.0	4.8	5.1	5.1	4.9
	Open Space Southwest Quadrant	**3**	4.6	0.0	0.0	5.1	5.5	5.5	5.3
	Open Space Northwest Quadrant	**4**	3.7	0.0	0.0	4.1	4.3	4.3	4.2

The Highest Values Presented in AQ Analysis are Bolded

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Mesoscale Results – NOx

Jamestown Virginia

NOx Emissions Inventory in Kilograms per Day

Pollutant	2001 Existing Condition	2020 No-Build Alternative A	2020 Build Alternative B	2020 Build Alternative C
Nitrogen Oxides	2,443.4	3,110.6	3,243.8	3,243.0
Difference - Existing		667.2	800.4	799.6
Difference - No-Build			133.2	132.4

Jamestown Virginia

2001 Existing Condition

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	Speed Peak (mph)	E.M.F. NOx (g/veh-mi)	Emissions NOx (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	Speed Off-Peak (mph)	E.M.F. NOx (g/veh-mi)	Emissions NOx (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	14,900	22,886	30	1.78	40.74	34,330	40	1.57	53.90
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	22,200	15,185	30	1.78	27.03	22,777	40	1.57	35.76
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	27,500	24,530	30	1.78	43.66	36,795	40	1.57	57.77
4	Route 60 from Route 199 to Route 5	1.90	16,300	12,388	30	1.78	22.05	18,582	40	1.57	29.17
5	Route 60 from Route 5 to Route 132	1.19	21,400	10,186	30	1.78	18.13	15,280	40	1.57	23.99
6	Route 60 from Route 132 to Route 162	1.18	21,400	10,101	30	1.78	17.98	15,151	40	1.57	23.79
7	Route 60 from Route 162 to Route 30	9.80	38,800	152,096	30	1.78	270.73	228,144	40	1.57	358.19
8	Route 5 from Route 132 to Route 31	1.88	8,300	6,242	30	1.78	11.11	9,362	40	1.57	14.70
9	Route 132 from Route 5 to Route 199	1.71	5,200	3,557	30	1.78	6.33	5,335	40	1.57	8.38
10	Route 132 from Route 60 to Route 5	1.08	14,300	6,178	30	1.78	11.00	9,266	40	1.57	14.55
11	Route 162 from Route 60 to Route 132	1.25	19,400	9,700	30	1.78	17.27	14,550	40	1.57	22.84
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	3,900	10,998	25	1.52	16.72	16,497	35	1.55	25.57
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	3,900	3,682	25	1.52	5.60	5,522	35	1.55	8.56
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	3,500	2,240	25	1.52	3.40	3,360	35	1.55	5.21
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	2,100	176	10	1.95	0.34	265	20	1.76	0.47
16	Route 199 from Interstate 64 to Route 60	1.08	24,500	10,584	30	1.78	18.84	15,876	40	1.57	24.93
17	Route 31 from Route 359 to Route 199	3.85	13,700	21,098	20	1.76	37.13	31,647	30	1.78	56.33
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	1,800	1,109	25	1.52	1.69	1,663	35	1.55	2.58
19	Jamestown Loop	2.27	2,200	1,998	10	1.95	3.90	2,996	10	1.95	5.84
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	57,100	48,649	60	2.19	106.54	72,974	65	2.47	180.25
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	57,100	42,939	60	2.19	94.04	64,409	65	2.47	159.09
22	Interstate 64 from Route 143 to Route 646	4.29	55,100	94,552	60	2.19	207.07	141,827	65	2.47	350.31

Mesoscale NOx Emissions
(kilograms/day)

2443.4

Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 511,073	**981.3**

Idle Emissions (kg/day)	**NOx**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 766,609	**1462.2**

Idle Emissions (kg/day)	**NOx**
	0.0

Jamestown Virginia

2020 No Build Alternative A

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	PEAK PERIOD Speed Peak (mph)	PEAK PERIOD E.M.F. NOx (g/veh-mi)	PEAK PERIOD Emissions NOx (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	OFF-PEAK PERIOD Speed Off-Peak (mph)	OFF-PEAK PERIOD E.M.F. NOx (g/veh-mi)	OFF-PEAK PERIOD Emissions NOx (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	22,200	34,099	30	1.40	47.74	51,149	40	1.43	73.14
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	33,000	22,572	30	1.40	31.60	33,858	40	1.43	48.42
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	41,800	37,286	30	1.40	52.20	55,928	40	1.43	79.98
4	Route 60 from Route 199 to Route 5	1.90	24,300	18,468	30	1.40	25.86	27,702	40	1.43	39.61
5	Route 60 from Route 5 to Route 132	1.19	31,900	15,184	30	1.40	21.26	22,777	40	1.43	32.57
6	Route 60 from Route 132 to Route 162	1.18	31,900	15,057	30	0.00	0.00	22,585	40	0.00	0.00
7	Route 60 from Route 162 to Route 30	9.80	57,800	226,576	30	1.40	317.21	339,864	40	1.43	486.01
8	Route 5 from Route 132 to Route 31	1.88	12,400	9,325	30	1.40	13.05	13,987	40	1.43	20.00
9	Route 132 from Route 5 to Route 199	1.71	7,800	5,335	30	1.40	7.47	8,003	40	1.43	11.44
10	Route 132 from Route 60 to Route 5	1.08	21,300	9,202	30	1.40	12.88	13,802	40	1.43	19.74
11	Route 162 from Route 60 to Route 132	1.25	28,800	14,400	30	1.40	20.16	21,600	40	1.43	30.89
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	7,100	20,022	25	1.29	25.83	30,033	35	1.31	39.34
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	6,200	5,853	25	1.29	7.55	8,779	35	1.31	11.50
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	5,500	3,520	25	1.29	4.54	5,280	35	1.31	6.92
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	4,400	370	10	1.49	0.55	554	20	1.37	0.76
16	Route 199 from Interstate 64 to Route 60	1.08	37,300	16,114	30	1.40	22.56	24,170	40	1.43	34.56
17	Route 31 from Route 359 to Route 199	3.85	21,500	33,110	20	1.37	45.36	49,665	30	1.40	69.53
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	2,784	1,715	25	1.29	2.21	2,572	35	1.31	3.37
19	Jamestown Loop	2.27	3,300	2,996	10	1.49	4.46	4,495	10	1.49	6.70
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	84,800	72,250	60	1.99	143.78	108,374	65	2.11	228.67
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	84,800	63,770	60	1.99	126.90	95,654	65	2.11	201.83
22	Interstate 64 from Route 143 to Route 646	4.29	82,800	142,085	60	1.99	282.75	213,127	65	2.11	449.70

Mesoscale NOx Emissions (kilograms/day)

3110.6

Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 769,307	**1215.9**
Idle Emissions (kg/day)	**NOx**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 1,153,960	**1894.7**
Idle Emissions (kg/day)	**NOx**
	0.0

Jamestown Virginia

2020 Build Alternative B

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	PEAK PERIOD Speed Peak (mph)	PEAK PERIOD E.M.F. **NOx** (g/veh-mi)	PEAK PERIOD Emissions **NOx** (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	OFF-PEAK PERIOD Speed Off-Peak (mph)	OFF-PEAK PERIOD E.M.F. **NOx** (g/veh-mi)	OFF-PEAK PERIOD Emissions **NOx** (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	22,700	34,867	30	1.40	48.81	52,301	40	1.43	74.79
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	33,000	22,572	30	1.40	31.60	33,858	40	1.43	48.42
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	45,100	40,229	30	1.40	56.32	60,344	40	1.43	86.29
4	Route 60 from Route 199 to Route 5	1.90	24,800	18,848	30	1.40	26.39	28,272	40	1.43	40.43
5	Route 60 from Route 5 to Route 132	1.19	32,400	15,422	30	1.40	21.59	23,134	40	1.43	33.08
6	Route 60 from Route 132 to Route 162	1.18	32,400	15,293	30	0.00	0.00	22,939	40	0.00	0.00
7	Route 60 from Route 162 to Route 30	9.80	58,300	228,536	30	1.40	319.95	342,804	40	1.43	490.21
8	Route 5 from Route 132 to Route 31	1.88	12,900	9,701	30	1.40	13.58	14,551	40	1.43	20.81
9	Route 132 from Route 5 to Route 199	1.71	8,300	5,677	30	1.40	7.95	8,516	40	1.43	12.18
10	Route 132 from Route 60 to Route 5	1.08	21,800	9,418	30	1.40	13.18	14,126	40	1.43	20.20
11	Route 162 from Route 60 to Route 132	1.25	28,800	14,400	30	1.40	20.16	21,600	40	1.43	30.89
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	11,800	33,276	25	1.29	42.93	49,914	35	1.31	65.39
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	7,600	7,174	25	1.29	9.25	10,762	35	1.31	14.10
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	6,400	4,096	25	1.29	5.28	6,144	35	1.31	8.05
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	9,100	764	10	1.49	1.14	1,147	20	1.37	1.57
16	Route 199 from Interstate 64 to Route 60	1.08	40,600	17,539	30	1.40	24.55	26,309	40	1.43	37.62
17	Route 31 from Route 359 to Route 199	3.85	25,800	39,732	20	1.37	54.43	59,598	30	1.40	83.44
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	2,632	1,621	25	1.29	2.09	2,432	35	1.31	3.19
19	Jamestown Loop	2.27	3,300	2,996	10	1.49	4.46	4,495	10	1.49	6.70
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	84,800	72,250	60	1.99	143.78	108,374	65	2.11	228.67
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	84,800	63,770	60	1.99	126.90	95,654	65	2.11	201.83
22	Interstate 64 from Route 143 to Route 646	4.29	86,100	147,748	60	1.99	294.02	221,621	65	2.11	467.62

Mesoscale NOx Emissions
(kilograms/day)

3243.8

Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 805,930	**1268.4**

Idle Emissions (kg/day)	**NOx**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 1,208,895	**1975.5**

Idle Emissions (kg/day)	**NOx**
	0.0

Jamestown Virginia

2020 Build Alternative C

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	Speed Peak (mph)	E.M.F. **NOx** (g/veh-mi)	Emissions **NOx** (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	Speed Off-Peak (mph)	E.M.F. **NOx** (g/veh-mi)	Emissions **NOx** (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	22,700	34,867	30	1.40	48.81	52,301	40	1.43	74.79
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	33,000	22,572	30	1.40	31.60	33,858	40	1.43	48.42
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	45,100	40,229	30	1.40	56.32	60,344	40	1.43	86.29
4	Route 60 from Route 199 to Route 5	1.90	24,800	18,848	30	1.40	26.39	28,272	40	1.43	40.43
5	Route 60 from Route 5 to Route 132	1.19	32,400	15,422	30	1.40	21.59	23,134	40	1.43	33.08
6	Route 60 from Route 132 to Route 162	1.18	32,400	15,293	30	0.00	0.00	22,939	40	0.00	0.00
7	Route 60 from Route 162 to Route 30	9.80	58,300	228,536	30	1.40	319.95	342,804	40	1.43	490.21
8	Route 5 from Route 132 to Route 31	1.88	12,900	9,701	30	1.40	13.58	14,551	40	1.43	20.81
9	Route 132 from Route 5 to Route 199	1.71	8,300	5,677	30	1.40	7.95	8,516	40	1.43	12.18
10	Route 132 from Route 60 to Route 5	1.08	21,800	9,418	30	1.40	13.18	14,126	40	1.43	20.20
11	Route 162 from Route 60 to Route 132	1.25	28,800	14,400	30	1.40	20.16	21,600	40	1.43	30.89
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 19	7.05	11,800	33,276	25	1.29	42.93	49,914	35	1.31	65.39
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	7,600	7,174	25	1.29	9.25	10,762	35	1.31	14.10
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 6	1.60	6,400	4,096	25	1.29	5.28	6,144	35	1.31	8.05
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	9,100	764	10	1.49	1.14	1,147	20	1.37	1.57
16	Route 199 from Interstate 64 to Route 60	1.08	40,600	17,539	30	1.40	24.55	26,309	40	1.43	37.62
17	Route 31 from Route 359 to Route 199	3.85	25,800	39,732	20	1.37	54.43	59,598	30	1.40	83.44
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestow	1.54	2,207	1,360	25	1.29	1.75	2,039	35	1.31	2.67
19	Jamestown Loop	2.27	3,300	2,996	10	1.49	4.46	4,495	10	1.49	6.70
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pk	2.13	84,800	72,250	60	1.99	143.78	108,374	65	2.11	228.67
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 1	1.88	84,800	63,770	60	1.99	126.90	95,654	65	2.11	201.83
22	Interstate 64 from Route 143 to Route 646	4.29	86,100	147,748	60	1.99	294.02	221,621	65	2.11	467.62

Mesoscale NOx Emissions
(kilograms/day)

3243.0

Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 805,668	**1268.0**
Idle Emissions (kg/day)	**NOx**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 1,208,502	**1974.9**
Idle Emissions (kg/day)	**NOx**
	0.0

Jamestown Virginia

Link No.	Roadway Description	2001 Existing Condition				2020 No Build Alternative A				2020 Build Alternative B				2020 Build Alternative C			
		Peak		Off Peak		Peak		Off Peak		Peak		Off Peak		Peak		Off Peak	
		Average Speed (mph)	NOx EMF (g-veh/mi)	Average Speed (mph)	Nox EMF (g-veh/mi)	Average Speed (mph)	NOx EMF (g-veh/mi)	Average Speed (mph)	NOx EMF (g-veh/mi)	Average Speed (mph)	NOx EMF (g-veh/mi)	Average Speed (mph)	NOx EMF (g-veh/mi)	Average Speed (mph)	NOx EMF (g-veh/mi)	Average Speed (mph)	NOx EMF (g-veh/mi)
1	Route 5 from Route 164 to Route 31	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
4	Route 60 from Route 199 to Route 5	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
5	Route 60 from Route 5 to Route 132	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
6	Route 60 from Route 132 to Route 162	30	1.78	40	1.57	30	1.78	40	1.57	30	1.78	40	1.57	30	1.78	40	1.57
7	Route 60 from Route 162 to Route 30	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
8	Route 5 from Route 132 to Route 31	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
9	Route 132 from Route 5 to Route 199	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
10	Route 132 from Route 60 to Route 5	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
11	Route 162 from Route 60 to Route 132	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	25	1.52	35	1.55	25	1.29	35	1.31	25	1.29	35	1.31	25	1.29	35	1.31
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	25	1.52	35	1.55	25	1.29	35	1.31	25	1.29	35	1.31	25	1.29	35	1.31
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	25	1.52	35	1.55	25	1.29	35	1.31	25	1.29	35	1.31	25	1.29	35	1.31
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	10	1.95	20	1.76	10	1.49	20	1.37	10	1.49	20	1.37	10	1.49	20	1.37
16	Route 199 from Interstate 64 to Route 60	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
17	Route 31 from Route 359 to Route 199	20	1.76	30	1.78	20	1.37	30	1.40	20	1.37	30	1.40	20	1.37	30	1.40
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	25	1.52	35	1.55	25	1.29	35	1.31	25	1.29	35	1.31	25	1.29	35	1.31
19	Jamestown Loop	10	1.95	10	1.95	10	1.49	10	1.49	10	1.49	10	1.49	10	1.49	10	1.49
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	60	2.19	65	2.47	60	1.99	65	2.11	60	1.99	65	2.11	60	1.99	65	2.11
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	60	2.19	65	2.47	60	1.99	65	2.11	60	1.99	65	2.11	60	1.99	65	2.11
22	Interstate 64 from Route 143 to Route 646	60	2.19	65	2.47	60	1.99	65	2.11	60	1.99	65	2.11	60	1.99	65	2.11

MOBILE5b Emission Factors

2001		2020	
Vehicle Speed (mph)	Nitrogen Oxides (g/veh-mile)	Vehicle Speed (mph)	Nitrogen Oxides (g/veh-mile)
2.5	2.23	2.5	1.89
3	2.10	3	1.78
4	1.93	4	1.63
5	1.83	5	1.54
6	1.76	6	1.48
7	1.71	7	1.44
8	1.67	8	1.40
9	1.64	9	1.38
10	1.95	10	1.49
11	1.59	11	1.34
12	1.58	12	1.33
13	1.56	13	1.31
14	1.55	14	1.30
15	1.54	15	1.29
16	1.53	16	1.29
17	1.52	17	1.28
18	1.51	18	1.27
19	1.50	19	1.27
20	1.76	20	1.37
21	1.50	21	1.27
22	1.51	22	1.28
23	1.51	23	1.28
24	1.52	24	1.28
25	1.52	25	1.29
26	1.52	26	1.29
27	1.53	27	1.29
28	1.53	28	1.30
29	1.54	29	1.30
30	1.78	30	1.40
31	1.78	31	1.31
32	1.54	32	1.31
33	1.55	33	1.31
34	1.55	34	1.31
35	1.55	35	1.31
36	1.55	36	1.32
37	1.56	37	1.32
38	1.56	38	1.32
39	1.56	39	1.32
40	1.57	40	1.43
41	1.82	41	1.33
42	1.57	42	1.33
43	1.58	43	1.33
44	1.58	44	1.33
45	1.58	45	1.34
46	1.59	46	1.34
47	1.59	47	1.34
48	1.60	48	1.34
49	1.60	49	1.38
50	1.65	50	1.55
51	1.99	51	1.46
52	1.76	52	1.51
53	1.81	53	1.55
54	1.86	54	1.59
55	1.92	55	1.63
56	1.97	56	1.67
57	2.03	57	1.71
58	2.08	58	1.75
59	2.14	59	1.79
60	2.19	60	1.99
61	2.61	61	1.88
62	2.30	62	1.92
63	2.36	63	1.96
64	2.41	64	2.01
65	2.47	65	2.11

NOTE: Emission factors were calculated by MOBILE5b and represent a composite vehicle type during summer conditions.

Jamestown Virginia

Average Daily Traffic (ADT) for Mesoscale Roadway Network

	Roadway Segment	Speed Limit (mph)	Peak-Period Average Speed* (mph)	Off-Peak Average Speed* (mph)	2001 **Existing** Volume (ADT)	2020 **No Build Alt A** Volume (ADT)	2020 **Build Alt B** Volume (ADT)	2020 **Build Alt C** Volume (ADT)	2020 **Build Alt D** Volume (ADT)	2020 **Build Alt E** Volume (ADT)
1	Route 5 from Route 164 to Route 31	40	30	40	**14,900**	**22,200**	**22,700**	**22,700**	**22,400**	**22,500**
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	40	30	40	**22,200**	**33,000**	**33,000**	**33,000**	**33,000**	**33,000**
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	40	30	40	**27,500**	**41,800**	**45,100**	**45,100**	**43,100**	**43,600**
4	Route 60 from Route 199 to Route 5	40	30	40	**16,300**	**24,300**	**24,800**	**24,800**	**24,500**	**24,600**
5	Route 60 from Route 5 to Route 132	40	30	40	**21,400**	**31,900**	**32,400**	**32,400**	**32,100**	**32,200**
6	Route 60 from Route 132 to Route 162	40	30	40	**21,400**	**31,900**	**32,400**	**32,400**	**32,100**	**32,200**
7	Route 60 from Route 162 to Route 30	40	30	40	**38,800**	**57,800**	**58,300**	**58,300**	**58,000**	**58,100**
8	Route 5 from Route 132 to Route 31	40	30	40	**8,300**	**12,400**	**12,900**	**12,900**	**12,600**	**12,700**
9	Route 132 from Route 5 to Route 199	40	30	40	**5,200**	**7,800**	**8,300**	**8,300**	**8,000**	**8,100**
10	Route 132 from Route 60 to Route 5	40	30	40	**14,300**	**21,300**	**21,800**	**21,800**	**21,500**	**21,600**
11	Route 162 from Route 60 to Route 132	40	30	40	**19,400**	**28,800**	**28,800**	**28,800**	**28,800**	**28,800**
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	35	25	35	**3,900**	**7,100**	**11,800**	**11,800**	**9,000**	**9,600**
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	35	25	35	**3,900**	**6,200**	**7,600**	**7,600**	**6,800**	**6,900**
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	35	25	35	**3,500**	**5,500**	**6,400**	**6,400**	**5,800**	**6,000**
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	20	10	20	**2,100**	**4,400**	**9,100**	**9,100**	**6,300**	**6,900**
16	Route 199 from Interstate 64 to Route 60	40	30	40	**24,500**	**37,300**	**40,600**	**40,600**	**38,600**	**39,100**
17	Route 31 from Route 359 to Route 199	30	20	30	**13,700**	**21,500**	**25,800**	**25,800**	**23,300**	**23,800**
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	35	25	35	**1,800**	**2,784**	**2,632**	**2,207**	**2,910**	**2,580**
19	Jamestown Loop	20	10	20	**2,200**	**3,300**	**3,300**	**3,300**	**3,300**	**3,300**
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	65	60	65	**57,100**	**84,800**	**84,800**	**84,800**	**84,800**	**84,800**
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	65	60	65	**57,100**	**84,800**	**84,800**	**84,800**	**84,800**	**84,800**
22	Interstate 64 from Route 143 to Route 646	65	60	65	**55,100**	**82,800**	**86,100**	**86,100**	**84,100**	**84,600**

Remember: Differences between the No-Build and Build are the basis for the mesoscale analysis.
Intuitive differences that our client or the public may have, must be addressed.

Notes:

The above data are necessary for the air quality mesoscale analysis. The data requested are required for each roadway segment (link), which are illustrated in the attached figure. **Please review the road segments** to see if links should be split to account for changes in **Build** traffic volumes along the link, or if links should be added because VHB can provide traffic volumes (particular **Build** traffic volumes) for additional roadway segments.

*** Speed data** are necessary for each roadway segment. **Your professional judgement (estimate) is acceptable** for peak and off-peak speed estimates, since its likely to be more accurate and based on actual conditions versus my best estimate. **Try to provide at least two of the three speed data for each segment** (eg 55 / 60 / 65, 30 / - / 35, 35 / 30 / -, etc).

Changes in BUILD speeds because of increased capacity are very important and should be noted.

Additional Information Required:

1) Photocopies of the AADT and monthly ADT from a **representative MHD count station**, for the 3-5 most recent years for which data are available. These data will be used to generate a seasonal adjustment factor that will convert the AADT project data into July data. **If the project traffic data represents a particular month, and not annual average daily traffic, this should be noted.**

2) Copies of the **HCS** intersection LOS analysis, for both signalized and unsignalized intersections. **Copies are not needed if I can borrow originals for a few hours**.

3) Copies of the project ATR traffic counts. **I only** need the hourly values for midweek.

Jamestown Virginia
Mesoscale Roadway Data

Link No.	Description	Link Length (miles)	Speed Limit (mph)	Peak Speed (mph)	Off-Peak Speed (mph)
1	Route 5 from Route 164 to Route 31	3.84	40	30	40
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	40	30	40
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	40	30	40
4	Route 60 from Route 199 to Route 5	1.90	40	30	40
5	Route 60 from Route 5 to Route 132	1.19	40	30	40
6	Route 60 from Route 132 to Route 162	1.18	40	30	40
7	Route 60 from Route 162 to Route 30	9.80	40	30	40
8	Route 5 from Route 132 to Route 31	1.88	40	30	40
9	Route 132 from Route 5 to Route 199	1.71	40	30	40
10	Route 132 from Route 60 to Route 5	1.08	40	30	40
11	Route 162 from Route 60 to Route 132	1.25	40	30	40
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	35	25	35
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	35	25	35
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	35	25	35
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	20	10	20
16	Route 199 from Interstate 64 to Route 60	1.08	40	30	40
17	Route 31 from Route 359 to Route 199	3.85	30	20	30
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	35	25	35
19	Jamestown Loop	2.27	20	10	10
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	65	60	65
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	65	60	65
22	Interstate 64 from Route 143 to Route 646	4.29	65	60	65

Jamestown Virginia

Link No.	Roadway Description	2001 Existing Condition Roadway S.A.F.	2001 Existing Condition Roadway ADT (veh/day)	2001 Existing Condition Seasonal ADT (veh/day)	2020 No Build Alternative A Roadway ADT (veh/day)	2020 No Build Alternative A Seasonal ADT (veh/day)	2020 No Build Alternative A Traffic Increase (existing)	2020 Build Alternative B Roadway ADT (veh/day)	2020 Build Alternative B Seasonal ADT (veh/day)	2020 Build Alternative B Traffic Increase (existing)	2020 Build Alternative B Traffic Increase (no-build)	2020 Build Alternative C Roadway ADT (veh/day)	2020 Build Alternative C Seasonal ADT (veh/day)	2020 Build Alternative C Traffic Increase (existing)	2020 Build Alternative C Traffic Increase (no-build)
1	Route 5 from Route 164 to Route 31	**100%**	14,900	14,900	22,200	22,200	49.0%	22,700	22,700	52.3%	2.3%	22,700	22,700	52.3%	2.3%
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	**100%**	22,200	22,200	33,000	33,000	48.6%	33,000	33,000	48.6%	0.0%	33,000	33,000	48.6%	0.0%
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	**100%**	27,500	27,500	41,800	41,800	52.0%	45,100	45,100	64.0%	7.9%	45,100	45,100	64.0%	7.9%
4	Route 60 from Route 199 to Route 5	**100%**	16,300	16,300	24,300	24,300	49.1%	24,800	24,800	52.1%	2.1%	24,800	24,800	52.1%	2.1%
5	Route 60 from Route 5 to Route 132	**100%**	21,400	21,400	31,900	31,900	49.1%	32,400	32,400	51.4%	1.6%	32,400	32,400	51.4%	1.6%
6	Route 60 from Route 132 to Route 162	**100%**	21,400	21,400	31,900	31,900	49.1%	32,400	32,400	51.4%	1.6%	32,400	32,400	51.4%	1.6%
7	Route 60 from Route 162 to Route 30	**100%**	38,800	38,800	57,800	57,800	49.0%	58,300	58,300	50.3%	0.9%	58,300	58,300	50.3%	0.9%
8	Route 5 from Route 132 to Route 31	**100%**	8,300	8,300	12,400	12,400	49.4%	12,900	12,900	35.7%	3.9%	12,900	12,900	35.7%	3.9%
9	Route 132 from Route 5 to Route 199	**100%**	5,200	5,200	7,800	7,800	50.0%	8,300	8,300	37.3%	6.0%	8,300	8,300	37.3%	6.0%
10	Route 132 from Route 60 to Route 5	**100%**	14,300	14,300	21,300	21,300	49.0%	21,800	21,800	34.4%	2.3%	21,800	21,800	34.4%	2.3%
11	Route 162 from Route 60 to Route 132	**100%**	19,400	19,400	28,800	28,800	48.5%	28,800	28,800	32.6%	0.0%	28,800	28,800	32.6%	0.0%
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	**100%**	3,900	3,900	7,100	7,100	82.1%	11,800	11,800	66.9%	39.8%	11,800	11,800	66.9%	39.8%
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	**100%**	3,900	3,900	6,200	6,200	59.0%	7,600	7,600	48.7%	18.4%	7,600	7,600	48.7%	18.4%
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	**100%**	3,500	3,500	5,500	5,500	57.1%	6,400	6,400	45.3%	14.1%	6,400	6,400	45.3%	14.1%
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	**100%**	2,100	2,100	4,400	4,400	109.5%	9,100	9,100	76.9%	51.6%	9,100	9,100	76.9%	51.6%
16	Route 199 from Interstate 64 to Route 60	**100%**	24,500	24,500	37,300	37,300	52.2%	40,600	40,600	39.7%	8.1%	40,600	40,600	39.7%	8.1%
17	Route 31 from Route 359 to Route 199	**100%**	13,700	13,700	21,500	21,500	56.9%	25,800	25,800	46.9%	16.7%	25,800	25,800	46.9%	16.7%
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	**100%**	1,800	1,800	2,784	2,784	54.7%	2,632	2,632	31.6%	-5.8%	2,207	2,207	18.4%	-26.1%
19	Jamestown Loop	**100%**	2,200	2,200	3,300	3,300	50.0%	3,300	3,300	33.3%	0.0%	3,300	3,300	33.3%	0.0%
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	**100%**	57,100	57,100	84,800	84,800	48.5%	84,800	84,800	32.7%	0.0%	84,800	84,800	32.7%	0.0%
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	**100%**	57,100	57,100	84,800	84,800	48.5%	84,800	84,800	32.7%	0.0%	84,800	84,800	32.7%	0.0%
22	Interstate 64 from Route 143 to Route 646	**100%**	55,100	55,100	82,800	82,800	50.3%	86,100	86,100	36.0%	3.8%	86,100	86,100	36.0%	3.8%

Peak Period Volume Factor

Peak Period Factor Assumed => **0.400**

Seasonal Adjustment Factor (S.A.F.)

Principal Arterial - ADT Adjustment Factor => **1.00**

Jamestown Virginia

NOx Emissions Inventory in Kilograms per Day

Pollutant	2001 Existing Condition	2020 No-Build Alternative A	2020 Build Alternative B	2020 Build Alternative C
Nitrogen Oxides	2,443.4	3,110.6	3,243.8	3,243.0
Difference - Existing		667.2	800.4	799.6
Difference - No-Build			133.2	132.4

Jamestown Virginia

2001 Existing Condition

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	Speed Peak (mph)	E.M.F. NOx (g/veh-mi)	Emissions NOx (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	Speed Off-Peak (mph)	E.M.F. NOx (g/veh-mi)	Emissions NOx (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	14,900	22,886	30	1.78	40.74	34,330	40	1.57	53.90
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	22,200	15,185	30	1.78	27.03	22,777	40	1.57	35.76
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	27,500	24,530	30	1.78	43.66	36,795	40	1.57	57.77
4	Route 60 from Route 199 to Route 5	1.90	16,300	12,388	30	1.78	22.05	18,582	40	1.57	29.17
5	Route 60 from Route 5 to Route 132	1.19	21,400	10,186	30	1.78	18.13	15,280	40	1.57	23.99
6	Route 60 from Route 132 to Route 162	1.18	21,400	10,101	30	1.78	17.98	15,151	40	1.57	23.79
7	Route 60 from Route 162 to Route 30	9.80	38,800	152,096	30	1.78	270.73	228,144	40	1.57	358.19
8	Route 5 from Route 132 to Route 31	1.88	8,300	6,242	30	1.78	11.11	9,362	40	1.57	14.70
9	Route 132 from Route 5 to Route 199	1.71	5,200	3,557	30	1.78	6.33	5,335	40	1.57	8.38
10	Route 132 from Route 60 to Route 5	1.08	14,300	6,178	30	1.78	11.00	9,266	40	1.57	14.55
11	Route 162 from Route 60 to Route 132	1.25	19,400	9,700	30	1.78	17.27	14,550	40	1.57	22.84
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	3,900	10,998	25	1.52	16.72	16,497	35	1.55	25.57
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	3,900	3,682	25	1.52	5.60	5,522	35	1.55	8.56
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	3,500	2,240	25	1.52	3.40	3,360	35	1.55	5.21
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	2,100	176	10	1.95	0.34	265	20	1.76	0.47
16	Route 199 from Interstate 64 to Route 60	1.08	24,500	10,584	30	1.78	18.84	15,876	40	1.57	24.93
17	Route 31 from Route 359 to Route 199	3.85	13,700	21,098	20	1.76	37.13	31,647	30	1.78	56.33
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	1,800	1,109	25	1.52	1.69	1,663	35	1.55	2.58
19	Jamestown Loop	2.27	2,200	1,998	10	1.95	3.90	2,996	10	1.95	5.84
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	57,100	48,649	60	2.19	106.54	72,974	65	2.47	180.25
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	57,100	42,939	60	2.19	94.04	64,409	65	2.47	159.09
22	Interstate 64 from Route 143 to Route 646	4.29	55,100	94,552	60	2.19	207.07	141,827	65	2.47	350.31

Mesoscale NOx Emissions
(kilograms/day)

2443.4

Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 511,073	**981.3**

Idle Emissions (kg/day)	**NOx**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 766,609	**1462.2**

Idle Emissions (kg/day)	**NOx**
	0.0

Jamestown Virginia

2020 No Build Alternative A

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	PEAK PERIOD Speed Peak (mph)	PEAK PERIOD E.M.F. **NOx** (g/veh-mi)	PEAK PERIOD Emissions **NOx** (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	OFF-PEAK PERIOD Speed Off-Peak (mph)	OFF-PEAK PERIOD E.M.F. **NOx** (g/veh-mi)	OFF-PEAK PERIOD Emissions **NOx** (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	22,200	34,099	30	1.40	47.74	51,149	40	1.43	73.14
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	33,000	22,572	30	1.40	31.60	33,858	40	1.43	48.42
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	41,800	37,286	30	1.40	52.20	55,928	40	1.43	79.98
4	Route 60 from Route 199 to Route 5	1.90	24,300	18,468	30	1.40	25.86	27,702	40	1.43	39.61
5	Route 60 from Route 5 to Route 132	1.19	31,900	15,184	30	1.40	21.26	22,777	40	1.43	32.57
6	Route 60 from Route 132 to Route 162	1.18	31,900	15,057	30	0.00	0.00	22,585	40	0.00	0.00
7	Route 60 from Route 162 to Route 30	9.80	57,800	226,576	30	1.40	317.21	339,864	40	1.43	486.01
8	Route 5 from Route 132 to Route 31	1.88	12,400	9,325	30	1.40	13.05	13,987	40	1.43	20.00
9	Route 132 from Route 5 to Route 199	1.71	7,800	5,335	30	1.40	7.47	8,003	40	1.43	11.44
10	Route 132 from Route 60 to Route 5	1.08	21,300	9,202	30	1.40	12.88	13,802	40	1.43	19.74
11	Route 162 from Route 60 to Route 132	1.25	28,800	14,400	30	1.40	20.16	21,600	40	1.43	30.89
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	7,100	20,022	25	1.29	25.83	30,033	35	1.31	39.34
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	6,200	5,853	25	1.29	7.55	8,779	35	1.31	11.50
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	5,500	3,520	25	1.29	4.54	5,280	35	1.31	6.92
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	4,400	370	10	1.49	0.55	554	20	1.37	0.76
16	Route 199 from Interstate 64 to Route 60	1.08	37,300	16,114	30	1.40	22.56	24,170	40	1.43	34.56
17	Route 31 from Route 359 to Route 199	3.85	21,500	33,110	20	1.37	45.36	49,665	30	1.40	69.53
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	2,784	1,715	25	1.29	2.21	2,572	35	1.31	3.37
19	Jamestown Loop	2.27	3,300	2,996	10	1.49	4.46	4,495	10	1.49	6.70
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	84,800	72,250	60	1.99	143.78	108,374	65	2.11	228.67
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	84,800	63,770	60	1.99	126.90	95,654	65	2.11	201.83
22	Interstate 64 from Route 143 to Route 646	4.29	82,800	142,085	60	1.99	282.75	213,127	65	2.11	449.70

Mesoscale NOx Emissions
(kilograms/day)

3110.6

Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 769,307	**1215.9**
Idle Emissions (kg/day)	**NOx**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 1,153,960	**1894.7**
Idle Emissions (kg/day)	**NOx**
	0.0

Jamestown Virginia

2020 Build Alternative D

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	PEAK PERIOD Speed Peak (mph)	PEAK PERIOD E.M.F. **NOx** (g/veh-mi)	PEAK PERIOD Emissions **NOx** (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	OFF-PEAK PERIOD Speed Off-Peak (mph)	OFF-PEAK PERIOD E.M.F. **NOx** (g/veh-mi)	OFF-PEAK PERIOD Emissions **NOx** (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	22,400	34,406	30	1.40	48.17	51,610	40	1.43	73.80
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	33,000	22,572	30	1.40	31.60	33,858	40	1.43	48.42
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	43,100	38,445	30	1.40	53.82	57,668	40	1.43	82.46
4	Route 60 from Route 199 to Route 5	1.90	24,500	18,620	30	1.40	26.07	27,930	40	1.43	39.94
5	Route 60 from Route 5 to Route 132	1.19	32,100	15,280	30	1.40	21.39	22,919	40	1.43	32.77
6	Route 60 from Route 132 to Route 162	1.18	32,100	15,151	30	0.00	0.00	22,727	40	0.00	0.00
7	Route 60 from Route 162 to Route 30	9.80	58,000	227,360	30	1.40	318.30	341,040	40	1.43	487.69
8	Route 5 from Route 132 to Route 31	1.88	12,600	9,475	30	1.40	13.27	14,213	40	1.43	20.32
9	Route 132 from Route 5 to Route 199	1.71	8,000	5,472	30	1.40	7.66	8,208	40	1.43	11.74
10	Route 132 from Route 60 to Route 5	1.08	21,500	9,288	30	1.40	13.00	13,932	40	1.43	19.92
11	Route 162 from Route 60 to Route 132	1.25	28,800	14,400	30	1.40	20.16	21,600	40	1.43	30.89
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	9,000	25,380	25	1.29	32.74	38,070	35	1.31	49.87
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	6,800	6,419	25	1.29	8.28	9,629	35	1.31	12.61
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	5,800	3,712	25	1.29	4.79	5,568	35	1.31	7.29
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	6,300	529	10	1.49	0.79	794	20	1.37	1.09
16	Route 199 from Interstate 64 to Route 60	1.08	38,600	16,675	30	1.40	23.35	25,013	40	1.43	35.77
17	Route 31 from Route 359 to Route 199	3.85	23,300	35,882	20	1.37	49.16	53,823	30	1.40	75.35
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	2,910	1,793	25	1.29	2.31	2,689	35	1.31	3.52
19	Jamestown Loop	2.27	3,300	2,996	10	1.49	4.46	4,495	10	1.49	6.70
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	84,800	72,250	60	1.99	143.78	108,374	65	2.11	228.67
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	84,800	63,770	60	1.99	126.90	95,654	65	2.11	201.83
22	Interstate 64 from Route 143 to Route 646	4.29	84,100	144,316	60	1.99	287.19	216,473	65	2.11	456.76

Mesoscale NOx Emissions
(kilograms/day)

3164.6

Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 784,191	**1237.2**
Idle Emissions (kg/day)	**NOx**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 1,176,286	**1927.4**
Idle Emissions (kg/day)	**NOx**
	0.0

Jamestown Virginia

2020 Build Alternative E

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	Speed Peak (mph)	E.M.F. **NOx** (g/veh-mi)	Emissions **NOx** (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	Speed Off-Peak (mph)	E.M.F. **NOx** (g/veh-mi)	Emissions **NOx** (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	22,500	34,560	30	1.40	48.38	51,840	40	1.43	74.13
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	33,000	22,572	30	1.40	31.60	33,858	40	1.43	48.42
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	43,600	38,891	30	1.40	54.45	58,337	40	1.43	83.42
4	Route 60 from Route 199 to Route 5	1.90	24,600	18,696	30	1.40	26.17	28,044	40	1.43	40.10
5	Route 60 from Route 5 to Route 132	1.19	32,200	15,327	30	1.40	21.46	22,991	40	1.43	32.88
6	Route 60 from Route 132 to Route 162	1.18	32,200	15,198	30	0.00	0.00	22,798	40	0.00	0.00
7	Route 60 from Route 162 to Route 30	9.80	58,100	227,752	30	1.40	318.85	341,628	40	1.43	488.53
8	Route 5 from Route 132 to Route 31	1.88	12,700	9,550	30	1.40	13.37	14,326	40	1.43	20.49
9	Route 132 from Route 5 to Route 199	1.71	8,100	5,540	30	1.40	7.76	8,311	40	1.43	11.88
10	Route 132 from Route 60 to Route 5	1.08	21,600	9,331	30	1.40	13.06	13,997	40	1.43	20.02
11	Route 162 from Route 60 to Route 132	1.25	28,800	14,400	30	1.40	20.16	21,600	40	1.43	30.89
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 19	7.05	9,600	27,072	25	1.29	34.92	40,608	35	1.31	53.20
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	6,900	6,514	25	1.29	8.40	9,770	35	1.31	12.80
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 6	1.60	6,000	3,840	25	1.29	4.95	5,760	35	1.31	7.55
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	6,900	580	10	1.49	0.86	869	20	1.37	1.19
16	Route 199 from Interstate 64 to Route 60	1.08	39,100	16,891	30	1.40	23.65	25,337	40	1.43	36.23
17	Route 31 from Route 359 to Route 199	3.85	23,800	36,652	20	1.37	50.21	54,978	30	1.40	76.97
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestow	1.54	2,580	1,589	25	1.29	2.05	2,384	35	1.31	3.12
19	Jamestown Loop	2.27	3,300	2,996	10	1.49	4.46	4,495	10	1.49	6.70
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pk	2.13	84,800	72,250	60	1.99	143.78	108,374	65	2.11	228.67
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 1	1.88	84,800	63,770	60	1.99	126.90	95,654	65	2.11	201.83
22	Interstate 64 from Route 143 to Route 646	4.29	84,600	145,174	60	1.99	288.90	217,760	65	2.11	459.47

Mesoscale NOx Emissions (kilograms/day)

3182.8

Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 789,146	**1244.4**

Idle Emissions (kg/day)	**NOx**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**NOx**
VMT = 1,183,719	**1938.5**

Idle Emissions (kg/day)	**NOx**
	0.0

Jamestown Virginia

Roadway Description	2001 Existing Condition				2020 No Build Alternative A				2020 Build Alternative D				2020 Build Alternative E			
	Peak		Off Peak		Peak		Off Peak		Peak		Off Peak		Peak		Off Peak	
	verage Speed (mph)	NOx EMF (g-veh/mi)	verage peed (mph)	NOx EMF (g-veh/mi)	verage Speed (mph)	NOx EMF (g-veh/mi)	verage Speed (mph)	NOx EMF (g-veh/mi)	verage Speed (mph)	NOx EMF (g-veh/mi)	verage peed (mph)	NOx EMF (g-veh/mi)	verage Speed (mph)	NOx EMF (g-veh/mi)	verage Speed (mph)	NOx EMF (g-veh/mi)
Route 5 from Route 164 to Route 31	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
Route 199 from Route 31 to Colonial	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
Route 199 from Colonial Nat'l Hist'l P	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
Route 60 from Route 199 to Route 5	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
Route 60 from Route 5 to Route 132	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
Route 60 from Route 132 to Route 16	30	1.78	40	1.57	30	1.78	40	1.57	30	1.78	40	1.57	30	1.78	40	1.57
Route 60 from Route 162 to Route 30	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
Route 5 from Route 132 to Route 31	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
Route 132 from Route 5 to Route 199	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
Route 132 from Route 60 to Route 5	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
Route 162 from Route 60 to Route 13	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
Colonial Nat'l Hist'l Pkwy from Route	25	1.52	35	1.55	25	1.29	35	1.31	25	1.29	35	1.31	25	1.29	35	1.31
Colonial Nat'l Hist'l Pkwy from Route	25	1.52	35	1.55	25	1.29	35	1.31	25	1.29	35	1.31	25	1.29	35	1.31
Colonial Nat'l Hist'l Pkwy from Route	25	1.52	35	1.55	25	1.29	35	1.31	25	1.29	35	1.31	25	1.29	35	1.31
Route 359 from Route 31 to Colonial	10	1.95	20	1.76	10	1.49	20	1.37	10	1.49	20	1.37	10	1.49	20	1.37
Route 199 from Interstate 64 to Rout	30	1.78	40	1.57	30	1.40	40	1.43	30	1.40	40	1.43	30	1.40	40	1.43
Route 31 from Route 359 to Route 19	20	1.76	30	1.78	20	1.37	30	1.40	20	1.37	30	1.40	20	1.37	30	1.40
Colonial Nat'l Hist'l Pkwy from Route	25	1.52	35	1.55	25	1.29	35	1.31	25	1.29	35	1.31	25	1.29	35	1.31
Jamestown Loop	10	1.95	10	1.95	10	1.49	10	1.49	10	1.49	10	1.49	10	1.49	10	1.49
Interstate 64 from Route 143 to Colo	60	2.19	65	2.47	60	1.99	65	2.11	60	1.99	65	2.11	60	1.99	65	2.11
Interstate 64 from Colonial Nat'l Hist'	60	2.19	65	2.47	60	1.99	65	2.11	60	1.99	65	2.11	60	1.99	65	2.11
Interstate 64 from Route 143 to Rout	60	2.19	65	2.47	60	1.99	65	2.11	60	1.99	65	2.11	60	1.99	65	2.11

MOBILE5b Emission Factors

2001		2020	
Vehicle Speed (mph)	Nitrogen Oxides (g/veh-mile)	Vehicle Speed (mph)	Nitrogen Oxides (g/veh-mile)
2.5	2.23	2.5	1.89
3	2.10	3	1.78
4	1.93	4	1.63
5	1.83	5	1.54
6	1.76	6	1.48
7	1.71	7	1.44
8	1.67	8	1.40
9	1.64	9	1.38
10	1.95	10	1.49
11	1.59	11	1.34
12	1.58	12	1.33
13	1.56	13	1.31
14	1.55	14	1.30
15	1.54	15	1.29
16	1.53	16	1.29
17	1.52	17	1.28
18	1.51	18	1.27
19	1.50	19	1.27
20	1.76	20	1.37
21	1.50	21	1.27
22	1.51	22	1.28
23	1.51	23	1.28
24	1.52	24	1.28
25	1.52	25	1.29
26	1.52	26	1.29
27	1.53	27	1.29
28	1.53	28	1.30
29	1.54	29	1.30
30	1.78	30	1.40
31	1.78	31	1.31
32	1.54	32	1.31
33	1.55	33	1.31
34	1.55	34	1.31
35	1.55	35	1.31
36	1.55	36	1.32
37	1.56	37	1.32
38	1.56	38	1.32
39	1.56	39	1.32
40	1.57	40	1.43
41	1.82	41	1.33
42	1.57	42	1.33
43	1.58	43	1.33
44	1.58	44	1.33
45	1.58	45	1.34
46	1.59	46	1.34
47	1.59	47	1.34
48	1.60	48	1.34
49	1.60	49	1.38
50	1.65	50	1.55
51	1.99	51	1.46
52	1.76	52	1.51
53	1.81	53	1.55
54	1.86	54	1.59
55	1.92	55	1.63
56	1.97	56	1.67
57	2.03	57	1.71
58	2.08	58	1.75
59	2.14	59	1.79
60	2.19	60	1.99
61	2.61	61	1.88
62	2.30	62	1.92
63	2.36	63	1.96
64	2.41	64	2.01
65	2.47	65	2.11

NOTE: Emission factors were calculated by MOBILE5b and represent a composite vehicle type during summer conditions.

