L'ENFANT PROMENADE AND BENJAMIN BANNEKER PARK EA

Environmental Assessment for Improvements to L'Enfant Promenade and Benjamin Banneker Park

APPENDICES

March 2006

DISTRICT DEPARTMENT OF TRANSPORTATION

FEDERAL HIGHWAY ADMINISTRATION,
EASTERN FEDERAL LANDS HIGHWAY DIVISION

District Department of Transportation
Michelle Pourciau, Acting Director
2000 14th St., NW, 6th Floor, Washington, DC 20009

Government of the District of Columbia
Anthony A. Williams, Mayor

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Appendices

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I. BENJAMIN BANNEKER MEMORIAL LEGISLATION AND AUTHORIZATION

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studies regarding the establishment of National Park System units in the following areas in the State of Hawaii:

(1) Island of Maui: The shoreline area known as "North Beach", immediately north of the present resort hotels at Kaanapali Beach, in the Lahaina district in the area extending from the beach inland to the main highway.

(2) Island of Lanai: The mountaintop area known as "Hale" a the central part of the island.

(3) Island of Kauai: The shoreline area from "Anini Beach" to "Makua Tunnels" on the north coast of this island.

(4) Island of Molokai: The "Halawa Valley" on the eastern end of the island, including its shoreline, cove and lookout/access roadway.

(b) KALAUPAPA SETTLEMENT BOUNDARIES.—The studies conducted under this section shall include a study of the feasibility of extending the present National Historic Park boundaries at Kalaupapa Settlement eastward to Halawa Valley along the island's north shore.

(c) REPORT.—A report containing the results of the studies under this section shall be submitted to the Congress promptly upon completion.

40 USC 1003 note [table].

SEC. 512. MEMORIAL TO MR. BENJAMIN BANNEKER IN THE DISTRICT OF COLUMBIA.

(a) MEMORIAL AUTHORIZED.—The Washington Interdependence Council of the District of Columbia is authorized to establish a memorial in the District of Columbia to honor and commemorate the accomplishments of Mr. Benjamin Banneker.

(b) COMPLIANCE WITH STANDARDS FOR COMMEMORATIVE WORKS.—The establishment of the memorial shall be in accordance with the Commemorative Works Act (40 U.S.C. 1001 et seq.).

(c) PAYMENT OF EXPENSES.—The Washington Interdependence Council shall be solely responsible for acceptance of contributions for, and payment of the expenses of, the establishment of the memorial. No Federal funds may be used to pay any expense of the establishment of the memorial.

(d) DEPOSIT OF EXCESS FUNDS.—If, upon payment of all expenses of the establishment of the memorial (including the maintenance and preservation amount required under section 8(b) of the Commemorative Works Act (40 U.S.C. 1008(b))), or upon expiration of the authority for the memorial under section 10(b) of such Act (40 U.S.C. 1010(b)), there remains a balance of funds received for the establishment of the memorial, the Washington Interdependence Council shall transmit the amount of the balance to the Secretary of the Treasury for deposit in the account provided for in section 8(b)(1) of such Act (40 U.S.C. 1008(b)(1)).

SEC. 513. LAND ACQUISITION, BOSTON HARBOR ISLANDS RECREATION AREA.

Section 1029(c) of division I of the Omnibus Parks and Public Lands Management Act of 1996 (Public Law 104–333; 110 Stat. 4233; 16 U.S.C. 460kkk(c)) is amended by adding at the end the following new paragraph:

United States Department of the Interior

NATIONAL PARK SERVICE
National Capital Region
1100 Ohio Drive, S.W.
Washington, D.C. 20242

IN REPLY REFER TO
L58 (NCR-LRP)

AUG 19 1999

Ms. Peggy C. Seats
Executive Director
Washington Interdependence Council
2020 Pennsylvania Avenue, NW., Suite 225
Washington, D.C. 20006

Dear Ms. Seats:

As a result of the July 22 meeting of the National Capital Memorial Commission (NCMC) and our recent meeting on August 4 relative to the Benjamin Banneker Memorial, I believe that it would be beneficial to clarify the current situation from our perspective. First, let me assure you that the National Park Service (NPS) is committed to assisting the Washington Interdependence Council in this important effort to appropriately recognize the life of Mr. Benjamin Banneker whose accomplishments went beyond the contributions to the original survey of the District of Columbia. As you know, we are at the very important stage of selecting a site for the memorial.

We have learned from our management of 150 existing memorials and the 20 that have been recently authorized that site selection is a very critical phase of their implementation. The first consideration in establishing a memorial is finding the nexus between a site and the subject matter. Of course, the fact that the Banneker Overlook and L'Enfant Promenade have been named in contemporary times has lead both of us to these sites. Others have suggested that we consider Jones Point in Alexandria, Virginia, where he actually performed the task of positioning the first boundary stone for laying out the District of Columbia. In our view, the Jones Point alternative is valid, but the short-term impacts of the Woodrow Wilson Bridge project on Jones Point over the next 8-10 years may make this site undesirable. Further, while his relationship with the site is undisputed, the fact that it is in Virginia makes the nexus with the city to which Mr. Banneker contributed too remote to be meaningful.

After an appropriate site is approved by NCMC, the NPS, the Commission of Fine Arts and the National Capital Planning Commission, review and approval of the design concept is required. In that regard, the second major consideration is the scale of the proposed memorial and ensuring that the scale is proportionate to the subject matter in the context of other commemorative works throughout the city. In our judgment, the life-size statue of Mr. Banneker, which you have described, is the appropriate size of the memorial. Naturally, a suitable setting of paved and landscaped areas would be needed to complete the composition.

Ms Peggy C Seats

While we are still at the site approval stage, you have progressed well into the design concept stage and thus, have developed the appropriate sized statue. For a memorial of this scale, its site must complement rather than overwhelm the overall composition. What NCMC was conveying to us is that the 5-acre park that surrounds and includes Banneker Overlook must be considered as a whole and that the property is too large for the composition. Further, NCMC concluded that it is so large that it should be saved for a major future memorial such as one for a President or a major event in the history of the nation. However, NCMC also concluded that the relationship between Banneker and L'Enfant is such that placing the memorial on the promenade is the most logical location in the city.

The most positive aspect of the situation is that the District of Columbia is about to undertake a major renovation of the promenade which can provide an enhanced setting for the memorial. However, NCMC cautioned that the entire promenade should not be dedicated to the Banneker Memorial as it would be out of scale with existing comparable subject matter of commemorative works in the city.

In response to this renovation project, we intend to begin discussions with District of Columbia officials about the potential benefits of placing a memorial on the promenade. While we understand that this is not the result you anticipated, we believe that there is merit to the opinion of NCMC and that we should explore the possibilities that may exist. We hope that you are willing to participate in these discussions. In that regard, I would ask that you keep in contact with John G. Parsons, Associate Regional Director for Lands, Resources and Planning. Mr Parsons can be reached at (202) 619-7025.

Sincerely,

Sgd "Terry R. Carlstrom"

Regional Director, National Capital Region

II. MEMORANDUM OF AGREEMENT FOR THE PLANNING, DESIGN ENGINEERING AND CONSTRUCTION SERVICES ASSOCIATED WITH THE REDESIGN AND REHABILITATION OF THE PROJECT AREA WHICH INCLUDES THE L'ENFANT PROMENADE (10TH STREET, SW) FROM INDEPENDENCE AVENUE THROUGH U.S. RESERVATION 719 WHICH INCLUDES AN OVERLOOK NAMED BENJAMIN BANNEKER PARK TO THE SOUTHWEST WATERFRONT AND SITE DESIGN AND CONSTRUCTION SERVICES FOR THE BENJAMIN BANNEKER MEMORIAL ON THE L'ENFANT PROMENADE

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Roger File

DTFH71-00-X-00003

Agreement No: DPW-FHWA-NPS-WIC-00-00001

MEMORANDUM OF AGREEMENT

among the

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

and

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
DISTRICT OF COLUMBIA DIVISION

and

DISTRICT OF COLUMBIA
DEPARTMENT OF PUBLIC WORKS

and

U.S. DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
NATIONAL CAPITAL REGION

and

WASHINGTON INTERDEPENDENCE COUNCIL
OF THE DISTRICT OF COLUMBIA

for

PLANNING, DESIGN, ENGINEERING AND CONSTRUCTION SERVICES ASSOCIATED WITH THE REDESIGN AND REHABILITATION OF THE PROJECT AREA WHICH INCLUDES L'ENFANT PROMENADE (10TH STREET, S.W.) FROM INDEPENDENCE AVENUE THROUGH U.S. RESERVATION 719 WHICH INCLUDES AN OVERLOOK NAMED BENJAMIN BANNEKER PARK TO THE SOUTHWEST WATERFRONT AND SITE DESIGN AND CONSTRUCTION SERVICES FOR THE BENJAMIN BANNEKER MEMORIAL ON THE L'ENFANT PROMENADE WASHINGTON, D.C.

MEMORANDUM OF AGREEMENT BETWEEN THE U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION, EASTERN FEDERAL LANDS HIGHWAY DIVISION; THE U.S. DEPARTMENT OF TRANSPORTATION, FEDERAL HIGHWAY ADMINISTRATION, D.C. DIVISION; THE DISTRICT OF COLUMBIA, DEPARTMENT OF PUBLIC WORKS; THE U.S. DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE, NATIONAL CAPITAL REGION; AND THE WASHINGTON INTERDEPENDENCE COUNCIL OF THE DISTRICT OF COLUMIA, FOR THE PLANNING, DESIGN ENGINEERING AND CONSTRUCTION SERVICES ASSOCIATED WITH THE REDESIGN AND REHABILITATION OF THE PROJECT AREA WHICH INCLUDES THE L'ENFANT PROMENADE (10TH STREET, S.W.) FROM INDEPENDENCE AVENUE THROUGH U.S. RESERVATION 719 WHICH INCLUDES AN OVERLOOK NAMED BENJAMIN BANNEKER PARK TO THE SOUTHWEST WATERFRONT AND SITE DESIGN AND CONSTRUCTION SERVICES FOR THE BENJAMIN BANNEKER MEMORIAL ON THE L'ENFANT PROMENADE WASHINGTON, D.C.

This Memorandum of Agreement ("Agreement") entered into by and among the United States Department of Transportation, Federal Highway Administration, Eastern Federal Lands Highway Division ("EFLHD"), the United States Department of Transportation, Federal Highway Administration, D.C. Division ("FHWA D.C. Division") the District of Columbia, Department of Public Works ("DCDPW"), the United States Department of Interior, National Park Service, National Capital Region, ("NPSNCR"), and the Washington Interdependence Council of Washington, D.C. ("WIC"), collectively known as the "parties".

WHEREAS, the purpose of this Agreement is to establish the roles, responsibilities, and procedures under which work shall be performed by the EFLHD, FHWA D.C. Division, DCDPW, NPSNCR, and WIC to conduct planning, design, engineering and construction services associated with the redesign and rehabilitation of the project area which includes the L'Enfant Promenade (10th Street, S.W.) from Independence Avenue through U.S. Reservation 719 which includes an overlook named Benjamin Banneker Park to the Southwest Waterfront and site design and construction services for the Benjamin Banneker Memorial ("Memorial") on the L'Enfant Promenade Washington, D.C.

WHEREAS, the DCDPW has the jurisdictional and maintenance responsibility for the L'Enfant Promenade (10th Street, S.W.) from Independence Avenue to U.S. Reservation 719;

WHEREAS, the DCDPW has requested assistance from the EFLHD to conduct the planning, design, engineering and construction services of the L'Enfant Promenade (10th Street, S.W.) from Independence Avenue to U.S. Reservation 719 and to prepare the site design for the Memorial on the L'Enfant Promenade;

WHEREAS, 23 U.S.C. §308(a) authorizes the FHWA to perform engineering and other services in connection with the survey, design, construction, and improvements of highways for other federal or state cooperating agencies;

WHEREAS, the EFLHD has the authority under 23 U.S.C. §308 to enter into partnerships and interagency agreements among federal and state transportation agencies to provide highway and bridge infrastructure improvements;

WHEREAS, the FHWA D.C. Division is the Federal agency with administrative, financial, and project implementation and management oversight of the District of Columbia's Federal-aid Highway program;

WHEREAS, 23 U.S.C. §132 authorizes EFLHD to receive funds in advance of the estimated Federal share of a proposed Federal-aid project;

WHEREAS, the NPS has the jurisdictional and maintenance responsibility for the approximate 4.67 acre U.S. Reservation 719 that includes the .6 acre overlook feature known as Benjamin Banneker Park, located at the southern end of the L'Enfant Promenade;

WHEREAS, the parties will work cooperatively to redesign and revitalize the L'Enfant Promenade in such a manner that the facility will better accommodate vehicular traffic, pedestrians, and bicyclists by incorporating a memorial, and other public amenities into the facility in an effort to link tourist traffic between the National Mall and the District's southwest waterfront;

WHEREAS, Public Law 105-355 §512 authorizes the WIC to establish a memorial in the District to honor and commemorate the accomplishments of Benjamin Banneker which is envisioned as a statue and pedestal;

WHEREAS, Public Law 105-355 §512(c) stipulates that no federal funds may be used to pay for the establishment of the Benjamin Banneker Memorial;

WHEREAS, the WIC is completely responsible for raising funds to design and establish the Benjamin Banneker Memorial subject to the approval of the Secretary of the Interior, the National Capital Memorial Commission, the Commission of Fine Arts, and the National Capital Planning Commission;

WHEREAS, the WIC after satisfactory completion and acceptance by all parties of the Benjamin Banneker Memorial, will convey the statue and pedestal to the NPSNCR and will allow for federal maintenance and preservation of the statue and pedestal which are to be located on D.C. land;

WHEREAS, the NPS is responsible for managing federal lands in accordance with the Organic Act, 16 U.S.C. to conserve and to provide for enjoyment of the same in such a manner as will leave them unimpaired for the enjoyment of future generations;

WHEREAS, the DCDPW will continue to retain responsibility for the L'Enfant Promenade upon completion of the project and retains the responsibility for the structural integrity of the area of the L'Enfant Promenade upon which the Memorial is to be supported;

WHEREAS, the NPSNCR shall assume responsibility for the perpetual maintenance and preservation of the Benjamin Banneker Memorial upon its successful completion by WIC; and continue to maintain all of U.S. Reservation 719 including the overlook named Benjamin Banneker Park; and

WHEREAS, the EFLHD, FHWA D.C. Division, NPSNCR, and DCDPW are authorized to enter into this Agreement pursuant to the authority contained in 31 U.S.C. §1535 and 1537.

NOW, THEREFORE, pursuant to the authority contained in 16 U.S.C. §1 *et seq.*; 31 U.S.C. §1535 and 1537; Title 23 C.F.R. (Highways); the Commemorative Works Act (P.L. 99-652); the Intermodal Surface Transportation Efficiency Act (P.L. 102-240, December 18, 1991); the Surface Transportation Extension Act of 1997 (P.L. 105-130); the Transportation Equity Act for the 21st Century (P.L. 105-130, June 9, 1998), and the Transportation Equity Act-Restoration Act (P.L. 105-206, July 22, 1998) the parties in consideration of the mutual promises herein expressed, do hereby agree as follows:

ARTICLE I: SCOPE OF WORK (Obligations, Responsibilities, and Funding)

A. The DCDPW agrees to:

1. Participate on the project planning and design team and lead the review by the parties of all planning, design and construction activities;

2. Provide the required federal funding and local matching share of project planning, design, and construction improvement costs. It is understood that pursuant to Public Law 105-355 §512(c), no federal funds may be used to pay any expense of the establishment of the Benjamin Banneker Memorial;

3. Approve the final design standards for all improvements;

4. Assist EFLHD with activities necessary to obtain the required final environmental clearances and to coordinate the entire project;

5. Assign one project planner and one design engineer for the project so that all communication regarding the planning, design, and future construction of this project will be coordinated and managed through those persons;

6. Assist EFLHD with design alternatives and public meetings;

7. Participate in all design field reviews;

8. Submit for review and approval final contract plans, specifications, and engineering estimate ("PS&E") packages to the FHWA D.C. Division;

9. Prepare all necessary Federal-aid project approvals and authorization documents (Form 351/1240/Federal-aid Project Agreement (PR2A));

10. Prepare project documentation as part of the District's Annual Plan of Transportation Contracts and Capital Improvement Budget for approval of the D.C. Council and the Financial Responsibility and Management Assistance Authority;

11. Co-monitor projects' progress to ensure the satisfactory completion of the project;

12. Confer with EFLHD on all significant design and construction change orders, claims, and non-participating federal-aid costs;

13. Participate in the final construction inspection and closeout of this project;

14. Continue to maintain the L'Enfant Promenade with the exception of the physical Benjamin Banneker Memorial (to which the final dimensions will be determined at the time of final design approval by all parties);

15. Allow the NPSNCR access across D.C. property for NPSNCR maintenance and preservation of the Banneker statue and pedestal; and,

16. The NPSNCR will not be responsible for maintaining the structural integrity of the L'Enfant Promenade and Memorial support features.

B. The FHWA D.C. Division agrees to:

1. Participate on the project planning and design team;

2. Review and approve federal funding for the planning, design, and construction phases of this project;

3. Advance funds by phase for the estimated Federal share for proposed planning, design, and construction improvements in accordance with 23 U.S.C. §132 [not to include federal funds for the establishment of the Benjamin Banneker Memorial];

4. Approve environmental documentation required by the National Environmental

Policy Act (NEPA), as amended, and 23 CFR §771, including the Environmental Impact Statement, Record of Decision, Categorical Exclusion, Finding of No Significant Impact, and 4(f) Statement, and the coordination and approval of Section 106 in accordance with the National Historic Preservation Act;

5. Approve right-of-way plans and administratively review the right-of-way acquisition and utility relocation activities;

6. Approve the final PS&E packages for advertisement; and

7. Participate in the final construction inspection and closeout of the project.

C. The EFLHD agrees to:

1. Perform planning, design, and engineering services and prepare the contract PS&E package associated with the redesign and rehabilitation of the L'Enfant Promenade and U.S. Reservation 719 including site design and construction enhancements associated with the Benjamin Banneker Memorial;

2. Request written comments and concurrence from the DCDPW and the FHWA D.C. Division for the following activities and/or products:

   (a) preliminary plans, including alternatives;
   (b) right-of-way plans, based on 35 percent design;
   (c) plan-in-hand plans (70 percent plans);
   (d) final contract PS&E packages (95 percent plans); and,
   (e) completed construction project;

3. Administer all surveying, mapping and subsurface investigations for final design activities;

4. Act as the lead agency, in cooperation with FHWA D.C. Division for the preparation and approval of the NEPA document for this project;

5. Prepare the environmental documentation required pursuant to NEPA and 23 CFR §771, including the Environmental Impact Statement, Record of Decision, Categorical Exclusion, or Finding of No Significant Impact, and the coordination and approval of Section 106 in accordance with the National Historic Preservation Act;

6. Prepare documents for 4(f) statement, Coast Guard permit, Section 404 clearance (permit), Section 106 statement, National Park Service permits, and any construction permits and utility clearances required for each project;

7. Acquire any necessary utility and railroad easement agreements;

8. Design projects in accordance with the District of Columbia Downtown Streetscape Regulations, the Interagency Initiative for National Mall Road Improvement Program Streetscape Manual, applicable AASHTO standards and guides and use the DCDPW Standard Specifications for Highways and Structures, 1996, as amended [and as the contracting office, the General Provisions (Division 100) of the Standard Specifications for Highways and Structures, will be deleted and substituted with the General Requirements (Section 100) of the Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, 1996, as amended];

9. Select a consultant for planning, design, and construction assistance from available consultants in the Washington metropolitan area using procurement procedures in accordance with the Federal Acquisition Regulations (FAR), and the Transportation Acquisition Regulations (TAR);

10. Convene a panel of architectural and urban design experts to explore redesign concepts of the L'Enfant Promenade and improve the pedestrian connections across U.S. Reservation 719 to the Southwest waterfront;

11. With DCDPW, NPSNCR, and WIC representatives conduct public hearings to discuss design alternatives;

12. Submit a Standard Form 1080 Voucher [including federal taxpayer identification number, DUNS number and federal bank account number] to the DCDPW and FHWA D.C. Division for review and approval, funding requests pursuant to Title 23 U.S.C. §132 funding requests in two stages:

    (a) for planning, preliminary engineering, environmental compliance, and agreements; and,
    (b) for construction, construction engineering, and contingencies.

13. Coordinate and incorporate requirements of Advisory Neighborhood Commissions, National Capital Planning Commission, Commission of Fine Arts, State Historic Preservation Officer, DC Department of Consumer and Regulatory Affairs, National Park Service, utilities, railroads, business, neighborhood and civic associations;

14. Spend project funding in accordance with spending plans authorized by appropriate legislative bodies, the District of Columbia Financial Responsibility and Management Assistance Authority and the District's Office of the Chief Financial Officer;

15. Procure the construction contract in accordance with the FAR and the TAR and advertise and award the construction contract at a time requested y the DCDPW;

16. Coordinate with DCDPW and FHWA D.C. Division the analysis of bidders and bids;

17. Administer the construction contract including necessary construction inspections and provide to DCDPW before and after digital photo documentation;

18. Transport and install the completed Benjamin Banneker Memorial to the designated site on L'Enfant Promenade during the final construction phase of this project;

19. Prepare a temporary sign visible to the public on D.C. property, indicating the funding sources and participation levels provided by the federal government and the District of Columbia and design, locate and construct a permanent sign commemorating this project;

20. Assume responsibility for the administrative settlement or adjudication of claims arising from contracts awarded by the EFLHD and covered by this Agreement in accordance with the FAR and TAR, and subject to the availability of project funds;

21. Provide the DCDPW with a quarterly financial report reflecting the status of obligations and expenditures;

22. Adjust financial accounting information and return unexpended funds based upon the final cost of the project pursuant to Title 23 U.S.C. §132; and,

23. For the purposes of utility adjustments or relocations, the EFLHD will act for and on behalf of the DCDPW, and all prior rights shall be considered to be continuing to be under the jurisdiction of the DCDPW. Since the EFLHD is acting on behalf of the DCDPW with regard to utility adjustments, the same rights will apply with regard to adjustment or relocation costs and to the waiver of inspection fees incurred by the EFLHD on behalf of the DCDPW.

D. The NPSNCR agrees to:

1. Act as the lead agency and be responsible for guiding the decisions associated with the planning, design and location of the proposed Benjamin Banneker Memorial on the L'Enfant Promenade and the planned construction of bike and pedestrian improvements to the Southwest waterfront associated with the amendment of the design of U.S. Reservation 719 including Benjamin Banneker Park;

2. Provide design and engineering assistance with the EFLHD and DCDPW for the planning and design of portions of this project within U.S. Reservation 719;

3. Participate on the project planning and design team;

4. Assist with the preparation of the NEPA decision documentation;

5. Assist with the activities necessary to provide the required final environmental and historical clearances and the requisite coordination and approval process;

6. Assist the EFLHD and DCDPW with design alternative public involvement meetings;

7. Assist EFLHD with the preparation of documents for 4(f) statement, Section 106 statement, and any other necessary permits;

8. Participate in necessary construction inspections and the final inspection of the project with the EFLHD and DCDPW; and,

9. Assume responsibility for the perpetual maintenance and preservation of the Benjamin Banneker Memorial statue and pedestal after satisfactory completion and acceptance by all parties to the project in accord with § 512 of Public Law 105-355;

E. The WIC agrees to:

1. Act as the lead agency and be responsible for raising funds and designing the Benjamin Banneker Memorial and for obtaining design approval of the Secretary of the Interior, Commission of Fine Arts, and the National Capital Planning Commission;

2. Fund the establishment of the Benjamin Banneker Memorial statue and pedestal;

3. Co-monitor projects' progress to ensure the satisfactory completion of Benjamin Banneker Memorial;

4. Participate on the project planning and design team;

5. Assist the EFLHD, DCDPW, and NPSNCR with the design alternative public involvement meetings;

6. Take sole responsibility for accepting contributions and accounting for funds associated with the establishment of the Benjamin Banneker Memorial;

7. Ensure that no federal funds are used to pay for any expense for the establishment of the memorial;

8. Coordinate all press and media related matters concerning this project with DCDPW, EFLHD and NPSNCR; and

9. Transfer to the NPSNCR, by letter agreement, the Banneker statue and pedestal for NPS maintenance and preservation.

ARTICLE II: TERM OF AGREEMENT

This Agreement shall be in force for five (5) years from the date of the last approving signature, and shall remain in effect until the work, including payment, has been completed to the mutual satisfaction of the DCDPW, WIC, NPSNCR, EFLHD, and FHWA D.C. Division.

This Agreement may be renewed for an additional term upon the written consent of the parties. The Agreement may be modified by written consent of all of the parties to cover any questions that may arise subsequent to the date of this Agreement.

All parties to the Agreement will be afforded the opportunity to inspect, at any time, work in progress, the financial records, and any other supporting documentation; and to participate in all meetings, field reviews, bid openings, pre-construction conferences, and periodic and final construction inspections.

ARTICLE III: KEY OFFICIALS AND CONTACTS

A. For the EFLHD:

KEY OFFICIAL:

Mr. Allen W. Burden, P.E.
Division Engineer
Eastern Federal Lands
Highway Division
Federal Highway Administration
21400 Ridgetop Circle
Sterling, VA 20166-6511
(703) 404-6203 (phone)
(703) 404-6217 (fax)

CONTACT PERSON:

Mr. Alan T. Teikari
Planning & Coordination Engineer
Eastern Federal Lands
Highway Division
Federal Highway Administration
21400 Ridgetop Circle
Sterling, VA 20166-6511
(703) 404-6277 (phone)
(703) 404-6217 (fax)

B. For the FHWA D.C. Division:

KEY OFFICIAL:

Mr. James Cheatham
Administrator
D.C. Division
Federal Highway Administration

CONTACT PERSON:

Mr. Edward A. Sheldahl
Fields Operations Engineer
D.C. Division
Federal Highway Admin.

820 First Street, N.E.
Suite 750
Washington, D.C. 20002
(202) 523-0163 (phone)
(202) 523-0181 (fax)

820 First Street, N.E.
Suite 750
Washington, D.C. 20002
(202) 523-0168 (phone)
(202) 523-0181 (fax)

C. For the DCDPW:

KEY OFFICIAL:

Ms. Vanessa Dale Burns
Director
Department of Public Works
2000 14th Street, N.W., 6th Floor
Washington, D.C. 20009
(202) 673-6812 (phone)
(202) 939-8191 (fax)

CONTACT PERSON:

Mr. James Evans
Chief of Resource Allocation
Department of Public Works
2000 14th Street, N.W., 7th Floor
Washington, D.C. 20009
(202) 673-2377 (phone)
(202) 939-7185 (fax)D. For the NPSNCR

D. For the NPSNCR

KEY OFFICIAL:

Mr. Terry R. Carlstrom
Regional Director
U.S. Department of Interior
National Park Service
National Capital Region
1100 Ohio Drive, S.W.
Washington, D.C. 20242
(202) 619-7000(phone)
(202) 619-7220(fax)

CONTACT PERSON:

Mr. John G. Parsons
Associate Regional Director
U.S. Department of Interior
National Park Service
National Capital Region
1100 Ohio Drive, S.W.
Washington, D.C. 20242
(202) 619-7025 (phone)
(202) 619-7420 (fax)

E. For the WIC

KEY OFFICIAL:

Ms. Peggy C. Seats
Executive Director
Washington Interdependence Council
2020 Pennsylvania Avenue, N.W. Suite 225
Washington, D.C. 20006
(202) 387-3380 (phone)
(202) 387-6967 (fax)

CONTACT PERSON:

Ms. Peggy C. Seats
Washington Interdependence Council

ARTICLE IV: TERMINATION

This Agreement will terminate when its five (5) year term or renewal period has expired or when all transfers of funds are completed and all work associated with this Agreement has been inspected and approved in writing by the parties with written notification to the FHWA DC Division.

In case of the failure on the part of any party to observe any of the conditions of the Agreement, the affected party may terminate this Agreement for default without any legal process whatsoever

by giving thirty (30) days written notice of termination to such party, effective at the end of the thirty (30) day period.

Any party may terminate this Agreement for its convenience when it is in the best interest of the public to do so, without legal process by giving thirty (30) days notice to the other parties. Such termination shall not be deemed a breach of the Agreement.

ARTICLE V: ASSIGNMENT

No transfer or assignment of this Agreement, or any part thereof or interest therein, directly or indirectly, voluntarily or involuntarily, shall be made unless such transfer or assignment is first approved in writing by the EFLHD, FHWA D.C. Division, NPSNCR, and DCDPW.

ARTICLE VI: LIABILITY

A. The parties accept full responsibility for any property damage, injury, or death caused by the acts or omissions of their respective employees, acting within the scope of their employment, or their contractors' scope of work, to the fullest extent of the law. All claims shall be processed pursuant to applicable governing law. To the extent that work is performed by other than federal or District employees, those persons shall be licensed to do business in the District of Columbia, as indicated in 23 C.F.R. §635.110(c).

B. Construction contracts awarded by the EFLHD will include by reference Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, FP (current edition), particularly Section 107, which among other things requires the Contractor to indemnify and hold harmless the Government from all claims for injuries or damage resulting from construction operations, or arising out of the negligent performance of the contract.

To the extent that work is performed by other than federal or District employees, the parties shall require such person or corporation to:

1. Procure public and employee liability insurance from a responsible company or companies with a minimum limitation 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. The policies shall name the United States and the District of Columbia as an additional insured, shall specify that the insured shall have no right of subrogation against the United States and the District of Columbia for payments of any premiums or deductibles due thereunder, and shall specify that the insurance shall be assumed by, be for the account of, and be at the insured's sole risk. Pay the United States and the District of Columbia the full value for all damages to the lands or other

property of the United States or the District of Columbia caused by such person or organization, its representatives, or employees;

2. In the event the United States is paid for damages to property owned by the District of Columbia, then said payment will be forwarded to the appropriate party;

3. Indemnify, save and hold harmless, and defend the United States, the District of Columbia and all other parties, against all fines claims, damages, losses, judgments, and expenses arising out of or from any omission of activity of such person, organization, its representatives or employees; and,

4. The Standard Specification for Construction of Roads FP (current edition), Section 107, also holds the Contractor responsible for the protection and restoration of property and landscape.

C. **TORT CLAIMS:** Any claim filed under the Federal Tort Claims Act (28 U.S.C. §2671 et seq. (1994)), alleging an injury during the performance of this Agreement, which may be traced to a party, shall be received and processed by the party having responsibility for the particular injury causing condition.

ARTICLE VII: REQUIRED AND STANDARD CLAUSES

A. Nothing in this Agreement shall be construed as limiting or affecting the legal authorities of the DCDPW, NPSNCR or the FHWA, or as requiring the parties to perform beyond their respective authorities. Nothing in this Agreement shall be deemed to bind any party to expend funds in excess of available appropriations.

B. **NON-DISCRIMINATION:** The parties shall not discriminate in the selection of employees or participants for any employment or other activities undertaken pursuant to this Agreement on the grounds of race, creed, color, sex, or national origin, and shall observe all of the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252; 42 U.S.C. §2000(d) et. seq.). The parties shall take positive action to ensure that all applicants for employment or participation in any activities pursuant to this Agreement shall be employed or involved without regard to race, creed, color, sex, or national origin.

C. **ANTI-DEFICIENCY ACT:** Pursuant to the Anti-Deficiency Act, 31 U.S.C. §1341(a)(1) (1994), nothing contained in this Agreement shall be construed as binding the United States or the District of Columbia to expend any sum in excess of appropriations made by Congress for the purposes of this Agreement, or as involving the United States or the District of Columbia in any contract or other obligation for the further expenditure of money in excess of such appropriations.

D. **INTEREST OF MEMBERS OF CONGRESS:** No member of, or Delegate to, or Resident Commissioner in Congress shall be admitted to any share or part of this Agreement, or to any benefits that may arise therefrom, unless the share or part or benefit is for the general benefit of a corporation or company.

E. **LOBBY PROHIBITION:** The parties will abide by the provisions of Section 1913 (Lobbying with Appropriated Monies) of 18 U.S.C., which states:

> No part of the money appropriated by any enactment of Congress shall, in the absence of express authorization by Congress, be used directly or indirectly to pay for any personal service, advertisement, telegram, telephone, letter, printed or written matter, or other devise, 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 the introduction of any bill or resolution proposing such legislation or appropriation; but this shall not prevent officers or employees of the United States or its departments or agencies from communicating to Members of Congress on the request of any Members of Congress, through the proper official channels, requests for legislation or appropriations which they deem necessary for the efficient conduct of public business.

F. This Agreement is subject to all laws governing Federal and District of Columbia procurement and to all regulations and rules promulgated thereunder, whether now in force or hereafter enacted or promulgated, except as specified in this Agreement. Nothing in this Agreement shall be construed as in any way impairing the general powers of the District of Columbia and NPSNCR for supervision, regulation, and control of its property under such applicable laws, regulations, and rules.

IN WITNESS THEREOF, the parties hereto have caused this Agreement to be executed by their duly authorized representatives.

DISTRICT OF COLUMBIA
DEPARTMENT OF PUBLIC WORKS

Vanessa Dale Burns 1/12/00
Vanessa Dale Burns Date
Director

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
DISTRICT OF COLUMBIA DIVISION OFFICE

James A. Cheatham 1/12/00
James A. Cheatham Date
Division Administrator

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

Allen W Burden 1/12/00
Allen W. Burden, P.E. Date
Division Engineer

U.S DEPARTMENT OF INTERIOR
NATIONAL PARK SERVICE
NATIONAL CAPITAL REGION

Terry R. Carlstrom 1/12/00
Terry R. Carlstrom Date
Regional Director

WASHINGTON INTERDEPENDENCE COUNCIL

Peggy C. Seats 1/12/00
Peggy C. Seats Date
Executive Director

III. STRUCTURAL CONDITION ASSESSMENT

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L'Enfant Promenade

Additional Structural Inspection and Concrete Core Testing

Supplement to Existing Conditions Report and Alternatives Analysis

May 2005, revised January 2006

Introduction

The information in this report is intended to supplement the structural findings documented in the "L'Enfant Promenade/10th Street Overlook Site Existing Conditions Report," dated May 2003, and the "Alternatives Analysis: L'Enfant Promenade and Banneker Overlook Park Sites," dated February 2004. Excerpts from each of those documents highlighting the relevant structural findings are provided at the end of this report. The condition ratings documented in that report were determined from a visual walk-through inspection of the Promenade bridge structures and from existing inspection reports. It was determined that a more in-depth investigation of the bridge deck was required to accurately estimate its current condition and remaining life. The additional inspection included analyzing deck cores taken from the concrete slab and a detailed inspection of the more heavily deteriorated areas of the superstructure.

