

# ANNUAL REPORT FOR 2009



**Jeffreys Warehouse Stream Mitigation Site  
Wayne County  
TIP No. R-1030AA**



Prepared By:  
Natural Environment Unit & Roadside Environmental Unit  
North Carolina Department of Transportation  
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## **SUMMARY**

The following report summarizes the stream monitoring activities conducted during the Year 2009 along an unnamed tributary emptying into the Little River, hereinafter referred to as the Jeffreys Warehouse Mitigation Site. The site, situated on US 117 in Goldsboro, was designed and constructed during 2006 by the North Carolina Department of Transportation (NCDOT) in order to provide mitigation for stream impacts associated with the construction of Transportation Improvement Program (TIP) number R-1030AA. This report provides the monitoring results for the third formal year of monitoring (Year 2009).

Based on the overall monitoring assessment, the Jeffreys Warehouse Mitigation Site has met the required monitoring protocols for the third formal year of monitoring and is stable at this time. There is extensive growth of vegetation throughout the stream corridor, both within and outside of the bankfull limits associated with the channel. All fourteen of the cross sections along the unnamed tributary are stable. A surface gauge was installed in December 2007 in order to assist in determining the number of bankfull events that the site has experienced. A review of peak stream flows was conducted for the period between January 2009 and November 2009. According to the graph, there were approximately four bankfull events documented during this monitoring period.

The longitudinal profile survey was not conducted along the stream at the Jeffreys Warehouse Mitigation Site in 2009 due to extensive growth along the channel. The extensive growth made it impossible to survey the channel without cutting down many of the desired species along the channel. An onsite agency review meeting was held on January 11, 2010. It was determined during this meeting that in lieu of doing the longitudinal profile, visual inspection of the channel stability throughout the reach and photo documentation at the permanent photo point locations would be completed. All other monitoring activities will continue to be completed throughout the five year monitoring period.

The NCDOT will continue stream monitoring at the Jeffreys Warehouse Mitigation Site in 2010.

## **1.0 INTRODUCTION**

### **1.1 Project Description**

The following report summarizes the stream monitoring activities that have occurred during the Year 2009 at the Jeffreys Warehouse Mitigation Site. The site is located adjacent to US 117 in Goldsboro (Figure 1). The Jeffreys Warehouse Mitigation Site was constructed to provide mitigation for stream impacts associated with TIP number R-1030AA in Wayne County.

The mitigation project covers approximately 3,380 linear feet of channel length. Construction was completed during 2006 by the NCDOT. Stream restoration involved the installation of cross vanes, j-hooks, and rootwads, sloping the adjacent streambanks to promote stability, and widening of the floodplain to allow for overbank flooding. It also included the installation of coir fiber matting and live stakes along the streambank and bareroot seedlings in the buffer area.

### **1.2 Purpose**

In order for a mitigation site to be considered successful, the site must meet the success criteria. This report details the monitoring in 2009 at the Jeffreys Warehouse Mitigation Site.

### **1.3 Project History**

March 2006	Construction Completed.
October 2007	Stream Channel Monitoring (Year 1)
November 2008	Stream Channel Monitoring (Year 2)
October 2009	Stream Channel Monitoring (Year 3)
January 2010	Stream Stability Review Meeting with Resource Agencies

