BEAVERDAM CREEK
STREAM RESTORATION PROJECT

ANNUAL MONITORING REPORT FOR 2009 - 2010 (YEAR 4)

Project Number: D05016-1

Submitted to:

NC Ecosystem Enhancement Program
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EXECUTIVE SUMMARY

This Annual Report details the monitoring activities during the 2010 growing season on the Beaverdam Creek Stream Restoration Site ("Site"). Construction of the Site, including planting of trees, was completed in March 2007. In order to document project success, twenty-four vegetation monitoring plots, eighteen permanent cross-sections, 3,562 linear feet (LF) of longitudinal profile survey, and two automated stage recorders were installed and assessed across the Site. The 2010 data represents results from the fourth year of vegetation and hydrologic monitoring for streams.

Prior to restoration, stream and buffer functions on the Site were historically impaired as a result of heavy land timbering and subsequent aggressive farming. More recently some areas were reforested within the project area, but it continued to be actively farmed, grazed or converted to medium density residential developments. The restoration project restored/enhanced 13,203 linear feet (LF) of channelized stream on two unnamed tributaries of Beaverdam Creek: UT1 and UT2, and preserved an additional 1,641 LF of Beaverdam Creek and 962 LF of UT2 to total 15,806 LF of restored, enhanced, or preserved stream.

Weather station data from the for NRCS National Climate and Water Center (Charlotte WSO AP WETS Station in Mecklenburg County – NC 1690) and the USGS Water Data for North Carolina (USGS 35090308100454 Withers Cove in Mecklenburg County, NC) were used to document precipitation amounts. For the 2009 - 2010 growing season, the total recorded rainfall in inches was less than the historical average totals. May and June of 2010 were the only two months within the growing season that recorded rainfall data above the historical average.

Twenty-four monitoring plots that are 10 meters by 10 meters (0.025 acre) in size were used to assess survivability of the woody vegetation planted on Site. They are randomly located to represent the different zones within the project. The vegetation monitoring indicated an overall average of 473 stems per acre. The Site is on track for meeting final success criteria of 260 trees per acre by the end of year five.

In general, dimension, pattern, profile and in-stream structures remained stable during the fourth growing season.

1.0 PROJECT BACKGROUND

The Beaverdam Creek Stream Restoration Site ("Site") is located within the extraterritorial jurisdiction (ETJ) of the City of Charlotte, Mecklenburg County, and lies within the Catawba River Basin (Figure 1). The Site lies within North Carolina Department of Water Quality (NCDWQ) sub-basin 03-08-34 and U.S. Geologic Survey (USGS) hydrologic unit 03050101170040. The recent land use of the Site consists of agriculture and medium density residential development.

The project involved the restoration, enhancement and preservation of 15,806 LF of stream along Beaverdam Creek (the mainstem) and two unnamed tributaries (UT1 and UT2).

1.1 Project Location

The Site is located approximately 3 miles southwest of the Charlotte-Douglas International Airport. The Site extends from the newly constructed I-485 corridor to Brown's Cove of Lake Wylie, an impounded reservoir on the Catawba River. The Site can be accessed from Dixie River Road (UT1 to the north and UT2 to the south) 1.5 miles northeast of the intersection with Steele Creek Road. See Figures 1 and 2 for an overview of the project area.

1.2 Mitigation Goals and Objectives

The specific goals for the Beaverdam Creek Restoration Project were as follows:

- Preserve/Restore/Enhance 15,806 LF of stream channel.
- Create geomorphically stable stream channel and floodplain conditions along UT1, UT2 and their associated tributaries within the Beaverdam Creek watershed.
- Improve the local hydrology through increased groundwater recharge, groundwater storage, and hydrologic connectivity between the channel and the adjacent floodplain.
- Improve water quality in the Beaverdam Creek watershed by increasing dissolved oxygen concentrations and reducing nutrient and sediment loads.
- Improve aquatic and riparian terrestrial habitat through improved hydraulic and biologic diversity.

1.3 Project Description and Restoration Approach

For analysis and design purposes, Beaverdam Creek and the two unnamed tributaries (UT1 and UT2) were subdivided into 15 individual reaches based on their hydrologic and geomorphic characteristics. The mainstem of Beaverdam Creek consists of only 1 of the 15 design reaches, where only preservation and no restoration activities were proposed. The remaining 14 reaches exist within UT1 (8 reaches) and UT2 (6 reaches). Among these 14 reaches, 12 were scheduled for restoration, the upstream reach of UT1 was scheduled for enhancement and the downstream reach of UT2 was scheduled for preservation. All reach locations are shown in Figure 3. The following describes the Site's preconstruction conditions.

The project extents on UT1 began at I-485 flowing from the northeast direction. UT1 was divided into 5 reaches starting in the upstream with Reach 1 and continuing downstream to Reach 5 and changing designation at tributary confluences or at significant grade breaks. The three tributary confluences were included within the design parameters on UT1 and were identified as UT1B, UT1C, and UT1D from the upstream confluence and continuing downstream.

The UT2 watershed abuts the southern boundary of UT1's watershed, is bordered by Dixie River Road, and generally flows in the southwest direction. The mainstem of UT2 was divided into four reaches starting upstream at Reach 1 and continuing downstream to Reach 4. One tributary confluence, UT2A, was included within the design parameters of UT2. Reach UT2A, upstream of station 10+00, consisted

only of a non-disturbance area (not for credit). The downstream section of UT2A, from a headcut at station 10+00 to its confluence at the terminus of UT2 Reach 2, was 1,138 LF with a channel slope of 1.4 percent.

Preservation was proposed for reaches within the project area that were currently in stable, functioning condition and did not warrant restoration. The two reaches proposed for preservation were along the mainstem of Beaverdam and the downstream section of UT2. The reach along the mainstem of Beaverdam Creek proposed for preservation had a reach length of 1,641 LF. It began at the confluence with UT1 and extended downstream to the confluence of UT2. The reach along the mainstem of UT2 proposed for preservation had a length of 962 LF. It began immediately downstream of UT2 Reach 4 and ended at its confluence with Beaverdam Creek.

Throughout most of UT1, the restoration approach accelerated the existing evolutionary process and established a natural, successionally stable, C/E-type stream channel. Additionally, soil bioengineering, structural reinforcement, and revetments were applied to promote stability immediately following construction when the stream was most vulnerable. Given the wide floodplain, relatively flat slopes, generally stable nature of the soil, and favorable growing conditions at the Site, this restoration approach was an achievable goal. Removal of the majority of invasive species and planting of native vegetative species throughout the riparian buffer complemented the channel restoration and promoted climax successional habitat.

Similar to UT1, the restoration approach throughout UT2 entailed establishing a successional C/E-type stream channel while maintaining the ability to accommodate subsequent natural channel evolution towards an E-type channel, as warranted by future influences to the discharge and sediment regime. This was accomplished through application of a Priority 1 design throughout with short segments of Priority 2 design to tie into the incised channels.

Table 1. Project Mitigation Approach

Beaverdam Creek Restoration Site: Project No. D05016-1								
Project Segment or Reach ID	**Existing Footage/Acreage**	**Mitigation Type ***	**Approach****	**Linear Footage or Acreage**	**Mitigation Ratio**	**Mitigation Units**	**Stationing**	**Comment**
UT1 (Reach 1)	542	E	EI	567	1.5:1	378	10+00 - 15+67	Low slope, minimal meander and floodplain benching.
UT1 (Reach 2-5)	5796	R	P1	6,310	1:1	6,310	15+67 - 78+77	The beginning of channel utilizes the existing wide, flat floodplain then narrows through the valley and straightens through the Duke Power easement and connects into the mainstem of Beaverdam through a wide, flat floodplain.
UT1B	743	R	P2	778	1:1	778	10+00 - 17+78	The valley is pinched so floodplain grading will create adequate benching.
UT1C	744	R	P1	624	1:1	624	10+00 - 16+24	Step-pool design dominated by log drops. The valley is narrow resulting minimal meander.
UT1D	323	R	P1	338	1:1	338	10+00 - 13+38	The channel will have the appropriate belt width throughout the ample floodplain. A series of drop structures at the end of the reach will tie into UT1.
UT2	3130	R	P1	3,448	1:1	3,448	10+00 - 44+48	Increase sinuosity, pool development, and reestablish connection with the floodplain and construct in channel step-pools in areas where the valley is confined and steep.
UT2A	886	R	P1	1,138	1:1	1,138	10+00 - 21+38	A step-pool channel will be constructed in the areas where the valley is confined and steep. Transition connections constructed between the constructed channel and the existing channels.
Beaverdam Creek	1641	P	---	1,641	1:5	328	-	-
UT2	962	P	---	962	1:5	192	-	
Total linear ft of channel restored or preserved:				15,806				
Mitigation Unit Summation for Streams:				13,534				

* R = Restoration
E = Enhancement
P = Preservation

** P1 = Priority I
P2 = Priority II
P3 = Priority III
EI = Enhancement I

1.4 Project History and Background

The chronology of the Beaverdam Creek Restoration Project is presented in Table 2. The contact information for all designers, contractors, and relevant suppliers is presented in Table 3. Relevant project background information is presented in Table 4.

Table 2. Project Activity and Reporting History

Beaverdam Creek Restoration Site: Project No. D05016-1			
Activity or Report	**Scheduled Completion**	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration Plan Prepared	Nov-05	N/A	-
Restoration Plan Amended	Dec-05	N/A	-
Restoration Plan Approved	Dec-05	N/A	-
Final Design – (at least 90% complete)	Dec-05	N/A	-
Construction Begins	May-06	N/A	Jun-06
Temporary S&E mix applied to entire project area	N/A	N/A	Jan-07
Permanent seed mix applied to entire project area	Mar-06	N/A	Jan-07
Planting of live stakes	Nov-06	N/A	Jan-07
Planting of bare root trees	Nov-06	N/A	Jan-07
Survey of As-built conditions (Year 0 Monitoring-baseline)	Jan-07	Mar-07	Apr-07
Repair work			
Year 1 Monitoring	Dec-07	Nov-07	Dec-07
Year 2 Monitoring	Dec-08	Nov-08	Dec-08
Year 3 Monitoring	Dec-09	Nov-09	Dec-09
Year 4 Monitoring	Dec-10	Oct-10	Nov-10
Year 5 Monitoring	Dec-11	Unknown	Unknown

Table 3. Project Contact

Beaverdam Creek Restoration Site: Project No. D05016-1	
Full Service Delivery Contractor	
River Works, Incorporated	8000 Regency Parkway, Suite 200 Cary, NC 27518 Contact: Will Pedersen, Tel. 919-459-9001
Designer	
Michael Baker Engineering, Inc.	8000 Regency Parkway, Suite 200 Cary, NC 27518 Contact: Kevin Tweedy, Tel 919-463-5488

Table 3. Project Contact

Beaverdam Creek Restoration Site: Project No. D05016-1	
Construction Contractor	
River Works, Inc.	8000 Regency Parkway, Suite 200 Cary, NC 27518 Contact: Will Pedersen, Tel. 919-459-9001
Planting Contractor	
River Works, Inc.	8000 Regency Parkway, Suite 200 Cary, NC 27518 Contact: Will Pedersen, Tel. 919-459-9001
Seeding Contractor	
River Works, Inc.	8000 Regency Parkway, Suite 200 Cary, NC 27518 Contact: Will Pedersen, Tel. 919-459-9001
Seed Mix Sources	Mellow Marsh Farm, 919-742-1200
Nursery Stock Suppliers	Mellow Marsh Farm, 919-742-1200 International Paper, 1-888-888-7159
Monitoring Performers	
Michael Baker Engineering, Inc.	1447 S. Tryon Street, Suite 200 Charlotte, NC 28203
Stream Monitoring Point of Contact:	Ian Eckardt, Tel.704-334-4454
Vegetation Monitoring Point of Contact:	Ian Eckardt, Tel. 704-334-4454

Table 4. Project Background

Beaverdam Creek Restoration Site: Project No. D05016-1	
Project County:	Mecklenburg County, NC
Drainage Area:	
UT1 (Reach 1)	0.70 mi^2
UT1 (Reach 2-5)	1.73 mi^2
UT1B	0.34 mi^2
UT1C	0.15mi^2
UT1D	0.16 mi^2
UT2	0.3 mi^2
UT2A	0.1 mi^2
Estimated Drainage % Impervious Cover:	
UT1 (Reach 1)	15%
UT1 (Reach 2-5)	12%
UT1B	10%
UT1C	5%
UT1D	21%
UT2	4%
UT2A	2%

Table 4. Project Background Table

Beaverdam Creek Restoration Site: Project No. D05016-1	
Stream Order:	
UT1 (Reach 1)	1
UT1 (Reach 2-5)	2
UT1B	1
UT1C	1
UT1D	1
UT2	1
UT2A	1
Physiographic Region	Piedmont
Ecoregion	Southern Outer Piedmont
Rosgen Classification of As-Built	
UT1 (Reach 1)	C/E
UT1 (Reach 2-5)	C/E
UT1B	C/E
UT1C	C/E
UT1D	C/E
UT2	C/E
UT2A	C/E
Cowardin Classification	Riverine, Upper Perennial, Unconsolidated Bottom, Cobble-Gravel
Dominant Soil Types	
UT1 (Reach 1)	MO
UT1 (Reach 2-5)	MO, DaD, CeD2, PaE
UT1B	MO
UT1C	MO, PaE, CeD2
UT1D	MO, PaE, CeD2
UT2	MO, CeD2
UT2A	MO
Reference site ID	Spencer Creek, UT to Spencer Creek, McDowell Park, Latta Plantation, McClintock Creek (McNair & Stockwood), UT to Cleghorn, UT to Lake Jeanette, UT to Big Lost Cove
USGS HUC for Project and Reference sites	3050101170040
NCDWQ Sub-basin for Project and Reference	03-08-34
NCDWQ classification for Project and Reference	C
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor?	N/A
% of project easement fenced	10%

1.5 Project Plan

Plans depicting the as-built conditions of the major project elements, location of permanent monitoring cross-sections, and locations of permanent vegetation monitoring plots are presented in Appendix C of this report.

2.0 VEGETATION MONITORING

2.1 Soil Data

The soil data for the Site are presented in Table 5.

Table 5. Soil Data for Project

Beaverdam Creek Restoration Site: Project No. D05016-1					
Series	**Max Depth (in)**	**% Clay on Surface**	**K**	**T**	**OM %**
Cecil Sandy Clay Loam (CeD2)	80	20-35	0.28	5	0.5-1
Monacan Loam (MO)	80	7-27	0.43	5	2-3
Davidson sandy clay loam (DaD)	75	20-35	0.28	5	0.5-2
Pacolet sandy loam (PaE)	62	8-20	0.2	5	0.5-2
Pacolet sandy loam (PaF)	62	8-20	0.2	5	0.5-2

(USDA, 2006. Official Soil Series Descriptions: http://soils.usda.gov/technical/classification/osd/index.html)

General taxonomy of soils:

Cecil: The Cecil series consists of well-drained soils with moderate permeability on and near floodplains. They formed in residuum weathered felsic igneous and metamorphic rock, such as granite. Slopes range from 8 to 15 percent (USDA, 2006. "Soil Taxonomy").

Monacan: Soils of the Monacan series are deep, moderately well and somewhat poorly drained with moderate permeability. They formed in recent alluvial sediments of the Piedmont and Coastal Plain. Slopes are commonly less than 2 percent (USDA, 2006. "Soil Taxonomy").

Pacolet: The Pacolet series consists of very deep, well drained, moderately permeable soils that formed in material weathered mostly from acid crystalline rocks of the Piedmont uplands. Slopes commonly are 15 to 25 percent but range up to 2 to 60 percent (USDA, 2006. "Soil Taxonomy").

Davidson: The Davidson series consists of very deep, well drained moderately permeable soils that formed in materials weathered from dark colored rocks high in ferromagnesian minerals. These soils are on gently sloping to moderately steep uplands in the Piedmont. Slopes are commonly 2 to 15 percent but range up to 25 percent (USDA, 2006. "Soil Taxonomy").

2.2 Description of Species and Monitoring Protocol

The Site was planted in bottomland hardwood forest species in early – mid March of 2007. There were twenty-four vegetation-monitoring plots established throughout the planting areas.
The following tree species were planted in the restoration area:

Table 6. Tree Species Planted

Beaverdam Creek Restoration Site: Project No. D05016-1			
ID	**Scientific Name**	**Common Name**	**FAC Status**
1	*Alnus serrulata*	Tag Alder	FACW+
2	*Asimina triloba*	Paw paw	FAC
3	*Cercis canadensis*	Redbud	FACU
4	*Celtis laevigata*	Sugarberry	FACW
5	*Cephalanthus occidentalis*	Buttonbush	OBL
6	*Cornus amomum*	Silky Dogwood	FACW+
7	*Cornus florida*	Flowering Dogwood	FACU
8	*Diospyros virginiana*	Persimmon	FAC
9	*Fraxinus pennsylvanica*	Green Ash	FACW
10	*Juglan nigra*	Black Walnut	FACU
11	*Liriodendron tulipifera*	Tulip poplar	FACW
12	*Platanus occidentalis*	Sycamore	FACW-
13	*Nyssa sylvatica*	Blackgum	FAC
14	*Quercus michauxii*	Swamp chestnut oak	FACW-
15	*Quercus phellos*	Willow oak	FACW-
16	*Quercus rubra*	Red oak	FACU
17	*Sambucus candensis*	Elderberry	FACW-
18	*Viburnum dentatum*	Arrow-wood viburnum	FAC

(USDA, 2007: http://plants.usda.gov)

The following monitoring protocol was designed to predict vegetative survivability. Twenty-four plots were established throughout the Site. The number of plots was based on the species/area curve method and their location was based on EEP monitoring guidance. The size of individual plots was 100 square meters. The locations of the vegetation plots are shown on the as-built plan sheets in Appendix C.

Individual quadrant data provided includes density and coverage quantities. Relative values were calculated, and importance values were determined. Individual seedlings were marked to ensure that they can be found in succeeding monitoring years. Mortality was determined from the difference between the previous year's living, planted seedlings and the current year's living, planted seedlings.

2.3 Vegetation Success Criteria

The interim measure of vegetative success for the Site will be the survival of at least 320 3-year old planted trees per acre at the end of year three of the monitoring period. The final vegetative success criteria will be the survival of 260 5-year old planted trees per acre at the end of year five of the monitoring period.

2.4 Results of Vegetative Monitoring

The following table presents stem counts for each of the monitoring plots. Each planted tree species is identified down the left column, and each plot is identified across the top row. The numbers on the top row correlate to the vegetation plot IDs. Trees are flagged in the field on an as-needed basis before the flags degrade. Flags are utilized because they will not interfere with the growth of the tree. Volunteer species are also flagged during this process.

During the initial counts of species totals during the as-built monitoring report, some tree species were unidentifiable (no buds or leafs) and documented as *Unknown Quercus* in the stem plot counts or were labeled incorrectly. During Year 1 vegetative monitoring, three of the four *Unknown Quercus* were identified as *Quercus michauxii* and updated. Tree species that were labeled incorrectly have been updated and coded within Table 7 to represent the correction.

The average stem count per acre for Year 4 monitoring was 473. The range of stem counts throughout the 24 vegetative monitoring plots was from 160 – 680. The current survivability rate for Year 4 is 76.0%. The data reflects that the Site is on trajectory for meeting the final success criteria of 260 trees per acre by the end of year five.

No volunteer species were noted in any of the Site's vegetation plots, or were too small to verify. If any woody volunteer species are observed in subsequent monitoring years they will be flagged and added to the overall stems per acre assessment of the Site.

Table 7. Year 4 Stem Counts for Each Species Arranged by Plot

Beaverdam Creek Restoration Site: Project No. D05016-1																													
	Plots																									As-built Totals	Year 1 Totals	Year 2 Totals	Year 3 Totals	Year 4 Totals	% Survival
	UT1																	UT2												
Tree Species	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	1	2	3	4	5	6	7						
Alnus serrulata																									2	2	0	0	0	0.0
Asimina tuiloba								3	1		3	2	1												21	18	13	13	10	47.6
Cercis canadensis																									3	3	1	1	0	0.0
Celtis laevigata	1				1									2											6	3	3	4	4	66.7
Cephalanthus occidentalis									1																1	1	1	0	1	100.0
Cornus amomum									1																1	0	1	0	1	100.0
Cornus florida																									2	3	0	0	0	0.0
Diospyros virginiana		1																					1		3	3	2	2	2	66.7
Fraxinus pennsylvanica	4			3	6	1	6				1	3	3	3	6	5		3	13		2	8	6	1	77	76	75	76	74	96.1
Juglan nigra	1		1	2		4	1	2		7		3	2												31	28	21	20	23	74.2
Liriodendron tulipifera	1		1	1	1		3			2		3		2			2	2		1	1			2	36	29	21	20	22	61.1
Platanus occidentalis		2		1	4	4	1	6		2						1	1			7	4		1	1	54	46	36	35	35	64.8
Nyssa sylvatica	2	1	3	3		1		1				1	5		4	2	5	3		3	2		5	2	55	50	46	38	43	78.2
Quercus michauxii	1	4	7	2			2	4			1	1	3	3	2	1		5			3	6	2	1	55	57	47	48	48	87.3
Quercus phellos	1	1	2	1	1		1			1	4		1			4		1							20	20	18	18	18	90.0
Quercus rubra								1						1											1	1	3	2	2	200.0
Sambucus candensis																									1	0	0	0	0	0.0
Viburnum dentatum									1																2	2	1	1	1	50.0
Unknown Quercus																									4	1	1	0	0	0.0
Stems/plot	11	9	14	13	13	10	14	17	4	12	9	13	15	11	12	13	8	14	13	11	12	14	15	7	375	343	290	278	284	75.7
Stems/acre	440	360	560	520	520	400	560	680	160	480	360	520	600	440	480	520	320	560	520	440	480	560	600	280					473	Average

Tree # 3-7 was mislabeled as Platanus occidentalis in As-built Initial Counts
Tree # 3-16 was mislabeled as Liriodendron tulipifera in As-built Initial Counts
Tree # 7-10 was mislabeled as Asimina tuiloba in As-built Initial Counts
Tree # 7-2, -3, -4 were mislabeled as Fraxinus pennsylvanica in As-built Initial Counts
Tree # 14-5, -8, -10 were labeled as unknown in As-built Initial Counts
Tree # 7-21 was labeled as Liriodendron tulipifera in the field but was not added in the As-built Initial Counts
Tree # 7-4 was mislabeled as Quercus michauxii in the Year 1 Monitoring Counts
Tree # 16-6 was mislabeled as Nyssa sylvatica in the Year 1 Monitoring Counts
Tree # 9-1 was incorrectly counted as Cercis canadensis instead of Cornus amomum in the Year 1 Monitoring Counts
Tree # 8-10 was mislabeled as Quercus phellos in the As-built Initial Counts
Tree # 1-6 was mislabeled as Quercus phellos in the As-built Initial Counts
Tree 4-2 and 4-4 were mislabeled as Platanus occidentalis and Fraxinus pennsylvanica respectively through Year 3 monitoring.

2.5 Vegetation Observations

Overall the stream-side and floodplain vegetation has continued to successfully establish throughout the project area. The maintenance work performed and documented during 2009 has remained stable. Vegetation has reestablished within the sewer line that was installed by Mecklenburg County during the spring of 2009. The sewer line crosses UT1 at Station 76+60.

2.6 Vegetation Problem Areas

Invasive species are present but minimal throughout the project area. At this time, there seem to be no invasive species problem areas. Although none seem to be posing any problems, invasive species can very quickly affect the survivability of the planted stems the weedy species should be monitored to prevent any major mortality issue.

2.7 Vegetation Photos

Photos of the project showing the on-site vegetation are included in Appendix A of this report.

3.0 STREAM MONITORING

3.1 Description of Stream Monitoring

To document the stated success criteria, the following monitoring program was instituted following construction completion on the Site:

Bankfull Events: The occurrence of bankfull events within the monitoring period was documented by the use of two automated stage recorders. The University of North Carolina (UNCC) installed and monitored the readings from both stage recorders. Gauging station BD2 was installed on UT1 and gauging station BD3 was installed on UT2. Each data logger recorded the watermark at 15 minute intervals at each station and was checked at each Site visit to determine if a bankfull event had occurred. Photos of the bankfull events were not available from UNCC. Figure 4 shows the locations of the stage recorders.

Cross-Sections: Two permanent cross-sections were installed per 1,000 linear feet of stream restoration work, with one located at a riffle cross-section and one located at a pool cross-section. Twenty four total cross sections were established. Each cross-section was marked on both banks with permanent pins to establish the exact transect used. A common benchmark was used for cross-sections and consistently referenced to facilitate comparison of year-to-year data. The annual cross-sectional survey included points measured at all breaks in slope, including top of bank, bankfull, inner berm, edge of water, and thalweg, if the features are present. Riffle cross-sections were classified using the Rosgen stream classification system (Rosgen, 1994). Permanent cross-sections for 2010 (Year 4) were surveyed in September 2010.

Longitudinal Profiles: A representative longitudinal profile was surveyed for 2010 (Year 4). The initial 3,562 linear feet of profile was collected for the mainstem reach of UT1. Measurements included thalweg, water surface, bankfull, and top of low bank. Each of these measurements was taken at the head of each feature (e.g., riffle, pool, glide). In addition, maximum pool depth was recorded. All survey was tied to a single permanent benchmark.

Bed Material Analysis: Pebble counts were conducted for the permanent cross-sections (100 counts per cross-section) on the project reaches. Pebble count data was plotted on a semi-log graph and are included in Appendix B.

Photo Reference Stations: Photographs were used to visually document restoration success. Fifty-one (51) reference stations were established to document conditions at the constructed grade control structures

across the Site. These photos are provided in Appendix A. The GPS coordinates of each photo station were noted as additional reference to ensure the same photo location was used throughout the monitoring period. These stations are included in the As-built Plan Sheets in Appendix C. Reference photos were taken once per year.

Each streambank was photographed at each permanent cross-section photo station. For each streambank photo, the photo view line followed a survey tape placed across the channel, perpendicular to flow (representing the cross-section line). The photograph was framed so that the survey tape is centered in the photo (appears as a vertical line at the center of the photograph), keeping the channel water surface line horizontal and near the lower edge of the frame. These photos are presented along with the cross-section monitoring data in Appendix B.

3.2 Stream Restoration Success Criteria

The approved Mitigation Plan requires the following criteria be met to achieve stream restoration success:

- *Bankfull Events*: Two bankfull flow events must be documented within the five-year monitoring period. The two bankfull events must occur in separate years.
- *Cross-Sections:* There should be little change in as-built cross-sections. If changes to channel cross-section take place, they should be minor changes representing an increase in stability (e.g., settling, vegetative changes, deposition along the banks, or decrease in width/depth ratio).
- *Longitudinal Profiles:* The longitudinal profiles should show that the bedform features are remaining stable (not aggrading or degrading). The pools should remain deep with flat water surface slopes and the riffles should remain steeper and shallower than the pools.
- *Bed Material Analysis*: Pebble counts should indicate maintenance of bed material.
- *Photo Reference Stations*: Photographs will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation and effectiveness of erosion control measures. Photos should indicate the absence of developing bars within the channel, no excessive bank erosion or increase in channel depth over time, and maturation of riparian vegetation.

3.3 Bankfull Discharge Monitoring Results

On-site data loggers documented the occurrence of multiple bankfull flow events during the fourth year (2010) of the post-construction monitoring period (Table 8). Maximum stage heights of 7.18 ft and 2.66 ft were recorded on 1/25/10 by the data loggers BD2 and BD3, respectively. See Table 8, below, for all bankfull events during monitoring Year 4.

Table 8. Verification of Bankfull Events

Beaverdam Creek Restoration Site: Project No. D05016-1				
Station Number	Date of Data Collection	Date of Occurrence of Bankfull Event	Method of Data Collection	Gage Height (feet)
BD2	N/A	1/25/2010	Datalogger	7.18
	N/A	2/5/2010	Datalogger	6.44
	N/A	6/1/2010	Datalogger	6.35
BD3	N/A	1/25/2010	Datalogger	2.66
	N/A	2/5/2010	Datalogger	2.01
	N/A	3/12/2010	Datalogger	1.76
	N/A	6/1/2010	Datalogger	1.7

3.4 Stream Monitoring Data and Photos

A photo log of the project showing each of the fifty-one (51) permanent photo locations is included in Appendix A of this report. Survey data and photos from each permanent cross-section are included in Appendix B of this report.

3.5 Stream Stability Assessment

Table 9 presents a summary of the results obtained from the visual inspection of in-stream structures performed during Year 4 of post-construction monitoring. The percentages noted are a general overall field evaluation of how the features were performing at the time of the on-site visual stability assessment on October 7, 2010. These percentages are solely based on the field evaluator's visual assessment at the time of the site visit.

Visual observations of the various structures throughout Year 4 growing season indicated that structures were functioning as designed and holding their elevation grade. Root wads placed on the outside of meander bends provided bank stability and in-stream cover for fish and other aquatic organisms. Cover logs placed in meander pool areas allowed scour to keep pools deep and provide cover for fish. During the Year 4 site visit, remnant scour was observed immediately underneath a few of the cover logs and other log vane structures. The channel throughout the project has remained largely unchanged through Year 4.

The Year 3 assessment noted log sill structures at stations 12+05 and 25+90 on UT1 had been bypassed either by scour under the structure or failure of the fabric seal. During Year 4 functionality has returned to the log sill at station 12+05 however the log sill at station 25+90 remains unchanged. In addition the root wad structure at station 57+50 has experienced scour at the center of the structure. These observations are reflected in minor changes in the performance scores.

Table 9. Categorical Stream Feature Visual Stability Assessment

Beaverdam Creek Restoration Site: Project No. D05016-1						
	Performance Percentage					
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
Riffles	100%	100%	100%	100%	100%	
Pools	100%	100%	100%	100%	100%	
Thalweg	100%	100%	100%	100%	100%	
Meanders	100%	100%	100%	100%	100%	
Bed General	100%	99%	99%	99%	99%	
Vanes / J Hooks etc.	100%	97%	95%	97%	98%	
Wads and Boulders	100%	100%	100%	100%	99%	

3.6 Cross-section, Longitudinal Profile, and Bed Material Analysis Monitoring Results

Cross Sections

Year 4 cross-section monitoring data for stream stability were collected during September 2010 and compared to as-built, Year 1, Year 2, and Year 3 conditions.

The twenty four permanent cross-sections along the restored channels (twelve located across riffles and twelve across pools) were re-surveyed to document stream dimension at the end of the Year 4 monitoring period. Cross-sections are provided in Appendix B, and data from the cross-sections are summarized in Appendix E. Most cross-sections show that there has been minor adjustment to stream dimension within the last year; with the exception of cross-sections 10, 11, 12, 13, and 15.

Cross-section 10 is located across a pool that has experienced minor degradation during Year 4. Scour and deepening of some pools is expected and has not resulted in any observed channel instability. Photographs of X10 indicate that the banks of the stream are stable with vegetation.

Cross-sections 11 and 12 are located along UT1D. Aggradation was documented during Year 3 at the top of UT1D, including the pool at Cross-section 11, and attributed to an unknown offsite sediment source. During Year 4 cross-section 11 shows minor channel adjustment. The riffle at Cross-section 12 displays a minor change in bed geometry during Year 4. The change in channel geometry doesn't reflect the accumulation of sediment in the riffle but rather the growth of vegetation in the channel bed during intervals of little or no baseflow.

Cross-section 13 is located in a pool that has experienced minor bed aggradation along the inner half of the meander bend during Year 4. This slight adjustment has not resulted in any observed channel instability.

Cross-section 15, a riffle, also experienced aggradation. X15 is located immediately upstream of a large in-stream boulder. This change in channel geometry is most likely influenced by the boulder structure and will be monitored.

Longitudinal Profiles

The Year 4 longitudinal profile was conducted during September 2010. The initial 3,065 LF of channel was surveyed along the mainstem of UT1. The longitudinal profile is included in Appendix B. A summary of parameters measured are provided in Appendix D. Please note that this summary represents only the portion of project that was surveyed.

The representative longitudinal profile along the restored channel was resurveyed to document stream profile at the end of monitoring Year 4. Dry conditions resulted in little to no water within the restored channels and therefore profile data such as riffle slopes and pool-to-pool spacing could not be calculated. Sinuosity for Reach 1 of UT1 was 1.05, which differs slightly from the Year 3 value of 1.04. The sinuosity of Reaches 2-5 remained the same with a value of 1.3.

Profile remained largely unchanged with a few exceptions where pools had deepened due to scour or slightly aggraded. Overall pattern shows little to no change.

Bed Material Analysis

Year 4 bed material samples were collected at each permanent cross-section during September 2010. The pebble count data were plotted on a semi-log graph and will be compared with future monitoring data. Data indicates maintenance of a coarse bed in constructed riffles and a relative fining in the pools for the majority of cross-sections. One exception was Cross-section 1 on UT2A. This riffle has displayed an increase in fine bed material. Field observations document a thin layer of fine mud overlying the coarser bed material installed during construction. The finer sediment is from an unknown offsite source. The

accumulation hasn't affected channel stability but will be monitored. All pebble count data are provided in Appendix B.

3.7 Areas of Concern

Currently there are no areas of concern.

4.0 HYDROLOGY

Rainfall data were collected to document the hydrologic conditions throughout the project area in the 2010 growing season. Since no rain gauges were installed within the project boundaries, monthly rainfall totals were calculated from data downloaded from the Withers Cove USGS gauge 35090308100454 in Mecklenburg County, NC. Historical rainfall data were collected from the Charlotte WSO AP WETS Station in Mecklenburg County (NC 1690) using NRCS National Water and Climate Data Center web-site.

Though the total rainfall in inches for 2009 – 2010 is less than the historical average totals, the totals are similar. Monthly rainfall averages from November and December of 2009 were recorded as above the 70 percentile mark and was a major factor in a yearly average of rainfall that was similar to the historical average. Throughout the growing season, rainfall monthly averages did not meet historical averages over 62% of the time. April, July, and October recorded monthly averages below the 30 percentile mark. Hydrologic monitoring results are shown in Table 10 and Figure 5.

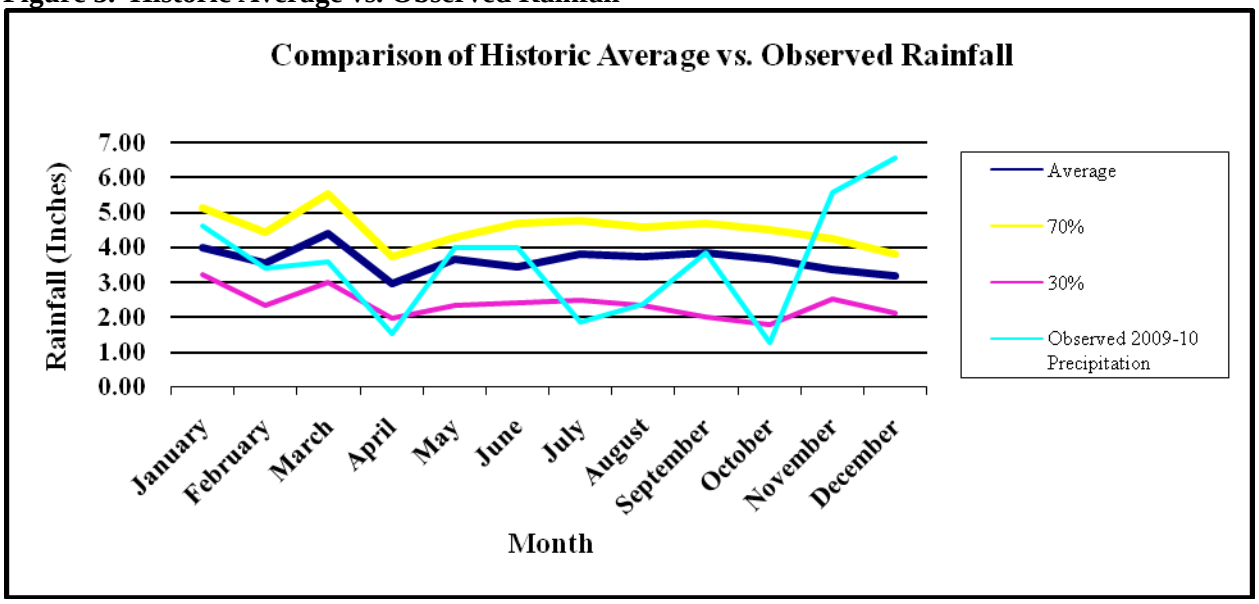
Table 10. Comparison of Historic Rainfall to Observed Rainfall

Beaverdam Creek Restoration Site: EEP Contract No. D05016-1				
Month	**Average**	**30%**	**70%**	**Observed 2009-2010 Precipitation***
January	4.00	3.21	5.15	4.60
February	3.55	2.34	4.42	3.40
March	4.39	3.01	5.54	3.58
April	2.95	1.98	3.73	1.54
May	3.66	2.33	4.29	3.99
June	3.42	2.43	4.68	4.00
July	3.79	2.49	4.76	1.87
August	3.72	2.34	4.57	2.37
September	3.83	2.00	4.68	3.83
October	3.66	1.80	4.49	1.29
November	3.36	2.51	4.24	5.57
December	3.18	2.11	3.81	6.55
Total Rainfall	**43.51**	**28.55**	**54.36**	**42.59**

(NRCS National Climate and Water Center, 2003 and USGS, 2010)

* Monthly rainfall data was calculated based on rainfall data from 11/1/09 – 10/31/10 using the nearest USGS rain gauge data (USGS 35090308100454 Withers Cove in Mecklenburg County) to the project site. (USGS, 2010)

Figure 5. Historic Average vs. Observed Rainfall



5.0 CONCLUSIONS AND RECOMMENDATIONS

Vegetation Monitoring. Vegetation monitoring efforts have calculated the range of stems per acre for each plot to be from 160 to 680 stems per acre on the 24 vegetation plots. The average number of stems per acre is 473, which is a survival rate of 76% based on the initial planting count of 625 stems per acre. Overall the Site has met the minimum success interim criteria of 320 trees per acre by the end of Year 3, and assuming that preventative methods will be used to maintain any invasive exotics, vegetation survivability on the Site should remain excellent and final vegetative success criteria of 260 trees per acre by the end of year five will be met.

Stream Monitoring. The total length of stream channel restored and/or preserved on the Site was 15,806 linear feet. This entire length was inspected during Year 4 of the monitoring period (2010) to assess stream performance. Based on the data collected, riffles, pools, and other constructed features along the restored channel are stable and functioning as designed. Minor bed scour, the result of a large storm event shortly after construction was complete, was noted at isolated pockets along UT1 but has changed little. One log sill structure should be resealed along UT1 to restore functionality. One rootwad should be repaired along UT1. The lack of major problem areas along the length of the restored channels after the occurrence of two stream flow events larger than bankfull discharge further supports functionality of the design. It is expected that stability and in-stream habitat of the system will continue to improve in the coming years as permanent vegetation becomes more established.

6.0 WILDLIFE OBSERVATIONS

During the year 4 monitoring assessment, field scientists recorded observing a red tail hawk within the project area. Observations of deer and raccoon tracks are also common on the Site. In addition, frogs, turtles, turkey, and fish have also been observed periodically through the 4 years of monitoring initiatives.

7.0 REFERENCES

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APPENDIX A

PHOTO LOG

PROJECT ID PHOTOS

PHOTO LOG – UT1

UT1 – PID 1

UT1 – PID 2

UT1 – PID 3

UT1 – PID 4

UT1 – PID 5

UT1 – PID 6

PHOTO LOG – UT1

UT1 – PID 7

UT1 – PID 8

UT1 – PID 9

UT1 – PID 10

UT1 – PID 11

UT1 – PID 12

PHOTO LOG – UT1

UT1 – PID 13

UT1 – PID 14

UT1 – PID 15

UT1 – PID 16

UT1 – PID 17

UT1 – PID 18

PHOTO LOG – UT1

UT1 – PID 19

UT1 – PID 20

UT1 – PID 21

UT1 – PID 22

UT1 – PID 23

PHOTO LOG – UT1B, UT1C, & UT1D

UT1B – PID 1

UT1B – PID 2

UT1B – PID 3

UT1B – PID 4

UT1B – PID 5

UT1C – PID 6

PHOTO LOG – UT1B, UT1C, & UT1D

UT1C – PID 7

UTIC – PID 8

UT1C – PID 9

UT1D – PID 10

UT1D – PID 11

UT1D – PID 12

PHOTO LOG – UT2 & UT2A

UT2 – PID 1

UT2 – PID 2

UT2 – PID 3

UT2 – PID 4

UT2 – PID 5

UT2 – PID 6

PHOTO LOG – UT2 & UT2A

UT2 – PID 7

UT2 – PID 8

UT2 – PID 9

UT2 – PID 10

UT2 – PID 11

UT2 – PID 12

PHOTO LOG – UT2 & UT2A

UT2A – PID 1

UT2A – PID 2

UT2A – PID 3

UT2A – PID 4

VEG PLOT PHOTOS

VEG PLOT PHOTOS – UT1 & UT1B – UT1D

UT1 – Veg Plot 1

UT1 – Veg Plot 2

UT1 – Veg Plot 3

UT1 – Veg Plot 4

UT1 – Veg Plot 5

UT1 – Veg Plot 6

VEG PLOT PHOTOS – UT1 & UT1B – UT1D

UT1 – Veg Plot 7

UT1 – Veg Plot 8

UT1 – Veg Plot 9

UT1 – Veg Plot 10

UT1 – Veg Plot 11

UT1 – Veg Plot 12

VEG PLOT PHOTOS – UT1 & UT1B – UT1D

UT1 – Veg Plot 13

UT1 – Veg Plot 14

UT1B – Veg Plot 15

UT1C – Veg Plot 16

UT1D – Veg Plot 17

VEG PLOT PHOTOS – UT2 & UT2A

UT2A – Veg Plot 1

UT2A – Veg Plot 2

UT2 – Veg Plot 3

UT2 – Veg Plot 4

UT2 – Veg Plot 5

UT2 – Veg Plot 6

VEG PLOT PHOTOS – UT2 & UT2A

UT2 – Veg Plot 7

APPENDIX B

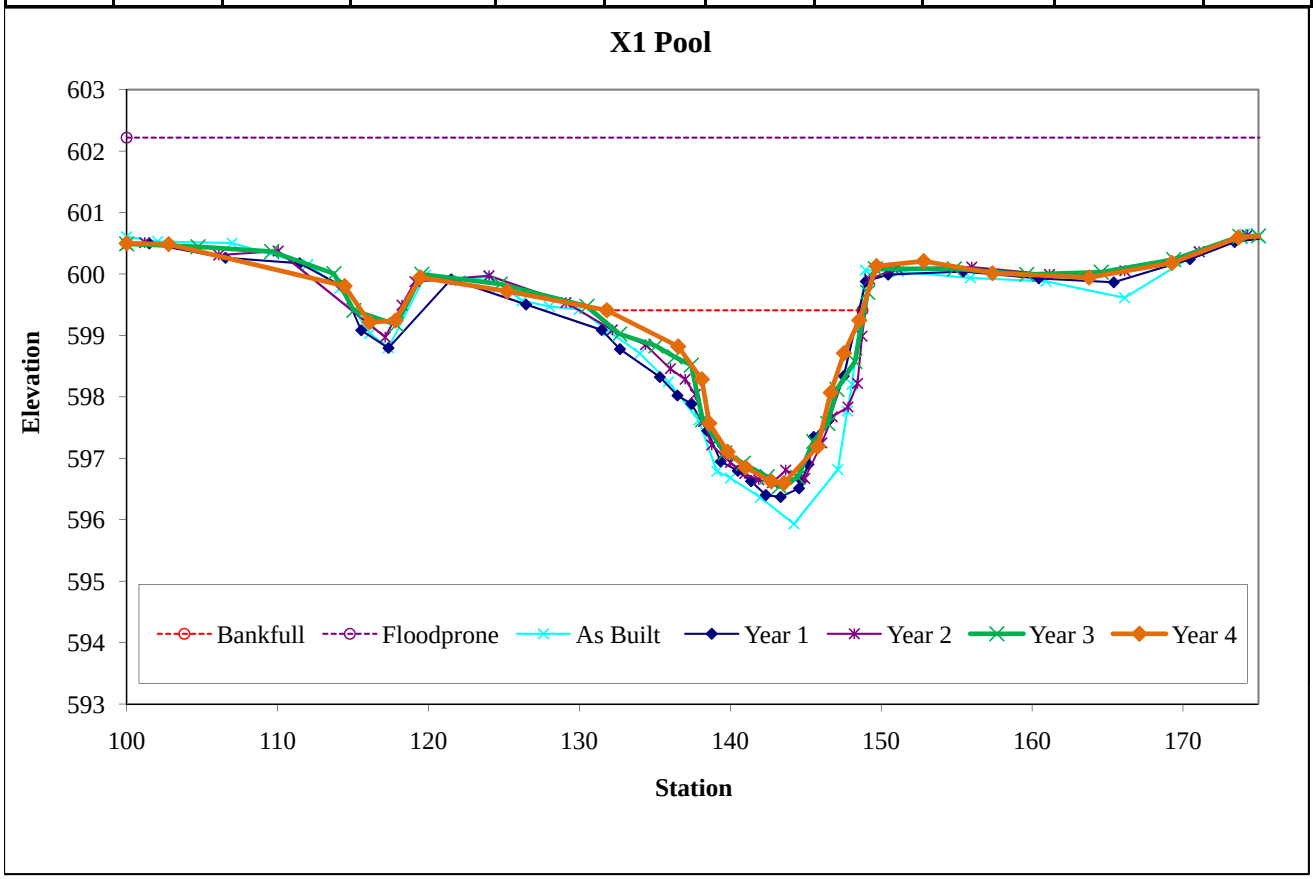
STREAM MONITORING DATA

UT1 Permanent Cross Section X1
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		24.3	16.94	1.43	2.81	11.81	1	4.4	599.41	599.41

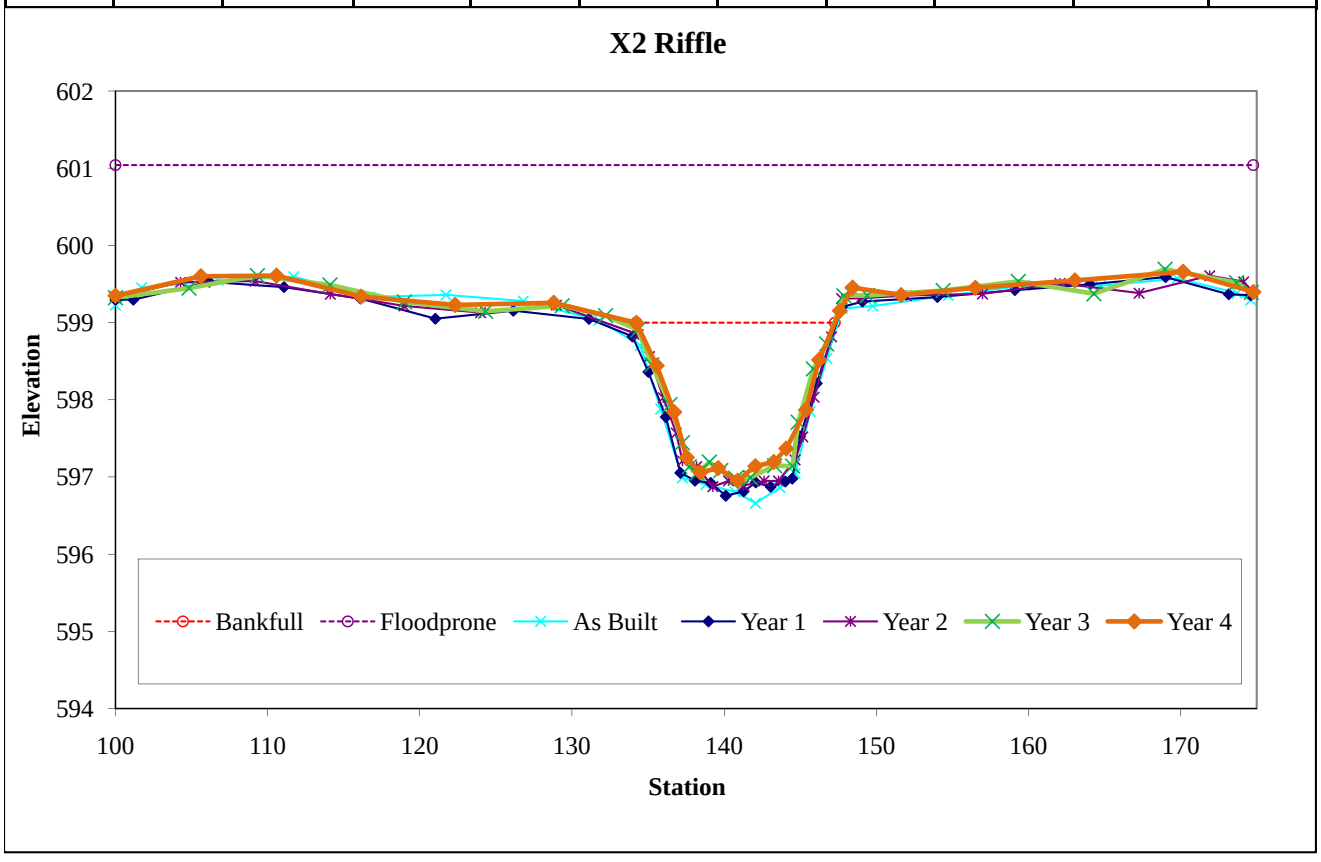


UT1 Permanent Cross Section X2
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	17.6	13.04	1.35	2.05	9.68	1	5.7	599	599

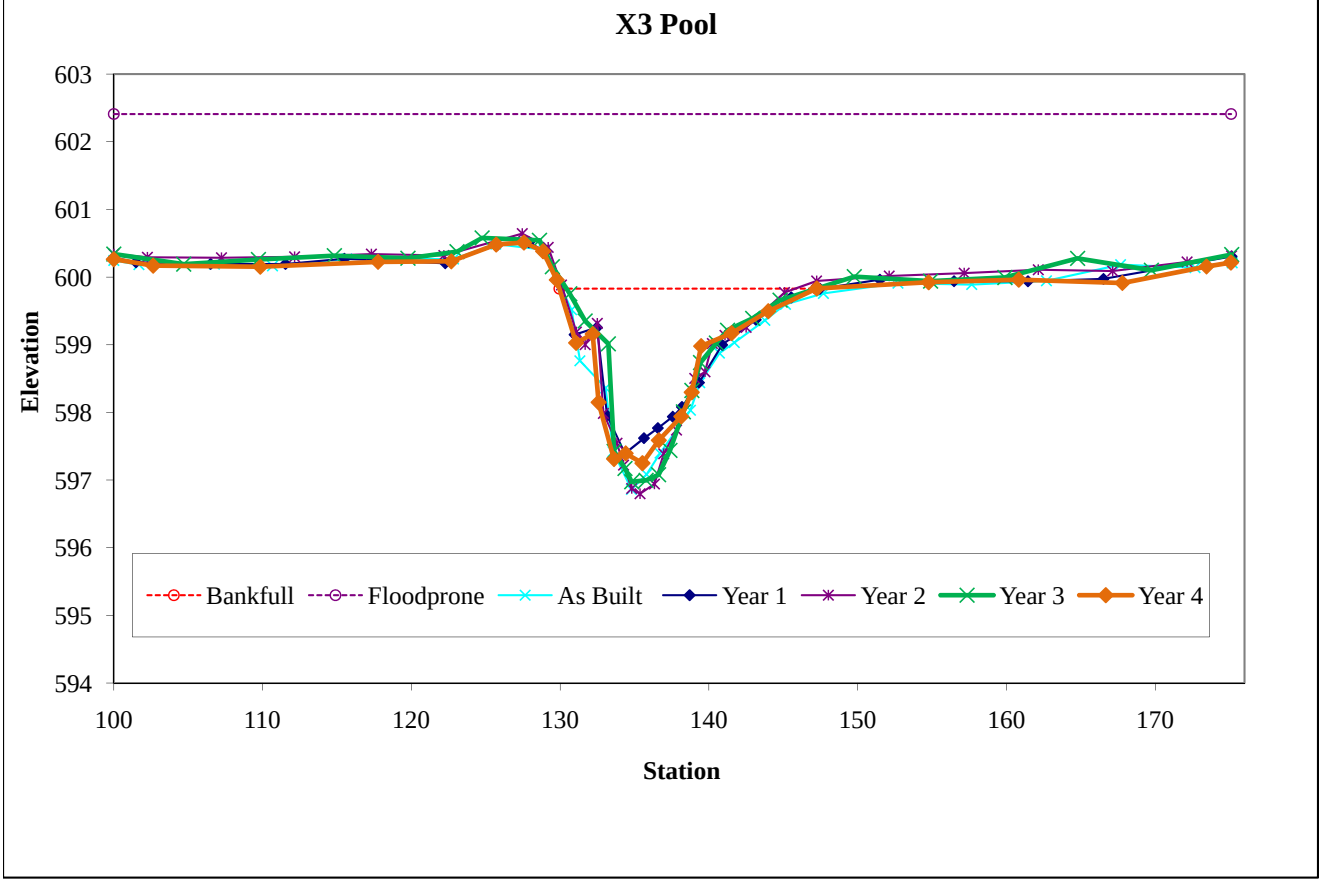


UT1B Permanent Cross Section X3
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		19.8	17.3	1.14	2.58	15.14	1	4.3	599.83	599.83

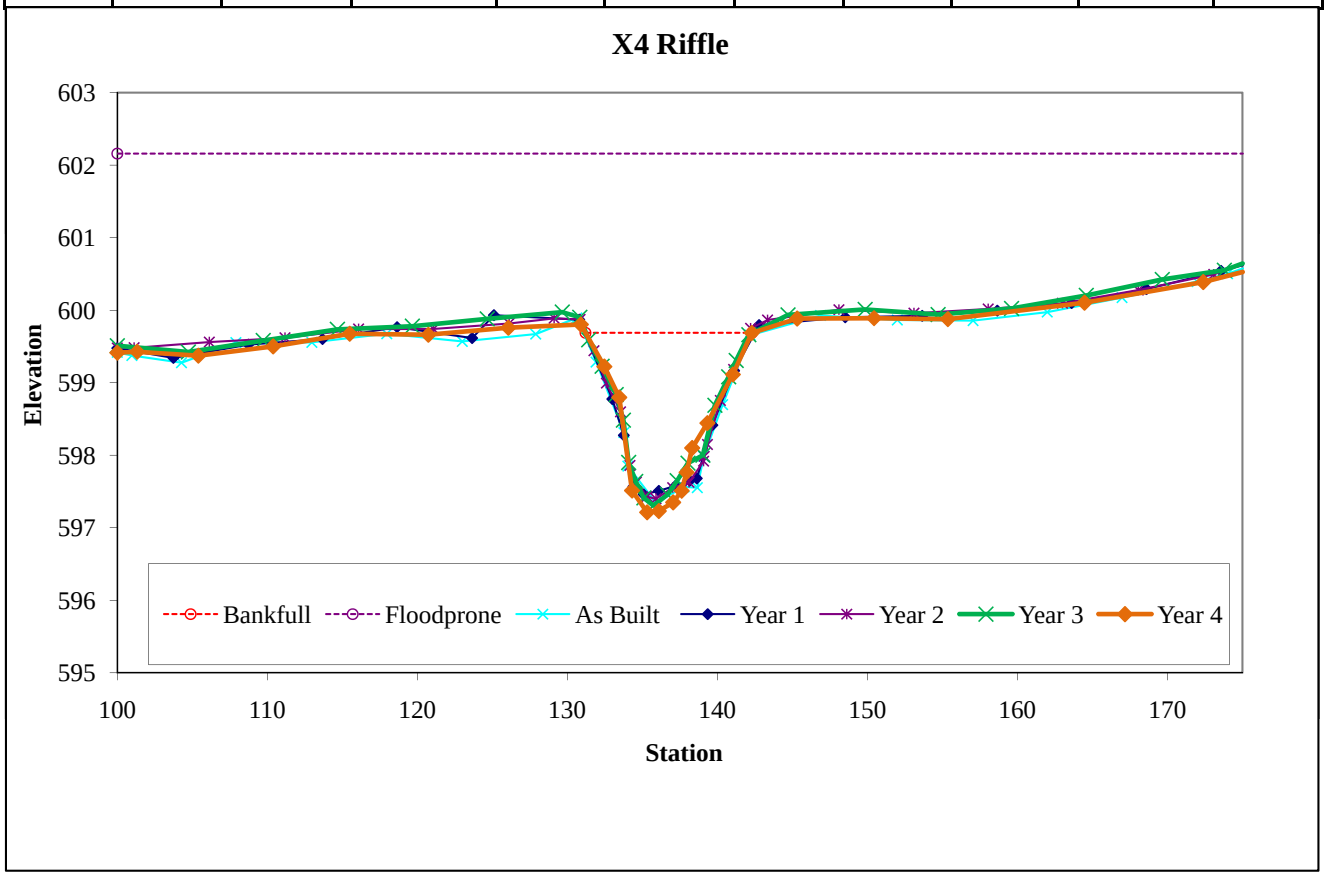


UT1B Permanent Cross Section X4
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	14.8	11.09	1.33	2.47	8.33	1	6.8	599.69	599.69

