Coddle Creek Tributary
(Indian Run) Stream Restoration
EEP Project # 94

Monitoring Report Year 1 of 5
Cabarrus County, North Carolina

Prepared for:

North Carolina Department of Environmental and Natural Resources
Ecosystem Enhancement Program
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1.0 EXECUTIVE SUMMARY

The Coddle Creek Tributary (Indian Run) Stream Restoration Project, completed in March 2011, enhanced (level1) or restored a total of 2,270 linear feet of stream in the Upper Rocky River watershed including restoring 6.17 acres of riparian buffer. In addition, approximately 852 linear feet of stream was preserved within the 19.61 acre conservation easement. The project is located in the USGS Hydrologic Unit (HU) 03040105020010 of the Yadkin Pee-Dee River Basin. This HU is within the EEP's Upper Rocky River Local Watershed Plan and is also listed as a Targeted Local Watershed (TLW) in EEP's Lower Yadkin Pee-Dee River Basin Restoration Priorities Plan 2009. The project goals and objectives are listed below.

Project Goals

- Improve local water quality by reestablishing stream stability and capacity to transport watershed flows and sediment load.
- Provide additional floodplain storage by increasing the capacity of the stream to mitigate flood flows.
- Restore aquatic and riparian habitat.
- Reducing non-point source sedimentation and nutrient inputs into the project reaches.

Project Objectives

- Restore/Enhance (level 1) 2,270 linear feet of stable stream channel morphology, supported by instream habitat and grade/bank stabilization structures.
- Preserve 852 linear feet of stream within the conservation easement.
- Eliminate accelerated bank erosion by creating a bankfull bench, floodplain, and laying back slopes.
- Reestablish a native riparian buffer.

The project site, which is protected by a 19.61-acre permanent conservation easement held by the State of North Carolina, is situated in Cabarrus County in the Southern Outer Piedmont ecoregion of the Piedmont physiographic province. Coddle Creek, from 0.2 miles upstream of NC Highway 73 (NC-73) to Rocky River, is currently listed on the NC 303(d) List as biologically impaired (NCDENR 2010). In addition to the current non-supporting use classification for the lower portions of Coddle Creek, anticipated high rates of development in the watershed pose critical challenges in managing the region's aquatic resources. Land Use / Land Cover analysis indicates that more than 90 percent of the 1.5- square mile Indian Run watershed is currently pervious with a dominance of forested lands, and about 8 to 10 percent is impervious land (Figures 3a & 3b). It is likely that the majority of the watershed will be built-out within 10 to 20 years. Anticipated impervious cover (as a percentage of the total watershed) is likely to approach 25 to 30 percent at built-out conditions.

The vegetative success of the restoration site is based on criteria established in the USACE Stream Mitigation Guidelines (2003). Vegetation monitoring will be considered successful if a minimum of 260 planted stems/acre are surviving at the end of five years. The interim measure of vegetative success for the site will be the survival of a minimum of 320 planted stems/acre in year three and 288 stems/acre at the end of year four. The Monitoring Year 1 (MY1) stem counts are located in Tables 7 and 9 in Appendix C. Currently, all 11 vegetation plots are meeting the interim measures of success. Vegetation throughout the reach appears to be growing at acceptable rates and the mortality rate appears to be fairly low.

One location was noted along the reach as having sparse vegetation as a result of deposition on the floodplain. This area is located on the lower reach near Sta. 11+25 and illustrated on the Current Condition Plan View (CCPV) in Appendix B. In addition to this location, there is an increasing number of cattails (*Typha latifolia*) growing within the stream. These locations are noted on the CCPV and represent approximately 489 linear feet of the reach or 22 % of the total reach. The cattails are likely to continue to grow and take over additional stream footage without maintenance activities to control the growth. The cattails aren't currently creating issues to the current vegetation; however, they may start outcompeting other riparian herbaceous species and appear to be having some effects on channel morphology. The CCPV also illustrates an easement encroachment planting area. This area was replanted during construction as a developer had cleared into the conservation easement. No new encroachments were noted.

The upper and lower reaches of the restoration project were observed to be in stable condition. The channel's profile and cross-sections adjusted minimally from the baseline conditions. The channel accesses its floodplain and evidence of bankfull events were observed during Year 1 monitoring. This evidence included the presence of wrack lines, sediment deposits, and the crest gauge. The substrate shows a gradual change to more coarse material in the upper reach although the lower reach still has finer sediment. This is expected as the lower reach is an offline channel restoration and the larger particles haven't yet migrated downstream. Sediment transport analysis and shear stress fall within acceptable ranges and similar to those of the baseline condition.

One notable area of aggradation was observed on the upper reach at Sta. 26+50. This area has a small midchannel bar forming and could be the result of some of the cattail growth in that location. Other minor areas of aggradation are noted on the CCPV. These areas seem to be closely associated with the cattails found growing in the channel. These areas do not appear to be negatively impacting the channel morphology at this time. One location of a bank failure occurred upstream of Sta. 22+00 on the upper reach and was approximately 25 linear feet. The cause of the bank erosion is not known but possibly due to poor bank material. The bank does have vegetation on it and will be monitored for further degradation. At approximately Sta. 18+00 on the left bank of the upper reach an area noted as a terrace rill was noted on the CCPV. This is an approximately 15-foot segment and will be monitored for additional erosion. This bank was heavily armored due to a storm event during construction and the structure looks to be in stable condition. One final area of concern was noted on the upper reach at approximately Sta. 14+75 beyond the project area. This area was collecting a growing amount of debris at the permanent sewer line crossing and was determined to be a beaver dam during the 8/16/2012 EEP site visit.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting documentation formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly the Restoration Plan) documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

2.0 METHODOLOGY

Channel stability and vegetation survival were monitored on the project site. Post restoration monitoring will occur for a minimum of five years or until the success criteria are met. The monitoring survey was completed using submeter accuracy GPS and rod and level on May 29 and 30, 2012. This report details the results of Monitoring Year 1.

2.1 Morphometric Parameters and Channel Stability

2.1.1 Profile

The entire length of the reach was surveyed by HDR using GPS and a rod and level. Multiple parameters were located including top of bank, thalweg, and water surface. The longitudinal profiles show that the bed features are stable. Riffles throughout the upper and lower reach show a general trend of becoming shorter and steeper in Year 1 as compared to baseline. However, overall channel and bankfull slopes remain consistent in comparison to the baseline condition. Pool slopes and depths remain stable and similar to baseline values as well.

A large presence and growth of cattails was noted in the lower reach as well as a small portion of the lower end of the upper reach. The presence of cattails in these areas has removed distinct bed features (riffles, pools, etc.) or at least made them difficult to discern. Cattail removal is recommended to allow bed features to form.

2.1.2 Dimension

Eight cross sections were surveyed by HDR staff on May 29 and 30, 2012. The morphological data is presented in Tables 10 and 11 in Appendix D, along with the cross-sectional data. The channel cross-section dimensions lie within the design parameters for this reach. Comparison with baseline values, along with visual assessment, show no excessive aggradation, degradation, or trends toward instability in the cross sections.

2.1.3 Pattern

The pattern of the channel was obtained using GPS. The location is illustrated on the current condition plan view map in Appendix B. No lateral movement in stream pattern was observed in Year 1 monitoring.

2.1.4 Substrate

Pebble counts were taken for Year 1 monitoring. The Wolman Pebble count methodology was used to calculate the D50 and D84 to assess changes in particle size distributions at all of the permanent cross-sections. Pebble count data for the upper reach cross sections indicate similar values compared to baseline. The exception would be the upper most riffle section where significantly larger material

dominates the bed compared to the baseline value. This indicates a good movement of material at least in the upstream parts of the upper reach. The lower reach riffle sections still exhibits a small particle size making up the riffle section. As the lower reach was constructed as an offline segment, these values are not unexpected. It will take longer for coarser material to progress to the lower reach from upstream areas. Also, back water effects from Coddle Creek may play a role in the type of bed material for the lower reach. Since the cross section dimensions have remained relatively the same for the lower reach, the sections are stable despite the smaller bed material.

2.1.5 Sediment Transport

Shear stress values calculated from Year 1 riffle data and average slope remain within acceptable values when compared to the design and baseline. As the average channel slopes and cross section dimensions remained relatively unchanged, the shear stress values fall within acceptable ranges.

2.1.6 Photo Documentation

Photos were taken at the 23 stream photo stations and 11 vegetation plots on May 29 and 30, 2012. The locations of the photos stations and vegetation plots are noted on Figure 2 in Appendix B. The photos for monitoring year 1 are also provided in Appendix B.

2.2 Vegetation

The Carolina Vegetation Survey (CVS) Protocol Level 2 methodology was used to sample vegetation on May 29 and 30, 2012. Monitoring was conducted on eleven vegetation plots (6 on the upper reach and 5 on the lower reach). The 100-square meter CVS plots are permanently marked with galvanized metal pipe. The plots occur within the floodplain/riparian area with a few running upslope slightly.

According to the data collected, the average plant density among the 11 plots is 769 stems/acre with the range from 1,174 to 445 stems/acre. The highest plant density occurred in plot 1 with over 1,000 stems/acre. The two plots which did not meet the planting baseline of 680 planted stems/acre last year, plots 7 and 11, have the lowest density/acre. This was a result of the impact by off road vehicle vandalism shortly after planting. There were no signs of this type of vandalism during this monitoring event. Currently, all plots are meeting the interim 3-year vegetation success criteria of 320 stems/acre. Year 1 monitoring data is provided in Appendix C.

2.3 Hydrology

No groundwater monitoring gauges were installed onsite; however, a crest gauge was installed and evidence of a bankfull event was noted at the gauge as well as wrack lines noted in the floodplain.

3.0 REFERENCES

HDR Engineering, Inc. 2007. Final Stream Restoration Plan for Indian Run (Trib. to Coddle Creek).

HDR Engineering, Inc. 2009. Indian Run Stream Restoration Final Plans (90%).

HDR Engineering, Inc. 2011. Baseline Monitoring and As Built Baseline Report.

Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation. Version 4.0. (http://cvs.bio.unc.edu/methods.htm.)

North Carolina Ecosystem Enhancement Program. 2011. Procedure Guidance and Content Requirements for EEP Monitoring Reports. Version 1.4
(http://www.nceep.net/business/EEP_Mon_Rep_Temp_1.3_01-15-10.pdf)

U.S. Army Corps of Engineers, Wilmington District. 2003. Stream Mitigation Guidelines. North Carolina Division of Water Quality (DWQ), U.S. Environmental Protection Agency, Region IV (EPA), Natural Resources Conservation Service (NRCS) and the North Carolina Wildlife Resources Commission (WRC).

Appendix A. Project Vicinity Maps and Background Tables

Restoration Site Vicinity

Figure 1

Coddle Creek Tributary (Indian Run) | Monitoring Year 1 | Cabarrus County, NC
NC Ecosystem Enhancement Program | Project No. 94

Ecosystem Enhancement Program

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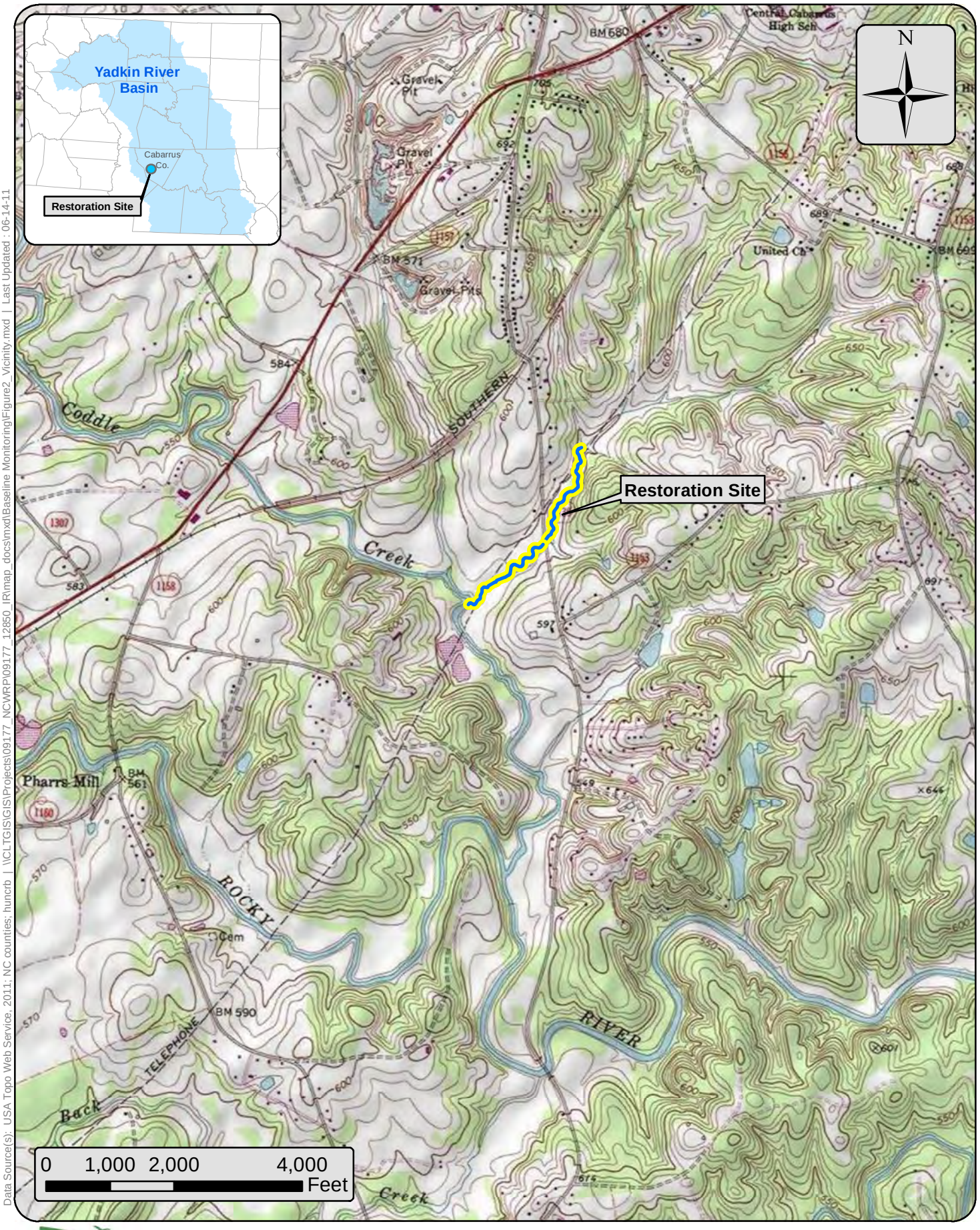

Data Source(s): USA Topo Web Service, 2011; NC counties; huncrb | \\CLTGIS\GIS\Projects\09177_NCWRP\09177_12850_IR\map_docs\mxd\Baseline Monitoring\Figure2_Vicinity.mxd | Last Updated : 06-14-11

USGS Concord SE Quad

Figure 2

Coddle Creek Tributary (Indian Run) | Monitoring Year 1 | Cabarrus County, NC
NC Ecosystem Enhancement Program | Project No. 94

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Table 1a. Project Components									
Coddle Creek Tributary (Indian Run) / 94									
Project Component or Reach ID	**Existing Feet/Acres**	**Restoration Level**	**Approach**	**Footage or Acreage**	**Stationing**	**Mitigation Ratio**	**Mitigation Units**	**BMP Elements**	**Comment**
Reach 1 - Upper	1330 lf	E (Level 1)	P3	1295 lf	15+00 –27+95	1.5:1	863		Restored bankfull dimension within the existing channel, utilized a partial floodplain bench to restore floodprone conditions, and enhanced existing pattern and profile.
Reach 1 - Upper	671 lf	P		455 lf	8+29 – 15+00	5:1	91		Preserved channel in its existing condition within the conservation easement. Utility line easements have been removed from Mitigation Units.
Reach 2 - Lower	735 lf	R	P2	975 lf	10+00 – 19+75	1:1	975		Fully restored pattern, dimension and profile, excavated a new channel within an adjoining floodplain bench to restore floodplain conditions.
Reach 2 - Lower	915 lf	P		397 lf	19+75 – 28+06	5:1	79		Preserved channel in its existing condition within the conservation easement. Utility line easements have been removed from Mitigation Units.

