WELLS CREEK
FINAL MONITORING REPORT
YEAR 5 OF 5
2009
EEP Project # 414
Alamance County, North Carolina

Submitted to:

NCDENR-EEP
1652 Mail Service Center
Raleigh, NC 27699

Monitoring Firm:

1025 Wade Avenue
Raleigh, NC 27605
Phone: (919) 789-9977
Project Manager:
Phillip Todd
ptodd@sepiengineering.com

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APPENDICES

MONITORING SUMMARY

The North Carolina Ecosystem Enhancement Program (EEP) restored two reaches along Wells Creek and on reach along an unnamed tributary in 2004. This project is located in Alamance County, NC. The three reaches flow through pasture wooded areas. Prior to restoration, cattle and horses had unlimited access to the stream channels which caused severe loss of vegetation and bank erosion. Since the restoration has been complete, the livestock have been fenced out of the stream. The main goal of the Wells Creek Stream Restoration Project is the improve water quality within the Cape Fear River basin. Specific objectives to meet this goal are to:

- Reduce nutrient runoff, reduce water temperatures, and improve wildlife habitat through the establishment of a permanent riparian buffer and cattle exclusion measures;
- Stabilize stream banks (i.e., reduce bank erosion) through streamside vegetation plantings;
- Help the stream reach a stable equilibrium through the use of proper dimension, pattern, and profile design ratios.

The stem densities on Reaches 2 and the UT are well above the Monitoring Year 5 stem density goal (260 stems per acre), except for in Vegetation Plot (VP) #4 on Reach UT that had a stem density of 97 stems per acre. Stem densities on Reach 1 were below the Monitoring Year 5 goal (260 stems/acre). This trend may be influenced by populations of both fescue (*Festuca spp.*) and Japanese stilt grass (*Microstegium virmineum*) at Monitoring Reach 1. The overall survival rate among all vegetation plots was just over 51% in Monitoring Year 5. The only vegetation-specific problem areas documented in Monitoring Year 5 were associated with invasive species. Invasive species documented at one or more of the reaches include: *Rosa multiflora, Ligustrum sinense, Microstegium virmineum,* and *Ailanthus altissima* (see Plan Views in Appendix A).

All reaches are considered to have remained stable between Monitoring Years 4 and 5. There are bar formation areas to note along Reaches 1 and UT. Most of these are only instances of the channeling naturally narrowing to a stable dimension in the riffle sections by depositing sediment along the channel margins. However, there are a couple of areas where a bar has formed on the outside of the meander, thereby diverting flow toward the inside of the meander away from the As-Built thalweg (i.e., Station 18+00.6 and 19+02.2 along Reach 1; see Current Condition Plan View and Stream Problem Area Photolog). Also, there are a couple of places where grass clumps have formed scattered permanent bars mid-channel in a riffle (e.g., Station 19+00.1 along Reach UT; see Current Condition Plan View and Stream Problem Area Photolog). There were three severe cases of bank erosion documented on Reach 2. One of these areas (Station 15+36 along the right bank) may need attention as it is 60 feet long. In addition, there were 'non-severe' cases of bank erosion found along all three reaches that are not considered to be a threat to the project because they affect a small percentage of each reach. There was a crossvane located at Station 12+75 on Reach 1 that had water piping around the right arm. There were two j-hooks (Station 14+08 and 15+14) on Reach 2 that have piping around the structure arm. Also there were four rootwads on the UT reach where bank failure/undermining around the footing was documented. It should be noted that it was observed on April 7, 2009 that an unknown number of cattle had accessed the project easement of Monitoring Reach 2 at some point between January 8 and April 7th. The cattle were no longer present at the time of observation (April 7th field visit), but fresh hoof prints were observed at all locations, forming trails along the top of bank and over other areas of the floodplain. Minor hoof-shear was observed at a couple of locations along the top of bank and the herbaceous understory had been grazed at many locations. This appears to have been an isolated incident because no additional cattle evidence was noted in subsequent field visits and the hoof shear and cattle trail areas were noted to have filled in with vegetation as of the October 8, 2009.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and restoration plan documents available on EEPs website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

METHODOLOGY

Vegetation Methodology

For this monitoring project, a total of nine (9) plots were studied. Plot sizes measure 10 meters by 10 meters (or equivalent to 100 square meters) depending on buffer width. The vegetation monitoring was not the Carolina Vegetation Survey (CVS) protocol, but consisted of a count of the total number of planted stems having survived since Monitoring Year 4. The planted material in the plot (previously marked with flagging) was identified by species and a tally of each species was kept and recorded in a field book. Any stems for a given species in a given plot that were not flagged and were counted over and above the baseline total were considered volunteers.