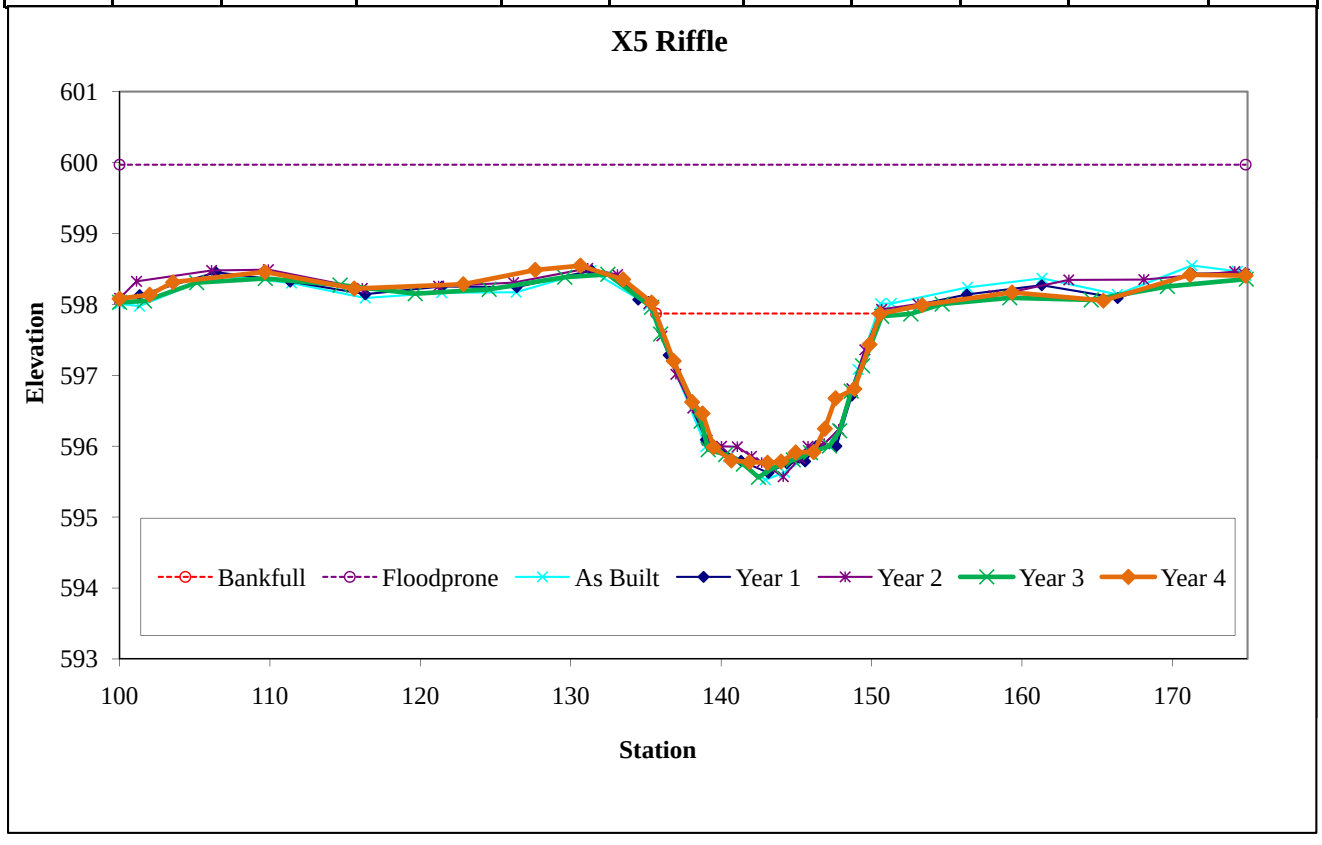


UT1 Permanent Cross Section X5
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	21.9	14.91	1.47	2.1	10.16	1	5	597.87	597.87

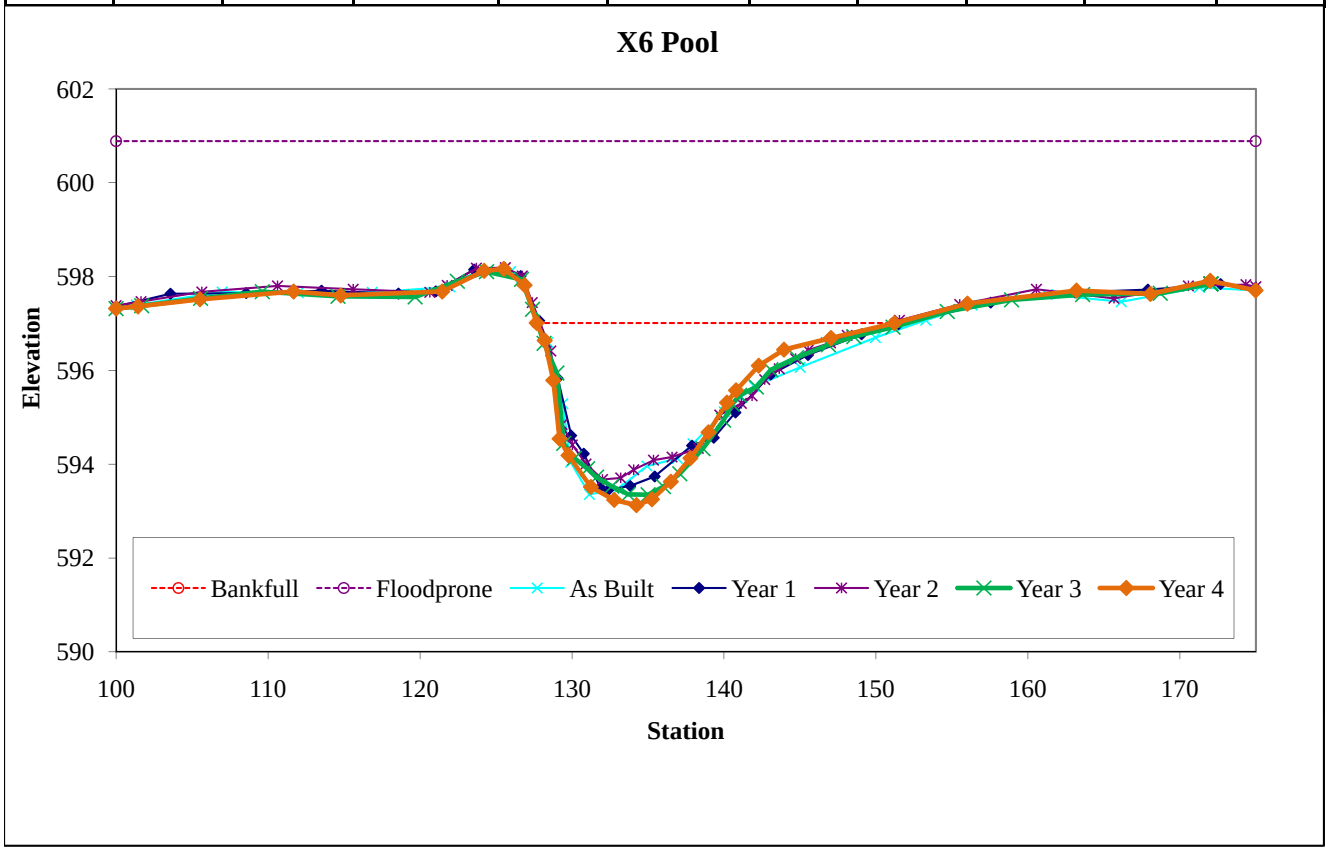


UT1 Permanent Cross Section X6
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		42.5	23.53	1.81	3.88	13.02	1	3.2	597.01	597.01

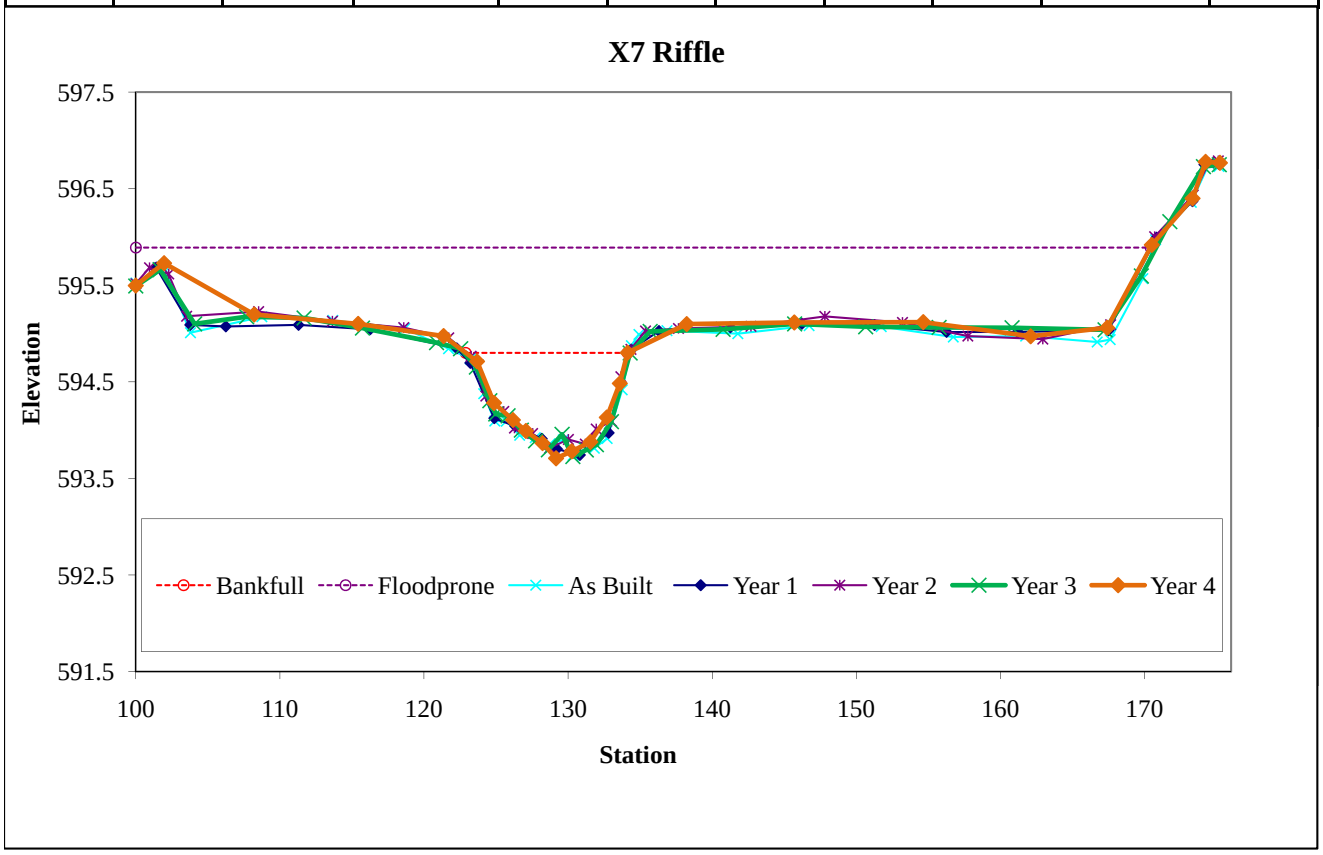


UT1C Permanent Cross Section X7
(Year 4 Monitoring Data - collected September 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	7.7	11.24	0.68	1.09	16.46	1	6.3	594.8	594.8

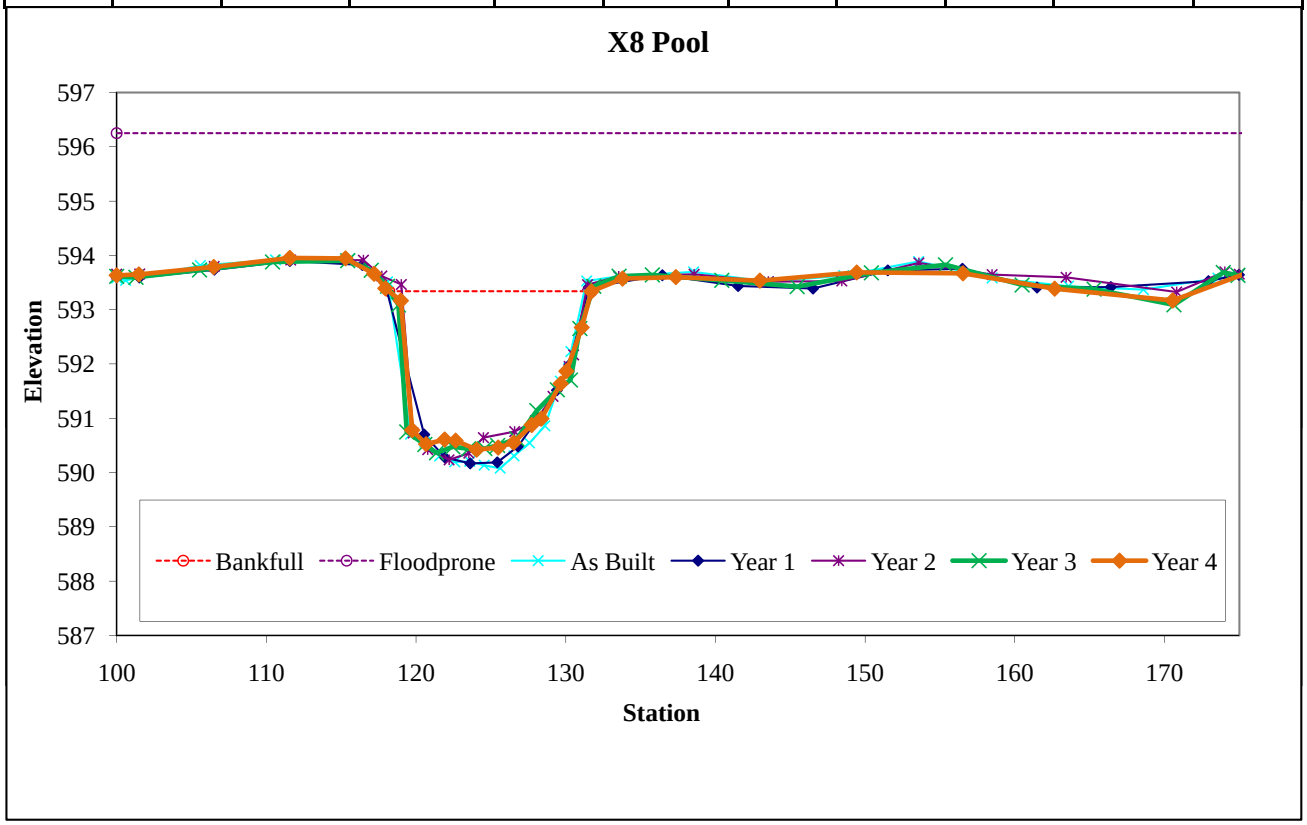


UT1C Permanent Cross Section X8
(Year 4 Monitoring Data - collected September 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		29.3	13.51	2.17	2.92	6.22	1	5.6	593.34	593.34

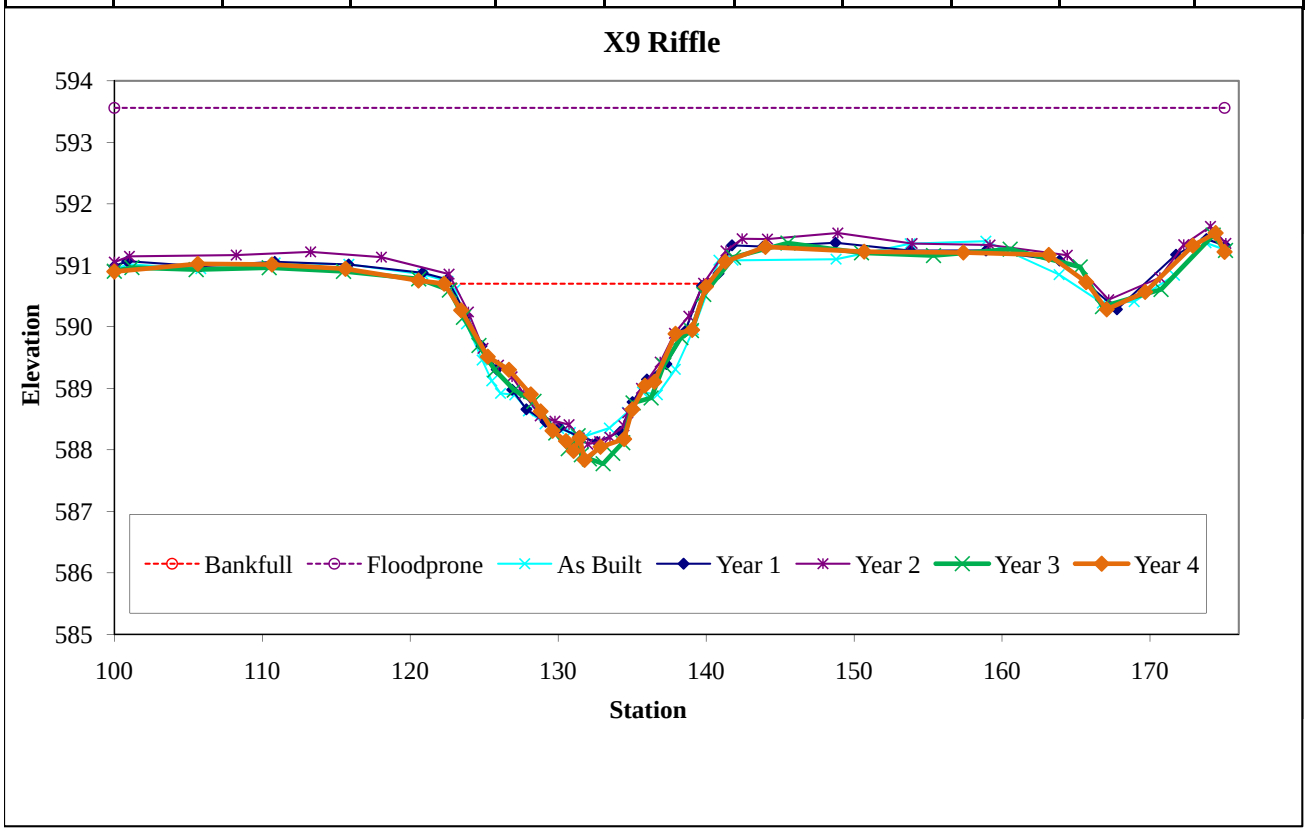


UT1 Permanent Cross Section X9
(Year 4 Monitoring Data - collected September 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	28.5	17.85	1.6	2.86	11.16	1	4.2	590.7	590.7

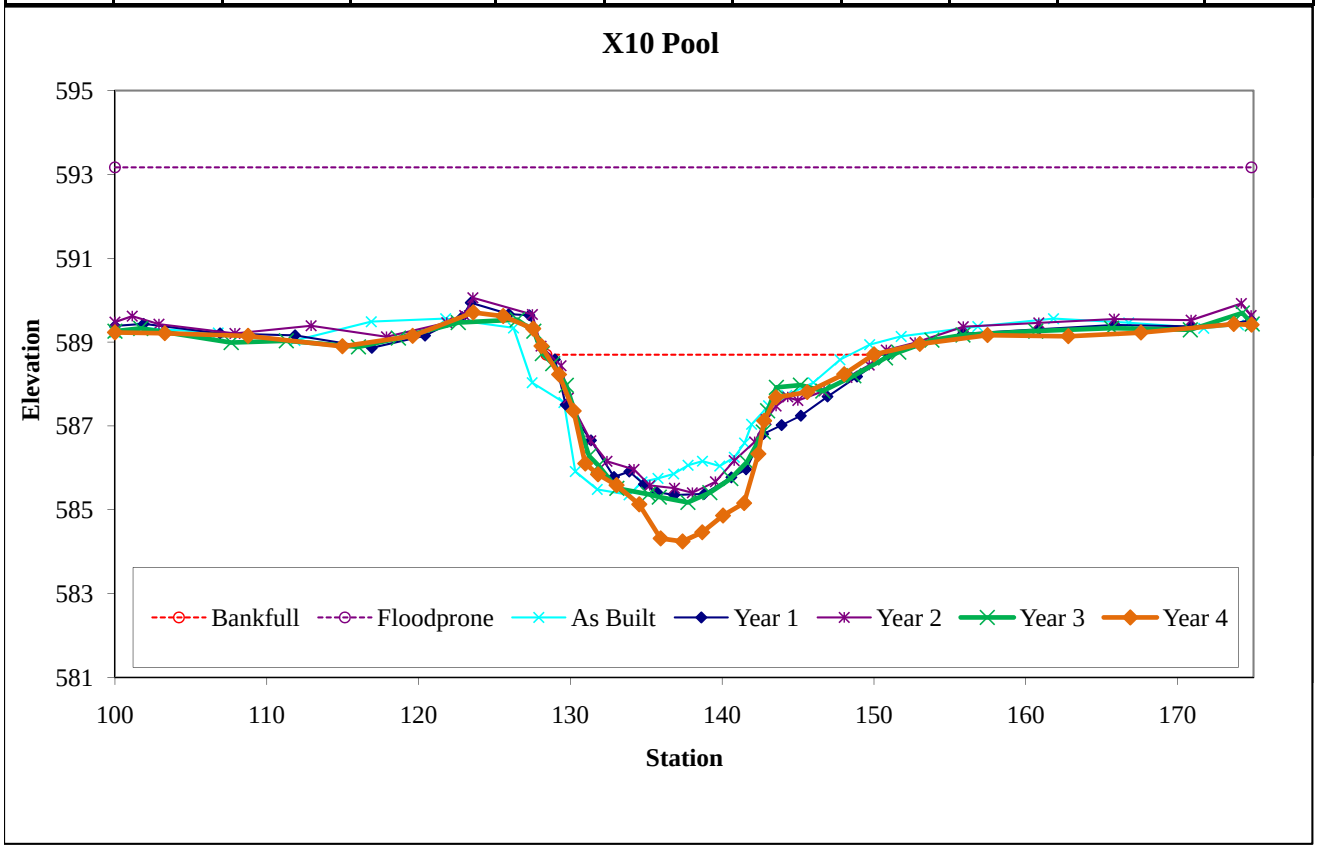


UT1 Permanent Cross Section X10
(Year 4 Monitoring Data - collected September 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		50.5	21.57	2.34	4.46	9.21	1	3.5	588.7	588.7

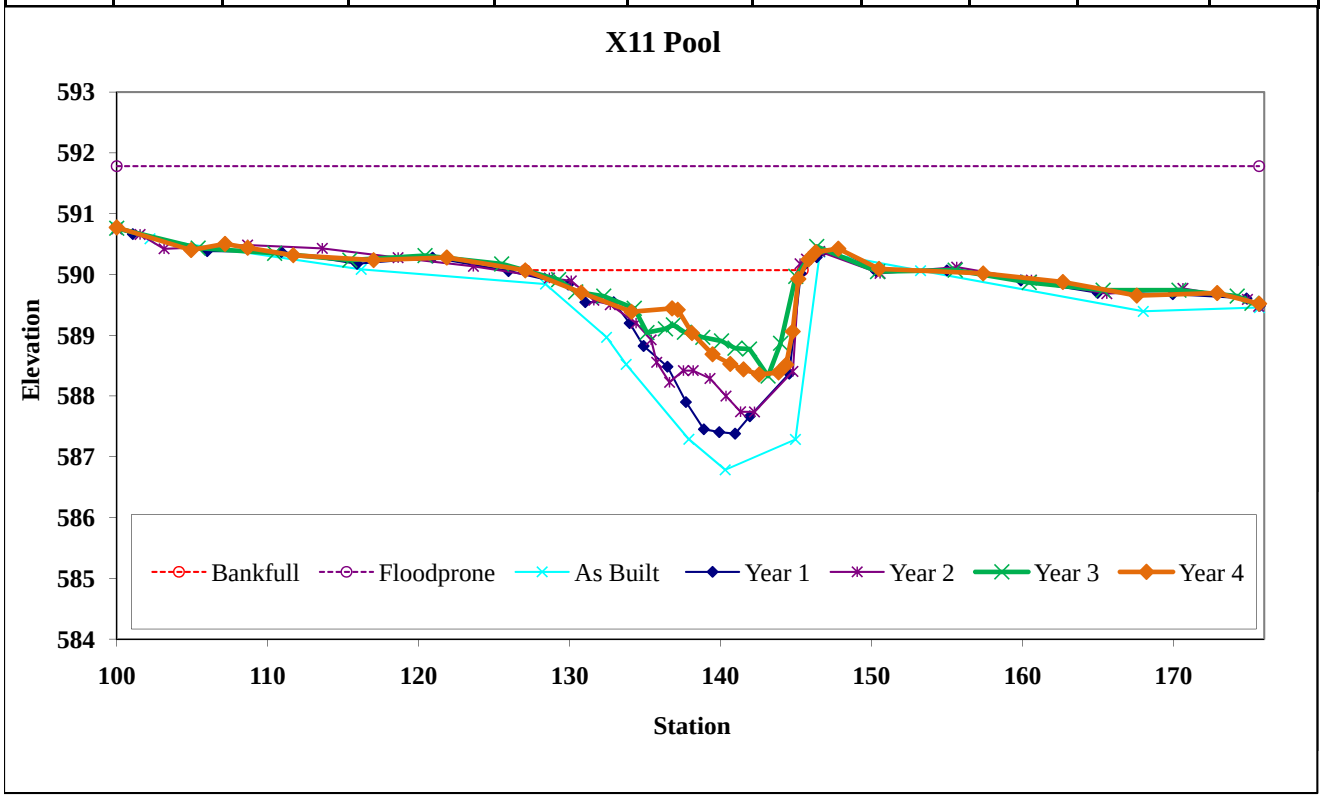


UT1D Permanent Cross Section X11
(Year 4 Monitoring Data - collected September 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		15.5	18.38	0.84	1.71	21.86	1	4.1	590.07	590.07

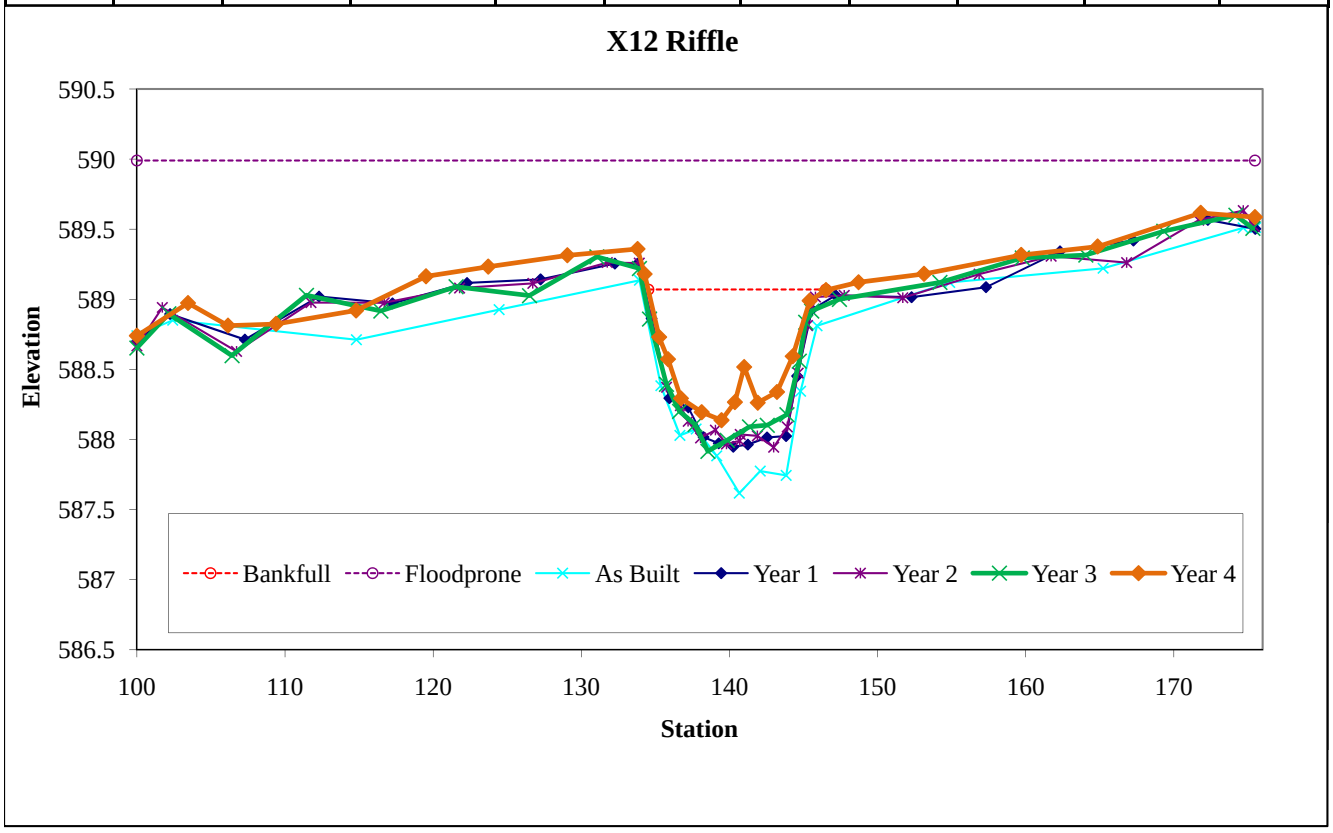


UT1D Permanent Cross Section X12
(Year 4 Monitoring Data - collected September 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	7.1	11.99	0.59	0.93	20.29	1	6.3	589.07	589.07

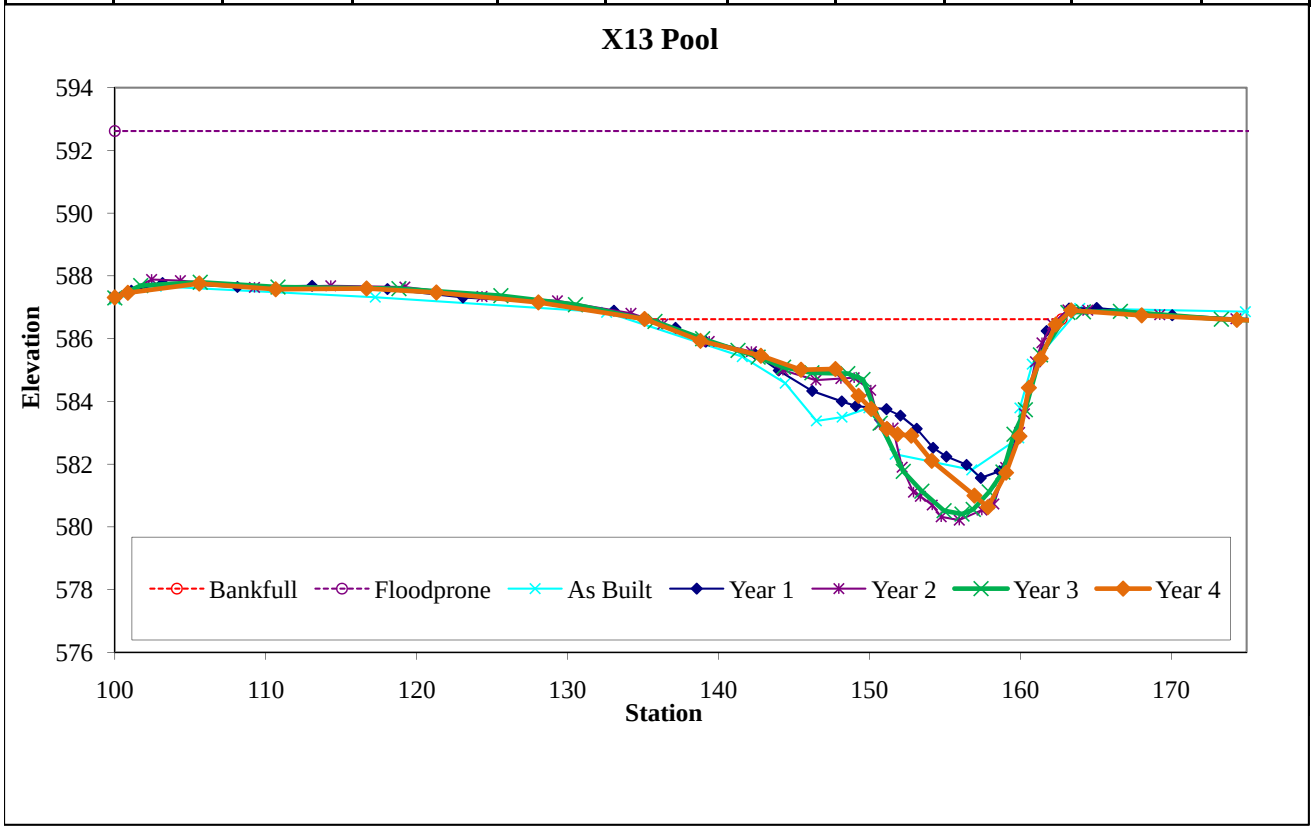


UT1 Permanent Cross Section X13
(Year 4 Monitoring Data - collected September 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		66.4	27.64	2.4	6	11.51	1	3.3	586.62	586.62

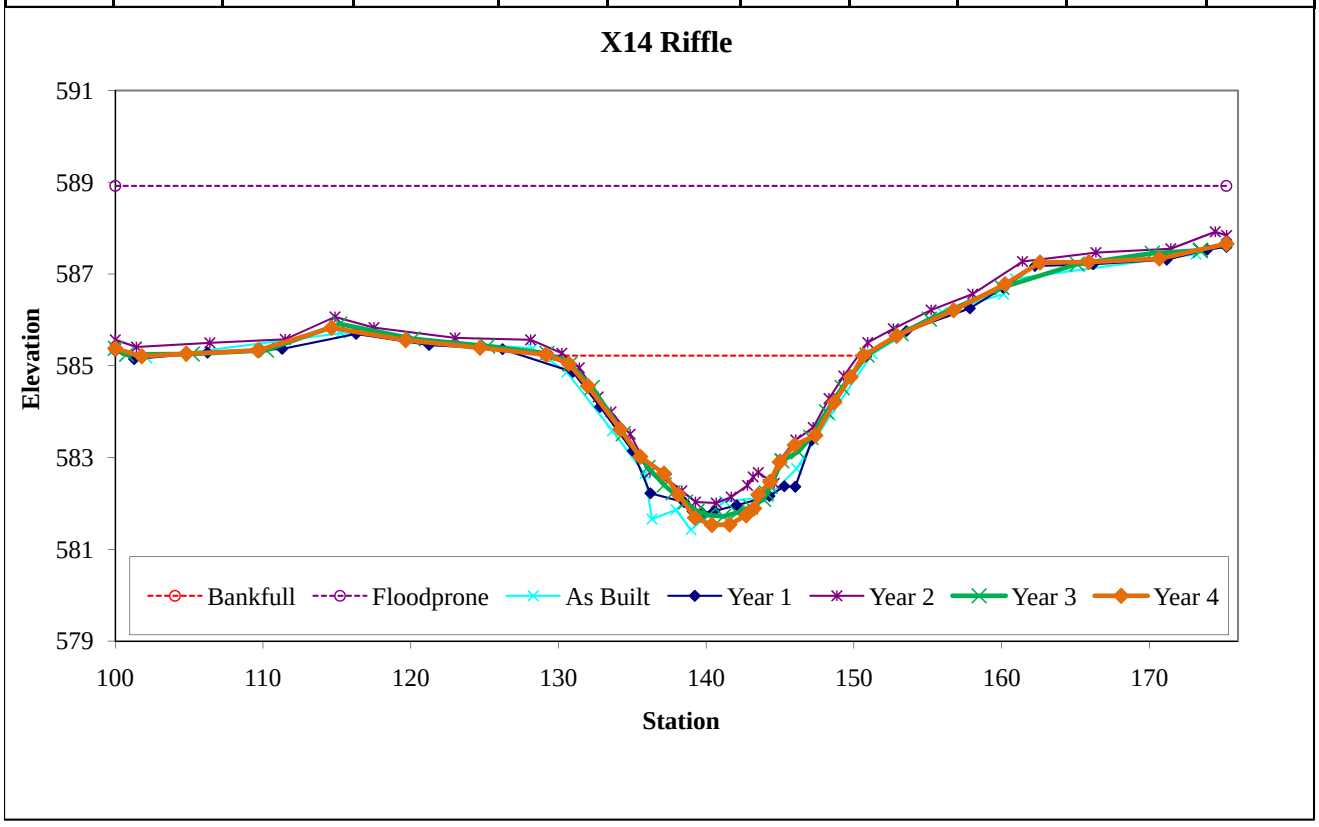


UT1 Permanent Cross Section X14
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	42.8	21.35	2.01	3.69	10.64	1	3.5	585.22	585.22

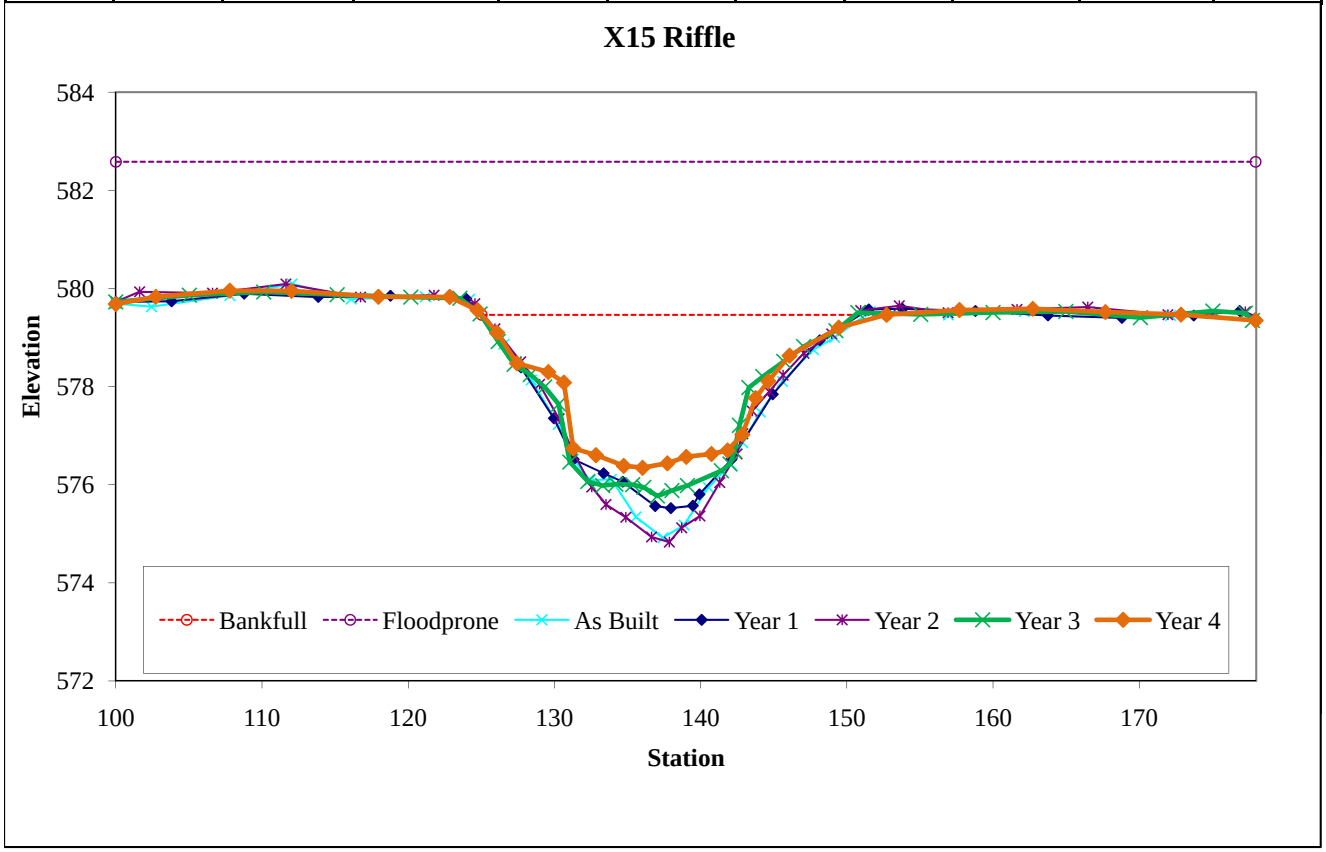


UT1 Permanent Cross Section X15
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	46.8	27.71	1.69	3.12	16.39	1	2.8	579.46	579.46

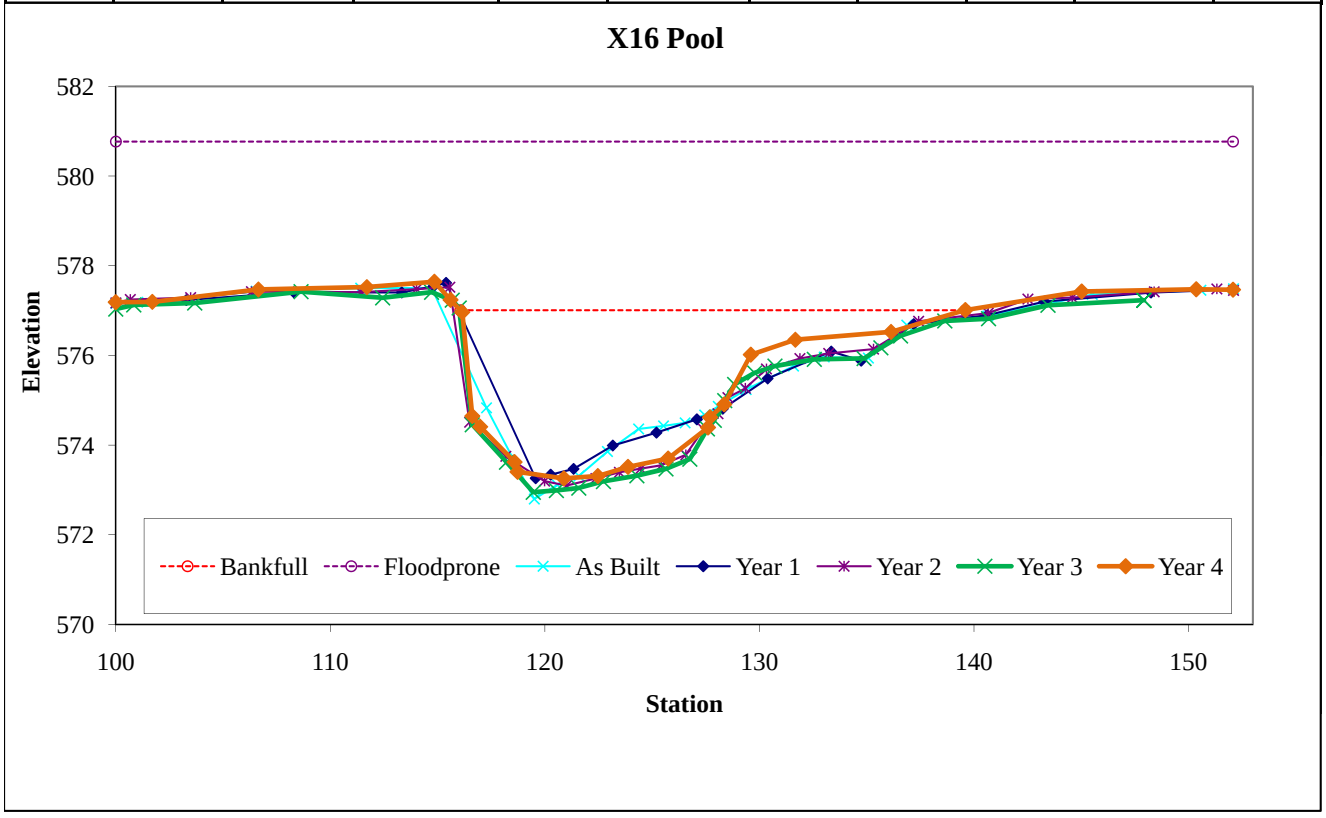


UT1 Permanent Cross Section X16
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		46.3	23.55	1.97	3.75	11.97	1	2.2	577.01	577.01

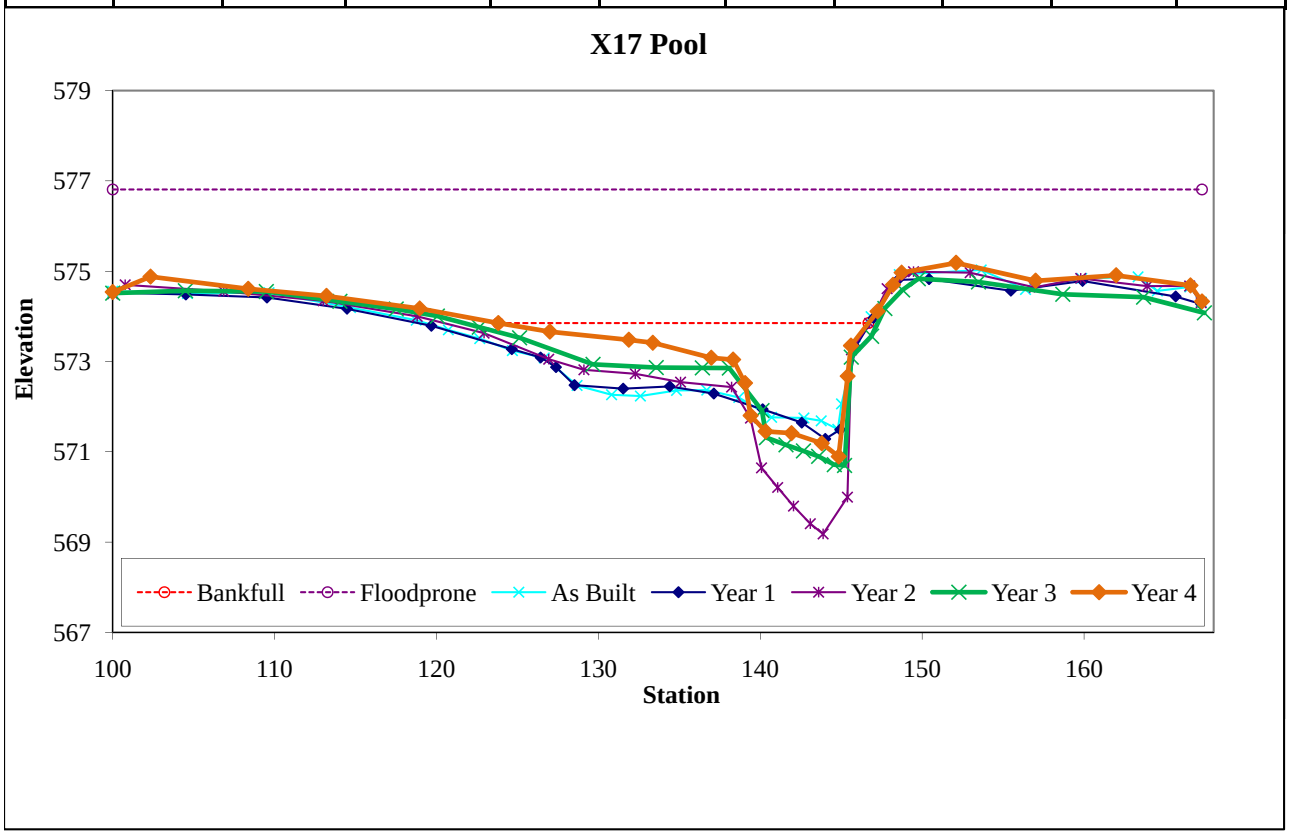


UT1 Permanent Cross Section X17
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		22.1	22.86	0.97	2.96	23.67	1	2.9	573.85	573.85

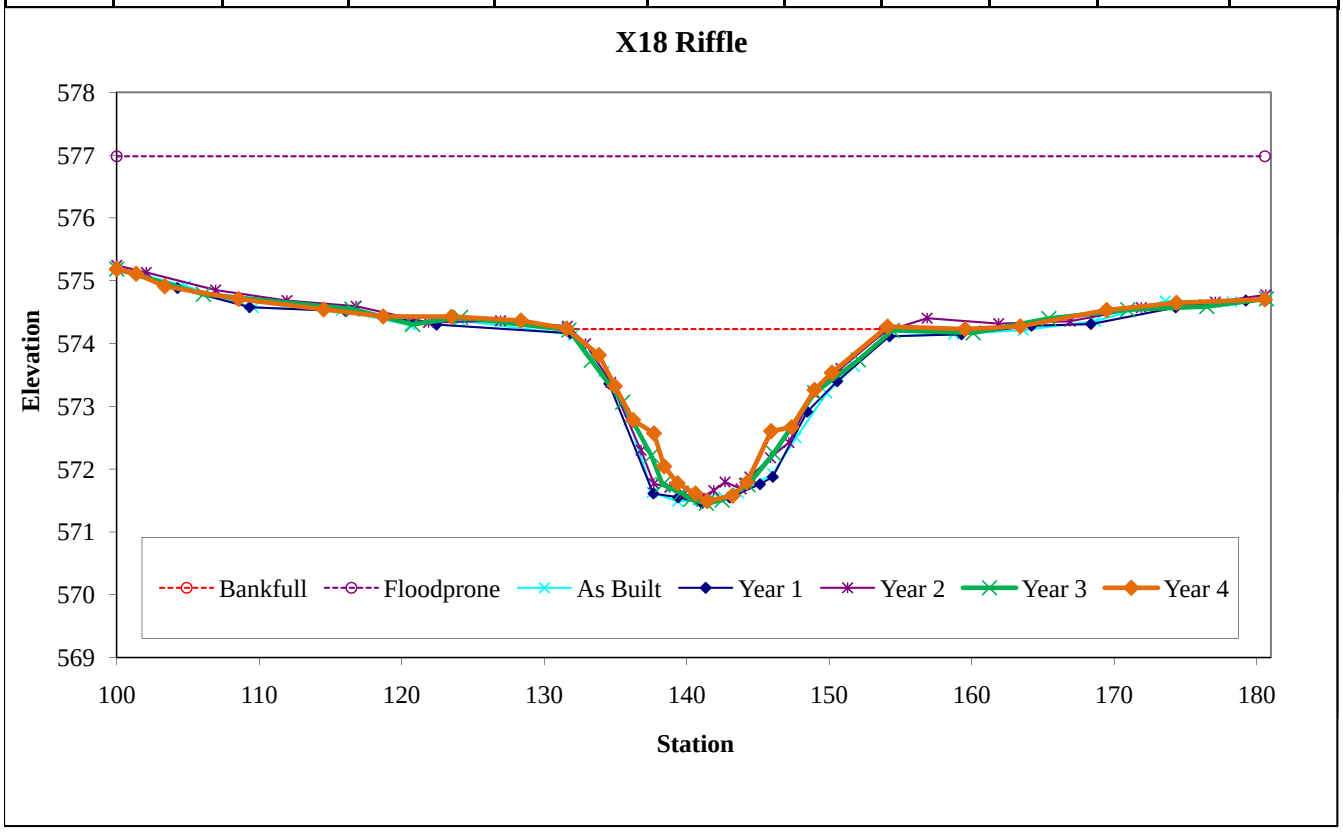


UT1 Permanent Cross Section X18
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	31.5	22.35	1.41	2.74	15.84	1	3.6	574.23	574.23

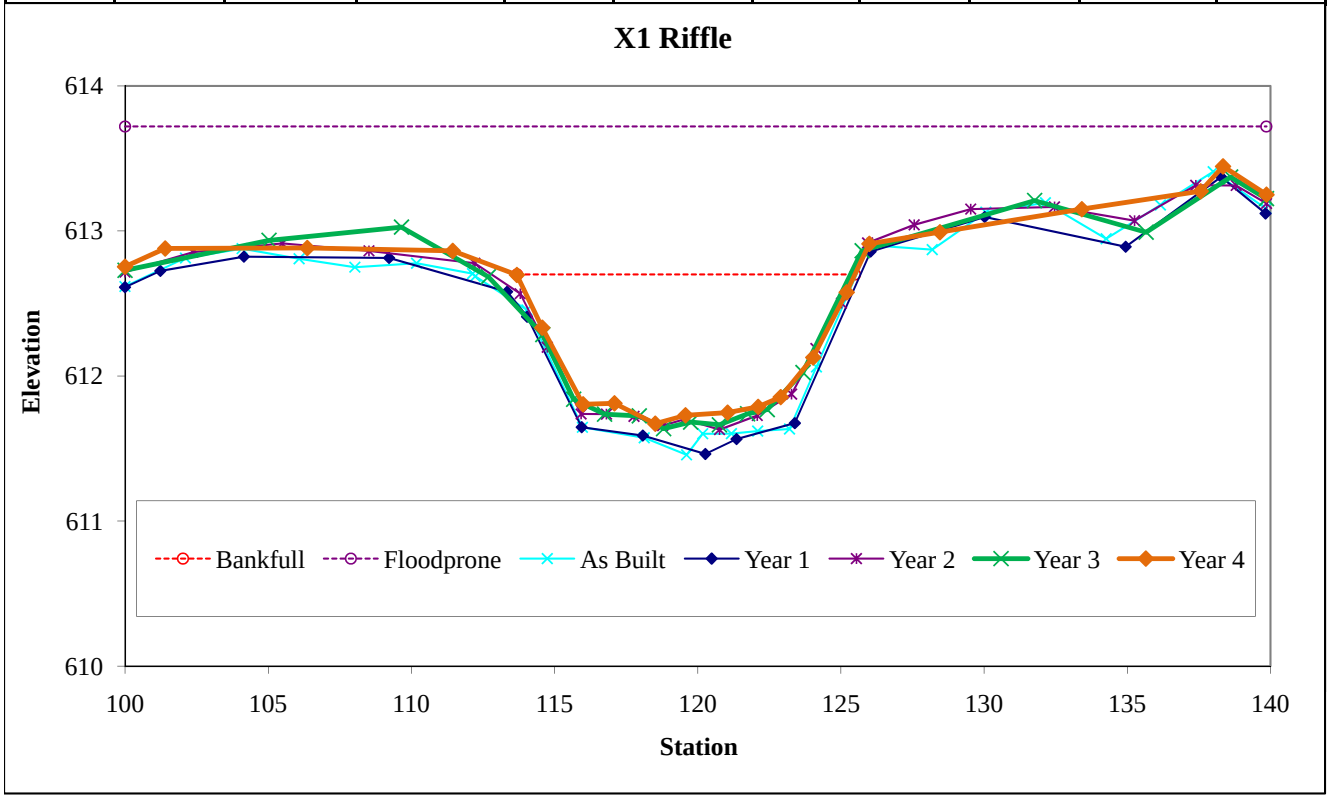


UT2A Permanent Cross Section X1
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	8.8	11.8	0.74	1.03	15.91	1	3.4	612.7	612.7

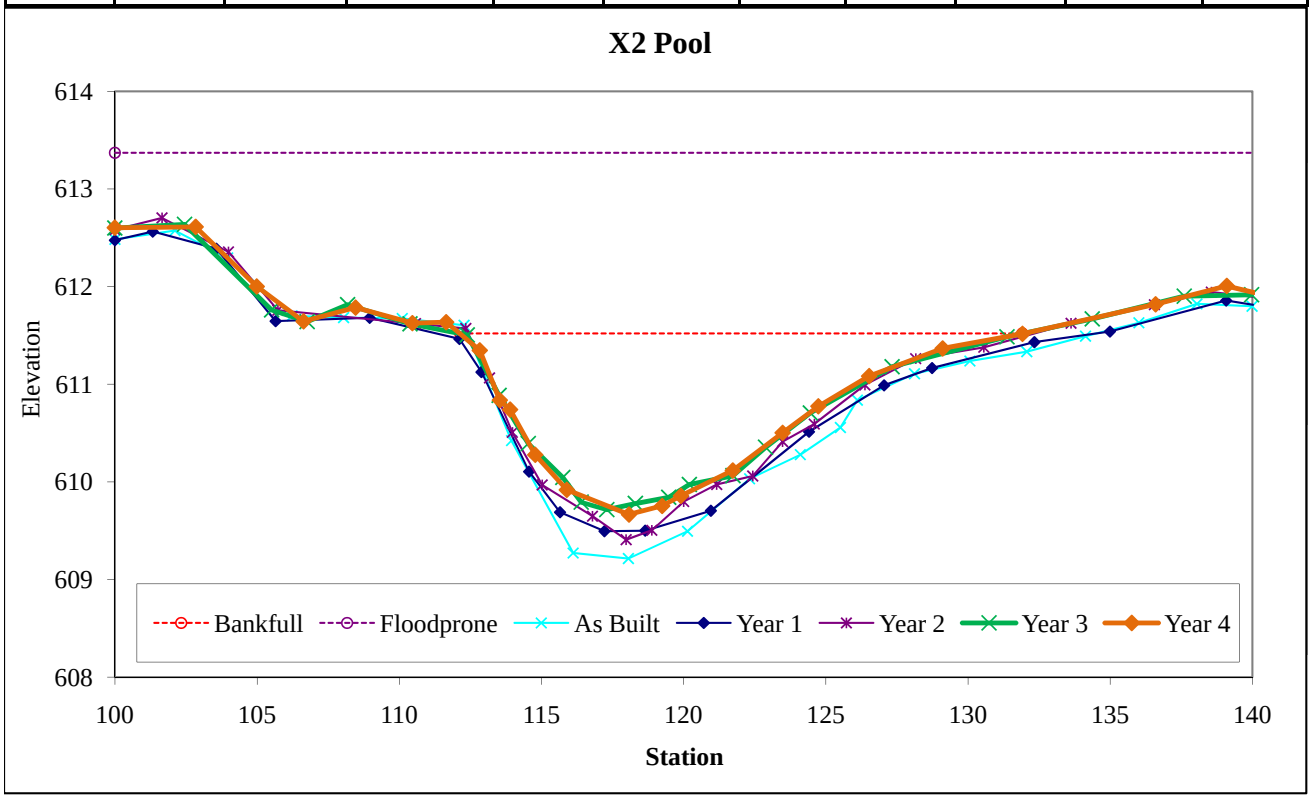


UT2A Permanent Cross Section X2
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		18.1	19.78	0.92	1.85	21.6	1	2	611.52	611.52

