



Illinois Department of Transportation

2300 South Dirksen Parkway / Springfield, Illinois / 62764

July 19, 2019

CIRCULAR LETTER 2019-14

NBIP INSPECTION PROCEDURES – METRIC 15 – BRIDGE FILES – CHANNEL CROSS-SECTIONS FOR STRUCTURES

COUNTY ENGINEERS / SUPERINTENDENTS OF HIGHWAYS
MUNICIPAL ENGINEERS / DIRECTORS OF PUBLIC WORKS / MAYORS
METROPOLITAN PLANNING ORGANIZATIONS – DIRECTORS
TOWNSHIP HIGHWAY COMMISSIONERS
CONSULTING ENGINEERS

The purpose of this Circular Letter is to provide information to Local Public Agencies in an effort to improve the State of Illinois compliance with the National Bridge Inspection Program (NBIP).

A recent FHWA review of the bridge inspection program in the State revealed deficiencies in our program that must be addressed.

To help the Department fulfill the requirements of the FHWA 23 Metrics of the National Bridge Inspection Program (NBIP), please review the attached July 17, 2019 NBI Subscription Service Announcement regarding the subject Metric 15 and the need for channel cross sections at structures. Please incorporate this into your agency's bridge inspection program as soon as possible.

References to the Structural Services Manual may be found at <http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Bridges/Inspection/Structural%20Services%20Manual.pdf>. Please also consider subscribing to the IDOT Bureau of Bridges and Structures' NBI Subscription Service at subscribe-dot-nbi@lists.illinois.gov.

Questions regarding this circular letter may be directed to the Bridge Management and Inspection Unit by telephone at (217) 785-4537 or by email at DOT.BBS.BridgeMgmt@illinois.gov.

Sincerely,

Handwritten signature of Stephane B. Seck-Birhame in blue ink.

Stephane B. Seck-Birhame, P.E., PTOE
Acting Engineer of Local Roads and Streets

Handwritten signature of D. Carl Puzey in blue ink.

D. Carl Puzey, P.E., S.E.
Engineer of Bridges and Structures

JK/

cc: Dan Brydl, FHWA - Illinois Division
Mike Pedigo, Illinois Association of County Engineers
Jeff Scott, Illinois Municipal League
Bryan Smith, Township Officials of Illinois
Charlie Montgomery, Township Highway Commissioners of Illinois



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July 17, 2019

NBI Subscription Service Announcement 20190717

National Bridge Inspection Program (NBIP) Metric #15: Inspection Procedures – Bridge Files

The purpose of this NBI Subscription Service Announcement is to provide information to NBIS Program Managers, NBIS Team Leaders and others involved in the bridge inspection program of an effort to improve the State of Illinois' compliance with the NBIP.

A recent FHWA review of the bridge inspection program in the State revealed deficiencies with NBIP Metric 15 that must be addressed. Item #4 of NBI Subscription Service Announcement 20190430 provided initial notification regarding the submittal of channel cross-sections for structures over waterways. In addition, the announcement stated the development of a standard IDOT Form, with further guidance, was underway and would be distributed in the future. The guidance has been finalized and is included with this announcement. The standard IDOT Form is still under development and will be released at a later date.

Section 3.3.3.1 – Routine Inspections – Structures over Waterways of the *Structural Services Manual* will be revised to incorporate the following information. The *Structural Services Manual* may be found at <http://www.idot.illinois.gov/Assets/uploads/files/Doing-Business/Manuals-Guides-&-Handbooks/Highways/Bridges/Inspection/Structural%20Services%20Manual.pdf>.

Channel Cross-Section Documentation

Purpose: The most common cause of structure failure stems from the scouring of foundations. To document changes in the streambed elevations, stream channel cross-sections must be obtained at the structure fascias. Measurements from successive inspections may reveal channel migration and/or degradation, thus aiding in the identification and assessment of scour at the site. Photographs may also be considered to augment the documentation. Results from the channel cross-sections may provide an indication of the need to revisit ISIS Item 113 "Scour Critical Evaluation", and in some cases ISIS Item 60 "Substructure Condition".