Jamestown Virginia

Average Daily Traffic (ADT) for Mesoscale Roadway Network

	Roadway Segment	Speed Limit (mph)	Peak-Period Average Speed* (mph)	Off-Peak Average Speed* (mph)	2001 **Existing** Volume (ADT)	2020 **No Build Alt A** Volume (ADT)	2020 **Build Alt B** Volume (ADT)	2020 **Build Alt C** Volume (ADT)	2020 **Build Alt D** Volume (ADT)	2020 **Build Alt E** Volume (ADT)
1	Route 5 from Route 164 to Route 31	40	30	40	**14,900**	**22,200**	**22,700**	**22,700**	**22,400**	**22,500**
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	40	30	40	**22,200**	**33,000**	**33,000**	**33,000**	**33,000**	**33,000**
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	40	30	40	**27,500**	**41,800**	**45,100**	**45,100**	**43,100**	**43,600**
4	Route 60 from Route 199 to Route 5	40	30	40	**16,300**	**24,300**	**24,800**	**24,800**	**24,500**	**24,600**
5	Route 60 from Route 5 to Route 132	40	30	40	**21,400**	**31,900**	**32,400**	**32,400**	**32,100**	**32,200**
6	Route 60 from Route 132 to Route 162	40	30	40	**21,400**	**31,900**	**32,400**	**32,400**	**32,100**	**32,200**
7	Route 60 from Route 162 to Route 30	40	30	40	**38,800**	**57,800**	**58,300**	**58,300**	**58,000**	**58,100**
8	Route 5 from Route 132 to Route 31	40	30	40	**8,300**	**12,400**	**12,900**	**12,900**	**12,600**	**12,700**
9	Route 132 from Route 5 to Route 199	40	30	40	**5,200**	**7,800**	**8,300**	**8,300**	**8,000**	**8,100**
10	Route 132 from Route 60 to Route 5	40	30	40	**14,300**	**21,300**	**21,800**	**21,800**	**21,500**	**21,600**
11	Route 162 from Route 60 to Route 132	40	30	40	**19,400**	**28,800**	**28,800**	**28,800**	**28,800**	**28,800**
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	35	25	35	**3,900**	**7,100**	**11,800**	**11,800**	**9,000**	**9,600**
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	35	25	35	**3,900**	**6,200**	**7,600**	**7,600**	**6,800**	**6,900**
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	35	25	35	**3,500**	**5,500**	**6,400**	**6,400**	**5,800**	**6,000**
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	20	10	20	**2,100**	**4,400**	**9,100**	**9,100**	**6,300**	**6,900**
16	Route 199 from Interstate 64 to Route 60	40	30	40	**24,500**	**37,300**	**40,600**	**40,600**	**38,600**	**39,100**
17	Route 31 from Route 359 to Route 199	30	20	30	**13,700**	**21,500**	**25,800**	**25,800**	**23,300**	**23,800**
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	35	25	35	**1,800**	**2,784**	**2,632**	**2,207**	**2,910**	**2,580**
19	Jamestown Loop	20	10	20	**2,200**	**3,300**	**3,300**	**3,300**	**3,300**	**3,300**
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	65	60	65	**57,100**	**84,800**	**84,800**	**84,800**	**84,800**	**84,800**
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	65	60	65	**57,100**	**84,800**	**84,800**	**84,800**	**84,800**	**84,800**
22	Interstate 64 from Route 143 to Route 646	65	60	65	**55,100**	**82,800**	**86,100**	**86,100**	**84,100**	**84,600**

Remember: Differences between the No-Build and Build are the basis for the mesoscale analysis.
Intuitive differences that our client or the public may have, must be addressed.

Notes:

The above data are necessary for the air quality mesoscale analysis. The data requested are required for each roadway segment (link), which are illustrated in the attached figure. **Please review the road segments** to see if links should be split to account for changes in **Build** traffic volumes along the link, or if links should be added because VHB can provide traffic volumes (particular **Build** traffic volumes) for additional roadway segments.

*** Speed data** are necessary for each roadway segment. **Your professional judgement (estimate) is acceptable** for peak and off-peak speed estimates, since its likely to be more accurate and based on actual conditions versus my best estimate. **Try to provide at least two of the three speed data for each segment** (eg 55 / 60 / 65, 30 / - / 35, 35 / 30 / -, etc).

Changes in BUILD speeds because of increased capacity are very important and should be noted.

Additional Information Required:

1) Photocopies of the AADT and monthly ADT from a **representative MHD count station**, for the 3-5 most recent years for which data are available. These data will be used to generate a seasonal adjustment factor that will convert the AADT project data into July data. **If the project traffic data represents a particular month, and not annual average daily traffic, this should be noted.**

2) Copies of the **HCS** intersection LOS analysis, for both signalized and unsignalized intersections. **Copies are not needed if I can borrow originals for a few hours**.

3) Copies of the project ATR traffic counts. **I only** need the hourly values for midweek.

Jamestown Virginia
Mesoscale Roadway Data

Link No.	Description	Link Length (miles)	Speed Limit (mph)	Peak Speed (mph)	Off-Peak Speed (mph)
1	Route 5 from Route 164 to Route 31	3.84	40	30	40
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	40	30	40
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	40	30	40
4	Route 60 from Route 199 to Route 5	1.90	40	30	40
5	Route 60 from Route 5 to Route 132	1.19	40	30	40
6	Route 60 from Route 132 to Route 162	1.18	40	30	40
7	Route 60 from Route 162 to Route 30	9.80	40	30	40
8	Route 5 from Route 132 to Route 31	1.88	40	30	40
9	Route 132 from Route 5 to Route 199	1.71	40	30	40
10	Route 132 from Route 60 to Route 5	1.08	40	30	40
11	Route 162 from Route 60 to Route 132	1.25	40	30	40
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	35	25	35
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	35	25	35
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	35	25	35
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	20	10	20
16	Route 199 from Interstate 64 to Route 60	1.08	40	30	40
17	Route 31 from Route 359 to Route 199	3.85	30	20	30
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	35	25	35
19	Jamestown Loop	2.27	20	10	10
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	65	60	65
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	65	60	65
22	Interstate 64 from Route 143 to Route 646	4.29	65	60	65

Jamestown Virginia

Link No.	Roadway Description	2001 Existing Condition Roadway S.A.F.	2001 Existing Condition Roadway ADT (veh/day)	2001 Existing Condition Seasonal ADT (veh/day)	2020 No Build Alternative A Roadway ADT (veh/day)	2020 No Build Alternative A Seasonal ADT (veh/day)	2020 No Build Alternative A Traffic Increase (existing)	2020 Build Alternative D Roadway ADT (veh/day)	2020 Build Alternative D Seasonal ADT (veh/day)	2020 Build Alternative D Traffic Increase (existing)	2020 Build Alternative D Traffic Increase (no-build)	2020 Build Alternative E Roadway ADT (veh/day)	2020 Build Alternative E Seasonal ADT (veh/day)	2020 Build Alternative E Traffic Increase (existing)	2020 Build Alternative E Traffic Increase (no-build)
1	Route 5 from Route 164 to Route 31	**100%**	14,900	14,900	22,200	22,200	49.0%	22,400	22,400	50.3%	0.9%	22,500	22,500	51.0%	1.4%
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkw	**100%**	22,200	22,200	33,000	33,000	48.6%	33,000	33,000	48.6%	0.0%	33,000	33,000	48.6%	0.0%
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 6	**100%**	27,500	27,500	41,800	41,800	52.0%	43,100	43,100	56.7%	3.1%	43,600	43,600	58.5%	4.3%
4	Route 60 from Route 199 to Route 5	**100%**	16,300	16,300	24,300	24,300	49.1%	24,500	24,500	50.3%	0.8%	24,600	24,600	50.9%	1.2%
5	Route 60 from Route 5 to Route 132	**100%**	21,400	21,400	31,900	31,900	49.1%	32,100	32,100	50.0%	0.6%	32,200	32,200	50.5%	0.9%
6	Route 60 from Route 132 to Route 162	**100%**	21,400	21,400	31,900	31,900	49.1%	32,100	32,100	50.0%	0.6%	32,200	32,200	50.5%	0.9%
7	Route 60 from Route 162 to Route 30	**100%**	38,800	38,800	57,800	57,800	49.0%	58,000	58,000	49.5%	0.3%	58,100	58,100	49.7%	0.5%
8	Route 5 from Route 132 to Route 31	**100%**	8,300	8,300	12,400	12,400	49.4%	12,600	12,600	34.1%	1.6%	12,700	12,700	34.6%	2.4%
9	Route 132 from Route 5 to Route 199	**100%**	5,200	5,200	7,800	7,800	50.0%	8,000	8,000	35.0%	2.5%	8,100	8,100	35.8%	3.7%
10	Route 132 from Route 60 to Route 5	**100%**	14,300	14,300	21,300	21,300	49.0%	21,500	21,500	33.5%	0.9%	21,600	21,600	33.8%	1.4%
11	Route 162 from Route 60 to Route 132	**100%**	19,400	19,400	28,800	28,800	48.5%	28,800	28,800	32.6%	0.0%	28,800	28,800	32.6%	0.0%
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 1	**100%**	3,900	3,900	7,100	7,100	82.1%	9,000	9,000	56.7%	21.1%	9,600	9,600	59.4%	26.0%
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 6	**100%**	3,900	3,900	6,200	6,200	59.0%	6,800	6,800	42.6%	8.8%	6,900	6,900	43.5%	10.1%
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate	**100%**	3,500	3,500	5,500	5,500	57.1%	5,800	5,800	39.7%	5.2%	6,000	6,000	41.7%	8.3%
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkw	**100%**	2,100	2,100	4,400	4,400	109.5%	6,300	6,300	66.7%	30.2%	6,900	6,900	69.6%	36.2%
16	Route 199 from Interstate 64 to Route 60	**100%**	24,500	24,500	37,300	37,300	52.2%	38,600	38,600	36.5%	3.4%	39,100	39,100	37.3%	4.6%
17	Route 31 from Route 359 to Route 199	**100%**	13,700	13,700	21,500	21,500	56.9%	23,300	23,300	41.2%	7.7%	23,800	23,800	42.4%	9.7%
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamesto	**100%**	1,800	1,800	2,784	2,784	54.7%	2,910	2,910	38.1%	4.3%	2,580	2,580	30.2%	-7.9%
19	Jamestown Loop	**100%**	2,200	2,200	3,300	3,300	50.0%	3,300	3,300	33.3%	0.0%	3,300	3,300	33.3%	0.0%
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l P	**100%**	57,100	57,100	84,800	84,800	48.5%	84,800	84,800	32.7%	0.0%	84,800	84,800	32.7%	0.0%
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route	**100%**	57,100	57,100	84,800	84,800	48.5%	84,800	84,800	32.7%	0.0%	84,800	84,800	32.7%	0.0%
22	Interstate 64 from Route 143 to Route 646	**100%**	55,100	55,100	82,800	82,800	50.3%	84,100	84,100	34.5%	1.5%	84,600	84,600	34.9%	2.1%

Peak Period Volume Factor

Peak Period Factor Assumed => **0.400**

Seasonal Adjustment Factor (S.A.F.)

Principal Arterial - ADT Adjustment Factor => **1.00**

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Mesoscale Results – VOC

Jamestown Virginia

VOC Emissions Inventory in Kilograms per Day

Pollutant	2001 Existing Condition	2020 No-Build Alternative A	2020 Build Alternative D	2020 Build Alternative E
Volatile Organic Compounds	1,707.5	1,759.5	1,797.6	1,810.0
Difference - Existing		52.0	90.1	102.5
Difference - No-Build			38.1	50.5

Jamestown Virginia

2020 Build Alternative E

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	Speed Peak (mph)	E.M.F. **VOC** (g/veh-mi)	Emissions **VOC** (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	Speed Off-Peak (mph)	E.M.F. **VOC** (g/veh-mi)	Emissions **VOC** (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	22,500	34,560	30	1.07	36.98	51,840	40	0.86	44.58
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	33,000	22,572	30	1.07	24.15	33,858	40	0.86	29.12
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	43,600	38,891	30	1.07	41.61	58,337	40	0.86	50.17
4	Route 60 from Route 199 to Route 5	1.90	24,600	18,696	30	1.07	20.00	28,044	40	0.86	24.12
5	Route 60 from Route 5 to Route 132	1.19	32,200	15,327	30	1.07	16.40	22,991	40	0.86	19.77
6	Route 60 from Route 132 to Route 162	1.18	32,200	15,198	30	0.00	0.00	22,798	40	0.00	0.00
7	Route 60 from Route 162 to Route 30	9.80	58,100	227,752	30	1.07	243.69	341,628	40	0.86	293.80
8	Route 5 from Route 132 to Route 31	1.88	12,700	9,550	30	1.07	10.22	14,326	40	0.86	12.32
9	Route 132 from Route 5 to Route 199	1.71	8,100	5,540	30	1.07	5.93	8,311	40	0.86	7.15
10	Route 132 from Route 60 to Route 5	1.08	21,600	9,331	30	1.07	9.98	13,997	40	0.86	12.04
11	Route 162 from Route 60 to Route 132	1.25	28,800	14,400	30	1.07	15.41	21,600	40	0.86	18.58
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 19	7.05	9,600	27,072	25	1.19	32.22	40,608	35	0.92	37.36
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	6,900	6,514	25	1.19	7.75	9,770	35	0.92	8.99
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 6	1.60	6,000	3,840	25	1.19	4.57	5,760	35	0.92	5.30
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	6,900	580	10	2.24	1.30	869	20	1.47	1.28
16	Route 199 from Interstate 64 to Route 60	1.08	39,100	16,891	30	1.07	18.07	25,337	40	0.86	21.79
17	Route 31 from Route 359 to Route 199	3.85	23,800	36,652	20	1.47	53.88	54,978	30	1.07	58.83
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestow	1.54	2,580	1,589	25	1.19	1.89	2,384	35	0.92	2.19
19	Jamestown Loop	2.27	3,300	2,996	10	2.24	6.71	4,495	10	2.24	10.07
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pk	2.13	84,800	72,250	60	0.82	59.24	108,374	65	0.88	95.37
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 1	1.88	84,800	63,770	60	0.82	52.29	95,654	65	0.88	84.18
22	Interstate 64 from Route 143 to Route 646	4.29	84,600	145,174	60	0.82	119.04	217,760	65	0.88	191.63

Mesoscale VOC Emissions (kilograms/day)

1810.0

Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 789,146	**781.4**

Idle Emissions (kg/day)	**VOC**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 1,183,719	**1028.6**

Idle Emissions (kg/day)	**VOC**
	0.0

Jamestown Virginia

2020 Build Alternative D

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	PEAK PERIOD Speed Peak (mph)	PEAK PERIOD E.M.F. **VOC** (g/veh-mi)	PEAK PERIOD Emissions **VOC** (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	OFF-PEAK PERIOD Speed Off-Peak (mph)	OFF-PEAK PERIOD E.M.F. **VOC** (g/veh-mi)	OFF-PEAK PERIOD Emissions **VOC** (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	22,400	34,406	30	1.07	36.81	51,610	40	0.86	44.38
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	33,000	22,572	30	1.07	24.15	33,858	40	0.86	29.12
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	43,100	38,445	30	1.07	41.14	57,668	40	0.86	49.59
4	Route 60 from Route 199 to Route 5	1.90	24,500	18,620	30	1.07	19.92	27,930	40	0.86	24.02
5	Route 60 from Route 5 to Route 132	1.19	32,100	15,280	30	1.07	16.35	22,919	40	0.86	19.71
6	Route 60 from Route 132 to Route 162	1.18	32,100	15,151	30	0.00	0.00	22,727	40	0.00	0.00
7	Route 60 from Route 162 to Route 30	9.80	58,000	227,360	30	1.07	243.28	341,040	40	0.86	293.29
8	Route 5 from Route 132 to Route 31	1.88	12,600	9,475	30	1.07	10.14	14,213	40	0.86	12.22
9	Route 132 from Route 5 to Route 199	1.71	8,000	5,472	30	1.07	5.86	8,208	40	0.86	7.06
10	Route 132 from Route 60 to Route 5	1.08	21,500	9,288	30	1.07	9.94	13,932	40	0.86	11.98
11	Route 162 from Route 60 to Route 132	1.25	28,800	14,400	30	1.07	15.41	21,600	40	0.86	18.58
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	9,000	25,380	25	1.19	30.20	38,070	35	0.92	35.02
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	6,800	6,419	25	1.19	7.64	9,629	35	0.92	8.86
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	5,800	3,712	25	1.19	4.42	5,568	35	0.92	5.12
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	6,300	529	10	2.24	1.19	794	20	1.47	1.17
16	Route 199 from Interstate 64 to Route 60	1.08	38,600	16,675	30	1.07	17.84	25,013	40	0.86	21.51
17	Route 31 from Route 359 to Route 199	3.85	23,300	35,882	20	1.47	52.75	53,823	30	1.07	57.59
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	2,910	1,793	25	1.19	2.13	2,689	35	0.92	2.47
19	Jamestown Loop	2.27	3,300	2,996	10	2.24	6.71	4,495	10	2.24	10.07
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	84,800	72,250	60	0.82	59.24	108,374	65	0.88	95.37
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	84,800	63,770	60	0.82	52.29	95,654	65	0.88	84.18
22	Interstate 64 from Route 143 to Route 646	4.29	84,100	144,316	60	0.82	118.34	216,473	65	0.88	190.50

Mesoscale VOC Emissions
(kilograms/day)

1797.6

Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 784,191	**775.7**
Idle Emissions (kg/day)	**VOC**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 1,176,286	**1021.8**
Idle Emissions (kg/day)	**VOC**
	0.0

Jamestown Virginia

2020 No Build Alternative A

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	PEAK PERIOD Speed Peak (mph)	PEAK PERIOD E.M.F. **VOC** (g/veh-mi)	PEAK PERIOD Emissions **VOC** (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	OFF-PEAK PERIOD Speed Off-Peak (mph)	OFF-PEAK PERIOD E.M.F. **VOC** (g/veh-mi)	OFF-PEAK PERIOD Emissions **VOC** (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	22,200	34,099	30	1.07	36.49	51,149	40	0.86	43.99
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	33,000	22,572	30	1.07	24.15	33,858	40	0.86	29.12
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	41,800	37,286	30	1.07	39.90	55,928	40	0.86	48.10
4	Route 60 from Route 199 to Route 5	1.90	24,300	18,468	30	1.07	19.76	27,702	40	0.86	23.82
5	Route 60 from Route 5 to Route 132	1.19	31,900	15,184	30	1.07	16.25	22,777	40	0.86	19.59
6	Route 60 from Route 132 to Route 162	1.18	31,900	15,057	30	0.00	0.00	22,585	40	0.00	0.00
7	Route 60 from Route 162 to Route 30	9.80	57,800	226,576	30	1.07	242.44	339,864	40	0.86	292.28
8	Route 5 from Route 132 to Route 31	1.88	12,400	9,325	30	1.07	9.98	13,987	40	0.86	12.03
9	Route 132 from Route 5 to Route 199	1.71	7,800	5,335	30	1.07	5.71	8,003	40	0.86	6.88
10	Route 132 from Route 60 to Route 5	1.08	21,300	9,202	30	1.07	9.85	13,802	40	0.86	11.87
11	Route 162 from Route 60 to Route 132	1.25	28,800	14,400	30	1.07	15.41	21,600	40	0.86	18.58
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	7,100	20,022	25	1.19	23.83	30,033	35	0.92	27.63
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	6,200	5,853	25	1.19	6.96	8,779	35	0.92	8.08
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	5,500	3,520	25	1.19	4.19	5,280	35	0.92	4.86
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	4,400	370	10	2.24	0.83	554	20	1.47	0.81
16	Route 199 from Interstate 64 to Route 60	1.08	37,300	16,114	30	1.07	17.24	24,170	40	0.86	20.79
17	Route 31 from Route 359 to Route 199	3.85	21,500	33,110	20	1.47	48.67	49,665	30	1.07	53.14
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	2,784	1,715	25	1.19	2.04	2,572	35	0.92	2.37
19	Jamestown Loop	2.27	3,300	2,996	10	2.24	6.71	4,495	10	2.24	10.07
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	84,800	72,250	60	0.82	59.24	108,374	65	0.88	95.37
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	84,800	63,770	60	0.82	52.29	95,654	65	0.88	84.18
22	Interstate 64 from Route 143 to Route 646	4.29	82,800	142,085	60	0.82	116.51	213,127	65	0.88	187.55

Mesoscale VOC Emissions
(kilograms/day)

1759.5

Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 769,307	**758.4**
Idle Emissions (kg/day)	**VOC**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 1,153,960	**1001.1**
Idle Emissions (kg/day)	**VOC**
	0.0

Jamestown Virginia

2001 Existing Condition

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	Speed Peak (mph)	E.M.F. VOC (g/veh-mi)	Emissions VOC (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	Speed Off-Peak (mph)	E.M.F. VOC (g/veh-mi)	Emissions VOC (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	14,900	22,886	30	1.50	34.33	34,330	40	1.24	42.57
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	22,200	15,185	30	1.50	22.78	22,777	40	1.24	28.24
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	27,500	24,530	30	1.50	36.80	36,795	40	1.24	45.63
4	Route 60 from Route 199 to Route 5	1.90	16,300	12,388	30	1.50	18.58	18,582	40	1.24	23.04
5	Route 60 from Route 5 to Route 132	1.19	21,400	10,186	30	1.50	15.28	15,280	40	1.24	18.95
6	Route 60 from Route 132 to Route 162	1.18	21,400	10,101	30	1.50	15.15	15,151	40	1.24	18.79
7	Route 60 from Route 162 to Route 30	9.80	38,800	152,096	30	1.50	228.14	228,144	40	1.24	282.90
8	Route 5 from Route 132 to Route 31	1.88	8,300	6,242	30	1.50	9.36	9,362	40	1.24	11.61
9	Route 132 from Route 5 to Route 199	1.71	5,200	3,557	30	1.50	5.34	5,335	40	1.24	6.62
10	Route 132 from Route 60 to Route 5	1.08	14,300	6,178	30	1.50	9.27	9,266	40	1.24	11.49
11	Route 162 from Route 60 to Route 132	1.25	19,400	9,700	30	1.50	14.55	14,550	40	1.24	18.04
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	3,900	10,998	25	1.66	18.26	16,497	35	1.35	22.27
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	3,900	3,682	25	1.66	6.11	5,522	35	1.35	7.46
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	3,500	2,240	25	1.66	3.72	3,360	35	1.35	4.54
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	2,100	176	10	3.04	0.54	265	20	1.98	0.52
16	Route 199 from Interstate 64 to Route 60	1.08	24,500	10,584	30	1.50	15.88	15,876	40	1.24	19.69
17	Route 31 from Route 359 to Route 199	3.85	13,700	21,098	20	1.98	41.77	31,647	30	1.50	47.47
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	1,800	1,109	25	1.66	1.84	1,663	35	1.35	2.25
19	Jamestown Loop	2.27	2,200	1,998	10	3.04	6.07	2,996	10	3.04	9.11
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	57,100	48,649	60	1.18	57.41	72,974	65	1.30	94.87
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	57,100	42,939	60	1.18	50.67	64,409	65	1.30	83.73
22	Interstate 64 from Route 143 to Route 646	4.29	55,100	94,552	60	1.18	111.57	141,827	65	1.30	184.38

Mesoscale VOC Emissions
(kilograms/day)

1707.5

Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 511,073	**723.4**
Idle Emissions (kg/day)	**VOC**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 766,609	**984.1**
Idle Emissions (kg/day)	**VOC**
	0.0

Jamestown Virginia

Link No.	Roadway Description	2001 Existing Condition				2020 No Build Alternative A				2020 Build Alternative D				2020 Build Alternative E			
		Peak		Off Peak		Peak		Off Peak		Peak		Off Peak		Peak		Off Peak	
		Average Speed (mph)	VOC EMF (g-veh/mi)	Average Speed (mph)	VOC EMF (g-veh/mi)	Average Speed (mph)	VOC EMF (g-veh/mi)	Average Speed (mph)	VOC EMF (g-veh/mi)	Average Speed (mph)	VOC EMF (g-veh/mi)	Average Speed (mph)	VOC EMF (g-veh/mi)	Average Speed (mph)	VOC EMF (g-veh/mi)	Average Speed (mph)	VOC EMF (g-veh/mi)
1	Route 5 from Route 164 to Route 31	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
2	Route 199 from Route 31 to Colonial	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
3	Route 199 from Colonial Nat'l Hist'l P	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
4	Route 60 from Route 199 to Route 5	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
5	Route 60 from Route 5 to Route 132	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
6	Route 60 from Route 132 to Route 16	30	1.50	40	1.24	30	1.50	40	1.24	30	1.50	40	1.24	30	1.50	40	1.24
7	Route 60 from Route 162 to Route 30	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
8	Route 5 from Route 132 to Route 31	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
9	Route 132 from Route 5 to Route 199	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
10	Route 132 from Route 60 to Route 5	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
11	Route 162 from Route 60 to Route 13	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
12	Colonial Nat'l Hist'l Pkwy from Route	25	1.66	35	1.35	25	1.19	35	0.92	25	1.19	35	0.92	25	1.19	35	0.92
13	Colonial Nat'l Hist'l Pkwy from Route	25	1.66	35	1.35	25	1.19	35	0.92	25	1.19	35	0.92	25	1.19	35	0.92
14	Colonial Nat'l Hist'l Pkwy from Route	25	1.66	35	1.35	25	1.19	35	0.92	25	1.19	35	0.92	25	1.19	35	0.92
15	Route 359 from Route 31 to Colonial	10	3.04	20	1.98	10	2.24	20	1.47	10	2.24	20	1.47	10	2.24	20	1.47

MOBILE5b Emission Factors

2001		2020	
Vehicle Speed (mph)	Volatile Organics (g/veh-mile)	Vehicle Speed (mph)	Volatile Organics (g/veh-mile)
2.5	11.02	2.5	8.05
3	8.91	3	6.48
4	6.51	4	4.72
5	5.20	5	3.77
6	4.38	6	3.18
7	3.82	7	2.78
8	3.47	8	2.52
9	3.20	9	2.33
10	3.04	10	2.24
11	2.80	11	2.04
12	2.64	12	1.93
13	2.51	13	1.84
14	2.40	14	1.76
15	2.30	15	1.69
16	2.22	16	1.63
17	2.14	17	1.57
18	2.07	18	1.52
19	2.01	19	1.48
20	1.98	20	1.47
21	1.87	21	1.37
22	1.81	22	1.32
23	1.76	23	1.27
24	1.71	24	1.23
25	1.66	25	1.19
26	1.62	26	1.15
27	1.57	27	1.12
28	1.54	28	1.09
29	1.50	29	1.06
30	1.50	30	1.07
31	1.47	31	1.01
32	1.44	32	0.98
33	1.41	33	0.96
34	1.38	34	0.94
35	1.35	35	0.92
36	1.33	36	0.90
37	1.30	37	0.88
38	1.28	38	0.86
39	1.26	39	0.85
40	1.24	40	0.86
41	1.25	41	0.82
42	1.20	42	0.80
43	1.19	43	0.79
44	1.17	44	0.78
45	1.15	45	0.77
46	1.14	46	0.75
47	1.12	47	0.74
48	1.11	48	0.73
49	1.10	49	0.73
50	1.09	50	0.76
51	1.11	51	0.73
52	1.09	52	0.72
53	1.08	53	0.72
54	1.08	54	0.72
55	1.08	55	0.72
56	1.08	56	0.73
57	1.10	57	0.75
58	1.13	58	0.76
59	1.15	59	0.78
60	1.18	60	0.82
61	1.22	61	0.81
62	1.23	62	0.83
63	1.25	63	0.84
64	1.28	64	0.86
65	1.30	65	0.88

NOTE: Emission factors were calculated by MOBILE5b and represent a composite vehicle type during summer conditions.

Jamestown Virginia

Average Daily Traffic (ADT) for Mesoscale Roadway Network

	Roadway Segment	Speed Limit (mph)	Peak-Period Average Speed* (mph)	Off-Peak Average Speed* (mph)	2001 **Existing** Volume (ADT)	2020 **No Build Alt A** Volume (ADT)	2020 **Build Alt B** Volume (ADT)	2020 **Build Alt C** Volume (ADT)	2020 **Build Alt D** Volume (ADT)	2020 **Build Alt E** Volume (ADT)
1	Route 5 from Route 164 to Route 31	40	30	40	**14,900**	**22,200**	**22,700**	**22,700**	**22,400**	**22,500**
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	40	30	40	**22,200**	**33,000**	**33,000**	**33,000**	**33,000**	**33,000**
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	40	30	40	**27,500**	**41,800**	**45,100**	**45,100**	**43,100**	**43,600**
4	Route 60 from Route 199 to Route 5	40	30	40	**16,300**	**24,300**	**24,800**	**24,800**	**24,500**	**24,600**
5	Route 60 from Route 5 to Route 132	40	30	40	**21,400**	**31,900**	**32,400**	**32,400**	**32,100**	**32,200**
6	Route 60 from Route 132 to Route 162	40	30	40	**21,400**	**31,900**	**32,400**	**32,400**	**32,100**	**32,200**
7	Route 60 from Route 162 to Route 30	40	30	40	**38,800**	**57,800**	**58,300**	**58,300**	**58,000**	**58,100**
8	Route 5 from Route 132 to Route 31	40	30	40	**8,300**	**12,400**	**12,900**	**12,900**	**12,600**	**12,700**
9	Route 132 from Route 5 to Route 199	40	30	40	**5,200**	**7,800**	**8,300**	**8,300**	**8,000**	**8,100**
10	Route 132 from Route 60 to Route 5	40	30	40	**14,300**	**21,300**	**21,800**	**21,800**	**21,500**	**21,600**
11	Route 162 from Route 60 to Route 132	40	30	40	**19,400**	**28,800**	**28,800**	**28,800**	**28,800**	**28,800**
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	35	25	35	**3,900**	**7,100**	**11,800**	**11,800**	**9,000**	**9,600**
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	35	25	35	**3,900**	**6,200**	**7,600**	**7,600**	**6,800**	**6,900**
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	35	25	35	**3,500**	**5,500**	**6,400**	**6,400**	**5,800**	**6,000**
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	20	10	20	**2,100**	**4,400**	**9,100**	**9,100**	**6,300**	**6,900**
16	Route 199 from Interstate 64 to Route 60	40	30	40	**24,500**	**37,300**	**40,600**	**40,600**	**38,600**	**39,100**
17	Route 31 from Route 359 to Route 199	30	20	30	**13,700**	**21,500**	**25,800**	**25,800**	**23,300**	**23,800**
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	35	25	35	**1,800**	**2,784**	**2,632**	**2,207**	**2,910**	**2,580**
19	Jamestown Loop	20	10	20	**2,200**	**3,300**	**3,300**	**3,300**	**3,300**	**3,300**
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	65	60	65	**57,100**	**84,800**	**84,800**	**84,800**	**84,800**	**84,800**
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	65	60	65	**57,100**	**84,800**	**84,800**	**84,800**	**84,800**	**84,800**
22	Interstate 64 from Route 143 to Route 646	65	60	65	**55,100**	**82,800**	**86,100**	**86,100**	**84,100**	**84,600**

Remember: Differences between the No-Build and Build are the basis for the mesoscale analysis.
Intuitive differences that our client or the public may have, must be addressed.

Notes:

The above data are necessary for the air quality mesoscale analysis. The data requested are required for each roadway segment (link), which are illustrated in the attached figure. **Please review the road segments** to see if links should be split to account for changes in **Build** traffic volumes along the link, or if links should be added because VHB can provide traffic volumes (particular **Build** traffic volumes) for additional roadway segments.

*** Speed data** are necessary for each roadway segment. **Your professional judgement (estimate) is acceptable** for peak and off-peak speed estimates, since its likely to be more accurate and based on actual conditions versus my best estimate. **Try to provide at least two of the three speed data for each segment** (eg 55 / 60 / 65, 30 / - / 35, 35 / 30 / -, etc).

Changes in BUILD speeds because of increased capacity are very important and should be noted.

Additional Information Required:

1) Photocopies of the AADT and monthly ADT from a **representative MHD count station**, for the 3-5 most recent years for which data are available. These data will be used to generate a seasonal adjustment factor that will convert the AADT project data into July data. **If the project traffic data represents a particular month, and not annual average daily traffic, this should be noted.**

2) Copies of the **HCS** intersection LOS analysis, for both signalized and unsignalized intersections. **Copies are not needed if I can borrow originals for a few hours**.

3) Copies of the project ATR traffic counts. **I only** need the hourly values for midweek.

Jamestown Virginia
Mesoscale Roadway Data

Link No.	Description	Link Length (miles)	Speed Limit (mph)	Peak Speed (mph)	Off-Peak Speed (mph)
1	Route 5 from Route 164 to Route 31	3.84	40	30	40
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	40	30	40
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	40	30	40
4	Route 60 from Route 199 to Route 5	1.90	40	30	40
5	Route 60 from Route 5 to Route 132	1.19	40	30	40
6	Route 60 from Route 132 to Route 162	1.18	40	30	40
7	Route 60 from Route 162 to Route 30	9.80	40	30	40
8	Route 5 from Route 132 to Route 31	1.88	40	30	40
9	Route 132 from Route 5 to Route 199	1.71	40	30	40
10	Route 132 from Route 60 to Route 5	1.08	40	30	40
11	Route 162 from Route 60 to Route 132	1.25	40	30	40
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	35	25	35
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	35	25	35
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	35	25	35
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	20	10	20
16	Route 199 from Interstate 64 to Route 60	1.08	40	30	40
17	Route 31 from Route 359 to Route 199	3.85	30	20	30
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	35	25	35
19	Jamestown Loop	2.27	20	10	10
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	65	60	65
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	65	60	65
22	Interstate 64 from Route 143 to Route 646	4.29	65	60	65

Jamestown Virginia

Link No.	Roadway Description	2001 Existing Condition Roadway S.A.F.	2001 Existing Condition Roadway ADT (veh/day)	2001 Existing Condition Seasonal ADT (veh/day)	2020 No Build Alternative A Roadway ADT (veh/day)	2020 No Build Alternative A Seasonal ADT (veh/day)	2020 No Build Alternative A Traffic Increase (existing)	2020 Build Alternative D Roadway ADT (veh/day)	2020 Build Alternative D Seasonal ADT (veh/day)	2020 Build Alternative D Traffic Increase (existing)	2020 Build Alternative D Traffic Increase (no-build)	2020 Build Alternative E Roadway ADT (veh/day)	2020 Build Alternative E Seasonal ADT (veh/day)	2020 Build Alternative E Traffic Increase (existing)	2020 Build Alternative E Traffic Increase (no-build)
1	Route 5 from Route 164 to Route 31	**100%**	14,900	14,900	22,200	22,200	49.0%	22,400	22,400	50.3%	0.9%	22,500	22,500	51.0%	1.4%
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	**100%**	22,200	22,200	33,000	33,000	48.6%	33,000	33,000	48.6%	0.0%	33,000	33,000	48.6%	0.0%
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	**100%**	27,500	27,500	41,800	41,800	52.0%	43,100	43,100	56.7%	3.1%	43,600	43,600	58.5%	4.3%
4	Route 60 from Route 199 to Route 5	**100%**	16,300	16,300	24,300	24,300	49.1%	24,500	24,500	50.3%	0.8%	24,600	24,600	50.9%	1.2%
5	Route 60 from Route 5 to Route 132	**100%**	21,400	21,400	31,900	31,900	49.1%	32,100	32,100	50.0%	0.6%	32,200	32,200	50.5%	0.9%
6	Route 60 from Route 132 to Route 162	**100%**	21,400	21,400	31,900	31,900	49.1%	32,100	32,100	50.0%	0.6%	32,200	32,200	50.5%	0.9%
7	Route 60 from Route 162 to Route 30	**100%**	38,800	38,800	57,800	57,800	49.0%	58,000	58,000	49.5%	0.3%	58,100	58,100	49.7%	0.5%
8	Route 5 from Route 132 to Route 31	**100%**	8,300	8,300	12,400	12,400	49.4%	12,600	12,600	34.1%	1.6%	12,700	12,700	34.6%	2.4%
9	Route 132 from Route 5 to Route 199	**100%**	5,200	5,200	7,800	7,800	50.0%	8,000	8,000	35.0%	2.5%	8,100	8,100	35.8%	3.7%
10	Route 132 from Route 60 to Route 5	**100%**	14,300	14,300	21,300	21,300	49.0%	21,500	21,500	33.5%	0.9%	21,600	21,600	33.8%	1.4%
11	Route 162 from Route 60 to Route 132	**100%**	19,400	19,400	28,800	28,800	48.5%	28,800	28,800	32.6%	0.0%	28,800	28,800	32.6%	0.0%
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	**100%**	3,900	3,900	7,100	7,100	82.1%	9,000	9,000	56.7%	21.1%	9,600	9,600	59.4%	26.0%
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	**100%**	3,900	3,900	6,200	6,200	59.0%	6,800	6,800	42.6%	8.8%	6,900	6,900	43.5%	10.1%
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	**100%**	3,500	3,500	5,500	5,500	57.1%	5,800	5,800	39.7%	5.2%	6,000	6,000	41.7%	8.3%
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	**100%**	2,100	2,100	4,400	4,400	109.5%	6,300	6,300	66.7%	30.2%	6,900	6,900	69.6%	36.2%
16	Route 199 from Interstate 64 to Route 60	**100%**	24,500	24,500	37,300	37,300	52.2%	38,600	38,600	36.5%	3.4%	39,100	39,100	37.3%	4.6%
17	Route 31 from Route 359 to Route 199	**100%**	13,700	13,700	21,500	21,500	56.9%	23,300	23,300	41.2%	7.7%	23,800	23,800	42.4%	9.7%
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	**100%**	1,800	1,800	2,784	2,784	54.7%	2,910	2,910	38.1%	4.3%	2,580	2,580	30.2%	-7.9%
19	Jamestown Loop	**100%**	2,200	2,200	3,300	3,300	50.0%	3,300	3,300	33.3%	0.0%	3,300	3,300	33.3%	0.0%
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	**100%**	57,100	57,100	84,800	84,800	48.5%	84,800	84,800	32.7%	0.0%	84,800	84,800	32.7%	0.0%
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	**100%**	57,100	57,100	84,800	84,800	48.5%	84,800	84,800	32.7%	0.0%	84,800	84,800	32.7%	0.0%
22	Interstate 64 from Route 143 to Route 646	**100%**	55,100	55,100	82,800	82,800	50.3%	84,100	84,100	34.5%	1.5%	84,600	84,600	34.9%	2.1%

Peak Period Volume Factor

Peak Period Factor Assumed => **0.400**

Seasonal Adjustment Factor (S.A.F.)