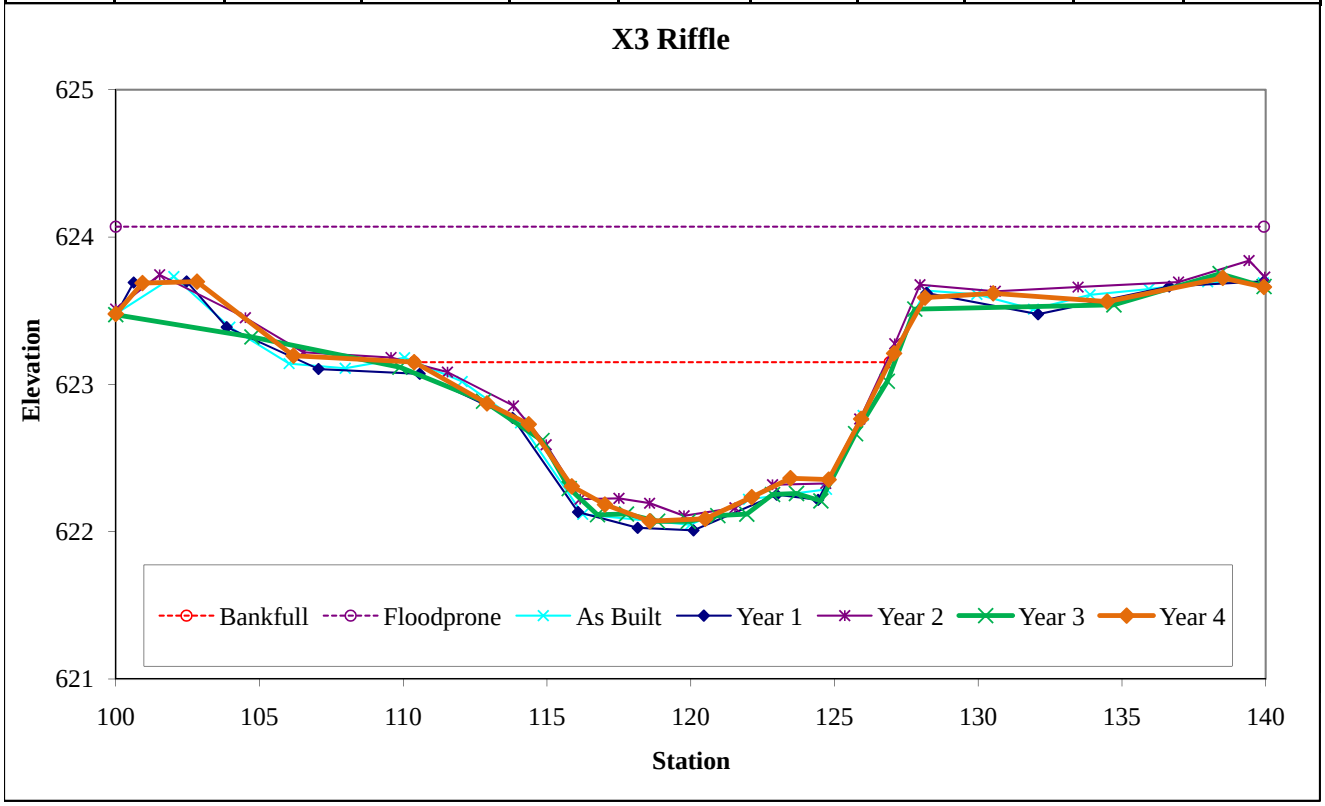


UT2 Permanent Cross Section X3
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	11.2	16.54	0.68	1.08	24.49	1	2.4	622.99	622.99

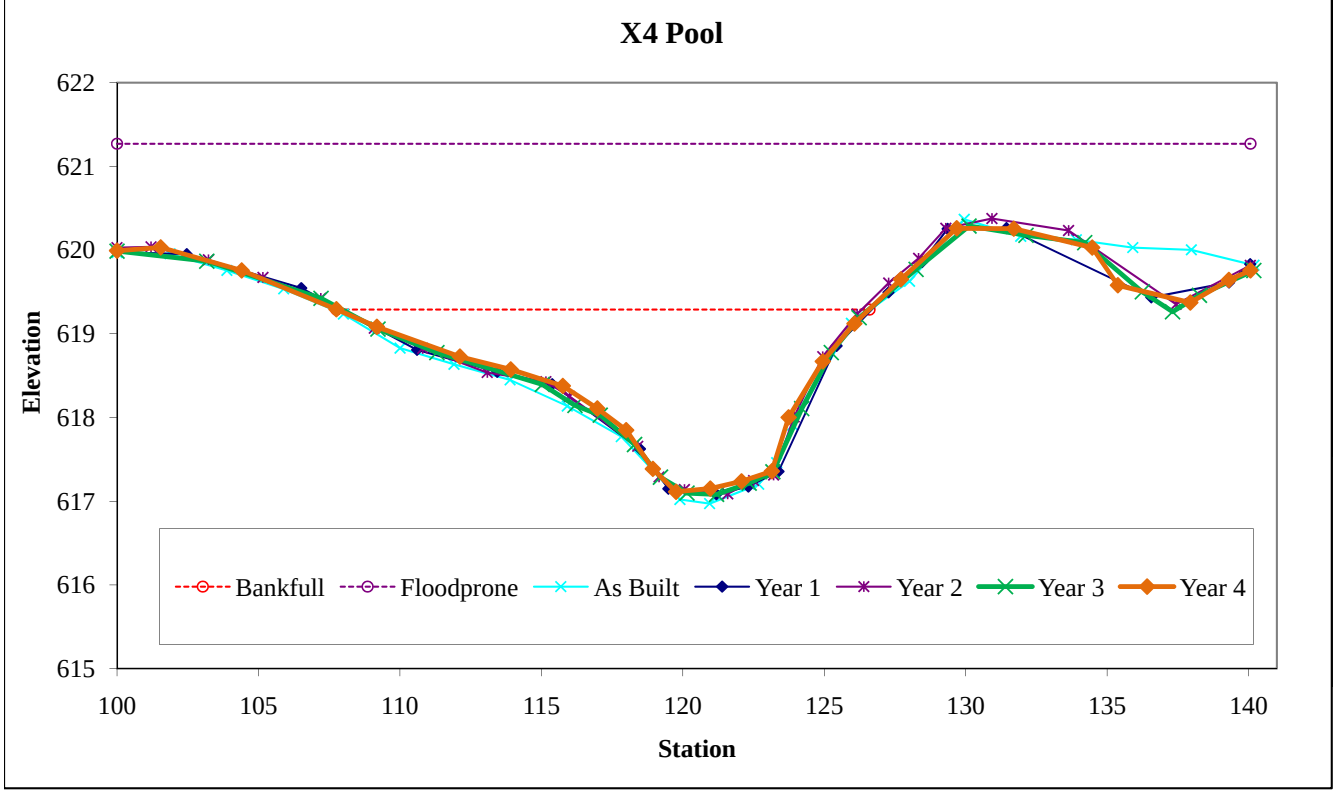


UT2 Permanent Cross Section X4
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		19.5	18.85	1.03	2.18	18.22	1	2.1	619.09	619.09

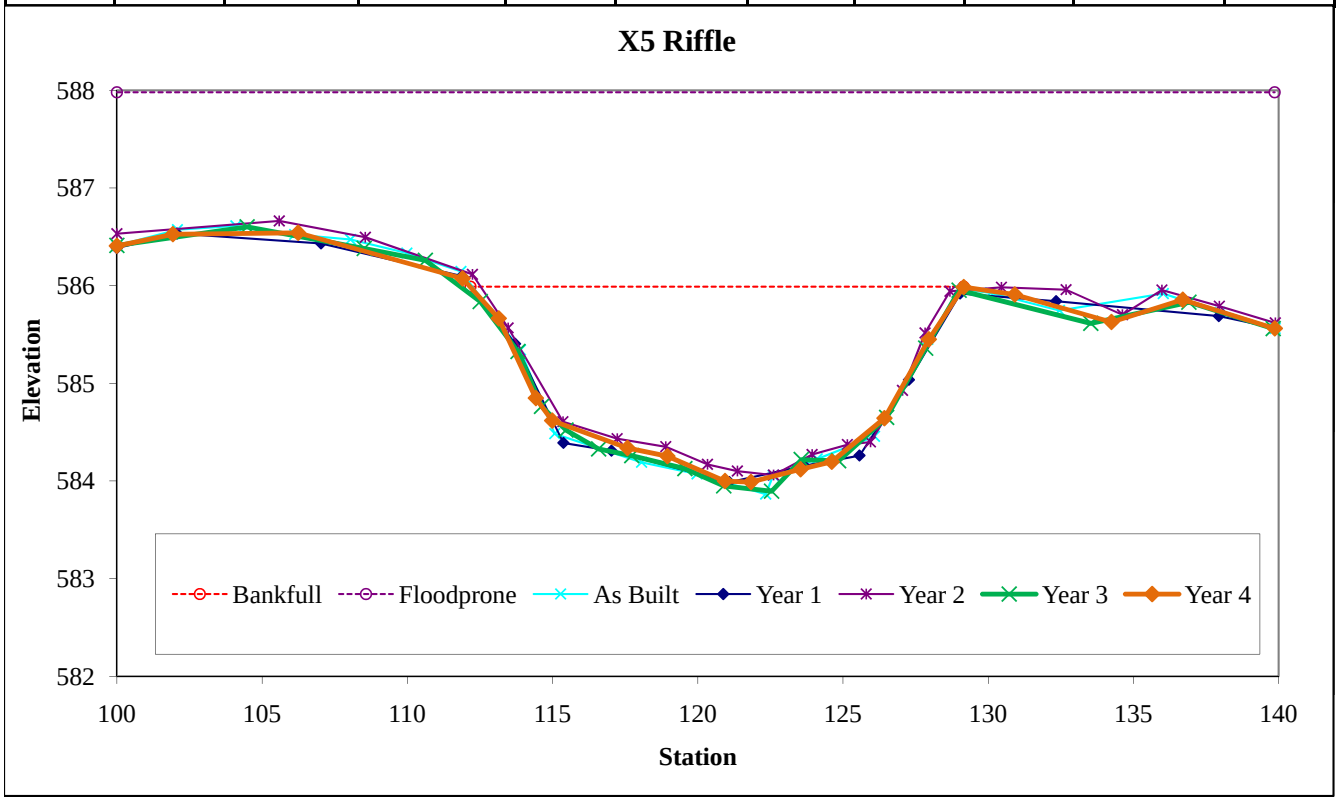


UT2 Permanent Cross Section X5
(Year 4 Monitoring Data - collected August 2010)

Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	C	23.3	16.98	1.37	2	12.36	1	2.3	585.99	585.99

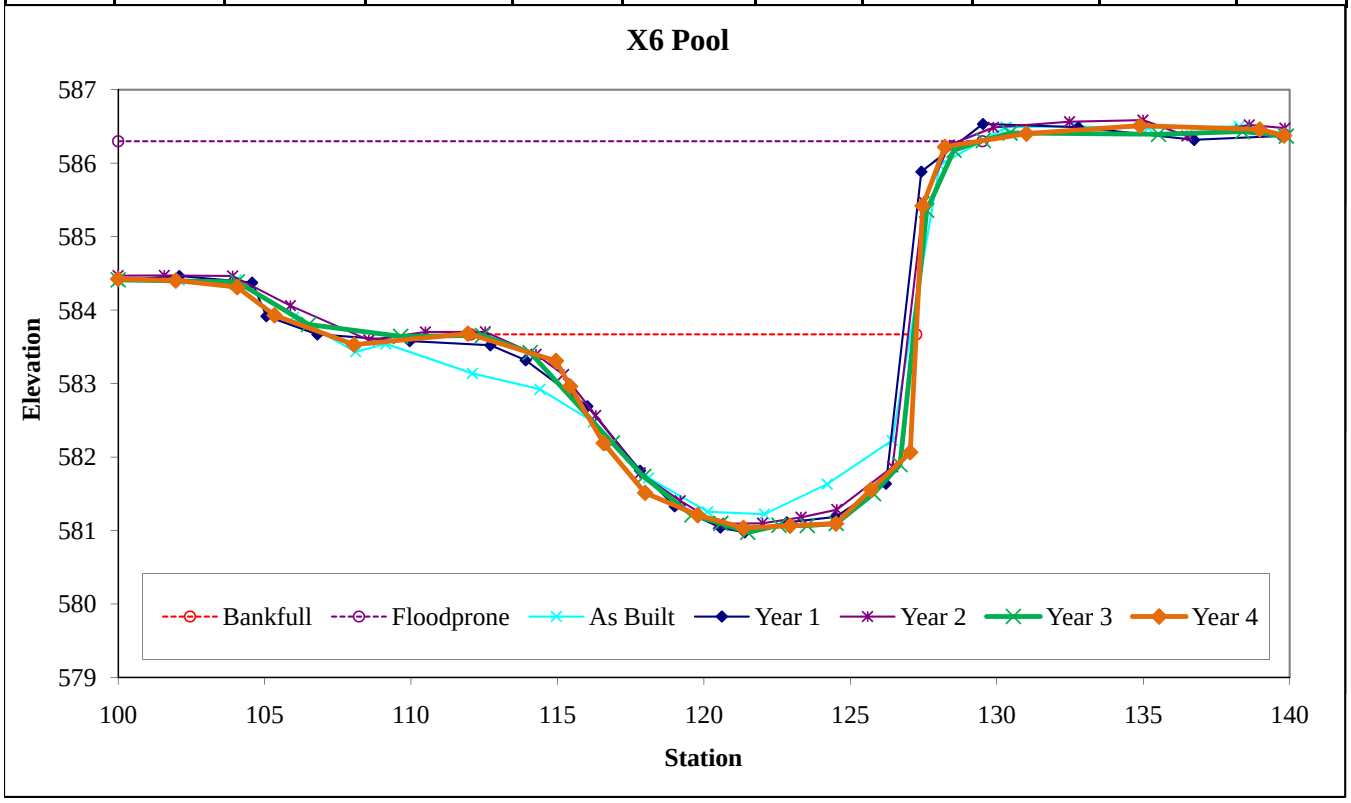


UT2 Permanent Cross Section X6
(Year 4 Monitoring Data - collected August 2010)

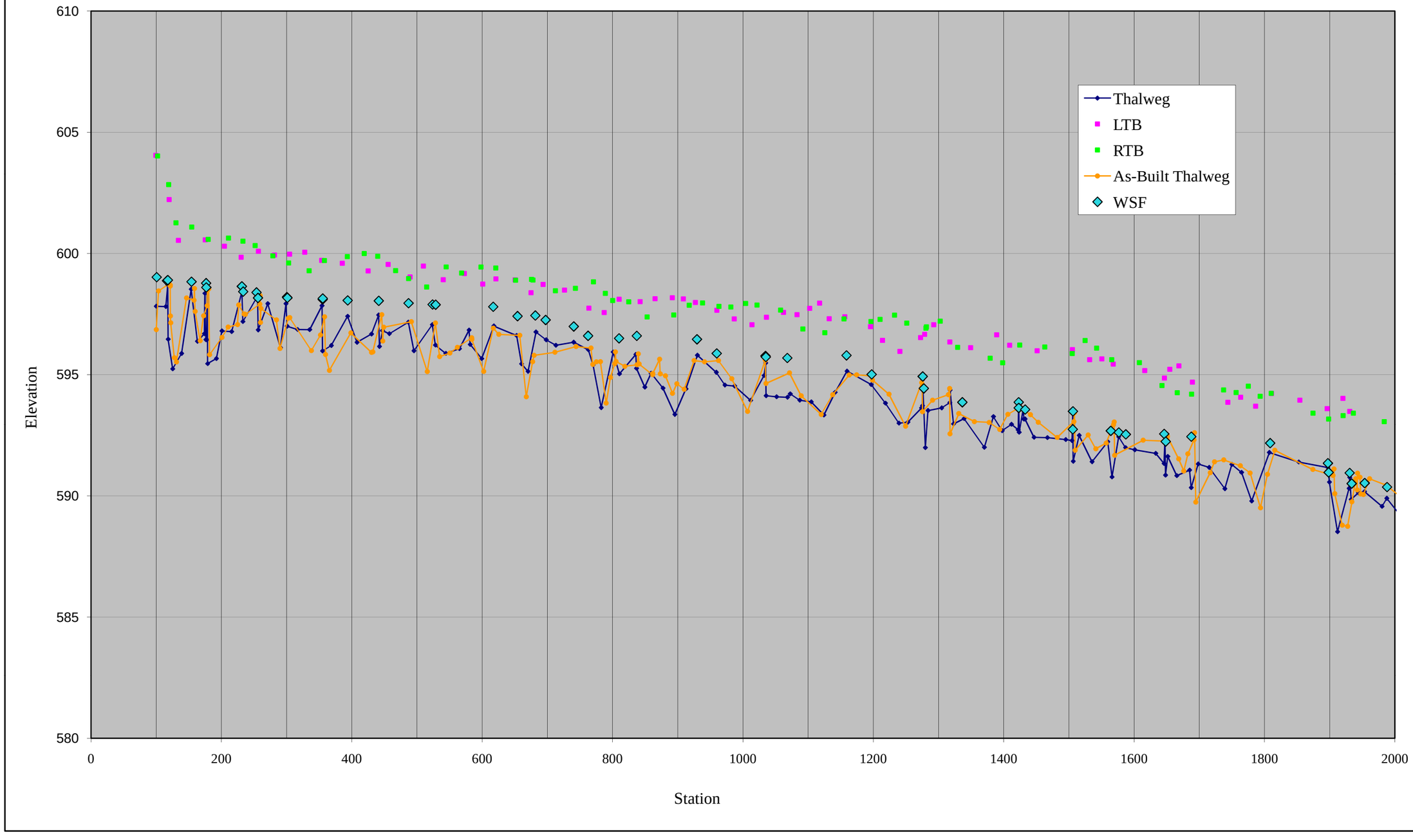
Looking at the Left Bank

Looking at the Right Bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		26.4	15.22	1.74	2.63	8.77	1	1.9	583.67	583.68

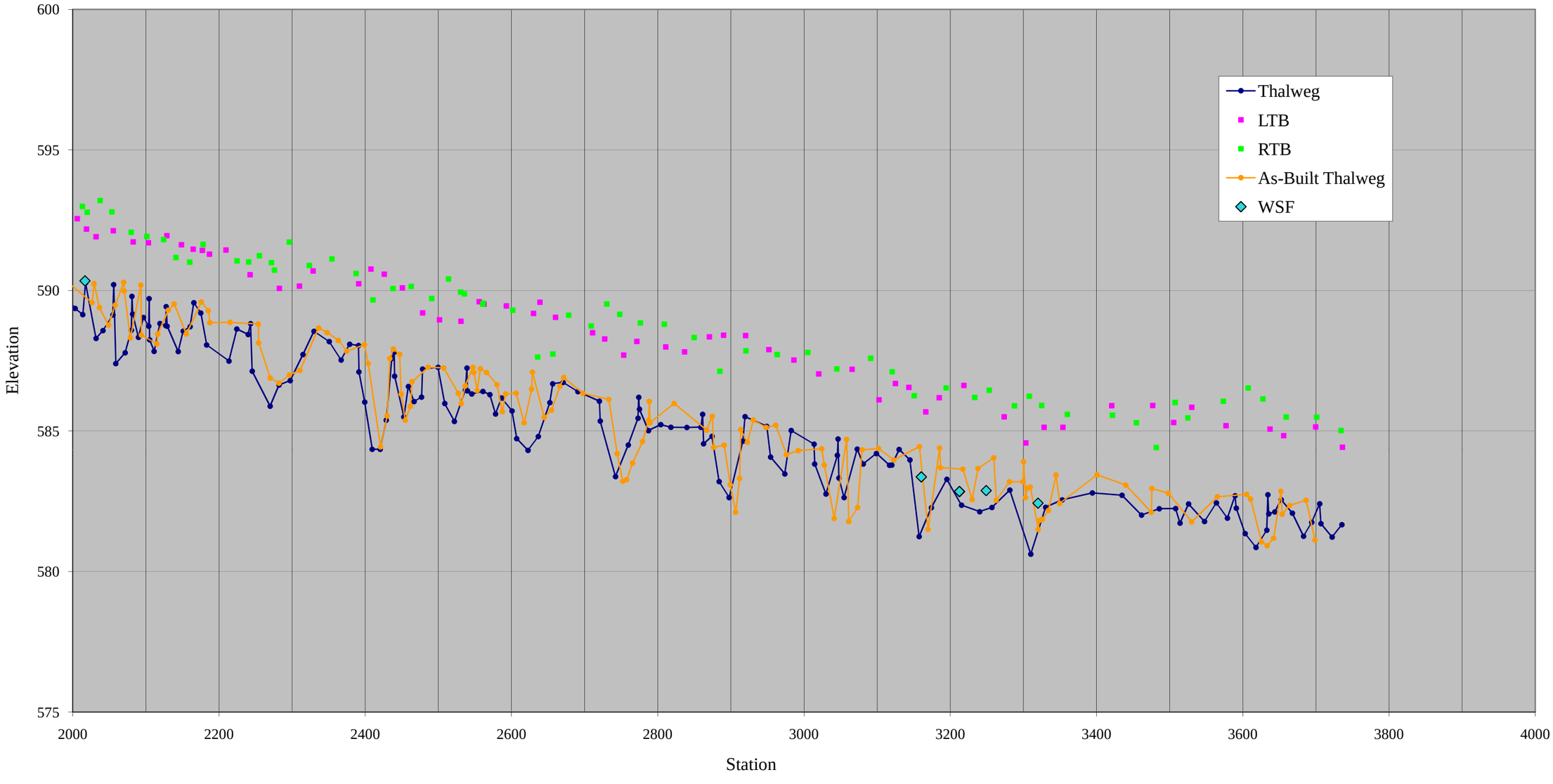


Beaverdam Creek UT1 Mainstem Profile (2010 Monitoring)



Beaverdam Creek, EEP Contract No. D05016-1, Baker Engineering/River Works, Inc.
December 2010, Monitoring Year 4

Beaverdam Creek UT1 Mainstem Profile (2010 Monitoring)



Beaverdam Creek, EEP Contract No. D05016-1, Baker Engineering/River Works, Inc.
December 2010, Monitoring Year 4

PEBBLE COUNT DATA SHEET: POOL 100-COUNT

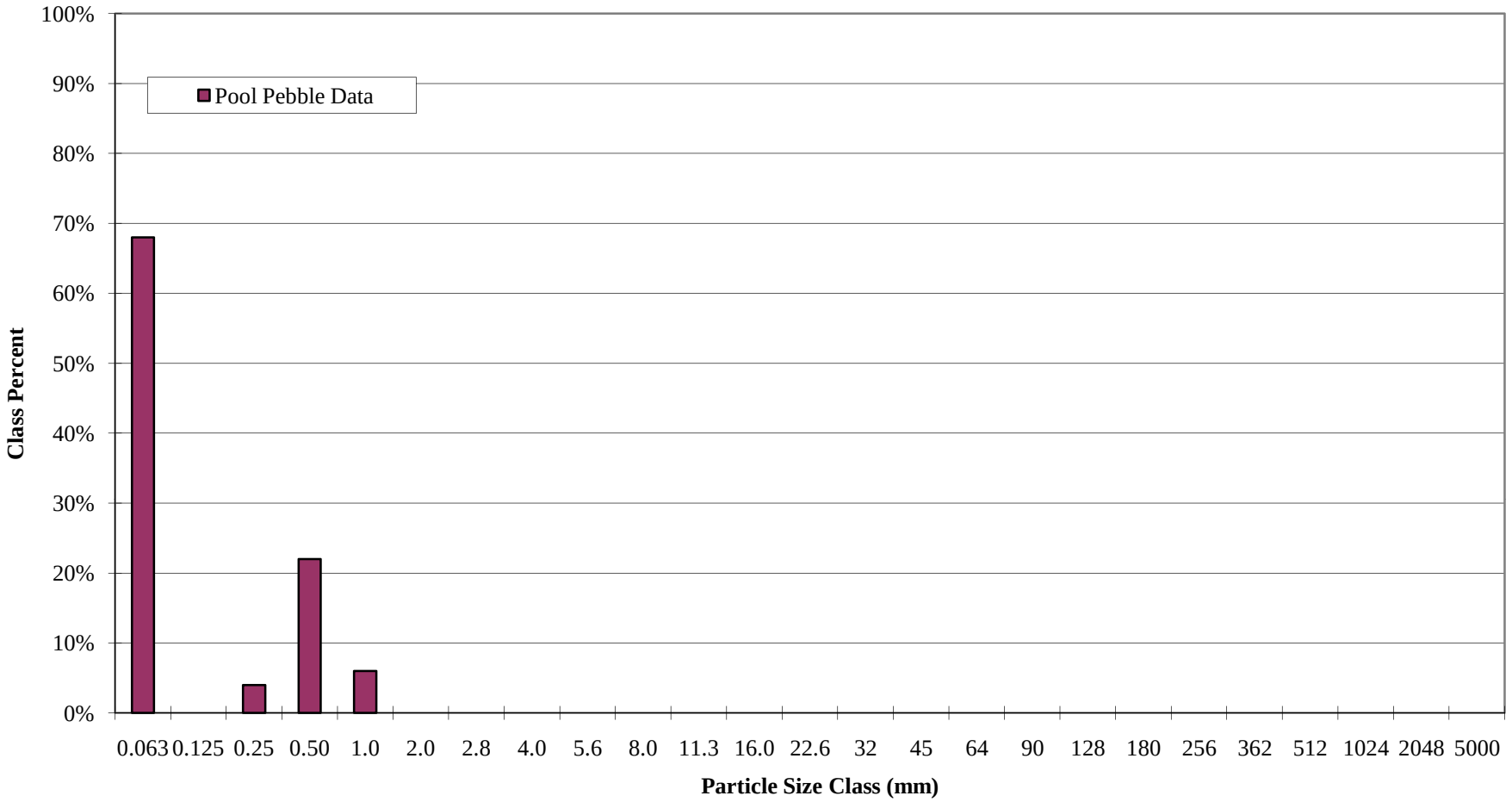
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1 X1-Pool
DATE COLLECTED:	8/31/2010
FIELD COLLECTION BY:	KS & IE
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Pool	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	68	68%	68%
SAND	Very Fine	.063 - .125			68%
	Fine	.125 - .25	4	4%	72%
	Medium	.25 - .50	22	22%	94%
	Coarse	.50 - 1.0	6	6%	100%
	Very Coarse	1.0 - 2.0			100%
GRAVEL	Very Fine	2.0 - 2.8			100%
	Very Fine	2.8 - 4.0			100%
	Fine	4.0 - 5.6			100%
	Fine	5.6 - 8.0			100%
	Medium	8.0 - 11.0			100%
	Medium	11.0 - 16.0			100%
	Coarse	16.0 - 22.6			100%
	Coarse	22.6 - 32			100%
	Very Coarse	32 - 45			100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

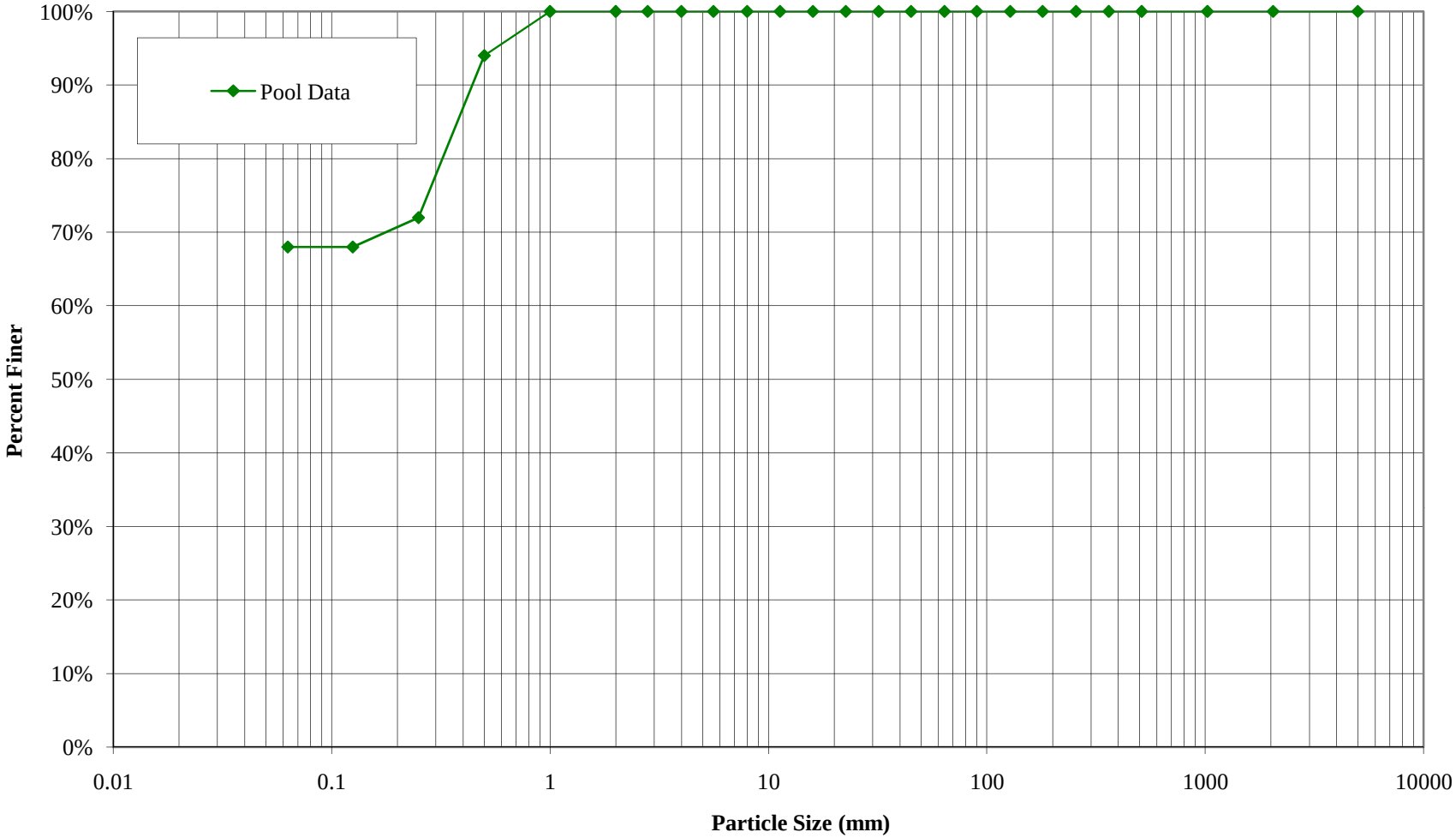
Largest particles: _____

(pool)

UT1
X1-Pool
Pebble Count Size Class Distribution



UT1
X1-Pool
Pebble Count Particle Size Distribution



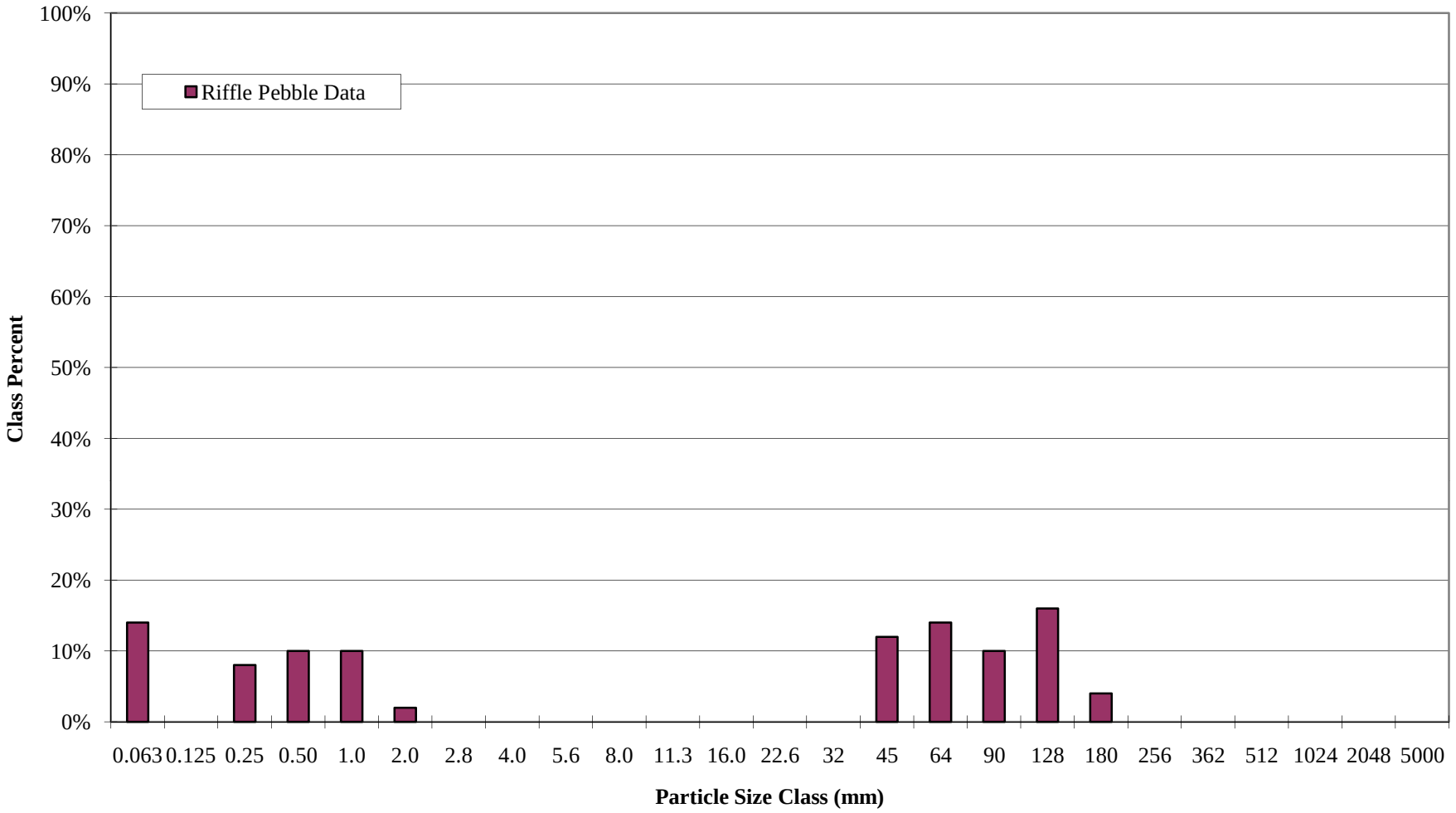
PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1 X2-Riffle
DATE COLLECTED:	8/31/2010
FIELD COLLECTION BY:	KS & IE
DATA ENTRY BY:	KS

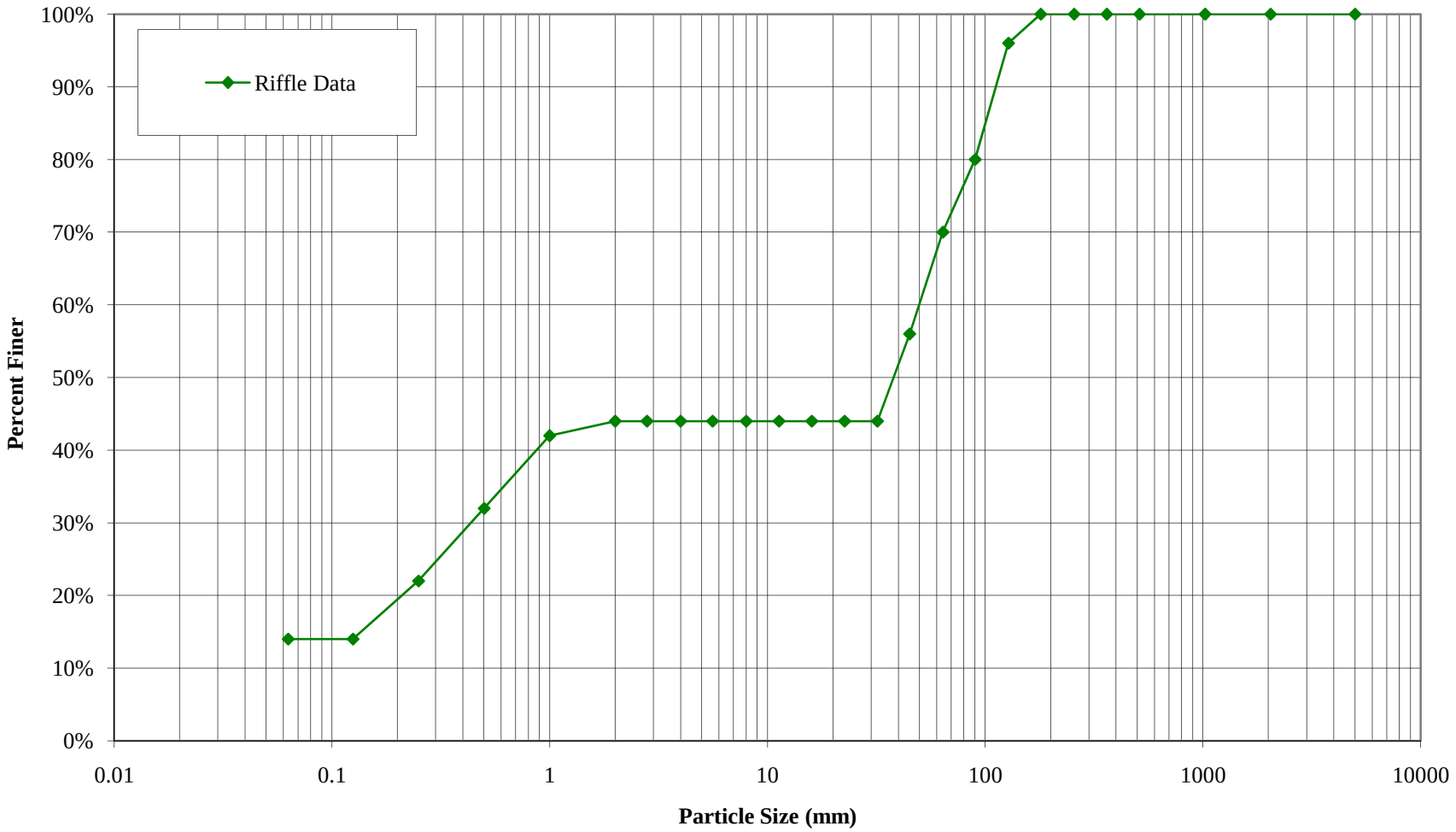
			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	14	14%	14%
SAND	Very Fine	.063 - .125			14%
	Fine	.125 - .25	8	8%	22%
	Medium	.25 - .50	10	10%	32%
	Coarse	.50 - 1.0	10	10%	42%
	Very Coarse	1.0 - 2.0	2	2%	44%
GRAVEL	Very Fine	2.0 - 2.8			44%
	Very Fine	2.8 - 4.0			44%
	Fine	4.0 - 5.6			44%
	Fine	5.6 - 8.0			44%
	Medium	8.0 - 11.0			44%
	Medium	11.0 - 16.0			44%
	Coarse	16.0 - 22.6			44%
	Coarse	22.6 - 32			44%
	Very Coarse	32 - 45	12	12%	56%
	Very Coarse	45 - 64	14	14%	70%
COBBLE	Small	64 - 90	10	10%	80%
	Small	90 - 128	16	16%	96%
	Large	128 - 180	4	4%	100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

Largest particles: 130 mm
(riffle)

UT1
X2-Riffle
Pebble Count Size Class Distribution



UT1
X2-Riffle
Pebble Count Particle Size Distribution



PEBBLE COUNT DATA SHEET: POOL 100-COUNT

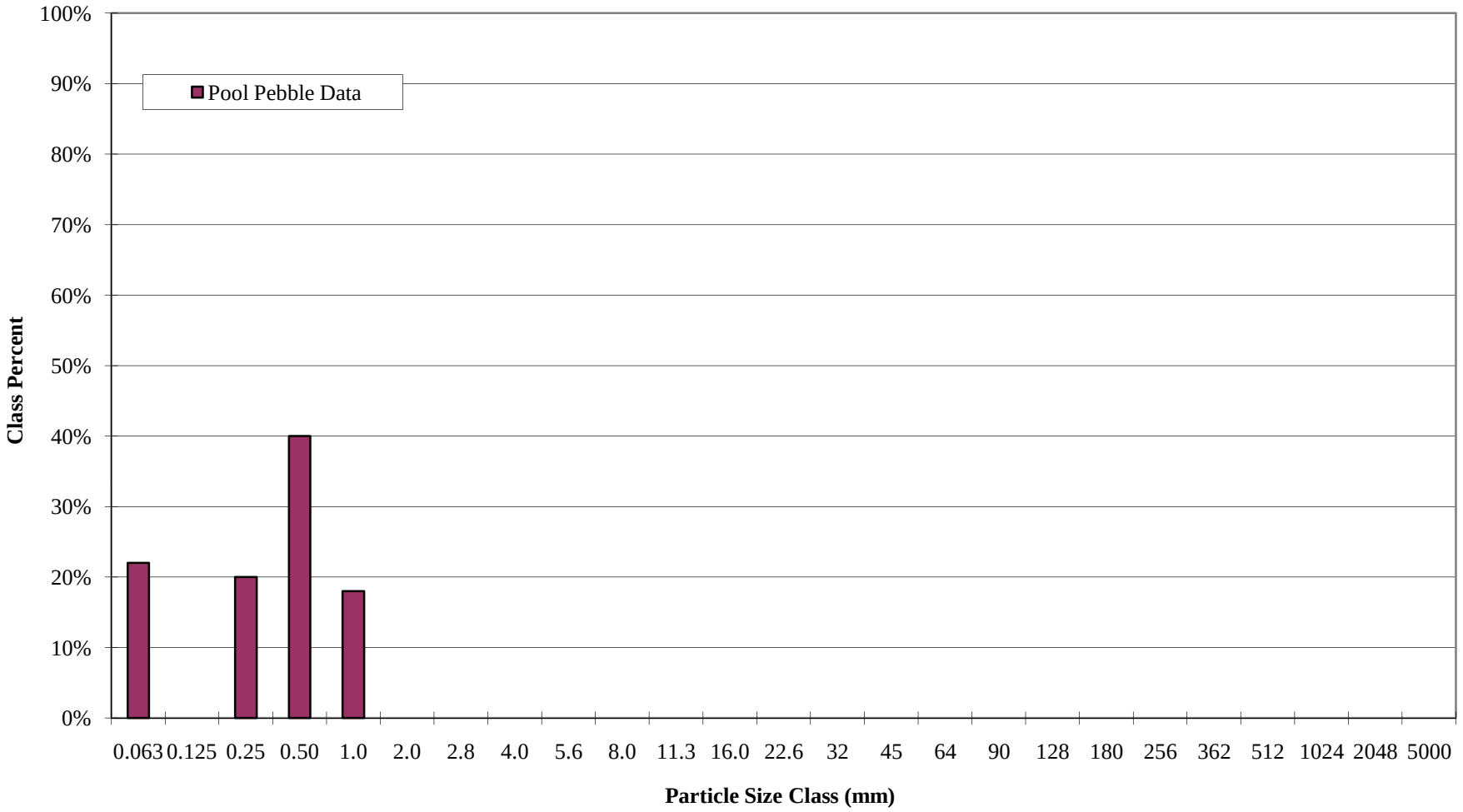
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1B X3-Pool
DATE COLLECTED:	8/31/2010
FIELD COLLECTION BY:	KS & IE
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Pool	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	22	22%	22%
SAND	Very Fine	.063 - .125			22%
	Fine	.125 - .25	20	20%	42%
	Medium	.25 - .50	40	40%	82%
	Coarse	.50 - 1.0	18	18%	100%
	Very Coarse	1.0 - 2.0			100%
GRAVEL	Very Fine	2.0 - 2.8			100%
	Very Fine	2.8 - 4.0			100%
	Fine	4.0 - 5.6			100%
	Fine	5.6 - 8.0			100%
	Medium	8.0 - 11.0			100%
	Medium	11.0 - 16.0			100%
	Coarse	16.0 - 22.6			100%
	Coarse	22.6 - 32			100%
	Very Coarse	32 - 45			100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

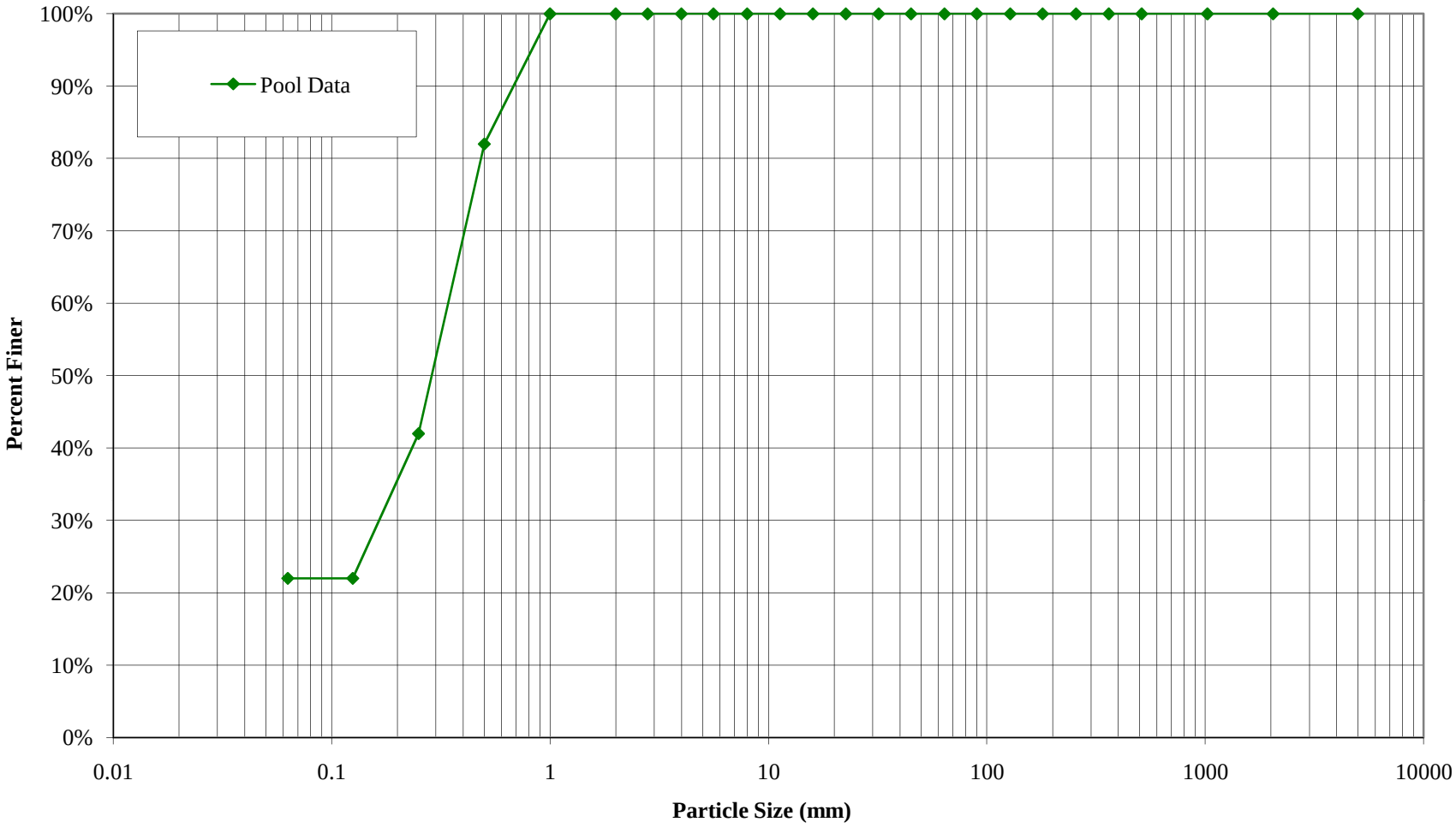
Largest particles: _____

(pool)

UT1B
X3-Pool
Pebble Count Size Class Distribution



UT1B
X3-Pool
Pebble Count Particle Size Distribution



PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

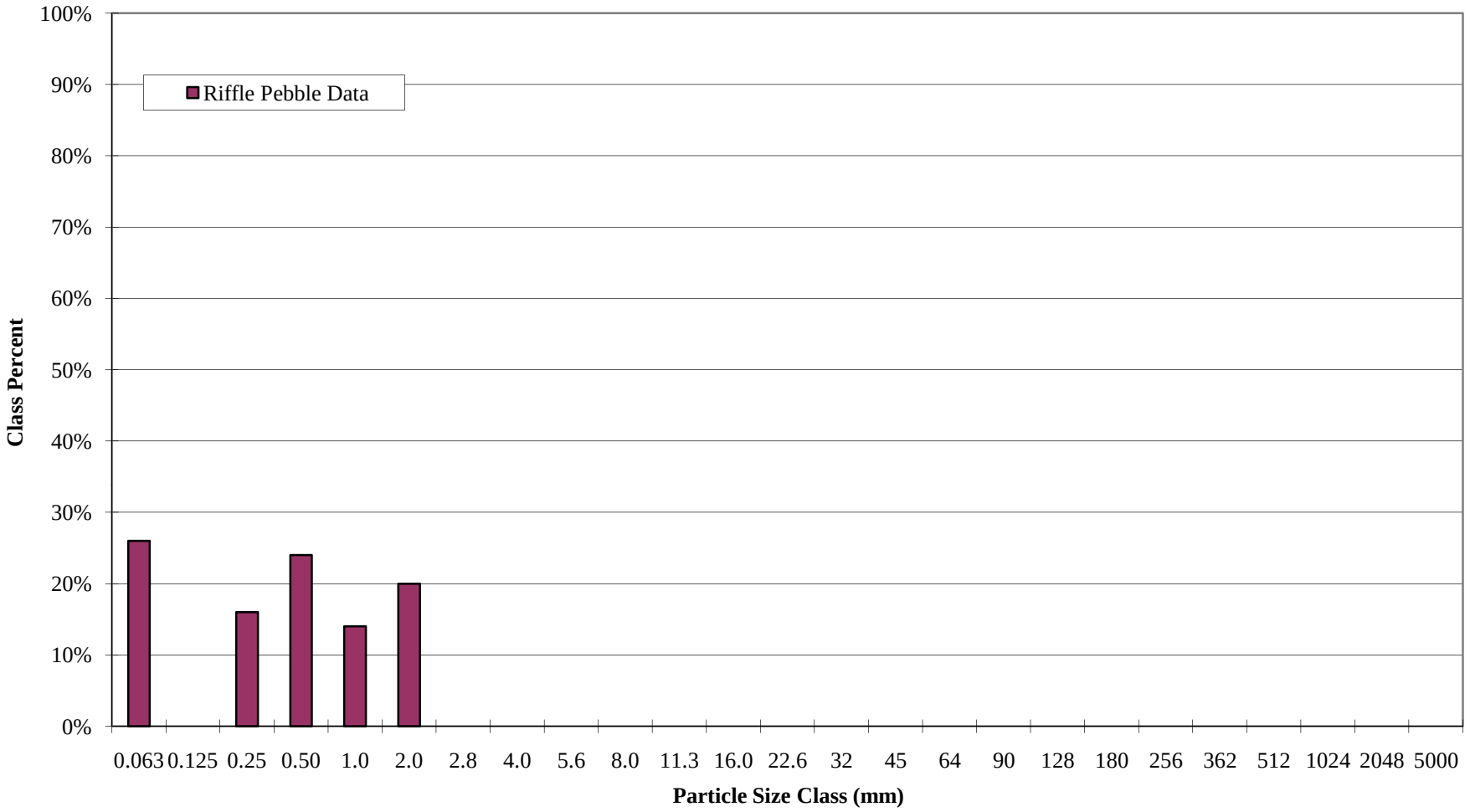
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1B X4-Riffle
DATE COLLECTED:	8/31/2010
FIELD COLLECTION BY:	KS & IE
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	**PARTICLE**	**SIZE (mm)**	**Riffle**	**Class %**	**% Cum**
SILT/CLAY	Silt / Clay	< .063	26	26%	26%
SAND	Very Fine	.063 - .125			26%
	Fine	.125 - .25	16	16%	42%
	Medium	.25 - .50	24	24%	66%
	Coarse	.50 - 1.0	14	14%	80%
	Very Coarse	1.0 - 2.0	20	20%	100%
GRAVEL	Very Fine	2.0 - 2.8			100%
	Very Fine	2.8 - 4.0			100%
	Fine	4.0 - 5.6			100%
	Fine	5.6 - 8.0			100%
	Medium	8.0 - 11.0			100%
	Medium	11.0 - 16.0			100%
	Coarse	16.0 - 22.6			100%
	Coarse	22.6 - 32			100%
	Very Coarse	32 - 45			100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

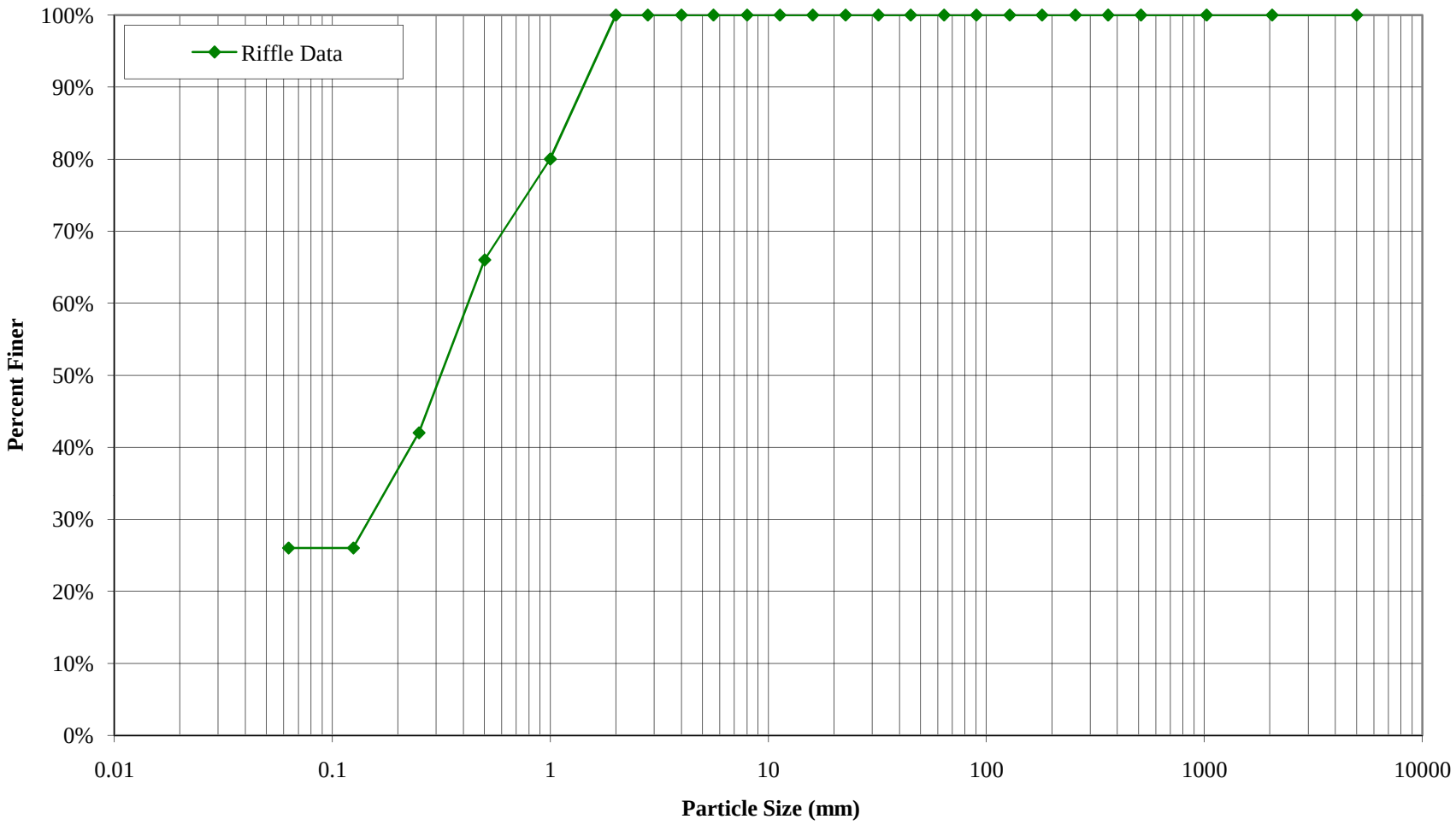
Largest particles: _____

(riffle)