Table 1b. Component Summations Coddle Creek Tributary (Indian Run) / 94								
Restoration Level	**Stream (lf)**	**Stream Mitigation Units (lf)**	**Riparian Wetland (Ac)**		**Planted Area (Ac)**	**Potential Buffer Area (Ac)**	**Total Conservation Area (Ac)**	**BMP**
			Riverine	Non-Riverine				
Restoration (Lower)	975	975			4.21	2.58	10.11	
Enhancement (Upper)	1295	863			4.30	3.59	9.50	
Preservation	852	170				1.89		
(Feet/Acres)	**3,122**	**2,008**			**8.51**	**8.06**	**19.61**	

Table 2. Project Activity and Reporting History Coddle Creek Tributary (Indian Run) / 94		
Elapsed Time Since Grading Complete: 1 yrs 3 months		
Elapsed Time Since Planting Complete: 1 yrs 3 Months		
Number of Reporting Years: 1		
	Data Collection	**Completion or**
Activity or Deliverable	**Complete**	**Delivery**
Restoration Plan	Jun-07	Aug-07
Final Design – Construction Plans	Jun-07	Jul-09
Construction/Grading	NA	Mar-11
Planting	NA	Mar-11
Final Inspection	NA	Mar-11
Monitoring – baseline)	May-11	Aug-11
Year 1 Monitoring	5/29/2012 - 5/30/2012	Sep-12
Year 2 Monitoring		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

Table 3. Project Contacts Table Coddle Creek Tributary (Indian Run) / 94	
Designer	HDR Engineering Inc. of the Carolinas
	3733 National Drive, Suite 207, Raleigh, NC 27612
Primary project design POC	Jonathan Henderson, PE (919) 785-1118
Construction Contractor	Land Mechanic Designs, Inc.
	126 Circle G Lane, Willow Spring, NC 27592
Construction contractor POC	Lloyd Glover, (919) 639-6132
Survey Contractor	Stewart Proctor Pllc
	319 Chapanoke Road #106, Raleigh, NC 27603
Survey contractor POC	Herb Proctor, (919) 799-1855
Planting Contractor	HARP, Inc.
	301 McCullough Drive, 4th Floor, Charlotte, NC 28262
Planting contractor POC	Alan Peoples, (704) 841-2841
Seeding Contractor	Land Mechanic Designs, Inc.
	126 Circle G Lane, Willow Spring, NC 27592
Contractor point of contact	Lloyd Glover, (919) 639-6132
Seed Mix Sources	Green Resource, Charlotte, NC
	Phone: (704) 927-3100
Nursery Stock Suppliers	Cure Nursery, Pittsboro, NC - (919) 542-6186
	ArborGen, Blenheim, SC - (843) 528-3203
	Foggy Mountain Nursery llc, Creston, NC - (336) 384-5323
	Habitat and Restoration Plants, Lexington, NC - (336) 362-6776
	NC Division of Forest Resources, Greensboro, NC - (919) 731-7988
Monitoring Performers - Baseline & Year 1	HDR Engineering Inc. of the Carolinas
	3733 National Drive, Suite 207, Raleigh, NC 27612
Stream Monitoring POC	Wyatt Yelverton, PE (919) 232-6623
Vegetation Monitoring POC	Vickie Miller, AICP, PWS (919) 232-6637

Table 4. Project Attribute Table Coddle Creek Tributary (Indian Run) / 94		
Project County	Cabarrus	
Physiographic Region	Piedmont	
Ecoregion	Southern Outer Piedmont	
Project River Basin	Yadkin / Pee Dee	
USGS HUC for Project (14 digit)	3040105020010	
NCDWQ Sub-basin for Project	03 - 07 - 11	
Within extent of EEP Watershed Plan?	Upper Rocky River	
WRC Hab Class (Warm, Cool, Cold)	Warm	
% of project easement fenced or demarcated	100% marked with EEP easement signage	
Beaver activity observed during design phase?	No	
Restoration Component Attribute Table		
	UPPER	LOWER
Drainage area (ac)	1.5	
Stream order	2nd	
Restored length (feet)	1295	975
Perennial or Intermittent	Per	
Watershed type (Rural, Urban, Developing etc.)	Devel.	
Watershed LULC Distribution (e.g.)		
Medium Density Residential	11	
Low Density Residential / Open Fields/ Lawns	34	
Forested	52	
Watershed impervious cover (%)	3	
NCDWQ AU/Index number	-	
NCDWQ classification	C	
303d listed?	No	
Upstream of a 303d listed segment?	Yes	
Reasons for 303d listing or stressor	Bio. Integ.	Turbidity
Total acreage of easement	9.5	10.11
Total vegetated acreage within the easement	9.5	10.11
Total planted acreage as part of the restoration	4.3	4.21
Rosgen classification of pre-existing	Imp. C4	Ditch
Rosgen classification of As-built	C4	C4
Valley type	VIII	VIII
Valley slope	0.63%	0.61%
Valley side slope range (e.g. 2-3.%)	-	-
Valley toe slope range (e.g. 2-3.%)	-	-
Cowardin classification	NA	
Trout waters designation	No	
Species of concern, endangered etc.? (Y/N)	No	
Dominant soil series and characteristics		
Series	Chewacla	
Depth	U	U
Clay%	U	U
K	U	U
T	U	U

Appendix B. Visual Assessment

Figure 3a – Current Condition Plan View – Upper Reach

Figure 3b – Current Condition Plan View – Lower Reach

Table 5a – Visual Stream Morphology Stability Assessment – Upper Reach

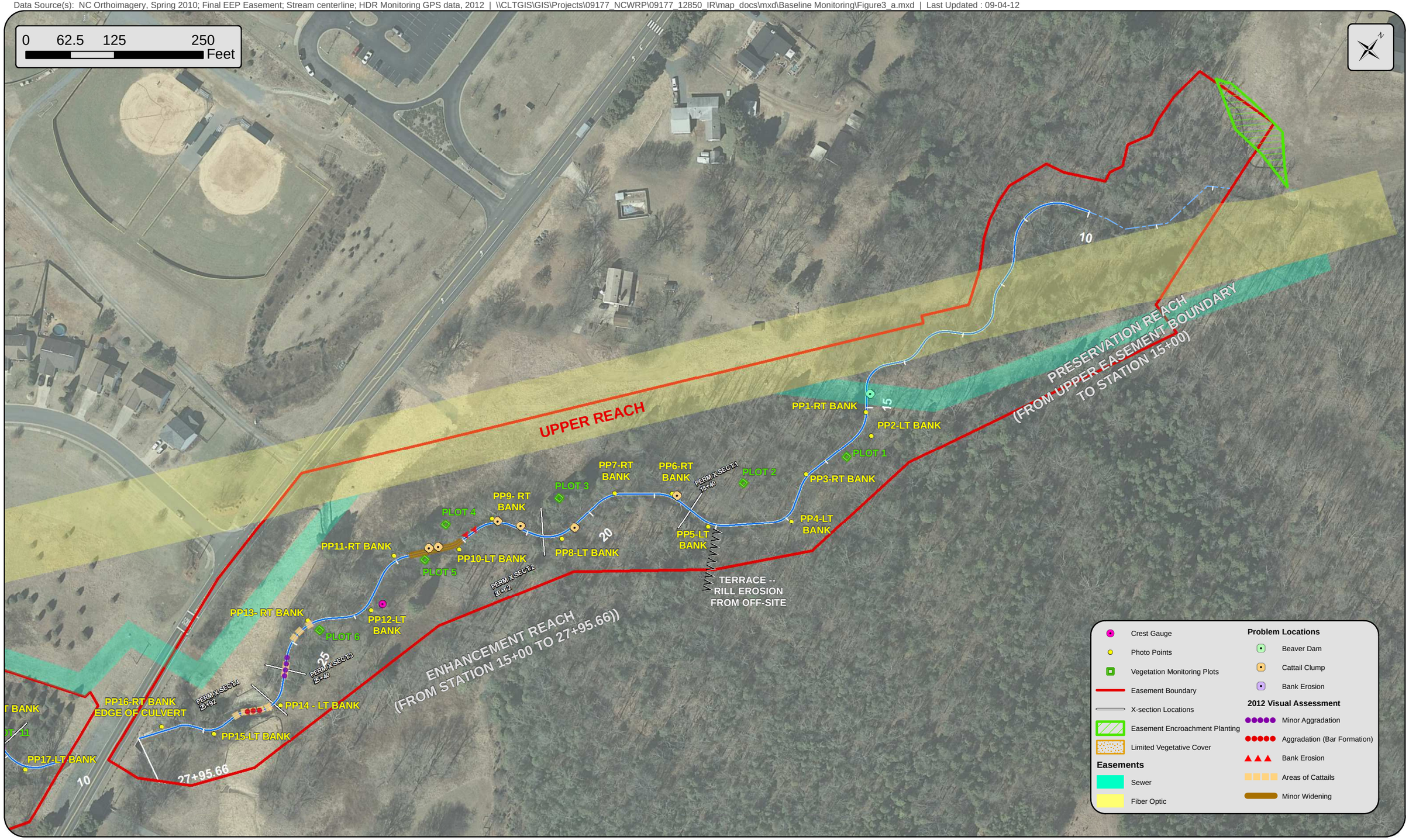
Table 5b – Visual Stream Morphology Stability Assessment – Lower Reach

Table 6 – Vegetation Condition Assessment

Photos – Permanent Photo Points

Photos – Vegetation Plots

Data Source(s): NC Orthoimagery, Spring 2010; Final EEP Easement; Stream centerline; HDR Monitoring GPS data, 2012 | \\CLTGIS\GIS\Projects\09177_NCWRP\09177_12850_IR\map_docs\mxd\Baseline Monitoring\Figure3_a.mxd | Last Updated : 09-04-12



Coddle Creek Tributary (Indian Run) Upper Reach -- Year 1 Monitoring

Figure 3A

Current Condition Plan View | Cabarrus County, NC
NC Ecosystem Enhancement Program | Project No. 94

Ecosystem Enhancement Program

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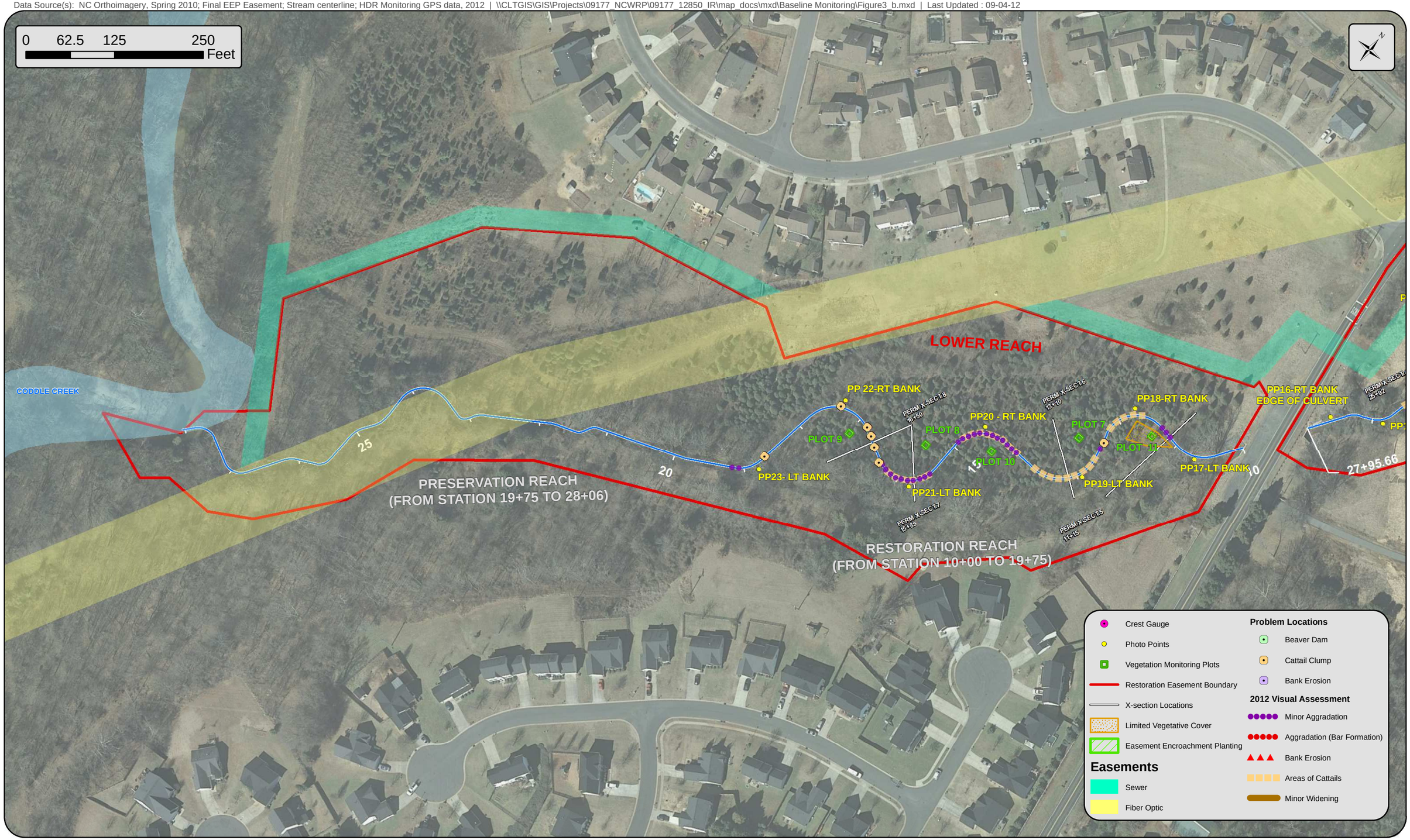
Data Source(s): NC Orthoimagery, Spring 2010; Final EEP Easement; Stream centerline; HDR Monitoring GPS data, 2012 | \\CLTGIS\GIS\Projects\09177_NCWRP\09177_12850_IR\map_docs\mxd\Baseline Monitoring\Figure3_b.mxd | Last Updated : 09-04-12



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Coddle Creek Tributary (Indian Run) Lower Reach -- Year 1 Monitoring

Figure 3B

Current Condition Plan View | Cabarrus County, NC
NC Ecosystem Enhancement Program | Project No. 94

Table 5a **Visual Stream Morphology Stability Assessment**
Reach ID **Upper Reach**
Assessed Length **1295**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			1	25	98%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	11	11			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	14	15			93%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	14	15			93%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	15	15			100%			
		2. Thalweg centering at downstream of meander (Glide)	15	15			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			1	25	99%	1	5	99%
				Totals	1	25	99%	1	5	99%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	14	14			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	8	8			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	14	14			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	13	13			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	12	13			92%			

Table 5b **Visual Stream Morphology Stability Assessment**
Reach ID **Lower Reach**
Assessed Length **975**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			1	25	97%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	6	6			100%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	6	7			86%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	7	7			100%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	7	7			100%			
		2. Thalweg centering at downstream of meander (Glide)	7	7			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	9	9			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	9	9			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	9	9			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	8	9			89%			

*Riffles were not supplied with coarse substrate in the as-built condition. Aside from minor aggradation, riffles remain stable.

Cells for data entry are accessible, all others are protected (without a password). If access is needed for any reason go to the 'Tools' menu and choose 'Protection' and then choose 'Unprotect Sheet'

Table 6 Vegetation Condition Assessment

Planted Acreage[1] **8.51**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.027	Pattern and Color	1	0.03	0.3%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0	Pattern and Color	0	0.00	0.0%
			Total	1	0.03	0.3%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0	Pattern and Color	0	0.00	0.0%
			Cumulative Total	1	0.03	0.3%

Easement Acreage[2] **19.61**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Areas or points (if too small to render as polygons at map scale).	0	Pattern and Color	0	0.00	0.0%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

2 = The acreage within the easement boundaries.

3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1,2 or 3) as well as a parallel tally in item 5.

4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern spcies are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by EEP such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likley trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designator in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly ealry in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolzing invasives polygons, particulalry for situations where the conditon for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

Photo Station 1 Downstream (5/30/2012 Year 1)

Photo Station 1 Upstream (5/30/2012 Year 1)

Photo Station 2 Downstream (5/30/2012 Year 1)

Photo Station 2 Upstream (5/30/2012 Year 1)

Photo Station 3 Downstream (5/30/2012 Year 1)

Photo Station 3 Upstream (5/30/2012 Year 1)

Photo Station 4 Downstream (5/30/2012 Year 1)

Photo Station 4 Upstream (5/30/2012 Year 1)

Photo Station 5 Downstream (5/30/2012 Year 1)

Photo Station 5 Upstream (5/30/2012 Year 1)

Photo Station 6 Downstream (5/30/2012 Year 1)

Photo Station 6 Upstream (5/30/2012 Year 1)

Photo Station 7 Downstream (5/30/2012 Year 1)

Photo Station 7 Upstream (5/30/2012 Year 1)

Photo Station 8 Downstream (5/30/2012 Year 1)

Photo Station 8 Upstream (5/30/2012 Year 1)

Photo Station 9 Downstream (5/30/2012 Year 1)

Photo Station 9 Upstream (5/30/2012 Year 1)

Photo Station 10 Downstream (5/30/2012 Year 1)

Photo Station 10 Upstream (5/30/2012 Year 1)

Photo Station 11 Downstream (5/30/2012 Year 1)

Photo Station 11 Upstream (5/30/2012 Year 1)

Photo Station 12 Downstream (5/30/2012 Year 1)

Photo Station 12 Upstream (5/30/2012 Year 1)

Photo Station 13 Downstream (5/30/2012 Year 1)

Photo Station 13 Upstream (5/30/2012 Year 1)

Photo Station 14 Downstream (5/30/2012 Year 1)

Photo Station 14 Upstream (5/30/2012 Year 1)

Photo Station 15 Downstream (5/30/2012 Year 1)

Photo Station 15 Upstream (5/30/2012 Year 1)

Photo Station 16 Downstream (5/30/2012 Year 1)

Photo Station 16 Upstream (5/30/2012 Year 1)

Photo Station 17 Downstream (5/30/2012 Year 1)

Photo Station 17 Upstream (5/30/2012 Year 1)

Photo Station 18 Downstream (5/30/2012 Year 1)

Photo Station 18 Upstream (5/30/2012 Year 1)

Photo Station 19 Downstream (5/30/2012 Year 1)

Photo Station 19 Upstream (5/30/2012 Year 1)

Photo Station 20 Downstream (5/30/2012 Year 1)

Photo Station 20 Upstream (5/30/2012 Year 1)

Photo Station 21 Downstream (5/30/2012 Year 1)

Photo Station 21 Upstream (5/30/2012 Year 1)

Photo Station 22 Downstream (5/30/2012 Year 1)

Photo Station 22 Upstream (5/30/2012 Year 1)

Photo Station 23 Downstream (5/30/2012 Year 1)

Photo Station 23 Upstream (5/30/2012 Year 1)

