

Torres-Rojas, Genara

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Sent: Monday, October 26, 2015 4:10 PM
To: Olivencia, Mildred
Cc: Torres-Rojas, Genara; Van Duyne, Sheree; Ng, Danny
Subject: Freedom of Information Online Request Form

Information:

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Required copies of the records: No

List of specific record(s):

Please provide the inspection schedule, procedures and follow-up compliance requirements for the Holland Tunnel, Lincoln Tunnel and George Washington Bridge, along with a definition of codes. Please provide records of all inspections, follow-up inspections, and all subsequent follow-up documents of the Holland Tunnel, Lincoln Tunnel and George Washington Bridge from 2010 - present.

THE PORT AUTHORITY OF NY & NJ

May 11, 2016

FOI Administrator

Ms. Karin Attonito
News 12 NJ
450 Raritan Center Parkway
Edison, NJ 08904

Re: Freedom of Information Reference No. 16428

Dear Ms. Attonito:

This is in response to your October 26, 2015 request, which has been processed under the Port Authority's Freedom of Information Code, copy enclosed, for copies of the following records: the inspection schedule, procedures and follow-up compliance requirements for the Holland Tunnel, Lincoln Tunnel and George Washington Bridge, along with a definition of codes. Please provide records of all inspections, follow-up inspections, and all subsequent follow-up documents of the Holland Tunnel, Lincoln Tunnel and George Washington Bridge from 2010 to the date of your request.

In an effort to provide available documents as quickly as possible, we are responding to a portion of your request at this time. We will continue the processing of your request as expeditiously as possible and to the extent that our review would permit us to provide you with additional responsive documents while the review is ongoing, we will endeavor to do so.

Material responsive to your request can be found on the Port Authority's website at <http://corpinfo.panynj.gov/documents/16428-O/>. Paper copies of the available records are available upon request.

Certain portions of the material responsive to your request are exempt from disclosure as, among other classifications, security.

Please refer to the above FOI reference number in any future correspondence relating to your request.

Very truly yours,



Danny Ng
FOI Administrator

Enclosure

4 World Trade Center, 18th Floor
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T: 212 435 3642 F: 212 435 7555

**Engineering
Quality Assurance Division
B02-925.078**

Port Authority Facility Condition Survey Program

**Holland Tunnel
Air Ducts and Drum Rings**

September 2011

Engineering Department ●

THE PORT AUTHORITY OF NY & NJ

October 17, 2011

Mr. C. John Lin, P.E.
Assistant Chief Engineer, Quality Assurance
The Port Authority of New York & New Jersey
3 Gateway Center, 3rd Floor
Newark, N.J. 07102

Attention: Mr. Camille Dagher, P.E.
Project Manager
Quality Assurance Division

Reference: P. A. Agreement No. 405-11-022
Professional Services for the Condition Survey of
Holland Tunnel Air Ducts and Drum Rings

Subject: **Final Report Submittal**

Gentlemen:

We are pleased to submit 12 copies of the Port Authority Condition Survey Program inspection report for the Holland Tunnel Air Ducts and Drum Rings in accordance with our Agreement No. 405-11-022.

The report covers the results of a field inspection of the above referenced tunnels. Independent quality control by our senior technical and management staff have ensured the thoroughness and accuracy of all work on this project. The report adheres to current practices and standards of the Port Authority of New York and New Jersey.

Very truly yours,

JENNY ENGINEERING CORPORATION



Stanley Niemiec, P.E.
Vice President, Chief Engineer

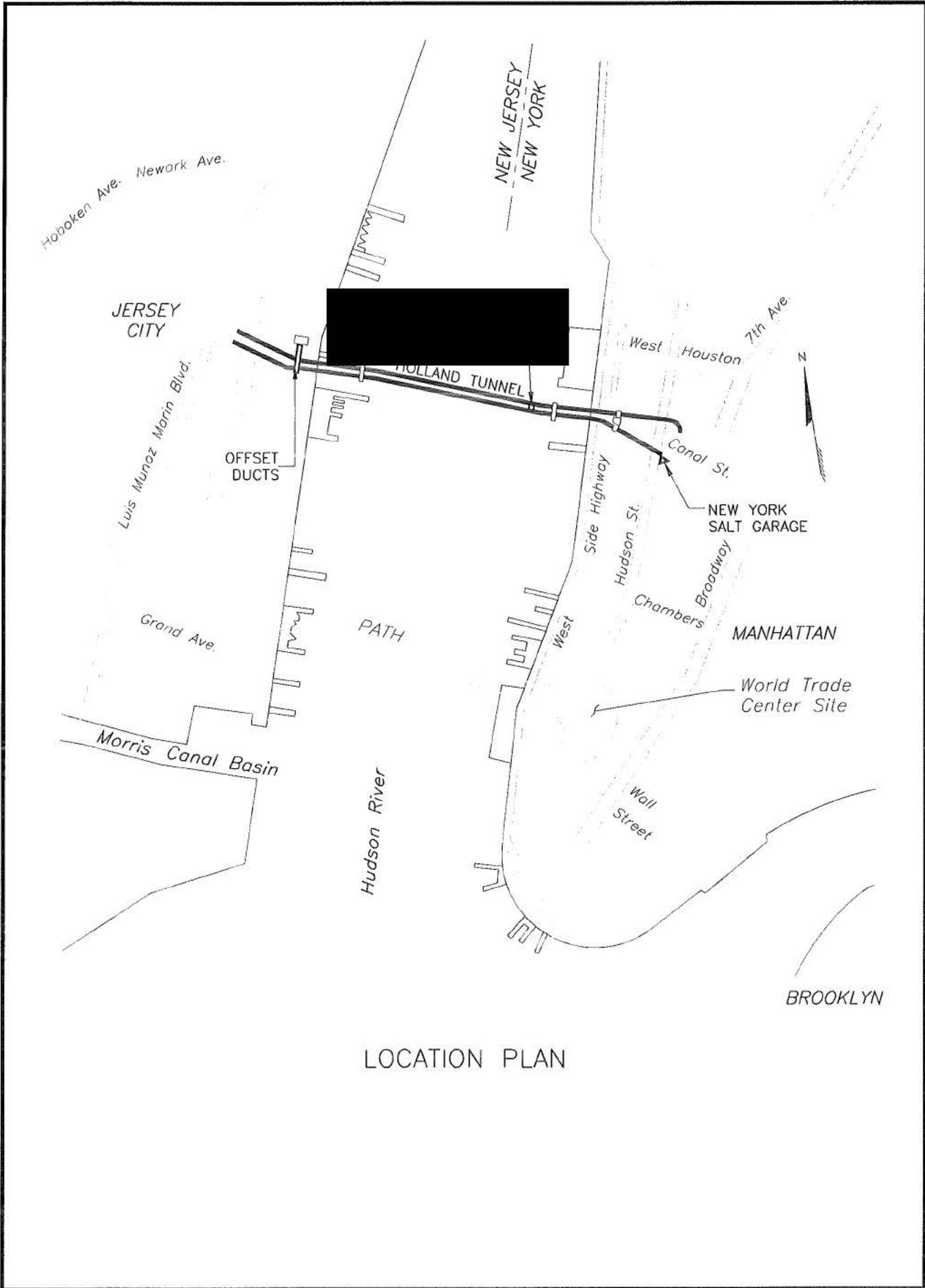
Enclosure

**TABLE 2
SUMMARY OF 2011 SAFETY ITEMS**

Safety Item #	Location	Station	Description	Recommendation	Figure #/ Photo #
S1	North Tunnel Blower Duct Steel Bent	91+13	Broken floor slab (approx. 2 sf.) at base of access ladder. (1 loc.)	Repair concrete slab.	A1/A5
S2	South Tunnel Exhaust Duct Steel Bent	90+25	Moderate corrosion to bottom of access ladder, ladder not secured at the base. (1 loc.)	Install bolts, clean and paint bottom of ladder.	B1/ B6
S3	South Tunnel Roadway Steel Bent	11+13	Large spall (approx. 3 sf.) on safety walk. (1 loc.)	Repair spall.	B1/B7
S4	South Tunnel Roadway Steel Bent	13+90	Water seeping from manhole down through an access hatch in the south wall of the roadway causing severe corrosion of manhole rungs. One rung excessively bent. (1 loc.)	Seal leaks and replace rungs.	B1/B8
S5	South Tunnel Roadway Drum Ring	15+95 25+17 34+02 61+35 67+89 81+45	Electrical junction boxes with missing covers and exposed wires. (6 locs.)	Install covers.	B1/B9

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LOCATION PLAN

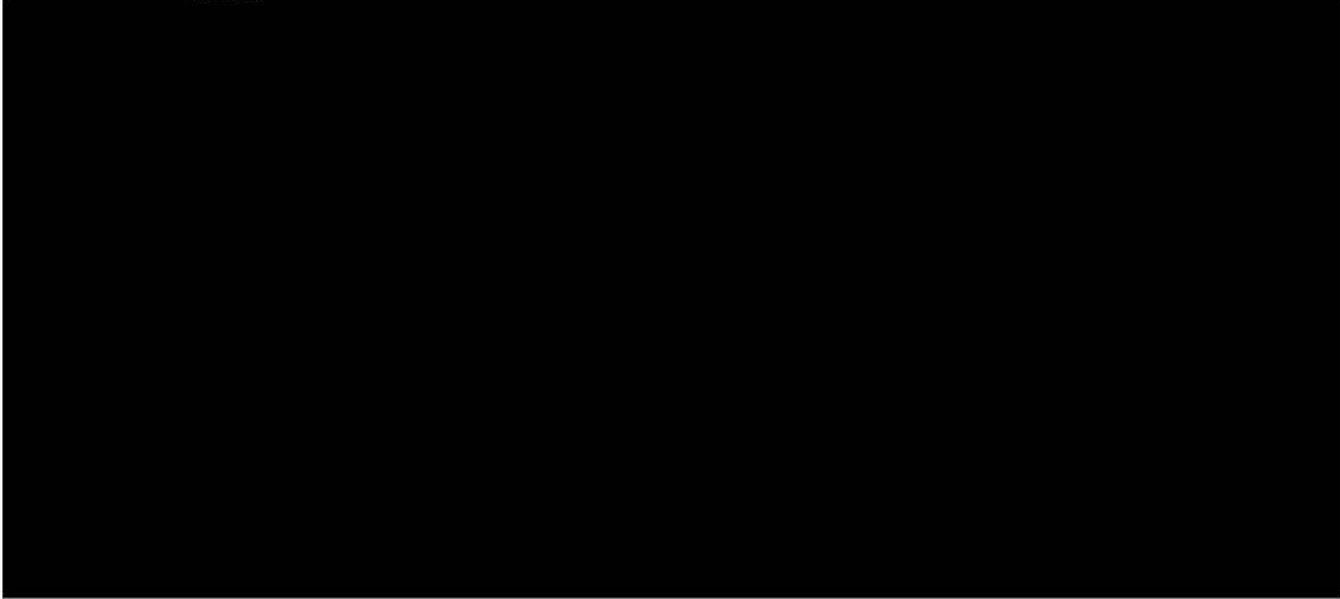
III. SCOPE OF WORK AND INSPECTION PROCEDURE

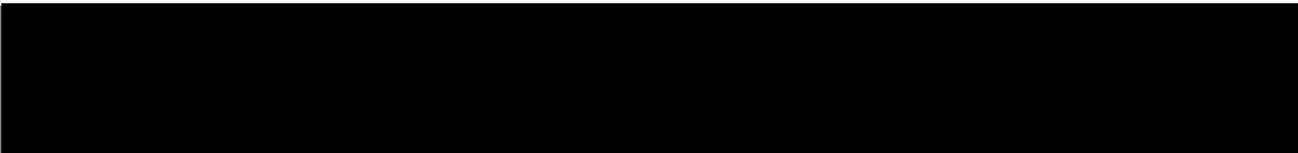
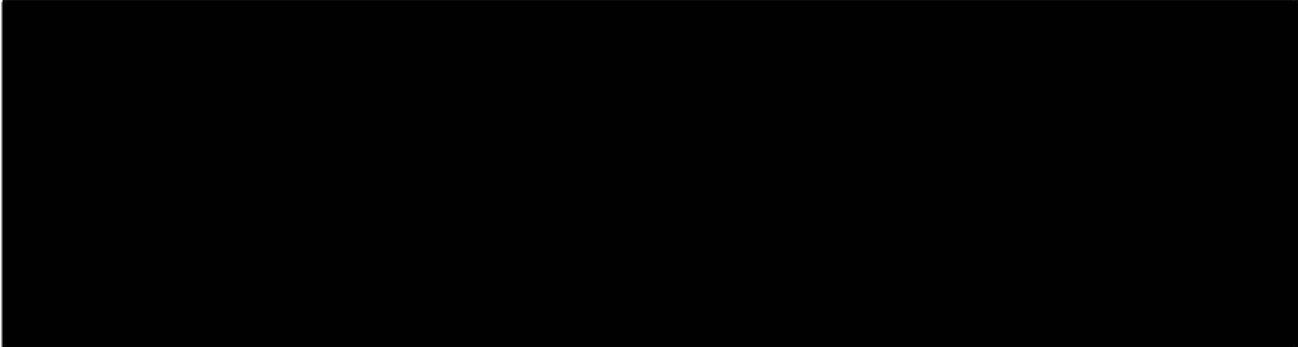
A condition survey was performed on the Holland Tunnel. The survey included the north and south tunnels, the offset ducts, and the Low Point Sump Pump Room. The purpose of the condition survey was to determine the overall condition of the structures and identify structural and non-structural deficiencies.



B. Inspection Procedure

This condition survey is a cyclical inspection of the tunnels and miscellaneous structures. Generally, a five-member crew was utilized for the inspection. Two, two-member teams, each lead by a licensed professional engineer, conducted inspections of the exhaust and blower ducts simultaneously. The fifth member served as safety support for both crews when required. The inspection generally consisted of the following procedures:

1. The roadway walk-through inspection was 100% visual and always performed with the flow of traffic. The inspection was coordinated with the facility personnel and utilized the scheduled lane closing for each tube. The three-member inspection crew worked between a lead vehicle equipped with a yellow warning light, and a trailing vehicle equipped with a flashing arrow board and impact attenuator. Tunnel stationing was based on the station markers located on the far wall (no safety walk) side of the tunnels. All crewmembers wore safety vests while working in the roadway areas.
- 



5. The tunnel blower and offset ducts were inspected during the day between the hours of 10:00 a.m and 4:00 p.m. The tunnel exhaust ducts and roadway were inspected at night between the hours of 11:00 p.m. and 5:00 a.m., subject to the requirements of the Facility Operations and the PA police.

The primary deficiencies expected in a sub-aqueous tunnel are related to the water tightness of the structure. Therefore, emphasis was placed on recording water leaks and leak related damages to the structures. Other signs of distress such as cracking and spalling of the concrete liner and corrosion of steel or cast iron elements were also identified. Passive leaks, deposits, minor efflorescence and other minor deficiencies of no structural significance and not requiring repairs, were generally not recorded.

Notes and Photographs

The terminology used for description of the deficiencies is based on the Port Authority of New York and New Jersey's condition survey definitions and terminology (page xiv) and the Repair Recommendation Guide for Tunnels (Figure 3). Deficiencies were recorded during the inspection on field forms with each sheet of the field forms representing 100 linear feet of tunnel.

Photographs were taken during the inspection of significant or typical deficiencies. The location and orientation of the photos were noted on the field forms.

C. Condition Rating System and Definitions

Definitions of Repair Recommendation Categories

- Hands-On - Close-up inspection from not further away than arm's length where the member or element can be physically touched.
- Inspection
- Visual - The inspection from a reasonable distance of a member or element where initial determination of the condition can be made.
- Inspection

Four categories of repair recommendations are identified and defined as follows:

- Immediate - Requires immediate action including possible closing of the structure or areas affected for safety reasons until interim remedial measures, such as shoring or removal of potentially unsafe structures (or elements) can be implemented. These closings or interim remedial actions, if any, always require immediate action upon discovery.
- Priority - Conditions for which no immediate action may be required, or for which immediate action has been completed, but for which further investigations, design, and implementation of interim or long-term repairs should be undertaken on a priority basis, i.e., taking precedence over all other scheduled work.
- Safety - Conditions that present a potential hazard and which should be repaired as soon as possible.
- Routine - Conditions requiring further investigation or remedial work that can be undertaken as part of a scheduled maintenance program or other scheduled project, or routine facility maintenance, depending on the action required.

Definitions of Condition Ratings

The following terms are used to rate the condition of structural systems or individual elements and are defined below. When a term is applied to an overall system, it does not mean that some other element of the system may not be in a different condition.

- Excellent - Element is in as-new condition
- Good - Element is sound and performing its functions, although it shows signs of use and may require some minor repairs, mostly routine.
- Fair - Element is still performing adequately at this time but needs priority and/or routine repairs to prevent further deterioration and to restore it to good condition.
- Poor - Element cannot be relied upon to continue to perform its original function without immediate and/or priority repairs.

IV. HISTORY OF TUNNEL, EVALUATION OF DEFICIENCIES AND INSPECTION FINDINGS PRESENTATION METHODS

A. History of the Holland Tunnel

The Hudson River Vehicular Tunnel was authorized in 1919 and construction started in 1920. The Chief Engineer for the project was Clifford M. Holland. The tunnel was renamed after Holland when he died suddenly in 1927 prior to its completion. The Holland Tunnel was opened to traffic on November 13, 1927 with a total construction cost of \$48 million. Control and operation of the tunnel was put under the Port Authority in 1931. The facility generally consists of two parallel, two-lane vehicular tunnel tubes and four ventilation buildings.

B. Evaluation of Deficiencies

Figure 3 shows the classifications of deficiencies in the tunnel in terms of repair recommendation categories (no repair required, routine, priority and immediate). Cracks within concrete linings and concrete elements are classified by category as to crack size, orientation and any signs of recent propagation or measurable deflection. Spalls are categorized by size, propagation into the lining or element, and the extent of concrete deterioration around the spall.

Deficiencies within the cast iron sections of the tunnel lining are classified by cracks, corrosion, and miscellaneous deficiencies. Cracks are categorized by width, length, location and any measurable lining deflection. Corrosion of the cast iron segments is categorized by the severity of the corrosion and amount of section loss. Miscellaneous deficiencies include missing, loose, or severely deteriorated bolts; missing grout plugs; or dry leaks and deposits. Steel elements of the tunnels and underground structures are also classified by the severity of corrosion and amount of section loss.

Water infiltration into the tunnel is classified separately by whether the water inflow is gushing, flowing, dripping, or seeping. Repair recommendations for any water leak combined with another deficiency as cited above are summarized in a separate classification table in Figure 3.

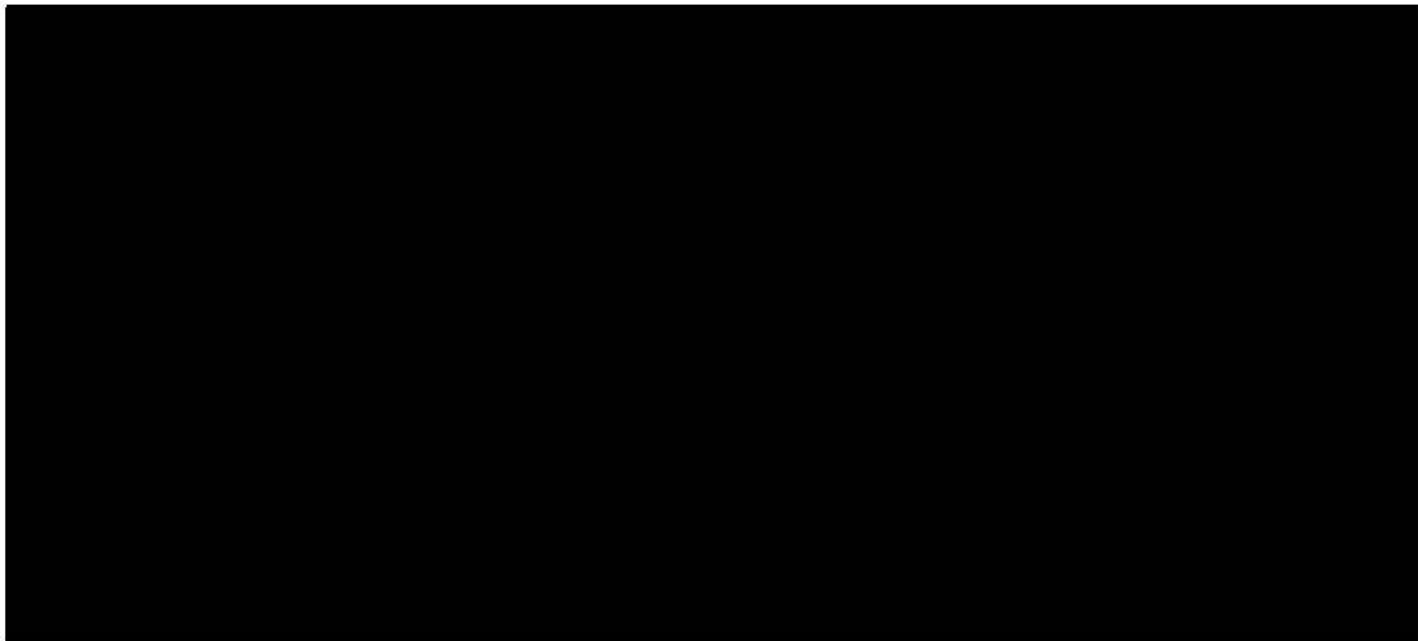
The criteria indicated in Figure 3 shall serve only as a guide for determining a repair recommendation. Engineering judgment shall be used to determine the effect of all deficiencies on the integrity of the structure.