Equipment: The following examples of equipment will allow personnel to obtain stream channel cross-sections at most structures: range pole; weighted measuring tape; laser measuring tool; hip/chest waders; small boat; sonar; writing instrument; paper and clipboard.

Procedures:

Channel Cross-Sections at Bridge Fascias

Channel cross-sections, along the upstream and downstream fascias, shall be taken along the entire bridge length using the following guidelines. Additional cross-sections may be appropriate after significant flood events.

1. All vertical measurements must be taken from a reference datum line on the bridge that is not likely to change over time. Examples are top of parapet/rail; top of curb/deck; and top or bottom of abutment/pier cap.
2. All channel cross-sections should be taken and plotted with the orientation looking downstream at both fascias of the bridge.
3. Substructure Unit should be labeled per the existing plans, if applicable, for consistency.
4. Vertical measurements must be taken at all substructure units. At abutments, measure where ground intersects the exposed face. At Piers/Intermediate Bents, measure at the centerline of the substructure unit.
5. Vertical measurements should be taken at regular longitudinal intervals in each span. The longitudinal interval can be a predetermined percentage of span length or at fixed points on the structure, such as side mounted rail posts.
6. Vertical measurements must be taken at: the beginning and end of a slope; beginning, low points, and end of a scour hole; edges of water; low streambed elevation and any other location(s) with a substantial change in elevation.
7. Vertical measurements should be taken, at a minimum, at the midpoint of a significant 'flat' area and the location(s) labeled.
8. Vertical measurements should be taken to the nearest one-half foot unless a scour hole is being measured. Scour hole measurements should be taken to the nearest tenth of a foot.
9. Horizontal measurements should be taken to the nearest foot.
10. If debris piles are present, suggest taking measurements at the ends of the scour hole and across the top of the debris pile to document the extent of the decreased structure opening.
11. If there is a set of twin bridges in close proximity, such as an interstate, and no appreciable difference in streambed elevation between the adjacent fascias, the measurements obtained from one fascia can be used for both bridges.
12. Additional channel cross-sections should be taken when conditions indicate significant changes from original construction or previous inspections. An elevation 'grid' may be established for tracking local scour around individual substructure units. Whether accomplished during Routine Inspection or by a Special Inspection, the condition of substructure units below the waterline and the streambed adjacent to those units must be determined to verify existing conditions do not compromise the safety of the bridge. This need for inspection applies to all bridges over water, including those which may have been designed to structurally accommodate an established scour depth determined by analysis. See *Structural Services Manual* Figure 3.4-2.
13. Inputting the vertical measurements obtained through the above steps into an Excel Spreadsheet is one way to produce a neat and legible Stream Channel Cross-Section. This also allows additional information to be easily added/graphed in the future.

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Channel Cross-Sections at Culverts

Channel cross-sections, along the inlet and outlet of the barrel openings, shall be taken along the entire culvert length using the following guidelines. Additional cross-sections may be appropriate after significant flood events.

1. All vertical measurements must be taken from a reference datum line on the culvert that is not likely to change over time. Examples are headwalls and the bottom of the top slab.
2. All channel cross-sections should be taken and plotted with the orientation looking downstream at both ends of the culvert.
3. Culvert barrels should be labeled consistently and if applicable, per the existing plans.
4. Vertical measurements must be taken at the inside face of all interior and exterior walls.
5. Vertical measurements should be taken at regular longitudinal intervals in each barrel. The longitudinal interval can be a predetermined percentage of the barrel clear span or at fixed points on the structure, such as headwall mounted rail posts.
6. Vertical measurements must be taken at: the beginning and end of a slope; beginning, low points, and end of a scour hole; edges of water; low streambed elevation and any other location(s) with a substantial change in elevation.
7. Vertical measurements should be taken, at a minimum, at the midpoint of a significant 'flat' area and the location(s) labeled.
8. Vertical measurements should be taken to the nearest one-half foot unless a scour hole is being measured. Scour hole measurements should be taken to the nearest tenth of a foot.
9. Horizontal measurements should be taken to the nearest foot.
10. If debris piles are present, suggest taking measurements at the ends of the scour hole and across the top of the debris pile to document the extent of the decreased structure opening.
11. Additional channel cross-sections should be taken when conditions indicate significant changes from original construction or previous inspections. An elevation 'grid' may be established for tracking local scour around the inlet and outlet of the barrel openings. Whether accomplished during Routine Inspection or by a Special Inspection, the condition of inlet and outlet barrel openings below the waterline and the streambed adjacent to those areas must be determined to verify existing conditions do not compromise the safety of the culvert. This need for inspection applies to all culverts over water, including those which may have been designed to structurally accommodate an established scour depth determined by analysis. See *Structural Services Manual* Figure 3.4-2.
12. Inputting the vertical measurements obtained through the above steps into an Excel Spreadsheet is one way to produce a neat and legible Stream Channel Cross-Section. This also allows additional information to be easily added/graphed in the future.
13. For culverts with an apron, vertical measurements should be taken at the end of the apron, with the top of apron as the reference datum.

