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## GANNETT FLEMING MEMORANDUM

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**Date:** January 27, 2016

**To:** Radnor Township

**From:** Gannett Fleming

**Re:** Earles Lane Culvert Field View

A field view was performed on November 23, 2015 on the above-referenced culvert located just west of Saw Mill Park which carries Earles Lane over Saw Mill Run in Radnor Township, Delaware County. The field view was performed to determine the need for the structure's repair, rehabilitation, or replacement. The field view was limited to observation of the above ground, visible and accessible elements. Elements below the waterline or ground line were not assessed. Load ratings and structural plans of the existing bridge were not available at the time of field viewing.

### Structure Description

The structure is composed of an original concrete slab bridge supported by two stone masonry abutments. The structure was previously widened on the west side to accommodate and support a 2'x6' inlet. The bridge is on an approximately 60 degree skew, and carries two 10'-0" minimum lanes/shoulder. There is a single 3 ½" diameter pipe railing supported by two masonry pillars along the east fascia with no guide rails present along west fascia.

The slab bridge has a 6'-9" clear span; the slab thickness measured from the east fascia is 18".

Sawmill Run flows generally west to east in the vicinity of the culvert. Its alignment entering the culvert is on a 45 degree skew.



*General View of Culvert – Looking South. Note Inlet Structure in West Shoulder*



*Upstream Elevation. Note Stream Flow Entering the Culvert with a Sharp Skew and Skew of the Culvert*

## Structure Findings

The condition of the original portion of slab superstructure is in good condition, and the existing stone masonry abutments are in fair condition with some missing mortar joints and undermining.

The widened portion of the structure and inlet are in serious condition. Both abutment extensions are undermined by more than 4 feet.

### *Original Concrete Slab Bridge*

The original slab bridge shows no spalls or sign of water leakage and in good condition. Both stone masonry abutments are generally in fair condition with voids and missing mortar joints occasionally at various locations along the base.



*View of Original Concrete Slab Superstructure (underside)*



*View of Original North Stone Masonry Abutment*



*2' Deep Void in North Abutment*



*View of Original South Stone Masonry Abutment*



*East End of South Stone Masonry Abutment,  
Note Large Stones with Missing Mortar Joints*



*East Fascia*

### ***Widened Inlet Structure***

The widened inlet structure is in poor condition; both abutments are severely undermined.



*North Abutment of Inlet Structure – Looking  
Northwest*



*North Abutment of Inlet Structure – Looking  
Southwest*



*4' Undermining under North Abutment of Inlet Structure*



*South Abutment of Inlet Structure – Looking Southwest*



*Inlet Structure*



*West Fascia - Inlet Structure*

### ***Conclusions***

The original concrete slab superstructure is in good condition with no noticeable spalls, cracks or distress. The original stone masonry abutments are in fair condition with some undermining, missing stones and voids.

The inlet structure is in poor condition, with both abutments undermined about 4 feet.

## **Safety Features**

The roadway in this area has adequate lane width. Due to the relatively shallow drop from the roadway to the stream and the low traffic volumes on Earles Lane, guide rail is not required at this location. To clearly highlight the stream location, a consistent 8" reveal barrier curb should be provided over and approaching the stream. The curbing will serve to warn motorists traveling within the speed limit to keep on the roadway at this location. The hazard markers are present on all four approaches. The culvert should be extended or the proposed headwalls buried to prevent them from being an obstruction within the roadway clear zone. Curb openings should be provided to allow for drainage off of the road surface in lieu of the existing inlet on the structure. The existing inlet on the structure should be removed.

## **Environmental**

Earles Lane crosses Saw Mill Run which supports protected water uses for Cold Water and Migratory Fishes (CWF/MF) according to Title 25, Chapter 93 of Pennsylvania State Code. The stream is not trout-stocked nor does it support a naturally reproducing trout population. However, it is within a half-mile of Darby Creek, which is trout-stocked. Therefore, seasonal construction restrictions will be required and no instream work may occur between March 1 and June 15. A PNDI database search was conducted and the results indicated that a Pennsylvania rare plant, puttyroot, may occur at this location and may be impacted. Coordination with the Pennsylvania Department of Conservation and Natural Resources may be required in order to gain authorization to construct the project. No known historic or archaeological sites are known to exist at or near the site of the bridge according to the Pennsylvania State Historic Preservation Office's Cultural Resources GIS website.