Principal Arterial - ADT Adjustment Factor => **1.00**

Jamestown Virginia

VOC Emissions Inventory in Kilograms per Day

Pollutant	2001 Existing Condition	2020 No-Build Alternative A	2020 Build Alternative B	2020 Build Alternative C
Volatile Organic Compounds	1,707.5	1,759.5	1,852.9	1,852.2
Difference - Existing		52.0	145.4	144.7
Difference - No-Build			93.4	92.7

Jamestown Virginia

2001 Existing Condition

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles	Speed Peak (mph)	E.M.F. VOC (g/veh-mi)	Emissions VOC (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles	Speed Off-Peak (mph)	E.M.F. VOC (g/veh-mi)	Emissions VOC (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	14,900	22,886	30	1.50	34.33	34,330	40	1.24	42.57
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	22,200	15,185	30	1.50	22.78	22,777	40	1.24	28.24
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	27,500	24,530	30	1.50	36.80	36,795	40	1.24	45.63
4	Route 60 from Route 199 to Route 5	1.90	16,300	12,388	30	1.50	18.58	18,582	40	1.24	23.04
5	Route 60 from Route 5 to Route 132	1.19	21,400	10,186	30	1.50	15.28	15,280	40	1.24	18.95
6	Route 60 from Route 132 to Route 162	1.18	21,400	10,101	30	1.50	15.15	15,151	40	1.24	18.79
7	Route 60 from Route 162 to Route 30	9.80	38,800	152,096	30	1.50	228.14	228,144	40	1.24	282.90
8	Route 5 from Route 132 to Route 31	1.88	8,300	6,242	30	1.50	9.36	9,362	40	1.24	11.61
9	Route 132 from Route 5 to Route 199	1.71	5,200	3,557	30	1.50	5.34	5,335	40	1.24	6.62
10	Route 132 from Route 60 to Route 5	1.08	14,300	6,178	30	1.50	9.27	9,266	40	1.24	11.49
11	Route 162 from Route 60 to Route 132	1.25	19,400	9,700	30	1.50	14.55	14,550	40	1.24	18.04
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	3,900	10,998	25	1.66	18.26	16,497	35	1.35	22.27
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	3,900	3,682	25	1.66	6.11	5,522	35	1.35	7.46
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	3,500	2,240	25	1.66	3.72	3,360	35	1.35	4.54
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	2,100	176	10	3.04	0.54	265	20	1.98	0.52
16	Route 199 from Interstate 64 to Route 60	1.08	24,500	10,584	30	1.50	15.88	15,876	40	1.24	19.69
17	Route 31 from Route 359 to Route 199	3.85	13,700	21,098	20	1.98	41.77	31,647	30	1.50	47.47
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	1,800	1,109	25	1.66	1.84	1,663	35	1.35	2.25
19	Jamestown Loop	2.27	2,200	1,998	10	3.04	6.07	2,996	10	3.04	9.11
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	57,100	48,649	60	1.18	57.41	72,974	65	1.30	94.87
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	57,100	42,939	60	1.18	50.67	64,409	65	1.30	83.73
22	Interstate 64 from Route 143 to Route 646	4.29	55,100	94,552	60	1.18	111.57	141,827	65	1.30	184.38

Mesoscale VOC Emissions
(kilograms/day)

1707.5

Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 511,073	**723.4**
Idle Emissions (kg/day)	**VOC**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 766,609	**984.1**
Idle Emissions (kg/day)	**VOC**
	0.0

Jamestown Virginia

2020 No Build Alternative A

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles	Speed Peak (mph)	E.M.F. VOC (g/veh-mi	Emissions VOC (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles	Speed Off-Peak (mph)	E.M.F. VOC (g/veh-mi	Emissions VOC (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	22,200	34,099	30	1.07	36.49	51,149	40	0.86	43.99
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	33,000	22,572	30	1.07	24.15	33,858	40	0.86	29.12
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	41,800	37,286	30	1.07	39.90	55,928	40	0.86	48.10
4	Route 60 from Route 199 to Route 5	1.90	24,300	18,468	30	1.07	19.76	27,702	40	0.86	23.82
5	Route 60 from Route 5 to Route 132	1.19	31,900	15,184	30	1.07	16.25	22,777	40	0.86	19.59
6	Route 60 from Route 132 to Route 162	1.18	31,900	15,057	30	0.00	0.00	22,585	40	0.00	0.00
7	Route 60 from Route 162 to Route 30	9.80	57,800	226,576	30	1.07	242.44	339,864	40	0.86	292.28
8	Route 5 from Route 132 to Route 31	1.88	12,400	9,325	30	1.07	9.98	13,987	40	0.86	12.03
9	Route 132 from Route 5 to Route 199	1.71	7,800	5,335	30	1.07	5.71	8,003	40	0.86	6.88
10	Route 132 from Route 60 to Route 5	1.08	21,300	9,202	30	1.07	9.85	13,802	40	0.86	11.87
11	Route 162 from Route 60 to Route 132	1.25	28,800	14,400	30	1.07	15.41	21,600	40	0.86	18.58
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	7,100	20,022	25	1.19	23.83	30,033	35	0.92	27.63
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	6,200	5,853	25	1.19	6.96	8,779	35	0.92	8.08
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	5,500	3,520	25	1.19	4.19	5,280	35	0.92	4.86
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	4,400	370	10	2.24	0.83	554	20	1.47	0.81
16	Route 199 from Interstate 64 to Route 60	1.08	37,300	16,114	30	1.07	17.24	24,170	40	0.86	20.79
17	Route 31 from Route 359 to Route 199	3.85	21,500	33,110	20	1.47	48.67	49,665	30	1.07	53.14
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	2,784	1,715	25	1.19	2.04	2,572	35	0.92	2.37
19	Jamestown Loop	2.27	3,300	2,996	10	2.24	6.71	4,495	10	2.24	10.07
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	84,800	72,250	60	0.82	59.24	108,374	65	0.88	95.37
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	84,800	63,770	60	0.82	52.29	95,654	65	0.88	84.18
22	Interstate 64 from Route 143 to Route 646	4.29	82,800	142,085	60	0.82	116.51	213,127	65	0.88	187.55

Mesoscale VOC Emissions
(kilograms/day)

1759.5

Peak Emissions Inventory	
VMT Emissions (kg/day)	**VOC**
VMT = 769,307	**758.4**
Idle Emissions (kg/day)	**VOC**
	0.0

Off-Peak Emissions Inventory	
VMT Emissions (kg/day)	**VOC**
VMT = 1,153,960	**1001.1**
Idle Emissions (kg/day)	**VOC**
	0.0

Jamestown Virginia

2020 Build Alternative B

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	PEAK PERIOD Speed Peak (mph)	PEAK PERIOD E.M.F. **VOC** (g/veh-mi)	PEAK PERIOD Emissions **VOC** (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	OFF-PEAK PERIOD Speed Off-Peak (mph)	OFF-PEAK PERIOD E.M.F. **VOC** (g/veh-mi)	OFF-PEAK PERIOD Emissions **VOC** (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	22,700	34,867	30	1.07	37.31	52,301	40	0.86	44.98
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	33,000	22,572	30	1.07	24.15	33,858	40	0.86	29.12
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	45,100	40,229	30	1.07	43.05	60,344	40	0.86	51.90
4	Route 60 from Route 199 to Route 5	1.90	24,800	18,848	30	1.07	20.17	28,272	40	0.86	24.31
5	Route 60 from Route 5 to Route 132	1.19	32,400	15,422	30	1.07	16.50	23,134	40	0.86	19.89
6	Route 60 from Route 132 to Route 162	1.18	32,400	15,293	30	0.00	0.00	22,939	40	0.00	0.00
7	Route 60 from Route 162 to Route 30	9.80	58,300	228,536	30	1.07	244.53	342,804	40	0.86	294.81
8	Route 5 from Route 132 to Route 31	1.88	12,900	9,701	30	1.07	10.38	14,551	40	0.86	12.51
9	Route 132 from Route 5 to Route 199	1.71	8,300	5,677	30	1.07	6.07	8,516	40	0.86	7.32
10	Route 132 from Route 60 to Route 5	1.08	21,800	9,418	30	1.07	10.08	14,126	40	0.86	12.15
11	Route 162 from Route 60 to Route 132	1.25	28,800	14,400	30	1.07	15.41	21,600	40	0.86	18.58
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	11,800	33,276	25	1.19	39.60	49,914	35	0.92	45.92
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	7,600	7,174	25	1.19	8.54	10,762	35	0.92	9.90
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	6,400	4,096	25	1.19	4.87	6,144	35	0.92	5.65
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	9,100	764	10	2.24	1.71	1,147	20	1.47	1.69
16	Route 199 from Interstate 64 to Route 60	1.08	40,600	17,539	30	1.07	18.77	26,309	40	0.86	22.63
17	Route 31 from Route 359 to Route 199	3.85	25,800	39,732	20	1.47	58.41	59,598	30	1.07	63.77
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	2,632	1,621	25	1.19	1.93	2,432	35	0.92	2.24
19	Jamestown Loop	2.27	3,300	2,996	10	2.24	6.71	4,495	10	2.24	10.07
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	84,800	72,250	60	0.82	59.24	108,374	65	0.88	95.37
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	84,800	63,770	60	0.82	52.29	95,654	65	0.88	84.18
22	Interstate 64 from Route 143 to Route 646	4.29	86,100	147,748	60	0.82	121.15	221,621	65	0.88	195.03

Mesoscale VOC Emissions
(kilograms/day)

1852.9

Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 805,930	**800.9**
Idle Emissions (kg/day)	**VOC**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 1,208,895	**1052.0**
Idle Emissions (kg/day)	**VOC**
	0.0

Jamestown Virginia

2020 Build Alternative C

Link No.	Description	Roadway Link Length (miles)	Seasonal Adjusted Volume (vehicles)	PEAK PERIOD VMT Peak (veh-miles)	Speed Peak (mph)	E.M.F. **VOC** (g/veh-mi)	Emissions **VOC** (Kg/day)	OFF-PEAK PERIOD VMT Off-Peak (veh-miles)	Speed Off-Peak (mph)	E.M.F. **VOC** (g/veh-mi)	Emissions **VOC** (Kg/day)
1	Route 5 from Route 164 to Route 31	3.84	22,700	34,867	30	1.07	37.31	52,301	40	0.86	44.98
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	33,000	22,572	30	1.07	24.15	33,858	40	0.86	29.12
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	45,100	40,229	30	1.07	43.05	60,344	40	0.86	51.90
4	Route 60 from Route 199 to Route 5	1.90	24,800	18,848	30	1.07	20.17	28,272	40	0.86	24.31
5	Route 60 from Route 5 to Route 132	1.19	32,400	15,422	30	1.07	16.50	23,134	40	0.86	19.89
6	Route 60 from Route 132 to Route 162	1.18	32,400	15,293	30	0.00	0.00	22,939	40	0.00	0.00
7	Route 60 from Route 162 to Route 30	9.80	58,300	228,536	30	1.07	244.53	342,804	40	0.86	294.81
8	Route 5 from Route 132 to Route 31	1.88	12,900	9,701	30	1.07	10.38	14,551	40	0.86	12.51
9	Route 132 from Route 5 to Route 199	1.71	8,300	5,677	30	1.07	6.07	8,516	40	0.86	7.32
10	Route 132 from Route 60 to Route 5	1.08	21,800	9,418	30	1.07	10.08	14,126	40	0.86	12.15
11	Route 162 from Route 60 to Route 132	1.25	28,800	14,400	30	1.07	15.41	21,600	40	0.86	18.58
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 19	7.05	11,800	33,276	25	1.19	39.60	49,914	35	0.92	45.92
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	7,600	7,174	25	1.19	8.54	10,762	35	0.92	9.90
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 6	1.60	6,400	4,096	25	1.19	4.87	6,144	35	0.92	5.65
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	9,100	764	10	2.24	1.71	1,147	20	1.47	1.69
16	Route 199 from Interstate 64 to Route 60	1.08	40,600	17,539	30	1.07	18.77	26,309	40	0.86	22.63
17	Route 31 from Route 359 to Route 199	3.85	25,800	39,732	20	1.47	58.41	59,598	30	1.07	63.77
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestow	1.54	2,207	1,360	25	1.19	1.62	2,039	35	0.92	1.88
19	Jamestown Loop	2.27	3,300	2,996	10	2.24	6.71	4,495	10	2.24	10.07
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pk	2.13	84,800	72,250	60	0.82	59.24	108,374	65	0.88	95.37
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 1	1.88	84,800	63,770	60	0.82	52.29	95,654	65	0.88	84.18
22	Interstate 64 from Route 143 to Route 646	4.29	86,100	147,748	60	0.82	121.15	221,621	65	0.88	195.03

Mesoscale VOC Emissions (kilograms/day)

1852.2

Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 805,668	**800.6**
Idle Emissions (kg/day)	**VOC**
	0.0

Off-Peak Emissions Inventory

VMT Emissions (kg/day)	**VOC**
VMT = 1,208,502	**1051.6**
Idle Emissions (kg/day)	**VOC**
	0.0

Jamestown Virginia

Roadway Description	2001 Existing Condition				2020 No Build Alternative A				2020 Build Alternative B				2020 Build Alternative C			
	Peak		Off Peak		Peak		Off Peak		Peak		Off Peak		Peak		Off Peak	
	verage Speed (mph)	VOC EMF (g-veh/mi)	verage Speed (mph)	VOC EMF (g-veh/mi)	verage Speed (mph)	VOC EMF (g-veh/mi)	verage Speed (mph)	VOC EMF (g-veh/mi)	verage Speed (mph)	VOC EMF (g-veh/mi)	verage Speed (mph)	VOC EMF (g-veh/mi)	verage Speed (mph)	VOC EMF (g-veh/mi)	verage Speed (mph)	VOC EMF (g-veh/mi)
Route 5 from Route 164 to Route 31	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
Route 60 from Route 199 to Route 5	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
Route 60 from Route 5 to Route 132	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
Route 60 from Route 132 to Route 162	30	1.50	40	1.24	30	1.50	40	1.24	30	1.50	40	1.24	30	1.50	40	1.24
Route 60 from Route 162 to Route 30	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
Route 5 from Route 132 to Route 31	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
Route 132 from Route 5 to Route 199	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
Route 132 from Route 60 to Route 5	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
Route 162 from Route 60 to Route 132	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	25	1.66	35	1.35	25	1.19	35	0.92	25	1.19	35	0.92	25	1.19	35	0.92
Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	25	1.66	35	1.35	25	1.19	35	0.92	25	1.19	35	0.92	25	1.19	35	0.92
Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	25	1.66	35	1.35	25	1.19	35	0.92	25	1.19	35	0.92	25	1.19	35	0.92
Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	10	3.04	20	1.98	10	2.24	20	1.47	10	2.24	20	1.47	10	2.24	20	1.47
Route 199 from Interstate 64 to Route 60	30	1.50	40	1.24	30	1.07	40	0.86	30	1.07	40	0.86	30	1.07	40	0.86
Route 31 from Route 359 to Route 199	20	1.98	30	1.50	20	1.47	30	1.07	20	1.47	30	1.07	20	1.47	30	1.07
Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	25	1.66	35	1.35	25	1.19	35	0.92	25	1.19	35	0.92	25	1.19	35	0.92
Jamestown Loop	10	3.04	10	3.04	10	2.24	10	2.24	10	2.24	10	2.24	10	2.24	10	2.24
Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	60	1.18	65	1.30	60	0.82	65	0.88	60	0.82	65	0.88	60	0.82	65	0.88
Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	60	1.18	65	1.30	60	0.82	65	0.88	60	0.82	65	0.88	60	0.82	65	0.88
Interstate 64 from Route 143 to Route 646	60	1.18	65	1.30	60	0.82	65	0.88	60	0.82	65	0.88	60	0.82	65	0.88

MOBILE5b Emission Factors

2001		2020	
Vehicle Speed (mph)	Volatile Organics (g/veh-mile)	Vehicle Speed (mph)	Volatile Organics (g/veh-mile)
2.5	11.02	2.5	8.05
3	8.91	3	6.48
4	6.51	4	4.72
5	5.20	5	3.77
6	4.38	6	3.18
7	3.82	7	2.78
8	3.47	8	2.52
9	3.20	9	2.33
10	3.04	10	2.24
11	2.80	11	2.04
12	2.64	12	1.93
13	2.51	13	1.84
14	2.40	14	1.76
15	2.30	15	1.69
16	2.22	16	1.63
17	2.14	17	1.57
18	2.07	18	1.52
19	2.01	19	1.48
20	1.98	20	1.47
21	1.87	21	1.37
22	1.81	22	1.32
23	1.76	23	1.27
24	1.71	24	1.23
25	1.66	25	1.19
26	1.62	26	1.15
27	1.57	27	1.12
28	1.54	28	1.09
29	1.50	29	1.06
30	1.50	30	1.07
31	1.47	31	1.01
32	1.44	32	0.98
33	1.41	33	0.96
34	1.38	34	0.94
35	1.35	35	0.92
36	1.33	36	0.90
37	1.30	37	0.88
38	1.28	38	0.86
39	1.26	39	0.85
40	1.24	40	0.86
41	1.25	41	0.82
42	1.20	42	0.80
43	1.19	43	0.79
44	1.17	44	0.78
45	1.15	45	0.77
46	1.14	46	0.75
47	1.12	47	0.74
48	1.11	48	0.73
49	1.10	49	0.73
50	1.09	50	0.76
51	1.11	51	0.73
52	1.09	52	0.72
53	1.08	53	0.72
54	1.08	54	0.72
55	1.08	55	0.72
56	1.08	56	0.73
57	1.10	57	0.75
58	1.13	58	0.76
59	1.15	59	0.78
60	1.18	60	0.82
61	1.22	61	0.81
62	1.23	62	0.83
63	1.25	63	0.84
64	1.28	64	0.86
65	1.30	65	0.88

NOTE: Emission factors were calculated by MOBILE5b and represent a composite vehicle type during summer conditions.

Jamestown Virginia

Average Daily Traffic (ADT) for Mesoscale Roadway Network

	Roadway Segment	Speed Limit (mph)	Peak-Period Average Speed* (mph)	Off-Peak Average Speed* (mph)	2001 **Existing** Volume (ADT)	2020 **No Build Alt A** Volume (ADT)	2020 **Build Alt B** Volume (ADT)	2020 **Build Alt C** Volume (ADT)	2020 **Build Alt D** Volume (ADT)	2020 **Build Alt E** Volume (ADT)
1	Route 5 from Route 164 to Route 31	40	30	40	**14,900**	**22,200**	**22,700**	**22,700**	**22,400**	**22,500**
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	40	30	40	**22,200**	**33,000**	**33,000**	**33,000**	**33,000**	**33,000**
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	40	30	40	**27,500**	**41,800**	**45,100**	**45,100**	**43,100**	**43,600**
4	Route 60 from Route 199 to Route 5	40	30	40	**16,300**	**24,300**	**24,800**	**24,800**	**24,500**	**24,600**
5	Route 60 from Route 5 to Route 132	40	30	40	**21,400**	**31,900**	**32,400**	**32,400**	**32,100**	**32,200**
6	Route 60 from Route 132 to Route 162	40	30	40	**21,400**	**31,900**	**32,400**	**32,400**	**32,100**	**32,200**
7	Route 60 from Route 162 to Route 30	40	30	40	**38,800**	**57,800**	**58,300**	**58,300**	**58,000**	**58,100**
8	Route 5 from Route 132 to Route 31	40	30	40	**8,300**	**12,400**	**12,900**	**12,900**	**12,600**	**12,700**
9	Route 132 from Route 5 to Route 199	40	30	40	**5,200**	**7,800**	**8,300**	**8,300**	**8,000**	**8,100**
10	Route 132 from Route 60 to Route 5	40	30	40	**14,300**	**21,300**	**21,800**	**21,800**	**21,500**	**21,600**
11	Route 162 from Route 60 to Route 132	40	30	40	**19,400**	**28,800**	**28,800**	**28,800**	**28,800**	**28,800**
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	35	25	35	**3,900**	**7,100**	**11,800**	**11,800**	**9,000**	**9,600**
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	35	25	35	**3,900**	**6,200**	**7,600**	**7,600**	**6,800**	**6,900**
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	35	25	35	**3,500**	**5,500**	**6,400**	**6,400**	**5,800**	**6,000**
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	20	10	20	**2,100**	**4,400**	**9,100**	**9,100**	**6,300**	**6,900**
16	Route 199 from Interstate 64 to Route 60	40	30	40	**24,500**	**37,300**	**40,600**	**40,600**	**38,600**	**39,100**
17	Route 31 from Route 359 to Route 199	30	20	30	**13,700**	**21,500**	**25,800**	**25,800**	**23,300**	**23,800**
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	35	25	35	**1,800**	**2,784**	**2,632**	**2,207**	**2,910**	**2,580**
19	Jamestown Loop	20	10	20	**2,200**	**3,300**	**3,300**	**3,300**	**3,300**	**3,300**
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	65	60	65	**57,100**	**84,800**	**84,800**	**84,800**	**84,800**	**84,800**
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	65	60	65	**57,100**	**84,800**	**84,800**	**84,800**	**84,800**	**84,800**
22	Interstate 64 from Route 143 to Route 646	65	60	65	**55,100**	**82,800**	**86,100**	**86,100**	**84,100**	**84,600**

Remember: Differences between the No-Build and Build are the basis for the mesoscale analysis.
Intuitive differences that our client or the public may have, must be addressed.

Notes:

The above data are necessary for the air quality mesoscale analysis. The data requested are required for each roadway segment (link), which are illustrated in the attached figure. **Please review the road segments** to see if links should be split to account for changes in **Build** traffic volumes along the link, or if links should be added because VHB can provide traffic volumes (particular **Build** traffic volumes) for additional roadway segments.

*** Speed data** are necessary for each roadway segment. **Your professional judgement (estimate) is acceptable** for peak and off-peak speed estimates, since its likely to be more accurate and based on actual conditions versus my best estimate. **Try to provide at least two of the three speed data for each segment** (eg 55 / 60 / 65, 30 / - / 35, 35 / 30 / -, etc).

Changes in BUILD speeds because of increased capacity are very important and should be noted.

Additional Information Required:

1) Photocopies of the AADT and monthly ADT from a **representative MHD count station**, for the 3-5 most recent years for which data are available. These data will be used to generate a seasonal adjustment factor that will convert the AADT project data into July data. **If the project traffic data represents a particular month, and not annual average daily traffic, this should be noted.**

2**)** Copies of the **HCS** intersection LOS analysis, for both signalized and unsignalized intersections. **Copies are not needed if I can borrow originals for a few hours**.

3) Copies of the project ATR traffic counts. **I only** need the hourly values for midweek.

Jamestown Virginia
Mesoscale Roadway Data

Link No.	Description	Link Length (miles)	Speed Limit (mph)	Peak Speed (mph)	Off-Peak Speed (mph)
1	Route 5 from Route 164 to Route 31	3.84	40	30	40
2	Route 199 from Route 31 to Colonial Nat'l Hist'l Pkwy	1.71	40	30	40
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Route 60	2.23	40	30	40
4	Route 60 from Route 199 to Route 5	1.90	40	30	40
5	Route 60 from Route 5 to Route 132	1.19	40	30	40
6	Route 60 from Route 132 to Route 162	1.18	40	30	40
7	Route 60 from Route 162 to Route 30	9.80	40	30	40
8	Route 5 from Route 132 to Route 31	1.88	40	30	40
9	Route 132 from Route 5 to Route 199	1.71	40	30	40
10	Route 132 from Route 60 to Route 5	1.08	40	30	40
11	Route 162 from Route 60 to Route 132	1.25	40	30	40
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Route 199	7.05	35	25	35
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Route 60	2.36	35	25	35
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Interstate 64	1.60	35	25	35
15	Route 359 from Route 31 to Colonial Nat'l Hist'l Pkwy	0.21	20	10	20
16	Route 199 from Interstate 64 to Route 60	1.08	40	30	40
17	Route 31 from Route 359 to Route 199	3.85	30	20	30
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jamestown Loop	1.54	35	25	35
19	Jamestown Loop	2.27	20	10	10
20	Interstate 64 from Route 143 to Colonial Nat'l Hist'l Pkwy	2.13	65	60	65
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to Route 199	1.88	65	60	65
22	Interstate 64 from Route 143 to Route 646	4.29	65	60	65

Jamestown Virginia

Link No.	Roadway Description	2001 Existing Condition Roadway S.A.F.	2001 Existing Condition Roadway ADT (veh/day)	2001 Existing Condition Seasonal ADT (veh/day)	2020 No Build Alternative A Roadway ADT (veh/day)	2020 No Build Alternative A Seasonal ADT (veh/day)	2020 No Build Alternative A Traffic Increase (existing)	2020 Build Alternative B Roadway ADT (veh/day)	2020 Build Alternative B Seasonal ADT (veh/day)	2020 Build Alternative B Traffic Increase (existing)	2020 Build Alternative B Traffic Increase (no-build)	2020 Build Alternative C Roadway ADT (veh/day)	2020 Build Alternative C Seasonal ADT (veh/day)	2020 Build Alternative C Traffic Increase (existing)	2020 Build Alternative C Traffic Increase (no-build)
1	Route 5 from Route 164 to Route 31	**100%**	14,900	14,900	22,200	22,200	49.0%	22,700	22,700	52.3%	2.3%	22,700	22,700	52.3%	2.3%
2	Route 199 from Route 31 to Colonial Nat'l Hist'l	**100%**	22,200	22,200	33,000	33,000	48.6%	33,000	33,000	48.6%	0.0%	33,000	33,000	48.6%	0.0%
3	Route 199 from Colonial Nat'l Hist'l Pkwy to Ro	**100%**	27,500	27,500	41,800	41,800	52.0%	45,100	45,100	64.0%	7.9%	45,100	45,100	64.0%	7.9%
4	Route 60 from Route 199 to Route 5	**100%**	16,300	16,300	24,300	24,300	49.1%	24,800	24,800	52.1%	2.1%	24,800	24,800	52.1%	2.1%
5	Route 60 from Route 5 to Route 132	**100%**	21,400	21,400	31,900	31,900	49.1%	32,400	32,400	51.4%	1.6%	32,400	32,400	51.4%	1.6%
6	Route 60 from Route 132 to Route 162	**100%**	21,400	21,400	31,900	31,900	49.1%	32,400	32,400	51.4%	1.6%	32,400	32,400	51.4%	1.6%
7	Route 60 from Route 162 to Route 30	**100%**	38,800	38,800	57,800	57,800	49.0%	58,300	58,300	50.3%	0.9%	58,300	58,300	50.3%	0.9%
8	Route 5 from Route 132 to Route 31	**100%**	8,300	8,300	12,400	12,400	49.4%	12,900	12,900	35.7%	3.9%	12,900	12,900	35.7%	3.9%
9	Route 132 from Route 5 to Route 199	**100%**	5,200	5,200	7,800	7,800	50.0%	8,300	8,300	37.3%	6.0%	8,300	8,300	37.3%	6.0%
10	Route 132 from Route 60 to Route 5	**100%**	14,300	14,300	21,300	21,300	49.0%	21,800	21,800	34.4%	2.3%	21,800	21,800	34.4%	2.3%
11	Route 162 from Route 60 to Route 132	**100%**	19,400	19,400	28,800	28,800	48.5%	28,800	28,800	32.6%	0.0%	28,800	28,800	32.6%	0.0%
12	Colonial Nat'l Hist'l Pkwy from Route 359 to Ro	**100%**	3,900	3,900	7,100	7,100	82.1%	11,800	11,800	66.9%	39.8%	11,800	11,800	66.9%	39.8%
13	Colonial Nat'l Hist'l Pkwy from Route 199 to Ro	**100%**	3,900	3,900	6,200	6,200	59.0%	7,600	7,600	48.7%	18.4%	7,600	7,600	48.7%	18.4%
14	Colonial Nat'l Hist'l Pkwy from Route 60 to Inter	**100%**	3,500	3,500	5,500	5,500	57.1%	6,400	6,400	45.3%	14.1%	6,400	6,400	45.3%	14.1%
15	Route 359 from Route 31 to Colonial Nat'l Hist'l	**100%**	2,100	2,100	4,400	4,400	109.5%	9,100	9,100	76.9%	51.6%	9,100	9,100	76.9%	51.6%
16	Route 199 from Interstate 64 to Route 60	**100%**	24,500	24,500	37,300	37,300	52.2%	40,600	40,600	39.7%	8.1%	40,600	40,600	39.7%	8.1%
17	Route 31 from Route 359 to Route 199	**100%**	13,700	13,700	21,500	21,500	56.9%	25,800	25,800	46.9%	16.7%	25,800	25,800	46.9%	16.7%
18	Colonial Nat'l Hist'l Pkwy from Route 359 to Jam	**100%**	1,800	1,800	2,784	2,784	54.7%	2,632	2,632	31.6%	-5.8%	2,207	2,207	18.4%	-26.1%
19	Jamestown Loop	**100%**	2,200	2,200	3,300	3,300	50.0%	3,300	3,300	33.3%	0.0%	3,300	3,300	33.3%	0.0%
20	Interstate 64 from Route 143 to Colonial Nat'l H	**100%**	57,100	57,100	84,800	84,800	48.5%	84,800	84,800	32.7%	0.0%	84,800	84,800	32.7%	0.0%
21	Interstate 64 from Colonial Nat'l Hist'l Pkwy to R	**100%**	57,100	57,100	84,800	84,800	48.5%	84,800	84,800	32.7%	0.0%	84,800	84,800	32.7%	0.0%
22	Interstate 64 from Route 143 to Route 646	**100%**	55,100	55,100	82,800	82,800	50.3%	86,100	86,100	36.0%	3.8%	86,100	86,100	36.0%	3.8%

Peak Period Volume Factor

Peak Period Factor Assumed => **0.400**

Seasonal Adjustment Factor (S.A.F.)

Principal Arterial - ADT Adjustment Factor => **1.00**

I

Appendix I:
Noise Data

mawald.checkin.31005.03.subdividers.p65

Noise Data

- Noise Monitoring Data
- TNM Input Data
- TNM Results

Noise Monitoring Data

Noise Monitoring Data

Receptor Number	Receptor Location	L_{eq} Measured	FHWA Criterion
1	Jamestown Island Loop Drive	51	57
2	Jamestown Island Parking Area	53	67
3	Jamestown Settlement – Route 31 at Route 359	65	67
4	Residences at Back River Lane	51	67
5	Colonial Parkway near attempted settlement sign	64	67
6	Colonial Parkway at the Isthmus pullout	65*	67
7	Williamsburg Visitor's Center – Route 132Y	69	67
8	Route 31 at Old Colony Lane	62	67

Source:Vanasse Hangen Brustlin, Inc.

* Wind noise was a substantial noise source at this location

Receptor 1 Noise Monitoring Data

SLM & RTA Summary

Translated:	11-Apr-02	11:27:11
File Translated:	E:\twholley\Projects\Virginia Jamestown\Noise\Monitoring Data\23Mar Site 1.slmdl	
Model Number:	824	
Serial Number:	A0184	
Firmware Rev:	3.111	
Software Version:	3.05	
Name:	VHB	
Descr1:	Enter Address Line 1	
Descr2:	Enter Address Line 2	
Setup:	GenRTA.ssa	
Setup Descr:	Gen - SLM & Real-Time Analyzer	
Location:	Site 1	
Note 1:		
Note 2:		

Overall Measurement

Start Time:	23-Mar-10	14:31:34
Ln Start Level:	15 dB	

L 1.00	62.5 dBA
L 5.00	57.9 dBA
L 10.00	56.5 dBA
L 50.00	50.3 dBA
L 90.00	46.3 dBA
L 95.00	45.8 dBA

Interval Records:	Enabled	Number Interval Records:	3
History Records:	Disabled	Number History Records:	0

Current Any Data

Start Time:	23-Mar-10	14:34:50
Elapsed Time:	04:29.1	

	A Weight		C Weight		Flat	
Leq:	50.7 dBA		66.9 dBC		72.6 dBF	
SEL:	75.0 dBA		91.2 dBC		96.9 dBF	
Peak:	78.5 dBA		91.0 dBC		96.6 dBF	
	3/23/2010 14:34		3/23/2010 14:37		3/23/2010 14:37	
Lmax (slow):	61.6 dBA		80.6 dBC		83.9 dBF	
	3/23/2010 14:40		3/23/2010 14:40		3/23/2010 14:40	
Lmin (slow):	44.9 dBA		58.3 dBC		60.3 dBF	
	3/23/2010 14:35		3/23/2010 14:38		3/23/2010 14:38	
Lmax (fast):	57.2 dBA		82.0 dBC		88.4 dBF	
	3/23/2010 14:37		3/23/2010 14:37		3/23/2010 14:37	
Lmin (fast):	44.6 dBA		57.0 dBC		58.7 dBF	
	3/23/2010 14:35		3/23/2010 14:38		3/23/2010 14:38	
Lmax (impulse):	57.3 dBA		85.1 dBC		91.8 dBF	
	3/23/2010 14:37		3/23/2010 14:37		3/23/2010 14:37	
Lmin (impulse):	44.8 dBA		59.7 dBC		61.6 dBF	
	3/23/2010 14:35		3/23/2010 14:38		3/23/2010 14:38	

Spectra

Start Time:	23-Mar-10		14:34:50	Run Time:	04:29.1			
Freq Hz	Leq 1/3 Oct		Leq 1/1 Oct	Max 1/3 Oct	Max 1/1 Oc		Min 1/3 Oc	Min 1/1 Oc
12.5	68.1			63.8			39.6	
16	66		71	59.7	66.5		41.3	45.3
20	63.6			60.4			40.5	
25	62.7			64.9			44.2	
31.5	60.5		66	57.9	66.4		46.5	50.6
40	60.1			58.5			46.5	
50	55.8			55			43.3	
63	53.5		58.7	49.9	56.7		43.5	47.2
80	51.1			47.5			39.5	
100	47			46.7			38.5	
125	46.5		50.4	45.8	51.1		37.1	41.6
160	42			46.4			33.5	
200	38.2			39.5			31.8	
250	39.1		43.6	38.6	45.2		30.4	36.3
315	39			42.2			32.1	
400	40.1			39.6			33.8	

Receptor 2 Noise Monitoring Data

SLM & RTA Summary

Translated:	11-Apr-02 11:38:11
File Translated:	E:\twholley\Projects\Virginia Jamestown\Noise\Monitoring Data\24Mar Site 2 A.slmdl
Model Number:	824
Serial Number:	A0184
Firmware Rev:	3.111
Software Version:	3.05
Name:	VHB
Descr1:	Enter Address Line 1
Descr2:	Enter Address Line 2
Setup:	GenRTA.ssa
Setup Descr:	Gen - SLM & Real-Time Analyzer
Location:	
Note 1:	
Note 2:	

Overall Measurement

Start Time:	24-Mar-10 10:52:12
Ln Start Level:	15 dB
L 1.00	59.7 dBA
L 5.00	57.4 dBA
L 10.00	55.2 dBA
L 50.00	50.9 dBA
L 90.00	47.2 dBA
L 95.00	46.6 dBA
Interval Records:	Enabled Number Interval Re 1
History Records:	Disabled Number History Re 0

Current Any Data

Start Time:	24-Mar-10 10:52:12		
Elapsed Time:	15:00.7		
	A Weight	C Weight	Flat
Leq:	52.6 dBA	66.3 dBC	70.5 dBF
SEL:	82.2 dBA	95.8 dBC	100.0 dBF
Peak:	85.2 dBA	98.3 dBC	104.8 dBF
	3/24/2010 10:58	3/24/2010 11:05	3/24/2010 11:05
Lmax (slow):	66.3 dBA	85.8 dBC	90.9 dBF
	3/24/2010 10:58	3/24/2010 11:05	3/24/2010 11:05
Lmin (slow):	46.0 dBA	58.7 dBC	60.7 dBF
	3/24/2010 11:00	3/24/2010 11:03	3/24/2010 11:02
Lmax (fast):	69.9 dBA	92.0 dBC	97.9 dBF
	3/24/2010 10:58	3/24/2010 11:05	3/24/2010 11:05
Lmin (fast):	45.5 dBA	56.9 dBC	58.6 dBF
	3/24/2010 11:01	3/24/2010 11:00	3/24/2010 11:00
Lmax (impulse):	71.5 dBA	94.8 dBC	101.3 dBF
	3/24/2010 10:58	3/24/2010 11:05	3/24/2010 11:05
Lmin (impulse):	45.8 dBA	59.1 dBC	60.8 dBF
	3/24/2010 11:03	3/24/2010 11:03	3/24/2010 11:03

Spectra

Start Time:	24-Mar-10	10:52:12	Run Time:	15:00.7			
Freq Hz	Leq 1/3 Oct	Leq 1/1 Oct	Max 1/3 Oct	Max 1/1 Oct	Min 1/3 Oc	Min 1/1 Oct	
12.5	65.4		51.3		38.3		
16	63	68.6	53.6	61.1	36.6	43.3	
20	62.4		59.6		40		
25	61.7		57.5		44		
31.5	59.2	65.4	55.8	63.1	40.8	48.8	
40	60.5		60.4		45.8		
50	57.5		56.1		44.8		
63	53.9	60.3	52.6	62.7	42.5	47.9	
80	54.2		61		41.4		
100	51.7		56.6		40.2		
125	50.6	55.1	59.2	62.5	39.3	43.9	
160	47.8		56.8		37.4		
200	46.5		56.5		36.8		
250	46.2	50.8	62.8	67.8	36	40.5	
315	45.2		65.7		34		
400	44.3		64.1		34.8		

Receptor 3 Noise Monitoring Data

SLM & RTA Summary

Translated:	11-Apr-02	11:48:42
File Translated:	E:\twholley\Projects\Virginia Jamestown\Noise\Monitoring Data\23Mar Site 3.slmdl	
Model Number:	824	
Serial Number:	A0184	
Firmware Rev:	3.111	
Software Version:	3.05	
Name:	VHB	
Descr1:	Enter Address Line 1	
Descr2:	Enter Address Line 2	
Setup:	GenRTA.ssa	
Setup Descr:	Gen - SLM & Real-Time Analyzer	
Location:		
Note 1:		
Note 2:		

Overall Measurement

Start Time:	23-Mar-10	15:21:33

Ln Start Level: 15 dB

L 1.00	76.1 dBA
L 5.00	72.1 dBA
L 10.00	65.6 dBA
L 50.00	59.8 dBA
L 90.00	52.8 dBA
L 95.00	52 dBA

Interval Records:	Enabled	Number Interval Records:	1
History Records:	Disabled	Number History Records:	0

Current Any Data

Start Time:	23-Mar-10	15:21:33
Elapsed Time:	15:38.1	

	A Weight	C Weight	Flat
Leq:	64.6 dBA	73.7 dBC	74.9 dBF
SEL:	94.3 dBA	103.4 dBC	104.6 dBF
Peak:	98.4 dBA	98.2 dBC	99.1 dBF
	3/23/2010 15:28	3/23/2010 15:25	3/23/2010 15:25
Lmax (slow):	79.1 dBA	88.3 dBC	89.4 dBF
	3/23/2010 15:25	3/23/2010 15:25	3/23/2010 15:25
Lmin (slow):	50.9 dBA	63.9 dBC	65.7 dBF
	3/23/2010 15:36	3/23/2010 15:33	3/23/2010 15:36
Lmax (fast):	80.8 dBA	90.9 dBC	92.2 dBF
	3/23/2010 15:22	3/23/2010 15:25	3/23/2010 15:25
Lmin (fast):	48.5 dBA	61.0 dBC	63.4 dBF
	3/23/2010 15:36	3/23/2010 15:36	3/23/2010 15:36
Lmax (impulse):	82.1 dBA	92.0 dBC	93.3 dBF
	3/23/2010 15:22	3/23/2010 15:25	3/23/2010 15:25
Lmin (impulse):	50.9 dBA	64.6 dBC	65.8 dBF
	3/23/2010 15:34	3/23/2010 15:36	3/23/2010 15:36

Spectra

Start Time:	23-Mar-10	15:21:33	Run Time:	15:38.1			
Freq Hz	Leq 1/3 Oct	Leq 1/1 Oct	Max 1/3 Oct	Max 1/1 Oct	Min 1/3 Oc	Min 1/1 Oc	
12.5	60.9		64.4		34.8		
16	59.6	64.4	68.7	77.2	38.8	43.1	
20	57.9		76.3		39.9		
25	61.4		70.9		40.9		
31.5	65.5	68.9	72.7	75.7	43.3	48.4	
40	64.5		67.9		45.5		
50	69.5		72.8		45.4		
63	65.6	71.9	78	79.2	46	49.9	
80	64.5		61.7		43.5		
100	62.7		65		43.8		
125	59	65	74.5	75.2	43	47.3	
160	57		62.1		40		
200	56.4		61.8		39.1		
250	55.5	61.3	64.2	67.7	40.2	44.1	
315	57.4		62.5		38.5		
400	55.6		60.4		37.4		

Receptor 4 Noise Monitoring Data

SLM & RTA Summary

Translated:	11-Apr-02	15:57:43
File Translated:	E:\twholley\Projects\Virginia Jamestown\Noise\Monitoring Data\23Mar Site4.slmdl	
Model Number:	824	
Serial Number:	A0184	
Firmware Rev:	3.111	
Software Version:	3.05	
Name:	VHB	
Descr1:	Enter Address Line 1	
Descr2:	Enter Address Line 2	
Setup:	GenRTA.ssa	
Setup Descr:	Gen - SLM & Real-Time Analyzer	
Location:		
Note 1:		
Note 2:		

Overall Measurement

Start Time:	23-Mar-10	15:54:23

Ln Start Level: 15 dB

L 1.00	57.1	dBA
L 5.00	55	dBA
L 10.00	54.1	dBA
L 50.00	49	dBA
L 90.00	43.8	dBA
L 95.00	43	dBA

Interval Records:	Enabled	Number Interval Re	1
History Records:	Disabled	Number History Re	0

Current Any Data

Start Time:	23-Mar-10	15:54:23
Elapsed Time:	10:04.1	

	A Weight	C Weight	Flat
Leq:	50.6 dBA	61.0 dBC	62.4 dBF
SEL:	78.5 dBA	88.8 dBC	90.2 dBF
Peak:	82.0 dBA	80.9 dBC	82.8 dBF
	3/23/2010 15:54	3/23/2010 16:03	3/23/2010 16:03
Lmax (slow):	60.0 dBA	67.2 dBC	68.3 dBF
	3/23/2010 16:03	3/23/2010 15:56	3/23/2010 15:56
Lmin (slow):	42.2 dBA	56.2 dBC	58.0 dBF
	3/23/2010 16:01	3/23/2010 15:55	3/23/2010 15:57
Lmax (fast):	63.6 dBA	69.9 dBC	70.4 dBF
	3/23/2010 16:03	3/23/2010 15:56	3/23/2010 15:56
Lmin (fast):	41.4 dBA	53.9 dBC	56.0 dBF
	3/23/2010 16:01	3/23/2010 15:55	3/23/2010 15:55
Lmax (impulse):	65.4 dBA	71.2 dBC	73.2 dBF
	3/23/2010 16:03	3/23/2010 15:56	3/23/2010 15:59
Lmin (impulse):	42.0 dBA	56.7 dBC	58.2 dBF
	3/23/2010 16:01	3/23/2010 15:55	3/23/2010 15:55

Spectra

Start Time:	23-Mar-10	15:54:23	Run Time:	10:04.1

Freq Hz	Leq 1/3 Oct	Leq 1/1 Oct	Max 1/3 Oct	Max 1/1 Oct	Min 1/3 Oc	Min 1/1 Oct
12.5	49.2		48.3		32.3	
16	48.5	54	50.6	52.9	32.8	38.3
20	49.8		41.5		35	
25	55.6		52.7		41.4	
31.5	53	59.3	51.7	56.7	38.9	45.8
40	54.7		51.2		42.2	
50	49.2		50.3		38.6	
63	52.1	56.1	50.6	56.5	39.4	43.7
80	52		53.5		38.8	
100	50.7		57.3		37.7	
125	51.2	55.1	52	58.8	35.7	40.3
160	48.6		47.8		30.7	
200	43.1		44.9		29.4	
250	42.1	46.8	55.8	57	28.6	34.5
315	40.6		49.3		30.9	
400	42.1		52.6		32.6	

Receptor 5 Noise Monitoring Data

SLM & RTA Summary

Translated:	11-Apr-02	16:04:13
File Translated:	E:\twholley\Projects\Virginia Jamestown\Noise\Monitoring Data\23Mar Site5.slmdl	
Model Number:	824	
Serial Number:	A0184	
Firmware Rev:	3.111	
Software Version:	3.05	
Name:	VHB	
Descr1:	Enter Address Line 1	
Descr2:	Enter Address Line 2	
Setup:	GenRTA.ssa	
Setup Descr:	Gen - SLM & Real-Time Analyzer	
Location:		
Note 1:		
Note 2:		

Overall Measurement

Start Time:	23-Mar-10	16:32:03

Ln Start Level: 15 dB

L 1.00	76.2 dBA
L 5.00	72.3 dBA
L 10.00	68.7 dBA
L 50.00	51.2 dBA
L 90.00	45.6 dBA
L 95.00	44.5 dBA

Interval Records:	Enabled	Number Interval Record	1
History Records:	Disabled	Number History Record	0

Current Any Data

Start Time:	23-Mar-10	16:32:03
Elapsed Time:	10:01.1	

	A Weight	C Weight	Flat
Leq:	64.3 dBA	73.5 dBC	78.9 dBF
SEL:	92.1 dBA	101.3 dBC	106.7 dBF
Peak:	93.2 dBA	99.1 dBC	105.9 dBF
	3/23/2010 16:40	3/23/2010 16:32	3/23/2010 16:32
Lmax (slow):	78.3 dBA	87.9 dBC	94.3 dBF
	3/23/2010 16:40	3/23/2010 16:32	3/23/2010 16:32
Lmin (slow):	42.5 dBA	53.9 dBC	57.2 dBF
	3/23/2010 16:41	3/23/2010 16:36	3/23/2010 16:37
Lmax (fast):	80.0 dBA	93.0 dBC	100.3 dBF
	3/23/2010 16:40	3/23/2010 16:32	3/23/2010 16:32
Lmin (fast):	41.9 dBA	52.0 dBC	53.2 dBF
	3/23/2010 16:41	3/23/2010 16:41	3/23/2010 16:41
Lmax (impulse):	81.4 dBA	94.8 dBC	102.9 dBF
	3/23/2010 16:40	3/23/2010 16:32	3/23/2010 16:32
Lmin (impulse):	42.3 dBA	54.3 dBC	58.1 dBF
	3/23/2010 16:36	3/23/2010 16:36	3/23/2010 16:37

Spectra

Start Time:	23-Mar-10	16:32:03	Run Time:	10:01.1

Freq Hz	Leq 1/3 Oct	Leq 1/1 Oct	Max 1/3 Oct	Max 1/1 Oct	Min 1/3 Oc	Min 1/1 Oct
12.5	74.6		65.9		38.6	
16	72.8	77.7	65.2	69.5	36.5	42.2
20	70.4		62.1		36.9	
25	68.2		60.9		37.1	
31.5	65.3	70.7	61.2	65.6	39	43.2
40	62.5		60.4		38.9	
50	60.4		68.1		38.1	
63	59.7	64.2	71.4	73.5	40	43.9
80	57.6		63.4		39.1	
100	57.1		67		37.7	
125	55.8	60.9	65.3	70.4	35.9	40.6
160	55.3		64		32.6	
200	56.2		70.9		29.5	
250	56.3	60.6	71.8	75.1	28.9	33.5
315	54.8		66.6		27.7	
400	54.4		66.3		29.4	

Receptor 6 Noise Monitoring Data

Note 1:
Note 2:

Overall Measurement
Start Time: 24-Mar-10 11:22:24

Ln Start Level: 15 dB

L 1.00	71.3 dBA
L 5.00	68.6 dBA
L 10.00	67.4 dBA
L 50.00	64.5 dBA
L 90.00	62.2 dBA
L 95.00	61.5 dBA

Interval Records: Enabled Number Interval F 1
History Records: Disabled Number History R 0

Current Any Data
Start Time: 24-Mar-10 11:22:24
Elapsed Time: 10:00.6

	A Weight	C Weight	Flat
Leq:	65.4 dBA	90.1 dBC	94.7 dBF
SEL:	93.2 dBA	117.9 dBC	122.5 dBF
Peak:	105.2 dBA	116.0 dBC	119.9 dBF
	3/24/2010 11:26	3/24/2010 11:30	3/24/2010 11:30
Lmax (slow):	72.2 dBA	102.0 dBC	107.5 dBF
	3/24/2010 11:30	3/24/2010 11:30	3/24/2010 11:30
Lmin (slow):	60.4 dBA	76.1 dBC	81.3 dBF
	3/24/2010 11:23	3/24/2010 11:22	3/24/2010 11:22
Lmax (fast):	77.7 dBA	106.0 dBC	111.3 dBF
	3/24/2010 11:26	3/24/2010 11:30	3/24/2010 11:30
Lmin (fast):	59.1 dBA	74.0 dBC	78.3 dBF
	3/24/2010 11:23	3/24/2010 11:22	3/24/2010 11:22
Lmax (impulse):	82.6 dBA	108.8 dBC	114.1 dBF
	3/24/2010 11:26	3/24/2010 11:30	3/24/2010 11:30
Lmin (impulse):	59.3 dBA	77.8 dBC	83.5 dBF
	3/24/2010 11:23	3/24/2010 11:22	3/24/2010 11:22

Spectra
Start Time: 24-Mar-10 11:22:24 Run Time: 10:00.6

Freq Hz	Leq 1/3 Oct	Leq 1/1 Oct	Max 1/3 Oct	Max 1/1 Oct	Min 1/3 Oc	Min 1/1 Oct
12.5	90		85.8		67.1	
16	88.8	93.7	84.8	91	65.1	70.3
20	87.7		87.7		63.9	
25	86.7		81.5		64.3	
31.5	85.2	90.1	81.4	88.5	63.3	68.6
40	83.6		86.4		63.8	
50	81.3		77.2		61.9	
63	77.6	83.3	79.1	81.9	58.7	64.1
80	73.6		73.4		54.4	
100	69		66.5		51.2	
125	64.8	70.9	64.8	69.3	52.1	55.9
160	61.1		60		49.8	
200	57.8		55.1		47.2	
250	54.7	60.3	53.5	58.2	46	51
315	52.4		50.8		45.1	
400	52.1		53.4		45.5	
500	52.8	57.7	52.8	58.3	46.5	51.7
630	53.7		54.3		48.3	
800	54.5		55		49.5	
1000	54.8	59.3	54.8	59.9	49.2	54.2
1250	54.4		55.6		49.5	
1600	54.1		56.9		48.1	
2000	53.5	58.3	58.1	62.6	47.6	52.1
2500	53		58.4		46.2	
3150	52.3		63.2		44.9	
4000	51.2	56	64	68.3	43.3	48.2
5000	49.8		63.2		41.3	
6300	48		67.6		39	
8000	46.6	51.1	71.9	74.4	37.1	41.9

Receptor 7 Noise Monitoring Data

SLM & RTA Summary

Translated:	11-Apr-02	16:13:35
File Translated:	E:\twholley\Projects\Virginia Jamestown\Noise\Monitoring Data\24Mar Site 7.slmdl	
Model Number:	824	
Serial Number:	A0184	
Firmware Rev:	3.111	
Software Version:	3.05	
Name:	VHB	
Descr1:	Enter Address Line 1	
Descr2:	Enter Address Line 2	
Setup:	GenRTA.ssa	
Setup Descr:	Gen - SLM & Real-Time Analyzer	
Location:		
Note 1:		
Note 2:		

Overall Measurement

Start Time:	24-Mar-10	12:45:07

Ln Start Level: 15 dB

L 1.00	78.9	dBA
L 5.00	75.4	dBA
L 10.00	73.3	dBA
L 50.00	61.7	dBA
L 90.00	53.8	dBA
L 95.00	52.6	dBA

Interval Records:	Enabled	Number Interval Records:	1
History Records:	Disabled	Number History Records:	0

Current Any Data

Start Time:	24-Mar-10	12:45:07
Elapsed Time:	15:02.6	

	A Weight	C Weight	Flat
Leq:	69.2 dBA	75.8 dBC	76.6 dBF
SEL:	98.8 dBA	105.4 dBC	106.2 dBF
Peak:	99.8 dBA	103.4 dBC	104.1 dBF
	3/24/2010 12:57	3/24/2010 12:57	3/24/2010 12:57
Lmax (slow):	86.5 dBA	91.7 dBC	92.1 dBF
	3/24/2010 12:57	3/24/2010 12:57	3/24/2010 12:57
Lmin (slow):	50.6 dBA	62.7 dBC	64.3 dBF
	3/24/2010 12:59	3/24/2010 12:51	3/24/2010 12:51
Lmax (fast):	88.6 dBA	93.7 dBC	94.0 dBF
	3/24/2010 12:57	3/24/2010 12:57	3/24/2010 12:57
Lmin (fast):	49.6 dBA	61.1 dBC	63.1 dBF
	3/24/2010 12:59	3/24/2010 12:51	3/24/2010 12:51
Lmax (impulse):	88.9 dBA	94.5 dBC	94.9 dBF
	3/24/2010 12:57	3/24/2010 12:57	3/24/2010 12:57
Lmin (impulse):	50.5 dBA	63.2 dBC	64.9 dBF
	3/24/2010 12:59	3/24/2010 12:51	3/24/2010 12:51

Spectra

Start Time:	24-Mar-10	12:45:07	Run Time:	15:02.6			
Freq Hz	Leq 1/3 Oct	Leq 1/1 Oct	Max 1/3 Oct	Max 1/1 Oct	Min 1/3 Oc	Min 1/1 Oct	
12.5	63.6		66.6		38.1		
16	62.1	67.2	64.6	71.3	36.2	43.9	
20	61.4		67.8		41.4		
25	61.6		75.3		45.2		
31.5	62.2	66.8	71.9	79	46.9	51	
40	62.2		74.9		46.5		
50	63.1		76.1		48.5		
63	65.6	71.1	71	89.8	47.9	52.6	
80	68.6		89.6		47.1		
100	66.1		79.6		45		
125	64.9	69.8	77	85	44.7	49	
160	63.8		82.4		42.7		
200	63.3		73.3		43		
250	63.5	67.5	77.3	80.9	39.5	45.6	
315	61.1		76.9		38.7		
400	60.8		75		38.4		

Receptor 8 Noise Monitoring Data

SLM & RTA Summary

Translated:	11-Apr-02	16:24:50	
File Translated:	E:\twholley\Projects\Virginia Jamestown\Noise\Monitoring Data\24Mar Site 8.slmdl		
Model Number:	824		
Serial Number:	A0184		
Firmware Rev:	3.111		
Software Version:	3.05		
Name:	VHB		
Descr1:	Enter Address Line 1		
Descr2:	Enter Address Line 2		
Setup:	GenRTA.ssa		
Setup Descr:	Gen - SLM & Real-Time Analyzer		
Location:			
Note 1:			
Note 2:			

Overall Measurement

Start Time:	24-Mar-10	15:14:31	
Ln Start Level:	15 dB		
L 1.00	68.9 dBA		
L 5.00	65.9 dBA		
L 10.00	64.8 dBA		
L 50.00	60.2 dBA		
L 90.00	54.8 dBA		
L 95.00	53.4 dBA		
Interval Records:	Enabled	Number Interval Records:	1
History Records:	Disabled	Number History Records:	0

Current Any Data

Start Time:	24-Mar-10	15:14:31	
Elapsed Time:	15:19.1		

	A Weight	C Weight	Flat
Leq:	61.8 dBA	76.7 dBC	82.6 dBF
SEL:	91.5 dBA	106.4 dBC	112.2 dBF
Peak:	88.9 dBA	102.2 dBC	107.2 dBF
	3/24/2010 15:25	3/24/2010 15:23	3/24/2010 15:20
Lmax (slow):	73.6 dBA	88.8 dBC	95.1 dBF
	3/24/2010 15:25	3/24/2010 15:23	3/24/2010 15:23
Lmin (slow):	50.5 dBA	63.9 dBC	65.3 dBF
	3/24/2010 15:15	3/24/2010 15:17	3/24/2010 15:15
Lmax (fast):	74.7 dBA	92.8 dBC	100.7 dBF
	3/24/2010 15:25	3/24/2010 15:20	3/24/2010 15:20
Lmin (fast):	49.2 dBA	62.2 dBC	64.1 dBF
	3/24/2010 15:15	3/24/2010 15:27	3/24/2010 15:27
Lmax (impulse):	75.4 dBA	95.8 dBC	103.6 dBF
	3/24/2010 15:25	3/24/2010 15:20	3/24/2010 15:20
Lmin (impulse):	49.9 dBA	64.3 dBC	66.4 dBF
	3/24/2010 15:15	3/24/2010 15:14	3/24/2010 15:15

Spectra

Start Time:	24-Mar-10	15:14:31	Run Time:	15:19.1			
Freq Hz	Leq 1/3 Oct	Leq 1/1 Oct	Max 1/3 Oct	Max 1/1 Oc	Min 1/3 Oc	Min 1/1 Oc	
12.5	77.9		71.2		39.1		
16	75.6	80.7	73.9	77	43.4	46.3	
20	73		70.9		41.1		
25	70.8		71.7		45.9		
31.5	68.6	73.8	66.2	73.8	42.1	50.3	
40	66.5		66.8		47.1		
50	65		70.5		46.9		
63	65.5	69.7	82.2	85.9	49	52.7	
80	64.3		83.2		47.7		
100	64.5		82		48		
125	61.7	67.1	78.2	84.9	47.4	51.5	
160	59.2		79.4		43.7		
200	57.8		79.3		43		
250	53.2	59.7	70.7	80.1	42	46.5	
315	50.8		67		39.5		
400	49.6		60.5		38.4		

TNM Input Data

Existing Conditions

Existing Conditions

			Autos		Med Trucks		Heavy Trucks		Busses		Motorcycles	
Roadway	**Point**	**Segment**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**	**Volume**	**Speed**
Colonial Williamsburg	point113	113	150	45	10	45	0	0	0	0	0	0
	point113	113										
CWP Northbound"	point124	124	150	45	10	45	0	0	0	0	0	0
	point125	125	150	45	10	45	0	0	0	0	0	0
	point126	126	150	45	10	45	0	0	0	0	0	0
	point127	127	150	45	10	45	0	0	0	0	0	0
	point128	128	150	45	10	45	0	0	0	0	0	0
	point129	129	150	45	10	45	0	0	0	0	0	0
	point150	150	150	45	10	45	0	0	0	0	0	0
	point130	130	150	45	10	45	0	0	0	0	0	0
	point131	131	150	45	10	45	0	0	0	0	0	0
	point132	132	150	45	10	45	0	0	0	0	0	0
	point133	133	150	45	10	45	0	0	0	0	0	0
	point134	134	150	45	10	45	0	0	0	0	0	0
SR 31 Jamestown Roa	point151	151	825	45	25	45	0	0	0	0	0	0
Loop Road"	point187	187	40	20	0	0	10	20	0	0	0	0
	point188	188	1	30	0	0	0	0	0	0	0	0
	point189	189	1	30	0	0	0	0	0	0	0	0
	point190	190	40	20	0	0	10	20	0	0	0	0
	point191	191	1	30	0	0	0	0	0	0	0	0
	point192	192	40	20	0	0	10	20	0	0	0	0
	point193	193	40	20	0	0	10	20	0	0	0	0
	point194	194	1	30	0	0	0	0	0	0	0	0
	point195	195	40	20	0	0	10	20	0	0	0	0
	point196	196	40	20	0	0	10	20	0	0	0	0
	point197	197	1	30	0	0	0	0	0	0	0	0
	point324	324	1	30	0	0	0	0	0	0	0	0
	point198	198	40	20	0	0	10	20	0	0	0	0
	point199	199	1	1	0	0	0	0	0	0	0	0
	point200	200	40	20	0	0	10	20	0	0	0	0
	point201	201	40	20	0	0	0	0	0	0	0	0
	point202	202	1	30	0	0	0	0	0	0	0	0

Alternative A 2020

			Alternative A 2020									
			Autos		Med Trucks		Heavy Trucks		Busses		Motorcycles	
Roadway	Point	Segment	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed	Volume	Speed
Colonial Williamsburg Parkway	point113	113	223	45	15	45	0	0	4	45	0	0
CWP Northbound"	point124	124	223	45	11	45	0	0	4	45	0	0
SR 31 Jamestown Road	point151	151	1226	45	37	45	0	0	4	45	0	0
Loop Road"	point187	187	36	20	0	0	11	20	4	20	0	0
	point188	188	1	30	0	0	0	0	0	0	0	0
	point189	189	1	30	0	0	0	0	0	0	0	0
	point190	190	34	20	0	0	11	20	4	20	0	0
	point191	191	1	30	0	0	0	0	0	0	0	0
	point192	192	34	20	0	0	11	20	4	20	0	0
	point193	193	34	20	0	0	11	20	4	20	0	0
	point194	194	1	30	0	0	0	0	0	0	0	0
	point195	195	34	20	0	0	11	20	4	20	0	0
	point196	196	34	20	0	0	11	20	4	20	0	0
	point197	197	1	30	0	0	0	0	0	0	0	0
	point324	324	1	30	0	0	0	0	0	0	0	0
	point198	198	34	20	0	0	11	20	4	20	0	0
	point199	199	1	1	0	0	0	0	0	0	0	0
	point200	200	34	20	0	0	11	20	4	20	0	0
	point201	201	34	20	0	0	0	0	4	20	0	0

Alternatives B, C, D, & E

Alternatives B, C, d, & E 2020

Roadway	Point	Segment	Autos Volume	Autos Speed	Med Trucks Volume	Med Trucks Speed	Heavy Trucks Volume	Heavy Trucks Speed	Busses Volume	Busses Speed	Motorcycles Volume	Motorcycles Speed	
Colonial Williamsburg	point113	113	223	45	15	45	0	0	5	45	0	0	
CWP Northbound"	point124	124	223	45	11	45	0	0	5	45	0	0	
SR 31 Jamestown Roa	point151	151	1226	45	37	45	0	0	5	45	0	0	
Loop Road"	point187	187	36	20	0	0	11	20	5	20	0	0	
	point188	188	1	30	0	0	0	0	0	0	0	0	
	point189	189	1	30	0	0	0	0	0	0	0	0	
	point190	190	34	20	0	0	11	20	5	20	0	0	
	point191	191	1	30	0	0	0	0	0	0	0	0	
	point192	192	34	20	0	0	11	20	5	20	0	0	
	point193	193	34	20	0	0	11	20	5	20	0	0	
	point194	194	1	30	0	0	0	0	0	0	0	0	
	point195	195	34	20	0	0	11	20	5	20	0	0	
	point196	196	34	20	0	0	11	20	5	20	0	0	
	point197	197	1	30	0	0	0	0	0	0	0	0	
	point324	324	1	30	0	0	0	0	0	0	0	0	
	point198	198	34	20	0	0	11	20	5	20	0	0	
	point199	199	1	1	0	0	0	0	0	0	0	0	
	point200	200	34	20	0	0	11	20	5	20	0	0	
	point201	201	34	20	0	0	0	0	4	20	0	0	
	point202	202	1	30	0	0	0	0	0	0	0	0	

TNM Results

Existing Conditions

Reciever	No.	Existing	FHWA Criteria
Receptor 1 - Loop Road	2	50.7	66
Receptor 2- Near Church Point"	4	52.2	66
Receptor 3 - CNHP/Jamestown Road"	7	64.6	66
Receptor 4 - Pages Landing"	8	50.6	66
Receptor 5 - Colonial Parkway"	12	64.3	66
Receptor 6 - Colonial Parkway"	14	65.4	66
Receptor 7 verify location"	16	69.2	66
Receptor 8 -- Jamestown Road/Old Colony Lane"	18	61.6	66

Alternative A 2020

Reciever	No.	Existing	FHWA Criteria
Receptor 1 - Loop Road	2	51.8	66
Receptor 2- Near Church Point"	4	53.1	66
Receptor 3 - CNHP/Jamestown Road"	7	66.3	66
Receptor 4 - Pages Landing"	8	52.8	66
Receptor 5 - Colonial Parkway"	12	65.9	66
Receptor 6 - Colonial Parkway"	14	65.7	66
Receptor 7 verify location"	16	71.1	66
Receptor 8 -- Jamestown Road/Old Colony Lane"	18	64.4	66

Alternatives B, C, D, & E 2020

Reciever	No.	Existing	FHWA Criteria
Receptor 1 - Loop Road	2	52.3	66
Receptor 2- Near Church Point"	4	53.4	66
Receptor 3 - CNHP/Jamestown Road"	7	66.4	66
Receptor 4 - Pages Landing"	8	53.2	66
Receptor 5 - Colonial Parkway"	12	66.4	66
Receptor 6 - Colonial Parkway"	14	65.9	66
Receptor 7 verify location"	16	71.3	66
Receptor 8 -- Jamestown Road/Old Colony Lane"	18	64.1	66

J

Appendix J:
Transportation Data

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Transportation Data

- Monthly Vehicle Trip Projections for Alternatives A through E
- Existing Parking Accumulation Analysis
- Year 2020 Auto Parking Accumulation Analysis – 25% Shuttle Mode
- Year 2020 Parking Accumulation Analysis – Charter/School Buses
- Water Taxi Mode Split
- Water Taxi Cost Analysis Worksheets
- Highway Capacity Analysis Worksheets

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Monthly Vehicle Trip Projections for Alternatives A through E

Projected Year 2020 Visitation to Jamestown Island by Travel Mode for Alternative A

Annual Visitor and Vehicle Trip Projections

With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	8,539	991	11.60%	1,887	22.1%	5,661	66.3%	100.0%	24	42	1,887	1,953
February	12,996	4,328	33.30%	2,167	16.7%	6,501	50.0%	100.0%	101	49	2,167	2,317
March	37,150	16,643	44.80%	5,127	13.8%	15,380	41.4%	100.0%	388	114	5,127	5,629
April	66,541	30,542	45.90%	9,000	13.5%	26,999	40.6%	100.0%	711	200	9,000	9,911
May	60,903	29,416	48.30%	7,872	12.9%	23,615	38.8%	100.0%	685	175	7,872	8,732
June	65,572	14,754	22.50%	12,705	19.4%	38,113	58.1%	100.0%	344	283	12,705	13,332
July	74,515	1,937	2.60%	18,144	24.3%	54,434	73.1%	100.0%	46	404	18,145	18,595
August	63,835	638	1.00%	15,799	24.7%	47,398	74.3%	100.0%	15	352	15,800	16,167
September	42,022	3,320	7.90%	9,676	23.0%	29,026	69.1%	100.0%	78	216	9,676	9,970
October	58,574	12,476	21.30%	11,524	19.7%	34,574	59.0%	100.0%	291	257	11,525	12,073
November	40,363	17,074	42.30%	5,822	14.4%	17,467	43.3%	100.0%	398	130	5,823	6,351
December	21,190	4,068	19.20%	4,280	20.2%	12,842	60.6%	100.0%	95	96	4,281	4,472
TOTALS	552,200	136,187	24.70%	104,003	18.8%	312,010	56.5%	100.0%	3,176	2,318	104,008	109,502

Average Annual Growth Rate: **1.9%**

With 0 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	8,539	991	11.60%	0	0.0%	7,548	88.4%	100.0%	24	0	2,516	2,540
February	12,996	4,328	33.30%	0	0.0%	8,668	66.7%	100.0%	101	0	2,890	2,991
March	37,150	16,643	44.80%	0	0.0%	20,507	55.2%	100.0%	388	0	6,836	7,224
April	66,541	30,542	45.90%	0	0.0%	35,999	54.1%	100.0%	711	0	12,000	12,711
May	60,903	29,416	48.30%	0	0.0%	31,487	51.7%	100.0%	685	0	10,496	11,181
June	65,572	14,754	22.50%	0	0.0%	50,818	77.5%	100.0%	344	0	16,940	17,284
July	74,515	1,937	2.60%	0	0.0%	72,578	97.4%	100.0%	46	0	24,193	24,239
August	63,835	638	1.00%	0	0.0%	63,197	99.0%	100.0%	15	0	21,066	21,081
September	42,022	3,320	7.90%	0	0.0%	38,702	92.1%	100.0%	78	0	12,901	12,979
October	58,574	12,476	21.30%	0	0.0%	46,098	78.7%	100.0%	291	0	15,366	15,657
November	40,363	17,074	42.30%	0	0.0%	23,289	57.7%	100.0%	398	0	7,763	8,161
December	21,190	4,068	19.20%	0	0.0%	17,122	80.8%	100.0%	95	0	5,708	5,803
TOTALS	552,200	136,187	24.70%	0	0.0%	416,013	75.3%	100.0%	3,176	0	138,675	141,851

Annual Visitor and Vehicle Trip Projections

Projected Year 2020 Visitation to Jamestown Island by Travel Mode for Alternative A

With 10 Percent Shuttle Usage

Month	Visitors								Entering Vehicles			
	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	8,539	991	11.60%	854	10.0%	6,694	78.4%	100.0%	24	19	2,232	2,275
February	12,996	4,328	33.30%	1,300	10.0%	7,368	56.7%	100.0%	101	29	2,456	2,586
March	37,150	16,643	44.80%	3,715	10.0%	16,792	45.2%	100.0%	388	83	5,598	6,069
April	66,541	30,542	45.90%	6,654	10.0%	29,345	44.1%	100.0%	711	148	9,782	10,641
May	60,903	29,416	48.30%	6,090	10.0%	25,397	41.7%	100.0%	685	136	8,466	9,287
June	65,572	14,754	22.50%	6,557	10.0%	44,261	67.5%	100.0%	344	146	14,754	15,244
July	74,515	1,937	2.60%	7,452	10.0%	65,126	87.4%	100.0%	46	166	21,709	21,921
August	63,835	638	1.00%	6,384	10.0%	56,813	89.0%	100.0%	15	142	18,938	19,095
September	42,022	3,320	7.90%	4,202	10.0%	34,500	82.1%	100.0%	78	94	11,500	11,672
October	58,574	12,476	21.30%	5,857	10.0%	40,241	68.7%	100.0%	291	131	13,414	13,836
November	40,363	17,074	42.30%	4,036	10.0%	19,253	47.7%	100.0%	398	90	6,418	6,906
December	21,190	4,068	19.20%	2,119	10.0%	15,003	70.8%	100.0%	95	48	5,001	5,144
TOTALS	552,200	136,187	24.70%	55,220	10.0%	360,793	65.3%	100.0%	3,176	1,232	120,268	124,676

With 50 Percent Shuttle Usage

Month	2020 Visitors								Entering Vehicles			
	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	8,539	991	11.60%	4,270	50.0%	3,278	38.4%	100.0%	24	95	1,093	1,212
February	12,996	4,328	33.30%	6,498	50.0%	2,170	16.7%	100.0%	101	145	724	970
March	37,150	16,643	44.80%	18,575	50.0%	1,932	5.2%	100.0%	388	413	644	1,445
April	66,541	30,542	45.90%	33,271	50.0%	2,728	4.1%	100.0%	711	740	910	2,361
May	60,903	29,416	48.30%	30,452	50.0%	1,035	1.7%	100.0%	685	677	345	1,707
June	65,572	14,754	22.50%	32,786	50.0%	18,032	27.5%	100.0%	344	729	6,011	7,084
July	74,515	1,937	2.60%	37,258	50.0%	35,320	47.4%	100.0%	46	828	11,774	12,648
August	63,835	638	1.00%	31,918	50.0%	31,279	49.0%	100.0%	15	710	10,427	11,152
September	42,022	3,320	7.90%	21,011	50.0%	17,691	42.1%	100.0%	78	467	5,897	6,442
October	58,574	12,476	21.30%	29,287	50.0%	16,811	28.7%	100.0%	291	651	5,604	6,546
November	40,363	17,074	42.30%	20,182	50.0%	3,107	7.7%	100.0%	398	449	1,036	1,883
December	21,190	4,068	19.20%	10,595	50.0%	6,527	30.8%	100.0%	95	236	2,176	2,507
TOTALS	552,200	136,187	24.70%	276,103	50.0%	139,910	25.3%	100.0%	3,176	6,140	46,641	55,957

Projected Year 2020 Visitation to Jamestown Island by Travel Mode for Alternative A

Peak Design Day Vehicle Trip Projections (May and July)

66,264 Peak Design Month (12 percent of annual visitation)
2,187 Peak Design Day (3.3 percent of peak design month)
With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month/ Shuttle Mode Share	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
May												
25%	2,187	1,056	48.3%	547	25.0%	584	26.7%	100.0%	25	13	195	233
0%	2,187	1,056	48.3%	0	0.0%	1,131	51.7%	100.0%	25	0	377	402
10%	2,187	1,056	48.3%	219	10.0%	912	41.7%	100.0%	25	5	304	334
50%	2,187	1,056	48.3%	1,094	50.0%	37	1.7%	100.0%	25	25	13	63
July												
25%	2,187	57	2.6%	547	25.0%	1,583	72.4%	100.0%	2	13	528	543
0%	2,187	57	2.6%	0	0.0%	2,130	97.4%	100.0%	2	0	710	712
10%	2,187	57	2.6%	219	10.0%	1,911	87.4%	100.0%	2	5	637	644
50%	2,187	57	2.6%	1094	50.0%	1036	47.4%	100.0%	2	25	346	373

Projected Year 2020 Visitation to Jamestown Island by Travel Mode for Alternative A

Peak Design Day Vehicle Trip Projections by Month

With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month/ Shuttle Mode Share	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	282	33	11.7%	70	24.8%	179	63.4%	100.0%	1	2	60	63
February	429	143	33.3%	107	24.9%	179	41.7%	100.0%	4	3	60	67
March	1,226	549	44.8%	306	25.0%	371	30.3%	100.0%	13	7	124	144
April	2,196	1,008	45.9%	549	25.0%	639	29.1%	100.0%	24	13	213	250
May	2,010	971	48.3%	502	25.0%	537	26.7%	100.0%	23	12	**179**	214
June	2,164	487	22.5%	541	25.0%	1,136	52.5%	100.0%	12	13	379	404
July	2,459	64	2.6%	615	25.0%	1,780	72.4%	100.0%	2	14	**594**	610
August	2,107	21	1.0%	527	25.0%	1,559	74.0%	100.0%	1	12	520	533
September	1,387	110	7.9%	347	25.0%	930	67.0%	100.0%	3	8	310	321
October	1,933	412	21.3%	483	25.0%	1,038	53.7%	100.0%	10	11	346	367
November	1,332	563	42.3%	333	25.0%	436	32.7%	100.0%	14	8	146	168
December	699	134	19.2%	175	25.0%	390	55.8%	100.0%	4	4	131	139
	18,223	4,495	24.7%	4,556	25.0%	9,173	50.3%	100.0%	111	107	3,062	3,280

Projected Year 2020 Visitation to Jamestown Island by Travel Mode for Alternative B

Annual Visitor and Vehicle Trip Projections

With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	12,840	1,489	11.60%	2,838	22.1%	8,513	66.3%	100.0%	35	64	2,838	2,937
February	19,542	6,507	33.30%	3,259	16.7%	9,776	50.0%	100.0%	152	73	3,259	3,484
March	55,859	25,025	44.80%	7,709	13.8%	23,125	41.4%	100.0%	582	172	7,709	8,463
April	100,053	45,924	45.90%	13,532	13.5%	40,597	40.6%	100.0%	1,068	301	13,533	14,902
May	91,575	44,231	48.30%	11,836	12.9%	35,508	38.8%	100.0%	1,029	264	11,836	13,129
June	98,596	22,184	22.50%	19,103	19.4%	57,309	58.1%	100.0%	516	425	19,103	20,044
July	112,042	2,913	2.60%	27,282	24.3%	81,847	73.1%	100.0%	68	607	27,283	27,958
August	95,983	960	1.00%	23,756	24.8%	71,267	74.2%	100.0%	23	528	23,756	24,307
September	63,186	4,992	7.90%	14,549	23.0%	43,645	69.1%	100.0%	117	324	14,549	14,990
October	88,073	18,760	21.30%	17,328	19.7%	51,985	59.0%	100.0%	437	386	17,329	18,152
November	60,690	25,672	42.30%	8,755	14.4%	26,263	43.3%	100.0%	598	195	8,755	9,548
December	31,862	6,118	19.20%	6,436	20.2%	19,308	60.6%	100.0%	143	144	6,436	6,723
TOTALS	830,300	204,775	24.70%	156,383	18.8%	469,143	56.5%	100.0%	4,768	3,483	156,386	164,637

Average Annual Growth Rate: **4.0%**

With 0 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	12,840	1,489	11.60%	0	0.0%	11,351	88.4%	88.4%	35	0	3,784	3,819
February	19,542	6,507	33.30%	0	0.0%	13,035	66.7%	66.7%	152	0	4,345	4,497
March	55,859	25,025	44.80%	0	0.0%	30,834	55.2%	55.2%	582	0	10,278	10,860
April	100,053	45,924	45.90%	0	0.0%	54,129	54.1%	54.1%	1,068	0	18,043	19,111
May	91,575	44,231	48.30%	0	0.0%	47,344	51.7%	51.7%	1,029	0	15,782	16,811
June	98,596	22,184	22.50%	0	0.0%	76,412	77.5%	77.5%	516	0	25,471	25,987
July	112,042	2,913	2.60%	0	0.0%	109,129	97.4%	97.4%	68	0	36,377	36,445
August	95,983	960	1.00%	0	0.0%	95,023	99.0%	99.0%	23	0	31,675	31,698
September	63,186	4,992	7.90%	0	0.0%	58,194	92.1%	92.1%	117	0	19,398	19,515
October	88,073	18,760	21.30%	0	0.0%	69,313	78.7%	78.7%	437	0	23,105	23,542
November	60,690	25,672	42.30%	0	0.0%	35,018	57.7%	57.7%	598	0	11,673	12,271
December	31,862	6,118	19.20%	0	0.0%	25,744	80.8%	80.8%	143	0	8,582	8,725
TOTALS	830,300	204,775	24.70%	0	0.0%	625,526	75.3%	75.3%	4,768	0	208,513	213,281

Projected Year 2020 Visitation to Jamestown Island by Travel Mode for Alternative B

Annual Visitor and Vehicle Trip Projections

With 10 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	12,840	1,489	11.60%	1,284	10.0%	10,067	78.4%	88.4%	35	29	3,356	3,420
February	19,542	6,507	33.30%	1,954	10.0%	11,081	56.7%	66.7%	152	44	3,694	3,890
March	55,859	25,025	44.80%	5,586	10.0%	25,248	45.2%	55.2%	582	125	8,416	9,123
April	100,053	45,924	45.90%	10,005	10.0%	44,124	44.1%	54.1%	1,068	223	14,708	15,999
May	91,575	44,231	48.30%	9,158	10.0%	38,186	41.7%	51.7%	1,029	204	12,729	13,962
June	98,596	22,184	22.50%	9,860	10.0%	66,552	67.5%	77.5%	516	220	22,184	22,920
July	112,042	2,913	2.60%	11,204	10.0%	97,925	87.4%	97.4%	68	249	32,642	32,959
August	95,983	960	1.00%	9,598	10.0%	85,425	89.0%	99.0%	23	214	28,475	28,712
September	63,186	4,992	7.90%	6,319	10.0%	51,875	82.1%	92.1%	117	141	17,292	17,550
October	88,073	18,760	21.30%	8,807	10.0%	60,506	68.7%	78.7%	437	196	20,169	20,802
November	60,690	25,672	42.30%	6,069	10.0%	28,949	47.7%	57.7%	598	135	9,650	10,383
December	31,862	6,118	19.20%	3,186	10.0%	22,558	70.8%	80.8%	143	71	7,520	7,734
TOTALS	830,300	204,775	24.70%	83,030	10.0%	542,496	65.3%	75.3%	4,768	1,851	180,835	187,454

With 50 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	12,840	1,489	11.60%	6,420	50.0%	4,931	38.4%	88.4%	35	143	1,644	1,822
February	19,542	6,507	33.30%	9,771	50.0%	3,264	16.7%	66.7%	152	218	1,088	1,458
March	55,859	25,025	44.80%	27,930	50.0%	2,904	5.2%	55.2%	582	621	968	2,171
April	100,053	45,924	45.90%	50,027	50.0%	4,102	4.1%	54.1%	1,068	1,112	1,368	3,548
May	91,575	44,231	48.30%	45,788	50.0%	1,556	1.7%	51.7%	1,029	1,018	519	2,566
June	98,596	22,184	22.50%	49,298	50.0%	27,114	27.5%	77.5%	516	1,096	9,038	10,650
July	112,042	2,913	2.60%	56,021	50.0%	53,108	47.4%	97.4%	68	1,245	17,703	19,016
August	95,983	960	1.00%	47,992	50.0%	47,031	49.0%	99.0%	23	1,067	15,677	16,767
September	63,186	4,992	7.90%	31,593	50.0%	26,601	42.1%	92.1%	117	703	8,867	9,687
October	88,073	18,760	21.30%	44,037	50.0%	25,276	28.7%	78.7%	437	979	8,426	9,842
November	60,690	25,672	42.30%	30,345	50.0%	4,673	7.7%	57.7%	598	675	1,558	2,831
December	31,862	6,118	19.20%	15,931	50.0%	9,813	30.8%	80.8%	143	355	3,271	3,769
TOTALS	830,300	204,775	24.70%	415,150	50.0%	210,373	25.3%	75.3%	4,768	9,232	70,127	84,127

Projected Year 2020 Visitation to Jamestown Island by Travel Mode for Alternative B

Peak Design Day Vehicle Trip Projections (May and July)

99,636 Peak Design Month (12 percent of annual visitation)
3,288 Peak Design Day (3.3 percent of peak design month)
With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month/ Shuttle Mode Share	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
May												
25%	3,288	1,588	48.3%	822	25.0%	878	26.7%	100.0%	37	19	293	349
0%	3,288	1,588	48.3%	0	0.0%	1,700	51.7%	100.0%	37	0	567	604
10%	3,288	1,588	48.3%	329	10.0%	1,371	41.7%	100.0%	37	8	457	502
50%	3,288	1,588	48.3%	1,644	50.0%	56	1.7%	100.0%	37	37	19	93
July												
25%	3,288	85	2.6%	822	25.0%	2,381	72.4%	100.0%	2	19	794	815
0%	3,288	85	2.6%	0	0.0%	3,203	97.4%	100.0%	2	0	1,068	1,070
10%	3,288	85	2.6%	329	10.0%	2,874	87.4%	100.0%	2	8	958	968
50%	3,288	85	2.6%	1,644	50.0%	1,559	47.4%	100.0%	2	37	520	559

Projected Year 2020 Visitation to Jamestown Island by Travel Mode for Alternative B

Peak Design Day Parking Accumulation by Month

With 25 Percent Shuttle Usage

	Total	Neck of Land Parking Lot			Island Parking Lot		
Month	Accum	Peak Accum	Capacity	% Full	Peak Accum	Capacity	% Full
January	39	10	200	5%	29	150	19%
February	39	10	200	5%	29	150	19%
March	83	21	200	11%	62	150	41%
April	140	35	200	18%	105	150	70%
May	127	32	200	16%	95	150	63%
June	247	97	200	49%	150	150	100%
July	348	198	200	99%	150	150	100%
August	343	193	200	97%	150	150	100%
September	204	54	200	27%	150	150	100%
October	230	80	200	40%	150	150	100%
November	96	24	200	12%	72	150	48%
December	86	22	200	11%	64	150	43%

Projected Year 2020 Visitation to Jamestown Island by Travel Mode for Alternative B

Peak Design Day Vehicle Trip Projections by Month

With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month/ Shuttle Mode Share	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	424	49	11.6%	106	25.0%	269	63.4%	100.0%	2	3	90	95
February	645	215	33.3%	161	25.0%	269	41.7%	100.0%	5	4	90	99
March	1,843	826	44.8%	461	25.0%	556	30.2%	100.0%	20	11	186	217
April	3,302	1,515	45.9%	825	25.0%	962	29.1%	100.0%	36	19	321	376
May	3,022	1,460	48.3%	755	25.0%	807	26.7%	100.0%	34	17	**269**	320
June	3,254	732	22.5%	813	25.0%	1,709	52.5%	100.0%	18	19	570	607
July	3,697	96	2.6%	924	25.0%	2,677	72.4%	100.0%	3	21	**893**	917
August	3,167	32	1.0%	792	25.0%	2,343	74.0%	100.0%	1	18	782	801
September	2,085	165	7.9%	521	25.0%	1,399	67.1%	100.0%	4	12	467	483
October	2,906	619	21.3%	727	25.0%	1,560	53.7%	100.0%	15	17	521	553
November	2,003	847	42.3%	501	25.0%	655	32.7%	100.0%	20	12	219	251
December	1,051	202	19.2%	263	25.0%	586	55.8%	100.0%	5	6	196	207
	27,400	6,758	24.7%	6,850	25.0%	13,793	50.3%	100.0%	163	159	4,604	4,926

Projected Year 2020 Visitation to Jamestown Island for Alternative C

Annual Visitor and Vehicle Trip Projections

With 25 Percent Shuttle Usage

		Visitors							Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	12,840	1,489	11.60%	2,838	22.1%	8,513	66.3%	100.0%	35	64	2,838	2,937
February	19,542	6,507	33.30%	3,259	16.7%	9,776	50.0%	100.0%	152	73	3,259	3,484
March	55,859	25,025	44.80%	7,709	13.8%	23,125	41.4%	100.0%	582	172	7,709	8,463
April	100,053	45,924	45.90%	13,532	13.5%	40,597	40.6%	100.0%	1,068	301	13,533	14,902
May	91,575	44,231	48.30%	11,836	12.9%	35,508	38.8%	100.0%	1,029	264	11,836	13,129
June	98,596	22,184	22.50%	19,103	19.4%	57,309	58.1%	100.0%	516	425	19,103	20,044
July	112,042	2,913	2.60%	27,282	24.3%	81,847	73.1%	100.0%	68	607	27,283	27,958
August	95,983	960	1.00%	23,756	24.8%	71,267	74.2%	100.0%	23	528	23,756	24,307
September	63,186	4,992	7.90%	14,549	23.0%	43,645	69.1%	100.0%	117	324	14,549	14,990
October	88,073	18,760	21.30%	17,328	19.7%	51,985	59.0%	100.0%	437	386	17,329	18,152
November	60,690	25,672	42.30%	8,755	14.4%	26,263	43.3%	100.0%	598	195	8,755	9,548
December	31,862	6,118	19.20%	6,436	20.2%	19,308	60.6%	100.0%	143	144	6,436	6,723
TOTALS	830,300	204,775	24.70%	156,383	18.8%	469,143	56.5%	100.0%	4,768	3,483	156,386	164,637

Average Annual Growth Rate: **4.0%**

With 0 Percent Shuttle Usage

	2020	Visitors							Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	12,840	1,489	11.60%	0	0.0%	11,351	88.4%	88.4%	35	0	3,784	3,819
February	19,542	6,507	33.30%	0	0.0%	13,035	66.7%	66.7%	152	0	4,345	4,497
March	55,859	25,025	44.80%	0	0.0%	30,834	55.2%	55.2%	582	0	10,278	10,860
April	100,053	45,924	45.90%	0	0.0%	54,129	54.1%	54.1%	1,068	0	18,043	19,111
May	91,575	44,231	48.30%	0	0.0%	47,344	51.7%	51.7%	1,029	0	15,782	16,811
June	98,596	22,184	22.50%	0	0.0%	76,412	77.5%	77.5%	516	0	25,471	25,987
July	112,042	2,913	2.60%	0	0.0%	109,129	97.4%	97.4%	68	0	36,377	36,445
August	95,983	960	1.00%	0	0.0%	95,023	99.0%	99.0%	23	0	31,675	31,698
September	63,186	4,992	7.90%	0	0.0%	58,194	92.1%	92.1%	117	0	19,398	19,515
October	88,073	18,760	21.30%	0	0.0%	69,313	78.7%	78.7%	437	0	23,105	23,542
November	60,690	25,672	42.30%	0	0.0%	35,018	57.7%	57.7%	598	0	11,673	12,271
December	31,862	6,118	19.20%	0	0.0%	25,744	80.8%	80.8%	143	0	8,582	8,725
TOTALS	830,300	204,775	24.70%	0	0.0%	625,526	75.3%	75.3%	4,768	0	208,513	213,281

Projected Year 2020 Visitation to Jamestown Island for Alternative C

Annual Visitor and Vehicle Trip Projections

With 10 Percent Shuttle Usage

2020	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	12,840	1,489	11.60%	1,284	10.0%	10,067	78.4%	88.4%	35	29	3,356	3,420
February	19,542	6,507	33.30%	1,954	10.0%	11,081	56.7%	66.7%	152	44	3,694	3,890
March	55,859	25,025	44.80%	5,586	10.0%	25,248	45.2%	55.2%	582	125	8,416	9,123
April	100,053	45,924	45.90%	10,005	10.0%	44,124	44.1%	54.1%	1,068	223	14,708	15,999
May	91,575	44,231	48.30%	9,158	10.0%	38,186	41.7%	51.7%	1,029	204	12,729	13,962
June	98,596	22,184	22.50%	9,860	10.0%	66,552	67.5%	77.5%	516	220	22,184	22,920
July	112,042	2,913	2.60%	11,204	10.0%	97,925	87.4%	97.4%	68	249	32,642	32,959
August	95,983	960	1.00%	9,598	10.0%	85,425	89.0%	99.0%	23	214	28,475	28,712
September	63,186	4,992	7.90%	6,319	10.0%	51,875	82.1%	92.1%	117	141	17,292	17,550
October	88,073	18,760	21.30%	8,807	10.0%	60,506	68.7%	78.7%	437	196	20,169	20,802
November	60,690	25,672	42.30%	6,069	10.0%	28,949	47.7%	57.7%	598	135	9,650	10,383
December	31,862	6,118	19.20%	3,186	10.0%	22,558	70.8%	80.8%	143	71	7,520	7,734
TOTALS	830,300	204,775	24.70%	83,030	10.0%	542,496	65.3%	75.3%	4,768	1,851	180,835	187,454

With 50 Percent Shuttle Usage

2020	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	12,840	1,489	11.60%	6,420	50.0%	4,931	38.4%	88.4%	35	143	1,644	1,822
February	19,542	6,507	33.30%	9,771	50.0%	3,264	16.7%	66.7%	152	218	1,088	1,458
March	55,859	25,025	44.80%	27,930	50.0%	2,904	5.2%	55.2%	582	621	968	2,171
April	100,053	45,924	45.90%	50,027	50.0%	4,102	4.1%	54.1%	1,068	1,112	1,368	3,548
May	91,575	44,231	48.30%	45,788	50.0%	1,556	1.7%	51.7%	1,029	1,018	519	2,566
June	98,596	22,184	22.50%	49,298	50.0%	27,114	27.5%	77.5%	516	1,096	9,038	10,650
July	112,042	2,913	2.60%	56,021	50.0%	53,108	47.4%	97.4%	68	1,245	17,703	19,016
August	95,983	960	1.00%	47,992	50.0%	47,031	49.0%	99.0%	23	1,067	15,677	16,767
September	63,186	4,992	7.90%	31,593	50.0%	26,601	42.1%	92.1%	117	703	8,867	9,687
October	88,073	18,760	21.30%	44,037	50.0%	25,276	28.7%	78.7%	437	979	8,426	9,842
November	60,690	25,672	42.30%	30,345	50.0%	4,673	7.7%	57.7%	598	675	1,558	2,831
December	31,862	6,118	19.20%	15,931	50.0%	9,813	30.8%	80.8%	143	355	3,271	3,769
TOTALS	830,301	204,775	24.70%	415,153	50.0%	210,373	25.3%	75.3%	4,768	9,232	70,127	84,127

Projected Year 2020 Visitation to Jamestown Island for Alternative C

Peak Design Day Vehicle Trip Projections (May and July)