Vegetation Plot 1 – 5mx20m (5/29/2012 Year 1 of 5)

Vegetation Plot 2 – 10mx10m (5/29/2012 Year 1 of 5)

Vegetation Plot 3 – 10mx10m (5/29/2012 Year 1 of 5)

Vegetation Plot 4 – 5mx20m (5/29/2012 Year 1 of 5)

Vegetation Plot 5 – 5mx20m (5/29/2012 Year 1 of 5)

Vegetation Plot 6 – 10mx10m (5/29/2012 Year 1 of 5)

Vegetation Plot 7 – 10mx10m (5/30/2012 Year 1 of 5)

Vegetation Plot 8 – 10mx10m (5/30/2012 Year 1 of 5)

Vegetation Plot 9 – 10mx10m (5/30/2012 Year 1 of 5)

Vegetation Plot 10 – 10mx10m (5/30/2012 Year 1 of 5)

Vegetation Plot 11 – 10mx10m (5/30/2012 Year 1 of 5)

Appendix C. Vegetation Plot Data

Table 7 – Vegetation Plot Mitigation Success Summary

Table 8 – CVS Vegetation Metadata

Table 9 – Vegetation Plot Data

Table 7. Vegetation Plot Mitigation Success Summary Coddle Creek Tributary (Indian Run) / 94		
Plot	**Planted Stems/Ac**	**Meeting Criteria**
094-HDR-0001-year:2012	1174	Yes
094-HDR-0002-year:2012	809	Yes
094-HDR-0003-year:2012	850	Yes
094-HDR-0004-year:2012	850	Yes
094-HDR-0005-year:2012	809	Yes
094-HDR-0006-year:2012	850	Yes
094-HDR-0007-year:2012	445	Yes
094-HDR-0008-year:2012	647	Yes
094-HDR-0009-year:2012	647	Yes
094-HDR-0010-year:2012	850	Yes
094-HDR-0011-year:2012	526	Yes

Table 8. CVS Vegetation Metadata
Coddle Creek Tributary (Indian Run) / 94

Report Prepared By	Vickie Miller
Date Prepared	7/11/2012 13:11
database name	cvs-eep-entrytool-v2.2.7_2012.mdb
database location	R:\EEP-WRP\Indian Run\Monitoring\2012 Monitoring\VegetationMonitoring
computer name	RAL-0982400
file size	39264256
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	94
project Name	Indian Run Tributary to Coddle Creek
Description	Stream Restoration
River Basin	Yadkin-Pee Dee
length(ft)	2270
stream-to-edge width (ft)	100
area (sq m)	42173.71
Required Plots (calculated)	11
Sampled Plots	0

Table 9. Vegetation Plot Data

Coddle Creek Tributary (Indian Run) / 94

Species	Common Name	Total Stems	Total Planted Stems	094-HDR-0001-year:2012		094-HDR-0002-year:2012		094-HDR-0003-year:2012		094-HDR-0004-year:2012		094-HDR-0005-year:2012		094-HDR-0006-year:2012		094-HDR-0007-year:2012		094-HDR-0008-year:2012		094-HDR-0009-year:2012		094-HDR-0010-year:2012		094-HDR-0011-year:2012	
				P	V	P	V	P	V	P	V	P	V	P	V	P	V	P	V	P	V	P	V	P	V
Acer negundo	boxelder	9	0												5		2		2						
Acer rubrum	red maple	36	28	11		3	2	4				5		4	6									1	
Alnus serrulata	hazel alder	21	21	5						2		5		2		5				1		1			
Betula nigra	river birch	674	20		651							3		3						4	3	3		7	
Callicarpa americana	American beautyberry	7	7			2				3		1		1											
Calycanthus floridus	eastern sweetshrub	1	1					1																	
Celtis laevigata	sugarberry	10	10											1		1		6		2					
Cornus amomum	silky dogwood	34	34	1		4				8				4		4		5		6		1		1	
Diospyros virginiana	common persimmon	18	18	1		4		4				1		1						3		4			
Fraxinus pennsylvanica	green ash	21	21	6		4		7		2		2													
Juglans nigra	black walnut	5	5					1		3				1											
Liquidambar styraciflua	sweetgum	9	0						5				2		2										
Platanus occidentalis	American sycamore	1536	0				315		95		1000		118		8										
Populus deltoides	eastern cottonwood	662	0		48		25		4		18		13		5		119		174		195		59		2
Quercus nigra	water oak	8	8					2				1		1								3		1	
Quercus phellos	willow oak	21	21	4		3		2		3		1		1				4						3	
Salix nigra	black willow	18	13									1		1		1		1				9			5
Sambucus canadensis	common elderberry	2	2	1										1											
Ulmus sp.	elm	33	0								21		7		5										
	Stem Count	3125	209																						
	Species Count			29	699	20	342	21	104	21	1039	20	140	21	31	11	121	16	176	16	198	21	59	13	7
	Planted Stems / acre			1174		809		850		850		809		850		445		647		647		850		526	
	Total Stems			728		362		125		1060		160		52		132		192		214		80		20	
	Total Stems / acre			29461		14650		5059		42897		6475		2104		5342		7770		8660		3237		809	

*P – Planted, V – Volunteer

Appendix D. Stream Survey Data

Cross-Sections with Annual Overlays

Longitudinal Profiles with Annual Overlays

Pebble Counts with Annual Overlays

Table 10a – Baseline Stream Data Summary – Upper Reach

Table 10b – Baseline Stream Data Summary – Lower Reach

Table 11a – Monitoring Data – Dimensional Morphology Summary

Table 11b – Monitoring Data – Stream Reach Data Summary – Upper Reach

Table 11c – Monitoring Data – Stream Reach Data Summary – Lower Reach

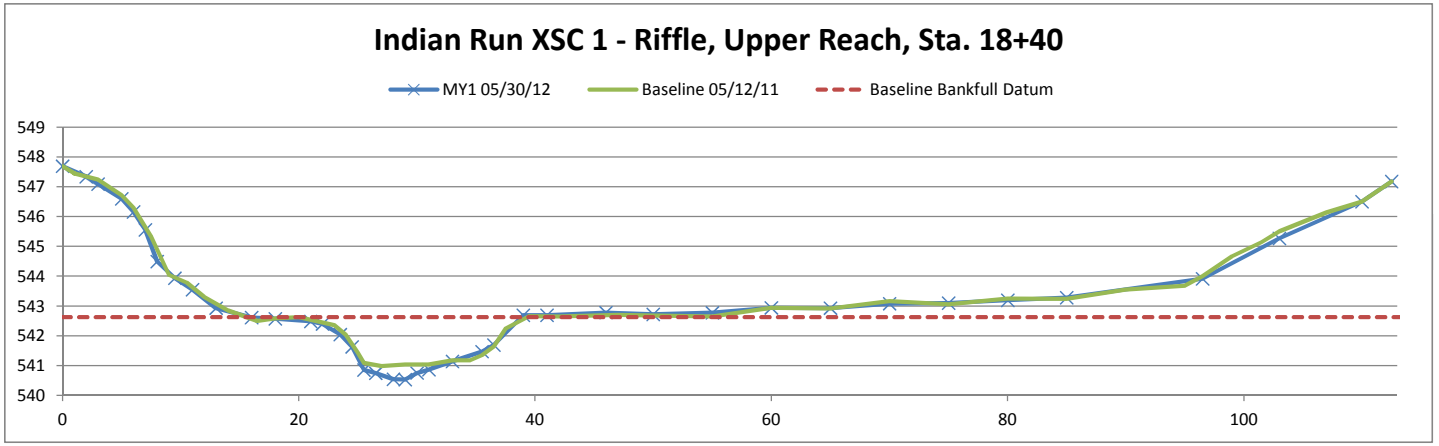
Station	Elevation
0	547.69
2	547.34
3	547.09
5	546.6
6	546.16
7	545.56
8	544.49
9.5	543.93
11	543.55
13	542.93
16	542.61
18	542.57
21	542.48
22	542.4
23.5	542.04
24.5	541.63
25.5	540.85
26.5	540.74
28	540.54
29	540.53
30	540.75
31	540.86
33	541.14
35.5	541.47
36.5	541.69
39	542.69
41	542.69
46	542.78
50	542.72
55	542.77
60	542.94
65	542.93
70	543.08
75	543.1
80	543.19
85	543.28
96.5	543.91
103	545.27
110	546.5
112.5	547.18

Reach	Indian Run, Upper Reach
River Basin	Yadkin / Pee Dee
Cross Section ID	XSC-1, Riffle, Upper Reach, 18+40
Drainage Area (Sq Mi)	1.5
Date	5/29/2012
Observers	V. Miller, C. Myers, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	542.62
Bankfull Cross Sectional Area, ft^2	22.60
Bankfull Width, ft	22.90
Max Depth at Bankfull, ft	2.09
Mean Depth at Bankfull, ft	0.99
Width/Depth Ratio	23.20
Flood Prone Width, ft	92.50
Flood Prone Area Elevation	544.71
Entrenchment Ratio	4.04
Bank Height Ratio	0.98

Stream Type	C4

Sta. 18+40 Looking Downstream



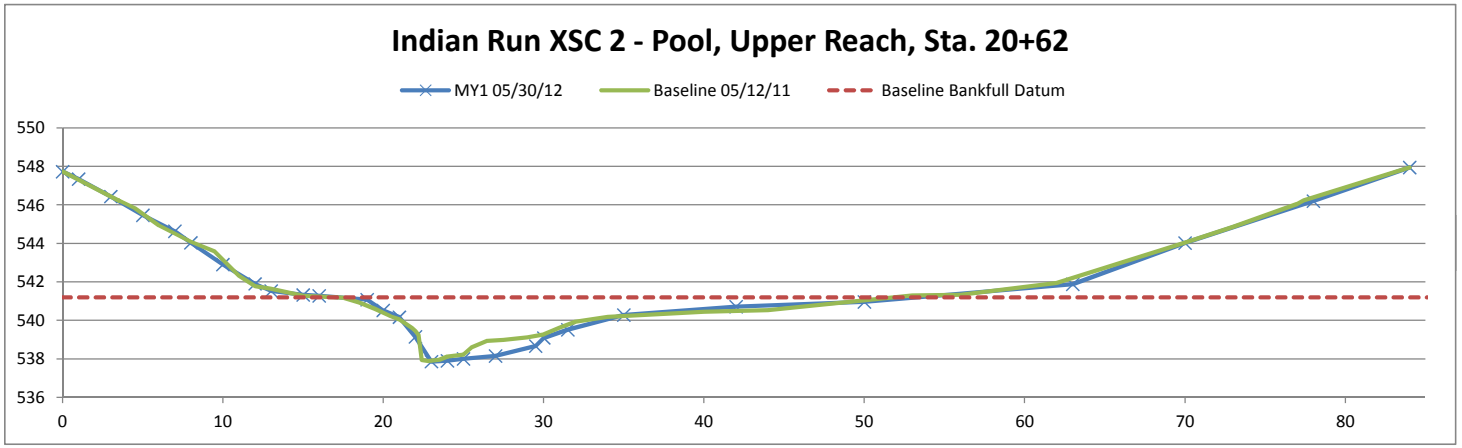
Station	Elevation
0	547.73
1	547.34
3	546.44
5	545.46
7	544.63
8	544.03
10	542.9
12	541.9
13	541.53
15	541.32
16	541.28
19	541.08
20	540.52
21	540.17
22	539.15
23	537.86
24	537.9
25	538
27	538.15
29.5	538.67
30	539.09
31.5	539.52
35	540.28
42	540.71
50	540.96
63	541.88
70	544.02
78	546.2
84	547.95

Reach	Indian Run, Upper Reach
River Basin	Yadkin / Pee Dee
Cross Section ID	XSC-2, Pool, Upper Reach, 20+62
Drainage Area (Sq Mi)	1.5
Date	5/29/2012
Observers	V. Miller, C. Myers, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	541.18
Bankfull Cross Sectional Area, ft^2	41.46
Bankfull Width, ft	35.59
Max Depth at Bankfull, ft	3.32
Mean Depth at Bankfull, ft	1.16
Width/Depth Ratio	30.55
Flood Prone Width, ft	60.70
Flood Prone Area Elevation	544.50
Entrenchment Ratio	1.71
Bank Height Ratio	1.00

Stream Type	C4

Sta. 20+62 Looking Downstream, foreground



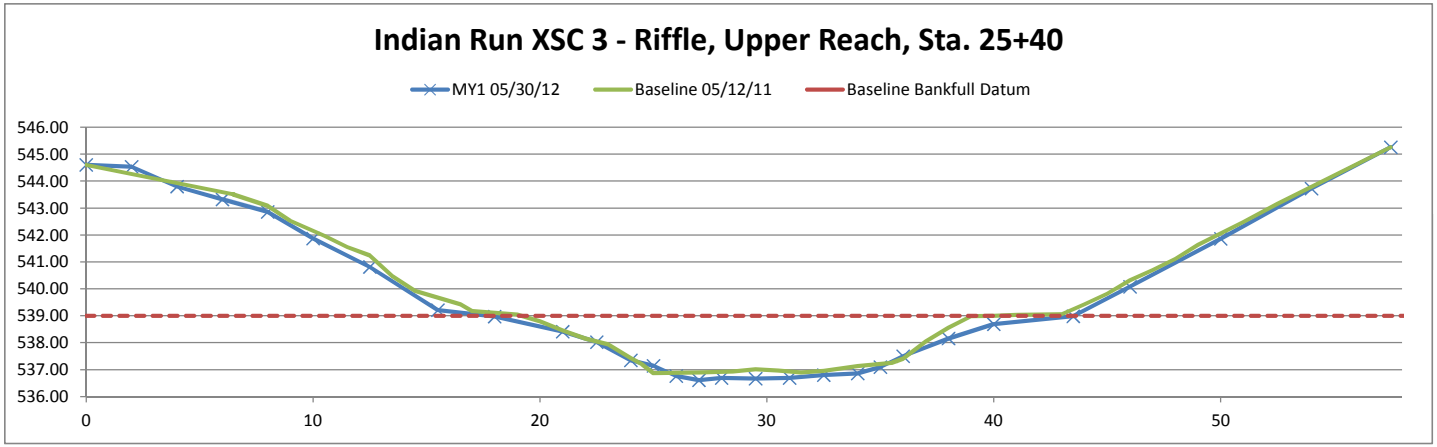
Station	Elevation
0	544.60
2	544.53
4	543.80
6	543.32
8	542.86
10	541.87
12.5	540.81
15.5	539.21
18	538.97
21	538.41
22.5	538.02
24	537.35
25	537.14
26	536.76
27	536.61
28	536.69
29.5	536.67
31	536.69
32.5	536.80
34	536.86
35	537.10
36	537.50
38	538.16
40	538.69
43.5	538.98
46	540.08
50	541.86
54	543.72
57.5	545.26

Reach	Indian Run, Upper Reach
River Basin	Yadkin / Pee Dee
Cross Section ID	XSC-3, Riffle, Upper Reach, 25+40
Drainage Area (Sq Mi)	1.5
Date	5/29/2012
Observers	V. Miller, C. Myers, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	539.00
Bankfull Cross Sectional Area, ft^2	33.89
Bankfull Width, ft	25.86
Max Depth at Bankfull, ft	2.39
Mean Depth at Bankfull, ft	1.31
Width/Depth Ratio	19.73
Flood Prone Width, ft	37.80
Flood Prone Area Elevation	541.39
Entrenchment Ratio	1.46
Bank Height Ratio	1.00

Stream Type	C4

Sta. 25+40, Looking Upstream



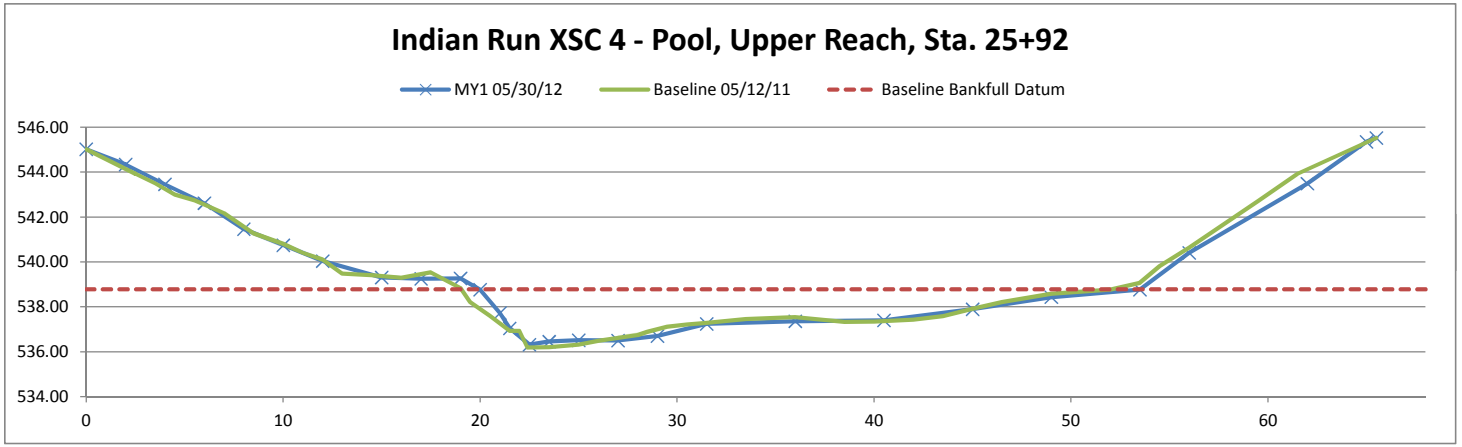
Station	Elevation
0	545.02
2	544.34
4	543.46
6	542.62
8	541.46
10	540.74
12	540.04
15	539.31
17	539.25
19	539.27
20	538.76
21	537.72
21.5	537.04
22.5	536.31
23.5	536.45
25	536.51
27	536.50
29	536.70
31.5	537.24
36	537.36
40.5	537.40
45	537.89
49	538.43
53.5	538.77
56	540.40
62	543.49
65	545.35
65.5	545.52