UT1B
X4-Riffle
Pebble Count Size Class Distribution



UT1B
X4-Riffle
Pebble Count Particle Size Distribution



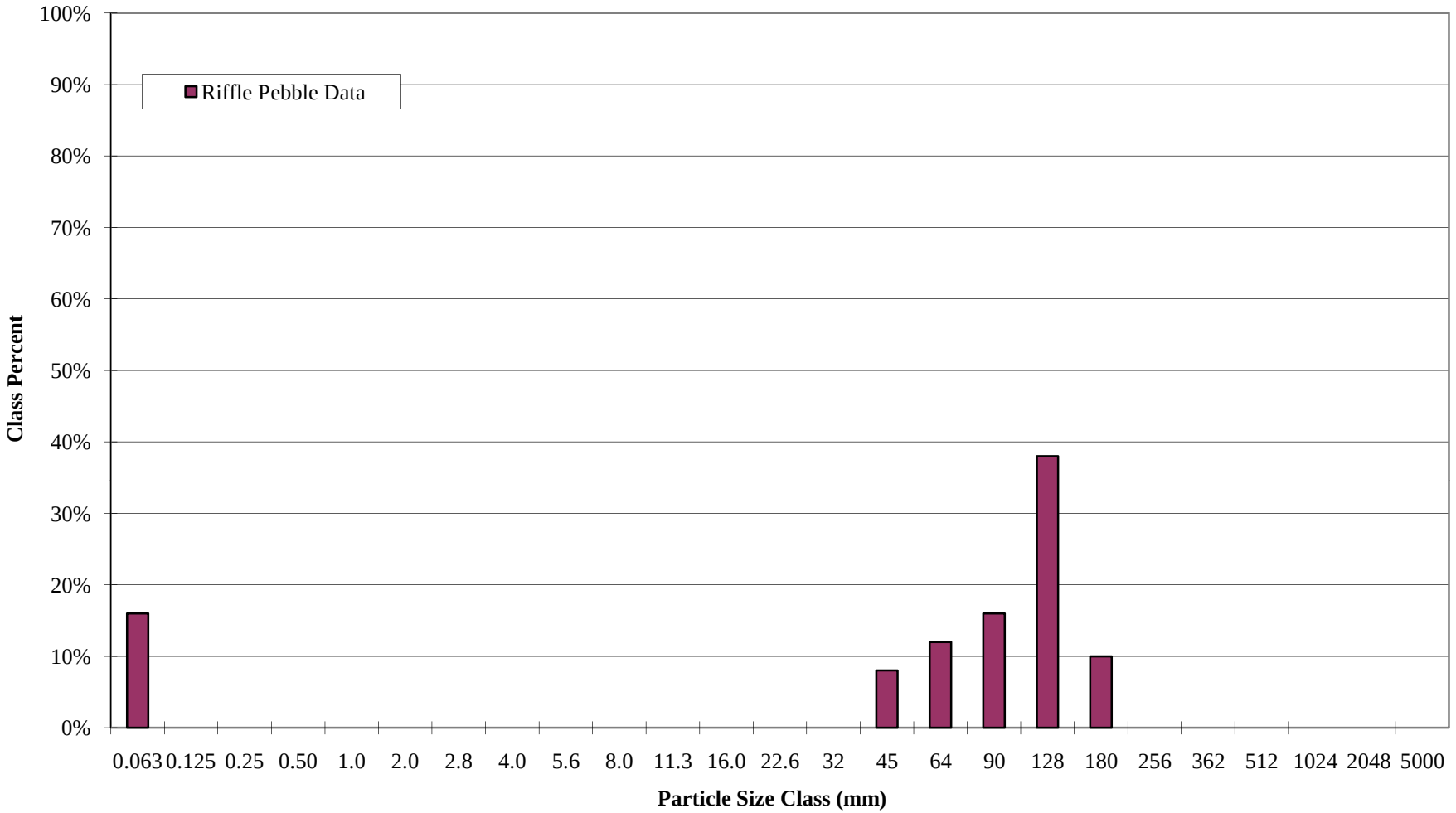
PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1 X5-Riffle
DATE COLLECTED:	8/31/2010
FIELD COLLECTION BY:	KS & IE
DATA ENTRY BY:	KS

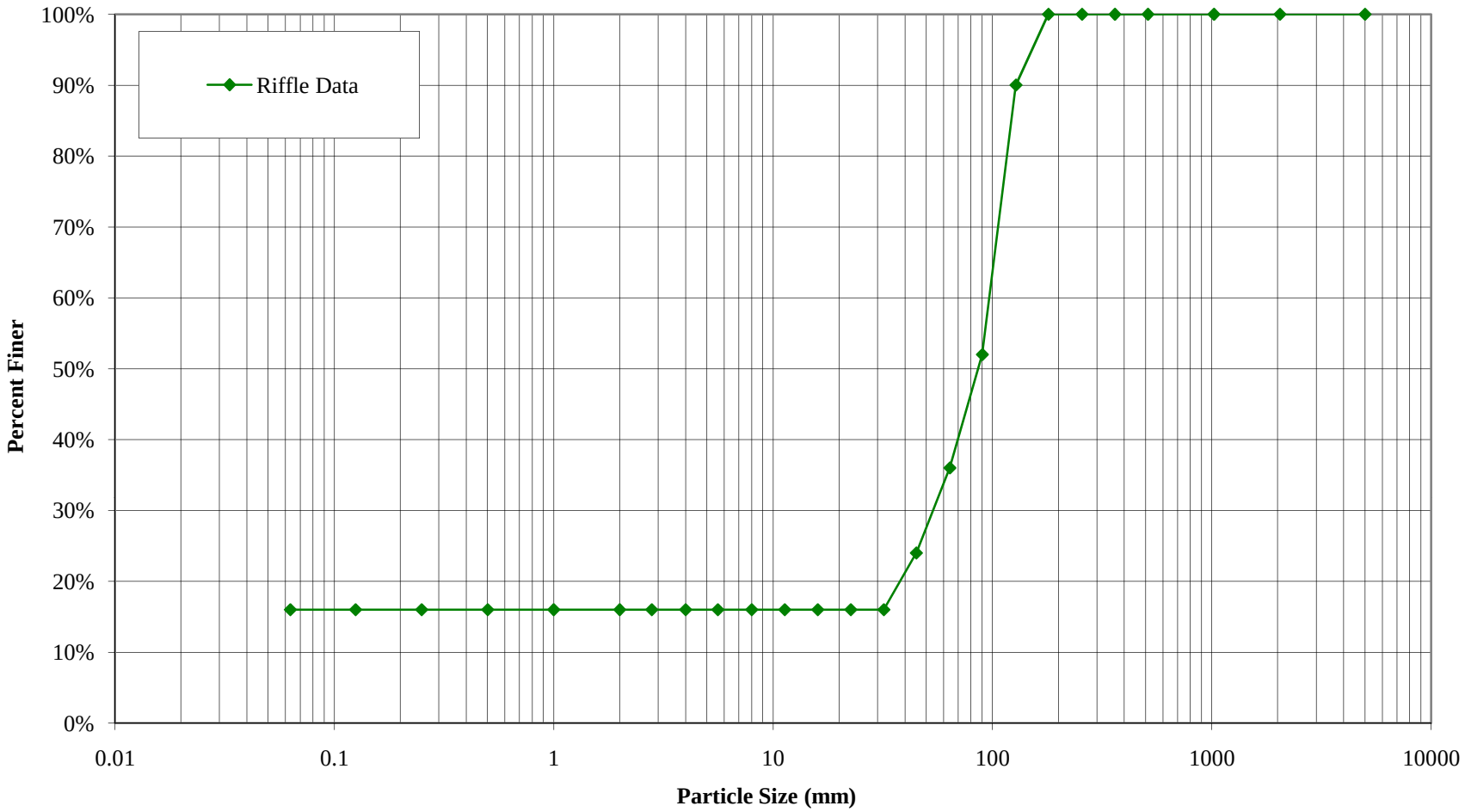
			PARTICLE CLASS COUNT	Summary	
MATERIAL	**PARTICLE**	**SIZE (mm)**	**Riffle**	**Class %**	**% Cum**
SILT/CLAY	Silt / Clay	< .063	16	16%	16%
SAND	Very Fine	.063 - .125			16%
	Fine	.125 - .25			16%
	Medium	.25 - .50			16%
	Coarse	.50 - 1.0			16%
	Very Coarse	1.0 - 2.0			16%
GRAVEL	Very Fine	2.0 - 2.8			16%
	Very Fine	2.8 - 4.0			16%
	Fine	4.0 - 5.6			16%
	Fine	5.6 - 8.0			16%
	Medium	8.0 - 11.0			16%
	Medium	11.0 - 16.0			16%
	Coarse	16.0 - 22.6			16%
	Coarse	22.6 - 32			16%
	Very Coarse	32 - 45	8	8%	24%
	Very Coarse	45 - 64	12	12%	36%
COBBLE	Small	64 - 90	16	16%	52%
	Small	90 - 128	38	38%	90%
	Large	128 - 180	10	10%	100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

Largest particles: 160 mm
(riffle)

UT1
X5-Riffle
Pebble Count Size Class Distribution



UT1
X5-Riffle
Pebble Count Particle Size Distribution



PEBBLE COUNT DATA SHEET: POOL 100-COUNT

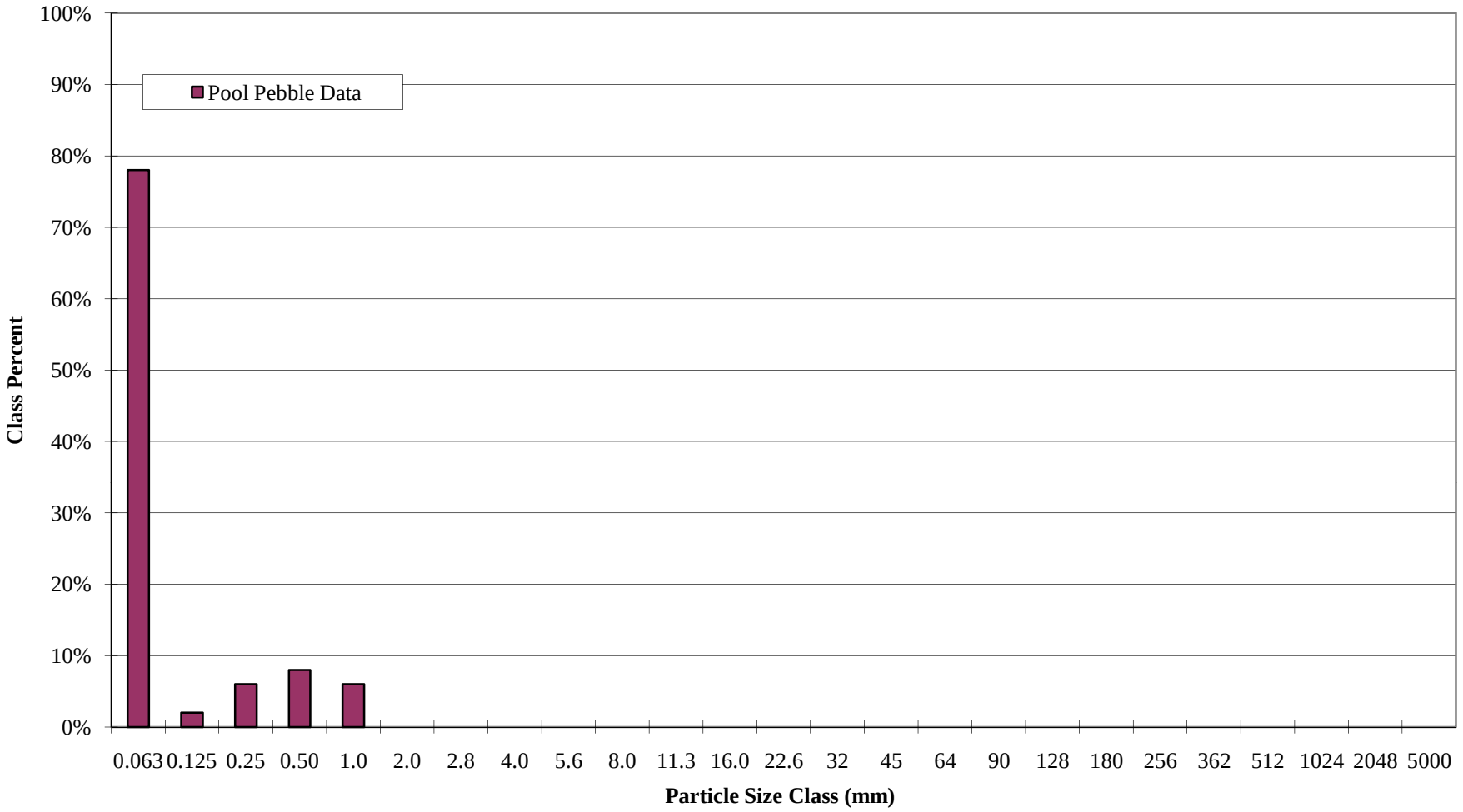
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1 X6-Pool
DATE COLLECTED:	8/31/2010
FIELD COLLECTION BY:	KS & IE
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	**PARTICLE**	**SIZE (mm)**	**Pool**	**Class %**	**% Cum**
SILT/CLAY	Silt / Clay	< .063	78	78%	78%
SAND	Very Fine	.063 - .125	2	2%	80%
	Fine	.125 - .25	6	6%	86%
	Medium	.25 - .50	8	8%	94%
	Coarse	.50 - 1.0	6	6%	100%
	Very Coarse	1.0 - 2.0			100%
GRAVEL	Very Fine	2.0 - 2.8			100%
	Very Fine	2.8 - 4.0			100%
	Fine	4.0 - 5.6			100%
	Fine	5.6 - 8.0			100%
	Medium	8.0 - 11.0			100%
	Medium	11.0 - 16.0			100%
	Coarse	16.0 - 22.6			100%
	Coarse	22.6 - 32			100%
	Very Coarse	32 - 45			100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

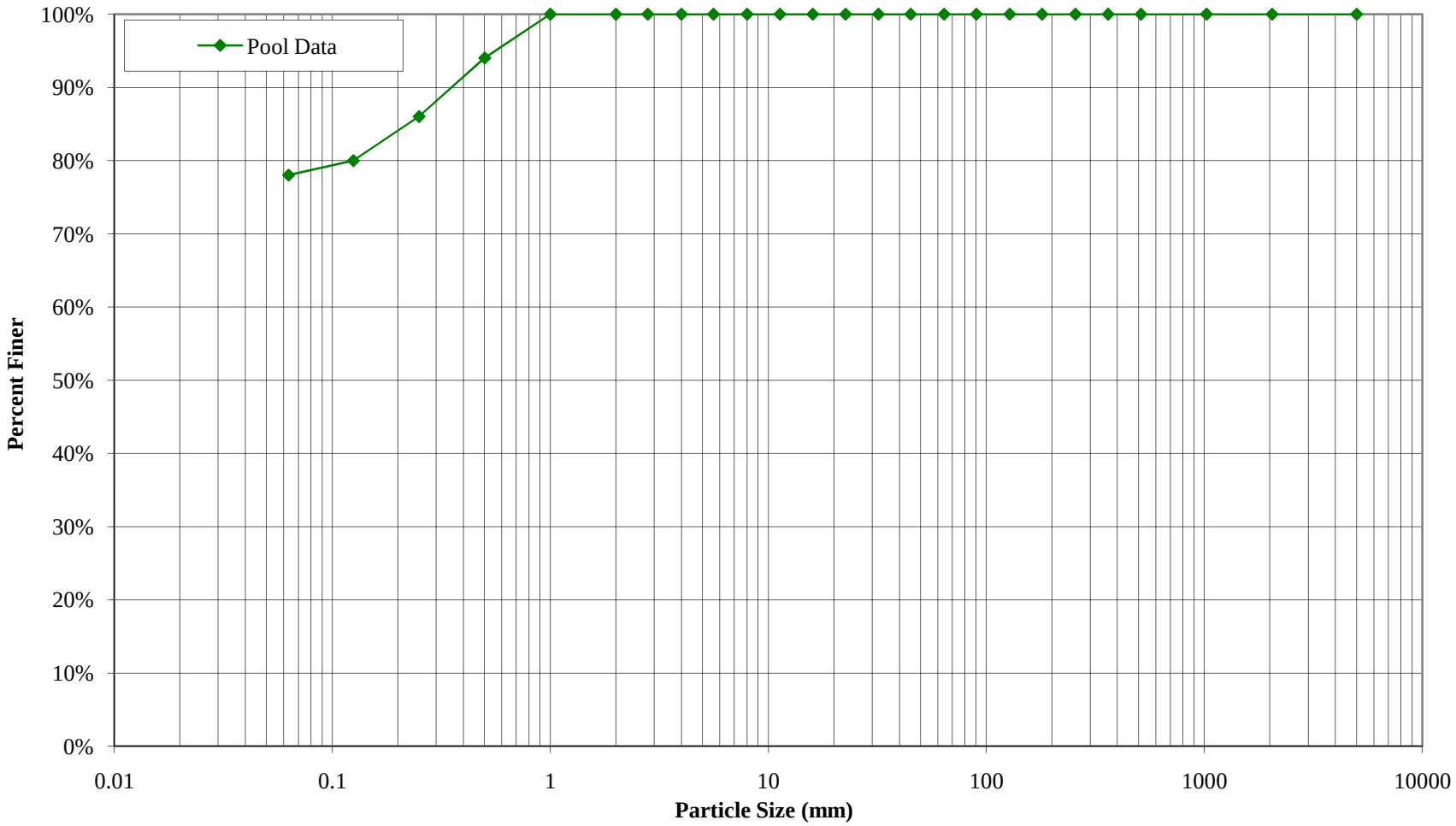
Largest particles: _____

(pool)

UT1
X6-Pool
Pebble Count Size Class Distribution



UT1
X6-Pool
Pebble Count Particle Size Distribution



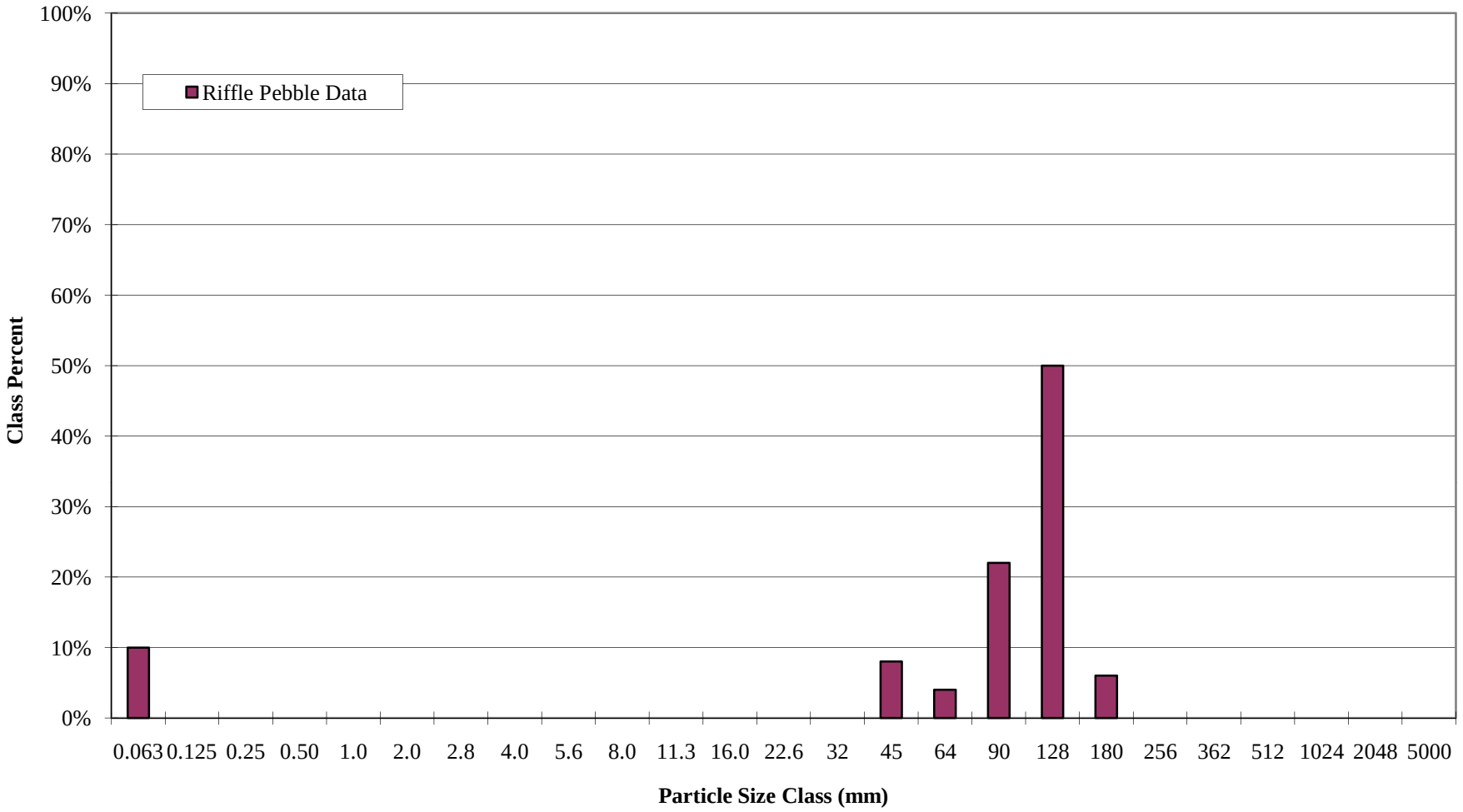
PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

	BAKER PROJECT NO. 108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1C X7-Riffle
DATE COLLECTED:	8/31/2010
FIELD COLLECTION BY:	KS & IE
DATA ENTRY BY:	KS

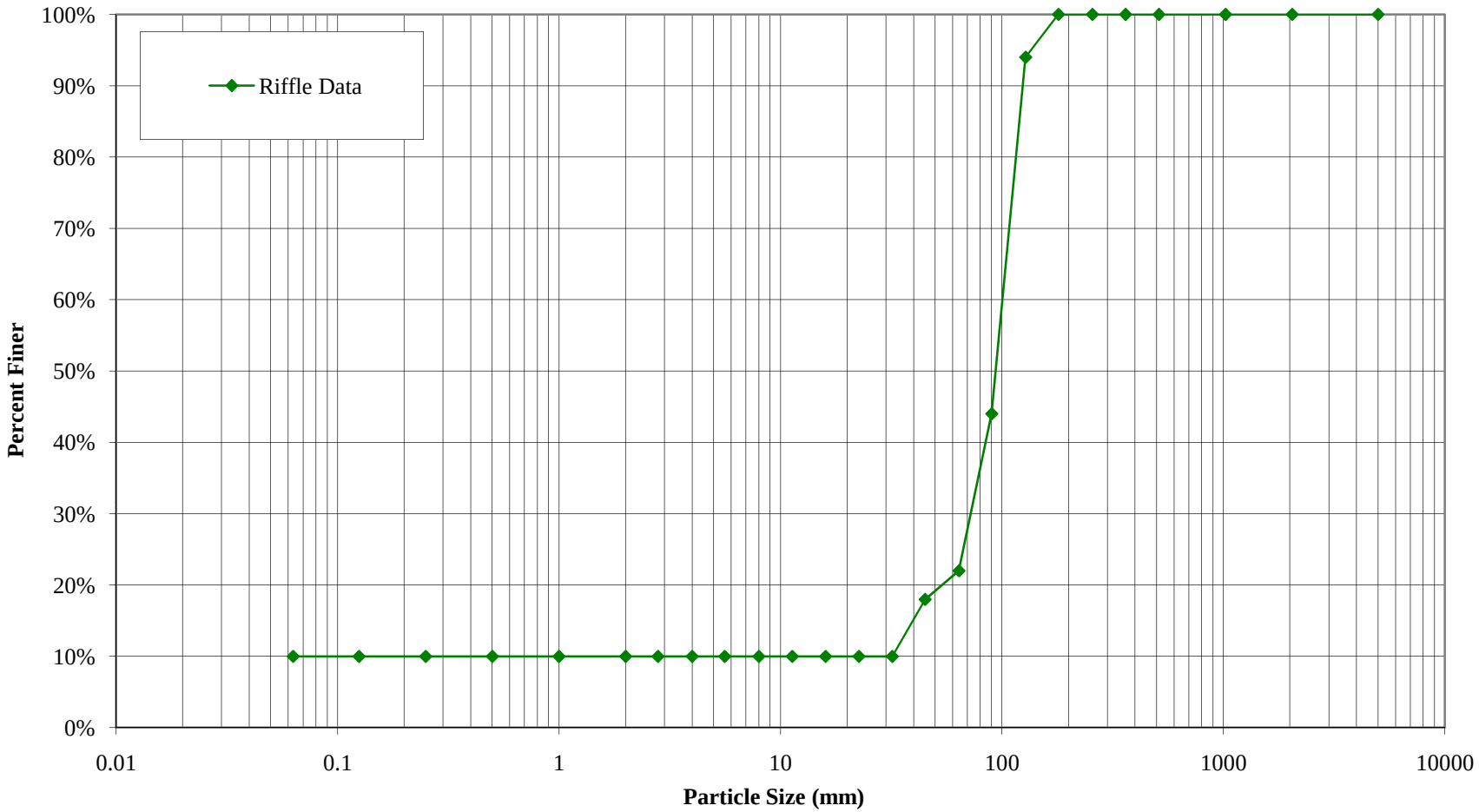
			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	10	10%	10%
SAND	Very Fine	.063 - .125			10%
	Fine	.125 - .25			10%
	Medium	.25 - .50			10%
	Coarse	.50 - 1.0			10%
	Very Coarse	1.0 - 2.0			10%
GRAVEL	Very Fine	2.0 - 2.8			10%
	Very Fine	2.8 - 4.0			10%
	Fine	4.0 - 5.6			10%
	Fine	5.6 - 8.0			10%
	Medium	8.0 - 11.0			10%
	Medium	11.0 - 16.0			10%
	Coarse	16.0 - 22.6			10%
	Coarse	22.6 - 32			10%
	Very Coarse	32 - 45	8	8%	18%
	Very Coarse	45 - 64	4	4%	22%
COBBLE	Small	64 - 90	22	22%	44%
	Small	90 - 128	50	50%	94%
	Large	128 - 180	6	6%	100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

Largest particles: 150 mm
(riffle)

UT1C
X7-Riffle
Pebble Count Size Class Distribution



UT1C
X7-Riffle
Pebble Count Particle Size Distribution



PEBBLE COUNT DATA SHEET: POOL 100-COUNT

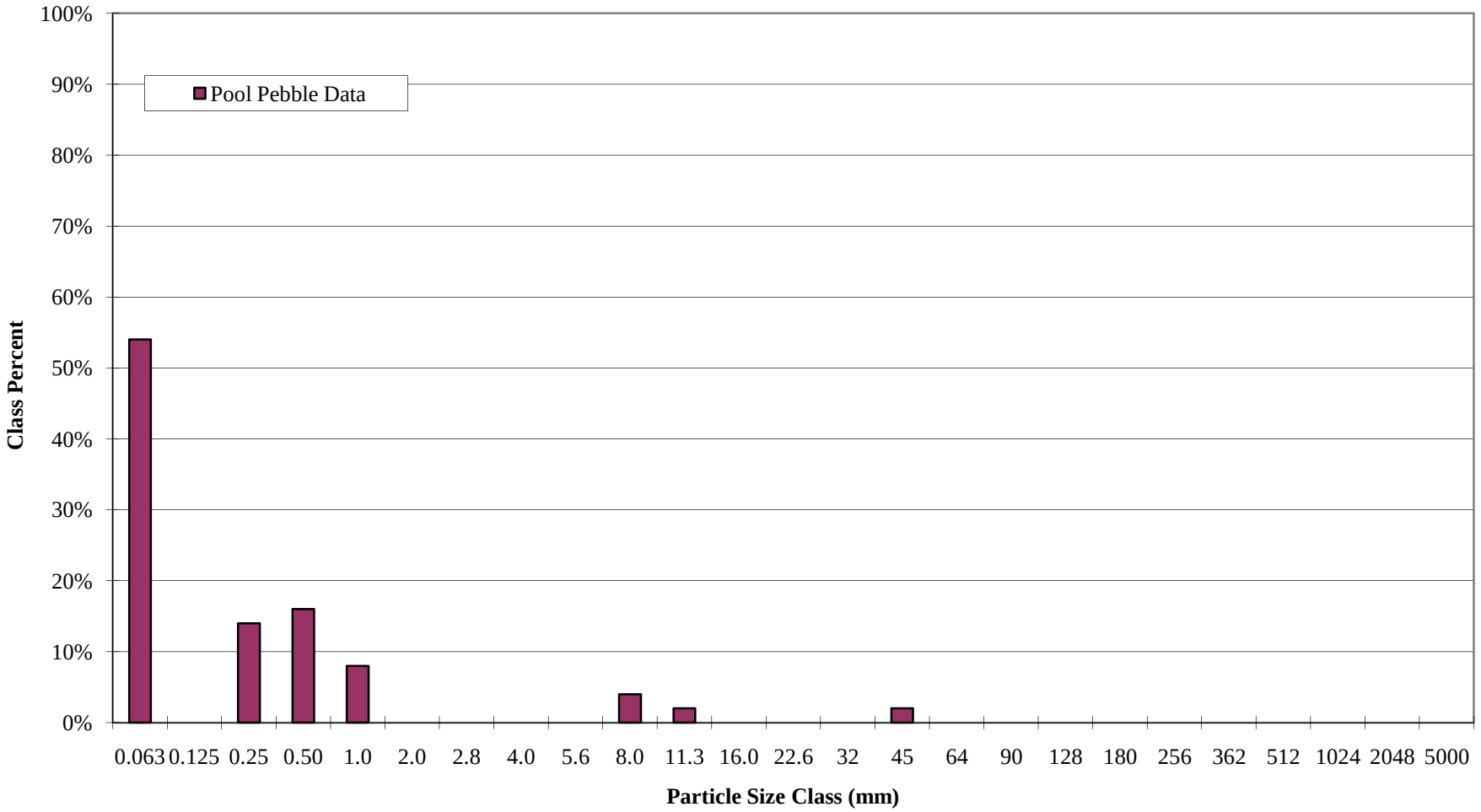
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1C X8-Pool
DATE COLLECTED:	8/31/2010
FIELD COLLECTION BY:	KS & IE
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Pool	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	54	54%	54%
SAND	Very Fine	.063 - .125			54%
	Fine	.125 - .25	14	14%	68%
	Medium	.25 - .50	16	16%	84%
	Coarse	.50 - 1.0	8	8%	92%
	Very Coarse	1.0 - 2.0			92%
GRAVEL	Very Fine	2.0 - 2.8			92%
	Very Fine	2.8 - 4.0			92%
	Fine	4.0 - 5.6			92%
	Fine	5.6 - 8.0	4	4%	96%
	Medium	8.0 - 11.0	2	2%	98%
	Medium	11.0 - 16.0			98%
	Coarse	16.0 - 22.6			98%
	Coarse	22.6 - 32			98%
	Very Coarse	32 - 45	2	2%	100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

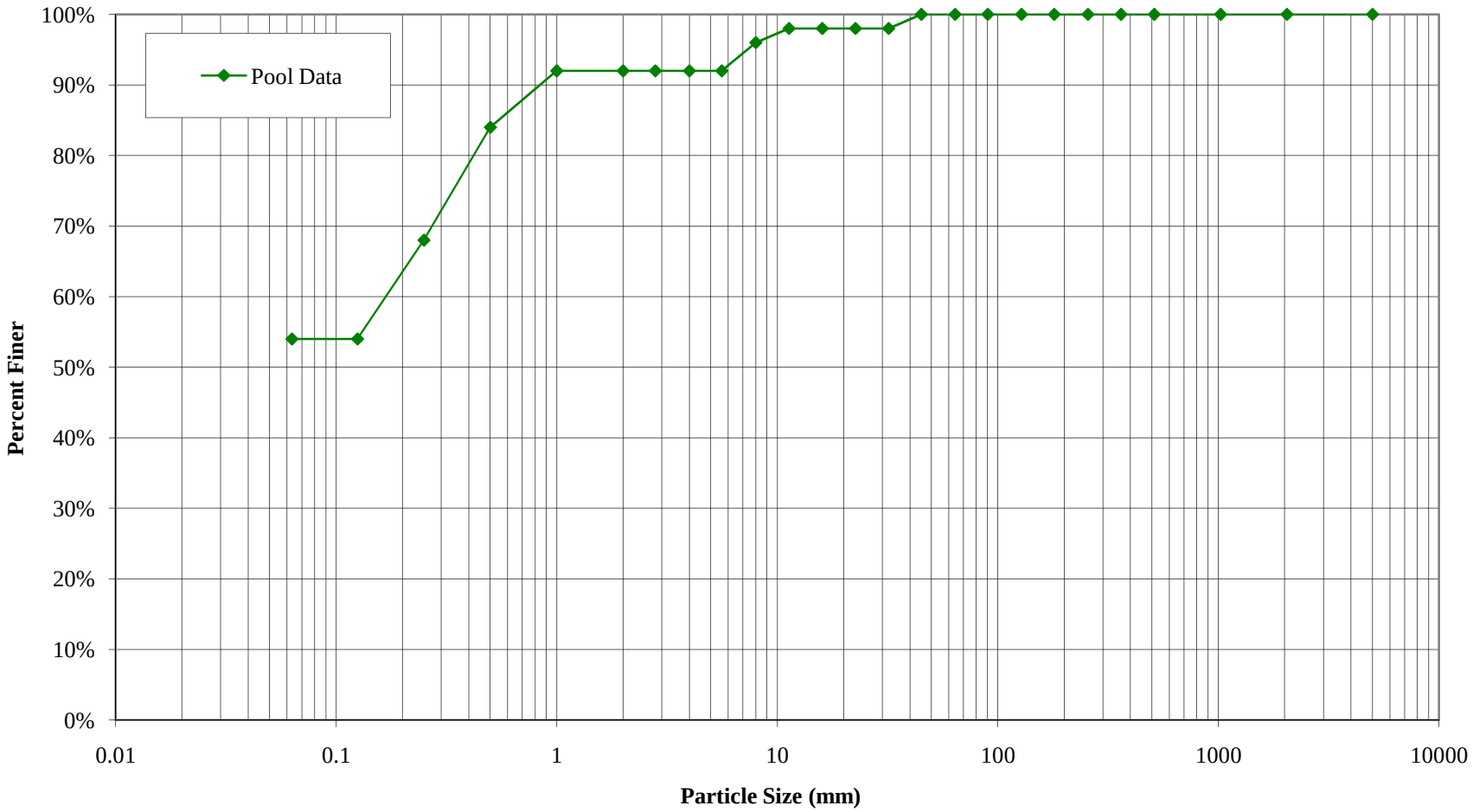
Largest particles: _____

(pool)

UT1C
X8-Pool
Pebble Count Size Class Distribution



UT1C
X8-Pool
Pebble Count Particle Size Distribution



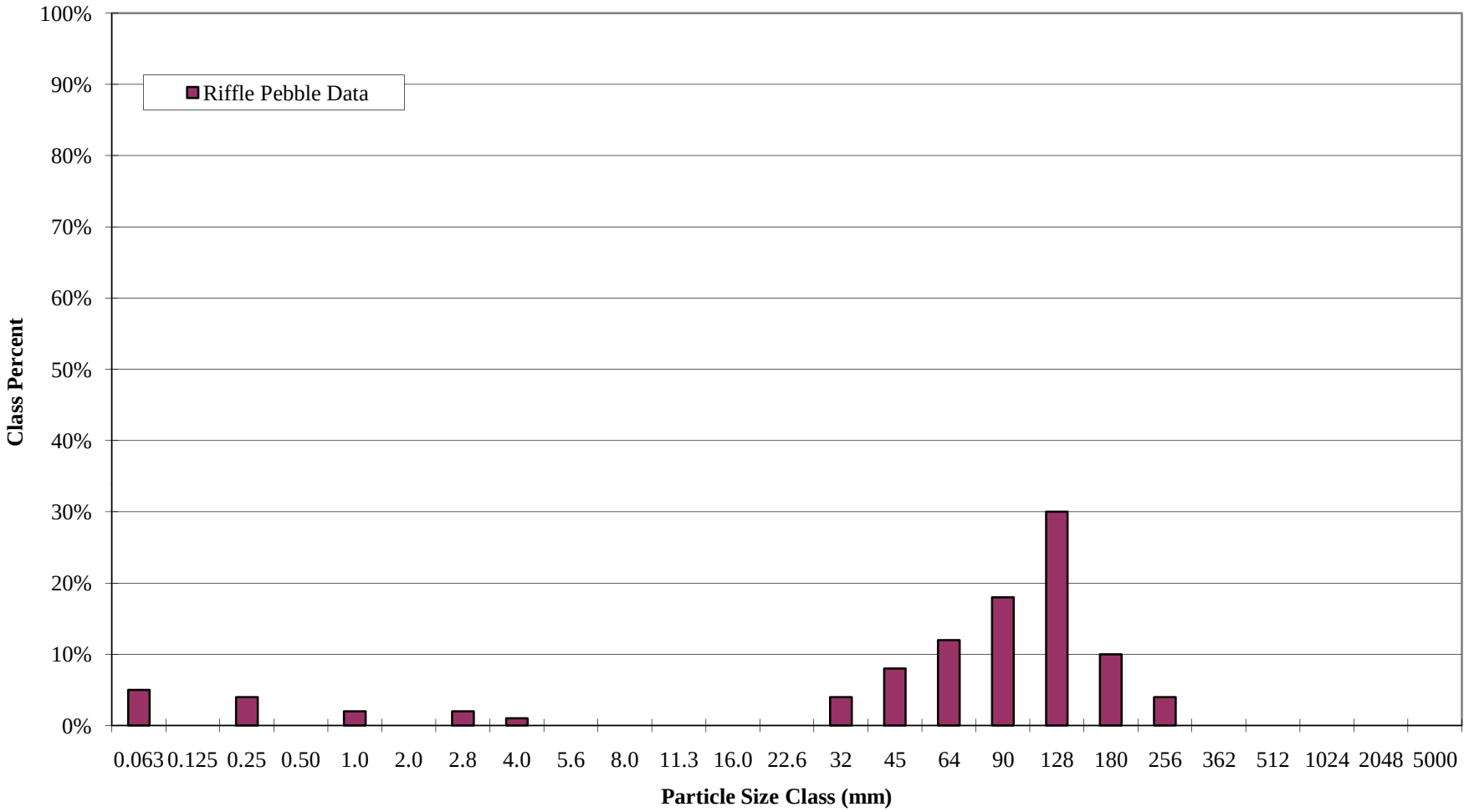
PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

	BAKER PROJECT NO. 108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1 X9-Riffle
DATE COLLECTED:	8/31/2010
FIELD COLLECTION BY:	KS & IE
DATA ENTRY BY:	KS

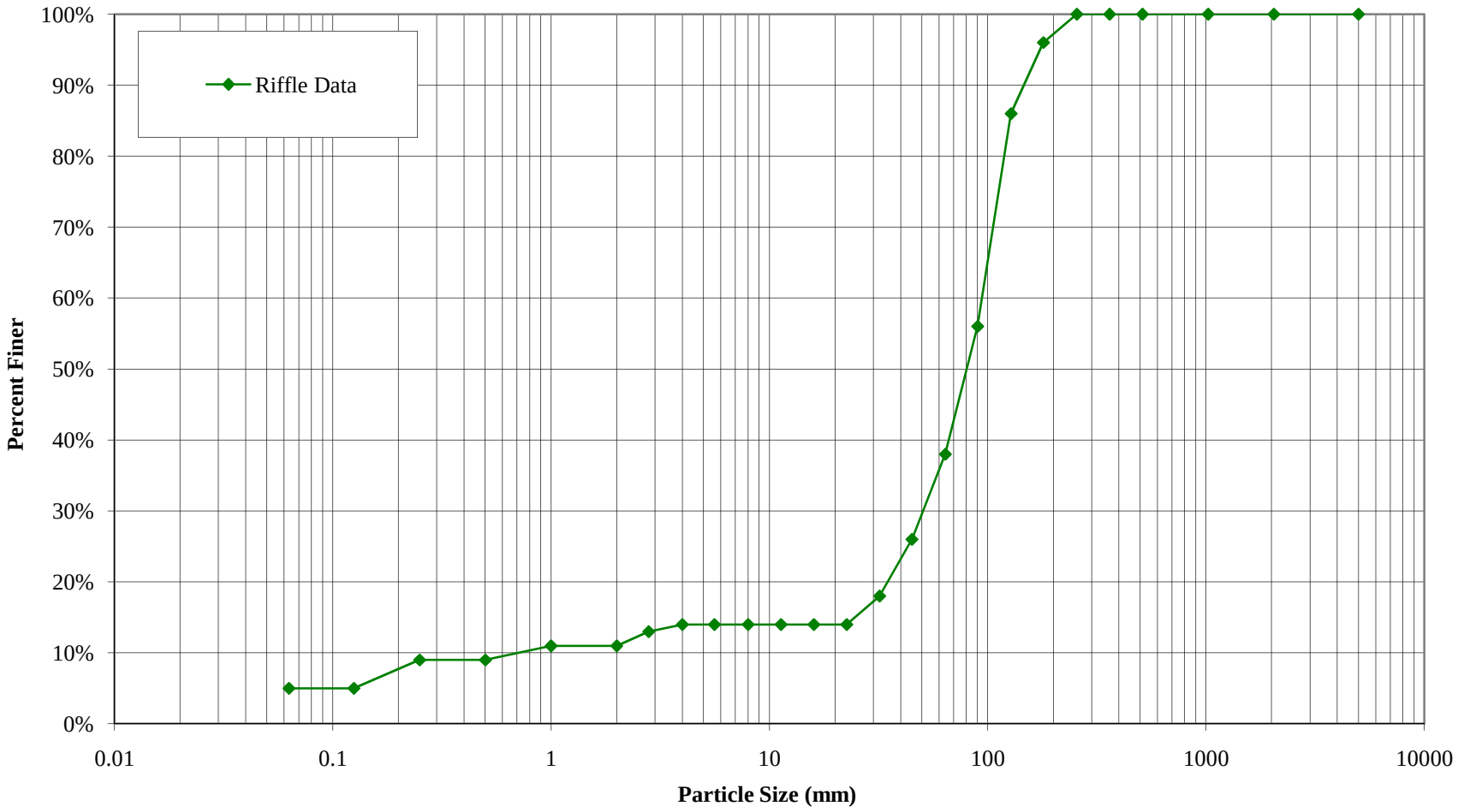
			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	5	5%	5%
SAND	Very Fine	.063 - .125			5%
	Fine	.125 - .25	4	4%	9%
	Medium	.25 - .50			9%
	Coarse	.50 - 1.0	2	2%	11%
	Very Coarse	1.0 - 2.0			11%
GRAVEL	Very Fine	2.0 - 2.8	2	2%	13%
	Very Fine	2.8 - 4.0	1	1%	14%
	Fine	4.0 - 5.6			14%
	Fine	5.6 - 8.0			14%
	Medium	8.0 - 11.0			14%
	Medium	11.0 - 16.0			14%
	Coarse	16.0 - 22.6			14%
	Coarse	22.6 - 32	4	4%	18%
	Very Coarse	32 - 45	8	8%	26%
	Very Coarse	45 - 64	12	12%	38%
COBBLE	Small	64 - 90	18	18%	56%
	Small	90 - 128	30	30%	86%
	Large	128 - 180	10	10%	96%
	Large	180 - 256	4	4%	100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

Largest particles: 250 mm
(riffle)

UT1
X9-Riffle
Pebble Count Size Class Distribution



UT1
X9-Riffle
Pebble Count Particle Size Distribution



PEBBLE COUNT DATA SHEET: POOL 100-COUNT

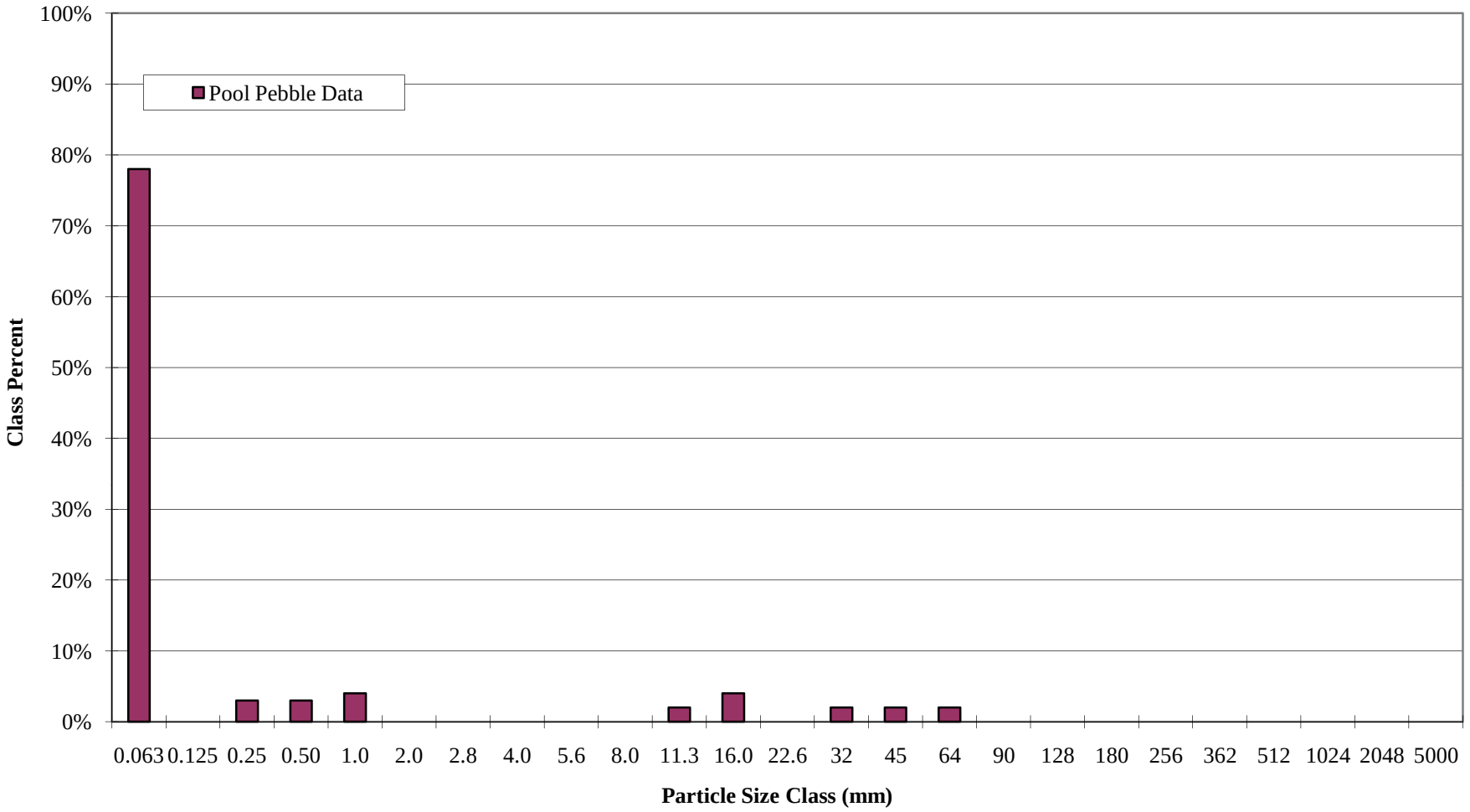
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1 X10-Pool
DATE COLLECTED:	8/31/2010
FIELD COLLECTION BY:	KS & IE
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	**PARTICLE**	**SIZE (mm)**	**Pool**	**Class %**	**% Cum**
SILT/CLAY	Silt / Clay	< .063	78	78%	78%
SAND	Very Fine	.063 - .125			78%
	Fine	.125 - .25	3	3%	81%
	Medium	.25 - .50	3	3%	84%
	Coarse	.50 - 1.0	4	4%	88%
	Very Coarse	1.0 - 2.0			88%
GRAVEL	Very Fine	2.0 - 2.8			88%
	Very Fine	2.8 - 4.0			88%
	Fine	4.0 - 5.6			88%
	Fine	5.6 - 8.0			88%
	Medium	8.0 - 11.0	2	2%	90%
	Medium	11.0 - 16.0	4	4%	94%
	Coarse	16.0 - 22.6			94%
	Coarse	22.6 - 32	2	2%	96%
	Very Coarse	32 - 45	2	2%	98%
	Very Coarse	45 - 64	2	2%	100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

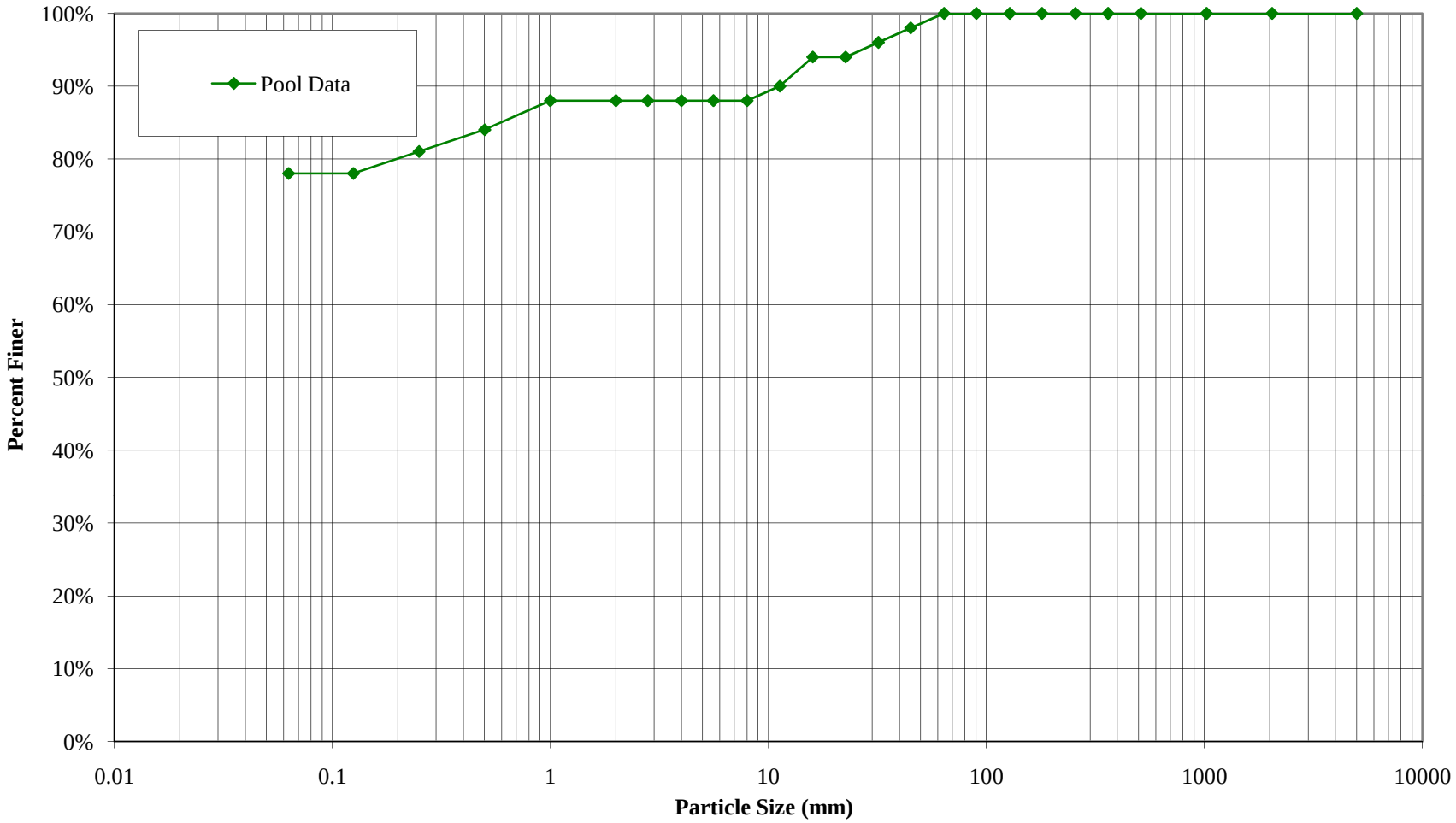
Largest particles: _____

(pool)

UT1
X10-Pool
Pebble Count Size Class Distribution



UT1
X10-Pool
Pebble Count Particle Size Distribution



PEBBLE COUNT DATA SHEET: POOL 100-COUNT

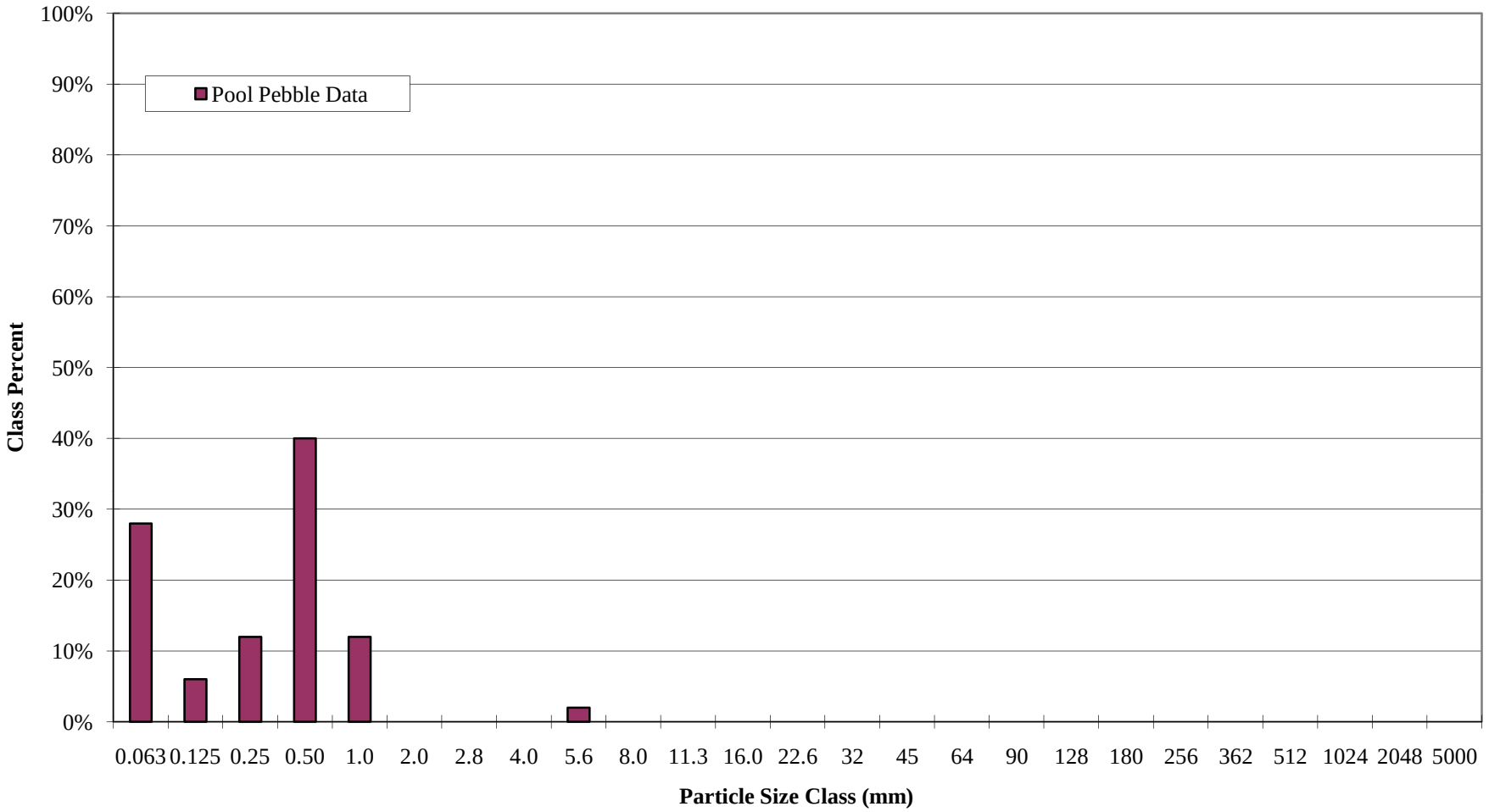
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1D X11-Pool
DATE COLLECTED:	8/31/2010
FIELD COLLECTION BY:	KS & IE
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Pool	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	28	28%	28%
SAND	Very Fine	.063 - .125	6	6%	34%
	Fine	.125 - .25	12	12%	46%
	Medium	.25 - .50	40	40%	86%
	Coarse	.50 - 1.0	12	12%	98%
	Very Coarse	1.0 - 2.0			98%
GRAVEL	Very Fine	2.0 - 2.8			98%
	Very Fine	2.8 - 4.0			98%
	Fine	4.0 - 5.6	2	2%	100%
	Fine	5.6 - 8.0			100%
	Medium	8.0 - 11.0			100%
	Medium	11.0 - 16.0			100%
	Coarse	16.0 - 22.6			100%
	Coarse	22.6 - 32			100%
	Very Coarse	32 - 45			100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

