Chavis Park Stream Restoration
(Garner Branch of Walnut Creek)
2004 Annual Monitoring Report

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February, 2005

Ecosystem Enhancement PROGRAM

NCDENR

NC STATE UNIVERSITY

2004 Chavis Park Monitoring Abstract

The Garner Branch of Walnut Creek was restored through the North Carolina Wetlands Restoration Program (NCWRP). The objectives of the project are to:

1.) Establish an stable dimension, pattern and profile on 1750 feet of The Garner Branch of Walnut Creek
2.) Improve habitat within The Garner Branch of Walnut Creek
3.) Establish an riparian buffer along The Garner Branch of Walnut Creek
4.) Incorporate this project into a watershed wide management plan

This is the 1st year of the 5-year monitoring plan for The Garner Branch of Walnut Creek.

Table 1A. Background Information

Project Name	The Garner Branch of Walnut Creek
Designer's Name	Becky L.Ward Consulting 1512 Eglantyne Ct. Raleigh, NC 27613
Contractor's Name	Unknown
Project County	Wilson County, North Carolina
Directions to Project Site	From Interstate I-440 take exit 15 to Poole Road west toward the City of Raleigh. Poole Road diverges into Martin Luther King Jr. Blvd continue on MLK Blvd until you reach The City of Raleigh's Chavis Park on the north side of MLK Blvd. Make a right and head north on Holmes Street the site is on the left side (west) as soon as you turn onto Holmes Street.
Drainage Area	0.5 sq. mi.
USGS Hydro Unit	3020203020040
NCDWQ Subbasin	03-04-07 Neuse River Basin
Project Length	1,765 Linear feet
Restoration Approach	1,765 ft of priority 2 Natural Channel Design (dimension, pattern, and profile) with urban constraints
Date of Completion	Summer - Fall, 2002
Monitoring Dates	June, 2004

Results and Discussion

Overall, while the majority of the stream is functioning well and holding grade, the stream has areas of concern and areas of immediate need. Table 2 shows a summary of monitoring measurement results. The stream classifies as a C5 and B5c with areas of bedrock outcrops that control and hold the grade. Channel dimension and pattern are similar to as-built conditions with the exceptions of some limited areas of bank erosion. The channel profile is void of many defined bed features and is dominated by runs and pools. Vegetation is not succeeding to levels required for mitigation credit. Placed structures are holding grade and functioning well, with the exception of some localized erosion on cross vane arms.

Table 1. Summary of Channel Conditions

DIMENSION	Garner Branch Cross-section #1 Riffle		Garner Branch Cross-section #2 Pool		Garner Branch Cross-section #3 Riffle		Garner Branch Cross-section #4 Pool		Garner Branch Cross-section #5 Pool		Garner Branch Cross-section #UT Riffle	
Monitoring Year	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004
Bankfull Cross-sectional Area	N/A	12.8	N/A	22.1	N/A	15.8	N/A	25.0	N/A	22.4	N/A	12.0
Bankfull Width	N/A	15.2	N/A	14.7	N/A	15.1	N/A	19.2	N/A	25.5	N/A	14.6
Bankfull Mean Depth	N/A	0.8	N/A	1.5	N/A	1.0	N/A	1.3	N/A	0.9	N/A	0.8
Bankfull Max Depth	N/A	1.7	N/A	2.1	N/A	1.7	N/A	2.3	N/A	1.6	N/A	1.3

PATTERN	Garner Branch Design			Garner Branch As-built 2002			Garner Branch 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Meander Wave Length	Not Reported			Not Reported			83	104	100
Radius of Curvature	Not Reported			Not Reported			28	87	66
Beltwidth	Not Reported			Not Reported			24	56	33

PROFILE	Garner Branch Design			Garner Branch As-built 2002			Garner Branch 2004		
	Minimum	Maximum	Median	Minimum	Maximum	Median	Minimum	Maximum	Median
Riffle Length	Not Reported			Not Reported			22	71	31
Riffle Slope	Not Reported			Not Reported			0.62%	4.53%	1.49%
Pool Length	Not Reported			Not Reported			9	51	18
Pool to Pool Spacing	Not Reported			Not Reported			19	402	61
Valley (TOB) Slope	Not Reported			Not Reported			1.22%		
Bankfull Slope	Not Reported			Not Reported			0.9%	2.2%	1.15%

SUBSTRATE	Garner Branch Cross-section #1 Riffle		Garner Branch Cross-section #2 Pool		Garner Branch Cross-section #3 Riffle		Garner Branch Cross-section #4 Pool		Garner Branch Cross-section #5 Pool		Garner Branch Cross-section #UT Pool	
Monitoring Year	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004	2002	2004
d50	N/A	0.64	N/A	0.65	N/A	0.65	N/A	0.90	N/A	0.95	N/A	1.33
d84	N/A	9.50	N/A	10.45	N/A	10.45	N/A	5.83	N/A	6.77	N/A	19.22

VEGETATION 2004 Monitoring	Quad 1 - Chavis		Quad 2 - Chavis		Quad 3 - Chavis		Quad 4 - Chavis	
	Observed	Planted*	Observed	Planted*	Observed	Planted*	Observed	Planted*
Tree Stratum (stems/acre)	680	80	280	0	960	200	360	0
Shrub Stratum (% cover)	8	n/a	11	n/a	0	n/a	0	n/a
Herb Stratum (%cover)	100	n/a	112	n/a	107	n/a	28	n/a

* Planted value represents number of stems observed alive that were planted.

The following areas of concern should be monitored closely and considered for repair as suggested:

The Garner Branch of Walnut Creek

- Areas with bank erosion
    - Bank erosion has been noted at six locations on the stream including hillslope sheet erosion, hillslope Gully erosion, and shearing stream bank erosion
    - Hillslope sheet erosion occured on the left bank above the bankfull elevation at stations 16+50 and 15+50 each area of erosion is less than 50 sqft. Possible repairs would include a preparing these areas and seeding with a tackafier and straw mulch
    - Hillslope gully erosion occurred on the right bank above bankfull elevation at station 17+00 this area is about 15sqft. Possible repairs would include regarding the gully, preparing this area and seeding with a tackafier and straw mulch
    - There are two areas of major bank erosion due to the in-channel shearing forces of stream at station 4+75 and station at 14+75
        - At station 4+75 there is a blow out and severe bank erosion most likely due to a urban debris jam occurring at the cross vane directly upstream. The debris jam caused a high near bank stress on the right bank, to fix this erosional issue the debris should be removed from the stream on a regular basis and possible rebuild the blown out bank with a geo-grid, brush mattress, or by regrading
        - At station 14+75 to 15+00 there is a area of severe bank erosion on the right bank at the confluence of Garner Branch and UT to Garner Branch this is discussed in the next bullet item
- Confluence at STA 15+00
    - The cross vane directly upstream of the confluence of Garner Branch and UT to Garner Branch at STA 15+00 if directly flow into the outside of the down stream meander bend creating significant bank erosion
    - The area of bank has had approximately 15 tons of soil eroded from the bank since construction
    - The bank is now vertical with unconsolidated fill as the existing bank face this bank has a Very High Bank Erosion Hazard Index of 41
    - The channel will continue to cutout the bank until a stable meander pattern is formed approximately 150 ton of soil will be eroded before this section of the stream reaches a stable radius of curvature.
    - The meander bend could be stabilized with a brush mattress, live stake cuttings and a single vane to help turn the water. Another repair option would be to cut a new channel based on the direction of flow over the cross vane, which would include 150 tons of excavation and placement of a new structure
    - All of this area should be able to be reached with a CAT 325c type tracked excavator without entering into the floodplain
- Areas lacking stream feature
    - The entire length of restored stream has on six existing riffle features, but as it can be observed from the as-build longitudinal profile there were not may riffles that showed up in the as-build survey

- The restored stream lacks many defined features and has reaches with very large pool to pool spacing

- Vegetation
  - Replanting trees should occur to obtain mitigation requirements
  - The site could benefit from larger containerized trees both for bank stability and aesthetics, although mitigation requirements are currently being met.
  - It is recommended to stake in areas where erosion is problematic, particularly on outside meander bends.
  - Exotic invasive vegetation is a major issue on this project site. Without control the exotic invasive vegetation will likely out-compete native vegetation for resources. A maintenance plan is recommended for control of these species.

Photos

The following are photographs of typical sections and areas of concern throughout the project.

Typical Pool

Typical Riffle

Issue Photo 1. Arm Scour left bank STA: 0+95, STA: 4+75 & STA 14+75

Issue Photo 2. Bank Erosion Due to Urban Debris Blockage

Issue Photo 3 Hillslope Sheet/rill erosion At STA: 15+50 & 16+50

Issue Photo 4 Bank Erosion at STA: 14+75

Issue Photo 5 Hillslope Gully erosion At STA: 17+00

Issue Photo 6 Geo-Grid brake-down at STA: 15+00 on right bank of UT

***There are more issue photos in the photo log of this report**

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1.0 BACKGROUND INFORMATION

Project planning was initiated for the ChavisPark Stream Restoration in 2001 for the implementation of an urban stream restoration project in Raleigh, North Carolina (Figure 1).

The project consisted of the analysis of the 0.5 square mile portion of the The Garner Branch of Walnut Creek watershed (located within USGS 14-digit Hydrologic Unit Code 03020203020040, NCDWQ Subbasin 03-04-07 of the Neuse River Basin) that contributes drainage to the project site. The watershed analysis, including the assessment of stream channel, was conducted for the purpose of developing a clear understanding of existing system characteristics. The resulting Restoration Plan identified opportunities to improve water quality and overall system functions including targeted strategies such as wetland/riparian buffer preservation, stormwater BMP development/retrofitting, stream restoration, and community education.

Following coordination with local leaders, the Wetlands Restoration Program and citizens groups, the project was initiated and focused on the restoration of approximately 1800 linear feet of degraded stream within the Chavis Recreation Park. Detailed environmental assessments and engineering studies were conducted and design plans and documents were prepared to facilitate the stream and riparian buffer restoration. Implementation of the project was completed by September 2002.

The restoration of this portion of The Garner Branch of Walnut Creek, located within the City of Raleigh's Chavis Park, was conducted to correct identified system deficiencies including severe bank erosion, channel widening, and the loss of aquatic habitat resulting from stream channelization, the loss of riparian vegetation, and watershed development. The goal of the project was to develop a stable stream channel with reduced bank erosion, efficient sediment transport, enhanced warm water fisheries, and improved overall stream habitat and site aesthetics. Implementation of the project was completed by September 2002.

1.1 Goals and Objective

The goals and objectives of this project are as follows:

1.) Restore 1,765-linear feet of The Garner Branch of Walnut Creek through a priority 2 natural channel design approach.
2.) Establish a riparian zone surrounding restored section of The Garner Branch of Walnut Creek.
3.) Improve the habitat within the channel and the riparian zone.
4.) Incorporate this project into a watershed wide management plan.

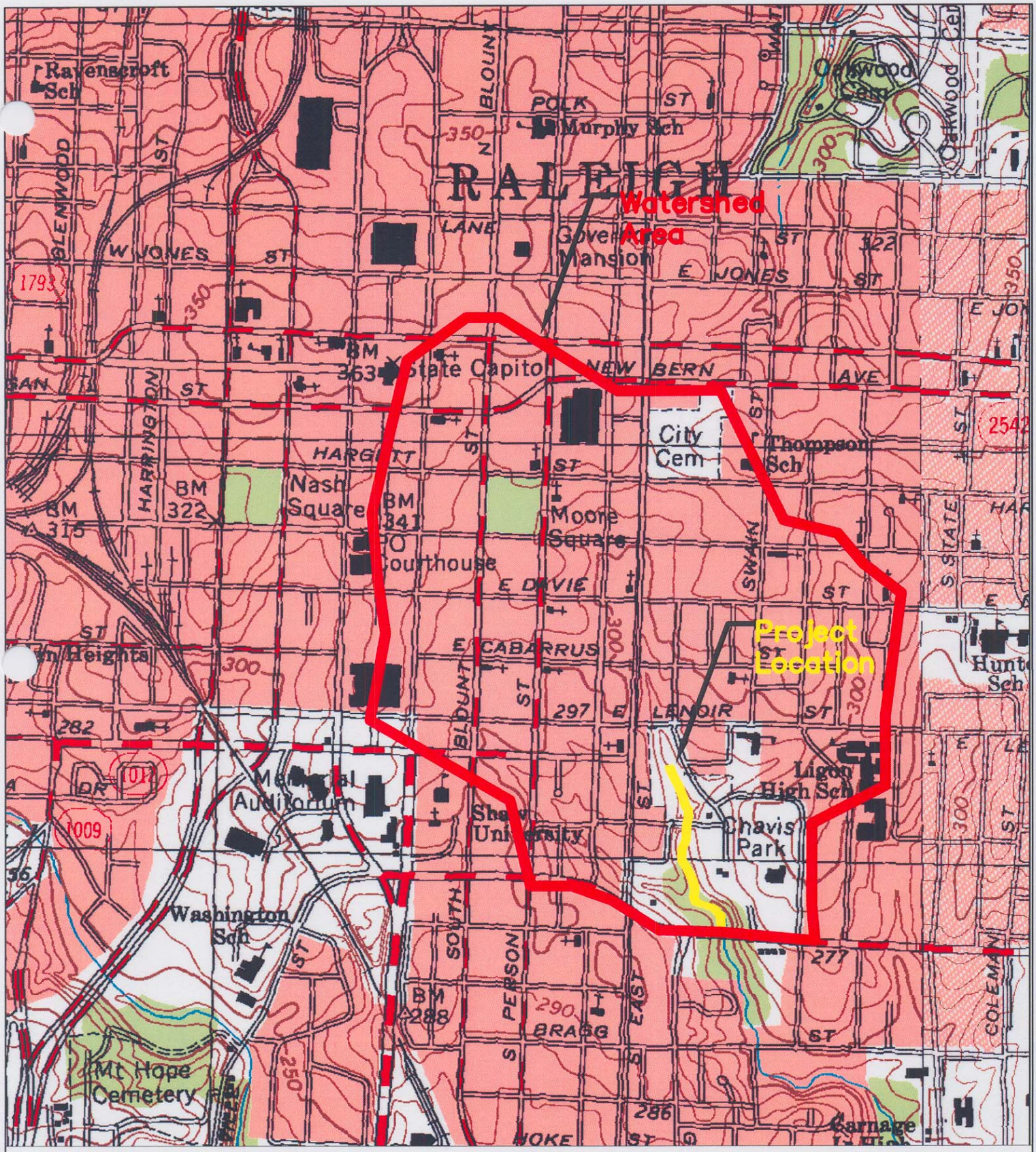
1.2 Project Location

This project is located within the city limits of Raleigh, North Carolina. From Interstate I-440 take exit 15 to Poole Road west toward the City of Raleigh. Poole Road diverges into

Martin Luther King Jr. Blvd continue on MLK Blvd until you reach The City of Raleigh's Chavis Park on the north side of MLK Blvd. Make a right and head north on Holmes Street the site is on the left side (west) as soon as you turn onto Holmes Street.

1.3 Project Description

A previously straight and incised channel through the Chavis Recreational Park, the Garner Branch of Walnut Creek was restored using channel dimension, pattern, and profile modifications and the establishment of riparian zone adjacent to the creek. Channel profile is maintained through the use of rock cross vanes. Channel pattern is maintained through the use of single vanes and vegetation along the channel banks. Due to multiple urban constraints, pattern modifications were limited throughout the project.



CHAVIS PARK
CITY OF RALEIGH
WAKE COUNTY, N.C.

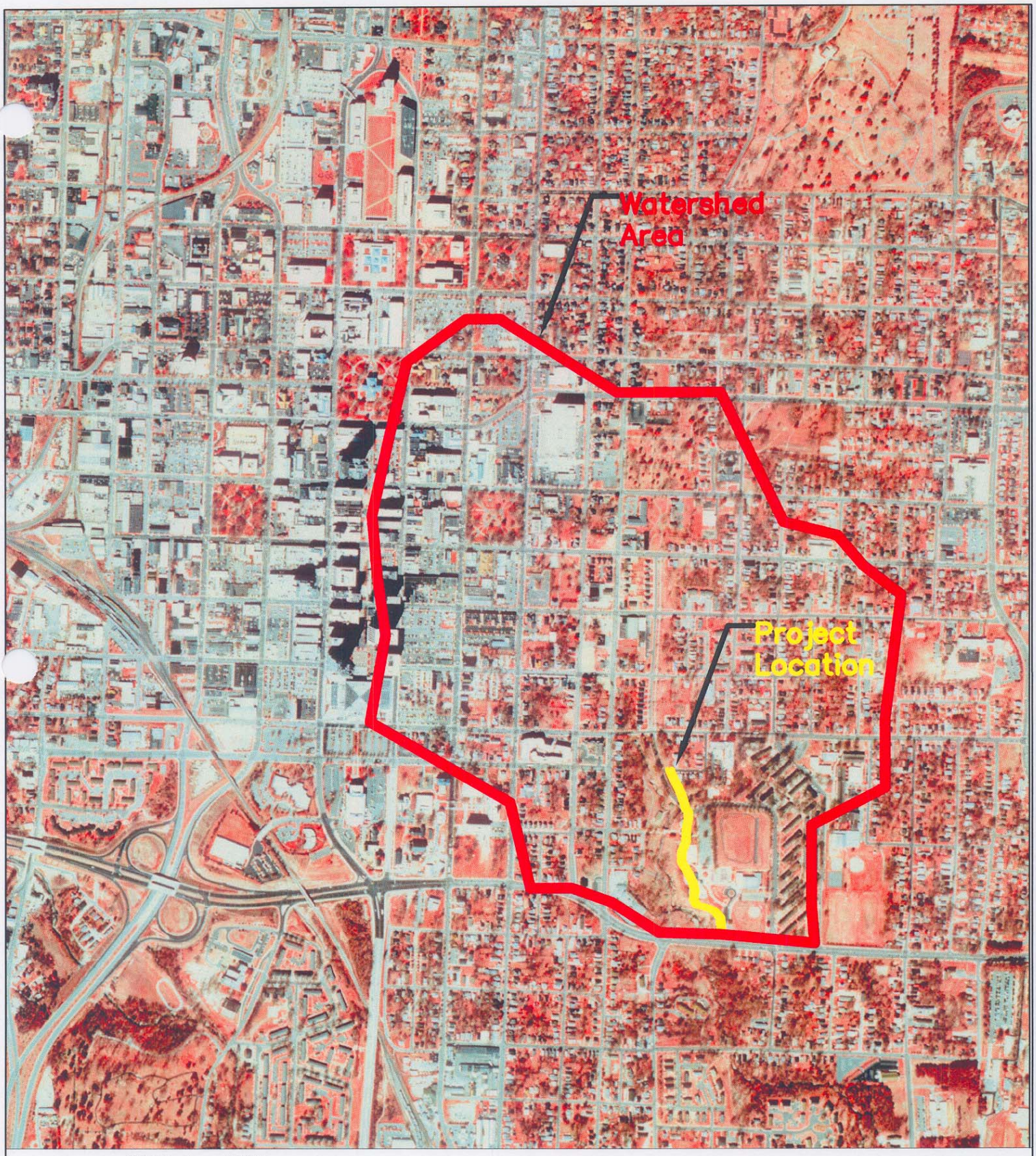
WATERSHED AREA 0.5 SQMI
USGS TOPO MAP

DRAWING NO.
SHEET NO. FIGURE - 1
FILENAME CHAVIS WS.DWG
PROJECT NO.
DATE 02/08/2005

NC STATE UNIVERSITY

BIOLOGICAL & AGRICULTURAL ENGINEERING
Weaver Labs Campus Box 7625
North Carolina State University
Raleigh, NC 27695

NO	REVISIONS	DRN	CHK	DATE
1	WATERSHED AREA	GAT	DAB	02/08/05



SCALE 1" = 1000'

500 0 500 1000

NORTH

CHAVIS PARK
CITY OF RALEIGH
WAKE COUNTY, N.C.

WATERSHED AREA 0.5 SQMI
DIGITAL ORTHO PHOTO MAP

NC STATE UNIVERSITY

BIOLOGICAL & AGRICULTURAL ENGINEERING
Weaver Labs Campus Box 7625
North Carolina State University
Raleigh, NC 27695

DRAWING NO.	SHEET NO.	FILENAME	PROJECT NO.	DATE
	FIGURE - 2	CHAVIS WS.DWG		02/08/2005

NO	REVISIONS	DRN	CHK	DATE
1	WATERSHED AREA	GAT	DAB	02/08/05

Figure 3. Plan view of As-built conditions
(To be attached)
showing all structures with station numbers
showing vegetation permanent plots
showing permanent cross-sections and benchmarks
showing vegetation plots
showing monitoring gauges

Figure 4. Plan view of 2003 overlain on As-built
(To be attached)

2.0 YEAR 2004 RESULTS AND DISCUSSION

Year 2004 monitoring results are shown for The Garner Branch of Walnut Creek Monitoring.