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Channel Cross-Section Frequency

Channel cross-sections shall be taken on all structures located over a waterway. The frequency, as stated below, begins when the initial baseline channel cross-section is completed.

1. For structures meeting the 'Basic Submergence Criteria' outlined in the *Structural Services Manual* Section 3.3.4, an Underwater Inspection is required. The Underwater Inspection shall have a maximum interval of 60 months (5 years).
2. For new structures and those with minimal change to the streambed, channel cross-sections shall be recorded at a maximum interval equal to the structures In-Depth Inspection interval. Per *Structural Services Manual* Section 3.3.7, the In-Depth Inspection interval is a multiple of the Routine Inspection Interval.
 - a. Routine Inspection Interval = 12 months => In-Depth Inspection Interval = 48 months;
 - b. Routine Inspection Interval = 24 months => In-Depth Inspection Interval = 72 months;
 - c. Routine Inspection Interval = 48 months => In-Depth Inspection Interval = 96 months
3. The agency having maintenance responsibility of a structure may elect to record Channel Cross-Sections more frequently than required above.

Requirements: A copy of the most recent channel cross-section data/graphs/sketches, preferably in pdf format, must be submitted to the Bridge Management and Inspection Unit at the following email address: DOT.BBS.BridgeMgmt@illinois.gov. If channel cross-sections have not yet been completed, we suggest the information be obtained during the next Routine Inspection.

See attached examples of channel cross-sections. Channel Cross-Section Examples #2-#4 (Figures 10-12) are from the *Kentucky Bridge Inspection Procedure Manual*.

Questions regarding this NBI Subscription Service Announcement are to be directed to the Bridge Management and Inspection Unit by telephone at 217/785-4537 or by email at DOT.BBS.BridgeMgmt@illinois.gov.