C. Inspection Findings Presentation Methods

Priority, safety, and routine repair items are presented in tabular form and supplemented with figures furnishing the locations of the repair items (deficiencies). The tables provide a description of the deficiency, location, repair recommendation, and photo reference, if used. Photos are used to enhance the description of an item, or to record the status of a previously reported repair item.

V. STRUCTURE DESCRIPTION, INSPECTION FINDINGS AND RECOMMENDATIONS

A. NORTH TUNNEL



2. Inspection Findings and Repair Recommendations

The overall condition of the north tunnel is good with a fair rating applied to the steel bent sections of the blower duct, between Stations 91+00 to 94+64. This is due to the high concentration of deficiencies in this area.

Priority Repairs:

There were two priority repairs at two locations recommended in the previous inspection, none of which have been repaired and remain priority repairs. The first priority repair consists of a clogged invert drain with ponding water up to 2” deep from seeping pipe in the blower duct. The second priority repair consists of leakage through a ring joint of the exhaust duct resulting in seeping and dripping water through the ceiling slab and walls of the roadway. One new priority repair at nine locations was noted during the current inspection and consists of a wide crack in the concrete lining with a temporary water containment system installed. The locations and descriptions of the priority repairs are furnished in Table A1 and the locations are shown on Figure A1.

Safety Items:

One safety item at one location was noted during the current inspection. This safety item consists of a broken floor slab at the base of an access ladder, located in the steel bent section at the transition between upper and lower blower ducts. The safety item recommendation is listed in Table A2 and the location is shown on Figure A1.

Routine Repairs:

Routine repair recommendations are presented in Tables A3, A4 and A5 and their locations are shown on Figure A1.

Findings with No Recommendations:

There is 1 finding with no recommendations at 51 locations. The finding with no recommendations is presented in Table A6 and their locations are shown on Figure A1.

**TABLE A3
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R1	Drum Ring & Steel Bent	14+50 16+58 16+86 to 16+88 (2 locs.) 17+18 17+33 to 17+70 (3 locs.) 18+12 to 18+55 (5 locs.) 18+84 to 20 +26 (9 locs.) 20+90 to 21+30 (9 locs.) 21+70 to 21+98 (4 locs.) 23+20 to 23+78 (6 locs.) 24+15 24+46 24+60 25+30 25+84 29+08 30+44 to 30+52 (2 locs.) 31+09 33+90 34+23 35+72 36+20 to 36+67 (9 locs.) 36+84 37+30 37+76 to 37+87 (3 locs.) 38+22 38+64 39+02 to 40+08 (9 locs.) 40+36 41+12 43+34 to 43+98 (6 locs.) 45+48 to 45+72 (8 locs.)	Seeps. (94 locs.)	Clean and seal leaks.

TABLE A3 (Continued)
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R1 (Continued)	Drum Ring & Steel Bent	57+96 to 57+98 (2 locs.) 61+18 to 61+68 (3 locs.) 63+20 65+84 69+10 69+42 to 69+68 (2 locs.) 70+78 71+84 to 71+92 (4 locs.) 72+12 72+84 73+92 75+46 75+96 76+90 78+71 78+96 79+40 81+21 to 81+37 (3 locs.) 81+73 to 81+82 (3 locs.) 82+02 to 82+93 (13 locs.) 83+20 83+34 83+44 83+93 to 83+98 (2 locs.) 84+10 84+30 to 84+36 (2 locs.) 84+62 88+44 to 88+47 (2 locs.) 89+94 to 89+98 (4 locs.) 90+36 94+20	Seeps. (60 locs.)	Clean and seal leaks.

**TABLE A3 (Continued)
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R2	Drum Ring	17+16 22+07 24+00 26+38 27+68 32+00 34+23 37+00 40+33 45+90 51+00 51+50 55+00 57+22 62+91 68+40 69+00 74+63 81+30	Moderate to severe corrosion of manhole frames. (19 locs.)	Clean and paint manhole covers and frames.
R3	Drum Ring	28+68 37+80 38+69 38+96 to 39+04 (3 locs.) 48+02 to 48+07 (1 loc.) 84+32 84+49 to 84+53 (2 locs.)	Medium spalls with exposed ring joints. (10 locs.)	Clean and repair.
R4	Steel Bent	13+22 15+17 16+02 84+95	Medium spalls with exposed steel bent columns/beams. (4 locs.)	Clean and repair.

**TABLE A3 (Continued)
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R4 (Continued)	Steel Bent	85+64 87+64 88+86 to 88+96 (2 locs.) 89+60 90+27 90+33 91+53 to 91+75 (4 locs.) 92+01 to 92+07 (2 locs.) 92+49 92+53 92+97 93+07 to 93+28 (4 locs.) 93+85 94+59	Medium spalls with exposed steel bent columns/beams. (22 locs.)	Clean and repair.
R5	Steel Bent	10+22 to 13+10 (23 locs.) 13+25 to 15+08 (13 locs.) 15+59 to 16+37 (7 locs.) 84+90 to 85+00 (3 locs.) 89+14 to 89+94 (5 locs.) 91+15 to 94+80 (35 locs.)	Concentration of fine to wide cracks and adjacent hollow concrete. (86 locs.)	Seal cracks.
R6	Steel Bent	10+84 13+17 13+49 93+43 94+04 94+54 94+68	Vent ports filled with water and debris. (7 locs.)	Drain and clean inlet vents.

**TABLE A4
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
EXHAUST AIR DUCT**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R7	Drum Ring & Steel Bent	12+80 13+98 85+00 88+10 90+41 92+40 93+22	Seeps and drips. (7 locs.)	Clean and seal leaks.
R8	Drum Ring	37+60 61+90 64+38 82+22 84+15 84+45	Exposed ring joint with seeps and drips. (6 locs.)	Clean, seal leak and repair.
R9	Steel Bent	16+22 16+33 85+12 86+04 88+05 88+40 88+80 88+88 89+60 to 89+74 (3 locs.) 90+13 to 90+18 (2 locs.) 90+41 91+80	Medium spalls with exposed steel bent columns/beams. (15 locs.)	Clean and repair spalls.
R10	Steel Bent	10+24 to 10+29 (2 locs.) 10+90 12+08 13+20 91+75 to 91+90 (3 locs.) 94+01 94+30	Wide cracks and adjacent hollow concrete. (10 locs.)	Seal cracks.

**TABLE A4 (Continued)
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
EXHAUST AIR DUCT**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R10 (Continued)	Steel Bent	94+45	Wide cracks and adjacent hollow concrete. (1 loc.)	Seal cracks.
R11	Drum Ring & Steel Bent	10+60 11+60 24+35 37+27 37+30 37+70 64+76 to 64+80 (2 locs.) 69+52 to 69+56 (2 locs.) 83+00 to 83+03 (3 locs.) 83+34 90+44 90+78 to 90+94 (3 locs.) 92+30 to 92+50 (5 locs.) 92+88 93+28 94+28	Seeps and drips. (26 locs.)	Clean and seal leaks.

**TABLE A5
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
ROADWAY**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R12	Drum Ring & Steel Bent	30+00 to 30+10 (1 loc.) 31+05 33+76 34+47 to 34+65 (1 loc.) 38+01 39+96 40+02 to 40+12 (2 locs.) 40+95 41+95 to 42+05 (2 locs.) 42+50 to 42+65 (1 loc.) 42+82 43+38 to 43+78 (3 locs.) 44+49 to 44+64 (3 locs.) 45+03 to 45+12 (2 locs.) 45+85 71+30 72+78 to 73+00 (1 loc.) 76+65 to 76+70 (1 loc.) 79+08 80+77 to 80+87 (2 locs.) 81+20 to 81+29 (1 loc.) 82+78	Small to medium spalls and adjacent hollow concrete at vent ports. (30 locs.)	Repair spalls.
R13	Steel Bent	15+08 15+88 24+32 to 24+38 (1 loc.)	Wide crack in roadway walls with cracked and/or missing tiles. (3 locs.)	Seal crack and replace cracked and/or missing tiles.
R14	Steel Bent	11+62 12+80 94+10 95+10	Seeping from hatch or standpipe. (4 locs.)	Clean and seal leak.
R15	Drum Ring & Steel Bent	10+36 13+96 to 14+06 (1 loc.) 15+27	3 sf. 30 sf. 6 sf. Missing tiles. (3 locs.)	Replace missing tiles.

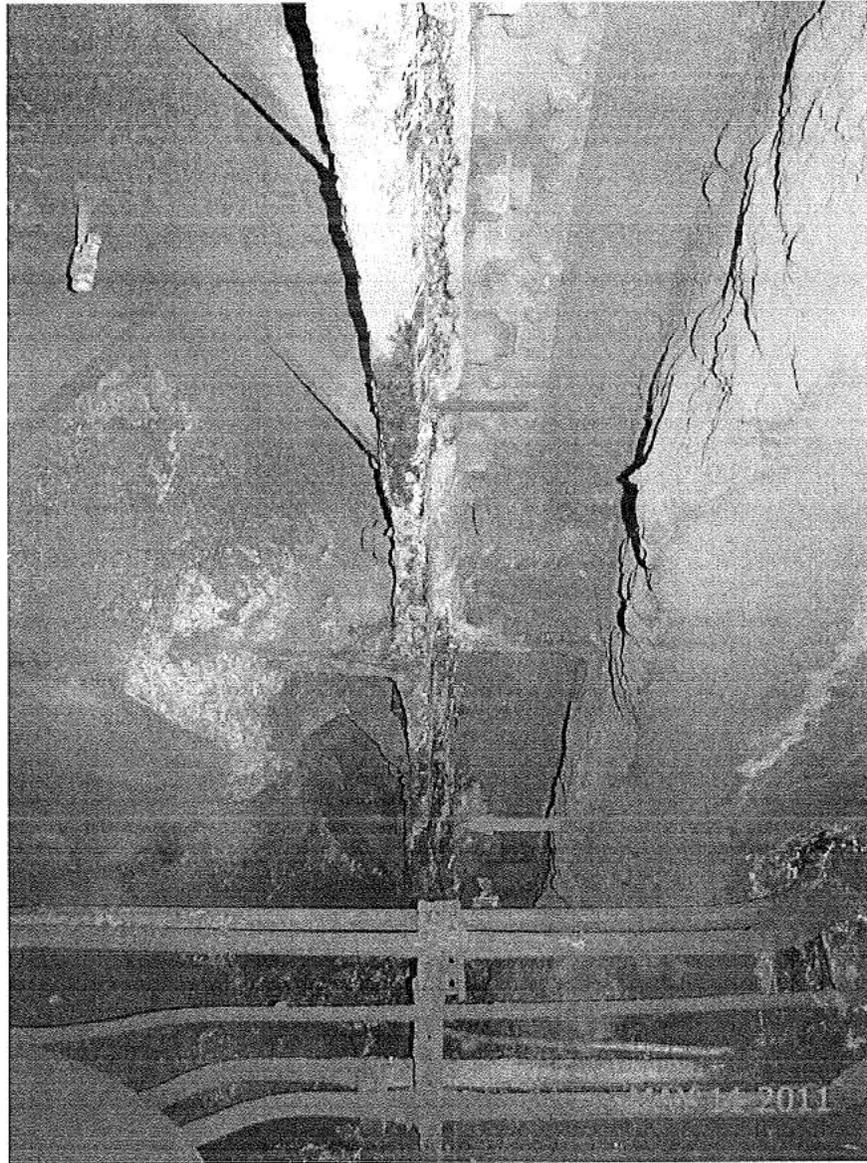
TABLE A5 (Continued)
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
ROADWAY

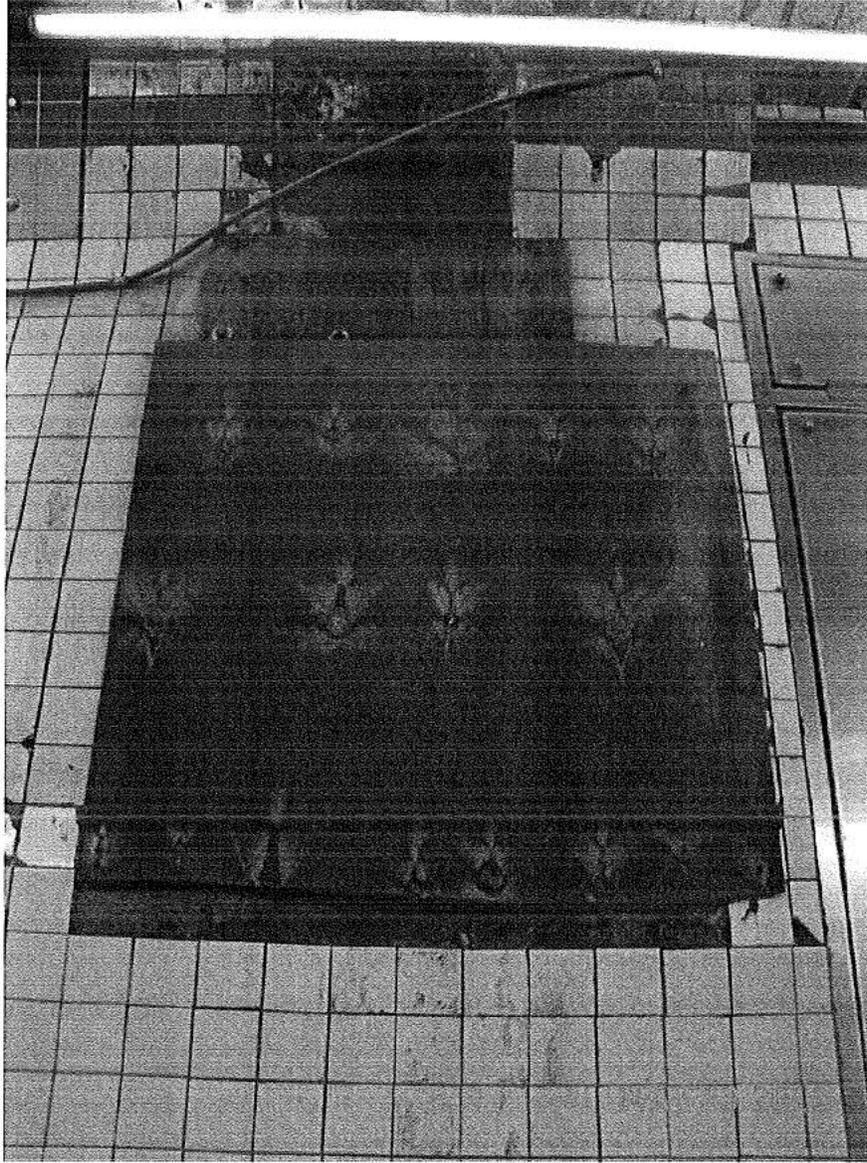
Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R15 (Continued)	Drum Ring & Steel Bent	15+65 to 15+68 (1 loc.)	25 sf.	Replace missing tiles.
		15+89	2 sf.	
		21+50 to 21+58	4 sf.	
		24+32	10 sf.	
		25+61	3 sf.	
		26+52	3 sf.	
		28+44 to 28+61 (2 locs.)	28 sf.	
		29+66 to 29+70 (1 loc.)	6 sf.	
		30+88 to 30+94 (1 loc.)	18 sf.	
		31+91 to 31+99 (1 loc.)	20 sf.	
		33+13	6 sf.	
		34+21 to 34+26 (1 loc.)	12 sf.	
		35+42	4 sf.	
		37+07 to 37+13 (1 loc.)	30 sf.	
		39+00 to 39+15 (1 loc.)	10 sf.	
		39+66 to 39+97 (2 loc.)	10 sf.	
		40+51 to 40+57 (1 loc.)	30 sf.	
		41+15 to 41+29 (1 loc.)	12 sf.	
		41+43 to 41+50 (1 loc.)	5 sf.	
		43+20 to 43+30 (1 loc.)	18 sf.	
		45+58 to 45+68 (1 loc.)	14 sf.	
		49+46 to 49+50 (1 loc.)	3 sf.	
		50+00 to 50+10 (1 loc.)	7 sf.	
		50+90	2 sf.	
		66+80	3 sf.	
		68+47 to 68+49 (1 loc.)	4 sf.	
		69+74 to 69+78 (1 loc.)	3 sf.	
		73+30	2 sf.	
75+65 to 75+92 (1 loc.)	12 sf.			
82+95	4 sf.			
86+44 to 86+56 (1 loc.)	20 sf.			
90+19 to 90+26 (1 loc.)	28 sf.			
91+54	3 sf.			

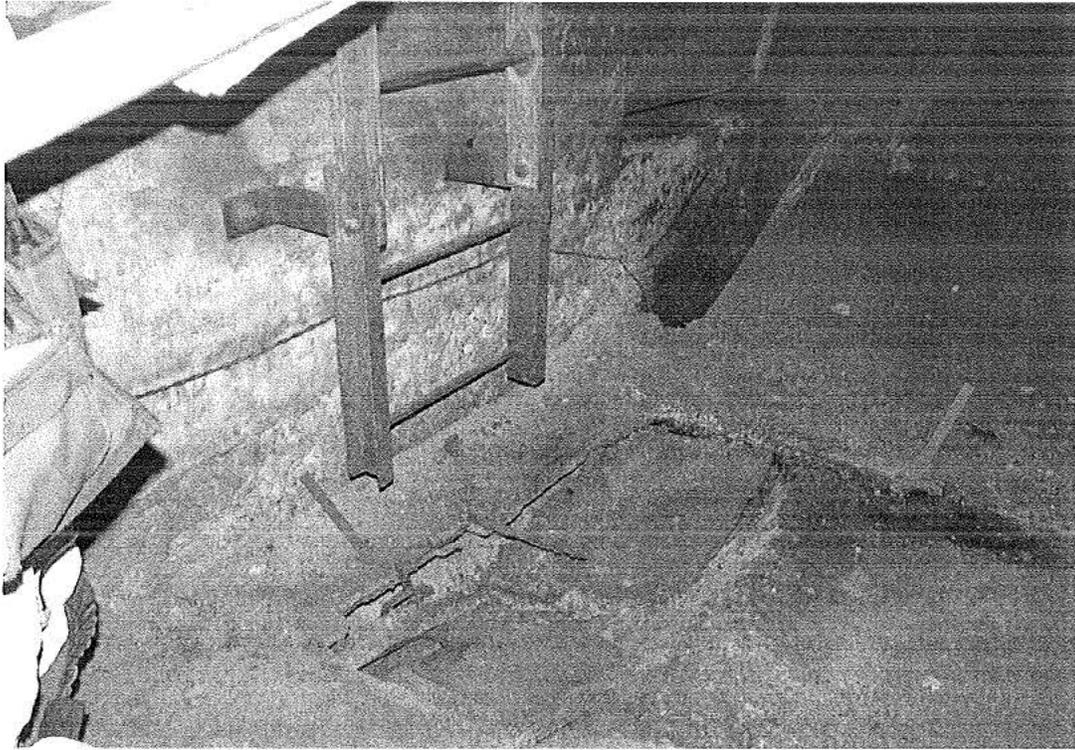
**TABLE A6
NORTH TUNNEL
FINDINGS WITH NO RECOMMENDATIONS OF THE 2011 CONDITION SURVEY
EXHAUST AIR DUCT**

Finding #	Tunnel Type	Station	Description	Figure #
1	Drum Ring & Steel Bent	24+70 to 24+85 (3 locs.) 25+10 to 25+23 (3 locs.) 25+45 to 25+55 (4 locs.) 26+30 to 26+42 (4 locs.) 28+32 to 28+60 (5 locs.) 28+80 32+00 to 32+35 (3 locs.) 37+03 to 37+10 (2 locs.) 37+65 to 37+90 (4 locs.) 38+62 to 38+72 (3 locs.) 44+27 61+72 to 61+85 (3 locs.) 62+46 to 62+71 (3 locs.) 64+40 to 64+51 (2 locs.) 71+02 to 71+20 (3 locs.) 74+25 74+65 80+60 to 80+85 (5 locs.)	Medium spalls in tunnel lining and adjacent hollow concrete. (51 locs.)	A1

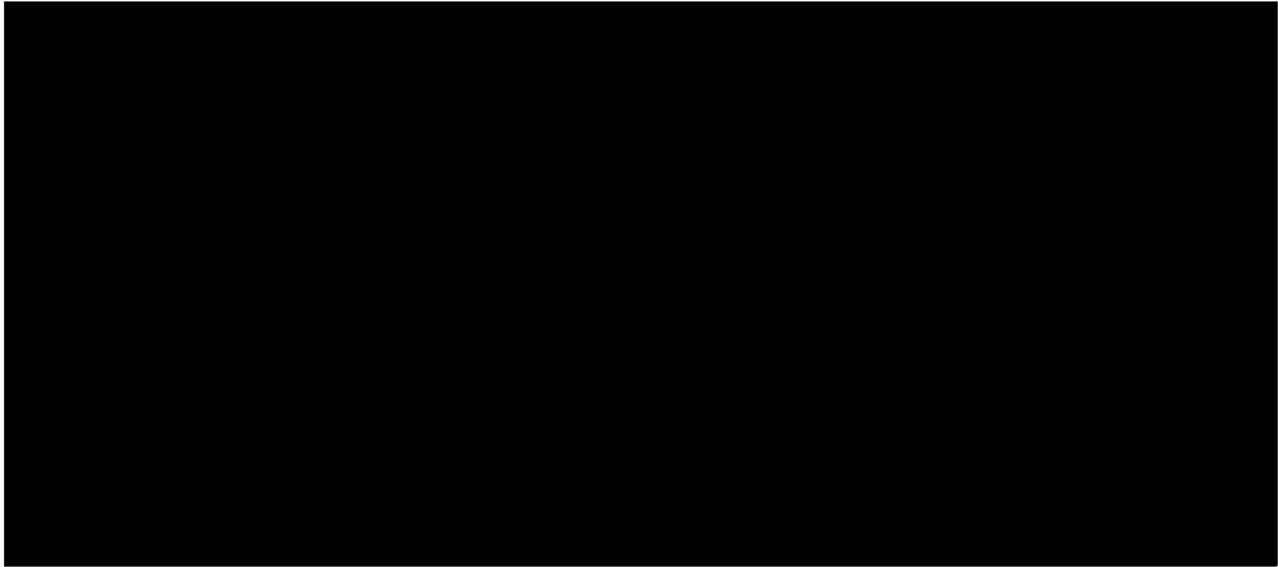








B. SOUTH TUNNEL



2. Inspection Findings and Repair Recommendations

The overall condition of the south tunnel is good with a fair rating applied to the steel bent sections of the blower and exhaust ducts, between Stations 90+41 to 93+87. This is due to the high concentration of deficiencies in this area.