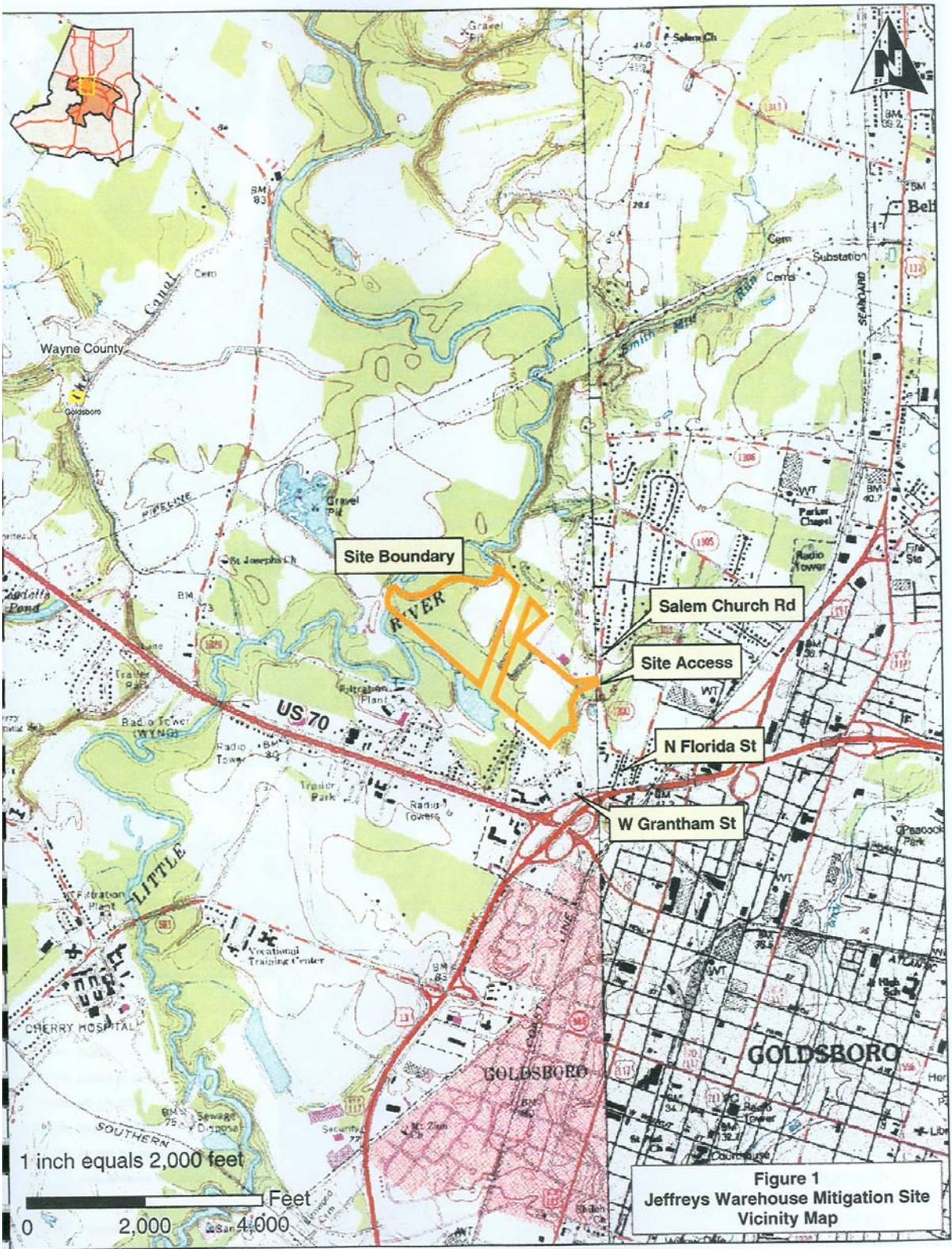


Figure 1. Vicinity Map

## **2.0 STREAM ASSESSMENT**

### **2.1 Stream Monitoring Requirements**

#### **US Army Corps of Engineers (USACE):**

Per the Jeffreys Warehouse Conceptual Mitigation Plan dated September 17, 2004: The stream will be monitored using the criteria set forth in the Stream Mitigation Guidelines document issued by an interagency team of the USACE, Environmental Protection Agency, N.C. Wildlife Resource Commission and N.C. Division of Water Quality in April 2003. Monitoring Level I procedures, as set forth in the document, will be followed.

#### **NC Division of Water Quality (NCDWQ):**

DWQ No. 060332: The permittee shall monitor the relocated stream channel annually. Physical monitoring should include an evaluation of streambank stability as well as stream morphology. The geomorphology of the stream should be assessed using Rosgen or similar classification system. The report should include permanent cross sections of riffles and pools, longitudinal profiles, and pebble counts.

### **2.2 Stream Description**

#### ***2.2.1 Post-Construction Conditions***

The mitigation project covers approximately 3,380 linear feet of channel length. Construction was completed during 2006 by the NCDOT. Stream restoration involved the installation of cross vanes, j-hooks, and rootwads, sloping the adjacent streambanks to promote stability, and widening of the floodplain to allow for overbank flooding. It also included the installation of coir fiber matting and live stakes along the streambank and bareroot seedlings in the buffer area.