Stream Methodology

The project monitoring for the stream channel included a longitudinal survey, cross-sectional surveys, pebble counts and photo documentation. These measurements were taken at each reach. The methodology for each portion of the stream monitoring is described in detail below.

Longitudinal Profile and Plan View

A longitudinal profile was surveyed for each reach with a Nikon DTM-520 Total Station, prism, and a TDS Recon Pocket PC. The heads of features (i.e. riffles, runs, pools, and glides) were surveyed, as well as the point of maximum depth of each pool, boundaries of problem areas, and any other significant slope-breaks or points of interest. At the head of each feature and at the maximum pool depth, thalweg, water surface, edge of water, left and right bankfull, and left and right top of bank were surveyed. All profile measurements were extracted from this survey, including channel and valley length and length of each feature, water surface slope for each reach and feature, bankfull slope for the reach, and pool-to-pool spacing. This survey also was used to draw plan view figures with Microstation v8 (Bentley Systems, Inc., Exton, PA) for each reach, and all pattern measurements (i.e. meander length, radius of curvature, belt width, meander width ratio, and sinuosity) were extracted from the plan view. Stationing was calculated along the thalweg.

Permanent Cross Sections

Four permanent cross sections (two riffles and two pools) were surveyed at each reach. The beginning and end of each permanent cross section were originally marked with a wooden stake. Cross sections were established perpendicular to the stream flow with station 0+00 feet located on the left bank. The survey noted all changes in slopes, tops of both banks, left and right bankfull, edges of water, thalweg and water surface. The cross sections were plotted, and Monitoring Year 5 data was overlain on all previous monitoring years for comparison. All dimension measurements (i.e., bankfull width, floodprone width, bankfull mean depth, cross sectional area, width-to-depth ratio, entrenchment ratio, bank height ratio, wetted perimeter, and hydraulic radius) were extracted from these plots for comparision with data from previous monitoring years.

Pebble Counts

A modified Wolman pebble count (Rosgen 1994), consisting of 50 samples, was taken at each permanent cross section. The cumulative percentages were plotted, and the D50 and D84 particle sizes were calculated and compared data from previous monitoring years.

Photo Documentation

Permanent photo points were established during Monitoring Year 1. A set of three photographs (facing upstream, downstream, and facing the channel) were taken at each photo point with a digital camera. Two photographs were taken at each cross-section (facing upstream and downstream). A representative photograph of each vegetation plot was taken at the designated corner of the vegetation plot and in the same direction as the Monitoring Year 1 photograph. An arrow was placed on the designated corner of each vegetation plot on the plan view sheets to document the corner and direction of each photograph. Photos were also taken of all significant stream and vegetation problem areas.