Six concrete cores were drilled and extracted from the top of the deck slab at chosen locations throughout the structure. The cores were located adjacent to deteriorated deck joints where possible. Inspectors monitored the coring activities and the removal and replacement of the deck paver blocks. The coring was performed on February 22, and 23, 2005. All six cores were tested for compressive strength and chloride ion content. Two of the cores also underwent a petrographic analysis, which basically measures the ability of the concrete to protect the rebar. Results of the tests are used along with the visual inspection findings to determine the condition of the bridge deck.

The additional inspection focused on the concrete deck and steel girders adjacent to deteriorated deck joints. Condition of the superstructure was noted and used to verify the original report. The visual inspection was performed on the 22-span Bridge No. 1114 Promenade structure since the previous inspection found that the majority of the deterioration was located within this structure. Further inspection of the underside of the bridge structure over I-395/Southwest Freeway (Bridge No. 1108) was not conducted since it is in similar condition and did not warrant temporary closure of I-395. Further inspection of the underside of the southernmost bridge structure (Bridge No. 517) over the CSX Railroad was also not performed since it is in better condition than the other bridges and did not warrant temporary closure of the railroad.

A further inspection was also performed on the precast concrete canopy wall panels on Bridge No. 1108 over I-395/Southwest Freeway. Several panels were

missing along the wall as documented in the Alternatives Analysis Report. The visual inspection focused on the panel support system, to determine the potential of additional panel failures.

Concrete Coring

Concrete core samples were taken and analyzed to determine the strength and other structural properties of the Promenade bridge deck. Materials engineer Froehling & Robertson, Inc., performed both the on-site coring work and laboratory testing. Six, 3-inch diameter cores were drilled to a maximum depth of 5 inches in order to avoid the bottom deck reinforcement or penetrate the deck. Prior to drilling, several 4" thick asphaltic paver blocks, bonded to the top surface of the slab, were removed to allow access for the coring drill. Six cores were taken throughout the main bridge structure (Bridge No. 1114) and the bridge over I-395/Southwest Freeway (Bridge No. 1108). Cores were located in the vicinity of known deteriorated deck joints, if possible. All coring work was limited to the parking lanes on the Promenade to minimize disruption to traffic. Highway and Safety Services, Inc. provided maintenance of traffic and signage on the Promenade. Once extracted, the cores were labeled and sent to the lab for testing. The holes left by the coring procedure were filled with concrete and the original paver blocks were replaced and grouted back in their original position.

Lab Test Results

Lab results from the core testing indicate that the concrete bridge deck is in good structural condition. A strength test was performed on the six cores to determine the compressive capacity of the concrete deck slab. The results for the six (6) samples ranged from 3820 psi to 5750 psi for compressive strength (see Appendix A: Results of Compressive Strength Test). These values are well above the 3000 psi compressive design strength indicated on the as-built drawings.

A petrographic analysis was performed on of two the core samples. The purpose of this test is to determine the depth of carbonation in the cement paste. The results indicate that paste carbonation was not present in either core sample (see Appendix B: Results of Petrographic Analysis). Therefore, at the core locations, the deck concrete shows no sign of carbon dioxide penetration and is able to protect the reinforcing steel as designed.

The final test performed was a chloride ion analysis. All six (6) samples were analyzed. This test determines the amount of chloride present (percentage by mass) in the concrete. The resulting chloride rates ranged from 0.001 to 0.002 percent by mass. These rates are much lower than the ACI recommended threshold of 0.2 percent by mass (ACI 201.2R-92 Section 4.2.1) where tests show that the chloride concentration is high enough for reinforcing steel to begin

to corrode in the right conditions. (See Appendix C: Results of Chloride Ion Analysis).

Additional Inspection

Bridge Structure:

The additional inspection concentrated on the underside of the concrete deck and steel girders along the deteriorated deck joints of the bridge structure that were not readily accessible for the previous inspection. During the original inspection, for the Existing Conditions Report, the underside of the deck was observed from street level approximately thirty feet below the deck. A scissor lift was used for this current inspection, which allowed for the underside of the deck joint and the joint side of the girders to be visually inspected. However, the gap between the girder flanges was too narrow to sound the concrete or scrape the corroded steel. The temporary wood plank protection shield spanning the girder bottom flanges limited observation of the joints at some locations. The shield was placed below the deteriorated joints to prevent pieces of spalled concrete from falling onto traffic. The areas inspected included the joints along column line 3, between columns D and G; along column line 5, between columns D and G; along column line D, between columns 9 and 10; and along column line 12, between columns A and G.

The additional inspection confirmed the condition of the armored deck joint and adjacent concrete deck and girder that was stated in the previous report. In some locations, the joint filler material was missing or out-of-place allowing water to pond on top of the joint or pass through the joint and infiltrate the deck edge, the underside of the deck and girder web and flanges below. The severity and quantity of deck deterioration along the joint was consistent with our previous estimate for the joint replacement and adjacent deck rehabilitation, as stated in the Alternatives Analysis Report.

The steel girders facing the deteriorated joints generally exhibited light to moderate corrosion. The majority of the corrosion was located along the underside of the top flange, the bottom areas of the web and stiffeners and the top and bottom surfaces of the bottom flange. There were no areas observed with any significant section loss on any components of the girders. (See Appendix D: Inspection Photographs for observations described above).

Parapet Canopy Walls:

Several of the precast concrete canopy parapet panels along both sides of Bridge No. 1108 over I-395/Southwest Freeway were missing during the inspection, as noted in the Alternatives Analysis Report. Three panels were missing on the west parapet and two on the east parapet. This existing condition is also identified in the 2005 Bridge inspection report by RK&K.

The concrete panels were constructed under a subsequent contract to the bridge. The construction plans for the panels could not be located for this inspection. The inspectors, however, were able to observe portions of the support system that were visible at locations of missing panels. The panels roughly have an inverted “V” shape with one leg hooked over the concrete parapet wall and the outer leg bearing horizontally against a steel soffit frame. The panels are also attached to a series of steel frames supporting the panel joints, and are connected by embedded anchors. The top of each frame is bolted to the parapet wall, while the bottom of the frame is welded to the steel soffit frame. See Appendix D: Inspection Photographs.

Several precast panels were spalled at the corners and along the top and back edges, and others had cracks up to 1/8” wide along the back face (sidewalk side). Random light to moderate spalls and delaminated areas of the precast concrete were observed on some of the inclined panel faces. Many panels also had small areas of exposed rebar (avg. 3”) on the back face, due to insufficient concrete cover.

Due to the shape of the panels, the most likely method of panel failure would consist of a crack allowing water to corrode the rebar and embedded anchors, causing small pieces of concrete to spall off and fall on traffic below. It is not likely that large panel sections could break off and fall. Our inspection did not find any panels that appear to pose an immediate risk of failure, however, cracks and spalls in the concrete panels should be repaired as they develop to reduce the risk of future panel failures.

Conclusion/Recommendations

The additional concrete testing and inspection performed on the promenade concrete deck and girders verified the conclusions presented in the previous report.

The deterioration of the concrete deck is limited to the areas along the joints. The original asphalt pavers and sealant/adhesive detail used throughout the promenade structure has performed well in preserving the deck slab from deterioration due to exposure to moisture, chemicals and traffic wear. This is confirmed by the positive results of the concrete core tests. The tested compressive strength is higher than the design value; carbonation was not discovered in the cement paste; and only trace amounts of chloride were encountered in the concrete. The underside of the concrete deck slab is typically free of deterioration with only occasional hairline cracks and minor efflorescence.

The majority of the steel girders, diaphragms and bearings throughout the Promenade structure are typically in fair condition, with areas of paint failure and light to moderate rust as presented in the previous report.

It is recommended that the deteriorated deck joints should be replaced and the surrounding concrete deck rehabilitated. All steel members throughout the superstructure and support structure, including girders, diaphragms, bearings and columns, should be cleaned and painted.

As stated in the Alternatives Analysis Report, proper rehabilitation and sustained general maintenance of the promenade concrete deck should help to ensure its full serviceability for many more years. Based on the current condition of the bridge deck and the extra protection provided by the pavers and asphalt sealant, it is reasonable to expect the concrete deck to last 75 years under light service conditions before replacement is required. Given that this structure was built in the 1960's, approximately 40 years ago, it should last another 30 years or more.

Because redevelopment of the Promenade is part of a 50 year plan for DDOT, however, the most viable option may be to replace the deck. Complete replacement would prevent the frequent and undesirable rehabilitation that may be required to sustain the life of the existing deck, such as deck joint replacements. As the existing deck gets older, repetitive rehabilitation and repairs will become more frequent and costly. A deck replacement will typically incur only periodic maintenance measures in the first several years of service. If a general maintenance program is implemented and performed at regular intervals, the time period until the first rehabilitation measures will be greatly extended.

Our inspection did not find any panels that appear to pose an immediate risk of failure. We recommend that the biannual DDOT bridge inspection teams be directed to inspect the precast canopy panels for additional concrete deterioration and that cracks and spalls in the concrete panels should be repaired as they develop to reduce the risk of future panel failures.

Given the existing condition of the precast panels we recommend that all the canopy panels on Bridge No. 1108, and the adjacent panels on Bridge No. 1114, be replaced during the general rehabilitation of the Promenade.

Plans depicting the deficiencies discussed in this report are found on the following pages.

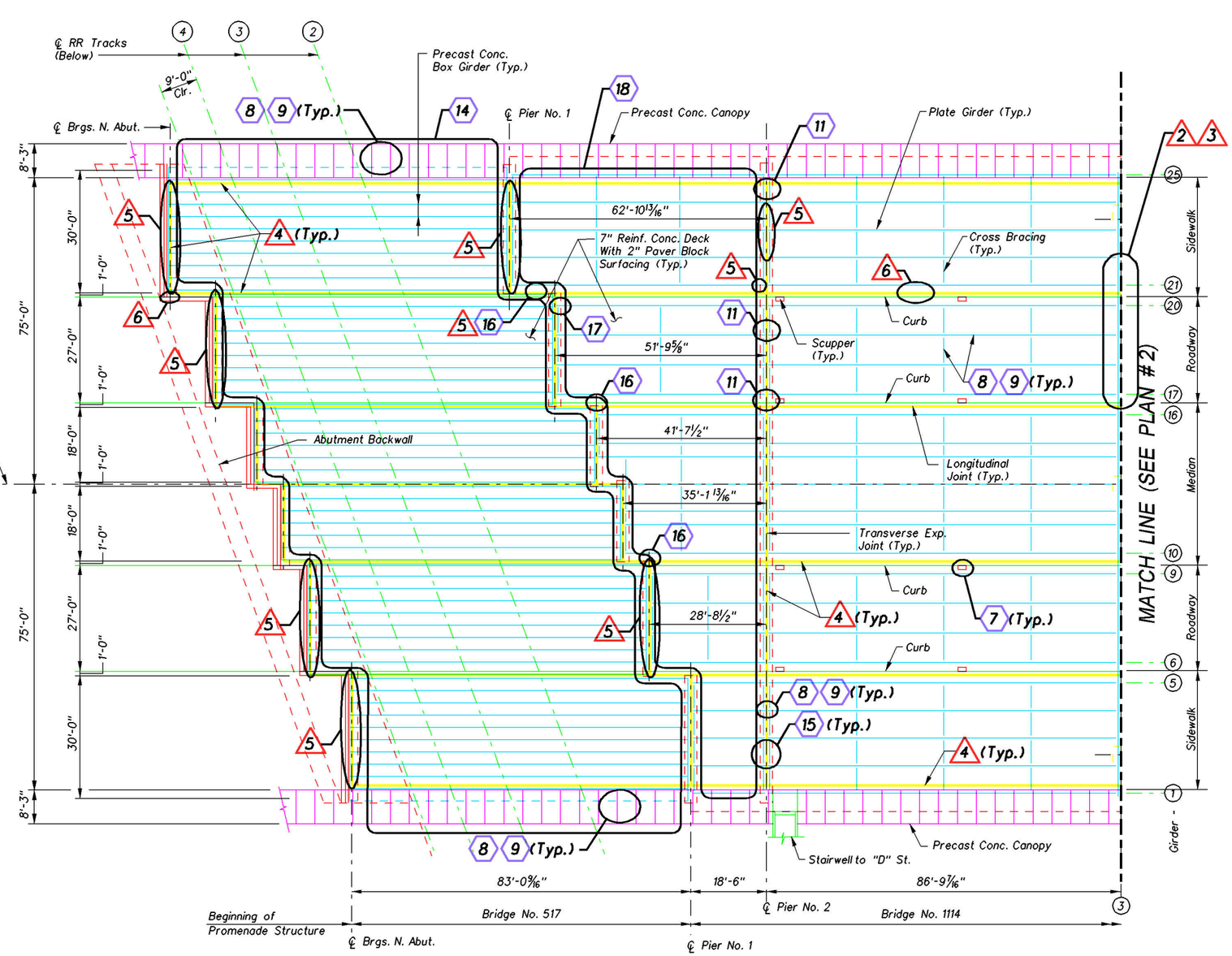
REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX

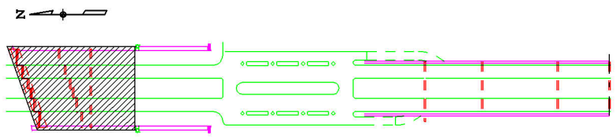
Legend:

1. Replace all precast concrete panels from parapet wall canopy on Birdge #1108 and adjacent similar panels on Bridge #1114.
2. Repair concrete at spalled deck joints.
3. Remove and replace armored joint and premoulded sealant at longitudinal and transverse deck joints
4. Replace joint membrane/sealant.
5. Replace missing, damaged or misaligned paver blocks in sidewalk, median, and roadway.
6. Replace missing or misaligned granite curb blocks and backup stones over longitudinal deck joint at curb.
7. Clean and remove debris from scuppers (Typ.).
8. Blast clean lead-based paint from all structural steel members (girders, beams, diaphragms, soffits, bearings), and properly contain/dispose of debris.
9. Paint all structural steel members (girders, beams, diaphragm, soffits, bearings).
10. Repair cracks (up to ½" wide) on underside of concrete deck.
11. Repair cracks and spalls in concrete piers and abutments.
12. Replace/strengthen structural steel.
13. Repoint joints between fascia panels on piers and abutments of Bridge #1108.
14. Clean water stains from faces of the piers and abutments, and exhaust stains from underside of Bridge #517. (Typ.)
15. Remove debris from the bearing assemblies (Typ.).
16. Replace damaged drainage pipe.
17. Replace missing anchor bolt and nut at bearing. (One locaton at Pier No. 1, Bridge #1114)
18. Remove ground debris in area between Piers Nos. 1 & 2 of Bridge #1114.

△ - Structural or safety priority

⬡ - Maintenance and repair





Key Plan

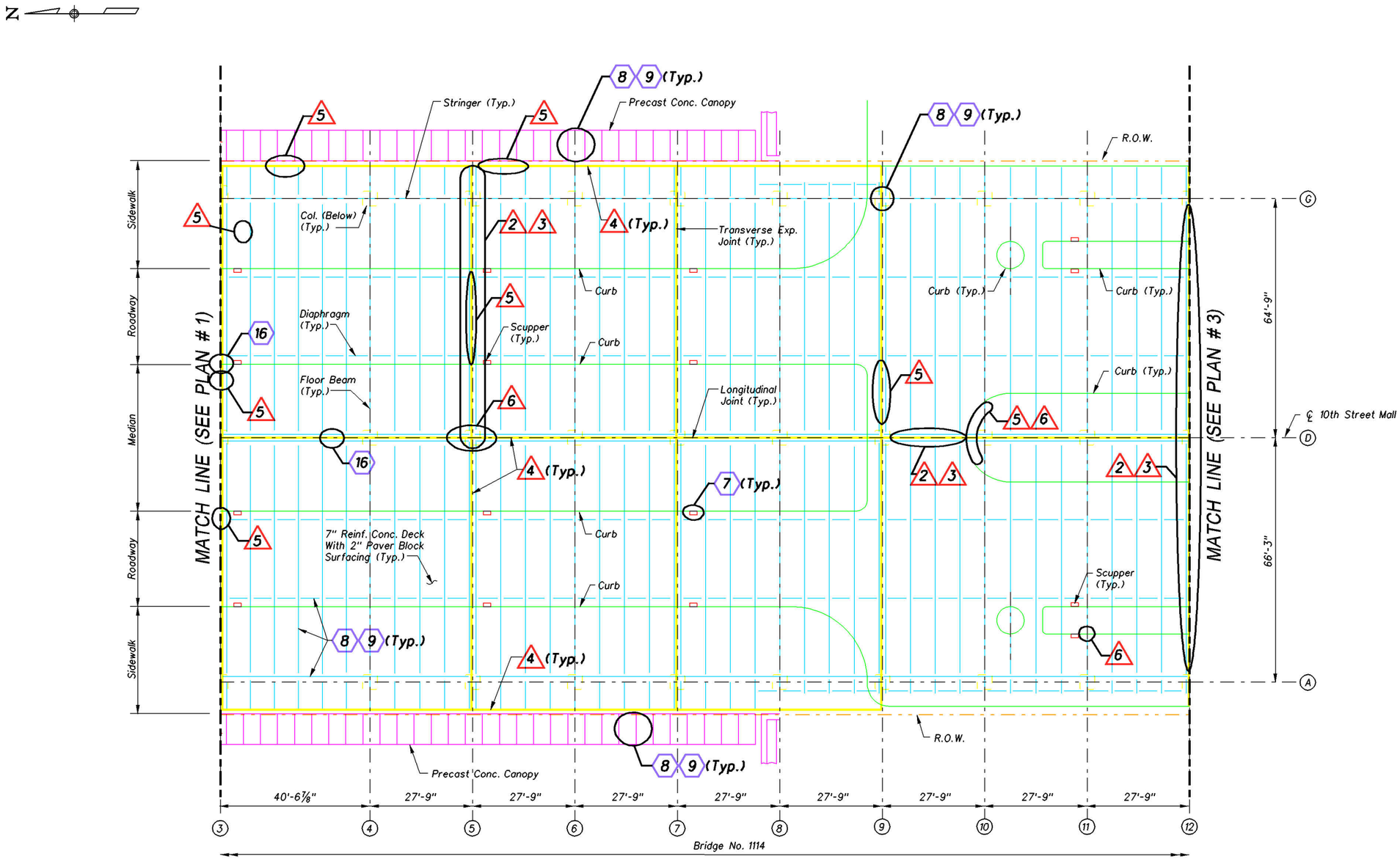
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

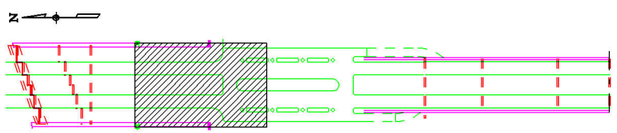
L'Enfant Promenade
Rehabilitation Plan #1

DATE: FEB., 2004	SCALE: 1"=30'-0"	SHEET NO. 1 of 4

$$$$DATE$$$$ $TIME$ Design File = G:\Projects\23077A_L'Enfant Plaza\CADD\23077_P01.dgn

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX





Key Plan

Note:

For repair items, see legend on Sheet No. 1.

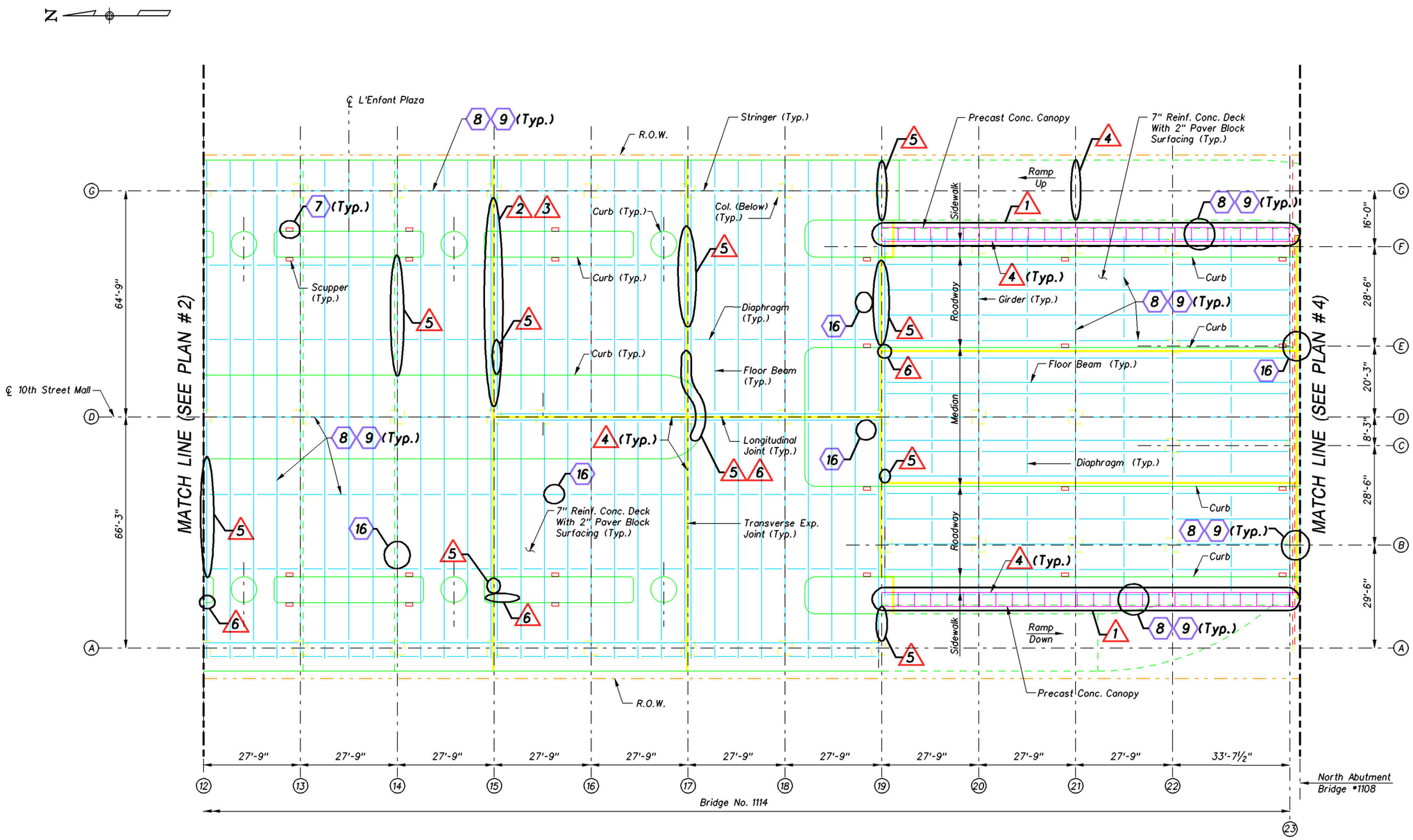
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

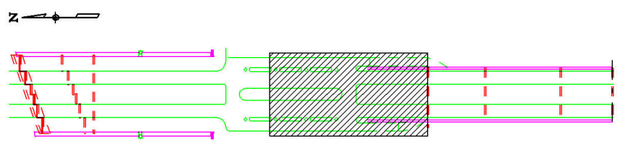
L'Enfant Promenade
Rehabilitation Plan •2

DATE: FEB., 2004	SCALE: 1"=30'-0"	SHEET NO. 2 of 4

$$$$$DATE$$$$$ $TIME$ Design File - G:\Projects\23077A.L'Enfant Plaza\CADD\23077_P02.dgn

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX





Key Plan

Note:

For repair items, see legend on Sheet No. 1.

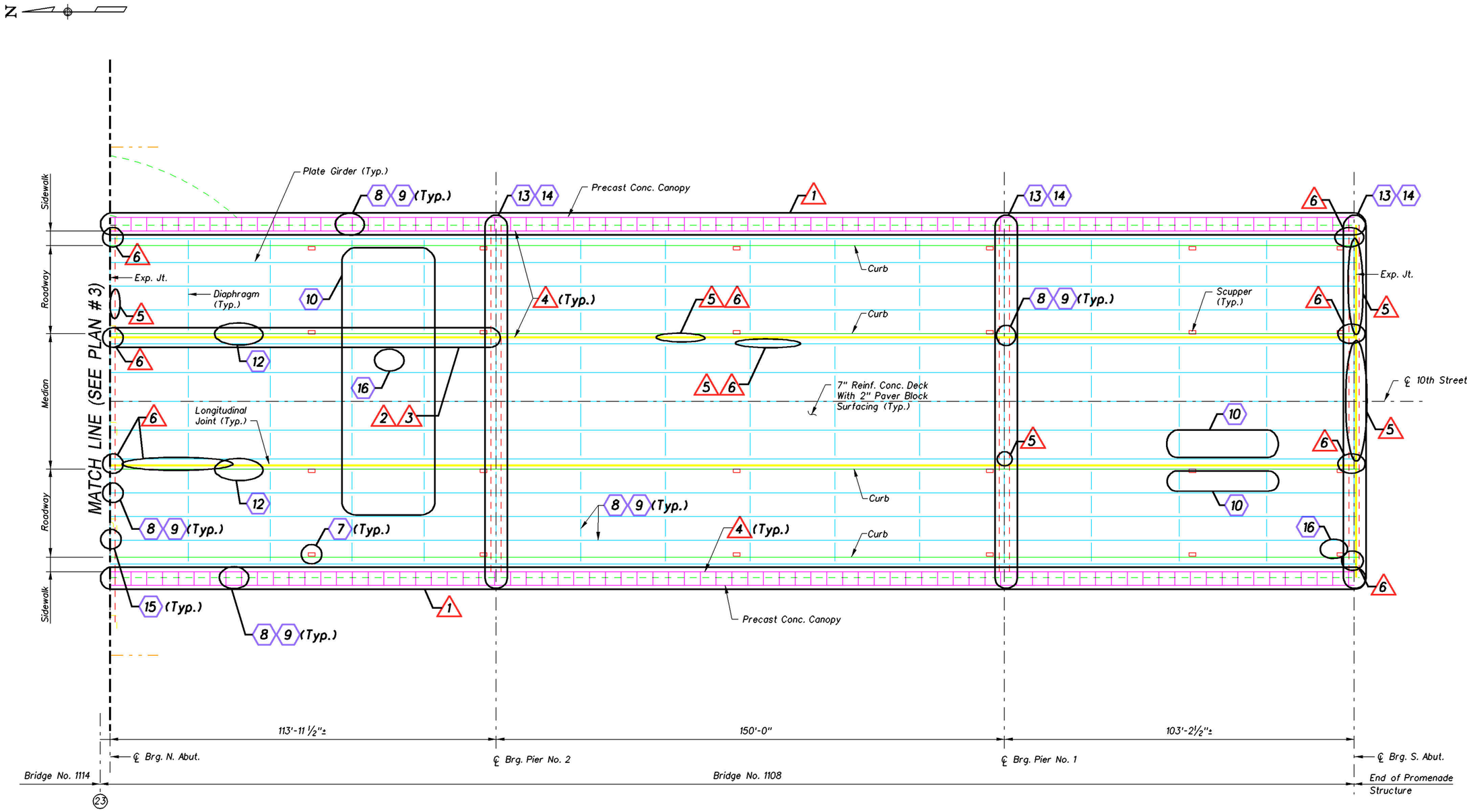
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

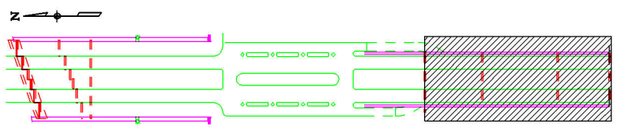
L'Enfant Promenade
Rehabilitation Plan #3

DATE: FEB., 2004	SCALE: 1"=30'-0"	SHEET NO. 3 of 4

$$$$DATE$$$$ $TIME$ Design File - G:\Projects\23077A_L'Enfant Plaza\CADD\23077_P03.dgn

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX





Key Plan

Note:
For repair items, see legend on Sheet No. 1.

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

L'Enfant Promenade
Rehabilitation Plan #4

DATE: FEB., 2004	SCALE: 1"=30'-0"	SHEET NO. 4 of 4

Appendix A:

Results of Compressive Strength Test

SINCE 1881

FROEHLING & ROBERTSON, INC.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS
ENGINEERS • LABORATORIES
"OVER ONE HUNDRED YEARS OF SERVICE"

7798 WATERLOO RAOD • JESSUP, MD 20794
(443) 733-1011 • FAX (443) 733-1015
DC METRO (301) 470-7555

REPORT OF CORES COMPRESSIVE STRENGTH

Client: Parson Brinkerhoff, Quade Douglas

Date: 03/07/05

Project: L'Enfant Plaza

Project No.:F68-201T

Set No.:

Concrete Supplier: Unknown

Date Cored: February 22 and 23, 2005

Date Received: February 24, 2005

Technician: D. Wright

Design Strength: Unknown

Weather: NA:

Air Temperature:

Location: Paving

TEST DATA

Sample Number.	Test Age (days)	Diameter (inches)	Load (pounds)	Strength (psi)
1		2.99	29,180	4130
2		2.99	27,000	3820
3		2.99	35,000	4950
4		2.99	40,620	5750
5		2.98	36,040	5100
6		2.99	40,600	5740

Respectfully submitted,

Remarks:

Froehling & Robertson, Inc.

Appendix B:

Results of Petrographic Analysis

SINCE
1881

FROEHLING & ROBERTSON, INC.
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DC METRO (301) 470-7555

March 30, 2005

PETROGRAPHIC EXAMINATION OF HARDENED CONCRETE

PROJECT NO.:	F68-201T
CLIENT:	Parsons, Brinkerhoff, Quade & Douglas 465 Spring Park Place Herndon, Virginia 20170
ATTN:	Mr. John Michels
PROJECT:	L ' Enfant Plaza
TEST METHOD:	ASTM C 856-88, Standard Practice for Petrographic Examination of Hardened Concrete

Dear Sir,

Froehling & Robertson, Inc. is pleased to submit the results of testing performed on two concrete core samples to determine the depth of carbonation in the concrete paste. The samples were identified with permanent black marker as core samples #3 and #6. The testing was performed by Mr. James Crenshaw.

EXAMINATION

For this examination, the cores were split in half parallel with the length. Each surface of the core sample was treated with phenolphthalein reagent and observed for the presence and depth of carbonation. After treatment with phenolphthalein it was determined that no paste carbonation was present in either core sample.

Should you have any questions about this report or require additional information or testing, please contact us at your convenience.

Respectfully Submitted,
FROEHLING & ROBERTSON, INC.

Brian E. Smith, P.E.
Manager, Technical Services

Appendix C:

Results of Chloride Ion Analysis

SINCE F&R 1881

FROEHLING & ROBERTSON, INC.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS
ENGINEERS • LABORATORIES
"OVER ONE HUNDRED YEARS OF SERVICE"
7798 Waterloo Road, Jessup, MD 20794
Phone: 443.733.1011 DC Metro: 301.470.7555
Fax: 443.733.1015

FACSIMILE TRANSMISSION

TO: JOHN MICHEWS

COMPANY: P. B. Q. D

TEL. LINE: _____ FAX LINE: (703) 742-5800

RE: L'ENFANT PLAZA

FROM: BRIAN SMITH

NUMBER OF PAGES: 3 (INCLUDING COVER LETTER)

DATE OF TRANSMISSION: 3/29/05

HARD COPY TO FOLLOW: ☑ YES VIA: MAIL ☐ NO

REMARKS: ☐ Urgent ☑ For your review ☐ Reply ASAP ☐ Please Comment

CHLORIDE ION TEST RESULTS

FROEHLING & ROBERTSON, INC
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ENGINEERS • LABORATORIES
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SINCE 1881

CERTIFICATE OF ANALYSIS

March 16, 2005

LAB#: 0503183

CLIENT: F&R Baltimore
7798 Waterloo Rd
Jessup MD, 20794
Brian Smith

PROJECT: L'Enfant Plaza
PROJECT NO.: F68-201T
SAMPLED BY:
RECEIVED: 03/09/05

PARAMETER	PREP DATE/TIME	ANALYSIS DATE/TIME	METHOD	ANALYST
Chloride Ion	3/14/05 10:35	3/14/05 10:35	AASHTO T260	AT

LAB #	0503183-01	0503183-02	0503183-03	0503183-04		
SAMPLE ID	Core #1	Core #2	Core #3	Core #4		
DATE/TIME	03/08/05	03/08/05	03/08/05	03/08/05	Quant	
MATRIX	Other	Other	Other	Other	Limit:	Units
Materials Testing (Other)						
Chloride	0.001	0.002	0.001	0.002	0.001	%

Audrey Brubeck
Manager Analytical Laboratory Services

HEADQUARTERS: 3015 DUMBARTON ROAD • BOX 27524 • RICHMOND, VA 23261-7524
TELEPHONE (804) 264-2701 • FAX (804) 264-1202 • www.FandR.com

BRANCHES: ASHEVILLE, NC • BALTIMORE, MD • CHARLOTTE, NC • CHESAPEAKE, VA
CROZET, VA • FAYETTEVILLE, NC • FREDERICKSBURG, VA
GREENVILLE, SC • HICKORY, NC • RALEIGH, NC • ROANOKE, VA • STERLING, VA

CERTIFICATIONS: VIRGINIA DRINKING WATER - 00150
NORTH CAROLINA DENR - 462
SOUTH CAROLINA DHEC- 99010001 & 91010
MARYLAND DRINKING WATER - 279

SINCE 1881

LAB #	0503183-05	0503183-06	-	-		
SAMPLE ID	Core #5	Core #6	-	-		
DATE/TIME	03/08/05	03/08/05	-	-	Quant	
MATRIX	Other	Other	-	-	Limit:	Units
Materials Testing (Other)						
Chloride	**0.001**	**0.001**	-	-	0.001	%

Notes and Definitions

mg/L = milligrams per Liter
µg/L = micrograms per Liter
BQL = Below the Quantitation Limit
mg/kg = milligrams per kilogram
ppm = parts per million
CFU/mL = Colony forming units per milliliter
su = standard units
NTU = Nephelometric Turbidity Units
MPN/100 mL = Most Probable Number per 100 milliliters

Appendix D:

Inspection Photographs

Photo 1: Active drops of water, and corroded top flanges of girders at deteriorated deck joint.

Photo 2: Moisture and corrosion found on top of bottom flange and lower areas of web and stiffeners on a girder near a failed joint.

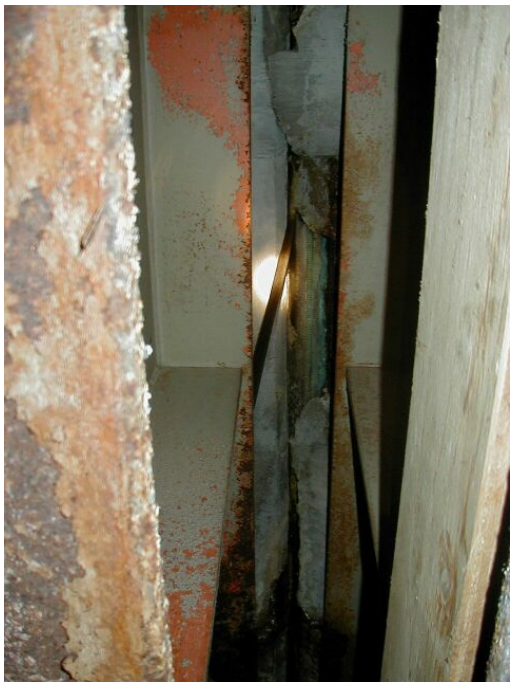


Photo 3: Attempted repair on slab and hanging joint filler material at deck joint.