2.1 Vegetation

Using the Draft Vegetation Monitoring Plan for NCWRP Riparian Buffer and Wetland Restoration Projects, 4 vegetation monitoring plots were randomly located within the riparian buffer of the Chavis Park project. No reference area was studied; therefore no comparisons could be made to reference conditions.

2.1.1 Results and Discussion

Vegetation within the riparian buffer of this project is overall considered mixed in success. Many portions of the restoration site were well vegetated with live stakes and naturally regenerating native species of shrubs and trees. Live stakes were doing exceptionally well throughout most of the project corridor, although plot counts did not reveal this. Sambucus canadensis and Cornus amomum comprised much of the healthy live stake population throughout the area. Albizia julibrissin, and Acer negundo comprised a large portion of the naturally regenerating trees. Very few planted trees were noted. Several existing large species of oaks were present at various locations along the stream banks. Both native and exotic herbaceous species were growing well in most all areas

Extrapolation from the four plots resulted in an overall average of approximately 70 planted trees per acre for this restoration site. These trees were mostly surviving species of Quercus phellos. If natural regeneration is included with planted trees, the number is increased to an average of approximately 570 trees per acre. Natural regeneration obviously plays an important role in the restoration of this site; however, more planted trees are needed to meet mitigation requirements.

Invasive plant species on the site included Festuca spp., Hedera helix, and Microstegium vimineum. Species not accounted for in the plots included Lonicera japonica, Ligustrum sinense, and Rosa multiflora. All of these species could be found in varying abundance throughout the corridor.

Recommendations include replanting trees to obtain mitigation requirements. The site could benefit from larger containerized trees both for bank stability and aesthetics due to its park setting. Exotic invasive vegetation is a major issue on this site. Without control, it will likely out-compete native vegetation for resources. A maintenance plan is recommended for control of these species.

2.2 Morphology

Restored channel dimension, pattern, profile and substrate were examined during the 2004 monitoring.

2.2.1 Results and Discussion

The Garner Branch of Walnut Creek is sand bed channel with a percentage of gravel and therefore the dune and anti-dune characteristics of sand-bed sediment transport should be considered. There are three major bedrock outcrops that hold grade on this reach. The channel profile along The Garner Branch of Walnut Creek has not shown any significant changes in between the as-build profile and this year's monitoring. The stream is moving toward a step pool and run dominated system pools are filling in and riffles are flattening. Rock cross vanes are holding the grade of the stream and there are no major failures with the cross vanes. The stream profile of the as-build shows that riffles were constructed but transitioning into runs. The design was most likely intended to build a riffle/pool sequence plan form C5 type channel for the majority of the project, but this intent was not maintained over the monitoring period thus far. The location of riffles has not changed significantly from construction to the present, but riffles have transitioned in to other bed features. The average riffle length has also increased and only the steeper riffles remain. The number of riffles has decreased and only the longer and or steeper riffles remain. Unless the substrate become more course the system will stay embedded with sand and will continue to migrate toward a run dominated system

Cross section results were calculated using NCSU techniques for consistency purposes, there were no as-build cross sections available for analysis. Cross-sectional trends were analyzed by looking at the cross-sections, change in planform, BEHI, and the longitudinal profile. Cross-section 1 is a riffle and has signs of slightly aggrading since construction the current cross sectional area is 12.8 square feet. Cross section 1 is fairly stable, has low near bank stress and a low bank erosion hazard. This first cross section classifies as a C5 channel with an ER of ~3.0, and is 25 ft upstream of a stable rock cross vane. Cross-section 2 is a pool and has signs of slightly aggrading or filling since construction the current cross sectional area is 22.1 square feet. Cross section 2 is fairly stable, has low near bank stress and a low bank erosion hazard. There is a rock vane with a debris jam approximately 15ft downstream from cross section 2. Cross-section 3 is a riffle the current cross sectional area is 15.8 square feet. Cross section 3 is fairly stable, has low near bank stress, a low bank erosion hazard, and classifies as a C5 channel with an ER of ~3.0. Cross-section 4 is a pool and has signs of slightly scour since construction the current cross sectional area is 25.0 square feet. This cross section is down stream of a misdirected rock cross vane that is directing water into the outside of the meander bend producing high scour rates approximately 15 tons of bank sediments have been eroded from this bank since construction. Cross section 4 is unstable, has very high near bank stress and a very high bank erosion hazard. This cross section falls approximately 25ft upstream from the confluence of an unnamed tributary and the Garner Branch. Cross-section 5 is a pool and has signs of slightly aggrading or filling since construction the current cross sectional area is 22.4 square feet. Cross section 5 is fairly stable, has low near bank stress and a moderate bank erosion hazard due to the BHR. There is a w-rock vane about 75ft downstream from cross section 5 that makes the end of

the project. Cross-section UT is a riffle with a current cross sectional area is 12.0 square feet located on the tributary to Garner Branch just upstream of the confluence. Cross section UT is fairly stable, has low near bank stress and a low bank erosion hazard due to the use of geo-grid on the banks that are greater than a 1:1 slope. This first cross section classifies as a B4c channel with an ER of ~1.8, and is 35 ft upstream of a stable rock cross vane. The geo-grid is breaking down but the banks are also fairly well vegetated

The channel substrate in the riffle sections are sand and have a D50 of 0.65 mm with a D84 of 10.0 mm. The channel substrate in the pool sections are sand and have a D50 of 0.93 mm with a D84 of 6.2 mm. Future monitoring should better evaluate channel substrate and sediment loading patterns.

Channel pattern appears to have been maintained since construction. A few of the outside meander bends are experiencing slight migration through bank slumping but no excessive migration is evident and no shoot cut-offs are apparent. The pattern aligns closely with the as-build pattern (Figure 4). Channel banks throughout The Garner Branch of Walnut Creek remains fairly stable, with the exception of two spot areas of bank slumping and scour. Slumping and scour is likely the result of a misdirected rock vane and a rock vane that formed a debris jam in the channel.

While loosing bedform this project has fairly stable banks and is able to transport the sediment supplied through the reach without forming mid-channel bars. There were no areas of concern noted due to high near bank stress and the bank erosion hazard index was used to rank the stream banks as having a moderate low erodibility rating. Bed scour is primarily limited to meander beds below structures where energy show be dissipated in a stream. Vegetation is growing well and there is a lot of volunteer growth on this project but does not meet the vegetation requirements of the Ecosystem Enhancement Program yet. This reach of Chavis Park is a run dominated sand bed stream but the system seems to be relatively stable with an aggrading bedform that is controlled by three major bedrock outcrops and rock vane structure.

Table 2. Summary of Channel Conditions

DIMENSION	Garner Branch Cross-section #1 Riffle		Garner Branch Cross-section #2 Pool		Garner Branch Cross-section #3 Riffle		Garner Branch Cross-section #4 Pool		Garner Branch Cross-section #5 Pool		Garner Branch Cross-section #UT Riffle	
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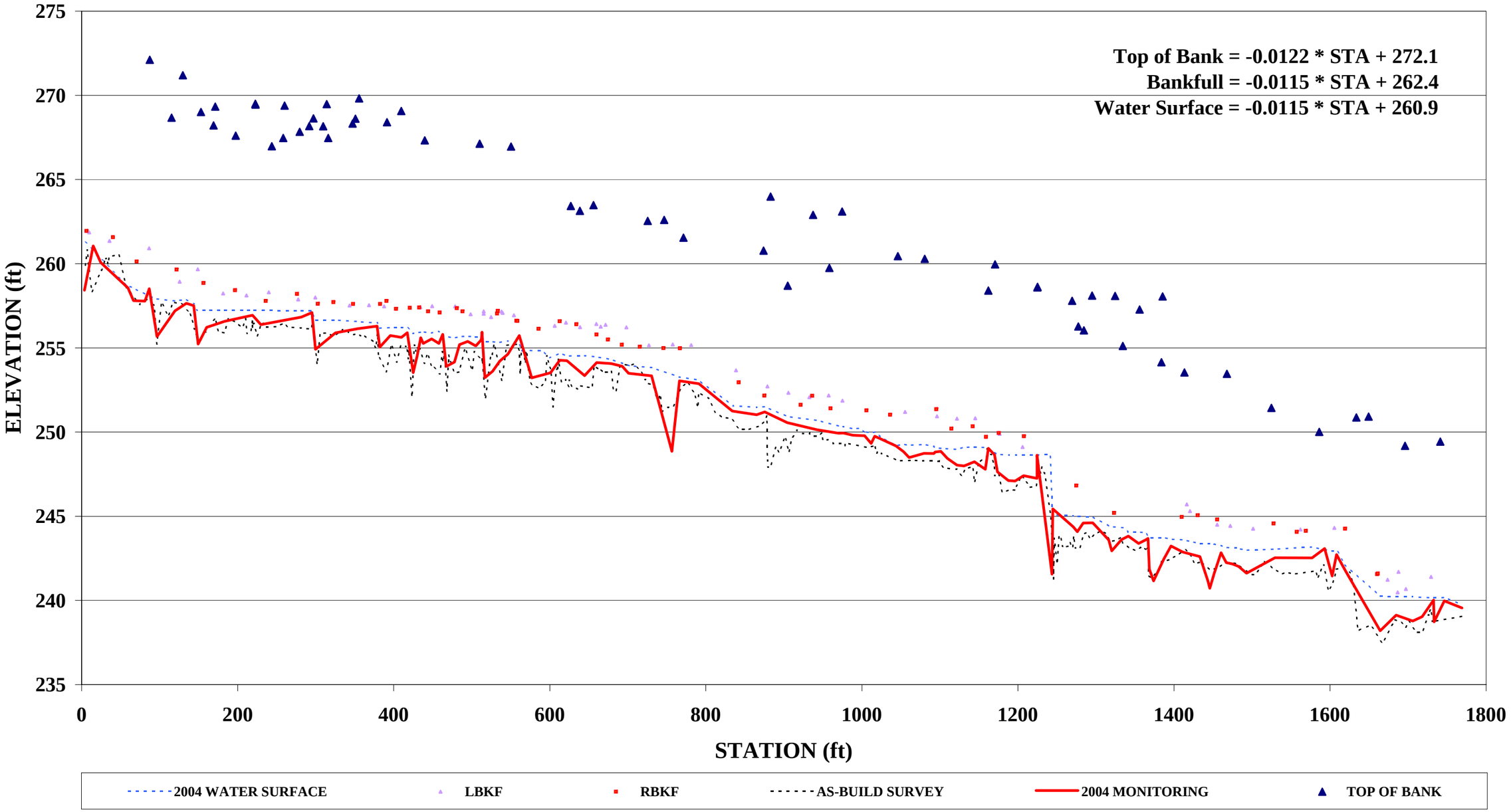
GARNER BRANCH OF WALNUT CREEK
CHAVIS PARK - LONG PROFILE
2004 MONITORING



2.3 Areas of Concern

The following areas of concern should be monitored closely and considered for repair as suggested:

- Areas with bank erosion
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    - All of this area should be able to be reached with a CAT 325c type tracked excavator without entering into the floodplain
- Areas lacking stream feature

    - The entire length of restored stream has on six existing riffle features, but as it can be observed from the as-build longitudinal profile there were not may riffles that showed up in the as-build survey
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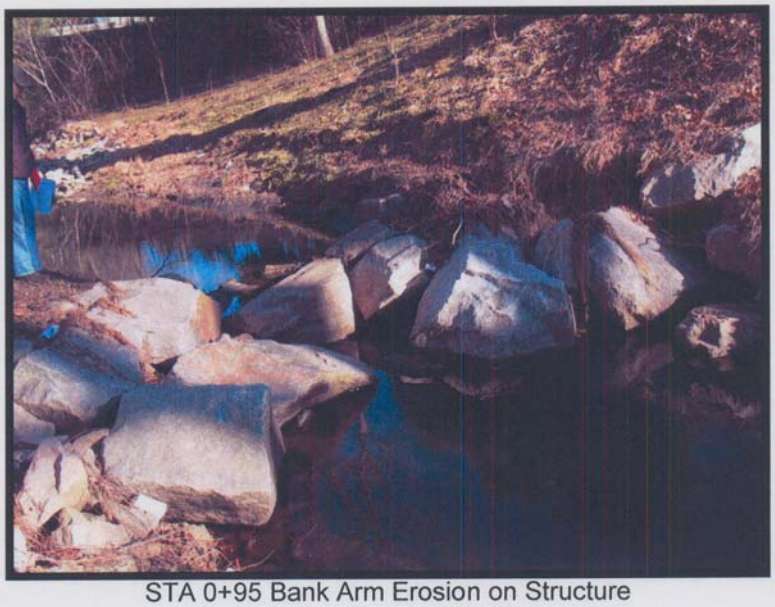
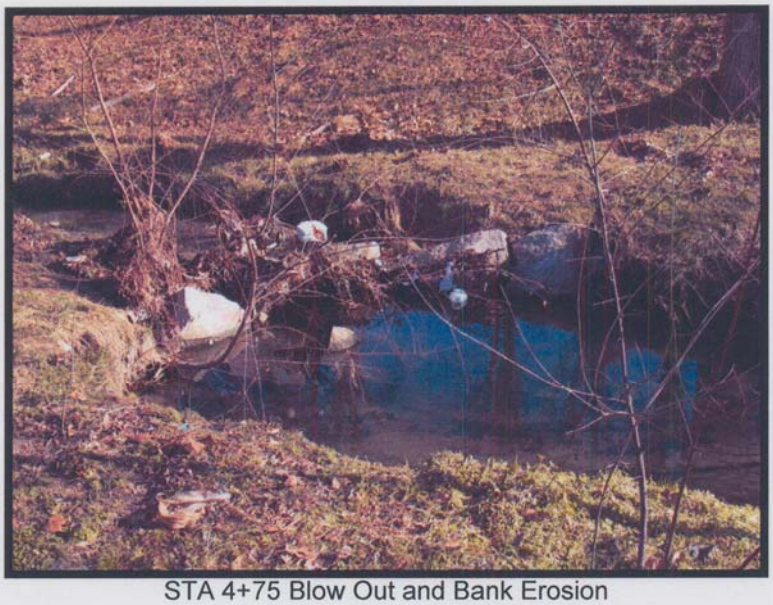
    - Exotic invasive vegetation is a major issue on this project site. Without control the exotic invasive vegetation will likely out-compete native vegetation for resources. A maintenance plan is recommended for control of these species.

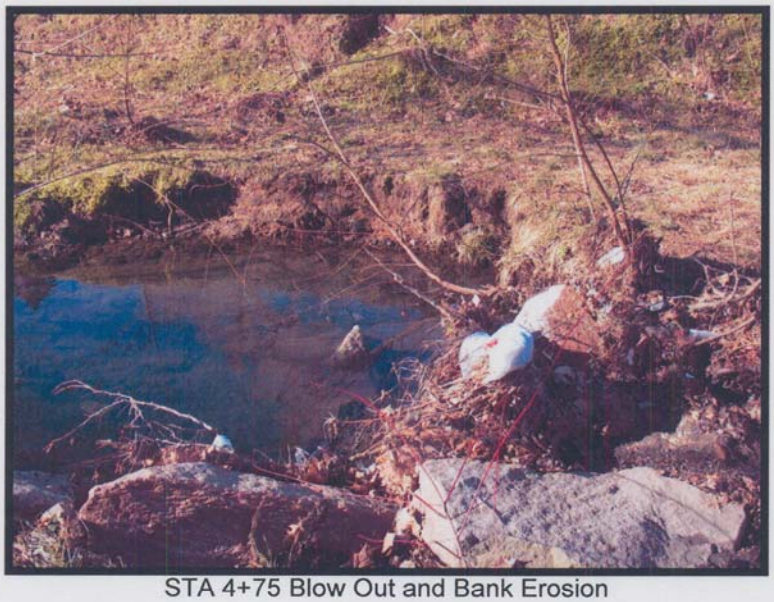


STA 0+95 Bank Arm Erosion on Structure

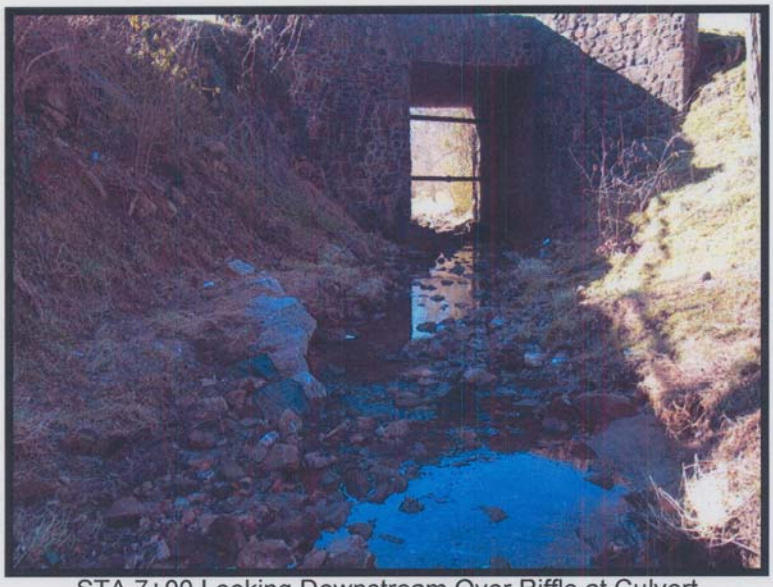
STA 2+70 Looking Downstream at Bankfull Bench



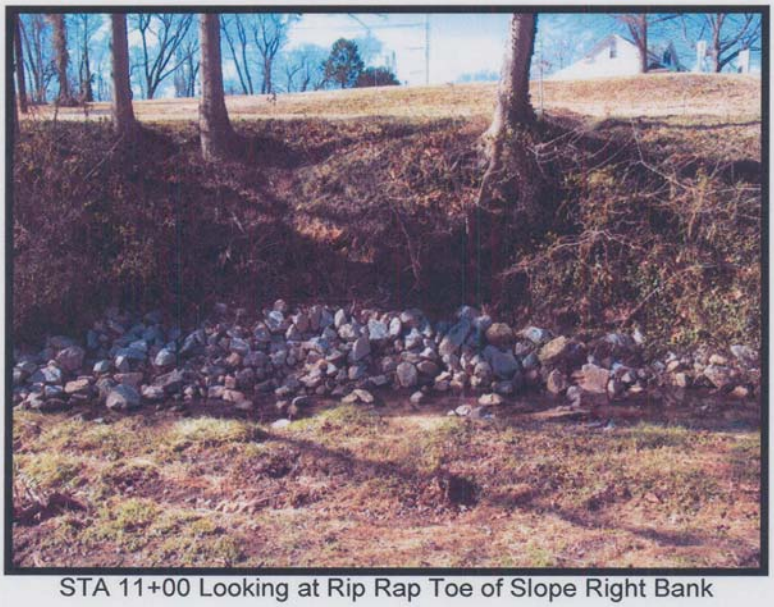
STA 4+75 Blow Out and Bank Erosion



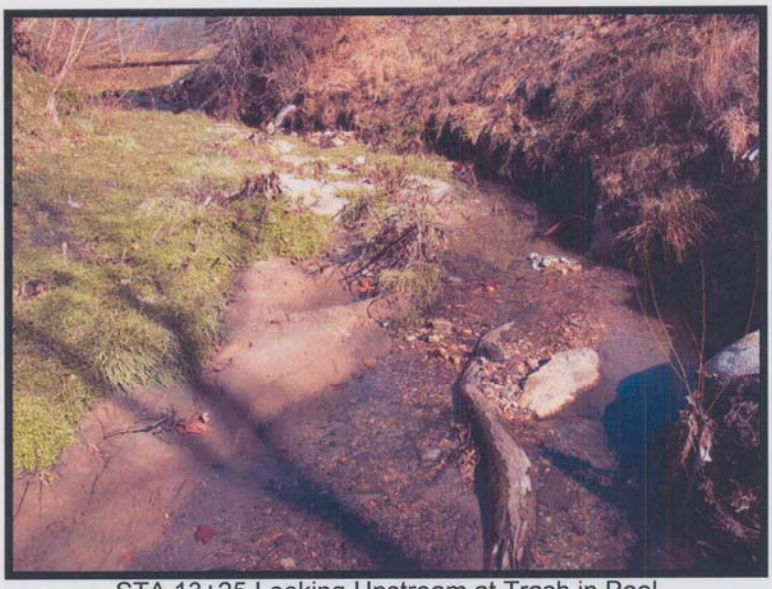
STA 4+75 Blow Out and Bank Erosion



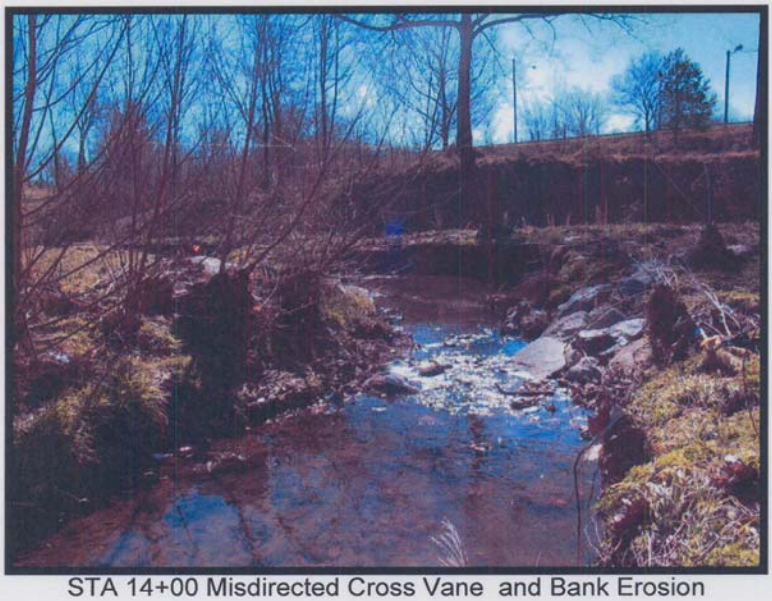
STA 7+00 Looking Downstream Over Riffle at Culvert



