2013 Monitoring Report for structures with determination of
'May Affect, is Likely to Adversely Affect'
the Topeka shiner

Introduction:

RPM four in the *2008 Programmatic Biological Opinion* refers to the monitoring of all replaced structures found to "Adversely Affect" Topeka shiners. The Monitoring Program Plan "***South Dakota Fish Passage Monitoring Protocol for Projects Regulated by the 2008 Programmatic Biological Opinion: Stream Crossing Projects Administered/Funded by the South Dakota Department of Transportation and the Federal Highway Administration***" was completed and approved by FWS, FHWA, and SDDOT in July, 2012. After approval of the Monitoring Program Plan, representatives from FWS, FHWA, and SDDOT continued to discuss and revise data collection methods and guidelines. In October 2012, this group agreed upon a set of data collection guidelines and a '***SDDOT Fish Passage Assessment Work Sheet***' for use in 2012.

Monitoring:

Monitoring of 34 structures with a determination of 'May Affect, Likely to Adversely Affect' Topeka shiners, which were constructed 2009 – 2011, was completed in November 2012. As indicated in the Monitoring Plan, the FWS, FHWA, and SDDOT met on April 11, 2013 to review findings from the monitoring report for 2012. During this annual meeting the group also evaluated effectiveness of the data being collected on the '*SDDOT Fish Passage Assessment Work Sheet*'. Revisions to sampling methods, and

structures of concern were discussed. It was determined that measuring stream velocities at bridge sites was no longer necessary. Measurements recorded at culverts and pipes would remain the same. The group also determined that eight structures should be re-monitored in 2013. Individual 2012 *SDDOT Fish Passage Assessment Work Sheet*s for these eight structures are included within this report, for comparison to the 2013 individual *SDDOT Fish Passage Assessment Work Sheet*s for these structures.

2013 Monitoring:

In June and July 2013, 21 structures completed in 2012 with a determination of 'May Affect, Likely to Adversely Affect' Topeka shiners were monitored. In addition, eight structures were monitored for a second consecutive year, due to concerns raised at the April 2013 monitoring report review meeting. As a condition of the Monitoring Plan, the monitoring report for 2013 is included with the *Annual Compliance Report* (Appendix IV). Within one month of distribution of the *Annual Compliance Report* (or other time agreed to by all parties), the FWS, FHWA, and SDDOT will meet to review the 2013 monitoring report findings. Revisions will be discussed and implemented as needed to meet the terms and conditions of the 2008 Biological Opinion.

Two of the 21 new structures monitored were bridges, eight were box culverts, five were box or pipe extensions and repairs, and six were bridges involving scour protection projects. Of the eight structures re-monitored from the prior year (November 2012), four involved box culvert replacements, one involved a box culvert extension, and three included new bridges (Table 1). After re-monitoring in 2013, it was determined

that fish passage was definitely compromised at structure 40-180-094 in Lake County. Excess riprap was removed in November 2013 as a corrective measure.

Due to a second year of dry conditions, there were several structures where water levels and/or stream velocities were so low that we were unable to record velocities at structures. As a result, we are considering moving future monitoring periods to earlier in June.

Table 1. Stream crossing projects where monitoring was conducted in 2013. All projects listed were assigned a determination of "May Affect, Likely to Adversely Affect" Topeka shiners. Eight projects were initially monitored in 2012, but were re-monitored in 2013 due to concerns from the April 11, 2013 monitoring report meeting.