Photo 4: Typical corrosion found on bottom flanges of girders, and wood shoring located between them, at a failed deck joint.

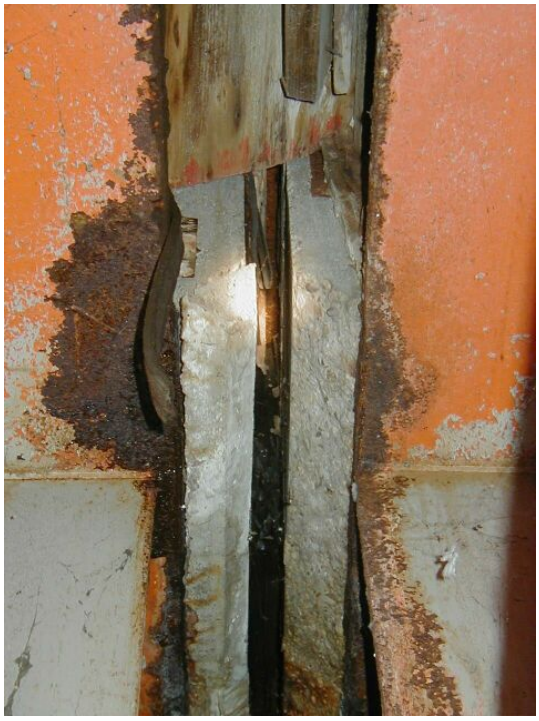


Photo 5: Spalled and sheared off bottom edges of concrete deck slab, corroded top flanges of adjacent girders, and hanging piece of joint filler at failed joint.

Photo 6: Top surface of damp wood shoring, and corroded flanges, webs, and stiffeners of adjacent girders below failed joint.

Photo 7: Missing precast concrete panel at parapet wall on Bridge No. 1108, over I-395/Southwest Freeway.

Photo 8: Steel frame used to help support precast panels; shown at location of missing panel on Bridge No. 1108.

Appendix E:

Structural Findings (Excerpt)
L'Enfant Promenade/10th Street Overlook Site Existing Conditions Report
May 2003

II. Existing Conditions

A. Structural Condition of the Promenade

The District of Columbia Department of Transportation (DDOT) last conducted bridge inspections of the L'Enfant Promenade between January and July 2001. The L'Enfant Promenade is an elevated structure that carries vehicular and pedestrian traffic on 10th Street, SW. The entire elevated structure contains 26 spans with a total length of 1,152 feet. It ranges in width from 166 feet at the north end to 110 feet at the south end. A four-lane (two-way) north-south roadway, separated by a 40-foot wide median, runs the full length of the Promenade. In addition, sidewalks ranging from 4 to 29 feet wide and canopy parapet walls line the east and west edges of the bridges. More than half the length of the Promenade is composed of bridge structures. Three separate bridges align end-to-end spanning the CSX (formerly Conrail) Railroad, D Street and the lower level of the Promenade, Frontage Road, and I-395. **Figure 6** shows the locations of each structure.

The structural condition of each of these bridge structures is rated separately. The condition ratings (critical, poor, fair, good) are based on DDOT's inspection rating system, which utilizes National Bridge Inventory (NBI) coding. **Table 1** gives the descriptions of the condition ratings.

Table 1
Condition Ratings

Rating	Description
Good	No problems noted.
Fair	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
Poor	Advanced Section loss, deterioration, spalling or scour.
Critical	Advanced deterioration of primary structural elements. May require that bridge be closed until corrective action is taken.

Source: Adopted from the USDOT, FHWA Conditions and Performance Report, 2002.

L'Enfant Promenade Structure Over CSX Railroad (Bridge No. 517)

Bridge No. 517, the northern-most structure of the Promenade, spans the CSX Railroad. It is a single-span prestressed concrete box girder structure with a cast-in-place concrete deck, supported by concrete abutments. The structure is 83 feet long by 166 feet wide. The roadways, sidewalks, and median are on individual slabs, separated by longitudinal joints. Transverse deck joints with premoulded joint sealer are located at both abutments. The deck's riding surface, sidewalk, and median are composed of Durex asphalt paving blocks. Granite blocks line the curbs along the sidewalks and median. Fifty box girders, tied together laterally in groups by transverse tensioning rods, support the deck. A continuous concrete wall abutment at the north end, and a series of six staggered concrete wall piers at the south end support the superstructure. (See Photograph 1.)

Figure 6
L'Enfant Promenade
Bridges

The structure was built in 1966. DDOT performed the most recent bridge inspection on January 29, 2001. The bridge was given a fair rating with minor deterioration.

Superstructure

Bridge Deck

The deck is generally in fair condition. Numerous paving blocks were either missing or had significant cracks. At some locations along the transverse deck joints, missing blocks have been replaced with asphalt patches. (See Photograph 2.) Premoulded joint sealer along the deck joints was also deteriorated or out of place from vehicle and pedestrian traffic, allowing water infiltration. The sidewalk is generally in good condition, except for uneven paving tiles observed at several locations.

Supporting Members (Girders, Bearings)

The box girders are in fair condition. Some cracks were observed from the underside of the box girders. Most of these cracks showed signs of water leakage and efflorescence. Exhaust from trains passing beneath the bridge stained the bottom surface of the girders. The bearings and elastomeric pads are in generally good condition, although standing water was beginning to accumulate around the bearings at the north abutment.

Photograph 1 L'Enfant Promenade Structure over CSX Railroad (Bridge No. 517).

Photograph 2 Bridge No. 517, Bridge Deck.

Substructure (Abutment, Piers)
The substructure is in fair condition. The breastwall at the north abutment has several spalls and many cracks on the surface. The cracks range from 1/16" to 1/8" wide, and many run the full height of the wall. The piers at the south end are in generally good condition.

L'Enfant Promenade Structure Over D St. and 10th Street (Bridge No. 1114)
Bridge No. 1114, the middle structure along the Promenade, carries traffic over D Street and 10th Street SW. It is the longest of the three bridges at 22 spans. The bridge is a steel plate girder structure with a cast-in-place concrete deck, and is supported on concrete abutments and a series of steel and concrete columns. The deck is composed of various-sized slabs separated by longitudinal and transverse expansion joints. The deck's riding surface, sidewalk, and median are composed of Durex asphalt paving blocks. Granite blocks line the curbs along the sidewalks and median. The entire structure ranges in length from 681 feet on the west side to 723 feet on the east side, and in width from 150 to 166 feet.

The steel girder layout of the superstructure varies throughout the 22 spans. Twenty-five variable-length simply supported girders lay across spans 1 and 2 (spans are numbered from north to south). Spans 3 through 19 contain multiple transverse girders that frame into 2- and 3-span continuous longitudinal girders, located at the columns. At spans 19 through 22, series of longitudinal girders span between continuous transverse girders. Steel diaphragms brace the girders throughout the superstructure. (See Photograph 3.)

Pier 1 is a line of staggered concrete wall piers at the north end of the bridge. It is also the same set of members supporting the southern end of Bridge No. 517. Pier 2 is a continuous concrete wall pier. The remainder of the substructure is composed of a varied series of concrete columns and steel columns, in three longitudinal rows below the superstructure.

Two ramps at the southern end provide access between the upper and lower levels of the Promenade. An enclosed pedestrian walkway is suspended from the underside of the structure at span 13, leading from the L'Enfant Plaza to the US Postal Service.

The structure was built in 1967. DDOT performed the most recent inspection on the bridge in April 2001. The bridge was given an overall rating of good.

Superstructure

Bridge Deck

Overall the deck is in good condition. The underside surface was relatively free of deterioration with only occasional small cracks with minor efflorescence. Isolated areas of the soffit exhibited minor spalling and efflorescence. Most deterioration was located at the longitudinal and transverse expansion joints. There were several areas along these joints where the joint sealer was missing, allowing water to pass through the joints and corrode the steel girders below. (See Photograph 4.) On the top surface of the deck, at several transverse joint locations, filler material had been damaged or out of place from vehicle and pedestrian traffic. It was also observed that the stone blocks covering the longitudinal joints adjacent to the curbs were occasionally missing or out of place, exposing the joint below it and allowing runoff from the median to drain into the exposed joint before it could reach the proper drainage gratings. Several drainage scuppers along the curb were blocked with debris, preventing proper drainage and possibly channeling water to

Photograph 3 L'Enfant Promenade Structure over D Street & 10th Street (Bridge No. 1114)

Photograph 4 Bridge No. 1114, Bridge Deck.

nearby joints. It should be noted that repairs were being made to the longitudinal expansion joint along the eastern edge of the structure between the bridge and L'Enfant Plaza during the visual inspection.

Pieces of concrete had spalled off the deck at the expansion joints. Temporary wood shoring had been installed between girders below the joints to prevent the spalled concrete from falling into traffic. (See Photograph 5.) Shoring was located below transverse joints at column lines 3, 5, 12, and 15, and below the longitudinal joint at the center of the bridge between columns D-9 and D-10 (columns are numbered north to south and lettered west to east). There were a few locations, however, where pieces of concrete up to 12 inches in length were laying on the pavement below, most likely from spalling off the deck. Some of these locations were below joints where shoring was already in place, most notably column lines 12, 15 and 19. (See Photograph 6.)

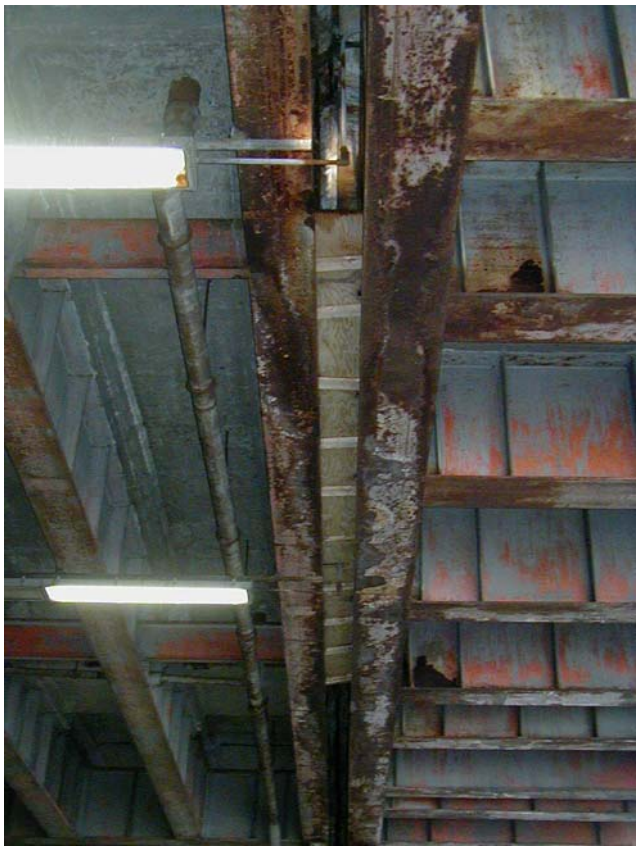
Supporting Members (Girders, Beams, Diaphragms, Bearings)
Supporting members are in generally fair condition. Steel girders, beams, and diaphragms throughout the structure were typically observed to have areas of peeling paint and/or light surface rust. Girders and beams below the expansion joints are in worse condition, exhibiting light to moderate corrosion along most of the member. The most notable deterioration was found at column lines 3, 5, 7, 12 15, 19, and between columns D-9 and D-10. (See Photograph 7.) Most rust was observed along the bottom flanges of these girders. The wood shoring installed between girders mentioned in the previous section has directed the runoff infiltrating the deck joint to the bottom flanges of the girders, compounding the corrosion. Most diaphragms, except those that framed into girders at failed expansion joints, exhibited only paint failure and light surface rust.

Steel bearings throughout the structure are located atop the concrete piers and each steel and concrete column. The bearings that could be observed had mainly moderate paint failure and light surface rust. Those located directly below deck expansion joints exhibited the most deterioration. Bearings at Pier 1 had moderate rust due to trapped runoff and debris atop the pier. There was also a bearing with a missing anchor bolt and nut. At Pier 2, a poor deck joint and malfunctioning drainage pipe had caused light rust on adjacent steel members and moderate to heavy rust on bearings 14 through 21. At spans 3 through 18, most steel members were observed to have failure of the protective paint. Bearings within these spans had light to moderate rust. The steel members at spans 19 through 22 had only some areas of light surface rust and paint failure.

Substructure (Abutments, Piers, Columns)
The substructure is in good condition. Significant debris and a fenced-in area greatly limited the inspection of Pier 1, but observations revealed it to be in good condition. Map cracking and cracks containing efflorescence were found on Pier 2. Large water spots were also observed on the pier face directly below the longitudinal expansion joints. In addition, the vertical expansion joint in the pier wall in the vicinity of girder G-12 was observed to be wider at the base of the wall

than at the top. Larger cracks with moderate efflorescence build-up were observed on the curtain walls along the east and west sides of spans 3 through 18.

Both the steel columns and concrete columns were typically in good condition. Large cracks up to ½" wide were found in several concrete bases at the steel columns along the west side of the structure.



Photograph 5 Bridge No. 1114, Bridge Deck

Photograph 6 Underneath Bridge No. 1114.


Photograph 7 Bridge No. 1114, showing deterioration of girders and beams.

L'Enfant Promenade Structure Over I-395/S.W. Fwy. (Bridge No. 1108)
Bridge No. 1108, the southern-most structure carries the Promenade over Frontage Road and I-395/Southwest Freeway. It is a continuous three-span steel plate girder bridge with a cast-in-place concrete deck, and is supported by concrete abutments and piers. Separated by longitudinal joints, the deck is composed of three individual slabs, one under each roadway and sidewalk, and one below the median. Steel tooth expansion dams are located in the roadways

at both abutments. The remainder of the expansion joint, through the median and sidewalks, is composed of a steel-lined joint with filler material at the north abutment and sliding plates at the south abutment. The deck's riding surfaces for the roadway, sidewalk, and median are composed of Durex asphalt paving blocks. Granite blocks line the curbs along the sidewalks and median. Fifteen girders, braced laterally by steel diaphragms, support the deck. A 5-column concrete bent abutment at the north end, two concrete wall piers, and a concrete retaining wall abutment at the south end support the superstructure. Granite fascia panels cover the south abutment and both piers. The structure is 367 feet long by 109 feet wide**.** (See Photograph 8.)

Photograph 8 L'Enfant Promenade Structure over I-395/Frontage Road.

Originally constructed in 1961, the bridge went through a major rehabilitation in 1988. DDOT performed the most recent bridge inspection in July 2001. The bridge was given a fair rating with minor deterioration.

Superstructure

Bridge Deck

Overall the deck is in fair condition. Occasional very narrow cracks, some with light efflorescence, were observed in some locations on the underside of the deck. Map cracking was found in the soffit, along with leaking water and efflorescence. Water damage was found between girders G-5 and G-6, and between G-10 and G-11 (girders are labeled east to west), at both longitudinal expansion deck joints. There were several areas along these expansion joints where the joint sealer was missing, allowing water to pass through the joints and significantly corrode the steel girders below. It was observed from the top surface of the deck that the stone blocks covering the joints were occasionally missing or out of place, exposing the joint below it. In addition, a narrow line of

caulked sealant along the joint between the blocks and curb, directly over the longitudinal joints, had failed due to normal deck expansion. The misaligned blocks and failed sealant had allowed runoff from the median to drain into the exposed joint before it could reach the proper drainage gratings. Several drainage scuppers along the curb were blocked with debris, preventing proper drainage and possibly channeling water to nearby joints.

Pieces of concrete had spalled off the deck at the longitudinal joints. Temporary wood shoring had been installed below the joint between girders G-5 and G-6 to prevent the concrete from falling into traffic below. (See Photo 9.)

Photograph 9 Bridge No. 1108, Bridge Deck.

The steel tooth and sliding plate expansion joints at the abutments are in good condition, while the joint portion with filler material is satisfactory with minor deterioration. A steel trough is located below the expansion joints at both abutments to catch runoff draining through the joints.

Supporting Members (Girders, Diaphragms, Bearings)

The steel members of the superstructure are generally in fair condition. Typically, the girders and diaphragms were observed to have areas of peeling paint and/or light surface rust. Girders below the longitudinal expansion joints (girders G-5, G-6, G-10, and G-11) were in worse condition, exhibiting light to moderate corrosion along the entire girder, with areas of minor section loss. Girder G-11 was most severe, with significant section loss in the bottom flange and base of web stiffeners. The wood shoring installed between girders G-5 and G-6 has directed the runoff infiltrating the deck joint to the bottom flanges of the girders, compounding the corrosion. Diaphragms at the north and south abutments also exhibit heavy rust, due to failure of the expansion joints.

Most bearings throughout the bridge were observed with only moderate paint failure and light surface rust. The outermost abutment bearings and those located at the failed longitudinal expansion joints exhibited more significant deterioration, most severely at girders G-1, G-5, G-11, and G-15. Moderate to heavy rusting was observed on these expansion bearings at both abutments.

Substructure (Abutments, Piers)

The condition of the substructure is generally fair. At the south abutment water damage was observed in the granite fascia panel joints. Wet panels were found at the locations below the longitudinal expansion joints in the deck. Water stains and cracks were found on the backwall, in addition to spalls on the cheekwall. Light water stains and water damage in the fascia panels were also observed on the piers below the longitudinal deck joints. At the column bent abutment areas of spalls and cracks up to 5 feet long were found on the face of the pier caps. Large spalled areas were also observed on the underside of the pier caps between bent columns. The largest spalls are a 4' x 6' area between columns 1 and 2 and a 10' x 4' area each between columns 2 and 3 and between columns 4 and 5. In addition bearing pedestals at the south abutment were observed covered with debris and a few showed signs of deterioration, most notably at bearings G-1, G-10, and G-11.

Appendix F:

Structural Findings (Excerpt)
Alternatives Analysis: L'Enfant Promenade and Banneker Overlook Park Sites
February 2004

1. Present Condition of the L'Enfant Promenade Structures

A condition assessment was performed to determine the existing conditions of the Promenade bridge structures. The assessment was based on both the most current DDOT inspection reports and on an on-site visual inspection. A thorough evaluation of the previous inspection reports was performed to determine the types and extent of past deterioration. A visual inspection was performed to verify the findings of the inspection reports.

The goal of this technical memorandum is to identify and categorize deficiencies which, based on the inspection, are in need of rehabilitation. Each item is described with general recommendations for its rehabilitation. In addition, the estimated quantities and repair costs of the various items have been tabulated. Proper repair and sustained general maintenance of these items will help to ensure the full serviceability of the Promenade bridge structure. In addition, the various design options proposed for the Promenade should incorporate these rehabilitation recommendations where applicable.

Rehabilitation recommendations for the bridge structure have been broken down in to three categories, decreasing in importance and severity. "Repair/Safety" items are those requiring immediate repair since they may have an impact on public safety. These items may further deteriorate, creating hazards, if not repaired. "Repair" items do not pose a direct threat to public safety, but may affect the serviceability of the structure. These items are not in direct public contact or interaction. If not properly repaired, these items will continue to deteriorate and limit the life of the bridge. "Maintenance" items are those that are products of normal exposure of the bridge structure to the environment. They do not directly impact the service life of the structure or public safety. However, lack of attention to some of these items has been the cause of some "Repair" items. Continual proper maintenance through a scheduled program will help to ensure the service life of the structure. Rehabilitation items are described in the sections below and are also listed in Table A-1.

In addition to the repair, safety, and maintenance items, a few replacement options may also be considered. These include the existing paver blocks found in the median, roadways, and sidewalks; the structural concrete bridge deck; and the deck drainage system. These options are applicable as replacement items throughout the entire structure, and they may be utilized with either the bridge rehabilitation or Promenade options. The cost estimate considers these items to be completely removed and then replaced in kind. The only modification may be to use a larger and more decorative paver block, with grouted joints to reduce water intrusion, to replace the existing one square foot blocks that appear to be separated by sand or very fine gravel. Replacement options are listed in the tables that follow.

Although it was constructed approximately forty years ago, the concrete deck is in better condition than a typical bridge deck of the same age. The Promenade deck does not have the same exposure to environmental elements and vehicle loads. The top surface of the deck is protected mostly by the paver blocks. Only the underside of the deck is exposed, and was found to be in good condition. In addition, traffic requirements on the Promenade do not subject the deck to typical high impact bridge vehicle loading. This creates less stress in the deck slab. The majority of deterioration in the deck is found in isolated locations at the deck joints, where concrete aligning the joints has spalled. Proper repair and sustained general maintenance will help to ensure the full serviceability of the concrete deck.

If the rehabilitation is implemented as recommended, the deck should not need replacement for at least 25 years. But due to the expected life of bridge structures, the deck inevitably will need to be replaced within the next 50 years. The condition assessment performed on the bridge structure was limited to the most current DDOT inspection reports and the on-site visual inspection. At the time of rehabilitation, a full inspection should be performed to better verify the condition of the deck. Paver blocks should be removed in select locations to inspect the top surface of the deck. In addition, core samples could be taken and analyzed to help determine if and when a complete deck replacement is required.

During the rehabilitation effort, traffic on and below the L'Enfant promenade will have to be protected from construction activities. To this end, a detailed Maintenance of Traffic plan must be devised and enacted. The L'Enfant Promenade crosses over Conrail tracks, local roads, and Interstate 395. Many of the items described in the rehabilitation section of this report will impact the traffic below. Replacing the deck joints and surrounding concrete and removing the lead based paint are two of the most significant repair items. Protection shields and enclosures can be installed to capture debris, but traffic may need to be detoured during their installation.

Working over the railroad involves special considerations to operate in their right-of-way. Restricted working hours, obtaining and coordination permits and payment of railroad flagmen must all be taken into account. While working over roadways, traffic must be kept safe from construction activities. Access to businesses and to the post office must be maintained. Lane closures on D Street, 10th Street and I-395 will require a maintenance-of-traffic plan and approval by DDOT. Performing the MOT plan for the duration of the rehabilitation project will require a great deal of effort.

Traffic on the promenade itself will be affected by the proposed rehabilitation. Some of the repair items indicated for rehabilitation of the promenade will require restricted traffic and must be accomplished in phases. A detailed Maintenance-of-traffic plan for the promenade must be developed and submitted to DDOT for

approval. During construction, effort must be expended to implement lane closures and create detours.

A. L'Enfant Promenade Structure Over CSX Railroad (Bridge No. 517)

1. Repair/Safety Items

Repair items that may affect the safety of the general public are located on the walking surfaces of the Promenade. In many locations the filler material in transverse expansion and longitudinal joints is missing, damaged, or out of place. This presents a tripping hazard to the public. It is recommended that all joint filler material at Bridge No. 517 be replaced. In addition, all caulked joints along the granite curb backup stones and along the parapet walls at the deck should be replaced. Another safety concern is related to the paver surfacing blocks on the sidewalks, roadway, and median. At several locations, these blocks are cracked, missing, or uneven and out of alignment. This also poses a tripping hazard for the public. Pavers should be realigned or repaired and reinstalled in their proper locations. Some missing pavers have been replaced with asphalt; they should also be reinstalled at those locations. Rehabilitation Plan #1, found at the end of this appendix, identifies the location of deficiencies identified for this structure.

2. Repair Items

General repair items are located along the underside of the concrete box girders and at the breastwall of the north abutment. Cracks up to 1/8" wide were observed, some of which are leaking and stained with efflorescence. Shallow spalls were also observed on the concrete surface. Cracks and spalls should be cleaned and repaired.

3. Maintenance Items

Maintenance items involve cleaning the exhaust stains found on the box girders and removing the standing water at the bearings of the north abutment. The exhaust stains are for general appearance, but the standing water may lead to corrosion of the bearings.

B. L'Enfant Promenade Structure Over D St. and 10th Street (Bridge No. 1114)

4. Repair/Safety Items

Similar to the bridge structure over the CSX Railroad, many repair items that may impact public safety are located on the walking surfaces of the Promenade. Rehabilitation Plans #1-3 (***see January 2006 supplement to Existing Conditions Report and Alternatives Analysis***) identify the location of deficiencies identified for this structure. In many locations the filler material in the transverse expansion and longitudinal joints is missing, damaged, or out of place. This presents a tripping hazard to the public. It is recommended that all joint filler material at Bridge No. 1114 be replaced. In addition to the paver surfacing blocks on the sidewalks, roadway, and median, the granite curb blocks and

backup stones are also a safety concern. In several locations, these blocks and stones are cracked, missing, or uneven and out of alignment. This also poses a tripping hazard for the public. All caulked joints along the granite curb backup stones and along the parapet walls at the deck should be replaced. Pavers and stones should be realigned or repaired and reinstalled in their proper locations.

Although more of an architectural treatment than a structural item, missing panels were observed on a precast canopy along the walls of the bridge, adjacent to one of the ramps. This particular location is not suspended above a roadway, however most portions of the canopy do hang directly over vehicular and pedestrian traffic. A detailed inspection of the canopies should be considered to determine their stability.

A related safety repair item involves the spalling of concrete from deck joints. Temporary plywood protection shields, located between girders at the underside of the structure, have been placed to catch pieces of concrete that may spall from the joint between deck sections. In some places, the shield is inadequately installed, and pieces of concrete were observed on the ground directly below the joint. Falling pieces of concrete, some found to be the size of softballs, pose an obvious hazard to the public. Repair of the deck joint will eliminate the need for the protection shield, and this problem will be resolved. The spalls are most likely the result of water and surface salt that have infiltrated the concrete deck and have corroded and expanded the reinforcing steel, causing concrete to crack and break off the deck. The water and salt have most likely entered the deck joint through gaps left from the missing or misaligned curb blocks and joint filler material mentioned earlier. All deck transverse expansion joints that have spalled should be repaired along the length of the deterioration. This repair includes replacing the concrete along both sides of the deteriorated joint, and replacing the steel armored joints and premolded sealant.

5. Repair Items

Repair items are generally related to conditions observed on concrete members. Shallow spalls and narrow cracks, some with efflorescence, and areas of map cracks were found on the underside of the deck and on the faces of piers and curtain walls. These cracks and spalls should be cleaned and repaired. Cracks up to ½" wide were found in the concrete infill at the bases of several of the steel columns. These cracks are not structurally significant, however, if they are not repaired, water may infiltrate the concrete and lead to corrosion of the steel columns below finished grade.

Other repair items relate to the surface condition of some steel members. Girders and bearings at longitudinal and transverse expansion joints show the most deterioration due to the infiltration of water into the deck joints mentioned above. In some locations, the plywood protection shield below the joints has actually expedited corrosion by channeling the infiltrating water to the girder flanges. Many bearings, especially those at expansion joints, were found to be

corroded, some with heavy rust. Corroded steel areas will require cleaning to remove the rust and prepare the surface for painting.

In several locations, sections of the drainage pipe are damaged. The pipe is located along the underside of the bridge deck and occasionally penetrates the steel girders and floor beams. Sections of the pipe are either damaged or out of place and need to be replaced to provide proper drainage of the deck.

At one location on Pier No. 1, and anchor bolt and nut are missing. It is located on the west side of the expansion bearing supporting one of the steel girders that spans between Pier Nos. 1 and 2. The anchor bolt should be replaced so that the bearing is properly supported.

6. Maintenance Items

The surface of most steel members throughout the bridge superstructure requires some maintenance. On many girders, beams, and bearings, the paint system has failed, exposing the steel. Some members exhibit light to moderate surface rust, while others are more heavily corroded. Steel framing members at the underside of the soffit also exhibit light surface rust and should be cleaned and painted. All steel members should be cleaned and painted throughout the structure. The steel columns, however, are generally in good condition, appear to have been repainted in the last several years, and may only require a surface coat to match the rest of the rehabilitated structure.

Because supporting documentation could not be located, and because of the age of the structure, it should be assumed that all exposed superstructure steel surfaces (girders, beams, diaphragms, soffits, and bearings) are coated with lead-based paint. A proper lead abatement program must be implemented during the removal and disposal of the existing paint.

Drainage scuppers throughout the deck are blocked with debris, most of them completely. Blocked scuppers cannot properly remove water from the deck surface and will allow the water to pass through the deteriorated deck joints. This leads to the problem of spalling concrete in the joints. All scuppers throughout the bridge deck should be cleaned and continually maintained to allow proper drainage on the deck.

Maintenance items are also located at the substructure. Large water stains observed on the face of Pier 2 should be removed. They are most likely the result of water leaking through deck joints, and the problem should cease once the joints are properly repaired. There is also a significant amount of debris located in the fenced-in area between Piers 1 and 2. This area requires a large amount of debris removal.

C. L'Enfant Promenade Structure Over I-395/Southwest Freeway (Bridge No. 1108)

Most of the repair items associated with this bridge structure are identical to those required for the bridge structure over D and 10th Streets. The similar structural system of a reinforced concrete deck separated by joints and supported by steel plate girders, and similar surface features of paver blocks, granite curbs and drainage scuppers have yielded many of the same rehabilitation requirements. Rehabilitation Plan #4 (***see January 2006 supplement to Existing Conditions Report and Alternatives Analysis***) identifies the location of deficiencies identified for this structure.

1. Repair/Safety Items

Joint sealer along the longitudinal joints between curb blocks and backup stones, and along the parapet wall at the deck, is either missing or has been repaired with an inadequate thickness and needs to be replaced. The curb blocks and backup stones that are out of alignment or missing need to be restored or replaced. In addition, the concrete adjacent to the longitudinal joints have spalled and need to be repaired similar to the previous bridge section. Temporary plywood protection shields are being used to catch falling pieces of spalled off concrete, but gaps in the shields may allow pieces through to the traffic below. As mentioned earlier, the proper rehabilitation of the longitudinal joints will eliminate the need for shields. All deck joints that have spalled should be repaired along the length of the deterioration. This repair includes replacing the concrete and the premolded joint sealant.

Also similar to the previous bridge section, four precast concrete canopy panels were observed to be missing. These are located directly above the expressway. A detailed inspection of the canopies should be considered to determine their condition.

2. Repair Items

Repair items are generally limited to concrete members of the bridge. Shallow spalls and narrow cracks, and map cracking, some with water leaks and light efflorescence, were found on the underside of the deck and on the abutment faces. Larger spalled areas up to 40 ft^2 were found on the underside of the column bent at the north end of the bridge section. All cracks and spalls should be cleaned and repaired.

Although all structural steel members at this bridge section will need to be cleaned and painted, some areas will require additional repair work. In particular, the steel plate girders directly adjacent to the longitudinal deck joints exhibit moderate to heavy surface rust, mainly on the bottom flanges. The corrosion is most likely the result of water infiltrating the deck through deteriorated or exposed joints. Girder G-11 exhibited the most corrosion and some section loss in the bottom flange and one of the web stiffeners. The stiffener may need to be

strengthened, and the flange area with the section loss should be strengthened with additional steel. The bearings at the joints and along the exterior of the bridge also need to be blast cleaned and painted.

3. Maintenance Items

As mentioned in the “Repair” section, all structural steel should be cleaned and painted. Peeling paint and light surface rust needs to be removed from the girders, diaphragms, and bearings and a new paint system should be applied. Steel members at the underside of the soffit also exhibit light surface rust and should be cleaned and painted. Debris found around the bearings should be removed prior to cleaning steel.

Also, as mentioned in the previous bridge section, the age of the structure should dictate the existence of lead-based paint on all exposed steel surfaces. A proper lead abatement program must be implemented during the removal and disposal of the existing paint.

Drainage scuppers in this portion of the bridge structure were generally blocked with debris. The scuppers should be cleared of debris so that the deck can drain as designed.

Maintenance items also pertain to the substructure. Water stains found on the faces of piers and abutments should be removed. Future water staining should be eliminated once the deck joints are properly repaired. Deteriorated and stained joints between granite fascia panels on the piers and south abutment should be cleaned and repaired.

The estimated cost of the proposed rehabilitation items is listed in Table A-1.

SUPERCEDED

TABLE A-1. REHABILITATION COST ESTIMATE

Recommended Rehabilitation Item	Type	Quantity	Cost ($)[1]
Maintenance of Traffic		1 each (ea)	100,000
Superstructure Deck			
Replace missing panels from parapet wall canopy.	Immediate Concern	5 ea	25,000
Replace concrete at spalled deck joints.	Immediate Concern	420 linear feet (lf)	40,320
Replace armored joints and premolded sealant at longitudinal and transverse deck joints.	Repair/Safety	420 lf	9,790
Replace joint seal.	Repair/Safety	4770 lf	52,470
Replace missing, damaged, or misaligned paver blocks in sidewalk, median and roadway.	Repair/Safety	780 ea	31,200
Replace missing or misaligned granite curb blocks and backup stones over longitudinal deck joint at curb.	Repair/Safety	140 lf	7,000
Remove debris from scuppers.	Maintenance	72 ea	1,080
Repair cracks (up to 1/2 inch wide) on underside of concrete deck.	Repair	1000 lf	10,000
Clean water stains from faces of piers and abutments, and exhaust stains from underside of Bridge #517.	Maintenance	36900 square feet (sf)	7,380
Replace damaged drainage pipe.	Repair	80 lf	5,520
Superstructure Steel			
Blast clean lead-based paint from all structural steel members (girders, beams, diaphragms, soffits, bearings), properly contain/dispose of debris, and repaint steel.	Maintenance	203900 sf	3,100,000
Replace/strengthen structural steel members.	Repair	3000 lbs	60,000
Remove debris from bearing assemblies.	Maintenance	182 ea	2,730
Substructure			
Repair cracks and spalls in concrete piers and abutments.	Repair	1000 sf	35,500
Repoint 3/8” joints between fascia panels on piers and abutments of Bridge #1108.	Repair	4200 lf	4,200
Remove ground debris in area between Piers No. 1 & No.2 of Bridge #1114	Maintenance	1 ea	2,000
Mobilization (included in costs above)			
Scaffolding/Roadway Protection (included in costs above)			
SUBTOTAL – REHABILITATION CONSTRUCTION			**$ 3,494,200**
Contingency		25%	873,600
Supervision, Inspection, Overhead		15%	655,200
Post-construction Award Services		2%	87,400
Engineering Design		10%	436,800
TOTAL COST ESTIMATE			**$ 5,547,200**

Recommended Rehabilitation Item	Type	Quantity	Cost ($)[1]
Potential Additional Rehabilitation Items [2]			
Maintenance of Traffic		1 ea	$279,000
Remove & replace concrete deck slab	Complete Removal & Replacement	164,800 sf	$17,300,000
Remove & replace parapet canopy wall	Complete Removal & Replacement	1700 lf	$3,050,000
Remove and replace pavers, curbs, and granite backup blocks, and grout joints to reduce water infiltration, at sidewalk, median & roadway.	Complete Removal & Replacement	143,000 sf	$2,500,000
Remove & replace deck drainage pipe system	Complete Removal & Replacement	4010 lf	$387,000
TOTAL Additional Items			**$23,516,000**

Source: Parsons Brinckerhoff, July 2003.