Priority Repairs:

There were four priority repairs recommended at 24 locations during the previous inspection, five locations of which have been repaired and two new locations were noted during the current inspection, all remain priority repairs at 21 locations. The priority repairs consist of exposed ring joints filled with water in the blower duct, water seeping through exposed ring joints in the exhaust duct causing leakage through the ceiling and walls of the roadway, center post supporting roadway beams at mid-span has perforated flanges in the blower duct with exposed severely corroded bottom flange of roadway beam, and severe corrosion of exposed column flanges and displaced concrete encasement at the overhead and invert beams in the exhaust duct. No new priority repairs were recommended during the current inspection. The locations and descriptions of the priority repairs are furnished in Table B1 and the locations are shown on Figure B1.

Safety Items:

Four safety items at nine locations were noted during the current inspection. One of the safety items consists of missing anchor bolts and moderate corrosion at the base of an access ladder, located in the steel bent section at the transition between upper and lower exhaust ducts of the south tunnel. The remaining three safety items are located in the roadway and consist of a large spall on the floor of the safety walk, electrical junction boxes with exposed wires next to the safety walk, and severe corrosion of manhole rungs with one rung bent inside an access hatch. The safety repair recommendations are listed in Table B2 and the locations are shown on Figure B1.

Routine Repairs:

Routine repair recommendations are presented in Tables B3, B4 and B5 and their locations are shown on Figure B1.

Findings with No Recommendations:

There is 1 finding with no recommendations at 32 locations. The finding with no recommendations is presented in Table B6 and their locations are shown on Figure B1.

**TABLE B2
SOUTH TUNNEL
SAFETY ITEMS**

Safety Item #	Tunnel Type	Duct	Station	Description	Repair Recommendation	Figure #/ Photo #
S2	Steel Bent	Exhaust Duct	90+25	Moderate corrosion to bottom of access ladder, ladder not secured at the base. (1 loc.)	Install bolts, clean and paint bottom of ladder.	B1/B6
S3	Steel Bent	Roadway	11+13	Large spall (approx. 3 sf.) on the safety walk. (1 loc.)	Repair spall.	B1/B7
S4	Steel Bent	Roadway	13+90	Water seeping from manhole down through an access hatch in the south wall of the roadway causing severe corrosion of manhole rungs. One rung excessively bent. (1 loc.)	Seal leaks and replace rungs.	B1/B8
S5	Drum Ring	Roadway	15+95 25+17 34+02 61+35 67+89 81+45	Electrical junction boxes with missing covers and exposed wires. (6 locs.)	Install covers.	B1/B9

**TABLE B3
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R1	Drum Ring & Steel Bent	11+48 13+86 14+08 to 14+91 (12 locs.) 15+04 to 15+84 (17 locs.) 16+26 16+58 to 16+66 (4 locs.) 17+95 18+05 to 18+23 (3 locs.) 18+60 to 18+70 (2 locs.) 19+10 to 19+94 (22 locs.) 20+26 to 20+40 (3 locs.) 20+82 21+24 to 21+88 (5 locs.) 24+02 to 24+10 (2 locs.) 24+38 35+04 to 35+35 (4 locs.) 37+30 38+30 45+34 53+08 to 53+86 (5 locs.) 54+24 to 54+30 (2 locs.) 54+72 to 54+74 (2 locs.) 55+00 to 55+22 (2 locs.) 55+45 56+80 58+13 59+52 to 59+60 (2 locs.) 59+96 60+22 to 61+00 (6 locs.) 61+50 to 62+98 (30 locs.) 63+40 to 63+82 (7 locs.) 64+06 to 65+84 (34 locs.) 66+00 to 66+30 (10 locs.)	Seeps. (187 locs.)	Clean and seal leaks.

TABLE B3 (Continued)
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R1 (Continued)	Drum Ring & Steel Bent	66+58 to 66+76 (6 locs.) 66+80 to 67+12 (11 locs.) 67+16 to 68+00 (12 locs.) 68+04 to 68+90 (16 locs.) 69+08 to 69+16 (3 locs.) 69+27 79+20 80+04 to 80+99 (17 locs.) 81+12 to 81+64 (6 locs.) 82+04 82+84 83+28 91+34 91+78 93+50 to 93+60 (3 locs.)	Seeps. (81 locs.)	Clean and seal leaks.
R2	Drum Ring & Steel Bent	14+86 15+55 20+88 22+34 26+36 32+89 38+65 55+83 61+40 67+08 72+87 78+73 79+76 91+29	Moderate to severe corrosion of manhole frames. (14 locs.)	Clean and paint manhole covers and frames.
R3	Drum Ring & Steel Bent	14+47 to 14+63 (1 loc.) 55+00 62+50	Medium spalls with exposed ring joints. (3 locs.)	Clean and repair.

TABLE B3 (Continued)
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R3 (Continued)	Drum Ring & Steel Bent	63+90 to 63+96 (1 loc.) 66+40 to 66+84 (4 locs.) 67+56 79+42	Medium spalls with exposed ring joints. (7 locs.)	Clean and repair.
R4	Drum Ring & Steel Bent	14+90 15+20 15+35 17+00 22+08 28+35 31+04 49+13	Vent ports filled with debris. (8 locs.)	Clean inlet vents.
R5	Steel Bent	11+00 to 12+00 (6 locs.) 13+08 13+80 14+00 84+00 to 85+00 (10 locs.) 85+14 to 85+64 (8 locs.) 88+32 to 88+64 (3 locs.) 90+00 90+67 to 90+78 (2 locs.) 91+00 91+84 92+44	Medium spalls with exposed steel bent columns/beams. (36 locs.)	Clean and repair.
R6	Steel Bent	10+68 to 12+30 (17 locs.) 13+30 to 13+60 (4 locs.) 13+86 to 13+91 (3 locs.)	Concentration of fine to wide cracks and adjacent hollow concrete. (24 locs.)	Seal cracks.
R7	Steel Bent	10+76 13+10 15+36	Vent ports filled with water and debris. (3 locs.)	Drain and clean inlet vents.

**TABLE B4
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
EXHAUST AIR DUCT**

R8	Drum Ring & Steel Bent	23+25 35+81 64+25 to 64+27 (2 locs.) 69+72 70+70 72+08 90+51 to 91+66 (13 locs.) 92+11 to 92+13 (2 locs.) 92+31 92+41 92+66	Seeps. (25 locs.)	Clean and seal leaks.
R9	Drum Ring	14+16 14+38 17+16 18+10 18+15 to 18+18 (1 loc.) 18+25 19+02 19+32 19+68 19+78 19+92 20+25 20+47 20+60 20+72 21+28 22+80 to 22+92 (1 loc.) 36+30 to 36+41 (1 loc.) 62+75 64+25 71+77 72+08 72+40 78+14 78+20	Exposed ring joint with moderate to severe corrosion. (25 locs.)	Clean and repair.

TABLE B4 (Continued)
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
EXHAUST AIR DUCT

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R10	Steel Bent	85+29 90+35 91+46	Medium spalls with exposed steel bent columns/beams. (3 locs.)	Clean and repair.
R11	Steel Bent	11+08 to 11+80 (10 locs.) 13+54 to 14+00 (6 locs.) 83+70 to 83+77 (3 locs.) 84+44 to 84+62 (3 locs.) 85+60 to 85+92 (3 locs.) 86+30 to 87+10 (6 locs.)	Concentration of fine to wide cracks and adjacent hollow concrete. (31 locs.)	Seal cracks.

**TABLE B5
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
ROADWAY**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R12	Drum Ring & Steel Bent	10+20 14+03 to 14+14 (1 loc.) 14+20 14+40 to 14+60 (1 loc.) 23+30 35+83 36+00 36+25 83+28	Seeps and drips. (9 locs.)	Clean and seal leaks.
R13	Drum Ring & Steel Bent	10+12 16+90 to 17+00 (1 loc.) 17+96 23+26 28+03 to 28+08 (1 loc.) 38+25 to 39+00 (6 locs.) 39+71 to 39+86 (2 loc.) 43+31 to 43+56 (1 loc.) 43+90 to 44+00 (1 loc.) 48+17 to 48+21 (1 loc.) 55+47 to 57+37 (1 loc.) 57+95 to 58+13 (1 loc.) 62+20 to 62+50 (1 loc.) 62+90 to 63+14 (1 loc.) 64+60 to 64+94 (1 loc.) 67+23 to 67+30 (1 loc.) 69+40 to 69+47 (1 loc.) 70+40 to 70+45 (1 loc.) 72+35 to 72+52 (1 loc.) 73+83 to 73+88 (1 loc.) 74+04 to 74+30 (1 loc.) 77+36 79+08 to 79+59 (3 locs.)	Small to medium spalls and adjacent hollow concrete at vent ports. (31 locs.)	Repair spalls.

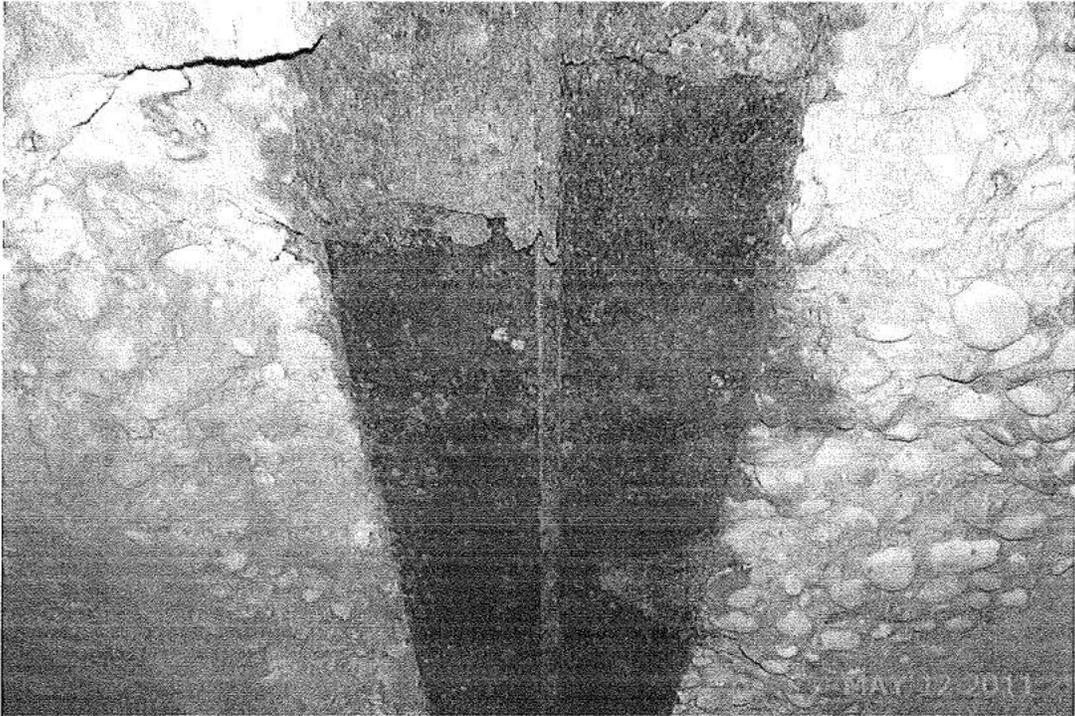
TABLE B5 (Continued)
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
ROADWAY

Routine Repair #	Tunnel Type	Station	Description		Repair Recommendation
R13 (continued)	Drum Ring & Steel Bent	81+72 to 81+92 (3 locs.) 89+99	Small to medium spalls and adjacent hollow concrete at vent ports. (4 locs.)		Repair spalls.
R14	Drum Ring	20+08 40+36 to 40+40 (1 loc.) 59+18	Hollow sounding tiles in side walls. (3 locs.)		Repair tiles.
R15	Drum Ring & Steel Bent	35+92 88+24 91+80 92+70	Seeping from hatch or standpipe. (4 locs.)		Clean and seal leaks.
R16	Drum Ring & Steel Bent	10+28 to 10+31 (1 loc.) 10+84 20+90 to 20+93 (1 loc.) 22+90 23+00 to 23+16 (1 loc.) 33+92 36+12 to 36+18 (1 loc.) 36+27 40+52 54+26 to 54+36 (1 loc.) 54+56 63+24 to 63+30 (1 loc.) 65+36 69+80 70+90 75+21 83+49 93+40 to 93+50 (2 locs.) 93+86 to 93+98 (1 loc.)	3 sf. 2 sf. 2 sf. 3 sf. 6 sf. 4 sf. 6 sf. 3 sf. 4sf. 80 sf. 4 sf. 20 sf. 3 sf. 2 sf. 2 sf. 2 sf. 3sf. 4 sf. 2 sf.	Missing tiles. (20 locs.)	Replace missing tiles.

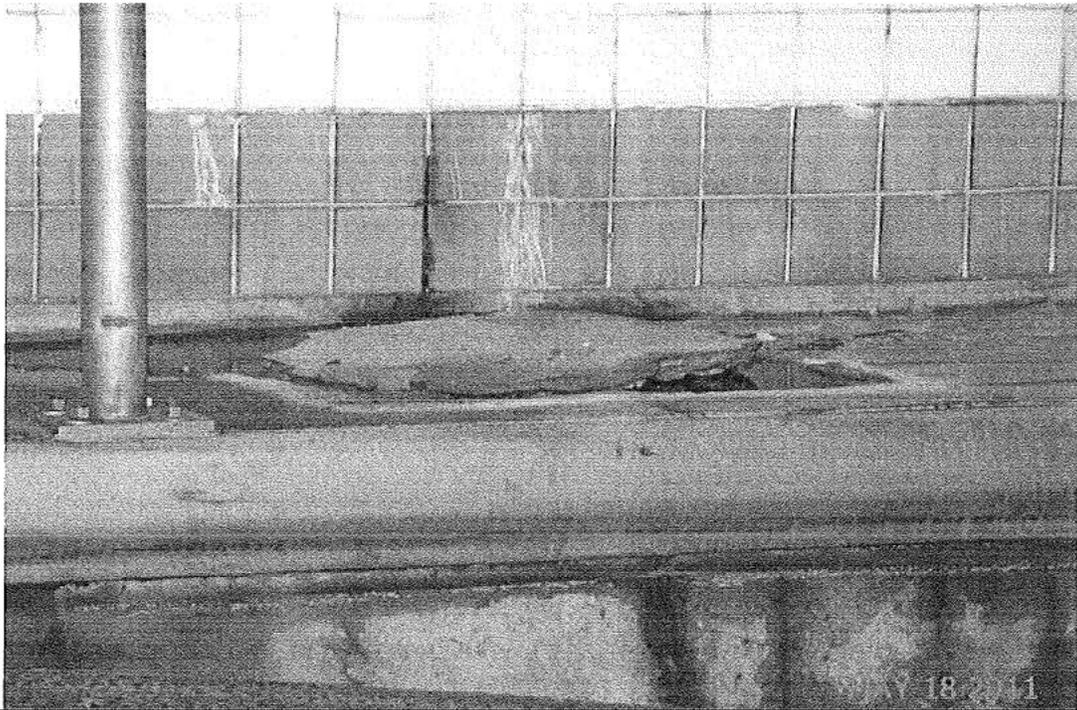
**TABLE B6
SOUTH TUNNEL
FINDINGS WITH NO RECOMMENDATIONS OF THE 2011 CONDITION SURVEY
EXHAUST AIR DUCT**

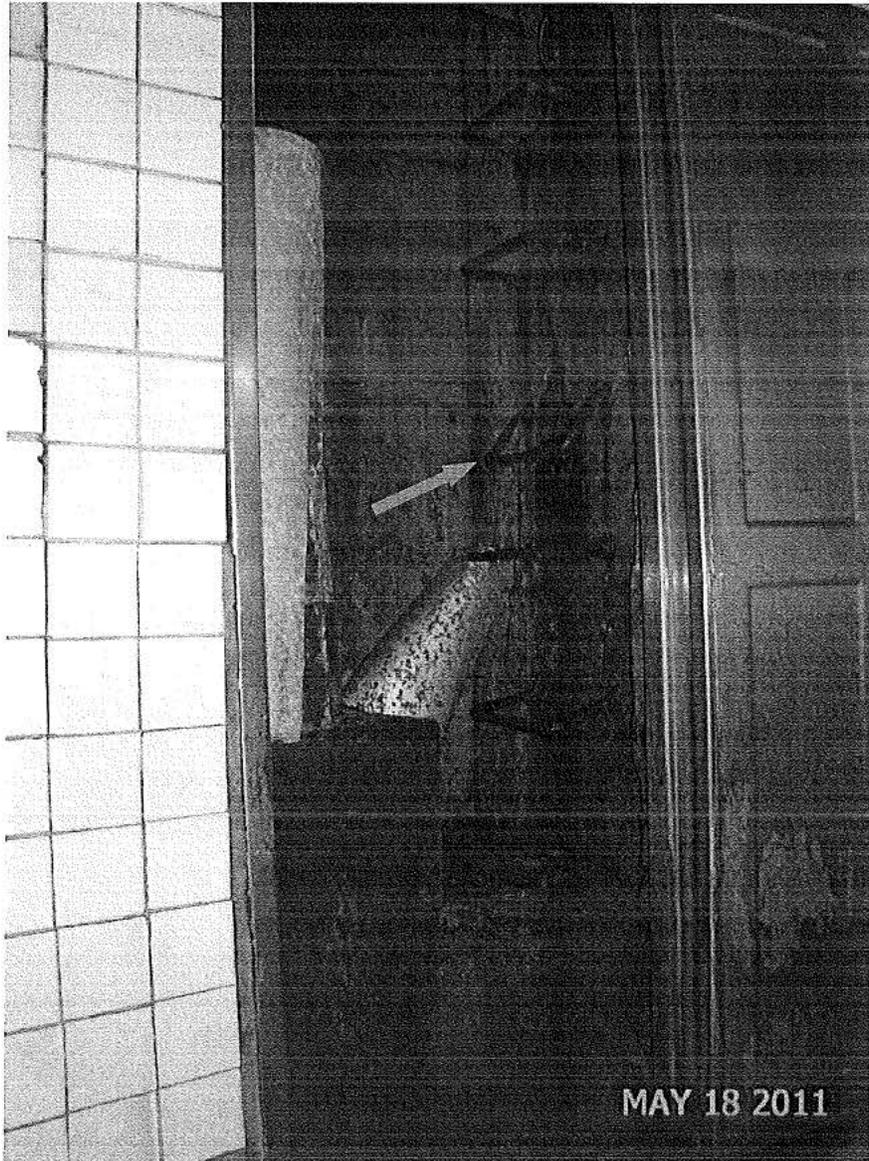
Finding #	Tunnel Type	Station	Description	Figure #
1	Drum Ring	20+98 22+80 23+35 to 23+53 (1 loc.) 23+76 25+20 to 26+00 (6 locs.) 28+20 28+70 to 28+90 (6 locs.) 35+52 to 35+74 (2 locs.) 36+44 to 37+75 (13 locs.)	Medium spalls in tunnel lining and adjacent hollow concrete. (32 locs.)	B1

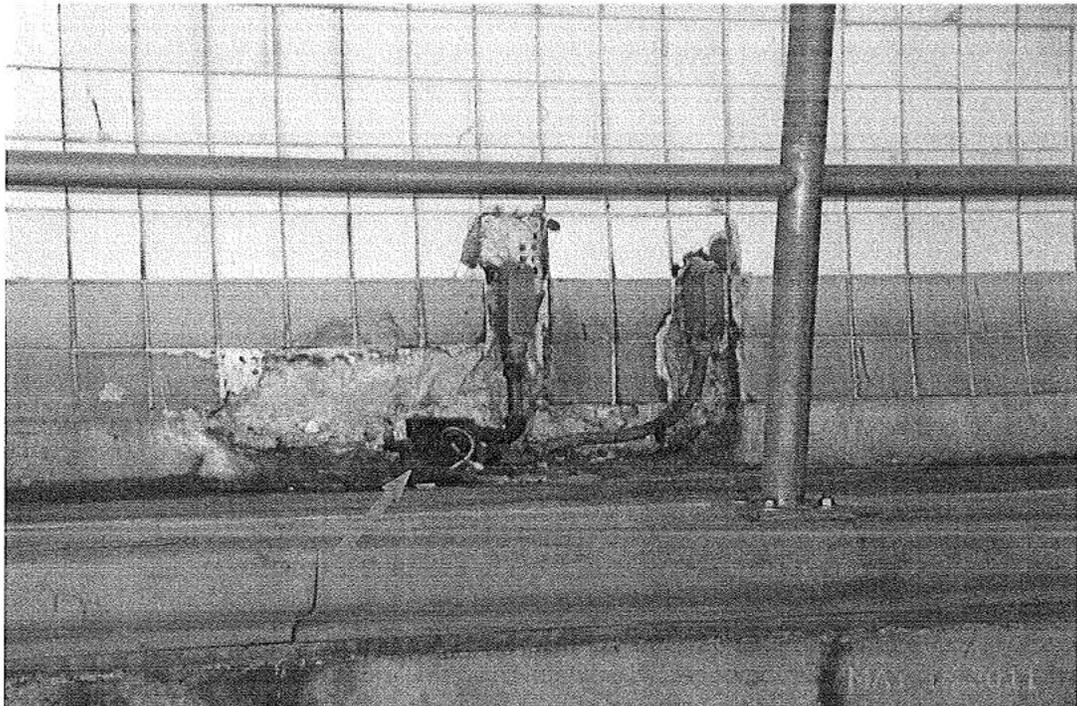












C. OFFSET DUCTS

2. Inspection Findings and Repair Recommendations

The overall condition of the offset ducts is good.