PCN	County	Project Number	Structure Number	Structure Type	Stream	Annual Report Year	Potential Issues
01DU	McCook	BRF 6344(15)	44-006-170	Bridge	Wolf Creek	2012	
00ZH	Lake/Moody	BRF 6320(04)	40-239-030	Bridge	Battle Creek	2012	
00KS	Clay	CS 8014(30)	14-141-070	Box Culvert	Baptist Creek	2012	
01DS	Aurora	BRF 6169(05)	02-040-063	Box Culvert	Unnamed creek	2012	No velocities were recorded
5551	Lincoln	BRF 6116(2)	42-026-260	Box Culvert	Blind Creek	2012	No velocities were recorded
01P0	Davison	P 6042(02)	18-042-210	Box Culvert	Trib. to Twelve Mile Creek	2012	Possible fish passage
01D3	Hutchinson	P 0025(58)07	34-202-187	Box Culvert	S. Branch Lonetree Creek	2012	No velocities were recorded
01D3	Bon Homme	P 0025(58)07	05-230-027	Box Culvert	Trib. to Dawson Creek	2012	
026L	Lincoln	P 0017(07)43	42-020-025	Box Culvert	Trib. to Beaver Creek	2012	No velocities were recorded
6162	Hutchinson	P-BRF 0018(134)394	34-268-180	Box Culvert	Trib. to James River	2012	No velocities were recorded
H034	Minnehaha	P-PH 0038(27)348	50-161-170	Box Extension	Trib. to Willow Creek	2012	No velocities were recorded
H034	Minnehaha	P-PH 0038(27)348	50-115-164	Box Extension	Trib. to Skunk Creek	2012	No velocities were recorded
0243	Turner	P 019(33)31	None	Pipe Extension	Trib. to Frog Creek	2012	No velocities were recorded
0243	Turner	P 019(33)31	None	Pipe Extension	Frog Creek	2012	No velocities were recorded
000U	Grant	IM 0297(33)193	None	RCP Repair	Trib. to Soo Creek	2012	
000U	Grant	IM 0297(33)193	None	Scour Repair	Trib. to Indian River	2012	
00L8	Beadle	NH 001(156)357	03-359-180	Scour Protection	Pearl Creek	2012	
00L8	Beadle	NH 001(156)357	03-393-180	Scour Protection	Middle Pearl Creek	2012	
00L4	Brown	NH 0281(81)187	07-100-342	Scour Protection	Foot Creek	2012	
029X	Hanson	BRF 0042(39)313	31-094-210	Scour Protection	Bloom Creek	2012	
029X	Hanson	BRF 0042(39)313	31-103-210	Scour Protection	Bloom Creek	2012	
6795	Miner	BRF 6242(07)	**49-054-220***	Box Culvert	Pooley Creek	2009	
6778	Brookings	BRO 8006(46)	**06-290-177***	Box Culvert	Medary Creek	2009	No velocities were recorded
00RV	Codington	EM-P 4411(01)	**15-202-190***	Bridge	Willow Creek	2010	Possible fish passage
H092	Deuel	BRO 8020(04)	**20-105-180***	Bridge	Trib. to Hidewood Creek	2009	
033U	Hamlin	P0028(33)334	**29-115-150***	Box Culvert	Trib. to Dolph Creek	2011	
00Q9	Hutchinson	P 0018(135)390	**34-293-180***	Box Extension	Trib. to James River	2009	No velocities were recorded
00JT	Lake	BRF 6321(05)	**40-180-094***	Box Culvert	Battle Creek	2009	
6582	Lincoln	BRO 8042(28)	**42-050-199***	Bridge	Saddle Creek	2010	

* Structures initially monitored in 2012, but re-monitored in 2013.

Appendix I: South Dakota Fish Passage Monitoring Protocol

South Dakota Fish Passage Monitoring Protocol for Projects Regulated by the 2008 Programmatic Biological Opinion: Stream Crossing Projects Administered/Funded by the South Dakota Department of Transportation and the Federal Highway Administration

Office of Project Development-Environmental
South Dakota Department of Transportation
2012

Submitted to:

United States Fish and Wildlife Service
Mountain-Prairie Region 6
South Dakota Ecological Services Office
Pierre, SD

Background and Purpose:

Construction of bridges and culverts by South Dakota Department of Transportation (SDDOT) and the Federal Highway Administration (FHWA) have and will continue to affect the streams and rivers of South Dakota. In 2008, SDDOT, FHWA, and the US Fish and Wildlife Service (FWS) developed and implemented a Programmatic Biological Opinion (Opinion) that evaluates potential impacts of stream-crossing projects on all federally listed Threatened and Endangered species in South Dakota. The Opinion specifically addresses adverse impacts to the Topeka Shiner (*Notropis topeka)* and the American Burying Beetle (*Nicrophorus americanus),* identifying nondiscretionary 'Reasonable and Prudent Measures' (RPMs) and their implementing Terms and Conditions (TCs) that, if followed, ensure the Incidental Take Statement issued with the Opinion remains valid and that any take resulting from stream-crossing projects is exempt under section 7(o)(2) of the Endangered Species Act. The RPMs and TCs relative to the Topeka Shiner are intended to minimize take primarily by preventing decreases in Topeka Shiner population and their occupied range in South Dakota.

Monitoring and reporting is required in the Opinion to ensure the RPMs and TCs for the Topeka shiner are appropriate and effective, and the level of take exempt by the Opinion is not exceeded. Development of a monitoring program is required under RPM 4 of the Opinion. The purpose of this monitoring program is to verify that SDDOT structures, as designed, constructed, and maintained are not influencing stream geomorphology or prohibiting fish movement.

The monitoring, to include field work and observations, will be done by SDDOT Environmental staff scientists and biologists, consultants, or temporary employees. Consultants and temporary employees will be trained by qualified SDDOT Environmental staff to ensure consistency in the assessments.

Fish Passage and Stream Crossing Design:

During project scoping, the Project Identification Coordinators (PICs) in cooperation with the Environmental Staff will identify structures where fish passage is required based on the Opinion. These structures are located in the eastern part of South Dakota where Topeka Shiners occur. Anomalous structures may also be included if it is determined that the structures may affect Topeka shiners. Anomalous structures may include features such as rock check dams to aid in fish passage or fish ladders when unusual methodology is determined necessary for fish passage. The USFWS will be notified if there are structures outside the main scope of this protocol.

TCs within the Opinion require that stream crossings be designed in a manner that facilitates development of normal channel features within the crossing. The SDDOT hydraulic design procedures have been established to meet or exceed the TCs of the BO. These procedures and definitions are documented in the South Dakota Drainage Manual hyperlinked at: http://sddot.com/business/design/forms/drainage/Default.aspx. Chapter 10 and sections 10.3.4.6 titled "Fish Passage" and Appendix 10.A titled "Fish Passage Guidelines" include additional design parameters used for fish passage.

The hydraulic design procedures for fish passage reference FHWA's Aquatic Organism Passage Design Guidelines for Roadway Culverts, Hydraulic Engineering Circular No.

26 (HEC 26). SDDOT design procedures and the USACE 404 nationwide permit further require culverts be sunk below the stream flow line to allow development of natural channel features within the culvert and to prevent outlet perching that may lead to restricted fish movement.

Specifically, the natural channel forming process is to be maintained by sizing stream crossings according to bankfull (Q_2) channel size, streambed slope, and channel complexity. The floor elevation of culverts is to be set below flow line of the stream as appropriate to facilitate the development of normal channel features within the culvert. At a minimum the culvert floor elevation will be set 1 foot below the stream flow line but not less than the adjustment profile line. Depth of counter sinking will be determined through design analysis tools and programs as discussed in the hydraulics design procedures. The culvert width will be at least 1.2 times the Q_2 channel width unless special circumstances dictate otherwise and shall be estimated using project survey data and peak flow estimation models or other models as appropriate. Finally, any installed diversion channels must be at grade with the stream bed with no fish passage obstructions.