[1] Costs are based on unit cost estimate using 2003 dollars.

[2] Costs for Potential Additional Rehabilitation Items include the following costs:

10 % Contingency

15% Supervision, inspection, overhead

2% Post construction award services

10% Engineering design

2. Structural Evaluation of Desired Design Elements

A. L'Enfant Promenade Rehabilitation Alternative

Several design elements have been proposed as features of the rehabilitation alternative. The design elements described below require structural modifications to the Promenade.

1. Promenade Design Elements

Planters

There are two different styles of tree planters: surface or at-grade and sunken or below grade. Surface planters consist of a longitudinal series of 1-foot thick concrete-walled boxes that project 2'-6" above the finished sidewalk surface. The walls are used to contain a minimum 2-foot depth of lightweight soil (40 pounds per cubic foot) and shrubs of various sizes. Surface planters are supported entirely on the concrete bridge deck. Proper waterproofing and drainage of the planters will be provided.

Sunken planters are identical to surface planters, but in addition feature fiberglass planter tubs that extend 2'-6" below the finished sidewalk surface. These tubs are placed only at proposed tree locations, to accommodate the required depth for the root ball. Tubs are sized to fit between floor beams and girders, to prevent cutting of the existing steel framing. Openings will be cut in the existing bridge deck at the sunken tub locations. In addition, a steel beam that will frame into the adjacent bridge girders will support the base of each planter tub.

In addition to the tree planters, grass planters will also be used. These planters are found in the wide (or existing) median option, and are located in the median between the existing roadways. A grass planter will also be used in the center "island" of the Maryland Ave. Roundabout. Grass planters have 2' high concrete walls that contain the soil and enclose the grass areas at each location.

Monuments

A monument has been proposed to be included with the Promenade Options. As of this report, a design for the monument has not been finalized. In order to investigate the existing structure's ability to support a monument, assumptions were made regarding its composition and geometry. It is assumed that the monument will consist of a statue supported by a large pedestal. The statue is assumed to be solid bronze and will represent a slightly larger-than-life human figure with a height of approximately 10 feet. The statue will be supported on a solid granite pedestal with a height of approximately 8 feet, and 6 feet square in plan. The entire monument will rise approximately 18 feet above the sidewalk surface. A monument composed of these materials and built to these specifications will weight approximately 43,000 pounds (14,000 lbs. for the statue and 29,000 lbs. for the pedestal).

There are two proposed locations for the monument: 1) At the intersection of the centerline of the Promenade Structure and centerline of Maryland Ave., and 2) At the intersection of the centerline of the Promenade Structure and centerline of L'Enfant Plaza. The node at Maryland Ave. will require significant structural modifications to support the proposed monument. The existing bridge structure at this location is composed of prestressed concrete box girders that support the existing median of the Promenade. The box girders are not designed to support such a substantial additional weight. Strengthening below the girders is not feasible due to vertical clearance requirements above the existing railroad, which passes beneath the bridge at this location. The capacity of the girders will limit the total additional allowable monument load to approximately 25,000 pounds, and therefore a much lighter monument would need to be specified.

The node at L'Enfant Plaza is the other proposed location for the monument. The bridge structure is composed of steel plate girders. The location of the main girder that would support the monument may allow the additional load to be offset by the removal of heavy truck loads used in the original design. The additional load limit for a monument at this location is 50,000 pounds.

Staircase and Elevator

A stairway and elevator are proposed that would allow pedestrian access between the Promenade level and the lower level of D Street. They would be located just south of the intersection of 10th Street and D Street, on 10th Street. There are two alternatives for the placement of the open stairway in conjunction with an elevator at the Promenade.

Each placement alternative is related to the two configurations of the median, sidewalks, and roadways described in the design Options for the Promenade. The wide Median Option keeps the existing roadway and median widths. The proposed stairway and elevator would be located within the boundaries of the median. Structural requirements preclude the removal of girders supporting the floor beams at the centerline of the structure; therefore, the stairway and elevator should be placed opposite each other on each side of the centerline. For the Narrow Median Option, the median width will be reduced and the stairway and elevator will be located at each sidewalk. Structural requirements prevent the removal of longitudinal stringers supporting the floor beams at the outer edge of the Promenade; therefore, the stairway and elevator should be located within the limits of each sidewalk, but adjacent to the stringers. A portion of one steel floor beam at each location will be cut to allow the required opening. Additional beams framed into adjacent floor beams will support the cut ends. It is assumed that both the stairway and the elevator will be self-supporting structures, imparting no additional loads on the bridge. General structural modifications required for each of the stairway/elevator locations are listed in the Options section below.

Maryland Avenue Roundabout

The proposal to create a roundabout at the Maryland Ave. axis intersection with the centerline of 10th Street requires an expansion of the Promenade deck. An assumed roundabout diameter of approximately 200 feet would require widening on each side of the bridge deck, each a partial circle in plan, to complete the configuration of the roundabout. The northern portion of the roundabout would be on grade, while the remainder of the expansion would be comprised of the structural deck, spanning the CSX Railroad similar to the existing bridge.

The widened portions at the west and east sides of the deck would each be independent structures, separated from the existing bridge by a longitudinal joint. This would prevent the new structure from adding load to the existing structure. The northern edge of each new deck would be supported on the retaining wall adjacent to the railroad, while columns and extensions of the existing piers would support the south end of the span. The superstructure would be a reinforced concrete slab supported by steel girders and floor beams. Girders would span between the pier extensions and retaining wall or column. New piers and columns would be spaced to avoid adjacent substructures.

The majority of each extension can be designed to support only grass and pedestrian loading. Only a small portion of each may need to be designed for vehicle loads, depending on the final layout of the surface features. In the proposed configuration, portions of the existing sidewalk would be transformed into roadway. Existing concrete box girders in this area would be removed and replaced with box girders designed to support vehicle loads. In addition, a 2'-0" high wall, 62 feet in diameter, would enclose a large grass area at the center of the roundabout. Portions of the existing sidewalk slabs would be removed and replaced with roadway slabs. A lightweight concrete overlay would be placed over portions of the existing sidewalk and roadway to acheive the required deck elevations.

Maryland Avenue Deck Extension

One of the options for redesigning the Promenade includes extending the Maryland Ave. elevated deck from its current terminus at 12th Street to the Promenade at the proposed Maryland Ave. Roundabout. This would provide direct access for both pedestrians and vehicles between Maryland Ave. and the Promenade. The proposed extension would continue its current alignment and run directly above the CSX Railroad. To avoid impacting traffic at the 12th Street Expressway, the deck must pass over it. The minimum vertical clearance between the top of the 12th Street Expressway and underside of the proposed structure would require a slope of approximately 12% for the deck extension. This grade is too steep for vehicular traffic and may also discourage pedestrian usage. To decrease the slope, the 12th Street Expressway could be lowered. However, this would entail depressing the CSX Railroad in order to maintain the minimum vertical clearance for the railroad. Changing the grade of the railroad will be very costly and may not be feasible.

2. Structural Modifications for Rehabilitation Options

The three bridges making up the L'Enfant Promenade bridge structure have been divided into five general sections each with a unique arrangement of structural members. The Bridge Over Railroad (Bridge No. 517) is the single-span concrete box girder structure at the northern end of the Promenade that crosses over the CSX Railroad. The Main Bridge (Bridge No. 1114) is the 22-span steel plate girder and floor beam structure that accounts for the majority of the Promenade and passes over 10th Street. The Main Bridge is composed of three unique sections whose structural layouts require different modifications to incorporate the proposed options. The Bridge Over I-395 (Bridge No. 1108) is the 3-span steel plate girder structure at the southern end of the Promenade that spans over the I-395/Southwest Freeway. A location plan and sections of the existing bridges are found in Figures 1 through 5 (***see L'Enfant Promenade and Benjamin Banneker Park EA, Appendix IV***). Plans and sections cut from the same location plan showing the proposed modifications are found in Figures 6 through 14 (***see L'Enfant Promenade and Benjamin Banneker Park EA, Appendix IV***).

The following assumptions apply to structural modifications for the two Promenade Options:

- Structural modifications that affect the geometry of the sidewalk, median, roadway, or their structural slabs are to be carried out along the entire length of the referenced bridge section.
- The structure is symmetrical about the centerline of the 10th Street Mall; modifications are listed for one half, and pertain to both halves, unless noted otherwise.
- Both options require rehabilitation of the structure as described in the Rehabilitation section of the report.
- Modifications only need to be applied to the bridge superstructure based on the assumed dimensions of proposed planters, and proposed geometry for sidewalks, medians, and roadways. The columns and foundations of the bridges are assumed to be able to support the revised loading.

<u>Promenade - Wide Median Option</u>

The Wide Median Option keeps the existing geometry of the sidewalk, median and roadway. A grass planter is located along the median, while the option of either surface or sunken planters is provided at the sidewalk (see Figs. 6 & 7). In addition, a staircase and elevator may be installed near the Promenade's intersection with D Street.

1. Bridge Over Railroad

No structural modifications are required.

2. **Main Bridge – 2 North Spans, 4 South Spans (see Fig. 6: *Section 2 – Wide Median*)**
   - Grass median planter:
     - » Provide 2’ high planter wall along median, adjacent to existing sidewalk
   - For sunken planters:
     - » Remove 9’ wide portion of sidewalk paver blocks at planter location
     - » Cut 4’ diameter hole in concrete sidewalk slab for sunken planter tub
     - » Provide 2’-6” high concrete planter box walls
     - » Provide support beam for sunken planter tub, and frame into adjacent girders
     - » Provide adequate drainage from planter
   - For surface planters:
     - » Remove 9’ wide portion of sidewalk paver blocks at planter location
     - » Provide 2’-6” high concrete planter box walls
     - » Provide adequate drainage from planter

3. **Main Bridge – Typical Section (see Fig. 7: *Section 3 – Wide Median*)**
   - Grass median planter:
     - » Provide 2’ high planter wall along median, adjacent to existing sidewalk
   - Stairway/elevator (located at median):
     - » Remove 12’ x 12’ sections of deck for stairway and elevator opening
     - » Cut one floor beam as required and remove
     - » Install new end beams to support cut end of floor beam, spanning between adjacent floor beams
     - » Install new beams at edge of cut deck at stairway and elevator locations where required, and frame into new end beams
   - For sunken planters:
     - » Remove 9’ wide portion of sidewalk paver blocks at planter location
     - » Cut 4’ diameter hole in concrete sidewalk slab to accommodate sunken planter tub
     - » Provide 2’-6” high concrete planter box walls
     - » Provide support beam for sunken planter tub, and frame into adjacent floor beams
     - » Provide adequate drainage from planter
   - For surface planters:
     - » Remove 9’ wide portion of sidewalk paver blocks at planter location
     - » Provide 2’-6” high concrete planter box walls
     - » Provide adequate drainage from planter

4. **Main Bridge – Section at USPS/L’Enfant Plaza**
   - Grass median planter:
     - » Provide 2’ high planter wall along median, adjacent to existing sidewalk
   - Remove sidewalk “islands” adjacent to roadways
   - Provide 17’ and 11’ wide overlays for sidewalk on each side of proposed planter

- Option to provide monument; no structural modifications required (see Monument details above)
- For sunken planters:
  - » *See* Main Bridge – Typical Section
- For surface planters:
  - » *See* Main Bridge – Typical Section

5. Bridge Over I-395

- Grass median planter:
  - » Provide 2' high planter wall along median, adjacent to existing sidewalk

Promenade – Narrow Median Option

The Narrow Median Option reduces the median width and shifts the roadway locations inward toward the centerline of the Promenade. Several structural modifications are required at the roadway, median and sidewalk slabs to incorporate the revised geometry. The Maryland Ave. Roundabout is provided at the north end of the Promenade (see Figs. 8 & 9). The option of either surface or sunken planters is provided at the revised sidewalk location (see Figs. 10 through 12). In addition, a staircase and elevator may be installed near at the sidewalk near the Promenade's intersection with D Street (see Figs. 13 & 14).

1. Bridge Over Railroad

Provide deck extension and structural modifications for Maryland Ave. Roundabout (see Roundabout section of Appendix and Figs. 8 & 9).

2. Main Bridge – 2 North Spans, 4 South Spans (see Fig. 10: *Section 2 – Narrow Median*)

- Remove 17' wide portion of roadway paver blocks
- Remove & replace 29' wide portion of existing roadway and median deck slabs with slab for new 26' roadway and 2.5' median; remove & replace curbs
- Remove & replace 5' wide portion of existing sidewalk and roadway deck slabs with new integral sidewalk slab, between Girders 5 & 6
- Install new cross-bracing between Girders 5 & 6
- Provide 17' wide sidewalk overlay on existing roadway
- Remove & replace 3 girders (total) at middle of structure with redesigned shallower girders to accommodate new roadway grade and median
- Provide additional cross bracing or diaphragms where new integral slabs will have replaced existing longitudinal joints, between Girders 9 & 10, 11 & 12, 12 & 13
- (Optional): Remove 8.5' wide portion of sidewalk paver blocks and replace with new blocks
- Install new paver blocks at remainder of new sidewalk and median
- For sunken planters:
  - » Remove 21' wide portion of sidewalk paver blocks
  - » Cut 4' diameter hole in concrete sidewalk slab for sunken planter tub
  - » Provide 2'-6" high concrete planter box walls

- » Provide support beam for sunken planter tub, and frame into adjacent girders
- » Provide adequate drainage from planter

- For surface planters:
  - » Remove 21’ wide portion of sidewalk paver blocks at planter location
  - » Provide 2’-6” high concrete planter box walls
  - » Provide adequate drainage from planter

3. Main Bridge – Typical Section (see Fig. 11: *Section 3 – Narrow Median*)

- Remove 17’ wide portion of roadway paver blocks
- Remove & replace 29’ wide portion of existing roadway and median deck slabs with slab for new 26’ roadway and 2.5’ median; remove & replace curbs
- Provide 17’ wide sidewalk overlay on existing roadway
- (Optional): Remove 8.5’ wide portion of sidewalk paver blocks and replace with new blocks
- Install new paver blocks in remainder of sidewalk and median
- Stairway/elevator (located at sidewalk) (see Figs. 13 & 14):
  - » Remove 12’ x 12’ section of deck for stairway or elevator opening
  - » Cut one floor beam as required and remove
  - » Install new end beams to support cut end of floor beam, and span to next adjacent floor beams
  - » Install new edge beams at edge of cut deck at elevator location, and frame into new end beams
- For sunken planters:
  - » Remove 21’ wide portion of sidewalk paver blocks
  - » Cut 4’ diameter hole in concrete sidewalk slab for sunken planter tub
  - » Provide 2’-6” high concrete planter box walls
  - » Provide support beam for sunken planter tub, and frame into adjacent floor beams
  - » Provide adequate drainage from planter
- For surface planters:
  - » Remove 21’ wide portion of sidewalk paver blocks at planter location
  - » Provide 2’-6” high concrete planter box walls
  - » Provide adequate drainage from planter

4. Main Bridge – Section at USPS/L’Enfant Plaza

- Remove sidewalk “islands” adjacent to roadways
- *See* Main Bridge – Typical Section
- Option to provide monument; no structural modifications required (see Monument details above)

5. Bridge Over I-395 (see Fig. 12: *Section 4 – Narrow Median*)

- Remove & replace 29’ wide portion of existing roadway and median deck slabs with slab for new 26’ roadway and 2.5’ median; remove & replace curbs

- Provide new 22’ wide sidewalk overlay on existing roadway
- Install diaphragm at location of existing longitudinal joint
- For sunken planters:
  - » Remove 22’ wide portion of sidewalk and roadway paver blocks
  - » Cut 4’ diameter hole in concrete sidewalk slab for sunken planter tub
  - » Provide 2’-6” high concrete planter box walls
  - » Provide support beam for sunken planter tub, and frame into adjacent girders
  - » Provide adequate drainage from planter
- For surface planters:
  - » Remove 22’ wide portion of sidewalk and roadway paver blocks
  - » Provide 2’-6” high concrete planter box walls
  - » Provide adequate drainage from planter

Maintenance of Traffic

During the rehabilitation effort, traffic on and below the L’Enfant promenade will have to be protected from construction activities. To this end, a detailed Maintenance of Traffic plan must be devised and enacted. The L’Enfant Promenade crosses over Conrail tracks, local roads, and Interstate 395. Many of the items described in the Rehabilitation Options section of this report will impact the traffic below. Replacing the deck joints and surrounding concrete is one of the most significant rehabilitation items. Protection shields and enclosures can be installed to capture debris, but traffic may need to be detoured during their installation.

Working over the railroad involves special considerations to operate in their right-of-way. Restricted working hours, obtaining and coordination permits and payment of railroad flagmen must all be taken into account. While working over roadways, traffic must be kept safe from construction activities. Access to businesses and to the post office must be maintained. Lane closures on D Street, 10th Street and I-395 will require a maintenance-of-traffic plan and approval by DDOT. Performing the MOT plan for the duration of the rehabilitation project will require a great deal of effort.

Traffic on the promenade itself will be affected by the proposed rehabilitation. Some of the items indicated for rehabilitation of the promenade will require restricted traffic and must be accomplished in phases. A detailed Maintenance-of-traffic plan for the promenade must be developed and submitted to DDOT for approval. During construction, effort must be expended to implement lane closures and create detours.

If either of the Options is chosen to be implemented, then MOT concerns are compounded. Whether the narrow or the wide median option is pursued, extensive modifications to the roadway will be made. Large areas of the existing deck will be demolished and new concrete deck will be constructed. This type of

activity requires a great deal of coordination to keep the vehicular and pedestrian traffic flowing.

B. L'Enfant Promenade Replacement Alternative

An alternate approach to the structural rehabilitation is the replacement of the entire Promenade superstructure. A new structure could be designed for the live loads and requirements of the chosen design option. The new design may be more efficient in supporting design loads than modifying the existing structure to accommodate the chosen option. There are, however, a few points to consider with replacement of the structure.

The existing condition of the bridge and the required modifications for the chosen option may be factors in deciding whether to completely replace the Promenade structure. The superstructure (concrete deck, steel girders, beams, and related components) requires both repair and maintenance to maintain full serviceability of the bridge, regardless of the chosen design option. Modifications to the superstructure are minor with the Wide Median Option, since the original roadway, sidewalk, and median locations are retained. Significant modifications, however, including removal and replacement of concrete slabs and steel girders, are required to reconfigure the layout for the Narrow Median Option. The concrete box girders over the railroad do not need replacing except for those required to accommodate the revised loading for the Maryland Ave. Roundabout option. In either case, the substructure (columns, pier, and abutments) is in good condition and requires only minor repairs and maintenance. Other than the option to incorporate the Maryland Ave. Roundabout, it is assumed that because the loading does not substantially change, the substructure requires no modifications. It may be cost effective, therefore, to use the existing substructure, including foundations.

Keeping the existing column layout is recommended since eliminating some of the columns would result in larger loads on the remaining columns and their foundations. Since the existing foundations were not presumably designed for additional loads, piles may need to be added with an enlarged pile cap. This may not be feasible, however, due to the constraints inherent in the Promenade location. Several building structures abut sections of the Promenade. Driving new piles may cause excessive noise and vibration, and have a strong negative impact on the adjacent properties.

The option to reuse the existing substructure may dictate that the new superstructure will generally match the existing geometry. The existing columns are designed for the existing superstructure configuration. The beams may be designed to support the reconfigured live loads. The existing 36 ksi structural steel may be replaced with stronger 50 ksi steel, resulting in shallower beams and girders, and less weight. As stated earlier, the condition of the

superstructure, and the chosen design option, are important factors in determining the limits of replacement.

For the complete replacement of the superstructure, a detailed Maintenance of Traffic plan must be devised and enacted. Working over the railroad involves special considerations to operate in their right-of-way, including restricted working hours, obtaining and coordination permits and payment of railroad flagmen. While working over roadways, traffic must be kept safe from construction activities, and access to businesses and to the post office must be maintained. Lane closures on D Street, 10th Street and I-395 will require a maintenance-of-traffic plan and approval by DDOT. Traffic on the promenade itself will be affected by the proposed rehabilitation. If either the narrow or the wide median option is pursued, then MOT concerns are compounded, because large areas of the existing deck will be demolished and new concrete deck will be constructed. Performing the MOT plan for the duration of the rehabilitation project will require a great deal of coordination to keep the vehicular and pedestrian traffic flowing.

IV. STRUCTURAL PLANS

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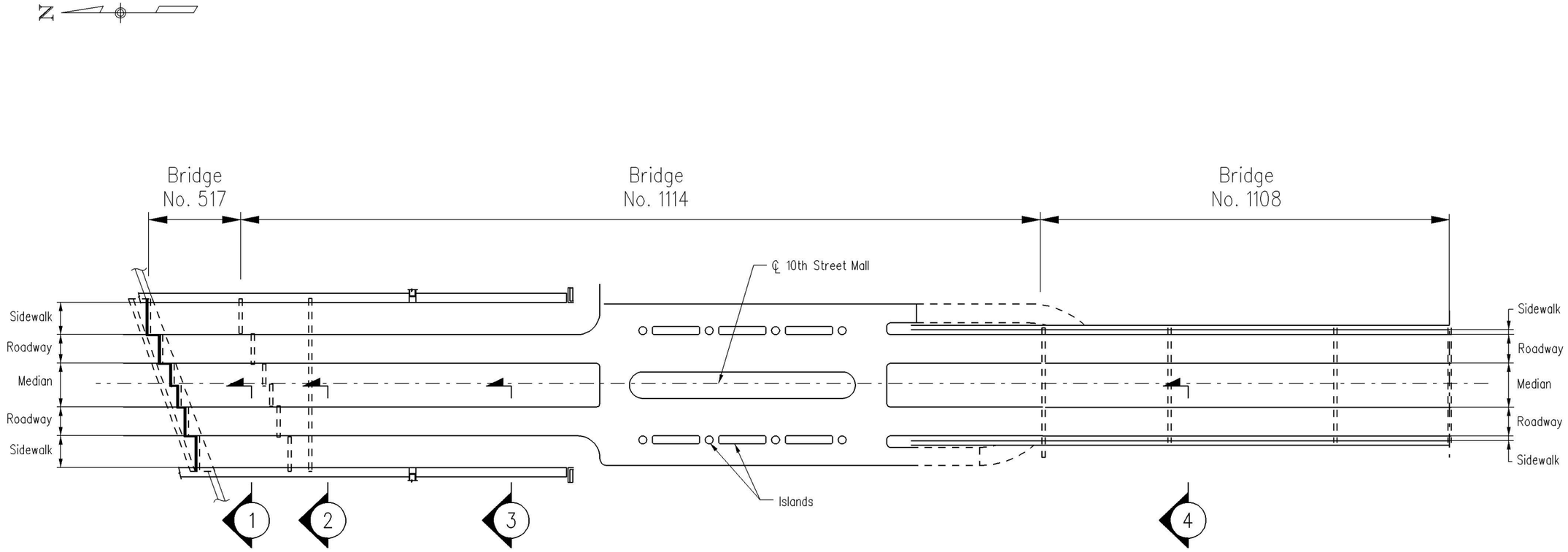
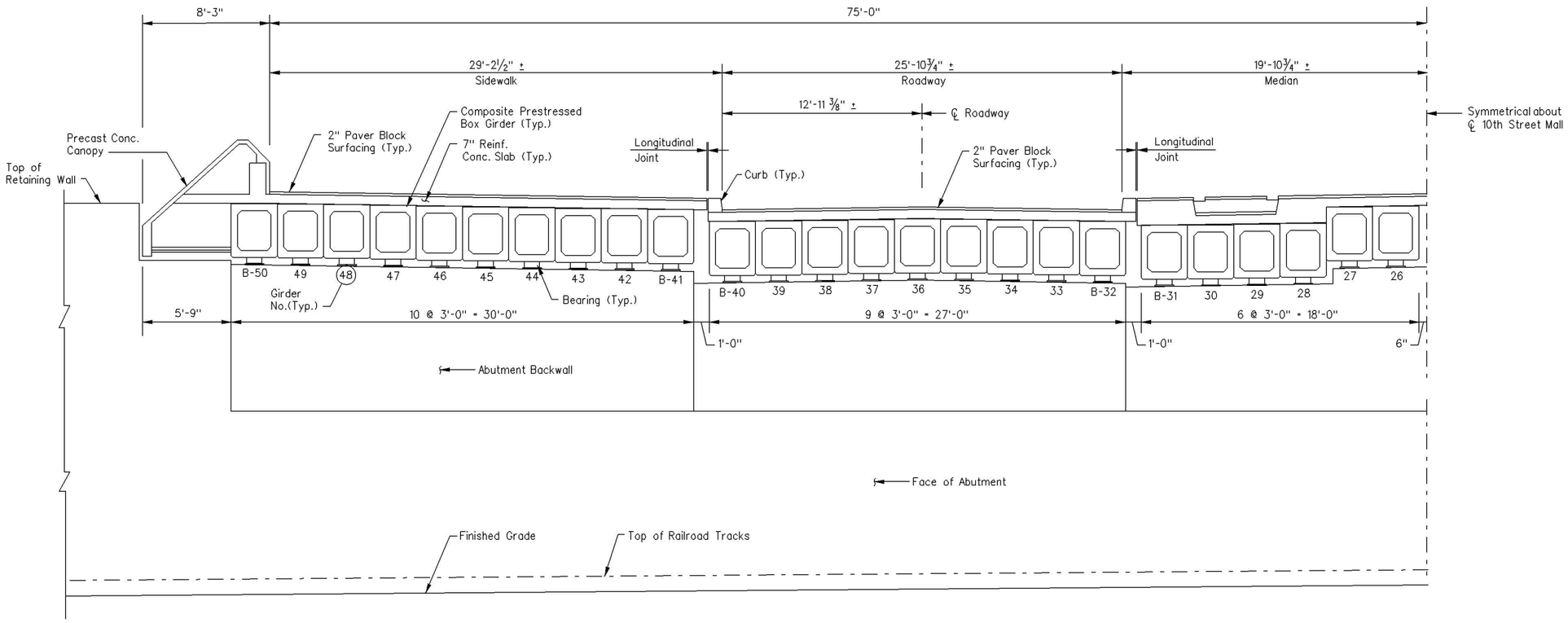


EXISTING LOCATION PLAN

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION EASTERN FEDERAL LANDS HIGHWAY DIVISION		
L'Enfant Promenade Existing Location Plan		
DATE: FEB. 2004	NOT TO SCALE	Fig. 1

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX



SECTION 1 - EXISTING

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

L'Enfant Promenade

Section 1 - Existing

DATE: FEB., 2004	SCALE: ⅛"=1'-0"	FIG. 2

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
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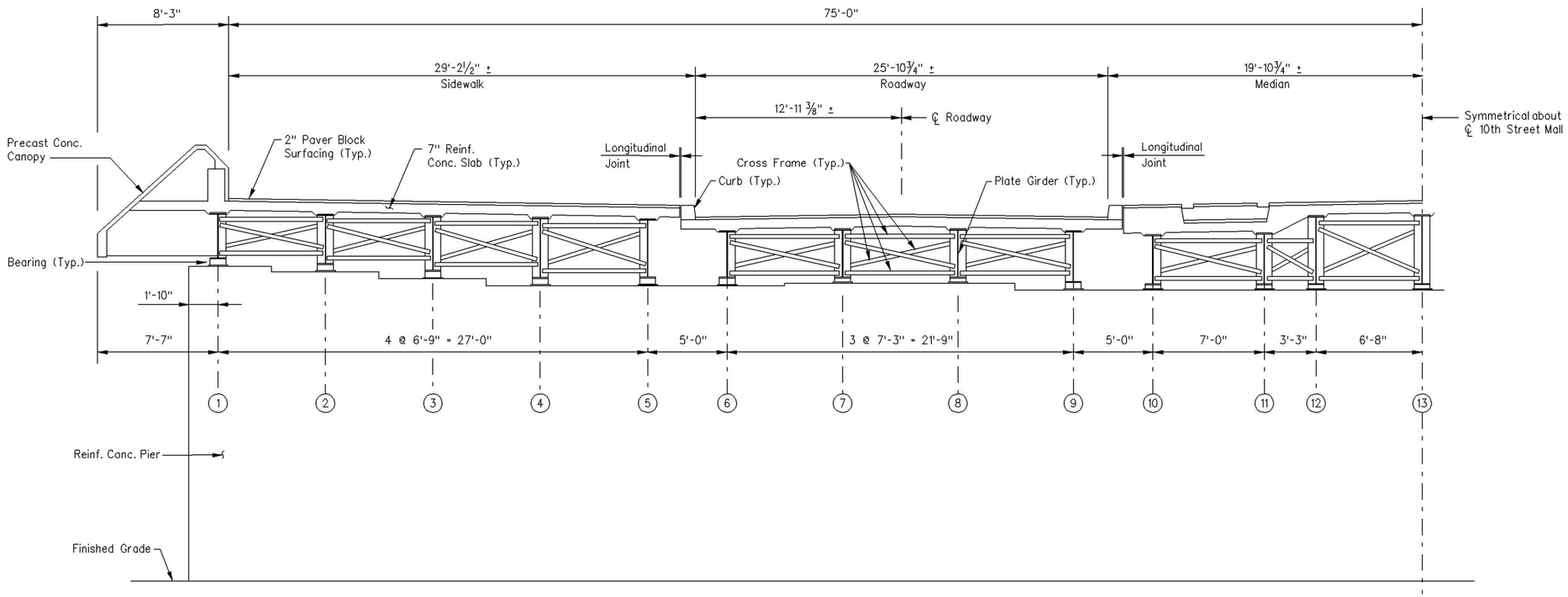

SECTION 2 - EXISTING

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

L'Enfant Promenade

Section 2 - Existing

DATE: FEB., 2004	SCALE: ⅛"=1'-0"	FIG. 3

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
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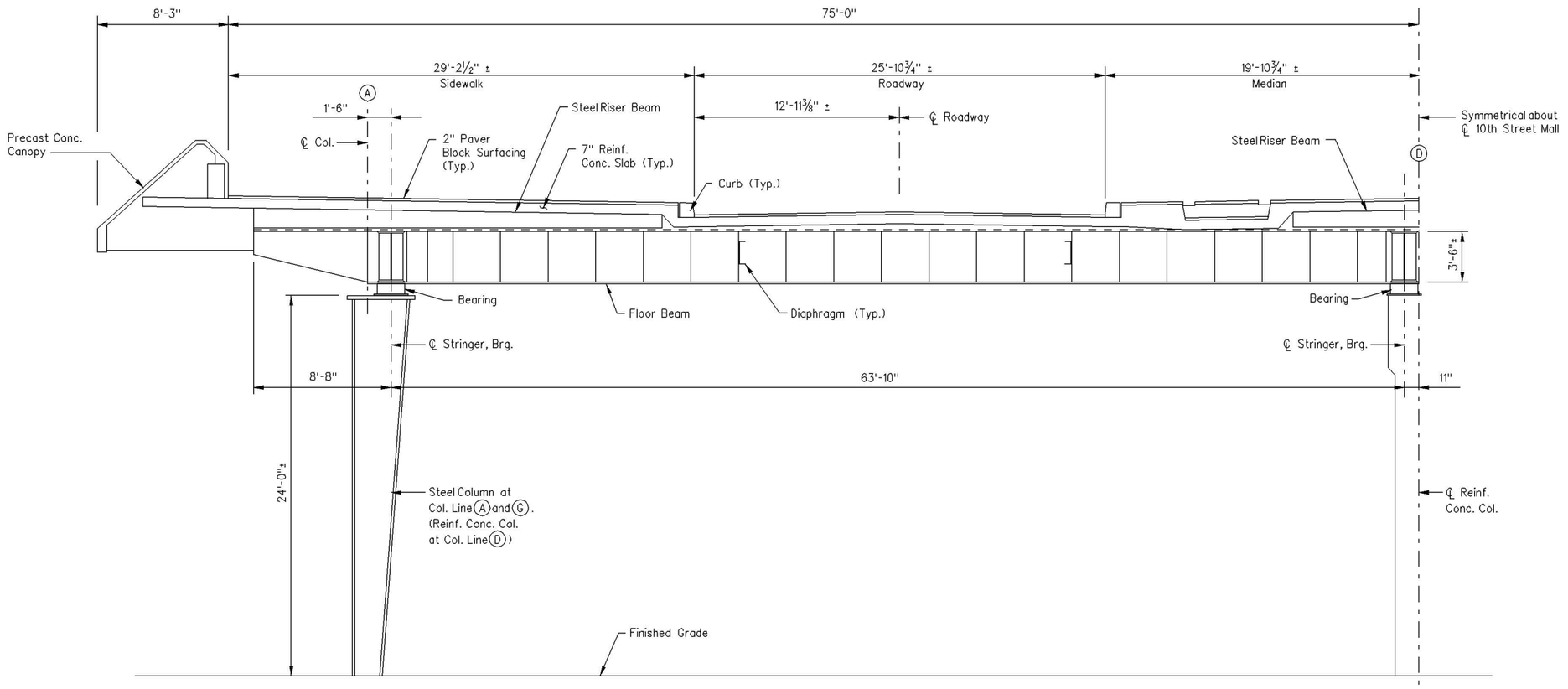