STA 11+00 Looking at Rip Rap Toe of Slope Right Bank

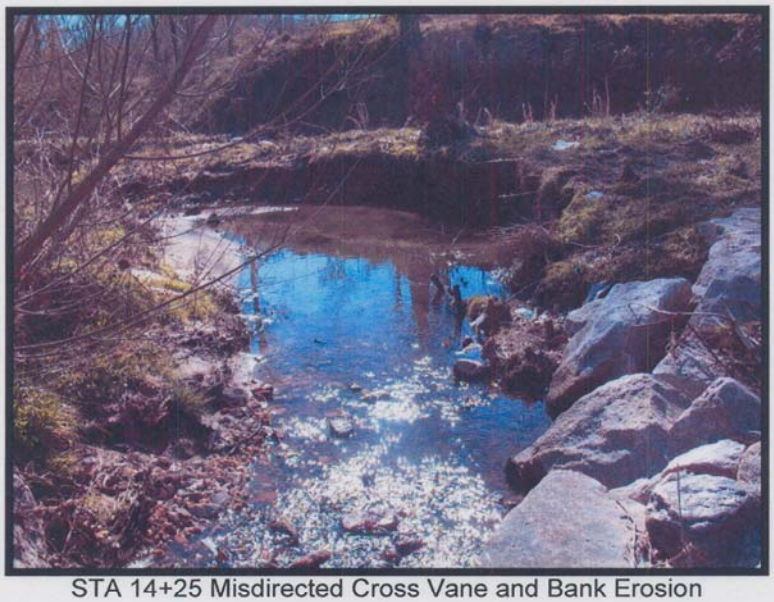


STA 13+25 Looking Upstream at Trash in Pool



STA 14+00 Misdirected Cross Vane and Bank Erosion

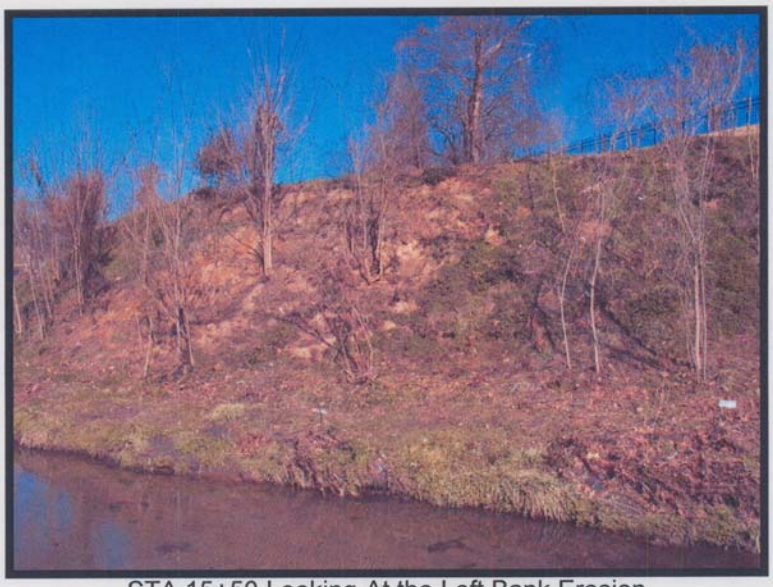
STA 14+25 Looking Downstream at Confluence



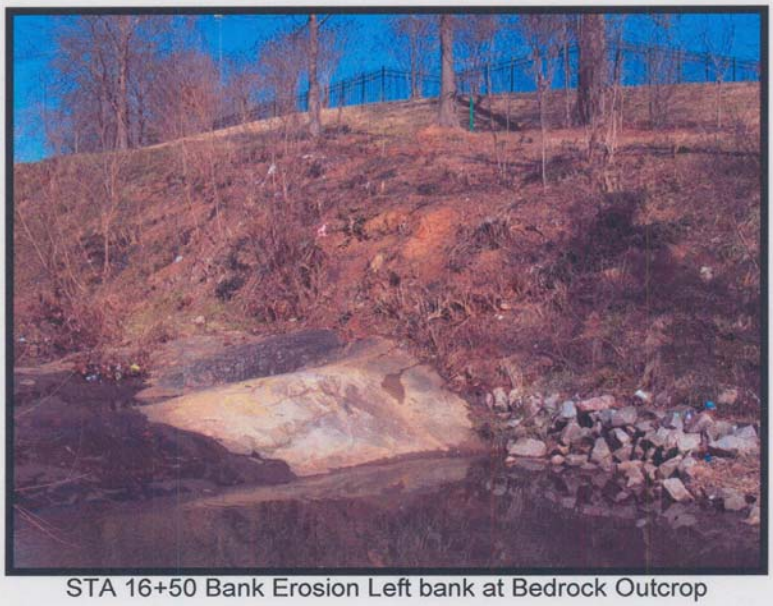
STA 14+25 Misdirected Cross Vane and Bank Erosion

STA 15+00 Fish in Pool on UT

STA 15+00 GeoGrid Bank Stabilization on UT



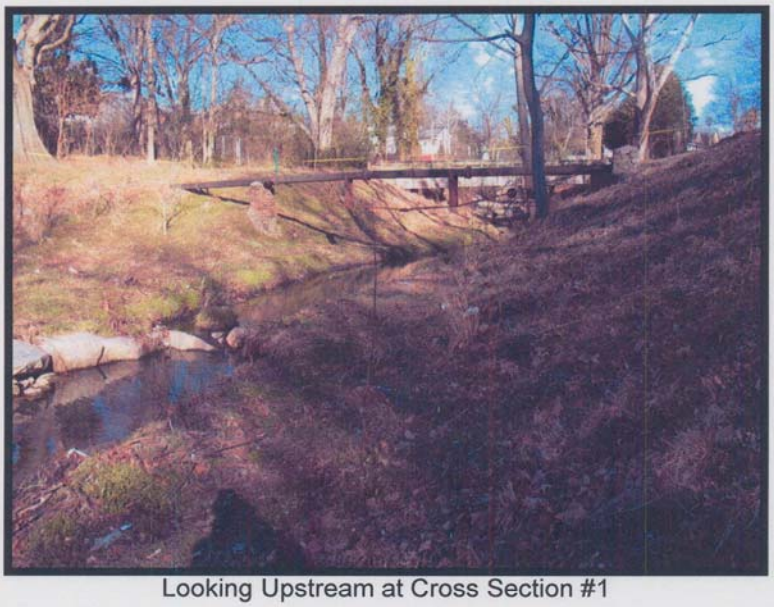
STA 15+50 Looking At the Left Bank Erosion



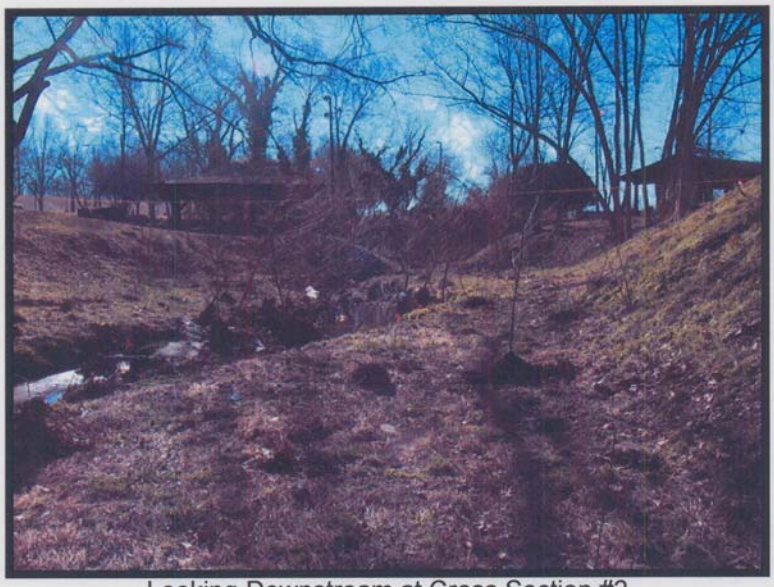
STA 16+50 Bank Erosion Left bank at Bedrock Outcrop