The bankfull channel can generally be defined as the Q2 stream channel or the elevation at which stream flow spills into the floodplain, whichever is less. In most cases, culverts will be sized much greater than the bankfull channel based solely on hydraulic criteria. In some rare cases, culverts may constrict the bankfull channel, especially if the culvert is designed for a very low flood recurrence frequency or the culvert is being placed in a watershed with a very large drainage area (i.e., > 100 sq mi). In some special cases, an exemption to the minimum culvert width may be allowed if strong evidence is available to suggest that fish passage will not be adversely impacted due to the width of the culvert. The USFWS will be notified if there are structures outside the main scope of this protocol and these projects will be processed through individual formal consultation. While exemptions do not fall under the terms and conditions of the BO, these structures will be monitored under this monitoring plan.

Site Inspections:

Monitoring in the late summer or fall will take place to adequately assess channel and streambed conditions resulting from past seasonal flows. Low flows of late summer and fall provide the best opportunity to access the site, evaluate channel and streambed conditions, take photos, and assess how the structure is functioning with regards to fish passage during low flows. Monitoring will be completed after the first high flow season following project completion and in the third and fifth year after construction[1]. For example, a structure built in the summer of 2012 will be assessed in the fall of 2013, 2015 and finally 2017. In order to limit stream degradation and harm to fish during these assessments, stream disturbance will be limited to the greatest extent practicable.

The SDDOT will make a reasonable effort to perform surveys for each structure appended to the 2008 B.O. in accordance with this monitoring protocol however; the FWS recognizes there may be conditions and limitations that may preclude completion of surveys at each site. It is also noted that structures built between 2009 and 2011 have not been reviewed to date (pending an approved monitoring protocol). These

[1] Opinion, p.46 RPMs/TCs B-1, Monitoring will be conducted on an annual or biennial basis

structures will be given initial priority and the first assessment observations of these structures will be compared to the original design drawings and NBI photos (if available). The inspection and findings documentation will be recorded on the 'SDDOT Fish Passage Assessment' form (See Attachment A).

The 'SDDOT Fish Passage Assessment' form includes the following:

General Project Information: This information will include specific project information, year constructed, county, structure location, stream name, date of assessment, and name of person completing the assessment.

- **Structure Type**: The structure type and size will be documented.

- **Structure Shape Comment:** The structure shape will be recorded using descriptions defined in the data sheet. The intent of recording structure shapes is to document whether the stream transition to and from the structure maintains and promotes fish passage. Terms used to describe the applicable outlet configuration are as follows:

  Inlet Type

  Projecting: The barrel simply extends beyond the embankment. No additional support is used.

  Wing wall: A wing wall is a retaining wall placed adjacent to a culvert to retain fill and to a lesser extent direct water.

  Head wall: Used along with wing walls to retain the fill, resist scour and improve the hydraulic capacity of the culvert

  Apron: Aprons are usually made of concrete or riprap and installed to prevent or reduce scour. If an apron exists, a brief description will be provided in the observation section, including any low flow concentration structures.

  Other: Could be Energy dissipaters, Bridge, etc...

  Outlet Type

  At Stream Grade: No perched condition at the outlet exists

  Cascade over Riprap: Culvert flows onto either a rough riprap surface causing turbulence or a riprap / bedrock surface where flow depth decreases as it exits the culvert. If this condition exists, observation will be made to document whether or not this condition may prevent fish passage.

  Free fall into Pool: Culvert outlet is perched directly over a pool, requires migrating fish to jump into culvert from outlet pool. If this condition exists, observation will be made to document whether or not this condition may prevent fish passage.

Free fall onto riprap: Culvert outlet is perched and exiting water plunges onto riprap or bedrock with no pool. If this condition exists, observation will be made to document whether or not this condition may prevent fish passage.
Outlet apron: Aprons are usually made of concrete or riprap and installed to prevent or reduce scour. If an apron exists, provide a brief description in the observation section, including any low flow concentration structures.