REFERENCES

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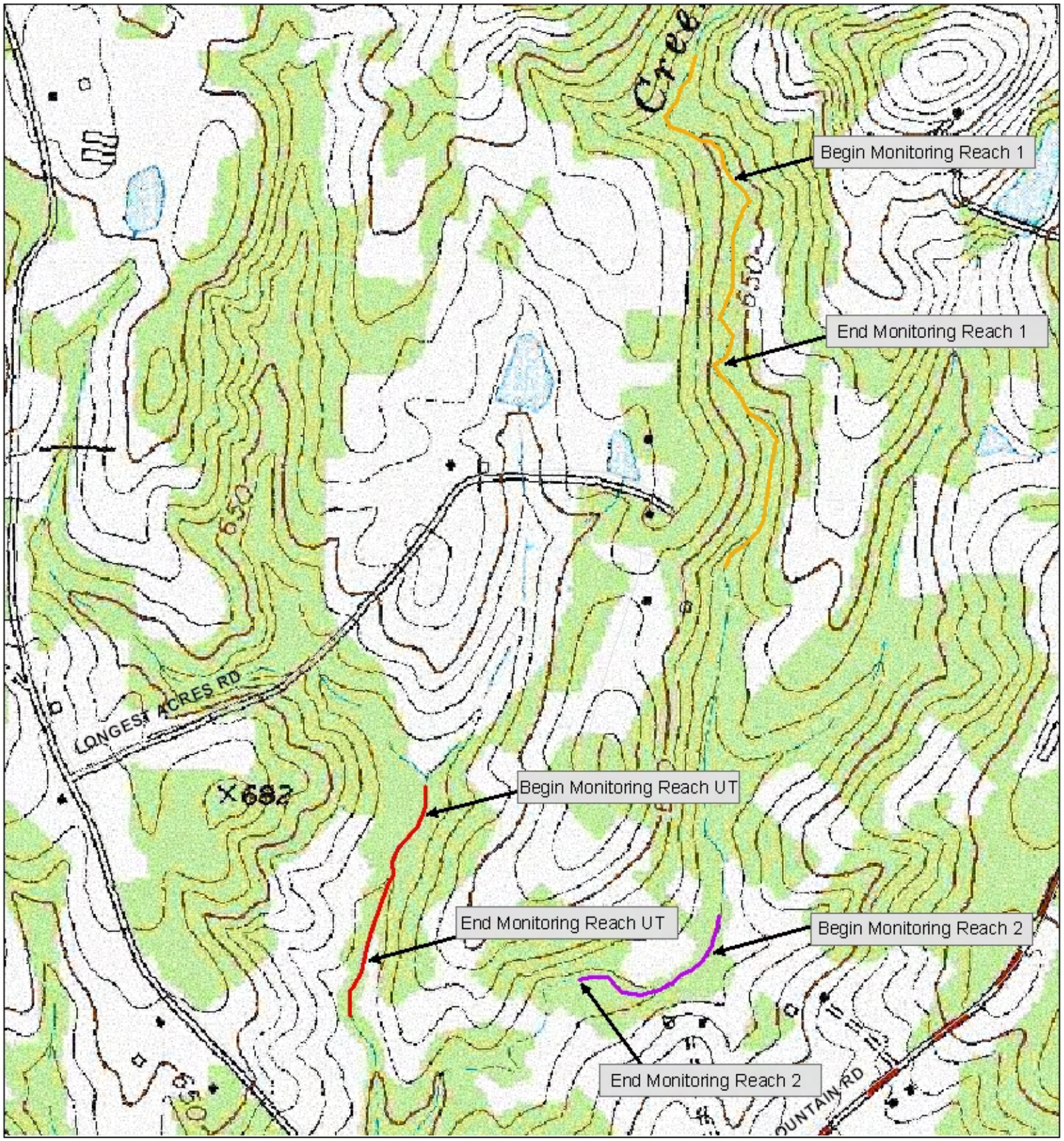
APPENDIX A