Priority Repairs:

There was one priority repair at one location recommended during the previous inspection which remains outstanding. The outstanding priority repair consists of a construction joint (between the outside skin plate of the caisson and the concrete roof of the offset duct) that has separated along the entire width of the duct with water dripping and seeping. No new priority repairs were noted during the current inspection. The location and description of the repair is furnished in Table C1 and the location is shown on Figure C1.

Safety Items:

No safety items were noted during the current inspection.

Routine Repairs:

Routine repair recommendations are presented in Table C2 and their locations are shown on Figure C1.

Findings with No Recommendations:

There is 1 finding with no recommendations at 4 locations. The finding with no recommendations is presented in Table C3 and their locations are shown on Figure C1.

**TABLE C2
OFFSET DUCTS
ROUTINE REPAIR RECOMMENDATIONS**

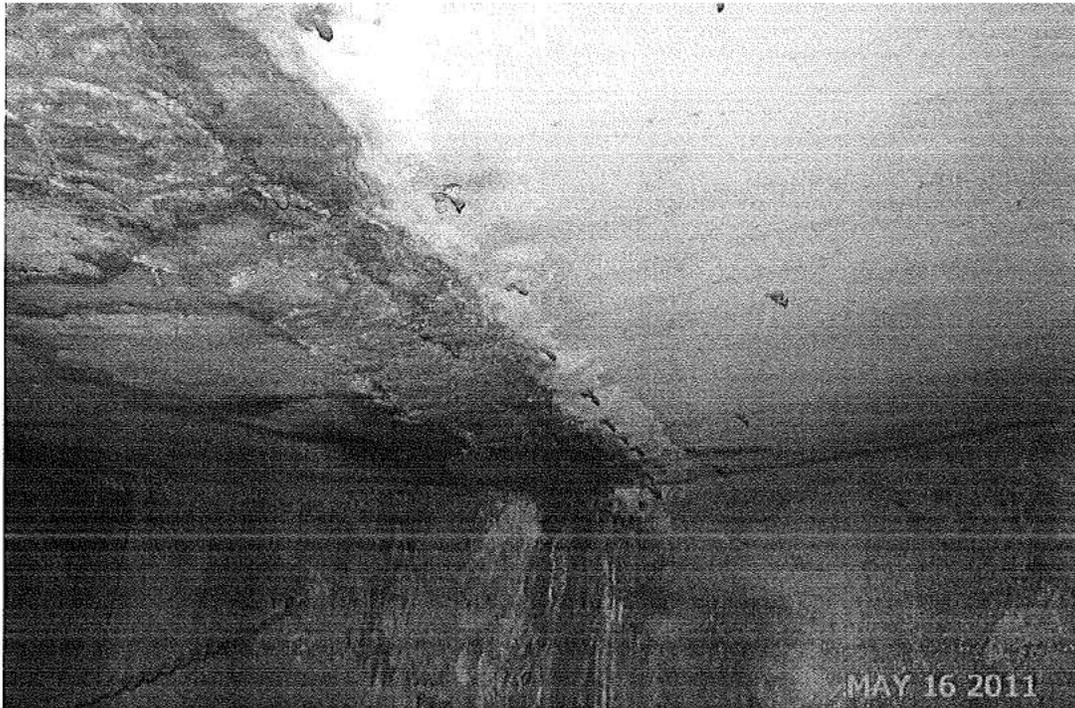
Routine Repair #	Tunnel Type	Area	Station	Description	Repair Recommendation	
R1	Steel Bent	NB1	0+58 0+70	Seeps. (24 locs.)	Clean and seal leaks.	
		NB2	0+30 0+64 0+79 0+97 1+22			
			SB1			0+32 0+97
			SB2			0+34
		NE2	0+01 1+32			
		SE1	1+23 2+25			
		SE2	0+00 0+30 0+48 0+58 0+63 to 0+65 (2 locs.) 0+88 1+57 1+63 1+65			
R2	Steel Bent	NB2	0+79	Wide cracks. (9 locs.)	Clean and seal cracks.	
		SB1	0+52 0+98			
			SB2			1+69 1+70
		NE1	0+00			
		NE2	0+95			
		SE2	1+60 to 1+72 (2 locs.)			

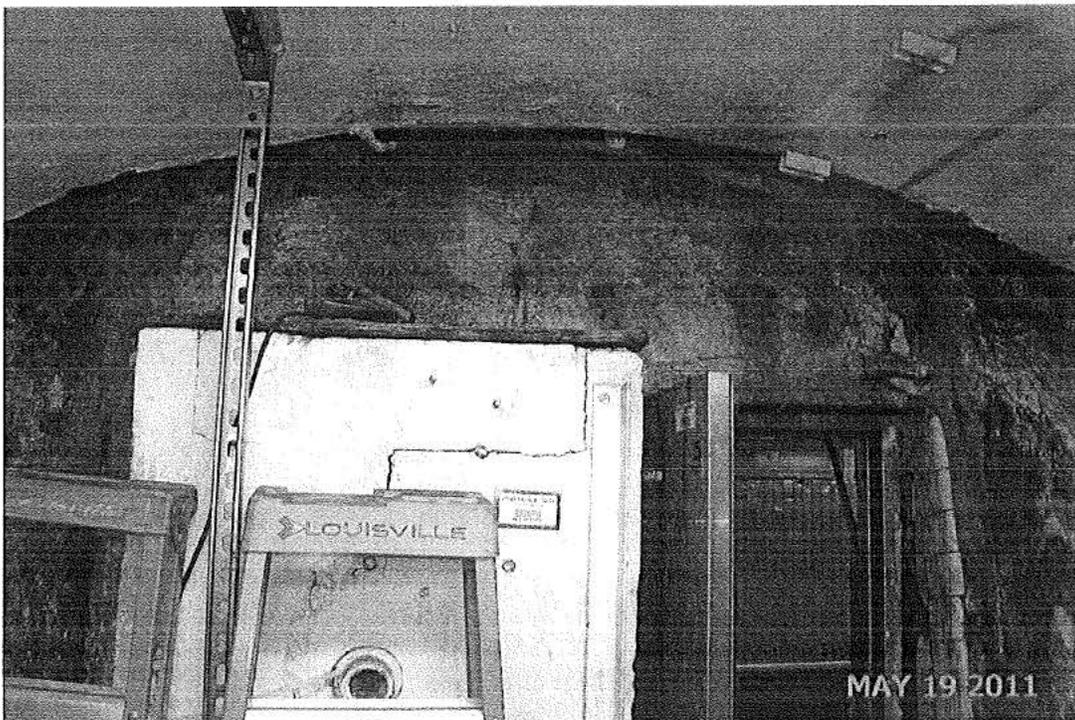
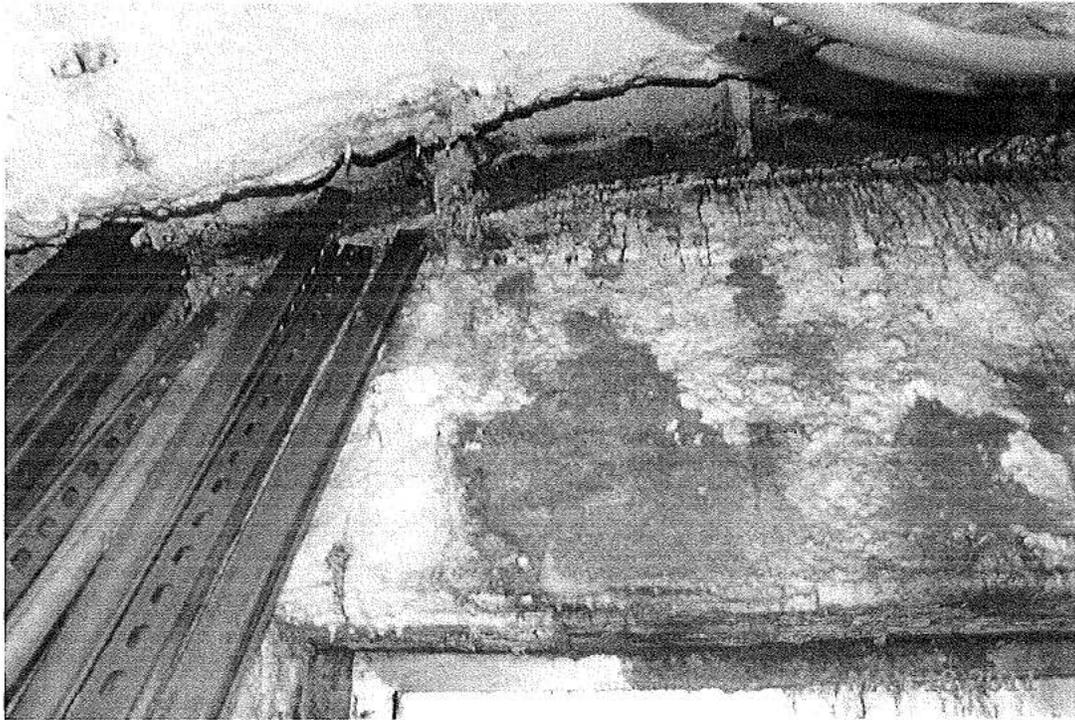
**TABLE C2
OFFSET DUCTS
ROUTINE REPAIR RECOMMENDATIONS**

Routine Repair #	Tunnel Type	Area	Station	Description	Repair Recommendation
R3	Steel Bent	NB1	0+00	Joint with spalled/hollow concrete and exposed moderately corroded column/beam. (4 locs.)	Clean and repair.
		SB1	0+32		
		NE1	0+00		
		SE2	0+00		
R4	Steel Bent	SB1	00+52 to 1+00 (1 loc.)	Concentration of fine to wide cracks and adjacent hollow concrete. (1 loc.)	Seal cracks.
R5	Steel Bent	NB1	0+58	Ponding water on invert. (6 locs.)	Clean and seal leak.
		NB2	0+10 to 0+83 (1 loc.)		
		NE2	0+50 to 0+80 (1 loc.)		
			1+15 to 1+24 (1 loc.)		
		SE1	1+09 to 1+36 (1 loc.)		
SE2	1+00 to 1+65 (1 loc.)				

**TABLE C3
OFFSET DUCTS
FINDINGS WITH NO RECOMMENDATIONS OF THE 2011 CONDITION SURVEY**

Finding #	Tunnel Type	Area	Station	Description	Figure #
1	Steel Bent	NB1	1+00 (2 locs.)	Medium spall and adjacent hollow concrete. (4 locs.)	C1
		NB2	1+00		
		SB1	2+00		





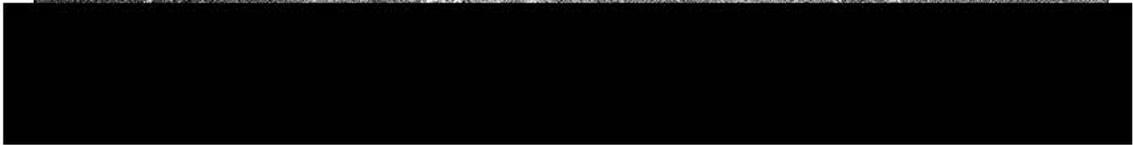
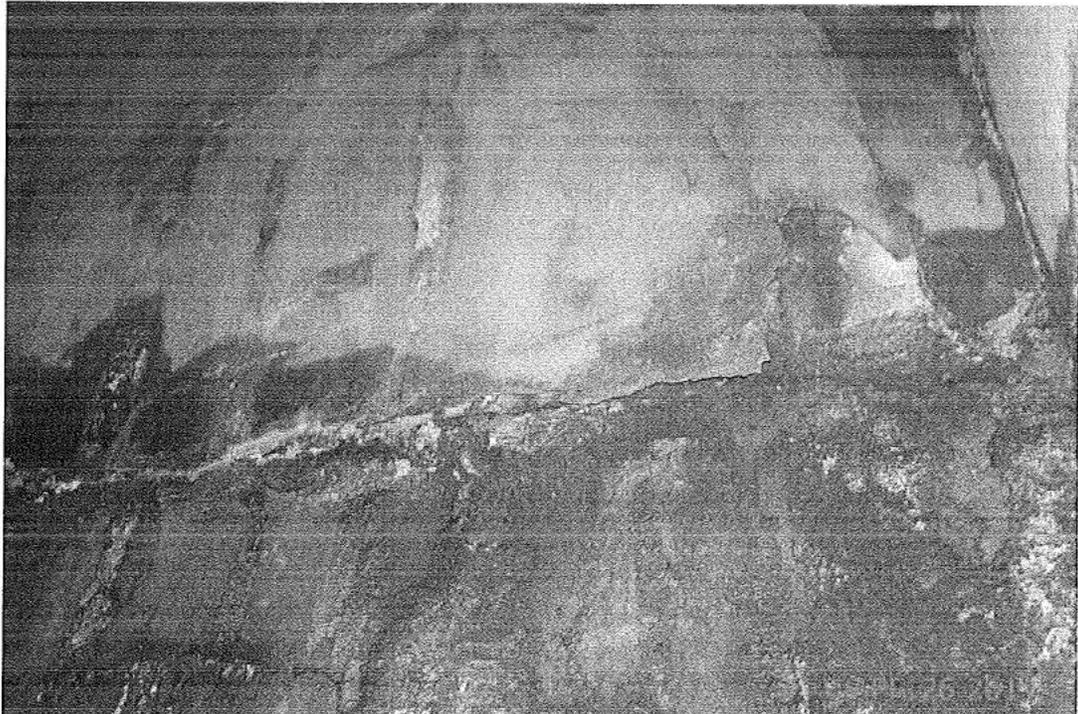
APPENDIX A
AVAILABLE DOCUMENTS

AVAILABLE DOCUMENTS

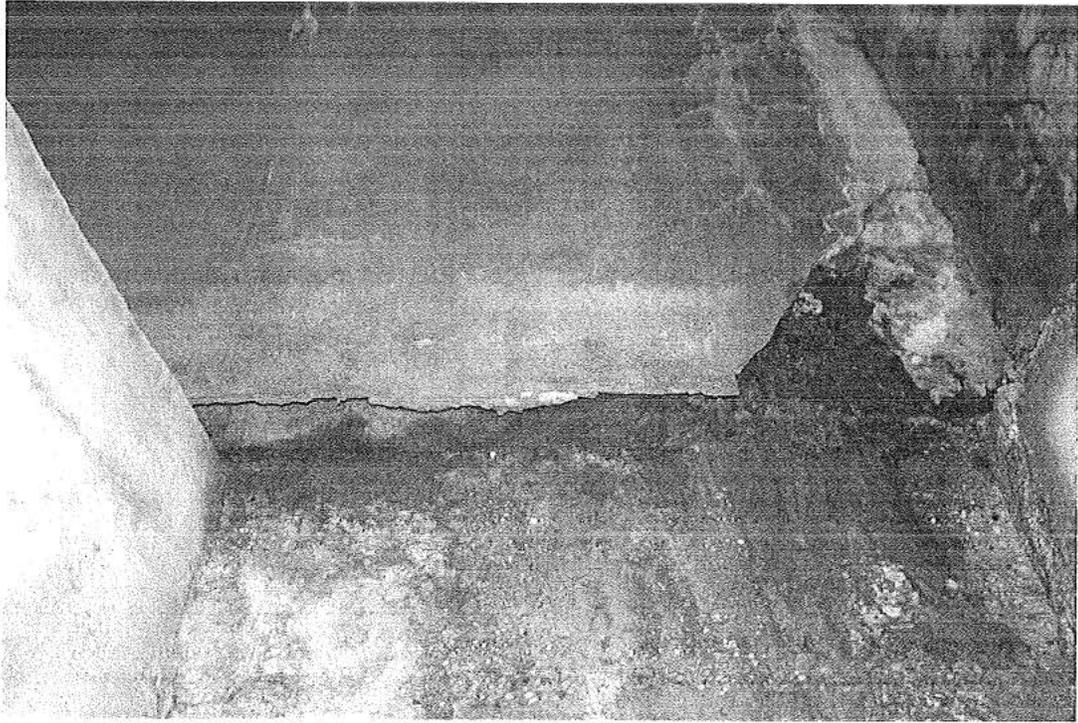
1. Port Authority Facility Condition Survey Program; Guidelines for Condition Survey of Tunnels, March 2002
2. Port Authority Facility Condition Survey Program; Holland Tunnel Air Ducts and Drum Rings, September 2009
3. Hudson River Vehicular Tunnel Contract Numbers:
 - Contract No. 1
 - Contract No. 3
 - Contract No. 4
 - Contract No. 5
 - Contract No. 5A
 - Contract No. 6
 - Contract No. 7
 - Contract No. 14