Reach	Indian Run, Upper Reach
River Basin	Yadkin / Pee Dee
Cross Section ID	XSC-4, Pool, Upper Reach, 25+92
Drainage Area (Sq Mi)	1.5
Date	5/29/2012
Observers	V. Miller, C. Myers, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	538.77
Bankfull Cross Sectional Area, ft^2	43.72
Bankfull Width, ft	33.51
Max Depth at Bankfull, ft	2.46
Mean Depth at Bankfull, ft	1.30
Width/Depth Ratio	25.68
Flood Prone Width, ft	47.90
Flood Prone Area Elevation	541.23
Entrenchment Ratio	1.43
Bank Height Ratio	1.00

Stream Type	C4

Sta. 25+92 Looking Downstream, foreground



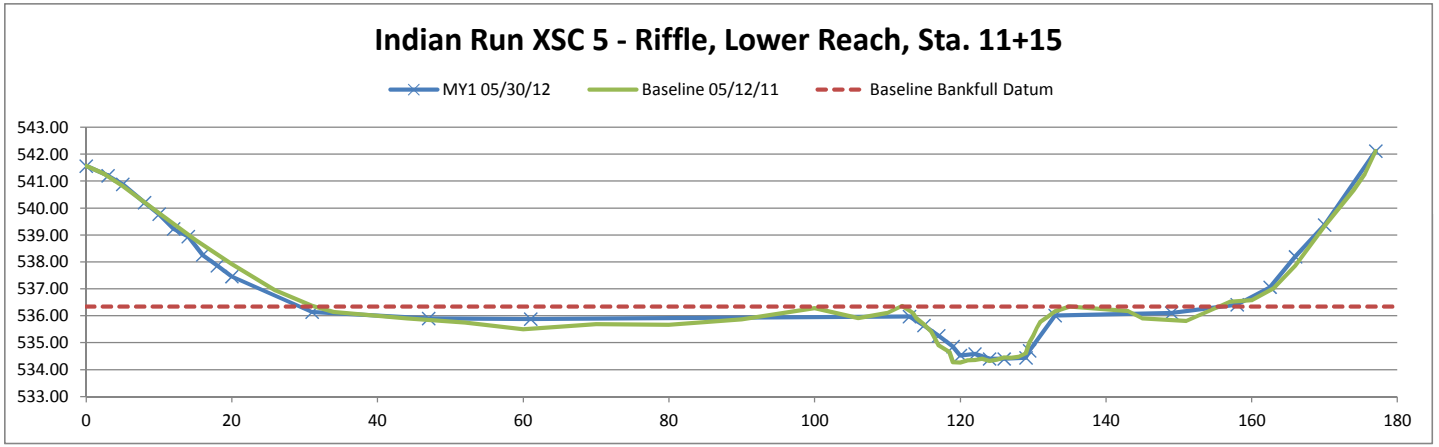
Station	Elevation
0	541.56
3	541.20
5	540.88
8	540.20
10	539.77
12	539.23
14	538.94
16	538.26
18	537.86
20	537.46
31	536.14
47	535.90
61	535.88
113	535.97
115	535.64
117	535.26
119	534.86
120	534.53
122	534.58
124	534.40
126	534.40
129	534.44
129.5	534.70
133	536.01
149	536.11
158	536.41
162.5	537.06
166	538.19
170	539.37
177	542.11

Reach	Indian Run, Lower Reach
River Basin	Yadkin / Pee Dee
Cross Section ID	XSC-5, Riffle, Lower Reach, 11+15
Drainage Area (Sq Mi)	1.5
Date	5/30/2012
Observers	V. Miller, C. Myers, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	536.34
Bankfull Cross Sectional Area, ft^2	27.92
Bankfull Width, ft	19.98
Max Depth at Bankfull, ft	1.94
Mean Depth at Bankfull, ft	1.40
Width/Depth Ratio	14.30
Flood Prone Width, ft	150.10
Flood Prone Area Elevation	538.28
Entrenchment Ratio	7.51
Bank Height Ratio	0.83

Stream Type	C4

Sta. 11+15 Looking Downstream



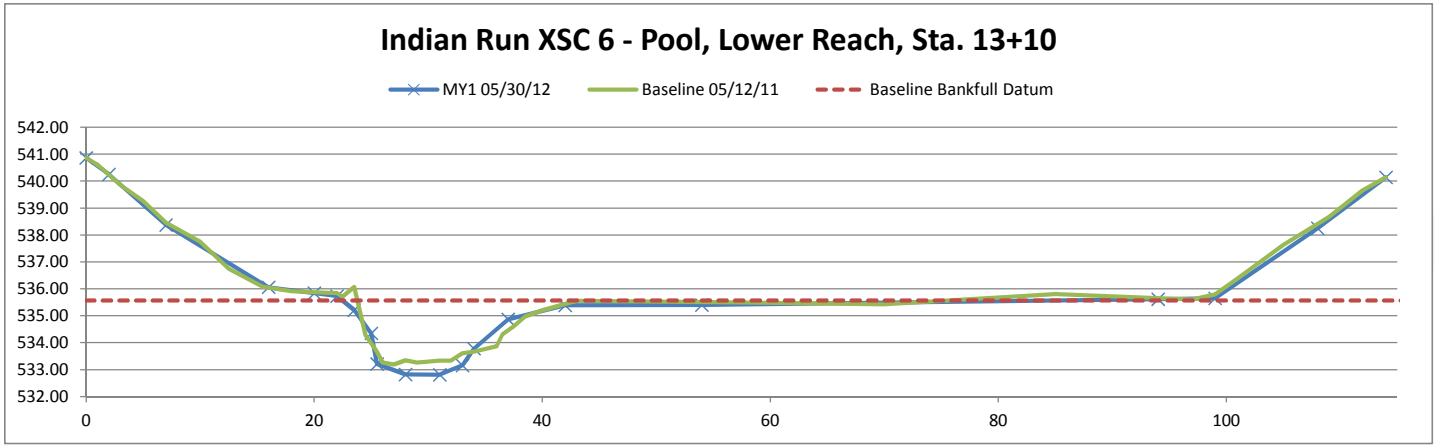
Station	Elevation
0	540.86
2	540.25
7	538.37
16	536.06
20	535.84
22	535.73
23.5	535.21
25	534.35
25.5	533.21
28	532.82
31	532.81
33	533.16
34	533.78
37	534.87
42	535.39
54	535.40
94	535.62
99	535.65
108	538.25
114	540.14

Reach	Indian Run, Lower Reach
River Basin	Yadkin / Pee Dee
Cross Section ID	XSC-6, Pool, Lower Reach, 13+10
Drainage Area (Sq Mi)	1.5
Date	5/30/2012
Observers	V. Miller, C. Myers, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	535.56
Bankfull Cross Sectional Area, ft^2	26.71
Bankfull Width, ft	19.03
Max Depth at Bankfull, ft	2.75
Mean Depth at Bankfull, ft	1.40
Width/Depth Ratio	13.56
Flood Prone Width, ft	104.40
Flood Prone Area Elevation	538.31
Entrenchment Ratio	5.49
Bank Height Ratio	0.94

Stream Type	C4

Sta. 13+10 Looking Downstream



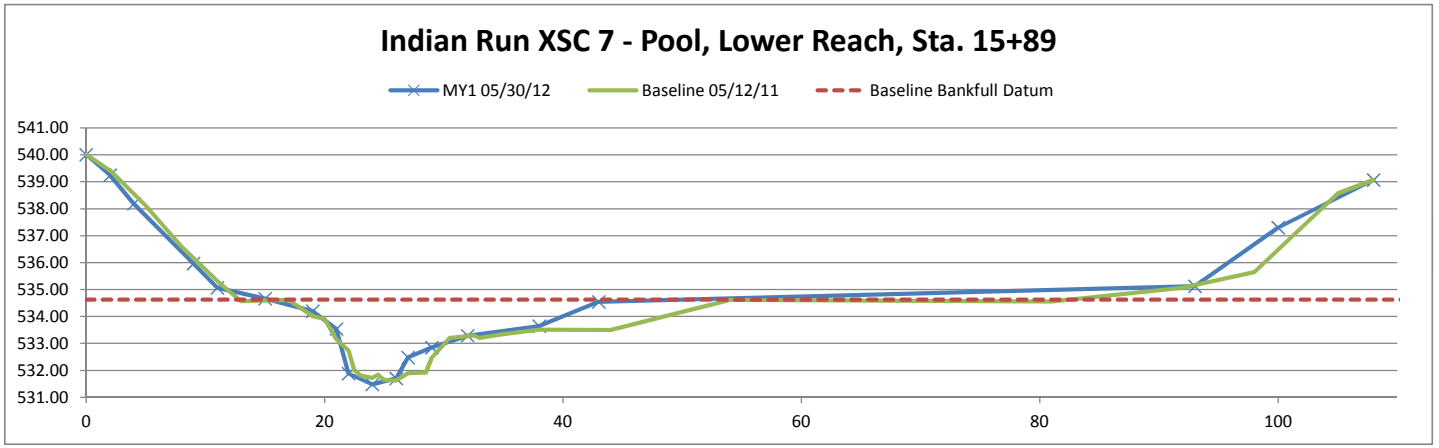
Station	Elevation
0	540.01
2	539.25
4	538.19
9	535.97
11	535.07
15	534.66
19	534.20
21	533.54
22	531.88
24	531.48
26	531.70
27	532.48
29	532.85
32	533.29
38	533.64
43	534.54
93	535.12
100	537.30
108	539.07

Reach	Indian Run, Lower Reach
River Basin	Yadkin / Pee Dee
Cross Section ID	XSC-7, Pool, Lower Reach, 15+89
Drainage Area (Sq Mi)	1.5
Date	5/30/2012
Observers	V. Miller, C. Myers, W. Yelverton

SUMMARY DATA	
Bankfull Elevation, ft	534.62
Bankfull Cross Sectional Area, ft^2	37.08
Bankfull Width, ft	34.53
Max Depth at Bankfull, ft	3.14
Mean Depth at Bankfull, ft	1.07
Width/Depth Ratio	32.16
Flood Prone Width, ft	99.00
Flood Prone Area Elevation	537.76
Entrenchment Ratio	2.87
Bank Height Ratio	1.00

Stream Type	C4

Sta. 15+89 Looking Downstream



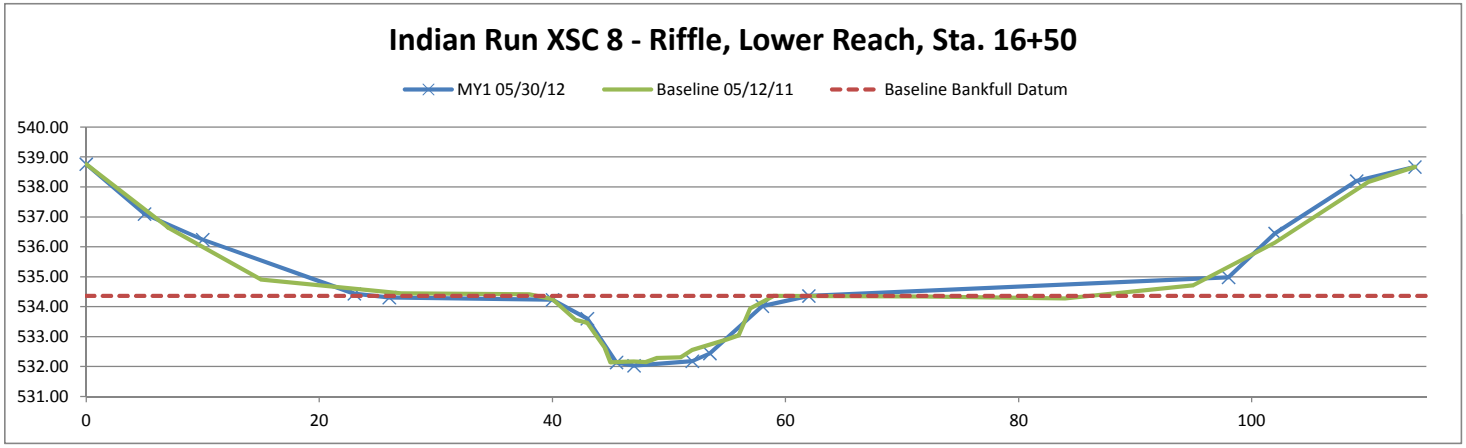
Station	Elevation
0	538.76
5	537.10
10	536.24
23	534.43
26	534.31
40	534.23
43	533.60
45.5	532.14
47	532.03
52	532.18
53.5	532.44
58	534.02
62	534.36
98	534.98
102	536.45
109	538.20
114	538.67

Reach	Indian Run, Lower Reach
River Basin	Yadkin / Pee Dee
Cross Section ID	XSC-8, Riffle, Lower Reach, 16+50
Drainage Area (Sq Mi)	1.5
Date	5/30/2012
Observers	V. Miller, C. Myers, W. Yelverton

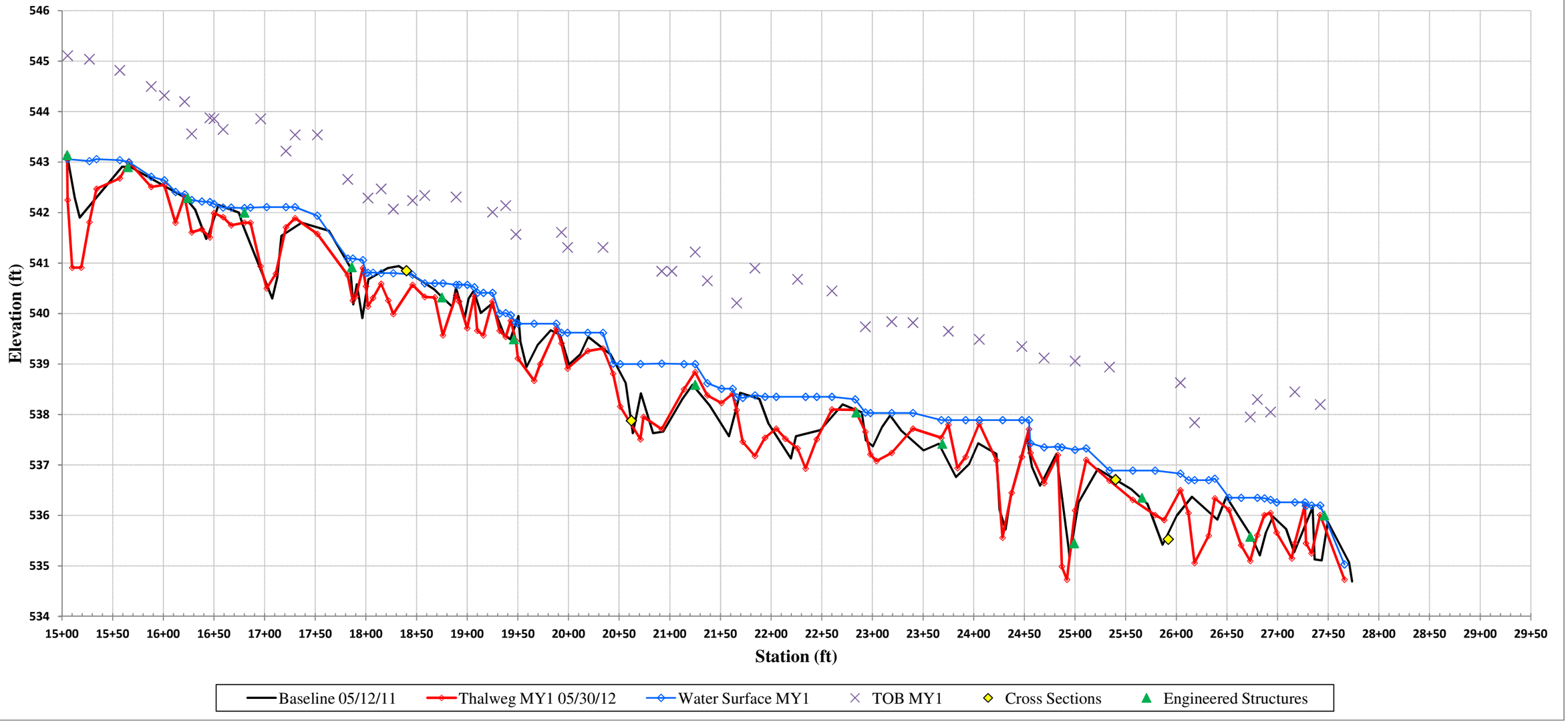
SUMMARY DATA	
Bankfull Elevation, ft	534.36
Bankfull Cross Sectional Area, ft^2	28.64
Bankfull Width, ft	22.02
Max Depth at Bankfull, ft	2.33
Mean Depth at Bankfull, ft	1.30
Width/Depth Ratio	16.93
Flood Prone Width, ft	95.60
Flood Prone Area Elevation	536.69
Entrenchment Ratio	4.34
Bank Height Ratio	0.94