- **Observations:**
  1. *The structure is installed generally in accordance with plans (width, depth, location, size, countersunk, etc…).* This question will be answered during the first assessment only.
  2. *Overall structure width is wider than the average stream width upstream and downstream.* This measurement will be compared to background information from the hydraulic data and cross sections developed and used during design. If the background information does not exist, the stream width will be determined during the 1st assessment by taking an average of 3 measurements upstream and 3 measurements downstream.
  3. *Natural streambed material exists throughout structure (i.e. structure remains counter sunk approximately 1 foot).*
  4. *Stream channel is free of scour activity that may impede fish passage.*
  5. *A natural low flow channel exists through the structure or <u>if not</u> the streambed surface within the structure simulate the streambed beyond the structure inlet and outlet similar to design conditions.*
  6. *Steam is free of channelizing along the surface of the structure.* Presence of a Thalweg allows the stream to flow in a narrower defined low flow channel within the stream which is suitable for fish passage and not along the surface of the structure. If a Thalweg is not present, a wider shallower stream may impede fish movement due to limited depths, elevated water temperatures, and/or other conditions that are not ideal for fish passage.
  7. *Up & downstream channel appears stable (no apparent erosion).*
  8. *Vegetation is/has re-established on the stream banks within the construction area.*

- **Stream Cross-Sections:** To evaluate whether the SDDOT structures are performing as intended, stream cross-sections will be taken perpendicular to the stream at the following locations:

  3 cross sections will be taken at the following locations to determine if a Thalweg exists within the structure (see Figure 1): 1) within 10 feet of the structure inlet, 2) within 10 feet of the structure outlet, and 3) inside the structure (if accessible). Visual observations will be used instead of the 3rd cross section if this location is not be accessible (i.e. structure is too small to access with survey equipment, soil conditions are not stable, water volumes are excessive).

  If a Thalweg does not exist within the structure (the area is flat or there is only a slight depression with no true defined low flow channel), a 4th cross section will be taken downstream of the structure at a distance of approximately 7 times the width of the stream (refer to Figure 2) to determine whether the structure appears to be changing the stream profile.

If a Thalweg does not exist within the structure or downstream of the structure, a 5th cross section will be taken upstream of the structure at approximately 7 times the width of the stream (refer to Figure 3) to determine whether the structure appears to be changing the stream profile.
Analysis of cross sections taken will be used as follows and findings will be documented in the report as shown below:

1. If a Thalweg exists within the structure (cross sections 1, 2, and 3), no additional cross-sections will be taken and the assessment will document the structure is performing as intended. Else…
2. If a Thalweg does not exist within the structure (cross sections 1, 2, and 3) and does not exist downstream (cross section 4), no additional cross-sections will be taken. The assessment will document "no further conclusion can be made at this time as fish restriction (if occurring) is below the structure". Else…
3. If a Thalweg does not exist upstream, exists downstream but does not exist within the structure the report will document "the structure is no more of a barrier than the stream upstream and no further conclusion can be made at this time".
4. If a Thalweg exists upstream and downstream of the structure but does not exist within the structure a detailed survey and correction plan will be required.

- **Stream Velocity:** A natural earthen and/or granular stream bank edge is a good indicator the stream is acting independent of the structure. If the edge of the stream is in contact with the structure during Q_2 or lower conditions, material within the structure may have shifted or water velocities, turbulence, and friction along the structure walls may have an effect on fish movement.