99,636 Peak Design Month (12 percent of annual visitation)
3,288 Peak Design Day (3.3 percent of peak design month)
With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month/ Shuttle Mode Share	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
May												
25%	3,288	1,588	48.3%	822	25.0%	878	26.7%	100.0%	37	19	293	349
0%	3,288	1,588	48.3%	0	0.0%	1,700	51.7%	100.0%	37	0	567	604
10%	3,288	1,588	48.3%	329	10.0%	1,371	41.7%	100.0%	37	8	457	502
50%	3,288	1,588	48.3%	1,644	50.0%	56	1.7%	100.0%	37	37	19	93
July												
25%	3,288	85	2.6%	822	25.0%	2,381	72.4%	100.0%	2	19	794	815
0%	3,288	85	2.6%	0	0.0%	3,203	97.4%	100.0%	2	0	1,068	1,070
10%	3,288	85	2.6%	329	10.0%	2,874	87.4%	100.0%	2	8	958	968
50%	3,288	85	2.6%	1,644	50.0%	1,559	47.4%	100.0%	2	37	520	559

Projected Year 2020 Visitation to Jamestown Island for Alternative C

Peak Design Day Vehicle Trip Projections by Month

With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month/ Shuttle Mode Share	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	424	49	11.6%	106	25.0%	269	63.4%	100.0%	2	3	90	95
February	645	215	33.3%	161	25.0%	269	41.7%	100.0%	5	4	90	99
March	1,843	826	44.8%	461	25.0%	556	30.2%	100.0%	20	11	186	217
April	3,302	1,515	45.9%	825	25.0%	962	29.1%	100.0%	36	19	321	376
May	3,022	1,460	48.3%	755	25.0%	807	26.7%	100.0%	34	17	**269**	320
June	3,254	732	22.5%	813	25.0%	1,709	52.5%	100.0%	18	19	570	607
July	3,697	96	2.6%	924	25.0%	2,677	72.4%	100.0%	3	21	**893**	917
August	3,167	32	1.0%	792	25.0%	2,343	74.0%	100.0%	1	18	782	801
September	2,085	165	7.9%	521	25.0%	1,399	67.1%	100.0%	4	12	467	483
October	2,906	619	21.3%	727	25.0%	1,560	53.7%	100.0%	15	17	521	553
November	2,003	847	42.3%	501	25.0%	655	32.7%	100.0%	20	12	219	251
December	1,051	202	19.2%	263	25.0%	586	55.8%	100.0%	5	6	196	207
	27,400	6,758	24.7%	6,850	25.0%	13,793	50.3%	100.0%	163	159	4,604	4,926

Projected Year 2020 Visitation to Jamestown Island for Alternative C

Peak Design Day Parking Accumulation by Month

With 25 Percent Shuttle Usage

	Total	Neck of Land Parking Lot			Island Parking Lot		
Month	Accum	Peak Accum	Capacity	% Full	Peak Accum	Capacity	% Full
January	39	35	250	14%	4	100	4%
February	39	35	250	14%	4	100	4%
March	83	75	250	30%	8	100	8%
April	140	126	250	50%	14	100	14%
May	127	114	250	46%	13	100	13%
June	247	222	250	89%	25	100	25%
July	347	250	250	100%	97	100	97%
August	343	250	250	100%	93	100	93%
September	204	184	250	74%	20	100	20%
October	230	207	250	83%	23	100	23%
November	96	86	250	34%	10	100	10%
December	86	77	250	31%	9	100	9%

Projected Year 2020 Visitation to Jamestown Island for Alternative D

Annual Visitor and Vehicle Trip Projections

With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	10,284	1,193	11.60%	2,273	22.1%	6,818	66.3%	100.0%	28	51	2,273	2,352
February	15,651	5,212	33.30%	2,610	16.7%	7,829	50.0%	100.0%	122	58	2,610	2,790
March	44,738	20,043	44.80%	6,174	13.8%	18,521	41.4%	100.0%	467	138	6,174	6,779
April	80,134	36,782	45.90%	10,838	13.5%	32,514	40.6%	100.0%	856	241	10,838	11,935
May	73,344	35,425	48.30%	9,480	12.9%	28,439	38.8%	100.0%	824	211	9,480	10,515
June	78,967	17,768	22.50%	15,300	19.4%	45,899	58.1%	100.0%	414	340	15,300	16,054
July	89,736	2,333	2.60%	21,851	24.4%	65,552	73.0%	100.0%	55	486	21,851	22,392
August	76,874	769	1.00%	19,026	24.7%	57,079	74.3%	100.0%	18	423	19,027	19,468
September	50,606	3,998	7.90%	11,652	23.0%	34,956	69.1%	100.0%	93	259	11,652	12,004
October	70,539	15,025	21.30%	13,879	19.7%	41,635	59.0%	100.0%	350	309	13,879	14,538
November	48,608	20,561	42.30%	7,012	14.4%	21,035	43.3%	100.0%	479	156	7,012	7,647
December	25,519	4,900	19.20%	5,155	20.2%	15,464	60.6%	100.0%	114	115	5,155	5,384
TOTALS	665,000	164,009	24.70%	125,250	18.8%	375,741	56.5%	100.0%	3,820	2,787	125,251	131,858

Average Annual Growth Rate: **2.9%**

With 0 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	10,284	1,193	11.60%	0	0.0%	9,091	88.4%	88.4%	28	0	3,031	3,059
February	15,651	5,212	33.30%	0	0.0%	10,439	66.7%	66.7%	122	0	3,480	3,602
March	44,738	20,043	44.80%	0	0.0%	24,695	55.2%	55.2%	467	0	8,232	8,699
April	80,134	36,782	45.90%	0	0.0%	43,352	54.1%	54.1%	856	0	14,451	15,307
May	73,344	35,425	48.30%	0	0.0%	37,919	51.7%	51.7%	824	0	12,640	13,464
June	78,967	17,768	22.50%	0	0.0%	61,199	77.5%	77.5%	414	0	20,400	20,814
July	89,736	2,333	2.60%	0	0.0%	87,403	97.4%	97.4%	55	0	29,135	29,190
August	76,874	769	1.00%	0	0.0%	76,105	99.0%	99.0%	18	0	25,369	25,387
September	50,606	3,998	7.90%	0	0.0%	46,608	92.1%	92.1%	93	0	15,536	15,629
October	70,539	15,025	21.30%	0	0.0%	55,514	78.7%	78.7%	350	0	18,505	18,855
November	48,608	20,561	42.30%	0	0.0%	28,047	57.7%	57.7%	479	0	9,349	9,828
December	25,519	4,900	19.20%	0	0.0%	20,619	80.8%	80.8%	114	0	6,873	6,987
TOTALS	665,000	164,009	24.70%	0	0.0%	500,991	75.3%	75.3%	3,820	0	167,001	170,821

Projected Year 2020 Visitation to Jamestown Island for Alternative D

Annual Visitor and Vehicle Trip Projections

With 10 Percent Shuttle Usage

Month	Visitors								Entering Vehicles			
	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	10,284	1,193	11.60%	1,028	10.0%	8,063	78.4%	88.4%	28	23	2,688	2,739
February	15,651	5,212	33.30%	1,565	10.0%	8,874	56.7%	66.7%	122	35	2,958	3,115
March	44,738	20,043	44.80%	4,474	10.0%	20,221	45.2%	55.2%	467	100	6,741	7,308
April	80,134	36,782	45.90%	8,013	10.0%	35,339	44.1%	54.1%	856	179	11,780	12,815
May	73,344	35,425	48.30%	7,334	10.0%	30,585	41.7%	51.7%	824	163	10,195	11,182
June	78,967	17,768	22.50%	7,897	10.0%	53,302	67.5%	77.5%	414	176	17,768	18,358
July	89,736	2,333	2.60%	8,974	10.0%	78,429	87.4%	97.4%	55	200	26,143	26,398
August	76,874	769	1.00%	7,687	10.0%	68,418	89.0%	99.0%	18	171	22,806	22,995
September	50,606	3,998	7.90%	5,061	10.0%	41,547	82.1%	92.1%	93	113	13,849	14,055
October	70,539	15,025	21.30%	7,054	10.0%	48,460	68.7%	78.7%	350	157	16,154	16,661
November	48,608	20,561	42.30%	4,861	10.0%	23,186	47.7%	57.7%	479	109	7,729	8,317
December	25,519	4,900	19.20%	2,552	10.0%	18,067	70.8%	80.8%	114	57	6,023	6,194
TOTALS	665,000	164,009	24.70%	66,500	10.0%	434,491	65.3%	75.3%	3,820	1,483	144,834	150,137

With 50 Percent Shuttle Usage

Month	Visitors								Entering Vehicles			
	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	10,284	1,193	11.60%	5,142	50.0%	3,949	38.4%	88.4%	28	115	1,317	1,460
February	15,651	5,212	33.30%	7,826	50.0%	2,613	16.7%	66.7%	122	174	871	1,167
March	44,738	20,043	44.80%	22,369	50.0%	2,326	5.2%	55.2%	467	498	776	1,741
April	80,134	36,782	45.90%	40,067	50.0%	3,285	4.1%	54.1%	856	891	1,095	2,842
May	73,344	35,425	48.30%	36,672	50.0%	1,247	1.7%	51.7%	824	815	416	2,055
June	78,967	17,768	22.50%	39,484	50.0%	21,715	27.5%	77.5%	414	878	7,239	8,531
July	89,736	2,333	2.60%	44,868	50.0%	42,535	47.4%	97.4%	55	998	14,179	15,232
August	76,874	769	1.00%	38,437	50.0%	37,668	49.0%	99.0%	18	855	12,556	13,429
September	50,606	3,998	7.90%	25,303	50.0%	21,305	42.1%	92.1%	93	563	7,102	7,758
October	70,539	15,025	21.30%	35,270	50.0%	20,244	28.7%	78.7%	350	784	6,748	7,882
November	48,608	20,561	42.30%	24,304	50.0%	3,743	7.7%	57.7%	479	541	1,248	2,268
December	25,519	4,900	19.20%	12,760	50.0%	7,859	30.8%	80.8%	114	284	2,620	3,018
TOTALS	665,000	164,009	24.70%	332,502	50.0%	168,489	25.3%	75.3%	3,820	7,396	56,167	67,383

Projected Year 2020 Visitation to Jamestown Island for Alternative D

Peak Design Day Vehicle Trip Projections (May and July)

79,800 Peak Design Month (12 percent of annual visitation)
2,633 Peak Design Day (3.3 percent of peak design month)
With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month/ Shuttle Mode Share	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
May												
25%	2,633	1,272	48.3%	658	25.0%	703	26.7%	100.0%	30	15	235	280
0%	2,633	1,272	48.3%	0	0.0%	1,361	51.7%	100.0%	30	0	454	484
10%	2,633	1,272	48.3%	263	10.0%	1,098	41.7%	100.0%	30	6	366	402
50%	2,633	1,272	48.3%	1,317	50.0%	44	1.7%	100.0%	30	30	15	75
July												
25%	2,633	68	2.6%	658	25.0%	1,907	72.4%	100.0%	2	15	636	653
0%	2,633	68	2.6%	0	0.0%	2,565	97.4%	100.0%	2	0	855	857
10%	2,633	68	2.6%	263	10.0%	2,302	87.4%	100.0%	2	6	768	776
50%	2,633	68	2.6%	1,317	50.0%	1,248	47.4%	100.0%	2	30	416	448

Projected Year 2020 Visitation to Jamestown Island for Alternative D

Peak Design Day Vehicle Trip Projections by Month

With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month/ Shuttle Mode Share	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
June	2,606	586	22.5%	651	25.0%	1,369	52.5%	100.0%	14	15	457	486
July	2,961	77	2.6%	740	25.0%	2,144	72.4%	100.0%	2	17	**715**	734
August	2,537	25	1.0%	634	25.0%	1,878	74.0%	100.0%	1	15	626	642
September	1,670	132	7.9%	417	25.0%	1,121	67.1%	100.0%	4	10	374	388
October	2,328	496	21.3%	582	25.0%	1,250	53.7%	100.0%	12	13	417	442
November	1,604	679	42.3%	401	25.0%	524	32.7%	100.0%	16	9	175	200
December	842	162	19.2%	211	25.1%	469	55.7%	100.0%	4	5	157	166
	14,548	2,157	14.8%	3,637	25.0%	8,755	60.2%	100.0%	53	84	2,921	3,058

Projected Year 2020 Visitation to Jamestown Island for Alternative D

Peak Design Day Parking Accumulation by Month

With 25 Percent Shuttle Usage

	Total	Island Parking Lot			Island Parking Lot		
Month	Accum	Peak Accum	Capacity	% Full	Peak Accum	Capacity	% Full
January	32	32	333	10%	0	0	0%
February	32	32	333	10%	0	0	0%
March	66	66	333	20%	0	0	0%
April	113	113	333	34%	0	0	0%
May	102	102	333	31%	0	0	0%
June	200	200	333	60%	0	0	0%
July	278	278	333	83%	0	0	0%
August	274	274	333	82%	0	0	0%
September	163	163	333	49%	0	0	0%
October	182	182	333	55%	0	0	0%
November	76	76	333	23%	0	0	0%
December	69	69	333	21%	0	0	0%

Projected Year 2020 Visitation to Jamestown Island for Alternative E

Annual Visitor and Vehicle Trip Projections

With 25 Percent Shuttle Usage

		Visitors							Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	10,859	1,260	11.60%	2,400	22.1%	7,199	66.3%	100.0%	30	54	2,400	2,484
February	16,527	5,503	33.30%	2,756	16.7%	8,268	50.0%	100.0%	128	62	2,756	2,946
March	47,241	21,164	44.80%	6,519	13.8%	19,558	41.4%	100.0%	493	145	6,520	7,158
April	84,617	38,839	45.90%	11,444	13.5%	34,334	40.6%	100.0%	904	255	11,445	12,604
May	77,446	37,406	48.30%	10,010	12.9%	30,030	38.8%	100.0%	870	223	10,010	11,103
June	83,384	18,761	22.50%	16,156	19.4%	48,467	58.1%	100.0%	437	360	16,156	16,953
July	94,756	2,464	2.60%	23,073	24.3%	69,219	73.0%	99.9%	58	513	23,073	23,644
August	81,175	812	1.00%	20,091	24.8%	60,272	74.2%	100.0%	19	447	20,091	20,557
September	53,437	4,222	7.90%	12,304	23.0%	36,911	69.1%	100.0%	99	274	12,304	12,677
October	74,485	15,865	21.30%	14,655	19.7%	43,965	59.0%	100.0%	369	326	14,655	15,350
November	51,327	21,711	42.30%	7,404	14.4%	22,212	43.3%	100.0%	505	165	7,404	8,074
December	26,946	5,174	19.20%	5,443	20.2%	16,329	60.6%	100.0%	121	121	5,443	5,685
TOTALS	702,200	173,181	24.70%	132,255	18.8%	396,764	56.5%	100.0%	4,033	2,945	132,257	139,235

Average Annual Growth Rate: **3.1%**

With 0 Percent Shuttle Usage

2020	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	10,859	1,260	11.60%	0	0.0%	9,599	88.4%	88.4%	30	0	3,200	3,230
February	16,527	5,503	33.30%	0	0.0%	11,024	66.7%	66.7%	128	0	3,675	3,803
March	47,241	21,164	44.80%	0	0.0%	26,077	55.2%	55.2%	493	0	8,693	9,186
April	84,617	38,839	45.90%	0	0.0%	45,778	54.1%	54.1%	904	0	15,260	16,164
May	77,446	37,406	48.30%	0	0.0%	40,040	51.7%	51.7%	870	0	13,347	14,217
June	83,384	18,761	22.50%	0	0.0%	64,623	77.5%	77.5%	437	0	21,541	21,978
July	94,756	2,464	2.60%	0	0.0%	92,292	97.4%	97.4%	58	0	30,764	30,822
August	81,175	812	1.00%	0	0.0%	80,363	99.0%	99.0%	19	0	26,788	26,807
September	53,437	4,222	7.90%	0	0.0%	49,215	92.1%	92.1%	99	0	16,405	16,504
October	74,485	15,865	21.30%	0	0.0%	58,620	78.7%	78.7%	369	0	19,540	19,909
November	51,327	21,711	42.30%	0	0.0%	29,616	57.7%	57.7%	505	0	9,872	10,377
December	26,946	5,174	19.20%	0	0.0%	21,772	80.8%	80.8%	121	0	7,258	7,379
TOTALS	702,200	173,181	24.70%	0	0.0%	529,019	75.3%	75.3%	4,033	0	176,343	180,376

Projected Year 2020 Visitation to Jamestown Island for Alternative E

Annual Visitor and Vehicle Trip Projections

With 10 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	10,859	1,260	11.60%	1,086	10.0%	8,513	78.4%	88.4%	30	25	2,838	2,893
February	16,527	5,503	33.30%	1,653	10.0%	9,371	56.7%	66.7%	128	37	3,124	3,289
March	47,241	21,164	44.80%	4,724	10.0%	21,353	45.2%	55.2%	493	105	7,118	7,716
April	84,617	38,839	45.90%	8,462	10.0%	37,316	44.1%	54.1%	904	189	12,439	13,532
May	77,446	37,406	48.30%	7,745	10.0%	32,295	41.7%	51.7%	870	173	10,765	11,808
June	83,384	18,761	22.50%	8,338	10.0%	56,285	67.5%	77.5%	437	186	18,762	19,385
July	94,756	2,464	2.60%	9,476	10.0%	82,816	87.4%	97.4%	58	211	27,606	27,875
August	81,175	812	1.00%	8,118	10.0%	72,245	89.0%	99.0%	19	181	24,082	24,282
September	53,437	4,222	7.90%	5,344	10.0%	43,871	82.1%	92.1%	99	119	14,624	14,842
October	74,485	15,865	21.30%	7,449	10.0%	51,171	68.7%	78.7%	369	166	17,057	17,592
November	51,327	21,711	42.30%	5,133	10.0%	24,483	47.7%	57.7%	505	115	8,161	8,781
December	26,946	5,174	19.20%	2,695	10.0%	19,077	70.8%	80.8%	121	60	6,359	6,540
TOTALS	702,200	173,181	24.70%	70,223	10.0%	458,796	65.3%	75.3%	4,033	1,567	152,935	158,535

With 50 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	10,859	1,260	11.60%	5,430	50.0%	4,169	38.4%	88.4%	30	121	1,390	1,541
February	16,527	5,503	33.30%	8,264	50.0%	2,760	16.7%	66.7%	128	184	920	1,232
March	47,241	21,164	44.80%	23,621	50.0%	2,456	5.2%	55.2%	493	525	819	1,837
April	84,617	38,839	45.90%	42,309	50.0%	3,469	4.1%	54.1%	904	941	1,157	3,002
May	77,446	37,406	48.30%	38,723	50.0%	1,317	1.7%	51.7%	870	861	439	2,170
June	83,384	18,761	22.50%	41,692	50.0%	22,931	27.5%	77.5%	437	927	7,644	9,008
July	94,756	2,464	2.60%	47,378	50.0%	44,914	47.4%	97.4%	58	1,053	14,972	16,083
August	81,175	812	1.00%	40,588	50.0%	39,775	49.0%	99.0%	19	902	13,259	14,180
September	53,437	4,222	7.90%	26,719	50.0%	22,496	42.1%	92.1%	99	594	7,499	8,192
October	74,485	15,865	21.30%	37,243	50.0%	21,377	28.7%	78.7%	369	828	7,126	8,323
November	51,327	21,711	42.30%	25,664	50.0%	3,952	7.7%	57.7%	505	571	1,318	2,394
December	26,946	5,174	19.20%	13,473	50.0%	8,299	30.8%	80.8%	121	300	2,767	3,188
TOTALS	702,200	173,181	24.70%	351,104	50.0%	177,915	25.3%	75.3%	4,033	7,807	59,310	71,150

Projected Year 2020 Visitation to Jamestown Island for Alternative E

Peak Design Day Vehicle Trip Projections

84,264 Peak Design Month (12 percent of annual visitation)
2,781 Peak Design Day (3.3 percent of peak design month)
With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month/ Shuttle Mode Share	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
May												
25%	2,781	1,343	48.3%	695	25.0%	743	26.7%	100.0%	32	16	248	296
0%	2,781	1,343	48.3%	0	0.0%	1,438	51.7%	100.0%	32	0	480	512
10%	2,781	1,343	48.3%	278	10.0%	1,160	41.7%	100.0%	32	7	387	426
50%	2,781	1,343	48.3%	1,391	50.0%	47	1.7%	100.0%	32	31	16	79
July												
25%	2,781	72	2.6%	695	25.0%	2,014	72.4%	100.0%	2	16	672	690
0%	2,781	72	2.6%	0	0.0%	2,709	97.4%	100.0%	2	0	903	905
10%	2,781	72	2.6%	278	10.0%	2,431	87.4%	100.0%	2	7	811	820
50%	2,781	72	2.6%	1,391	50.0%	1,318	47.4%	100.0%	2	31	440	473

Projected Year 2020 Visitation to Jamestown Island for Alternative E

Peak Design Day Vehicle Trip Projections by Month

With 25 Percent Shuttle Usage

	Visitors								Entering Vehicles			
Month/ Shuttle Mode Share	Alt A Visitors	Charters/ School Buses	Charter Mode Split	Colonial Parkway Shuttle	Shuttle Mode Split	Auto Visitors	Auto Mode Split	Total All Modes	Charters/ School Buses	Colonial Parkway Shuttle	Auto Visitors	Total Vehicles
January	358	42	11.7%	90	25.1%	226	63.2%	100.0%	1	2	76	79
February	545	182	33.4%	136	24.9%	227	41.7%	100.0%	5	4	76	85
March	1,559	698	44.8%	390	25.0%	471	30.2%	100.0%	17	9	157	183
April	2,792	1,282	45.9%	698	25.0%	812	29.1%	100.0%	30	16	271	317
May	2,556	1,234	48.3%	639	25.0%	683	26.7%	100.0%	29	15	228	272
June	2,752	619	22.5%	688	25.0%	1,445	52.5%	100.0%	15	16	482	513
July	3,127	81	2.6%	782	25.0%	2,264	72.4%	100.0%	2	18	**755**	775
August	2,679	27	1.0%	670	25.0%	1,982	74.0%	100.0%	1	15	661	677
September	1,763	139	7.9%	441	25.0%	1,183	67.1%	100.0%	4	10	395	409
October	2,458	524	21.3%	615	25.0%	1,319	53.7%	100.0%	13	14	440	467
November	1,694	716	42.3%	423	25.0%	555	32.8%	100.0%	17	10	185	212
December	889	171	19.2%	222	25.0%	496	55.8%	100.0%	4	5	166	175
	23,173	5,715	24.7%	5,793	25.0%	11,664	50.3%	100.0%	138	134	3,892	4,164

Projected Year 2020 Visitation to Jamestown Island for Alternative E

Peak Design Day Parking Accumulation by Month

With 25 Percent Shuttle Usage

	Total	Neck of Land Parking Lot			Island Parking Lot		
Month	Accum	Peak Accum	Capacity	% Full	Peak Accum	Capacity	% Full
January	33	12	100	12%	21	200	11%
February	33	12	100	12%	21	200	11%
March	69	24	100	24%	45	200	23%
April	118	41	100	41%	77	200	39%
May	108	38	100	38%	70	200	35%
June	211	74	100	74%	137	200	69%
July	294	100	100	100%	194	200	97%
August	289	98	100	98%	191	200	96%
September	173	61	100	61%	112	200	56%
October	192	67	100	67%	125	200	63%
November	81	28	100	28%	53	200	27%
December	73	26	100	26%	47	200	24%

Projected Year 2020 Visitation to the Neck of Land Parcel

ALTERNATIVE B

Month	% of Auto Visitors Captured	Var % Autos	75% Shuttle	75% Charter Bus	Total Daily Visitors	33% By Tram	33% By Water	34% Walk Mode	Total Monthly Visitors	34% By Tram	31% By Water	35% Walk Mode	Percent By Water Rounded	
		Daily Visitors by Mode				Percent Mode Distribution**				Pecent Mode Distribution				
January	25%	61			61			61	1,838			1,838		
February	25%	61			61			61	1,836			1,836		
March	68%	342	346	620	1,308			1,308	39,630			39,630		
April	68%	590	619	1,137	2,346	774	774	798	71,091	24,171	22,038	24,882	22,038	22040
May	68%	496	566	1,095	2,157	712	712	733	65,354	22,220	20,260	22,874	20,260	20260
June	68%	1,049	610	549	2,208	729	729	750	66,900	22,746	20,739	23,415	20,739	20740
July	68%	1,643	693	72	2,408	795	795	818	72,985	24,815	22,625	25,545	22,625	22630
August	68%	1,439	594	24	2,057	679	679	699	62,337	21,195	19,324	21,818	19,324	19320
September	68%	859	391	125	1,375	454	454	467	41,661	14,165	12,915	14,581	12,915	12920
October	68%	959	545	465	1,969	650	650	669	59,653	20,282	18,492	20,879	18,492	18490
November	25%	148			148			148	4,482			4,482		
December	25%	133			133			133	4,019			4,019		
Total	62%	**7,778**	**4,364**	**4,087**	**16,229**	**4,793**	**4,793**	**6,643**	**488,112**	**149,594**	**136,393**	**202,125**	**136,393**	**136,400**

ALTERNATIVE C

Month	% of Auto Visitors Captured	Var % Autos	90% Shuttle	100% Charter Bus	Total NOL Daily Visitors	53% By Tram	47% By Water	0% Walk Mode	Monthly NOL Visitors	53% By Tram	47% By Water	Walk Mode	Percent By Water Rounded	
		Daily Visitors by Mode				Percent Mode Distribution**				Pecent Mode Distribution				
January	95%	231	106	49	386			386	11,682			11,682		
February	95%	230	161	215	606			606	18,370			18,370		
March	95%	477	95	826	1,398			1,398	42,378			42,378		
April	95%	824	145	1,515	2,484	1,316	1,168	0	75,280	39,898	35,382		35,382	35380
May	95%	693	415	1,460	2,568	1,361	1,207	0	77,804	41,236	36,568		36,568	36570
June	95%	1,465	743	732	2,940	1,558	1,382	0	89,094	47,220	41,874		41,874	41870
July	95%	2,296	680	96	3,072	1,628	1,444	0	93,092	49,339	43,753		43,753	43750
August	95%	2,011	732	32	2,775	1,471	1,304	0	84,076	44,560	39,516		39,516	39520
September	95%	1,200	832	165	2,197	1,164	1,033	0	66,570	35,282	31,288		31,288	31290
October	95%	1,339	713	620	2,672	1,416	1,256	0	80,974	42,916	38,058		38,058	38060
November	95%	562	501	847	1,910			1,910	57,880			57,880		
December	95%	504	263	202	969			969	29,364			29,364		
Total	**95%**	**11,832**	**5,386**	**6,759**	**23,977**	**9,914**	**8,794**	**5,269**	**726,564**	**300,451**	**266,439**	**159,674**	**266,439**	**266,440**

ALTERNATIVE E

Month	% of Auto Visitors Captured	Var* Autos	50% Shuttle	50% Charter Bus	Total NOL Daily Visitors	52% By Tram	48% By Water	0% Walk Mode	Monthly NOL Visitors	52% By Tram	48% By Water	Walk Mode	Percent By Water Rounded	
		Daily Visitors by Mode				Percent Mode Distribution**				Pecent Mode Distribution				
January	35%	75			75			75	2,275			2,275		
February	35%	75			75			75	2,276			2,276		
March	35%	155	195	350	700			700	21,216					
April	35%	268	349	641	1,258	654	604	0	38,122	19,823	18,299		18,299	18300
May	35%	225	320	617	1,162	604	558	0	35,202	18,305	16,897		16,897	16900
June	35%	476	344	310	1,130	588	542	0	34,246	17,808	16,438		16,438	16440
July	28%	597	391	41	1,029	535	494	0	31,180	16,214	14,966		14,966	14970
August	28%	523	335	14	872	454	418	0	26,414	13,735	12,679		12,679	12680
September	35%	390	220	70	680	354	326	0	20,610	10,717	9,893		9,893	9890
October	35%	435	308	262	1,005	523	482	0	30,454	15,836	14,618		14,618	14620
November	35%	182			182			182	5,527			5,527		
December	35%	164			164			164	4,958			4,958		
Total	32%	**3,565**	**2,462**	**2,305**	**8,332**	**3,712**	**3,424**	**1,196**	**252,480**	**112,438**	**103,790**	**15,036**	**103,790**	**103,800**

* Percent of visitors (by travel mode) destined to Jamestown Island that stop at the Neck of Land Parcel.

** Peak season mode distribution only (April through October).

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Existing Parking Accumulation Analysis

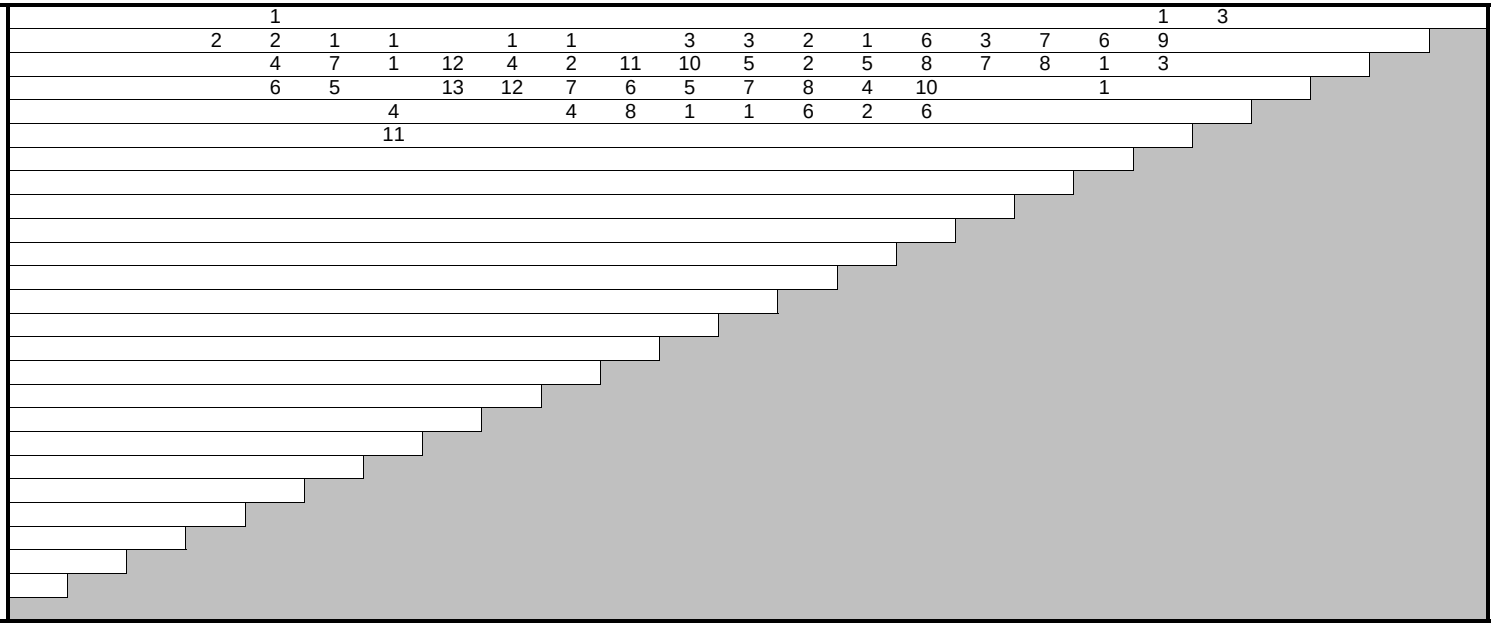
Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	42
	Peak Out	43

5/1/2001 Survey 3.46

*Hourly Total Volume----------> *				0	0	2	15	29	35	49	61	51	58	79	82	80	74	**85**	71	56	64	68	63	37	17	4	0	
Capacity	***333***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**2**	**15**	**25**	**40**	**60**	**63**	**71**	**83**	**80**	**71**	**68**	**57**	**67**	**66**	**61**	**48**	**35**	**17**	**4**	**0**	**0**	**0**	**933**
Peak Occ.	***83***	***25%***		**0%**	**0%**	**0%**	**1%**	**5%**	**8%**	**12%**	**18%**	**19%**	**21%**	**25%**	**24%**	**21%**	**20%**	**17%**	**20%**	**20%**	**18%**	**14%**	**11%**	**5%**	**1%**	**0%**	**0%**	**0%**	
Turnover	***0.8***	***3.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**5**	**14**	**6**	**13**	**22**	**25**	**21**	**23**	**20**	**11**	**20**	**21**	**26**	**21**	**13**	**4**	**0**	**0**	**270**
Volume	***270***		IN	*0*	*0*	*0*	*2*	*13*	*13*	*17*	*25*	*17*	*14*	*25*	*19*	*16*	*18*	*12*	*30*	*10*	*15*	*8*	*13*	*3*	*0*	*0*	*0*	*0*	**270**

Avg. Duration	***#***	***3.46***	***%***
1.0	5	2%	2%
2.0	48	18%	20%
3.0	90	33%	53%
4.0	84	31%	84%
5.0	32	12%	96%
6.0	11	4%	100%
7.0	0	0%	100%
8.0	0	0%	100%
9.0	0	0%	100%
10.0	0	0%	100%
11.0	0	0%	100%
12.0	0	0%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	270		



Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	4
	Peak Out	10

5/1/2001 Survey 3.62

*Hourly Total Volume----------> *				0	0	0	3	6	4	1	3	3	0	5	8	3	5	12	**14**	10	5	2	0	0	0	0	0	
Capacity	***25***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**0**	**3**	**6**	**5**	**5**	**2**	**2**	**2**	**7**	**10**	**10**	**11**	**6**	**5**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**76**
Peak Occ.	***11***	***44%***		**0%**	**0%**	**0%**	**0%**	**12%**	**24%**	**20%**	**20%**	**8%**	**8%**	**8%**	**28%**	**40%**	**40%**	**44%**	**24%**	**20%**	**8%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	
Turnover	***0.8***	***1.9***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**2**	**6**	**4**	**3**	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**21**
Volume	***21***		IN	*0*	*0*	*0*	*0*	*3*	*3*	*0*	*0*	*0*	*0*	*0*	*5*	*3*	*0*	*3*	*1*	*3*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	**21**
Avg. Duration	***#***	***3.62***	***%***																									**0**
1.0	5	24%	24%															3	1	1								
2.0	4	19%	43%					1								1				2								
3.0	3	14%	57%						1							2												
4.0	2	10%	67%					2																				
5.0	3	14%	81%												3													
6.0	2	10%	90%												2													
7.0	0	0%	90%																									
8.0	0	0%	90%																									
9.0	1	5%	95%						1																			
10.0	1	5%	100%						1																			
11.0	0	0%	100%																									
12.0	0	0%	100%																									
13.0	0	0%	100%																									
14.0	0	0%	100%																									
15.0	0	0%	100%																									
16.0	0	0%	100%																									
17.0	0	0%	100%																									
18.0	0	0%	100%																									
19.0	0	0%	100%																									
20.0	0	0%	100%																									
21.0	0	0%	100%																									
22.0	0	0%	100%																									
23.0	0	0%	100%																									
24.0	0	0%	100%																									
25.0	0	0%	100%																									
26.0	0	0%	100%																									
	21																											

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Year 2020 Parking Accumulation Analysis – 25% Shuttle Mode

Total Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	30
	Peak Out	31

Year 2020 Projections 3.46

*Hourly Total Volume----------> *				0	0	1	10	21	26	36	45	38	43	58	60	57	52	**61**	51	41	47	48	44	26	12	3	0	
Capacity	***333***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**1**	**10**	**18**	**30**	**44**	**47**	**52**	**60**	**58**	**52**	**49**	**42**	**48**	**47**	**43**	**34**	**25**	**12**	**3**	**0**	**0**	**0**	**675**
Peak Occ.	***60***	***18%***		**0%**	**0%**	**0%**	**0%**	**3%**	**5%**	**9%**	**13%**	**14%**	**16%**	**18%**	**17%**	**16%**	**15%**	**13%**	**14%**	**14%**	**13%**	**10%**	**8%**	**4%**	**1%**	**0%**	**0%**	**0%**	
Turnover	***0.6***	***3.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**2**	**1**	**4**	**10**	**5**	**10**	**16**	**18**	**15**	**16**	**15**	**8**	**15**	**15**	**18**	**15**	**9**	**3**	**0**	**0**	**195**
Volume	***195***		IN	*0*	*0*	*0*	*1*	*9*	*10*	*13*	*18*	*13*	*10*	*18*	*14*	*12*	*12*	*9*	*21*	*7*	*11*	*6*	*9*	*2*	*0*	*0*	*0*	*0*	**195**

Avg. Duration	***#***	***3.46***	***%***																									
1.0	4	2%	2%	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	
2.0	33	17%	19%	0	0	0	1	1	1	1	0	1	1	0	2	2	1	1	4	2	5	4	6	0	0	0	0	
3.0	66	34%	53%	0	0	0	0	3	5	1	9	3	1	8	7	4	1	4	6	5	6	1	2	0	0	0		
4.0	61	31%	84%	0	0	0	0	4	4	0	9	9	5	4	4	5	6	3	7	0	0	1	0	0	0			
5.0	23	12%	96%	0	0	0	0	0	0	3	0	0	3	6	1	1	4	1	4	0	0	0	0	0				
6.0	8	4%	100%	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0					
7.0	0	0%	100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
8.0	0	0%	100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
9.0	0	0%	100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
10.0	0	0%	100%	0																								
11.0	0	0%	100%	0																								
12.0	0	0%	100%	0																								
13.0	0	0%	100%	0																								
14.0	0	0%	100%	0																								
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24.0	0	0%	100%																									
25.0	0	0%	100%																									
26.0	0	0%	100%																									
	195																											

Total Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	46
	Peak Out	50

Year 2020 Projections 5.46

*Hourly Total Volume----------> *				0	0	2	16	28	32	48	50	40	64	70	57	74	82	**96**	93	74	59	57	62	55	53	38	18	
Capacity	***350***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**2**	**16**	**30**	**48**	**72**	**88**	**98**	**110**	**124**	**127**	**124**	**109**	**120**	**106**	**102**	**99**	**91**	**71**	**42**	**18**	**4**	**0**	**1601**
Peak Occ.	***127***	***36%***		**0%**	**0%**	**0%**	**1%**	**5%**	**9%**	**14%**	**21%**	**25%**	**28%**	**31%**	**35%**	**36%**	**35%**	**31%**	**34%**	**30%**	**29%**	**28%**	**26%**	**20%**	**12%**	**5%**	**1%**	**0%**	
Turnover	***0.8***	***2.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**5**	**16**	**6**	**14**	**23**	**27**	**23**	**25**	**21**	**12**	**22**	**23**	**29**	**24**	**14**	**4**	**293**
Volume	***293***		IN	*0*	*0*	*0*	*2*	*14*	*14*	*18*	*27*	*18*	*15*	*28*	*20*	*17*	*20*	*12*	*34*	*11*	*17*	*9*	*14*	*3*	*0*	*0*	*0*	*0*	**293**

Avg. Duration	***#***	***5.46***	***%***
1.0	0	0%	0%
2.0	0	0%	0%
3.0	5	2%	2%
4.0	52	18%	19%
5.0	97	33%	53%
6.0	92	31%	84%
7.0	35	12%	96%
8.0	12	4%	100%
9.0	0	0%	100%
10.0	0	0%	100%
11.0	0	0%	100%
12.0	0	0%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	293		

0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	3	0	0					
0	0	0	2	2	1	1	0	1	1	0	3	3	2	1	7	3	8	7	10	0	0							
0	0	0	0	4	8	1	13	4	2	12	11	5	2	5	9	8	9	1	3	0								
0	0	0	0	7	5	0	14	13	8	7	5	8	9	4	11	0	0	1	0									
0	0	0	0	0	0	4	0	0	4	9	1	1	7	2	7	0	0	0										
0	0	0	0	0	0	12	0	0	0	0	0	0	0	0	0	0	0											
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
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Total Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	46
	Peak Out	50

Year 2020 Projections 5.46

*Hourly Total Volume----------> *				0	0	2	16	28	32	48	50	40	64	70	57	74	82	**96**	93	74	59	57	62	55	53	38	18		
Capacity	***350***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**		
Occupancy				**0**	**0**	**0**	**2**	**16**	**30**	**48**	**72**	**88**	**98**	**110**	**124**	**127**	**124**	**109**	**120**	**106**	**102**	**99**	**91**	**71**	**42**	**18**	**4**	**0**	**1601**	
Peak Occ.	***127***	***36%***		**0%**	**0%**	**0%**	**1%**	**5%**	**9%**	**14%**	**21%**	**25%**	**28%**	**31%**	**35%**	**36%**	**35%**	**31%**	**34%**	**30%**	**29%**	**28%**	**26%**	**20%**	**12%**	**5%**	**1%**	**0%**		
Turnover	***0.8***	***2.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**5**	**16**	**6**	**14**	**23**	**27**	**23**	**25**	**21**	**12**	**22**	**23**	**29**	**24**	**14**	**4**	**293**	
Volume	***293***		IN	*0*	*0*	*0*	*2*	*14*	*14*	*18*	*27*	*18*	*15*	*28*	*20*	*17*	*20*	*12*	*34*	*11*	*17*	*9*	*14*	*3*	*0*	*0*	*0*	*0*	**293**	

Avg. Duration	***#***	***5.46***	***%***	
1.0	0	0%	0%	
2.0	0	0%	0%	
3.0	5	2%	2%	0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 0 0
4.0	52	18%	19%	0 0 0 2 2 1 1 0 1 1 0 3 3 2 1 7 3 8 7 10 0 0
5.0	97	33%	53%	0 0 0 0 4 8 1 13 4 2 12 11 5 2 5 9 8 9 1 3 0
6.0	92	31%	84%	0 0 0 0 7 5 0 14 13 8 7 5 8 9 4 11 0 0 1 0
7.0	35	12%	96%	0 0 0 0 0 0 4 0 0 4 9 1 1 7 2 7 0 0 0
8.0	12	4%	100%	0 0 0 0 0 0 12 0 0 0 0 0 0 0 0 0 0 0
9.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
10.0	0	0%	100%	0
11.0	0	0%	100%	0
12.0	0	0%	100%	0
13.0	0	0%	100%	0
14.0	0	0%	100%	0
15.0	0	0%	100%	0
16.0	0	0%	100%	0
17.0	0	0%	100%	0
18.0	0	0%	100%	0
19.0	0	0%	100%	0
20.0	0	0%	100%	0
21.0	0	0%	100%	0
22.0	0	0%	100%	0
23.0	0	0%	100%	
24.0	0	0%	100%	
25.0	0	0%	100%	
26.0	0	0%	100%	
	293			

Total Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	36
	Peak Out	41

Year 2020 Projections 5.43

*Hourly Total Volume----------> *				0	0	2	13	22	26	39	40	32	50	56	47	59	66	**77**	74	59	47	46	50	44	41	30	16	
Capacity	***333***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**2**	**13**	**24**	**39**	**57**	**69**	**77**	**87**	**99**	**102**	**100**	**88**	**95**	**84**	**80**	**77**	**72**	**57**	**34**	**16**	**4**	**0**	**1276**
Peak Occ.	***102***	***31%***		**0%**	**0%**	**0%**	**1%**	**4%**	**7%**	**12%**	**17%**	**21%**	**23%**	**26%**	**30%**	**31%**	**30%**	**26%**	**29%**	**25%**	**24%**	**23%**	**22%**	**17%**	**10%**	**5%**	**1%**	**0%**	
Turnover	***0.7***	***2.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**4**	**12**	**5**	**11**	**18**	**22**	**19**	**20**	**17**	**10**	**17**	**18**	**23**	**18**	**12**	**4**	**235**
Volume	***235***		IN	*0*	*0*	*0*	*2*	*11*	*11*	*15*	*21*	*14*	*12*	*22*	*17*	*14*	*16*	*10*	*26*	*9*	*13*	*7*	*12*	*3*	*0*	*0*	*0*	*0*	**235**