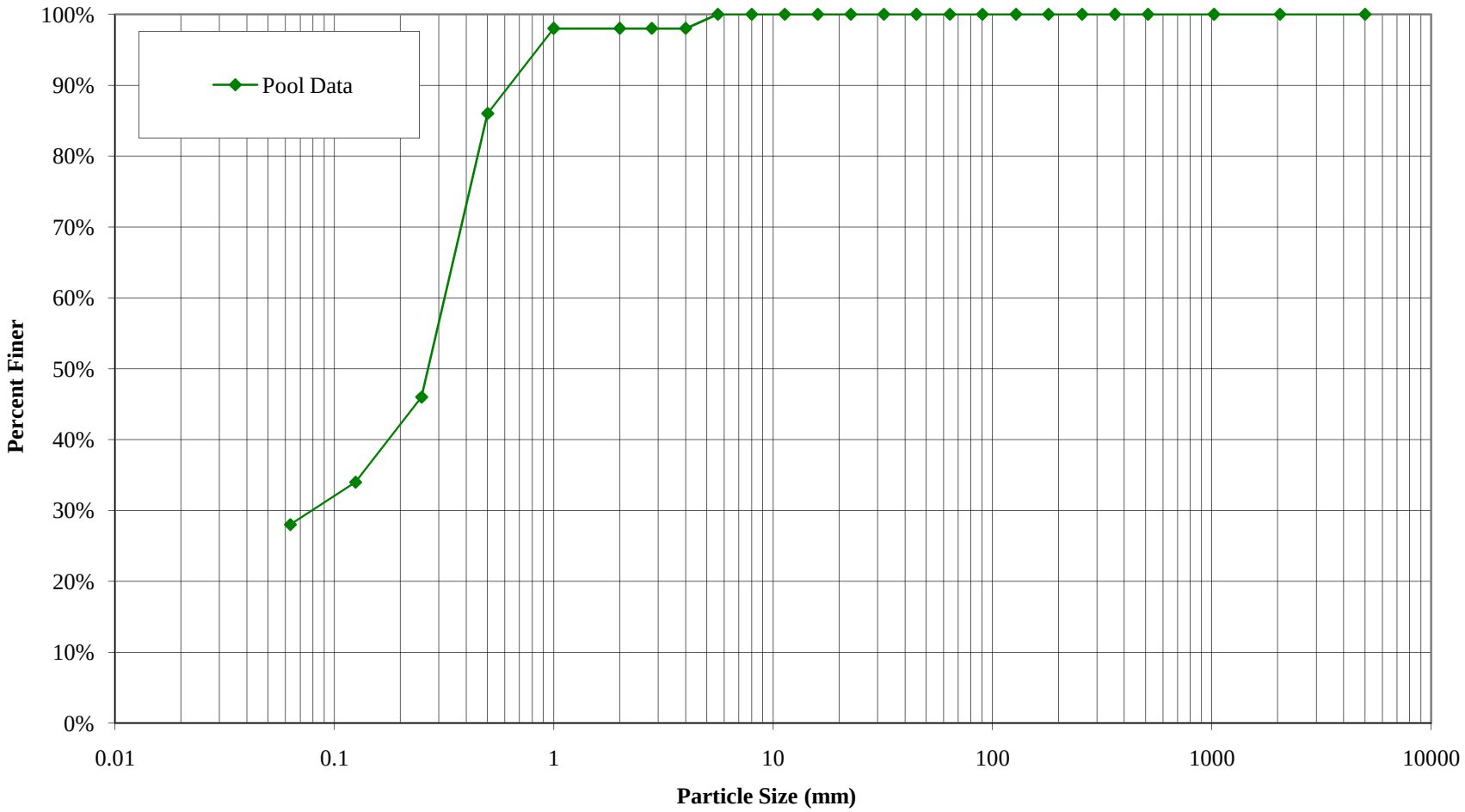
Largest particles: _____

(pool)

UT1D
X11-Pool
Pebble Count Size Class Distribution



UT1D
X11-Pool
Pebble Count Particle Size Distribution



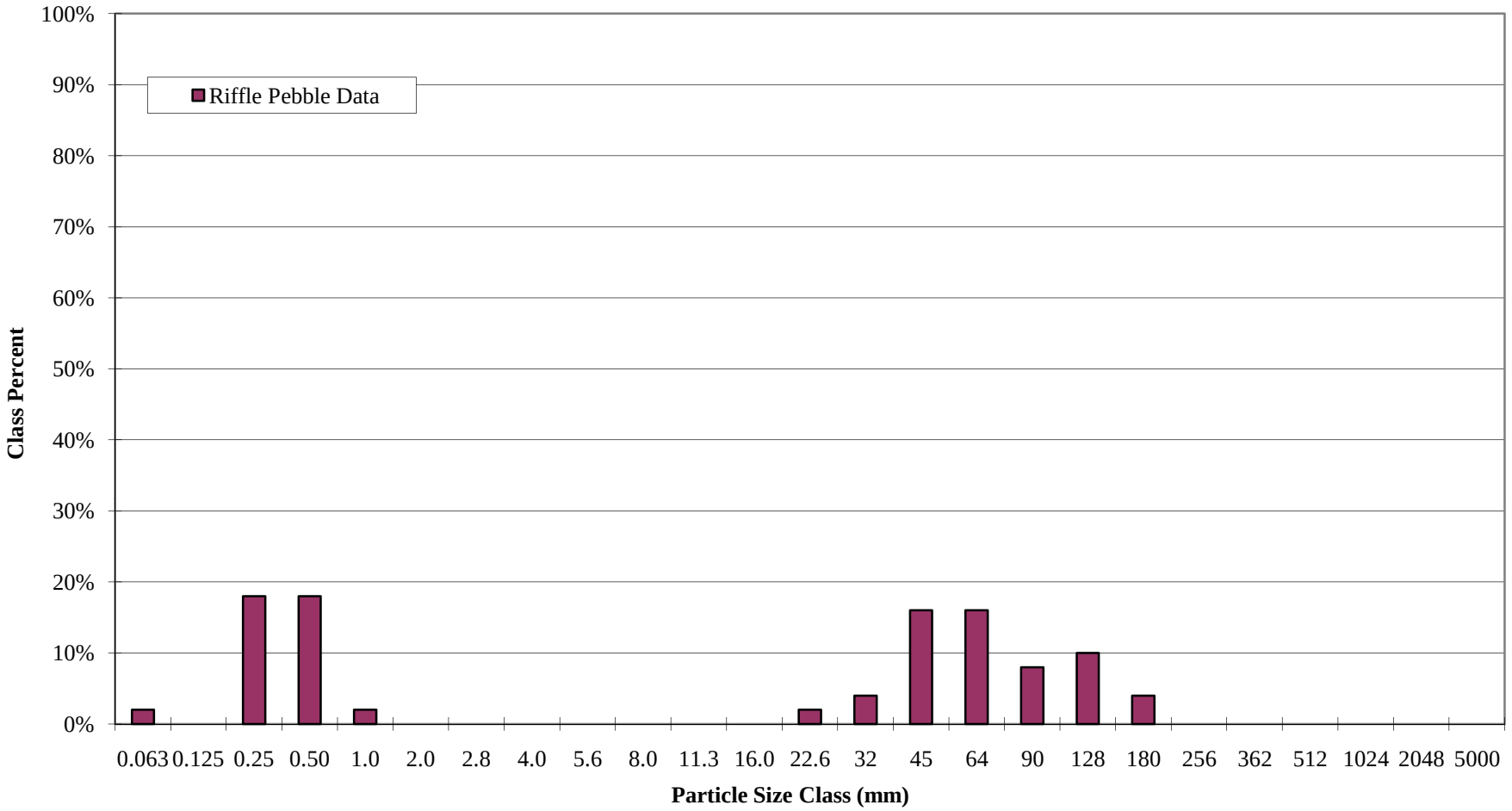
PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

	BAKER PROJECT NO. 108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1D X12-Riffle
DATE COLLECTED:	8/31/2010
FIELD COLLECTION BY:	KS & IE
DATA ENTRY BY:	KS

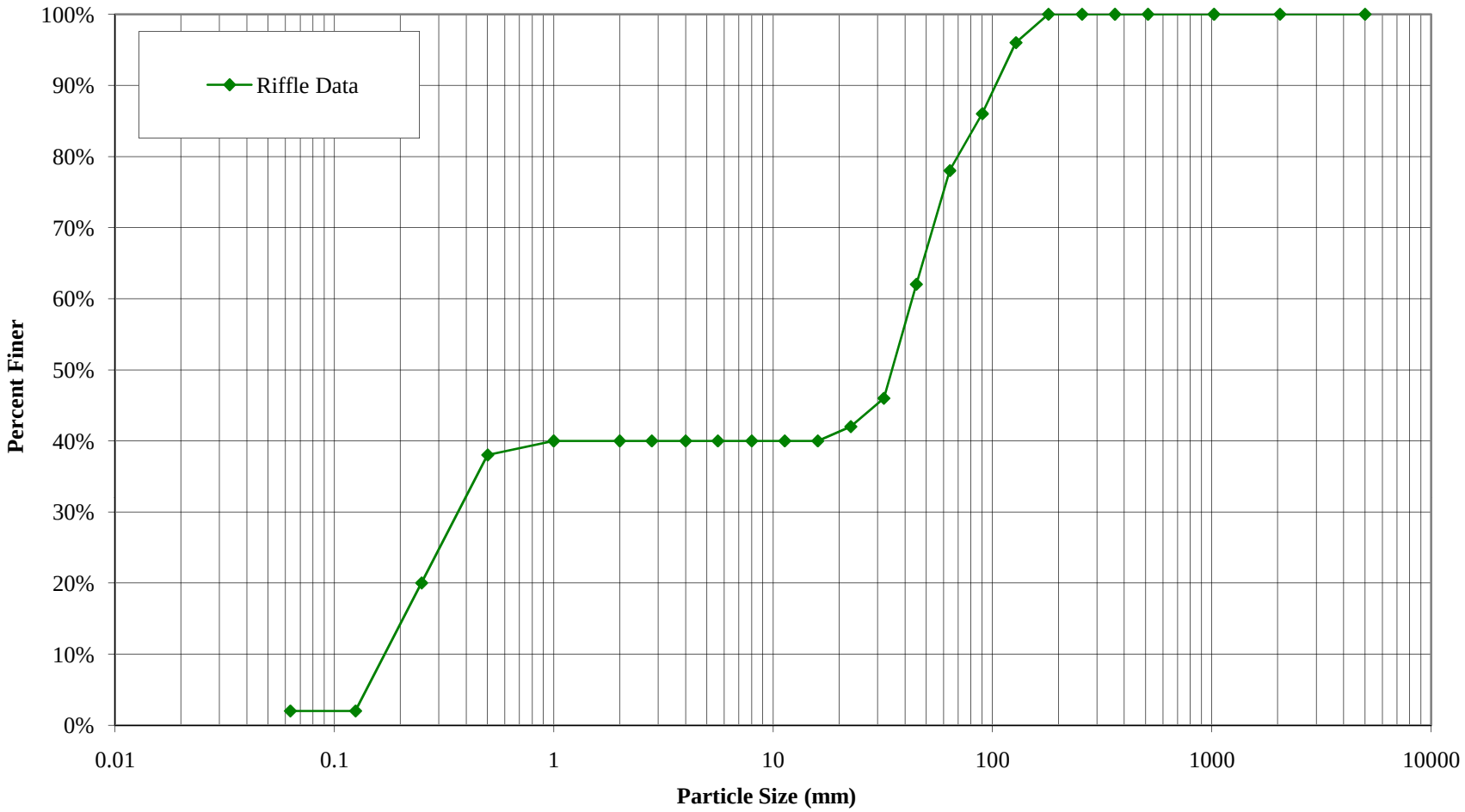
			PARTICLE CLASS COUNT	Summary	
MATERIAL	**PARTICLE**	**SIZE (mm)**	**Riffle**	**Class %**	**% Cum**
SILT/CLAY	Silt / Clay	< .063	2	2%	2%
SAND	Very Fine	.063 - .125			2%
	Fine	.125 - .25	18	18%	20%
	Medium	.25 - .50	18	18%	38%
	Coarse	.50 - 1.0	2	2%	40%
	Very Coarse	1.0 - 2.0			40%
GRAVEL	Very Fine	2.0 - 2.8			40%
	Very Fine	2.8 - 4.0			40%
	Fine	4.0 - 5.6			40%
	Fine	5.6 - 8.0			40%
	Medium	8.0 - 11.0			40%
	Medium	11.0 - 16.0			40%
	Coarse	16.0 - 22.6	2	2%	42%
	Coarse	22.6 - 32	4	4%	46%
	Very Coarse	32 - 45	16	16%	62%
	Very Coarse	45 - 64	16	16%	78%
COBBLE	Small	64 - 90	8	8%	86%
	Small	90 - 128	10	10%	96%
	Large	128 - 180	4	4%	100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

Largest particles: 150 mm
(riffle)

UT1D
X12-Riffle
Pebble Count Size Class Distribution



UT1D
X12-Riffle
Pebble Count Particle Size Distribution



PEBBLE COUNT DATA SHEET: POOL 100-COUNT

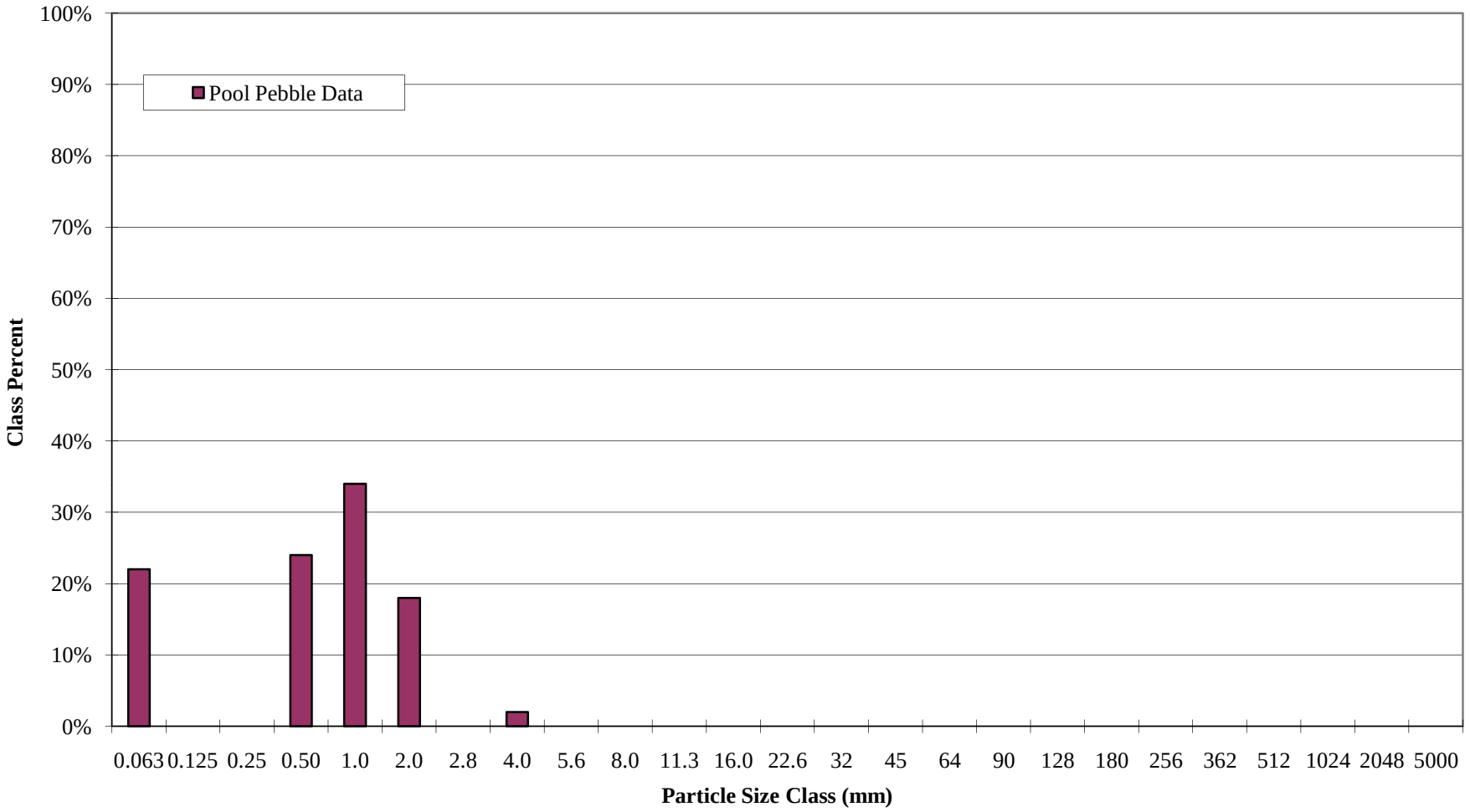
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1 X13-Pool
DATE COLLECTED:	9/9/2010
FIELD COLLECTION BY:	CT/PL
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Pool	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	22	22%	22%
SAND	Very Fine	.063 - .125			22%
	Fine	.125 - .25			22%
	Medium	.25 - .50	24	24%	46%
	Coarse	.50 - 1.0	34	34%	80%
	Very Coarse	1.0 - 2.0	18	18%	98%
GRAVEL	Very Fine	2.0 - 2.8			98%
	Very Fine	2.8 - 4.0	2	2%	100%
	Fine	4.0 - 5.6			100%
	Fine	5.6 - 8.0			100%
	Medium	8.0 - 11.0			100%
	Medium	11.0 - 16.0			100%
	Coarse	16.0 - 22.6			100%
	Coarse	22.6 - 32			100%
	Very Coarse	32 - 45			100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

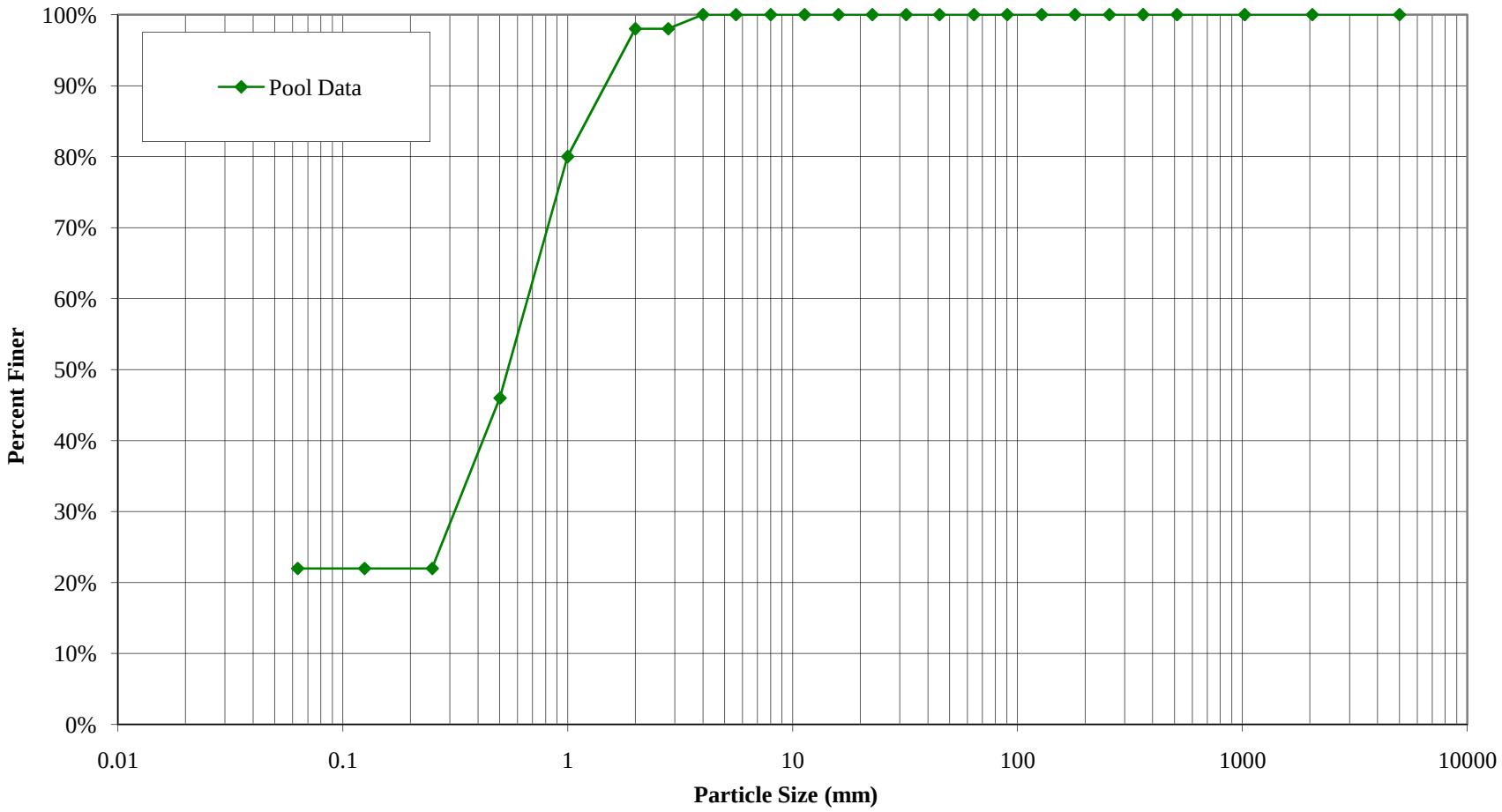
Largest particles: _____

(pool)

UT1
X13-Pool
Pebble Count Size Class Distribution



UT1
X13-Pool
Pebble Count Particle Size Distribution



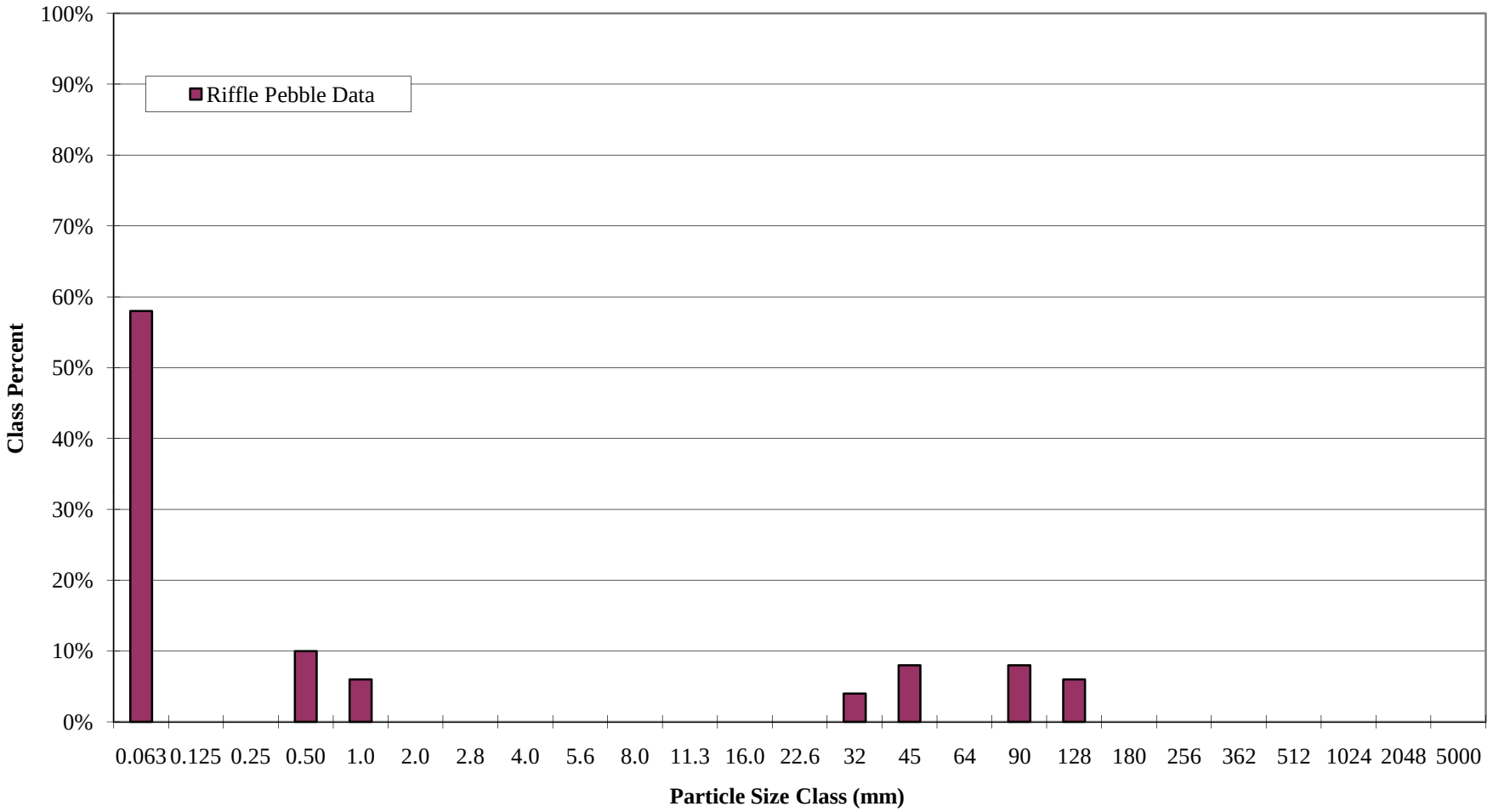
PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1 X14-Riffle
DATE COLLECTED:	9/9/2010
FIELD COLLECTION BY:	CT/PL
DATA ENTRY BY:	KS

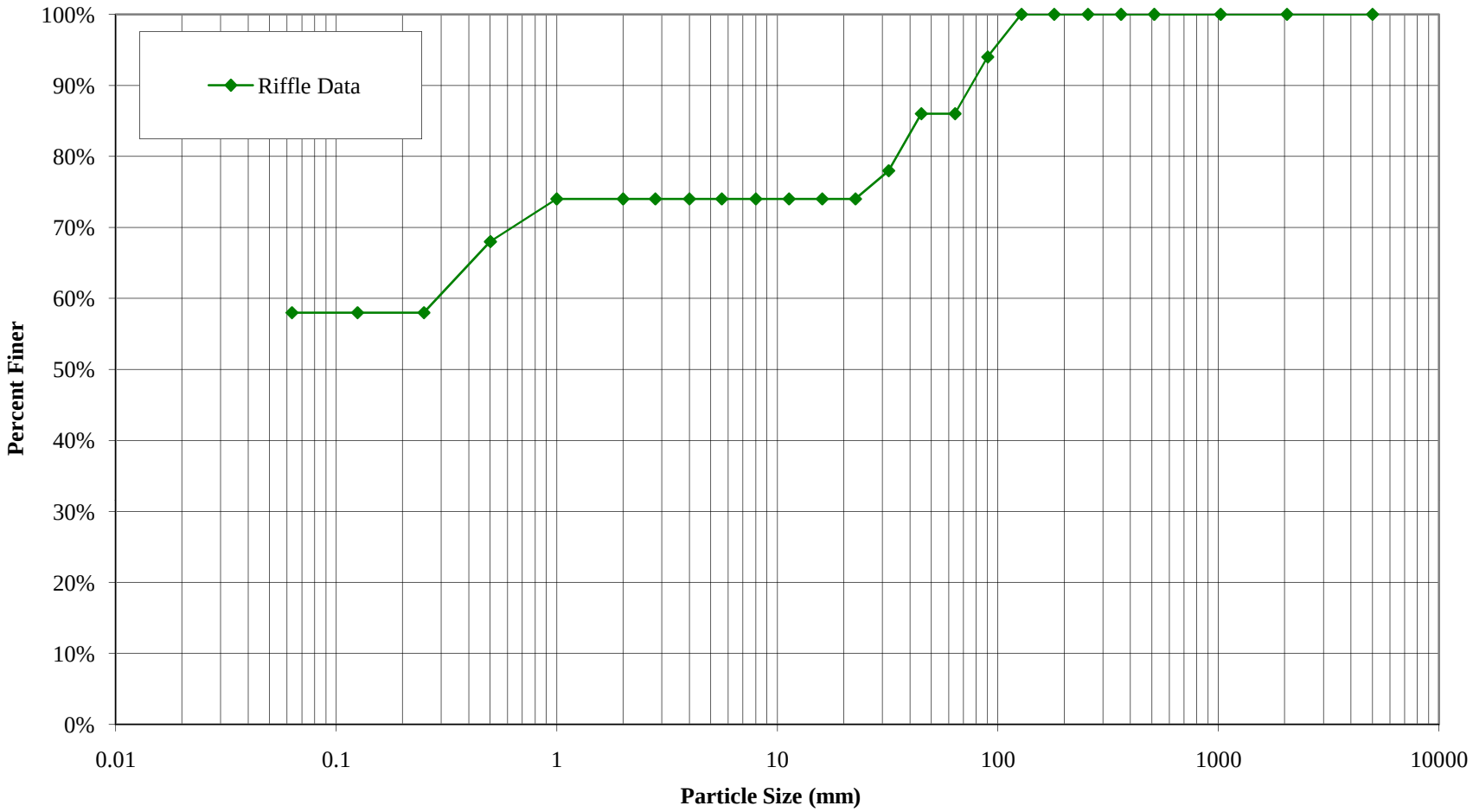
			PARTICLE CLASS COUNT	Summary	
MATERIAL	**PARTICLE**	**SIZE (mm)**	**Riffle**	**Class %**	**% Cum**
SILT/CLAY	Silt / Clay	< .063	58	58%	58%
SAND	Very Fine	.063 - .125			58%
	Fine	.125 - .25			58%
	Medium	.25 - .50	10	10%	68%
	Coarse	.50 - 1.0	6	6%	74%
	Very Coarse	1.0 - 2.0			74%
GRAVEL	Very Fine	2.0 - 2.8			74%
	Very Fine	2.8 - 4.0			74%
	Fine	4.0 - 5.6			74%
	Fine	5.6 - 8.0			74%
	Medium	8.0 - 11.0			74%
	Medium	11.0 - 16.0			74%
	Coarse	16.0 - 22.6			74%
	Coarse	22.6 - 32	4	4%	78%
	Very Coarse	32 - 45	8	8%	86%
	Very Coarse	45 - 64			86%
COBBLE	Small	64 - 90	8	8%	94%
	Small	90 - 128	6	6%	100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

Largest particles: 120 mm
(riffle)

UT1
X14-Riffle
Pebble Count Size Class Distribution



UT1
X14-Riffle
Pebble Count Particle Size Distribution



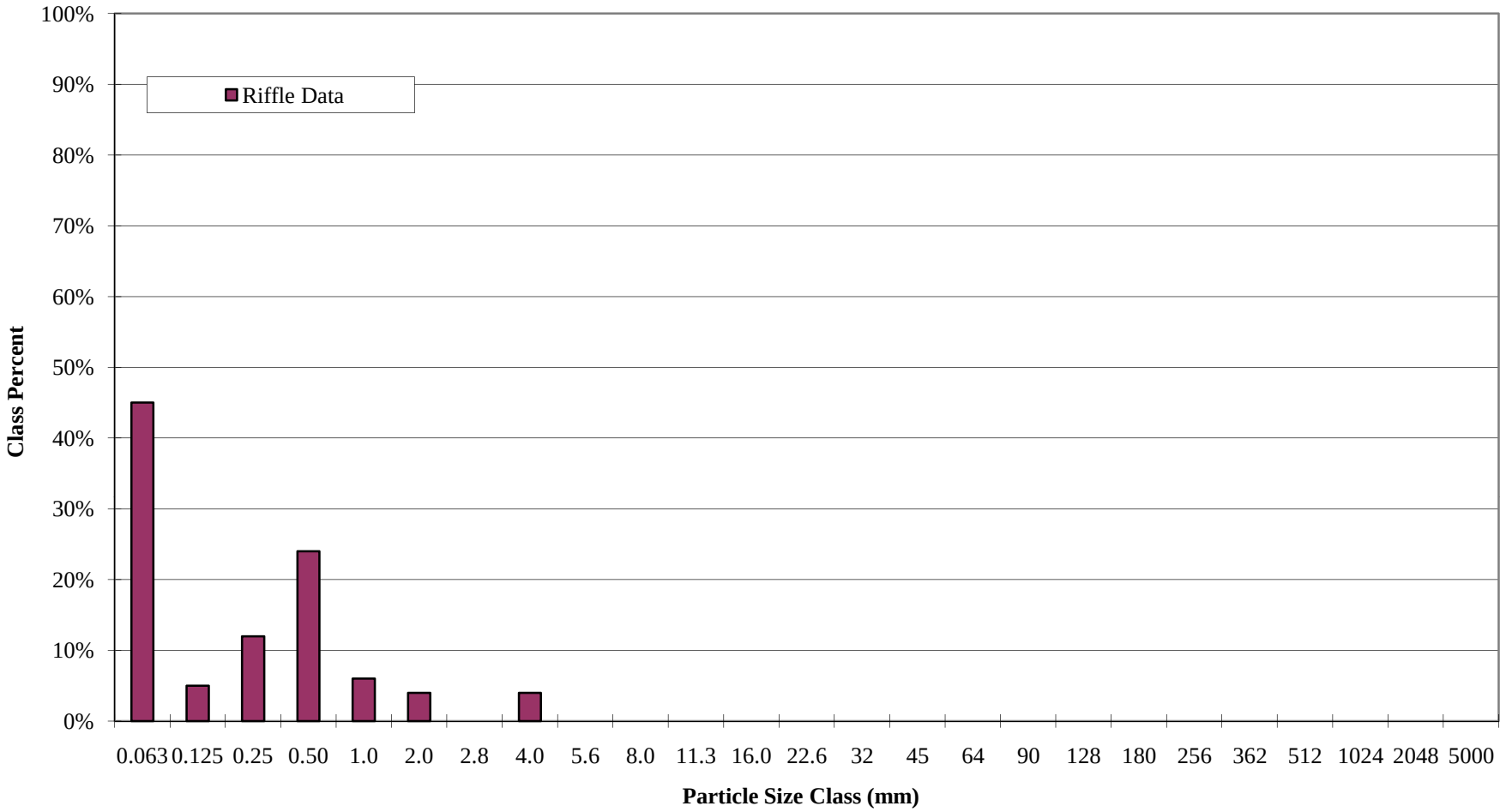
PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1 X15-Riffle
DATE COLLECTED:	9/9/2010
FIELD COLLECTION BY	CT / PL
DATA ENTRY BY:	KS

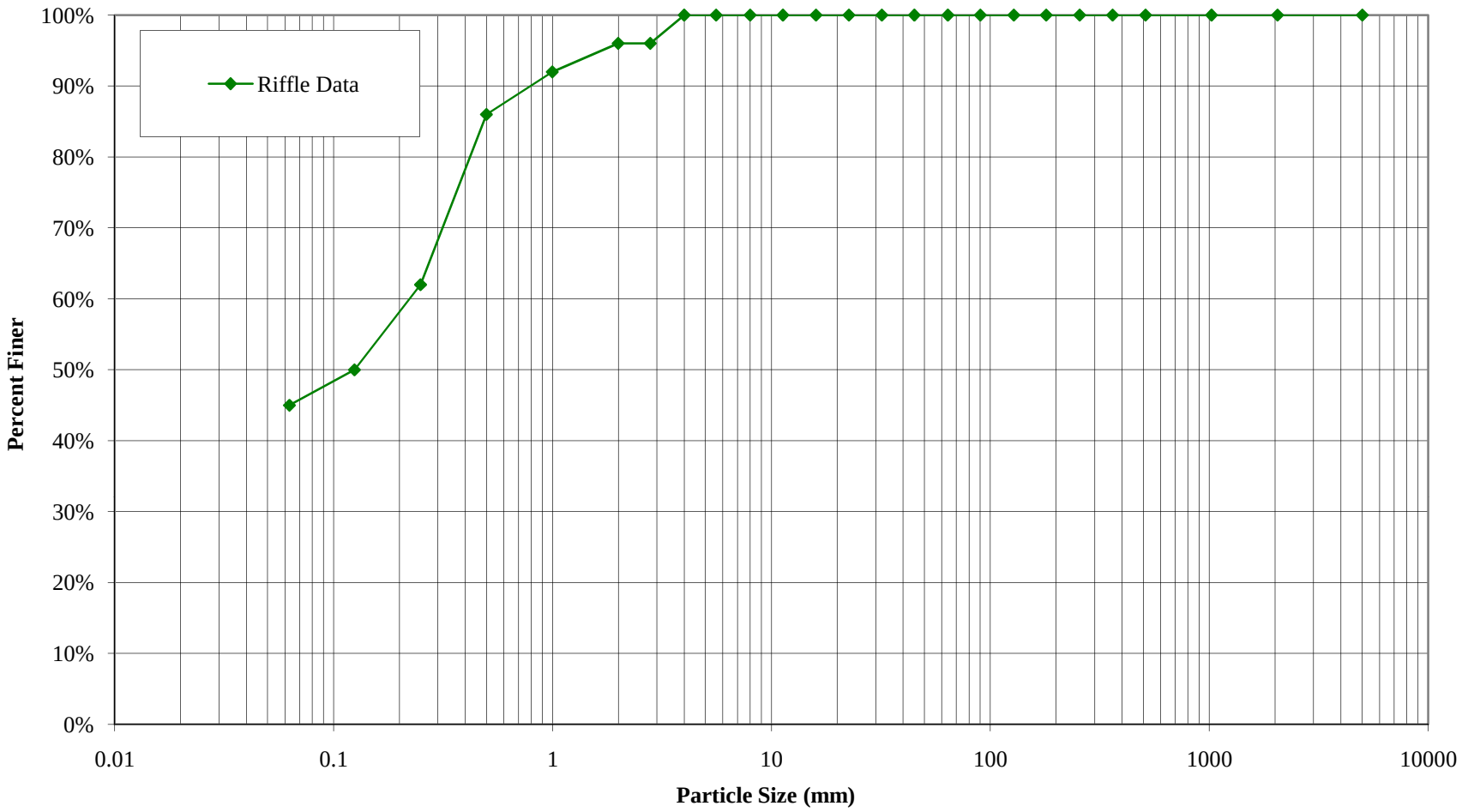
			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	45	45%	45%
SAND	Very Fine	.063 - .125	5	5%	50%
	Fine	.125 - .25	12	12%	62%
	Medium	.25 - .50	24	24%	86%
	Coarse	.50 - 1.0	6	6%	92%
	Very Coarse	1.0 - 2.0	4	4%	96%
GRAVEL	Very Fine	2.0 - 2.8			96%
	Very Fine	2.8 - 4.0	4	4%	100%
	Fine	4.0 - 5.6			100%
	Fine	5.6 - 8.0			100%
	Medium	8.0 - 11.0			100%
	Medium	11.0 - 16.0			100%
	Coarse	16.0 - 22.6			100%
	Coarse	22.6 - 32			100%
	Very Coarse	32 - 45			100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	rge-Very Lar	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

Largest particles: _____
(riffle)

UT1
X15-Riffle
Pebble Count Size Class Distribution



UT1
X15-Riffle
Pebble Count Particle Size Distribution



PEBBLE COUNT DATA SHEET: POOL 100-COUNT

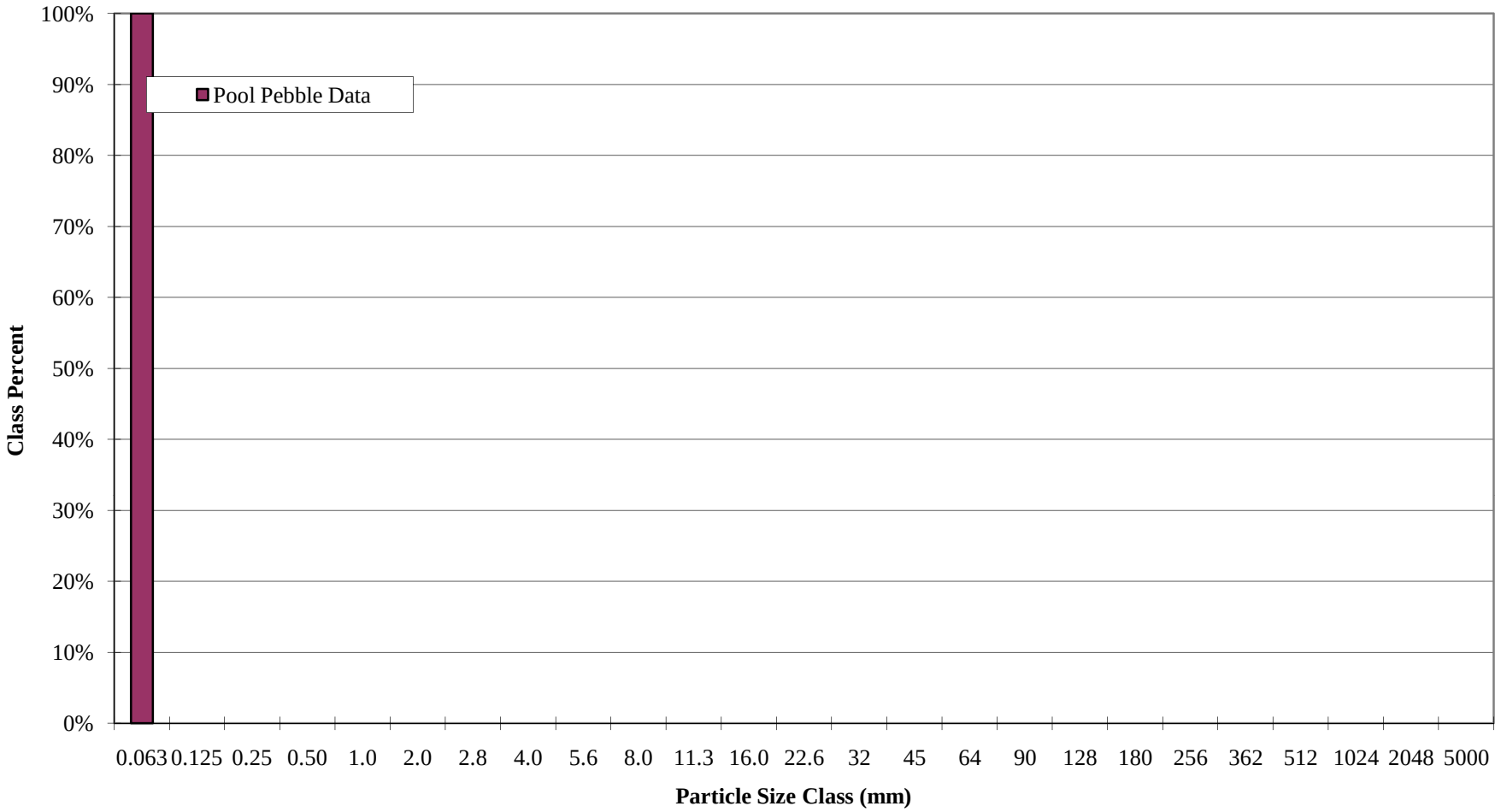
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1 X16-Pool
DATE COLLECTED:	9/9/2010
FIELD COLLECTION BY:	CT/PL
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Pool	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	100	100%	100%
SAND	Very Fine	.063 - .125			100%
	Fine	.125 - .25			100%
	Medium	.25 - .50			100%
	Coarse	.50 - 1.0			100%
	Very Coarse	1.0 - 2.0			100%
GRAVEL	Very Fine	2.0 - 2.8			100%
	Very Fine	2.8 - 4.0			100%
	Fine	4.0 - 5.6			100%
	Fine	5.6 - 8.0			100%
	Medium	8.0 - 11.0			100%
	Medium	11.0 - 16.0			100%
	Coarse	16.0 - 22.6			100%
	Coarse	22.6 - 32			100%
	Very Coarse	32 - 45			100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

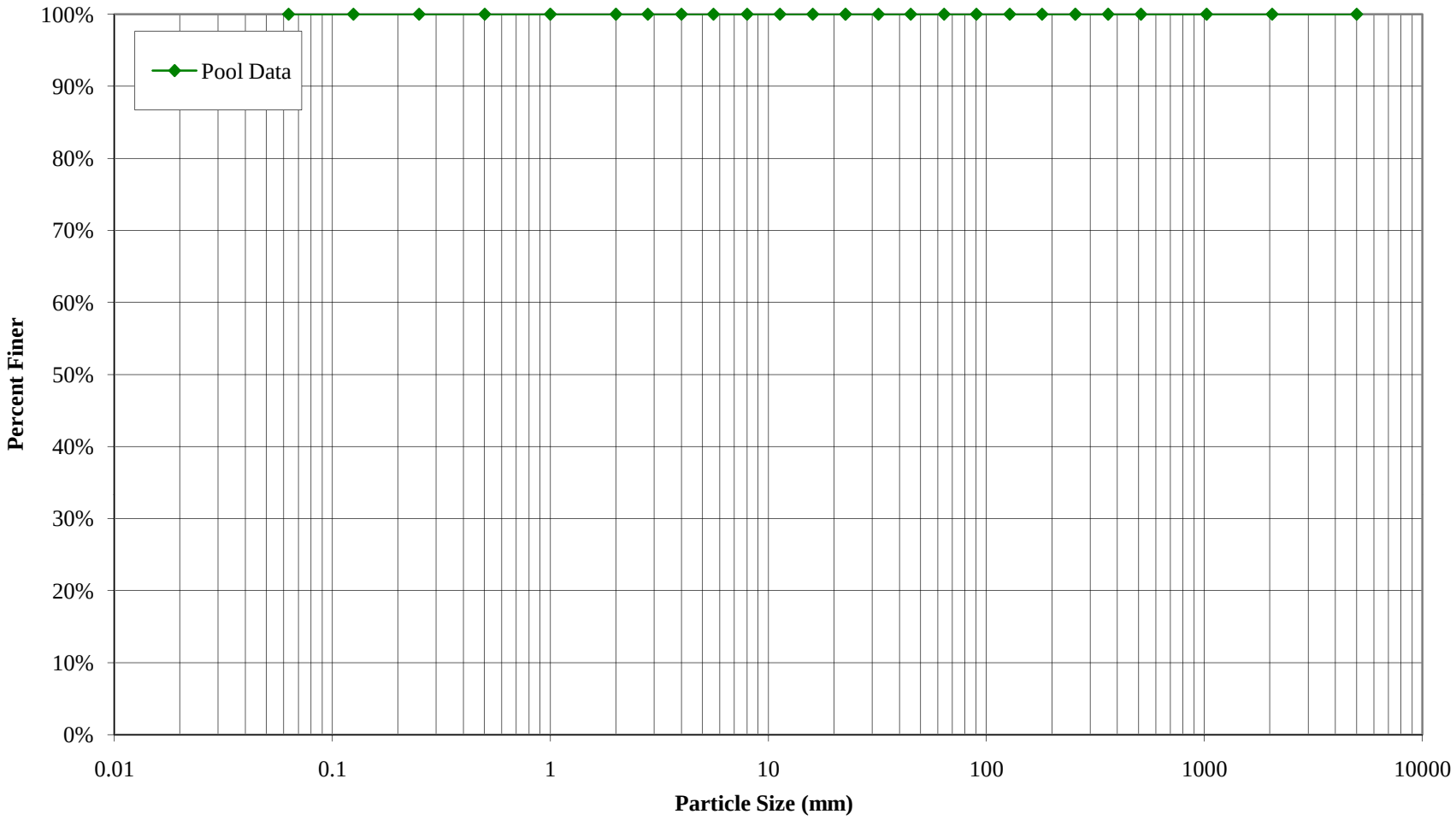
Largest particles: _____

(pool)

UT1
X16-Pool
Pebble Count Size Class Distribution



UT1
X16-Pool
Pebble Count Particle Size Distribution



PEBBLE COUNT DATA SHEET: POOL 100-COUNT

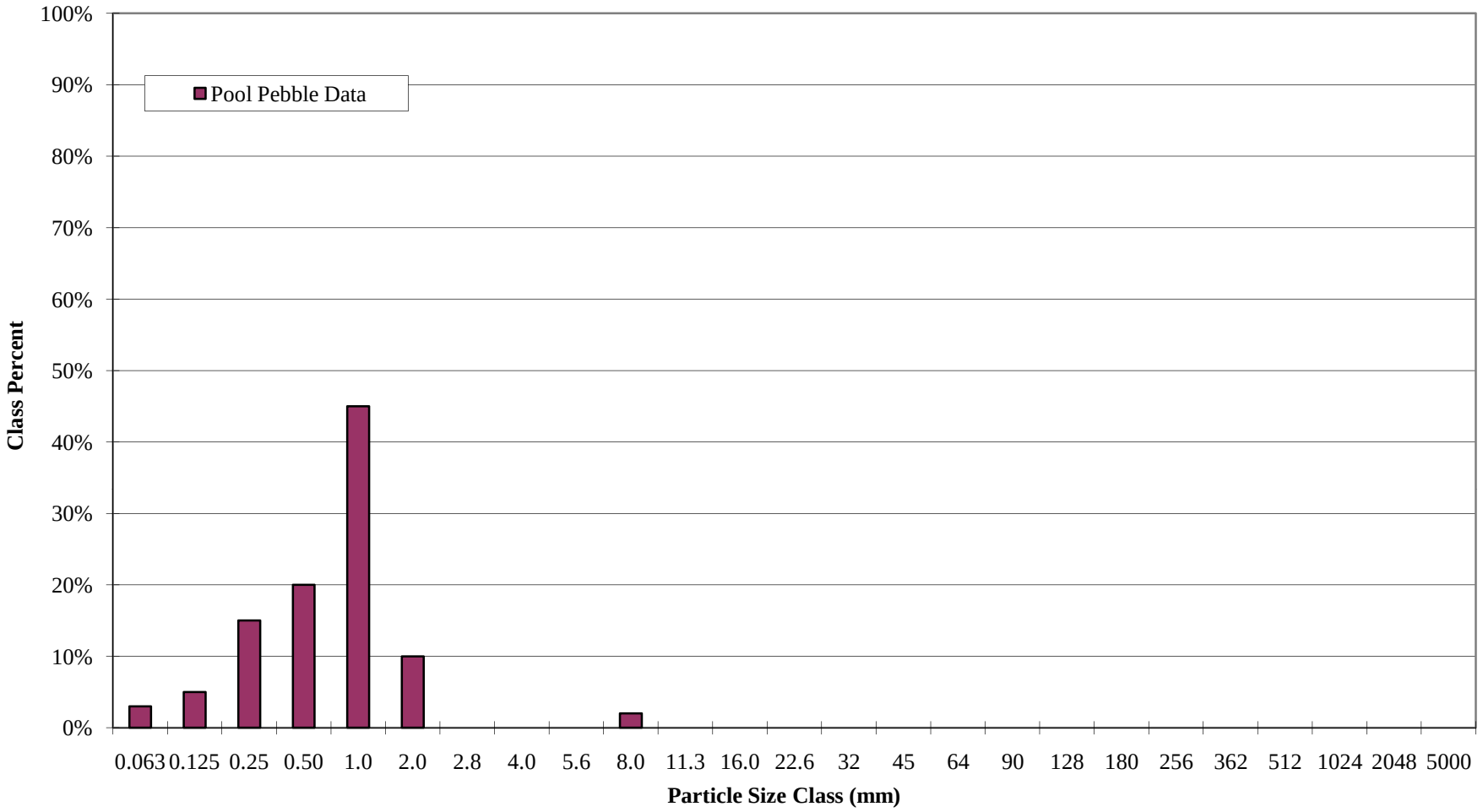
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1 X17-Pool
DATE COLLECTED:	9/2/2010
FIELD COLLECTION BY:	CT & PL
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	**PARTICLE**	**SIZE (mm)**	**Pool**	**Class %**	**% Cum**
SILT/CLAY	Silt / Clay	< .063	3	3%	3%
SAND	Very Fine	.063 - .125	5	5%	8%
	Fine	.125 - .25	15	15%	23%
	Medium	.25 - .50	20	20%	43%
	Coarse	.50 - 1.0	45	45%	88%
	Very Coarse	1.0 - 2.0	10	10%	98%
GRAVEL	Very Fine	2.0 - 2.8			98%
	Very Fine	2.8 - 4.0			98%
	Fine	4.0 - 5.6			98%
	Fine	5.6 - 8.0	2	2%	100%
	Medium	8.0 - 11.0			100%
	Medium	11.0 - 16.0			100%
	Coarse	16.0 - 22.6			100%
	Coarse	22.6 - 32			100%
	Very Coarse	32 - 45			100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

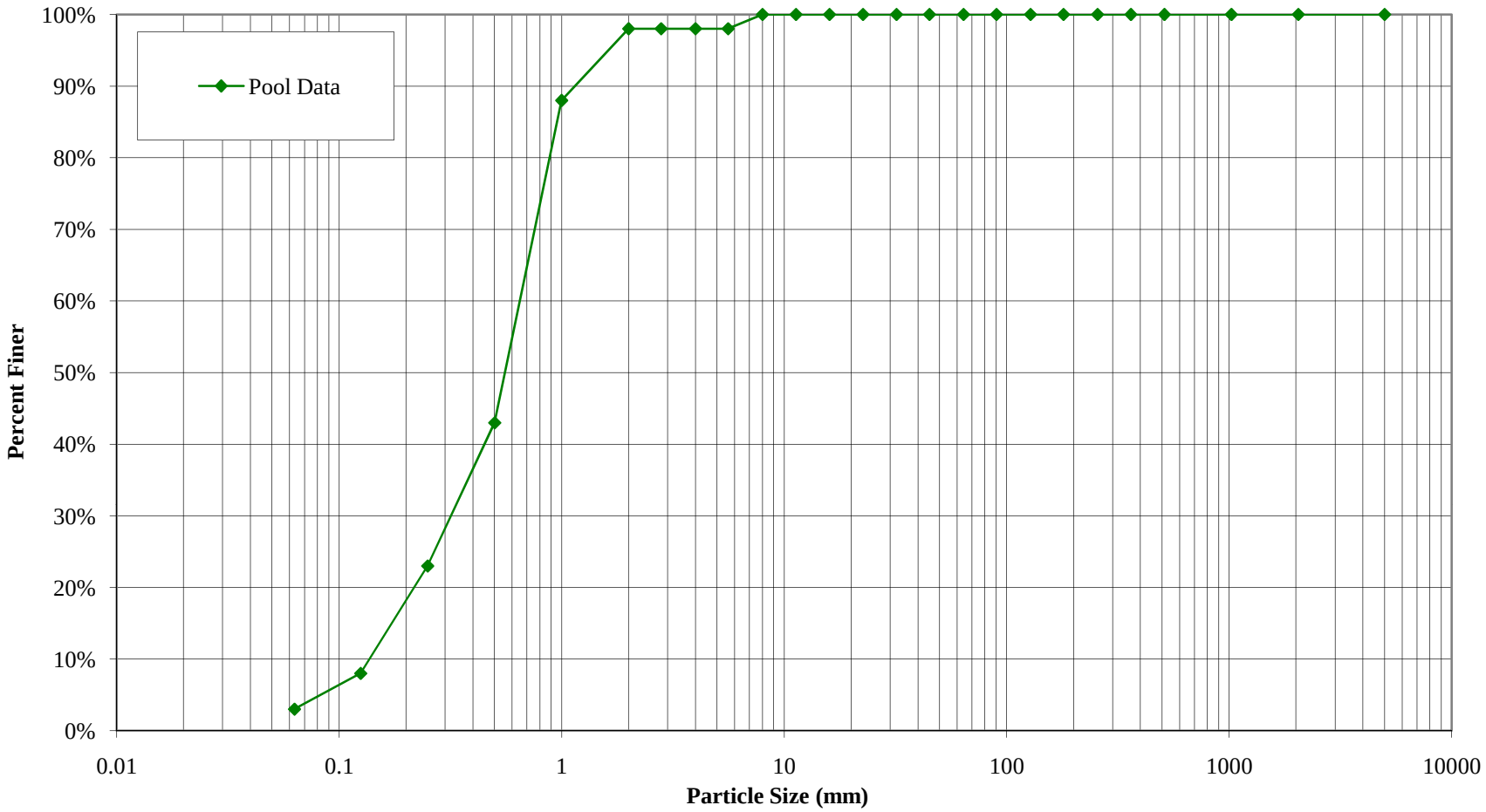
Largest particles: _____

(pool)

