

SUMMARY REPORT
ANTELOPE VALLEY BRIDGES INVESTIGATION

I. INTRODUCTION

On the 4th of January a piece of concrete fell off of the underside of the “O” Street Bridge causing portions of the trails in Union Plaza to be closed. The closure of the trail eventually led to a press conference with Mayor Chris Beutler questioning what caused the damage, seeking proposed solutions to reopen the trail and ultimately identify the responsible parties for implementing the repairs. An article was published in the Lincoln Journal Star on January 6th which brought the entire matter to the attention of both NDOR and FHWA.

Here is a chronological listing of events that have occurred to date and documented by the City of Lincoln/JAVA:

January 4, 2011

A piece of concrete approximately 18 inches in diameter fell off the underside of the O Street Bridge. The trails in Union Plaza from N Street to Q Street were closed due to the safety risk to the public.

January 5&6, 2011

City of Lincoln/JAVA asked Commonwealth Electric and Watts Electric Company blow-out the electrical conduits for the bollard lights on the bridges. WATTS Electric blew out bollard conduits on N, P, Q, Vine, Y and Military. Commonwealth Electric blew out bollard conduits on O Street. Both contractors reported finding water in the conduit sections.

January 6, 2011

Parsons Brinckerhoff (PB) inspected the N, O, P, and Q street bridge sections over the trail system and determined that no additional delaminated areas had formed since initial inspections in December.

Lincoln City Mayor, Chris Beutler held a press conference and the Lincoln Journal Star printed an article.

January 7, 2011

FHWA contacted NDOR to determine the level of risk and exposure to both agencies as a result of press release.

January 8, 2011

NDOR contacted the City of Lincoln and requested a tri-party meeting between FHWA, NDOR, and the City to discuss the bridges.

January 10, 2011

Meeting held between City of Lincoln, NDOR, and FHWA. NDOR volunteered to lead an independent investigation into the cause for the spontaneous concrete spalling on the various Antelope Valley bridges.

January 11, 2011

Meeting held between JAVA, City of Lincoln, NDOR, Parsons Brinckerhoff, Olsson Associates, United Contractors, Hawkins Construction Company and WATTS Electric to review the conditions at that time. Contractors asked to review site and remove concrete that is delaminated, but still attached to the undersides,

January 27, 2011

United contractors were at the O Street Bridge removing delaminated concrete. Hawkins Construction was at P and Q street Bridges removing delaminated concrete.

January 28, 2011

The trails were reopened.

February 9, 2011

Kick Off Meeting was held for the independent review team to discuss bridge plans, specifications, and construction methodology to familiarize the team with the projects before conducting a formal field investigation.

February 14, 2011

Independent Investigation Team conducts field review on N, O, P, and Q street bridges.

March 21, 2011

Independent Investigation Team releases the final report documenting findings from the field investigation and associated research to determine causes for cracking and spalling of concrete.

April 14, 2011

FHWA, NDOR, and the City of Lincoln met to discuss the Team's report and its findings. The City was informed that NDOR would be preparing this summary report to document the findings and outline recommended actions that need to be taken.

II. INITIAL RESPONSE BY CITY OF LINCOLN

In order to reopen the trail, the City of Lincoln working with the Joint Antelope Valley Authority (JAVA), had PB (Parsons Brinkerhoff) remove delaminated areas on the N, O, P, and Q street bridges where these were over the trail and could be reached without lift equipments.

Additionally PB was tasked with continually monitoring the bridges for the development of any new suspicious areas. Once the Contractors had removed all delaminated concrete from O,P,Q street bridges, it was determined that the structures no longer posed a risk to the public health and safety, the trails were reopened (January 28th, 2011). The City of Lincoln also contacted the construction contractors to get information on potential repair methods and cost estimates.

III. FHWA RESPONSE

PB and their subconsultants designed the bridges, inspected the construction of the bridges (except N Street and work on O, P, Q, Vine and Y which was part of USACE (US Army Corps Of Engineers) Antelope Creek phase 3) and provided overall project management services for the Antelope Valley project .The US Army Corps of Engineers designed the flood control elements of the Antelope Valley project, provided quality assurance (QA) on all phases of the Federal Flood Control project including the N Street Bridge and other work on O, P, Q,Vine and y, and provided overall management for the flood control elements of the Antelope Valley project. After the initial sections of concrete fell, the City of Lincoln and JAVA retained PB to do the inspections of the undersides of the bridges.

While it does appear that the City of Lincoln was taking proactive measures to protect the safety of the public and to determine what was causing the concrete to spall off of the bridges. FHWA requested that an independent investigation be conducted. NDOR agreed to serve as the investigator and conduct the independent investigation to determine the causes leading to the spalling of the concrete. Public funds were expended in the construction of the bridges and the independent investigation team was formed to determine the potential problems and who/what was responsible. Ultimately the team's recommendations would be provided to help the City of Lincoln and JAVA assess accountability and identify who is responsible to make the permanent repairs.