Avg. Duration	***#***	***5.43***	***%***	
1.0	0	0%	0%	
2.0	0	0%	0%	
3.0	5	2%	2%	0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 3 0 0
4.0	44	19%	21%	0 0 0 2 2 1 1 0 1 1 0 3 3 2 1 5 3 6 5 8 0 0
5.0	78	33%	54%	0 0 0 0 3 6 1 10 3 2 10 9 4 2 4 7 6 7 1 3 0
6.0	71	30%	84%	0 0 0 0 5 4 0 11 10 6 5 4 6 7 3 9 0 0 1 0
7.0	27	11%	96%	0 0 0 0 0 0 3 0 0 3 7 1 1 5 2 5 0 0 0
8.0	10	4%	100%	0 0 0 0 0 0 10 0 0 0 0 0 0 0 0 0 0 0 0
9.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
10.0	0	0%	100%	0
11.0	0	0%	100%	0
12.0	0	0%	100%	0
13.0	0	0%	100%	0
14.0	0	0%	100%	0
15.0	0	0%	100%	0
16.0	0	0%	100%	0
17.0	0	0%	100%	0
18.0	0	0%	100%	0
19.0	0	0%	100%	0
20.0	0	0%	100%	0
21.0	0	0%	100%	0
22.0	0	0%	100%	0
23.0	0	0%	100%	
24.0	0	0%	100%	
25.0	0	0%	100%	
26.0	0	0%	100%	
	235			

Total Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	39
	Peak Out	42

Year 2020 Projections 5.46

*Hourly Total Volume----------> *				0	0	2	14	24	28	41	43	35	53	59	50	63	71	**81**	77	62	49	48	52	46	43	31	16	
Capacity	***300***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**2**	**14**	**26**	**41**	**61**	**75**	**83**	**94**	**106**	**108**	**105**	**93**	**101**	**89**	**84**	**82**	**75**	**59**	**35**	**16**	**4**	**0**	**1350**
Peak Occ.	***108***	***36%***		**0%**	**0%**	**0%**	**1%**	**5%**	**9%**	**14%**	**20%**	**25%**	**28%**	**31%**	**35%**	**36%**	**35%**	**31%**	**34%**	**30%**	**28%**	**27%**	**25%**	**20%**	**12%**	**5%**	**1%**	**0%**	
Turnover	***0.8***	***2.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**5**	**13**	**6**	**12**	**20**	**23**	**19**	**21**	**18**	**10**	**18**	**19**	**24**	**19**	**12**	**4**	**248**
Volume	***248***		IN	*0*	*0*	*0*	*2*	*12*	*12*	*16*	*23*	*16*	*13*	*23*	*18*	*15*	*16*	*11*	*28*	*9*	*14*	*7*	*12*	*3*	*0*	*0*	*0*	*0*	**248**

Avg. Duration	***#***	***5.46***	***%***
1.0	0	0%	0%
2.0	0	0%	0%
3.0	5	2%	2%
4.0	44	18%	20%
5.0	83	33%	53%
6.0	77	31%	84%
7.0	29	12%	96%
8.0	10	4%	100%
9.0	0	0%	100%
10.0	0	0%	100%
11.0	0	0%	100%
12.0	0	0%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	248		

1.0	0	0%	0%																									
2.0	0	0%	0%																									
3.0	5	2%	2%	0	0	0	0	0.9	0	0	0	0	0	0	0	0	0	0	0	0	0	0.9	2.8	0	0			
4.0	44	18%	20%	0	0	0	1.8	1.8	0.9	0.9	0	0.9	0.9	0	2.8	2.8	1.8	0.9	5.5	2.8	6.4	5.5	8.3	0	0			
5.0	83	33%	53%	0	0	0	0	3.7	6.4	0.9	11	3.7	1.8	10.1	9.2	4.6	1.8	4.6	7.3	6.4	7.3	0.9	2.8	0				
6.0	77	31%	84%	0	0	0	0	5.5	4.6	0	11.9	11	6.4	5.5	4.6	6.4	7.3	3.7	9.2	0	0	0.9	0					
7.0	29	12%	96%	0	0	0	0	0	0	3.7	0	0	3.7	7.3	0.9	0.9	5.5	1.8	5.5	0	0	0						
8.0	10	4%	100%	0	0	0	0	0	0	10.1	0	0	0	0	0	0	0	0	0	0	0							
9.0	0	0%	100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
10.0	0	0%	100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									
11.0	0	0%	100%	0																								
12.0	0	0%	100%	0																								
13.0	0	0%	100%	0																								
14.0	0	0%	100%	0																								
15.0	0	0%	100%	0																								
16.0	0	0%	100%	0																								
17.0	0	0%	100%	0																								
18.0	0	0%	100%	0																								
19.0	0	0%	100%	0																								
20.0	0	0%	100%	0																								
21.0	0	0%	100%	0																								
22.0	0	0%	100%	0																								
23.0	0	0%	100%																									
24.0	0	0%	100%																									
25.0	0	0%	100%																									
26.0	0	0%	100%																									

Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	82
	Peak Out	84

Year 2020 Projections 3.45

*Hourly Total Volume----------> *				0	0	4	30	58	69	95	119	101	113	153	160	156	145	**166**	139	110	125	133	123	72	33	8	0		
Capacity	***200***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**		
Occupancy				**0**	**0**	**0**	**4**	**30**	**50**	**79**	**117**	**122**	**138**	**161**	**155**	**139**	**133**	**112**	**131**	**129**	**119**	**94**	**68**	**33**	**8**	**0**	**0**	**0**	**1822**	
Peak Occ.	***161***	***81%***		**0%**	**0%**	**0%**	**2%**	**15%**	**25%**	**40%**	**59%**	**61%**	**69%**	**81%**	**78%**	**70%**	**67%**	**56%**	**66%**	**65%**	**60%**	**47%**	**34%**	**17%**	**4%**	**0%**	**0%**	**0%**		
Turnover	***2.6***	***3.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**6**	**4**	**10**	**28**	**12**	**25**	**43**	**48**	**41**	**45**	**39**	**22**	**39**	**41**	**51**	**41**	**25**	**8**	**0**	**0**	**528**	
Volume	***528***		IN	*0*	*0*	*0*	*4*	*26*	*26*	*33*	*48*	*33*	*28*	*48*	*37*	*32*	*35*	*24*	*58*	*20*	*29*	*16*	*25*	*6*	*0*	*0*	*0*	*0*	**528**	
Avg. Duration	***#***	***3.45***	***%***																										
1.0	10	2%	2%	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	2	6	0	0	0	0		
2.0	95	18%	20%	0	0	0	4	4	2	2	0	2	2	0	6	6	4	2	12	6	14	12	17	0	0	0	0		
3.0	175	33%	53%	0	0	0	0	8	14	2	23	8	4	21	19	10	4	10	15	14	15	2	6	0	0	0			
4.0	164	31%	84%	0	0	0	0	12	10	0	25	23	14	12	10	14	15	8	19	0	0	2	0	0	0				
5.0	63	12%	96%	0	0	0	0	0	0	8	0	0	8	15	2	2	12	4	12	0	0	0	0	0					
6.0	21	4%	100%	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	0						
7.0	0	0%	100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0							
8.0	0	0%	100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
9.0	0	0%	100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									
10.0	0	0%	100%	0																									
11.0	0	0%	100%	0																									
12.0	0	0%	100%	0																									
13.0	0	0%	100%	0																									
14.0	0	0%	100%	0																									
15.0	0	0%	100%	0																									
16.0	0	0%	100%	0																									
17.0	0	0%	100%	0																									
18.0	0	0%	100%	0																									
19.0	0	0%	100%	0																									
20.0	0	0%	100%	0																									
21.0	0	0%	100%	0																									
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24.0	0	0%	100%																										
25.0	0	0%	100%																										
26.0	0	0%	100%																										
	528																												

Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	53
	Peak Out	58

Year 2020 Projections 5.45

*Hourly Total Volume----------> *				0	0	3	19	33	38	57	60	48	74	81	69	87	97	**111**	107	86	68	66	72	63	60	43	22	
Capacity	***150***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**3**	**19**	**36**	**57**	**85**	**104**	**115**	**129**	**146**	**150**	**144**	**128**	**139**	**123**	**117**	**113**	**104**	**81**	**48**	**22**	**5**	**0**	**1867**
Peak Occ.	***150***	***100%***		**0%**	**0%**	**0%**	**2%**	**13%**	**24%**	**38%**	**57%**	**69%**	**77%**	**86%**	**97%**	**100%**	**96%**	**85%**	**93%**	**82%**	**78%**	**75%**	**69%**	**54%**	**32%**	**14%**	**3%**	**0%**	
Turnover	***2.3***	***2.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**4**	**2**	**6**	**18**	**8**	**17**	**28**	**32**	**27**	**29**	**25**	**14**	**25**	**27**	**33**	**27**	**17**	**5**	**342**
Volume	***342***		IN	*0*	*0*	*0*	*3*	*17*	*17*	*22*	*32*	*22*	*18*	*32*	*24*	*20*	*23*	*15*	*38*	*13*	*19*	*10*	*17*	*4*	*0*	*0*	*0*	*0*	**342**

Avg. Duration	***#***	***5.45***	***%***
1.0	0	0%	0%
2.0	0	0%	0%
3.0	6	2%	2%
4.0	61	18%	20%
5.0	114	33%	53%
6.0	106	31%	84%
7.0	41	12%	96%
8.0	14	4%	100%
9.0	0	0%	100%
10.0	0	0%	100%
11.0	0	0%	100%
12.0	0	0%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	342		

0	0	0	0	1.3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.3	3.8	0	0					
0	0	0	2.5	2.5	1.3	1.3	0	1.3	1.3	0	3.8	3.8	2.5	1.3	7.6	3.8	8.9	7.6	11.4	0	0							
0	0	0	0	5.1	8.9	1.3	15.2	5.1	2.5	13.9	12.7	6.3	2.5	6.3	10.1	8.9	10.1	1.3	3.8	0								
0	0	0	0	7.6	6.3	0	16.4	15.2	8.9	7.6	6.3	8.9	10.1	5.1	12.7	0	0	1.3	0									
0	0	0	0	0	0	5.1	0	0	5.1	10.1	1.3	1.3	7.6	2.5	7.6	0	0	0										
0	0	0	0	0	0	13.9	0	0	0	0	0	0	0	0	0	0	0											
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
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341.635

Neck of Land Parking Accumulation

Peak Hour of Generator	Peak In	71
	Peak Out	77

Year 2020 Projections 5.46

*Hourly Total Volume----------> *				0	0	3	25	44	50	76	79	64	97	108	91	116	129	**148**	141	114	91	87	96	84	79	57	29	
Capacity	***200***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**3**	**25**	**47**	**76**	**113**	**138**	**153**	**171**	**193**	**198**	**191**	**170**	**185**	**163**	**154**	**149**	**138**	**107**	**64**	**29**	**7**	**0**	**2473**
Peak Occ.	***198***	***99%***		**0%**	**0%**	**0%**	**2%**	**13%**	**24%**	**38%**	**56%**	**69%**	**76%**	**86%**	**97%**	**99%**	**96%**	**85%**	**92%**	**81%**	**77%**	**75%**	**69%**	**54%**	**32%**	**14%**	**3%**	**0%**	
Turnover	***2.3***	***2.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**3**	**8**	**24**	**10**	**22**	**37**	**42**	**35**	**39**	**34**	**19**	**34**	**35**	**44**	**35**	**22**	**7**	**453**
Volume	***453***		IN	*0*	*0*	*0*	*3*	*22*	*22*	*29*	*42*	*29*	*24*	*42*	*32*	*27*	*30*	*20*	*50*	*17*	*25*	*14*	*22*	*5*	*0*	*0*	*0*	*0*	**453**

Avg. Duration	***#***	***5.46***	***%***
1.0	0	0%	0%
2.0	0	0%	0%
3.0	8	2%	2%
4.0	81	18%	20%
5.0	151	33%	53%
6.0	141	31%	84%
7.0	54	12%	96%
8.0	19	4%	100%
9.0	0	0%	100%
10.0	0	0%	100%
11.0	0	0%	100%
12.0	0	0%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	453		

0	0	0	0	1.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.7	5	0	0					
0	0	0	3.4	3.4	1.7	1.7	0	1.7	1.7	0	5	5	3.4	1.7	10.1	5	11.7	10.1	15.1	0	0							
0	0	0	0	6.7	11.7	1.7	20.1	6.7	3.4	18.5	16.8	8.4	3.4	8.4	13.4	11.7	13.4	1.7	5	0								
0	0	0	0	10.1	8.4	0	21.8	20.1	11.7	10.1	8.4	11.7	13.4	6.7	16.8	0	0	1.7	0									
0	0	0	0	0	0	6.7	0	0	6.7	13.4	1.7	1.7	10.1	3.4	10.1	0	0	0										
0	0	0	0	0	0	18.5	0	0	0	0	0	0	0	0	0	0	0											
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
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452.865

Jamestown IslandParking Accumulation

Peak Hour of Generator	Peak In	34
	Peak Out	38

Year 2020 Projections 5.46

*Hourly Total Volume----------> *				0	0	2	12	21	25	37	39	31	48	53	44	57	63	**72**	69	56	44	43	47	41	39	28	14	
Capacity	***100***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**2**	**12**	**23**	**37**	**55**	**68**	**75**	**84**	**95**	**97**	**94**	**83**	**90**	**80**	**76**	**73**	**67**	**53**	**31**	**14**	**3**	**0**	**1211**
Peak Occ.	***97***	***97%***		**0%**	**0%**	**0%**	**2%**	**12%**	**23%**	**37%**	**55%**	**68%**	**75%**	**84%**	**95%**	**97%**	**94%**	**83%**	**90%**	**80%**	**76%**	**73%**	**67%**	**53%**	**31%**	**14%**	**3%**	**0%**	
Turnover	***2.2***	***2.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**2**	**4**	**12**	**5**	**11**	**18**	**21**	**17**	**19**	**16**	**9**	**16**	**17**	**21**	**17**	**11**	**3**	**222**
Volume	***222***		IN	*0*	*0*	*0*	*2*	*11*	*11*	*14*	*21*	*14*	*12*	*21*	*16*	*13*	*15*	*10*	*25*	*8*	*12*	*7*	*11*	*3*	*0*	*0*	*0*	*0*	**222**

Avg. Duration	***#***	***5.46***	***%***
1.0	0	0%	0%
2.0	0	0%	0%
3.0	4	2%	2%
4.0	39	18%	20%
5.0	74	33%	53%
6.0	69	31%	84%
7.0	26	12%	96%
8.0	9	4%	100%
9.0	0	0%	100%
10.0	0	0%	100%
11.0	0	0%	100%
12.0	0	0%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	222		

0																												
0																												
0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	2.5	0	0				
0	0	0	1.6	1.6	0.8	0.8	0	0.8	0.8	0	2.5	2.5	1.6	0.8	4.9	2.5	5.8	4.9	7.4	0	0							
0	0	0	0	3.3	5.8	0.8	9.9	3.3	1.6	9.1	8.2	4.1	1.6	4.1	6.6	5.8	6.6	0.8	2.5	0								
0	0	0	0	4.9	4.1	0	10.7	9.9	5.8	4.9	4.1	5.8	6.6	3.3	8.2	0	0	0.8	0									
0	0	0	0	0	0	3.3	0	0	3.3	6.6	0.8	0.8	4.9	1.6	4.9	0	0	0										
0	0	0	0	0	0	9.1	0	0	0	0	0	0	0	0	0	0	0											
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
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222.46

Neck of Land Parking Accumulation

Peak Hour of Generator	Peak In	89
	Peak Out	97

Year 2020 Projections 5.46

*Hourly Total Volume----------> *				0	0	4	32	55	64	95	99	80	123	136	114	146	163	**186**	178	144	114	110	121	106	99	72	36	
Capacity	***250***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**4**	**32**	**59**	**95**	**142**	**174**	**193**	**216**	**244**	**250**	**241**	**214**	**233**	**205**	**195**	**188**	**174**	**136**	**81**	**36**	**9**	**0**	**3118**
Peak Occ.	***250***	***100%***		**0%**	**0%**	**0%**	**2%**	**13%**	**24%**	**38%**	**57%**	**69%**	**77%**	**86%**	**97%**	**100%**	**97%**	**86%**	**93%**	**82%**	**78%**	**75%**	**69%**	**54%**	**32%**	**14%**	**3%**	**0%**	
Turnover	***2.3***	***2.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**6**	**4**	**11**	**30**	**13**	**28**	**47**	**53**	**45**	**49**	**42**	**23**	**42**	**45**	**55**	**44**	**28**	**9**	**572**
Volume	***572***		IN	*0*	*0*	*0*	*4*	*28*	*28*	*36*	*53*	*36*	*30*	*53*	*40*	*34*	*38*	*25*	*64*	*21*	*32*	*17*	*28*	*6*	*0*	*0*	*0*	*0*	**572**

Avg. Duration	***#***	***5.46***	***%***
1.0	0	0%	0%
2.0	0	0%	0%
3.0	11	2%	2%
4.0	102	18%	20%
5.0	191	33%	53%
6.0	178	31%	84%
7.0	68	12%	96%
8.0	23	4%	100%
9.0	0	0%	100%
10.0	0	0%	100%
11.0	0	0%	100%
12.0	0	0%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	572		

				0	0	0	0	2.1	0	0	0	0	0	0	0	0	0	0	0	0	0	2.1	6.4	0	0			
				0	0	0	4.2	4.2	2.1	2.1	0	2.1	2.1	0	6.4	6.4	4.2	2.1	12.7	6.4	14.8	12.7	19.1	0	0			
				0	0	0	0	8.5	14.8	2.1	25.4	8.5	4.2	23.3	21.2	10.6	4.2	10.6	16.9	14.8	16.9	2.1	6.4	0					
				0	0	0	0	12.7	10.6	0	27.5	25.4	14.8	12.7	10.6	14.8	16.9	8.5	21.2	0	0	2.1	0						
				0	0	0	0	0	0	8.5	0	0	8.5	16.9	2.1	2.1	12.7	4.2	12.7	0	0	0							
				0	0	0	0	0	0	23.3	0	0	0	0	0	0	0	0	0	0	0								
				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									
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572.04

Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	99
	Peak Out	108

Year 2020 Projections 5.45

*Hourly Total Volume----------> *				0	0	5	35	61	71	106	111	90	137	151	128	163	181	**207**	198	160	127	123	134	118	111	80	40	
Capacity	***333***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**5**	**35**	**66**	**106**	**158**	**193**	**215**	**240**	**271**	**278**	**269**	**238**	**259**	**229**	**217**	**210**	**193**	**151**	**90**	**40**	**10**	**0**	**3471**
Peak Occ.	***278***	***84%***		**0%**	**0%**	**0%**	**1%**	**11%**	**20%**	**32%**	**47%**	**58%**	**64%**	**72%**	**81%**	**84%**	**81%**	**71%**	**78%**	**69%**	**65%**	**63%**	**58%**	**45%**	**27%**	**12%**	**3%**	**0%**	
Turnover	***1.9***	***2.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**7**	**5**	**12**	**33**	**14**	**31**	**52**	**59**	**50**	**54**	**47**	**26**	**47**	**49**	**61**	**49**	**31**	**10**	**636**
Volume	***636***		IN	*0*	*0*	*0*	*5*	*31*	*31*	*40*	*59*	*40*	*33*	*59*	*45*	*38*	*42*	*28*	*71*	*24*	*35*	*19*	*31*	*7*	*0*	*0*	*0*	*0*	**636**

Avg. Duration	***#***	***5.45***	***%***
1.0	0	0%	0%
2.0	0	0%	0%
3.0	12	2%	2%
4.0	113	18%	20%
5.0	212	33%	53%
6.0	198	31%	84%
7.0	75	12%	96%
8.0	26	4%	100%
9.0	0	0%	100%
10.0	0	0%	100%
11.0	0	0%	100%
12.0	0	0%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	636		

0	0	0	0	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.4	7.1	0	0				
0	0	0	4.7	4.7	2.4	2.4	0	2.4	2.4	0	7.1	7.1	4.7	2.4	14.1	7.1	16.5	14.1	21.2	0	0						
0	0	0	0	9.4	16.5	2.4	28.3	9.4	4.7	25.9	23.6	11.8	4.7	11.8	18.8	16.5	18.8	2.4	7.1	0							
0	0	0	0	14.1	11.8	0	30.6	28.3	16.5	14.1	11.8	16.5	18.8	9.4	23.6	0	0	2.4	0								
0	0	0	0	0	0	9.4	0	0	9.4	18.8	2.4	2.4	14.1	4.7	14.1	0	0	0									
0	0	0	0	0	0	25.9	0	0	0	0	0	0	0	0	0	0	0										
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
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Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	69
	Peak Out	76

Year 2020 Projections 5.46

*Hourly Total Volume----------> *				0	0	3	25	43	49	74	77	62	95	105	88	113	127	**145**	138	112	89	85	94	82	77	56	28	
Capacity	***200***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**3**	**25**	**46**	**74**	**110**	**135**	**150**	**168**	**189**	**194**	**187**	**166**	**181**	**159**	**151**	**146**	**135**	**105**	**62**	**28**	**7**	**0**	**2419**
Peak Occ.	***194***	***97%***		**0%**	**0%**	**0%**	**2%**	**12%**	**23%**	**37%**	**55%**	**67%**	**75%**	**84%**	**94%**	**97%**	**94%**	**83%**	**90%**	**80%**	**76%**	**73%**	**67%**	**53%**	**31%**	**14%**	**3%**	**0%**	
Turnover	***2.2***	***2.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**5**	**3**	**8**	**23**	**10**	**21**	**36**	**41**	**35**	**38**	**33**	**18**	**33**	**35**	**43**	**35**	**21**	**7**	**443**
Volume	***443***		IN	*0*	*0*	*0*	*3*	*21*	*21*	*28*	*41*	*28*	*23*	*41*	*31*	*26*	*30*	*20*	*49*	*16*	*25*	*13*	*21*	*5*	*0*	*0*	*0*	*0*	**443**

Avg. Duration	***#***	***5.46***	***%***
1.0	0	0%	0%
2.0	0	0%	0%
3.0	8	2%	2%
4.0	79	18%	20%
5.0	148	33%	53%
6.0	138	31%	84%
7.0	53	12%	96%
8.0	18	4%	100%
9.0	0	0%	100%
10.0	0	0%	100%
11.0	0	0%	100%
12.0	0	0%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	443		

0	0	0	0	1.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.6	4.9	0	0					
0	0	0	3.3	3.3	1.6	1.6	0	1.6	1.6	0	4.9	4.9	3.3	1.6	9.9	4.9	11.5	9.9	14.8	0	0							
0	0	0	0	6.6	11.5	1.6	19.7	6.6	3.3	18.1	16.4	8.2	3.3	8.2	13.1	11.5	13.1	1.6	4.9	0								
0	0	0	0	9.9	8.2	0	21.4	19.7	11.5	9.9	8.2	11.5	13.1	6.6	16.4	0	0	1.6	0									
0	0	0	0	0	0	6.6	0	0	6.6	13.1	1.6	1.6	9.9	3.3	9.9	0	0	0										
0	0	0	0	0	0	18.1	0	0	0	0	0	0	0	0	0	0	0											
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
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443.52

Neck of Land Parking Accumulation

Peak Hour of Generator	Peak In	36
	Peak Out	39

Year 2020 Projections 5.46

*Hourly Total Volume----------> *				0	0	2	13	22	25	38	40	32	49	54	45	58	65	**75**	71	58	46	44	48	42	40	29	14	
Capacity	***100***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**2**	**13**	**24**	**38**	**57**	**69**	**77**	**86**	**97**	**100**	**96**	**85**	**93**	**82**	**78**	**75**	**69**	**54**	**32**	**14**	**3**	**0**	**1245**
Peak Occ.	***100***	***100%***		**0%**	**0%**	**0%**	**2%**	**13%**	**24%**	**38%**	**57%**	**69%**	**77%**	**86%**	**97%**	**100%**	**96%**	**85%**	**93%**	**82%**	**78%**	**75%**	**69%**	**54%**	**32%**	**14%**	**3%**	**0%**	
Turnover	***2.3***	***2.3***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**3**	**2**	**4**	**12**	**5**	**11**	**19**	**21**	**18**	**20**	**17**	**9**	**17**	**18**	**22**	**18**	**11**	**3**	**228**
Volume	***228***		IN	*0*	*0*	*0*	*2*	*11*	*11*	*14*	*21*	*14*	*12*	*21*	*16*	*13*	*15*	*10*	*26*	*8*	*13*	*7*	*11*	*3*	*0*	*0*	*0*	*0*	**228**

Avg. Duration	***#***	***5.46***	***%***
1.0	0	0%	0%
2.0	0	0%	0%
3.0	4	2%	2%
4.0	40	18%	19%
5.0	76	33%	53%
6.0	71	31%	84%
7.0	27	12%	96%
8.0	9	4%	100%
9.0	0	0%	100%
10.0	0	0%	100%
11.0	0	0%	100%
12.0	0	0%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	228		

0	0	0	0	0.8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.8	2.5	0	0					
0	0	0	1.7	1.7	0.8	0.8	0	0.8	0.8	0	2.5	2.5	1.7	0.8	5.1	2.5	5.9	5.1	7.6	0	0							
0	0	0	0	3.4	5.9	0.8	10.2	3.4	1.7	9.3	8.5	4.2	1.7	4.2	6.8	5.9	6.8	0.8	2.5	0								
0	0	0	0	5.1	4.2	0	11	10.2	5.9	5.1	4.2	5.9	6.8	3.4	8.5	0	0	0.8	0									
0	0	0	0	0	0	3.4	0	0	3.4	6.8	0.8	0.8	5.1	1.7	5.1	0	0	0										
0	0	0	0	0	0	9.3	0	0	0	0	0	0	0	0	0	0	0											
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
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228.48

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Year 2020 Parking Accumulation Analysis – Charter/School Buses

Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	4
	Peak Out	10

Year 2020 Projections 5.62

*Hourly Total Volume----------> *				0	0	0	4	7	4	0	1	1	4	10	10	4	4	5	7	**13**	12	8	6	2	0	0	0	
Capacity	***25***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**0**	**4**	**7**	**7**	**7**	**6**	**6**	**2**	**8**	**12**	**12**	**16**	**17**	**18**	**11**	**6**	**2**	**0**	**0**	**0**	**0**	**0**	**142**
Peak Occ.	***18***	***72%***		**0%**	**0%**	**0%**	**0%**	**14%**	**29%**	**29%**	**29%**	**24%**	**24%**	**10%**	**34%**	**48%**	**48%**	**62%**	**67%**	**72%**	**43%**	**24%**	**10%**	**0%**	**0%**	**0%**	**0%**	**0%**	
Turnover	***1.0***	***1.4***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**4**	**0**	**0**	**0**	**0**	**(0)**	**2**	**7**	**5**	**4**	**2**	**0**	**0**	**0**	**0**	**25**
Volume	***25***		IN	*0*	*0*	*0*	*0*	*4*	*4*	*0*	*0*	*0*	*0*	*0*	*6*	*4*	*0*	*4*	*1*	*4*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	**25**

Avg. Duration	***#***	***5.62***	***%***
1.0	0	0%	0%
2.0	0	0%	0%
3.0	6	24%	24%
4.0	5	19%	43%
5.0	4	14%	57%
6.0	2	10%	67%
7.0	4	14%	81%
8.0	2	10%	90%
9.0	0	0%	90%
10.0	0	0%	90%
11.0	1	5%	95%
12.0	1	5%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	25		

1.0																												
2.0																												
3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.6	1.2	1.2	0	0	0	0	0	0					
4.0	0	0	0	0	1.2	0	0	0	0	0	0	0	1.2	0	0	0	2.4	0	0	0	0	0						
5.0	0	0	0	0	0	1.2	0	0	0	0	0	0	2.4	0	0	0	0	0	0	0	0							
6.0	0	0	0	0	2.4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
7.0	0	0	0	0	0	0	0	0	0	0	0	0	3.6	0	0	0	0	0	0									
8.0	0	0	0	0	0	0	0	0	0	0	0	0	2.4	0	0	0	0	0										
9.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0											
10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
11.0	0	0	0	0	0	1.2	0	0	0	0	0	0	0	0	0													
12.0	0	0	0	0	0	1.2	0	0	0	0	0	0	0	0														
13.0	0	0	0	0	0	0	0	0	0	0	0	0	0															
14.0	0	0	0	0	0	0	0	0	0	0	0	0																
15.0	0	0	0	0	0	0	0	0	0	0	0																	
16.0	0																											
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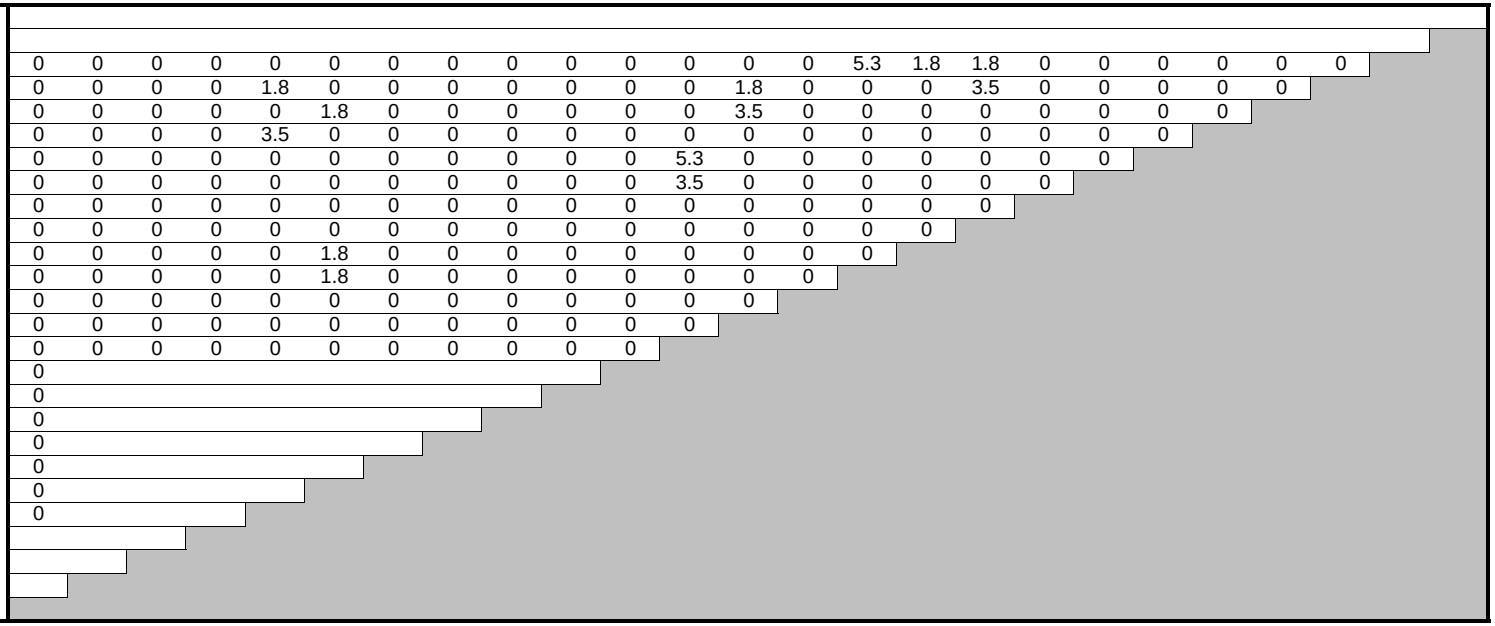
Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	5
	Peak Out	14

Year 2020 Projections 5.62

*Hourly Total Volume----------> *				0	0	0	5	11	5	0	2	2	5	14	14	5	5	7	11	**20**	18	12	9	4	0	0	0	
Capacity	***25***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**0**	**5**	**11**	**11**	**11**	**9**	**9**	**4**	**12**	**18**	**18**	**23**	**25**	**27**	**16**	**9**	**4**	**0**	**0**	**0**	**0**	**0**	**209**
Peak Occ.	***27***	***106%***		**0%**	**0%**	**0%**	**0%**	**21%**	**43%**	**43%**	**43%**	**36%**	**36%**	**14%**	**50%**	**71%**	**71%**	**92%**	**99%**	**106%**	**64%**	**35%**	**14%**	**0%**	**0%**	**0%**	**0%**	**0%**	
Turnover	***1.5***	***1.4***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**4**	**11**	**7**	**5**	**4**	**0**	**0**	**0**	**0**	**37**
Volume	***37***		IN	*0*	*0*	*0*	*0*	*5*	*5*	*0*	*0*	*0*	*0*	*0*	*9*	*5*	*0*	*5*	*2*	*5*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	**37**

Avg. Duration	***#***	***5.62***	***%***
1.0	0	0%	0%
2.0	0	0%	0%
3.0	9	24%	24%
4.0	7	19%	43%
5.0	5	14%	57%
6.0	4	9%	67%
7.0	5	14%	81%
8.0	4	9%	90%
9.0	0	0%	90%
10.0	0	0%	90%
11.0	2	5%	95%
12.0	2	5%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	37		



Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	4
	Peak Out	11

Year 2020 Projections 5.62

*Hourly Total Volume----------> *				0	0	0	4	9	4	0	1	1	4	12	12	4	4	6	9	**16**	14	10	7	3	0	0	0	
Capacity	***25***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**0**	**4**	**9**	**9**	**9**	**7**	**7**	**3**	**10**	**14**	**14**	**19**	**20**	**22**	**13**	**7**	**3**	**0**	**0**	**0**	**0**	**0**	**169**
Peak Occ.	***22***	***86%***		**0%**	**0%**	**0%**	**0%**	**17%**	**34%**	**34%**	**34%**	**28%**	**28%**	**11%**	**40%**	**57%**	**57%**	**74%**	**80%**	**86%**	**52%**	**29%**	**12%**	**0%**	**0%**	**0%**	**0%**	**0%**	
Turnover	***1.2***	***1.4***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**4**	**0**	**0**	**0**	**0**	**0**	**3**	**9**	**6**	**4**	**3**	**0**	**0**	**0**	**0**	**30**
Volume	***30***		IN	*0*	*0*	*0*	*0*	*4*	*4*	*0*	*0*	*0*	*0*	*0*	*7*	*4*	*0*	*4*	*1*	*4*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	**30**

Avg. Duration	***#***	***5.62***	***%***	
1.0	0	0%	0%	
2.0	0	0%	0%	
3.0	7	24%	24%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 4.3 1.4 1.4 0 0 0 0 0 0
4.0	6	19%	43%	0 0 0 0 1.4 0 0 0 0 0 0 0 1.4 0 0 0 2.9 0 0 0 0 0
5.0	4	14%	57%	0 0 0 0 0 1.4 0 0 0 0 0 0 2.9 0 0 0 0 0 0 0 0
6.0	3	10%	67%	0 0 0 0 2.9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
7.0	4	14%	81%	0 0 0 0 0 0 0 0 0 0 0 0 4.3 0 0 0 0 0 0 0
8.0	3	10%	91%	0 0 0 0 0 0 0 0 0 0 0 0 2.9 0 0 0 0 0 0
9.0	0	0%	91%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
10.0	0	0%	91%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
11.0	1	5%	95%	0 0 0 0 0 1.4 0 0 0 0 0 0 0 0 0 0
12.0	1	5%	100%	0 0 0 0 0 1.4 0 0 0 0 0 0 0 0 0
13.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0 0 0 0
14.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0 0 0
15.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0
16.0	0	0%	100%	0
17.0	0	0%	100%	0
18.0	0	0%	100%	0
19.0	0	0%	100%	0
20.0	0	0%	100%	0
21.0	0	0%	100%	0
22.0	0	0%	100%	0
23.0	0	0%	100%	
24.0	0	0%	100%	
25.0	0	0%	100%	
26.0	0	0%	100%	
	30			

Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	5
	Peak Out	12

Year 2020 Projections 5.62

*Hourly Total Volume----------> *				0	0	0	5	9	5	0	2	2	5	12	12	5	5	6	9	**17**	15	11	8	3	0	0	0	
Capacity	***25***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**0**	**5**	**9**	**9**	**9**	**8**	**8**	**3**	**11**	**15**	**15**	**20**	**21**	**23**	**14**	**8**	**3**	**0**	**0**	**0**	**0**	**0**	**178**
Peak Occ.	***23***	***91%***		**0%**	**0%**	**0%**	**0%**	**18%**	**36%**	**36%**	**36%**	**30%**	**30%**	**12%**	**42%**	**60%**	**60%**	**79%**	**85%**	**91%**	**54%**	**30%**	**12%**	**0%**	**0%**	**0%**	**0%**	**0%**	
Turnover	***1.3***	***1.4***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**	**0**	**5**	**0**	**0**	**0**	**0**	**0**	**3**	**9**	**6**	**5**	**3**	**0**	**0**	**0**	**0**	**32**
Volume	***32***		IN	*0*	*0*	*0*	*0*	*5*	*5*	*0*	*0*	*0*	*0*	*0*	*8*	*5*	*0*	*5*	*2*	*5*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	**32**

Avg. Duration	***#***	***5.62***	***%***	
1.0	0	0%	0%	
2.0	0	0%	0%	
3.0	8	24%	24%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 4.6 1.5 1.5 0 0 0 0 0 0
4.0	6	19%	43%	0 0 0 0 1.5 0 0 0 0 0 0 0 1.5 0 0 0 3 0 0 0 0 0
5.0	5	14%	57%	0 0 0 0 0 1.5 0 0 0 0 0 0 3 0 0 0 0 0 0 0 0
6.0	3	9%	67%	0 0 0 0 3 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
7.0	5	15%	81%	0 0 0 0 0 0 0 0 0 0 0 0 4.6 0 0 0 0 0 0 0
8.0	3	9%	91%	0 0 0 0 0 0 0 0 0 0 0 0 3 0 0 0 0 0 0
9.0	0	0%	91%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
10.0	0	0%	91%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
11.0	2	5%	95%	0 0 0 0 0 1.5 0 0 0 0 0 0 0 0 0 0
12.0	2	5%	100%	0 0 0 0 0 1.5 0 0 0 0 0 0 0 0 0
13.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0 0 0 0
14.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0 0 0
15.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0
16.0	0	0%	100%	0
17.0	0	0%	100%	0
18.0	0	0%	100%	0
19.0	0	0%	100%	0
20.0	0	0%	100%	0
21.0	0	0%	100%	0
22.0	0	0%	100%	0
23.0	0	0%	100%	
24.0	0	0%	100%	
25.0	0	0%	100%	
26.0	0	0%	100%	
	32			

Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	0
	Peak Out	1

Year 2020 Projections 5.62

*Hourly Total Volume----------> *				0	0	0	0	1	0	0	0	0	0	1	1	0	0	**0**	1	1	1	1	1	0	0	0	0	
Capacity	***25***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**12**
Peak Occ.	***2***	***6%***		**0%**	**0%**	**0%**	**0%**	**1%**	**2%**	**2%**	**2%**	**2%**	**2%**	**1%**	**3%**	**4%**	**4%**	**5%**	**6%**	**6%**	**4%**	**2%**	**1%**	**0%**	**0%**	**0%**	**0%**	**0%**	
Turnover	***0.1***	***1.4***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
Volume	***2***		IN	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	**2**

Avg. Duration	***#***	***5.62***	***%***																									
1.0	0	0%	0%																									
2.0	0	0%	0%																									
3.0	1	24%	24%	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.1	0.1	0	0	0	0	0	0			
4.0	0	19%	43%	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0.2	0	0	0	0	0			
5.0	0	14%	57%	0	0	0	0	0	0.1	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0				
6.0	0	10%	67%	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
7.0	0	14%	81%	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0						
8.0	0	10%	90%	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0							
9.0	0	0%	90%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
10.0	0	0%	90%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									
11.0	0	5%	95%	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0										
12.0	0	5%	100%	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0											
13.0	0	0%	100%	0	0	0	0	0	0	0	0	0	0	0	0	0												
14.0	0	0%	100%	0	0	0	0	0	0	0	0	0	0	0	0													
15.0	0	0%	100%	0	0	0	0	0	0	0	0	0	0	0														
16.0	0	0%	100%	0																								
17.0	0	0%	100%	0																								
18.0	0	0%	100%	0																								
19.0	0	0%	100%	0																								
20.0	0	0%	100%	0																								
21.0	0	0%	100%	0																								
22.0	0	0%	100%	0																								
23.0	0	0%	100%																									
24.0	0	0%	100%																									
25.0	0	0%	100%																									
26.0	0	0%	100%																									
	2																											

Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	0
	Peak Out	1

Year 2020 Projections 5.62

*Hourly Total Volume----------> *				0	0	0	0	1	0	0	0	0	0	1	1	0	0	**0**	1	1	1	1	1	0	0	0	0	
Capacity	***25***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**12**
Peak Occ.	***2***	***6%***		**0%**	**0%**	**0%**	**0%**	**1%**	**2%**	**2%**	**2%**	**2%**	**2%**	**1%**	**3%**	**4%**	**4%**	**5%**	**6%**	**6%**	**4%**	**2%**	**1%**	**0%**	**0%**	**0%**	**0%**	**0%**	
Turnover	***0.1***	***1.4***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
Volume	***2***		IN	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	**2**

Avg. Duration	***#***	***5.62***	***%***
1.0	0	0%	0%
2.0	0	0%	0%
3.0	1	24%	24%
4.0	0	19%	43%
5.0	0	14%	57%
6.0	0	10%	67%
7.0	0	14%	81%
8.0	0	10%	90%
9.0	0	0%	90%
10.0	0	0%	90%
11.0	0	5%	95%
12.0	0	5%	100%
13.0	0	0%	100%
14.0	0	0%	100%
15.0	0	0%	100%
16.0	0	0%	100%
17.0	0	0%	100%
18.0	0	0%	100%
19.0	0	0%	100%
20.0	0	0%	100%
21.0	0	0%	100%
22.0	0	0%	100%
23.0	0	0%	100%
24.0	0	0%	100%
25.0	0	0%	100%
26.0	0	0%	100%
	2		

3.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.3	0.1	0.1	0	0	0	0	0	0						
4.0	0	0	0	0	0.1	0	0	0	0	0	0	0	0.1	0	0	0	0.2	0	0	0	0	0							
5.0	0	0	0	0	0	0.1	0	0	0	0	0	0	0.2	0	0	0	0	0	0	0	0								
6.0	0	0	0	0	0.2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0									
7.0	0	0	0	0	0	0	0	0	0	0	0	0.3	0	0	0	0	0	0	0										
8.0	0	0	0	0	0	0	0	0	0	0	0	0.2	0	0	0	0	0	0											
9.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0												
10.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0													
11.0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0	0														
12.0	0	0	0	0	0	0.1	0	0	0	0	0	0	0	0															
13.0	0	0	0	0	0	0	0	0	0	0	0	0	0																
14.0	0	0	0	0	0	0	0	0	0	0	0	0																	
15.0	0	0	0	0	0	0	0	0	0	0	0																		
16.0	0	0																											
17.0	0	0																											
18.0	0	0																											
19.0	0	0																											
20.0	0	0																											
21.0	0	0																											
22.0	0	0																											
23.0	0	0																											
24.0	0	0																											
25.0	0	0																											
26.0	0	0																											

Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	0
	Peak Out	1

Year 2020 Projections 5.62

*Hourly Total Volume----------> *				0	0	0	0	1	0	0	0	0	0	1	1	0	0	**0**	1	1	1	1	1	0	0	0	0	
Capacity	***25***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**12**
Peak Occ.	***2***	***6%***		**0%**	**0%**	**0%**	**0%**	**1%**	**2%**	**2%**	**2%**	**2%**	**2%**	**1%**	**3%**	**4%**	**4%**	**5%**	**6%**	**6%**	**4%**	**2%**	**1%**	**0%**	**0%**	**0%**	**0%**	**0%**	
Turnover	***0.1***	***1.4***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
Volume	***2***		IN	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	**2**

Avg. Duration	***#***	***5.62***	***%***	
1.0	0	0%	0%	
2.0	0	0%	0%	
3.0	1	24%	24%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.3 0.1 0.1 0 0 0 0 0 0
4.0	0	19%	43%	0 0 0 0 0.1 0 0 0 0 0 0 0 0.1 0 0 0 0.2 0 0 0 0 0
5.0	0	14%	57%	0 0 0 0 0 0.1 0 0 0 0 0 0 0.2 0 0 0 0 0 0 0 0
6.0	0	10%	67%	0 0 0 0 0.2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
7.0	0	14%	81%	0 0 0 0 0 0 0 0 0 0 0 0.3 0 0 0 0 0 0 0
8.0	0	10%	90%	0 0 0 0 0 0 0 0 0 0 0 0.2 0 0 0 0 0 0
9.0	0	0%	90%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
10.0	0	0%	90%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
11.0	0	5%	95%	0 0 0 0 0 0.1 0 0 0 0 0 0 0 0 0
12.0	0	5%	100%	0 0 0 0 0 0.1 0 0 0 0 0 0 0 0
13.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0 0 0
14.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0 0
15.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0
16.0	0	0%	100%	0
17.0	0	0%	100%	0
18.0	0	0%	100%	0
19.0	0	0%	100%	0
20.0	0	0%	100%	0
21.0	0	0%	100%	0
22.0	0	0%	100%	0
23.0	0	0%	100%	
24.0	0	0%	100%	
25.0	0	0%	100%	
26.0	0	0%	100%	
	2			

Jamestown Island Parking Accumulation

Peak Hour of Generator	Peak In	0
	Peak Out	1

Year 2020 Projections 5.62

*Hourly Total Volume----------> *				0	0	0	0	1	0	0	0	0	0	1	1	0	0	**0**	1	1	1	1	1	0	0	0	0	
Capacity	***25***			**6:30**	**7:00**	**7:30**	**8:00**	**8:30**	**9:00**	**9:30**	**10:00**	**10:30**	**11:00**	**11:30**	**12:00**	**12:30**	**13:00**	**13:30**	**14:00**	**14:30**	**15:00**	**15:30**	**16:00**	**16:30**	**17:00**	**17:30**	**18:00**	**18:30**	
Occupancy				**0**	**0**	**0**	**0**	**0**	**1**	**1**	**1**	**1**	**1**	**0**	**1**	**1**	**1**	**1**	**1**	**2**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**12**
Peak Occ.	***2***	***6%***		**0%**	**0%**	**0%**	**0%**	**1%**	**2%**	**2%**	**2%**	**2%**	**2%**	**1%**	**3%**	**4%**	**4%**	**5%**	**6%**	**6%**	**4%**	**2%**	**1%**	**0%**	**0%**	**0%**	**0%**	**0%**	
Turnover	***0.1***	***1.4***	***OUT***	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**2**
Volume	***2***		IN	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	**2**

Avg. Duration	***#***	***5.62***	***%***	
1.0	0	0%	0%	
2.0	0	0%	0%	
3.0	1	24%	24%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0.3 0.1 0.1 0 0 0 0 0 0
4.0	0	19%	43%	0 0 0 0 0.1 0 0 0 0 0 0 0 0.1 0 0 0 0.2 0 0 0 0 0
5.0	0	14%	57%	0 0 0 0 0 0.1 0 0 0 0 0 0 0.2 0 0 0 0 0 0 0 0
6.0	0	10%	67%	0 0 0 0 0.2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
7.0	0	14%	81%	0 0 0 0 0 0 0 0 0 0 0 0.3 0 0 0 0 0 0 0
8.0	0	10%	90%	0 0 0 0 0 0 0 0 0 0 0 0.2 0 0 0 0 0 0
9.0	0	0%	90%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
10.0	0	0%	90%	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
11.0	0	5%	95%	0 0 0 0 0 0.1 0 0 0 0 0 0 0 0 0
12.0	0	5%	100%	0 0 0 0 0 0.1 0 0 0 0 0 0 0 0
13.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0 0 0
14.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0 0
15.0	0	0%	100%	0 0 0 0 0 0 0 0 0 0 0
16.0	0	0%	100%	0
17.0	0	0%	100%	0
18.0	0	0%	100%	0
19.0	0	0%	100%	0
20.0	0	0%	100%	0
21.0	0	0%	100%	0
22.0	0	0%	100%	0
23.0	0	0%	100%	
24.0	0	0%	100%	
25.0	0	0%	100%	
26.0	0	0%	100%	
	2			

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Water Taxi Mode Split

Travel Time Comparison/Estimated Mode Split Between the Neck of Land Parcel and Jamestown Island

		Composite Travel Time Estimates Between Jamestown Island and Neck of Land Parcel											
		Boat/Tram Mode				Walk Mode			Total				
Alternative	Mode	Distance (miles)	Travel Time (minutes)	Average Waiting Time (minutes)	Average Operating Speed (mph)	Distance (miles)	Travel Time (minutes)	Average Operating Speed (mph)	Distance (miles)	Optimal Travel Time (minutes)	Average Travel Time (minutes)	Average Operating Speed (mph)	Mode Split**
B	Boat Mode	0.42	11.89	9.51	10.50	0.23	5.00	2.73	0.64	7.38	16.89	2.29	33%
	Hiking Trail	NA	NA	NA	NA	0.64	14.17	2.73	0.64	14.17	14.17	2.73	34%
	Tram	1.75	16.34	9.34	15.00	NA	NA	NA	1.75	7.00	16.34	6.43	33%
C	Boat Mode	0.42	11.89	9.51	10.50	0.23	5.00	2.73	0.64	6.90	16.89	2.29	50%
	Hiking Trail*	NA	NA	NA	NA	1.21	26.67	2.73	1.21	26.67	26.67	2.73	0%
	Tram	1.75	16.34	9.34	15.00	NA	NA	NA	1.75	7.00	16.34	6.43	50%
E	Boat Mode	0.32	11.13	9.29	10.50	0.23	5.00	2.73	0.55	6.68	16.13	2.04	50%
	Hiking Trail*	NA	NA	NA	NA	1.14	25.00	2.73	1.14	25.00	25.00	2.73	0%
	Tram	1.75	16.34	9.34	15.00	NA	NA	NA	1.75	7.00	16.34	6.43	50%

* Hiking trail does not provide direct connection to Jamestown Island and is in excess of 1.2 miles. Mode is not competitive.