SECTION 3 - EXISTING

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

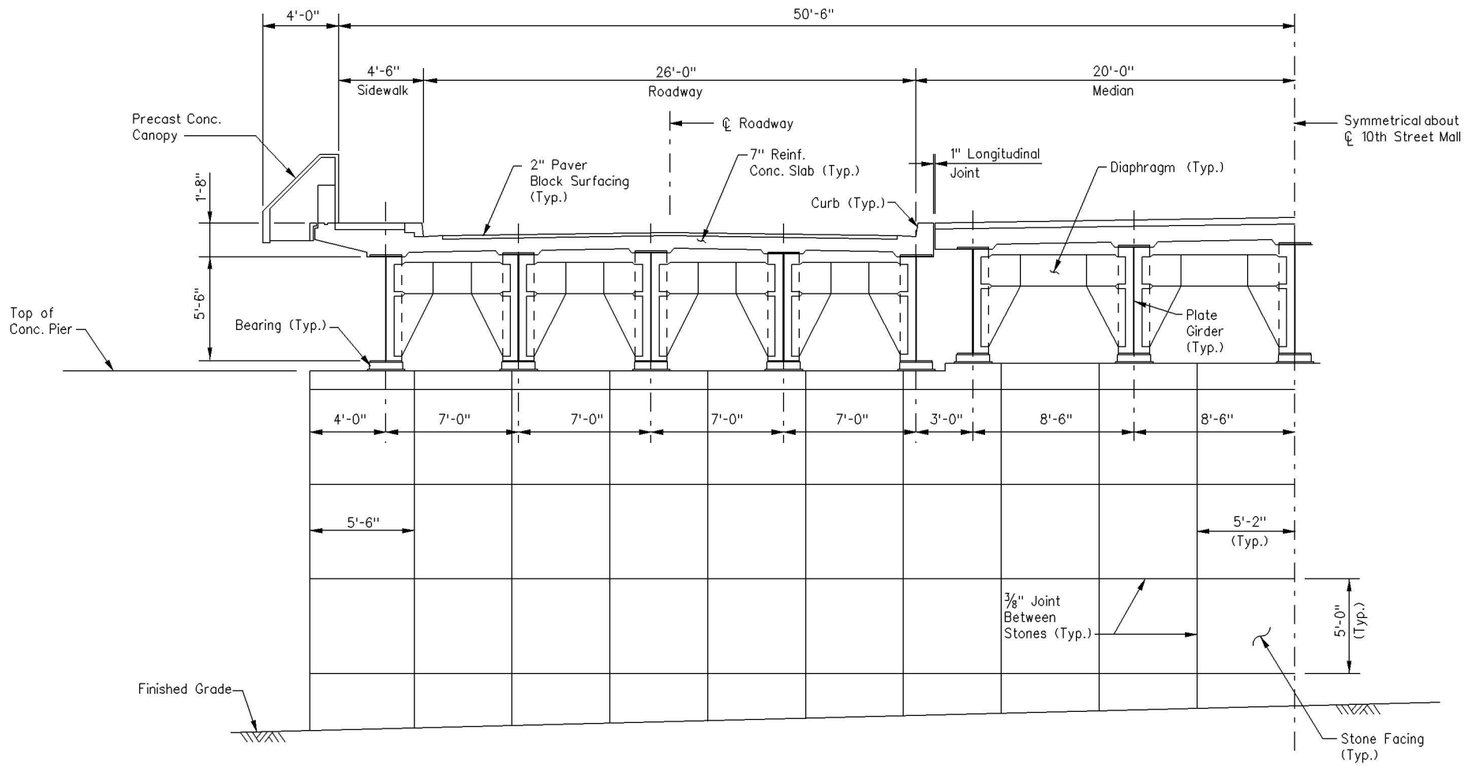
L'Enfant Promenade

Section 3 - Existing

DATE: FEB., 2004 | SCALE: ⅛"=1'-0" | FIG. 4

$$$$DATE$$$$ @TIME$ Design File - G:\Projects\23077A_L'Enfant Plaza\CADD\section3_ex.dgn

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX



SECTION 4 - EXISTING

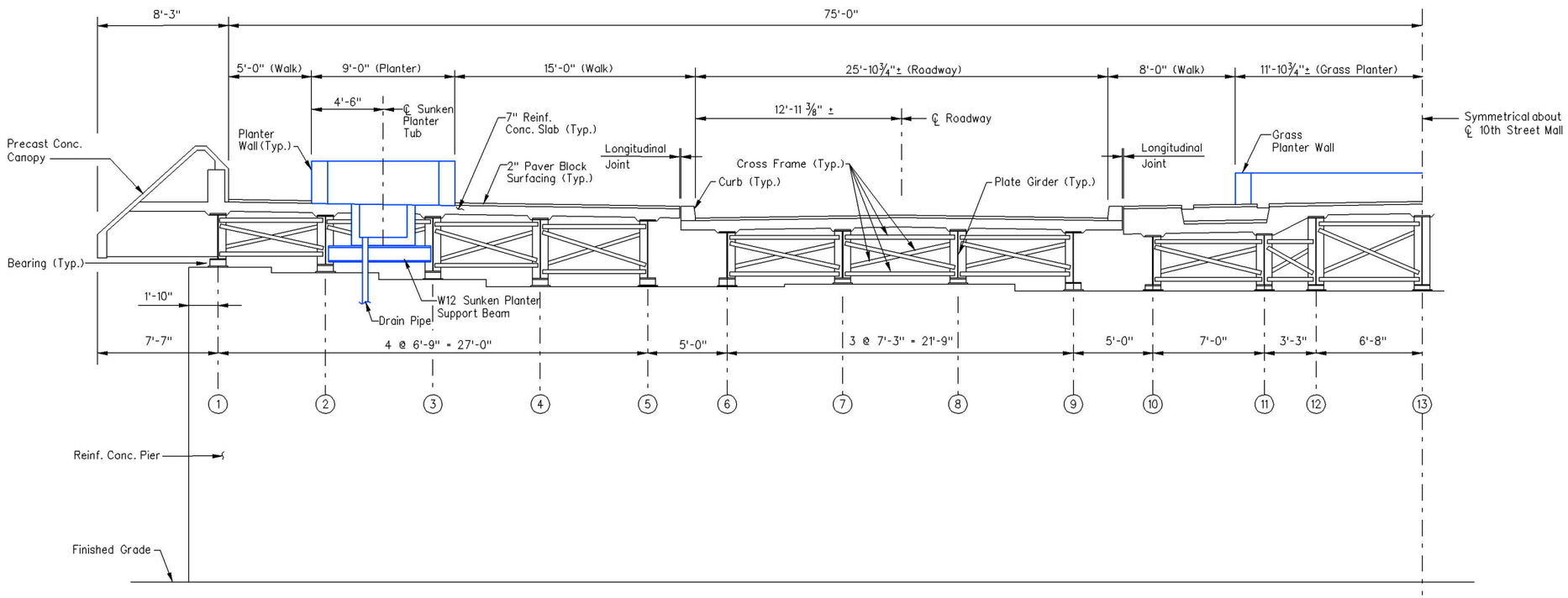
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

L'Enfant Promenade

Section 4 - Existing

DATE: FEB., 2004	SCALE: 1/8"=1'-0"	FIG. 5

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX



SECTION 2 - WIDE MEDIAN

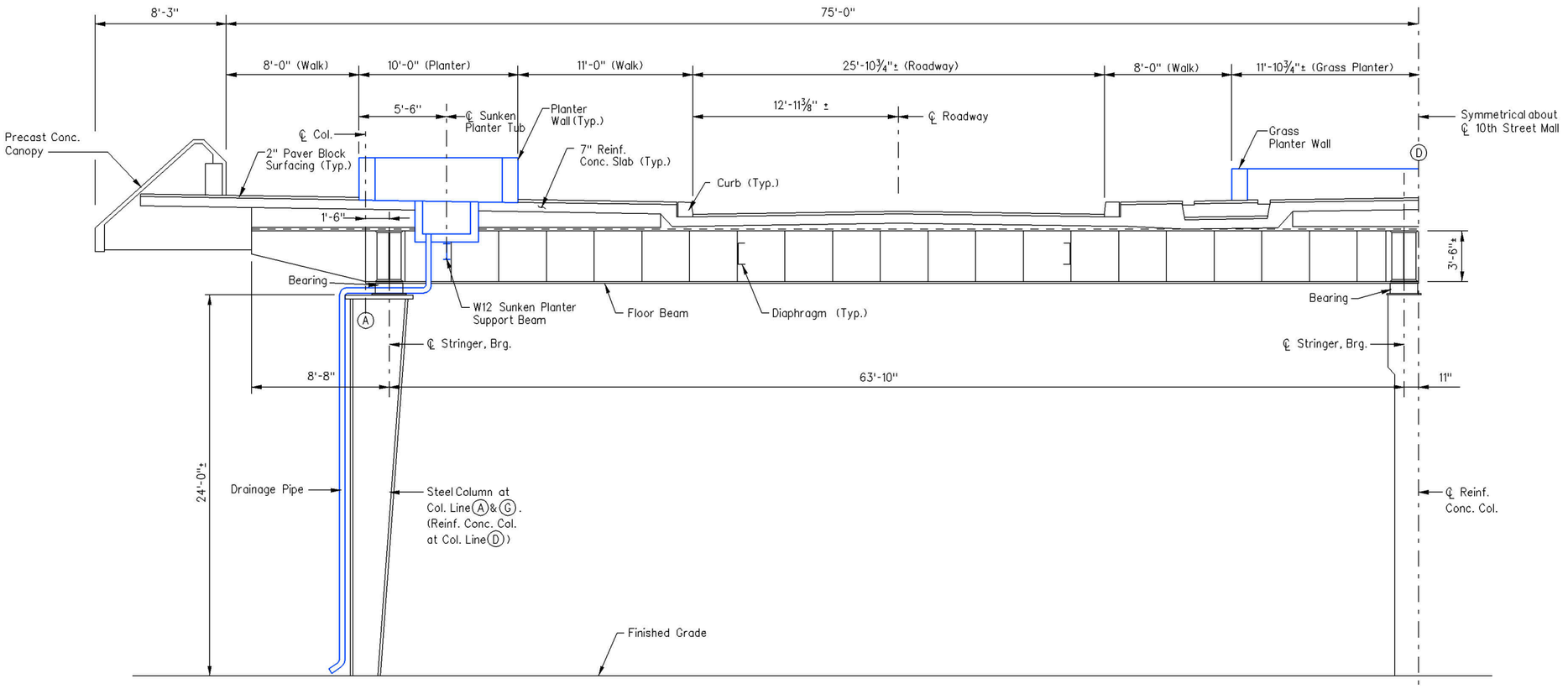
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

L'Enfant Promenade

Section 2 - Wide Median

DATE: FEB., 2004	SCALE: ⅛"=1'-0"	FIG. 6

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX



SECTION 3 - WIDE MEDIAN

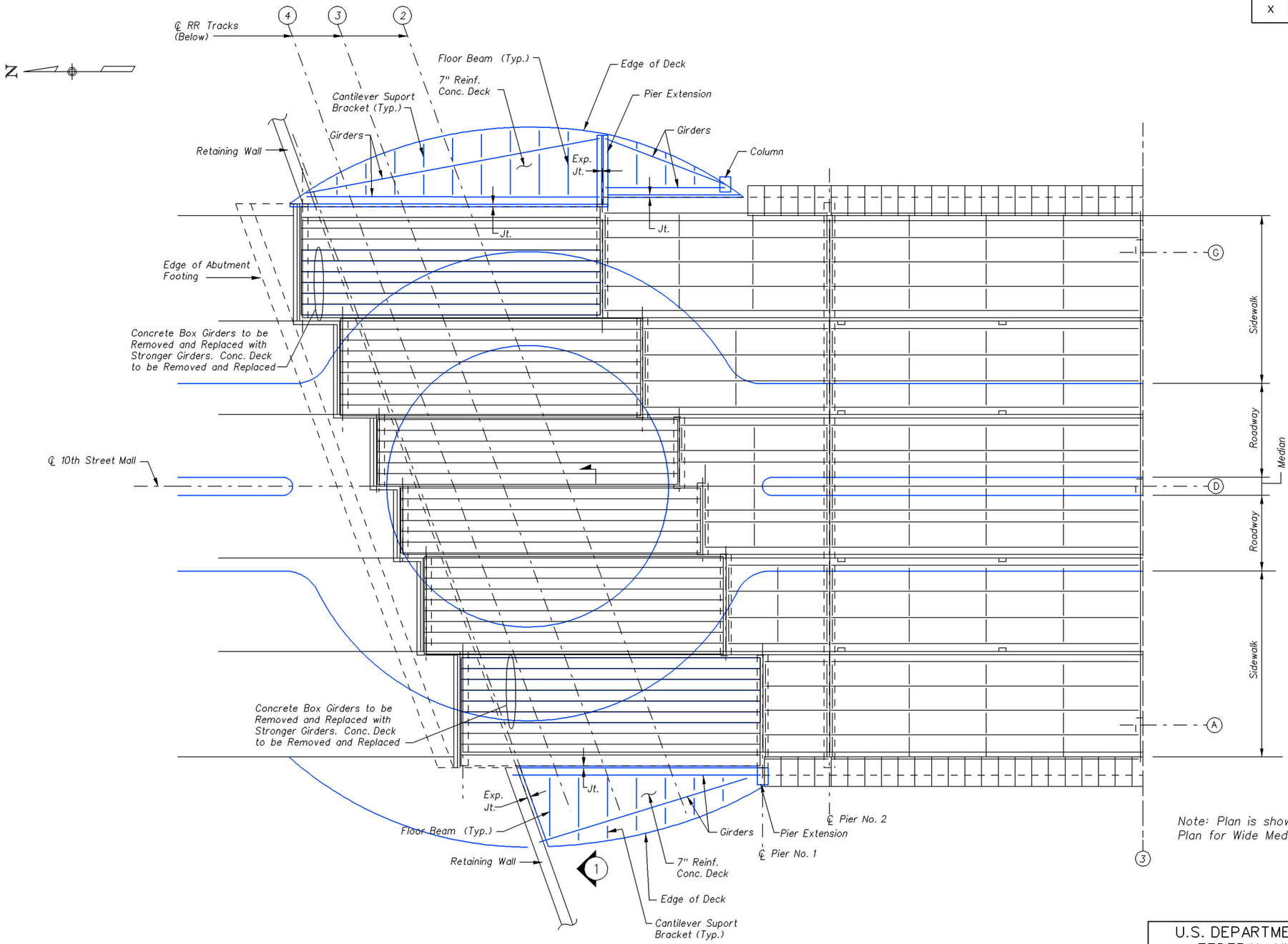
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

L'Enfant Promenade

Section 3 - Wide Median

DATE: FEB., 2004	SCALE: ⅛"=1'-0"	FIG. 7

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX



Note: Plan is shown for Narrow Median Option. Plan for Wide Median Option is similar.

FRAMING PLAN
MARYLAND AVE. ROUNDABOUT

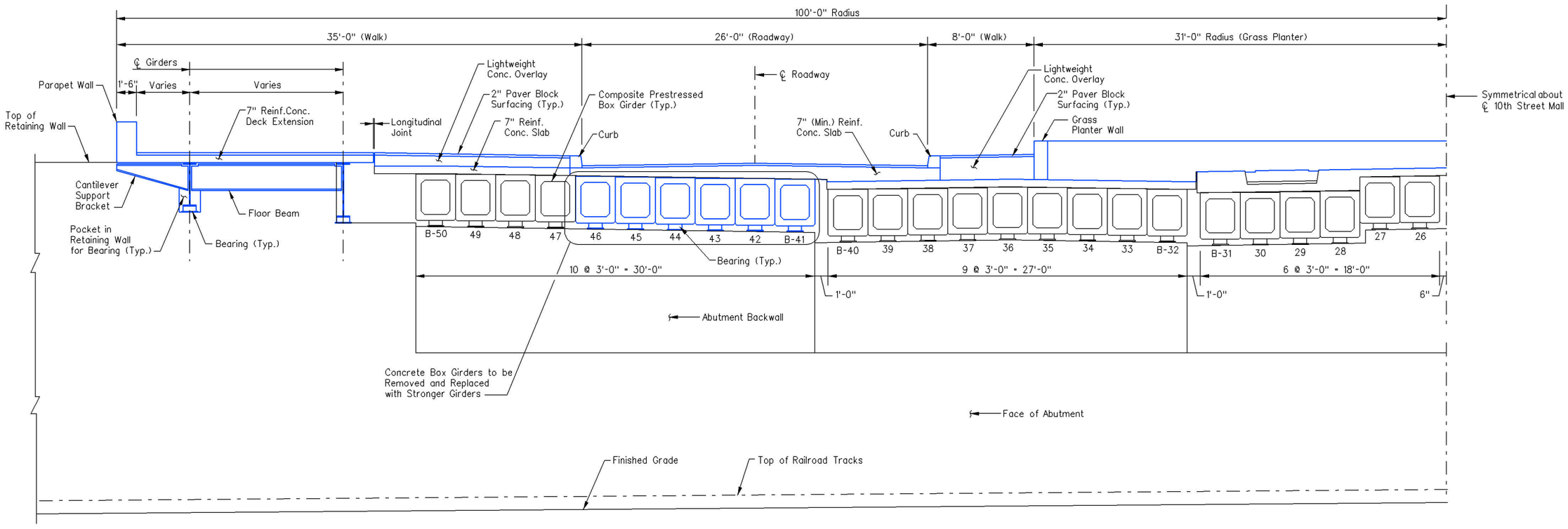
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

L'Enfant Promenade
Framing Plan
Maryland Ave. Roundabout

DATE: FEB., 2004	SCALE: 1"=30'-0"	SHEET NO. FIG. 8

$$$$DATE$$$$ $TIME$ Design File • G:\Projects\23077A_L'Enfant Plaza\CADD\23077_P05_Roundabout.dgn

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX



SECTION 1 - MARYLAND AVE. ROUNDABOUT

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

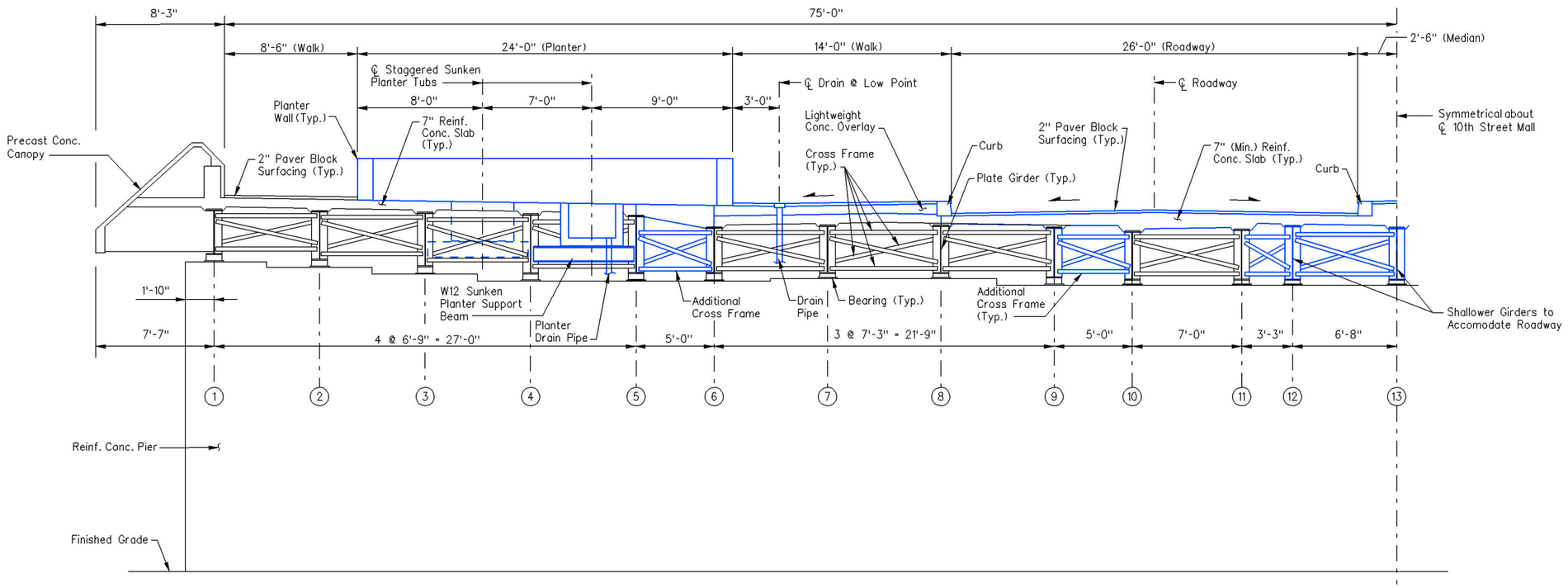
L'Enfant Promenade

Section 1 - Maryland Ave. Roundabout

DATE: FEB., 2004	SCALE: 1/8"=1'-0"	FIG. 9

$$$$DATE$$$$ @TIME$ Design File - G:\Projects\23077A_L'Enfant Plaza\CADD\section1_Roundabout.dgn

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX



SECTION 2 - NARROW MEDIAN

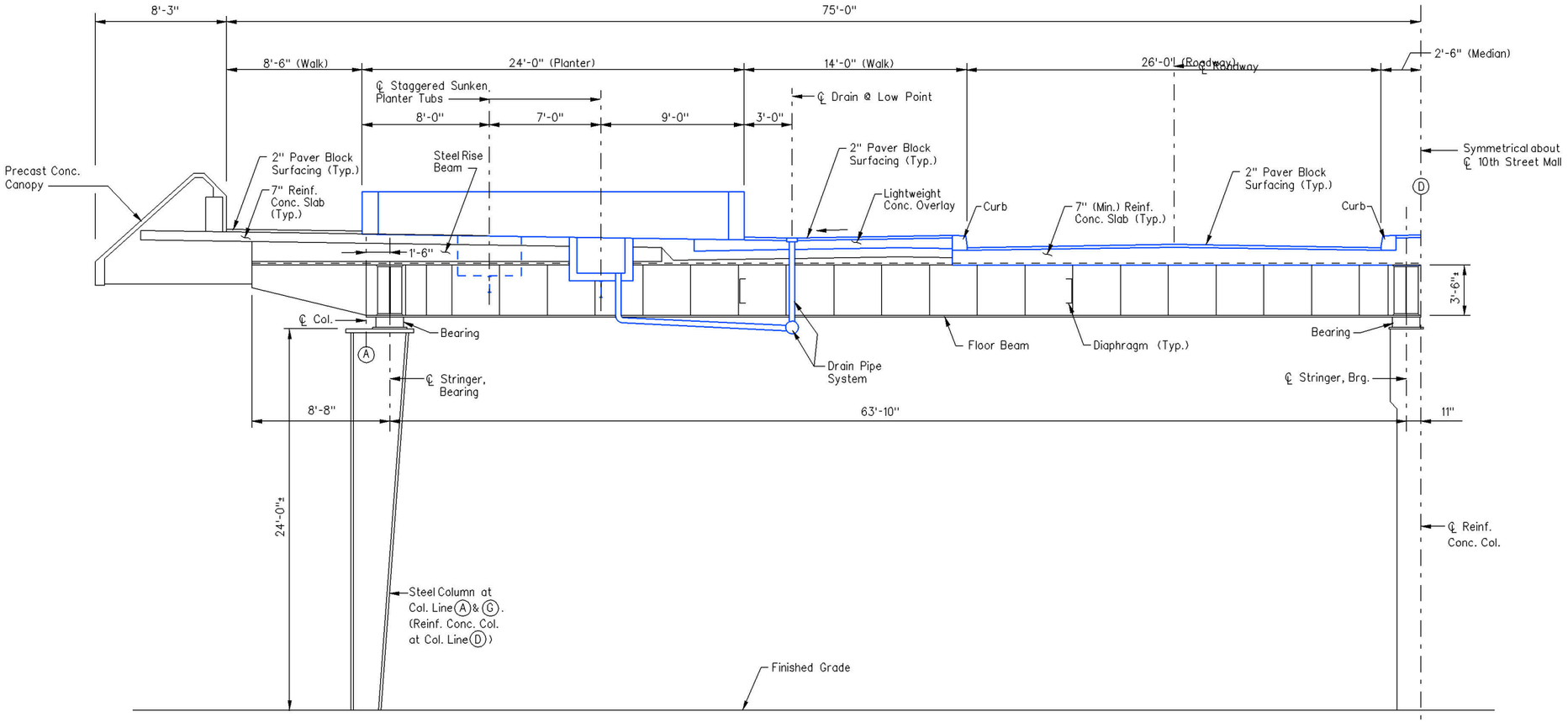
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

L'Enfant Promenade

Section 2 - Narrow Median

DATE: FEB., 2004	SCALE: 1/8"=1'-0"	FIG. 10

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX



Note: Sunken planter tubs are located between floor beams.

SECTION 3 - NARROW MEDIAN

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

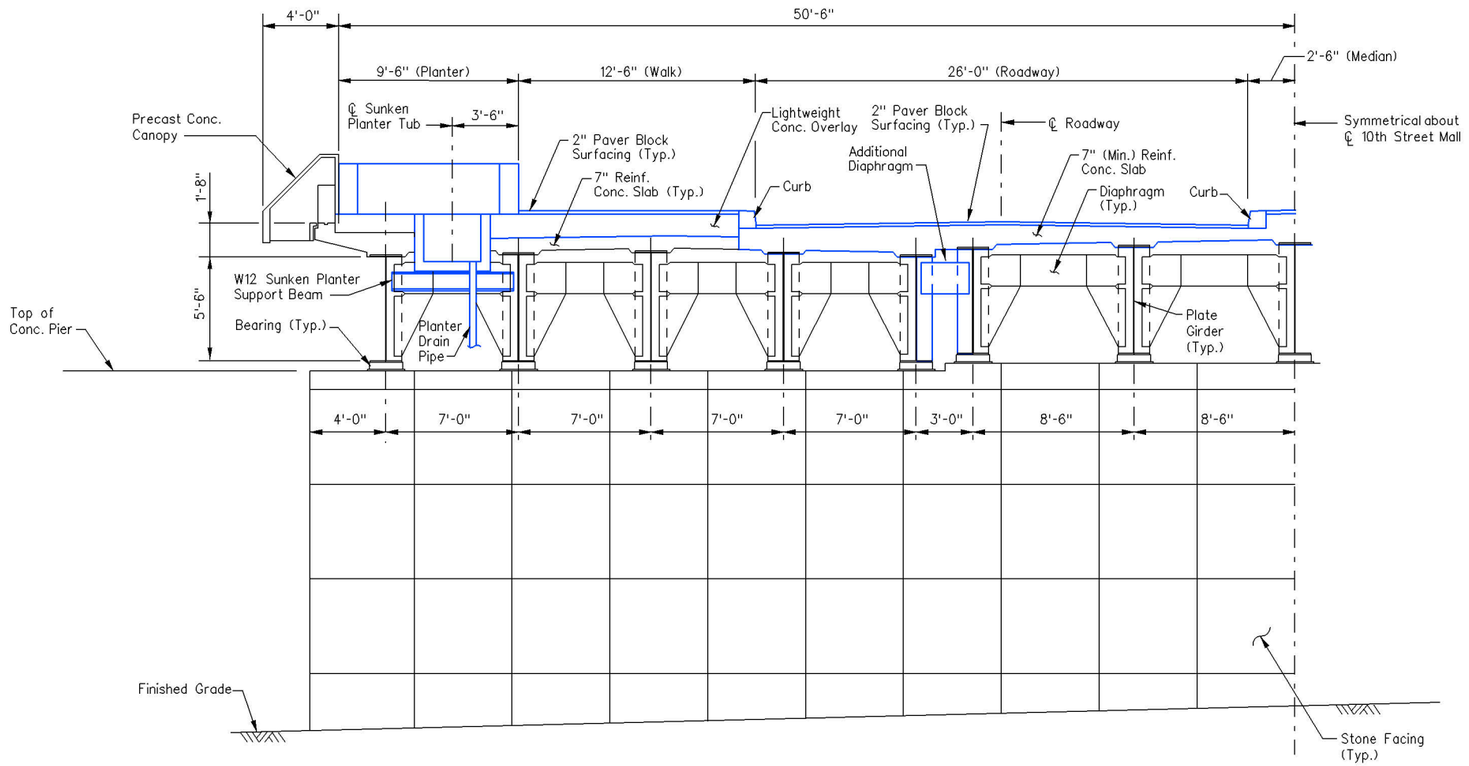
L'Enfant Promenade

Section 3 - Narrow Median

DATE: FEB., 2004	SCALE: 1/8"=1'-0"	FIG. 11

$$$$DATE$$$$ @TIME$ Design File = G:\Projects\23077A_L'Enfant Plaza\CADD\section3_NM.dgn

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX

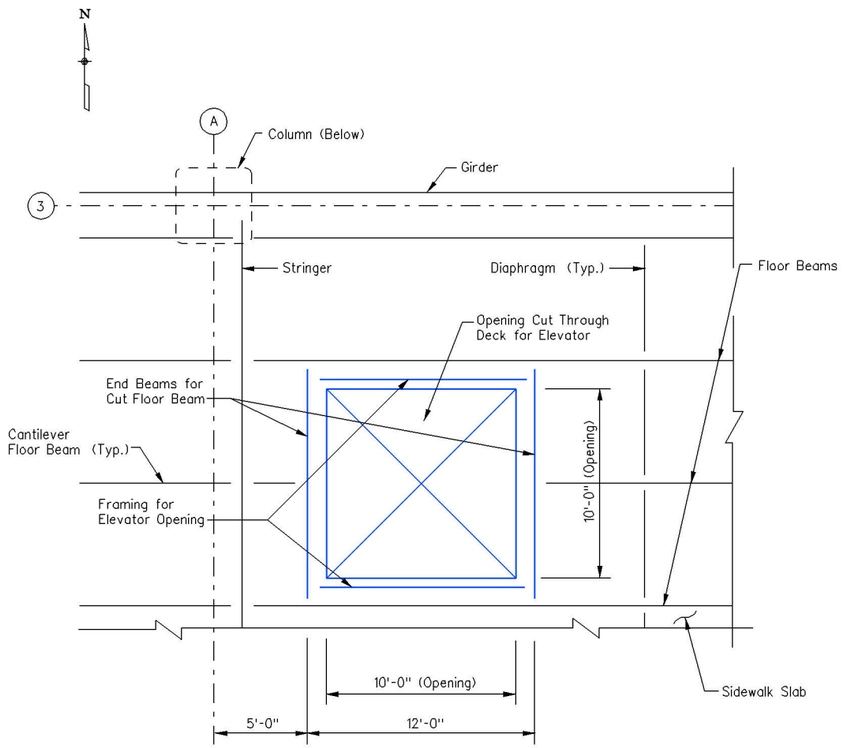


SECTION 4 - NARROW MEDIAN

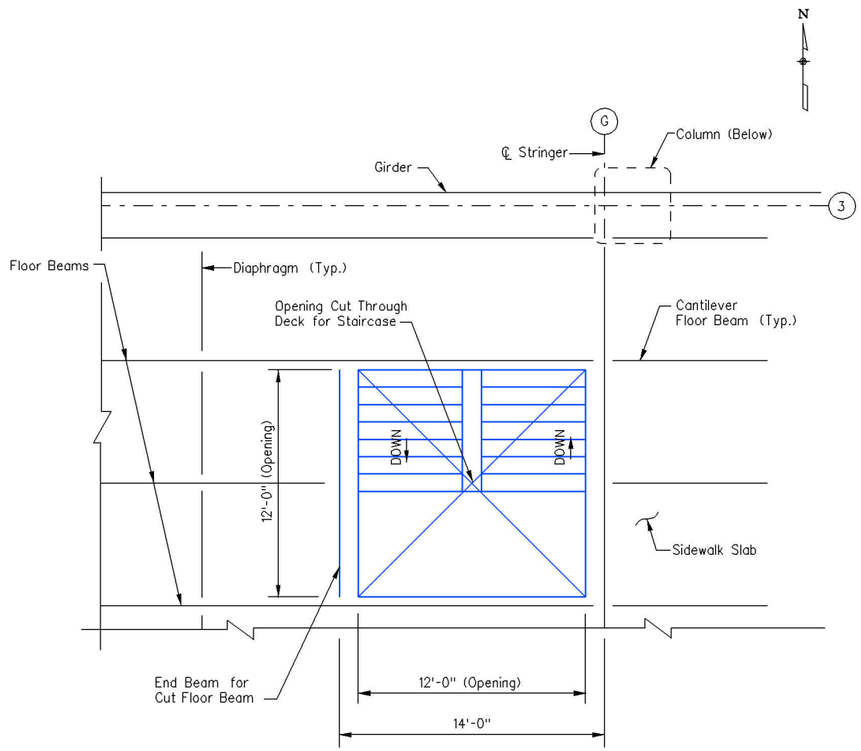
U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION EASTERN FEDERAL LANDS HIGHWAY DIVISION		
L'Enfant Promenade Section 4 - Narrow Median		
DATE: FEB., 2004	SCALE: 1/8"=1'-0"	FIG. 12

$$$$DATE$$$$ $TIME$ Design File = G:\Projects\23077A_L'Enfant Plaza\CADD\section4_NM.dgn

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX



FRAMING PLAN AT ELEVATOR



FRAMING PLAN AT STAIRCASE

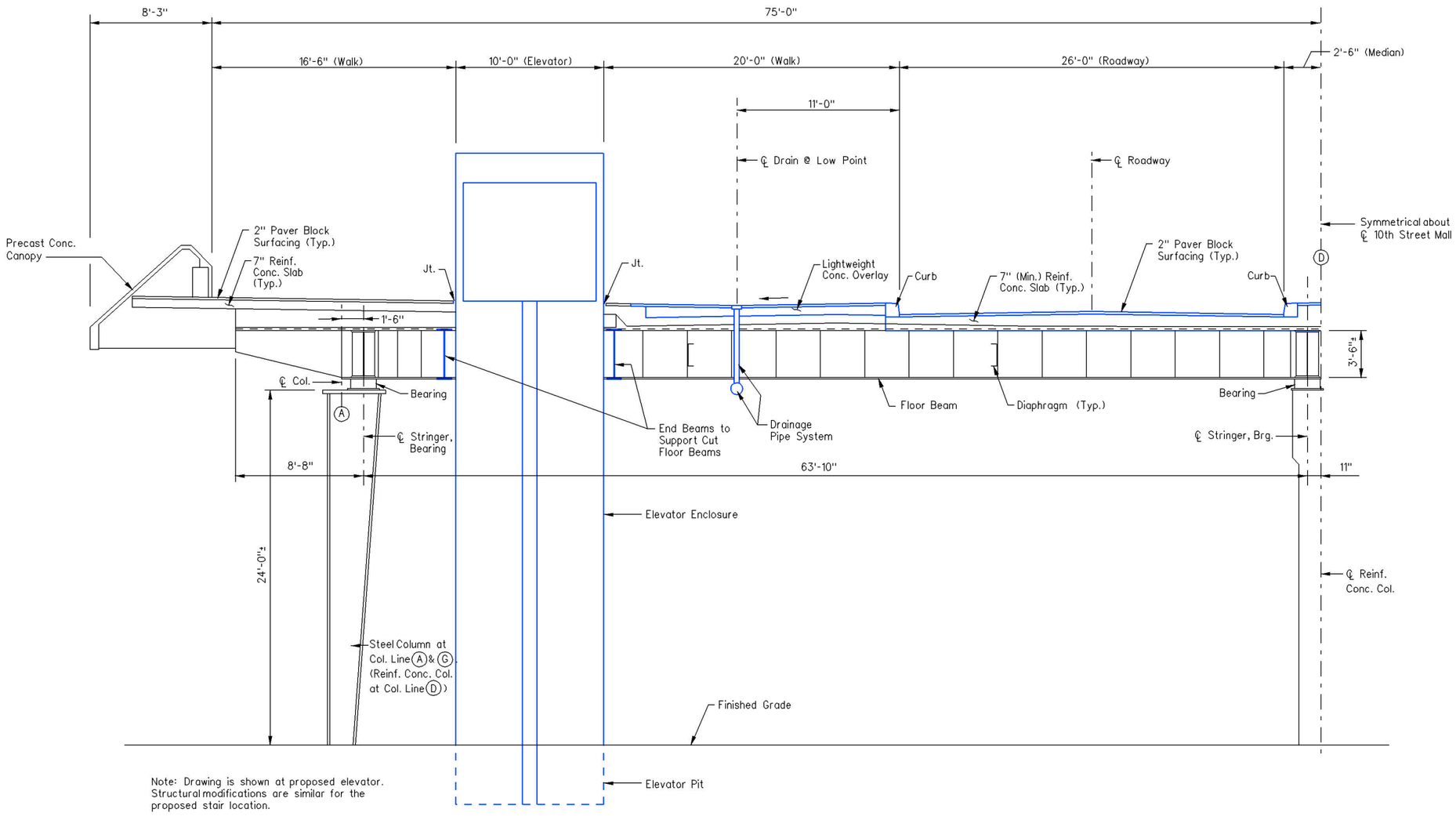
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

L'Enfant Promenade

Framing Plans at
Elevator and Staircase

DATE: FEB., 2004	SCALE: 1/8"-1'-0"	FIG. 13

REG	STATE	PROJECT	SHEET NO.	TOTAL SHEETS
X	X	L'ENFANT PROMENADE		XX



Note: Drawing is shown at proposed elevator. Structural modifications are similar for the proposed stair location.