Stream Type	C4

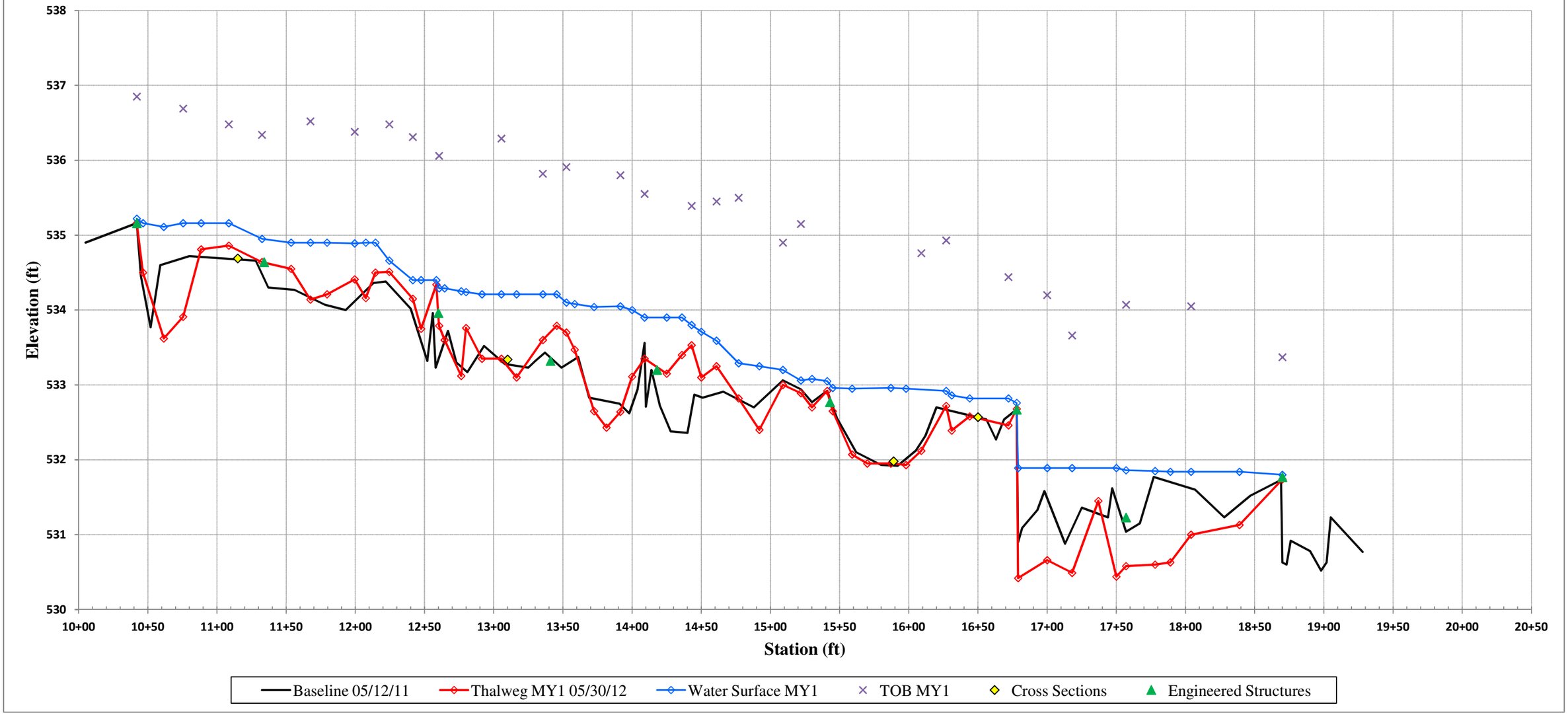
Sta. 16+50 Looking Upstream, above log struc.



Longitudinal Profile
Indian Run - Upper Reach
EEP Project #94



Longitudinal Profile
Indian Run - Lower Reach
EEP Project #94

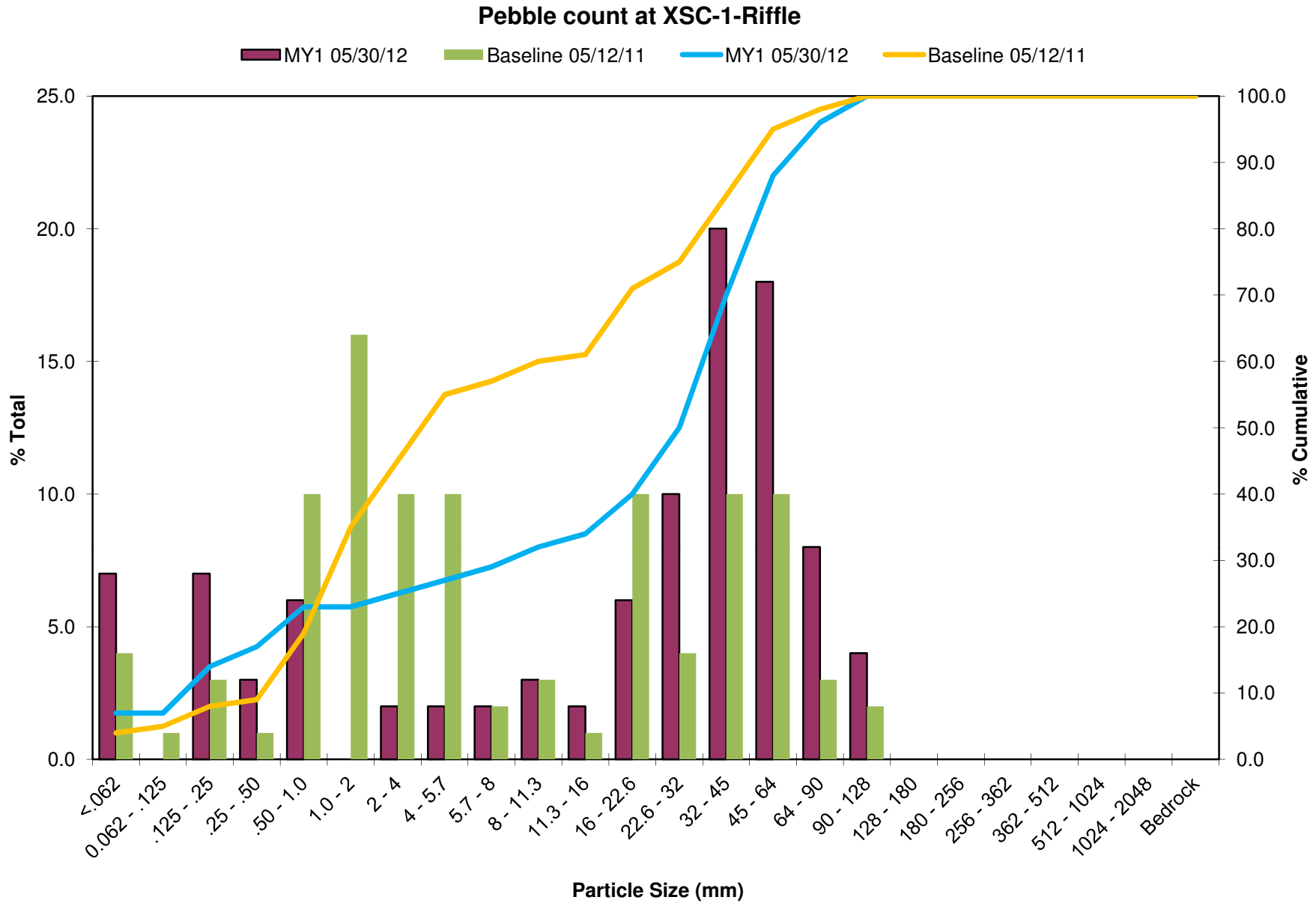


Indian Run - UR XSC-1 Riffle-Pebble Count

Location: STA 18+40

Inches	Particle	Millimeters		Count	%Total	% Cum.
	Silt/Clay	<.062	SILT/CLAY	7	7.0	7.0
	Very Fine	0.062 - .125	SAND	0	0.0	7.0
	Fine	.125 - .25		7	7.0	14.0
	Medium	.25 - .50		3	3.0	17.0
	Coarse	.50 - 1.0		6	6.0	23.0
.04 - .08	Very Coarse	1.0 - 2		0	0.0	23.0
.08 - .16	Very Fine	2 - 4	GRAVEL	2	2.0	25.0
.16 - .22	Fine	4 - 5.7		2	2.0	27.0
.22 - .31	Fine	5.7 - 8		2	2.0	29.0
.31 .44	Medium	8 - 11.3		3	3.0	32.0
.44 - .63	Medium	11.3 - 16		2	2.0	34.0
.63 - .89	Coarse	16 - 22.6		6	6.0	40.0
.89 - 1.26	Coarse	22.6 - 32		10	10.0	50.0
1.26 - 1.77	Very Coarse	32 - 45		20	20.0	70.0
1.77 - 2.5	Very Coarse	45 - 64		18	18.0	88.0
2.5 - 3.5	Small	64 - 90	COBBLE	8	8.0	96.0
3.5 - 5.0	Small	90 - 128		4	4.0	100.0
5.0 - 7.1	Large	128 - 180		0	0.0	100.0
7.1 - 10.1	Large	180 - 256		0	0.0	100.0
10.1 - 14.3	Small	256 - 362	BOULDER	0	0.0	100.0
14.3 - 20	Small	362 - 512		0	0.0	100.0
20 - 40	Medium	512 - 1024		0	0.0	100.0
40 - 80	Large - Very Lg	1024 - 2048		0	0.0	100.0
	Bedrock	Bedrock		0	0.0	100.0
			Total Counted	100		

Summary Data	
D50	32
D84	59
D95	86

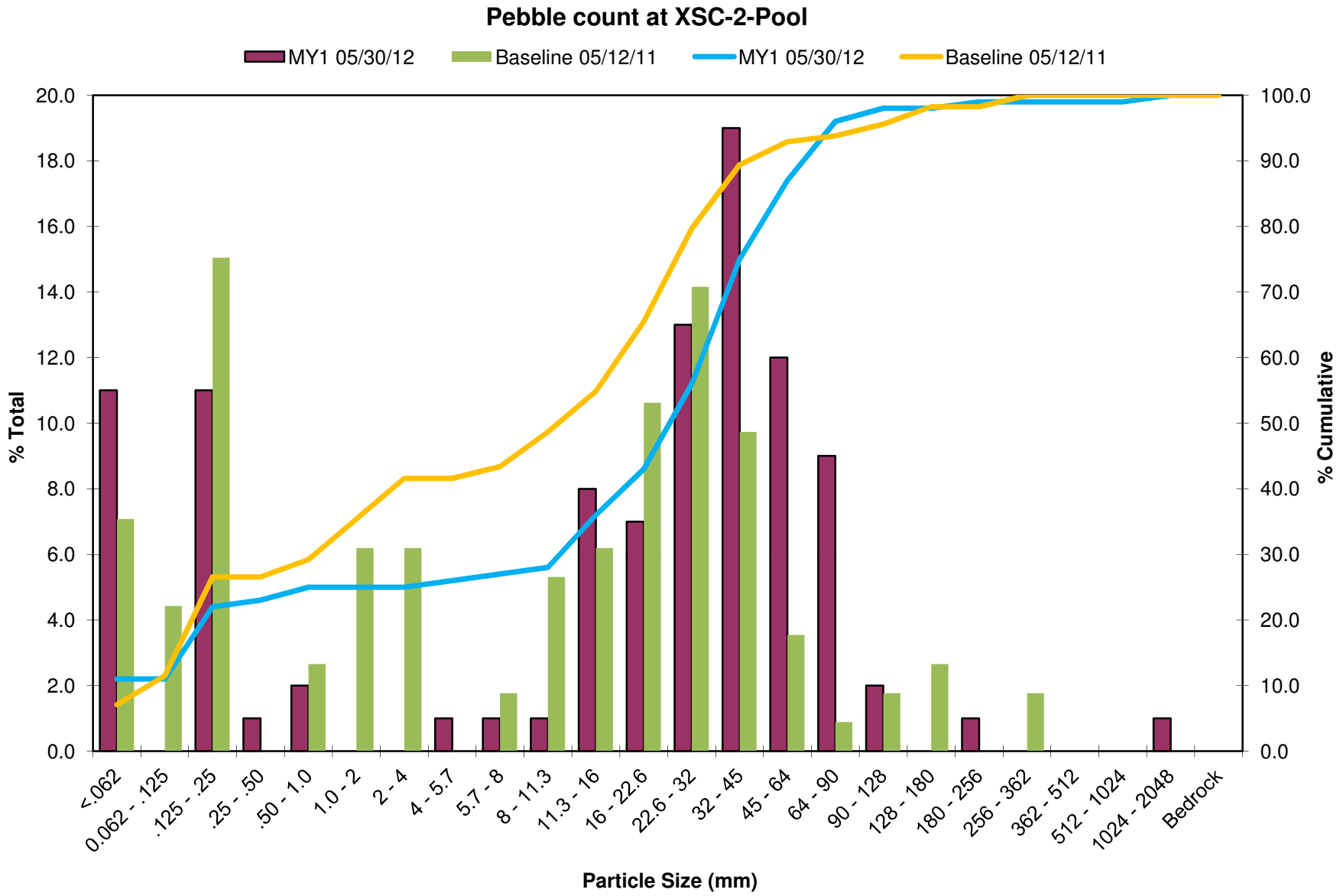

Pebble count at XSC-1-Riffle
MY1 05/30/12
Baseline 05/12/11
MY1 05/30/12
Baseline 05/12/11
% Total
% Cumulative
25.0
20.0
15.0
10.0
5.0
0.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
<.062
0.062 - .125
.125 - .25
.25 - .50
.50 - 1.0
1.0 - 2
2 - 4
4 - 5.7
5.7 - 8
8 - 11.3
11.3 - 16
16 - 22.6
22.6 - 32
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock
Particle Size (mm)

Indian Run -UR - XSC-2 Pool Pebble Count

Location: STA 20+62

Inches	Particle	Millimeters		Count	%Total	% Cum.
	Silt/Clay	<.062	SILT/CLAY	11	11.0	11.0
	Very Fine	0.062 - .125	SAND	0	0.0	11.0
	Fine	.125 - .25		11	11.0	22.0
	Medium	.25 - .50		1	1.0	23.0
	Coarse	.50 - 1.0		2	2.0	25.0
.04 - .08	Very Coarse	1.0 - 2		0	0.0	25.0
.08 - .16	Very Fine	2 - 4	GRAVEL	0	0.0	25.0
.16 - .22	Fine	4 - 5.7		1	1.0	26.0
.22 - .31	Fine	5.7 - 8		1	1.0	27.0
.31 .44	Medium	8 - 11.3		1	1.0	28.0
.44 - .63	Medium	11.3 - 16		8	8.0	36.0
.63 - .89	Coarse	16 - 22.6		7	7.0	43.0
.89 - 1.26	Coarse	22.6 - 32		13	13.0	56.0
1.26 - 1.77	Very Coarse	32 - 45		19	19.0	75.0
1.77 - 2.5	Very Coarse	45 - 64		12	12.0	87.0
2.5 - 3.5	Small	64 - 90	COBBLE	9	9.0	96.0
3.5 - 5.0	Small	90 - 128		2	2.0	98.0
5.0 - 7.1	Large	128 - 180		0	0.0	98.0
7.1 - 10.1	Large	180 - 256		1	1.0	99.0
10.1 - 14.3	Small	256 - 362	BOULDER	0	0.0	99.0
14.3 - 20	Small	362 - 512		0	0.0	99.0
20 - 40	Medium	512 - 1024		0	0.0	99.0
40 - 80	Large - Very Lg	1024 - 2048		1	1.0	100.0
	Bedrock	Bedrock		0	0.0	100.0
			Total Counted	100		

Summary Data	
D50	27
D84	59
D95	87

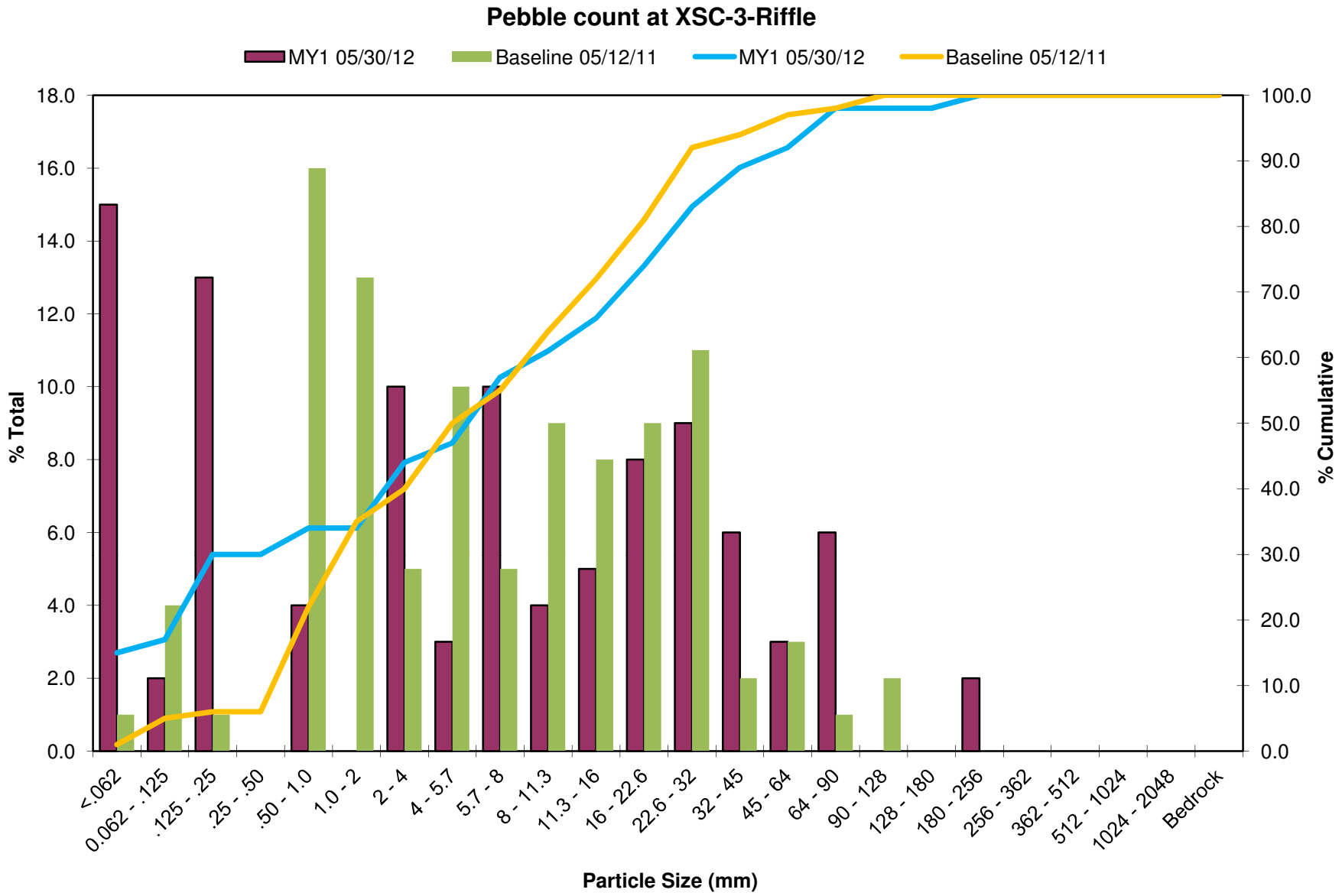

Pebble count at XSC-2-Pool
MY1 05/30/12
Baseline 05/12/11
MY1 05/30/12
Baseline 05/12/11
% Total
% Cumulative
20.0
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
<.062
0.062 - .125
.125 - .25
.25 - .50
.50 - 1.0
1.0 - 2
2 - 4
4 - 5.7
5.7 - 8
8 - 11.3
11.3 - 16
16 - 22.6
22.6 - 32
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock
Particle Size (mm)