STA 17+00 Gully Erosion on Right Bank

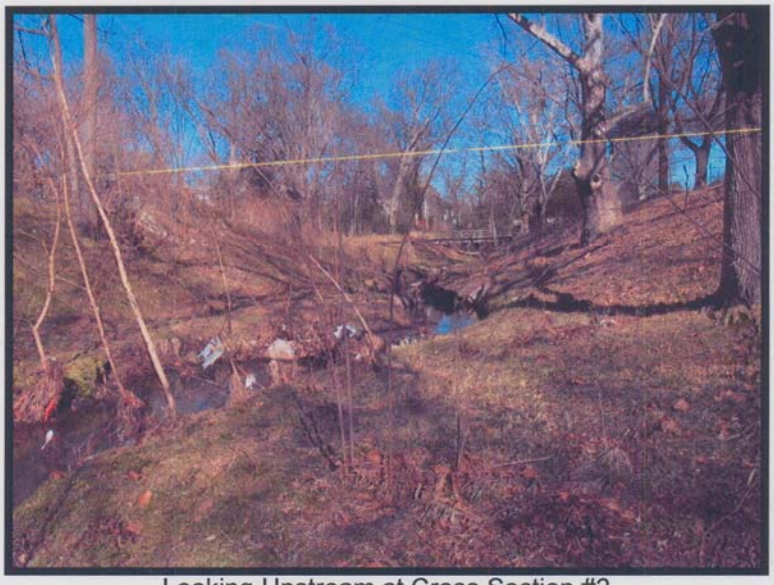
Looking Downstream at Cross Section #1



Looking Upstream at Cross Section #1

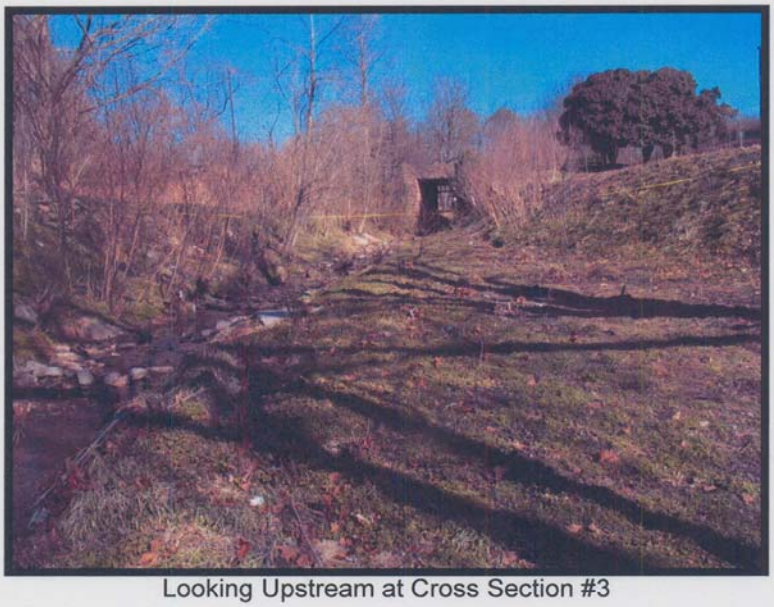


Looking Downstream at Cross Section #2

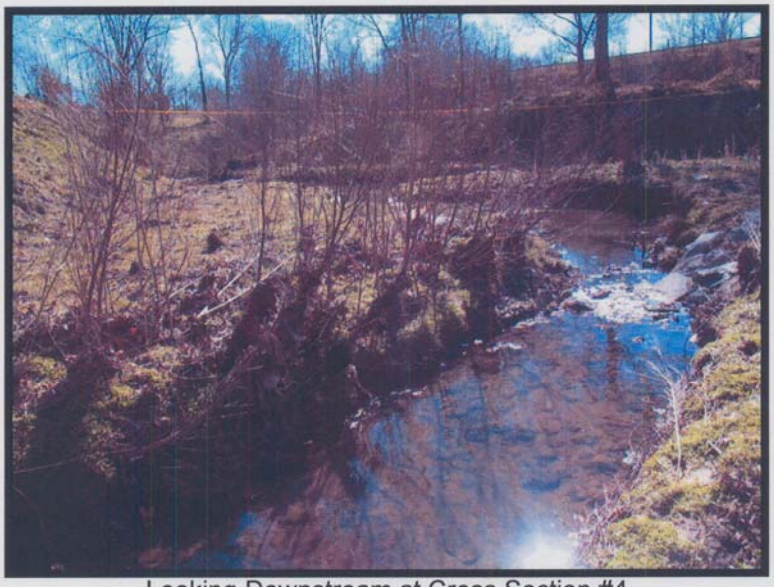


Looking Upstream at Cross Section #2

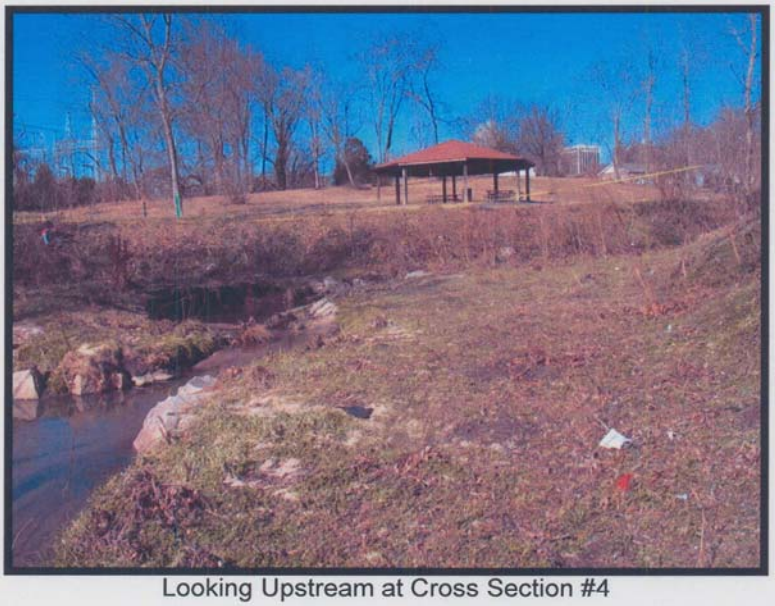
Looking Downstream at Cross Section #3



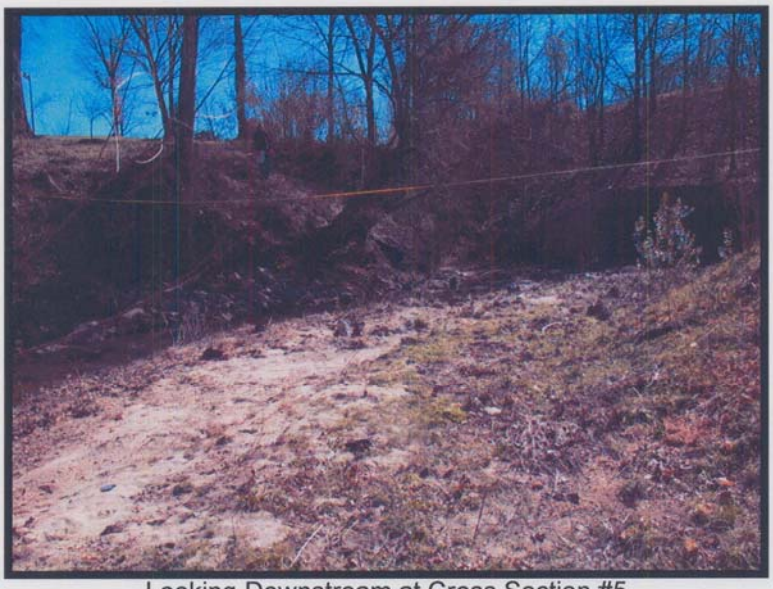
Looking Upstream at Cross Section #3



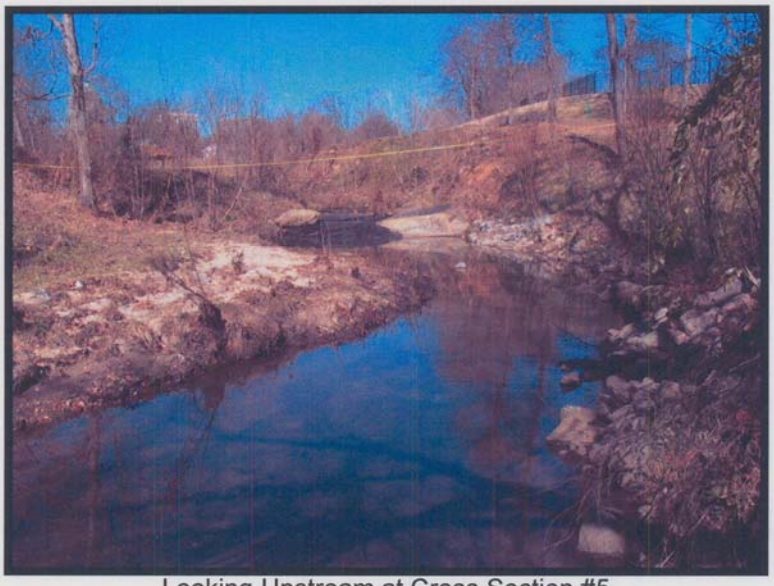
Looking Downstream at Cross Section #4



Looking Upstream at Cross Section #4

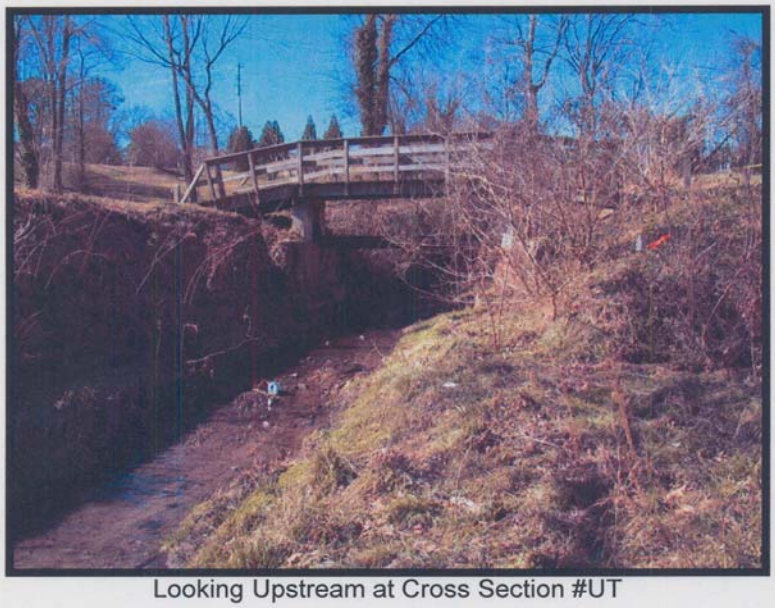


Looking Downstream at Cross Section #5

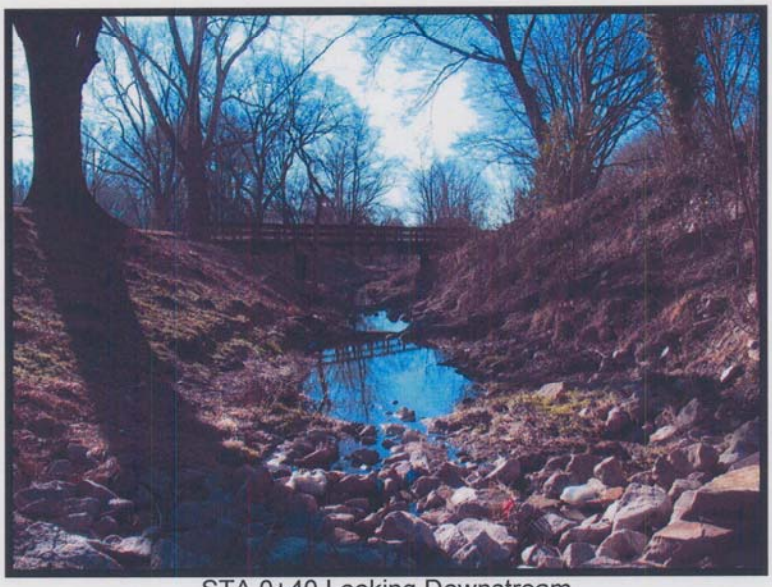


Looking Upstream at Cross Section #5

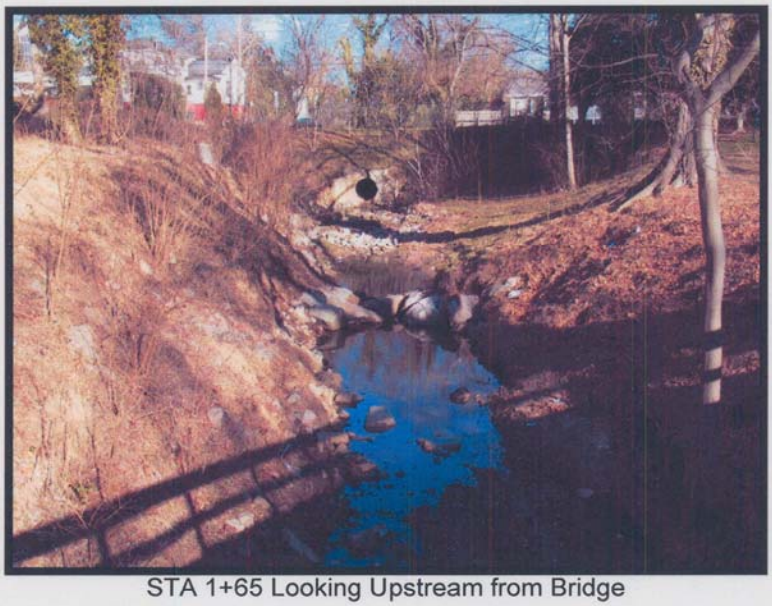
Looking Downstream at Cross Section #UT



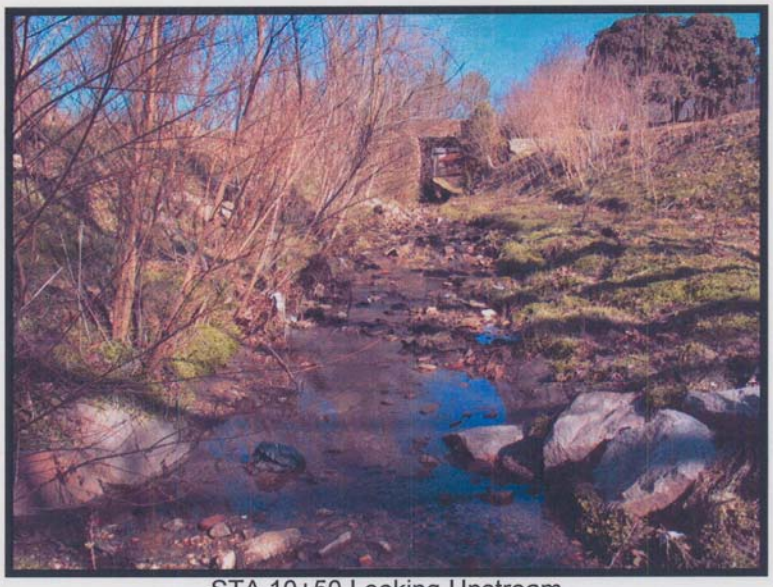
Looking Upstream at Cross Section #UT



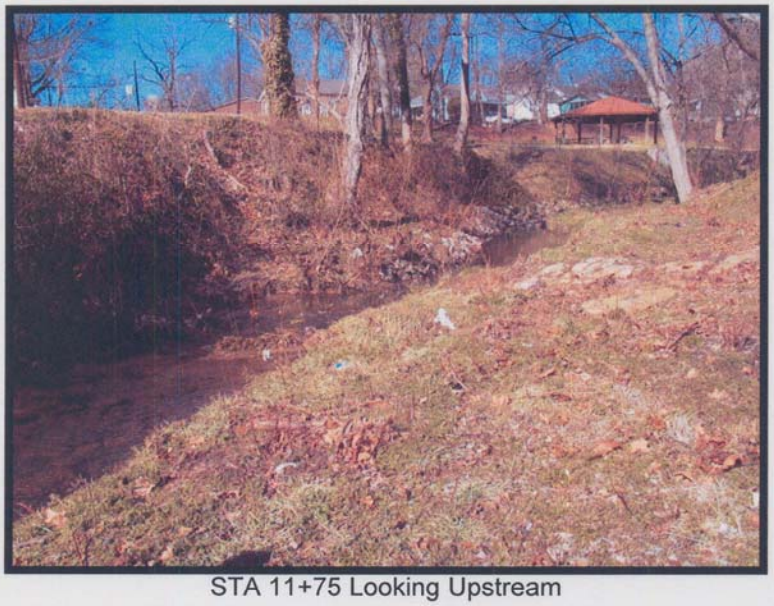
STA 0+40 Looking Downstream



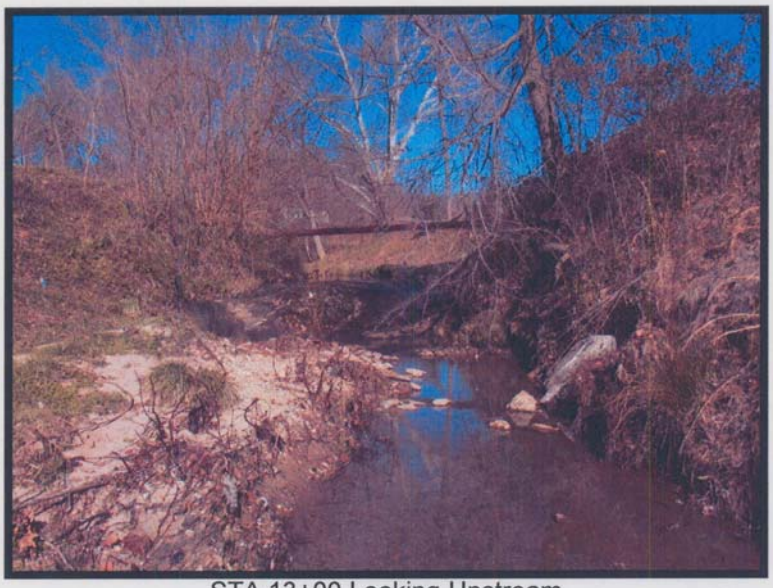
STA 1+65 Looking Upstream from Bridge



STA 10+50 Looking Upstream



STA 11+75 Looking Upstream



STA 13+00 Looking Upstream

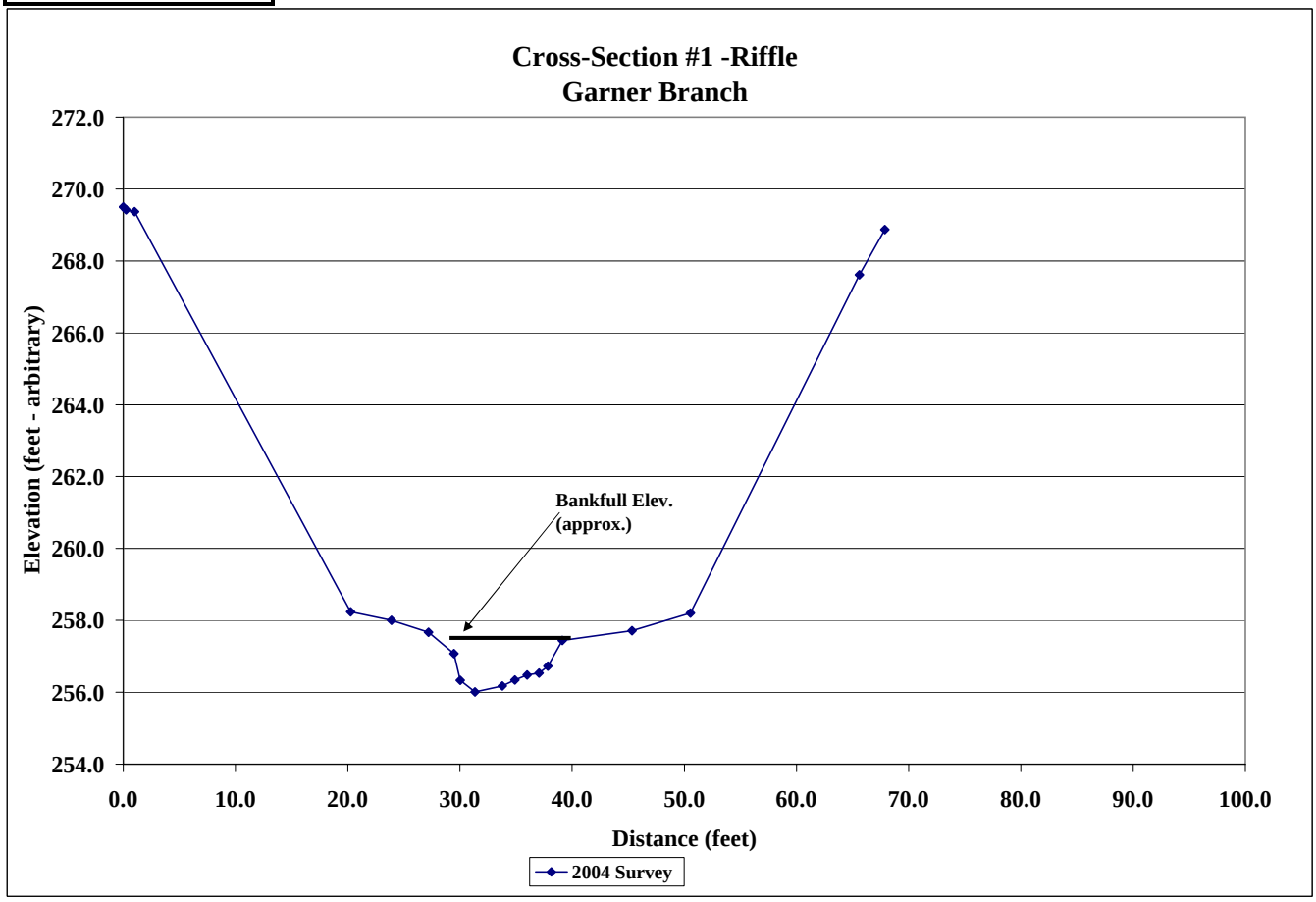
STA 15+50 Looking Upstream

Project Name	Chavis Park Garner Branch of Walnut Creek
Cross Section	#1
Feature	Riffle
Date	6/14/04
Crew	Bidelspach, Clinton

Station	2004 Survey Elevation	Notes
0.0	269.5	Left Pin
0.3	269.4	
1.0	269.4	
20.3	258.2	
23.9	258.0	
27.2	257.7	BKF
29.5	257.1	
30.0	256.3	
31.3	256.0	
33.8	256.2	
34.9	256.3	
36.0	256.5	
37.1	256.5	
37.8	256.7	
39.1	257.4	
45.3	257.7	
50.5	258.2	
65.6	267.6	
67.9	268.9	
69.0	269.1	Right Pin

Photo of Cross-Section #1 - Looking Downstream

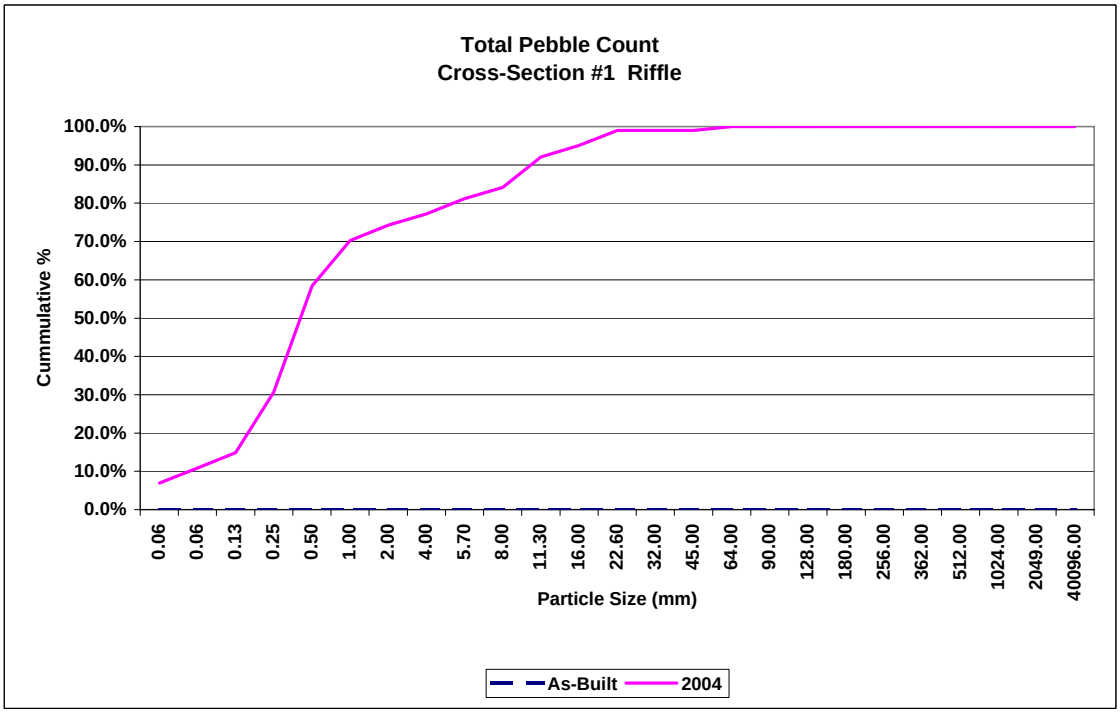
	2004
Area	12.8
Width	15.2
Mean Depth	0.8
Max Depth	1.7
W/D	18.1



Project Name	Garner Branch Chavis Park
Cross Section	#1
Feature	Riffle
Date	6/14/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bed**	**Riffle - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	7	6.9%	6.9%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	1	3	4.0%	10.9%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	1	3	4.0%	14.9%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	9	7	15.8%	30.7%
	course sand	0.50	0	#DIV/0!	#DIV/0!	28	0	27.7%	58.4%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	12	0	11.9%	70.3%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	4	0	4.0%	74.3%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	3	0	3.0%	77.2%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	4	0	4.0%	81.2%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	3	0	3.0%	84.2%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	8	0	7.9%	92.1%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	3	0	3.0%	95.0%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	4	0	4.0%	99.0%
	very course gravel	32	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.0%
	very course gravel	45	0	#DIV/0!	#DIV/0!	0	0	0.0%	99.0%
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	1	0	1.0%	100.0%
	medium cobble	90	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
TOTAL / %of whole count			0	#DIV/0!		81	20	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.20	0.43	0.64	9.50	19.21

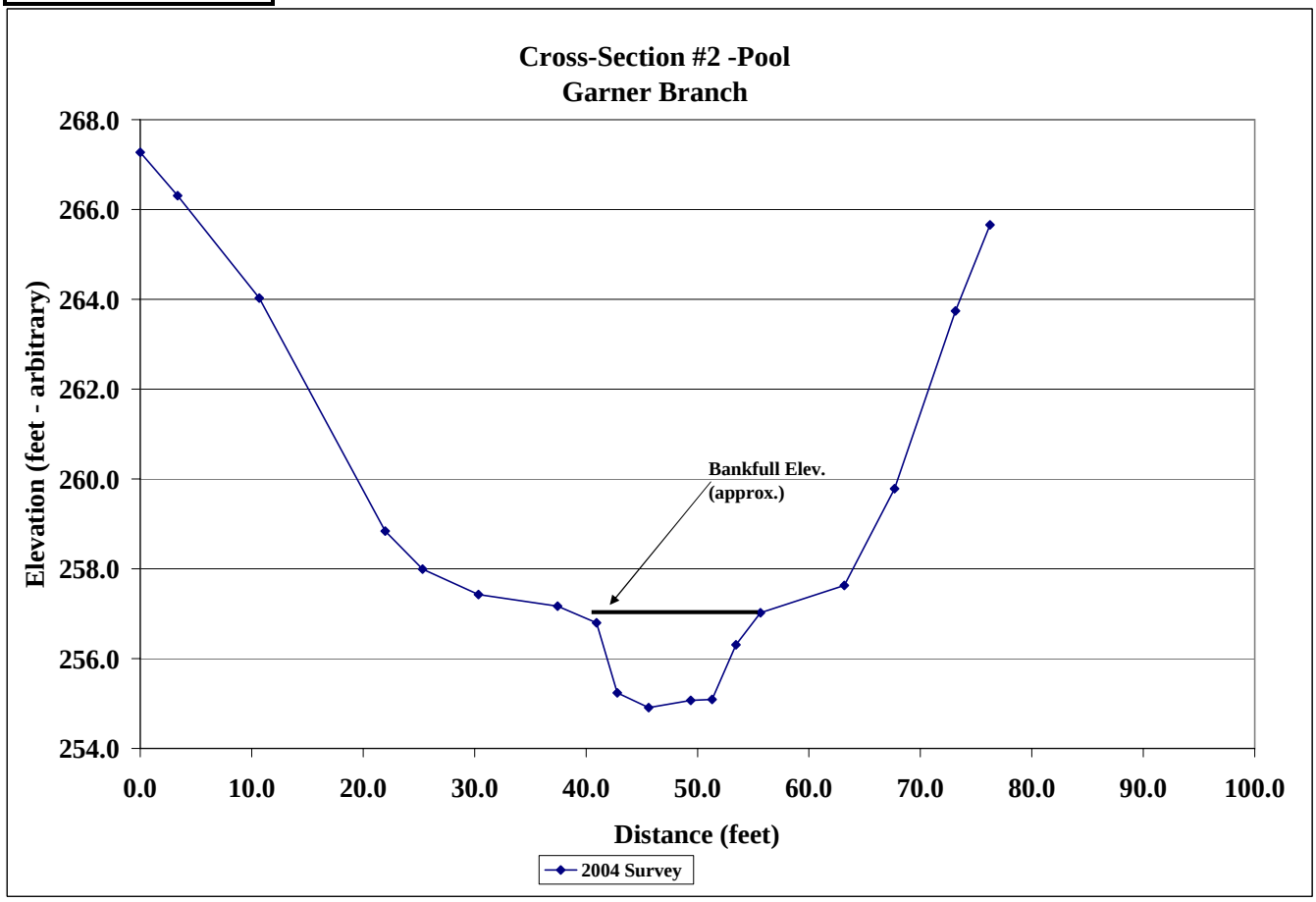


Project Name	Chavis Park Garner Branch of Walnut Creek
Cross Section	#2
Feature	Pool
Date	6/14/04
Crew	Bidelspach, Clinton

	2004	
	2004 Survey	
Station	**Elevation**	**Notes**
0.0	267.3	Left Pin
3.4	266.3	
10.7	264.0	
22.0	258.8	
25.3	258.0	
30.3	257.4	
37.5	257.2	
40.9	256.8	
42.8	255.2	
45.6	254.9	
49.4	255.1	
51.3	255.1	
53.5	256.3	
55.6	257.0	BKF
63.2	257.6	
67.7	259.8	
73.2	263.7	
76.2	265.7	
78.0	266.5	Right Pin