SECTION AT ELEVATOR - NARROW MEDIAN

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
EASTERN FEDERAL LANDS HIGHWAY DIVISION

L'Enfant Promenade

Section at Elevator-Narrow Median

DATE: FEB., 2004	SCALE: 1/8"=1'-0"	FIG. 14

V. TRANSPORTATION AND TRAFFIC TECHNICAL REPORT

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Memorandum

To: File

From: Greer Gillis, Jessica Juriga, Robert Brander

Date: August 25, 2003;
Revision 1 – August 28, 2003;
Revision 2 – September 8, 2003
Revision 3 – July 31, 2005
Revision 4 – August 30, 2005
Revision 5 – September 16, 2005

Subject: L'Enfant Promenade EA – Traffic Analysis

Methodology

The methodology for the traffic analysis of the L'Enfant Promenade study area includes: data collection; analysis of existing conditions; forecasting 2025 traffic volumes; and analysis of future traffic conditions (2025 No Build and 2025 Build Alternatives).

Data Collection. Traffic counts were performed in the study area in June 2003 as part of the project data collection. These included weekday intersection turning movement counts and tube counts on the applicable ramps. The intersection turning movement counts were performed during weekday peak hours, 7 am – 10 am and 3:30 pm – 6:30 pm, at thirteen (13) intersections in the study area. Pedestrian volumes were also counted during this count period. The mechanical / classification counts, or tube counts, were conducted over a two-day period at eleven ramp locations in the study area. Twenty-four hour volumes and vehicle classification counts were collected by means of the tubes.

Traffic data was reviewed for accuracy and reasonableness. Balanced 2003 traffic volumes were developed and documented for the analysis.

Analysis of Existing Conditions. The existing traffic data was analyzed using the Synchro and Highway Capacity Software (HCS) software packages. The Synchro model analyzes and optimizes signalized intersections. HCS analyzes the capacity of intersections, arterials, ramps, and freeways. Both programs determine the delay and Level of Service (LOS) of roadways, intersections, and sidewalks. Existing 2003 traffic conditions were determined from this analysis.

Level of service (LOS) is a measure of the traffic conditions through a given roadway segment or intersection. Different levels of service are based on the delay experienced by vehicles traveling through a roadway segment during the peak, or rush, hour. The LOS for a given intersection would be affected by factors such as existing traffic volumes and the presence of traffic signals or stop signs. **Table 1** provides a general description of the various LOS categories and delay ranges.

Table 1. LOS Criteria For Signalized and Unsignalized Intersections

LOS	Description	Average Delay Per Vehicle, sec	
		Signalized	***Unsignalized***
A	Operations with very low control delay occurring with favorable progression and/or short cycle lengths.	$d \leq 10.0$	$d \leq 10.0$
B	Operations with low control delay occurring with good progression and/or short cycle lengths.	$10.0 < d \leq 20.0$	$10.0 < d \leq 15.0$
C	Operations with average control delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	$20.0 < d \leq 35.0$	$15.0 < d \leq 25.0$
D	Operations with longer control delays due to a combination of unfavorable progression, long cycle lengths, or high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	$35.0 < d \leq 55.0$	$25.0 < d \leq 35.0$
E	Operations with high control delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences. This is considered the limit of acceptable delay.	$55.0 < d \leq 80.0$	$35.0 < d \leq 50.0$
F	Operation with control delays unacceptable to most drivers occurring due to over saturation, poor progression, or very long cycle lengths.	$d > 80.0$	$d > 50.0$

The peak-hour level of service is a measure of the adequacy of the existing lanes and/or signalization at an intersection or roadway segment for the particular peak hour. Level of service is measured on a scale of A through F, with LOS A representing the best operating conditions with little or no delay and LOS F representing the worst with unacceptable delay.

Pedestrian LOS is determined by a pedestrian's quality of service through a facility. Similar to roadway classifications, pedestrian values range from A through F, with A being the most ideal condition. LOS for walkway flow is dependent on pedestrian speed, space, and flow rates. At LOS A, pedestrians move freely along a walkway without any interference from other pedestrians, whereas LOS F conditions are characterized by severely restricted walk speeds and space, sporadic flow and conflicts with other pedestrians.

Existing traffic volumes, pedestrian volumes, and signal timings (from DDOT Traffic Services Administration) were entered into the Synchro and HCS programs.

Forecasting 2025 Traffic Volumes. To analyze the traffic conditions for the Promenade area build-out, traffic volumes were forecasted for the 2025 design year. The 2025 forecast volumes were calculated manually using the volumes and growth rates from the Metropolitan Washington Council of Governments (MWCOG) Travel Demand Model Version 2 for year 2025 model. The 2025 volumes were used for roadways in the study area. In cases where the 2025 volume was not given for a particular roadway, or the roadway was found to decrease in volume to an unreasonable degree, the 2025 volume was calculated by growing the 2003 volumes by a calculated average growth rate.

The 2025 intersection volumes were determined by converting the average daily traffic by the appropriate directional and peak hour factors and using the FRATAR method. These volumes were used to analyze the traffic conditions for 2025.

Also, the proposed vehicle and pedestrian trips resulting due to the addition of the 10th Visitor and Transportation Center / Parking Garage on 10th Street were calculated as part of the analysis using trip generation rates.

Analysis of Future Traffic Conditions. All of the alternatives, including the No Build, were analyzed for 2025 traffic conditions. The Synchro and HCS software programs were again used for the operation analysis. Signalized intersections were optimized for the future alternatives. Delay and levels of service were determined for signalized and unsignalized intersections. Vehicle and pedestrian circulation were reviewed and compared among alternatives.

A separate general analysis was performed for the Build Alternatives where improvements such as the reconfiguration of traffic lanes were considered. Special consideration was given to the analysis of Maine Avenue and 9th Street, since the proposed vehicle and pedestrian traffic from the 10th Street Visitor and Transportation Center and the Southwest Waterfront Development will impact the intersection.

All build alternatives were analyzed with common elements such as intersection signal optimization, geometric modifications, and a new mid-block pedestrian signal at Maine Avenue between 9th and 12th Streets. A description of each Build Alternative is provided below:

- Build Alternative A – this alternative includes improvements to L'Enfant Promenade to provide a more pedestrian-friendly environment and the addition of a pedestrian ramp from Benjamin Banneker Park to Maine Avenue while retaining the existing median width. Existing circulation patterns would be maintained on all roadways. The existing Promenade bridge structures would be modified to accommodate the proposed improvements.

- Build Alternative B – this alternative is similar to Alternative A, however the Promenade roadway would be reconfigured to create a narrower median and add a roundabout at the Maryland Avenue axis. A pedestrian ramp and staircase would be added to the Banneker Park site to traverse the slope down to Maine Avenue. Existing circulation patterns would be maintained on all roadways except for the proposed roundabout. The existing Promenade bridge structures would be modified to accommodate the proposed improvements.

- Build Alternative C – this alternative includes the narrow median and roundabout improvements to L'Enfant Promenade to provide a more pedestrian-friendly environment and the addition of a visitor and transportation center at Banneker Park. The center would provide parking for up to 1,200 cars/tour buses. A "grand" civic staircase would also be constructed to connect the Promenade to Maine Avenue. The existing roadway/ramps from the Promenade to 9th Street would be eliminated and a new, two-lane roadway/ramp contructed, north of the existing ramps, to maintain vehicular access between the Promenade and 9th Street. The existing Promenade bridge structures would be modified to accommodate the proposed improvements.

- Build Alternative D – this alternative is the same as Build Alternative C, except the Promenade bridge structures would be replaced with new structures, rather than modifying and rehabilitating the existing structures.

Existing Conditions

Traffic Circulation

Several major commuter and scenic routes link Washington, DC and its suburbs in Virginia and Maryland. Traffic generally travels into the District to employment or tourist destinations using major routes and river crossings. Major routes that are associated with the L'Enfant Promenade study area include the 14th Street Potomac River crossings (I-395/U.S. Route 1).

The roadway network in the study area includes other key facilities such as Independence Avenue, the 12th Street Expressway, L'Enfant Promenade (10th Street SW), 9th Street, D Street and Maine Avenue. Circulation is characterized by east-west traffic generated by employment centers including the Department of Energy (DOE), U.S. Department of Agriculture (USDA), U.S. Postal Service and L'Enfant Plaza Hotel; cultural attractions such as the Smithsonian Institution museums on the National Mall; and the fish market, restaurants and other destinations on the Southwest Waterfront. The major east-west routes are Independence Avenue and Maine Avenue. The north-south routes of 12th Street, L'Enfant Promenade and 9th Street currently provide access between these arterials.

L'Enfant Promenade can be accessed directly from the north at the signalized intersection with Independence Avenue and from the south at 9th Street, SW. Southbound traffic on the Promenade continues onto Benjamin Banneker Circle to 9th Street, which provides a direct vehicular connection to Maine Avenue and Water Street, SW, and the attractions at the Southwest Waterfront.

Direct vehicular access to the Promenade is also provided from 10th Street, SW via ramps to L'Enfant Plaza. Various points of indirect access to the Promenade exist from other streets in the study area.

I-395, a six-lane divided interstate highway passing through the study area, provides access to the Promenade, 12th Street, D Street and 9th Street. The 12th Street Expressway connects northbound I-395 to 12th Street north of Independence Avenue, passing over roadways and railroad tracks.

Though the Promenade provides a direct connection between the National Mall and the Southwest Waterfront, it is poorly signed and includes geometric and operational deficiencies. Vehicles merging onto Banneker Circle from 9th Street must yield to traffic on the circle, but limited sight distance makes this movement potentially dangerous. A weaving and merging area then confronts vehicles at the junction of 9th Street, the I-395 ramp to 9th Street, the ramps to and from Banneker Circle, and G Street. Southbound 9th Street traffic wishing to access the Promenade must avoid potential merging traffic from the I-395 ramp just prior to turning right onto the ramp to Banneker Circle.

The ramp from I-395/12th Street Expressway to D Street is also problematic, where anecdotal evidence suggests that semi-trailer trucks have difficulty turning within the provided radius. Though the existing radius is acceptable by AASHTO standards, the

downward slope of the ramp preceding the turn makes the movement challenging. Sight distance is limited where this ramp merges onto D Street.

Traffic Operations

The traffic volumes collected in June 2003, as shown in **Figure 1**, illustrated that Maine Avenue and Independence Avenue experience the highest volumes and longest delays of all the roadways in the study area. Currently, approximately 35, 000 vehicles travel on Independence Avenue on an average day, and 33,000 vehicles travel on Maine Avenue on an average day. Peak hour traffic volumes on both of these roadways are usually 2500 vehicles per hour (vph) and higher.

The intersection of Maine Avenue and 9th Street, SW experiences a breakdown of intersection operations in both the AM and PM peak hours, resulting in a LOS F. The high east-west through volumes, approximately 1000 - 1300 vph, and the southbound left turning movements, approximately 300 - 450 vph, are causing delays of over 100 seconds per vehicle for the westbound Maine Avenue approach in the morning, the eastbound Maine Avenue approach in the evening, and the southbound 9th Street approach during both peak hours.

Independence Avenue, SW also carries a high volume of east-west through movements, ranging from 1200 – 1500 vph. The directional traffic split is approximately even in both the AM and PM peak hours. Most of the intersections on Independence Avenue operate at LOS B or higher, with the exception of the intersection of Independence Avenue and 12th Street. Though this intersection experiences a LOS D in both the AM and PM peak hours, the eastbound Independence Avenue through movement operates at a LOS F.

12th Street, SW carries a significant volume of northbound traffic in both the AM and PM peak hours, ranging from 1000 – 1500 vph. The level of service at the intersection of 12th Street and C Street is LOS D in the PM, with the eastbound approach experiencing a LOS F and a delay of 191 seconds per vehicle. The eastbound delays are a result of only one lane of traffic carrying high volumes.

The traffic signals located at signalized intersections in the study area are pretimed traffic signals running in coordinated operation with cycle lengths ranging from 80 – 100 seconds. The cycle lengths sufficiently handles most of the traffic volumes at the intersections, with the exception of the intersection of 9th Street and Maine Avenue, where the cycle lengths do not sufficiently handle the large peak hour traffic volumes, thus resulting in failing levels of service and high intersection delays.

Table 2 summarizes the 2003 traffic operations analysis.

Table 2. Study Area Levels of Service - 2003

Intersections	LOS / Delay (AM)	LOS / Delay (PM)
Independence Avenue & 12th Street	D / 53.6	D / 39.0
Independence Avenue & L'Enfant Promenade	A / 9.2	A / 7.9
Independence Avenue & 9th Street	A / 1.6	B / 14.8
12th Street & DOE Garage Entrance	A / 7.2	B / 10.0
12th Street & C Street	B / 10.8	D / 45.7
12th Street & D Street	D / 45.4	A / 9.0
12th Street & Maryland Avenue	B / 15.1	B / 19.1
12th Street & Maiden Lane (Maine Avenue)	B / 19.7	D / 35.4
10th Street & D Street	A / 4.3	B / 11.6
9th Street & D Street	A / 7.9	B / 11.3
9th Street & Maine Avenue	F / 92.1	F / 108.8
9th Street & Water Street	A / 27.1	B / 61.0
Ramps		
12th Street Expressway ramp to D Street	B	B
SB 10th Street ramp to NB L'Enfant Promenade	A	B
SB 9th Street ramp to NB I-395	C	B
SB 9th Street ramp to SB I-395	F	F
NB I-395 ramp to 9th Street	F	E
Freeway Segments		
NB I-395 (3 lanes of through traffic)	F	D
SB I-395 (3 lanes of through traffic)	F	D

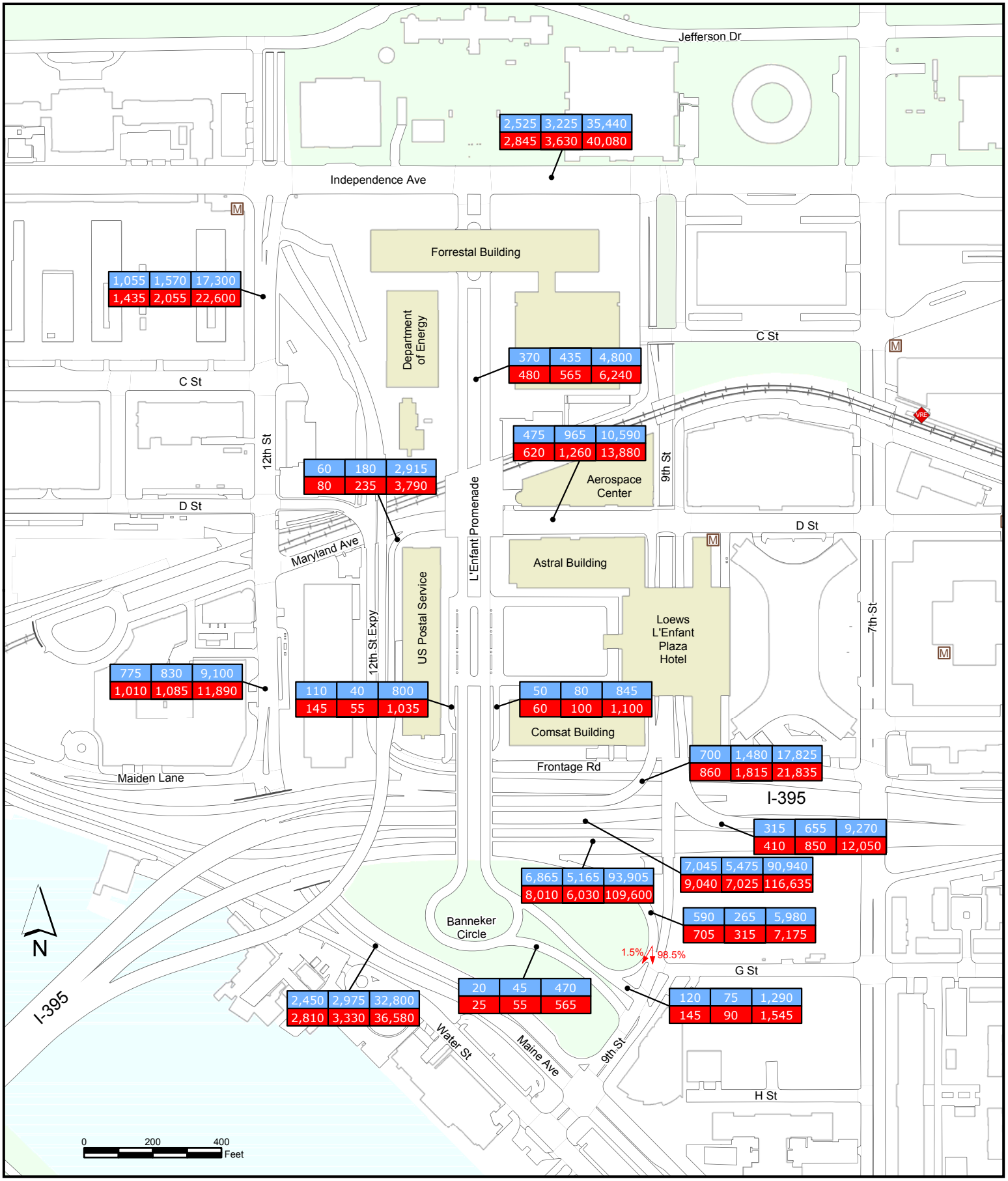
Pedestrian volumes collected with the traffic counts indicate that the sidewalks in the study are all operating at an acceptable LOS. The LOS analysis was performed using the Highway Capacity Manual method for sidewalks, which takes into account the pedestrian volume, sidewalk width, and width of any obstructions.

Table 3 summarizes the 2003 sidewalk operations analysis.

Table 3. 2003 Sidewalk LOS

Sidewalk	From	To	Peak Flow Rate (ped/15 min)	Sidewalk Width (ft)	Obstruction width (ft)	Obstruction	W(e) (ft)	V(p)	LOS (average)	LOS (platoon)
Independence Avenue (EB)	12th Street	L'Enfant Promenade	185	15	2	Jersey barrier	13	0.95	A	B
Independence Avenue (WB)	12th Street	L'Enfant Promenade	44	9	3.5	Tree, curb	5.5	0.53	A	B
Independence Avenue (EB)	L'Enfant Promenade	9th Street	67	15	2	Jersey barrier	13	0.34	A	A
Independence Avenue (WB)	L'Enfant Promenade	9th Street	38	9	3.5	Tree, curb	5.5	0.46	A	A
12th St (NB)	Independence Avenue	DOE Garage	145	12	0	-	12	0.81	A	B
12th St (SB)	Independence Avenue	DOE Garage	93	12	0	-	12	0.52	A	B
12th St (NB)	DOE Garage	C Street	101	12	7.5	Planter box, curb, light pole	4.5	1.50	A	B
12th St (SB)	DOE Garage	C Street	116	12	0	-	12	0.64	A	B
D Street (EB)	12th Street	10th Street	63	5	4	Curb, light pole	1	4.20	A	C
D Street (WB)	12th Street	10th Street	47	5	3.5	Curb, bridge pier	1.5	2.09	A	B

Source: Parsons Brinckerhoff, 2003
Street Smarts, 2003



LEGEND

AM Peak	PM Peak	Daily Volume	
AM Peak	PM Peak	Daily Volume	2003 Actual Volumes
AM Peak	PM Peak	Daily Volume	2025 Forecasted Volumes

M Metrorail Station Access Point

VRE Station Access Point

TRAFFIC VOLUMES

Analysis

To analyze the traffic conditions for the Promenade area future conditions, the traffic volumes were first forecasted for the 2025 design year. 2025 intersection turn movement volumes were then computed. The forecasted 2025 volumes were used for the traffic operations analysis of the No Build alternative and the various Build alternatives.

The volumes, both vehicle and pedestrian, resulting for the 10th Street Visitor and Transportation Center and the Southwest Waterfront Development (pedestrians only) were calculated and added to the overall 2025 traffic volumes for the Build alternatives only. **Figure 1** shows the 2025 forecasted volumes for the study area.

No Build Alternative

The 2025 No Build alternative only includes those roadway improvements that are already planned. Isolated intersection improvements were not included as part of the No Build alternative. The following assumptions were made for the No Build analysis:

- Maine Avenue – The Anacostia Waterfront Initiative (AWI) Plan, which was adopted by the District of Columbia Council in 2003, calls for Maine Avenue to become an urban boulevard. This concept would include a lowered speed limit and an additional through lane of traffic in each direction during the AM and PM rush hours. The AWI Plan is independent of this project, so these proposals were included in the analysis as future conditions.

- Traffic Signal Optimization – The entire network of signals was optimized, in addition to individual intersections. In some cases, the cycle length was increased from existing values but does not exceed 110 seconds.

- Also consistent with AWI Plan, Water Street was removed from the study area, and thus, from the operational analysis.

Findings

No Build Alternative

The LOS was determined for the study area facilities under the No Build Alternative. From the operations analysis, the intersections of Independence Avenue and 12th Street, and 12th Street and C Street will operate at a failing level of service, LOS F. Delays to these intersections range from 96 to 112 seconds per vehicle.

The results in an HCS ramp analysis shows that the ramps from southbound 9th Street to northbound and southbound I-395, and the northbound I-395 ramp to 9th Street will all operate at LOS F, due insufficient capacity to handle the forecasted volumes. The I-395 mainline will operate at LOS F in 2025, also due to insufficient capacity to handle the 2025 forecasted volumes. A failing LOS for streets in the study area equates to traffic operations with poor progression and high vehicle delays (over 80 seconds per vehicle), which are unacceptable to most drivers. **Table 4** summarizes the 2025 No Build LOS.

Table 4. Study Area Levels of Service – 2025 No Build

Intersection	LOS / Delay (AM)	LOS / Delay (AM)
Independence Avenue & 12th Street	F / 96.7	F / 112.1
Independence Avenue & L'Enfant Promenade	A / 6.6	A / 8.2
Independence Avenue & 9th Street	A / 2.9	A / 3.5
12th Street & DOE Garage Entrance	B / 18.1	B / 17.2
12th Street & C Street	C / 20.4	F / 102.9
12th Street & D Street	C / 25.8	B / 18.8
12th Street & Maryland Avenue	B / 14.8	D / 52.4
12th Street & Maiden Lane (Maine Avenue)	C / 28.2	B / 17.2
10th Street & D Street	A / 6.7	A / 9.1
9th Street & D Street	A / 6.1	D / 45.0
9th Street & Maine Avenue	C / 30.5	D / 39.2
9th Street & Water Street	(removed)	(removed)
Ramps		
12th Street Expressway ramp to D Street	B	E
SB 10th Street ramp to NB L'Enfant Promenade	B	B
SB 9th Street ramp to NB I-395	F	B
SB 9th Street ramp to SB I-395	F	F
NB I-395 ramp to 9th Street	F	F
Freeway Segments		
NB I-395 (3 lanes of through traffic)	F	E
SB I-395 (3 lanes of through traffic)	F	F

Analysis

Build Alternatives

All build alternatives were analyzed with common elements such as intersection signal optimization, geometric modifications, and a new mid-block pedestrian signal at the new Maine Avenue crossing.

Geometric Modifications

Various improvements were investigated for intersections that were found failing, or LOS F, under 2025 No Build conditions. **Table 5** shows a list of the study area intersections that experience LOS F during 2025 forecasted conditions.

Table 5. Improvements to Failing Intersections

Intersection	2025 No Build LOS (AM / PM)	Problem	2025 Build LOS (AM / PM)	Suggested improvements
Independence Avenue & 12th Street	F / F	Large volumes; insufficient capacity	E / E	Reconfigure NB lanes
12th Street & C Street	C / F	Large eastbound volumes in PM peak hour; insufficient capacity	C / D	Use eastbound parking lane as a travel lane during PM rush hour

Independence Avenue & 12th Street
Because Independence Avenue experiences very high through volumes in 2025, approximately 1800 vph, these volumes must be accommodated to improve the intersection's performance. This analysis investigated the reconfiguration of the existing traffic lanes, because physical modifications are unlikely at this location bordering the National Mall. The northbound approach was modified to have the following three-lane configuration: one left turn only lane; one shared left-through lane; and one shared through-right lane. This configuration, along with the traffic signal optimization of cycle length, splits and offset, resulted in an improved LOS E. This improvement can be made with pavement markings.

12th Street & C Street
This intersection would fail during the 2025 PM peak hour because a large volume of eastbound left and right turning movements must be made within one lane of travel, thus insufficient capacity to handle the eastbound movements. Eastbound C Street link volumes for 2025 are approximately 350 vph in the AM and 550 vph in the PM. Existing conditions include one traffic lane and one parking lane on C Street. This analysis found that modifying the parking lane to be an additional travel lane during the PM rush hour would significantly improve the capacity of the intersection. This improvement can be made with appropriate parking signage along C Street.

Another geometric modification common between Build Alternatives includes expanding Maine Avenue to three (3) traffic lanes in each direction. This is in harmony with the recommendations from the Southwest Waterfront Development Plan.

Signals
The traffic signals at the signalized intersections in the study area were optimized for improved coordination and traffic operation in the study area. The optimized signal parameters (timings, phasings, and cycle lengths) for the signalized intersections north of I-395 are similar between the Build A, B, C & D Alternatives. The resulting cycle lengths due to optimization were 100 seconds.

The differences in signal timing, phasings, and cycle lengths exist only for the intersection of 9th Street and Maine Avenue between Build alternatives. The resulting cycle lengths for this intersection varied between Build Alternatives.

Ramps
Improvements to ramps in study area are recommended for all Build Alternatives. This includes the ramp from I-395/12th Street Expressway to D Street. A new geometric design is needed for this ramp in order to modify the existing turn radius, soften the downward slope, and improve sight distance. A recommendation is made to rebuild the ramp in a way that provides a gradual slope to D Street, and connects D Street at an angle that will provide better sight distance to 12th Street, and a larger turn radius to D Street. The elimination of the sidewalk on the south side of D Street near the U.S. Postal Service Building will provide ample room to extend the ramp connection and lengthen the turn radius.

The ramp from I-395 to 9th Street currently carries approximately 6,000 vehicles per day, and as much as 600 vehicles during the morning peak hour, based on recent traffic counts. The traffic volumes on this ramp will increase to 7,175 vehicles per day and 700 vehicles in the morning peak hour in year 2025. The ramp is a one-lane ramp that expands to two

lanes as it approaches 9th Street. Because of the proposed increases to traffic volume using this ramp, it is recommended that the I-395 ramp to 9th Street remain as a two-lane ramp as it approaches 9th Street.

The intersection of 9th Street and the ramps to Banneker Circle needs to be simplified. The majority of I-395 ramp volumes merge onto southbound 9th Street. The closely spaced ramps between I-395, 9th Street, G Street, and Banneker Circle create potentially unsafe weaving and merging areas. It is recommended that this intersection be redesigned as a single, unsignalized intersection to create fewer conflicts, making the intersection potentially safe for vehicles and pedestrians.

Mid-Block Pedestrian Signal
A pedestrian traffic signal is recommended on Maine Avenue at the proposed crosswalk location. The signal would be a mid-block pedestrian-actuated signal. According to the *Manual of Uniform Traffic Devices* (MUTCD), a traffic signal is warranted if the pedestrian volume crossing the major street is 100 or more for each of any 4 hours or 190 or more for any 1 hour, AND there are fewer than 60 gaps per hour in the traffic stream of adequate length to allow pedestrians to cross when the volume criterion is satisfied.

The forecasted pedestrian volumes crossing Maine Avenue in 2025, approximately 300 – 500 pedestrians during the peak hours, indicate that a traffic signal is warranted. The proposed signal would have negligible impacts on the performance of the adjacent intersections in the study area, but would greatly increase pedestrian safety.

Build A
The traffic characteristics of this alternative are similar to the other Build Alternatives, including a mid-block pedestrian signal on Maine Avenue.

Build B
The traffic circulation in this proposal is similar to Build A, however, a roundabout at the Maryland Avenue axis on the Promenade would be added. This will require a widening of the bridge deck. The roundabout would not greatly impact the traffic operations on the Promenade, which is a low-speed and low-volume roadway. Emergency and maintenance vehicles would be required to reduce their speed while traveling the roundabout, but the radius would safely accommodate these vehicles.

The roundabout would be a single-lane roundabout with northbound and southbound approaches on the Promenade. On-street parking would not be allowed within the roundabout. The roundabout must be built with the appropriate radius to accommodate vehicles and buses, especially the proposed Downtown Circulator. Pedestrian activity within roundabout should be kept to a minimum, as vehicles will circulate counter-clockwise in roundabout. Traffic control devices, such as stop or yield signs and traffic signals, would not be required as this is a low-volume, low-speed facility.

Build C & D
The traffic circulation for Build C & D are similar to Build A & B, however, a parking structure is proposed at the 10th Street Overlook site. A new intersection would be added on southbound 9th Street. A proposed roadway (Roadway A) would connect the new Promenade southern terminus to 9th Street. Roadway A would be a two-lane road but access would be limited to right entrances and exits. Ninth Street is a southbound one-way

street north of the intersection but would become two-directional south of the intersection. The intersection is assumed to be stop sign controlled on Roadway A.

The proposed parking structure would include two access points: one entrance and exit on 9th Street for cars and one entrance and exit on Maine Avenue for tour buses. Two new intersections would be created from these access points.

Findings

Build Alternatives

The LOS was determined for all study area facilities and all alternatives. From the operations analysis, all intersections will operate at LOS E or higher. Delays to these intersections range from 6 to 75 seconds per vehicle.

The results in an HCS ramp and freeway analysis are similar to the No Build ramp analysis. No improvements were proposed for the southbound 9th Street ramps to northbound and southbound I-395, and the northbound I-395 ramp to 9th Street. Improvements were not proposed for the I-395 mainline. **Table 6** summarizes the levels of service and delays for the 2025 Build Alternatives.

Table 6. Study Area Levels of Service – 2025 Build

Intersection	2025 Build A LOS AM (PM)	2025 Build B LOS AM (PM)	2025 Build C LOS AM (PM)	2025 Build D LOS AM (PM)
Independence Avenue & 12th Street	E / 72.4 (E / 70.4)		E / 73.0 (E / 71.6)	
Independence Avenue & L'Enfant Promenade	A / 8.2 (A / 8.7)		A / 8.2 (A / 8.6)	
Independence Avenue & 9th Street	A / 6.1 (B / 10.7)		A / 6.1 (B / 11.6)	
12th Street & DOE Garage Entrance	C / 21.4 (C / 22.7)		C / 21.4 (C / 24.2)	
12th Street & C Street	C / 21.0 (D / 54.5)		C / 21.0 (E / 60.0)	
12th Street & D Street	C / 25.7 (C / 26.7)		C / 25.7 (C / 26.6)	
12th Street & Maryland Avenue	B / 14.9 (D / 47.2)		B / 14.9 (D / 47.1)	
12th Street & Maiden Lane (Maine Avenue)	C / 34.7 (B / 17.1)		C / 34.7 (B / 17.1)	
10th Street & D Street	A / 6.7 (B / 17.5)		A / 6.7 (B / 17.5)	
9th Street & D Street	A / 6.1 (C / 22.4)		A / 6.1 (C / 22.4)	
9th Street & Maine Avenue	C / 32.3 (D / 39.2)	C / 32.3 (D / 39.2))	D / 36.5 (D / 40.5)	D / 36.5 (D / 40.5)
9th Street & Water Street	(removed)			
9th Street & L'Enfant Promenade / Parking Garage	B / 11.7 (B / 12.9)	B / 11.7 (B / 12.9)	B / 12.3 (C / 19.5)	B / 12.3 (C / 19.5)
Maine Avenue Mid-Block Crosswalk	A / 4.1 (A / 3.2)	A / 4.1 (A / 3.2)	A / 9.4 (A / 9.4)	A / 9.4 (A / 9.4)
12th Street Expressway ramp to D Street	*Proposed improvements to ramps would improve traffic circulation to study area*			
SB 10th Street ramp to NB L'Enfant Promenade	*No proposed improvements to ramps*			

Intersection	2025 Build A LOS AM (PM)	2025 Build B LOS AM (PM)	2025 Build C LOS AM (PM)	2025 Build D LOS AM (PM)
SB 9th St ramp to NB I-395	*No proposed improvements to ramps*			
SB 9th St ramp to SB I-395	*No proposed improvements to ramps*			
NB I-395 ramp to 9th Street	*Ramp configuration remains the same*			
NB I-395 (3 lanes of through traffic)	*No proposed improvements to I-395*			
SB I-395 (3 lanes of through traffic)				

Build A
The results of the traffic operations analysis, similar for all Build alternatives, are shown in Table 6.

Build B
Maryland Axis Roundabout
An analysis of Maryland Axis roundabout was conducted using HCS procedures. Input data included 2025 forecasted peak hour volumes for L'Enfant Promenade, and a peak hour factor of 1.00. HCS procedures were used to calculate the approach capacity, circulating flow rates, and volume-to-capacity ratios of roundabout to determine the roundabout's operation. As a single-lane roundabout with two approaches, a value 10% of the through volumes was assumed to make up the u-turn volumes. U-turns were calculated to create realistic circulating volumes within roundabout. The results of the HCS analysis are presented in the table below.

Table 7. HCS Roundabout Results

	AM peak hour		PM peak hour	
Approach Flow				
Northbound	395		470	
Southbound	335		395	
Circulating Flow				
Northbound	33		40	
Southbound	40		47	
Capacity	**NB**	**SB**	**NB**	**SB**
Upper Bound	1349	1342	1342	1334
Lower Bound	1129	1122	1122	1115
V/C Ratio				
Upper Bound	0.29	0.25	0.35	0.30
Lower Bound	0.35	0.30	0.42	0.35

According to Roundabout literature, roundabouts should not operate beyond 85% of their estimated capacity. The Maryland Avenue roundabout will operate at most 42% of its estimated capacity. Thus, the roundabout volumes will not exceed the capacity and should operate without congestion.