GENERAL FIGURES AND PLAN VIEWS

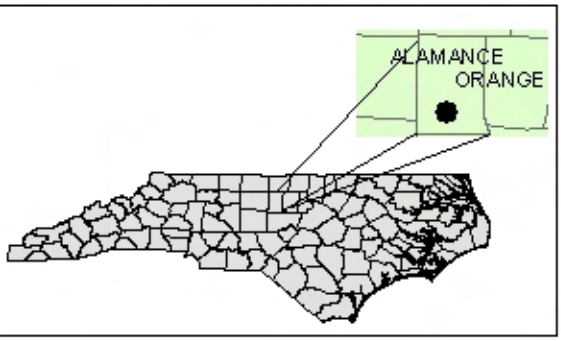


WELLS CREEK SITE VICINITY MAP

Ecosystem Enhancement Program

FIGURE 1
ALAMANCE COUNTY NC

Reach
- Restoration Reach 1
- Restoration Reach 2
- Restoration Reach UT



SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
414	1
PROJECT ENGINEER	

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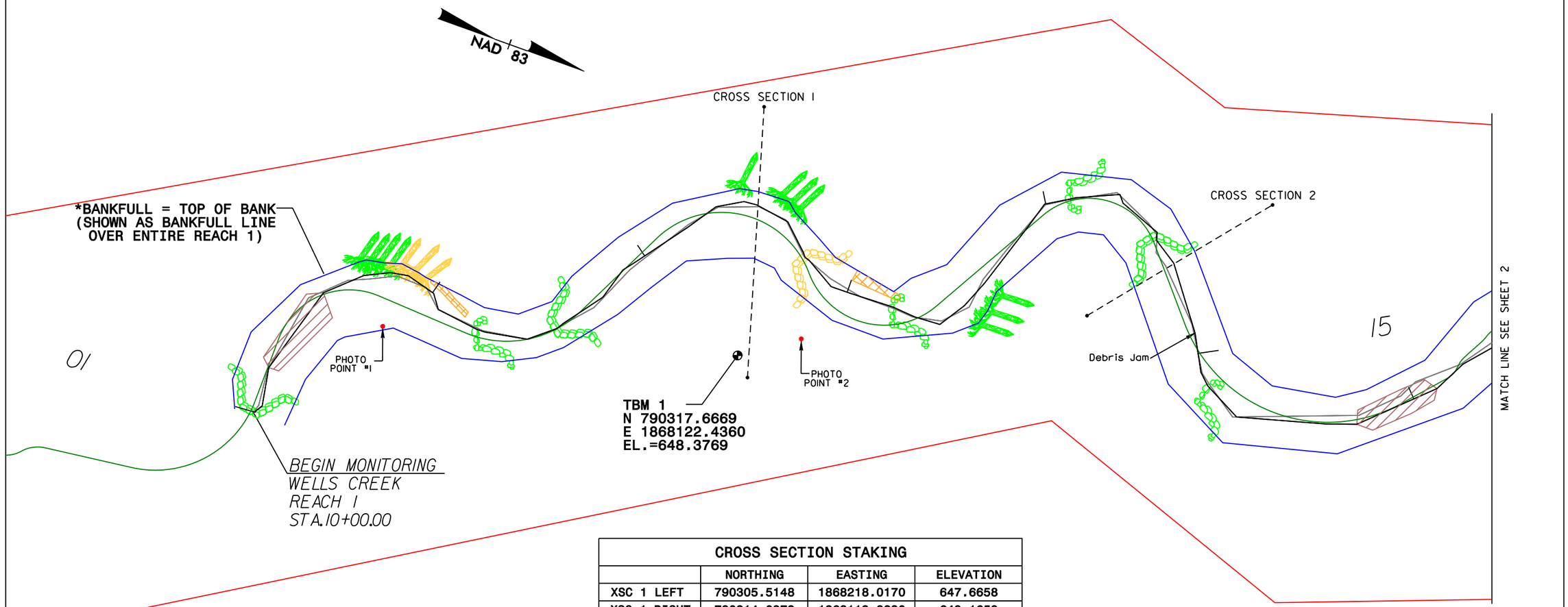

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XSC 2 LEFT	790110.5344	1868176.2530	647.0516
XSC 2 RIGHT	790182.8344	1868135.0260	647.4296

LEGEND

STREAM FEATURES
- THALWEG AS-BUILT
- THALWEG 2008
- THALWEG 2009
- BANKFULL 2009
- BANK EROSION
- SEVERE BANK EROSION
- UNDERCUT BANK
- BAR FORMATION

PROJECT ELEMENTS
- CROSS-SECTIONS
- CONTROL POINT/ BENCHMARK (TBM)
- PHOTO POINT
- EASEMENT BOUNDARY

STRUCTURE TYPES
- ROCK CROSS VANE
- J-HOOK VANE
- ROOTWAD
- ROCK VANE

COLOR CODE FOR STRUCTURES
- GOOD STRUCTURE
- STRUCTURE WITH POTENTIAL PROBLEM
- FAILING STRUCTURE

•SEPI was unable to locate quality aerial photographs for this figure. The old photographs were omitted due to poor quality.

WELLS CREEK - REACH 1

Ecosystem Enhancement PROGRAM

LOCATION:	WELLS CREEK CURRENT CONDITIONS PLAN VIEW FINAL STREAM - YEAR 5
PROJ #:	414
COUNTY:	ALAMANCE
PREPARED BY:	IPJ
CHECKED BY:	PDB
DATE:	5/26/2009

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
414	2
PROJECT ENGINEER	

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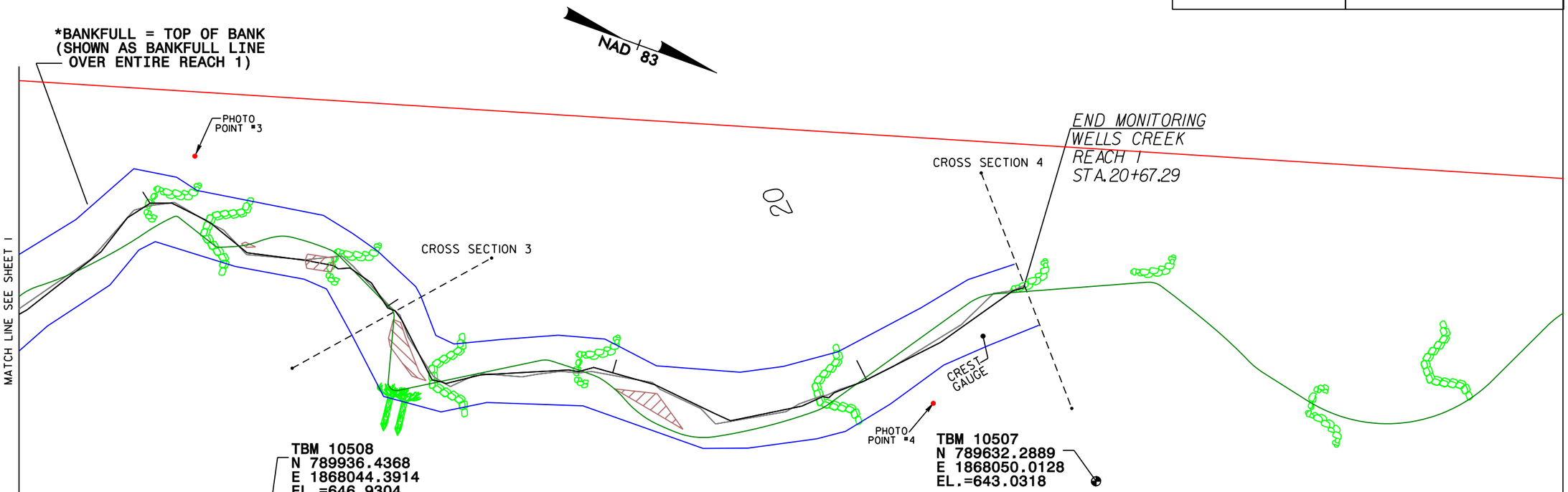
SCALE