Photo of Cross-Section #2 - Looking Upstream

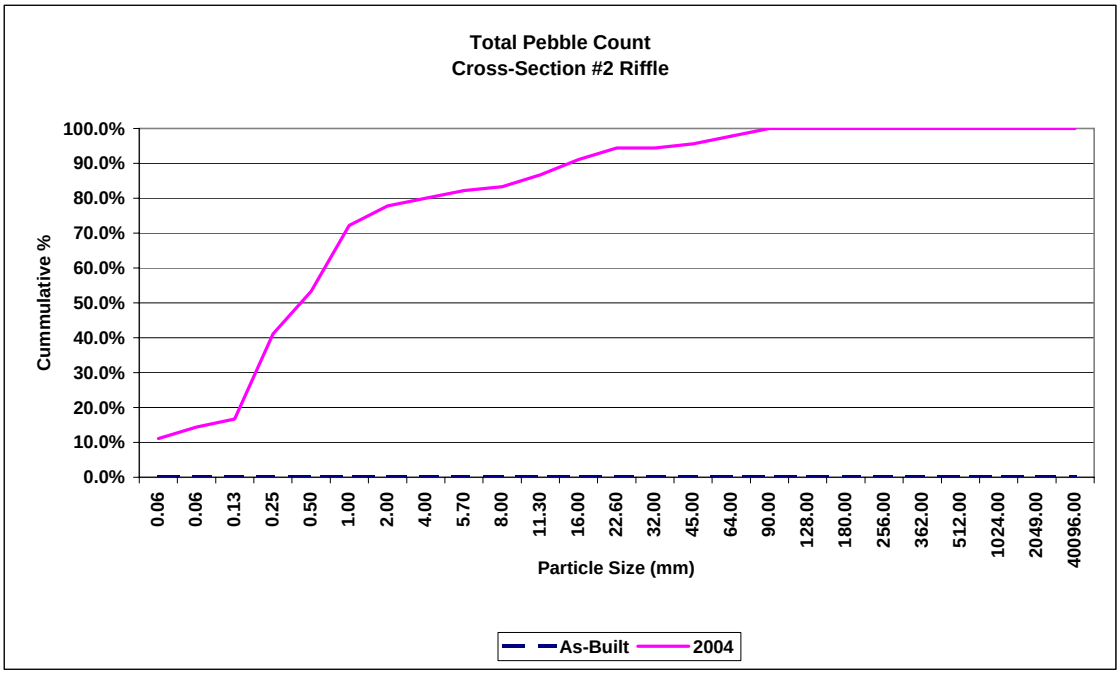
	2004
Area	22.1
Width	14.7
Mean Depth	1.5
Max Depth	2.1
W/D	9.8



Project Name	Garner Branch Chavis Park
Cross Section	#2
Feature	Riffle
Date	6/14/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bed**	**Riffle - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	10	11.1%	11.1%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	0	3	3.3%	14.4%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	2	2.2%	16.7%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	13	9	24.4%	41.1%
	course sand	0.50	0	#DIV/0!	#DIV/0!	11	0	12.2%	53.3%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	16	1	18.9%	72.2%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	5	0	5.6%	77.8%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	2	0	2.2%	80.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	2	0	2.2%	82.2%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	1	0	1.1%	83.3%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	3	0	3.3%	86.7%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	4	0	4.4%	91.1%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	3	0	3.3%	94.4%
	very course gravel	32	0	#DIV/0!	#DIV/0!	0	0	0.0%	94.4%
	very course gravel	45	0	#DIV/0!	#DIV/0!	1	0	1.1%	95.6%
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	2	0	2.2%	97.8%
	medium cobble	90	0	#DIV/0!	#DIV/0!	2	0	2.2%	100.0%
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
TOTAL / %of whole count			0	#DIV/0!		65	25	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.16	0.33	0.65	10.45	46.50

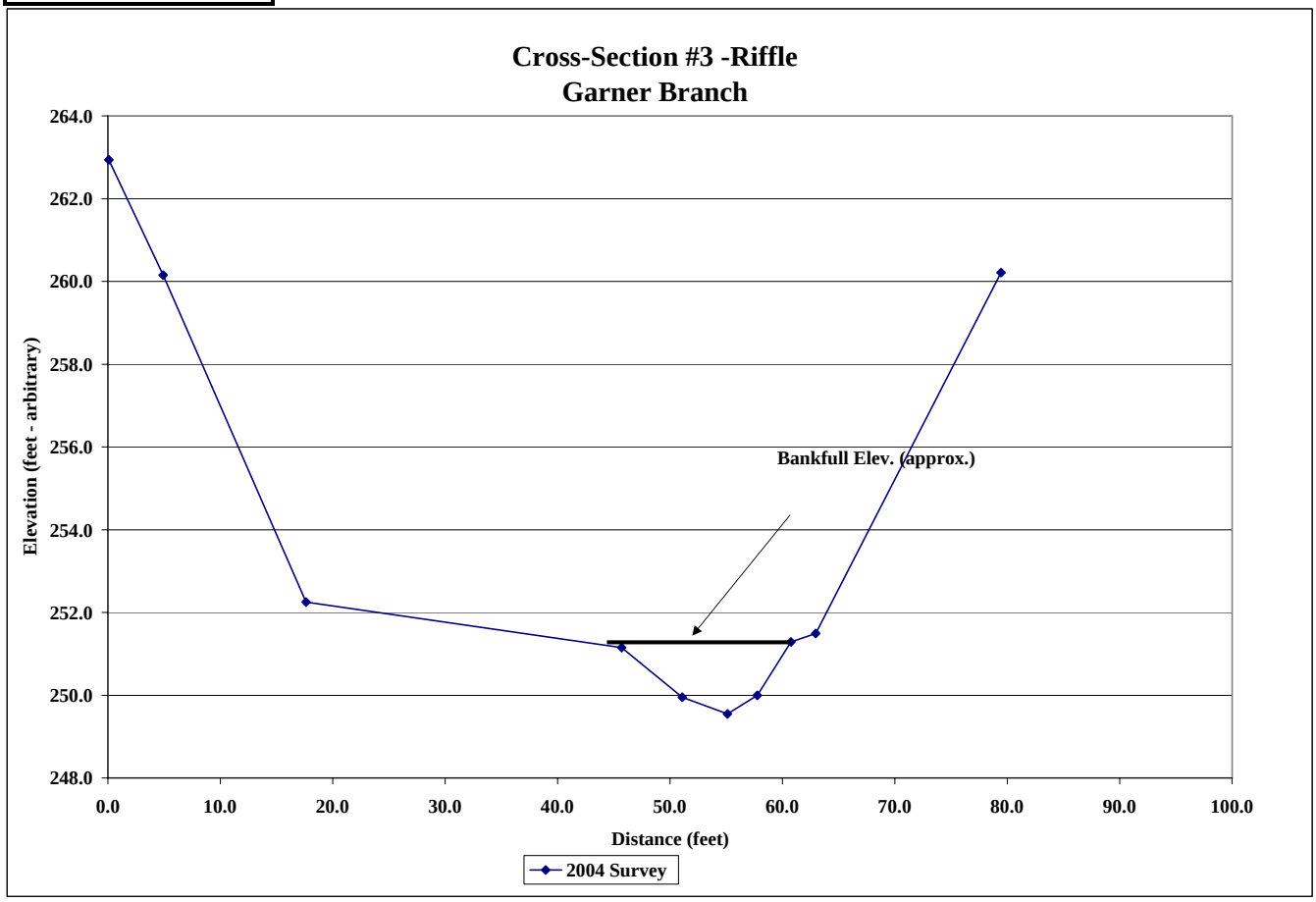


Project Name	Chavis Park Garner Branch of Walnut Creek
Cross Section	#3
Feature	Riffle
Date	6/14/04
Crew	Bidelspach, Clinton

Station	2004 Survey Elevation	Notes
0.1	262.9	Left Pin
4.9	260.2	
17.6	252.3	
45.7	251.2	
51.1	250.0	
55.1	249.6	
57.8	250.0	
60.8	251.3	BKF
63.0	251.5	
79.4	260.2	

Photo of Cross-Section #3 - Looking Downstream

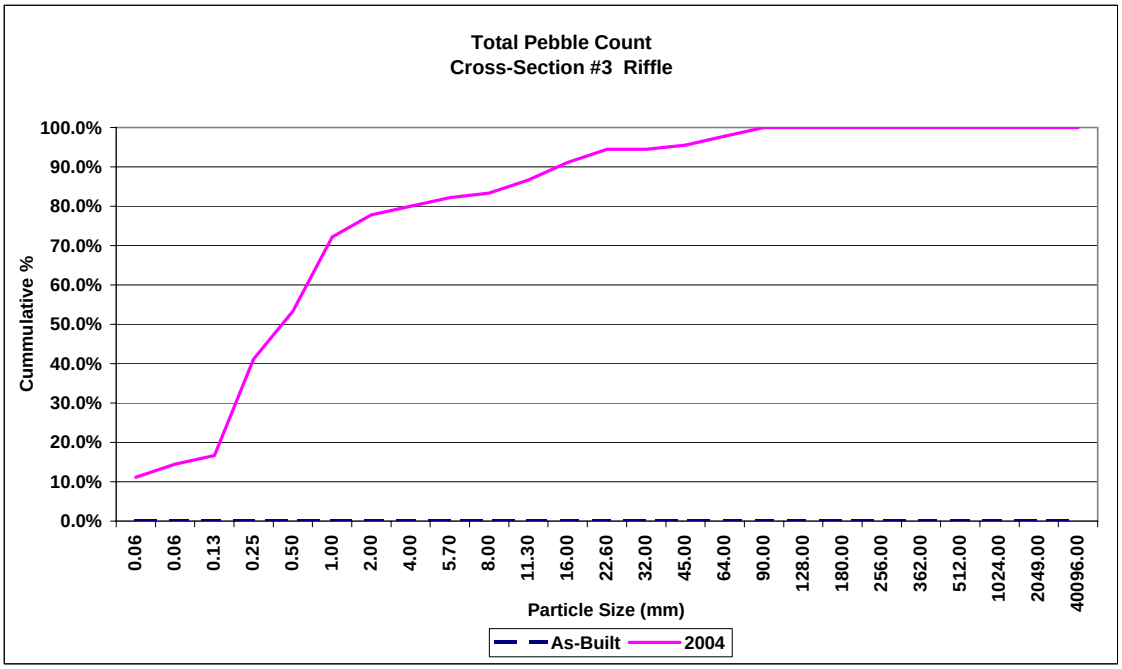
	2004
Area	15.8
Width	15.1
Mean Depth	1.0
Max Depth	1.7
W/D	14.4



Project Name	Garner Branch Chavis Park
Cross Section	#3
Feature	Pool
Date	6/14/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bed**	**Riffle - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	10	11.1%	11.1%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	0	3	3.3%	14.4%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	2	2.2%	16.7%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	13	9	24.4%	41.1%
	course sand	0.50	0	#DIV/0!	#DIV/0!	11	0	12.2%	53.3%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	16	1	18.9%	72.2%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	5	0	5.6%	77.8%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	2	0	2.2%	80.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	2	0	2.2%	82.2%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	1	0	1.1%	83.3%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	3	0	3.3%	86.7%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	4	0	4.4%	91.1%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	3	0	3.3%	94.4%
	very course gravel	32	0	#DIV/0!	#DIV/0!	0	0	0.0%	94.4%
	very course gravel	45	0	#DIV/0!	#DIV/0!	1	0	1.1%	95.6%
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	2	0	2.2%	97.8%
	medium cobble	90	0	#DIV/0!	#DIV/0!	2	0	2.2%	100.0%
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
TOTAL / %of whole count			0	#DIV/0!		65	25	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.16	0.33	0.65	10.45	46.50

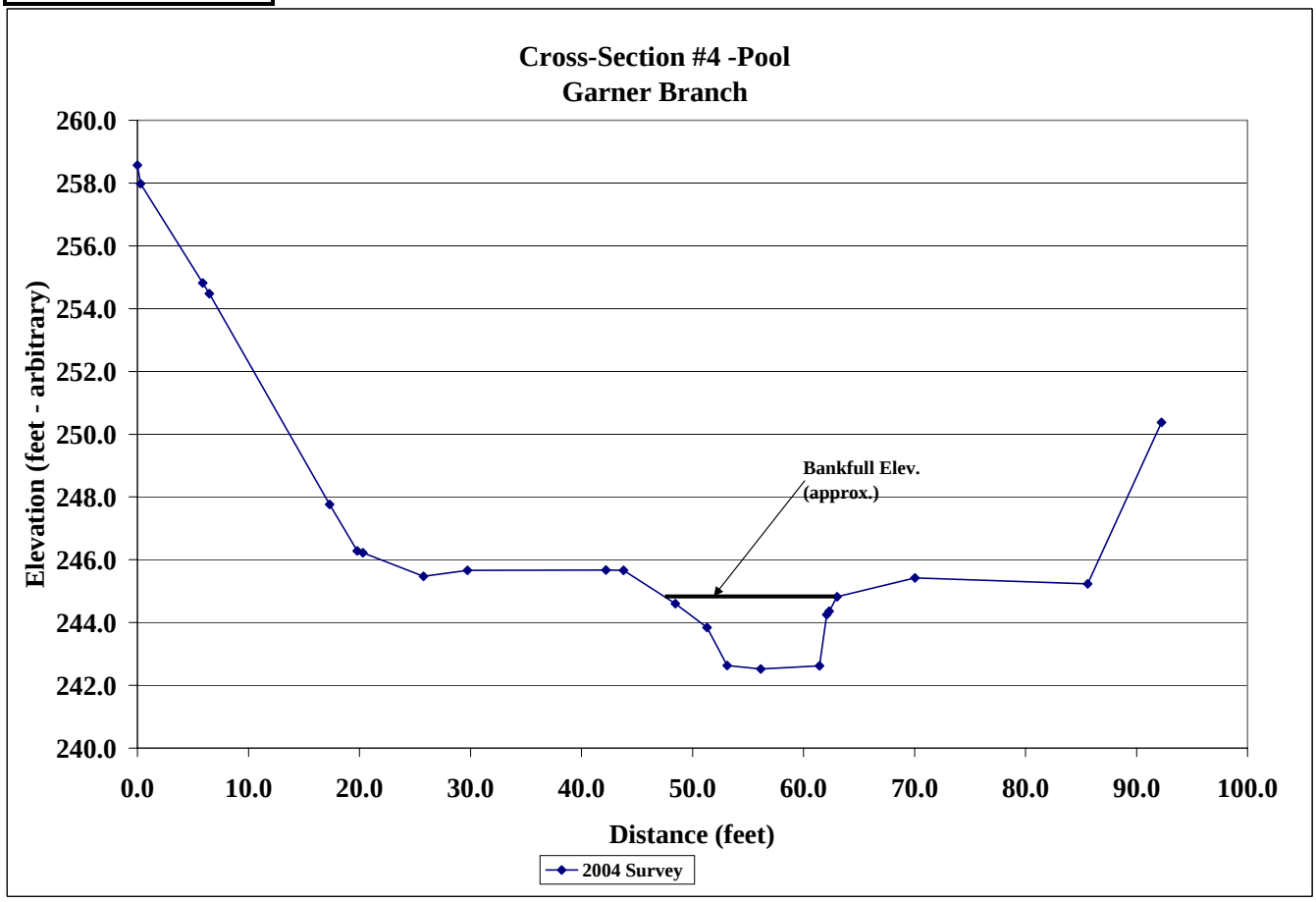


Project Name	Chavis Park Garner Branch of Walnut Creek
Cross Section	#4
Feature	Pool
Date	6/14/04
Crew	Bidelspach, Clinton

Station	2004 Survey Elevation	Notes
0.0	258.6	Left Pin
0.3	258.0	
5.9	254.8	
6.5	254.5	
17.3	247.8	
19.8	246.3	
20.3	246.2	
25.8	245.5	
29.7	245.7	
42.2	245.7	
43.8	245.7	
48.5	244.6	
51.3	243.8	
53.1	242.6	
56.1	242.5	
61.5	242.6	
62.1	244.3	
62.3	244.4	
63.0	244.8	BKF
70.05	245.42	
85.6	245.23	
92.25	250.38	Right Pin

Photo of Cross-Section #4 - Looking Downstream

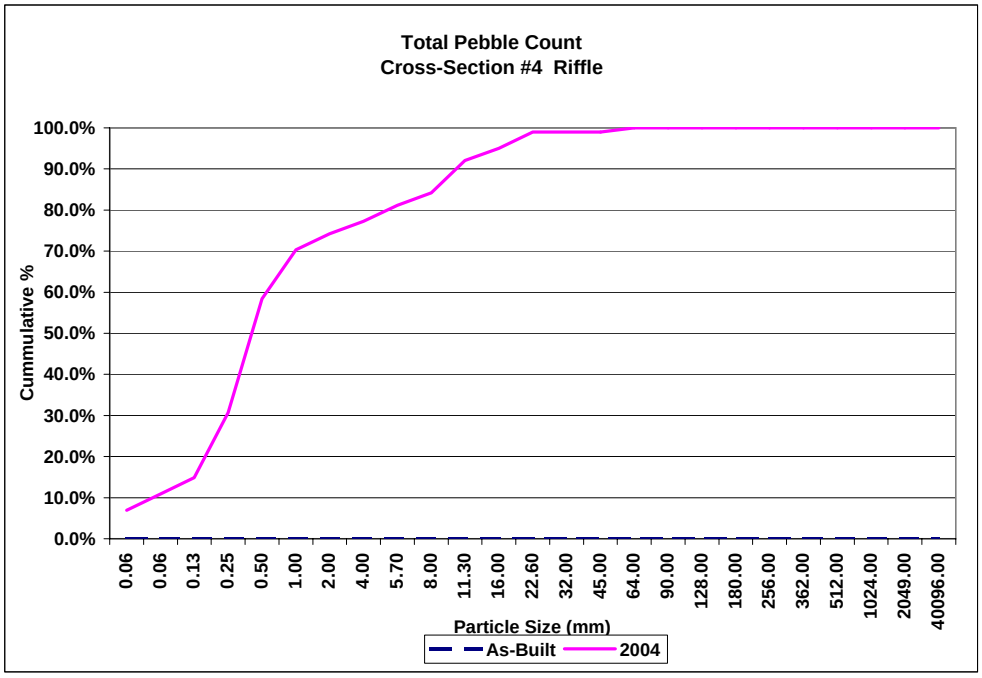
	2004
Area	25.0
Width	19.2
Mean Depth	1.3
Max Depth	2.3
W/D	14.8



Project Name	Garner Branch Chavis Park
Cross Section	#4
Feature	Pool
Date	6/14/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bed**	**Riffle - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	3	6	9.6%	9.6%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	0	10	10.6%	20.2%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	0	0.0%	20.2%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	12	0	12.8%	33.0%
	course sand	0.50	0	#DIV/0!	#DIV/0!	10	0	10.6%	43.6%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	31	0	33.0%	76.6%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	3	0	3.2%	79.8%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	2	0	2.1%	81.9%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	4	0	4.3%	86.2%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	5	0	5.3%	91.5%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	4	0	4.3%	95.7%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	2	0	2.1%	97.9%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	1	0	1.1%	98.9%
	very course gravel	32	0	#DIV/0!	#DIV/0!	1	0	1.1%	100.0%
	very course gravel	45	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium cobble	90	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	0.0%	100.0%
TOTAL / %of whole count			0	#DIV/0!		78	16	100.0%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.08	0.45	0.90	5.83	12.95