Channel Cross-Section Example #1 – SN 093-0009

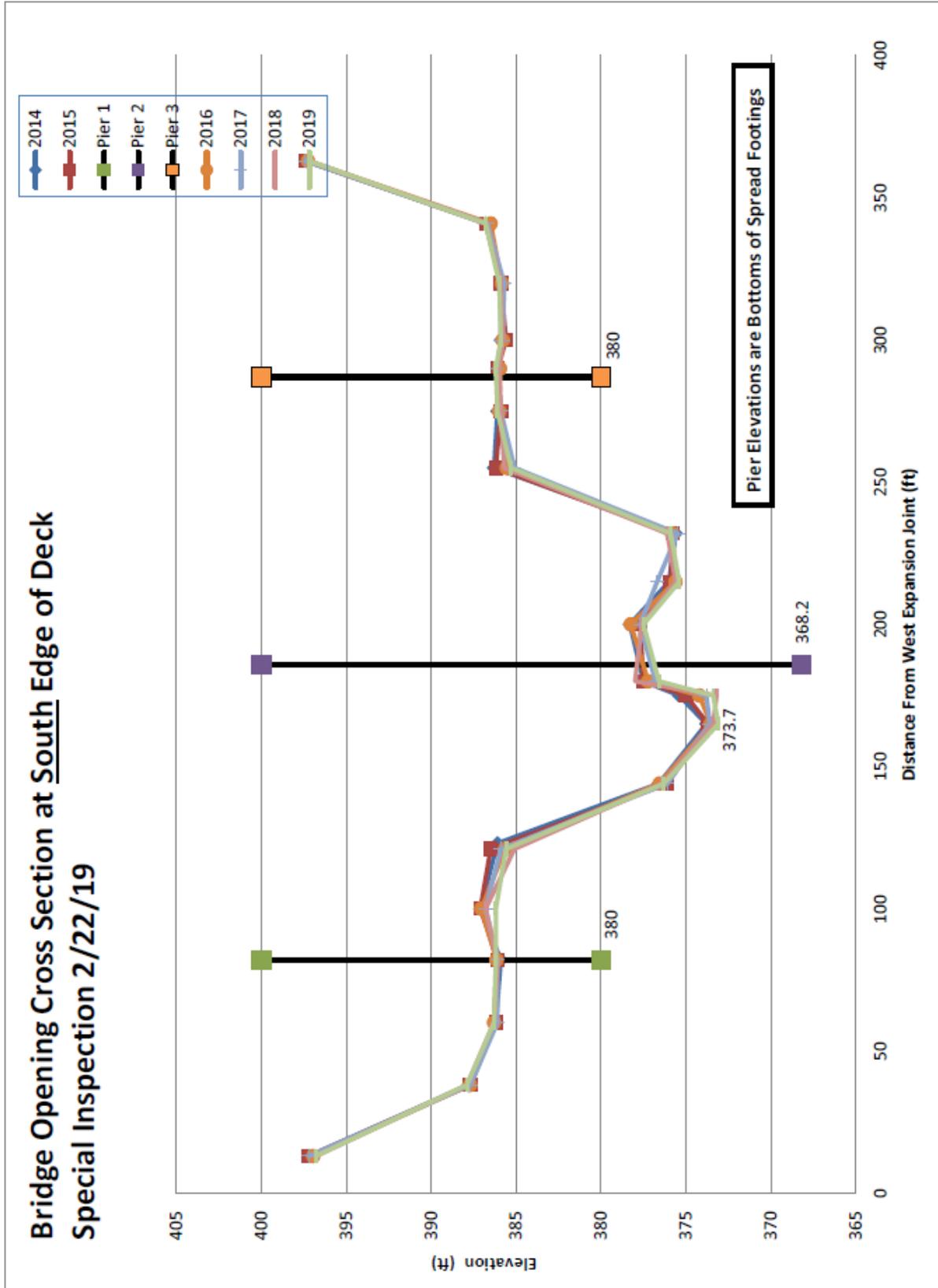
Special Inspection -- 2/26/2019					
Dist From Top Parape'			Dist From Top Parape'		
Dist From	North	Elev	Dist From	South	Elev
West Joint	Edge	Edge	West Joint	Edge	Edge
10	8.6	397.5	13	9.3	396.8
28	17.5	388.6	38	18.2	387.9
40	19.2	386.9	60	19.8	386.3
60	19.5	386.6	82	19.9	386.2
82	20	386.1	100	19.9	386.2
100	19.7	386.4	121	20.5	385.6
117	20.4	385.7	144	29.8	376.3
139	30.3	375.8	165	33	373.1
160	32.8	373.3	175	32.7	373.4
175	32	374.1	180	29.5	376.6
186	30.5	375.6	200	28.6	377.5
200	31.5	374.6	215	30.7	375.4
220	29.2	376.9	232	30.2	375.9
227	25.6	380.5	255	20.8	385.3
238	21.5	384.6	275	20	386.1
260	19.6	386.5	290	19.9	386.2
280	20	386.1	300	20.2	385.9
287	19.9	386.2	320	20.1	386
300	19.8	386.3	341	19.3	386.8
320	19.8	386.3	363	8.9	397.2
332	18.7	387.4			
360	8.8	397.3			

	Dist From West Joint	Elev
Pier 1	82	400
	82	380
Pier 2	186	400
	186	368.2
Pier 3	287	400
	287	380