APPENDIX B

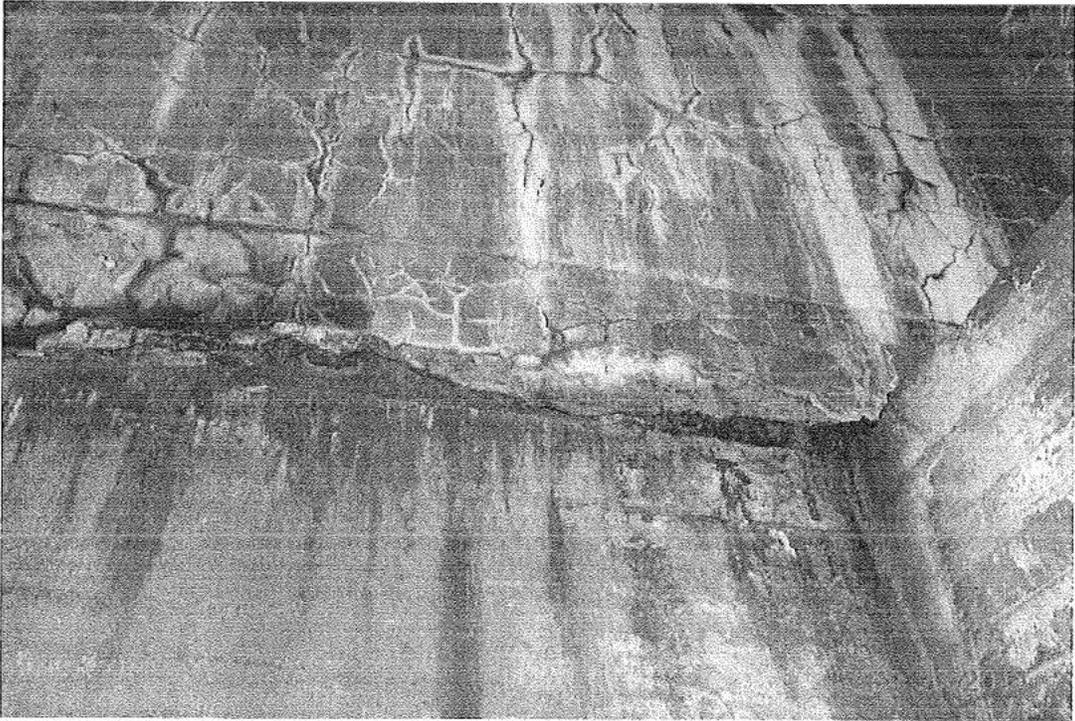
IMMEDIATE REPAIR CORRESPONDENCE

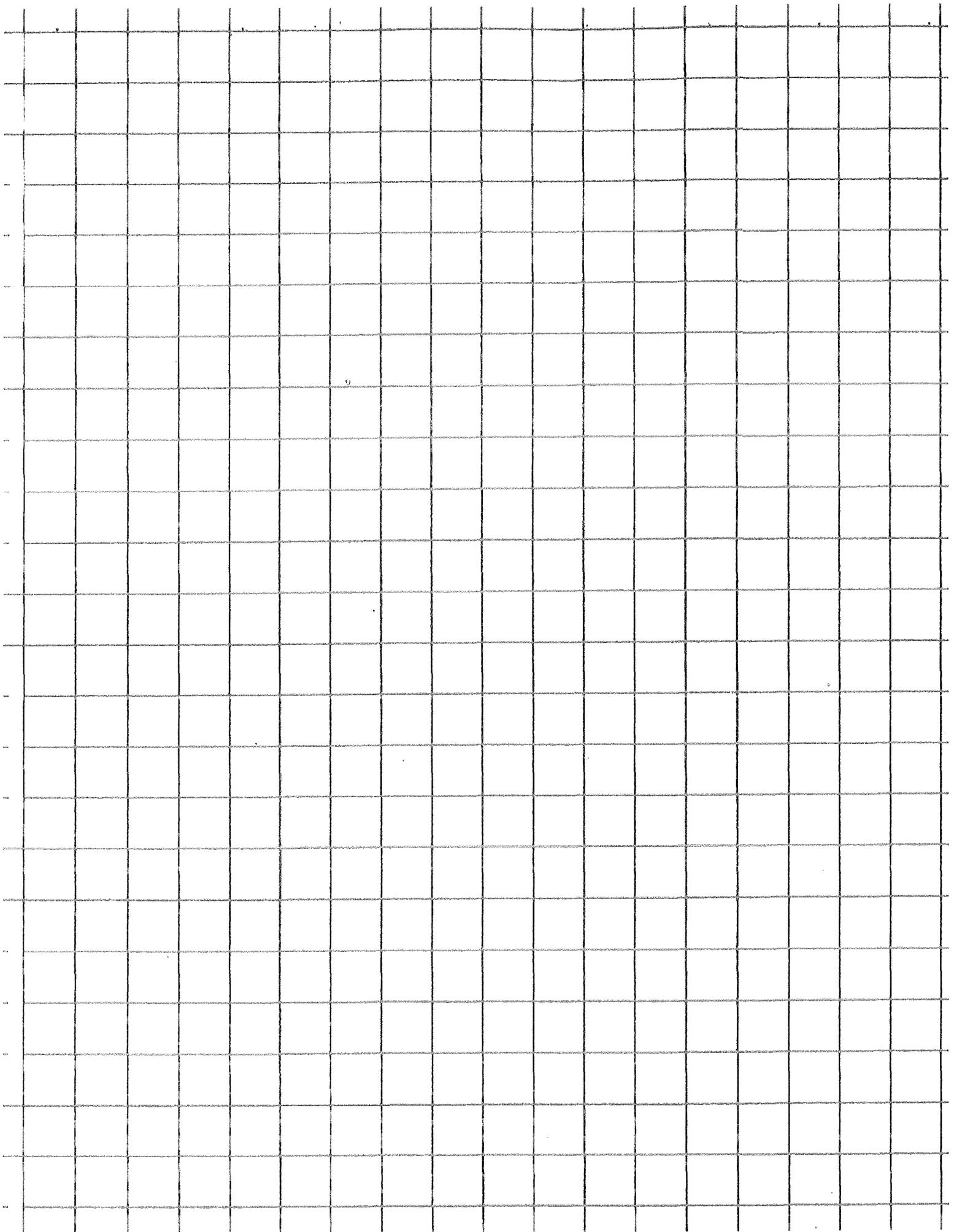












Engineering Quality
Assurance Division
B02-925.081

Port Authority Facility Condition Survey Program

Holland Tunnel
Air Ducts and Drum Rings

December 2013


Engineering Department

THE PORT AUTHORITY OF NY & NJ

January 8, 2014

Mr. C. John Lin, P.E.
Assistant Chief Engineer, Quality Assurance
The Port Authority of New York & New Jersey
3 Gateway Center, 3rd Floor
Newark, N.J. 07102

Attention: Mr. Camille Dagher, P.E.
Project Manager
Quality Assurance Division

Reference: P. A. Agreement No. 405-13-020
Professional Services for the Condition Survey of
Holland Tunnel Air Ducts and Drum Rings

Subject: **Final Report Submittal**

Gentlemen:

We are pleased to submit 12 copies of the Port Authority Condition Survey Program inspection report for the Holland Tunnel Air Ducts and Drum Rings in accordance with our Agreement No. 405-13-020.

The report covers the results of a field inspection of the above referenced tunnels. Independent quality control by our senior technical and management staff have ensured the thoroughness and accuracy of all work on this project. The report adheres to current practices and standards of the Port Authority of New York and New Jersey.

Very truly yours,

JENNY ENGINEERING CORPORATION



Stanley Niemiec, P.E.
Vice President, Chief Engineer

Enclosure

**TABLE 2
SUMMARY OF 2013 SAFETY REPAIR RECOMMENDATIONS**

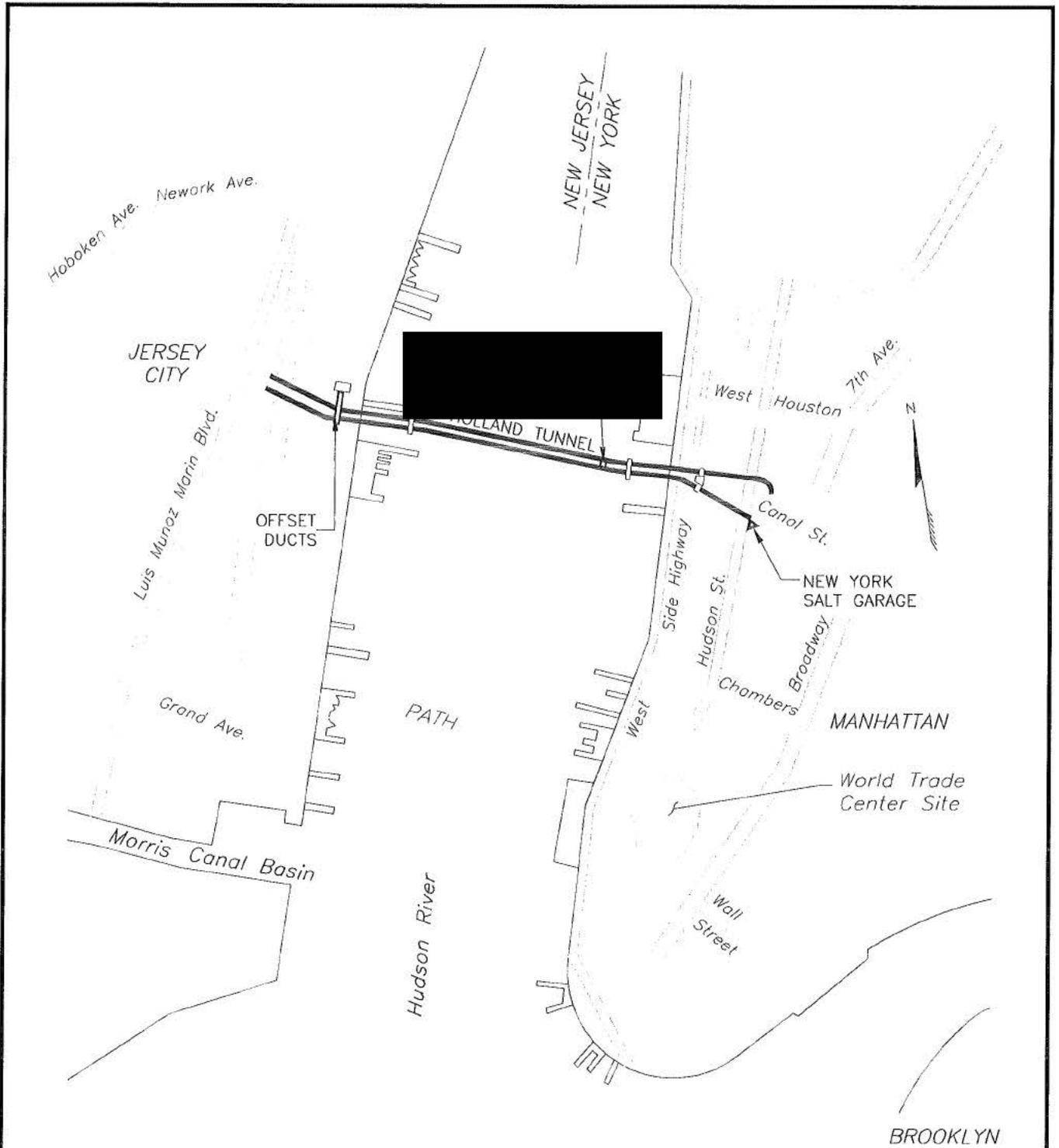
Safety Repair	Location	Station	Description	Recommendation	Figure #/ Photo #
S1	North Tunnel Blower Duct Steel Bent	91+13	Left connection at the top of ladder completely detached. (1 loc.)	Repair ladder connection.	A1/A3
S2	North Tunnel Blower Duct Steel Bent	91+13	Broken floor slab (approx. 2 sf.) at base of access ladder. (1 loc.)	Repair concrete slab.	A1/A4
S3	South Tunnel Exhaust Duct Steel Bent	90+25	Ladder not secured at the base. (1 loc.)	Install bolts.	B1/B6
S4	South Tunnel Roadway Steel Bent	13+90	Water seeping from manhole down through an access hatch in the south wall of the roadway causing severe corrosion of manhole rungs. One rung excessively bent. (1 loc.)	Seal leaks and replace rungs.	B1/B7

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LOCATION PLAN

III. SCOPE OF WORK AND INSPECTION PROCEDURE

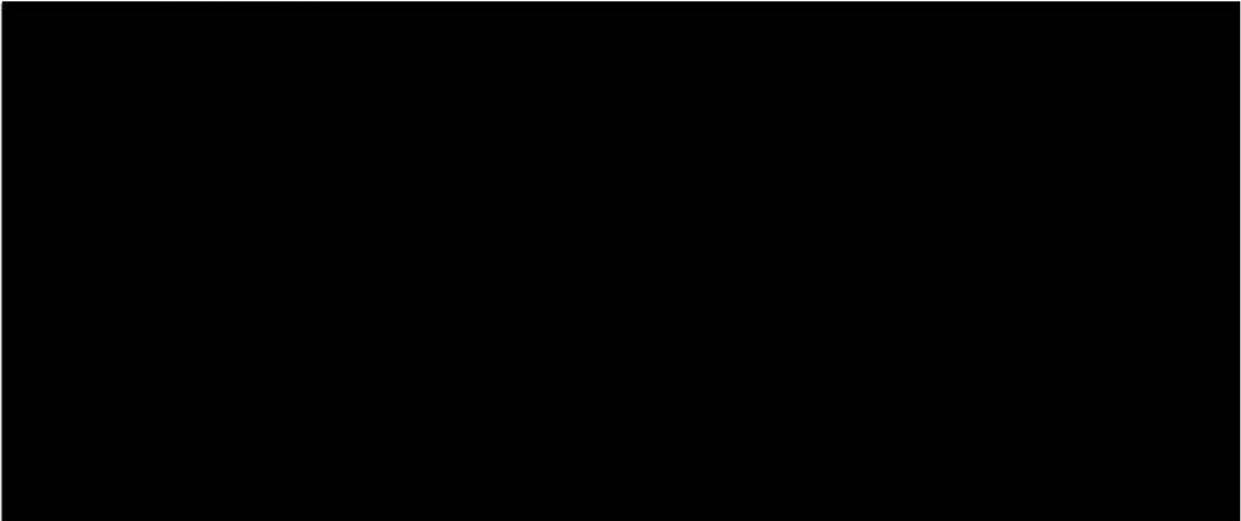
A condition survey was performed on the Holland Tunnel. The survey included the north and south tunnels, the offset ducts, and the Low Point Sump Pump Room. The purpose of the condition survey was to determine the overall condition of the structures and identify structural and non-structural deficiencies.



B. Inspection Procedure

This condition survey is a cyclical inspection of the tunnels and miscellaneous structures. Generally, a five-member crew was utilized for the inspection. Two, two-member teams, each lead by a licensed professional engineer, conducted inspections of the exhaust and blower ducts simultaneously. The fifth member served as safety support for both crews when required. The inspection generally consisted of the following procedures:

1. The roadway walk-through inspection was 100% visual and always performed with the flow of traffic. The inspection was coordinated with the facility personnel and utilized the scheduled lane closing for each tube. The four-member inspection crew worked between a lead vehicle equipped with a yellow warning light, and a trailing vehicle equipped with a flashing arrow board and impact attenuator. Tunnel stationing was based on the station markers located on the far wall (no safety walk) side of the tunnels. All crew members wore safety vests while working in the roadway areas.





5. The tunnel blower, exhaust and offset ducts and roadway were inspected at night between the hours of 11:00 p.m. and 5:00 a.m., subject to the requirements of the Facility Operations and the PA police.

The primary deficiencies expected in a sub-aqueous tunnel are related to the water tightness of the structure. Therefore, emphasis was placed on recording water leaks and leak related damages to the structures. Other signs of distress such as cracking and spalling of the concrete liner and corrosion of steel or cast iron elements were also identified. Passive leaks, deposits, minor efflorescence and other minor deficiencies of no structural significance and not requiring repairs, were generally not recorded.

Notes and Photographs

The terminology used for description of the deficiencies is based on the Port Authority of New York and New Jersey's condition survey definitions and terminology (page xv) and the Repair Recommendation Guide for Tunnels (Figure 3). Deficiencies were recorded during the inspection on field forms with each sheet of the field forms representing 100 linear feet of tunnel.

Photographs were taken during the inspection of significant or typical deficiencies. The location and orientation of the photos were noted on the field forms.

C. Condition Rating System and Definitions

Definitions of Repair Recommendation Categories

Hands-On - Inspection - Close-up inspection from not further away than arm's length where the member or element can be physically touched.

Visual - Inspection - The inspection from a reasonable distance of a member or element where initial determination of the condition can be made.

Four categories of repair recommendations are identified and defined as follows:

Immediate - Requires immediate action including possible closing of the structure or areas affected for safety reasons until interim remedial measures, such as shoring or removal of potentially unsafe structures (or elements) can be implemented. These closings or interim remedial actions, if any, always require immediate action upon discovery.

Priority - Conditions for which no immediate action may be required, or for which immediate action has been completed, but for which further investigations, design, and implementation of interim or long-term repairs should be undertaken on a priority basis, i.e., taking precedence over all other scheduled work.

Safety - Conditions that present a potential hazard and which should be repaired as soon as possible.

Routine - Conditions requiring further investigation or remedial work that can be undertaken as part of a scheduled maintenance program or other scheduled project, or routine facility maintenance, depending on the action required.

Definitions of Condition Ratings

The following terms are used to rate the condition of structural systems or individual elements and are defined below. When a term is applied to an overall system, it does not mean that some other element of the system may not be in a different condition.

Excellent - Element is in as-new condition

Good - Element is sound and performing its functions, although it shows signs of use and may require some minor repairs, mostly routine.

Fair - Element is still performing adequately at this time but needs priority and/or routine repairs to prevent further deterioration and to restore it to good condition.

Poor - Element cannot be relied upon to continue to perform its original function without immediate and/or priority repairs.

IV. HISTORY OF TUNNEL, EVALUATION OF DEFICIENCIES AND INSPECTION FINDINGS PRESENTATION METHODS

A. History of the Holland Tunnel

The Hudson River Vehicular Tunnel was authorized in 1919 and construction started in 1920. The Chief Engineer for the project was Clifford M. Holland. The tunnel was renamed after Holland when he died suddenly in 1927 prior to its completion. The Holland Tunnel was opened to traffic on November 13, 1927 with a total construction cost of \$48 million. Control and operation of the tunnel was put under the Port Authority in 1931. The facility generally consists of two parallel, two-lane vehicular tunnel tubes and four ventilation buildings.



B. Evaluation of Deficiencies

Figure 3 shows the classifications of deficiencies in the tunnel in terms of repair recommendation categories (no repair required, routine, priority and immediate). Cracks within concrete linings and concrete elements are classified by category as to crack size, orientation and any signs of recent propagation or measurable deflection. Spalls are categorized by size, propagation into the lining or element, and the extent of concrete deterioration around the spall.

Deficiencies within the cast iron sections of the tunnel lining are classified by cracks, corrosion, and miscellaneous deficiencies. Cracks are categorized by width, length, location and any measurable lining deflection. Corrosion of the cast iron segments is categorized by the severity of the corrosion and amount of section loss. Miscellaneous deficiencies include missing, loose, or severely deteriorated bolts; missing grout plugs; or dry leaks and deposits. Steel elements of the tunnels and underground structures are also classified by the severity of corrosion and amount of section loss.

Water infiltration into the tunnel is classified separately by whether the water inflow is gushing, flowing, dripping, or seeping. Repair recommendations for any water leak combined with another deficiency as cited above are summarized in a separate classification table in Figure 3.

The criteria indicated in Figure 3 shall serve only as a guide for determining a repair recommendation. Engineering judgment shall be used to determine the effect of all deficiencies on the integrity of the structure.

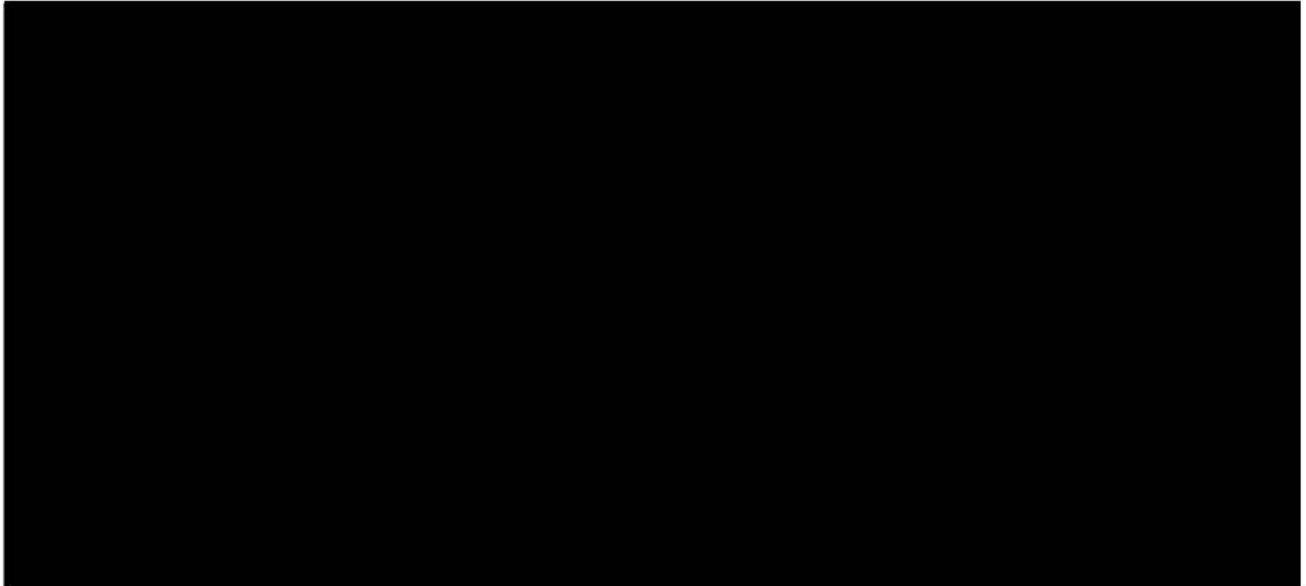
C. Inspection Findings Presentation Methods

Priority, safety, and routine repair items are presented in tabular form and supplemented with figures furnishing the locations of the repair items (deficiencies). The tables provide a description of the deficiency, location, repair recommendation, and photo reference, if used. Photos are used to enhance the description of an item, or to record the status of a previously reported repair item.

V. STRUCTURE DESCRIPTION, INSPECTION FINDINGS AND RECOMMENDATIONS

A. NORTH TUNNEL

1. Description



2. Inspection Findings and Repair Recommendations

The overall condition of the north tunnel is good with a fair rating applied to the steel bent sections of the blower duct between Stations 91+00 to 94+64. This is due to the high concentration of deficiencies in this area.

Priority Repairs:

There were 3 priority repairs at 3 locations recommended in the previous inspection, of which 2 have been repaired at 2 locations and 1 remains an outstanding priority repair at 1 location. The priority repair consists of leakage through a ring joint of the exhaust duct resulting in seeping and dripping water through the ceiling slab and walls of the roadway. No new priority repairs were recommended during the current inspection. The location and description of the priority repair is furnished in Table A1 and the locations are shown on Figure A1.

Safety Repairs:

There were 2 safety repairs at 2 locations noted during the current inspection. The safety repairs consist of a detached connection at the top left side of the access ladder and a broken floor slab at the base of the access ladder both in the steel bent section at the transition between the upper and lower blower duct. The safety repair recommendations are listed in Table A2 and the location is shown on Figure A1.

Routine Repairs:

There were 16 routine repairs at 450 locations noted during the current inspection. Routine repair recommendations are listed in Tables A3, A4 and A5 and their locations are shown on Figure A1.