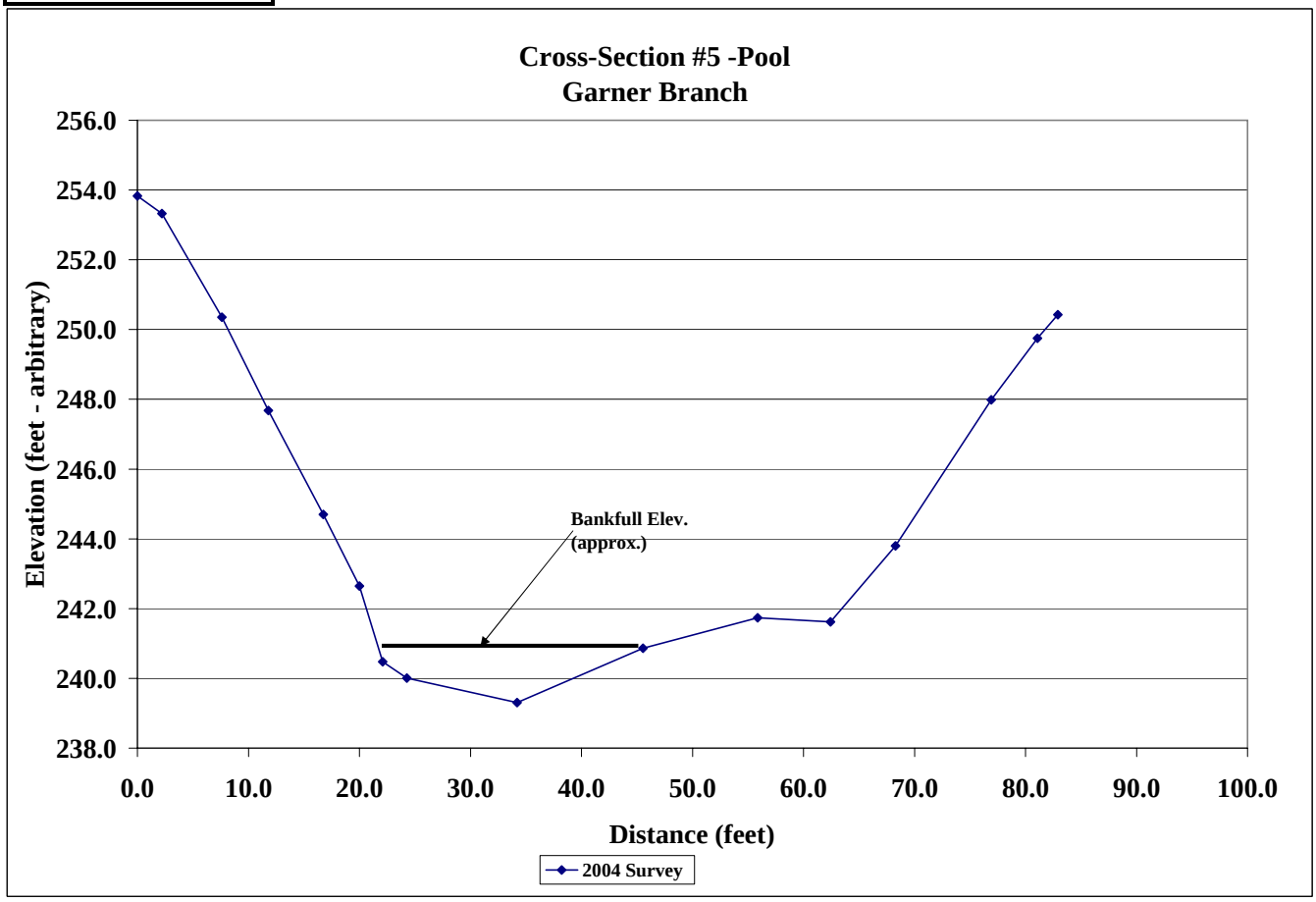


Project Name	Chavis Park Garner Branch of Walnut Creek
Cross Section	#5
Feature	Pool
Date	6/14/04
Crew	Bidelspach, Clinton

	2004 Survey	
Station	**Elevation**	**Notes**
0.0	253.8	Left Pin
2.2	253.3	
7.6	250.4	
11.8	247.7	
16.7	244.7	
20.0	242.7	
22.1	240.5	
24.3	240.0	
34.2	239.3	
45.5	240.9	BKF
55.9	241.7	
62.4	241.6	
68.3	243.8	
76.9	248.0	
81.1	249.8	
82.9	250.4	Right Pin

Photo of Cross-Section #5 - Looking Upstream

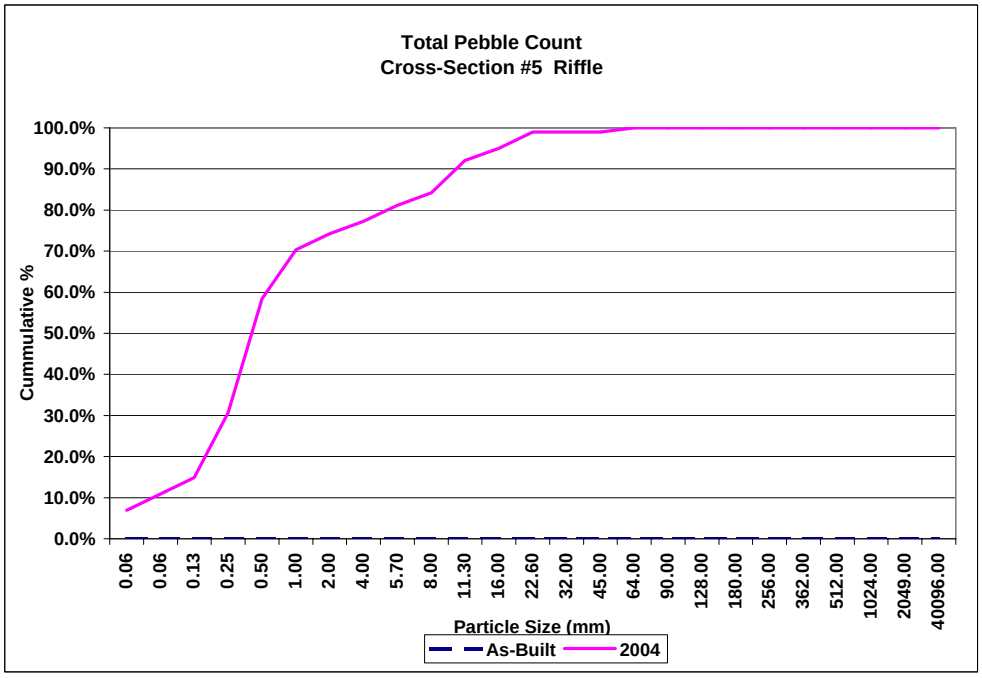
	2004
Area	22.4
Width	25.5
Mean Depth	0.9
Max Depth	1.6
W/D	29.0



Project Name	Garner Branch Chavis Park
Cross Section	#5
Feature	Pool
Date	6/14/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bed**	**Riffle - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	9	9.6%	9.6%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	0	6	6.4%	16.0%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	4	4.3%	20.2%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	6	2	8.5%	28.7%
	course sand	0.50	0	#DIV/0!	#DIV/0!	11	3	14.9%	43.6%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	18	4	23.4%	67.0%
G r a v e l	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	9	2	11.7%	78.7%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	4	0	4.3%	83.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	1	0	1.1%	84.0%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	2	0	2.1%	86.2%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	4	0	4.3%	90.4%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	0	0	0.0%	90.4%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	5	0	5.3%	95.7%
	very course gravel	32	0	#DIV/0!	#DIV/0!	9	0	9.6%	105.3%
	very course gravel	45	0	#DIV/0!	#DIV/0!	2	0	2.1%	107.4%
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	1	0	1.1%	108.5%
	medium cobble	90	0	#DIV/0!	#DIV/0!	0	0	0.0%	108.5%
	large cobble	128	0	#DIV/0!	#DIV/0!	0	0	0.0%	108.5%
	very large cobble	180	0	#DIV/0!	#DIV/0!	0	0	0.0%	108.5%
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	0.0%	108.5%
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	0.0%	108.5%
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	0.0%	108.5%
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	0.0%	108.5%
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	0.0%	108.5%
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	0.0%	108.5%
TOTAL / %of whole count			0	#DIV/0!		72	30	108.5%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.09	0.53	0.95	6.77	26.18

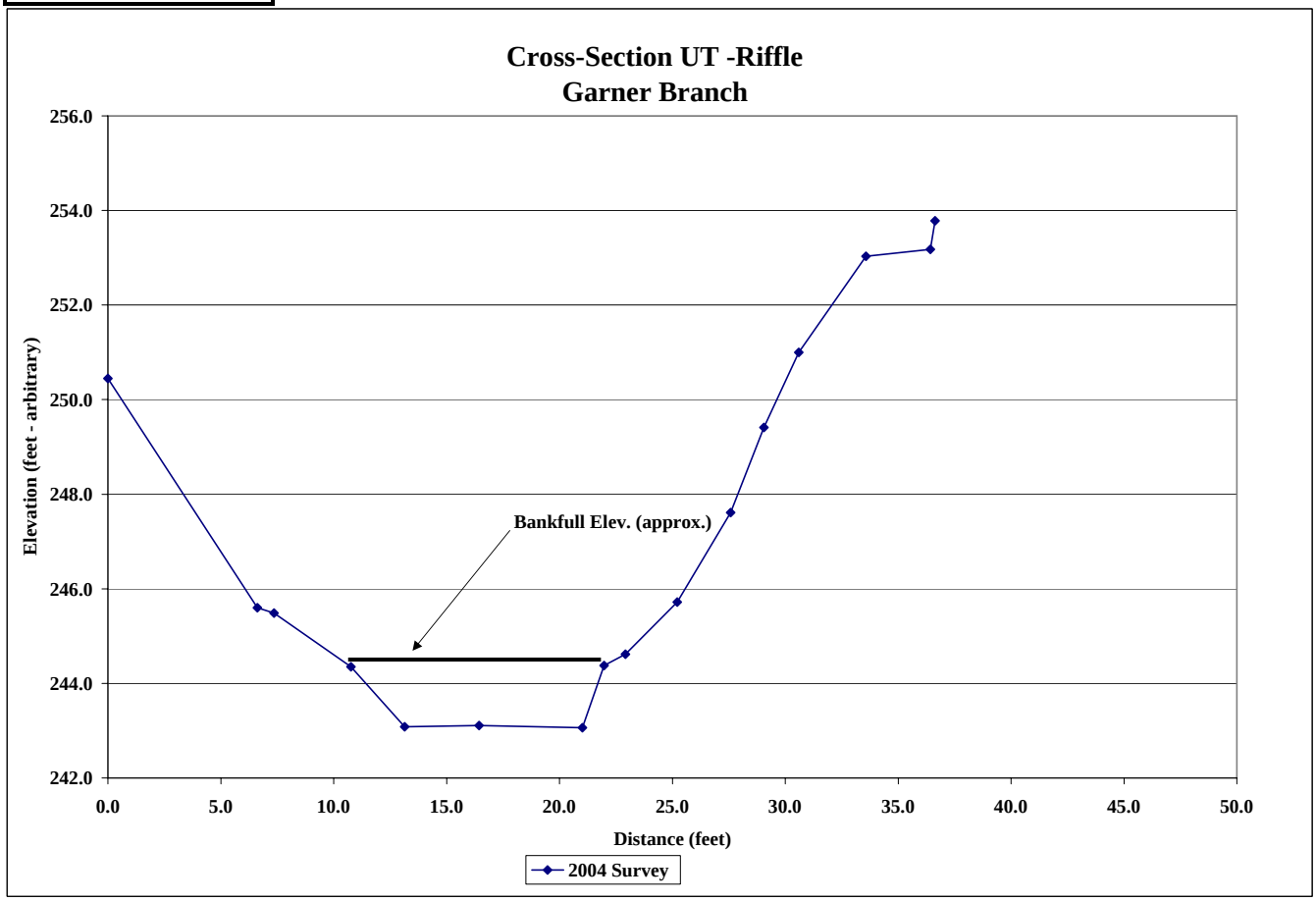


Project Name	Chavis Park Garner Branch of Walnut Creek
Cross Section	UT
Feature	Riffle
Date	6/14/04
Crew	Bidelspach, Clinton

Station	2004 Survey Elevation	Notes
0.0	250.5	Left Pin
6.6	245.6	
7.4	245.5	
10.8	244.4	BKF
13.2	243.1	
16.4	243.1	
21.0	243.1	
22.0	244.4	
22.9	244.6	
25.2	245.7	
27.6	247.6	
29.1	249.4	
30.6	251.0	
33.6	253.0	
36.4	253.2	
36.6	253.8	Right Pin

Photo of Cross-Section #UT - Looking Upstream

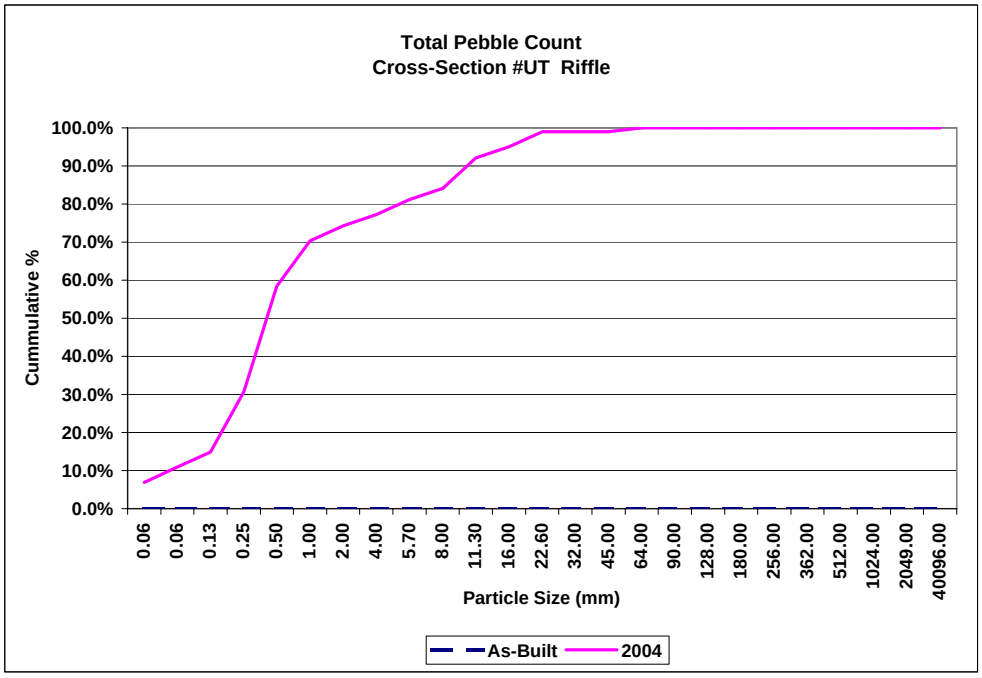
	2004
Area	12.0
Width	14.6
Mean Depth	0.8
Max Depth	1.3
W/D	17.8



Project Name	Garner Branch Chavis Park
Cross Section	#UT
Feature	Pool
Date	6/14/04
Crew	Bidelspach, Clinton

			As-Built			2004			
Description	**Material**	**Size (mm)**	**Riffle - Bed**	**%**	**Cum %**	**Riffle - Bed**	**Riffle - Bank**	**%**	**Cum %**
Silt/Clay	silt/clay	0.061	0	#DIV/0!	#DIV/0!	0	0	0.0%	0.0%
Sand	very fine sand	0.062	0	#DIV/0!	#DIV/0!	0	0	0.0%	0.0%
	fine sand	0.125	0	#DIV/0!	#DIV/0!	0	1	1.1%	1.1%
	medium sand	0.25	0	#DIV/0!	#DIV/0!	2	14	17.0%	18.1%
	course sand	0.50	0	#DIV/0!	#DIV/0!	2	14	17.0%	35.1%
	very course sand	1.0	0	#DIV/0!	#DIV/0!	13	5	19.1%	54.3%
Gravel	very fine gravel	2.0	0	#DIV/0!	#DIV/0!	6	1	7.4%	61.7%
	fine gravel	4.0	0	#DIV/0!	#DIV/0!	4	1	5.3%	67.0%
	fine gravel	5.7	0	#DIV/0!	#DIV/0!	2	0	2.1%	69.1%
	medium gravel	8.0	0	#DIV/0!	#DIV/0!	3	1	4.3%	73.4%
	medium gravel	11.3	0	#DIV/0!	#DIV/0!	2	5	7.4%	80.9%
	course gravel	16.0	0	#DIV/0!	#DIV/0!	2	1	3.2%	84.0%
	course gravel	22.6	0	#DIV/0!	#DIV/0!	0	2	2.1%	86.2%
	very course gravel	32	0	#DIV/0!	#DIV/0!	1	2	3.2%	89.4%
	very course gravel	45	0	#DIV/0!	#DIV/0!	1	2	3.2%	92.6%
Cobble	small cobble	64	0	#DIV/0!	#DIV/0!	2	1	3.2%	95.7%
	medium cobble	90	0	#DIV/0!	#DIV/0!	3	0	3.2%	98.9%
	large cobble	128	0	#DIV/0!	#DIV/0!	3	0	3.2%	102.1%
	very large cobble	180	0	#DIV/0!	#DIV/0!	4	0	4.3%	106.4%
Boulder	small boulder	256	0	#DIV/0!	#DIV/0!	0	0	0.0%	106.4%
	small boulder	362	0	#DIV/0!	#DIV/0!	0	0	0.0%	106.4%
	medium boulder	512	0	#DIV/0!	#DIV/0!	0	0	0.0%	106.4%
	large boulder	1024	0	#DIV/0!	#DIV/0!	0	0	0.0%	106.4%
	very large boulder	2049	0	#DIV/0!	#DIV/0!	0	0	0.0%	106.4%
Bedrock	bedrock	40096	0	#DIV/0!	#DIV/0!	0	0	0.0%	106.4%
TOTAL / %of whole count			0	#DIV/0!		50	50	106.4%	

	d16	**d35**	**d50**	**d85**	**d95**
2004	0.35	0.75	1.33	19.22	71.75



Chavis Park Stream Restoration
Wake County, NC

Quad 1

Tree Stratum

Species	Height (cm)	Diameter (mm)	Radius (mm)	Σ X-sec. (mm²)	Rel. x-sec (%)	Density	Rel. Density (%)	Rank (Importance)	Average
Quercus phellos	46.2	4	2	12.6					
	20	3	1.5	7.1					
Total				**19.6**	**0.5**	**2**	**11.8**	**3**	**6.2**
Morus alba	144	12	6	113.1					
	170	31	15.5	754.8					
	230	32	16	804.2					
	300	25	12.5	490.9					
	90	13	6.5	132.7					
	137	25	12.5	490.9					
	80	7	3.5	38.5					
	300	25	12.5	490.9					
	123	7	3.5	38.5					
	172	12	6	113.1					
Total				**3467.5**	**97.0**	**10**	**58.8**	**1**	**77.9**
Acer negundo	94	6	3	28.3					
Total				**28.3**	**0.8**	**1**	**5.9**	4	**3.3**
Carya sp.	57	5	2.5	19.6					
	46	3	1.5	7.1					
Total				**26.7**	**0.7**	**2**	**11.8**	**2**	**6.3**
Ilex glabra	23	6	3	28.3					
Total				**28.3**	**0.8**	**1**	**5.9**	**4**	**3.3**
Prunus serotina	28	2	1	3.1					
Total				**3.1**	**0.1**	**1**	**5.9**	**5**	**3.0**
Overall Total				**3573.6**	**100**	**17**	**100**		
Total Trees per acre						680			
Planted trees per acre						80			
Natural regen. trees per acre						600			

Shrub Stratum

Species	Cover (%)	Rel. cover (%)	Density	Rel. Density (%)	Rank (Importance)
Itea virginica	5	62.5	3	50	1
Azalea sp.	1	12.5	1	16.7	2
Myrica cerifera	1	12.5	1	16.7	2
Unknown sp.	1	12.5	1	16.7	3
Total	**8**	**100**	**6**	**100**	

Herb Stratum

Species	Cover (%)	Rel. cover (%)	Rank (Importance)
Microstegium vimineum	7	7	2
Carex sp.	90	90	1
Erigeron sp.	3	3	3
Total	**100**	**100**	

Chavis Park Stream Restoration
Wake County, NC

Quad 2

Tree Stratum

Species	Height (cm)	Diameter (mm)	Radius (mm)	Σ X-sec. (mm²)	Rel. x-sec (%)	Density	Rel. Density (%)	Rank (Importance)	Average
Robinia psuedoacacia	38.5	1	0.5	0.8					
Total				**0.8**	**0.0**	**1**	**14.3**	**5**	**7.2**
Albizia julibrissin	69	10	5	78.5					
Total				**5**	**78.5**	**3.9**	**1**	**14.3**	**4**	**9.1**
Acer negundo	300	17	8.5	227.0					
	300	17	8.5	227.0					
	11	12	6	113.1					
Total	**611**	**46**	**23**	**567.1**	**28.1**	**3**	**42.9**	**2**	**35.5**
Acer barbatum	88	12	6	113.1					
Total				**6**	**113.1**	**5.6**	**1**	**14.3**	**3**	**9.9**
Fraxinus sp.	44	40	20	1256.6					
Total				**20**	**1256.6**	**62.3**	**1**	**14.3**	**1**	**38.3**
Overall Total					**2016.1**	**100.0**	**7**	**100**		
Total Trees per acre							280			
Planted trees per acre							0			
Natural regen. trees per acre							280			