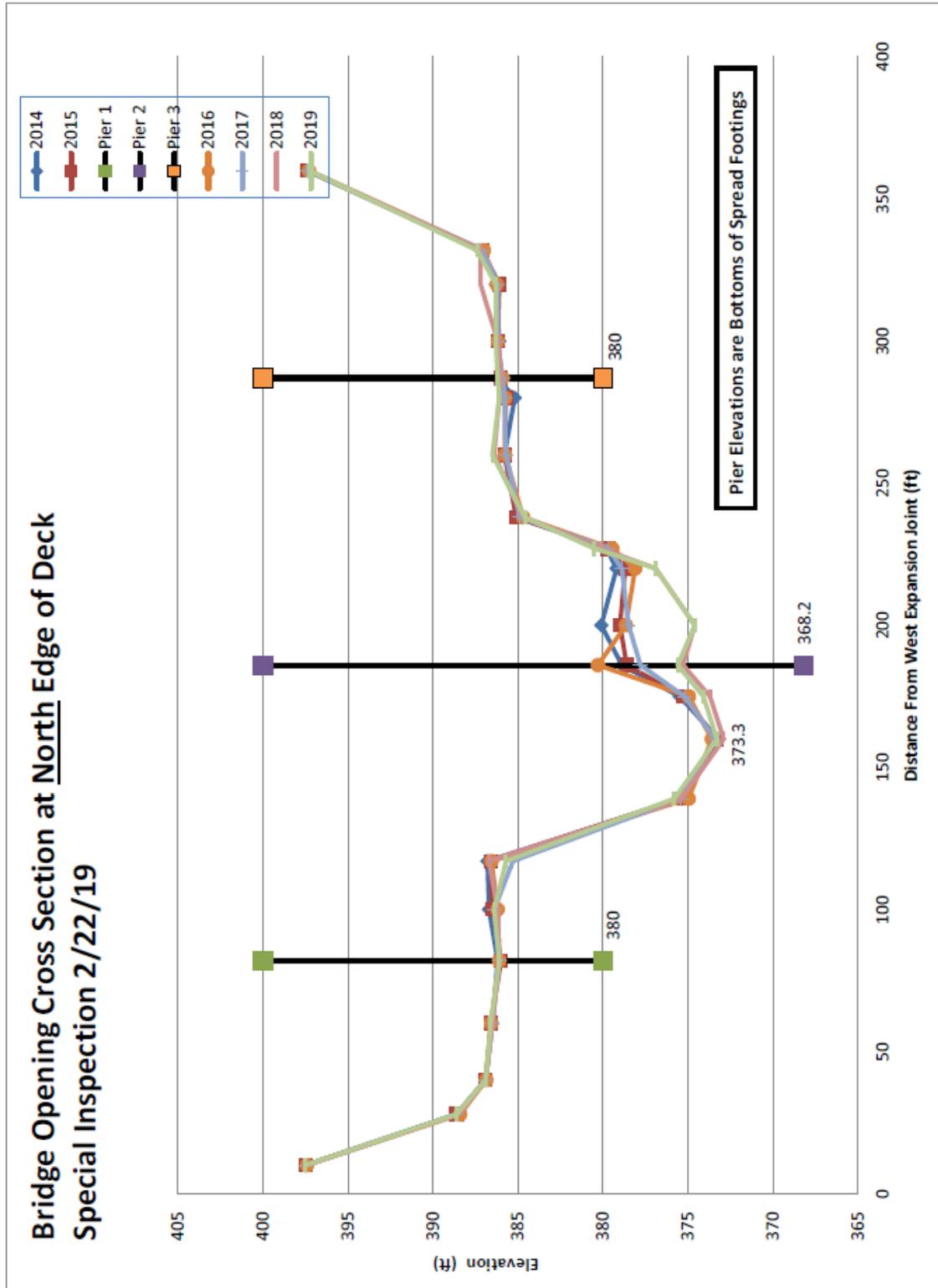
Top Of Parapet = Elev 406.1

Bottom of Footings -- P1 & P3 = 380.0; P2 = 368.2

Channel Cross-Section Example #1 – SN 093-0009