#### ***2.2.2 Monitoring Conditions***

The objective of the Jeffreys Warehouse Mitigation Site restoration was to build an E stream type as identified in the Rosgen's Applied River Morphology. A total of fourteen cross sections (seven in a riffle, six in a pool, and one in a glide) were surveyed. For this report, only cross sections containing riffles were used in the comparison of channel morphology presented below in Table 1. Data shown in Table 1 includes the riffle cross sections that were surveyed.

## 2.3 Results of the Stream Assessment

### 2.3.1 Site Data

The assessment included the survey of fourteen cross sections and pebble count for the entire reach at the Jeffreys Warehouse Mitigation Site. The length of the channel assessment was approximately 3,410 linear feet. Cross section locations are presented below. Benchmark stakes were installed on both the left and right streambanks for each cross section location. The layout comparisons of the cross sections are shown in Appendix B.

- Cross Section #1. Jeffreys Warehouse, Upper Reach, Station 256, midpoint of pool
- Cross Section #2. Jeffreys Warehouse, Upper Reach, Station 314, head of riffle
- Cross Section #3. Jeffreys Warehouse, Upper Reach, Station 487.2, midpoint of riffle
- Cross Section #4. Jeffreys Warehouse, Upper Reach, Station 546, midpoint of pool
- Cross Section #5. Jeffreys Warehouse, Upper Reach, Station 1030, midpoint of glide
- Cross Section #6. Jeffreys Warehouse, Upper Reach, Station 1122, midpoint of riffle
- Cross Section #7. Jeffreys Warehouse, Upper Reach, Station 1612.2, midpoint of pool
- Cross Section #8. Jeffreys Warehouse, Upper Reach, Station 1654.2, midpoint of riffle
- Cross Section #9. Jeffreys Warehouse, Upper Reach, Station 1953.3, midpoint of pool
- Cross Section #10. Jeffreys Warehouse, Upper Reach, Station 1982.8, head of riffle
- Cross Section #11. Jeffreys Warehouse, Lower Reach, Station 2773.6, midpoint of pool
- Cross Section #12. Jeffreys Warehouse, Lower Reach, Station 2862.7, midpoint of riffle
- Cross Section #13. Jeffreys Warehouse, Lower Reach, Station 3006, midpoint of pool
- Cross Section #14. Jeffreys Warehouse, Lower Reach, Station 3063.3, midpoint of riffle

The fourteen cross sections that were established during 2008 are being monitored on a yearly basis to determine the actual extent of aggradation or degradation. All of the cross section locations appeared stable. Morphological comparisons are presented in the charts depicted below. Appendix B depicts each cross section comparison as well as a summarized table of morphological variables. Future survey data will vary depending on actual location of rod placement and alignment; however this information should remain similar in appearance.