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XSC 4 LEFT	789672.2703	1868164.3220	645.0177
XSC 4 RIGHT	789640.7034	1868076.9910	643.5958

LEGEND

STREAM FEATURES
- THALWEG AS-BUILT
- THALWEG 2008
- THALWEG 2009
- BANKFULL 2009
- BANK EROSION
- SEVERE BANK EROSION
- UNDERCUT BANK
- BAR FORMATION

PROJECT ELEMENTS
- CROSS-SECTIONS
- CONTROL POINT/ BENCHMARK (TBM)
- PHOTO POINT
- EASEMENT BOUNDARY

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STRUCTURE TYPES
- ROCK CROSS VANE
- J-HOOK VANE
- ROOTWAD
- ROCK VANE

COLOR CODE FOR STRUCTURES
- GOOD STRUCTURE
- STRUCTURE WITH POTENTIAL PROBLEM
- FAILING STRUCTURE

WELLS CREEK - REACH 1

Ecosystem Enhancement Program

LOCATION:	WELLS CREEK CURRENT CONDITIONS PLAN VIEW FINAL STREAM - YEAR 5
PROJ #: 414	COUNTY: ALAMANCE
PREPARED BY:	IPJ
CHECKED BY: PDB	DATE: 5/26/2009

CROSS SECTION STAKING			
	NORTHING	EASTING	ELEVATION
XSC 9 LEFT	786147.0086	1867645.1790	605.1506
XSC 9 RIGHT	786109.7831	1867662.7060	606.0970
XSC 10 LEFT	786229.4962	1867681.8020	604.8637
XSC 10 RIGHT	786208.5385	1867718.8310	604.6050

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1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
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PROJECT ENGINEER	