Indian Run -UR - XSC-3 Riffle Pebble Count

Location: STA 25+40

Inches	Particle	Millimeters		Count	%Total	% Cum.
	Silt/Clay	<.062	SILT/CLAY	15	15.0	15.0
	Very Fine	0.062 - .125	SAND	2	2.0	17.0
	Fine	.125 - .25		13	13.0	30.0
	Medium	.25 - .50		0	0.0	30.0
	Coarse	.50 - 1.0		4	4.0	34.0
.04 - .08	Very Coarse	1.0 - 2		0	0.0	34.0
.08 - .16	Very Fine	2 - 4	GRAVEL	10	10.0	44.0
.16 - .22	Fine	4 - 5.7		3	3.0	47.0
.22 - .31	Fine	5.7 - 8		10	10.0	57.0
.31 .44	Medium	8 - 11.3		4	4.0	61.0
.44 - .63	Medium	11.3 - 16		5	5.0	66.0
.63 - .89	Coarse	16 - 22.6		8	8.0	74.0
.89 - 1.26	Coarse	22.6 - 32		9	9.0	83.0
1.26 - 1.77	Very Coarse	32 - 45		6	6.0	89.0
1.77 - 2.5	Very Coarse	45 - 64		3	3.0	92.0
2.5 - 3.5	Small	64 - 90	COBBLE	6	6.0	98.0
3.5 - 5.0	Small	90 - 128		0	0.0	98.0
5.0 - 7.1	Large	128 - 180		0	0.0	98.0
7.1 - 10.1	Large	180 - 256		2	2.0	100.0
10.1 - 14.3	Small	256 - 362	BOULDER	0	0.0	100.0
14.3 - 20	Small	362 - 512		0	0.0	100.0
20 - 40	Medium	512 - 1024		0	0.0	100.0
40 - 80	Large - Very Lg	1024 - 2048		0	0.0	100.0
	Bedrock	Bedrock		0	0.0	100.0
			Total Counted	100		

Summary Data	
D50	6.5
D84	34
D95	76

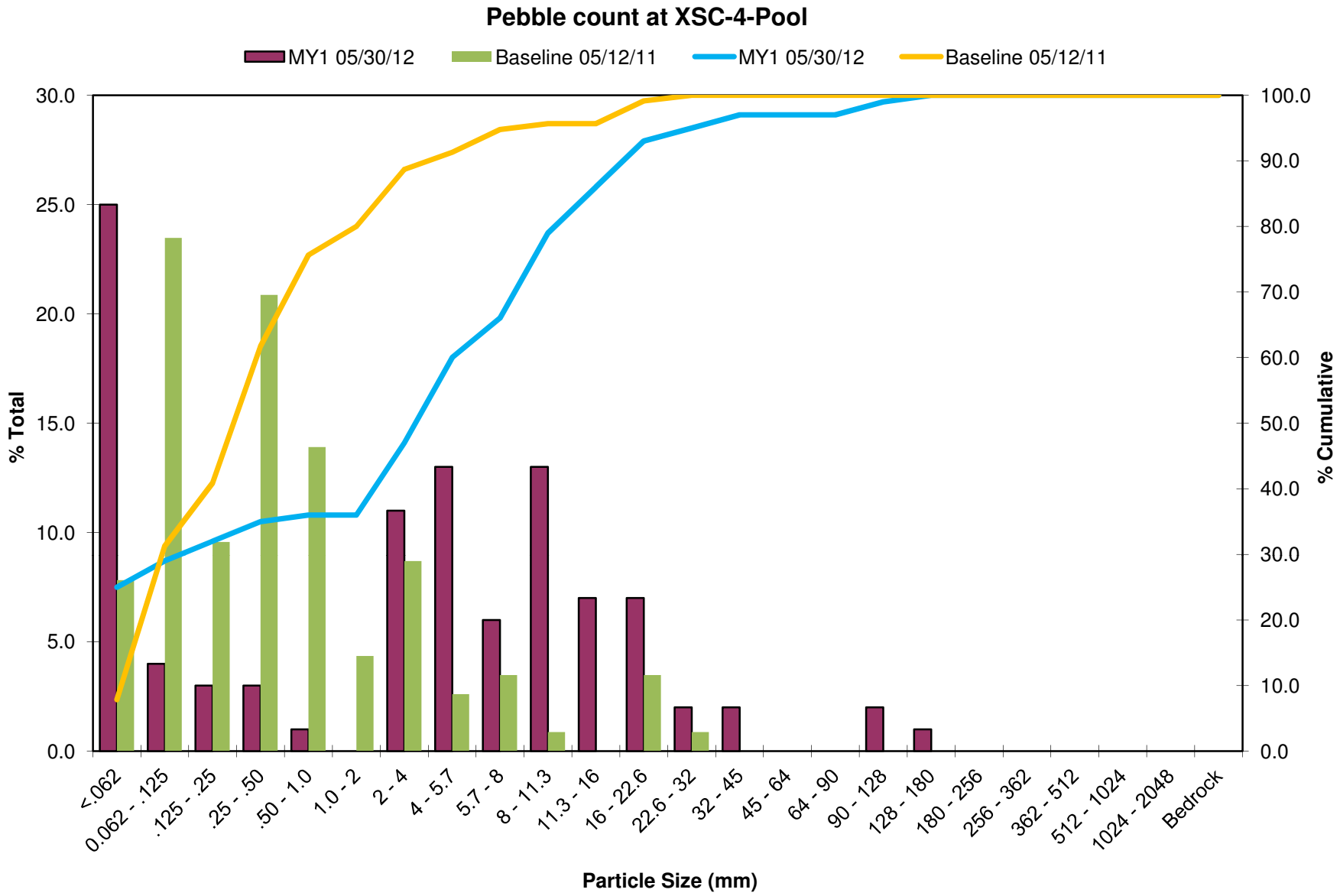

Pebble count at XSC-3-Riffle
MY1 05/30/12
Baseline 05/12/11
MY1 05/30/12
Baseline 05/12/11
% Total
% Cumulative
Particle Size (mm)
<.062
0.062 - .125
.125 - .25
.25 - .50
.50 - 1.0
1.0 - 2
2 - 4
4 - 5.7
5.7 - 8
8 - 11.3
11.3 - 16
16 - 22.6
22.6 - 32
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock

Indian Run -UR - XSC-4 Pool Pebble Count

Location: STA 25+92

Inches	Particle	Millimeters		Count	%Total	% Cum.
	Silt/Clay	<.062	SILT/CLAY	25	25.0	25.0
	Very Fine	0.062 - .125	SAND	4	4.0	29.0
	Fine	.125 - .25		3	3.0	32.0
	Medium	.25 - .50		3	3.0	35.0
	Coarse	.50 - 1.0		1	1.0	36.0
.04 - .08	Very Coarse	1.0 - 2		0	0.0	36.0
.08 - .16	Very Fine	2 - 4	GRAVEL	11	11.0	47.0
.16 - .22	Fine	4 - 5.7		13	13.0	60.0
.22 - .31	Fine	5.7 - 8		6	6.0	66.0
.31 .44	Medium	8 - 11.3		13	13.0	79.0
.44 - .63	Medium	11.3 - 16		7	7.0	86.0
.63 - .89	Coarse	16 - 22.6		7	7.0	93.0
.89 - 1.26	Coarse	22.6 - 32		2	2.0	95.0
1.26 - 1.77	Very Coarse	32 - 45		2	2.0	97.0
1.77 - 2.5	Very Coarse	45 - 64		0	0.0	97.0
2.5 - 3.5	Small	64 - 90	COBBLE	0	0.0	97.0
3.5 - 5.0	Small	90 - 128		2	2.0	99.0
5.0 - 7.1	Large	128 - 180		1	1.0	100.0
7.1 - 10.1	Large	180 - 256		0	0.0	100.0
10.1 - 14.3	Small	256 - 362	BOULDER	0	0.0	100.0
14.3 - 20	Small	362 - 512		0	0.0	100.0
20 - 40	Medium	512 - 1024		0	0.0	100.0
40 - 80	Large - Very Lg	1024 - 2048		0	0.0	100.0
	Bedrock	Bedrock		0	0.0	100.0
			Total Counted	100		

Summary Data	
D50	4.4
D84	14
D95	32

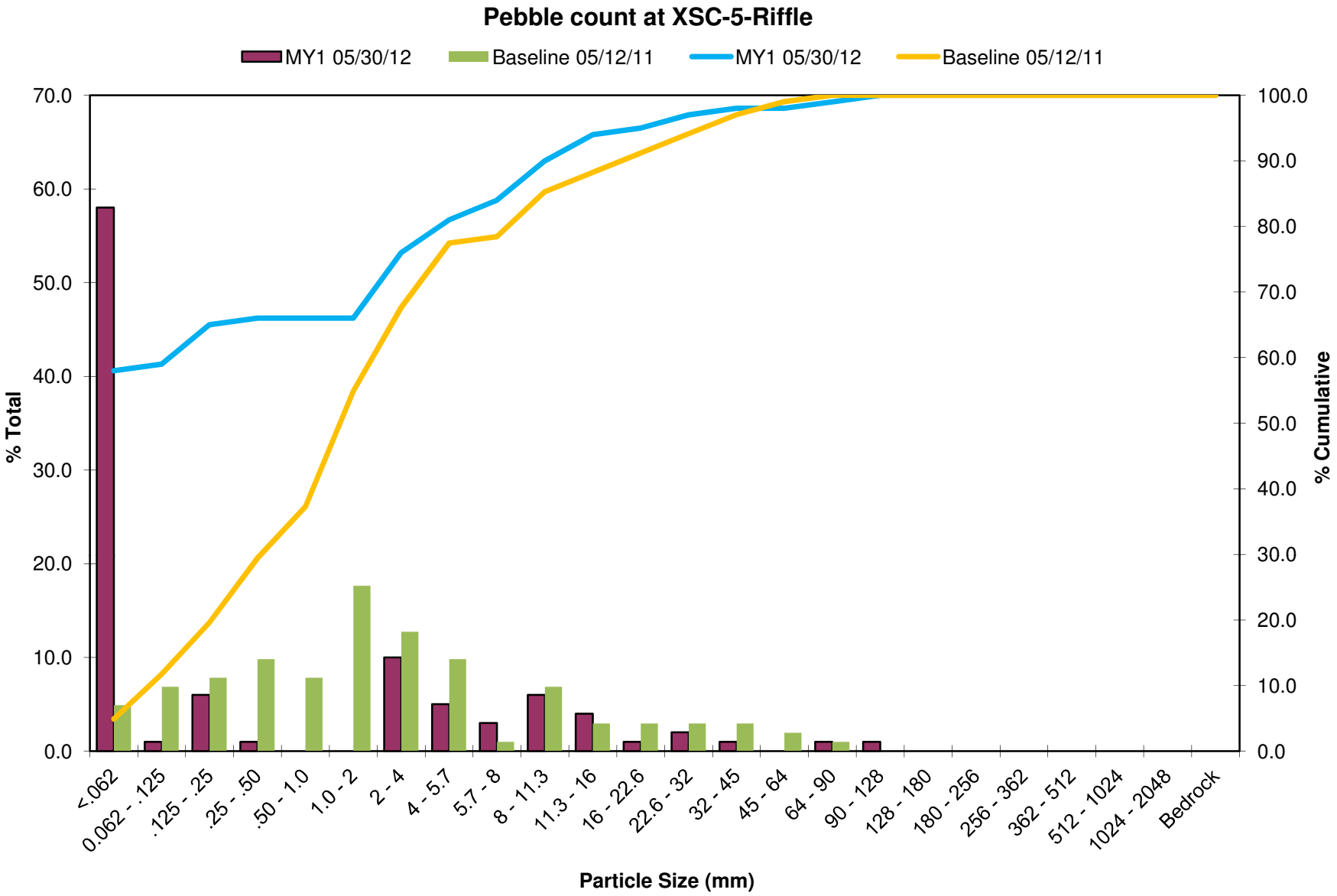

Pebble count at XSC-4-Pool
MY1 05/30/12
Baseline 05/12/11
MY1 05/30/12
Baseline 05/12/11
% Total
% Cumulative
30.0
25.0
20.0
15.0
10.0
5.0
0.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
<.062
0.062 - .125
.125 - .25
.25 - .50
.50 - 1.0
1.0 - 2
2 - 4
4 - 5.7
5.7 - 8
8 - 11.3
11.3 - 16
16 - 22.6
22.6 - 32
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock
Particle Size (mm)

Indian Run -LR - XSC-5 Riffle Pebble Count

Location: STA 11+15

Inches	Particle	Millimeters		Count	%Total	% Cum.
	Silt/Clay	<.062	SILT/CLAY	58	58.0	58.0
	Very Fine	0.062 - .125	SAND	1	1.0	59.0
	Fine	.125 - .25		6	6.0	65.0
	Medium	.25 - .50		1	1.0	66.0
	Coarse	.50 - 1.0		0	0.0	66.0
.04 - .08	Very Coarse	1.0 - 2		0	0.0	66.0
.08 - .16	Very Fine	2 - 4	GRAVEL	10	10.0	76.0
.16 - .22	Fine	4 - 5.7		5	5.0	81.0
.22 - .31	Fine	5.7 - 8		3	3.0	84.0
.31 .44	Medium	8 - 11.3		6	6.0	90.0
.44 - .63	Medium	11.3 - 16		4	4.0	94.0
.63 - .89	Coarse	16 - 22.6		1	1.0	95.0
.89 - 1.26	Coarse	22.6 - 32		2	2.0	97.0
1.26 - 1.77	Very Coarse	32 - 45		1	1.0	98.0
1.77 - 2.5	Very Coarse	45 - 64		0	0.0	98.0
2.5 - 3.5	Small	64 - 90	COBBLE	1	1.0	99.0
3.5 - 5.0	Small	90 - 128		1	1.0	100.0
5.0 - 7.1	Large	128 - 180		0	0.0	100.0
7.1 - 10.1	Large	180 - 256		0	0.0	100.0
10.1 - 14.3	Small	256 - 362	BOULDER	0	0.0	100.0
14.3 - 20	Small	362 - 512		0	0.0	100.0
20 - 40	Medium	512 - 1024		0	0.0	100.0
40 - 80	Large - Very Lg	1024 - 2048		0	0.0	100.0
	Bedrock	Bedrock		0	0.0	100.0
			Total Counted	100		