Build C & D
The level of service for the intersection of Roadway A (new two-lane road from L'Enfant Promenade) and 9th Street was calculated using HCS procedures for unsignalized intersections, since the new intersection will be stop sign controlled. The LOS for the

intersection will be LOS B in the AM peak hour and LOS C in the PM peak hour. Thus, the implementation of Roadway A will have minimal impact traffic operations on 9th Street.

10th Street Overlook Visitor and Transportation Center
The proposed Visitor and Transportation Center at the 10th Street Overlook site would be a three-level parking facility that would accommodate parking for visitors, tourists, commuters, and tour buses. The center would provide easily accessible parking for motorists entering the city that will enable them to park without having to traverse the congested city streets.

According the Southwest Waterfront Development Plan and the NCPC Memorials and Museums Master Plan, the site is also suitable for museum or memorial equal to or greater in size than the Jefferson Memorial or East Wing of National Gallery of Art to be situated above the parking structure. Based on preliminary plans from the AWI consultant team, the site would also include special retail shops and twelve residential units, along with the proposed museum. Across from the 10th Street Overlook site, the redevelopment and revitalization of the Southwest Waterfront is planned with a 2.3 million square feet development including 800 residential units, a 400-450 room hotel, retail establishments, small office space, and cultural and community uses.

The proposed new developments situated at the Southwest Waterfront will generate additional demands on all classes of traffic – vehicle, pedestrian, and bicycles. Thus, as part of the future conditions analysis, a trip generation analysis was performed to determine the vehicle and pedestrian impacts due to the new development. A trip generation analysis was not performed for bicycles because sufficient data to determine the impact of the proposed development to bicycle usage was not available.

Vehicle trip generation volumes were calculated using ITE trip generation rates. Vehicle trips were calculated only for the 10th Street Visitor and Transportation Center, as the MWCOG model was assumed to include the vehicle trip generation for the Southwest Waterfront Development. Too, based on comments from the Southwest Waterfront Plan, the new development would not generate a significant amount of traffic that would impact Maine Avenue, as Maine Avenue would be able to accommodate a "well-managed increase in traffic at the scale that will likely accompany the proposed development."[1]

Pedestrian trip generation rates were calculated using pedestrian trip generation rates based on various land uses. Pedestrian volumes were calculated for the Visitor and Transportation Center and all applicable uses (museum, retail, and residential). Pedestrian volumes were also calculated for Sites 1, 2, & 3 of the Southwest Waterfront Development, due their proximity to the Maine Avenue and 9th Street intersection.

The results of the vehicle trip generation show that approximately 3,100 daily vehicle trips will be generated from the 10th Street Visitor and Transportation Center. The pedestrian trip generation reveals that 21,000 pedestrians per day will visit the Visitor and Transportation Center and Sites 1, 2, & 3 of the Southwest Waterfront Development. Peak hour vehicle and pedestrian volumes, both entry and exit volumes, were generated as well. The peak hour volumes were adjusted for the Maine Avenue and 9th Street intersection and the mid-block pedestrian crosswalk on Maine Avenue to account for the additional traffic. **Table 8**

[1] NCRC, Development Plan & AWI Vision for The Southwest Waterfront, 2003. pg.7-C5.

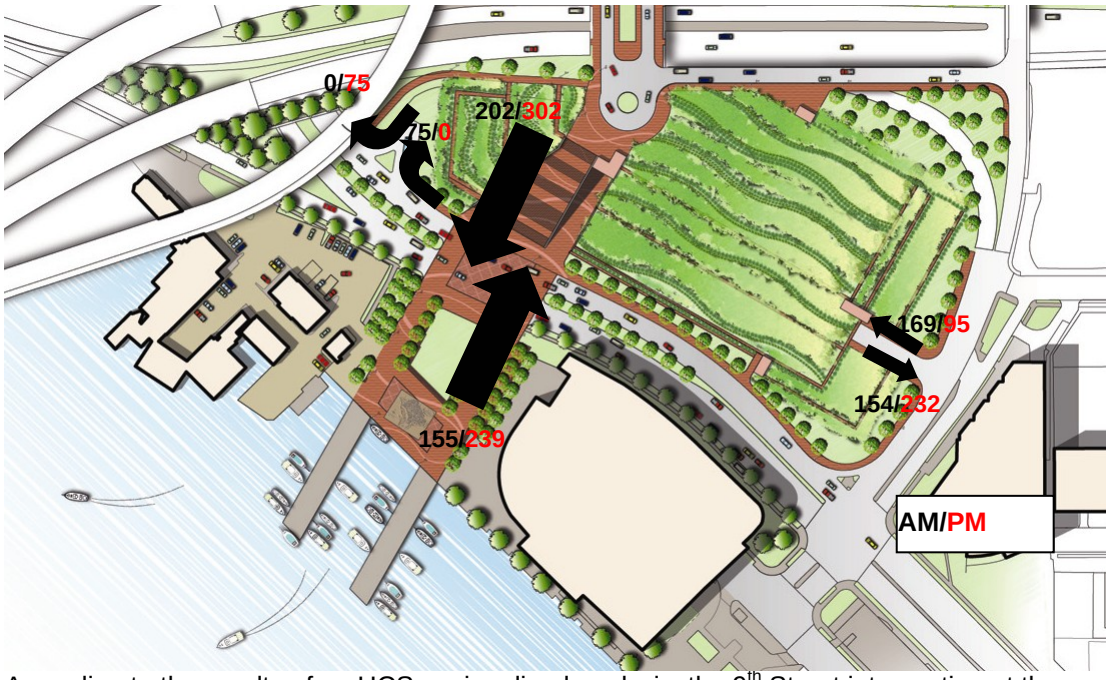
shows the results of the trip generation analysis. **Figure 2** shows the revised vehicle and pedestrian volumes as a result of the new developments.

Table 8. Trip Generation Results

Vehicle Trip Generation								
Land Use		**Daily Volume**	**AM Peak Volume**	**AM In**	**AM Out**	**PM Peak Volume**	**PM In**	**PM Out**
10th St Visitor & Transportation Ctr	Total	3,163	398	244	154	402	95	307

Pedestrian Trip Generation								
Land Use		**Est. Avg. Daily Volume**	**AM Peak Volume**	**AM In**	**AM Out**	**PM Peak Volume**	**PM In**	**PM Out**
SW Waterfront Development - Site 1	Subtotal	6,082	300	145	155	485	245	239
SW Waterfront Development - Site 2	Subtotal	3,783	175	35	141	310	179	131
SW Waterfront Development - Site 3	Subtotal	2,625	102	23	79	208	113	94
10th St Visitor & Transportation Ctr	Subtotal	8,946	395	167	228	721	373	347
	Total	**21,437**	**972**	**369**	**603**	**1,723**	**911**	**812**

Figure 2. 2025 Trips Generation Results



According to the results of an HCS unsignalized analysis, the 9th Street intersection at the parking structure entrance will operate at LOS B during the AM peak hour and LOS C during the PM peak hour. The additional vehicle and pedestrian volumes added to the Maine Avenue and 9th Street intersection results in the intersection operating at LOS C in the AM and LOS D in the PM.

The pedestrian mid-block crosswalk located on Maine Avenue was also analyzed as part of a 100-second pretimed traffic signal with a 32-second pedestrian phase. The mid-block pedestrian signal will not impact traffic flow on Maine Avenue. The level of service for the mid-block signal will be LOS B in the AM and LOS A in the PM. Thus, the mid-block crosswalk will operate above capacity.

Table 9 summarizes the results of the Build C & D operational analysis.

Table 9. Levels of Service – 2025 Build C & D

Intersection	LOS / Delay (AM)	LOS / Delay (PM)
9th Street & Parking Garage	B / 12.3	C / 19.5
9th Street & Maine Avenue	D / 36.5	D / 40.5
Mid-Block Pedestrian Signal	A / 9.4	A / 9.4

Future Pedestrian Conditions

The *District of Columbia Southwest Waterfront Pedestrian Circulation Study* (DDOT, January 2003) evaluates several crosswalks in the study area for crossing time. The report recommends that the following pedestrian signal timings be modified to allow for longer crossing time:

- Crossing 12th Street at Independence Avenue (north and south sides)
- Crossing C Street at 12th Street (east side)

This report identifies other problem areas in the vicinity of the Promenade. While sidewalks run along both sides of each of the two 12th Street/Maine Avenue tunnels under I-395, only one sidewalk provides a continuous route. The other three sidewalks terminate at the southern end of the tunnels, leaving pedestrians in the landscaped median of Maine Avenue. The only crosswalk in this area is at the 9th Street intersection, almost 800 feet to the southeast. In addition, light poles and fire hydrants obstruct portions of the sidewalk along the north side of Maine Avenue.

Conclusions

Table 10 shows the results of the operational analysis of 2025 alternatives.

Table 10. Comparison of Levels of Service - 2025 Alternatives

Intersection	2025 No Build LOS (AM/PM)	2025 Build A LOS (AM/PM)	2025 Build B LOS (AM/PM)	2025 Build C LOS (AM/PM)	2025 Build D LOS (AM/PM)
Independence Avenue & 12th Street	F / F	E / E			
Independence Avenue & L'Enfant Promenade	A / A	A / A			
Independence Avenue & 9th Street	A / A	A / B			
12th Street & DOE Garage Entrance	B / B	C / C			
12th Street & C Street	C / F	C / E			
12th Street & D Street	C / B	C / C			
12th Street & Maryland Avenue	B / D	B / D			
12th Street & Maiden Lane (Maine Avenue)	C / B	C / B			
10th Street & D Street	A / A	A / B			
9th Street & D Street	A / D	A / C			
9th Street & Maine Avenue	C / D	C / D	C / D	D / D	D / D
9th Street & Water Street	(removed)	(removed)			
9th Street & L'Enfant Promenade / Parking Garage	A/ B	B / B	B / B	B / C	B / C
Maine Ave Mid-Block Crosswalk	NA	A / A	A / A	A / A	A / A
Ramps					
12th Street Expressway ramp to D Street	B / E	*Proposed improvements to ramps would improve traffic circulation to study area*			
SB 10th Street ramp to NB L'Enfant Promenade	B / B	*No proposed improvements to ramps*			
SB 9th St ramp to NB I-395	F / B	*No proposed improvements to ramps*			
SB 9th St ramp to SB I-395	F / F	*No proposed improvements to ramps*			
NB I-395 ramp to 9th Street	F / F	*Ramp configuration remains the same*			
Freeway Segments					
NB I-395 (3 lanes of through traffic)	F / E	*No proposed improvements to I-395*			
SB I-395 (3 lanes of through traffic)	F / F				

Based on the results, the Build alternatives will improve traffic operations at most intersections. Improvements increased the LOS by one grade for a few of the intersections, or the LOS remained the same as that of the No Build alternative.

In cases where LOS deteriorated, the deterioration was due to increase in traffic due to traffic redistribution, or new development. For intersection of 12th Street & DOE Garage Entrance, the worsening of LOS was due to a reduction in green time for northbound and southbound movements. This reduction was performed to allow more green time for the east-west movements, in coordination with the east-west movements at Independence

Avenue and 12th Street, which is connected to the 12ths Street and DOE Garage Entrance signal. The deterioration of LOS from LOS A to LOS B for the 10th Street and D Street intersection was due to an overall reduction in cycle length for the D Street corridor, from 100 seconds to 80 seconds; this was done to allow for better coordination and progression on D Street. In all cases of reductions of levels of service, the reduction was only by one grade.

The traffic operations analysis of the L'Enfant Promenade study area revealed several things:

- Current traffic conditions range from good to failing operations, with the intersections of Independence Avenue and 12th Street, 12th Street and C Street, and 9th Street and Maine Avenue operating at with failing conditions;
- Independence Avenue and Maine Avenue carry the highest roadway volumes in the study area, over 30,000 vehicles per day, notwithstanding I-395;
- Traffic volumes will increase by 2025 by 30%;
- Intersections, ramps and freeway segments will operate at failing levels of service (LOS F) if roadway improvements are not made;
- Improvements proposed by the Build Alternatives will result in better operations at most intersections;
- The development of the 10th Street Visitor and Transportation Center and the Southwest Waterfront Development Plan will add vehicle and pedestrian traffic to the study area, particularly at the 9th Street and Maine Avenue intersection. However, the recommended roadway improvements for the Build alternatives will accommodate the increase in traffic; and
- The mid-block pedestrian signal will not impact traffic flow on Maine Avenue.

In summary, the recommended traffic and transportation improvements for the L'Enfant Promenade study area are as follows:

- Reconfigure the northbound lanes at the Independence Avenue & 12th Street intersection to one left, one shared left-through, and one shared through-right lanes;
- Use the eastbound parking lane at the 12th Street & C Street intersection as a travel lane during rush hours, and use appropriate signage where needed;
- Expand Maine Avenue to three (3) full travel lanes in each direction to accommodate future traffic volumes;
- Optimize all traffic signals for better progression and increase the traffic signal cycle lengths to 95 – 100 seconds;

- Increase pedestrian crossing time to signals at Independence Avenue & 12th Street and C Street – 12th Street intersections;

- Rebuild 12th Street ramp to D Street to soften downward slope, improve sight distance, and increase turning radius;

- Simplify intersections at I-395, 9th Street, G Street, and Banneker Circle into one (1) unsignalized intersection;

- Add a mid-block pedestrian crosswalk on Maine Avenue with traffic signal with dedicated pedestrian phase, crosswalk treatments such as textured pavements, and appropriate signage to inform drivers of pedestrian crossing.

This study did not review any suggested improvements to freeway segments and freeway ramps, other than the 12th Street ramp at D Street. Factors such as adding additional lane capacities to freeways and ramps will improve the operations of these roadway facilities, and thus would improve the traffic operations of the study area overall. The failing levels of service for select ramps and freeway segments reveal that improvement is needed. Representatives of sponsoring agencies, however, must make this decision. If determined that the improvements of freeway ramps and segments must be included in the environmental assessment, a detailed analysis should be performed of freeway facilities.

Permits

Permits are required to address the traffic impacts of the proposed alternatives. Signal timing plans will need to be developed for the optimized timings and approved by the District Department of Transportation. Permits will be needed for new signs at 12th Street and C Street regarding the use of parking lanes during rush hours, and at Maine Avenue to inform drivers of the mid-block pedestrian crosswalk. Permits will need to be approved by the District Department of Transportation.

Mitigation

Mitigation requirements are not appropriate to the traffic analysis.

Construction Impacts

Traffic will be impacted during the construction of the recommended roadway improvements. If new lanes of travel need to be built at an intersection, traffic will have to be re-routed during times of constructed. If re-striping is all that is needed to incorporate a new lane of travel, construction can be performed during off-peak hours or night hours so as not to impact traffic during heavy rush hour periods. Adding recommended signs with regards to the use of parking lanes during rush hour periods should not impact traffic operations on roadways.

References

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APPENDIX

2003 Intersection Turning Movement Counts
2003 ADT Counts
2025 Intersection Turning Movement Volumes
2025 ADTs
2025 Trip Generation Results

2003 Intersection Turning Movement Counts

Intersection	Peak Hour	Eastbound			Westbound			Northbound			Southbound		
		Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left
Independence Avenue & 12th Street	AM	257	1088	36	664	570	91	99	165	300	1	0	2
	PM	89	1195	8	141	1097	402	395	267	352	1	2	3
Independence Avenue & L'Enfant Promenade	AM	84	1105	0	0	1230	67	124	0	95	0	0	0
	PM	82	1511	0	0	1501	75	138	0	139	0	0	0
Independence Avenue & 9th Street	AM	81	1140	8	12	1258	94	32	0	33	6	0	0
	PM	52	1589	8	4	1455	35	85	0	105	16	0	2
12th Street & DOE Garage Entrance	AM	0	0	0	0	0	0	142	564	0	0	348	0
	PM	0	0	0	66	0	127	1	947	0	0	493	0
12th Street & C Street	AM	127	23	133	0	0	1	35	573	149	103	228	18
	PM	53	0	350	45	26	20	0	554	220	461	155	3
12th Street & D Street	AM	37	0	17	282	83	122	0	458	17	12	344	0
	PM	114	2	44	83	49	29	0	647	30	6	222	6
12th Street & Maryland Avenue	AM	7	19	7	59	36	39	73	409	37	110	208	185
	PM	76	59	84	207	20	101	40	386	5	21	220	124
12th Street & Maiden Lane	AM	0	0	0	0	0	0	0	519	943	151	103	0
	PM	0	0	0	0	0	0	0	431	754	171	226	0
10th Street & D Street	AM	131	225	0	0	111	52	54	0	25	0	0	0
	PM	60	411	0	0	190	1	290	0	108	0	0	0
10th Street & Frontage Road	AM	0	4	1	78	46	0	0	0	0	49	235*	133
	PM	0	7	10	390	129	0	0	0	0	16	95*	44
9th Street & D Street	AM	22	256	0	0	195	143	0	0	0	0	0	0
	PM	330	415	0	0	218	493	0	0	0	0	0	0
9th Street & Maine Avenue	AM	73	660	154	61	1379	20	5	5	28	55	55	324
	PM	149	1160	159	51	1064	47	48	67	99	140	101	465
9th Street & Water Street	AM	0	20	24	14	30	0	0	0	0	61	1	86
	PM	5	99	147	67	211	4	3	0	3	161	1	135

**Movement is a U-turn*

2003 Average Daily Volumes (Taken from24-hour Mechanical Counts)

	Location		12 hour	24 hour	12 hour	Total	%	ADT
1	NB I-395 (12th Street Expressway) ramp to EB Maryland Avenue/D Street	**all**	1400	2882	1547	5829		2915
		vehs	836	1814	967	3617	62%	
		trucks	564	1068	580	2212	38%	
			24 hour	**24 hour**				
2	SB 9th Street ramp to SB I-395	**all**	18099	17549		35648		17824
		vehs	17747	17241		34988	98%	
		trucks	352	308		660	2%	
			24 hour	**24 hour**				
3	SB 9th Street ramp to NB I-395	**all**	9266	9271		18537		9269
		vehs	8969	9013		17982	97%	
		trucks	297	258		555	3%	
			12 hour	**24 hour**	**12 hour**			
4	NB I-395 ramp to SB 9th Street/L'Enfant Promenade	**all**	2556	6073	3331	11960		5980
		vehs	1543	3475	1412	6430	54%	
		trucks	1013	2540	34	3587	30%	
			12 hour	**24 hour**	**12 hour**			
5	9th Street Ramp to NB L'Enfant Promenade	**all**	559	1301	712	2572		1286
		vehs	390	926	539	1855	72%	
		trucks	169	375	173	717	28%	
			12 hour	**24 hour**	**12 hour**			
6	9th Street/I-395 Ramp to NB L'Enfant Promenade	**all**	612	1398	727	2737		1369
		vehs	430	987	510	1927	70%	
		trucks	182	411	217	810	30%	
			12 hour	**24 hour**	**12 hour**			

	Location		12 hour	24 hour	12 hour	Total	%	ADT
7	SB L'Enfant Promenade ramp to SB 9th Street	**all**	278	462	200	940		470
		vehs	182	287	123	592	63%	
		trucks	96	175	77	348	37%	
			24 hour	**24 hour**				
8	I-395 northbound and southbound through traffic	**all**	185367	184320		369687		184844
		vehs	179189	178766		357955	97%	
		trucks	6178	5554		11732	3%	
			12 hour	**24 hour**	**12 hour**			
9	10th Street (garage) ramp to NB L'Enfant Promenade	**all**	470	839	381	1690		845
		vehs	237	462	200	899	53%	
		trucks	233	377	181	791	47%	
			12 hour	**24 hour**	**12 hour**			
10	SB L'Enfant Promenade ramp to 10th Street (garage)	**all**	271	795	525	1591		796
		vehs	178	528	335	1041	65%	
		trucks	93	267	190	550	35%	
			12 hour	**24 hour**	**12 hour**			
11	NB US Route 1 ramp to EB Maine Avenue	**all**	1065	2083	1146	4294		2147
		vehs	692	1348	745	2785	65%	
		trucks	373	735	401	1509	35%	

2025 Intersection Turning Movement Counts

Intersection	Peak Hour	Eastbound			Westbound			Northbound			Southbound		
		Right	Thru	Left	Right	Thru	Left	Right	Thru	Left	Right	Thru	Left
Independence Avenue & 12th Street	AM	361	1368	127	580	860	30	49	229	722	15	0	5
	PM	188	1455	17	138	1320	427	403	387	638	0	0	0
Independence Avenue & L'Enfant Promenade	AM	201	1220	0	0	1285	135	213	0	182	0	0	0
	PM	217	1640	0	0	1633	177	222	0	248	0	0	0
Independence Avenue & 9th Street	AM	25	1404	2	15	1355	85	167	0	48	20	0	0
	PM	78	1765	14	4	1627	39	92	0	153	22	0	3
12th Street & DOE Garage Entrance	AM	0	0	0	0	0	0	140	1000	0	0	390	0
	PM	0	0	0	68	0	127	0	1358	0	0	615	0
12th Street & C Street	AM	60	30	265	0	0	5	34	874	157	203	154	33
	PM	137	0	393	36	23	36	0	928	380	433	307	0
12th Street & D Street	AM	76	0	64	460	60	110	0	541	9	5	215	0
	PM	18	0	242	207	21	2	0	858	5	68	412	0
12th Street & Maryland Avenue	AM	145	117	68	85	116	119	45	398	82	122	220	58
	PM	107	232	71	333	193	274	201	449	33	51	148	231
12th Street & Maiden Lane	AM	0	0	0	0	0	0	0	525	1500	200	285	0
	PM	0	0	0	0	0	0	0	693	1047	274	256	0
10th Street & D Street	AM	115	185	0	0	220	165	295	0	100	0	0	0
	PM	155	745	0	0	798	277	452	0	3	0	0	0
10th Street & Frontage Road	AM	0	25	200	399	16	0	0	0	0	344	306*	95
	PM	0	488	92	404	506	0	0	0	0	79	125*	311
9th Street & D Street	AM	190	290	0	0	385	105	0	0	0	0	0	0
	PM	643	557	0	0	1075	425	0	0	0	0	0	0
9th Street & Maine Avenue	AM	0	1115	265	177	1810	0	0	0	0	147	0	560
	PM	0	1104	536	149	1356	0	0	0	0	560	0	698
9th Street & Water Street	AM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	PM	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

**Movement is a U-turn*

2025 Average Daily Volumes

Roadway	DDHV*	K**	D	2003 AADT	2025 AADT	Balanced 2025 AADT
Independence Avenue (west of 12th)	1450	0.091	0.53	30,200	39,750	**43,250**
Independence Avenue (west of L'Enfant)	1640	0.091	0.51	35,600	40,450	**40,950**
Independence Avenue (west of 7th)	1676	0.091	0.53	34,900	40,080	**40,450**
12th Street (north of Independence)	416	0.091	0.986	4,700	6,140	**6,255**
12th Street (north of DOE)	1014	0.091	0.673	16,600	21,690	**24,380**
12th Street (north of C)	949	0.091	0.605	17,300	22,600	**22,540**
12th Street (north of D)	774	0.091	0.772	11,100	14,500	**14,500**
12th Street (north of Maryland)	677	0.091	0.65	11,500	15,020	**15,020**
12th Street (north of Maiden)	431	0.091	0.521	9,100	11,890	**11,890**
C Street (west of 12th)	707	0.091	0.636	12,300	16,070	**17,360**
C Street (east of 12th)	91	0.091	0.948	1,100	1,440	**2,880**
D Street (west of 12th)	160	0.091	0.653	2,700	3,530	**3,540**
D Street (east of 12th)	161	0.091	0.988	1,800	2,350	**2,350**
D Street (west of 10th)	473	0.091	0.591	8,800	11,500	**11,625**
D Street (west of 9th)	745	0.091	0.774	10,600	13,850	**16,060**
D Street (west of 7th)	711	0.091	0.63	12,500	16,330	**17,565**
Maryland Ave (east of 12th)	328	0.091	0.595	6,100	7,970	**6,875**
Maine Avenue (east of 9th Street)	1468	0.091	0.53	30,500	36,580	**38,580**
Maine Avenue (west of 9th Street)	1673	0.091	0.59	31,200	49,300	**49,590**
L'Enfant Promenade	277	0.091	0.64	4,800	9,470	**9,475**
10th Street (north of Frontage)	398	0.091	0.867	5,100	6,660	**8,695**

Legend
DDHV = Directional Design Hourly Volume
D = Directional Factor
K = Proportion of AADT occurring in the peak hour
AADT = Average Annual Daily Traffic

Notes
* PM peak hour volume in highest direction
** K value was taken from HCM 2000 Exhibit 8-9
*** Taken from MWCOG model outputs
**** Calculated using average growth rate of 1.31(Average growth rate calculated from MWCOG values only)

2025 Trip Generation Results

Vehicle Trips for 10th Street Visitor and Transportation Center
Vehicle Trip Generation
Source: ITE Trip Generation, 6th Edition

Land Use	ITE Description	Unit	# Units	ITE Code	Daily	AM Peak	AM In	AM Out	PM Peak	PM In	PM Out
Parking Structure		Spaces	1080								
Tour Buses		Buses	75								
Commuter Parking	Park and Ride Lot w/ Bus Service	Spaces**	560	90	2,520	398	244	154	402	95	307
Museum	National Monument	Acres	5.33	418	28	1	1	0	2	0	2
Retail	Specialty Retail	SF	27,600	814	1,122	0	0	0	71	31	41
Residential	High-Rise Residential Condo / Townhouse	Units	12	233	50	5	1	4	5	3	2
				Subtotals	3,721	404	245	158	480	129	352
				Reduction* **	558	61	37	24	72	19	53
				TOTALS	**3,163**	**344**	**209**	**135**	**408**	**109**	**299**

* Assumed two-level museum from "Overlook Site Design Considerations" (116,000 SF x 2 = 5.33 acres)
**Assumed Level 3 Parking for Commuter Traffic Only
***Reduce vehicle trips by 15% to account for unexpected higher rate of transit and pedestrian travel in the study area

Pedestrian Trip Generation

Source: A Pedestrian Planning Procedures Manual, FHWA, 1979

Description	Units	Trip gen. rates / peds per 1000 SF	Est. Avg. Daily Volume	AM Peak Rate***	AM Peak Vol	AM In	AM Out	PM Peak Rate***	PM Peak Vol	PM In	PM Out
SW Waterfront Development - Site 1											
Specialty Retailing	76,000	29	2204	NA	NA	NA	NA	0.0636833	140	60	80
All Office Uses	17,000	4	68	0.1416894	10	8	1	0.1353315	9	2	8
Single Family Dwelling	76,000	16	1216	0.0783699	95	24	71	0.1055381	128	82	46
Apartment Dwellings	0	7	0	0.0769231	0	0	0	0.0935143	0	0	0
Hotel and Motels	215,000	12	2580	0.0751121	194	112	81	0.0795964	205	101	105
Parking Garage**	7,480	1	7	0.0930236	1	0	1	0.1034951	1	0	0
Parking Lot**	3,206	2	6	0.0930236	1	0	1	0.1034951	1	0	0
Totals	**394,686**		**6,082**		**300**	**145**	**155**		**485**	**245**	**239**
SW Waterfront Development - Site 2											
Specialty Retailing	54,000	29	1566	NA	NA	NA	NA	0.0636833	100	43	57
All Office Uses	17,000	4	68	0.1416894	10	8	1	0.1353315	9	2	8
Single Family Dwelling	0	16	0	0.0783699	0	0	0	0.1055381	0	0	0
Apartment Dwellings	304,000	7	2128	0.0769231	164	26	138	0.0935143	199	133	66
Hotel and Motels	0	12	0	0.0751121	0	0	0	0.0795964	0	0	0
Parking Garage**	11,457	1	11	0.0930236	1	0	1	0.1034951	1	1	1
Parking Lot**	4,910	2	10	0.0930236	1	0	1	0.1034951	1	0	1
Totals	**391,367**		**3,783**		**175**	**35**	**141**		**310**	**179**	**131**
SW Waterfront Development - Site 3											
Specialty Retailing	47,000	29	1363	NA	NA	NA	NA	0.0636833	87	37	49

Description	Units	Trip gen. rates / peds per 1000 SF	Est. Avg. Daily Volume	AM Peak Rate***	AM Peak Vol	AM In	AM Out	PM Peak Rate***	PM Peak Vol	PM In	PM Out
All Office Uses	17,000	4	68	0.1416894	10	8	1	0.1353315	9	2	8
Single Family Dwelling	0	16	0	0.0783699	0	0	0	0.1055381	0	0	0
Apartment Dwellings	168,000	7	1176	0.0769231	90	14	76	0.0935143	110	74	36
Hotel and Motels	0	12	0	0.0751121	0	0	0	0.0795964	0	0	0
Parking Garage**	9,682	1	10	0.0930236	1	0	1	0.1034951	1	0	1
Parking Lot**	4,149	2	8	0.0930236	1	0	1	0.1034951	1	0	0
Totals	**245,831**		**2,625**		**102**	**23**	**79**		**208**	**113**	**94**
10th St Visitor and Transportation Center											
Specialty Retailing	27,600	29	800	NA	NA	NA	NA	0.0636833	51	22	29
Single Family Dwelling	72,000	16	1152	0.0783699	90	23	68	0.1055381	122	78	44
Parking Garage	266,000	1	266	0.0606002	16	0	16	0.0824779	22	11	11
Cultural*	232,000	29	6728	0.0428305	288	144	144	0.0782123	526	263	263
Totals	**597,600**		**8,946**	**0**	**395**	**167**	**228**	**0**	**721**	**373**	**347**
Overall Totals	**1,629,484**		**21,437**		**972**	**369**	**603**		**1,723**	**911**	**812**

* Used specialty retail trip generation rates for cultural trips
** Assumed 30% of parking at SW Waterfront will be above ground
***Applied peak trip generation rate from ITE trip generation manual
Trip generation rates for parking garage and parking lot calculated by average of residential, commercial, & cultural rates.

VI. AIR QUALITY TECHNICAL REPORT

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L'ENFANT PROMENADE TRANSIT CENTER

District of Columbia

Air Quality Technical Report

Prepared by:
Parsons Brinckerhoff Quade and Douglas, Inc.

October 2005

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A. INTRODUCTION

This technical memorandum presents the results of the air quality impact assessment performed for the L'Enfant Promenade transit facility located in Washington, D.C.

This analysis provides support documentation and has been prepared in accordance with US Environmental Protection Agency (USEPA), Federal Highway Administration (FHWA), and the District Department of Transportation (DDOT). Carbon monoxide (CO) impacts are analyzed as the accepted indicator of vehicle-generated air pollution. The EPA CAL3QHC dispersion model is used to predict CO concentrations for air quality sensitive receptors for the project's design year of 2025. The detailed analyses predict air quality impacts at each receptor location from CO vehicular emissions for both the No-Build and the Build Alternates. Modeled one-hour and eight-hour average CO concentrations are added to background CO concentrations for comparison to the State and National Ambient Air Quality Standards. While the EPA has indicated that PM_{10} is a pollutant of concern for mobile-source projects, PM_{10} hot-spot analysis guidance has not been adopted by the EPA. It is possible that a hot-spot analysis for PM_{10} might be required in the future, though it is unlikely that the project study area would require this analysis as it is classified as an attainment area for PM_{10}. However, since the project involves diesel vehicles, which are large sources of PM_{10}, a quantitative screening analysis was conducted.

The objective of the analysis contained herein is to evaluate the effect(s) of the L'Enfant Promenade transit facility on air quality levels in the study area. The analysis conducted for this study, includes a screening analysis of 11 intersections and a detailed microscale CO and PM_{10} analysis at the intersection of Maine Avenue & 9^{th} Street.

B. RELEVANT POLLUTANTS

"Air Pollution" is a general term that refers to one or more chemical substances that degrade the quality of the atmosphere. Individual air pollutants degrade the atmosphere by reducing visibility, damaging property, reducing the productivity or vigor of crops or natural vegetation, or reducing human or animal health.

Eight air pollutants have been identified by the US Environmental Protection Agency (EPA) as being of concern nationwide: carbon monoxide, sulfur oxides, hydrocarbons, nitrogen oxides, ozone, particulate matter sized 10 microns or less, particulate matter with a size of 2.5 microns or less, and lead. The sources of these pollutants, their effects on human health and the nation's welfare, and their final deposition in the atmosphere vary considerably. A brief description of each pollutant is given below.

1. Carbon Monoxide

Carbon monoxide (CO) is a colorless and odorless gas that is generated in the urban environment primarily by the incomplete combustion of fossil fuels in motor vehicles. Relatively high concentrations of CO are typically found near crowded intersections and along heavily used roadways carrying slow-moving traffic. CO chemically combines with the hemoglobin in red

blood cells to decrease the oxygen carrying capacity of the blood. Prolonged exposure can cause headaches, drowsiness, or loss of equilibrium.

2. Sulfur Oxides

Sulfur oxides (SOx) constitute a class of compounds of which sulfur dioxide (SO_2) and sulfur trioxide (SO_3) are of great importance. The health effects of SOx include respiratory illness, damage to the respiratory tract, and bronchioconstriction. Relatively little SOx is emitted from motor vehicles.

3. Hydrocarbons

Hydrocarbons (HC) include a wide variety of organic compounds emitted principally from the storage, handling, and use of fossil fuels. Though HC can cause eye irritation and breathing difficulty, their principal health effects are related to their role in the formation of ozone.

4. Nitrogen Oxides

Nitrogen oxides (NO_X) constitute a class of compounds that include nitrogen dioxide (NO2) and nitric oxide (NO); both of which are emitted by motor vehicles. Although NO_2 and NO can irritate the eyes and nose and impair the respiratory system, NO_X, like HC, is of concern primarily because of its role in the formation of ozone.

5. Ozone

Ozone (O_3), or photochemical oxidants, is a major cause of lung and eye irritation in an urban environment. It is formed through a series of reactions involving HC and NO_X that take place in the atmosphere in the presence of sunlight. Relatively high concentrations of O_3 are normally found only in the summer.

6. Particulate Matter

Particulate pollution is composed of solid particles or liquid droplets which are small enough to remain suspended in the air. In general, the particulate pollution may include dust, soot, and smoke which may be irritating but not usually poisonous. Particulate pollution may also include bits of solid or liquid substances that may be highly toxic. Of particular concern are those particles that are smaller than or equal to 10 microns and 2.5 microns in size, (PM_{10}) and ($PM_{2.5}$) respectively. The data collected through many nationwide studies indicates that most of the PM_{10} is the product of fugitive dust, wind erosion and agricultural and forestry sources, while a small portion is the product of fuel combustion processes. In the case of $PM_{2.5}$ the combustion of fossil fuels account for a significant portion of this pollutant. The main health effect of air-borne particulate matter is on the respiratory system.

7. Lead

Lead (Pb) is a stable element that persists and accumulates both in the environment and in animals. Its principal effects in humans are on the blood-forming, nervous, and renal systems.