Finding with No Recommendation:

There was 1 finding with no recommendation at 51 locations. The finding with no recommendation is presented in Table A6 and the locations are shown on Figure A1.

**TABLE A3
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R1	Drum Ring & Steel Bent	19+36 to 20 +26 (6 locs.) 24+15 24+46 24+60 25+30 25+84 26+54 27+16 to 27+46 (3 locs.) 28+96 29+08 30+44 to 30+52 (2 locs.) 33+90 34+23 35+72 36+27 to 36+67 (7 locs.) 36+84 37+30 37+76 to 37+87 (3 locs.) 39+07 to 40+08 (4 locs.) 43+06 to 43+44 (3 locs.) 47+26 53+24 62+70 to 62+92 (5 locs.) 63+22 to 63+87 (6 locs.) 64+80 65+34 65+79 to 65+95 (3 locs.) 67+00 to 67+68 (23 locs.) 67+90 to 68+00 (3 locs.) 68+84 to 69+00 (3 locs.)	Seeps. (88 locs.)	Clean and seal leaks.

TABLE A3 (Continued)
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R1 (Cont'd)	Drum Ring & Steel Bent	69+10	Seeps. (47 locs.)	Clean and seal leaks.
		69+42 to 69+68 (3 locs.)		
		70+78		
		71+84 to 71+92 (4 locs.)		
		72+12		
		72+84		
		73+92		
		75+46		
		75+96		
		76+90		
		78+71		
		78+96		
		81+21 to 81+46 (4 locs.)		
		81+73 to 81+82 (3 locs.)		
		82+02 to 82+93 (6 locs.)		
		83+20		
		83+94 to 83+96 (2 locs.)		
		84+36		
		87+91 to 87+98 (6 locs.)		
		90+36		
91+24				
93+00				
93+58				
93+62				
93+78				
94+40				

TABLE A3 (Continued)
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R2	Drum Ring	17+16 22+07 24+00 26+38 27+68 32+00 34+23 37+00 40+33 45+90 51+00 51+50 55+00 57+22 62+91 68+40 69+00 74+63 81+30 82+00	Moderate to severe corrosion of manhole frames. (20 locs.)	Clean and paint manhole covers and frames.
R3	Drum Ring	28+68 37+80 38+69 38+96 to 39+04 (3 locs.) 48+02 to 48+07 (1 loc.) 69+78 84+49 to 84+53 (2 locs.)	Medium spalls with exposed ring joints. (10 locs.)	Clean and repair.
R4	Steel Bent	13+22 15+17 16+02 84+95	Medium spalls with exposed steel bent columns/beams. (4 locs.)	Clean and repair.

TABLE A3 (Continued)
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R4 (Cont'd)	Steel Bent	85+64 87+64 88+86 to 88+96 (2 locs.) 89+60 90+27 90+33 91+53 to 91+75 (3 locs.) 92+01 to 92+07 (2 locs.) 92+49 92+53 92+97 93+07 to 93+28 (4 locs.) 93+49 93+85 94+59	Medium spalls with exposed steel bent columns/beams. (22 locs.)	Clean and repair.
R5	Steel Bent	10+22 to 15+08 (36 locs.) 15+59 to 16+37 (7 locs.) 84+90 to 85+00 (3 locs.) 89+14 to 89+94 (5 locs.) 91+15 to 94+80 (35 locs.)	Concentration of fine to wide cracks and adjacent hollow concrete. (86 locs.)	Seal cracks.
R6	Steel Bent	13+17 13+49 93+43 94+07 94+54 94+68	Vent ports filled with water and debris. (6 locs.)	Drain and clean inlet vents.

**TABLE A4
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
EXHAUST AIR DUCT**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R7	Drum Ring & Steel Bent	12+80 13+98 85+00 88+10 90+92 93+22	Seeps and drips. (6 locs.)	Clean and seal leaks.
R8	Drum Ring	37+60 64+38 82+22	Exposed ring joint with seeps and drips. (3 locs.)	Clean, seal leak and repair.
R9	Steel Bent	16+22 16+33 85+12 86+04 88+05 88+40 88+80 88+88 89+60 to 89+74 (3 locs.) 90+13 to 90+18 (2 locs.) 90+41 91+80	Medium spalls with exposed steel bent columns/beams. (15 locs.)	Clean and repair spalls.
R10	Steel Bent	10+24 to 10+29 (2 locs.) 10+90 11+50 12+08 13+20 91+75 to 91+90 (3 locs.) 94+01 94+45	Wide cracks and adjacent hollow concrete. (11 locs.)	Seal cracks.

TABLE A4 (Continued)
 NORTH TUNNEL
 ROUTINE REPAIR RECOMMENDATIONS
 EXHAUST AIR DUCT

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R11	Drum Ring & Steel Bent	12+80 24+35 37+27 37+30 37+60 64+36 71+12 92+88	Seeps and drips. (8 locs.)	Clean and seal leaks.

**TABLE A5
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
ROADWAY**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R12	Drum Ring & Steel Bent	30+00 to 30+10 (1 loc.) 31+05 33+76 34+47 to 34+65 (1 loc.) 38+01 38+52 39+96 40+02 to 40+12 (2 locs.) 40+95 41+95 to 42+05 (2 locs.) 42+50 to 42+94 (3 locs.) 43+38 to 43+78 (6 locs.) 44+49 to 44+64 (3 locs.) 45+03 to 45+25 (3 locs.) 45+85 to 45+96 (2 locs.) 48+35 48+72 49+36 51+44 61+06 61+84 62+22 to 62+27 (1 loc.) 71+84 72+78 to 73+00 (1 loc.) 73+08 76+65 to 76+70 (1 loc.) 79+08 to 79+72 (3 locs.) 80+77 to 80+87 (2 locs.) 81+20 to 81+29 (1 loc.) 82+78 83+75	Small to medium spalls and adjacent hollow concrete at vent ports. (48 locs.)	Repair spalls.

**TABLE A5 (Continued)
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
ROADWAY**

Routine Repair #	Tunnel Type	Station	Description		Repair Recommendation
R13	Steel Bent	15+08 15+88 24+32 to 24+38 (1 loc.) 87+65	Wide crack in roadway walls with cracked and/or missing tiles. (4 locs.)		Seal crack and replace cracked and/or missing tiles.
R14	Steel Bent	10+60 11+62 12+80 94+10 95+10	Seeping from hatch or standpipe. (5 locs.)		Clean and seal leak.
R15	Drum Ring & Steel Bent	10+36 12+53 13+96 to 14+06 (1 loc.) 15+27 15+78 15+65 to 15+68 (1 loc.) 15+84 to 15+96 (1 loc.) 21+50 to 21+58 (1 loc.) 21+72 to 21+80 (1 loc.) 21+96 22+32 24+32 25+61 26+52 27+11 to 27+34 (1 loc.) 27+64 to 27+96 (2 locs.) 28+48 to 28+61 (2 locs.) 29+66 to 29+70 (1 loc.) 30+88 to 30+94 (1 loc.) 31+91 to 31+99 (1 loc.)	3 sf. 30 sf. 30 sf. 6 sf. 8 sf. 25 sf. 25 sf. 4 sf. 3 sf. 6 sf. 3 sf. 10 sf. 3 sf. 3 sf. 100 sf. 250 sf. 28 sf. 6 sf. 18 sf. 20 sf.	Missing tiles. (22 locs.)	Replace missing tiles

TABLE A5 (Continued)
NORTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
ROADWAY

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R15 (Cont'd)	Drum Ring & Steel Bent	33+13	6 sf.	Missing tiles. (34 locs.) Replace missing tiles.
		34+21 to 34+26 (1 loc.)	12 sf.	
		35+42	4 sf.	
		37+07 to 37+13 (1 loc.)	30 sf.	
		39+00 to 39+15 (1 loc.)	10 sf.	
		39+66 to 39+97 (2 loc.)	10 sf.	
		40+51 to 40+57 (1 loc.)	30 sf.	
		41+15 to 41+29 (1 loc.)	12 sf.	
		41+43 to 41+50 (1 loc.)	5 sf.	
		43+20 to 43+30 (1 loc.)	18 sf.	
		45+58 to 45+68 (1 loc.)	20 sf.	
		49+46 to 49+50 (1 loc.)	3 sf.	
		50+00 to 50+10 (1 loc.)	7 sf.	
		50+90	2 sf.	
		54+15	12 sf.	
		60+06	4 sf.	
		60+64	3 sf.	
		62+72	3 sf.	
		66+80	3 sf.	
		68+47 to 68+49 (1 loc.)	8 sf.	
69+71 to 69+83 (2 loc.)	30 sf.			
71+16	12 sf.			
73+30	2 sf.			
75+40	10 sf.			
75+65 to 75+92 (1 loc.)	12 sf.			
82+95	4 sf.			
84+80 to 84+87 (1 loc.)	10 sf.			
86+44 to 86+80 (2 locs.)	105 sf.			
90+22 to 90+29 (1 loc.)	28 sf.			
91+54	3 sf.			
93+82	4 sf.			

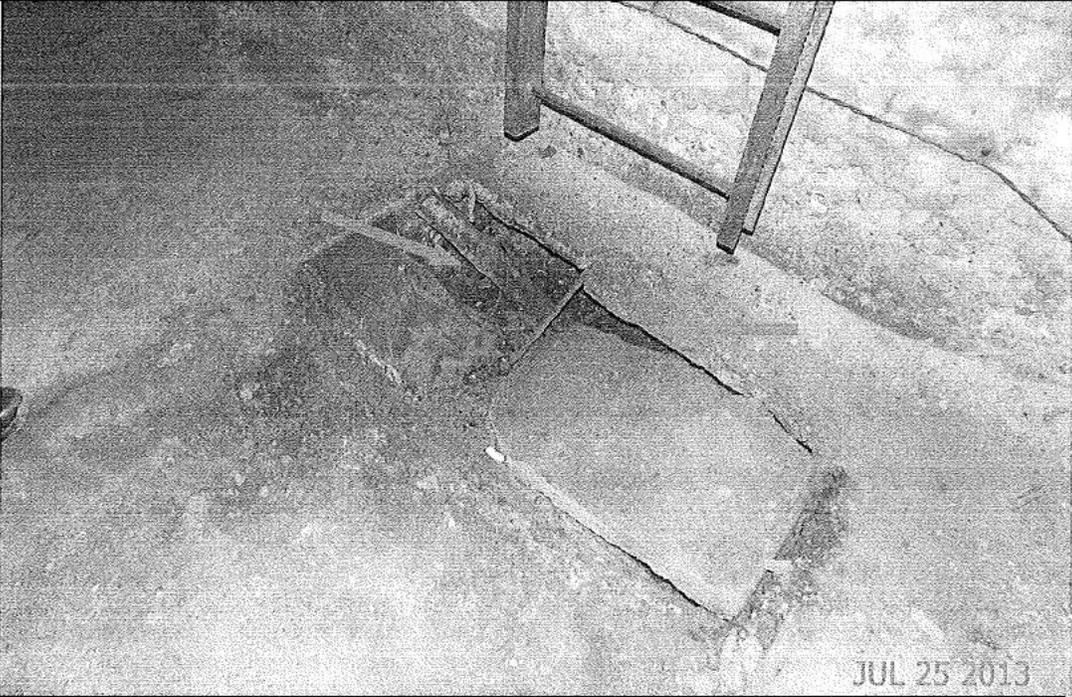
TABLE A5 (Continued)
 NORTH TUNNEL
 ROUTINE REPAIR RECOMMENDATIONS
 ROADWAY

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R16	Drum Ring & Steel Bent	16+24 to 16+28 (1 loc.) 19+80 to 19+88 (1 loc.) 32+90 to 33+24 (1 loc.) 38+85 to 39+00 (1 loc.) 62+36 to 62+50 (1 loc.) 71+00 to 71+08 (1 loc.) 72+40 to 72+50 (1 loc.) 72+60 to 72+70 (1 loc.) 72+84 to 73+00 (1 loc.) 76+70 to 76+85 (1 loc.) 82+40 to 82+50 (1 loc.)	Wide crack in safety walk. (11 locs.)	Seal crack.

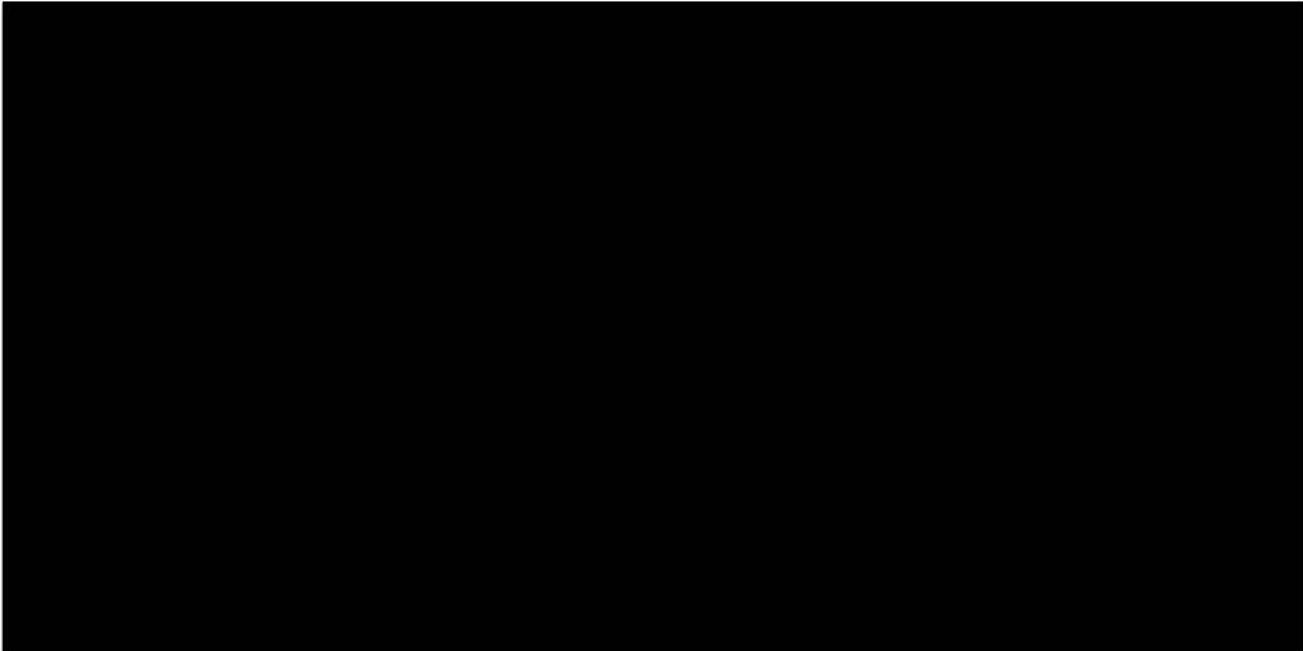
**TABLE A6
NORTH TUNNEL
FINDINGS WITH NO RECOMMENDATIONS**

Finding #	Tunnel Type	Location	Station	Description	Figure #
1	Drum Ring & Steel Bent	Exhaust Duct	24+70 to 24+85 (3 locs.) 25+10 to 25+23 (3 locs.) 25+45 to 25+55 (4 locs.) 26+30 to 26+42 (4 locs.) 28+32 to 28+60 (5 locs.) 28+80 32+00 to 32+35 (3 locs.) 37+03 to 37+10 (2 locs.) 37+65 to 37+90 (4 locs.) 38+62 to 38+72 (3 locs.) 44+27 61+72 to 61+85 (3 locs.) 62+46 to 62+71 (3 locs.) 64+40 to 64+51 (2 locs.) 71+02 to 71+20 (3 locs.) 74+25 74+65 80+60 to 80+85 (5 locs.)	Medium spalls in tunnel lining and adjacent hollow concrete. (51 locs.)	A1





B. SOUTH TUNNEL



2. Inspection Findings and Repair Recommendations

The overall condition of the south tunnel is good with a fair rating applied to the steel bent sections of the blower and exhaust ducts, between Stations 90+41 to 93+87. This is due to the high concentration of deficiencies in this area.

Priority Repairs:

There were 4 priority repairs recommended at 21 locations during the previous inspection, of which 1 was repaired at 6 locations and 3 remain outstanding priority repairs at 15 locations. The priority repairs consist of water seeping through exposed ring joints in the exhaust duct causing leakage through the ceiling and walls of the roadway, a center post supporting the roadway beams at mid-span has perforated flanges in the blower duct with exposed severely corroded bottom flange of roadway beam, and severe corrosion of exposed column flanges and displaced concrete encasement at the overhead and invert beams in the exhaust duct. No new priority repairs were recommended during the current inspection. The locations and descriptions of the priority repairs are furnished in Table B1 and the locations are shown on Figure B1.

Safety Repairs:

There were 2 safety repairs at 2 locations noted during the current inspection. The safety repairs consist of missing anchor bolts at the base of an access ladder in the steel bent section at the transition between upper and lower exhaust ducts, and severe corrosion of manhole rungs with one rung bent inside an access hatch in the roadway section. The safety repair recommendations are listed in Table B2 and the locations are shown on Figure B1.

Routine Repairs:

There were 17 routine repairs at 475 locations noted during the current inspection. Routine repair recommendations are presented in Tables B3, B4 and B5 and their locations are shown on Figure B1.

Finding with No Recommendation:

There was 1 finding with no recommendation at 32 locations. The finding with no recommendation is presented in Table B6 and the locations are shown on Figure B1.

**TABLE B2
SOUTH TUNNEL
SAFETY REPAIR RECOMMENDATIONS**

Safety Repair #	Tunnel Type	Duct	Station	Description	Repair Recommendation	Figure #/ Photo #
S3	Steel Bent	Exhaust Duct	90+25	Ladder not secured at the base. (1 loc.)	Install bolts.	B1/B6
S4	Steel Bent	Roadway	13+90	Water seeping from manhole down through an access hatch in the south wall of the roadway causing severe corrosion of manhole rungs. One rung excessively bent. (1 loc.)	Seal leaks and replace rungs.	B1/B7

**TABLE B3
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R1	Drum Ring & Steel Bent	14+08 to 14+91 (8 locs.) 15+31 15+80 15+96 16+58 to 16+70 (3 locs.) 17+95 19+15 19+82 to 19+94 (2 locs.) 24+10 24+38 38+30 45+34 54+54 to 54+60 (1 loc.) 55+00 59+96 60+80 to 61+95 (3 locs.) 61+50 to 62+98 (21 locs.) 63+40 to 63+65 (6 locs.) 64+06 to 65+98 (34 locs.) 66+00 to 66+30 (10 locs.) 66+58 to 66+76 (6 locs.) 66+80 to 67+12 (11 locs.) 67+16 to 68+00 (12 locs.) 68+04 to 68+90 (16 locs.) 69+00 to 69+29 (9 locs.) 79+20 79+88 80+04 to 80+99 (26 locs.) 81+08 to 81+88 (7 locs.) 82+04	Seeps. (189 locs.)	Clean and seal leaks.

**TABLE B3 (Continued)
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R1 (Cont'd)	Drum Ring & Steel Bent	82+84 83+28 93+60	Seeps. (3 locs.)	Clean and seal leaks.
R2	Drum Ring & Steel Bent	14+86 15+55 20+88 22+34 26+36 32+89 38+65 55+83 61+40 67+08 72+87 78+73 79+76 91+29	Moderate to severe corrosion of manhole frames. (14 locs.)	Clean and paint manhole covers and frames.
R3	Drum Ring & Steel Bent	14+47 to 14+63 (1 loc.) 62+50 62+93 to 62+95 (2 locs.) 63+90 to 63+96 (1 loc.) 66+40 to 66+84 (4 locs.) 67+56 79+42	Medium spalls with exposed ring joints. (11 locs.)	Clean and repair.

TABLE B3 (Continued)
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
BLOWER AIR DUCT

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R4	Drum Ring & Steel Bent	14+90 15+35 49+13	Vent ports filled with debris. (3 locs.)	Clean inlet vents.
R5	Steel Bent	11+00 to 12+00 (7 locs.) 12+41 13+08 13+80 14+00 16+66 18+38 22+84 83+28 to 83+41 (1 loc.) 84+00 to 85+64 (17 locs.) 88+32 to 88+64 (3 locs.) 90+00 90+56 to 90+90 (3 locs.) 91+00 91+84 92+44	Medium spalls with exposed steel bent columns/beams. (42 locs.)	Clean and repair.
R6	Steel Bent	10+68 to 12+30 (17 locs.) 13+30 to 13+60 (4 locs.) 13+86 to 13+91 (3 locs.)	Concentration of fine to wide cracks and adjacent hollow concrete. (24 locs.)	Seal cracks.
R7	Steel Bent	13+10	Vent ports filled with water and debris. (1 loc.)	Drain and clean inlet vents.

**TABLE B4
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
EXHAUST AIR DUCT**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R8	Drum Ring & Steel Bent	23+25 35+81 36+30 64+25 to 64+27 (2 locs.) 70+70 90+51 to 91+66 (9 locs.) 92+06 to 92+13 (3 locs.) 92+41 92+66	Seeps. (20 locs.)	Clean and seal leaks.
R9	Drum Ring	14+16 14+38 17+16 18+10 18+15 to 18+18 (1 loc.) 18+25 19+02 19+32 19+68 19+78 19+92 20+25 20+47 20+60 20+72 21+28 22+80 to 22+92 (1 loc.) 36+30 to 36+41 (1 loc.) 62+75	Exposed ring joint with moderate to severe corrosion. (19 locs.)	Clean and repair.