It appears that rehabilitation of the bridge, including the addition of scour protection would require a PADEP General Permit #11 for Maintenance, Testing, Repair, Rehabilitation or Replacement of Water Obstructions and Encroachments. It is assumed that federal authorization for this activity can be authorized by PASPGP-4 that will be issued by PADEP.

If wetlands are present, and greater than 0.05 acres of impacts are expected, GP-11 does not apply and A Joint Chapter 105/Section 404 Permit may be required.

## **Geotechnical**

A Site Geology Map, extracted from the Geologic Quadrangle Maps of Pennsylvania, indicates that the Earles Lane structure is underlain by Felsic Gneiss (fgp). According to *Engineering Characteristics of the Rocks of Pennsylvania*, the Felsic Gneiss (fgp) is described as medium to fine grained with up to 30% quartz.

The geotechnical investigation will consist of drilling two borings to a maximum depth of 30 ft below the ground surface. Rock will be cored for 5 ft if encountered. Laboratory testing will be conducted on the recovered samples as necessary. Following the subsurface investigation and the laboratory testing GF will prepare a brief memo with recommendations

## Recommendations

Based on the field assessment and finding, it is recommended to rehabilitate the existing culvert. The major work are listed below:

- Underpin the undermined footings on the original structure.
- Repoint masonry abutments on the original structure.
- Remove railing and pillars on the east fascia and provide curbing and signing.
- Remove the inlet and associated structure and extend the original slab bridge to satisfy the minimum lane width requirement. The proposed curb-to-curb distance is 22'-0".
- Construct upstream wingwalls.
- Relocate drainage inlet behind the bridge abutment
- Fill the scour hole at the inlet with riprap.

A conceptual construction cost estimate and estimate of engineering cost is provided for the recommended work.

**Earles Ln over Sawmill Run Culvert Rehabilitation**

**Construction Item Estimate:**

		Unit	Qty	Unit \$	Item Cost	
<b>Bridge</b>						
1	Bypass Pumping	LS	1	\$7,000	\$7,000	
2	Remove Existing Inlet Structure	LS	1	\$5,000	\$5,000	
3	Class AAA Cement Concrete	CY	4	\$2,000	\$8,000	
4	Class A Cement Concrete	CY	30	\$1,000	\$30,000	
5	Reinforcement Bars, Epoxy Coated	LB	8500	\$2	\$12,750	
6	Riprap at Inlet	LS	50	\$80	\$4,000	
7	Class 3 Excavation	CY	20	\$100	\$2,000	
8	Structure Backfill	CY	20	\$55	\$1,100	
9	Temporary Excavation Support and Protection System	SF	375	\$20	\$7,500	
10	Repoint Masonry Abutment and Wingwalls	LF	150	\$5	\$750	
11	Under Pin Undermined Footings.	CY	5	\$1,500	\$7,500	
				Total Str. Cost:	\$85,600	
<b>Roadway</b>						
1	Clearing and Grubbing	LS	1	\$500	\$500	
2	Class 1 Excavation	CY	50	\$25	\$1,250	
3	Approach Pavement	SY	120	\$55	\$6,600	
4	Curb	LF	48	\$40	\$1,920	
5	Traffic Control	LS	1	\$2,000	\$2,000	
6	Rock Class R-4	SY	4	\$150	\$600	
				Total Roadway Cost:	\$12,870	
				Total Construction Cost:	\$98,470	
<hr/>					Total Construction Cost:	\$98,470
					+ 5% Mobilization	
					+ 20% Contingency	
					Construction Total:	\$124,000
					Engineering Fee:	\$83,900
					Total Project Cost:	\$207,900