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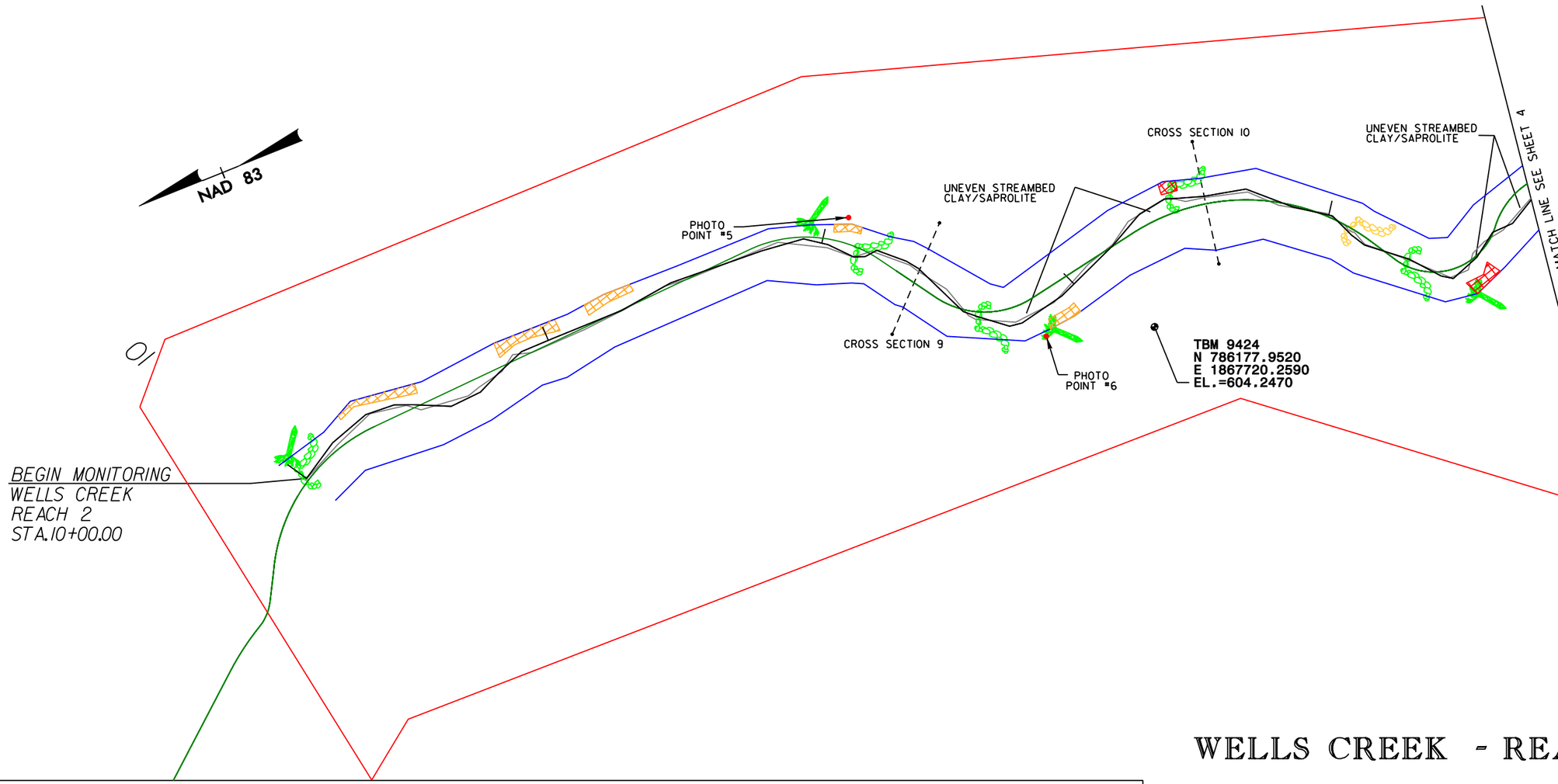

WELLS CREEK - REACH 2

LEGEND

STREAM FEATURES
- THALWEG AS-BUILT
- THALWEG 2008
- THALWEG 2009
- BANKFULL 2009
- BANK EROSION
- SEVERE BANK EROSION
- UNDERCUT BANK
- BAR FORMATION

PROJECT ELEMENTS
- CROSS-SECTIONS
- CONTROL POINT/ BENCHMARK (TBM)
- PHOTO POINT
- EASEMENT BOUNDARY

•SEPI was unable to locate quality aerial photographs for this figure. The old photographs were omitted due to poor quality.

STRUCTURE TYPES
- ROCK CROSS VANE
- J-HOOK VANE
- ROOTWAD
- ROCK VANE

COLOR CODE FOR STRUCTURES
- GOOD STRUCTURE
- STRUCTURE WITH POTENTIAL PROBLEM
- FAILING STRUCTURE

Ecosystem Enhancement PROGRAM

LOCATION:	WELLS CREEK CURRENT CONDITIONS PLAN VIEW FINAL STREAM - YEAR 5
PROJ #: 414	COUNTY: ALAMANCE
PREPARED BY:	IPJ
CHECKED BY: PDB	DATE: 5/26/2009

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TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
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PROJECT ENGINEER	