TABLE B4 (Continued)
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
EXHAUST AIR DUCT

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R9 (Cont'd)	Drum Ring	64+25 71+73 72+08 72+40 78+14 78+20 81+04 to 81+12 (1 loc.)	Exposed ring joint with moderate to severe corrosion. (7 locs.)	Clean and repair.
R10	Steel Bent	85+29 90+35 91+46 93+36 to 93+87 (5 locs.)	Medium spalls with exposed steel bent columns/beams. (8 locs.)	Clean and repair.
R11	Steel Bent	11+08 to 11+80 (10 locs.) 13+54 to 14+00 (6 locs.) 83+12 to 83+77 (8 locs.) 84+44 to 84+62 (3 locs.) 85+60 to 85+92 (4 locs.) 86+30 to 87+10 (6 locs.)	Concentration of fine to wide cracks and adjacent hollow concrete. (37 locs.)	Seal cracks.

**TABLE B5
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
ROADWAY**

Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R12	Drum Ring & Steel Bent	10+15 to 10+20 (4 locs.) 14+03 to 14+14 (1 loc.) 14+20 14+40 to 14+60 (1 loc.) 16+12 22+86 23+30 35+83 35+97 36+00 36+25 62+76 62+88 82+80 82+26 to 83+28 (2 locs.) 83+64	Seeps and drips. (20 locs.)	Clean and seal leaks.
R13	Drum Ring & Steel Bent	10+12 23+26 28+03 to 28+08 (1 loc.) 37+80 to 37+92 (1 loc.) 37+96 38+25 to 39+00 (7 locs.) 39+71 to 39+86 (2 loc.) 43+31 to 43+56 (1 loc.) 43+90 to 44+06 (1 loc.) 48+17 to 48+21 (1 loc.) 49+21 55+47 to 57+37 (1 loc.) 57+95 to 58+13 (1 loc.)	Small to medium spalls and adjacent hollow concrete at vent ports. (20 locs.)	Repair spalls.

**TABLE B5 (Continued)
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
ROADWAY**

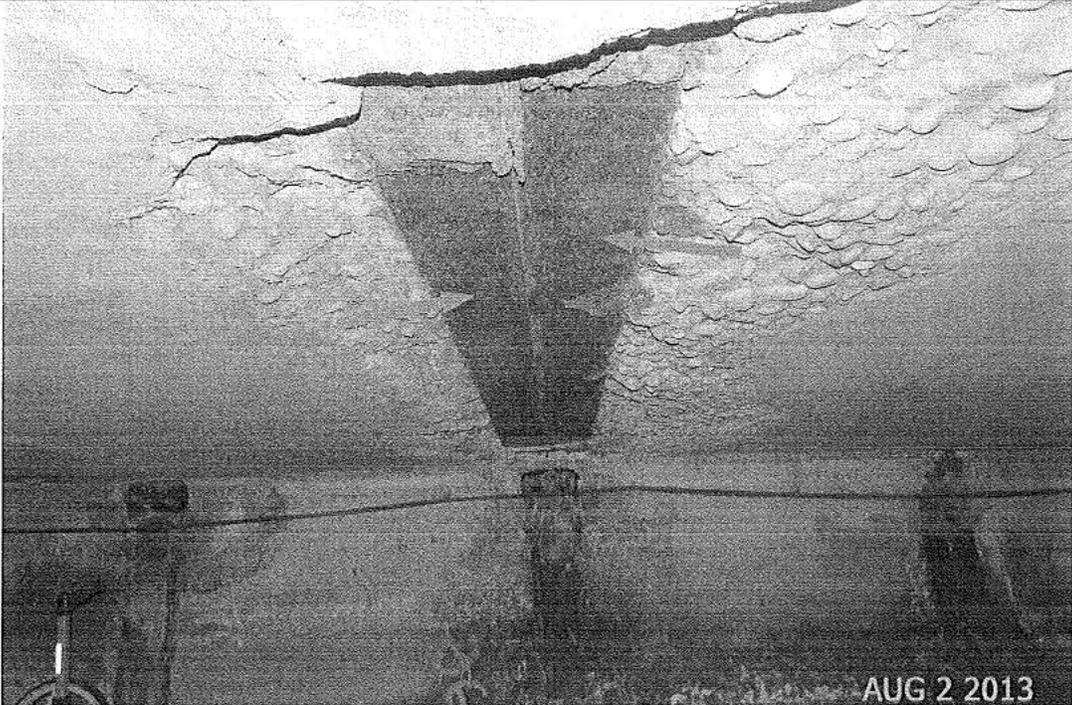
Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R13 (cont'd)	Drum Ring & Steel Bent	62+90 to 63+14 (1 loc.) 63+50 64+60 to 64+94 (1 loc.) 67+23 to 67+30 (1 loc.) 69+40 to 69+50 (2 loc.) 70+40 to 70+45 (1 loc.) 71+45 72+35 to 72+52 (1 loc.) 74+46 to 74+54 (1 loc.) 77+36 79+08 to 79+59 (3 locs.) 81+72 to 81+92 (3 locs.)	Small to medium spalls and adjacent hollow concrete at vent ports. (17 locs.)	Repair spalls.
R14	Drum Ring	20+08 16+29 to 16+37 (1 loc.) 18+60 to 18+72 (1 loc.) 19+08 to 19+15 (1 loc.) 26+59 to 26+72 (1 loc.) 31+44 to 31+52 (1 loc.) 38+12 to 38+20 (1 loc.) 59+18	Hollow sounding tiles in side walls. (8 locs.)	Repair tiles.
R15	Drum Ring & Steel Bent	35+92 73+74 78+56 83+21 88+24 91+80 92+70	Seeping from hatch or standpipe. (7 locs.)	Clean and seal leaks.

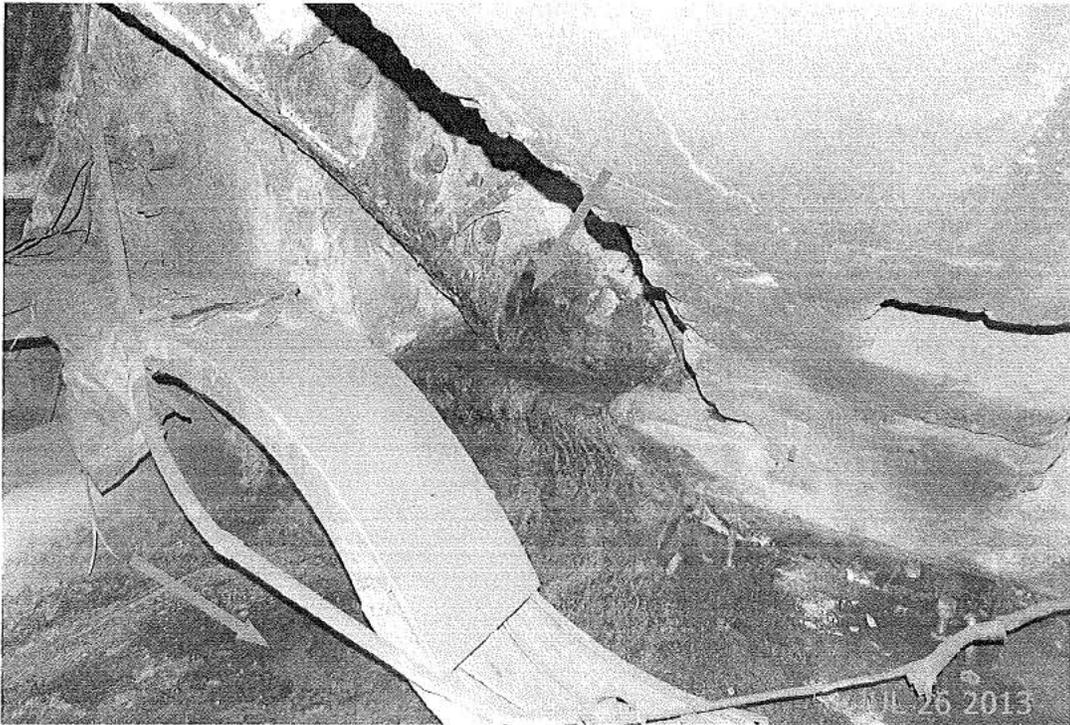
TABLE B5 (Continued)
SOUTH TUNNEL
ROUTINE REPAIR RECOMMENDATIONS
ROADWAY

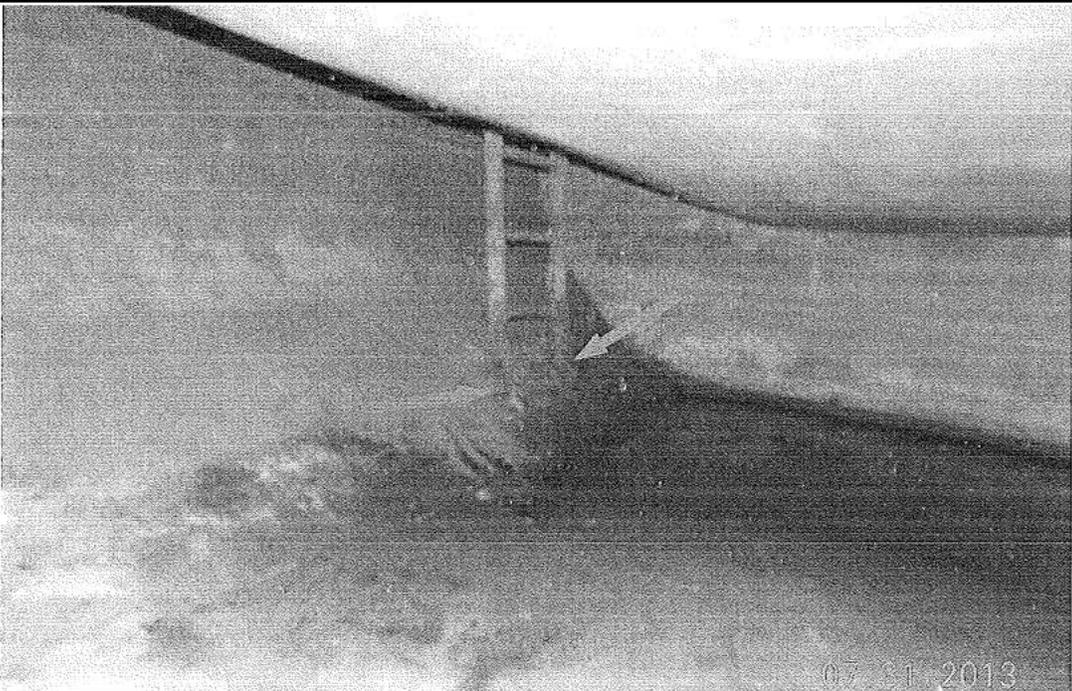
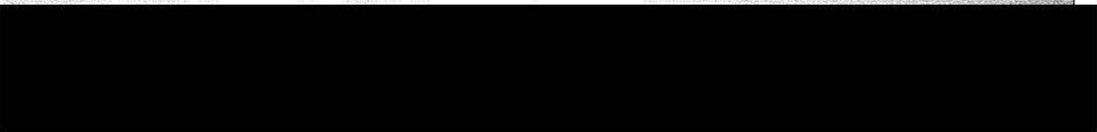
Routine Repair #	Tunnel Type	Station	Description	Repair Recommendation
R16	Drum Ring & Steel Bent	10+28 to 10+31 (1 loc.) 22+90 23+00 to 23+16 (2 locs.) 33+92 36+12 to 36+18 (1 loc.) 36+20 to 36+24 (1 loc.) 36+27 40+36 to 40+58 (2 locs.) 54+26 to 54+36 (1 loc.) 54+60 65+36 69+80 70+90 75+21 83+49 93+40 to 93+50 (2 locs.) 93+86 to 93+98 (1 loc.)	3 sf. 3 sf. 6 sf. 4 sf. 6 sf. 24 sf. 3 sf. 57 sf. 80 sf. 4 sf. 3 sf. 2 sf. 2 sf. 2 sf. 2 sf. 3sf. 4 sf. 13 sf.	Missing tiles. (20 locs.) Replace missing tiles.
R17	Drum Ring & Steel Bent	67+23 to 67+30 (1 loc.) 68+90 to 68+96 (1 loc.) 69+40 to 69+47 (1 loc.) 73+83 to 73+88 (1 loc.) 90+44 to 90+62 (1 loc.)	Wide crack in safety walk. (5 locs.)	Seal crack.

**TABLE B6
SOUTH TUNNEL
FINDINGS WITH NO RECOMMENDATIONS**

Finding #	Tunnel Type	Location	Station	Description	Figure #
1	Drum Ring	Exhaust Duct	20+98 22+80 23+35 to 23+53 (1 loc.) 23+76 25+20 to 26+00 (6 locs.) 28+20 28+70 to 28+90 (6 locs.) 35+52 to 35+74 (2 locs.) 36+44 to 37+75 (13 locs.)	Medium spalls in tunnel lining and adjacent hollow concrete. (32 locs.)	B1

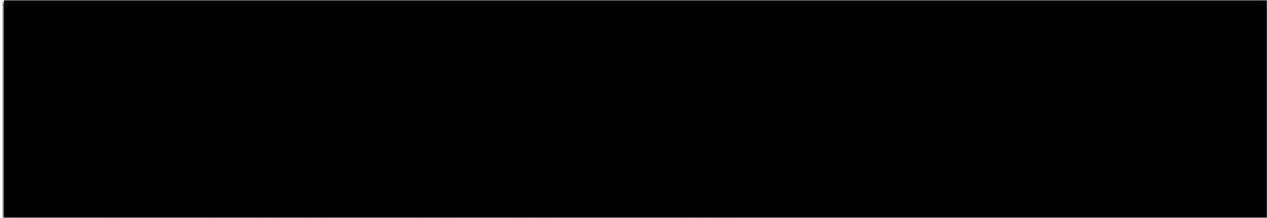








C. OFFSET DUCTS



2. Inspection Findings and Repair Recommendations

The overall condition of the offset ducts is good.

Priority Repairs:

There was 1 priority repair at one location recommended during the previous inspection which remains outstanding. The priority repair consists of a construction joint (between the outside skin plate of the caisson and the concrete roof of the offset duct) that has separated along the entire width of the duct with water seeping. No new priority repairs were recommended during the current inspection. The location and description of the priority repair is furnished in Table C1 and the location is shown on Figure C1.

Safety Repairs:

No safety repairs were noted during the current inspection.

Routine Repairs:

There were 5 routine repairs at 43 locations noted during the current inspection. Routine repair recommendations are presented in Table C2 and their locations are shown on Figure C1.

Finding with No Recommendation:

There was 1 finding with no recommendation at 4 locations. The finding with no recommendation is presented in Table C3 and the locations are shown on Figure C1.

**TABLE C2
OFFSET DUCTS
ROUTINE REPAIR RECOMMENDATIONS**

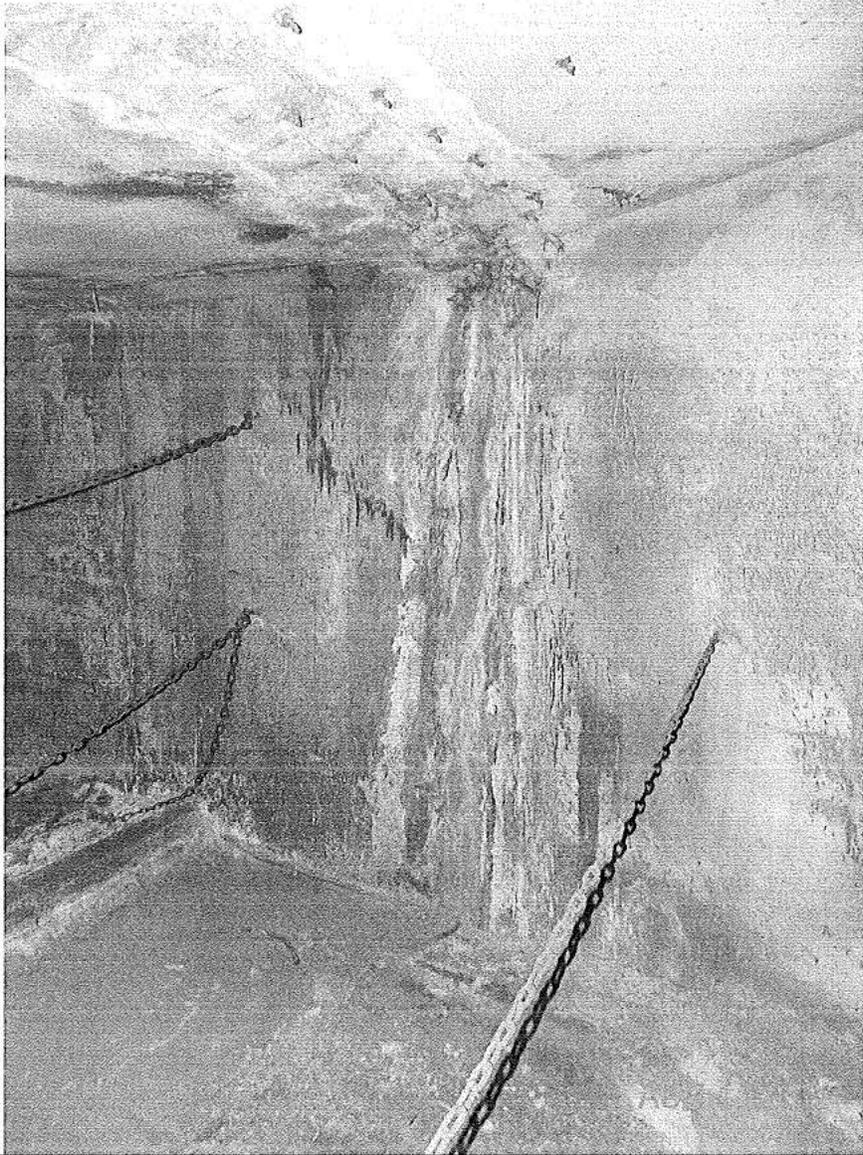
Routine Repair #	Tunnel Type	Area	Station	Description	Repair Recommendation	
R1	Steel Bent	NB1	0+58 0+70	Seeps. (21 locs.)	Clean and seal leaks.	
		NB2	0+30 0+64 0+79 1+22			
			SB2			0+34
			NE2			0+01 1+32
		SE1	1+23 2+25			
		SE2	0+00 0+30 0+48 0+58 0+63 to 0+65 (2 locs.) 0+88 1+57 1+63 1+65			
			R2			Steel Bent
SB1	0+52 0+98 1+69					
	SB2			1+03 1+70		
NE1	0+00					
NE2	0+95					
SE2	1+60 to 1+72 (2 locs.)					

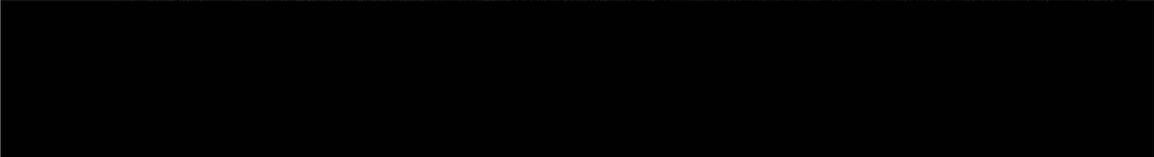
TABLE C2 (Continued)
OFFSET DUCTS
ROUTINE REPAIR RECOMMENDATIONS

Routine Repair #	Tunnel Type	Area	Station	Description	Repair Recommendation
R3	Steel Bent	NB1	0+00	Joint with spalled/hollow concrete and exposed moderately corroded column/beam. (4 locs.)	Clean and repair.
		SB1	0+32		
		NE1	0+00		
		SE2	0+00		
R4	Steel Bent	SB1	00+52 to 1+00 (1 loc.)	Concentration of fine to wide cracks and adjacent hollow concrete. (1 loc.)	Seal cracks.
R5	Steel Bent	NB1	0+12 to 0+34 (1 loc.) 0+58	Ponding water on invert. (7 locs.)	Clean and seal leak.
		NB2	0+10 to 0+83 (1 loc.)		
		NE2	0+50 to 0+80 (1 loc.) 1+15 to 1+24 (1 loc.)		
		SE1	1+09 to 1+36 (1 loc.)		
		SE2	1+00 to 1+65 (1 loc.)		