UT1
X17-Pool
Pebble Count Size Class Distribution



UT1
X17-Pool
Pebble Count Particle Size Distribution



PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

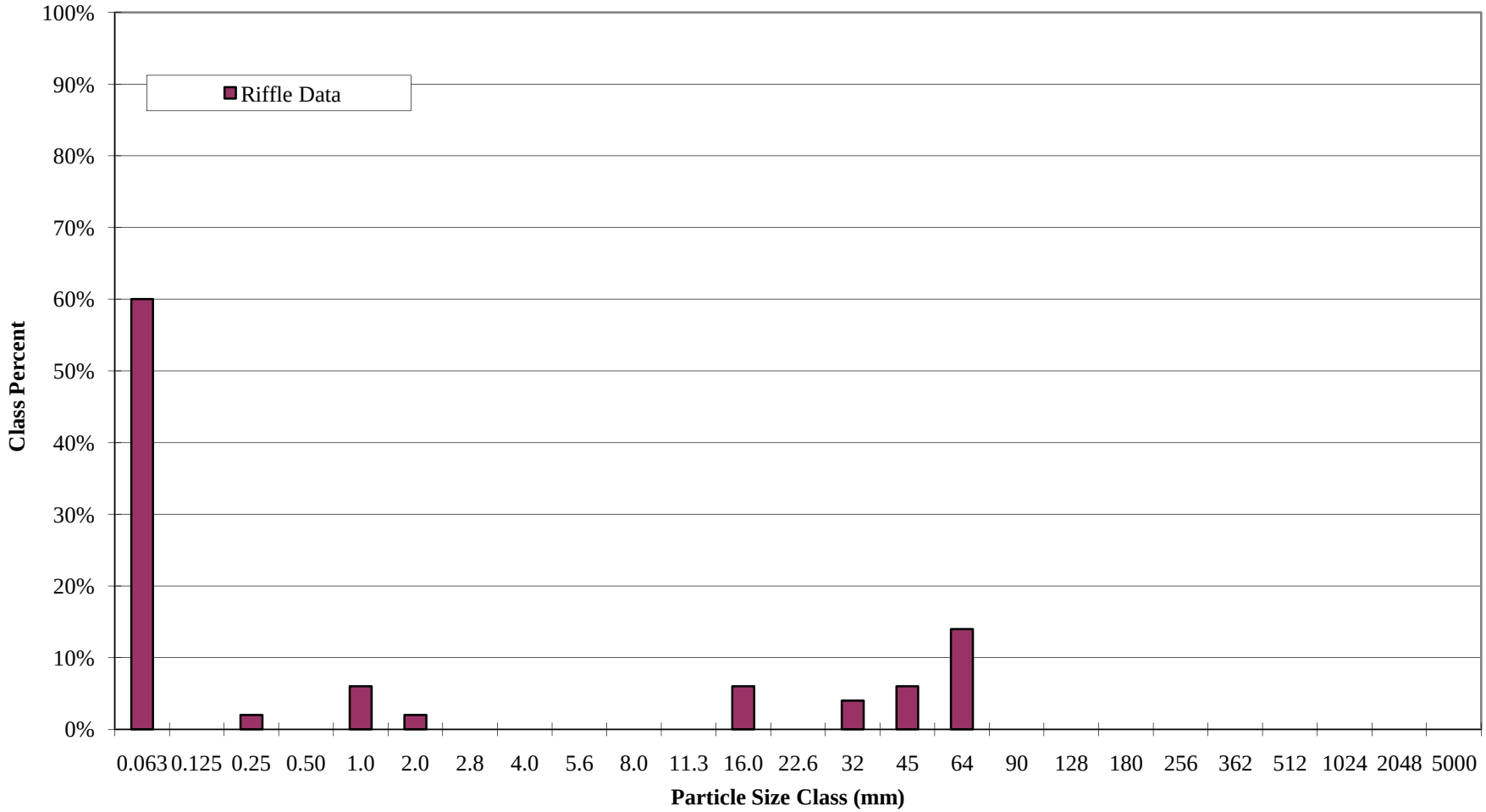
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT1 X18-Riffle
DATE COLLECTED:	9/2/2010
FIELD COLLECTION BY	PL & CT
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	60	60%	60%
SAND	Very Fine	.063 - .125			60%
	Fine	.125 - .25	2	2%	62%
	Medium	.25 - .50			62%
	Coarse	.50 - 1.0	6	6%	68%
	Very Coarse	1.0 - 2.0	2	2%	70%
GRAVEL	Very Fine	2.0 - 2.8			70%
	Very Fine	2.8 - 4.0			70%
	Fine	4.0 - 5.6			70%
	Fine	5.6 - 8.0			70%
	Medium	8.0 - 11.0			70%
	Medium	11.0 - 16.0	6	6%	76%
	Coarse	16.0 - 22.6			76%
	Coarse	22.6 - 32	4	4%	80%
	Very Coarse	32 - 45	6	6%	86%
	Very Coarse	45 - 64	14	14%	100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	rge-Very Lar	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

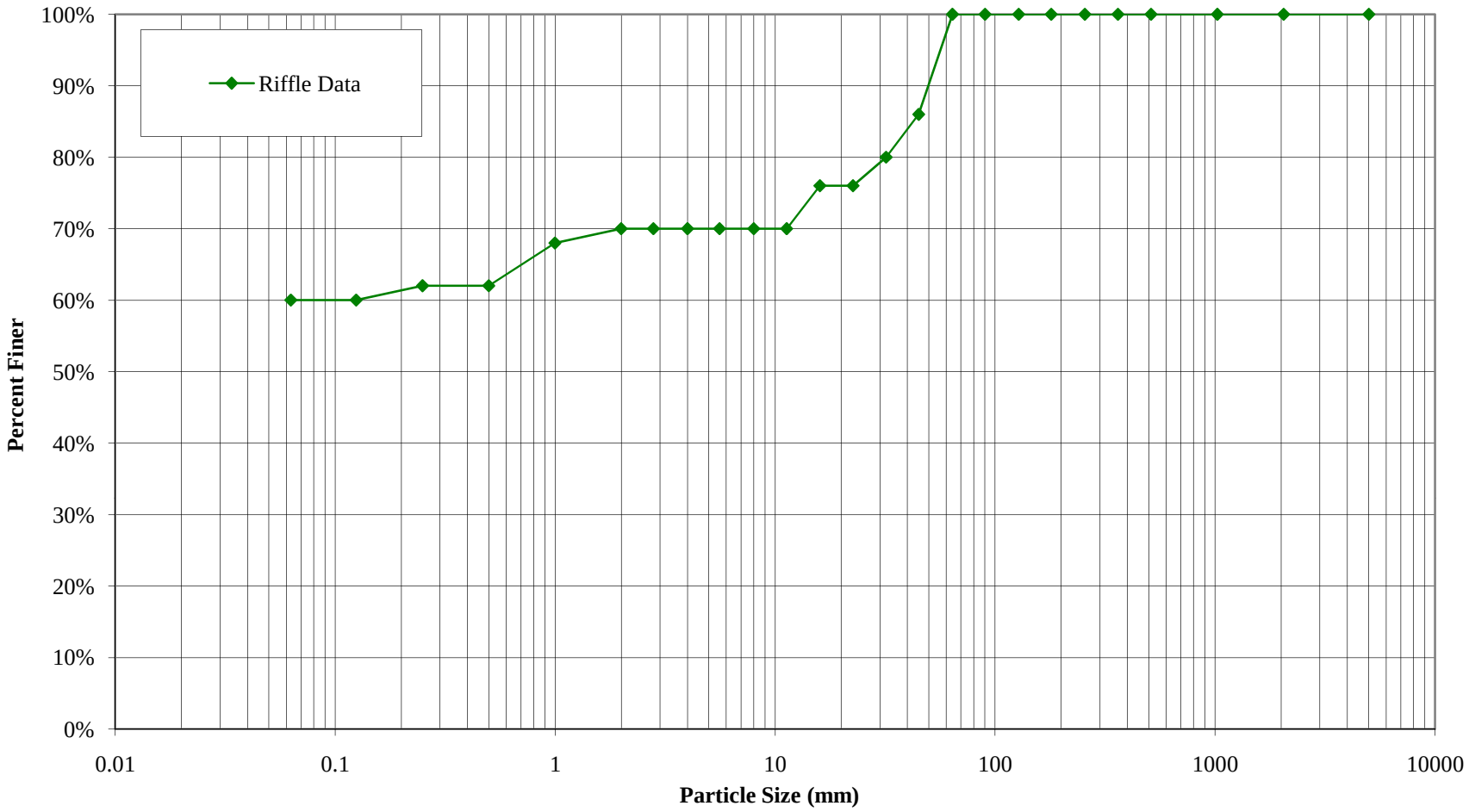
Largest particles: _____

(riffle)

UT1
X18-Riffle
Pebble Count Size Class Distribution



UT1
X18-Riffle
Pebble Count Particle Size Distribution



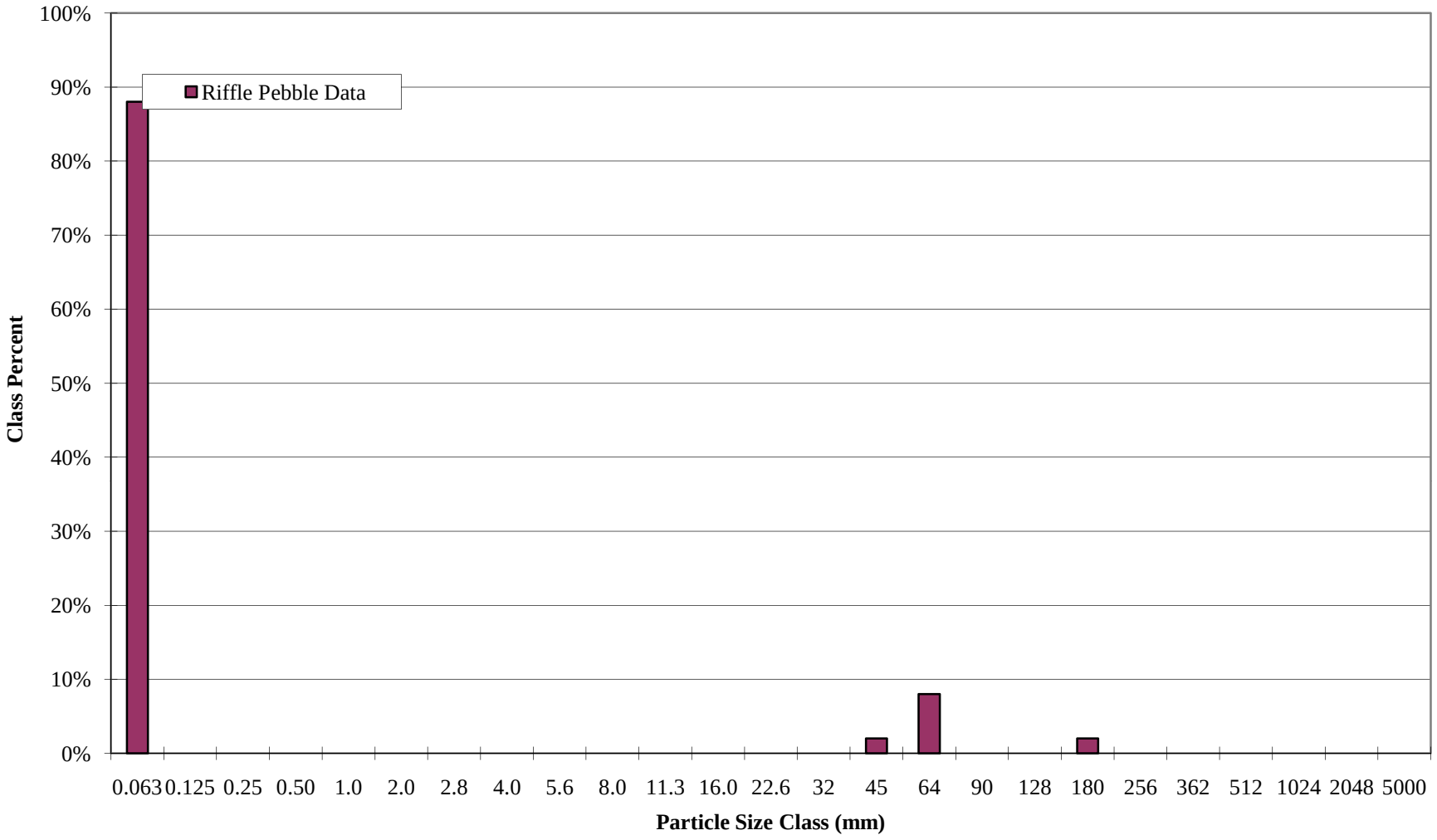
PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

	BAKER PROJECT NO. 108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT2A X1-Riffle
DATE COLLECTED:	9/1/2010
FIELD COLLECTION BY:	KS & CT
DATA ENTRY BY:	KS

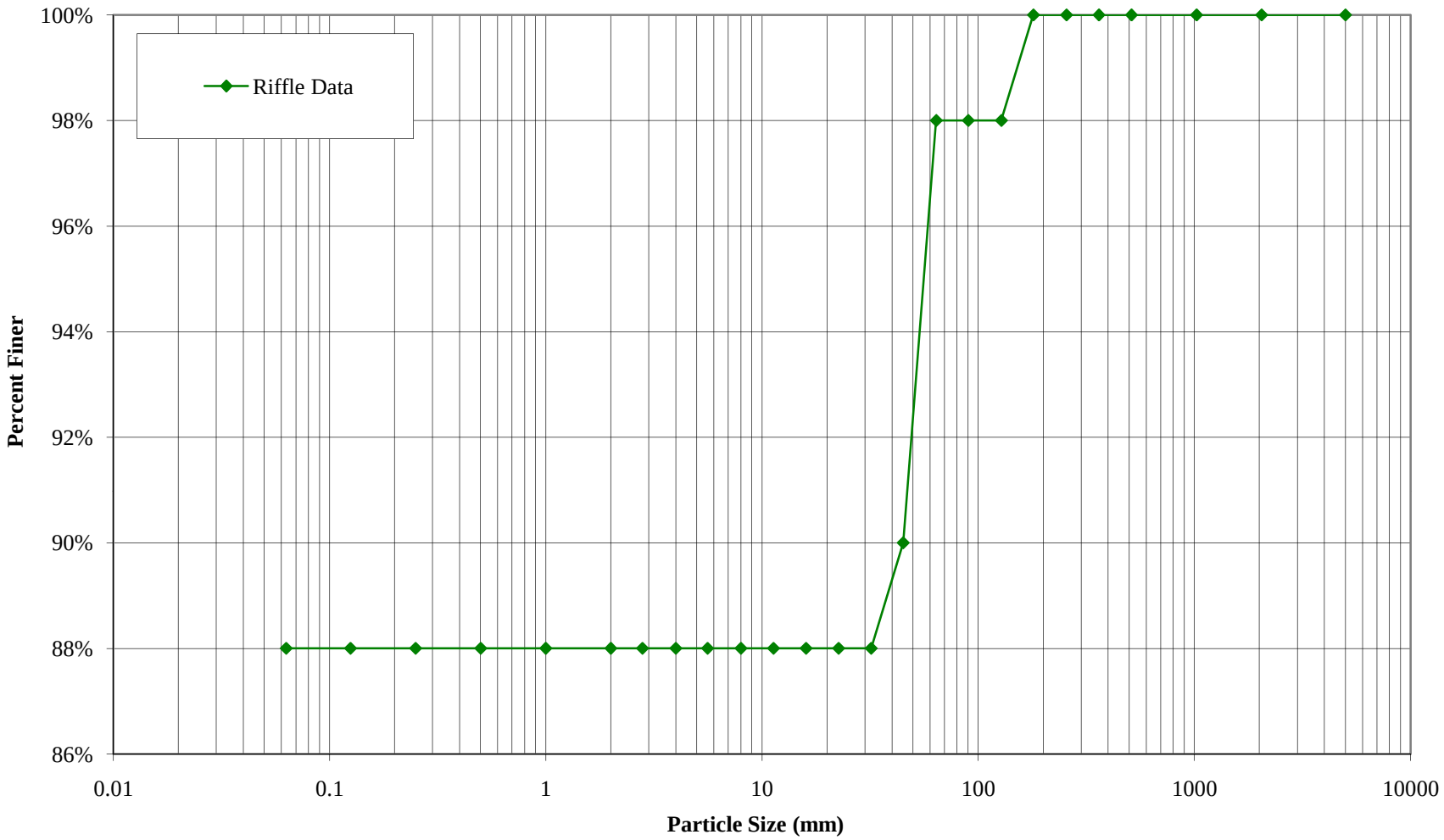
			PARTICLE CLASS COUNT	Summary	
MATERIAL	**PARTICLE**	**SIZE (mm)**	**Riffle**	**Class %**	**% Cum**
SILT/CLAY	Silt / Clay	< .063	88	88%	88%
SAND	Very Fine	.063 - .125			88%
	Fine	.125 - .25			88%
	Medium	.25 - .50			88%
	Coarse	.50 - 1.0			88%
	Very Coarse	1.0 - 2.0			88%
GRAVEL	Very Fine	2.0 - 2.8			88%
	Very Fine	2.8 - 4.0			88%
	Fine	4.0 - 5.6			88%
	Fine	5.6 - 8.0			88%
	Medium	8.0 - 11.0			88%
	Medium	11.0 - 16.0			88%
	Coarse	16.0 - 22.6			88%
	Coarse	22.6 - 32			88%
	Very Coarse	32 - 45	2	2%	90%
	Very Coarse	45 - 64	8	8%	98%
COBBLE	Small	64 - 90			98%
	Small	90 - 128			98%
	Large	128 - 180	2	2%	100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

Largest particles: 150 mm
(riffle)

UT2A
X1-Riffle
Pebble Count Size Class Distribution



UT2A
X1-Riffle
Pebble Count Particle Size Distribution



PEBBLE COUNT DATA SHEET: POOL 100-COUNT

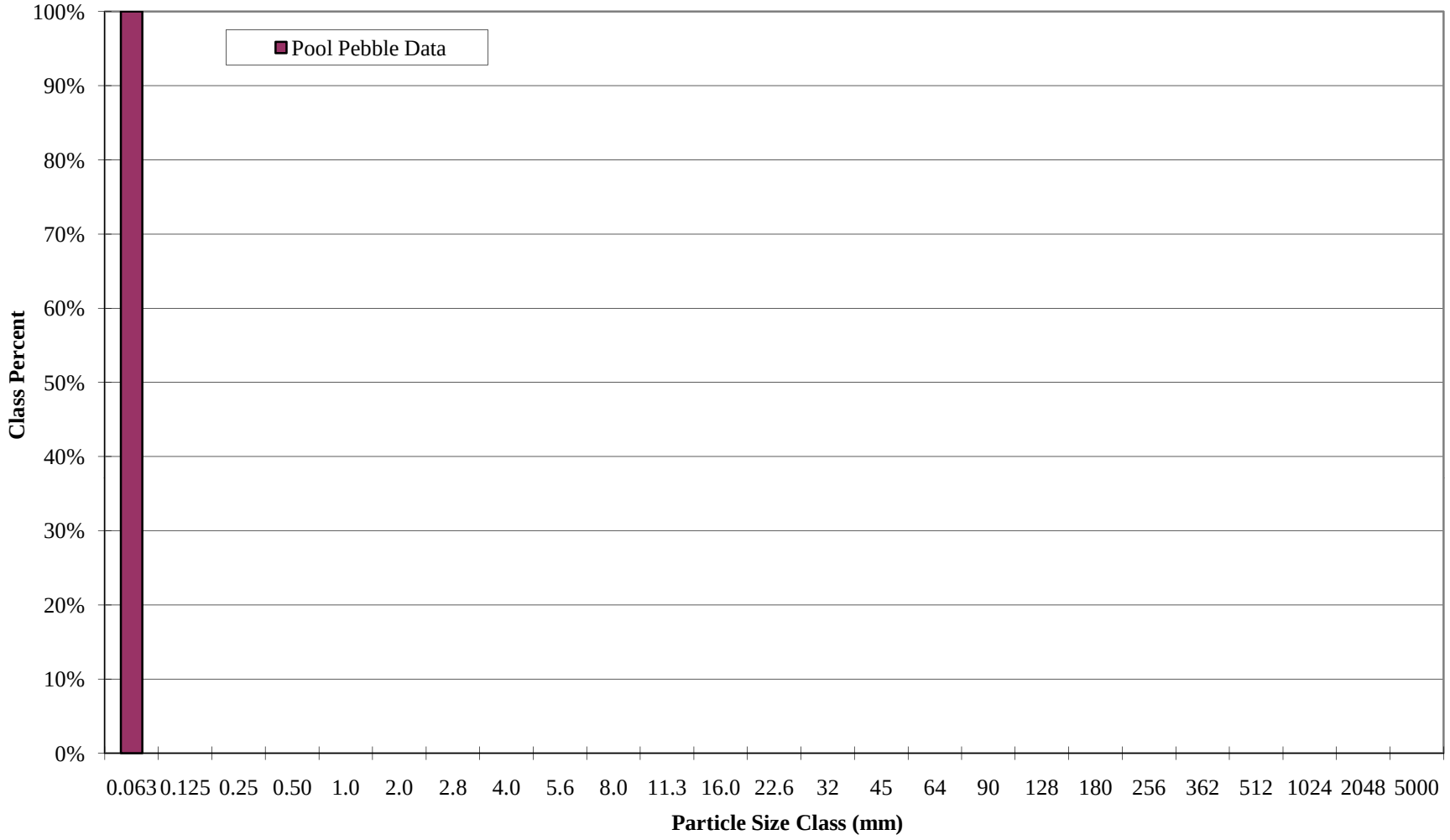
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT2A X2-Pool
DATE COLLECTED:	9/1/2010
FIELD COLLECTION BY:	KS & CT
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	**PARTICLE**	**SIZE (mm)**	**Pool**	**Class %**	**% Cum**
SILT/CLAY	Silt / Clay	< .063	100	100%	100%
SAND	Very Fine	.063 - .125			100%
	Fine	.125 - .25			100%
	Medium	.25 - .50			100%
	Coarse	.50 - 1.0			100%
	Very Coarse	1.0 - 2.0			100%
GRAVEL	Very Fine	2.0 - 2.8			100%
	Very Fine	2.8 - 4.0			100%
	Fine	4.0 - 5.6			100%
	Fine	5.6 - 8.0			100%
	Medium	8.0 - 11.0			100%
	Medium	11.0 - 16.0			100%
	Coarse	16.0 - 22.6			100%
	Coarse	22.6 - 32			100%
	Very Coarse	32 - 45			100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

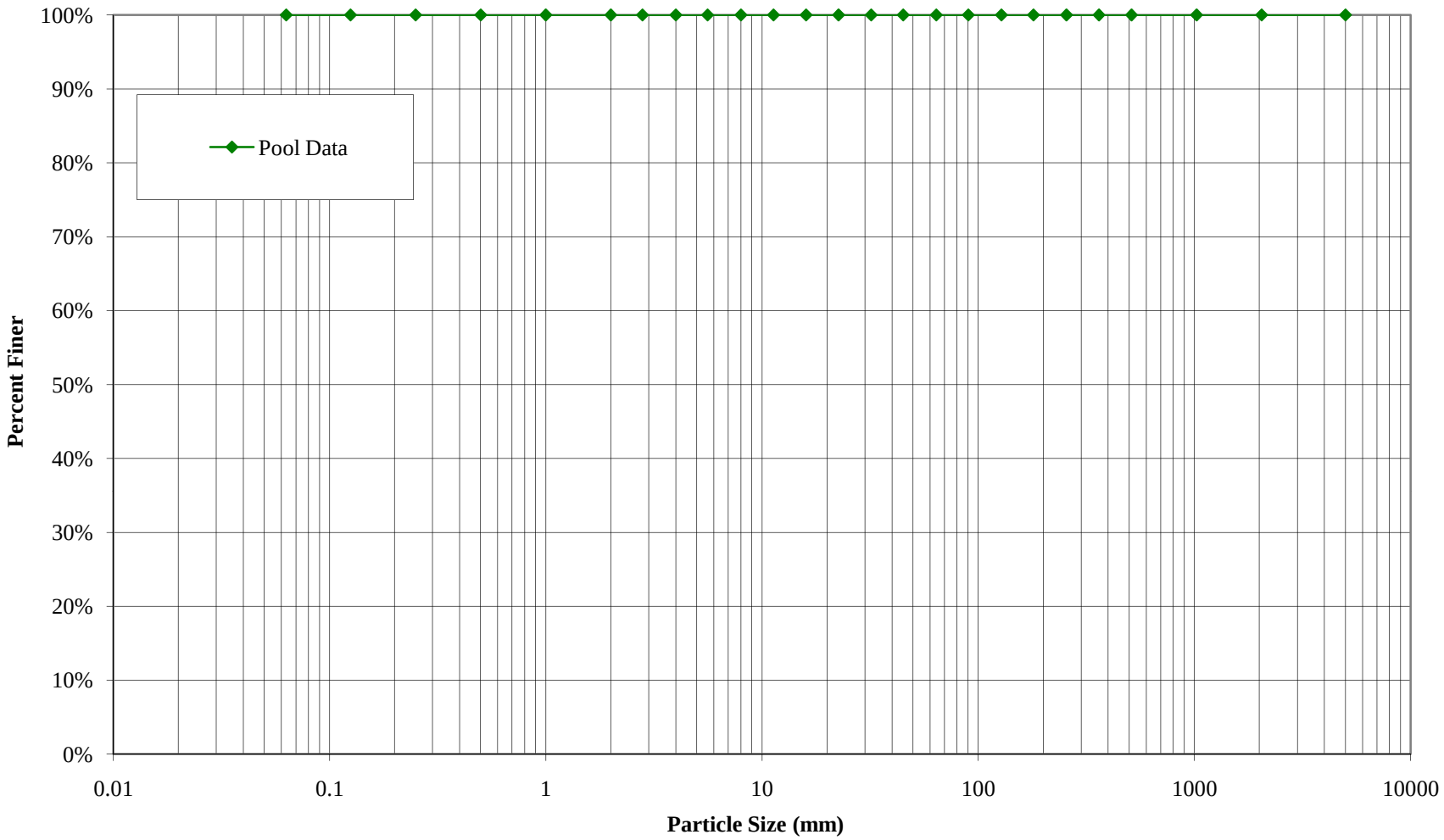
Largest particles: _____

(pool)

UT2A
X2-Pool
Pebble Count Size Class Distribution



UT2A
X2-Pool
Pebble Count Particle Size Distribution



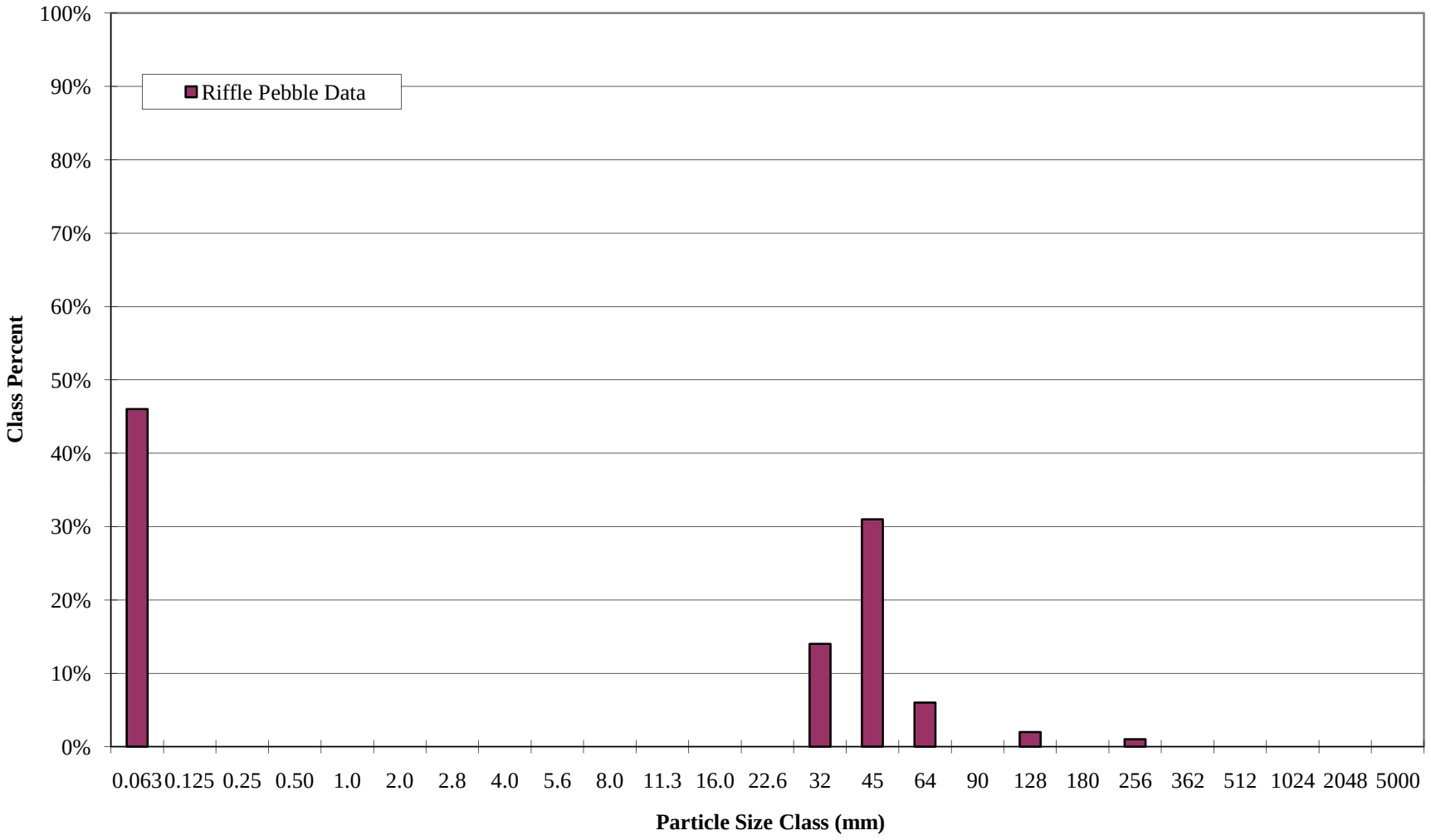
PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT2 X3-Riffle
DATE COLLECTED:	9/1/2010
FIELD COLLECTION BY:	KS & CT
DATA ENTRY BY:	KS

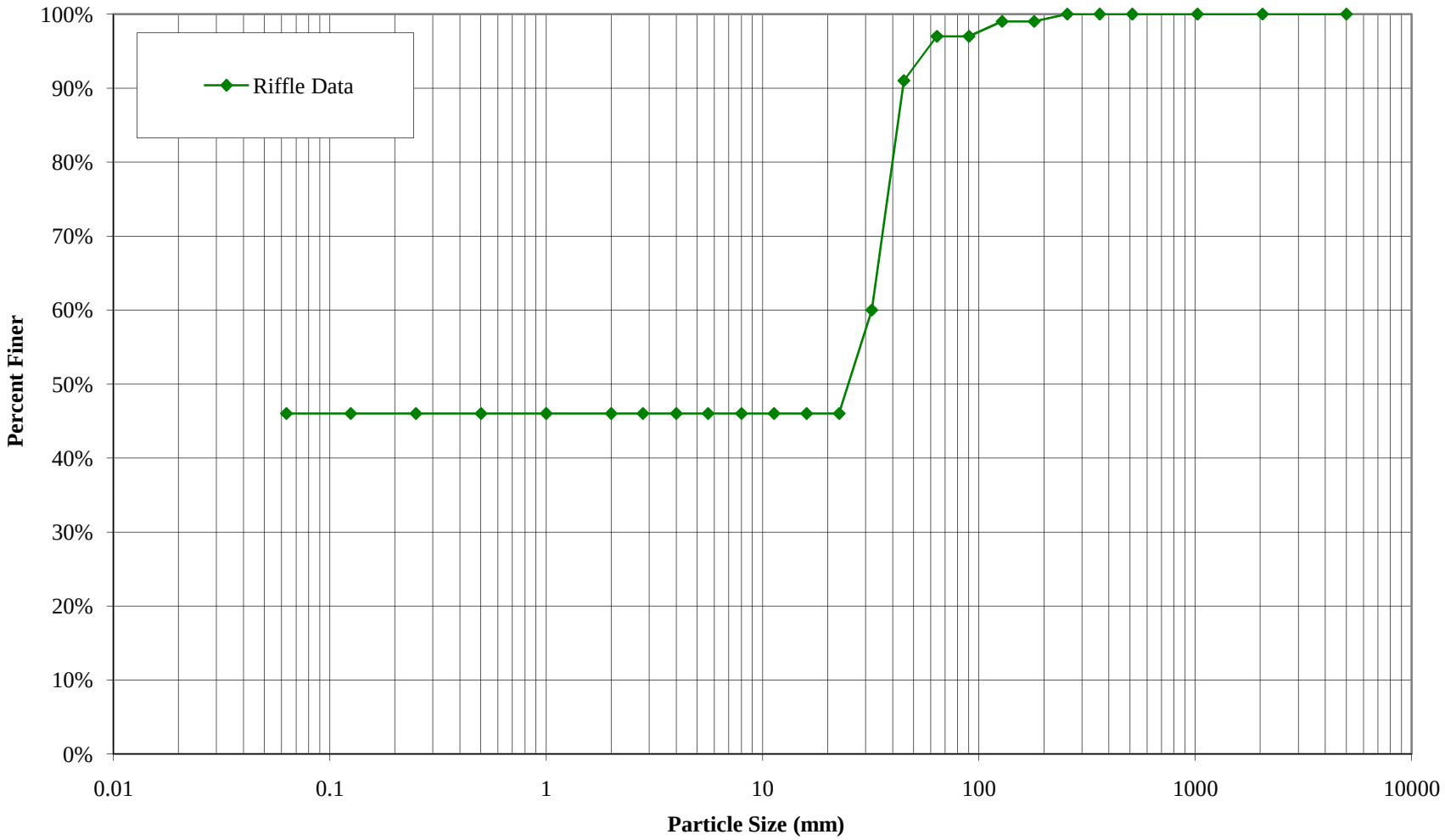
			PARTICLE CLASS COUNT	Summary		Distribution
MATERIAL	PARTICLE	SIZE (mm)	Riffle	Class %	% Cum	Plot Size (mm)
SILT/CLAY	Silt / Clay	< .063	46	46%	46%	0.063
SAND	Very Fine	.063 - .125			46%	0.125
	Fine	.125 - .25			46%	0.25
	Medium	.25 - .50			46%	0.50
	Coarse	.50 - 1.0			46%	1.0
	Very Coarse	1.0 - 2.0			46%	2.0
GRAVEL	Very Fine	2.0 - 2.8			46%	2.8
	Very Fine	2.8 - 4.0			46%	4.0
	Fine	4.0 - 5.6			46%	5.6
	Fine	5.6 - 8.0			46%	8.0
	Medium	8.0 - 11.0			46%	11.3
	Medium	11.0 - 16.0			46%	16.0
	Coarse	16.0 - 22.6			46%	22.6
	Coarse	22.6 - 32	14	14%	60%	32
	Very Coarse	32 - 45	31	31%	91%	45
	Very Coarse	45 - 64	6	6%	97%	64
COBBLE	Small	64 - 90			97%	90
	Small	90 - 128	2	2%	99%	128
	Large	128 - 180			99%	180
	Large	180 - 256	1	1%	100%	256
BOULDER	Small	256 - 362			100%	362
	Small	362 - 512			100%	512
	Medium	512 - 1024			100%	1024
	Large-Very Large	1024 - 2048			100%	2048
BEDROCK	Bedrock	> 2048			100%	5000
		Total	**100**	**100%**		

Largest particles: 250 mm **(riffle)**

UT2
X3-Riffle
Pebble Count Size Class Distribution



UT2
X3-Riffle
Pebble Count Particle Size Distribution



PEBBLE COUNT DATA SHEET: POOL 100-COUNT

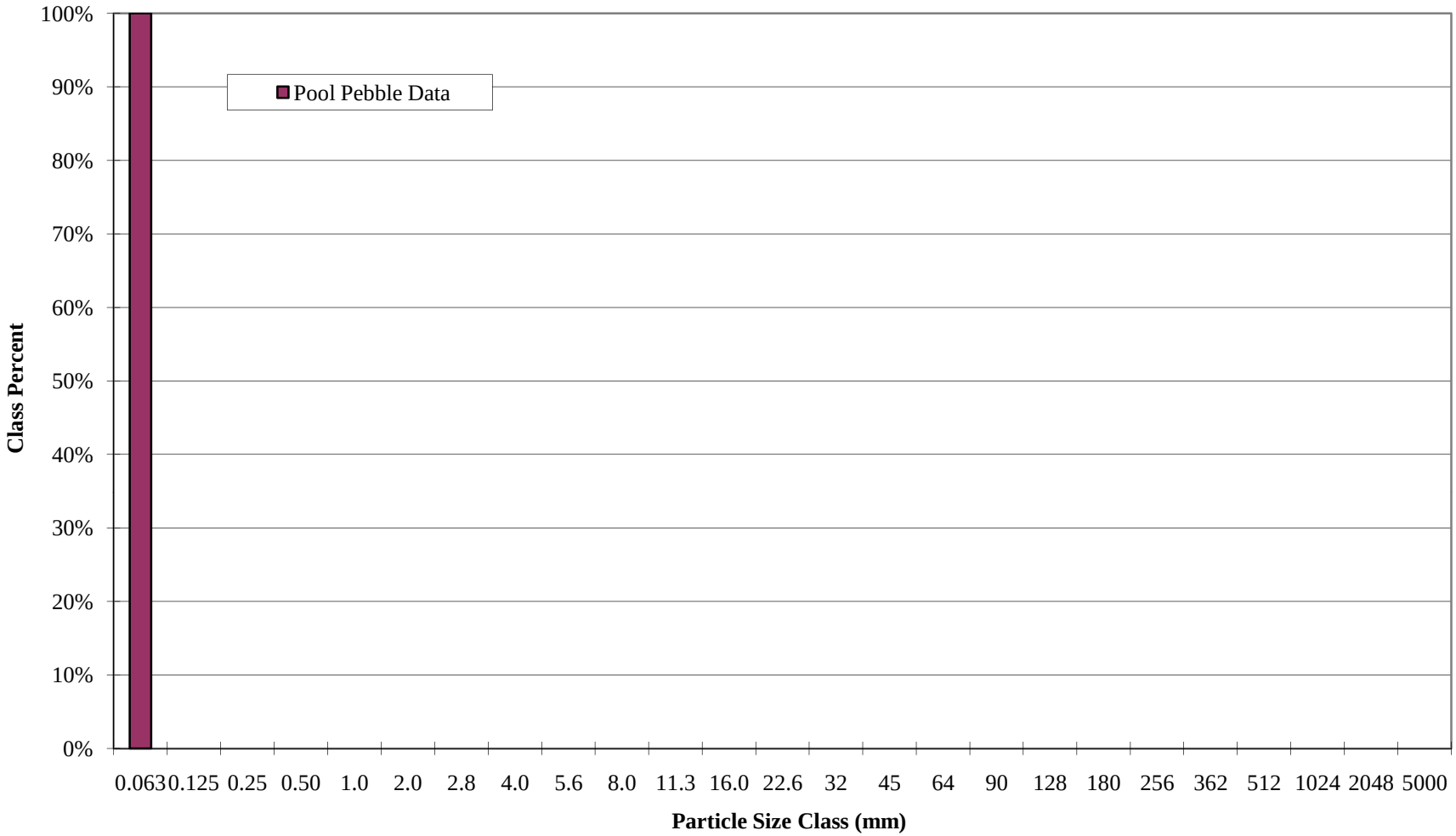
BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT2 X4-Pool
DATE COLLECTED:	9/1/2010
FIELD COLLECTION BY:	KS & CT
DATA ENTRY BY:	KS

			PARTICLE CLASS COUNT	Summary	
MATERIAL	PARTICLE	SIZE (mm)	Pool	Class %	% Cum
SILT/CLAY	Silt / Clay	< .063	100	100%	100%
SAND	Very Fine	.063 - .125			100%
	Fine	.125 - .25			100%
	Medium	.25 - .50			100%
	Coarse	.50 - 1.0			100%
	Very Coarse	1.0 - 2.0			100%
GRAVEL	Very Fine	2.0 - 2.8			100%
	Very Fine	2.8 - 4.0			100%
	Fine	4.0 - 5.6			100%
	Fine	5.6 - 8.0			100%
	Medium	8.0 - 11.0			100%
	Medium	11.0 - 16.0			100%
	Coarse	16.0 - 22.6			100%
	Coarse	22.6 - 32			100%
	Very Coarse	32 - 45			100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

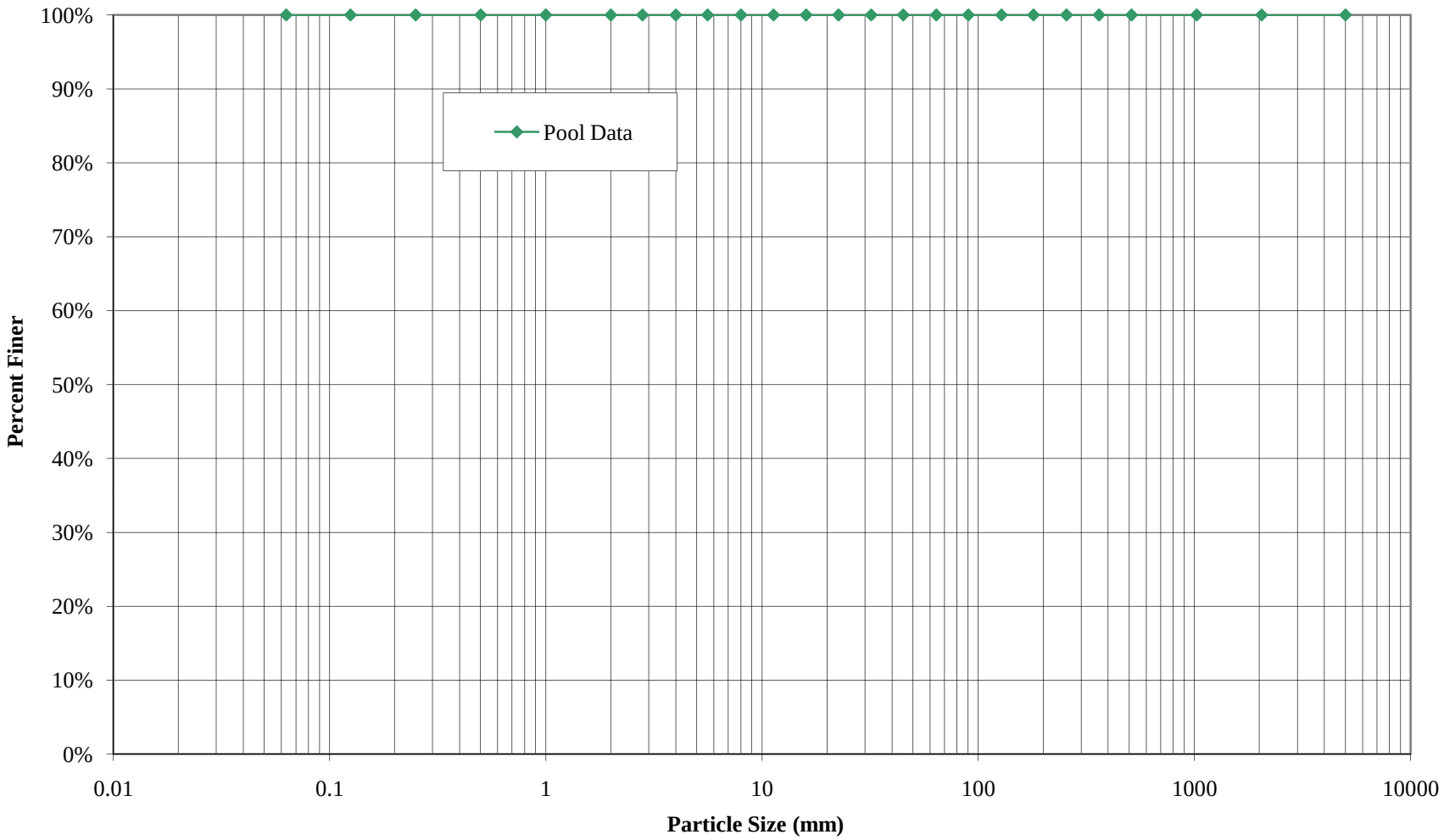
Largest particles: _____

(pool)

UT2
X4-Pool
Pebble Count Size Class Distribution



UT2
X4-Pool
Pebble Count Particle Size Distribution



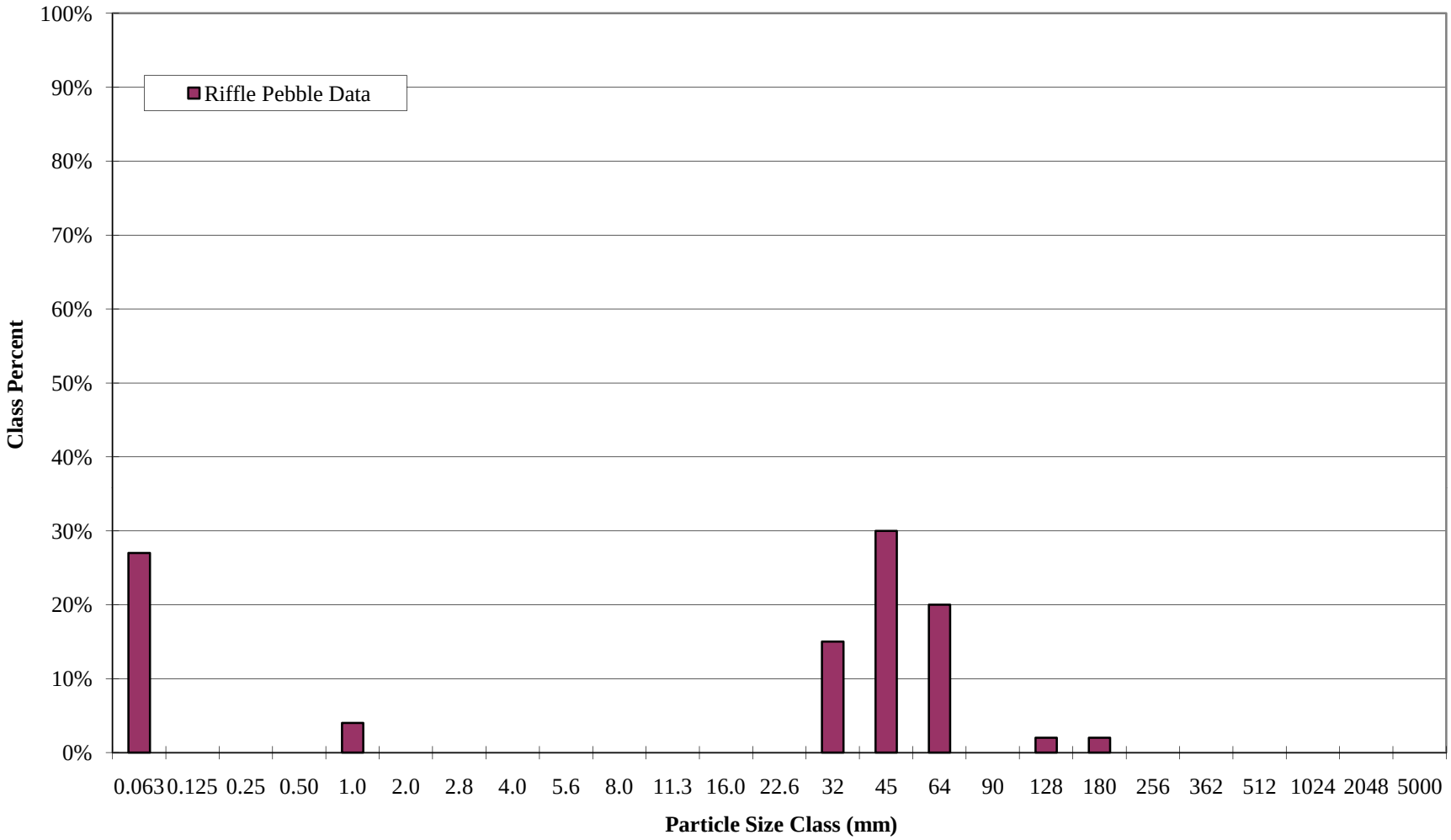
PEBBLE COUNT DATA SHEET: RIFFLE 100-COUNT

BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT2 X5-Riffle
DATE COLLECTED:	9/2/2010
FIELD COLLECTION BY:	PL & CT
DATA ENTRY BY:	KS

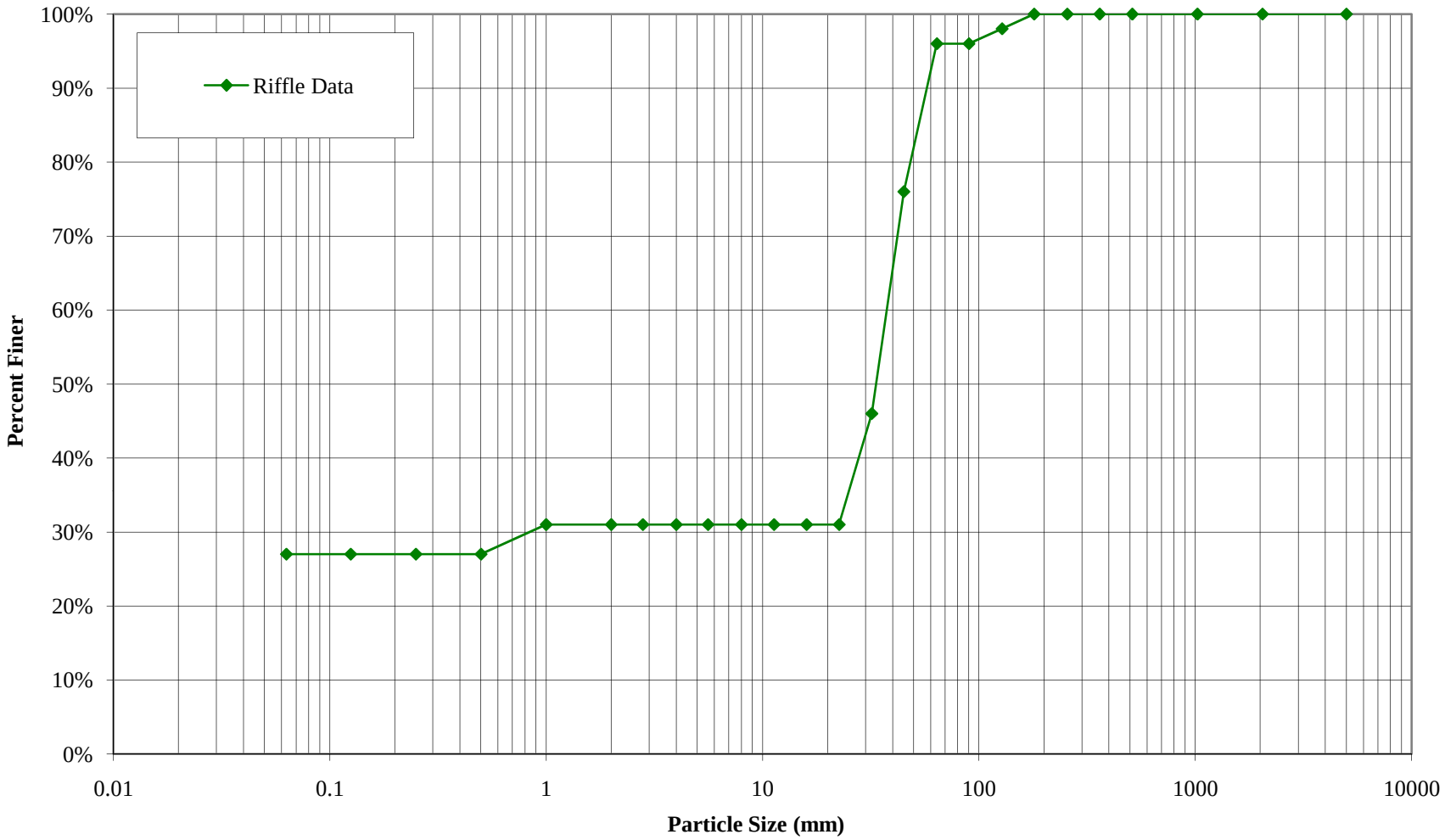
			PARTICLE CLASS COUNT	Summary	
MATERIAL	**PARTICLE**	**SIZE (mm)**	**Riffle**	**Class %**	**% Cum**
SILT/CLAY	Silt / Clay	< .063	27	27%	27%
SAND	Very Fine	.063 - .125			27%
	Fine	.125 - .25			27%
	Medium	.25 - .50			27%
	Coarse	.50 - 1.0	4	4%	31%
	Very Coarse	1.0 - 2.0			31%
GRAVEL	Very Fine	2.0 - 2.8			31%
	Very Fine	2.8 - 4.0			31%
	Fine	4.0 - 5.6			31%
	Fine	5.6 - 8.0			31%
	Medium	8.0 - 11.0			31%
	Medium	11.0 - 16.0			31%
	Coarse	16.0 - 22.6			31%
	Coarse	22.6 - 32	15	15%	46%
	Very Coarse	32 - 45	30	30%	76%
	Very Coarse	45 - 64	20	20%	96%
COBBLE	Small	64 - 90			96%
	Small	90 - 128	2	2%	98%
	Large	128 - 180	2	2%	100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