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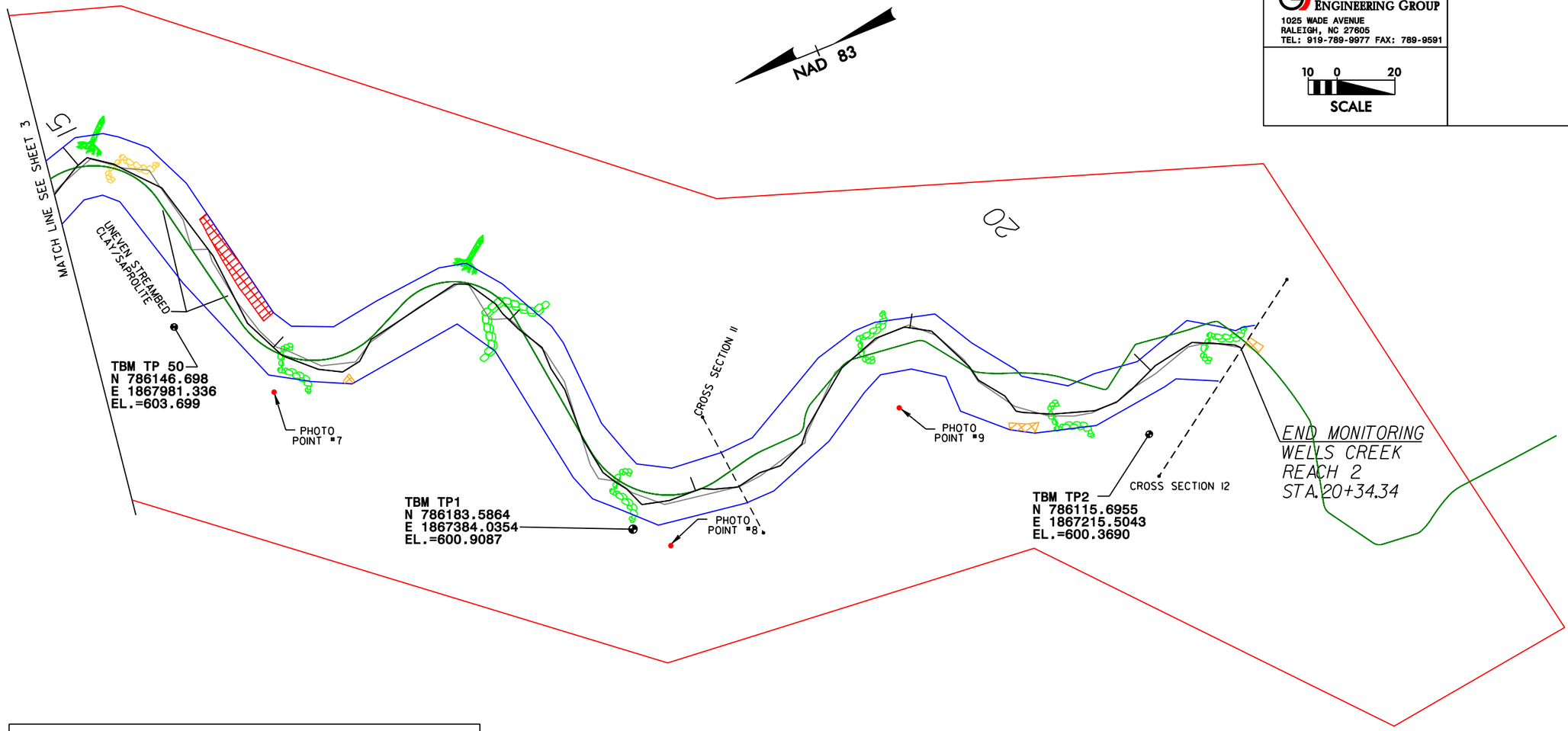

CROSS SECTION STAKING			
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XSC 11 RIGHT	786407.2489	1868024.1950	603.0278
XSC 12 LEFT	786600.8247	1868079.4820	601.5332
XSC 12 RIGHT	786522.4359	1868100.7920	602.3083

*The beaver dam listed last year at the very end of Reach 2 was either removed or washed downstream, as it was observed to be absent on May 12, 2009.

LEGEND

STREAM FEATURES
- THALWEG AS-BUILT
- THALWEG 2008
- THALWEG 2009
- BANKFULL 2009
- BANK EROSION
- SEVERE BANK EROSION
- UNDERCUT BANK
- BAR FORMATION

PROJECT ELEMENTS
- CROSS-SECTIONS
- CONTROL POINT/ BENCHMARK (TBM)
- PHOTO POINT
- EASEMENT BOUNDARY

•SEPI was unable to locate quality aerial photographs for this figure. The old photographs were omitted due to poor quality.

STRUCTURE TYPES
- ROCK CROSS VANE
- J-HOOK VANE
- ROOTWAD
- ROCK VANE

COLOR CODE FOR STRUCTURES
- GOOD STRUCTURE
- STRUCTURE WITH POTENTIAL PROBLEM
- FAILING STRUCTURE

WELLS CREEK - REACH 2

Ecosystem Enhancement PROGRAM

LOCATION:	WELLS CREEK CURRENT CONDITIONS PLAN VIEW FINAL STREAM - YEAR 5
PROJ #:	414
COUNTY:	ALAMANCE
PREPARED BY:	IPJ
CHECKED BY:	PDB
DATE:	5/26/2009

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RALEIGH, NC 27605
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PROJECT REFERENCE NO.	SHEET NO.
414	5
PROJECT ENGINEER	