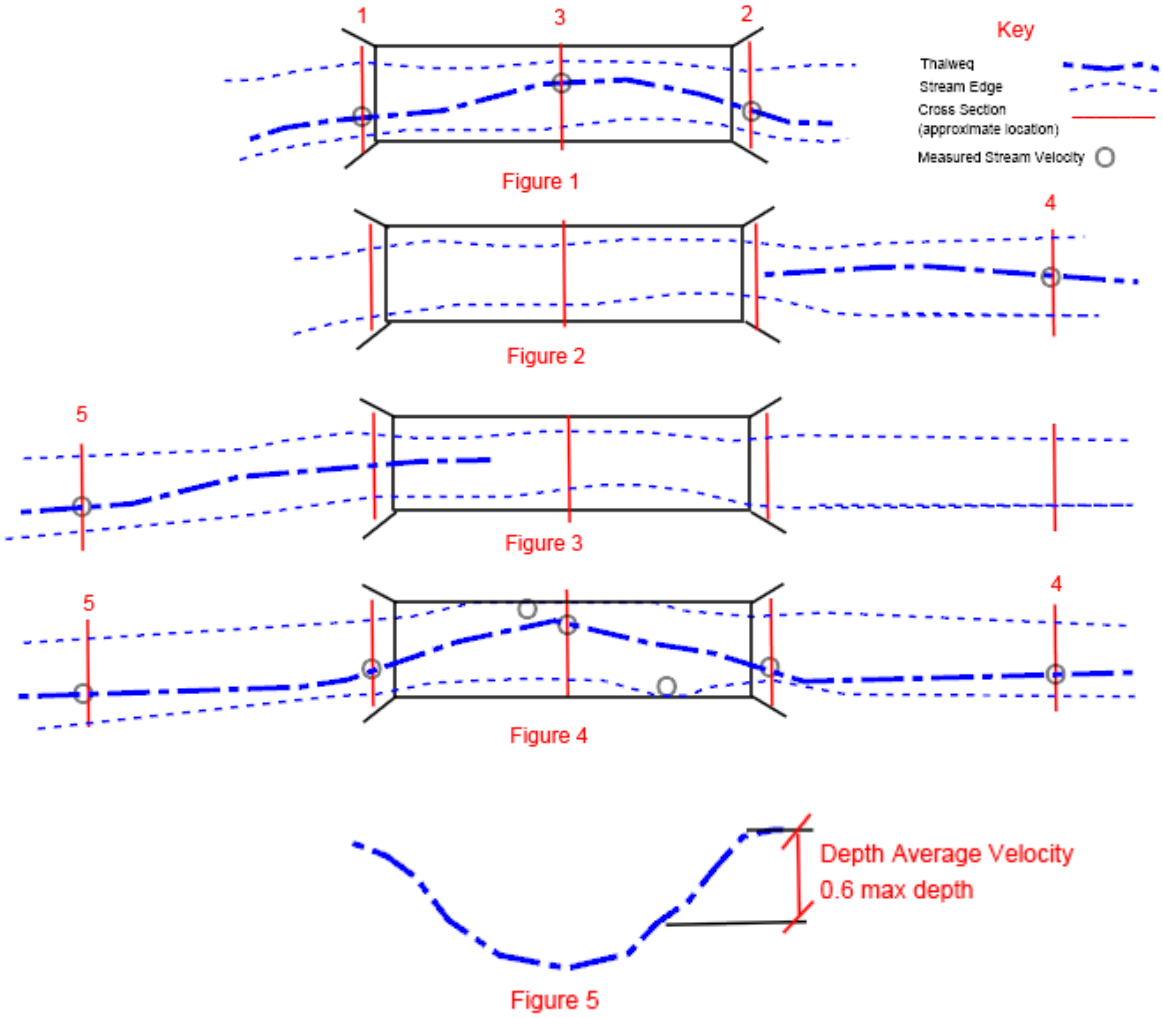
  If the stream is in contact with one or both sides of the structure during the time of the assessment, the stream bed depth and reveal along the edges shall be evaluated to determine how the velocities compares to the natural stream edge outside the structure. The depth average velocity measured at a depth of 0.6 times the depth of the stream at the thalweg (see Figure 5) will be recorded and compared to the depth average velocity a distance approximately 7 times the width of the stream upstream and downstream of the structure within the Thalweg (see Figures 4) if a Thalweg exists.

  Analysis of stream velocities taken will be used as follows and documented in the report findings.