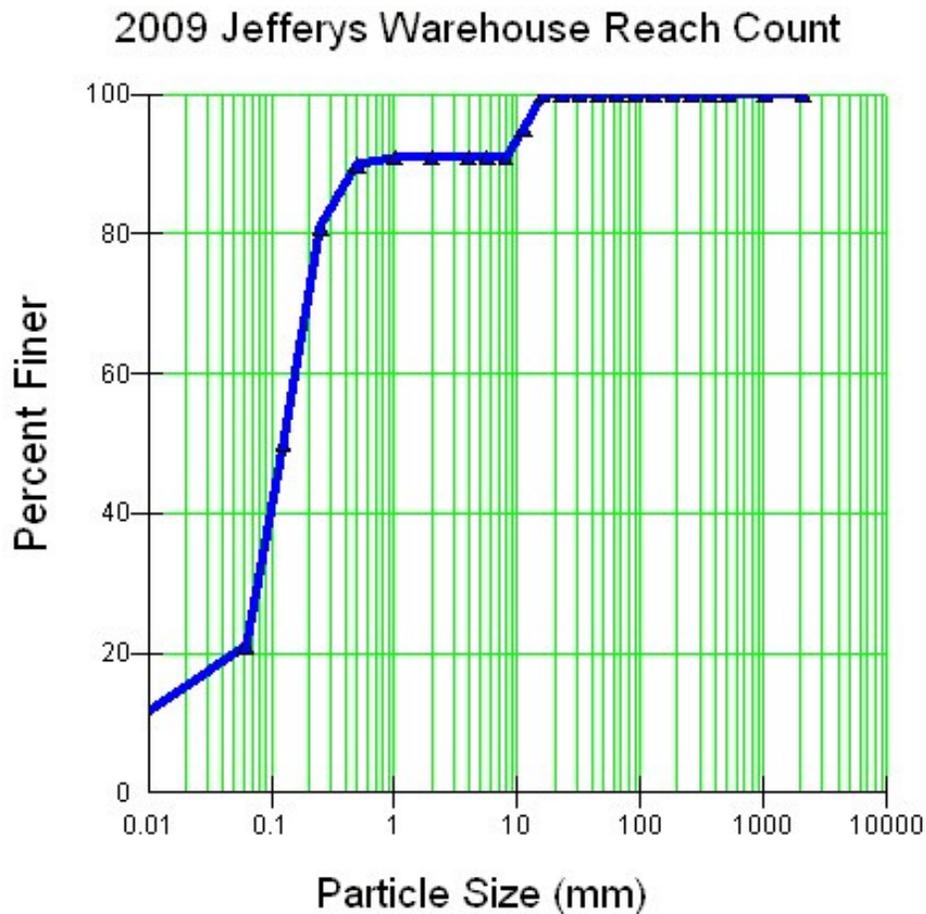
Table 1. Cross Section Comparisons - Upper Reach										
Variable	Proposed	Cross Section #2	Cross Section #3	Cross Section #6	Cross Section #8	Cross Section #10	Cross Section #12	Cross Section #14	Min. - Max Values (Riffle Sections Only)	
		(Riffle)	(Riffle)	(Riffle)	(Riffle)	(Riffle)	(Riffle)	(Riffle)	2008	2009
Drainage Area (sq. mi)	0.68-0.76	0.68-0.76	0.68-0.76	0.68-0.76	0.68-0.76	0.68-0.76	0.68-0.76	0.68-0.76	0.68 - 0.76	0.68 - 0.76
Bankfull Cross Sectional Area (ft <sup>2</sup> )	12	6.27	11.2	10.53	6.17	10.98	7.91	8.82	7.09 - 10.65	6.17 - 11.2
Maximum Bankfull Depth (ft)	1.1	1.2	1.52	1.83	0.93	1.31	1.07	1.25	1.06 - 1.46	0.93 - 1.83
Width of Floodprone Area (ft)	59	65	60	68.2	69	61	58	50	50 - 69	50 - 69
Bankfull Mean Depth (ft)	1.0	0.73	0.88	0.6	0.36	0.77	0.61	0.56	0.44 - 0.82	0.36 - 0.88
Width/Depth Ratio	12	11.73	14.42	29.33	47.22	18.61	21.13	27.98	11.62 - 38.64	11.73 - 47.22
Entrenchment Ratio	4.9	7.6	4.73	3.88	4.06	4.26	4.5	3.19	3.33 - 7.17	3.19 - 7.6
Bankfull Width (ft)	12	8.56	12.69	17.6	17	14.33	12.89	15.67	9.06 - 17.69	8.56 - 17.6

Table 2. Pebble Count – Entire Reach						
Particle Sizes	Proposed	2007	2008	2009	2010	2011
D16(mm)		0.07	0.06	0.05		
D35 (mm)		0.11	0.39	0.09		
D50 (mm)	< 1	0.22	0.67	0.13		
D84 (mm)		0.85	1.61	0.33		
D95 (mm)		2	1.97	11.3		

A representative pebble count was taken throughout the surveyed reach. This information is used to determine the stream type. Jeffreys Warehouse Mitigation Site was designed as a sand bed system with the  $D_{50}$  being less than one. The pebble counts taken during the Year 2009 monitoring period noted that the  $D_{50}$  (50 percent of the sampled population is equal to or finer than the representative particle diameter) for the entire reach of Jeffreys Warehouse Mitigation Site was approximately 0.13 mm, which is indicative of a sand-bed stream.

The graph depicting the 2009 particle size distributions for the entire reach of the Jeffreys Warehouse Mitigation Site is presented below.