** Mode split calculated based on the individual mode's impedance (average travel time for all modes versus individual mode).

Average Travel Time Summary Between Neck of Land Parcel and Jamestown Island for Alternative B

Transit Arrival Schedule	minute	Travel Time (minutes) Walking	Boat	Tram	Total	Travel Time Ratio (Average/Mode) Walking	Boat	Tram	Total	Estimated Mode Split Walking	Boat	Tram	Total
Tram	0	14.17	17.38	7.00	12.85	0.91	0.74	1.84	3.48	26%	21%	53%	100%
	1	14.17	16.38	26.00	18.85	1.33	1.15	0.72	3.21	41%	36%	23%	100%
	2	14.17	15.38	25.00	18.18	1.28	1.18	0.73	3.19	40%	37%	23%	100%
	3	14.17	14.38	24.00	17.52	1.24	1.22	0.73	3.18	39%	38%	23%	100%
	4	14.17	13.38	23.00	16.85	1.19	1.26	0.73	3.18	37%	40%	23%	100%
	5	14.17	12.38	22.00	16.18	1.14	1.31	0.74	3.18	36%	41%	23%	100%
	6	14.17	11.38	21.00	15.52	1.10	1.36	0.74	3.20	34%	43%	23%	100%
	7	14.17	10.38	20.00	14.85	1.05	1.43	0.74	3.22	33%	44%	23%	100%
	8	14.17	9.38	19.00	14.18	1.00	1.51	0.75	3.26	31%	46%	23%	100%
	9	14.17	8.38	18.00	13.52	0.95	1.61	0.75	3.32	29%	49%	23%	100%
Boat	10	14.17	7.38	17.00	12.85	0.91	1.74	0.76	3.40	27%	51%	22%	100%
	11	14.17	26.38	16.00	18.85	1.33	0.71	1.18	3.22	41%	22%	37%	100%
	12	14.17	25.38	15.00	18.18	1.28	0.72	1.21	3.21	40%	22%	38%	100%
	13	14.17	24.38	14.00	17.52	1.24	0.72	1.25	3.21	39%	22%	39%	100%
	14	14.17	23.38	13.00	16.85	1.19	0.72	1.30	3.21	37%	22%	40%	100%
	15	14.17	22.38	12.00	16.18	1.14	0.72	1.35	3.21	36%	22%	42%	100%
	16	14.17	21.38	11.00	15.52	1.10	0.73	1.41	3.23	34%	22%	44%	100%
	17	14.17	20.38	10.00	14.85	1.05	0.73	1.48	3.26	32%	22%	46%	100%
	18	14.17	19.38	9.00	14.18	1.00	0.73	1.58	3.31	30%	22%	48%	100%
	19	14.17	18.38	8.00	13.52	0.95	0.74	1.69	3.38	28%	22%	50%	100%
Tram	20	14.17	17.38	7.00	12.85	0.91	0.74	1.84	3.48	26%	21%	53%	100%
	21	14.17	16.38	26.00	18.85	1.33	1.15	0.72	3.21	41%	36%	23%	100%
	22	14.17	15.38	25.00	18.18	1.28	1.18	0.73	3.19	40%	37%	23%	100%
	23	14.17	14.38	24.00	17.52	1.24	1.22	0.73	3.18	39%	38%	23%	100%
	24	14.17	13.38	23.00	16.85	1.19	1.26	0.73	3.18	37%	40%	23%	100%
	25	14.17	12.38	22.00	16.18	1.14	1.31	0.74	3.18	36%	41%	23%	100%
	26	14.17	11.38	21.00	15.52	1.10	1.36	0.74	3.20	34%	43%	23%	100%
	27	14.17	10.38	20.00	14.85	1.05	1.43	0.74	3.22	33%	44%	23%	100%
	28	14.17	9.38	19.00	14.18	1.00	1.51	0.75	3.26	31%	46%	23%	100%
	29	14.17	8.38	18.00	13.52	0.95	1.61	0.75	3.32	29%	49%	23%	100%
Boat	30	14.17	7.38	17.00	12.85	0.91	1.74	0.76	3.40	27%	51%	22%	100%
	31	14.17	26.38	16.00	18.85	1.33	0.71	1.18	3.22	41%	22%	37%	100%
	32	14.17	25.38	15.00	18.18	1.28	0.72	1.21	3.21	40%	22%	38%	100%
	33	14.17	24.38	14.00	17.52	1.24	0.72	1.25	3.21	39%	22%	39%	100%
	34	14.17	23.38	13.00	16.85	1.19	0.72	1.30	3.21	37%	22%	40%	100%
	35	14.17	22.38	12.00	16.18	1.14	0.72	1.35	3.21	36%	22%	42%	100%
	36	14.17	21.38	11.00	15.52	1.10	0.73	1.41	3.23	34%	22%	44%	100%
	37	14.17	20.38	10.00	14.85	1.05	0.73	1.48	3.26	32%	22%	46%	100%
	38	14.17	19.38	9.00	14.18	1.00	0.73	1.58	3.31	30%	22%	48%	100%
	39	14.17	18.38	8.00	13.52	0.95	0.74	1.69	3.38	28%	22%	50%	100%
Tram	40	14.17	17.38	7.00	12.85	0.91	0.74	1.84	3.48	26%	21%	53%	100%
	41	14.17	16.38	26.00	18.85	1.33	1.15	0.72	3.21	41%	36%	23%	100%
	42	14.17	15.38	25.00	18.18	1.28	1.18	0.73	3.19	40%	37%	23%	100%
	43	14.17	14.38	24.00	17.52	1.24	1.22	0.73	3.18	39%	38%	23%	100%
	44	14.17	13.38	23.00	16.85	1.19	1.26	0.73	3.18	37%	40%	23%	100%
	45	14.17	12.38	22.00	16.18	1.14	1.31	0.74	3.18	36%	41%	23%	100%
	46	14.17	11.38	21.00	15.52	1.10	1.36	0.74	3.20	34%	43%	23%	100%
	47	14.17	10.38	20.00	14.85	1.05	1.43	0.74	3.22	33%	44%	23%	100%
	48	14.17	9.38	19.00	14.18	1.00	1.51	0.75	3.26	31%	46%	23%	100%
	49	14.17	8.38	18.00	13.52	0.95	1.61	0.75	3.32	29%	49%	23%	100%
Boat	50	14.17	7.38	17.00	12.85	0.91	1.74	0.76	3.40	27%	51%	22%	100%
	51	14.17	26.38	16.00	18.85	1.33	0.71	1.18	3.22	41%	22%	37%	100%
	52	14.17	25.38	15.00	18.18	1.28	0.72	1.21	3.21	40%	22%	38%	100%
	53	14.17	24.38	14.00	17.52	1.24	0.72	1.25	3.21	39%	22%	39%	100%
	54	14.17	23.38	13.00	16.85	1.19	0.72	1.30	3.21	37%	22%	40%	100%
	55	14.17	22.38	12.00	16.18	1.14	0.72	1.35	3.21	36%	22%	42%	100%
	56	14.17	21.38	11.00	15.52	1.10	0.73	1.41	3.23	34%	22%	44%	100%
	57	14.17	20.38	10.00	14.85	1.05	0.73	1.48	3.26	32%	22%	46%	100%
	58	14.17	19.38	9.00	14.18	1.00	0.73	1.58	3.31	30%	22%	48%	100%
	59	14.17	18.38	8.00	13.52	0.95	0.74	1.69	3.38	28%	22%	50%	100%
Tram	60	14.17	17.38	7.00	12.85	0.91	0.74	1.84	3.48	26%	21%	53%	100%
AVERAGE		**14.17**	**16.89**	**16.34**	**15.80**	**1.12**	**1.05**	**1.10**	**3.26**	**34%**	**33%**	**33%**	**100%**

Average Travel Time Summary Between the Neck of Land Parcel and Jamestown Island for Alternative C

Transit Arrival Schedule	minute	Travel Time (minutes) Walking	Boat	Tram	Total	Travel Time Ratio (Average/Mode) Walking	Boat	Tram	Total	Estimated Mode Split Walking	Boat	Tram	Total
Tram	0	26.67	16.90	7.00	16.86	0.00	1.00	2.41	3.41	0%	29%	71%	100%
	1	26.67	15.90	26.00	22.86	0.00	1.44	0.88	2.32	0%	62%	38%	100%
	2	26.67	14.90	25.00	22.19	0.00	1.49	0.89	2.38	0%	63%	37%	100%
	3	26.67	13.90	24.00	21.52	0.00	1.55	0.90	2.45	0%	63%	37%	100%
	4	26.67	12.90	23.00	20.86	0.00	1.62	0.91	2.52	0%	64%	36%	100%
	5	26.67	11.90	22.00	20.19	0.00	1.70	0.92	2.61	0%	65%	35%	100%
	6	26.67	10.90	21.00	19.52	0.00	1.79	0.93	2.72	0%	66%	34%	100%
	7	26.67	9.90	20.00	18.86	0.00	1.90	0.94	2.85	0%	67%	33%	100%
	8	26.67	8.90	19.00	18.19	0.00	2.04	0.96	3.00	0%	68%	32%	100%
	9	26.67	7.90	18.00	17.52	0.00	2.22	0.97	3.19	0%	69%	31%	100%
Boat	10	26.67	6.90	17.00	16.86	0.00	2.44	0.99	3.43	0%	71%	29%	100%
	11	26.67	25.90	16.00	22.86	0.00	0.88	1.43	2.31	0%	38%	62%	100%
	12	26.67	24.90	15.00	22.19	0.00	0.89	1.48	2.37	0%	38%	62%	100%
	13	26.67	23.90	14.00	21.52	0.00	0.90	1.54	2.44	0%	37%	63%	100%
	14	26.67	22.90	13.00	20.86	0.00	0.91	1.60	2.51	0%	36%	64%	100%
	15	26.67	21.90	12.00	20.19	0.00	0.92	1.68	2.60	0%	35%	65%	100%
	16	26.67	20.90	11.00	19.52	0.00	0.93	1.77	2.71	0%	34%	66%	100%
	17	26.67	19.90	10.00	18.86	0.00	0.95	1.89	2.83	0%	33%	67%	100%
	18	26.67	18.90	9.00	18.19	0.00	0.96	2.02	2.98	0%	32%	68%	100%
	19	26.67	17.90	8.00	17.52	0.00	0.98	2.19	3.17	0%	31%	69%	100%
Tram	20	26.67	16.90	7.00	16.86	0.00	1.00	2.41	3.41	0%	29%	71%	100%
	21	26.67	15.90	26.00	22.86	0.00	1.44	0.88	2.32	0%	62%	38%	100%
	22	26.67	14.90	25.00	22.19	0.00	1.49	0.89	2.38	0%	63%	37%	100%
	23	26.67	13.90	24.00	21.52	0.00	1.55	0.90	2.45	0%	63%	37%	100%
	24	26.67	12.90	23.00	20.86	0.00	1.62	0.91	2.52	0%	64%	36%	100%
	25	26.67	11.90	22.00	20.19	0.00	1.70	0.92	2.61	0%	65%	35%	100%
	26	26.67	10.90	21.00	19.52	0.00	1.79	0.93	2.72	0%	66%	34%	100%
	27	26.67	9.90	20.00	18.86	0.00	1.90	0.94	2.85	0%	67%	33%	100%
	28	26.67	8.90	19.00	18.19	0.00	2.04	0.96	3.00	0%	68%	32%	100%
	29	26.67	7.90	18.00	17.52	0.00	2.22	0.97	3.19	0%	69%	31%	100%
Boat	30	26.67	6.90	17.00	16.86	0.00	2.44	0.99	3.43	0%	71%	29%	100%
	31	26.67	25.90	16.00	22.86	0.00	0.88	1.43	2.31	0%	38%	62%	100%
	32	26.67	24.90	15.00	22.19	0.00	0.89	1.48	2.37	0%	38%	62%	100%
	33	26.67	23.90	14.00	21.52	0.00	0.90	1.54	2.44	0%	37%	63%	100%
	34	26.67	22.90	13.00	20.86	0.00	0.91	1.60	2.51	0%	36%	64%	100%
	35	26.67	21.90	12.00	20.19	0.00	0.92	1.68	2.60	0%	35%	65%	100%
	36	26.67	20.90	11.00	19.52	0.00	0.93	1.77	2.71	0%	34%	66%	100%
	37	26.67	19.90	10.00	18.86	0.00	0.95	1.89	2.83	0%	33%	67%	100%
	38	26.67	18.90	9.00	18.19	0.00	0.96	2.02	2.98	0%	32%	68%	100%
	39	26.67	17.90	8.00	17.52	0.00	0.98	2.19	3.17	0%	31%	69%	100%
Tram	40	26.67	16.90	7.00	16.86	0.00	1.00	2.41	3.41	0%	29%	71%	100%
	41	26.67	15.90	26.00	22.86	0.00	1.44	0.88	2.32	0%	62%	38%	100%
	42	26.67	14.90	25.00	22.19	0.00	1.49	0.89	2.38	0%	63%	37%	100%
	43	26.67	13.90	24.00	21.52	0.00	1.55	0.90	2.45	0%	63%	37%	100%
	44	26.67	12.90	23.00	20.86	0.00	1.62	0.91	2.52	0%	64%	36%	100%
	45	26.67	11.90	22.00	20.19	0.00	1.70	0.92	2.61	0%	65%	35%	100%
	46	26.67	10.90	21.00	19.52	0.00	1.79	0.93	2.72	0%	66%	34%	100%
	47	26.67	9.90	20.00	18.86	0.00	1.90	0.94	2.85	0%	67%	33%	100%
	48	26.67	8.90	19.00	18.19	0.00	2.04	0.96	3.00	0%	68%	32%	100%
	49	26.67	7.90	18.00	17.52	0.00	2.22	0.97	3.19	0%	69%	31%	100%
Boat	50	26.67	6.90	17.00	16.86	0.00	2.44	0.99	3.43	0%	71%	29%	100%
	51	26.67	25.90	16.00	22.86	0.00	0.88	1.43	2.31	0%	38%	62%	100%
	52	26.67	24.90	15.00	22.19	0.00	0.89	1.48	2.37	0%	38%	62%	100%
	53	26.67	23.90	14.00	21.52	0.00	0.90	1.54	2.44	0%	37%	63%	100%
	54	26.67	22.90	13.00	20.86	0.00	0.91	1.60	2.51	0%	36%	64%	100%
	55	26.67	21.90	12.00	20.19	0.00	0.92	1.68	2.60	0%	35%	65%	100%
	56	26.67	20.90	11.00	19.52	0.00	0.93	1.77	2.71	0%	34%	66%	100%
	57	26.67	19.90	10.00	18.86	0.00	0.95	1.89	2.83	0%	33%	67%	100%
	58	26.67	18.90	9.00	18.19	0.00	0.96	2.02	2.98	0%	32%	68%	100%
	59	26.67	17.90	8.00	17.52	0.00	0.98	2.19	3.17	0%	31%	69%	100%
Tram	60	26.67	16.90	7.00	16.86	0.00	1.00	2.41	3.41	0%	29%	71%	100%
AVERAGE		**0.00**	**16.41**	**16.34**	**19.81**	**0.00**	**1.21**	**1.21**	**2.42**	**0%**	**50%**	**50%**	**100%**

Walking Mode in excess of 1.2 miles - not competitive

Average Travel Time Summary Between the Neck of Land Parcel and Jamestown Island for Alternative E

Transit Arrival Schedule	minute	Travel Time (minutes) Walking	Boat	Tram	Total	Travel Time Ratio (Average/Mode) Walking	Boat	Tram	Total	Estimated Mode Split Walking	Boat	Tram	Total
Tram	0	25.00	16.68	7.00	16.23	0.00	0.97	2.32	3.29	0%	30%	70%	100%
	1	25.00	15.68	26.00	22.23	0.00	1.42	0.85	2.27	0%	62%	38%	100%
	2	25.00	14.68	25.00	21.56	0.00	1.47	0.86	2.33	0%	63%	37%	100%
	3	25.00	13.68	24.00	20.89	0.00	1.53	0.87	2.40	0%	64%	36%	100%
	4	25.00	12.68	23.00	20.23	0.00	1.60	0.88	2.47	0%	64%	36%	100%
	5	25.00	11.68	22.00	19.56	0.00	1.67	0.89	2.56	0%	65%	35%	100%
	6	25.00	10.68	21.00	18.89	0.00	1.77	0.90	2.67	0%	66%	34%	100%
	7	25.00	9.68	20.00	18.23	0.00	1.88	0.91	2.79	0%	67%	33%	100%
	8	25.00	8.68	19.00	17.56	0.00	2.02	0.92	2.95	0%	69%	31%	100%
	9	25.00	7.68	18.00	16.89	0.00	2.20	0.94	3.14	0%	70%	30%	100%
Boat	10	25.00	6.68	17.00	16.23	0.00	2.43	0.95	3.38	0%	72%	28%	100%
	11	25.00	25.68	16.00	22.23	0.00	0.87	1.39	2.25	0%	38%	62%	100%
	12	25.00	24.68	15.00	21.56	0.00	0.87	1.44	2.31	0%	38%	62%	100%
	13	25.00	23.68	14.00	20.89	0.00	0.88	1.49	2.37	0%	37%	63%	100%
	14	25.00	22.68	13.00	20.23	0.00	0.89	1.56	2.45	0%	36%	64%	100%
	15	25.00	21.68	12.00	19.56	0.00	0.90	1.63	2.53	0%	36%	64%	100%
	16	25.00	20.68	11.00	18.89	0.00	0.91	1.72	2.63	0%	35%	65%	100%
	17	25.00	19.68	10.00	18.23	0.00	0.93	1.82	2.75	0%	34%	66%	100%
	18	25.00	18.68	9.00	17.56	0.00	0.94	1.95	2.89	0%	33%	67%	100%
	19	25.00	17.68	8.00	16.89	0.00	0.96	2.11	3.07	0%	31%	69%	100%
Tram	20	25.00	16.68	7.00	16.23	0.00	0.97	2.32	3.29	0%	30%	70%	100%
	21	25.00	15.68	26.00	22.23	0.00	1.42	0.85	2.27	0%	62%	38%	100%
	22	25.00	14.68	25.00	21.56	0.00	1.47	0.86	2.33	0%	63%	37%	100%
	23	25.00	13.68	24.00	20.89	0.00	1.53	0.87	2.40	0%	64%	36%	100%
	24	25.00	12.68	23.00	20.23	0.00	1.60	0.88	2.47	0%	64%	36%	100%
	25	25.00	11.68	22.00	19.56	0.00	1.67	0.89	2.56	0%	65%	35%	100%
	26	25.00	10.68	21.00	18.89	0.00	1.77	0.90	2.67	0%	66%	34%	100%
	27	25.00	9.68	20.00	18.23	0.00	1.88	0.91	2.79	0%	67%	33%	100%
	28	25.00	8.68	19.00	17.56	0.00	2.02	0.92	2.95	0%	69%	31%	100%
	29	25.00	7.68	18.00	16.89	0.00	2.20	0.94	3.14	0%	70%	30%	100%
Boat	30	25.00	6.68	17.00	16.23	0.00	2.43	0.95	3.38	0%	72%	28%	100%
	31	25.00	25.68	16.00	22.23	0.00	0.87	1.39	2.25	0%	38%	62%	100%
	32	25.00	24.68	15.00	21.56	0.00	0.87	1.44	2.31	0%	38%	62%	100%
	33	25.00	23.68	14.00	20.89	0.00	0.88	1.49	2.37	0%	37%	63%	100%
	34	25.00	22.68	13.00	20.23	0.00	0.89	1.56	2.45	0%	36%	64%	100%
	35	25.00	21.68	12.00	19.56	0.00	0.90	1.63	2.53	0%	36%	64%	100%
	36	25.00	20.68	11.00	18.89	0.00	0.91	1.72	2.63	0%	35%	65%	100%
	37	25.00	19.68	10.00	18.23	0.00	0.93	1.82	2.75	0%	34%	66%	100%
	38	25.00	18.68	9.00	17.56	0.00	0.94	1.95	2.89	0%	33%	67%	100%
	39	25.00	17.68	8.00	16.89	0.00	0.96	2.11	3.07	0%	31%	69%	100%
Tram	40	25.00	16.68	7.00	16.23	0.00	0.97	2.32	3.29	0%	30%	70%	100%
	41	25.00	15.68	26.00	22.23	0.00	1.42	0.85	2.27	0%	62%	38%	100%
	42	25.00	14.68	25.00	21.56	0.00	1.47	0.86	2.33	0%	63%	37%	100%
	43	25.00	13.68	24.00	20.89	0.00	1.53	0.87	2.40	0%	64%	36%	100%
	44	25.00	12.68	23.00	20.23	0.00	1.60	0.88	2.47	0%	64%	36%	100%
	45	25.00	11.68	22.00	19.56	0.00	1.67	0.89	2.56	0%	65%	35%	100%
	46	25.00	10.68	21.00	18.89	0.00	1.77	0.90	2.67	0%	66%	34%	100%
	47	25.00	9.68	20.00	18.23	0.00	1.88	0.91	2.79	0%	67%	33%	100%
	48	25.00	8.68	19.00	17.56	0.00	2.02	0.92	2.95	0%	69%	31%	100%
	49	25.00	7.68	18.00	16.89	0.00	2.20	0.94	3.14	0%	70%	30%	100%
Boat	50	25.00	6.68	17.00	16.23	0.00	2.43	0.95	3.38	0%	72%	28%	100%
	51	25.00	25.68	16.00	22.23	0.00	0.87	1.39	2.25	0%	38%	62%	100%
	52	25.00	24.68	15.00	21.56	0.00	0.87	1.44	2.31	0%	38%	62%	100%
	53	25.00	23.68	14.00	20.89	0.00	0.88	1.49	2.37	0%	37%	63%	100%
	54	25.00	22.68	13.00	20.23	0.00	0.89	1.56	2.45	0%	36%	64%	100%
	55	25.00	21.68	12.00	19.56	0.00	0.90	1.63	2.53	0%	36%	64%	100%
	56	25.00	20.68	11.00	18.89	0.00	0.91	1.72	2.63	0%	35%	65%	100%
	57	25.00	19.68	10.00	18.23	0.00	0.93	1.82	2.75	0%	34%	66%	100%
	58	25.00	18.68	9.00	17.56	0.00	0.94	1.95	2.89	0%	33%	67%	100%
	59	25.00	17.68	8.00	16.89	0.00	0.96	2.11	3.07	0%	31%	69%	100%
Tram	60	25.00	16.68	7.00	16.23	0.00	0.97	2.32	3.29	0%	30%	70%	100%
AVERAGE		**0.00**	**16.19**	**16.34**	**19.18**	**0.00**	**1.18**	**1.17**	**2.36**	**0%**	**50%**	**50%**	**100%**

Walking Mode in excess of 1.2 miles - not competitive

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Water Taxi Cost Analysis

		Proposed Service: Pontoon, 50-60 passengers		
		Scenario B	Scenario C	Scenario E
Direct Operations & Maintenance Costs				
Vessels continuously operating		1	1	1
Total number of vessels		2	2	2
Revenue hours per year		2100	2100	2100
Vessel-revenue-hours per year		2100	2100	2100
Number of docks		3	3	2
Fuel		$8,400	$8,400	$8,400
Outside services		$6,000	$6,000	$6,000
Vessel supplies		$1,200	$1,200	$1,200
Engine replacement		$7,140	$7,140	$7,140
Vessel maintenance		$10,500	$10,500	$10,500
Dock maintenance		$4,500	$4,500	$3,000
Payroll		$70,980	$70,980	$70,980
Insurance		$30,000	$30,000	$30,000
Total		$138,720	$138,720	$137,220
Direct O&M Cost per ves-rev-hour		$66.06	$66.06	$65.34
Administrative Overhead				
Salaries/wages		$90,838	$90,838	$90,838
Office supplies/services		$1,500	$1,500	$1,500
Advertising/marketing		NA	NA	NA
Car/travel		NA	NA	NA
Accounting/legal		$5,000	$5,000	$5,000
Telephone/utilities		$10,000	$10,000	$10,000
Insurance		NA	NA	NA
Other	5%	$12,303	$12,303	$12,228
Fee	8%	$19,685	$19,685	$19,565
Total		$137,825	$137,825	$137,630
Total Operating Costs		**$276,545**	**$276,545**	**$274,850**
Total Operating Cost per vessel-revenue-hour		$131.69	$131.69	$130.88
Total Operating Cost per seat/vessel/year		$1,536	$1,536	$1,527

Direct Operating Costs - Calculations

Vessel-revenue-hour calculation

Months per year	7
Days per month	30
Rev-hours per day	10
Rev-hours per year	2100
Vehicles	2
Ves-rev-hour per year	4200

Assumption: Assumes 2 boats in revenue use. Third boat is kept as a spare and potentially for peak periods.

Fuel cost calculation

Rev-hours per year	2100
Gallons/engine per hour	2
Engines	2
$/gal	$1.00
Fuel cost per year	$8,400.00

Assumption: From Kane. Based on historical values from 47' pontoon boat with twin 100 hp 2-cycle engines. Extrapolated from Honda Marine prop tests for 75 hp four stroke engine.

Fuel price average for year 2001.

Payroll calculation

Rev-hour per year	2100
Captain per vessel	1
Crew per vessel	1
Captain's wage per hour	$15
Crew's wage per hour	$11
Base wages per year (per vessel)	$54,600
Overtime and benefits (30% of wages)	$16,380.0
Payroll cost per year (per vessel)	$70,980.0

Assumption: Wages from VHB's Winthrop study. Do not include overtime and benefits.

Insurance calculation

Insurance cost per vessel	$15,000

Assumption: This cost is taken from Tom Mountjoy's estimate, and includes liability.

Engine replacement calculation

Life cycle of engine (hours)	5,000
Cost of engine (Honda Marine BF75)	$8,500

Assumption: From Kane. Historical engine life for outboard motors on 47' pontoon boats. Engine life is average based on estimates by Kane and Honda marine dealer.

Vessel maintenance cost calculation

Rev-hours per year	2100
Cost per ves-rev-hour	$5
Cost per year	$10,500

Assumption: Kane; Historic costs per vessel.

Administrative Overhead Costs - Calculations

	Wage/hr	Hours	Base wage cost
Salary/wage calculation			
Business manager/supervisor	$17	2875	$48,875
Bookkeeper/general shore staff	$10	2100	$21,000
Subtotal			$69,875
Benefits/overtime @ 30% of base			$20,963
Wages total			$90,838

Assumption: Assumes business manager works during all operating hours, plus half-time during the 5 off-season months.

Fee Calculation

Fee rate	8%

Assumption: Our calculation assumes that fee would be charged on all cost components besides the "other" category in Administrative Overhead. This essentially assumes that all services would be outsourced to one contractor, and they would charge a fee on all services. If the Park Service separately contracted for services such as dock maintenance, the 8% fee might not apply to that cost.

Sources:

1. Ed Kane, Harbor Boating, Baltimore, Md. Telephone interview 1/2/02. Mr. Kane has been running pontoon boats in a water taxi service on the Inner Harbor for over 20 years.
2. Tom Mountjoy, Recreational Concepts, Inc. Telephone interview 10/xx/01. Mr. Mountjoy is the manager of the Jamestown Explorer, the scenic nature pontoon boat cruise service operating from Jamestown Marina on Powhatan Creek.

Annualized Capital Costs for Components

Item	Total Cost (present day)	Life Cycle	Annualization Factor	Annualized Capital Cost
Vessel	$66,667	25	0.086	$5,720.73
Dock	$50,000	25	0.086	$4,290.53

Discount rate 0.07

Annualized Capital Costs By Operating Scenario

	Scenario B	Scenario C	Scenario E
Total Number of Vessels	2	2	2
Annualized Vessel Cost	$11,441.46	$11,441.46	$11,441.46
Number of Docks	3	3	2
Annualized Dock Cost	$12,871.58	$12,871.58	$8,581.05
Annualized Capital Costs	$24,313.04	$24,313.04	$20,022.51

		Proposed Service: Pontoon, 50-60 passengers		
		Scenario B	Scenario C	Scenario E
Direct Operations & Maintenance Costs				
Fuel		$8,400	$8,400	$8,400
Outside services		$6,000	$6,000	$6,000
Vessel supplies		$1,200	$1,200	$1,200
Engine replacement		$7,140	$7,140	$7,140
Vessel maintenance		$10,500	$10,500	$10,500
Dock maintenance		$4,500	$4,500	$3,000
Payroll		$70,980	$70,980	$70,980
Insurance		$30,000	$30,000	$30,000
Total		**$138,720**	**$138,720**	**$137,220**
Administrative Overhead				
Salaries/wages		$90,838	$90,838	$90,838
Office supplies/services		$1,500	$1,500	$1,500
Advertising/marketing		NA	NA	NA
Car/travel		NA	NA	NA
Accounting/legal		$5,000	$5,000	$5,000
Telephone/utilities		$10,000	$10,000	$10,000
Insurance		NA	NA	NA
Other	5%	$12,303	$12,303	$12,228
Fee	10%	$19,685	$19,685	$19,565
Total		**$137,825**	**$137,825**	**$137,630**
Total Operating Costs		**$276,545**	**$276,545**	**$274,850**
Annualized Capital Costs				
Annualized Vessel Cost		$11,441	$11,441	$11,441
Annualized Dock Cost		$12,872	$12,872	$8,581
Total Annualized Capital Cost		**$24,313**	**$24,313**	**$20,023**
Total Annual Cost		**$300,858**	**$300,858**	**$294,872**
Projected Ridership (Round Trips)		**136,400**	**266,440**	**103,800**
Breakeven Fare Per Round Trip		**$2.21**	**$1.13**	**$2.84**

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Highway Capacity Analysis Worksheets

TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	SEA	Intersection	Colonial Parkway at Route 359
Agency/Co.	VHB	Jurisdiction	NPS
Date Performed	7/24/2001	Analysis Year	2000
Analysis Time Period	Peak Hour		

Project Description	NPS/Jamestown Island
East/West Street: Route 359	North/South Street: Colonial Parkway
Intersection Orientation: North-South	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Northbound			Southbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	77	72	0	0	19	46
Peak-Hour Factor, PHF	0.85	0.85	1.00	0.85	0.85	0.85
Hourly Flow Rate, HFR	90	84	0	0	22	54
Percent Heavy Vehicles	2	—	—	0	—	—
Median Type	Raised curb					
RT Channelized			0			1
Lanes	1	1	0	1	1	1
Configuration	L	T		L	T	R
Upstream Signal		0			0	

Minor Street	Westbound			Eastbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	2	4	131	1	17
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	0	2	4	154	1	19
Percent Heavy Vehicles	0	2	2	2	0	2
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	NB	SB	Westbound			Eastbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	L		LTR			LTR	
v (vph)	90	0		6			174	
C (m) (vph)	1593	1526		795			652	
v/c	0.06	0.00		0.01			0.27	
95% queue length	0.18	0.00		0.02			1.07	
Control Delay	7.4	7.4		9.6			12.5	
LOS	A	A		A			B	
Approach Delay	—	—	9.6			12.5		
Approach LOS	—	—	A			B		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	SEA
Agency/Co.	VHB
Date Performed	9/21/2001
Analysis Time Period	July Peak Hour

Site Information

Intersection	Colonial Parkway at Rte 359
Jurisdiction	NPS
Analysis Year	2020 Alternative A

Project Description 31005/Jamestown Island

East/West Street: Colonial Parkway | North/South Street: Route 359

Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	57	57	0	0	43	52
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	67	67	0	0	50	61
Percent Heavy Vehicles	2	—	—	0	—	—
Median Type	Raised curb					
RT Channelized			0			1
Lanes	1	1	0	0	1	1
Configuration	L		TR	LT		R
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	3	8	146	1	41
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	2	3	9	171	1	48
Percent Heavy Vehicles	100	2	25	2	2	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	LT		LTR			LTR	
v (vph)	67	0		14			220	
C (m) (vph)	1557	1547		752			721	
v/c	0.04	0.00		0.02			0.31	
95% queue length	0.13	0.00		0.06			1.29	
Control Delay	7.4	7.3		9.9			12.2	
LOS	A	A		A			B	
Approach Delay	—	—	9.9			12.2		
Approach LOS	—	—	A			B		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	SEA
Agency/Co.	VHB
Date Performed	12/5/2001
Analysis Time Period	July Peak Hour

Site Information

Intersection	Colonial Parkway at Rte 359
Jurisdiction	NPS
Analysis Year	2020 Alternative B

Project Description 31005/Jamestown Island

East/West Street: Colonial Parkway | North/South Street: Route 359

Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	55	28	0	0	12	76
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	64	32	0	0	14	89
Percent Heavy Vehicles	2	—	—	0	—	—
Median Type	Raised curb					
RT Channelized			0			1
Lanes	1	1	0	0	1	1
Configuration	L		TR	LT		R
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	3	8	165	1	43
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	2	3	9	194	1	50
Percent Heavy Vehicles	100	2	25	2	2	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	LT		LTR			LTR	
v (vph)	64	0		14			245	
C (m) (vph)	1604	1593		796			768	
v/c	0.04	0.00		0.02			0.32	
95% queue length	0.12	0.00		0.05			1.38	
Control Delay	7.3	7.3		9.6			11.9	
LOS	A	A		A			B	
Approach Delay	—	—	9.6			11.9		
Approach LOS	—	—	A			B		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	SEA	Intersection	Colonial Parkway at Rte 359
Agency/Co.	VHB	Jurisdiction	NPS
Date Performed	12/5/2001	Analysis Year	2020 Alternative C
Analysis Time Period	July Peak Hour		

Project Description	31005/Jamestown Island
East/West Street: Colonial Parkway	North/South Street: Route 359
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	53	38	0	0	31	78
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	62	44	0	0	36	91
Percent Heavy Vehicles	2	—	—	0	—	—
Median Type	Raised curb					
RT Channelized			0			1
Lanes	1	1	0	0	1	1
Configuration	L		TR	LT		R
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	3	8	175	1	33
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	2	3	9	205	1	38
Percent Heavy Vehicles	100	2	25	2	2	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	LT		LTR			LTR	
v (vph)	62	0		14			244	
C (m) (vph)	1575	1577		782			740	
v/c	0.04	0.00		0.02			0.33	
95% queue length	0.12	0.00		0.05			1.44	
Control Delay	7.4	7.3		9.7			12.2	
LOS	A	A		A			B	
Approach Delay	—	—	9.7			12.2		
Approach LOS	—	—	A			B		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	SEA	Intersection	Colonial Parkway at Rte 359
Agency/Co.	VHB	Jurisdiction	NPS
Date Performed	9/21/2001	Analysis Year	2020 Alternative D
Analysis Time Period	July Peak Hour		

Project Description 31005/Jamestown Island

East/West Street: Colonial Parkway	North/South Street: Route 359
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	66	67	0	0	52	52
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	77	78	0	0	61	61
Percent Heavy Vehicles	2	—	—	0	—	—
Median Type	Raised curb					
RT Channelized			0			1
Lanes	1	1	0	0	1	1
Configuration	L		TR	LT		R
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	3	8	146	1	49
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	2	3	9	171	1	57
Percent Heavy Vehicles	100	2	25	2	2	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	LT		LTR			LTR	
v (vph)	77	0		14			229	
C (m) (vph)	1542	1533		726			698	
v/c	0.05	0.00		0.02			0.33	
95% queue length	0.16	0.00		0.06			1.43	
Control Delay	7.5	7.3		10.1			12.7	
LOS	A	A		B			B	
Approach Delay	—	—	10.1			12.7		
Approach LOS	—	—	B			B		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	SEA
Agency/Co.	VHB
Date Performed	12/5/2001
Analysis Time Period	July Peak Hour

Site Information

Intersection	Colonial Parkway at Rte 359
Jurisdiction	NPS
Analysis Year	2020 Alternative E

Project Description 31005/Jamestown Island

East/West Street: Colonial Parkway | North/South Street: Route 359

Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	65	36	0	0	24	56
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	76	42	0	0	28	65
Percent Heavy Vehicles	2	—	—	0	—	—
Median Type	Raised curb					
RT Channelized			0			1
Lanes	1	1	0	0	1	1
Configuration	L		TR	LT		R
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	3	8	151	1	47
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	2	3	9	177	1	55
Percent Heavy Vehicles	100	2	25	2	2	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L	LT		LTR			LTR	
v (vph)	76	0		14			233	
C (m) (vph)	1585	1580		770			739	
v/c	0.05	0.00		0.02			0.32	
95% queue length	0.15	0.00		0.06			1.35	
Control Delay	7.4	7.3		9.8			12.1	
LOS	A	A		A			B	
Approach Delay	—	—	9.8			12.1		
Approach LOS	—	—	A			B		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	SEA
Agency/Co.	VHB
Date Performed	12/5/2001
Analysis Time Period	July Peak Hour

Site Information

Intersection	Colonial Pkwy at Neck of Land
Jurisdiction	NPS
Analysis Year	2020 Alternative B

Project Description 31005/Jamestown Island

East/West Street: Colonial Parkway	North/South Street: Neck of Land Entrance
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	180	21	54	62	0
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	0	211	24	63	72	0
Percent Heavy Vehicles	2	—	—	9	—	—
Median Type	Raised curb					
RT Channelized			0			1
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	26	0	55	0	0	0
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	30	0	64	0	0	0
Percent Heavy Vehicles	11	2	7	2	2	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L		LR				
v (vph)		63		94				
C (m) (vph)		1292		728				
v/c		0.05		0.13				
95% queue length		0.15		0.44				
Control Delay		7.9		10.7				
LOS		A		B				
Approach Delay	—	—	10.7					
Approach LOS	—	—	B					

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	SEA	Intersection	Colonial Pkwy at Neck of Land
Agency/Co.	VHB	Jurisdiction	NPS
Date Performed	9/21/2001	Analysis Year	2020 Alt C (No Shuttle Svc.)
Analysis Time Period	July Peak Hour		

Project Description	31005/Jamestown Island
East/West Street: Colonial Parkway	North/South Street: Neck of Land Entrance
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	167	91	76	61	0
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	0	196	107	89	71	0
Percent Heavy Vehicles	2	—	—	5	—	—
Median Type	Raised curb					
RT Channelized			0			1
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	91	0	91	0	0	0
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	107	0	107	0	0	0
Percent Heavy Vehicles	4	2	4	2	2	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L		LR				
v (vph)		89		214				
C (m) (vph)		1241		659				
v/c		0.07		0.32				
95% queue length		0.23		1.41				
Control Delay		8.1		13.1				
LOS		A		B				
Approach Delay	—	—	13.1					
Approach LOS	—	—	B					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	SEA
Agency/Co.	VHB
Date Performed	12/5/2001
Analysis Time Period	July Peak Hour