Shrub Stratum

Species	Cover (%)	Rel. cover (%)	Density	Rel. Density (%)	Rank (Importance)
Sambucus canadensis	3	27.3	10	29.4	1
Cornus amomum	1	9.1	1	2.9	4
Aronia arbutifolia	1	9.1	5	14.7	3
Clethra alnifolia	1	9.1	10	29.4	1
Salix nigra	5	45.5	8	23.5	2
Total	**11**	**100.0**	**34**	**100**	

Herb Stratum

Species	Cover (%)	Rel. cover (%)	Rank (Importance)
Polygonum sp.	8	7.1	2
Festuca sp.	100	89.3	1
Microstegium vimineum	2	1.8	3
Piliea pumila	2	1.8	3
Total	**112**	**100.0**	

Chavis Park Stream Restoration
Wake County, NC

Quad 3

Tree Stratum

Species	Height (cm)	Diameter (mm)	Radius (mm)	Σ X-sec. (mm²)	Rel. x-sec (%)	Density	Rel. Density (%)	Rank (Importance)	Average
Acer negundo	1219.2	300	150	70685.8					
Total				**70685.8**	**97.994**	**1**	**4.2**	**1**	**51.1**
Carya sp.	122	11	5.5	95.0					
	21.5	1	0.5	0.8					
	230	10	5	78.5					
	21	4	2	12.6					
	25.5	3	1.5	7.1					
	31.5	5	2.5	19.6					
Total				**213.6**	**0.296**	**6**	**25.0**	**2**	**12.65**
Melia azeradach	112	5	2.5	19.6					
	126	8	4	50.3					
	300	12	6	113.1					
Total				**183.0**	**0.254**	**3**	**12.5**	**5**	**6.38**
Prunus serotina	43	2	1	3.1					
	29	10	5	78.5					
	18	2	1	3.1					
	16.1	2	1	3.1					
	50	3	1.5	7.1					
	14	2	1	3.1					
Total				**98.2**	**0.136**	**6**	**25.0**	**3**	**12.57**
Morus alba	300	16	8	201.1					
	600	16	8	201.1					
	300	16	8	201.1					
Total				**603.2**	**0.836**	**3**	**12.5**	**4**	**6.67**
Acer rubrum	10.5	1	0.5	0.8					
Total				**0.8**	**0.001**	**1**	**4.2**	**9**	**2.08**
Ulmus sp.	21	20	10	314.2					
Total				**314.2**	**0.436**	**1**	**4.2**	**6**	**2.30**
Pyrus sp.	86	5	2.5	19.6					
Total				**19.6**	**0.027**	**1**	**4.2**	**7**	**2.10**
Acer barbatum	39	3	1.5	7.1					
Total				**7.1**	**0.010**	**1**	**4.2**	**8**	**2.09**
Albizia julibrissin	27	3	1.5	7.1					
Total				7.1	**0.010**	**1**	**4.2**	**8**	**2.09**
Overall Total				**72132.5**	**100.0**	**24**	**100**		
Total Trees per acre						960			
Planted trees per acre						200			
Natural regen. trees per acre						760			

Shrub Stratum

Species	Cover (%)	Rel. cover (%)	Density	Rel. Density (%)	Rank (Importance)
no shrubs					

Herb Stratum

Species	Cover (%)	Rel. cover (%)	Rank (Importance)
Hedera helix	100	93.5	1
Unk. Sp	1	0.9	3
Carex sp.	5	4.7	2
Aster sp.	1	0.9	3
Total	**107**	**100**	

Chavis Park Stream Restoration
Wake County, NC

Quad 4

Tree Stratum

Species	Height (cm)	Diameter (mm)	Radius (mm)	Σ X-sec. (mm²)	Rel. x-sec (%)	Density	Rel. Density (%)	Rank (Importance)	Average
Acer rubrum	6	1	0.5	0.8					
	7	1	0.5	0.8					
Total			**1**	**1.6**	**0.2**	**2**	**22.2**	**4**	**11.2**
Betula nigra	35.2	2	1	3.1					
	18.8	2	1	3.1					
Total			**2**	**6.3**	**1.0**	**2**	**22.2**	**3**	**11.6**
Prunus serotina	42.4	6	3	28.3					
Total			**3**	**28.3**	**4.3**	**1**	**11.1**	**6**	**7.7**
Robinia pseudoacacia	94.2	19	9.5	283.5					
Total			**9.5**	**283.5**	**43.6**	**1**	**11.1**	**2**	**27.4**
Acer negundo	53	9	4.5	63.6					
Total			**4.5**	**63.6**	**9.8**	**1**	**11.1**	**5**	**10.4**
Albizia julibrissin	103.5	14	7	153.9					
	136.2	12	6	113.1					
Total			**13**	**267.0**	**41.1**	**2**	**22.2**	**1**	**31.6**
Overall Total				**650.3**	**100**	**9**	**100**		
Total Trees per acre						360			
Planted trees per acre						0			
Natural regen. trees per acre						360			

Shrub Stratum

Species	Cover (%)	Rel. cover (%)	Density	Rel. Density (%)	ank (Importance)
No shrubs					

Herb Stratum

Species	Cover (%)	Rel. cover (%)	Rank (Importance)
Carex sp.	2	7.1	3
Aster sp.	1	3.6	4
Erigeron sp.	3	10.7	2
Oxalis sp.	20	71.4	1
Ambrosia sp.	1	3.6	4
Polygonum sp.	1	3.6	4
Total	**28**	**100**	

Chavis Park
6/14/2004
BEHI/NBS
Began at XS5 (Last One) and work up main stream

Length	BHR	Root Depth	Root Density	Bank Angle	Surface Protection	Other	NBS	Notes
60	(1.0 Inside	1	85	80	95	Rip-Rap,Toe	High	Deep near toe-low slope XS5
25	low					Bedrock	Low	Bedrock
110	(1.0) (3.0 T	0.5	95	90	100		Low	Very flat and wide
31	1	0.5	95	85	100	Xvane half	low	flat, deep
9	1	0.5	95	85	100		Mod	Steep and Deep Riffle
17	1	0.3	35	90	30	Blown out bank	High	Deep Pool along toe
10	1	0.4	90	65	100	X-vane	Mod	Steep center flow
25	1	0.4	90	80	100		Low	Flat
27	1	Bedrock Bank					Low	X-vane, Bedrock Bank
32	(1.0) (5.0 High)						V.H.	
18	1		Bedrock			Adjust Rock	V.H.	
50	1	0.1	20	85	70	Adjust for weather rocks	Mod	
30	Low						Low	Waterfall
110	1	0.5	85	70	90		Mod	Steep Riffle
50	1	0.4	40	80	80		Mod	Flat
50	1	0.3	70	80	80		Mod	Deep, Flat
70	1	0.4	85	80	90		Mod	Deep, Flat

60	1	1	1.5	6	1.2		10.7	642
25	1						10	250
110	1	4	1	8	1		15	1650
31	1	4	1	7	1		14	434
9	1	4	1	7	1		14	126
17	1	6	6	8	6		27	459
10	1	5	1.2	4.5	1		12.7	127
25	1	5	1.2	6	1		14.2	355
27	1	Bedrock Bank					5	135
32	1						5	160
18	1		Bedrock				5	90
50	1	8	7	7.5	2.5		26	1300
30	1						10	300
110	1	4	1.5	5	1.5		13	1430
50	1	5	5	6	2		19	950
50	1	6	1.5	6	2		16.5	825
70	1	5	1.5	6	1.5		15	1050
								10283

Max	27.0	Moderate
Average	14.2	Low
Min	5.0	Very Low

Point	Station	Elevation	Description
1224	87.31	272.11	Top of Bank
1282	115.43	268.67	Top of Bank
1227	129.73	271.19	Top of Bank
1284	153	269.01	Top of Bank
1230	169.2	268.21	Top of Bank
1283	171.26	269.33	Top of Bank
358	197.47	267.6	Top of Bank
1285	222.78	269.5	Top of Bank
356	222.89	269.45	Top of Bank
1236	243.81	266.98	Top of Bank
357	258.37	267.46	Top of Bank
354	260.16	269.39	Top of Bank
1237	279.52	267.83	Top of Bank
1239	291.78	268.17	Top of Bank
355	297.22	268.63	Top of Bank
1242	309.66	268.16	Top of Bank
351	314.19	269.48	Top of Bank
353	316.16	267.46	Top of Bank
350	347.26	268.32	Top of Bank
1245	350.96	268.61	Top of Bank
349	355.58	269.82	Top of Bank
250	391.3	268.4	Top of Bank
249	409.67	269.07	Top of Bank
248	439.72	267.32	Top of Bank
243	510.2	267.13	Top of Bank
244	550.47	266.96	Top of Bank
240	626.9	263.43	Top of Bank
242	638.51	263.14	Top of Bank
239	655.96	263.48	Top of Bank
235	725.47	262.54	Top of Bank
233	746.61	262.6	Top of Bank
232	771.32	261.54	Top of Bank
1137	874.04	260.78	Top of Bank
1138	882.98	263.99	Top of Bank
1136	904.88	258.69	Top of Bank
1135	937.43	262.9	Top of Bank
1134	958.37	259.75	Top of Bank
1133	974.75	263.1	Top of Bank
195	1046.12	260.45	Top of Bank
192	1080.41	260.29	Top of Bank
1074	1162.04	258.4	Top of Bank
1093	1170.67	259.96	Top of Bank
186	1224.99	258.59	Top of Bank
1088	1225.2	258.62	Top of Bank
11	1269.49	257.8	Top of Bank
185	1277.36	256.27	Top of Bank
18	1284.39	256.04	Top of Bank
15	1295.01	258.1	Top of Bank
19	1324.48	258.08	Top of Bank
23	1334.3	255.11	Top of Bank
36	1355.99	257.28	Top of Bank
27	1383.96	254.15	Top of Bank
40	1385.49	258.06	Top of Bank
32	1413.44	253.54	Top of Bank
99	1467.81	253.46	Top of Bank
104	1524.83	251.44	Top of Bank
107	1586.15	250.01	Top of Bank
149	1633.75	250.87	Top of Bank
112	1649.34	250.92	Top of Bank
148	1696.05	249.18	Top of Bank
147	1741.31	249.43	Top of Bank

Point	Station	Elevation	Description
709	4.63	259.91	ASB-thalweg
708	5.88	260.3	ASB-thalweg
707	7.26	260.81	ASB-thalweg
706	7.43	260.78	ASB-thalweg
705	9.04	259.86	ASB-thalweg
704	13.13	258.31	ASB-thalweg
703	25.31	259.6	ASB-thalweg
702	30.85	260.3	ASB-thalweg
701	31.04	260.32	ASB-thalweg
700	31.21	260.3	ASB-thalweg
699	33.23	260.33	ASB-thalweg
698	33.6	260	ASB-thalweg
697	34.05	260.09	ASB-thalweg
696	35.44	260.42	ASB-thalweg
695	47.73	260.55	ASB-thalweg
694	57.52	258.56	ASB-thalweg
693	74.96	257.59	ASB-thalweg
692	88.73	258.05	ASB-thalweg
691	92.3	257.56	ASB-thalweg
690	93.25	257.46	ASB-thalweg
689	96.34	255.24	ASB-thalweg
688	102.55	257.73	ASB-thalweg
687	110.94	256.87	ASB-thalweg
686	117.26	257.72	ASB-thalweg
685	127.81	257.61	ASB-thalweg
684	136.91	257.19	ASB-thalweg
683	138.55	257.11	ASB-thalweg
682	141.48	256.66	ASB-thalweg
681	144.51	256.11	ASB-thalweg
680	147.23	255.8	ASB-thalweg
679	147.23	255.8	ASB-thalweg
678	148.97	255.3	ASB-thalweg
677	159	255.95	ASB-thalweg
676	171.45	256.74	ASB-thalweg
675	171.96	256.62	ASB-thalweg
674	175.44	255.95	ASB-thalweg
673	183.13	255.89	ASB-thalweg
672	188	256.73	ASB-thalweg
670	196.29	256.55	ASB-thalweg
669	206.35	256.2	ASB-thalweg
668	210.2	256.73	ASB-thalweg
667	212.02	255.87	ASB-thalweg
666	212.04	255.85	ASB-thalweg
665	216.94	255.97	ASB-thalweg
664	218.88	256.61	ASB-thalweg
663	218.89	256.19	ASB-thalweg
662	219.31	256.58	ASB-thalweg
661	219.72	256.41	ASB-thalweg
660	220.88	256.45	ASB-thalweg
659	225.08	255.7	ASB-thalweg
658	230.58	256.46	ASB-thalweg
657	235.33	256.45	ASB-thalweg
656	237.09	256.24	ASB-thalweg
655	248.82	256.26	ASB-thalweg
654	259.96	256.47	ASB-thalweg
653	264.14	256.24	ASB-thalweg
652	281.33	256.18	ASB-thalweg
651	294.49	256.11	ASB-thalweg
650	295.59	256.48	ASB-thalweg
649	297.32	256.03	ASB-thalweg
648	297.58	256.07	ASB-thalweg
647	301.97	254.01	ASB-thalweg
646	305.8	255.86	ASB-thalweg
645	312.89	255.88	ASB-thalweg
644	323.83	255.69	ASB-thalweg
643	329.1	255.91	ASB-thalweg
642	334.65	256.09	ASB-thalweg
641	341.92	255.94	ASB-thalweg
640	348.73	255.78	ASB-thalweg
639	353.03	255.83	ASB-thalweg
638	357.55	255.71	ASB-thalweg
637	361.05	255.77	ASB-thalweg
635	373.43	255.38	ASB-thalweg
634	376.87	254.98	ASB-thalweg
633	379.11	255.81	ASB-thalweg
632	379.23	255.85	ASB-thalweg
631	380.5	254.52	ASB-thalweg

Point	Station	Elevation	Description

630	380.55	254.51	ASB-thalweg
629	390.54	253.58	ASB-thalweg
628	397.25	255.21	ASB-thalweg
627	403.86	254.16	ASB-thalweg
626	409.23	255.14	ASB-thalweg
625	415.37	255.07	ASB-thalweg
624	416.92	254.98	ASB-thalweg
623	417.15	254.9	ASB-thalweg
622	418.69	254.37	ASB-thalweg
621	419.34	254.86	ASB-thalweg
620	419.34	254.86	ASB-thalweg
619	423.45	252.07	ASB-thalweg
618	426.42	255.16	ASB-thalweg
617	428.2	254.82	ASB-thalweg
616	429.11	255.07	ASB-thalweg
615	433.12	254.8	ASB-thalweg
614	433.28	254.95	ASB-thalweg
613	439.32	254.09	ASB-thalweg
612	443.38	254.68	ASB-thalweg
611	448.55	253.91	ASB-thalweg
610	450.42	253.9	ASB-thalweg
609	459.15	253.46	ASB-thalweg
608	462.37	254.77	ASB-thalweg
607	462.94	254.2	ASB-thalweg
606	463.68	254.36	ASB-thalweg
605	465.25	254.61	ASB-thalweg
604	468.15	252.43	ASB-thalweg
603	470.5	254.58	ASB-thalweg
602	471.39	254.38	ASB-thalweg
601	477.82	253.51	ASB-thalweg
600	483.58	253.57	ASB-thalweg
599	491.65	255	ASB-thalweg
598	500.77	253.64	ASB-thalweg
597	503.35	254.77	ASB-thalweg
596	510.79	254.41	ASB-thalweg
595	512.14	254.35	ASB-thalweg
594	513.09	254.34	ASB-thalweg
593	513.18	254.28	ASB-thalweg
592	513.41	254.35	ASB-thalweg
591	517.54	251.95	ASB-thalweg
590	523.52	254.21	ASB-thalweg
589	524.27	254.61	ASB-thalweg
588	526.06	254.62	ASB-thalweg
587	528.87	255.24	ASB-thalweg
586	538.55	253.05	ASB-thalweg
585	544.75	255.15	ASB-thalweg
584	557.86	255.21	ASB-thalweg
583	561.21	254.83	ASB-thalweg
582	561.99	253.41	ASB-thalweg
581	563.87	255.06	ASB-thalweg
580	563.87	255.06	ASB-thalweg
579	564.93	255	ASB-thalweg
578	568.98	254.11	ASB-thalweg
577	568.98	254.11	ASB-thalweg
576	569.5	254.8	ASB-thalweg
575	570.89	254.66	ASB-thalweg
574	571.23	254.07	ASB-thalweg
573	575.24	252.91	ASB-thalweg
572	577.17	252.81	ASB-thalweg
571	586.52	252.59	ASB-thalweg
570	594.44	253	ASB-thalweg
569	596.33	254.53	ASB-thalweg
568	596.33	254.53	ASB-thalweg
567	599.65	253.92	ASB-thalweg
566	601.54	253.68	ASB-thalweg
565	604.04	251.52	ASB-thalweg
564	608.48	253.69	ASB-thalweg
563	609.89	253.78	ASB-thalweg
562	610.27	253.69	ASB-thalweg
561	610.27	253.69	ASB-thalweg
560	611.14	254.33	ASB-thalweg
559	614.87	252.97	ASB-thalweg
558	620.25	253.1	ASB-thalweg
557	620.25	253.1	ASB-thalweg
556	624.33	252.73	ASB-thalweg
555	625.03	253.08	ASB-thalweg
554	625.03	253.08	ASB-thalweg
553	628.44	252.69	ASB-thalweg
552	635.22	252.57	ASB-thalweg
551	638.98	252.75	ASB-thalweg

550	646.87	252.68	ASB-thalweg
549	654.25	252.62	ASB-thalweg
548	656.85	253.94	ASB-thalweg
547	664.92	253.67	ASB-thalweg
546	665.92	253.7	ASB-thalweg
545	670.26	253.53	ASB-thalweg
544	671.97	253.56	ASB-thalweg
543	674.62	253.56	ASB-thalweg
542	678.94	253.6	ASB-thalweg
541	681.36	252.56	ASB-thalweg
540	684.85	252.42	ASB-thalweg
539	689.85	253.84	ASB-thalweg
538	695.93	254.02	ASB-thalweg
537	701.89	253.95	ASB-thalweg
536	708.15	254.05	ASB-thalweg
535	717.14	253.57	ASB-thalweg
534	722.6	253.11	ASB-thalweg
533	726.13	252.89	ASB-thalweg
532	732.36	252.8	ASB-thalweg
531	737.17	252	ASB-thalweg
530	739.77	252.04	ASB-thalweg
529	741.75	252.24	ASB-thalweg
528	743.7	251.19	ASB-thalweg
527	751.25	251.47	ASB-thalweg
526	758.19	251.51	ASB-thalweg
525	768.22	252.6	ASB-thalweg
524	776.07	252.97	ASB-thalweg
523	785.55	252.3	ASB-thalweg
522	789.8	251.45	ASB-thalweg
521	790.93	252.35	ASB-thalweg
520	803.55	251.99	ASB-thalweg
519	812.32	251.18	ASB-thalweg
518	820.85	250.88	ASB-thalweg
517	832.7	250.8	ASB-thalweg
516	842.91	250.16	ASB-thalweg
515	854.39	250.14	ASB-thalweg
514	867.82	250.35	ASB-thalweg
513	875.44	250.65	ASB-thalweg
512	878.35	250.95	ASB-thalweg
511	879	248.31	ASB-thalweg
510	879	248.31	ASB-thalweg
509	879.49	247.92	ASB-thalweg
508	882.61	247.91	ASB-thalweg
507	889.85	249.13	ASB-thalweg
506	894.04	248.79	ASB-thalweg
505	901.71	249.73	ASB-thalweg
504	906.54	248.8	ASB-thalweg
503	910.4	249.67	ASB-thalweg
502	917.07	250.1	ASB-thalweg
501	924.1	249.91	ASB-thalweg
500	932.92	249.93	ASB-thalweg
499	938.75	249.75	ASB-thalweg
498	943.21	249.75	ASB-thalweg
497	948.33	249.96	ASB-thalweg
496	950.16	249.49	ASB-thalweg
495	956.52	249.55	ASB-thalweg
494	963.71	249.31	ASB-thalweg
493	972.68	249.32	ASB-thalweg
491	978.34	249.19	ASB-thalweg
492	978.8	249.35	ASB-thalweg
490	1006.97	249.08	ASB-thalweg
489	1015.71	249.17	ASB-thalweg
488	1016.86	249.1	ASB-thalweg
487	1016.86	249.1	ASB-thalweg
486	1018.86	248.74	ASB-thalweg
485	1019.78	248.8	ASB-thalweg
484	1019.78	248.8	ASB-thalweg
483	1025.05	248.74	ASB-thalweg
482	1032.29	248.6	ASB-thalweg
481	1046.44	248.3	ASB-thalweg
480	1066.86	248.32	ASB-thalweg
479	1078.19	248.3	ASB-thalweg
478	1099.15	248.28	ASB-thalweg
477	1104.68	247.88	ASB-thalweg
476	1121.46	247.79	ASB-thalweg
475	1128.25	247.39	ASB-thalweg
474	1132.65	247.81	ASB-thalweg
473	1141.97	247.96	ASB-thalweg
472	1144.51	247	ASB-thalweg
471	1149.84	248.2	ASB-thalweg