Channel Cross-Section Example #1 – SN 093-0009



Channel Cross-Section Example #2

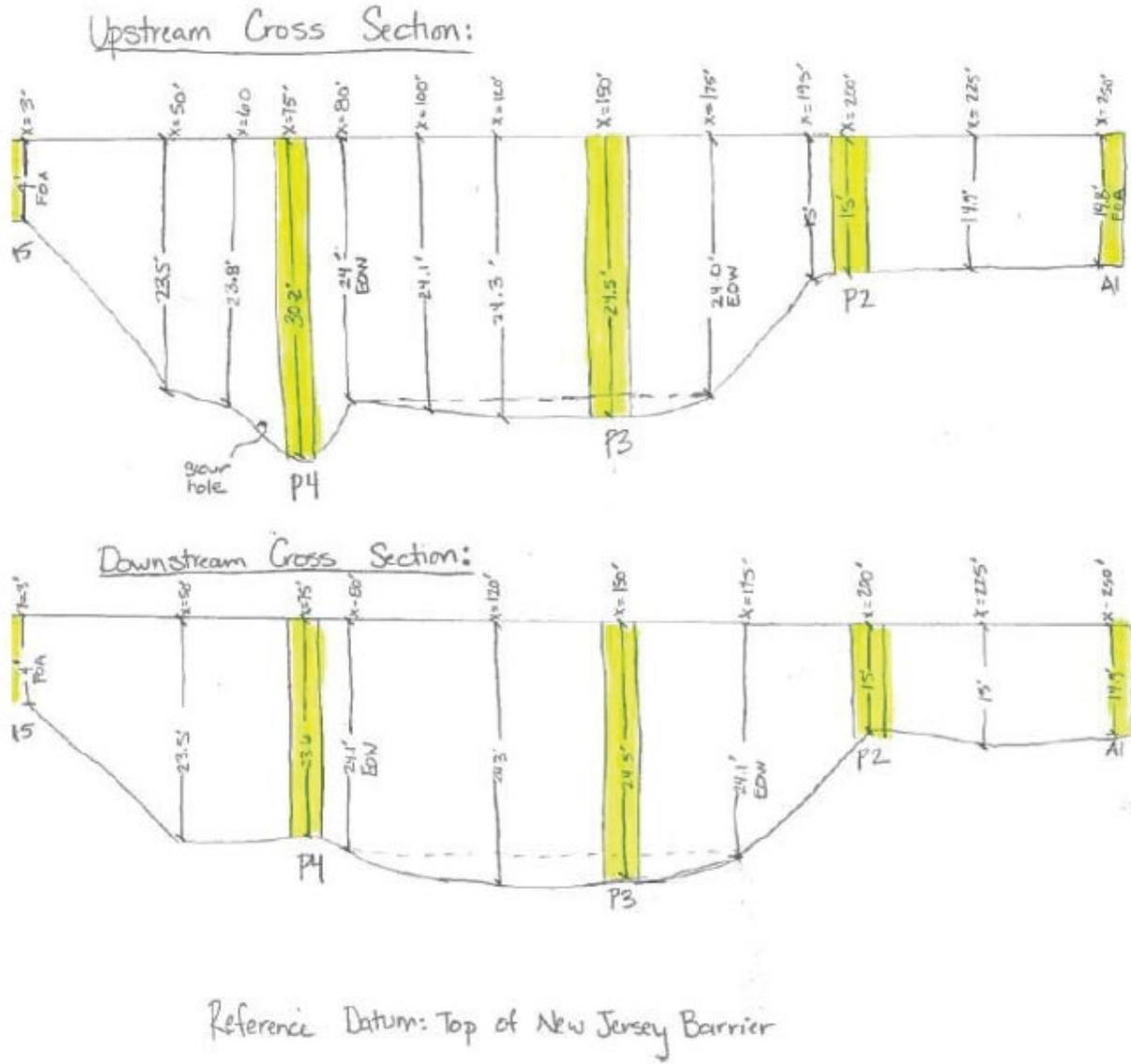
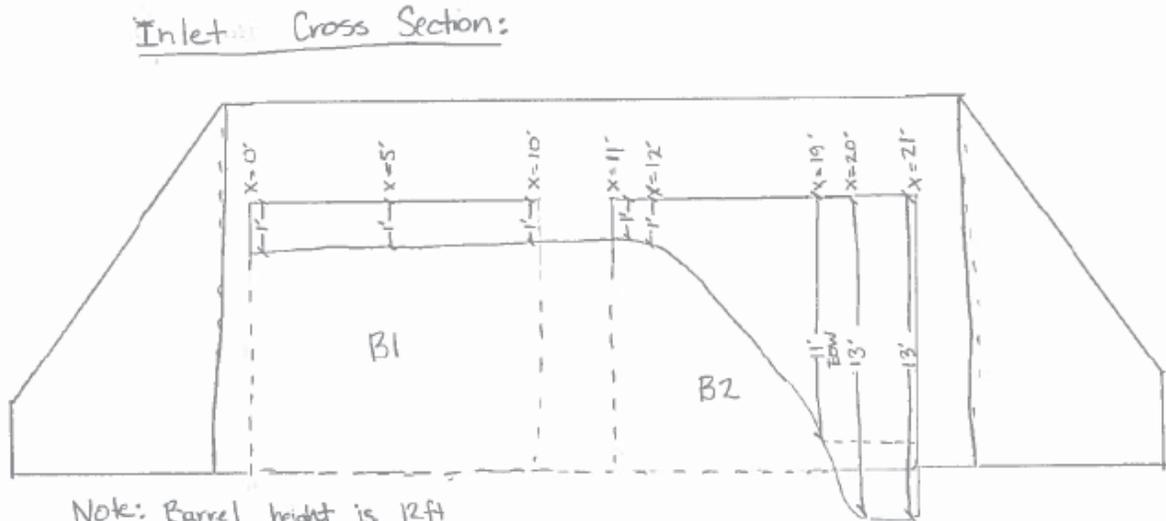