Summary Data	
D50	0.062
D84	8
D95	22

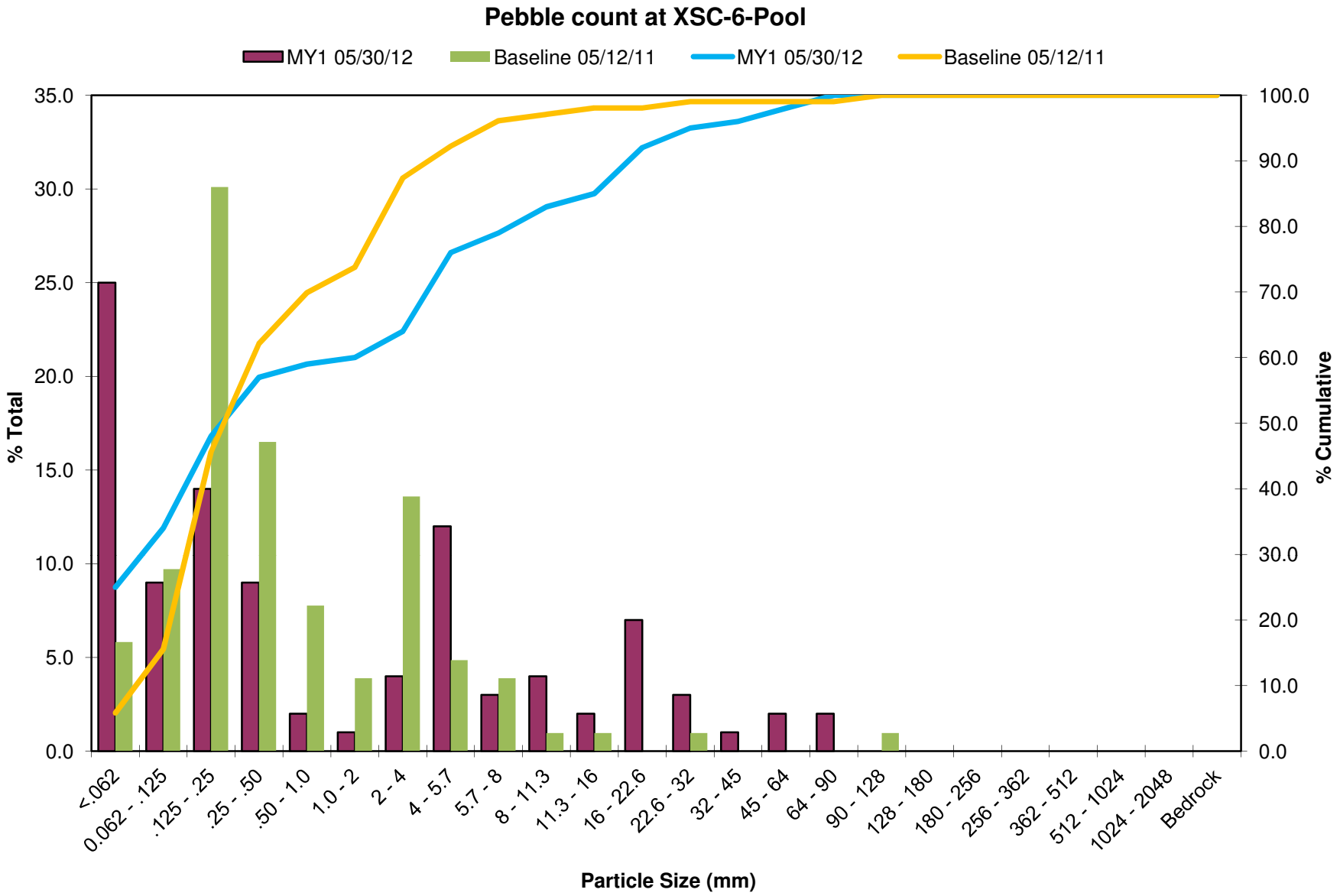

Pebble count at XSC-5-Riffle
MY1 05/30/12
Baseline 05/12/11
MY1 05/30/12
Baseline 05/12/11
% Total
% Cumulative
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
<.062
0.062 - .125
.125 - .25
.25 - .50
.50 - 1.0
1.0 - 2
2 - 4
4 - 5.7
5.7 - 8
8 - 11.3
11.3 - 16
16 - 22.6
22.6 - 32
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock
Particle Size (mm)

Indian Run -LR - XSC-6 Pool Pebble Count

Location: STA 13+10

Inches	Particle	Millimeters		Count	%Total	% Cum.
	Silt/Clay	<.062	SILT/CLAY	25	25.0	25.0
	Very Fine	0.062 - .125	SAND	9	9.0	34.0
	Fine	.125 - .25		14	14.0	48.0
	Medium	.25 - .50		9	9.0	57.0
	Coarse	.50 - 1.0		2	2.0	59.0
.04 - .08	Very Coarse	1.0 - 2		1	1.0	60.0
.08 - .16	Very Fine	2 - 4	GRAVEL	4	4.0	64.0
.16 - .22	Fine	4 - 5.7		12	12.0	76.0
.22 - .31	Fine	5.7 - 8		3	3.0	79.0
.31 .44	Medium	8 - 11.3		4	4.0	83.0
.44 - .63	Medium	11.3 - 16		2	2.0	85.0
.63 - .89	Coarse	16 - 22.6		7	7.0	92.0
.89 - 1.26	Coarse	22.6 - 32		3	3.0	95.0
1.26 - 1.77	Very Coarse	32 - 45		1	1.0	96.0
1.77 - 2.5	Very Coarse	45 - 64		2	2.0	98.0
2.5 - 3.5	Small	64 - 90	COBBLE	2	2.0	100.0
3.5 - 5.0	Small	90 - 128		0	0.0	100.0
5.0 - 7.1	Large	128 - 180		0	0.0	100.0
7.1 - 10.1	Large	180 - 256		0	0.0	100.0
10.1 - 14.3	Small	256 - 362	BOULDER	0	0.0	100.0
14.3 - 20	Small	362 - 512		0	0.0	100.0
20 - 40	Medium	512 - 1024		0	0.0	100.0
40 - 80	Large - Very Lg	1024 - 2048		0	0.0	100.0
	Bedrock	Bedrock		0	0.0	100.0
			Total Counted	100		

Summary Data	
D50	0.29
D84	13
D95	32

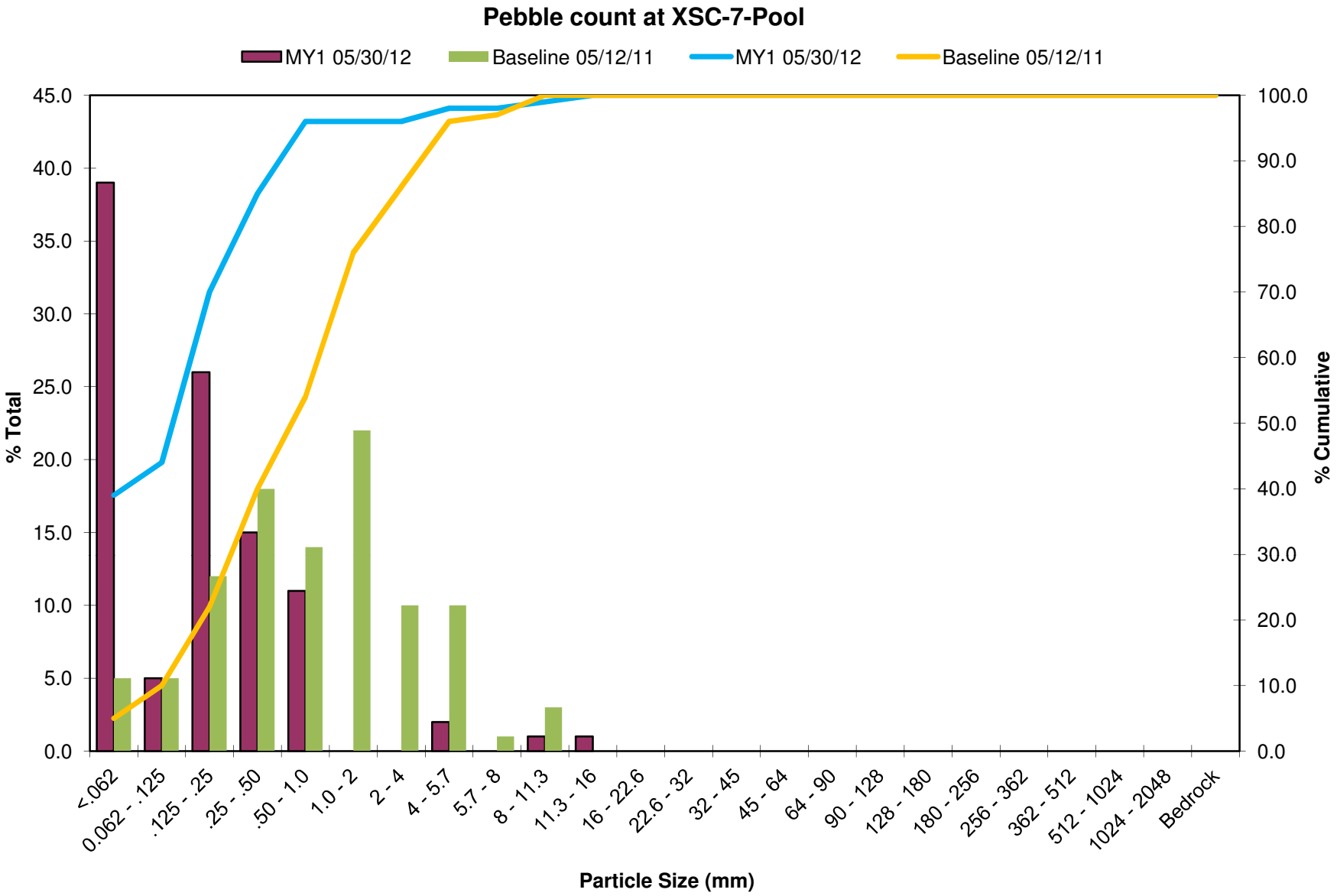

Pebble count at XSC-6-Pool
MY1 05/30/12
Baseline 05/12/11
MY1 05/30/12
Baseline 05/12/11
% Total
% Cumulative
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
<.062
0.062 - .125
.125 - .25
.25 - .50
.50 - 1.0
1.0 - 2
2 - 4
4 - 5.7
5.7 - 8
8 - 11.3
11.3 - 16
16 - 22.6
22.6 - 32
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock
Particle Size (mm)

Indian Run -LR - XSC-7 Pool Pebble Count

Location: STA 15+89

Inches	Particle	Millimeters		Count	%Total	% Cum.
	Silt/Clay	<.062	SILT/CLAY	39	39.0	39.0
	Very Fine	0.062 - .125	SAND	5	5.0	44.0
	Fine	.125 - .25		26	26.0	70.0
	Medium	.25 - .50		15	15.0	85.0
	Coarse	.50 - 1.0		11	11.0	96.0
.04 - .08	Very Coarse	1.0 - 2		0	0.0	96.0
.08 - .16	Very Fine	2 - 4	GRAVEL	0	0.0	96.0
.16 - .22	Fine	4 - 5.7		2	2.0	98.0
.22 - .31	Fine	5.7 - 8		0	0.0	98.0
.31 .44	Medium	8 - 11.3		1	1.0	99.0
.44 - .63	Medium	11.3 - 16		1	1.0	100.0
.63 - .89	Coarse	16 - 22.6		0	0.0	100.0
.89 - 1.26	Coarse	22.6 - 32		0	0.0	100.0
1.26 - 1.77	Very Coarse	32 - 45		0	0.0	100.0
1.77 - 2.5	Very Coarse	45 - 64		0	0.0	100.0
2.5 - 3.5	Small	64 - 90	COBBLE	0	0.0	100.0
3.5 - 5.0	Small	90 - 128		0	0.0	100.0
5.0 - 7.1	Large	128 - 180		0	0.0	100.0
7.1 - 10.1	Large	180 - 256		0	0.0	100.0
10.1 - 14.3	Small	256 - 362	BOULDER	0	0.0	100.0
14.3 - 20	Small	362 - 512		0	0.0	100.0
20 - 40	Medium	512 - 1024		0	0.0	100.0
40 - 80	Large - Very Lg	1024 - 2048		0	0.0	100.0
	Bedrock	Bedrock		0	0.0	100.0
			Total Counted	100		

Summary Data	
D50	0.15
D84	0.48
D95	0.94


Pebble count at XSC-7-Pool
MY1 05/30/12
Baseline 05/12/11
MY1 05/30/12
Baseline 05/12/11
% Total
% Cumulative
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
<.062
0.062 - .125
.125 - .25
.25 - .50
.50 - 1.0
1.0 - 2
2 - 4
4 - 5.7
5.7 - 8
8 - 11.3
11.3 - 16
16 - 22.6
22.6 - 32
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock
Particle Size (mm)

Indian Run -LR - XSC-8 Riffle Pebble Count

Location: STA 16+50

Inches	Particle	Millimeters		Count	%Total	% Cum.
	Silt/Clay	<.062	SILT/CLAY	49	49.0	49.0
	Very Fine	0.062 - .125	SAND	4	4.0	53.0
	Fine	.125 - .25		1	1.0	54.0
	Medium	.25 - .50		0	0.0	54.0
	Coarse	.50 - 1.0		2	2.0	56.0
.04 - .08	Very Coarse	1.0 - 2		0	0.0	56.0
.08 - .16	Very Fine	2 - 4	GRAVEL	3	3.0	59.0
.16 - .22	Fine	4 - 5.7		2	2.0	61.0
.22 - .31	Fine	5.7 - 8		0	0.0	61.0
.31 .44	Medium	8 - 11.3		1	1.0	62.0
.44 - .63	Medium	11.3 - 16		3	3.0	65.0
.63 - .89	Coarse	16 - 22.6		2	2.0	67.0
.89 - 1.26	Coarse	22.6 - 32		0	0.0	67.0
1.26 - 1.77	Very Coarse	32 - 45		5	5.0	72.0
1.77 - 2.5	Very Coarse	45 - 64		6	6.0	78.0
2.5 - 3.5	Small	64 - 90	COBBLE	15	15.0	93.0
3.5 - 5.0	Small	90 - 128		7	7.0	100.0
5.0 - 7.1	Large	128 - 180		0	0.0	100.0
7.1 - 10.1	Large	180 - 256		0	0.0	100.0
10.1 - 14.3	Small	256 - 362	BOULDER	0	0.0	100.0
14.3 - 20	Small	362 - 512		0	0.0	100.0
20 - 40	Medium	512 - 1024		0	0.0	100.0
40 - 80	Large - Very Lg	1024 - 2048		0	0.0	100.0
	Bedrock	Bedrock		0	0.0	100.0
			Total Counted	100		

Summary Data	
D50	0.074
D84	73
D95	100

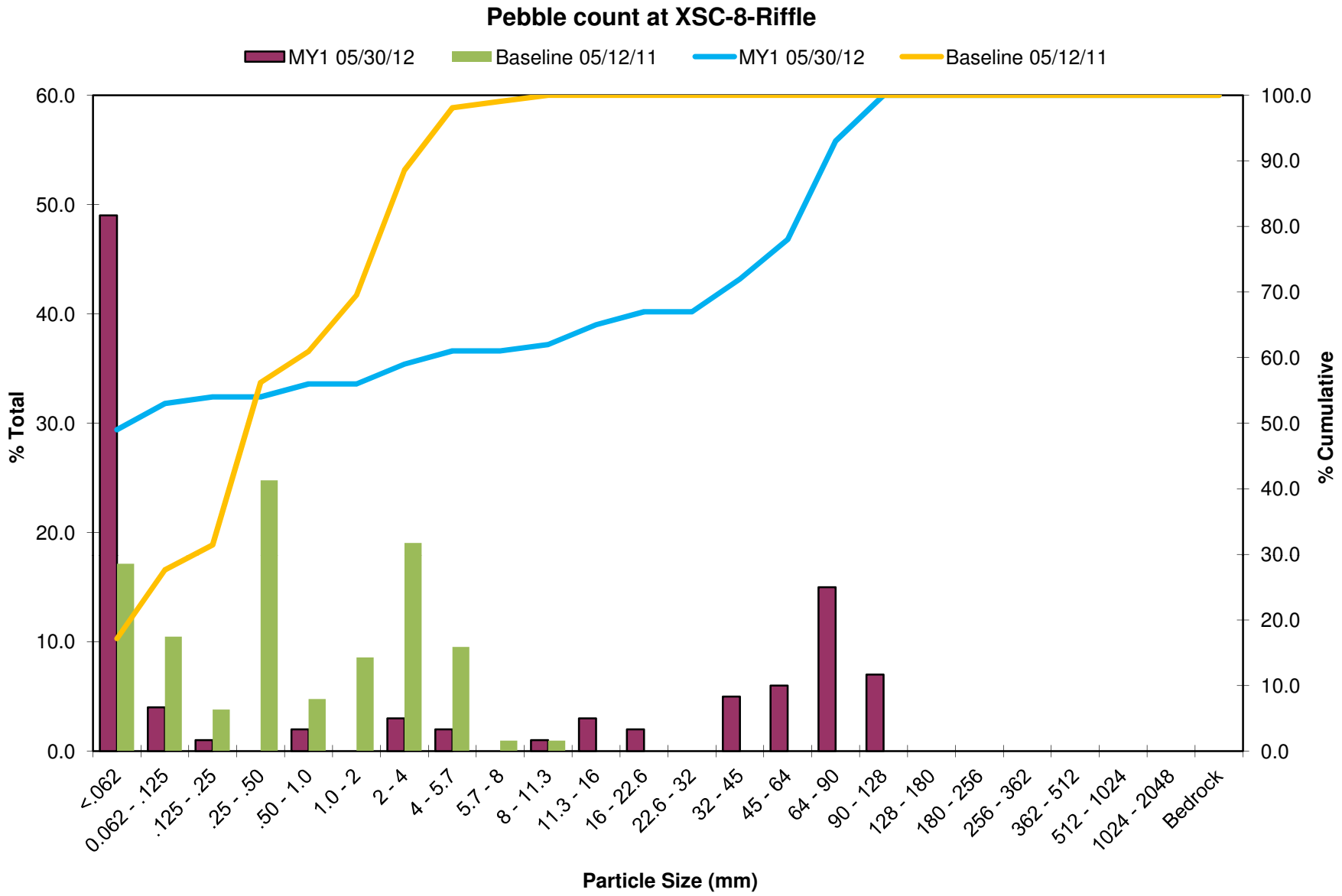

Pebble count at XSC-8-Riffle
MY1 05/30/12
Baseline 05/12/11
MY1 05/30/12
Baseline 05/12/11
% Total
% Cumulative
60.0
50.0
40.0
30.0
20.0
10.0
0.0
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
<.062
0.062 - .125
.125 - .25
.25 - .50
.50 - 1.0
1.0 - 2
2 - 4
4 - 5.7
5.7 - 8
8 - 11.3
11.3 - 16
16 - 22.6
22.6 - 32
32 - 45
45 - 64
64 - 90
90 - 128
128 - 180
180 - 256
256 - 362
362 - 512
512 - 1024
1024 - 2048
Bedrock
Particle Size (mm)