470	1149.84	248.2	ASB-thalweg
469	1159.91	248.55	ASB-thalweg
468	1160.46	248.99	ASB-thalweg
467	1165.7	248.67	ASB-thalweg
466	1169.7	247.98	ASB-thalweg
465	1170.31	247.43	ASB-thalweg
464	1170.31	247.43	ASB-thalweg
463	1174.04	247.8	ASB-thalweg
462	1179.84	246.42	ASB-thalweg
461	1189.96	246.57	ASB-thalweg
460	1196.16	246.55	ASB-thalweg
459	1197.39	246.74	ASB-thalweg
458	1201.75	247.14	ASB-thalweg
457	1204.18	247.43	ASB-thalweg
456	1207.74	247.27	ASB-thalweg
455	1215.11	246.72	ASB-thalweg
454	1223.67	246.78	ASB-thalweg
453	1225.76	247.9	ASB-thalweg
452	1229.56	247.56	ASB-thalweg
451	1230.63	247.91	ASB-thalweg
450	1234.36	247.53	ASB-thalweg
449	1241.78	245.08	ASB-thalweg
448	1243.37	243.93	ASB-thalweg
446	1245.58	243.43	ASB-thalweg
445	1245.71	241.29	ASB-thalweg
447	1246.69	243.69	ASB-thalweg
444	1250.34	242.16	ASB-thalweg
443	1251.66	243.08	ASB-thalweg
442	1252.72	243.82	ASB-thalweg
441	1254.91	243.71	ASB-thalweg
440	1256.95	243.23	ASB-thalweg
439	1257.43	243.21	ASB-thalweg
438	1258.88	243.16	ASB-thalweg
437	1264.09	243.22	ASB-thalweg
436	1266.86	243.42	ASB-thalweg
435	1267.75	243.35	ASB-thalweg
434	1270.35	243.17	ASB-thalweg
433	1271.36	243.79	ASB-thalweg
432	1271.36	243.79	ASB-thalweg
431	1273.66	243.12	ASB-thalweg
430	1279.08	243.07	ASB-thalweg
429	1284.36	243.94	ASB-thalweg
428	1288.62	244.05	ASB-thalweg
427	1292.59	243.64	ASB-thalweg
426	1298.06	243.92	ASB-thalweg
425	1306.52	244.14	ASB-thalweg
424	1312.51	243.98	ASB-thalweg
423	1318.83	243.49	ASB-thalweg
422	1325.33	243.57	ASB-thalweg
421	1331.97	243.75	ASB-thalweg
420	1334.37	243.41	ASB-thalweg
419	1341.62	243.14	ASB-thalweg
418	1349.78	242.97	ASB-thalweg
417	1357.41	243.15	ASB-thalweg
416	1361.73	243.1	ASB-thalweg
415	1363.96	243.02	ASB-thalweg
414	1364.47	242.92	ASB-thalweg
413	1365.79	243.08	ASB-thalweg
412	1367.33	243	ASB-thalweg
411	1367.61	241.48	ASB-thalweg
410	1371.19	241.33	ASB-thalweg
409	1380.14	241.82	ASB-thalweg
408	1384.23	242.31	ASB-thalweg
407	1393.64	242.42	ASB-thalweg
406	1403.98	242.69	ASB-thalweg
405	1414.65	242.99	ASB-thalweg
404	1420.77	242.69	ASB-thalweg
403	1423.44	242.51	ASB-thalweg
402	1426.38	242.17	ASB-thalweg
401	1432.58	242.27	ASB-thalweg
400	1433.16	242.2	ASB-thalweg
399	1437.69	242.16	ASB-thalweg
398	1446.42	241.81	ASB-thalweg
397	1456.37	241.94	ASB-thalweg
396	1466.42	242.27	ASB-thalweg
395	1480.73	242.19	ASB-thalweg
394	1498.68	241.54	ASB-thalweg
393	1503.82	241.52	ASB-thalweg
392	1508.42	241.77	ASB-thalweg
391	1515.46	242.35	ASB-thalweg

390	1526.65	241.9	ASB-thalweg
389	1538.97	241.58	ASB-thalweg
388	1544.2	241.68	ASB-thalweg
387	1553.69	241.56	ASB-thalweg
386	1581.77	241.76	ASB-thalweg
385	1583.94	241.3	ASB-thalweg
384	1586.77	241.6	ASB-thalweg
383	1590.44	242.07	ASB-thalweg
382	1591.89	242.11	ASB-thalweg
381	1598.04	240.55	ASB-thalweg
380	1602.85	240.96	ASB-thalweg
379	1605.66	241.36	ASB-thalweg
378	1608.08	241.86	ASB-thalweg
377	1618.73	241.94	ASB-thalweg
376	1625.56	241.64	ASB-thalweg
375	1630.07	240.92	ASB-thalweg
374	1635.77	238.2	ASB-thalweg
373	1651.84	238.54	ASB-thalweg
372	1666.94	237.46	ASB-thalweg
371	1683.39	238.86	ASB-thalweg
370	1690.95	238.71	ASB-thalweg
369	1696.76	238.39	ASB-thalweg
368	1700.56	238.77	ASB-thalweg
367	1710.48	238.11	ASB-thalweg
366	1718.33	238.11	ASB-thalweg
365	1726.17	239.14	ASB-thalweg
364	1726.17	239.14	ASB-thalweg
363	1726.62	239.28	ASB-thalweg
362	1729.27	239.5	ASB-thalweg
361	1731.13	238.78	ASB-thalweg
360	1731.13	238.78	ASB-thalweg
4	1732.02	238.75	ASB-thalweg
3	1769.09	239.06	ASB-thalweg

Point	Station	Elevation	Description
1204	3.59	258.42	(MP)
1203	3.63	258.42	(BOTCUL)
1206	14.83	261.06	(RR)
1207	24.58	260.07	(T)
1209	59.49	258.56	(T)
1212	66.55	257.81	(P)
1215	81.13	257.78	(P)
1214	86.77	258.51	(RV)
1218	96.6	255.67	(P)
1220	119.54	257.2	(T)
1222	134.32	257.65	(TR)
1225	143.83	257.51	(T)
1228	149.25	255.22	(P)
1231	160.31	256.22	(T)
1234	183.45	256.58	(T)
1240	219.1	256.94	(BR)
1243	229.87	256.38	(T)
1247	281.7	256.83	(T)
1251	295.22	257.1	(RV)
1255	299.72	254.92	(P)
1257	325.32	255.89	(T)
1249	354.06	256.14	(T)
274	378.66	256.29	(RV)
276	382.18	255.04	(M)
278	395.75	255.73	(T)
280	409.95	255.62	(T)
282	417.31	255.9	(RV)
284	425.01	253.53	(SP)
286	430.13	254.54	(T)
288	434.69	255.6	(T)
290	437.78	255.26	(T)
292	448.63	255.53	(T)
294	457.93	255.26	(T)
296	462.85	255.8	(T)
298	467.37	253.9	(T)
300	477.92	254.16	(T)
302	484.22	255.19	(T)
304	494.77	255.38	(T)
309	505.09	255.11	(T)
307	512.25	255.48	(T)
306	513.11	255.93	(RV)
311	516.86	253.23	(T)
313	526.63	253.61	(T)
315	536.05	254.22	(T)
317	546.19	254.63	(T)
319	560.95	255.73	(RV)
1183	576.9	253.22	(MP)
1183	600.9	253.52	(TP)
1188	612.81	254.27	(T)
1185	621.96	254.24	(T)
1181	644.55	253.35	(T)
1173	660.13	254.13	(T)
1160	678.71	254.07	(T)
1171	692.75	253.91	(CON)
1156	700.93	253.49	(T)
1152	730.52	253.34	(T)
1149	756.39	248.85	(T)
1146	766.2	253.04	(T)
1144	791.09	252.87	(CULIN)
219	833.86	251.25	(BOTCULV)
221	865.17	251.03	(T)
212	875.56	251.2	(T)
215	904.32	250.56	(T)
207	942.18	250.14	(T)
1131	970.22	249.93	(T)
202	976.28	249.94	(T)
1128	988.38	249.81	(T)
1120	1003.49	249.78	(T)
1111	1011.9	249.32	(T)
199	1016.34	249.75	(R)
1107	1023.78	249.6	(T)

Point	Station	Elevation	Description
1205	4.45	261.26	Water
1210	59.34	258.67	Water
1213	65.21	258.58	Water
1219	93.59	257.93	Water
1221	119.43	257.79	Water
1223	134.27	257.88	Water
1226	143.84	257.61	Water
1229	148.17	257.24	Water
1232	159.68	257.24	Water
1235	183.44	257.24	Water
1238	211.56	257.24	Water
1241	219.81	257.24	Water
1248	281.28	257.21	Water
	295.22	257.21	Water
1256	298.96	256.65	Water
1258	325.19	256.65	Water
1250	353.67	256.56	Water
275	378.61	256.48	Water
277	382.08	256.17	Water
279	395.82	256.2	Water
281	409.83	256.2	Water
283	417.3	256.21	Water
285	424.97	255.86	Water
287	430.11	255.89	Water
289	434.65	255.93	Water
291	437.63	255.95	Water
293	448.55	255.88	Water
295	457.74	255.98	Water
297	462.7	255.9	Water
299	464.48	255.69	Water
301	477.72	255.59	Water
303	484.25	255.66	Water
305	494.08	255.69	Water
310	505.21	255.65	Water
308	512.39	255.66	Water
312	516.7	255.36	Water
314	526.79	255.36	Water
316	535.79	255.32	Water
318	546.17	255.41	Water
320	560.77	255.31	Water
321	563.47	254.85	Water
1193	590.88	254.84	Water
1184	600.21	254.41	Water
1189	612.9	254.69	Water
1186	622.21	254.52	Water
1182	644.85	254.54	Water
1174	659.97	254.47	Water
1161	679.08	254.31	Water
1172	693.3	254.08	Water
1157	701.55	253.94	Water
1153	730.72	253.83	Water
1147	765.95	253.27	Water
1145	790.92	253.09	Water
220	835.01	251.56	Water
222	865.03	251.48	Water
213	876.21	251.51	Water
216	903.96	250.93	Water
209	944.31	250.68	Water
1132	970.14	250.36	Water
203	975.96	250.33	Water
1129	987.73	250.2	Water
1126	997.57	250.22	Water
1123	1003.25	249.99	Water
1121	1003.59	249.99	Water
1124	1005.81	250	Water
1112	1011.81	249.96	Water
200	1016.71	250	Water
1109	1023.37	249.73	Water
197	1043.82	249.19	Water
1104	1053.18	249.27	Water
194	1060.02	249.21	Water

Point	Station	Elevation	Description
1279	9.67	261.86	Left Bankfull
1280	35.64	261.35	Left Bankfull
1276	86.5	260.92	Left Bankfull
1273	125.61	258.93	Left Bankfull
1271	148.89	259.67	Left Bankfull
1269	181.45	258.23	Left Bankfull
1267	211.26	258.11	Left Bankfull
1265	239.84	258.3	Left Bankfull
1263	277.46	257.88	Left Bankfull
1261	299.54	258	Left Bankfull
1254	343.37	257.52	Left Bankfull
346	368.43	257.54	Left Bankfull
344	387.73	257.47	Left Bankfull
338	434.26	257.42	Left Bankfull
336	449.2	257.48	Left Bankfull
332	478.72	257.47	Left Bankfull
330	498.42	257	Left Bankfull
1197	515.26	257.17	Left Bankfull
328	515.38	257.03	Left Bankfull
1195	524.82	256.83	Left Bankfull
324	538.06	257.16	Left Bankfull
1192	539.61	257.08	Left Bankfull
322	554.03	256.94	Left Bankfull
1180	606.38	256.31	Left Bankfull
1179	620.82	256.5	Left Bankfull
1178	638.78	256.23	Left Bankfull
1170	659.6	256.42	Left Bankfull
1167	665.35	256.26	Left Bankfull
1165	671.49	256.37	Left Bankfull
1164	698.2	256.22	Left Bankfull
1162	727.09	255.15	Left Bankfull
1155	757.63	255.2	Left Bankfull
1148	781.24	255.16	Left Bankfull
217	838.75	253.67	Left Bankfull
210	878.94	252.71	Left Bankfull
208	905.77	252.33	Left Bankfull
206	932.64	252.07	Left Bankfull
205	957.45	252.17	Left Bankfull
1130	975.06	251.87	Left Bankfull
1098	1055.25	251.2	Left Bankfull
1089	1096.16	250.94	Left Bankfull
1084	1121.91	250.8	Left Bankfull
1071	1145.26	250.82	Left Bankfull
1064	1176.53	249.89	Left Bankfull
1061	1205.99	249.11	Left Bankfull
62	1416.29	245.71	Left Bankfull
45	1420.44	245.31	Left Bankfull
65	1455.36	244.5	Left Bankfull
1053	1472.11	244.43	Left Bankfull
1054	1501.46	244.26	Left Bankfull
113	1562	244.21	Left Bankfull
118	1605.54	244.31	Left Bankfull
124	1673.6	241.23	Left Bankfull
150	1686.71	240.48	Left Bankfull
146	1687.63	241.7	Left Bankfull
126	1697.21	240.68	Left Bankfull
127	1729.39	241.4	Left Bankfull
1277	6.22	261.94	Right Bankfull
1275	40.15	261.57	Right Bankfull
1274	70.51	260.13	Right Bankfull
1272	121.77	259.65	Right Bankfull
1270	156.25	258.85	Right Bankfull
1268	196.63	258.42	Right Bankfull
1266	235.94	257.79	Right Bankfull
1264	276.05	258.2	Right Bankfull
1262	302.83	257.62	Right Bankfull
1260	322.69	257.72	Right Bankfull
1253	347.97	257.61	Right Bankfull
347	382.55	257.61	Right Bankfull
345	390.62	257.79	Right Bankfull

196	1043.71	249.17	(T)
1103	1053.38	248.84	(T)
193	1060.58	248.49	(T)
190	1079.62	248.74	(R)
1105	1092.13	248.73	(T)
187	1093.92	248.82	(R)
183	1101.19	248.85	(T)
1100	1109.6	248.44	(T)
181	1121.74	248.04	(T)
1095	1130.85	247.99	(T)
1090	1144.18	248.24	(T)
1085	1158.13	247.79	(T)
1067	1162.01	249.03	(BR)
1083	1170	248.65	(BR)
1080	1173.67	247.64	(T)
1077	1187.74	247.12	(T)
1075	1196.26	247.09	(T)
1072	1207.29	247.41	(T)
1069	1224.5	247.25	(T)
1060	1224.54	248.63	(BR)
1065	1243.59	241.56	(MP)
1062	1244.62	245.44	(MP)
12	1270.93	244.37	(T)
16	1276.03	244.08	(T)
20	1283.59	244.6	(R)
24	1295.83	244.61	(U)
29	1316.41	243.59	(P)
34	1320.13	242.94	(M)
38	1332.64	243.61	(T)
42	1341.51	243.82	(R)
46	1354.73	243.38	(T)
49	1363.96	243.6	(RV)
53	1366.57	243.68	(RV)
56	1368.36	241.86	(P)
60	1373.85	241.16	(M)
63	1386.96	242.46	(T)
66	1396.2	243.23	(R)
68	1411.29	242.87	(T)
73	1433.24	242.61	(P)
93	1443.22	241.18	(T)
77	1445.82	240.72	(M)
1051	1451.34	241.6	(T)
1049	1460.22	242.83	(TR)
1046	1466.87	242.25	(TP)
1044	1474.96	242.17	(MP)
1040	1482.91	242.02	(MP)
1038	1492.99	241.62	(T)
1036	1529.32	242.54	(T)
1034	1576.95	242.53	(T)
1033	1592.94	243.08	(BR)
1031	1602.62	241.45	(T)
1029	1608.39	242.72	(BR)
1027	1619.53	241.78	(BR)
1025	1664.31	238.2	(T)
139	1684.64	239.13	(T)
1021	1705.9	238.78	(T)
1019	1718.13	239.04	(T)
1011	1732.73	240.02	(TV)
1013	1733.39	238.73	(MP)
1015	1746.44	239.97	(HR)
1017	1768.95	239.56	(TC)

191	1079.56	249.26	Water
1106	1092.07	249.16	Water
188	1094.7	249.05	Water
184	1101.3	249.03	Water
182	1121.68	248.97	Water
1096	1130.65	249.09	Water
1091	1143.87	249.1	Water
1086	1159.24	249.08	Water
1068	1161.75	249.02	Water
1081	1173.13	248.69	Water
1078	1188.42	248.63	Water
1076	1197.84	248.63	Water
1070	1225.31	248.64	Water
1063	1241.41	248.67	Water
1066	1244.21	245.08	Water
13	1270.82	245.03	Water
17	1277.26	244.98	Water
25	1296.24	244.96	Water
30	1317.76	244.39	Water
39	1334.59	244.32	Water
43	1341.16	244.07	Water
47	1354.63	244.06	Water
50	1363.99	244.02	Water
57	1367.49	243.72	Water
64	1386.96	243.73	Water
67	1395.92	243.64	Water
69	1412.6	243.59	Water
72	1421.12	243.5	Water
74	1433.23	243.38	Water
78	1445.64	243.38	Water
1052	1451.47	243.34	Water
1050	1460.5	243.26	Water
1047	1466.82	243.14	Water
1043	1479.74	243.12	Water
1041	1483.09	243.07	Water
1039	1493.1	242.98	Water
1037	1529	243.04	Water
1035	1576	243.17	Water
1032	1602.38	242.93	Water
1030	1609.17	242.94	Water
1028	1618.89	242.15	Water
1026	1664	240.25	Water
1022	1706	240.21	Water
1014	1732.6	240.15	Water
1016	1747.69	240.17	Water
1018	1769.03	239.74	Water

343	403	257.32	Right Bankfull
341	420.66	257.38	Right Bankfull
339	432.62	257.4	Right Bankfull
337	443.98	257.17	Right Bankfull
335	459.03	257.1	Right Bankfull
333	480.9	257.36	Right Bankfull
331	488.11	257.17	Right Bankfull
1196	532.6	257.04	Right Bankfull
325	533.47	257.2	Right Bankfull
323	557.35	256.61	Right Bankfull
1194	558.64	256.6	Right Bankfull
1191	585.57	256.13	Right Bankfull
1187	612.78	256.58	Right Bankfull
1177	634.16	256.4	Right Bankfull
1175	659.79	255.79	Right Bankfull
1163	674.52	255.49	Right Bankfull
1159	692.43	255.18	Right Bankfull
1154	715.42	255.06	Right Bankfull
1151	745.77	254.99	Right Bankfull
1143	766.75	254.98	Right Bankfull
223	842.19	252.95	Right Bankfull
218	874.99	252.16	Right Bankfull
214	921.61	251.62	Right Bankfull
211	936.46	252.15	Right Bankfull
204	959.79	251.41	Right Bankfull
1127	1005.86	251.29	Right Bankfull
1113	1036.21	251.03	Right Bankfull
1102	1095.41	251.36	Right Bankfull
1099	1114.82	250.2	Right Bankfull
1097	1142.06	250.34	Right Bankfull
1094	1159.11	249.71	Right Bankfull
1092	1175.5	249.94	Right Bankfull
1087	1207.77	249.75	Right Bankfull
14	1274.8	246.82	Right Bankfull
26	1323.13	245.2	Right Bankfull
37	1409.97	244.96	Right Bankfull
41	1430.39	245.06	Right Bankfull
70	1455.27	244.81	Right Bankfull
105	1527.69	244.57	Right Bankfull
114	1557.23	244.07	Right Bankfull
106	1568.89	244.13	Right Bankfull
117	1619.33	244.26	Right Bankfull
122	1660.36	241.56	Right Bankfull
120	1661.26	241.6	Right Bankfull