Largest particles: 140 mm **(riffle)**

UT2
X5-Riffle
Pebble Count Size Class Distribution



UT2
X5-Riffle
Pebble Count Particle Size Distribution



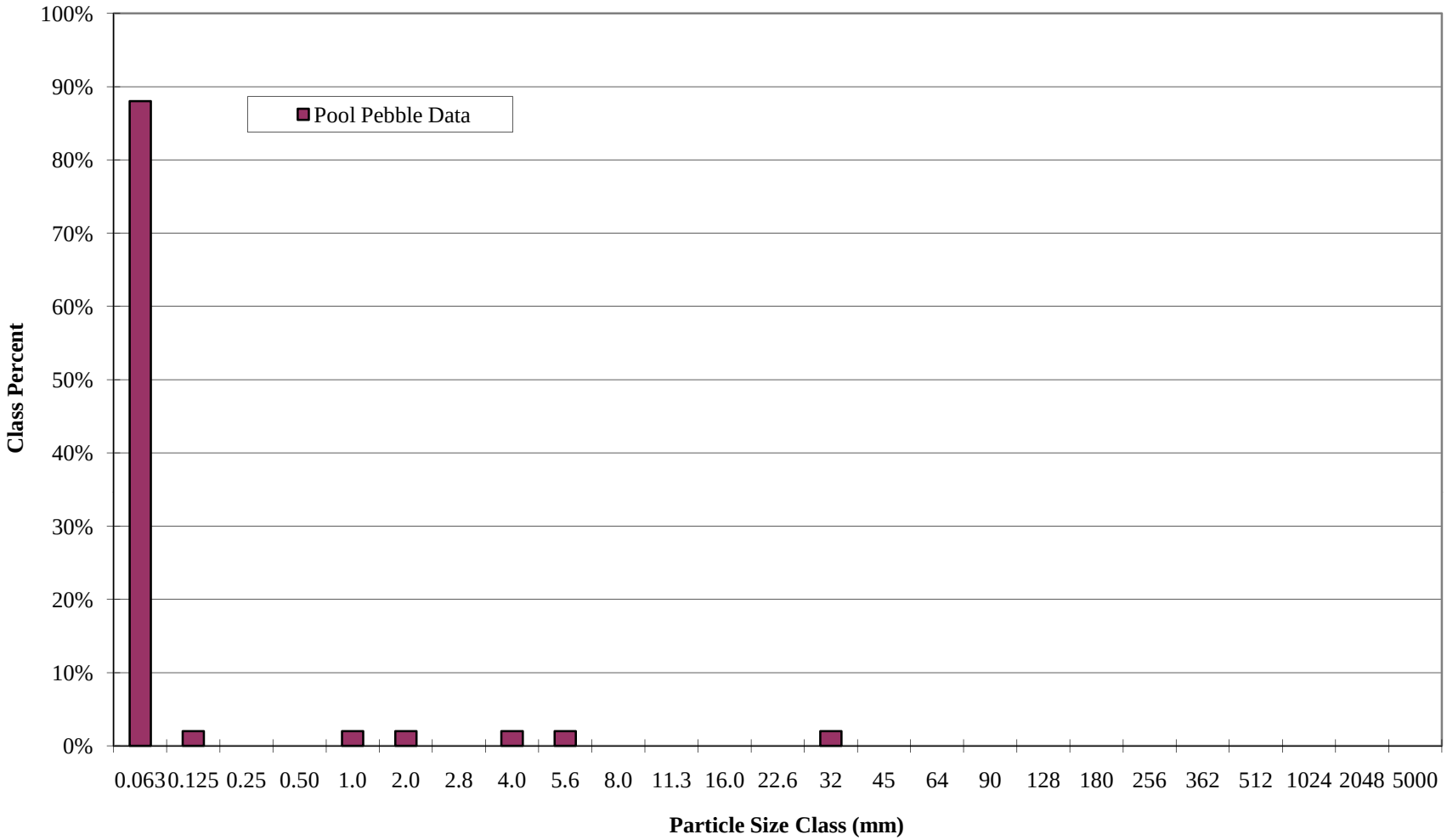
PEBBLE COUNT DATA SHEET: POOL 100-COUNT

BAKER PROJECT NO.	108528
SITE OR PROJECT:	Beaverdam Creek 4th Year Monitoring
REACH/LOCATION:	UT2 X6-Pool
DATE COLLECTED:	9/2/2010
FIELD COLLECTION BY:	PL & CT
DATA ENTRY BY:	KS

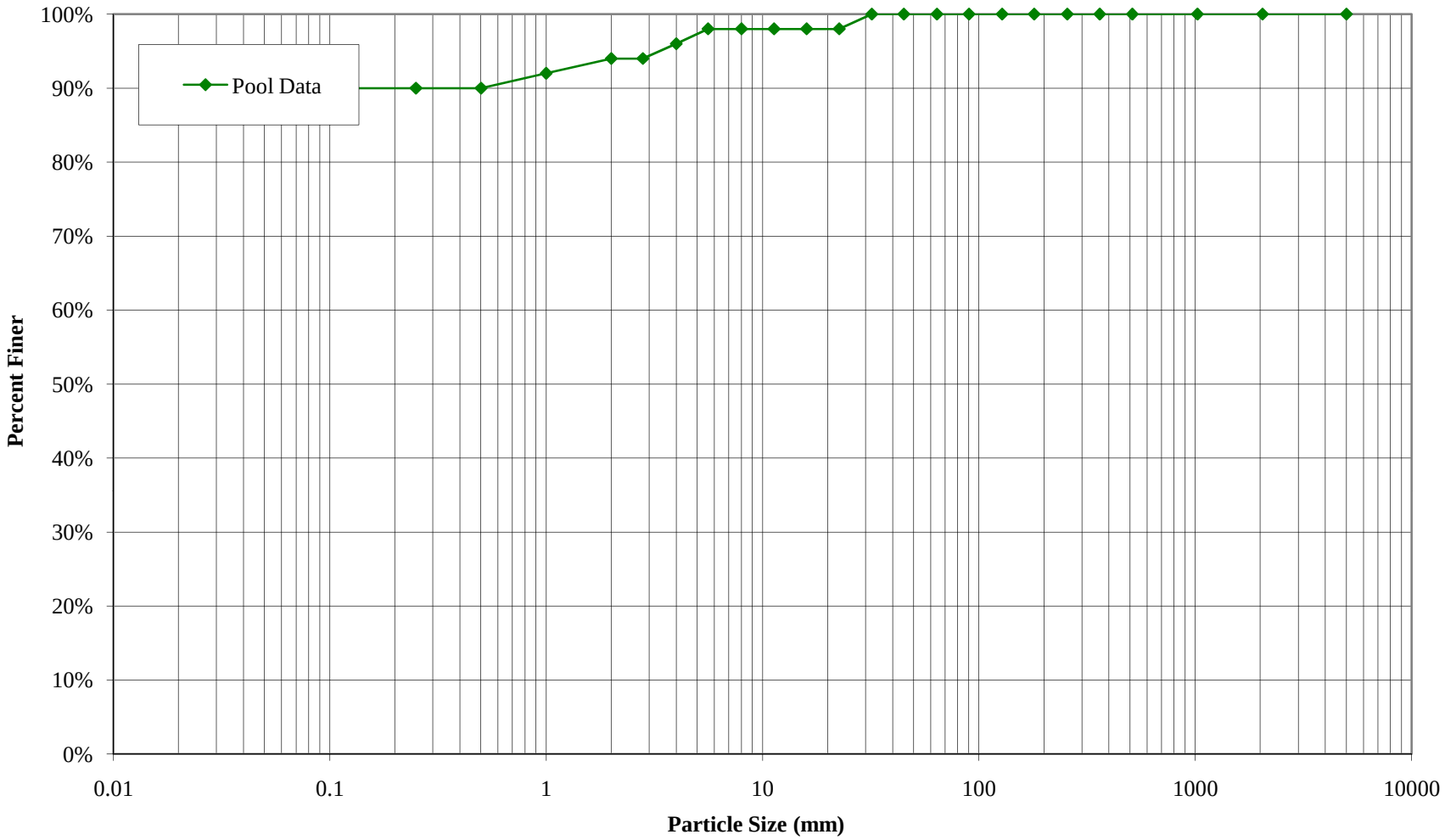
			PARTICLE CLASS COUNT	Summary	
MATERIAL	**PARTICLE**	**SIZE (mm)**	**Pool**	**Class %**	**% Cum**
SILT/CLAY	Silt / Clay	< .063	88	88%	88%
SAND	Very Fine	.063 - .125	2	2%	90%
	Fine	.125 - .25			90%
	Medium	.25 - .50			90%
	Coarse	.50 - 1.0	2	2%	92%
	Very Coarse	1.0 - 2.0	2	2%	94%
GRAVEL	Very Fine	2.0 - 2.8			94%
	Very Fine	2.8 - 4.0	2	2%	96%
	Fine	4.0 - 5.6	2	2%	98%
	Fine	5.6 - 8.0			98%
	Medium	8.0 - 11.0			98%
	Medium	11.0 - 16.0			98%
	Coarse	16.0 - 22.6			98%
	Coarse	22.6 - 32	2	2%	100%
	Very Coarse	32 - 45			100%
	Very Coarse	45 - 64			100%
COBBLE	Small	64 - 90			100%
	Small	90 - 128			100%
	Large	128 - 180			100%
	Large	180 - 256			100%
BOULDER	Small	256 - 362			100%
	Small	362 - 512			100%
	Medium	512 - 1024			100%
	Large-Very Large	1024 - 2048			100%
BEDROCK	Bedrock	> 2048			100%
		Total	**100**	**100%**	

Largest particles: ____ **(pool)**

UT2
X6-Pool
Pebble Count Size Class Distribution



UT2
X6-Pool
Pebble Count Particle Size Distribution



APPENDIX C

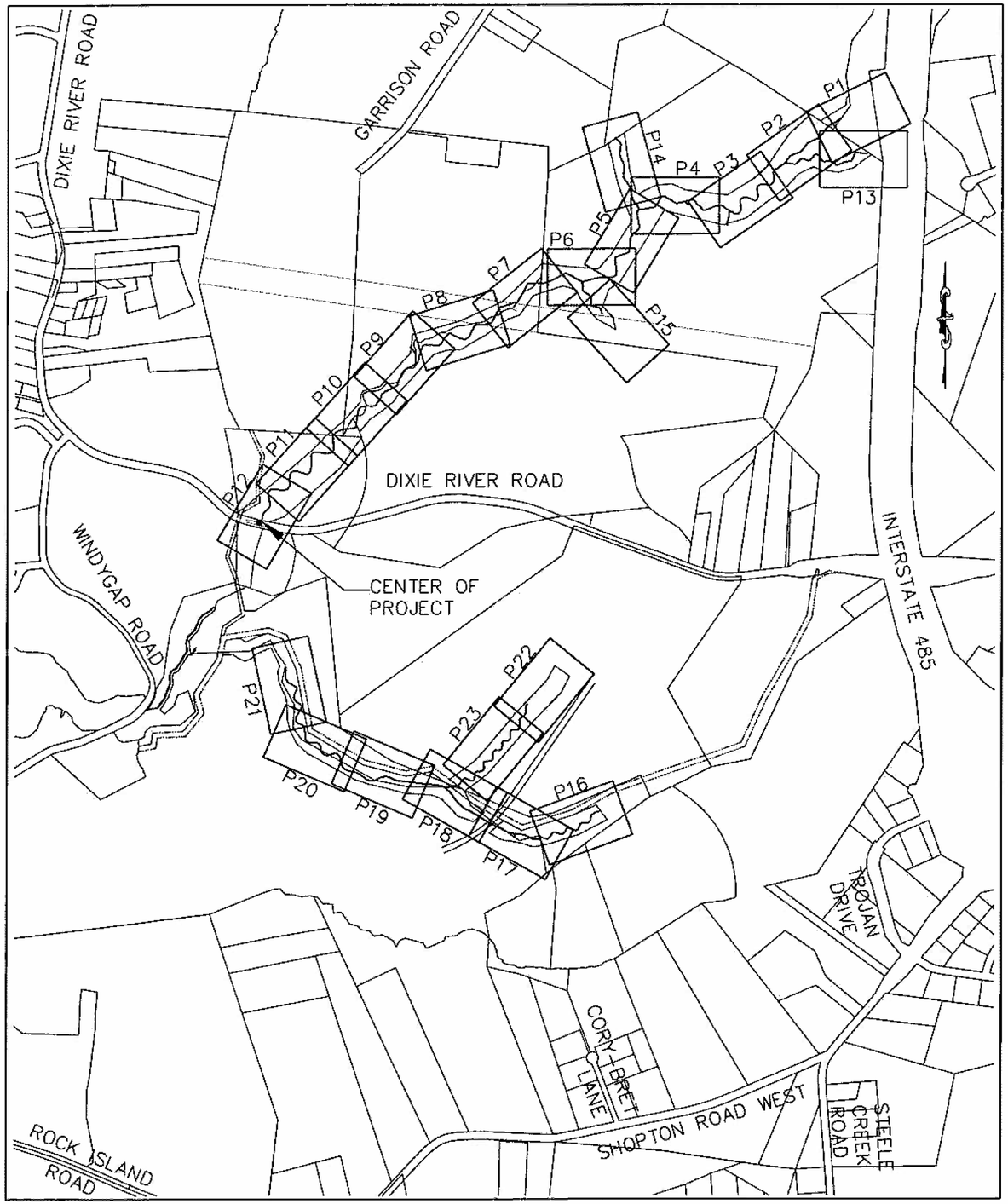
AS-BUILT PLAN SHEETS

PROJECT REFERENCE NO.	SHEET NO.
108528	T1

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

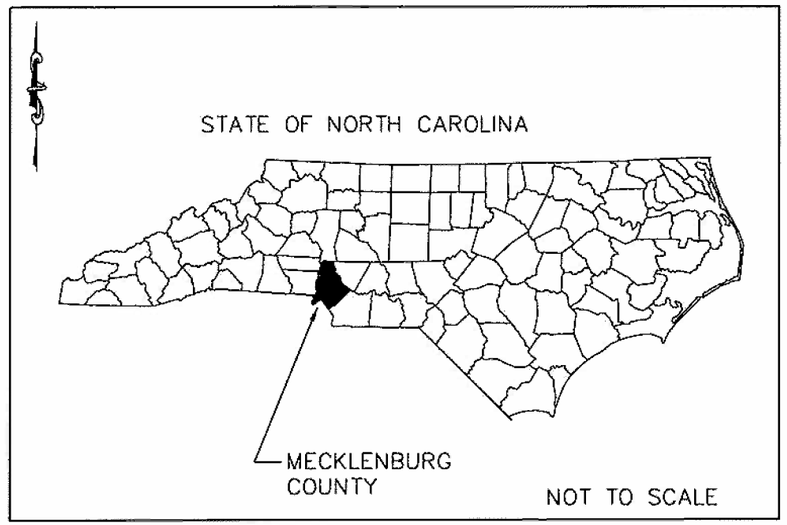
Baker
Baker Engineering NY, Inc.
5447 South Tryon Street
Suite 200
Charlotte, NC 28209
Phone: 704.334.4454
Fax: 704 334.4492

BEAVERDAM CREEK STREAM RESTORATION AS-BUILT PLANS



VICINITY MAP

500 0 500 1000
SCALE (FT)



INDEX OF SHEETS

CENTER OF PROJECT:
LAT: 35–10–21.7
LONG: 80–59–08.5

UT1
PRE-PROJECT STREAM LENGTH = 8,148 LF
AS-BUILT STREAM RESTORATION LENGTH = 8,617 LF

UT2
PRE-PROJECT STREAM LENGTH = 4,016 LF
AS-BUILT STREAM RESTORATION LENGTH = 4,377 LF
PRESERVATION LENGTH = 962 LF

BEAVERDAM CREEK
PRESERVATION LENGTH = 1,641 LF

BEAVERDAM CREEK
AS-BUILT WITH BMPS

TITLE SHEET

PROJECT REFERENCE NO.	SHEET NO.
108528	T2

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

Baker

CONVENTIONAL SYMBOLS

- 10+00 — AS-BUILT THALWEG
- 10+00 — DESIGN THALWEG
- 600 — EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- E — CONSERVATION EASEMENT
- PROPERTY LINE
- CONSTRUCTED RIFFLE
- EXISTING TREE
- LOG SILL
- LOG VANE
- FLOW DIRECTION
- ROCK CROSS VANE
- BOULDER CLUSTER
- PHOTO ID POINT
- SURVEY CONTROL POINT
- ROOT WAD
- ROCK VANE

BEAVERDAM CREEK
AS-BUILT WITH BMPS

LEGEND

PROJECT REFERENCE NO.	SHEET NO.
108528	R1

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

Baker
Baker Engineering NY, Inc.
1611 South Tryon Street
Suite 201
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4459

P13
P2
P3
P1
P4
P5
P15
P6
P7
P14
FLOW
FLOW
FLOW
UT1B
UT1C
200' DUKE POWER EASEMENT
10+00
17+78
16+24
13+38
31+64
40+64
15+67
UT1 REACH 1
UT1 REACH 2
UT1 REACH 3
UT1 REACH 4

BEAVERDAM CREEK – UT1

100 0 100 200
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

REFERENCE SHEET

L:\Projects\0269C\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	R2

PROJECT ENGINEER
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DATE
10/11/2007

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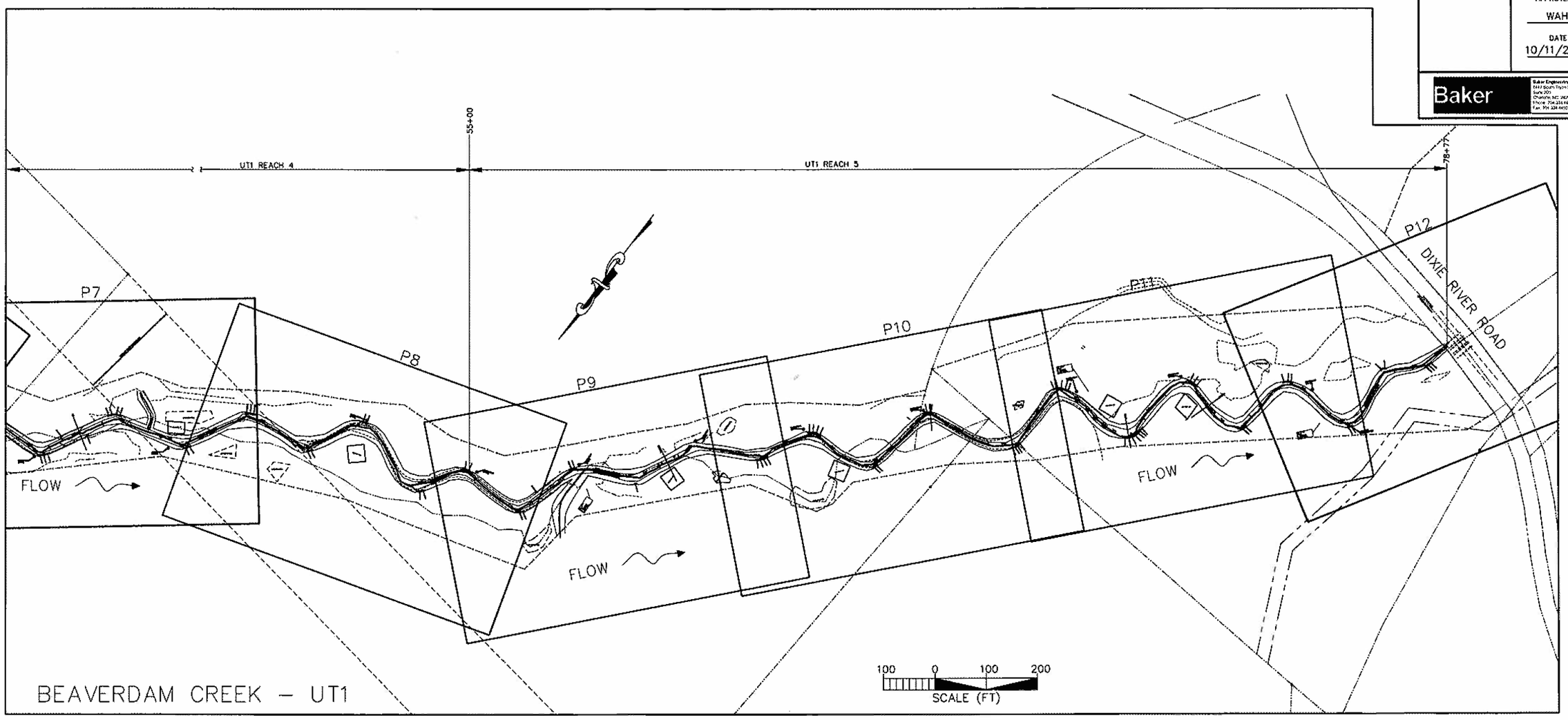

BEAVERDAM CREEK
AS-BUILT WITH BMPS

REFERENCE SHEET

PROJECT REFERENCE NO.	SHEET NO.
108528	R3

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

Baker
Baker Engineering NY, Inc.
7647 South Tryon Street
Suite 210
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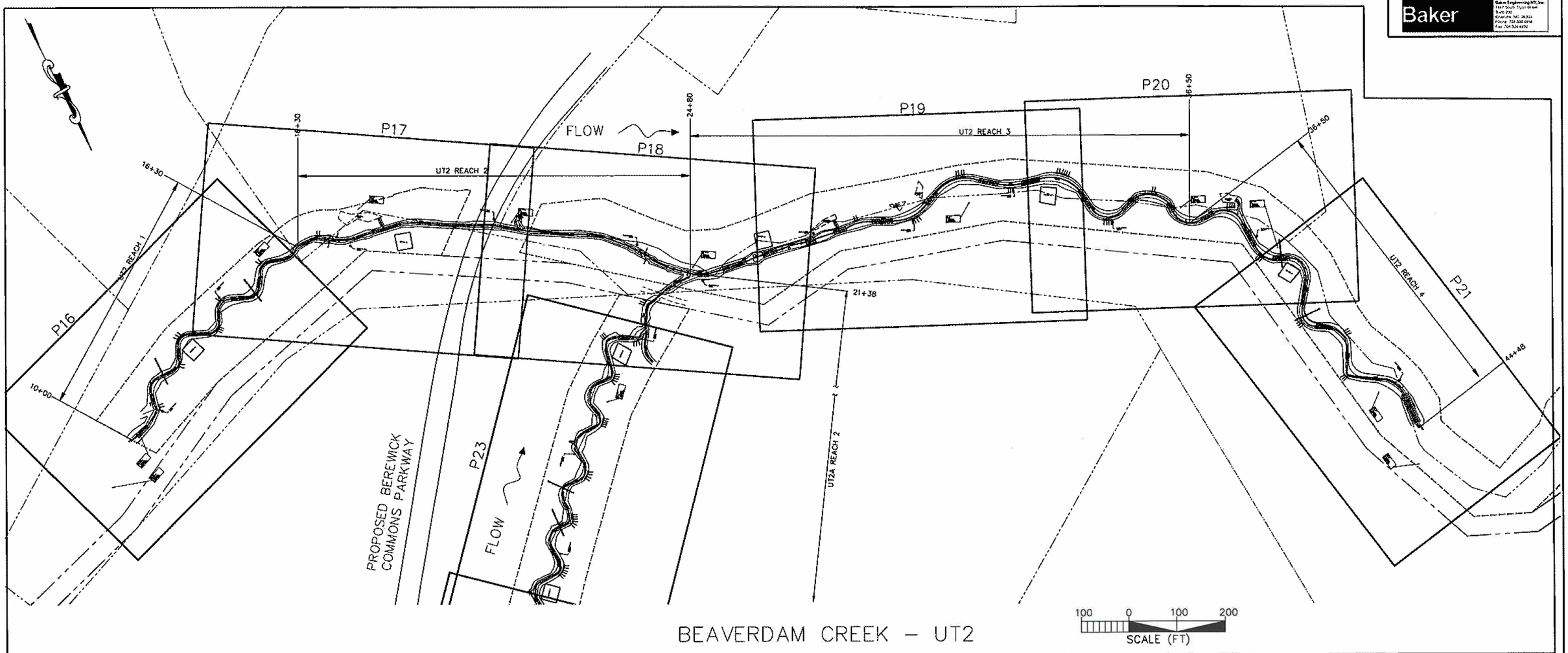
Fax: 704.525.4455



BEAVERDAM CREEK – UT2

BEAVERDAM CREEK
AS-BUILT WITH BMPS

REFERENCE SHEET

L:\Projects\0269C\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	R4

PROJECT ENGINEER
KLT
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WAH
DATE
10/11/2007

Baker
Baker Engineering NY, Inc.
1441 South Tryon Street
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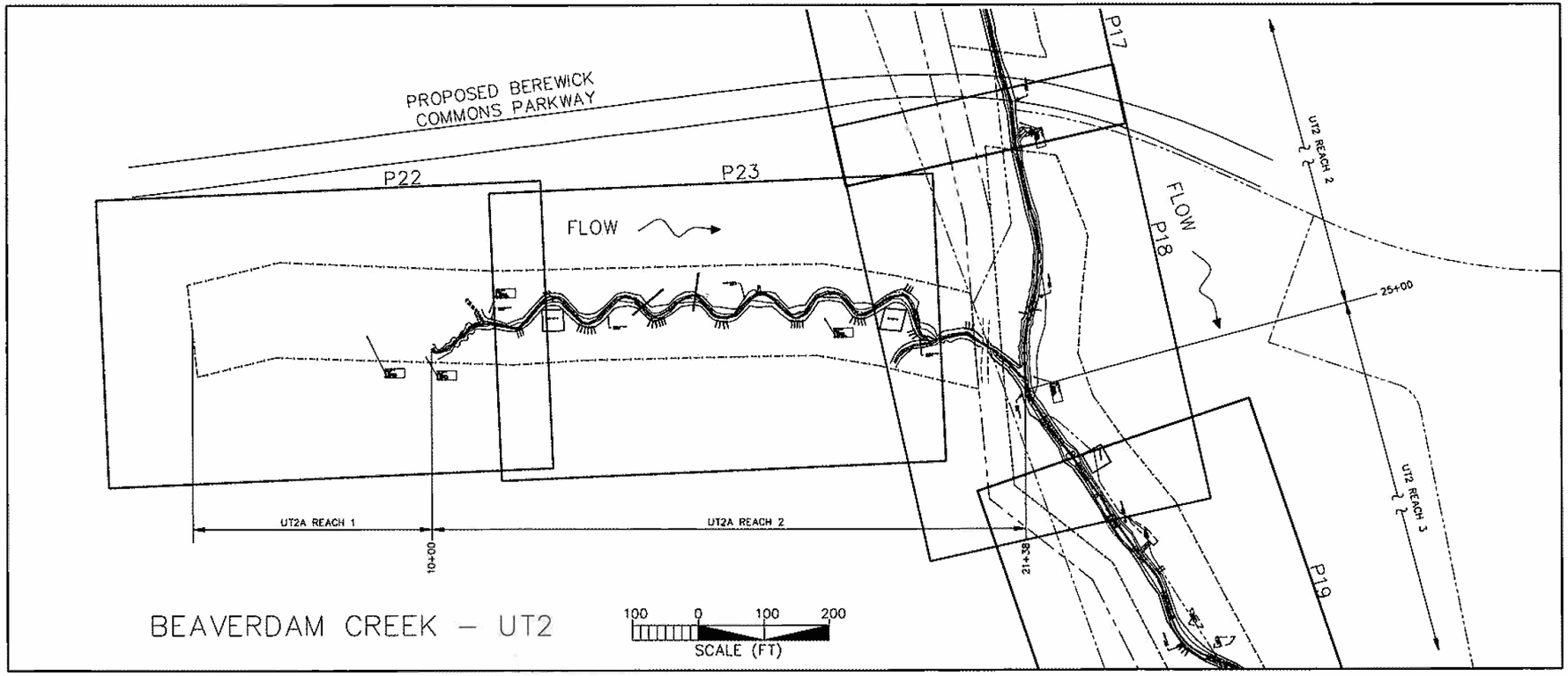
Phone: 704.334.4454
Fax: 704.334.4332



BEAVERDAM CREEK – UT2

BEAVERDAM CREEK
AS-BUILT WITH BMPS

REFERENCE SHEET

L:\Projects\02639C\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P1

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

Baker

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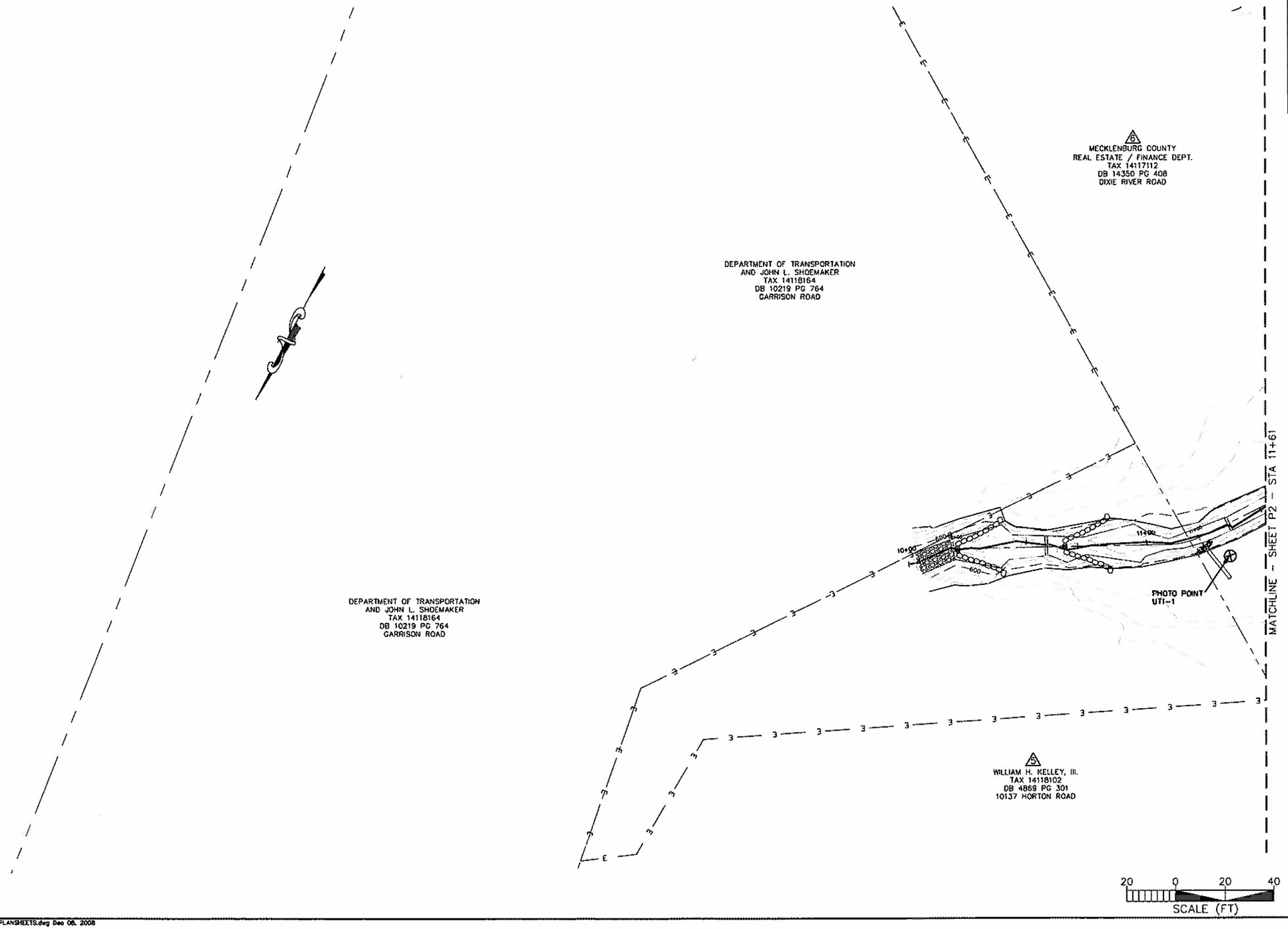
Fax: 704.334.4402



BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1 SITE PLAN

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PROJECT REFERENCE NO.	SHEET NO.
108528	P2

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MATCHLINE – SHEET P13 – STA 14+58

MATCHLINE – SHEET P1 – STA 11+61

MATCHLINE – SHEET P3 – STA 17+78

PHOTO POINT UT1B-2

PHOTO POINT UT1B-1

X4 RIFFLE

BCP #3314
REBAR
N 526512.23
E 1410924.41
ELEV.= 601.58

VEG. PLOT #1

VEG. PLOT #2

PHOTO POINT UT1-2

X1 POOL

PHOTO POINT UT1-3

X2 RIFFLE

6
MECKLENBURG COUNTY
REAL ESTATE / FINANCE DEPT.
TAX 14117112
DB 14350 PG 408
DIXIE RIVER ROAD

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1/UT1-B SITE PLAN

L:\Projects\02592C\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P3

PROJECT ENGINEER
KLT
APPROVED BY
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DATE
10/11/2007

Baker

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Charlotte, NC 28203
Phone: 704.334.4551
Fax: 704.334.4990

MATCHLINE - SHEET P2 - STA 17+78

PHOTO POINT UT1-4

XS RIFFLE

PHOTO POINT UT1-5

XS POOL

PHOTO POINT UT1-6

BCP #2699
REBAR
N 526194.98
E 1410385.07
ELEV = 597.30

EPHEMERAL POOL

EPHEMERAL POOL

VEG PLOT #4

EPHEMERAL POOL

BCP #2510
REBAR
N 526071.80
E 1410157.66
ELEV = 596.32

PHOTO POINT UT1-7

PHOTO POINT UT1-8

MATCHLINE - SHEET P4

MATCHLINE - SHEET P4 - STA 26+81

6
MECKLENBURG COUNTY
REAL ESTATE / FINANCE DEPT.
TAX 14117112
DB 14350 PG 408
DIXIE RIVER ROAD

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1 SITE PLAN

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PROJECT REFERENCE NO.	SHEET NO.
108528	P4

PROJECT ENGINEER
KLT
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DATE
10/11/2007

Baker

Baker Engineering NY, Inc.
1441 South Tryon Street
Suite 700
Charlotte, NC 28203
Phone: 704.344.4000
Fax: 704.344.4099

MATCHLINE - SHEET P5 - STA 31+14

MECKLENBURG COUNTY
REAL ESTATE / FINANCE DEPT.
TAX 14117712
DB 14350 PG 408
DIXIE RIVER ROAD

EPHEMERAL POOL

VEG PLOT #5

VEG PLOT #6

EPHEMERAL POOL

EPHEMERAL POOL

595

600

595

28+00

29+00

27+00

REBAR
N 535,230.94
E 1,409,824.61
ELEV = 593.85

MATCHLINE - SHEET P3 - STA 26+81

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1 SITE PLAN

PROJECT REFERENCE NO.	SHEET NO.
108528	P5

PROJECT ENGINEER
KLT
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DATE
10/11/2007

Baker

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1447 South Tryon Street
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Fax: 704.334.4492

MECKLENBURG COUNTY
REAL ESTATE / FINANCE DEPT.
TAX 14117112
DB 14350 PG 408
DIXIE RIVER ROAD

MATCHLINE - SHEET P4 - STA 31+14

MATCHLINE - SHEET P14- STA 15+25

MATCHLINE - SHEET P6 - STA 37+60

PHOTO POINT UT1-9

PHOTO POINT UT1-10

PHOTO POINT UT1-11

EPHEMERAL POOL

EPHEMERAL POOL

VEG. PLOT #7

X9 RIFFLE

X10 POOL

595

590

585

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1/UT1-C SITE PLAN

L:\Projects\02891C\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P6

PROJECT ENGINEER
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DATE
10/11/2007

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MATCHLINE – SHEET P15 – STA 12+16

MECKLENBURG COUNTY
REAL ESTATE / FINANCE DEPT.
TAX 1411711
DB 14350 PG 408
DIXIE RIVER ROAD

PHOTO POINT
UT10-10

PHOTO POINT
UT1-12

VEG PLOT #8

EPHEMERAL POOL

MATCHLINE – SHEET P5 – STA 37+60

MATCHLINE – SHEET P7 – STA 42+98

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1/UT1-D SITE PLAN

L:\Projects\02690\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P7

PROJECT ENGINEER
KLT
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DATE
10/11/2007

Baker

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1441 South Tryon Street
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Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.374.5492

MECKLENBURG COUNTY
REAL ESTATE / FINANCE DEPT.
TAX 14117112
DB 14350 PG 408
DIXIE RIVER ROAD

MECKLENBURG COUNTY
REAL ESTATE / FINANCE DEPT.
TAX 1411711
DB 14350 PG 402
DIXIE RIVER ROAD

200' DUKE POWER RIGHT-OF-WAY

MATCHLINE - SHEET P6 - STA 42+98

MATCHLINE - SHEET P8 - STA 49+32

EPHEMERAL POOL

EPHEMERAL POOL

VEG PLOT #9

EPHEMERAL POOL

PHOTO POINT
UT1-13

PHOTO POINT
UT1-14

WILLIAM A. SHAW JR.
TAX 14129103
DB 1766 PG 186
ADDRESS

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1 SITE PLAN

20 0 20 40
SCALE (FT)

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PROJECT REFERENCE NO.	SHEET NO.
108528	P8

PROJECT ENGINEER
KLT
APPROVED BY
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DATE
10/11/2007

Baker

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Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4192

MECKLENBURG COUNTY
REAL ESTATE / FINANCE DEPT.
TAX 14117111
DB 14350 PG 402
DIXIE RIVER ROAD

PHOTO POINT
UT1-15

PHOTO POINT
UT1-16

VEG PLOT #10

EPHEMERAL POOL

WILLIAM A. SHAW JR.
TAX 14129103
DB 1766 PG 186
ADDRESS

MATCHLINE - SHEET P7 - STA 49+32

MATCHLINE - SHEET P9 - STA 55+92

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1 SITE PLAN

L:\Projects\026RC\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 09, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P9

PROJECT ENGINEER
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APPROVED BY
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DATE
10/11/2007

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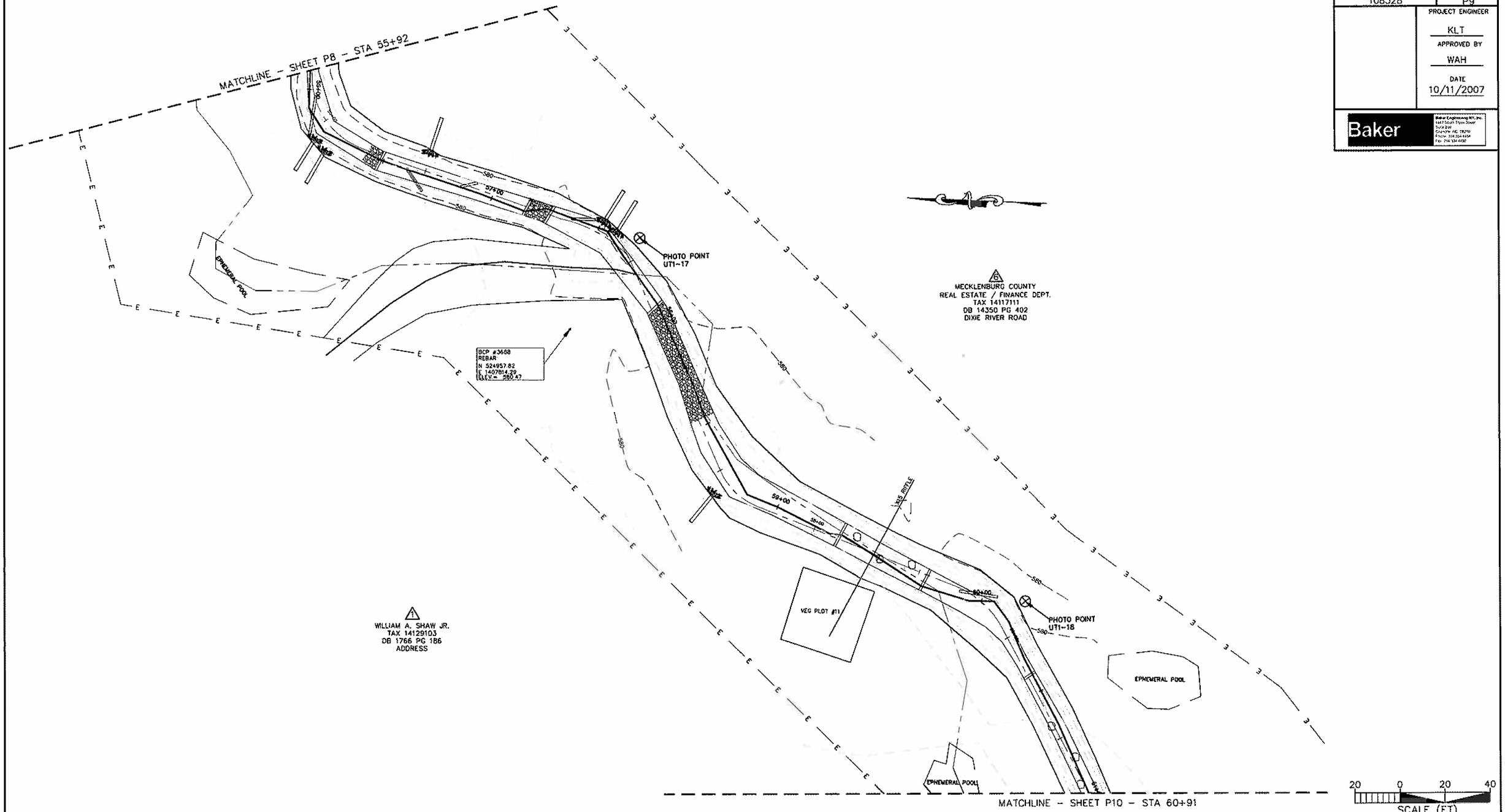
MATCHLINE - SHEET P8 - STA 55+92



20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1 SITE PLAN

L:\Projects\02690\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P10

PROJECT ENGINEER
KLT
APPROVED BY
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DATE
10/11/2007

Baker

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Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4183

MECKLENBURG COUNTY
REAL ESTATE / FINANCE DEPT.
TAX 14117111
DB 14350 PG 402
DIXIE RIVER ROAD

DIXIE RIVER LAND
COMPANY LLC AND
PAPPAS PROPERTIES LLC
TAX 14117106
DB 13089 PG 911
DIXIE RIVER ROAD

DIXIE RIVER LAND
COMPANY LLC AND
PAPPAS PROPERTIES LLC
TAX 14117101
DB 12722 PG 642
DIXIE RIVER ROAD

BURRIS HOLDING LLC
TAX 14129105
DB 12002 PG 826
10827 GARRISON ROAD

MATCHLINE - SHEET P9 - STA 60+91

MATCHLINE - SHEET P11 - STA 67+35

PHOTO POINT
UT1-18

PHOTO POINT
UT1-20

EPHEMERAL POOL

EPHEMERAL POOL

VEG PLOT #12

60+00

61+00

62+00

63+00

64+00

65+00

66+00

67+00

SCALE (FT)
20 0 20 40

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1 SITE PLAN

L:\Projects\0269C\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 06, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P11

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

Baker

Baker Engineering NY, Inc.
1447 South Tryon Street
Suite 700
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4492

MATCHLINE - SHEET P10 - STA 67+35

MATCHLINE - SHEET P12 - STA 76+10

DIXIE RIVER LAND COMPANY LLC AND PAPPAS PROPERTIES LLC
TAX 14117101
DB 12722 PG 642
DIXIE RIVER ROAD

BURRIS HOLDING LLC
TAX 14129105
DB 12002 PG 826
10827 GARRISON ROAD

BCP #3989
REBAR
N 524210.95
E 1407152.58
ELEV= 575.93

BCP #4490
REBAR
N 523987.43
E 1406755.96
ELEV= 573.78

PHOTO POINT UT1-21

PHOTO POINT UT1-22

PHOTO POINT UT1-23

EPHEMERAL POOL

EPHEMERAL POOL

VEG PLOT #13

VEG PLOT #14

X18 RIFFLE

67+00

68+00

69+00

70+00

71+00

72+00

73+00

74+00

75+00

76+00

575

580

585

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1 SITE PLAN

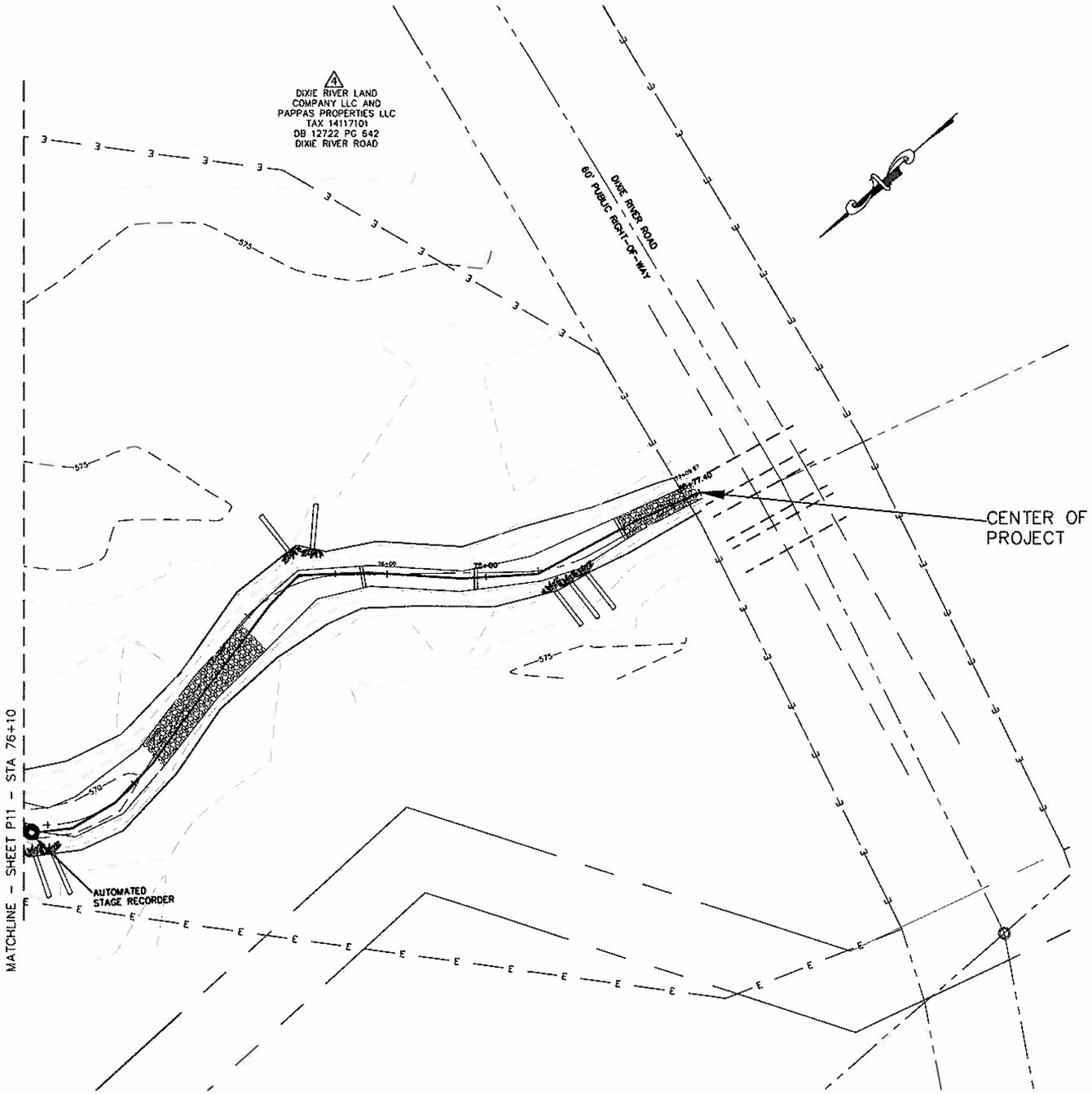
L:\Projects\028BC\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 06, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P12

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

Baker

Baker Engineering NY, Inc.
1447 South Tryon Street
Suite 700
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4630



20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1 SITE PLAN

L:\Projects\0269C\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P13

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

Baker

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Fax: 704.334.4490

MECKLENBURG COUNTY
REAL ESTATE / FINANCE DEPT.
TAX 14117112
DB 14350 PG 408
DIXIE RIVER ROAD

DEPARTMENT OF TRANSPORTATION
AND JOHN L. SHOEMAKER
TAX 14118164
DB 10219 PG 764
GARRISON ROAD

PHOTO POINT
UT1B-5

PHOTO POINT
UT1B-4

PHOTO POINT
UT1B-3

VEG PLOT #15

MATCHLINE - SHEET P2 - STA 14+58

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1-B SITE PLAN

L:\Projects\0269C\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P14

PROJECT ENGINEER
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DATE
10/11/2007

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MECKLENBURG COUNTY
REAL ESTATE / FINANCE DEPT.
TAX 14117112
DB 14350 PG 408
DIXIE RIVER ROAD

DWIGHT LEDWELL PHILLIPS
AND WACHOVIA BANK, NA.
TAX 14118101
DB 4727 PG 033
GARRISON ROAD

BCP #2113
DOC 10111
N 526357.66
E 1409463.96
ELEV.= 594.78

PHOTO POINT
UT1C-9

PHOTO POINT
UT1C-8

PHOTO POINT
UT1C-7

PHOTO POINT
UT1C-6

VEG PLOT #16

47 RIPTLE

MATCHLINE - SHEET P5 - STA 15+25

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1-C SITE PLAN

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PROJECT REFERENCE NO.	SHEET NO.
108528	P15

PROJECT ENGINEER
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DATE
10/11/2007

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200' DUKE POWER RIGHT-OF-WAY

MECKLENBURG COUNTY
REAL ESTATE / FINANCE DEPT.
TAX 14117112
DB 14350 PG 408
DIXIE RIVER ROAD

VEG PLOT #17

PHOTO POINT
UT1D-11

PHOTO POINT
UT1D-12

10+00

12+00

15+00

MATCHLINE - SHEET P6 - STA 12+20

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT1-D SITE PLAN

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PROJECT REFERENCE NO.	SHEET NO.
108528	P16

PROJECT ENGINEER
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APPROVED BY
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DATE
10/11/2007

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Charlotte, NC 28203
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Fax: 704 334 4882

WATERS CONSTRUCTION COMPANY, INC.
TAX 19924137
DB 12943 PG 842
DIXIE RIVER ROAD

WATERS CONSTRUCTION COMPANY, INC.
TAX 19925107
DB 12629 PG 885
WINDY GAP ROAD

PHOTO ID POINT
UT2-2

BCP #19
REBAR
N 521216.13
E 1408829.30
ELEV.= 819.10

XS-UT2-RIFFLE

XS-UT2-POOL

VEG PLOT #3

PHOTO ID POINT
UT2-1

BCP #22
REBAR/CAP
N 521473.02
E 1409237.43
ELEV.= 824.56

BCP #2
REBAR/CAP
N 521547.53
E 1409385.66
ELEV.= 829.71

40' CMU SANITARY SEWER EASEMENT

MATCHLINE - SHEET P17 - STA 16+32

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT2 SITE PLAN

L:\Projects\02898\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P17

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

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1447 South Tryon Street
Suite 205
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4882

DIXIE RIVER LAND COMPANY
AND PAPPAS PROPERTIES, LLC.
TAX 19925114
DB 13089 PG 911
GLENBURN LANE

DCP #16
REBAR
N 521241.18
E 1486540.84
ELEV = 617.67

EPHEMERAL POOL

PHOTO ID POINT
UT2-4

PHOTO ID POINT
UT2-3

VEG PLOT #4

WATERS CONSTRUCTION COMPANY, INC.
TAX 19925107
DB 12629 PG 886
WINDY GAP ROAD

40' CMU SANITARY SEWER EASEMENT

MATCHLINE - SHEET P16 - STA 16+32

MATCHLINE - SHEET P18 - STA 20+93

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT2 SITE PLAN

20 0 20 40
SCALE (FT)

L:\Projects\0269C\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P18

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

Baker

BELLASERA BEREWICK, LLC.
c/o THOMAS A SAIEED JR.
TAX 19925111
DB 18271 PG 145
WINDY GAP ROAD

DIXIE RIVER LAND COMPANY
AND PAPPAS PROPERTIES, LLC.
TAX 19925114
DB 13089 PG 911
PHOTO ID POINT UT2-5
RAVENBUEN LANE

WATERS CONSTRUCTION COMPANY, INC.
TAX 19925107
DB 12629 PG 886
WINDY GAP ROAD

WATERS CONSTRUCTION COMPANY, INC.
TAX 19925103
DB 12629 PG 902
DIXIE RIVER ROAD

BCP #1496
NAIL
N 521401.00
E 1408370.10
ELEV.= 809.83

BCP #1322
NAIL
N 521645.54
E 1408067.21
ELEV.= 802.77

EPHEMERAL POOL

VEG PLOT #5

PHOTO ID POINT UT2-3

PHOTO ID POINT UT2-6

40' CMU SANITARY SEWER EASEMENT

MATCHLINE - SHEET P17 - STA 20+93

MATCHLINE - SHEET P19 - STA 27+45

MATCHLINE - SHEET P23 - STA 19+72

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT2/UT2-A
SITE PLAN

L:\Projects\02890\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 06, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P19

PROJECT ENGINEER
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Baker

BELLASERA BEREWICK, LLC.
c/o THOMAS A SAIEED JR.
TAX 19925111
DB 18271 PG 145
WINDY GAP ROAD

EPHEMERAL POOL

EPHEMERAL POOL

EPHEMERAL POOL

PHOTO ID POINT UT2-8

PHOTO ID POINT UT2-9

VEG PLOT #6

BCP #10
REBAR
N 521757.32
E 1407469.66
ELEV = 993.05

40' CMU SANITARY SEWER EASEMENT

MATCHLINE - SHEET P18 - STA 27+45

MATCHLINE - SHEET P20 - STA 33+29

WATERS CONSTRUCTION COMPANY, INC.
TAX 19925106
DB 12629 PG 886
MB 33 PG 515
WINDY GAP ROAD

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT2 SITE PLAN

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PROJECT REFERENCE NO.	SHEET NO.
108528	P20

PROJECT ENGINEER
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WAH
DATE
10/11/2007

Baker

Baker Engineering NY, Inc.
1617 East Tryon Street
Suite 210
Charlotte, NC 28203
Phone: 704.334.4454
Fax: 704.334.4492

MATCHLINE - SHEET P19 - STA 33+29

PHOTO ID POINT
UT2-10

BCP #1052
REBAR
N 521964.77
E 1407094.05
ELEV.= 586.96

EPHEMERAL POOL

BCP #958
NAIL
N 522124.52
E 1408947.97
ELEV.= 586.29

1 BELLASERA BEREWICK, LLC.
c/o THOMAS A SAMEED JR.
TAX 19925111
DB 18271 PG 145
WINDY GAP ROAD

2 MI HOMES OF
CHARLOTTE, LLC
TAX 19925112
DB 19186 PG 179
GLENBURN LANE

PHOTO ID POINT
UT2-11

UT2-UT1-CENTLE

VEG PLOT #7

40' CMU SANITARY
SEWER EASEMENT

3 WATERS CONSTRUCTION COMPANY, INC.
TAX 19925106
DB 12629 PG 886
MB 33 PG 515
WINDY GAP ROAD

MATCHLINE - SHEET P21 - STA 40+05

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT2 SITE PLAN

20 0 20 40
SCALE (FT)

I:\Projects\0289C\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P21

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

Baker

Baker Engineering NY, Inc.
1417 South Tryon Street
Suite 200
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Phone 704.334.6154
Fax 704.334.6492

MI HOMES OF
CHARLOTTE, LLC
TAX 19925112
DB 19186 PG 179
GLENBURN LANE

PHOTO ID POINT
UT2-12

MATCHLINE - SHEET P20

MATCHLINE - SHEET P20 - STA 40+05

44+00

44+48.02

BCP #5
REBAR
N 522487.55
E 1406866.09
ELEV.= 583.38

BCP #4
REBAR
N 522657.63
E 1406823.42
ELEV.= 582.41

WATERS CONSTRUCTION COMPANY, INC.
TAX 19925106
DB 12629 PG 886
MB 33 PG 515
WINDY GAP ROAD

40' CMU SANITARY
SEWER EASEMENT

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT2 SITE PLAN

L:\Projects\0269C\Design\Plans\AS-BUILT-PLANSHEETS.dwg Dec 08, 2008

PROJECT REFERENCE NO.	SHEET NO.
108528	P22

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

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Phone: 704.334.4454
Fax: 704.334.4490

WATERS CONSTRUCTION COMPANY, INC.
TAX 19925103
DB 12629 PG 902
DIXIE RIVER ROAD

BCP #798
REBAR
N 522198.66
E 1408598.04
ELEV.= 616.69

PHOTO ID POINT
UT2A-1

18" CMP

11+00

10+00

MATCHLINE - SHEET P23 - STA 12+00

BCP #2360
REBAR
N 522361.78
E 1408795.08
ELEV.= XXX

BCP #2273
REBAR
N 522316.91
E 1408711.70
ELEV.= XXX

WATERS CONSTRUCTION COMPANY, INC.
TAX 19925103
DB 12629 PG 902
DIXIE RIVER ROAD

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT2-A SITE PLAN

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PROJECT REFERENCE NO.	SHEET NO.
108528	P23

PROJECT ENGINEER
KLT
APPROVED BY
WAH
DATE
10/11/2007

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WATERS CONSTRUCTION COMPANY, INC.
TAX 19925103
DB 12629 PG 902
DIXIE RIVER ROAD

MATCHLINE - SHEET P22 - STA 12+00

MATCHLINE - SHEET P18 - STA 19+76

VEG PLOT #1

VEG PLOT #2

PHOTO ID POINT UT2A-2

X1-UT2A-RIFFLE

X2-UT2A-POOL

PHOTO ID POINT UT2A-3

PHOTO ID POINT UT2A-4

BCP #1667
REBAR
N 521823.26
E 1408347.11
ELEV.= 808.53

20 0 20 40
SCALE (FT)

BEAVERDAM CREEK
AS-BUILT WITH BMPS

UT2-A SITE PLAN

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APPENDIX D

BASELINE STREAM SUMMARY FOR RESTORATION REACHES

Beaverdam Creek Restoration Site - UT1 (Reach 1)