Table 10a. Baseline Stream Data Summary
Coddle Creek Tributary (Indian Run) / 94 - Segment/Reach: Upper (1295 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)							20.0				8.0			9.2				20.0		19.3	20.1		20.8		2
Floodprone Width (ft)							53.7				20.0			92.0				35.0		35.4	62.1		88.7		2
Bankfull Mean Depth (ft)							3.1				1.2			1.5				1.6		1.0	1.2		1.4		2
[1]Bankfull Max Depth (ft)							4.6				1.3			1.9				1.8		1.6	1.9		2.1		2
Bankfull Cross Sectional Area (ft^2)							61.3				11.3			12.3				29.3		19.9	24.7		29.5		2
Width/Depth Ratio							6.5				5.3			7.5				12.0		14.7	16.8		18.8		2
Entrenchment Ratio							2.7				2.5			10.0				1.8		1.7	3.2		4.6		2
[1]Bank Height Ratio											1.6			1.7				1.0		1.0	1.0		1.0		2
Profile																									
Riffle Length (ft)							11.5													11.0	27.9	24.5	62.0	16.2	8
Riffle Slope (ft/ft)							0.027				0.017			0.033				0.0117		0.006	0.013	0.011	0.031	0.008	8
Pool Length (ft)							40				10.8			14.0						18.0	31.6	30.0	55.0	12.2	7
Pool Max depth (ft)							4.79				2.0			2.7				2.85		2.6	3.3	3.3	3.8	0.5	6
Pool Spacing (ft)							10				4.4			47.2			52.0		101.0	47.0	91.4	91.0	126.0	25.4	7
Pattern																									
Channel Beltwidth (ft)							130.0				20.0			69.0			50.0		173.0	50.0	55.6	54.0	67.0	6.7	5
Radius of Curvature (ft)							25.0				6.0			37.0			20.0		60.0	30.0	44.9	50.0	65.0	9.0	16
Rc:Bankfull width (ft/ft)							1.3				0.7			4.6			0.7		4.6	1.6	2.2		3.1		
Meander Wavelength (ft)							115.0				48.0			85.0			104.0		213.0	135.0	168.4	171.5	208.0	21.3	8
Meander Width Ratio							5.8				2.5			8.6			2.5		8.6	2.6	2.8		3.2		

Transport parameters						
Reach Shear Stress (competency) lb/f^2		0.53		0.47	0.42	
Max part size (mm) mobilized at bankfull		38.7		35.4	32.0	
Stream Power (transport capacity) W/m^2						
Additional Reach Parameters						
Rosgen Classification		Impaired C4	C4	C4	C4	
Bankfull Velocity (fps)		5.4		3.49		
Bankfull Discharge (cfs)		328.4				
Valley length (ft)		1638		1548	1122	
Channel Thalweg length (ft)		1900		1796	1295	
Sinuosity (ft)		1.16	1.3	1.16	1.15	
Water Surface Slope (Channel) (ft/ft)		0.0051	0.0061 - 0.0130	0.0047	0.0056	
BF slope (ft/ft)		0.0051		0.0047	0.0057	
[3]Bankfull Floodplain Area (acres)						
[4]% of Reach with Eroding Banks						
Channel Stability or Habitat Metric						
Biological or Other						

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 10b. Baseline Stream Data Summary
Coddle Creek Tributary (Indian Run) / 94 - Segment/Reach: Lower (975 feet)

Parameter	Gauge[2]	Regional Curve			Pre-Existing Condition						Reference Reach(es) Data						Design			Monitoring Baseline					
Dimension and Substrate - Riffle Only		LL	UL	Eq.	Min	Mean	Med	Max	SD[5]	n	Min	Mean	Med	Max	SD[5]	n	Min	Med	Max	Min	Mean	Med	Max	SD[5]	n
Bankfull Width (ft)							20.0				8.0			9.2				20.0		20.4	21.7		22.9		2
Floodprone Width (ft)							75.0				20.0			92.0				100.0		96.4	123.4		150.3		2
Bankfull Mean Depth (ft)							3.7				1.2			1.5				1.7		1.3	1.3		1.3		2
[1]Bankfull Max Depth (ft)							5.1				1.3			1.9				1.8		2.1	2.2		2.2		2
Bankfull Cross Sectional Area (ft^2)							74.5				11.3			12.3				29.3		27.1	28.0		28.8		2
Width/Depth Ratio							5.4				5.3			7.5				12.0		15.3	16.8		18.2		2
Entrenchment Ratio							3.8				2.5			10.0				5.0		4.7	5.7		6.6		2
[1]Bank Height Ratio											1.6			1.7				1.1		1.0	1.0		1.0		2
Profile																									
Riffle Length (ft)							6.0													18.0	32.0	31.0	48.0	12.3	5
Riffle Slope (ft/ft)							0.035				0.017			0.033				0.0114		0.0057	0.0090	0.0076	0.0150	0.0042	4
Pool Length (ft)							81.0				10.8			14.0						14.0	47.4	35.0	48.0	30.5	7
Pool Max depth (ft)							5.8				2.0			2.7				2.85		2.4	3.0	3.1	3.5	0.4	6
Pool Spacing (ft)							7.5				4.4			47.2			52		101	92.0	112.8	114.0	131.0	19.7	4
Pattern																									
Channel Beltwidth (ft)											20.0			69.0			50.0		173.0	67.0	77.2	75.0	89.0	9.1	5
Radius of Curvature (ft)											6.0			37.0			35.0		56.0	45.0	48.9	50.0	50.0	3.9	7
Rc:Bankfull width (ft/ft)											0.7			4.6			0.7		4.6	2.2	2.3		2.2		
Meander Wavelength (ft)											48.0			85.0			104.0		213.0	190.0	204.2	210.0	211.0	9.4	5
Meander Width Ratio											2.5			8.6			2.5		8.6	3.3	3.6		3.9		

Transport parameters						
Reach Shear Stress (competency) lb/f^2		0.53		0.36	0.34	
Max part size (mm) mobilized at bankfull		38.7		27.3	25.4	
Stream Power (transport capacity) W/m^2						
Additional Reach Parameters						
Rosgen Classification		Modified Channel	C4	C4	C4	
Bankfull Velocity (fps)		5.9		3.49		
Bankfull Discharge (cfs)		442.9				
Valley length (ft)		1550		1550	763	
Channel Thalweg length (ft)		1700		1922	975	
Sinuosity (ft)		1.1	1.3	1.24	1.28	
Water Surface Slope (Channel) (ft/ft)		0.0052	0.0061 - 0.0130	0.0035	0.0042	
BF slope (ft/ft)		0.0052		0.0035	0.0042	
[3]Bankfull Floodplain Area (acres)						
[4]% of Reach with Eroding Banks						
Channel Stability or Habitat Metric						
Biological or Other						

Shaded cells indicate that these will typically not be filled in.

1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile. 2 = For projects with a proximal USGS gauge in-line with the project reach (added bankfull verification - rare).

3. Utilizing survey data produce an estimate of the bankfull floodplain area in acres, which should be the area from the top of bank to the toe of the terrace riser/slope.

4 = Proportion of reach exhibiting banks that are eroding based on the visual survey for comparison to monitoring data; 5. Of value/needed only if the n exceeds 3

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters – Cross Sections)

Coddle Creek Tributary (Indian Run) / 94 Segment/Reach: Upper (1295', CS's 1-4) and Lower (975', CS's 5-8)

	Cross Section 1 (Riffle)							Cross Section 2 (Pool)							Cross Section 3 (Riffle)							Cross Section 4 (Pool)														
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+
Record elevation (datum) used	542.62	542.62						541.18	541.18						539.00	539.00						538.77	538.77													
Bankfull Width (ft)	19.31	22.90						34.10	35.59						20.80	25.86						33.00	33.51													
Floodprone Width (ft)	88.70	92.50						56.20	60.70						35.40	37.80						45.70	47.90													
Bankfull Mean Depth (ft)	1.03	0.99						1.20	1.16						1.40	1.31						1.30	1.30													
Bankfull Max Depth (ft)	1.60	2.09						3.30	3.32						2.10	2.39						2.60	2.46													
Bankfull Cross Sectional Area (ft^2)	19.90	22.60						39.43	41.46						29.50	33.89						43.50	43.72													
Bankfull Width/Depth Ratio	18.80	23.20						29.50	30.55						14.70	19.73						25.00	25.68													
Bankfull Entrenchment Ratio	4.60	4.04						1.60	1.71						1.70	1.46						1.40	1.43													
Bankfull Bank Height Ratio	1.00	0.98						1.00	1.00						1.00	1.00						1.00	1.00													
Cross Sectional Area between end pins (ft^2)	421.80	411.70						457.50	471.20						248.40	262.10						358.10	361.90													
d50 (mm)	4.90	32.00						12.00	27.00						6.00	6.50						0.34	4.40													
	Cross Section 5 (Riffle)							**Cross Section 6 (Pool)**							**Cross Section 7 (Pool)**							**Cross Section 8 (Riffle)**													
Based on fixed baseline bankfull elevation[1]	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+	Base	MY1	MY2	MY3	MY4	MY5	MY+															
Record elevation (datum) used	536.34	536.34						535.56	535.56						534.62	534.62						534.36	534.36													
Bankfull Width (ft)	22.90	19.98						19.30	19.03						69.30	34.53						20.40	22.02													
Floodprone Width (ft)	150.30	150.10						95.20	104.40						93.00	99.00						96.40	95.60													
Bankfull Mean Depth (ft)	1.30	1.40						1.50	1.40						0.70	1.07						1.30	1.30													
Bankfull Max Depth (ft)	2.10	1.94						2.40	2.75						3.00	3.14						2.20	2.33													
Bankfull Cross Sectional Area (ft^2)	28.80	27.92						28.20	26.71						48.90	37.08						27.10	28.64													
Bankfull Width/Depth Ratio	18.20	14.30						13.10	13.56						96.30	32.16						15.30	16.93													
Bankfull Entrenchment Ratio	6.60	7.51						5.00	5.49						1.30	2.87						4.70	4.34													
Bankfull Bank Height Ratio	1.00	0.83						1.00	0.94						1.00	1.00						1.00	0.94													
Cross Sectional Area between end pins (ft^2)	823.40	870.60						467.00	467.40						458.80	441.30						442.50	431.60													
d50 (mm)	1.60	0.062						0.30	0.29						0.82	0.15						0.42	0.074													

1 = Widths and depths for monitoring resurvey will be based on the baseline bankfull datum regardless of dimensional/depositional development. Input the elevation used as the datum, which should be consistent and based on the baseline datum established. If the performer has inherited the project and cannot acquire the datum used for prior years this must be discussed with EEP. If this cannot be resolved in time for a given years report submission a footnote in this should be included that states: "It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values. Additional data from a prior performer is being acquired to provide confirmation. Values will be recalculated in a future submission based on a consistent datum if determined to be necessary."

Exhibit Table 11b. Monitoring Data - Stream Reach Data Summary
Coddle Creek Tributary (Indian Run) / 94 - Segment/Reach: Upper (1295 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	19.3	20.1		20.8		2	22.9	24.4		25.9		2																								
Floodprone Width (ft)	35.4	62.1		88.7		2	37.8	65.2		92.5		2																								
Bankfull Mean Depth (ft)	1.0	1.2		1.4		2	1.0	1.2		1.3		2																								
[1]Bankfull Max Depth (ft)	1.6	1.9		2.1		2	1.7	2.1	2.1	2.4	0.2	10																								
Bankfull Cross Sectional Area (ft^2)	19.9	24.7		29.5		2	22.6	28.2		33.9		2																								
Width/Depth Ratio	14.7	16.8		18.8		2	19.7	21.5		23.2		2																								
Entrenchment Ratio	1.7	3.2		4.6		2	1.5	2.8		4.0		2																								
[1]Bank Height Ratio	1.0	1.0		1.0		2	1.0	1.0		1.0		2																								
Profile																																				
Riffle Length (ft)	11.0	27.9	24.5	62.0	16.2	8	4	13.1	12	23	6.6	11																								
Riffle Slope (ft/ft)	0.0060	0.0126	0.0107	0.0310	0.0078	8	0.0077	0.0234	0.0236	0.0425	0.0124	11																								
Pool Length (ft)	18.0	31.6	30.0	55.0	12.2	7	13	25.2	20	63	13.3	15																								
Pool Max depth (ft)	2.6	3.3	3.3	3.8	0.5	6	2.37	3.23	3.3	4.33	0.63	15																								
Pool Spacing (ft)	47.0	91.4	91.0	126.0	25.4	7	35	80.9	80	122.5	30.3	10																								
Pattern																																				
Channel Beltwidth (ft)	50.0	55.6	54.0	67.0	6.7	5																														
Radius of Curvature (ft)	30.0	44.9	50.0	65.0	9.0	16																														
Rc:Bankfull width (ft/ft)	1.6	2.2		3.1																																
Meander Wavelength (ft)	135.0	168.4	171.5	208.0	21.3	8																														
Meander Width Ratio	2.6	2.8		3.2																																

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Additional Reach Parameters																																				
Rosgen Classification	C4						C4																													
Channel Thalweg length (ft)	1295						1295																													
Sinuosity (ft)	1.15						1.15																													
Water Surface Slope (Channel) (ft/ft)	0.0056						0.0058																													
BF slope (ft/ft)	0.0057						0.0055																													
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks							2.3																													
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Exhibit Table 11c. Monitoring Data - Stream Reach Data Summary
Coddle Creek Tributary (Indian Run) / 94 - Segment/Reach: Lower (975 feet)

Parameter	Baseline						MY-1						MY-2						MY- 3						MY- 4						MY- 5					
Dimension and Substrate - Riffle only	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n	Min	Mean	Med	Max	SD[4]	n
Bankfull Width (ft)	20.4	21.7		22.9		2	20.0	21.0		22.0		2																								
Floodprone Width (ft)	96.4	123.4		150.3		2	95.6	122.9		150.1		2																								
Bankfull Mean Depth (ft)	1.3	1.3		1.3		2	1.3	1.4		1.4		2																								
[1]Bankfull Max Depth (ft)	2.1	2.2		2.2		2	1.9	2.2	2.2	2.4	0.2	7																								
Bankfull Cross Sectional Area (ft^2)	27.1	28.0		28.8		2	27.9	28.3		28.6		2																								
Width/Depth Ratio	15.3	16.8		18.2		2	14.3	15.6		16.9		2																								
Entrenchment Ratio	4.7	5.7		6.6		2	4.3	5.9		7.5		2																								
[1]Bank Height Ratio	1.0	1.0		1.0		2	0.8	0.9		0.9		2																								
Profile																																				
Riffle Length (ft)	18.0	32.0	31.0	48.0	12.3	5	4.0	13.5	14.5	24.0	7.2	6																								
Riffle Slope (ft/ft)	0.0057	0.0090	0.0076	0.0150	0.0042	4	0.0088	0.0141	0.0152	0.0188	0.0036	6																								
Pool Length (ft)	14.0	47.4	35.0	48.0	30.5	7	26.0	45.6	48.0	71.0	17.6	7																								
Pool Max depth (ft)	2.4	3.0	3.1	3.5	0.4	6	2.4	3.0	2.8	3.9	0.5	7																								
Pool Spacing (ft)	92.0	112.8	114.0	131.0	19.7	4	45.0	93.1	107.0	141.0	38.0	6																								
Pattern																																				
Channel Beltwidth (ft)	67.0	77.2	75.0	89.0	9.1	5																														
Radius of Curvature (ft)	45.0	48.9	50.0	50.0	3.9	7																														
Rc:Bankfull width (ft/ft)	2.2	2.3		2.2																																
Meander Wavelength (ft)	190.0	204.2	210.0	211.0	9.4	5																														
Meander Width Ratio	3.3	3.6		3.9																																

Pattern data will not typically be collected unless visual data, dimensional data or profile data indicate significant shifts from baseline

Additional Reach Parameters																																				
Rosgen Classification	C4						C4																													
Channel Thalweg length (ft)	975						975																													
Sinuosity (ft)	1.28						1.28																													
Water Surface Slope (Channel) (ft/ft)	0.0042						0.0042																													
BF slope (ft/ft)	0.0042						0.0046																													
[3]Ri% / Ru% / P% / G% / S%																																				
[3]SC% / Sa% / G% / C% / B% / Be%																																				
[3]d16 / d35 / d50 / d84 / d95 /																																				
[2]% of Reach with Eroding Banks							0																													
Channel Stability or Habitat Metric																																				
Biological or Other																																				

Shaded cells indicate that these will typically not be filled in.
1 = The distributions for these parameters can include information from both the cross-section surveys and the longitudinal profile.
2 = Proportion of reach exhibiting banks that are eroding based on the visual survey from visual assessment table
3 = Riffle, Run, Pool, Glide, Step; Silt/Clay, Sand, Gravel, Cobble, Boulder, Bedrock; dip = max pave, disp = max subpave
4. = Of value/needed only if the n exceeds 3

Appendix E. Hydrologic Data

Table 12 – Verification of Bankfull Events

Table 12. Verification of Bankfull Events			
Coddle Creek Tributary (Indian Run)/ 94 Segment/Reach: 2270 feet			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo**
5/30/2012	Between 5/11/2011 - 5/30/2012	Visual observation of wrack lines; stream gauge	See below