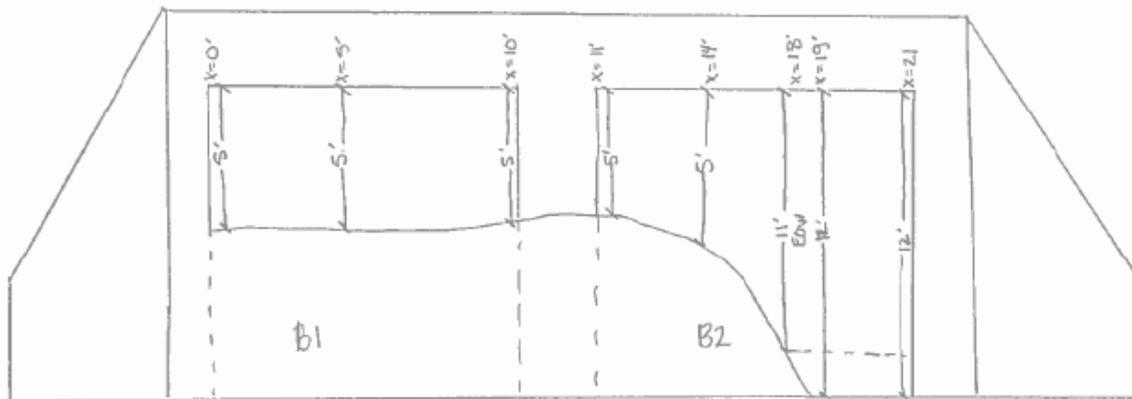
Figure 10- Example of a Stream Cross Sections at Bridge Fascias

Channel Cross-Section Example #3



Note: Barrel height is 12 ft
Reference Datum is bottom of culvert ceiling
Barrel 1 is almost completely filled with silt. Barrel 2 also has silt build up but not as severe.

Outlet Cross Section:



Note: Barrel height is 12 ft.
Reference Datum is bottom of culvert ceiling
Barrel 1 is about half-way filled with silt. Barrel 2 also has silt build up but not as severe.