IV. NDOR INDEPENDENT REVIEW

NDOR took the lead in assembling a team to conduct an independent review. The team consisted of:

Fouad Jaber	Bridge Division
Jim England	Construction Division - District 1
Ernest Murillo	State Representative - District 1

Kris Humphrey City of Lincoln
David Mraz FHWA

The team also consulted with Wally Heyen and Tim Krason from the NDOR Materials and Research Division and Ernie Voss from the NDOR Lighting Section.

The team met on February 9th to discuss the purpose of the review and to gather information to familiarize themselves with project. It was decided that the team concentrate on the following four bridges “N”, “O”, “P” and “Q” which were the exhibiting the greatest amount of delamination. All of the structures were cast in place, slab bridges, and post tensioned (transversely and longitudinally).

Below is a list of the topics prioritized based upon importance perceived by the investigation team:

1) Electrical Conduit

a. Findings

- i. No electrical conduit drainage was installed even though it was required as part of the special provisions.
- ii. Water in amounts above and beyond normal condensation, was found inside the electrical conduits, indicating possible infiltration during construction. Or water seeped into the broken seal around the light fixture on the top of the concrete bollard and leaked into the conduit
- iii. Everywhere spalling locations were identified; there was evidence of a coupling in the electrical conduit.

b. Recommendations

- i. It needs to be determined if water is still getting into the conduits and how it got into the conduits.
- ii. It needs to be determined if the conduit couplings are still sealed.
- iii. Drains have to be installed as stated in special provisions.

2) Delamination Areas on Underside of Bridges

a. Findings

- i. Significant areas of delaminated concrete occurred underneath the electrical conduit and in locations of the conduit couplings.

b. Recommendations

- i. Concrete needs to be sounded underside of the deck to determine if there are additional areas of delaminated concrete that need to be removed and repaired.
- ii. All delaminated areas have to be repaired.

3) Areas of poor Quality Assurance/Quality Control

a. Findings

- i. Several areas of poorly consolidated / poorly vibrated concrete and honeycombs in both the bridge deck and substructures. This is not in compliance with NDOR Standard Specification 704.03.
 - ii. Areas were found that clearly show contamination in the concrete. This is not in compliance with NDOR Standard Specification 704.03
 - b. Recommendations
 - i. Finish the surface according to specifications.
 - ii. Need to sound the concrete to determine the structural adequacy of the concrete. Repair and replace as necessary.
- 4) Damage to Underside of Bridges (Scarring)
 - a. Findings
 - i. There is evidence of scarring from mechanized equipment (tooth marks) on the underside of the bridge deck and edge of the deck possible due to removal of the waste slab (bond breaker was placed between the waste slab and bottom of the bridge to ease the waste slab removal)
 - b. Recommendations
 - i. Need to grind smooth and/or patch as necessary.
- 5) Concrete staining over exposed rebar and contaminated concrete
 - a. Findings
 - i. There is clear evidence that show staining over previous spalled areas. This is not in compliance with the surface preparation specifications as stated in special provision.
 - b. Recommendations
 - i. Need to patch and repair the deck per the specifications and then re-stain as necessary.
- 6) Roadway Expansion Joints at approach slabs
 - a. Findings
 - i. The material in the roadway expansion joints is not functioning correctly.
 - b. Recommendations
 - i. Need to re-install.
- 7) Water Ponding
 - a. Findings
 - i. Evidence of water ponding on the “P” Street Bridge deck by the concrete rail (NW side). It appears that at least portions of the deck did not comply with NDOR Standard Specifications 706.03.
 - b. Recommendations

- i. Need to determine the magnitude of the ponding and the impact to the roadway traffic, especially during icy conditions.
- ii. Need to determine if there are potential corrective measures and if they are cost effective.

All of the above items together call into question the 75 year service life of the bridges. The investigation team concluded that the structural integrity of the bridges were not compromised, but if left untreated service life of the structures could be significantly reduced.

V. NEXT STEPS

The City of Lincoln and JAVA need to review the above findings and conduct additional investigations to determine the exact causes that resulted in damage to the bridges. In some cases specialized equipment may be necessary to determine the extent of the damage. At a minimum additional monitoring of the structure will need to continue until repairs have been made. The City of Lincoln and JAVA need to take the appropriate corrective actions to ensure that the 75 year service life of the bridge has not been compromised and to public funds were used appropriately.

Even though the finding above were for the 4 bridges (N, O, P and Q) the team evaluated ,the City of Lincoln and JAVA need to evaluate the findings on the additional 3 bridges (Vine, Military and Y) total of 7 structures to ensure that corrective actions are taken on all structures. Additionally the City of Lincoln needs to review all upcoming projects to ensure that these problems with the conduit are not repeated again.

The City of Lincoln and JAVA need to respond to these finding and recommendations within the next 60 days. A time extension may be granted if specialized equipment and inspection services require additional time, provided the acquisition there of starts within the next 30 days.