**Chart 1.** Particle Size Distribution for Entire Reach



The longitudinal profile survey was not conducted along the stream at the Jeffreys Warehouse Mitigation Site in 2009 due to extensive growth along the channel. The extensive growth made it impossible to survey the channel without cutting down many of the desired species along the channel. An onsite agency review meeting was held on January 11, 2010. It was determined during this meeting that in lieu of doing the longitudinal profile, visual inspection of the channel stability throughout the reach and photo documentation at the permanent photo point locations would be completed. Photo points 1 through 3 showed an extensive growth of herbaceous and woody vegetation and the channel was stable throughout this section. Photo point 4 showed some signs of aggradation within the channel, as seen on the graph for cross section #8. This aggradation has been caused by beaver activity downstream. Photo points 5 through 7 also showed extensive growth of herbaceous and woody vegetation. The channel was stable throughout this section as well. The majority of the beaver activity was noted from photo points 4 to 7. NCDOT has contracted USDA to trap the beavers and breach the beaver dams throughout the monitoring period.

A surface gauge was installed in December 2007 in order to assist in determining the number of bankfull events that the site has experienced. A review of peak stream flows was conducted for the period between January 2009 and November 2009. According to the graph, there were approximately four bankfull events documented during this monitoring period. Herbaceous and woody vegetation is thriving throughout the stream restoration project. Some of the vegetation noted included cattail, black willow, silky dogwood, fennel, sedge, smartweed, *Juncus* sp., alder, woolgrass, and various grasses.

## **2.4 Conclusions**

Overall the Jeffreys Warehouse Stream Mitigation Site is very stable. There is extensive growth of vegetation throughout the stream corridor, both within and outside of the bankfull limits associated with the channel. All fourteen of the cross sections along the unnamed tributary are stable. There is evidence along the floodplain that the Jeffreys Warehouse Mitigation Site has experienced several bankfull events since construction was completed in March 2006.

## **3.0 REFERENCES**

North Carolina Department of Transportation. Jeffreys Warehouse Conceptual Mitigation Plan, September 17, 2004. Wayne County, North Carolina.

North Carolina Department of Transportation. Division of Water Quality No. 060332. TIP R-1030AA, March 21, 2006. Wayne County, North Carolina.

Rosgen, D.L., 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

**APPENDIX A**  
**SITE PHOTOGRAPHS AND SITE MAP**

# Jeffreys Warehouse



Photo Point #1 (upstream)



Photo Point #1 (downstream)



Photo Point #2 (upstream)



Photo Point #2 (downstream)



Photo Point #3 (upstream)



Photo Point #3 (downstream)

# Jeffreys Warehouse



Photo Point # 4 (upstream)



Photo Point # 4 (downstream)



Photo Point #5 (upstream)



Photo Point #5 (downstream)



Photo Point #6 (upstream)



Photo Point #6 (downstream)

October 2009

# Jeffreys Warehouse



Photo Point #7 (upstream)



Photo Point #7 (downstream)

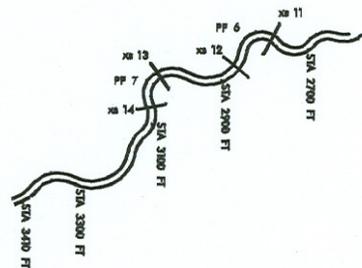
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# Jeffreys Warehouse Mitigation Site

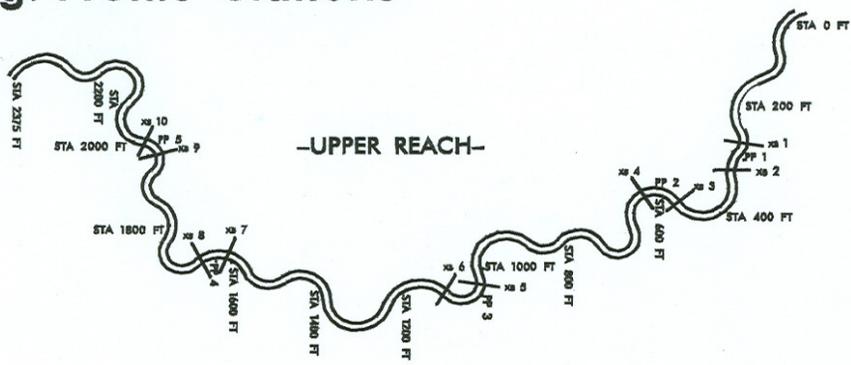
## Photo Point and Cross Section Locations and Long. Profile Stations

PROJECT REFERENCE NO.	SHEET NO.
R-2350AA	

**-LOWER REACH-**



**-UPPER REACH-**



PP - Photo Points  
XS - Cross Sections

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