Parameter	Design			As-built			MY-1 (2007)			MY-2 (2008)			MY-3 (2009)			MY-4 (2010)		
Dimension - Riffle	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Bankfull Width (ft)		14.6		-----	12.5	-----	-----	13.1	-----	-----	12.8	-----	-----	12.7	-----	-----	13.0	-----
Floodprone Width (ft)	-----	45.0	-----	-----	74.6	-----	-----	74.6	-----	-----	74.7	-----	-----	74.6	-----	-----	74.8	-----
Bankfull Mean Depth (ft)	-----	1.5	-----	-----	1.4	-----	-----	1.4	-----	-----	1.4	-----	-----	1.3	-----	-----	1.4	-----
Bankfull Max Depth (ft)	-----	2.1	-----	-----	2.0	-----	-----	2.1	-----	-----	2.0	-----	-----	1.9	-----	-----	2.1	-----
Bankfull Cross Sectional Area (ft2)	-----	21.0	-----	-----	18.0	-----	-----	18.8	-----	-----	17.8	-----	-----	16.9	-----	-----	17.6	-----
Width/Depth Ratio	-----	10.0	-----	-----	8.7	-----	-----	9.2	-----	-----	9.1	-----	-----	9.6	-----	-----	9.7	-----
Entrenchment Ratio	-----	3.1	-----	-----	6.0	-----	-----	5.7	-----	-----	5.9	-----	-----	5.9	-----	-----	5.7	-----
Bank Height Ratio	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----
Bankfull Velocity (fps)	-----	3.5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																		
Channel Beltwidth (ft)	-----	0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	0	-----	15	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	0	-----	29	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																		
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	0.0067	-----	0.009	-----	-----	-----	-----	-----	-----	-----	-----	0.009	-----	-----	0.014	-----	-----	0.01
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	43.8	-----	-----	-----	-----	-----	-----	-----	23	54	91	16	57	97	26	64	104
Substrate and Transport Parameters																		
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	25 / 36 / 42 / 75 / 105			0.12 / 40 / 50 / 110 / 160			<.063 / 0.5 / 59 / 110 / 140			0.15 / .65 / 38 / 97 / 125		
Reach Shear Stress (competency) lb/f2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																		
Channel length (ft)	-----	-----	555	-----	-----	567	-----	-----	568	-----	-----	563	-----	-----	562	-----	-----	570
Drainage Area (SM)	-----	-----	0.7	-----	-----	0.7	-----	-----	0.7	-----	-----	0.7	-----	-----	0.7	-----	-----	0.7
Rosgen Classification	-----	Bc	-----	-----	-----	-----	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----
Bankfull Discharge (cfs)	-----	75	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	1.02	-----	-----	-----	-----	-----	1.05	-----	-----	1.04	-----	-----	1.04	-----	-----	1.05	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Beaverdam Creek Restoration Site - UT1 (Reach 2-5)

Parameter	Design			As-built			MY-1 (2007)			MY-2 (2008)			MY-3 (2009)			MY-4 (2010)		
Dimension - Riffle	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Bankfull Width (ft)	16.8	-----	20.0	15.4	-----	23.0	15.2	-----	26.9	15.3	-----	26.0	15.1	-----	26.0	14.9	-----	27.7
Floodprone Width (ft)	-----	100.0	-----	74.9	-----	80.7	74.9	-----	80.7	74.8	-----	80.6	73.5	-----	80.7	74.9	-----	80.6
Bankfull Mean Depth (ft)	1.7	-----	2.0	1.7	-----	2.1	1.5	-----	2.2	1.5	-----	2.4	1.5	-----	2.1	1.4	-----	2.0
Bankfull Max Depth (ft)	2.4	-----	2.9	2.5	-----	4.1	2.3	-----	4.1	2.4	-----	4.7	2.3	-----	3.7	2.1	-----	3.7
Bankfull Cross Sectional Area (ft2)	28.0	-----	40.0	25.6	-----	26.8	23.8	-----	59.7	23.6	-----	62.4	22.8	-----	54.0	21.9	-----	46.8
Width/Depth Ratio	9.8	-----	10.1	9.2	-----	13.9	9.6	-----	14.6	9.9	-----	15.7	10.0	-----	15.2	10.2	-----	16.4
Entrenchment Ratio	5.0	-----	6.0	3.4	-----	4.9	2.9	-----	4.9	3.0	-----	4.9	3.0	-----	5.0	2.8	-----	5.0
Bank Height Ratio	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----
Bankfull Velocity (fps)	3.1	-----	3.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																		
Channel Beltwidth (ft)	84	-----	100	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	34	-----	60	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	134	-----	200	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	2	-----	10	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																		
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	0.005	-----	0.012	-----	-----	-----	-----	-----	-----	0.008	0.011	0.018	0.008	0.011	0.013	-----	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	101	-----	120	-----	-----	-----	-----	-----	-----	72	108	144	67	114	146	-----	-----	-----
Substrate and Transport Parameters																		
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	0.17-25 / 0.75-37 / 30-45 / 70-85 / 110-120			0.1-32 / 0.26-46 / 0.37 - 64 / 1.0 - 145 / 5.6-178			<0.063-1.6 / 0.063-47 / 0.26-70 / 0.55-140 / 1.4-165			<0.063-25 / <0.063-61 / <0.063-86 / 0.47-125 / 1.8-175		
Reach Shear Stress (competency) lb/f2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																		
Channel length (ft)	-----	-----	6155	-----	-----	5897	-----	-----	3021	-----	-----	3023	-----	-----	3000	-----	-----	3065
Drainage Area (SM)	0.7	-----	1.75	0.7	-----	1.75	0.7	-----	1.75	0.7	-----	1.75	0.7	-----	1.75	0.7	-----	1.75
Rosgen Classification	-----	C/E	-----	-----	-----	-----	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----
Bankfull Discharge (cfs)	105	-----	155	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	1.1	-----	1.2	-----	-----	-----	-----	1.3	-----	-----	1.3	-----	-----	1.3	-----	-----	1.3	-----
BF slope (ft/ft)	0.002	-----	0.006	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Beaverdam Creek Restoration Site - UT1B																		
Parameter	**Design**			**As-built**			**MY-1 (2007)**			**MY-2 (2008)**			**MY-3 (2009)**			**MY-4 (2010)**		
Dimension - Riffle	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Bankfull Width (ft)	-----	10.4	-----	-----	11.1	-----	-----	11.8	-----	-----	11.1	-----	-----	10.8	-----	-----	11.1	-----
Floodprone Width (ft)	----	100.0	-----	-----	75.0	-----	-----	75.0	-----	-----	75.0	-----	-----	75.0	-----	-----	75.0	-----
Bankfull Mean Depth (ft)	-----	1.1	-----	-----	1.4	-----	-----	1.4	-----	-----	1.4	-----	-----	1.3	-----	-----	1.3	-----
Bankfull Max Depth (ft)	-----	1.4	-----	-----	2.3	-----	-----	2.3	-----	-----	2.4	-----	-----	2.4	-----	-----	2.5	-----
Bankfull Cross Sectional Area (ft2)	-----	11.0	-----	-----	15.3	-----	-----	16.5	-----	-----	15.6	-----	-----	14.1	-----	-----	14.8	-----
Width/Depth Ratio	-----	9.7	-----	-----	8.0	-----	-----	8.5	-----	-----	7.9	-----	-----	8.3	-----	-----	8.3	-----
Entrenchment Ratio	-----	9.6	-----	-----	6.8	-----	-----	6.3	-----	-----	6.8	-----	-----	6.9	-----	-----	6.8	-----
Bank Height Ratio	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----
Bankfull Velocity (fps)	-----	4.0	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																		
Channel Beltwidth (ft)	-----	52	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	21	-----	31	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	83	-----	104	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	5	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																		
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	0.0104	-----	0.0138	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	52	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																		
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	<0.063 / <0.063 / <0.063 / 0.2 / 0.4			0.065 / 0.09 / 1.1 / 0.3 / 0.4			<0.063 / <0.063 / <0.063 / 0.13 / 0.39			<0.063 / 0.19 / 0.32 / 1.25 / 1.75		
Reach Shear Stress (competency) lb/f2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																		
Channel length (ft)	-----	-----	790	-----	-----	778	-----	-----	775	-----	-----	-----	-----	-----	-----	-----	-----	-----
Drainage Area (SM)	-----	-----	0.34	-----	-----	0.34	-----	-----	0.34	-----	-----	0.34	-----	-----	0.34	-----	-----	0.34
Rosgen Classification	-----	C/E	-----	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----
Bankfull Discharge (cfs)	-----	45	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	1.15	-----	-----	1.1	-----	-----	1.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF slope (ft/ft)	-----	0.003	-----	-----	0.013	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Beaverdam Creek Restoration Site - UT1C																		
Parameter	**Design**			**As-built**			**MY-1 (2007)**			**MY-2 (2008)**			**MY-3 (2009)**			**MY-4 (2010)**		
Dimension - Riffle	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Bankfull Width (ft)	-----	11.2	-----	-----	11.0	-----	-----	12.0	-----	-----	13.2	-----	-----	12.0	-----	-----	11.2	-----
Floodprone Width (ft)	----	100.0	-----	-----	70.2	-----	-----	70.6	-----	-----	71.2	-----	-----	71.1	-----	-----	70.4	-----
Bankfull Mean Depth (ft)	-----	0.8	-----	-----	0.7	-----	-----	0.7	-----	-----	0.7	-----	-----	0.7	-----	-----	0.7	-----
Bankfull Max Depth (ft)	-----	0.9	-----	-----	1.0	-----	-----	1.1	-----	-----	1.1	-----	-----	1.1	-----	-----	1.1	-----
Bankfull Cross Sectional Area (ft2)	-----	8.0	-----	-----	7.8	-----	-----	8.8	-----	-----	9.5	-----	-----	8.6	-----	-----	7.7	-----
Width/Depth Ratio	-----	14.8	-----	-----	15.6	-----	-----	16.5	-----	-----	18.4	-----	-----	16.9	-----	-----	16.5	-----
Entrenchment Ratio	-----	8.9	-----	-----	6.4	-----	-----	5.9	-----	-----	5.4	-----	-----	5.9	-----	-----	6.3	-----
Bank Height Ratio	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----
Bankfull Velocity (fps)	-----	3.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																		
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																		
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	0.0191	-----	0.0265	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	44.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																		
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	26 / 37 / 42 / 75 / 100			36 / 50 / 64 / 110 / 130			0.33 / 40 / 60 / 130 / 160			40 / 78 / 93 / 120 / 135		
Reach Shear Stress (competency) lb/f2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																		
Channel length (ft)	-----	-----	628	-----	-----	616	-----	-----	615	-----	-----	-----	-----	-----	-----	-----	-----	-----
Drainage Area (SM)	-----	-----	0.15	-----	-----	0.15	-----	-----	0.15	-----	-----	0.15	-----	-----	0.15	-----	-----	0.15
Rosgen Classification	-----	B	-----	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----
Bankfull Discharge (cfs)	-----	27	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	1.05	-----	-----	1.1	-----	-----	1.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF slope (ft/ft)	-----	0.017	-----	-----	0.013	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Beaverdam Creek Restoration Site - UT1D																		
Parameter	**Design**			**As-built**			**MY-1 (2007)**			**MY-2 (2008)**			**MY-3 (2009)**			**MY-4 (2010)**		
Dimension - Riffle	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Bankfull Width (ft)	-----	10.4	-----	-----	11.4	-----	-----	12.7	-----	-----	11.4	-----	-----	13.1	-----	-----	12.0	-----
Floodprone Width (ft)	----	100.0	-----	-----	75.5	-----	-----	75.5	-----	-----	75.5	-----	-----	75.3	-----	-----	75.5	-----
Bankfull Mean Depth (ft)	-----	0.9	-----	-----	0.8	-----	-----	0.7	-----	-----	0.8	-----	-----	0.7	-----	-----	0.6	-----
Bankfull Max Depth (ft)	-----	1.2	-----	-----	1.2	-----	-----	1.1	-----	-----	1.1	-----	-----	1.1	-----	-----	0.9	-----
Bankfull Cross Sectional Area (ft2)	-----	10.0	-----	-----	9.0	-----	-----	9.2	-----	-----	9.0	-----	-----	8.6	-----	-----	7.1	-----
Width/Depth Ratio	-----	11.2	-----	-----	14.4	-----	-----	17.5	-----	-----	14.4	-----	-----	19.9	-----	-----	20.3	-----
Entrenchment Ratio	-----	9.6	-----	-----	6.6	-----	-----	6.0	-----	-----	6.6	-----	-----	5.8	-----	-----	6.3	-----
Bank Height Ratio	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----
Bankfull Velocity (fps)	-----	2.9	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																		
Channel Beltwidth (ft)	-----	52	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	21	-----	31	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	83	-----	104	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	8	-----	10	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																		
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	52	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																		
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	32 / 38 / 43 / 85 / 120			25 / 33 / 38 / 60 / 88			0.12 / 0.19 / 26 / 50 / 68			0.22 / 0.45 / 35 / 80 / 125		
Reach Shear Stress (competency) lb/f2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																		
Channel length (ft)	-----	-----	352	-----	-----	338	-----	-----	334	-----	-----	-----	-----	-----	-----	-----	-----	-----
Drainage Area (SM)	-----	-----	0.16	-----	-----	0.16	-----	-----	0.16	-----	-----	0.16	-----	-----	0.16	-----	-----	0.16
Rosgen Classification	-----	C/E	-----	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----
Bankfull Discharge (cfs)	-----	28	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	1.15	-----	-----	1.2	-----	-----	1.2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF slope (ft/ft)	-----	0.007	-----	-----	0.014	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Beaverdam Creek Restoration Site - UT2																		
Parameter	**Design**			**As-built**			**MY-1 (2007)**			**MY-2 (2008)**			**MY-3 (2009)**			**MY-4 (2010)**		
Dimension - Riffle	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Bankfull Width (ft)	10.2	-----	15.6	16.8	-----	16.9	16.1	-----	16.6	16.2	-----	17.3	17.0	-----	17.1	16.5	-----	17.0
Floodprone Width (ft)	30.0	-----	80	39.9	-----	39.9	39.9	-----	39.9	39.9	-----	40.0	39.8	-----	40.0	39.9	-----	39.9
Bankfull Mean Depth (ft)	0.92	----	1.5	0.7	-----	1.4	0.7	-----	1.4	0.7	-----	1.3	0.7	-----	1.4	0.7	-----	1.4
Bankfull Max Depth (ft)	1.3	-----	2.3	1.1	-----	2.1	1.1	-----	1.9	1.1	-----	1.9	1.0	-----	2.1	1.1	-----	2.0
Bankfull Cross Sectional Area (ft2)	9.9	-----	23.9	12.2	-----	23.4	10.9	-----	22.6	11.2	-----	21.4	11.2	-----	23.4	11.2	-----	23.3
Width/Depth Ratio	10.2	-----	12.6	12.1	-----	23.4	12.2	-----	23.9	12.3	-----	26.6	12.4	-----	25.9	12.4	-----	24.5
Entrenchment Ratio	2.8	-----	5.9	2.4	-----	2.4	2.4	-----	2.5	2.3	-----	2.5	2.3	-----	2.3	2.3	-----	2.4
Bank Height Ratio	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.2	-----
Bankfull Velocity (fps)	4.7	-----	5.4	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																		
Channel Beltwidth (ft)	20	-----	75	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	23	-----	100	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	100	-----	300	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	9.6	-----	27.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																		
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	0.0122	-----	0.0279	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	40	----	105	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																		
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	26-27 / 35 / 39-39 / 53-59 / 95			0.13-25 / 26-35 / 36-40 / 60-64 / 115-140			26-27 / 33-34 / 38 / 45-58 / 65-90			<0.063 / <0.063 - 25 / <0.063 - 34 / 55 - 63		
Reach Shear Stress (competency) lb/f2	----	-----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																		
Channel length (ft)	-----	-----	3290	-----	-----	3293	-----	-----	3142	-----	-----	-----	-----	-----	-----	-----	-----	-----
Drainage Area (SM)	0.1	-----	0.3	0.1	-----	0.3	0.1	-----	0.3	0.1	-----	0.3	0.1	-----	0.3	0.1	-----	0.3
Rosgen Classification	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----
Bankfull Discharge (cfs)	48	-----	120	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	1.03	-----	1.21	-----	1.3	-----	-----	1.3	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF slope (ft/ft)	0.008	-----	0.019	-----	0.0138	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

Beaverdam Creek Restoration Site - UT2A																		
Parameter	**Design**			**As-built**			**MY-1 (2007)**			**MY-2 (2008)**			**MY-3 (2009)**			**MY-4 (2010)**		
Dimension - Riffle	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Bankfull Width (ft)	-----	15.6	-----	-----	13.3	-----	-----	12.2	-----	-----	13.4	-----	-----	12.6	-----	-----	11.8	-----
Floodprone Width (ft)	----	80.0	-----	-----	39.8	-----	-----	39.8	-----	-----	39.9	-----	-----	39.9	-----	-----	39.9	-----
Bankfull Mean Depth (ft)	-----	1.0	-----	-----	0.8	-----	-----	0.8	-----	-----	0.8	-----	-----	0.7	-----	-----	0.7	-----
Bankfull Max Depth (ft)	-----	1.4	-----	-----	1.2	-----	-----	1.1	-----	-----	1.2	-----	-----	1.0	-----	-----	1.0	-----
Bankfull Cross Sectional Area (ft2)	-----	10.2	-----	-----	10.6	-----	-----	9.6	-----	-----	10.4	-----	-----	9.1	-----	-----	8.8	-----
Width/Depth Ratio	-----	10.2	-----	-----	16.6	-----	-----	15.5	-----	-----	17.2	-----	-----	17.4	-----	-----	15.9	-----
Entrenchment Ratio	-----	5.9	-----	-----	3.0	-----	-----	3.3	-----	-----	3.0	-----	-----	3.2	-----	-----	3.4	-----
Bank Height Ratio	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----	-----	1.0	-----
Bankfull Velocity (fps)	-----	5.1	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pattern																		
Channel Beltwidth (ft)	40	-----	55	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	24	-----	30	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	100	-----	120	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	9.8	-----	11.8	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																		
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Riffle Slope (ft/ft)	0.02	-----	0.0273	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Pool Spacing (ft)	-----	57	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Substrate and Transport Parameters																		
d16 / d35 / d50 / d84 / d95	-----	-----	-----	-----	-----	-----	26 / 30 / 35 / 53 / 78			<0.063 / 33 / 40 / 60 / 83			32 / 37 / 42 / 57 / 61			<0.063 / <0.063 / <0.063 / <0.063 / 55		
Reach Shear Stress (competency) lb/f2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																		
Channel length (ft)	-----	-----	1099	-----	-----	1131	-----	-----	1121	-----	-----	-----	-----	-----	-----	-----	-----	-----
Drainage Area (SM)	-----	-----	0.1	-----	-----	0.1	-----	-----	0.1	-----	-----	0.1	-----	-----	0.1	-----	-----	0.1
Rosgen Classification	-----	C/E	-----	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----	-----	C	-----
Bankfull Discharge (cfs)	-----	51	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Sinuosity	-----	1.21	-----	-----	1.25	-----	-----	1.22	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
BF slope (ft/ft)	-----	0.012	-----	-----	0.015	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

APPENDIX E

MORHOLOGY AND HYDRAULIC MONITORING SUMMARY

Beaverdam Creek Restoration Site : Project No. D05016-1

Reach: Beaverdam Creek UT1 (Reach 1)

I. Cross-Section Parameters	Cross Section 1 Pool					Cross Section 2 Riffle				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
Dimension										
BF Width (ft)	22.1	19.9	18.4	16.9		13.1	12.8	12.7	13.0	
Floodprone Width (ft)	75.1	75.2	75.0	75.1		74.6	74.7	74.6	74.8	
BF Cross Sectional Area (ft2)	33.1	31.8	28.1	24.3		18.8	17.8	16.9	17.6	
BF Mean Depth (ft)	1.5	1.6	1.5	1.4		1.4	1.4	1.3	1.4	
BF Max Depth (ft)	3.1	2.9	2.9	2.8		2.1	2.0	1.9	2.1	
Width/Depth Ratio	14.8	12.4	12.1	11.8		9.2	9.1	9.6	9.7	
Entrenchment Ratio	-	-	-			5.7	5.9	5.9	5.7	
Wetted Perimeter (ft)	25.1	23.1	21.5	19.7		16.0	15.6	15.4	15.7	
Hydraulic Radius (ft)	1.3	1.4	1.3	1.2		1.2	1.1	1.1	1.1	
Substrate										
d50 (mm)	<0.063	0.1	0.097	<0.063		42	50	59	38	
d84 (mm)	<0.063	0.3	0.33	0.36		75	110	110	97	

II. Reachwide Parameters	MY-1 (2007)			MY-2 (2008)			MY-3 (2009)			MY-4 (2010)			MY-5 (2011)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern															
Channel Beltwidth (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Radius of Curvature (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Wavelength (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Width Ratio	-	-	-	-	-	-	-	-	-	-	-	-			
Profile															
Riffle length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Riffle Slope (ft/ft)	-	-	-	-	0.01	0.01	-	0.01	0.01	-	-	-			
Pool Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Pool Spacing (ft)	-	-	-	23	91	51	16	97	57	-	-	-			
Additional Reach Parameters															
Valley Length (ft)	540	-	-	540	-	-	540	-	-	540	-	-			
Channel Length (ft	568	-	-	563	-	-	562	-	-	570	-	-			
Sinuosity	1.05	-	-	1.04	-	-	1.04	-	-	1.05	-	-			
Water Surface Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
BF Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Rosgen Classification	C	-	-	C	-	-	C/E	-	-	C/E	-	-			

Reach: Beaverdam Creek UT1 (Reaches 2-5)

I. Cross-Section Parameters	Cross Section 5 Riffle					Cross Section 6 Pool					Cross Section 9 Riffle					Cross Section 10 Pool				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
Dimension																				
BF Width (ft)	15.2	15.3	15.1	14.9		23.5	23.6	23.3	23.5		17.8	17.6	17.4	17.9		22.2	22.4	23.5	21.6	
Floodprone Width (ft)	74.9	74.8	74.9	74.9		75.0	75.0	72.0	75.0		75.1	75.1	75.1	75.0		74.9	74.9	74.9	74.9	
BF Cross Sectional Area (ft2)	23.8	23.6	22.8	21.9		41.1	41.2	41.3	42.5		29.3	29.4	28.1	28.5		44.8	42.7	45.0	50.5	
BF Mean Depth (ft)	1.6	1.5	1.5	1.5		1.8	1.7	1.8	1.8		1.6	1.7	1.6	1.6		2.0	1.9	1.9	2.3	
BF Max Depth (ft)	2.3	2.4	2.3	2.1		3.5	3.4	3.6	3.9		2.7	2.8	2.8	2.9		3.3	3.4	3.6	4.5	
Width/Depth Ratio	9.7	9.9	10.0	10.2		13.4	13.6	13.2	13.0		10.8	10.6	10.8	11.2		11.0	11.8	12.3	9.2	
Entrenchment Ratio	4.9	4.9	5.0	5.0		-	-	-	-		4.2	4.3	4.3	4.2		-	-	-	-	
Wetted Perimeter (ft)	18.3	18.4	18.1	17.9		27.0	27.1	26.9	27.2		21.1	21.0	20.7	21.1		26.3	26.2	27.3	26.3	
Hydraulic Radius (ft)	1.3	1.3	1.3	1.2		1.5	1.5	1.5	1.6		1.4	1.4	1.4	1.4		1.7	1.6	1.6	1.9	
Substrate																				
d50 (mm)	45	64	70	86		0.2	<0.063	<0.063	<0.063		36	40	63	80		<0.063	0.08	<0.063	<0.063	
d84 (mm)	85	145	140	125		0.45	0.24	0.3	0.2		72	110	120	125		0.7	5	0.45	0.5	

II. Reachwide Parameters	MY-1 (2007)			MY-2 (2008)			MY-3 (2009)			MY-4 (2010)			MY-5 (2011)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern															
Channel Beltwidth (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Radius of Curvature (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Wavelength (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Width Ratio	-	-	-	-	-	-	-	-	-	-	-	-			
Profile															
Riffle length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Riffle Slope (ft/ft)	-	-	-	0.009	0.02	0.01	0.01	0.01	0.01	-	-	-			
Pool Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Pool Spacing (ft)	-	-	-	72	144	115	67	146	114	-	-	-			
Additional Reach Parameters															
Valley Length (ft)	2370	-	-	2370	-	-	2370	-	-	2370	-	-			
Channel Length (ft	3021	-	-	3023	-	-	3000	-	-	3065	-	-			
Sinuosity	1.3	-	-	1.3	-	-	1.3	-	-	1.3	-	-			
Water Surface Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
BF Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Rosgen Classification	C	-	-	C	-	-	C/E	-	-	C/E	-	-			

Beaverdam Creek Restoration Site : Project No. D05016-1

Reach: Beaverdam Creek UT1 (Reaches 2-5) cont'd

I. Cross-Section Parameters	Cross Section 13 Pool					Cross Section 14 Riffle					Cross Section 15 Riffle					Cross Section 16 Pool				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
Dimension																				
BF Width (ft)	30.0	28.64	27.0	27.6		19.1	20.2	21.4	21.4		26.9	26.0	26.0	27.7		20.9	21.6	22.6	23.6	
Floodprone Width (ft)	90.9	90.9	90.9	90.8		75.2	75.2	73.5	75.2		77.9	78.0	77.7	78.0		52.1	52.1	47.9	52.1	
BF Cross Sectional Area (ft2)	71.7	77.56	69.2	66.4		37.9	39.4	42.7	42.8		59.7	62.4	54.0	46.8		36.8	45.2	47.1	46.3	
BF Mean Depth (ft)	2.4	2.7	2.6	2.4		2.0	2.0	2.0	2.0		2.2	2.4	2.1	1.7		1.8	2.1	2.1	2.0	
BF Max Depth (ft)	5.3	6.6	6.1	6.0		3.1	3.3	3.5	3.7		4.1	4.7	2.7	3.1		3.4	3.7	3.8	3.8	
Width/Depth Ratio	12.6	10.57	10.5	11.5		9.6	10.3	10.7	10.6		12.1	10.8	12.5	16.4		11.8	10.3	10.8	12.0	
Entrenchment Ratio	-	-	-	-		3.9	3.7	3.4	3.7		2.9	3.0	3.0	3.1		-	-	-	-	
Wetted Perimeter (ft)	34.8	34.1	32.1	32.4		23.1	24.1	25.4	25.4		31.3	30.8	30.1	31.1		24.4	25.8	26.8	27.5	
Hydraulic Radius (ft)	2.1	2.3	2.2	2.0		1.6	1.6	1.7	1.7		1.9	2.0	1.8	1.5		1.5	1.8	1.8	1.7	
Substrate																				
d50 (mm)	0.3	0.1	0.063	0.54		30	0.4	0.26	<0.063		-	0.4	0.33	0.125		-	<0.063	<0.063	<0.063	
d84 (mm)	0.8	0.4	0.36	1.25		70	50	20	40		-	1.0	0.55	0.47		-	0.2	0.085	<0.063	

Reach: Beaverdam Creek UT1 (Reaches 2-5) cont'd

I. Cross-Section Parameters	Cross Section 17 Pool					Cross Section 18 Riffle				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
Dimension										
BF Width (ft)	27.0	23.3	24.5	22.9		22.5	23.4	22.7	22.4	
Floodprone Width (ft)	67.2	67.2	67.4	67.3		80.7	80.6	80.7	80.6	
BF Cross Sectional Area (ft2)	33.2	36.1	28.1	22.1		34.7	34.8	33.8	31.5	
BF Mean Depth (ft)	1.2	1.6	1.2	1.0		1.5	1.5	1.5	1.4	
BF Max Depth (ft)	2.5	4.4	3.1	3.0		2.7	2.7	2.8	2.7	
Width/Depth Ratio	21.9	15.1	21.3	23.7		14.6	15.7	15.2	15.8	
Entrenchment Ratio	-	-	-	-		3.6	3.5	3.6	3.6	
Wetted Perimeter (ft)	29.5	26.4	26.8	24.8		25.6	26.4	25.7	25.2	
Hydraulic Radius (ft)	1.1	1.4	1.0	0.9		1.4	1.3	1.3	1.3	
Substrate										
d50 (mm)	-	0.3	0.26	0.55		-	22	32	<0.063	
d84 (mm)	-	0.8	0.57	0.95		-	45	45	40	

Reach: Beaverdam Creek UT1B

I. Cross-Section Parameters	Cross Section 3 Pool					Cross Section 4 Riffle				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
Dimension										
BF Width (ft)	15.3	14.8	13.9	17.3		11.8	11.1	10.8	11.1	
Floodprone Width (ft)	75.1	75.1	75.1	75.1		75.0	75.0	75.0	75.0	
BF Cross Sectional Area (ft2)	16.4	19.4	16.3	19.8		16.5	15.6	14.1	14.8	
BF Mean Depth (ft)	1.1	1.3	1.2	1.1		1.4	1.4	1.3	1.3	
BF Max Depth (ft)	2.3	3.0	2.7	2.6		2.3	2.4	2.4	2.5	
Width/Depth Ratio	14.3	11.4	11.9	15.1		8.5	7.9	8.3	8.3	
Entrenchment Ratio	-	-	-	-		6.3	6.8	6.9	6.8	
Wetted Perimeter (ft)	17.5	17.4	16.2	19.6		14.6	13.9	13.4	13.8	
Hydraulic Radius (ft)	0.9	1.1	1.0	1.0		1.1	1.1	1.1	1.1	
Substrate										
d50 (mm)	0.16	0.14	0.1	0.28		<0.063	0.11	<0.063	0.32	
d84 (mm)	0.42	0.5	0.38	0.56		0.2	0.3	0.13	1.75	

II. Reachwide Parameters	MY-1 (2007)			MY-2 (2008)			MY-3 (2009)			MY-4 (2010)			MY-5 (2011)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern															
Channel Beltwidth (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Radius of Curvature (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Wavelength (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Width Ratio	-	-	-	-	-	-	-	-	-	-	-	-			
Profile															
Riffle length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Riffle Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Pool Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Pool Spacing (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Additional Reach Parameters															
Valley Length (ft)	680	-	-	-	-	-	-	-	-	-	-	-			
Channel Length (ft	775	-	-	-	-	-	-	-	-	-	-	-			
Sinuosity	1.1	-	-	-	-	-	-	-	-	-	-	-			
Water Surface Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
BF Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Rosgen Classification	C	-	-	C	-	-	C/E	-	-	C/E	-	-			

Beaverdam Creek Restoration Site : Project No. D05016-1

Reach: Beaverdam Creek UT1C

I. Cross-Section Parameters	Cross Section 7 Riffle					Cross Section 8 Pool				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
Dimension										
BF Width (ft)	12.0	13.2	12.0	11.2		13.6	12.4	13.8	13.5	
Floodprone Width (ft)	70.6	71.2	71.1	70.4		75.0	75.0	74.9	75.4	
BF Cross Sectional Area (ft2)	8.8	9.5	8.6	7.7		31.6	30.3	31.6	29.3	
BF Mean Depth (ft)	0.7	0.7	0.7	0.7		2.3	2.4	2.3	2.2	
BF Max Depth (ft)	1.1	1.1	1.1	1.1		3.2	3.2	3.1	2.9	
Width/Depth Ratio	16.5	18.4	16.9	16.5		5.9	5.1	6.0	6.2	
Entrenchment Ratio	5.9	5.4	5.9	6.3		-	-	-	-	
Wetted Perimeter (ft)	13.5	14.6	13.5	12.6		18.2	17.3	18.4	17.9	
Hydraulic Radius (ft)	0.7	0.6	0.6	0.6		1.7	1.7	1.7	1.6	
Substrate										
d50 (mm)	42	64	60	93		<0.063	<0.063	0.08	<0.063	
d84 (mm)	75	110	130	120		0.23	0.17	0.22	0.5	

II. Reachwide Parameters	MY-1 (2007)			MY-2 (2008)			MY-3 (2009)			MY-4 (2010)			MY-5 (2011)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern															
Channel Beltwidth (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Radius of Curvature (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Wavelength (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Width Ratio	-	-	-	-	-	-	-	-	-	-	-	-			
Profile															
Riffle length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Riffle Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Pool Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Pool Spacing (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Additional Reach Parameters															
Valley Length (ft)	544	-	-	-	-	-	-	-	-	-	-	-			
Channel Length (ft)	615	-	-	-	-	-	-	-	-	-	-	-			
Sinuosity	1.1	-	-	-	-	-	-	-	-	-	-	-			
Water Surface Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
BF Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Rosgen Classification	C	-	-	C	-	-	C	-	-	C	-	-			

Reach: Beaverdam Creek UT1D

I. Cross-Section Parameters	Cross Section 11 Pool					Cross Section 12 Riffle				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
Dimension										
BF Width (ft)	15.3	15.1	20.1	18.4		12.7	11.4	13.1	12.0	
Floodprone Width (ft)	75.7	75.6	75.2	75.7		75.5	75.5	75.3	75.5	
BF Cross Sectional Area (ft2)	20.9	18.9	16.1	15.5		9.2	9.0	8.6	7.1	
BF Mean Depth (ft)	1.4	1.3	0.8	0.8		0.7	0.8	0.7	0.6	
BF Max Depth (ft)	2.5	2.2	1.8	1.7		1.1	1.1	1.1	0.9	
Width/Depth Ratio	11.3	12.0	25.0	21.9		17.5	14.4	19.9	20.3	
Entrenchment Ratio	-	-	-	-		6.0	6.6	5.8	6.3	
Wetted Perimeter (ft)	18.0	17.6	21.7	20.1		14.1	13.0	14.4	13.2	
Hydraulic Radius (ft)	1.2	1.1	0.7	0.8		0.7	0.7	0.6	0.5	
Substrate										
d50 (mm)	<0.063	0.33	0.3	0.28		43	38	26	35	
d84 (mm)	0.22	0.85	0.43	0.48		85	60	50	80	

II. Reachwide Parameters	MY-1 (2007)			MY-2 (2008)			MY-3 (2009)			MY-4 (2010)			MY-5 (2011)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern															
Channel Beltwidth (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Radius of Curvature (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Wavelength (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Width Ratio	-	-	-	-	-	-	-	-	-	-	-	-			
Profile															
Riffle length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Riffle Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Pool Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Pool Spacing (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Additional Reach Parameters															
Valley Length (ft)	300	-	-	-	-	-	-	-	-	-	-	-			
Channel Length (ft)	334	-	-	-	-	-	-	-	-	-	-	-			
Sinuosity	1.1	-	-	-	-	-	-	-	-	-	-	-			
Water Surface Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
BF Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Rosgen Classification	C	-	-	C	-	-	C	-	-	C	-	-			

Beaverdam Creek Restoration Site : Project No. D05016-1

Reach: Beaverdam Creek UT2A

I. Cross-Section Parameters	Cross Section 1 Riffle					Cross Section 2 Pool				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
Dimension										
BF Width (ft)	12.2	13.4	12.6	11.8		20.1	20.6	19.2	19.8	
Floodprone Width (ft)	39.8	39.9	39.9	39.9		40.0	40.0	40.0	40.1	
BF Cross Sectional Area (ft2)	9.6	10.4	9.1	8.8		20.4	21.3	17.8	18.1	
BF Mean Depth (ft)	0.8	0.8	0.7	0.7		1.0	1.0	0.9	0.9	
BF Max Depth (ft)	1.1	1.2	1.0	1.0		1.9	2.2	1.8	1.9	
Width/Depth Ratio	15.5	17.2	17.4	15.9		19.8	19.9	20.7	21.6	
Entrenchment Ratio	3.3	3.0	3.2	3.4		-	-	-	-	
Wetted Perimeter (ft)	13.7	15.0	14.0	13.3		22.1	22.7	21.1	21.6	
Hydraulic Radius (ft)	0.7	0.7	0.6	0.7		0.9	0.9	0.8	0.8	
Substrate										
d50 (mm)	35	40	42	<0.063		<0.063	<0.063	<0.063	<0.063	
d84 (mm)	53	60	57	<0.063		<0.063	<0.063	<0.063	<0.063	

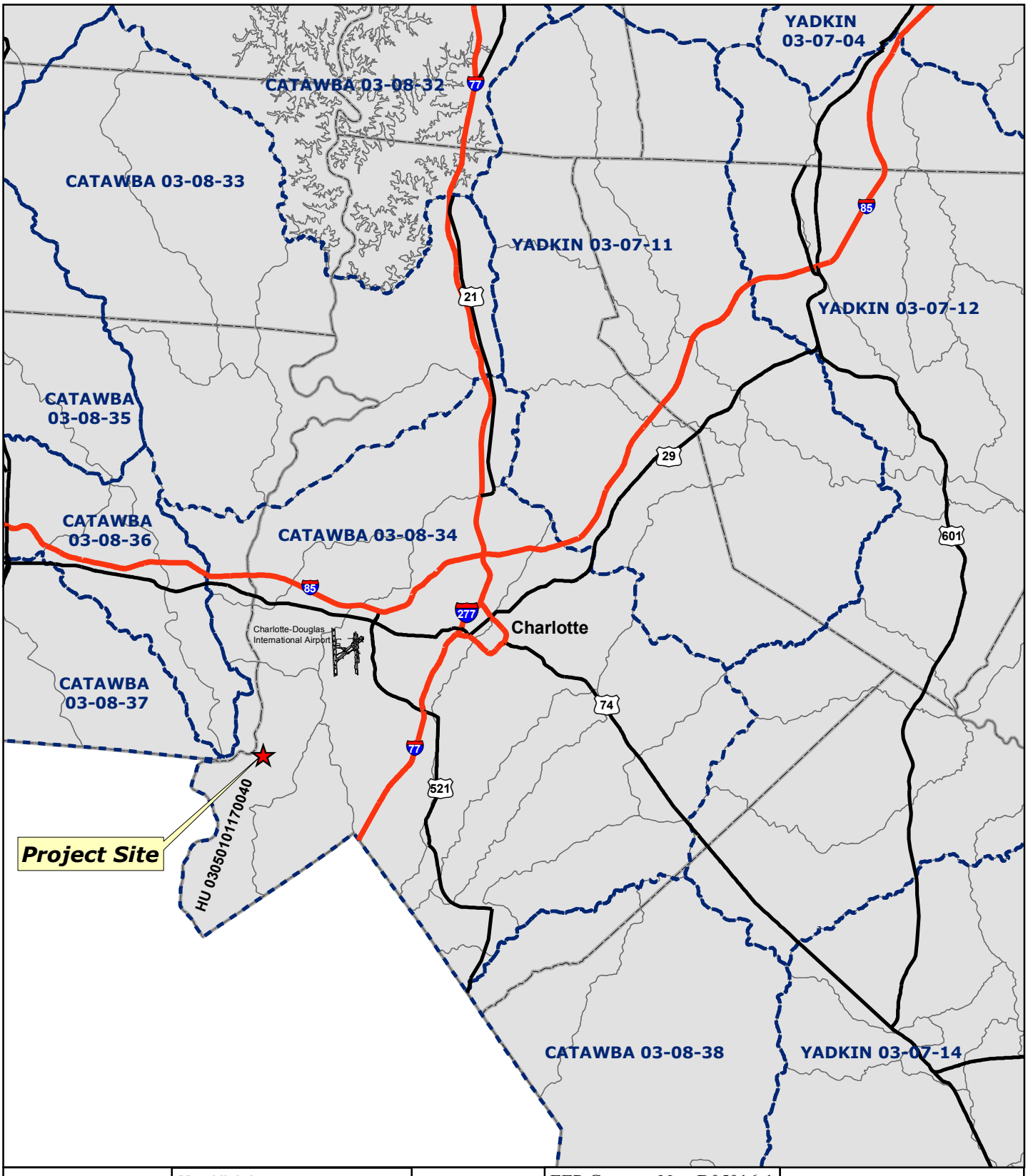
II. Reachwide Parameters	MY-1 (2007)			MY-2 (2008)			MY-3 (2009)			MY-4 (2010)			MY-5 (2011)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern															
Channel Beltwidth (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Radius of Curvature (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Wavelength (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Width Ratio	-	-	-	-	-	-	-	-	-	-	-	-			
Profile															
Riffle length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Riffle Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Pool Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Pool Spacing (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Additional Reach Parameters															
Valley Length (ft)	920	-	-	-	-	-	-	-	-	-	-	-			
Channel Length (ft)	1121	-	-	-	-	-	-	-	-	-	-	-			
Sinuosity	1.2	-	-	-	-	-	-	-	-	-	-	-			
Water Surface Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
BF Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Rosgen Classification	C	-	-	C	-	-	C	-	-	C	-	-			

Reach: Beaverdam Creek UT2

I. Cross-Section Parameters	Cross Section 3 Riffle					Cross Section 4 Pool					Cross Section 5 Riffle					Cross Section 6 Pool				
	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5	MY1	MY2	MY3	MY4	MY5
Dimension																				
BF Width (ft)	16.1	17.3	17.05	16.5		20.9	20.8	19.8	18.9		16.6	16.2	17.0	17.0		14.0	14.4	14.7	15.2	
Floodprone Width (ft)	40.0	40.0	39.95	39.9		40.1	40.1	40.2	40.1		39.9	39.9	39.8	39.9		28.0	28.8	29.7	29.5	
BF Cross Sectional Area (ft2)	10.9	11.2	11.2	11.2		25.8	25.1	22.9	19.5		22.6	21.4	23.4	23.3		23.2	24.9	25.8	26.4	
BF Mean Depth (ft)	0.7	0.7	0.7	0.7		1.2	1.2	1.2	1.0		1.4	1.3	1.4	1.4		1.7	1.7	1.8	1.7	
BF Max Depth (ft)	1.1	1.1	1.0	1.1		2.5	2.5	2.3	2.2		1.9	1.9	2.1	2.0		2.6	2.6	2.7	2.6	
Width/Depth Ratio	23.9	26.6	25.9	24.5		16.9	17.3	17.1	18.2		12.2	12.3	12.4	12.4		8.5	8.4	8.4	8.8	
Entrenchment Ratio	2.5	2.3	2.3	2.4		-	-	-	-		2.4	2.5	2.3	2.3		-	-	-	-	
Wetted Perimeter (ft)	17.5	18.6	18.4	17.9		23.4	23.3	22.1	20.9		19.4	18.8	19.7	19.7		17.3	17.9	18.2	18.7	
Hydraulic Radius (ft)	0.6	0.6	0.6	0.6		1.1	1.1	1.0	0.9		1.2	1.1	1.2	1.2		1.3	1.4	1.4	1.4	
Substrate																				
d50 (mm)	39	40	38	<0.063		<0.063	<0.063	<0.063	<0.063		38	36	38	34		<0.063	<0.063	0.063	<0.063	
d84 (mm)	59	64	58	42		<0.063	<0.063	<0.063	<0.063		59	60	45	52		<0.063	<0.063	0.16	<0.063	

II. Reachwide Parameters	MY-1 (2007)			MY-2 (2008)			MY-3 (2009)			MY-4 (2010)			MY-5 (2011)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern															
Channel Beltwidth (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Radius of Curvature (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Wavelength (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Meander Width Ratio	-	-	-	-	-	-	-	-	-	-	-	-			
Profile															
Riffle length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Riffle Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Pool Length (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Pool Spacing (ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Additional Reach Parameters															
Valley Length (ft)	2470	-	-	-	-	-	-	-	-	-	-	-			
Channel Length (ft)	3142	-	-	-	-	-	-	-	-	-	-	-			
Sinuosity	1.3	-	-	-	-	-	-	-	-	-	-	-			
Water Surface Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
BF Slope (ft/ft)	-	-	-	-	-	-	-	-	-	-	-	-			
Rosgen Classification	C	-	-	C	-	-	C	-	-	C	-	-			

FIGURES



Map Vicinity

Mecklenburg County, NC

LEGEND

HUC

DWQ Sub-basin

Counties

4 2 0 4 Miles

December 2010

EEP Contract No.: D05016-1

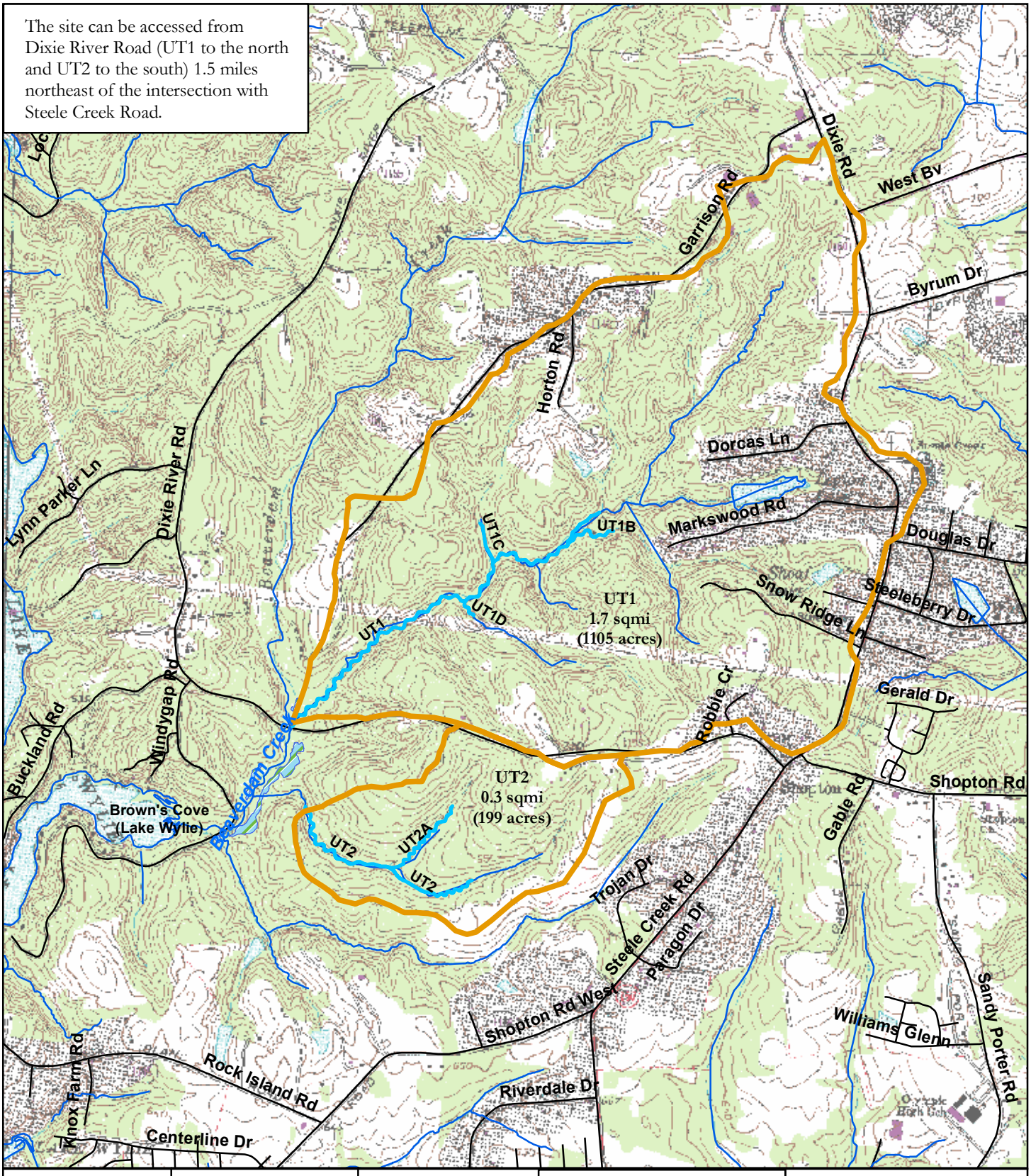
Figure 1: Project Vicinity Map

Beaverdam Creek
Year 4 Monitoring
Mecklenburg County, NC

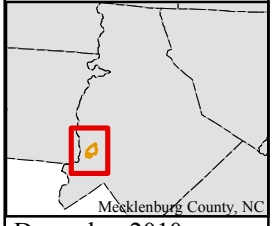
Ecosystem Enhancement Program

Baker

The site can be accessed from Dixie River Road (UT1 to the north and UT2 to the south) 1.5 miles northeast of the intersection with Steele Creek Road.



Map Vicinity



December 2010

EEP Contract No.: D05016-1

LEGEND

- Project Watershed Boundary
- Project Reaches
- Creeks
- Roads

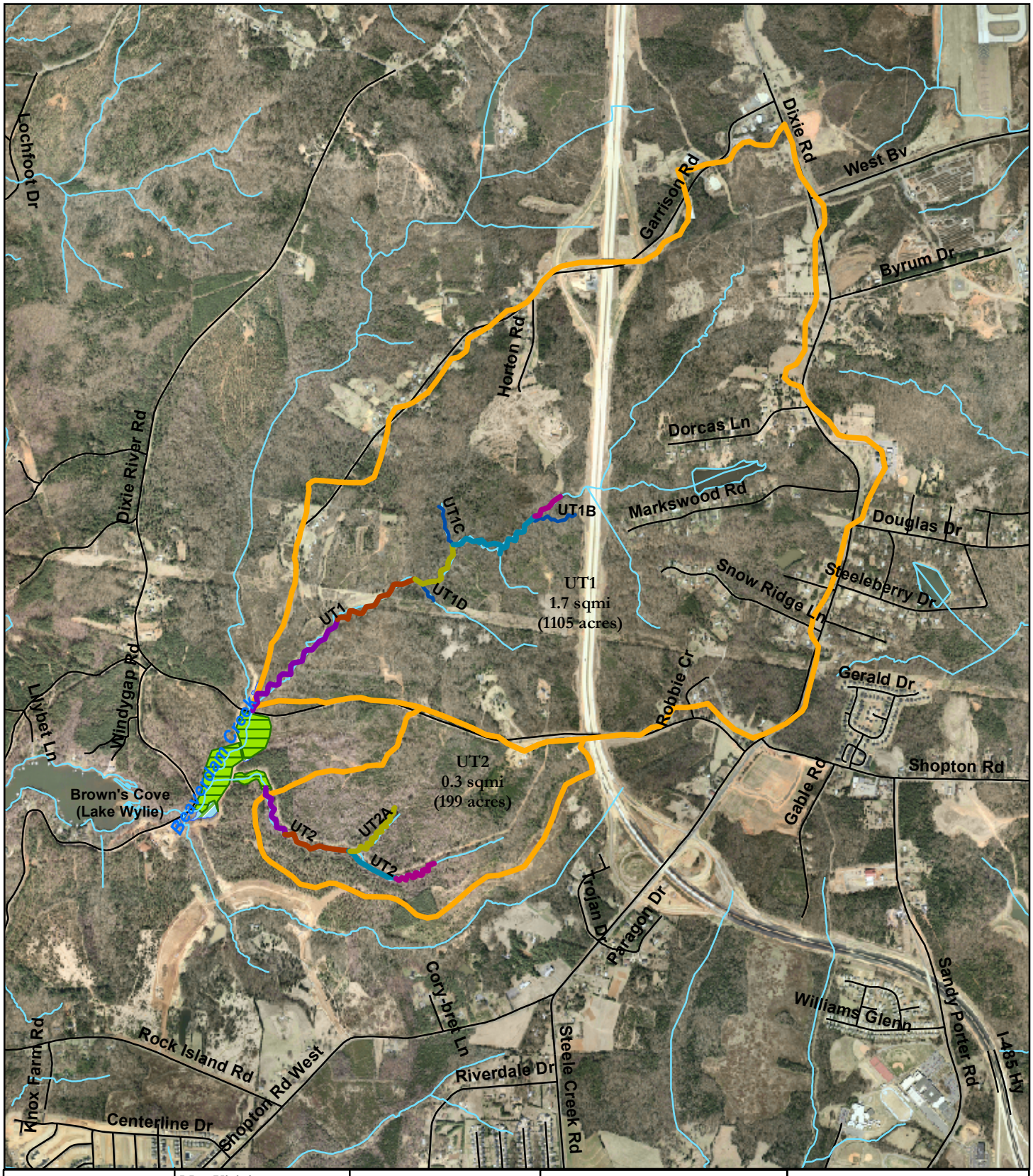
0 800 1,600 3,200 Feet

Figure 2: Site Topographic Map

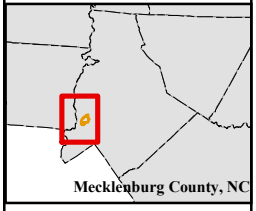
Beaverdam Creek
Year 4 Monitoring
Mecklenburg County, NC

Ecosystem Enhancement PROGRAM

Baker



Map Vicinity



December 2010

LEGEND

- Project Watershed Boundary
- Preservation Easement
- Creeks
- Roads

0 900 1,800 3,600 Feet

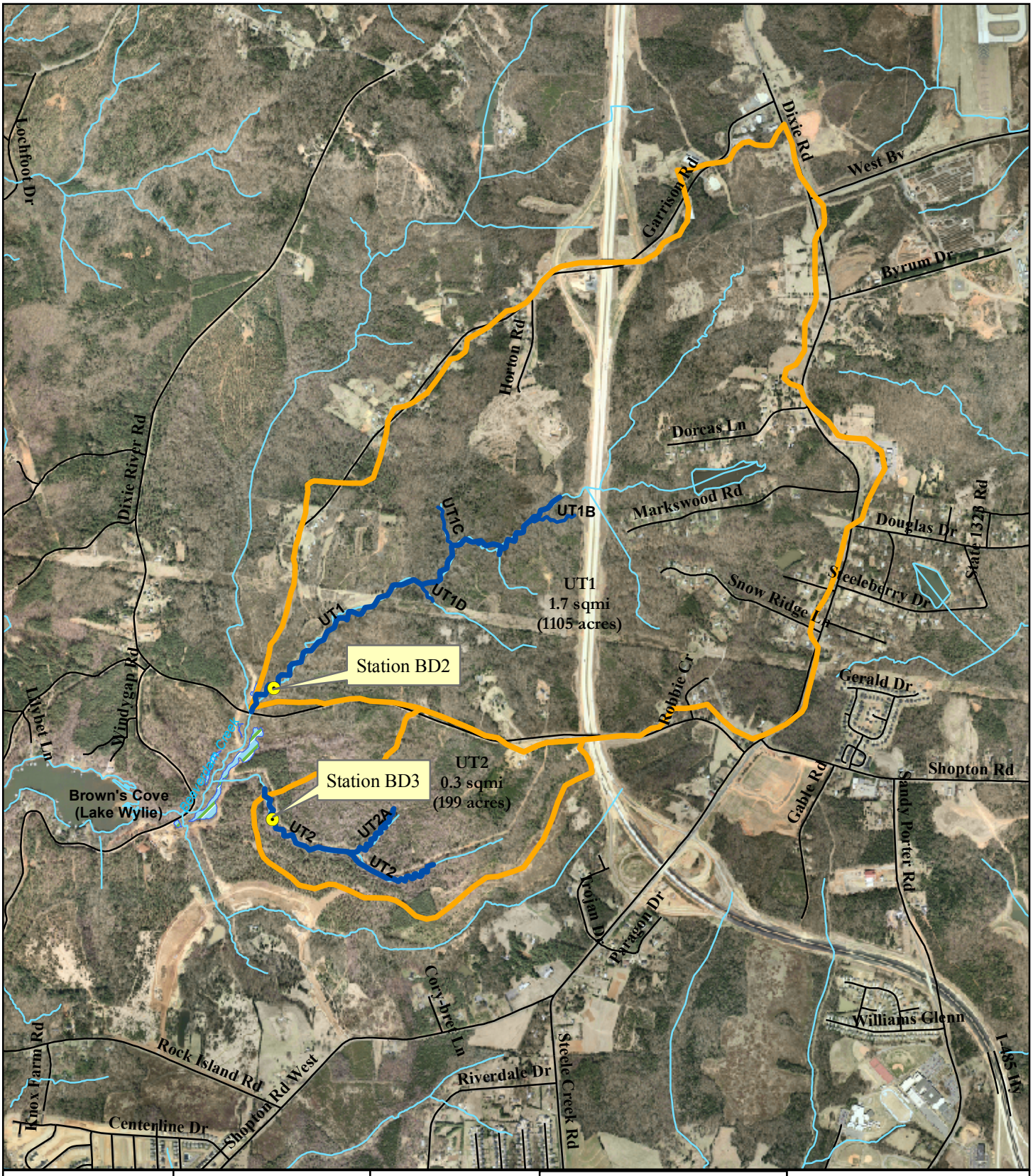
EEP Contract No.: D05016-1

Figure 3: Restoration Summary Map

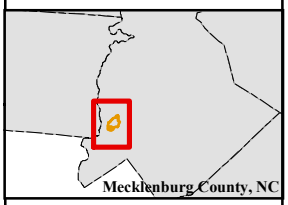
Beaverdam Creek
Year 4 Monitoring
Mecklenburg County, NC

Ecosystem Enhancement PROGRAM

Baker



Map Vicinity



December 2010

LEGEND

- Crest Gauges
- As-built Alignments
- Project Watershed Boundary
- Creeks
- Roads

0 950 1,900 3,800 Feet

EEP Contract No.: D05016-1

Figure 4: Stage Recorder Locations

Beaverdam Creek
Year 4 Monitoring
Mecklenburg County, NC

Ecosystem Enhancement PROGRAM

Baker