  1. If the stream is dry or water velocities are beyond the equipment's specified accuracy limits (i.e. <0.5 ft/s for March McBirney) at the locations where velocities are to be taken, the condition will be noted and no velocities will be taken. Else…
  2. If the depth average velocities within the structure are at or below those recorded upstream and downstream, the assessment will document the structure is not considered to be impeding fish passage. Else…
  3. If the depth average velocities within the structure are higher than those recorded upstream and downstream the structure <u>and</u> exceed the sustained swimming capabilities of Topeka shiner (0.9 ft./s -1.31ft./s. with burst swimming observed in water velocities of 1.31ft./s-2.46 ft./s (Adams 2000)[2]), the structure may be

[2] S. Reid Adams, Jan Jeffrey Hoover and K. Jack Kilgore 2000. Swimming Performance of the Topeka Shiner (Notropis topeka) an Endangered Midwestern Minnow. *American Midland Naturalist* Vol. 144, No. 1 pp. 178-186 Published by the University of Notre Dame

influencing the stream. A more detailed survey may be required. Further assessment and the need for a correction plan will be discussed with the FWS.



- **Comments**: Unique observations that have or may impact stream morphology or fish passage in the future such as widening of the channel, forming/changing pool locations/sizes, bank erosion, new deposits, isolated unusual channelization within the streambed, etc... will be noted. Changes to channel widths on structures designed narrower than the stream channel that were processed by Formal Consultation will be discussed.

- **Photographs:** A minimum of 2 photographs will be taken in the direction of the structure inlet and 2 in the direction of the structure outlet within a distance of 7 times the width of the structure. Photograph locations will be documented and recorded (i.e. GPS latitude and longitude coordinates) such that photographs taken during subsequent inspections will be from the same location and direction. The intent of these photographs is to document whether 1) the stream channel width, location, and/or depth is changing over time and 2) whether changes in the channel may

obstruct fish passage at the site. It is most important to select locations that capture the intended need for the photograph therefore locations shall be selected both upstream and downstream that are representative of: undisturbed channel beyond the construction area, disturbed channel, and the structure.

Assessment, Notifications, Corrective Actions:

Upon completion of the site inspection and assessment, each report will be filed with the project records and in an electronic Fish Passage file folder.

If it is determined a structure is not passable to fish, a report will be submitted to the FWS and FHWA within two weeks and a corrective action plan will be developed in coordination with FWS and FHWA. Where fish passage has been obstructed by debris or some other condition not related to the design or construction, the SDDOT Environmental Staff will coordinate with Operations to have the obstruction removed within three months of the inspection. Depending upon seasonal conditions, this timeframe may need to be extended. If necessary, extensions will be coordinated with FWS. Obstructions identified and corrected by the Area Offices, through normal roadway maintenance inspections, will be reported to the Environmental Office for further review and corrective actions if needed. Documentation of corrective actions will be made available to FWS within two weeks of completion. Any corrective actions taken will be documented in the annual report and a corrective action database will be maintained by the Environmental Office.

Annual Reporting:

Per RPM#6 in the Opinion, a hard copy of the annual report will be provided to the FWS by March 1 of each year that reviews activities conducted under the Opinion. In an effort to disseminate monitoring findings in a timely manner, monitoring reports will be completed, included, and disseminated with the Annual Report. These reports will also be available by request as well as online to the FWS, FHWA and any other interested entities at the SDDOT website:
http://www.sddot.com/business/environmental/endangered/Default.aspx
Within 1 month of distribution of the annual report (or other agreed time agreed to by all parties), the FWS, FHWA and SDDOT will meet to review report findings. If no corrective actions have been required within the first 5 years of monitoring, the need for further monitoring by site will be determined at this meeting. If systemic issues are identified, a corrective action plan will be developed and the group will determine whether any specific sites will be monitored beyond 5 years. During the annual meeting the group will also evaluate effectiveness of the data being collected on the 'SDDOT Fish Passage Assessment Work Sheet'. Revisions will be discussed and implemented as needed to meet the terms and conditions of the BO.

Appendix II

Individual *Fish Passage Assessment Work Sheets* with photographs for structures monitored in 2013 that impacted the Topeka shiner