Site Information

Intersection	Colonial Pkwy at Neck of Land
Jurisdiction	NPS
Analysis Year	2020 Alternative C

Project Description 31005/Jamestown Island

East/West Street: Colonial Parkway	North/South Street: Neck of Land Entrance
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	176	45	49	67	0
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	0	207	52	57	78	0
Percent Heavy Vehicles	2	—	—	5	—	—
Median Type	Raised curb					
RT Channelized			0			1
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	42	0	59	0	0	0
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	49	0	69	0	0	0
Percent Heavy Vehicles	4	2	4	2	2	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L		LR				
v (vph)		57		118				
C (m) (vph)		1288		714				
v/c		0.04		0.17				
95% queue length		0.14		0.59				
Control Delay		7.9		11.0				
LOS		A		B				
Approach Delay	—	—	11.0					
Approach LOS	—	—	B					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	SEA
Agency/Co.	VHB
Date Performed	12/5/2001
Analysis Time Period	July Peak Hour

Site Information

Intersection	Colonial Pkwy at Neck of Land
Jurisdiction	NPS
Analysis Year	2020 Alternative E

Project Description 31005/Jamestown Island

East/West Street: Colonial Parkway	North/South Street: Neck of Land Entrance
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	0	188	7	33	74	0
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	0	221	8	38	87	0
Percent Heavy Vehicles	2	—	—	9	—	—
Median Type	Raised curb					
RT Channelized			0			1
Lanes	0	1	0	1	1	0
Configuration			TR	L	T	
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	6	0	36	0	0	0
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	7	0	42	0	0	0
Percent Heavy Vehicles	11	2	7	2	2	2
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration		LR				

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration		L		LR				
v (vph)		38		49				
C (m) (vph)		1299		773				
v/c		0.03		0.06				
95% queue length		0.09		0.20				
Control Delay		7.9		10.0-				
LOS		A		A				
Approach Delay	—	—	10.0-					
Approach LOS	—	—	A					

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	SEA
Agency/Co.	VHB
Date Performed	9/21/2001
Analysis Time Period	July Peak Hour

Site Information

Intersection	Colonial Pkwy at Glasshouse
Jurisdiction	NPS
Analysis Year	2020 Alternative A

Project Description 31005/Jamestown Island

East/West Street: Colonial Parkway | North/South Street: Glasshouse Entrance

Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	9	65	0	0	45	23
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	10	76	0	0	52	27
Percent Heavy Vehicles	2	—	—	9	—	—
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	0	1	0
Configuration	L	T				TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	0	34	0	23
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	0	0	0	39	0	27
Percent Heavy Vehicles	11	2	7	10	2	20
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L						LR	
v (vph)	10						66	
C (m) (vph)	1519						859	
v/c	0.01						0.08	
95% queue length	0.02						0.25	
Control Delay	7.4						9.5	
LOS	A						A	
Approach Delay	—	—				9.5		
Approach LOS	—	—				A		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	SEA
Agency/Co.	VHB
Date Performed	12/5/2001
Analysis Time Period	July Peak Hour

Site Information

Intersection	Colonial Pkwy at Glasshouse
Jurisdiction	NPS
Analysis Year	2020 Alternative B

Project Description 31005/Jamestown Island

East/West Street: Colonial Parkway	North/South Street: Glasshouse Entrance
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	9	51	0	0	32	23
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	10	59	0	0	37	27
Percent Heavy Vehicles	2	—	—	9	—	—
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	0	1	0
Configuration	L	T				TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	0	34	0	23
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	0	0	0	39	0	27
Percent Heavy Vehicles	11	2	7	10	2	20
Percent Grade (%)	0			0		
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L						LR	
v (vph)	10						66	
C (m) (vph)	1538						889	
v/c	0.01						0.07	
95% queue length	0.02						0.24	
Control Delay	7.4						9.4	
LOS	A						A	
Approach Delay	—	—				9.4		
Approach LOS	—	—				A		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	SEA
Agency/Co.	VHB
Date Performed	12/5/2001
Analysis Time Period	July Peak Hour

Site Information

Intersection	Colonial Pkwy at Glasshouse
Jurisdiction	NPS
Analysis Year	2020 Alternative C

Project Description 31005/Jamestown Island

East/West Street: Colonial Parkway | North/South Street: Glasshouse Entrance

Intersection Orientation: East-West | Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	38	0	0	34	30
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	2	44	0	0	39	35
Percent Heavy Vehicles	2	—	—	9	—	—
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	0	1	0
Configuration	L	T				TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	0	55	0	2
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	0	0	0	64	0	2
Percent Heavy Vehicles	11	2	7	10	2	20
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L						LR	
v (vph)	2						66	
C (m) (vph)	1526						876	
v/c	0.00						0.08	
95% queue length	0.00						0.24	
Control Delay	7.4						9.4	
LOS	A						A	
Approach Delay	—	—				9.4		
Approach LOS	—	—				A		

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TWO-WAY STOP CONTROL SUMMARY

General Information

Analyst	SEA
Agency/Co.	VHB
Date Performed	9/21/2001
Analysis Time Period	July Peak Hour

Site Information

Intersection	Colonial Pkwy at Glasshouse
Jurisdiction	NPS
Analysis Year	2020 Alternative D

Project Description 31005/Jamestown Island

East/West Street: Colonial Parkway	North/South Street: Glasshouse Entrance
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	9	101	0	0	78	23
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	10	118	0	0	91	27
Percent Heavy Vehicles	2	—	—	9	—	—
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	0	1	0
Configuration	L	T				TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	0	34	0	23
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	0	0	0	39	0	27
Percent Heavy Vehicles	11	2	7	10	2	20
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L						LR	
v (vph)	10						66	
C (m) (vph)	1470						788	
v/c	0.01						0.08	
95% queue length	0.02						0.27	
Control Delay	7.5						10.0-	
LOS	A						A	
Approach Delay	—	—				10.0-		
Approach LOS	—	—				A		

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TWO-WAY STOP CONTROL SUMMARY

General Information		Site Information	
Analyst	SEA	Intersection	Colonial Pkwy at Glasshouse
Agency/Co.	VHB	Jurisdiction	NPS
Date Performed	12/5/2001	Analysis Year	2020 Alternative E
Analysis Time Period	July Peak Hour		

Project Description 31005/Jamestown Island

East/West Street: Colonial Parkway	North/South Street: Glasshouse Entrance
Intersection Orientation: East-West	Study Period (hrs): 0.25

Vehicle Volumes and Adjustments

Major Street	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	9	69	0	0	48	23
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	10	81	0	0	56	27
Percent Heavy Vehicles	2	—	—	9	—	—
Median Type	Undivided					
RT Channelized			0			0
Lanes	1	1	0	0	1	0
Configuration	L	T				TR
Upstream Signal		0			0	

Minor Street	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	0	0	0	34	0	23
Peak-Hour Factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85
Hourly Flow Rate, HFR	0	0	0	39	0	27
Percent Heavy Vehicles	11	2	7	10	2	20
Percent Grade (%)		0			0	
Flared Approach		N			N	
Storage		0			0	
RT Channelized			0			0
Lanes	0	0	0	0	0	0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Configuration	L						LR	
v (vph)	10						66	
C (m) (vph)	1514						851	
v/c	0.01						0.08	
95% queue length	0.02						0.25	
Control Delay	7.4						9.6	
LOS	A						A	
Approach Delay	—	—				9.6		
Approach LOS	—	—				A		

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K

Appendix K:
Statement of Findings





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Statement of Findings

INTRODUCTION

Colonial National Historical Park (Colonial NHP) has prepared and made available this Development Concept Plan / Environmental Impact Statement (DCP / EIS) for proposed improvements at the Jamestown unit of the park.

Executive Orders 11988, "Floodplain Management" and 11990, "Protection of Wetlands" require the NPS and other federal agencies to evaluate the likely impacts of actions in floodplains and wetlands. NPS *Director's Order 77-1: Wetland Protection* and *Procedural Manual 77-1* provide NPS policies and procedures for complying with Executive Order 11990, and NPS *Special Directive 93-4: Floodplain Management Guideline* provides NPS procedures for complying with Executive Order 11988. This Statement of Findings (SOF) documents compliance with these NPS wetland protection and floodplain management procedures.

PROPOSED ACTION

The proposed action is described in "Chapter 2: Alternatives" under "Section 2.6: Elements Common to the Action Alternatives" and "2.7: Alternative B: Preferred Alternative." Major elements of the proposed action include:

- A facility at Neck of Land that provides a directed approach, interpretive experience, and Intermodal Transportation Terminal, including a boat service, boat docks, a shuttle system, and a hike / bike trail;
- A small Observation Building on the site of the existing Visitor Center;
- A replacement Visitor Center and educational facility in the existing Island parking lot;
- An expanded Jamestown Rediscovery™ Center to house the Jamestown collection;
- Interpretive anchors: Ludwell exhibit facility and agricultural exhibit site; and
- Reconfigured parking throughout the site.

SITE DESCRIPTION

Jamestown Island is part of Colonial NHP in Tidewater, Virginia. It is situated in the Lower James River-Middle Tidal watershed at the base of the Chesapeake Bay (see Figure 3-5).

The Island topography follows a typical ridge and swale pattern with the higher elevations mostly found along the Colonial Parkway, at Glasshouse Point, and the northern portion of Neck of Land. The *Geological Development and Environmental Reconstruction of Jamestown Island* (Johnson et al. 2000) divides the Jamestown Project site into eight natural landscape regions, based on elevation, distinctive landforms, and vegetative / hydrographic features. The regions consist of the Mill Creek ridges, Back River marsh, Church Point ridge, Pitch and Tar trough, Confederate Ruins ridge, Passmore Creek lowland, Lower Point platform, and James River thalweg (see Figure 3-6).

Several tidally influenced waterways and their associated wetlands cover a large portion of the Jamestown Project site. The James River borders the site to the west, south, and east. At this point, the James River is wide and sluggish and maintains an average water elevation near sea level, thus resembling a bay and estuary system.

In addition, Powhatan Creek flows onto the site from the north and empties into the James River via the Sandy Bay, Back River, and The Thorofare system. This system divides Jamestown Island from Neck of Land and Glasshouse Point. The southern portion of the Island is mainly composed of Passmore Creek and several of its tributaries, which drain eastward toward the James River. In addition, the Pitch and Tar Swamp, located on the Island, feeds Kingsmill Creek, which flows into The Thorofare (see Figure 3-12).

Floodplains and Flood Zones

The James River, at the location of Jamestown Island, more closely resembles a bay and estuary system than a true floodplain because the river maintains an average water elevation near sea level. For this reason, the river can be viewed as having an expansive flood storage capacity. It can largely be assumed, therefore, that the Jamestown Island area is not at risk of severe flooding as a result of water cresting the banks of the James River due to upstream influxes. Additionally, the downstream limit of the Powhatan Creek floodplain that is subject to flooding from upstream water sources occurs approximately three miles upstream from Jamestown Island (FEMA 1991).

On the other hand, flooding as a result of a tidal storm surge is a more likely scenario. For example, the most severe flood on record occurred in 1933 as a result of an unnamed hurricane when the tidal surge reached an elevation of 9.8 feet above mean lower low water (MLLW) in the Hampton Roads area (FEMA 1991). Areas having a high risk of flooding from tidal storm surges have been identified by the Federal Emergency Management Agency (FEMA) based on a particular elevation. FEMA has determined the 100-year and 500-year flood zone elevations for the Jamestown Project area to be 8.5 and 9.8 feet, respectively. Approximately 1,611 acres (87%) of the project area are at or below 8.5 feet, implying that these areas have the probability of flooding as a result of a storm surge 1 out of every 100 years. Additionally, 63 acres (3%) at or below elevation 9.8 feet (but above 8.5 feet) are identified as being within the 500-year flood zone (moderate risk), meaning the probability of flooding is at least once in 500 years (see Figure 3-13).

Several structures are present within the 1,611 acres of the project area that are below the 100-year flood zone elevation of 8.5 feet. These include the Glasshouse, the Jamestown Rediscovery™ Center (formerly the Yeardley House) and storage sheds, the Dale House, the existing 1956 Visitor Center, and parking areas. In addition, the top of the seawall along the James River shoreline of the Townsite has an approximate elevation of 7.4 feet.

The Glasshouse is an open-air structure built at ground level that is used as an interpretive center for guests to observe glassblowing and the making of glasswares. The floor elevation appears to approximate +/-5.5 feet, which is 3 feet lower than the 100-year flood elevation and 4.3 feet lower than the 500-year flood elevation.

The Jamestown Rediscovery™ Center, located in the Townsite, is used as the APVA collections and research center. This structure was constructed at a site having a ground elevation of 6.5 to 7.3 feet. The floor elevation, however, was measured to be above the 500-year flood zone elevation of 9.8 feet by approximately 0.35 feet (10.15 feet).

The Dale House is located at the Townsite just landward of the seawall along the James River shoreline. This structure was built on land that has an elevation of approximately 5.1 to 6.6 feet. The eastern side of the house maintains a door entrance at the ground level of approximately 6.6 feet, which is also the internal floor elevation. The floor of this structure, therefore, is 1.9 feet below the 100-year flood zone elevation.

The existing 1956 Visitor Center is a multilevel structure built on sloping land and straddling the 8.5-foot contour elevation. The lower level of the

building is currently being used as the collections storage facility for all NPS Jamestown artifacts and as office space for the curator. The northernmost side of the structure leading into the storage area was built below grade and has a back door entrance with a floor elevation of 3.9 feet. The land surrounding this entrance is a parking area and rises to elevations of 5.5 feet and 6.4 feet before the elevation drops again toward the edge of Pitch and Tar Swamp. This configuration causes considerable problems due to rainwater flowing toward the building, into the northern entrance, and pooling outside the artifact storage area and offices. Colonial NHP staff has had to use sand bags during heavy rain events to protect the first floor from flooding (see Figure 1-3). On the other hand, the southernmost portion of the building is on land approximately 15 feet in elevation, approximately 5.2 feet above the 500-year flood zone.

The Colonial Parkway is entirely above the 100-year flood zone elevation with the exception of a portion of the parking area on the Island. One small section of the Parkway just north of the Sandy Bay bridge has an elevation of 8.8, which is 1 foot lower than the 500-year flood zone elevation of 9.8 feet.

Wetlands and Deepwater Habitat

The Jamestown study area was found to comprise a total of approximately 1,055 acres of estuarine tidal deepwater habitats and wetlands, nontidal wetlands, and palustrine open-water habitats (see Figures 3-14 and 3-15). Open waters associated with the main channels of Powhatan Creek, Sandy Bay, Back River, The Thorofare, and James River were not included in the acreage figures.

The tidal wetlands surrounding Jamestown Island and Neck of Land lie very close to the upper range of the estuarine environment and the lower range of the freshwater environment. Cowardin et al. (1979) distinguish the boundary between estuarine and palustrine (freshwater) systems to be the point where salinity reaches 0.5 parts per thousand (ppt) during low flow periods. The U.S. Fish and Wildlife Service's *National Wetlands Inventory* identifies the wetlands surrounding the Island as palustrine. However, the agency performed a fisheries and water quality study in 1991 in the vicinity of Jamestown Island (Swihart et al. 1991), which indicated that salinity levels for the main rivers and marsh creeks were 0.0 ppt during the spring of that year, but rose to between 4 to 8 ppt during the month of October (period of low flow). Assuming the data represents a normal year, the designation of the area's tidally influenced marshes and adjacent wetland forests may more appropriately be called estuarine. All other wetlands are classified as palustrine.

Table 3-16 of the DCP/EIS itemizes the wetland and deepwater habitat types using the Cowardin et al. (1979) classification system, and Figure 3-15 depicts their locations. Most of the wetlands are tidal marshes affiliated with Powhatan Creek, Sandy Bay, Back River, Kingsmill Creek, and Passmore Creek. Pitch and Tar Swamp is a large system composed of forested areas, scrub-shrub wetlands, marsh, and open water. A large beaver dam that crosses the entire marsh influences wetland hydrology of the Pitch and Tar Swamp. It is believed that tidal waters are able to overtop the dam and enter Pitch and Tar Swamp during seasonally high tides. Other wetlands include two small areas delineated adjacent to the NPS Maintenance Facility next to the Colonial Parkway and a large, isolated wetland on Glasshouse Point.

As noted above, tidally influenced marshes dominate the Jamestown Project site. The oligohaline marshes (E2EM1R) of Passmore Creek and Back River consist primarily of rice cut grass (*Leersia oryzoides*), giant bulrush (*Scirpus validus*), and big cordgrass (*Spartina cynosuroides*). The boundary between the freshwater and oligohaline marsh is not distinct, although plants such as arrow arum (*Peltandra virginica*), duck potato (*Saggitaria latifolia*), and cattails (*Typha latifolia*) indicate the change in salinity to a freshwater system (PEM2R). These

species dominate at upstream locations along Powhatan Creek, north of the Colonial Parkway. For this reason, the Parkway was conveniently used as the boundary between the oligohaline and freshwater environments.

Estuarine deepwater habitats occur in the study area in the form of tidal creeks (E1UB3R) and shallow-water ponds (E1UB3V, E1UB3Vb). Numerous tidal creeks (120.6 acres) can be found within the marshes of Neck of Land, Kingsmill Creek, The Thorofare, and Passmore Creek. These channels function as flow ways important to the distribution of tidal waters throughout the large marsh systems. They also serve as habitat to the area fisheries for spawning, cover for fingerlings, and foraging for adults. In addition, waterfowl and wading birds seek these narrow creeks for protection from harsh weather and foraging.

Four ponds also add to the deepwater habitats on the project site comprising approximately 14.2 acres. A 0.3-acre pond (E1UB3Vb) is located adjacent to the bus parking facility on the Island, which is hydrologically connected to a beaver pond within Pitch and Tar Swamp via an upland cut ditch. A second pond (E1UB3V) is located south of Pitch and Tar Swamp next to an old pecan orchard. This 1.3-acre water body is tidally influenced due to an upland cut ditch and outfall pipe connected to the James River shoreline. While water normally flows out of the pond into the James River, it appears that during extreme high tides, water will reverse flow and tidal water will enter the pond. Two additional ponds (PUBF and E1UB3Vb) are located in the southeastern section of the Island and would not be impacted by proposed improvements.

Small, forested wetland systems are also scattered across the study area. A small isolated depression of deciduous hardwoods (PFO1E) is located behind the NPS Maintenance Facility; another, just south of the Glasshouse, contains bald cypress (*Taxodium distichum*), loblolly pine (*Pinus taeda*), and red maple (*Acer rubrum*) (PFO2E); and several others on the eastern end of the Island (PFO1A, PFO1C, and PFO1E). Dominant species in these areas consist of black gum (*Nyssa sylvatica*), green ash (*Fraxinus pennsylvanica*), willow oak (*Quercus phellos*), and cherrybark oak (*Q. falcata* var. *pagodaefolia*). Most of these systems function as a result of a high water table, although some of the pine wetlands (E2FO4R) adjacent to Passmore Creek are influenced by seasonally high tides. Dominant species within the pine wetlands include loblolly pine, sweetgum (*Liquidambar styraciflua*), red maple, wax myrtle (*Myrica cerifera*), and greenbriar (*Smilax rotundifolia*).

Wetland Functional Values Assessment

A wetland functional values assessment was completed for all wetlands within the project area. The methodology, *Evaluation for Planned Wetlands Functional Capacity Index* (EPW) (Bartoldus et al. 1994), was developed to compare six functions and values of proposed impacted wetlands to those wetlands created for mitigation using a scoring system between 0 and 1.0. A higher score implies a higher functional capacity. A full description of the methodology and results can be found in "Section 3.3.2.7: Wetlands and Deepwater Habitats" of the DCP/EIS, and Appendix G contains the appropriate data sheets for each wetland assessed.

Generally, the Jamestown Project functional values analysis analyzed seven functions:

- Shoreline Bank Erosion Control
- Sediment Stabilization
- Water Quality
- Wildlife
- Fish (tidal and non tidal)
- Uniqueness/Heritage
- Floral Diversity[1]

[1] Floral diversity was added to the study, and to determine floral diversity, wetland scientists visited wetlands in the study area to document the common species of plants occupying each wetland. The total number of species within each wetland type was used as a floral diversity relative index.

According to methodology criteria, all of the wetlands, except Wetland 3 (which was too small, based on the size requirement), offer some functional value. The analysis has shown that the marshes associated with Powhatan Creek, Sandy Bay, and Back River (Wetlands 4 through 8, 10, and A1) offer the most overall functional values of the wetlands studied. Wetlands A1, 4, and 5 offer the highest level of shoreline bank erosion control, while Wetlands 7 and A2, although adjacent to tidal waters, contained steeply eroded banks, resulting in lower shoreline bank erosion control scores.

Most of the wetlands scored high for sediment stabilization and water quality. Under the normal process for scoring wetlands in this category, isolated wetlands or wetlands with one outlet would have no score (N / A). However, it was the opinion of the wetland scientists that several wetlands, because of their ability to capture surface runoff from neighboring upland areas, did offer water quality functions, and their scores were determined. Systems with large amounts of vegetative cover to filter pollutants scored the highest in this category. Other than those with a N / A score, Wetland 7, with its steep, eroded bank, scored the lowest due to its lack of vegetation.

Wetlands with multiple vegetative layers, fallen logs, and organic debris tend to provide the highest value for wildlife habitat. These conditions were most exemplified by Wetland 1, an isolated depression behind the NPS Maintenance Facility (score 0.64). Wetland 12, the Pitch and Tar Swamp, had the second-highest score as wildlife habitat (score 0.56), and Wetland 2, a mowed depression in front of the NPS Maintenance Facility, had the lowest score due to its lack of vegetative cover layers.

Those wetlands that contain fisheries habitat were scored as tidally influenced systems. Wetlands A1, 4, 5, and 10 rated the highest due to the vegetative cover for foraging, protection, and potential for spawning habitat. Wetland 7 offers very little vegetation for fingerling protection and adult spawning, although downed trees lying in the channel do provide some cover.

Unique wetlands – wetlands occupied by rare, threatened, and endangered species, or wetlands within parks – have been viewed as important to human interests. In taking this into consideration, the EPW methodology views all wetlands within natural parks and conservation areas as unique. Similarly, wetlands occupied by rare, threatened, and endangered species are, by virtue of their importance to the species, given the highest rating for heritage values. Wetlands within the Jamestown Project study area provide both unique and heritage values as part of the NPS and APVA property and as habitat for the bald eagle and sensitive joint-vetch. Therefore, all wetlands were given the score of 1.0, with the exception of Wetland 3. This wetland is a very small, temporarily saturated, isolated depression with virtually no functional importance.

JUSTIFICATION FOR USE OF THE FLOODPLAIN AND WETLANDS

Because of its low elevation and lack of topography, Jamestown Island is almost entirely within the 100- and 500-year flood zones. The majority of the existing structures at Jamestown are located in the flood zone areas; therefore, improvements or additions to these structures, as well as associated parking and trails, would necessarily be located in the flood zone. Facilities proposed for construction within the flood zone would have finished floor elevations above either the 100-year flood zone elevation of 8.5 or the 500-year flood zone elevation of 9.8, depending on the building purpose.

Construction within jurisdictional wetlands would consist only of walkways and boardwalks designed to interpret the wetlands and natural resources of the Jamestown Project area. In addition, adding utilities along the APVA service road would not, as previously thought, impact the adjacent Pitch and

Tar Swamp. The existing roadbed is wide enough to allow for trenching to install a water main and sewer line at least 10 feet apart and within 4-foot trenches without impacts to the wetland (Figure K-1).

A small, non-jurisdictional wetland (1,485 square feet or 0.035 acre) would be directly impacted by construction of a stormwater management facility and removal of an existing sanitary drain field (see Figure 4-1). This wetland, located behind the Jamestown Rediscovery™ Center (formerly the Yeardley House), does not provide any special functions or values, such as habitat for rare, threatened, or endangered species. In fact, it was excluded from the wetland functional values assessment because of its minimal size and location over the sanitary drain field. The impact would not require compensation because it is below the NPS threshold (0.1 acre).

INVESTIGATION OF ALTERNATIVES

In addition to the proposed action, three action alternatives and a no action alternative were considered. A full description of the Action Alternatives can be found in the DCP/EIS sections "2.8: Alternative C," "2.9: Alternative D," and "2.10: Alternative E."

SITE SPECIFIC FLOOD RISK

In addition to structures already within the flood zone, Alternative B proposes parking and structural features on Neck of Land adjacent to the Colonial Parkway. Although the majority of Neck of Land is above the 500-year flood zone, a small drainage ditch does cross the central portion. Therefore, the westernmost portions of the new parking area would be constructed in the 100-and the 500-year flood zones.

Portions of the existing 1956 Visitor Center now extend into both the 100- and 500-year flood zones. Renovations to the Visitor Center are proposed under this alternative to create the Observation Building. The existing building would be substantially downsized from 29,000 square feet to approximately 5,000 square feet, and that portion of the building within the flood zones would be removed resulting in the entire, new facility being outside of the flood zones.

A replacement Visitor Center/educational facility would be located in the existing Island parking lot, out of the 100-year flood zone. Additionally, approximately 8,000 square feet would be added to the existing Jamestown Rediscovery™ Center. The existing floor level of the Rediscovery Center is at 10.15 feet, and the addition would match this, placing the Jamestown collection out of the 100- and 500-year flood zones, in a two-story structure.

Other improvements such as the hike/bike trail and boat docks would be constructed within the 100-year flood zone, but these structures would not increase the potential for flooding.

Total impacts to the 100-year flood zone have been minimized as much as possible given the limited areas of high elevation within the project area. New buildings, parking areas (both paved and unpaved), and trails would impact 1.52 acres of the 100-year flood zone in the proposed alternative. The majority of this area, however, is parking (both paved and unpaved) and would not hinder the movement of waters during a flood. An additional 0.85 acres of buildings, parking, and trails would be constructed within the 500-year flood zone. Impacts resulting from elevated structures would be minimal, but bridges, boardwalks, and docks could become dislodged during a large flood event or could trap flowing debris. These raised structures would impact approximately 1.04 acres of the 100-year flood zone and 0.03 acre of the 500-year flood zone.

Insert Figure K-1 (black and white)

MITIGATIVE ACTIONS

Avoidance and minimization measures were applied throughout the project design to reduce impacts to sensitive wetland and floodplain resources. General mitigative measures would also include sustainable design and use of durable building materials, application of best management practices (BMPs), and use of standard erosion and sediment control measures throughout the construction process.

Floodplain Mitigation

Parking areas, docks, and trails would be constructed within the flood zone. As flooding of these features would not have adverse impacts to the environment, they have been exempted from the *NPS Floodplain Management Guidelines.* However, as a precautionary measure, appropriate structural design and a flood warning system would mitigate for any impacts from construction of the trail and docks. Signs could also be placed in these areas to warn of the potential hazard, should it be deemed necessary.

As with all new construction at Jamestown, precautions would be taken to ensure that the buildings would be structurally able to withstand flooding. Structures would be consistent with National Flood Insurance Program standards, and flood warning and evacuation plans would be prepared. In addition, facilities proposed for construction within the floodplain would have finished floor elevations above either the 100-year flood zone elevation of 8.5 or the 500-year flood zone elevation of 9.8, depending on the building purpose. Buildings housing collections would have finished floors above the 500-year flood zone elevation.

Wetland Mitigation

Consideration was given to minimizing work performed in wetlands and open waters, including using pile-supported boardwalks and boat docks rather than discharging dredge or fill material. In addition, the boardwalks would be installed at such an elevation as to provide no expected loss of wetland function, further minimizing wetland impacts. While the boardwalk alignment proposed under the Preferred Alternative would result in greater aerial cover of wetland habitat than other alternatives, this alignment is dictated by the need to avoid impacts to federally-listed endangered species: a population of sensitive-joint vetch and a nesting pair of bald eagles. Avoiding these protected resources requires locating the boardwalk over open marsh rather than along an old road trace.

Indirect impacts would include shading from the boardwalk, observation deck, and boat docks. In total, these elevated structures would indirectly impact 0.87 acres of tidal oligohaline marsh (0.68 acres of E2EM1R and 0.19 acres of E2EM1Rb). While these actions are exempt from the full procedures of the Statement of Findings, their impacts would be minimized by constructing decking at a height appropriate to allow angled light to penetrate the marsh surface and by using top-down construction methods. There would be no discharge of fill material, and the structures would not replace the bottom of the water body, reduce the reach or impair the flow or circulation of waters, nor cause an adverse alteration or elimination of aquatic functions. As such, no compensatory mitigation or permits for fill would be required by the U.S. Army Corps of Engineers (COE) or the Virginia Department of Environmental Quality (VDEQ).

Extending a water main and sewer line to the Jamestown Rediscovery™ Center would not result in impacts to the Pitch and Tar Swamp along the APVA service road (Figure K-1). The water main and sewer line must be separated by at least 10 feet, requiring two separate trench corridors. Trenching would be done with a small backhoe using a 1-foot wide bucket at a depth of approximately 4 feet. One line would be installed along the right shoulder approaching Pitch and Tar Swamp, and the other would be installed along the left road shoulder. At

the point where the road crosses the swamp, the width of the roadbed would provide enough space to allow installation of both utility lines without dredging or filling in wetlands.

The proposed action would result in direct impacts to a small, non-jurisdictional wetland behind the Jamestown Rediscovery™ Center (Yeardley House). The wetland, 0.035 acre, would be eliminated from installation of a stormwater management facility and removal of a sanitary drain field. The stormwater management facility would likely consist of infiltration piping and a grassed swale. No compensation would be required for this impact.

COMPLIANCE

The Coastal Zone Management Act of 1972 requires that federal activities that affect land, water, or natural resources of Virginia's designated coastal resources management area be consistent with the enforceable policies of the Virginia Coastal Resources Management Program. A Federal Consistency Determination (Appendix L) has found the project to be consistent to the maximum extent practicable with these policies. Further, in order to comply fully, permits will be obtained under the following regulations:

Consultation under Section 7 of the Endangered Species Act
U.S. Fish & Wildlife Service

Subaqueous Lands Permit
Virginia Marine Resources Commission

Bridge Construction Permit
U.S. Coast Guard

Section 10 of Rivers and Harbors Act Permit
Norfolk Division – U.S. Army Corps of Engineers

Virginia Pollutant Discharge Elimination System General Permit
Virginia Department of Environmental Quality

Water Quality Protection Permit/401 Water Quality Certification
Virginia Department of Environmental Quality

Consultation under Section 106 of the National Historic Preservation Act/Preparation of New Programmatic Agreement
Virginia Department of Historic Resources and the Advisory Council on Historic Preservation

Plan Review and Approval
James City County Planning Department
James City County Environmental Division and Division of Code Compliance

James City County Local Wetlands Permit
James City County Wetlands Board

National Environmental Policy Act
The Environmental Impact Statement, Section 106 Compliance review, this Statement of Findings for Executive Orders 11990 and 11988, and the Record of Decision would complete the requirements for the National Environmental Policy Act for this project.

CONCLUSIONS

The NPS finds that this proposed action is consistent with the policies and procedures of NPS *Special Directive 93-4: Floodplain Management Guideline* and *Director's Order #77-1: Wetland Protection*, including the "no net loss of wetlands" policy.

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Appendix L:
Federal Consistency Determination

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Federal Consistency Determination

INTRODUCTION

This document provides the National Park Service's Consistency Determination as required by the Coastal Zone Management Act of 1972, section 307(c)(1) and 15 CFR Part 930, subpart C. Based upon the information, data, and analysis provided below and in the DCP/EIS, the National Park Service finds that the proposed action is consistent to the maximum extent practicable with the enforceable policies of the Virginia Coastal Resources Management Program.

Proposed Action

The proposed action is described in "Chapter 2: Alternatives" under "Section 2.6: Elements Common to the Action Alternatives" and "2.7: Alternative B: Preferred Alternative." Major elements of the proposed action include:

- A facility at Neck of Land that provides a directed approach, interpretive experience, and Intermodal Transportation Terminal, including a boat service, boat docks, a shuttle system, and a hike/bike trail;
- A small Observation Building on the site of the existing Visitor Center;
- A replacement Visitor Center and educational facility in the existing Island parking lot;
- An expanded Jamestown Rediscovery™ Center to house the Jamestown collection;
- Interpretive anchors – Ludwell exhibit facility and agricultural exhibit site; and
- Reconfigured parking throughout the site.

ASSESSMENT OF EFFECT

Fisheries Management

The proposed action calls for the construction of three new boat docks on the edge of Powhatan Creek and Back River. Installation of piles could initially result in a temporary impact to fisheries habitat, particularly during construction when turbidity from pile driving would be most prevalent. Noise during construction could also contribute to secondary impacts to the fisheries resource. Once construction was completed, however, the docks would provide additional structural habitat for fish in locations where shoreline structure is presently absent. The dock at Powhatan Creek Overlook would also be designed and constructed in tandem with breakwater structures proposed as part of the *Shoreline Management Plan for Jamestown Island, Powhatan Creek, Sandy Bay, Back River, The Thorofare, and James River Shorelines* (Hardaway et al. 1999) to protect the highly eroded shoreline from further erosion. As noted, the breakwaters would be constructed as part of a separate project and are discussed here as cumulative impacts only. No direct losses in fisheries habitat would be expected from the docks. Additionally, boats using these docks would be moored and landed at the existing Jamestown Marina just upstream off of Powhatan Creek, and no additional landing facilities would be constructed.

Secondary impacts associated with the physical construction of the boat docks would include noise disturbance caused by the boats to such species as wading birds and waterfowl, and the additional air and water pollution caused by the proposed

transport boats; however, this impact would be minimized by the use of an environmentally friendly gas or electric engine. In addition, the creek is actively used by recreational boaters. No documentation from the U.S. Fish and Wildlife Service (FWS) and the Virginia Department of Game and Inland Fisheries (VDGIF), as part of their fisheries surveys, has indicated that the current level of boating activity in this region of the James River has damaged the ability of fish and wildlife populations to survive. Therefore, the increased use of boats is not expected to reduce the survivorship of fish populations.

"Section 3.3.2.10: Wildlife" provides a more detailed description of the existing conditions related to fisheries, and "Section 4.3.2.8: Wildlife" discusses the subsequent impacts of the alternatives on fisheries management.

Subaqueous Lands Management

As noted above, construction of three docks and a bridge across Back River between Neck of Land and Jamestown Island is proposed under Alternative B. Pilings would be installed in subaqueous lands to support the docks and the bridge. These support pilings would be constructed with top-down construction techniques to minimize impacts to the subaqueous lands and surrounding wetland habitat.

As part of a separate project, shoreline stabilization structures would be constructed in the Back River, Powhatan Creek, Thorofare, and James River to protect eroding shores. These would have a cumulative impact on subaqueous lands, which has been analyzed in a separate environmental document (COE 2002) and will therefore not be permitted as part of this project.

Wetlands Management

The NPS characterizes impacts to wetlands as either direct or indirect. Direct impacts include those activities that would result in the conversion of a wetland community to upland as a result of fill material for man-made structures (i.e., road). Indirect impacts include work that would result in temporary alteration to vegetation due to construction or the restricted access of sunlight due to shading (i.e., pile supported structure).

No direct impacts would accrue to jurisdictional wetlands as a result of the proposed action. Encroachment into wetlands resulting from the proposed boardwalks, observation decks, and boat docks would be performed using pilings at a reasonable spacing sufficient to support the platforms while protecting the integrity of the wetlands. Piles would be installed by top-down construction to minimize disturbance within the marsh. Further, installing the decking at a height to allow angled sunlight to penetrate to the marsh surface would minimize indirect shading impacts resulting from the boardwalk.

These activities would not have the effect of a discharge of fill material as defined in 40 CFR 232, as the structures would not replace the bottom of the water body, reduce the reach or impair the flow or circulation of waters, nor cause an adverse alteration or elimination of aquatic functions. However, approximately 0.87 acres of tidal oligohaline marsh would be potentially subject to shading effects by the new pile-supported structures, a negligible impact to the overall wetlands at the site.

Wetland-dependent species would also be affected by the placement of the hike/bike trail through the Neck of Land marsh. The trail would follow an existing road trace from Neck of Land, but veer off as a boardwalk through the wetland so as not to impact a bald eagle protection area and the last observed sensitive joint-vetch population. Effects of this action would cause indirect impacts to tidal oligohaline marsh habitat. Use of this boardwalk would also result in secondary human disturbance impacts to such species as rails, marsh wrens, and sparrows. No open water would be affected until the bike trail reaches the vegetated shoreline of Back

River. Therefore, waterfowl, shorebirds, wading birds, and other species preferring tidal creeks and open water for habitat would not be affected on Neck of Land.

In addition to the boardwalk across Neck of Land, a pedestrian footbridge would also cross Pitch and Tar Swamp on Jamestown Island. The boardwalk crossing Pitch and Tar Swamp would indirectly, but negligibly, affect wetland wildlife. However, the removal of the old footbridge leading to the existing Visitor Center would serve to offset the impacts caused by the new bridge. This would result in no net change to wetland and wetland-dependent species in this area.

Because there are no direct impacts to jurisdictional wetlands, no permits are required from the U.S. Army Corps of Engineers (COE) or the Virginia Department of Environmental Quality (VDEQ) for placement of fill in wetlands. As such, no compensatory mitigation involving wetland creation or restoration is proposed. Permits will be required for the crossing at Back River under Section 10 of the Rivers and Harbors Act. Additionally, indirect impacts to tidal wetlands will require a permit from the James City County Wetlands Board. The NPS will provide the Board with a copy of the Final DCP/EIS to initiate the permit process.

More detailed discussions of wetlands existing conditions and impacts are located in "Section 3.3.2.7: Wetlands and Deepwater Habitats" and "Section 4.3.2.5: Wetlands and Deepwater Habitats."

Dunes Management

No dunes exist within the developed areas of Jamestown Island that would be impacted by the proposed action. Further, the shorelines along James River, Powhatan Creek, Sandy Bay, and Back River in the immediate project area have been or will be stabilized according to provisions of the *Shoreline Management Plan* (Hardaway et al. 1999).

Non-point Source Pollution Control

The proposed preferred alternative calls for changes in parking areas and the arrangement of structures across the site.

Development at Neck of Land would increase impervious cover in that area. A stormwater collection and retention system for water quantity and quality could use a combination of perimeter swales and flexible pipe for directing filtered stormwater to existing marsh areas. Best Management Practice (BMP) facilities, such as marsh ponds, may have to be constructed upstream of the existing marsh to ensure downstream water quality.

Changes to the Jamestown Island parking lot would not increase impervious cover. However addition of structures on the Island (including the expansion of the Jamestown Rediscovery™ Center and construction of the Ludwell exhibit facility and the agricultural exhibit site) would add impervious surface area. A stormwater management system would be designed to minimize the impact of increased runoff on surface and ground waters. New stormwater collection systems would generally utilize small flexible pipe systems discharged at various outfalls in order to redirect flows away from pedestrian paths. Numerous systems or drainage features, including drain inlets, flumes, and swales, could be required.

No changes in runoff at Glasshouse Point would occur as a result of the parking lot reconfiguration. However, improvements would be made to the existing stormwater management system in the area.

Prior to site design, the NPS will prepare and implement Erosion and Sediment Control Plans that comply with the Virginia Erosion and Sediment Control Law. The NPS will be responsible for overseeing on-site contractors, conducting regular field inspections, and taking prompt action against non-compliance, if necessary.

More detailed descriptions of existing stormwater management systems and impacts to those systems are provided in "Section 3.7.2.3: Stormwater Management and Drainage Systems" and "Section 4.7: Impacts to Buildings and Utilities."

Point Source Pollution Control

There are no regulated point sources within the project area. However, because land disturbance in this project will exceed one acre, the project will require a Virginia Pollutant Discharge Elimination System general permit for stormwater discharges from construction activities.

Shoreline Sanitation

No wells and no new drain fields would be required for the project. In fact, the overall goal is to update existing infrastructure to comply with code and to fully connect the Island to public water and sewer.

A number of improvements to existing water and sewer facilities would be required to accommodate new buildings, increased building sizes, and expected increases in capacity. These improvements are fully described in "Section 4.7: Impacts to Buildings and Utilities." This information is summarized below.

Existing Comfort Station and Pedestrian Bridge

Removal of the existing Comfort Station restrooms and pedestrian bridge would require all existing utilities to the building, including sanitary sewer, water, and electrical power, to be disconnected and secured. These utilities would be secured in place and not removed in order to minimize impacts to the physical landscape.

Observation Building

Approximately 1,300 feet of new sanitary force main (6-inch typical) would be constructed crossing the new pedestrian bridge to the Observation Building. The existing 6-inch sanitary force main that lies in the marsh area would be capped at both ends, filled with flowable fill, and abandoned in place so that wetland areas are not disturbed. In addition, 4-inch fire and 4-inch domestic water lines would be extended to the Observation Building. Domestic water taps would be required for a 1 ½-inch line to the Observation Building and 1-inch lines to the Jamestown Rediscovery™ Center, Godspeed Cottage, and Dale House.

Replacement Visitor Center/Educational Facility

Construction of the replacement Visitor Center / educational facility would require new utility connections to the building from existing utility infrastructure, including a submersible pump station, or grinder-ejector pumps, removal of approximately 350 feet of existing 6-inch sanitary force main crossing the new building footprint, and separate connections for fire and domestic water.

Ludwell Exhibit Facility and NPS Collections Facility

The proposed parking area would not disturb the existing sanitary drain-field; however, the removal of this drain field is proposed once connections to public sewer service have been completed. A grinder-ejector pump and sanitary force main would be required so that the APVA property can connect to public water and sewer service and provide these services to the new facilities.

Intermodal Transportation Terminal

Sanitary sewer is proposed for the Neck of Land area and would likely require a submersible pump station with approximately 2,000 feet of 8-inch sanitary force main connecting the facility to an existing manhole at the NPS Maintenance Facility. In addition, an existing manhole would be modified to accept the new pipe and the existing sanitary line would be upgraded to accommodate additional flows.

Air Pollution Control

A complete assessment of air quality and the impacts of the Jamestown Project on air quality can

be found in the "Sections 3.3.2.13: Air Quality" and 4.3.2.11: Air Quality."

The air quality study demonstrates that the Jamestown Project and its alternatives comply with the 1990 Clean Air Act Amendments (CAAA) and the Virginia State Implementation Plan (SIP) criteria. The microscale analysis demonstrated that the carbon monoxide (CO) concentrations are below the National Ambient Air Quality Standards (NAAQS) for all of the action alternatives.

The proposed action would have minor short-term and negligible long-term impacts, because for each of these alternatives, future pollution levels of CO, volatile organic compounds (VOCs), and nitrous oxide (NOx) would either remain the same as or increase by 5% or less, compared to existing pollution levels.

An open-burning permit may be required for any open burning of land clearing or other debris, and a new source review permit may be required for the addition of fuel-burning facilities such as heaters or generators. The NPS will coordinate with VDEQ's Tidewater Regional Office when it has determined what fuel-burning equipment needs to be installed in new or renovated buildings.

Coastal Lands Management

Direct impacts to the 100-foot Resource Protection Area (RPA) buffer would occur only at the Jamestown Rediscovery™ Center expansion and existing parking area, where approximately 3,223 square feet of RPA would be impacted. This impact would occur in the landward 50 feet of the 100-foot RPA buffer and would be minor. This structure would be constructed in a previously developed area (i.e., the APVA parking area - existing impervious cover).

Mitigative measures taken to minimize any potential impacts would include strong and monitored erosion and sediment control plans, innovative stormwater management, and careful design planning. In addition, the NPS would work with the Center for Watershed Protection to determine state-of-the-art technologies to deal with runoff pollution.

The NPS will coordinate directly with the James City County Environmental Division and Chesapeake Bay Local Assistance Department (CBLAD), who will review site plans as prepared, to ensure maximum compliance with Chesapeake Bay Preservation Regulations.

In addition, existing impervious cover at the location of the Visitor Center (3,200 square feet) and septic infrastructure (12,632 square feet) would be removed from the RPA and returned to its natural vegetative state. While this does not directly offset impacts of the proposed action, it would serve to increase the functional capacity of the RPA buffer.

Existing conditions and impacts to the Chesapeake Bay Preservation Areas are discussed in more detail in "Section 3.3.2.4: Chesapeake Bay Resources" and "Section 4.3.2.2: Chesapeake Bay Resources," respectively.