**TABLE C3
OFFSET DUCTS
FINDINGS WITH NO RECOMMENDATIONS**

Finding #	Tunnel Type	Area	Station	Description	Figure #
1	Steel Bent	NB1	1+00 (2 locs.)	Medium spall and adjacent hollow concrete. (4 locs.)	C1
		NB2	1+00		
		SB1	2+00		





**TABLE E2
NEW JERSEY LAND VENTILATION BUILDING
PUMP ROOMS AND SUMP CHAMBERS
ROUTINE REPAIR RECOMMENDATIONS**

Routine Repair #	Location	Station	Description	Repair Recommendation	Figure #
R1	Pump Room	--	Medium to wide crack in concrete wall/column encasement/deck slab. (18 locs.)	Repair cracks.	E1 & E2
R2	Pump Room	--	Medium to large spall in concrete wall/underside of deck slab. (5 locs.)	Repair spalls.	E1 & E2
R3	Pump Room/ Sump Chamber	--	Large spall in concrete deck slab/ beam encasement with adjacent hollow concrete. (6 locs.)	Remove hollow concrete and repair spalls.	E1
R4	Pump Room	--	Seeps in wall. (2 locs.)	Clean and seal leaks.	E2
R5	Pump Room	--	Severe corrosion of conduit brackets. (1 loc.)	Repair conduit brackets.	E2
R6	Sump Chamber	--	Fine crack seeping at underside of concrete deck slab. (6 locs.)	Clean, seal leaks and repair cracks.	E2
R7	Sump Chamber	--	Moderate to severe corrosion of manhole frame. (1 loc.)	Clean and repaint manhole frame.	E2

**TABLE E3
NEW JERSEY RIVER VENTILATION BUILDING
PUMP ROOMS AND SUMP CHAMBERS
ROUTINE REPAIR RECOMMENDATIONS**

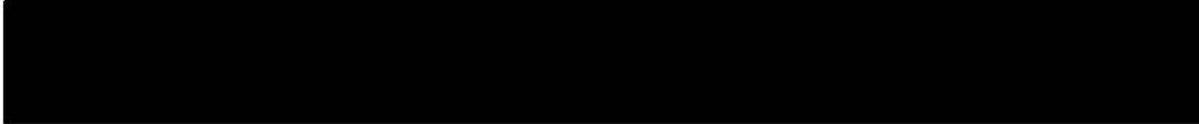
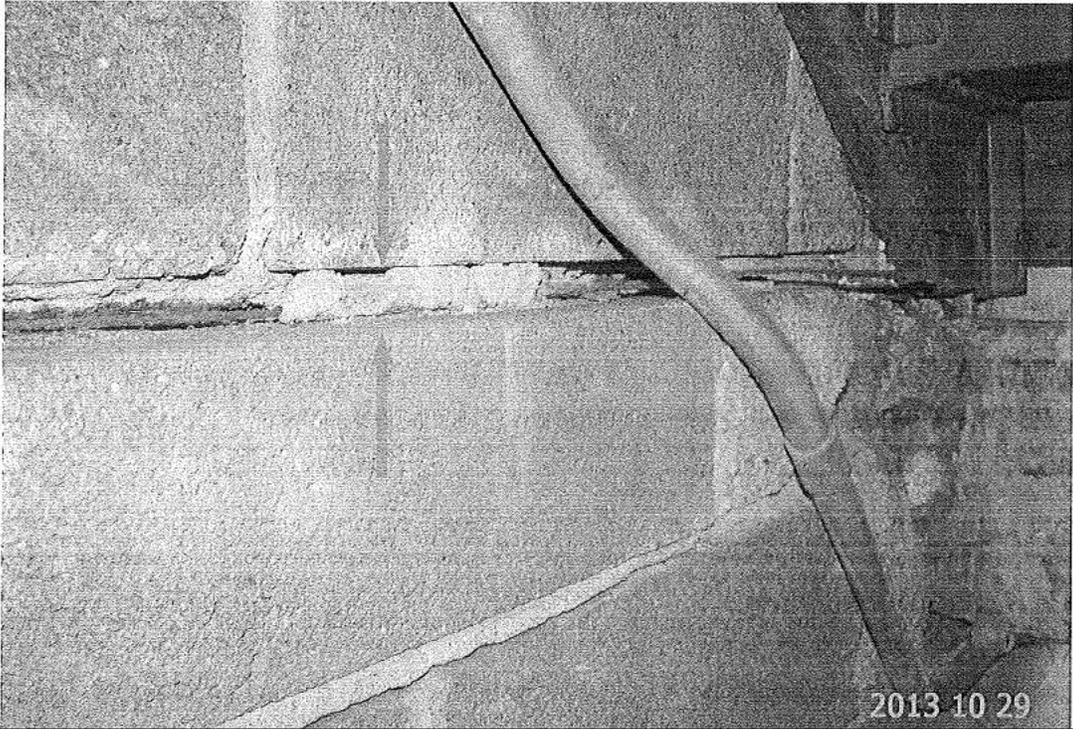
Routine Repair #	Location	Station	Description	Repair Recommendation	Figure #
R1	Pump Room/ Sump Chamber	--	Medium to wide crack in concrete wall/beam encasement/slab. (28 locs.)	Repair cracks.	E3 & E4
R2	Pump Room	--	Medium to large spall in concrete wall/deck slab. (8 locs.)	Repair spalls.	E3 & E4
R3	Pump Room	--	Large spall in concrete wall/column encasement with adjacent hollow concrete. (4 locs.)	Remove hollow concrete and repair spalls.	E3 & E4
R4	Pump Room	--	Corroded and damaged door or door frame. (4 locs.)	Clean and paint or replace door or door frame.	E3 & E4
R5	Pump Room	--	Severe corrosion or section loss to structural steel. (3 locs.)	Clean and repaint steel.	E4
R6	Sump Chamber	--	Large spalls with exposed severely corroded bottom flange and section loss of the beams. (15 locs.)	Repair beams and spalls.	E3 & E4
R7	Sump Chamber	--	Wide crack with hollow concrete in concrete beam encasement. (6 locs.)	Remove hollow concrete and repair concrete encasement.	E3
R8	Sump Chamber	--	Fine to medium crack seeping at underside of concrete deck slab. (3 locs.)	Clean, seal leak and repair cracks.	E3 & E4

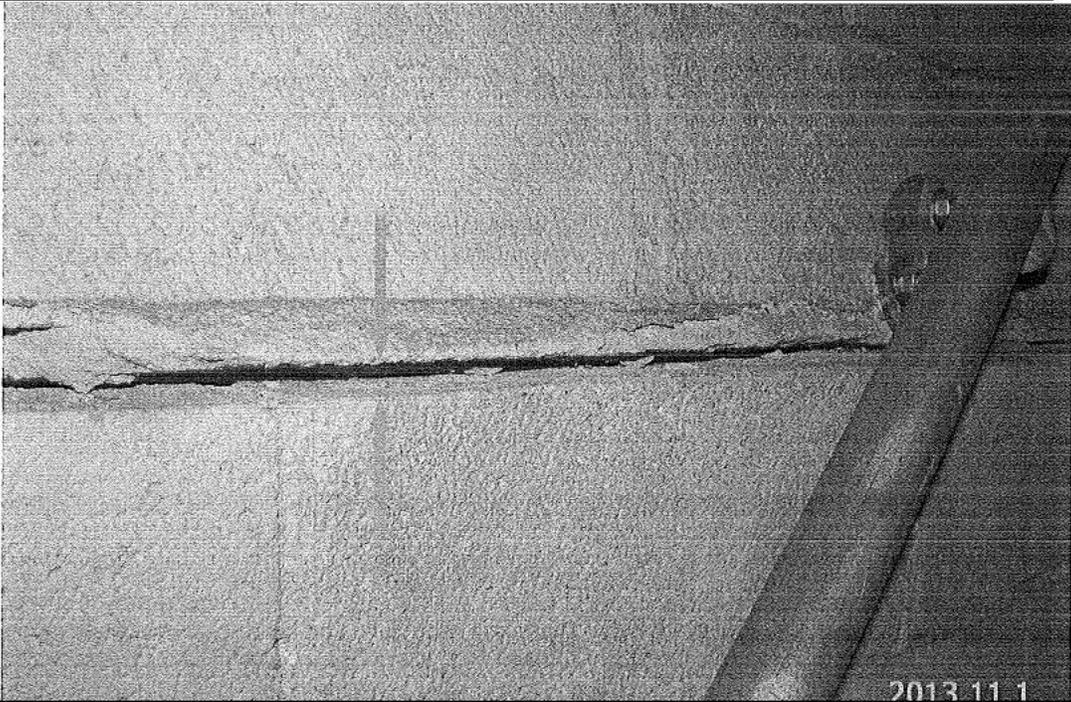
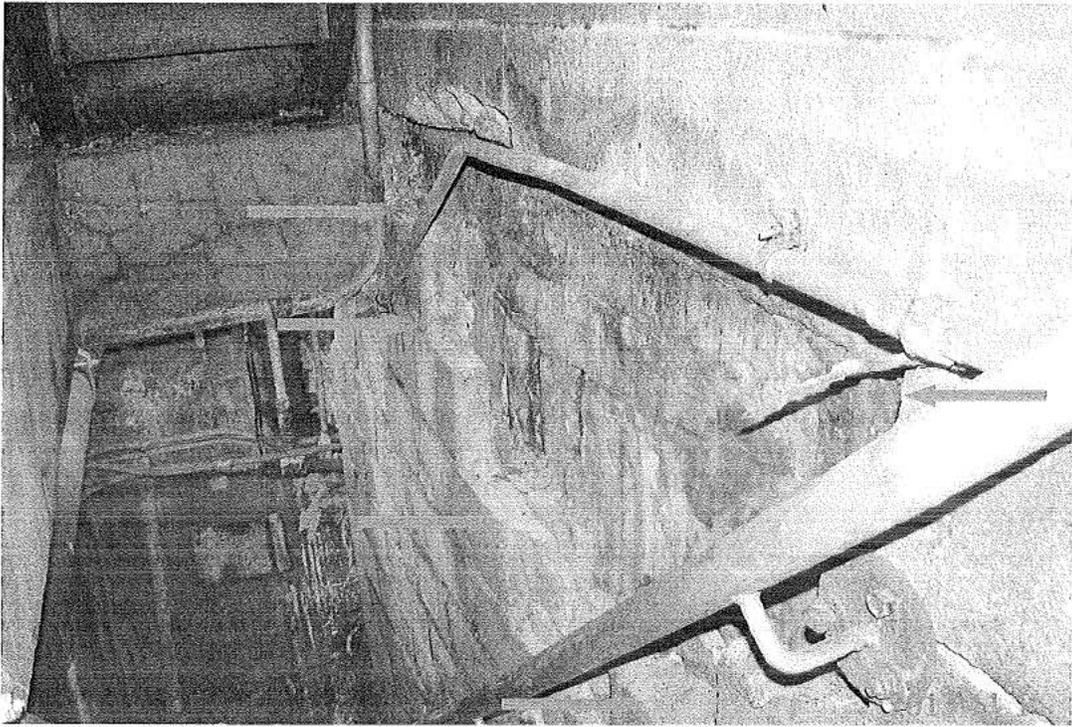
**TABLE E4
NEW YORK RIVER VENTILATION BUILDING
PUMP ROOMS AND SUMP CHAMBERS
ROUTINE REPAIR RECOMMENDATIONS**

Routine Repair #	Location	Station	Description	Repair Recommendation	Figure #
R1	Pump Room/ Sump Chamber	--	Medium to wide crack in concrete wall/beam encasement/deck slab. (19 locs.)	Repair cracks.	E5 & E6
R2	Pump Room	--	Spall in concrete wall/deck slab. (3 locs.)	Repair spalls.	E5
R3	Pump Room	--	Large spall in concrete beam encasement with adjacent hollow concrete. (3 locs.)	Remove hollow concrete and repair spalled concrete encasement.	E5 & E6
R4	Pump Room	--	Detached conduit. (1 loc.)	Reattach conduit.	E5
R5	Pump Room	--	Fine crack seeping. (2 locs.)	Clean, seal leak and repair cracks.	E5
R6	Sump Chamber	--	Large spalls with exposed severely corroded bottom beam flange with section loss. (17 locs.)	Repair beams and spalls.	E5 & E6
R7	Sump Chamber	--	Seep with heavy deposit at severely corroded pipe penetrating the ceiling slab. (1 loc.)	Clean, seal leak and repair piping.	E5
R8	Stairs to Pump Room	--	Seeps. (3 locs.)	Clean and seal leak.	E6
R9	Pump Room	--	Corroded and damaged door or door frame. (1 loc.)	Clean and paint or replace door/door frame.	E6
R10	Pump Room	--	Hollow concrete encasement around steps at concrete deck level. (1 loc.)	Remove hollow concrete and repair encasement.	E6

**TABLE E5
NEW YORK LAND VENTILATION BUILDING
PUMP ROOMS AND SUMP CHAMBERS
ROUTINE REPAIR RECOMMENDATIONS**

Routine Repair #	Location	Station	Description	Repair Recommendation	Figure #
R1	Pump Room	--	Spall with exposed corroded reinforcement in concrete. (3 locs.)	Clean and protect reinforcement and repair spall.	E7
R2	Pump Room	--	Seeps. (4 locs.)	Clean and seal leaks.	E7
R3	Pump Room	--	Severe corrosion of conduit brackets. (1 loc.)	Repair conduit brackets.	E7
R4	Sump Chamber	--	Hollow concrete at concrete beam encasement. (1 loc.)	Remove hollow concrete and repair concrete encasement.	E7
R5	Pump Room/ Sump Chamber	--	Medium to wide crack in concrete wall/ column or beam encasement. (7 locs.)	Repair cracks.	E7 & E8
R6	Sump Chamber	--	Fine crack with seep and efflorescence at wall/underside of concrete deck slab. (12 locs.)	Clean, seal leak and repair cracks.	E7 & E8
R7	Pump Room	--	Spalls in concrete wall/deck slab. (3 locs.)	Repair spalls.	E8
R8	Pump Room	--	Corroded and damaged door or door frame. (1 loc.)	Clean and paint or replace door/door frame.	E8
R9	Sump Chamber	--	Large spall with exposed severely corroded bottom flange and section loss of the beams. (1 loc.)	Repair beams and spalls.	E8







APPENDIX A
AVAILABLE DOCUMENTS

AVAILABLE DOCUMENTS

1. Port Authority Facility Condition Survey Program; Guidelines for Condition Survey of Tunnels, March 2002
2. Port Authority Facility Condition Survey Program; Holland Tunnel Air Ducts and Drum Rings, September 2011
3. Hudson River Vehicular Tunnel Contract Numbers:
 - Contract No. 1
 - Contract No. 3
 - Contract No. 4
 - Contract No. 5
 - Contract No. 5A
 - Contract No. 6
 - Contract No. 7
 - Contract No. 14

APPENDIX B

IMMEDIATE ACTION CORRESPONDENCE

August 12, 2013

Mr. C. John Lin, P.E.
Deputy Director, Quality Assurance
The Port Authority of New York & New Jersey
3 Gateway Center, 3rd Floor
Newark, N.J. 07102

Attention: Mr. Camille Dagher, P.E.
Project Manager
Quality Assurance

Reference: **Agreement No. 405-13-020 P.O. 4900009160**
Condition Survey of the Holland Tunnel Roadway - South Tube
Recommended Immediate Action

During the inspection of the South Tube of the Holland Tunnel Roadway on August 9, 2013, an Immediate Action item was observed by Jenny Engineering Corporation (JEC). Our staff observed a section of unsecured curb, approximately five feet long. This condition occurs at the North side curb (near lane) between Sta. 83+50 and Sta. 83+55 (refer to attached Photo 1). The piece of curb is not attached to the wall or the adjacent curbing, it is just resting on the curb on either side of it. In addition, the front of this curb piece is not flush with the adjacent curb (refer to attached Photo 2). It is our recommendation that the curb plate be repositioned and secured to the wall and adjacent curbing on an immediate basis.

If you have any questions or comments, please do not hesitate to contact us.

Very truly yours,
JENNY ENGINEERING CORPORATION



Keith J. Gaspar, P.E.
Project Manager

Attachments

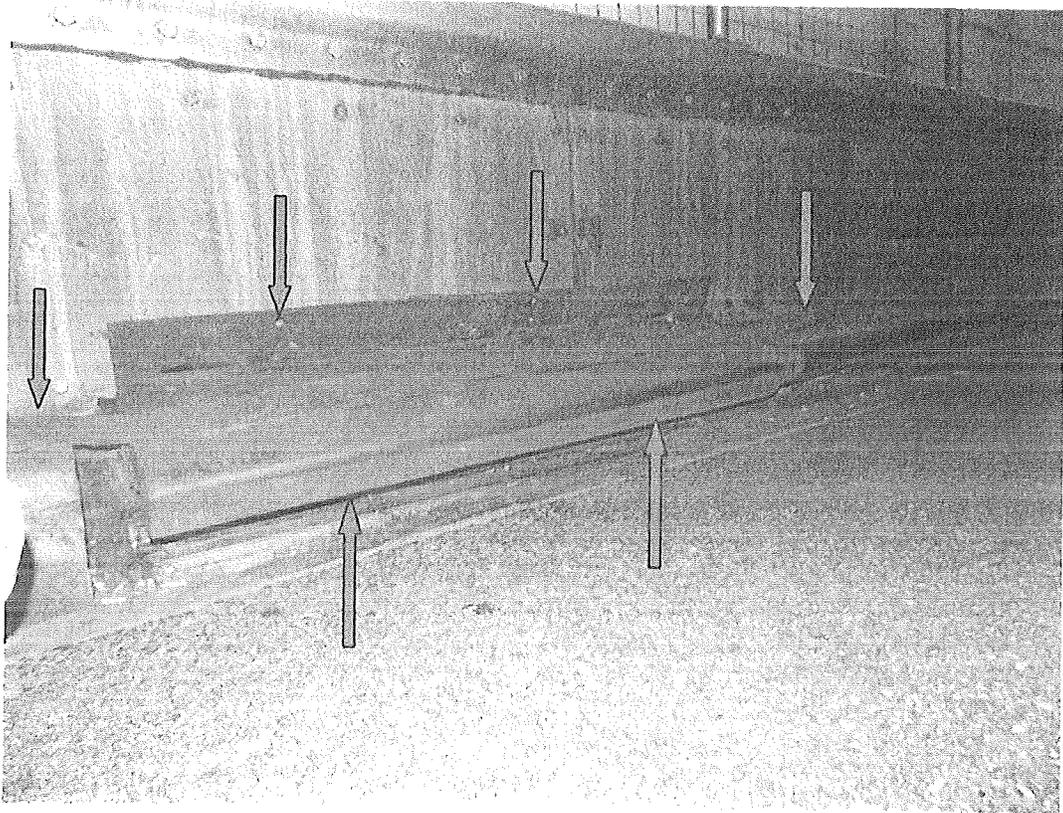


Photo 1 South Tunnel – Roadway – Station 83+50 to 83+55 – Approximately 5 ft. long section of unsecured curb resting on adjacent curbing.

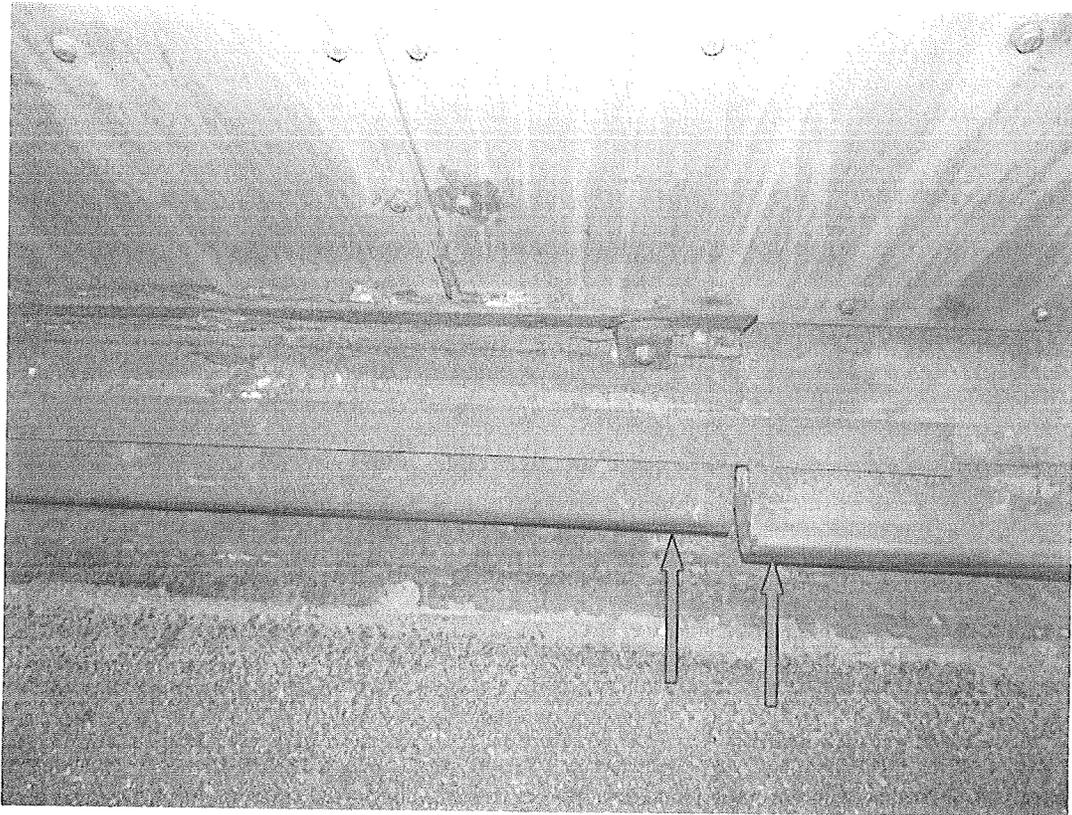


Photo 2 South Tunnel – Roadway – Station 83+55 – Approximate 1 ½" offset between unsecured curb section and adjacent curb.