Figure 11- Example of a Stream Cross Sections at Culverts without Aprons

Channel Cross-Section Example #4

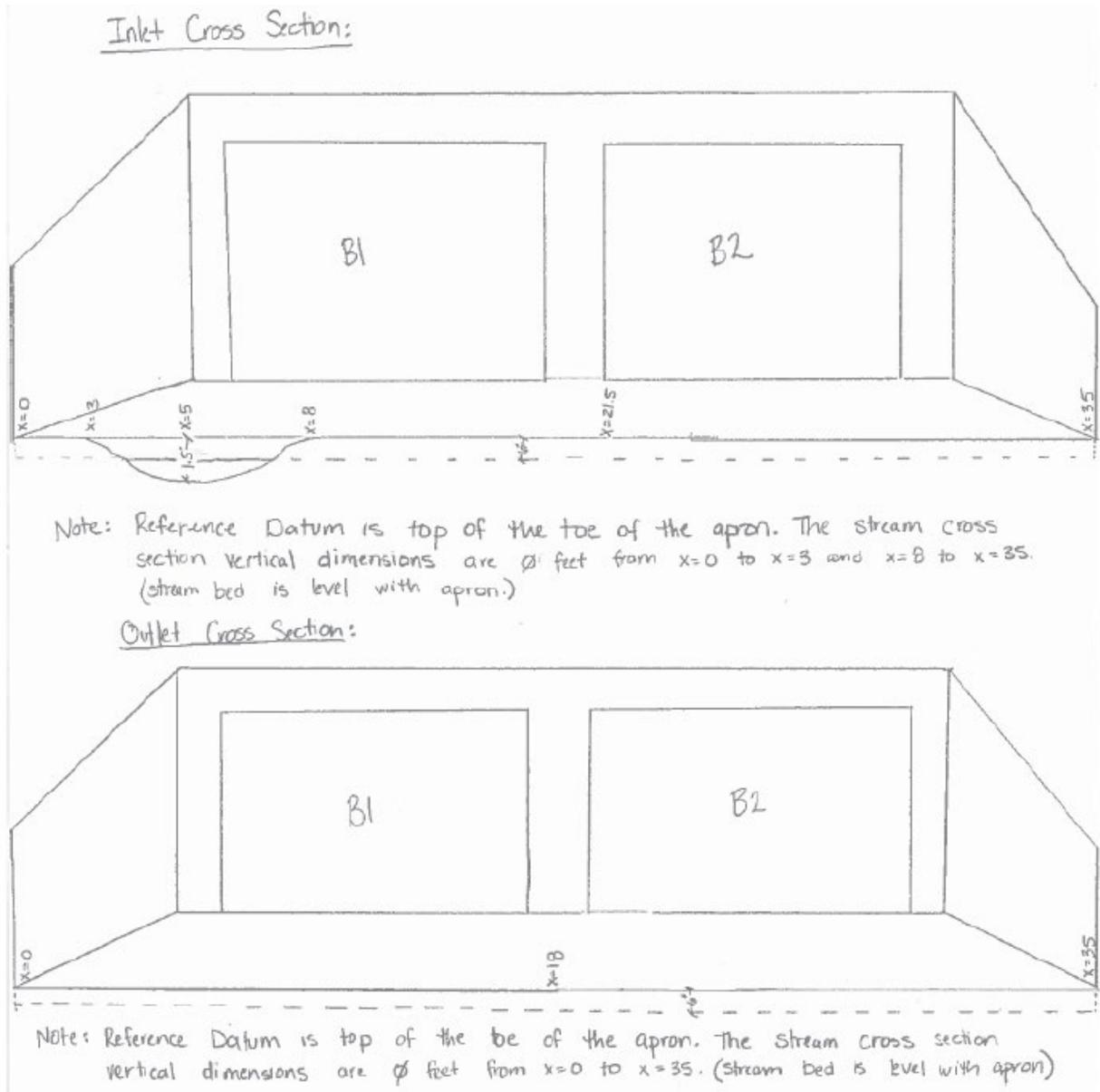


Figure 12- Example of a Stream Cross Sections at Culverts with Aprons