Lead levels in the urban environment from mobile sources have significantly decreased due to the federally mandated switch to lead-free gasoline.

The pollutants that are most important for air quality impact analysis are those that can be traced principally to motor vehicles. In the study area ambient concentrations of CO and O_3 are predominantly influenced by motor vehicle activity. Emissions of HC, NO_X and $PM_{10/2.5}$ come from both mobile and stationary sources. Emissions of SO_X and Pb are associated mainly with various stationary sources.

C. AIR QUALITY REGULATIONS AND PLANNING

As required by the Clean Air Act, National Ambient Air Quality Standards ("NAAQS") have been established for seven major air pollutants. These pollutants are: CO, NO_2, O_3, $PM_{2.5}$, PM_{10}, SO_2, and Pb.

The National and State ambient air quality standards are summarized in Table 1 and described below. The "primary" standards have been established to protect the public health. The "secondary" standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the general welfare.

1. Clean Air Act Amendments of 1990

The Clean Air Act Amendments of 1990 (CAAA) and the Final Conformity Rule (40 CFR Parts 51 and 93) direct the EPA to implement environmental policies and regulations that will ensure acceptable levels of air quality.

The Clean Air Act and the Final Conformity Rule affect proposed transportation projects such as the L'Enfant Promenade transit facility project. According to Title I, Section 101, Paragraph F of the Amendments, "No federal agency may approve, accept or fund any transportation plan, program or project unless such plan, program, or project has been found to conform to any applicable State Implementation Plan (SIP) in effect under this act." The Final Conformity Rule defines conformity as follows:

Conformity to an implementations plan's purpose of eliminating or reducing the severity and number of violations of the NAAQS and achieving expeditious attainment of such standards; and

That such activities will not:

- cause or contribute to any new violation of any NAAQS in any area:
- increase the frequency or severity of any existing violation of any NAAQS in any area; or
- delay timely attainment of any NAAQS or any required interim emission reductions or other milestones in any area.

Table 1
National and State Ambient Air Quality Standards

Pollutant	Primary Standards	Averaging Times	Secondary Standards
Carbon Monoxide	9 ppm (10 mg/m^3)	8-hour[1]	None
	35 ppm (40 mg/m^3)	1-hour[1]	None
Lead	1.5 $\mu g/m^3$	Quarterly Average	Same as Primary
Nitrogen Dioxide	0.053 ppm (100 $\mu g/m^3$)	Annual (Arithmetic Mean)	Same as Primary
Particulate Matter (PM_{10})	50 $\mu g/m^3$	Annual[2] (Arith. Mean)	Same as Primary
	150 ug/m^3	24-hour[1]	
Particulate Matter ($PM_{2.5}$)	15.0 $\mu g/m^3$	Annual[3] (Arith. Mean)	Same as Primary
	65 ug/m^3	24-hour[4]	
Ozone	0.08 ppm	8-hour[5]	Same as Primary
	0.12 ppm	1-hour[6]	Same as Primary
Sulfur Oxides	0.03 ppm	Annual (Arith. Mean)	-------
	0.14 ppm	24-hour[1]	-------
	-------	3-hour[1]	0.5 ppm (1300 ug/m^3)

Abbreviations: *ppm= parts per million, ug/m^3= micrograms per cubic meter*

[1] *Not to be exceeded more than once per year.*

[2] *To attain this standard, the expected annual arithmetic mean PM_{10} concentration at each monitor within an area must not exceed 50 ug/m^3.*

[3] *To attain this standard, the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 ug/m^3.*

[4] *To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 65 ug/m^3.*

[5] *To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.*

[6] *(a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is <= 1, as determined by appendix H.*

(b) The 1-hour NAAQS will no longer apply to an area one year after the effective date of the designation of that area for the 8-hour ozone NAAQS. The effective designation date for most areas is June 15, 2004. (40 CFR 50.9; see Federal Register of April 30, 2004 (69 FR 23996).)

2. Conformity with Regional Air Quality Planning

Section 107 of the 1977 CAAA requires that EPA publish a list of all geographic areas in compliance with the NAAQS, as well as those not in attainment of the NAAQS. Areas not in compliance with the NAAQS are termed nonattainment areas. Areas which have insufficient data to make a determination are unclassified, and are treated as being in attainment areas until proven otherwise. Areas which were designated as nonattainment when the CAAA were implemented but have since attained compliance with the standards are classified as "maintenance areas". The designation of an area is made on a pollutant-by-pollutant basis.

The District of Columbia is part of the Metropolitan Washington Council of Governments (MWCOG). The MWCOG is a regional organization of Washington area local governments. The MWCOG is composed of 17 local governments surrounding the nation's capital, plus area members of the Maryland and Virginia legislatures, the U.S. Senate and the U.S. House of Representatives. The District of Columbia was classified from 1992 – 1995 as a moderate nonattainment area for CO. It was reclassified as a maintenance area on March 3, 1996. The area is classified as severe nonattainment area for O_3 1-hour. On May 13, 2005, EPA approved the area's 1-hour O_3 air quality plan to meet the Clean Air Act requirements for a severe ozone nonattainment area. EPA plans to revoke the –hour standard on June 15, 2005. The Metropolitan Washington Air Quality Committee (MWAQC) is developing a new air quality plan to meet the 8-hour O_3 standard and has an attainment deadline of June 2010.

The area was classified as a nonattainment area for fine particles ($PM_{2.5}$) on April 5, 2005. As such the area must develop an implementation plan that will demonstrate attainment by April 2010.

D. AMBIENT AIR QUALITY IN THE STUDY AREA

1. Local Meteorology

The nature of the surrounding atmosphere is an important element in assessing the ambient air quality of an area. The project area is located approximately 50 miles east of the Blue Ridge Mountains and 35 miles west of the Chesapeake Bay, adjacent to the Potomac and Anacostia Rivers. Elevations range from a few feet above sea level to about 400 feet in parts of the northwest section of the city.

Summers in the DC area are warm and humid and winters are cold, but generally not severe. The summertime temperature is in the upper 80s and the winter is in the upper 20s. Thunderstorms can occur at any time but are most frequent during the late spring and summer. Annual precipitation has ranged from about 25 inches to more than 55 inches. Rainfalls of over 10 inches in a 24-hour period have been recorded during the passage of tropical storms. The seasonal snowfall is nearly 24 inches, but varies greatly from season to season. Snowfalls of 4 inches or more occur only twice each winter on average. Accumulations of over 20 inches from a single storm are extremely rare. Storm damage results mainly from heavy snows and freezing rains in winter and from hurricanes and severe thunderstorms during the other seasons. Precipitation helps cleanse the atmosphere of pollutants. Very small particles in the atmosphere act as condensation nuclei, triggering the formation of raindrops, while larger particles are

literally washed from the air during precipitation events. Precipitation also prevents the drying of the ground, alleviating the formation of fugitive dust; however, precipitation can combine with the oxides of sulfur and nitrogen to produce another form of pollution, namely acid rain.

Prevailing winds are from the south except during the winter months when they are from the northwest. The windiest period is late winter and early spring. Winds are generally less during the night and early morning hours and increase to a high in the afternoon. Winds may reach 50 to 60 miles per hour or even higher during severe summer thunderstorms, hurricanes, and winter storms. Wind speed direction, and its variability has a large influence on the dispersion of atmospheric pollutants.

2. Monitored Air Quality

The MWCOG collects and distributes air quality data from monitors located throughout the DC area. Monitored air quality data within or near the study area for CO, O_3 and PM_{10} for the years 2002-2004 is presented in Table 2. Appendix A contains detailed monitored air quality data.

Table 2
Monitored Ambient Air Quality Data
2002-2004

Contaminant Location/Year	Max 1-Hour	2nd Max 1-Hour	No. Days Standard Exceeded	Max 8-Hour	2nd Max 8-Hour	No. Days Standard Exceeded
Carbon Monoxide (CO)(ppm)						
34th and Dix Streets, NE - 2002	6.0	5.6	0	4.9	4.5	0
34th and Dix Streets, NE - 2003	8.6	7.6	0	4.5	4.0	0
34th and Dix Streets, NE - 2004	4.1	4.0	0	3.5	3.4	0
Air Quality Standard	**35.0**	**35.0**		**9.0**	**9.0**	

Particulate Matter 10 Microns or Less (PM_{10})(ug/m^3)	Maximum 24 Hour	2nd Maximum 24-Hour	No. Days Standard Exceeded
34th and Dix Streets, NE - 2002	87	60	0
34th and Dix Streets, NE - 2003	56	50	0
34th and Dix Streets, NE - 2004	60	55	0
Air Quality Standard	**150**	**150**	

	Highest Readings				
	First	Second	Third	Fourth	No. Days Standard Exceeded
Ozone (O_3)(ppm) – 1 hour					
S.E. End Mcmillian Res. - 2002	.151	.143	.126	.126	6
S.E. End Mcmillian Res. – 2003	.118	.110	.103	.094	0
S.E. End Mcmillian Res. - 2004	.113	.100	.098	.094	0
Air Quality Standard	**0.12**	**0.12**	**0.12**	**0.12**	

	Highest Readings				
	First	Second	Third	Fourth	No. Days Standard Exceeded
Ozone (O_3)(ppm) – 8 hour					
S.E. End Mcmillian Res. - 2002	.128	.114	.108	.102	12
S.E. End Mcmillian Res. – 2003	.107	.104	.083	.082	2
S.E. End Mcmillian Res. - 2004	.083	.080	.071	.070	0
Air Quality Standard	**0.08**	**0.08**	**0.08**	**0.08**	

Source: *6/7/05 - EPA Office of Air Quality Planning and Standards (AIRSData), MWCOG*

E. IMPACT ASSESSMENT

Pollutants that can be traced principally to motor vehicles are relevant to the evaluation of the project impacts; these pollutants include CO, HC, NO_x, O_3, and PM_{10}. Transportation sources account for a small percentage of regional emissions of SO_x and Pb; thus, a detailed analysis is not required. While the EPA has indicated that PM_{10} is a pollutant of concern for mobile-source projects, PM_{10} hot-spot analysis guidance has not been adopted by the EPA. It is possible that a hot-spot analysis for PM_{10} might be required in the future, though it is unlikely that the project study area would require this analysis as it is classified as an attainment area for PM_{10}. However, since the project involves diesel vehicles, which are large sources of PM_{10}, a quantitative screening analysis was conducted.

HC and NOx emissions from automotive sources are a concern primarily because they are precursors in the formation of ozone and particulate matter. Ozone is formed through a series of reactions which occur in the atmosphere in the presence of sunlight. Since the reactions are slow and occur as the pollutants are diffusing downwind, elevated ozone levels often are found many miles from sources of the precursor pollutants. Therefore, the effects of HC and NOx emissions generally are examined on a regional or "mesoscale" basis. PM_{10} also is examined on a regional basis. However, a localized or hot-spot analysis might be required in the near future (as previously discussed).

CO impacts are localized. Even under the worst meteorological conditions and most congested traffic conditions, high concentrations are limited within a relatively short distance (300 – 600 feet) of heavily traveled roadways. Vehicle emissions are the major sources of CO. Gasoline cars and trucks are sources of 96% of the CO. Consequently, it is appropriate to predict concentrations of CO on a localized or "microscale" basis.

1. Mesoscale Analysis

The regional or mesoscale analysis of a project determines a project's overall impact on regional air quality levels. A transportation project is analyzed as part of a regional transportation network developed by the County or State. Projects included in this network are found in the Constrained Long Range Transportation Plan (CLRP) and the Transportation Improvement Plan (TIP). The TIP includes a regional analysis which utilizes Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT) within the region to determine daily “pollutant burden” levels. The results are used to determine if an area is in conformity with regulations set forth in the Final Conformity Rule.

This project appears in the Fiscal Year 2005-2010 TIP (FY2005-2010 TIP) as project number 120. The TIP was approved by the National Capital Region Transportation Planning Board on November 17, 2004.

2. Microscale Analysis

Microscale air quality modeling was performed using the most recent version of the EPA mobile source emission factor model (MOBILE6.2) and the CAL3QHC version 2 air quality dispersion model. Future No-Build and Build CO and PM_{10} levels at selected locations in the project area were estimated.

Vehicular Emissions

Vehicular Emissions were estimated using the EPA MOBILE6.2 vehicular emission factor model. (User's Guide to MOBILE6.2, Mobile Source Emission Factor Model, Ann Arbor, Michigan, EPA420-R-02-028, October 2002). PM_{10} fugitive dust emissions were estimated based on EPA's AP-42 recommendations for roadway type.

MOBILE6.2 is a mobile source emission estimate program that provides current and future estimates of emissions from highway motor vehicles. The latest in the MOBILE series, dating back to 1978, MOBILE6.2, was designed by the EPA to address a wide variety of air pollution modeling needs. This latest version of MOBILE differs significantly in both structure and data requirements from previous versions. MOBILE6.2 incorporates updated information on basic emission rates, more realistic driving patterns, separation of start and running emissions, improved correction factors, and changing fleet composition. It also includes impacts of new regulations promulgated since MOBILE5b.

Dispersion Model

Mobile source models are the basic analytical tools used to estimate pollutant concentrations expected under given traffic, roadway geometry, and meteorological conditions. The mathematical expressions and formulations that comprise the various models attempt to describe an extremely complex physical phenomenon as closely as possible. The dispersion modeling program used in this study for estimating pollutant concentrations near roadway intersections is the CAL3QHC (Version 2.0) dispersion model developed by the EPA and released in 1992.

CAL3QHC is a Gaussian model recommended in the *EPA Guidelines for Modeling Carbon Monoxide From Roadway Intersections* (EPA-454/R-92-005). Gaussian models assume that the dispersion of pollutants downwind of a pollution source follow a normal distribution around the center of the pollution source.

Different emission rates occur when vehicles are stopped (idling), accelerating, decelerating and moving at different average speeds. CAL3QHC simplifies these different emission rates into the following two components:

- Emissions when vehicles are stopped (idling) during the red phase of a signalized intersection.
- Emissions when vehicles are in motion during the green phase of a signalized intersection.

The CAL3QHC (Version 2.0) air quality dispersion model has undergone extensive testing by the EPA and has been found to provide reliable estimates of inert (non-reactive) pollutant concentrations resulting from motor vehicle emissions. A complete description of the model can be found in the *User's Guide to CAL3QHC version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations near Roadway Intersections* (EPA-454/R-92-006).

Site Selection / Receptor Locations

CO and PM_{10} levels were estimated at the intersection of Maine Avenue and 9th Street, which is the closest intersection to the proposed transit center, using the CAL3QHC (version 2) model. This analysis site was selected through a screening methodology based on intersection volumes, Levels of Service (LOS) and project-induced changes in traffic conditions. 11 intersections within the study area were analyzed. The intersection of Maine Avenue and 9th Street was chosen for detailed analysis due to it's proximity to the proposed transit facility and it's LOS D rating. Receptors were placed at the intersection in accordance with the guidelines found in EPA's *Guideline for Modeling Carbon Monoxide from Roadway Intersections* (EPA-454/R-92-005) and with respect to the unique geometry of each analysis site. Receptors were also placed near the entrance of the proposed transit center. Receptor locations are shown in Figure 1.

Meteorological Conditions

The transport and concentration of pollutants emitted from motor vehicles are influenced by three principal meteorological factors: wind direction, wind speed, and the temperature profile of the atmosphere. The values for these parameters were chosen to maximize pollutant concentrations at each prediction site (i.e., to establish a conservative worst-case situation).

- **Wind Direction**. Maximum CO concentrations are normally found when the wind is assumed to blow parallel to a roadway adjacent to the receptor location. At complex intersections, however, it is difficult to predict which wind angle will result in maximum concentrations. At each receptor location, therefore, the approximate wind angle that would result in maximum pollutant concentrations was used in the analysis. All wind angles from 0° to 360° (in 5° increments) were considered.

- **Wind Speed**. CO concentrations are greatest at low wind speeds. A conservative wind speed of one meter per second (2.2 miles per hour) was used to predict CO concentrations during peak traffic periods.

- **Temperature and Profile of the Atmosphere**. An ambient temperature of 46.5°F, a "mixing" height (the height in the atmosphere to which pollutants will rise) of 1000 meters, and neutral atmospheric stability (stability class D) conditions were used in estimating microscale CO concentrations. The selection of these meteorological parameters was based on recommendations from the MWCOG. This data was found to be the most representative of the conditions existing along the project area.

The CO and PM_{10} levels estimated by the model are the maximum concentrations which could be expected to occur at each air quality receptor site analyzed, given the assumed simultaneous occurrence of a number of worst-case conditions (peak hour traffic conditions, conservative vehicular operating conditions, low wind speeds, low atmospheric temperature, neutral atmospheric conditions, and maximizing wind direction).


R1
- Receptor
- Free Flow Link
- Queue Link
File name: rEV Site 1 BD.dwg
Title: Site 1 Build Revised
Created by: AJL
PBQD Inc.
Date: 10/11/2005
Scale

Figure 1

Air Quality Analysis Site

Persistence Factor

Peak eight-hour concentrations of CO were obtained by multiplying the highest peak hour CO estimates by 0.7. This factor, recommended by MWCOG, the Maryland Department of the Environment (MDE) and approved by EPA, takes account of the fact that over eight hours (as distinct from a single hour) vehicle volumes will fluctuate downwards from the peak, vehicle speeds may vary, and meteorological conditions including wind speed and wind direction will vary as compared to the very conservative assumptions used for the single hour. Peak 24-hour concentrations of PM_{10} were obtained by multiplying the highest peak hour PM10 estimates by 0.4. Annual concentrations of PM_{10} were obtained by multiplying the highest peak hour PM_{10} estimates by 0.1

Analysis Year

The project's design year (2025) was analyzed to determine the project's air quality effects.

Background Concentrations

Microscale modeling is used to predict CO and PM_{10} concentrations resulting from emissions from motor vehicles using roadways immediately adjacent to the location at which predictions are being made. A "background" level must be added to these value to account for CO and PM_{10} entering the area from other sources upwind of the receptors.

A one-hour CO background level of 6.0 ppm and an eight hour background level of 4.5 ppm were added to each analysis site. A PM_{10} 24 hour background level of 60ug/m^3 and an annual background of 27 ug/m^3 were added to each analysis sites. These values are the second highest neighborhood scale monitored values.

Traffic Information

Traffic data for the air quality analysis were derived from traffic counts and other information developed as part of an overall traffic analysis for the project using methodology accepted by District Department of Transportation (DDOT). Output from the "Synchro5" signal timing traffic model was used to obtain signal timing parameters. The microscale analyses were performed based on data from this analysis for the AM and PM peak traffic periods. These are the periods when maximum traffic volumes occur on local streets and when the greatest traffic and air quality effects of the proposed project are expected.

The percentages of each type of vehicle, for the existing and future year conditions, were determined using data for the Metropolitan Washington area provided by the MWCOG. Vehicle speeds used in the analysis were obtained from traffic information developed for this project. The Transportation and Traffic Technical Report, prepared for the L'Enfant Promenade and Benjamin Banneker Park EA contains all traffic information used for the air quality analysis.

F. SUMMARY OF POTENTIAL IMPACTS

The maximum one-hour and eight-hour CO levels predicted at the intersection of Maine Avenue & 9th Street are shown in Table 3 and 4, respecitively. The maximum 24 hour and annual PM_{10} levels predicted at the intersection of Maine Avenue & 9th Street are shown in Table 5. The results shown are the maximum predicted concentrations at the analysis site.

The Build scenario is predicted to have the same pollutant levels as the No Build scenario. The Build with transit facility alternative demonstrates an increase (4 ug/m^3) in 24 hour PM_{10} predicted concentrations at the analysis site. This is due to increased traffic along Maine Avenue in the northwest direction. Annual PM_{10} predicted concentrations remain the same for the No Build and Build scenarios. All predicted concentrations are below the applicable Federal and State Standards.

Table 3
Maximum Predicted AM and PM Peak One-Hour CO Concentrations (ppm)

Site #	Description	No Build 2025		Build 2025		Build with Transit Facility 2025	
		AM	PM	AM	PM	AM	PM
1	Maine Avenue & 9th Street	6.8	6.8	6.8	6.8	6.8	6.8

Notes: *Predicted Levels include a background of 6.0 ppm. One-hour Federal and State CO standard = 35 ppm.*

Table 4
Maximum Predicted Peak Eight-Hour CO Concentrations (ppm)

Site #	Description	No Build 2025	Build 2025	Build with Transit Facility 2025
1	Maine Avenue & 9th Street	5.1	5.1	5.1

Note: *Predicted Levels include a background of 4.5 ppm. Eight-hour Federal and State CO standard = 9 ppm.*

Table 5
Maximum Predicted Peak PM_{10} Concentrations (ug/m^3) - Year - 2025

Site #	Description	No Build 24 hour	Build 24 hour	Build with Facility Center 24 hour	No Build Annual	Build Annual	Build with Transit Facility Annual
1	Maine Avenue & 9th Street	114	114	118	41	41	41

Note:
Predicted 24 hour levels include a background of 60ug/m^3, Federal and State PM_{10} 24 hour standard = 150 ug/m^3
Predicted annual levels include a background of 27 ug/m^3, Federal and State PM_{10} annual standard = 50 ug/m^3.

G. CONSTRUCTION IMPACTS ON AIR QUALITY

Construction related effects of the project would be limited to short-term increased fugitive dust and mobile source emissions during construction. During the construction period all appropriate measures and regulations would be incorporated to minimize the air quality impacts of the proposed project. Some general guidelines which help to reduce adverse air quality effects are described below.

1. Fugitive Dust Emissions

Fugitive dust is airborne particulate matter, generally of a relatively large particulate size. Construction-related fugitive dust would be generated by haul trucks, concrete trucks, delivery trucks, and other earth moving vehicles operating around the construction sites. This would be due primarily to particulate matter resuspended ("kicked up") by vehicle movement over paved and unpaved roads, dirt tracked onto paved surfaces from unpaved areas at access points, and material blown from uncovered haul trucks.

Generally, the distance that particles drift from their source depends on their size, emission height, and wind speed. Small particles (30 to 100 micron range) can travel several hundred feet before settling to the ground, depending on wind speed. Most fugitive dust, however, is made up of relatively large particles (i.e., particles greater than 100 microns in diameter). These particles are responsible for the reduced visibility often associated with this type of construction. Given their relatively large size, these particles tend to settle within 20 to 30 feet of their source.

In order to minimize the amount of construction dust generated, the guidelines below should be followed. The following preventative and mitigative measures should be taken to minimize the possible particulate pollution problem:

I. Site Preparation
   1. Minimize land disturbance;
   2. Use watering trucks to minimize dust;
   3. Cover trucks when hauling dirt;
   4. Stabilize the surface of dirt piles if not removed immediately;
   5. Use windbreaks to prevent any accidental dust pollution;
   6. Limit vehicular paths and stabilize these temporary roads; and
   7. Pave all unpaved construction roads and parking areas to road grade for a length no less than 50 feet where such roads and parking areas exit the construction site to prevent dirt from washing onto paved roadways.

II. Construction
   1. Cover trucks when transferring materials;
   2. Use dust suppressants on traveled paths which are not paved;
   3. Minimize unnecessary vehicular and machinery activities; and
   4. Minimize dirt track-out by washing or cleaning trucks before leaving the construction site (alternative to this strategy is to pave a few hundred feet of the exit road, just before entering the public road).

III. Post Construction

1. Revegetate any disturbed land not used;
2. Remove unused material;
3. Remove dirt piles; and
4. Revegetate all vehicular paths created during construction to avoid future off-road vehicular activities.

2. Mobile Source Emissions

Since emissions of CO from motor vehicles increase with decreasing vehicle speed, disruption of traffic during construction (such as the temporary reduction of roadway capacity and the increased queue lengths) could result in short-term elevated concentrations of CO. In order to minimize the amount of emissions generated, every effort should be made during the construction phase to limit disruption to traffic, especially during peak travel periods.

H. CONCLUSIONS

The project is not predicted to cause or exacerbate a violation of the applicable NAAQS. As part of an approved TIP, the project is an integral part of a regional plan to insure compliance with air quality regulations.

I. REFERENCES

1. USEPA, Office of Air Quality Planning and Standards, User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations near Roadway Intersections, EPA -454/R-92-006.
2. USEPA, Air Quality Analysis Branch, User's Guide to Mobile6.1 and Mobile6.2, EPA420-R-02-028, October 2002.
3. USEPA, AP-42, http://www.epa.gov/otaq/ap42.htm
4. District Department of Transportation
5. Metropolitan Washington County of Government (MWCOG).
6. Metropolitan Washington County of Governments, State Implementation Plan (SIP) Revision, Phase II Attainment Plan, February 3, 2000.
7. National Capital Region Transportation Planning Board, Metropolitan Washington Council of Governments, FY2005-2010 TIP, approved 11/17/04.
8. USEPA, Office of Air Quality Planning and Standards.

Appendix A

Monitored Air Quality Data

U.S. Environmental Protection Agency

AirData

Monitor Values Report - Criteria Air Pollutants

Geographic Area: District Of Columbia
Pollutant: Carbon Monoxide
Year: 2002, 2003, 2004

EPA Air Quality Standards:
Carbon Monoxide: 35 ppm (1-hour average), 9 ppm (8-hour average)

ppm = parts per million

6 Rows
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	CO (ppm)													
	1-Hour Values				8-Hour Values			Monitor Number	Measurement Scale	Year	Site ID	Site Address	City	Coun
Row #	# Obs	1st Max	2nd Max	# Exceed	1st Max	2nd Max	# Exceed							
SORT														
1	8,596	7.6	7.5	0	3.6	3.2	0	1	Microscale	2002	110010023	C&P Phone Co. L St. Bet 20th & 21st St N	Washington	Washing city
2	8,656	10.9	8.3	0	3.7	3.2	0	1	Microscale	2003	110010023	C&P Phone Co. L St. Bet 20th & 21st St N	Washington	Washing city
3	8,736	3.8	3.4	0	2.4	2.4	0	1	Microscale	2004	110010023	C&P Phone Co. L St. Bet 20th & 21st St N	Washington	Washing city
4	8,665	6.0	5.6	0	4.9	4.5	0	1	Neighborhood	2002	110010041	34th. And Dix Streets, N.E.		Washing city
5	8,489	8.6	7.6	0	4.5	4.0	0	1	Neighborhood	2003	110010041	34th. And Dix Streets, N.E.		Washing city
6	8,622	4.1	4.0	0	3.5	3.4	0	1	Neighborhood	2004	110010041	34th. And Dix Streets, N.E.		Washing city
Grand Total				0			0			2002				
				0			0			2003				
				0			0			2004				

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Monitor Values Report - Criteria Air Pollutants

Geographic Area: District Of Columbia
Pollutant: Nitrogen Dioxide
Year: 2002, 2003, 2004

EPA Air Quality Standards:
Nitrogen Dioxide: 0.053 ppm (annual mean)

ppm = parts per million

9 Rows
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	NO2 (ppm)												
	1-Hour Values			Annual		Monitor Number	Measurement Scale	Year	Site ID	Site Address	City	County
Row #	# Obs	1st Max	2nd Max	Mean	# Exceed							
SORT												
1	8,220	0.091	0.085	0.023	0	1	Urban Scale	2002	110010025	Takoma Sc. Piney Branch Rd & Dahlia St N	Washington	Washington city
2	8,661	0.090	0.087	0.025	0	1	Urban Scale	2003	110010025	Takoma Sc. Piney Branch Rd & Dahlia St N	Washington	Washington city
3	8,713	0.069	0.069	0.021	0	1	Urban Scale	2004	110010025	Takoma Sc. Piney Branch Rd & Dahlia St N	Washington	Washington city
4	8,657	0.103	0.092	0.024	0	1		2002	110010041	34th. And Dix Streets, N.E.		Washington city
5	8,523	0.102	0.098	0.023	0	1		2003	110010041	34th. And Dix Streets, N.E.		Washington city
6	8,535	0.115	0.106	0.021	0	1		2004	110010041	34th. And Dix Streets, N.E.		Washington city
7	8,658	0.090	0.082	0.023	0	1	Urban Scale	2002	110010043	S.E. End Mcmillian Reservoir, Wash. Dc.		Washington city
										S.E. End		

8	8,499	0.091	0.090	0.023	0	1	Urban Scale	2003	110010043	Mcmillian Reservoir, Wash. Dc.		Washington city
9	8,712	0.078	0.076	0.022	0	1	Urban Scale	2004	110010043	S.E. End Mcmillian Reservoir, Wash. Dc.		Washington city
Grand Total					0			2002				
					0			2003				
					0			2004				

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Monitor Values Report - Criteria Air Pollutants

Geographic Area: District Of Columbia
Pollutant: Ozone
Year: 2002, 2003, 2004

EPA Air Quality Standards:
Ozone: 0.12 ppm (1-hour average), 0.08 ppm (8-hour average)

ppm = parts per million

9 Rows
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	O3 (ppm)															
	1-Hour Values										8-Hour Values					
Row #	1st Max	2nd Max	3rd Max	4th Max	# Exceed-Actual	# Exceed-Estimated	Required Days	# Days	% Days	Missing Days	1st Max	2nd Max	3rd Max	4th Max	Days > Std	Required Days
SORT																
1	0.138	0.119	0.110	0.107	1	1.0	214	213	100	1	0.113	0.109	0.099	**0.097**	13	214
2	0.119	0.108	0.098	0.095	0	0.0	214	212	99	2	0.110	0.100	0.091	0.079	3	214
3	0.104	0.098	0.092	0.091	0	0.0	214	214	100	0	0.093	0.090	0.083	0.080	2	214
4	0.151	0.140	0.122	0.120	2	**2.0**	214	214	100	0	0.128	0.114	0.108	**0.102**	12	214
5	0.115	0.112	0.102	0.099	0	0.0	214	207	97	1	0.107	0.104	0.083	0.082	2	214
6	0.093	0.091	0.085	0.082	0	0.0	214	214	100	0	0.083	0.080	0.071	0.070	0	214
7	0.151	0.143	0.126	0.126	6	**6.0**	214	212	99	2	0.129	0.120	0.110	**0.106**	21	214

8	0.118	0.110	0.103	0.094	0	0.0	214	207	97	0	0.112	0.101	0.097	0.081	3	214
9	0.113	0.100	0.098	0.094	0	0.0	214	213	100	1	0.101	0.092	0.091	0.081	3	214
Grand Total						9.0									46	
						0.0									8	
						0.0									5	

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Monitor Values Report - Criteria Air Pollutants

Geographic Area: District Of Columbia
Pollutant: Lead
Year: 2002, 2003, 2004

EPA Air Quality Standards:
Lead: 1.5 µg/m3 (quarterly mean)

µg/m3 = micrograms per cubic meter

0 Rows
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No records matched the criteria you selected.

	Pb (µg/m3)														
	24-Hour Values			Quarterly Averages					Monitor Number	Measurement Scale					
Row #	# Obs	1st Max	2nd Max	Qtr 1	Qtr 2	Qtr 3	Qtr 4	# Exceed			Year	Site ID	Site Address	City	County

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AirData

Monitor Values Report - Criteria Air Pollutants

Geographic Area: District Of Columbia
Pollutant: Particulate (size < 10 micrometers)
Year: 2002, 2003, 2004

EPA Air Quality Standards:
Particulate (diameter < 10 micrometers): 150 µg/m3 (24-hour average), 50 µg/m3 (annual mean)

µg/m3 = micrograms per cubic meter

3 Rows
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	PM10 (µg/m3)														
	24-Hour Values							Annual							
Row #	# Obs	1st Max	2nd Max	3rd Max	4th Max	# Exceed-Actual	# Exceed-Estimated	Mean	# Exceed	Monitor Number	Measurement Scale	Year	Site ID	Site Address	Ci
SORT															
1	57	87	60	58	48	0	0.0	27	0	1	Neighborhood	2002	110010041	34th. And Dix Streets, N.E.	
2	54	56	50	41	39	0	0.0	24	0	1	Neighborhood	2003	110010041	34th. And Dix Streets, N.E.	
3	58	60	55	51	50	0	0.0	27	0	1	Neighborhood	2004	110010041	34th. And Dix Streets, N.E.	
Grand Total							0.0		0			2002			
							0.0		0			2003			
							0.0		0			2004			

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Monitor Values Report - Criteria Air Pollutants

Geographic Area: District Of Columbia
Pollutant: Particulate (size < 2.5 micrometers)
Year: 2002, 2003, 2004

EPA Air Quality Standards:
Particulate (diameter < 2.5 micrometers): 65 µg/m3 (24-hour average), 15.0 µg/m3 (annual mean)

µg/m3 = micrograms per cubic meter

14 Rows
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	PM2.5 (µg/m3)														
	24-Hour Values							Annual		Monitor Number	Measurement Scale				
Row #	# Obs	1st Max	2nd Max	3rd Max	4th Max	98th Pct	# Exceed	Mean	# Exceed			Year	Site ID	Site Address	City
SORT															
1	59	62	56	44	42	56	0	16.3	1	2		2002	110010041	34th. And Dix Streets, N.E.	
2	345	59	56	56	52	48	0	15.6	1	1	Urban Scale	2002	110010041	34th. And Dix Streets, N.E.	
3	51	64	39	34	28	39	0	14.9	0	2		2003	110010041	34th. And Dix Streets, N.E.	
4	313	63	62	47	42	39	0	14.8	0	1	Urban Scale	2003	110010041	34th. And Dix Streets, N.E.	
5	61	42	42	35	34	42	0	14.5	0	2		2004	110010041	34th. And Dix Streets, N.E.	
6	337	44	42	41	39	38	0	14.9	0	1	Urban Scale	2004	110010041	34th. And Dix Streets, N.E.	
7	113	53	41	36	36	36	0	15.6	1	1	Urban Scale	2002	110010042	Park Services Office 1100 Ohio Drive	Washin
8	114	61	54	39	33	39	0	13.4	0	1	Urban Scale	2003	110010042	Park Services Office 1100 Ohio	Washin

														Drive	
9	118	43	42	36	36	36	0	14.5	0	1	Urban Scale	2004	110010042	Park Services Office 1100 Ohio Drive	Washin
10	62	53	41	40	36	41	0	**15.6**	1	2	Urban Scale	2002	110010043	S.E. End Mcmillian Reservoir, Wash. Dc.	
11	352	56	52	51	47	40	0	**15.3**	1	1	Neighborhood	2002	110010043	S.E. End Mcmillian Reservoir, Wash. Dc.	
12	23	32	25	21	15	32	0	12.7	0	2	Urban Scale	2003	110010043	S.E. End Mcmillian Reservoir, Wash. Dc.	
13	322	59	45	40	38	35	0	14.3	0	1	Neighborhood	2003	110010043	S.E. End Mcmillian Reservoir, Wash. Dc.	
14	355	42	42	39	37	35	0	14.4	0	1	Neighborhood	2004	110010043	S.E. End Mcmillian Reservoir, Wash. Dc.	
Grand Total							0		5			2002			
							0		0			2003			
							0		0			2004			

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