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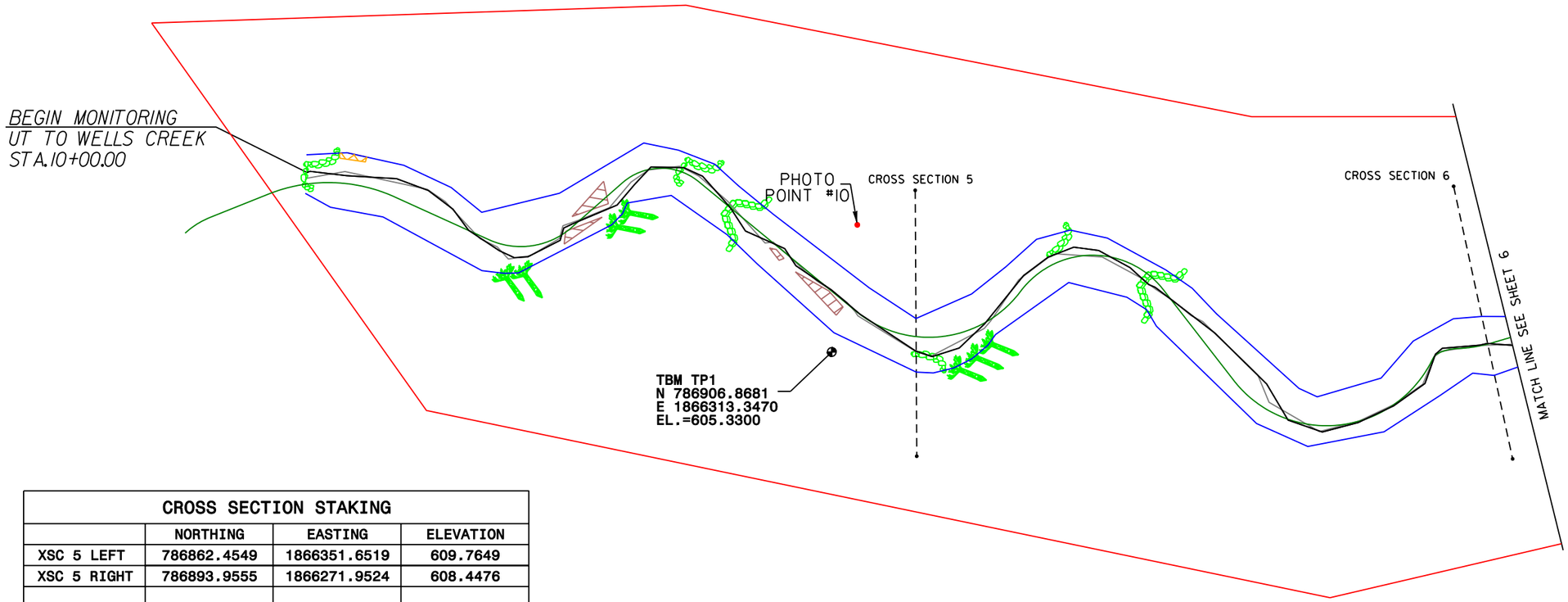
NAD 83



CROSS SECTION STAKING

	NORTHING	EASTING	ELEVATION
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XSC 5 RIGHT	786893.9555	1866271.9524	608.4476
XSC 6 LEFT	786700.8207	1866288.0700	609.6833
XSC 6 RIGHT	786715.8993	1866199.4730	606.5492

LEGEND

STREAM FEATURES
- THALWEG AS-BUILT
- THALWEG 2008
- THALWEG 2009
- BANKFULL 2009
- BANK EROSION
- SEVERE BANK EROSION
- UNDERCUT BANK
- BAR FORMATION

PROJECT ELEMENTS
- CROSS-SECTIONS
- CONTROL POINT/ BENCHMARK (TBM)
- PHOTO POINT
- EASEMENT BOUNDARY

STRUCTURE TYPES
- ROCK CROSS VANE
- J-HOOK VANE
- ROOTWAD
- ROCK VANE

COLOR CODE FOR STRUCTURES
- GOOD STRUCTURE
- STRUCTURE WITH POTENTIAL PROBLEM
- FAILING STRUCTURE

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UT TO WELLS CREEK

Ecosystem Enhancement PROGRAM

LOCATION: WELLS CREEK
CURRENT CONDITIONS PLAN VIEW
FINAL STREAM - YEAR 5

PROJ #: 414
COUNTY: ALAMANCE
PREPARED BY: IPJ
CHECKED BY: PDB
DATE: 5/26/2009

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PROJECT REFERENCE NO.	SHEET NO.
414	6
PROJECT ENGINEER	

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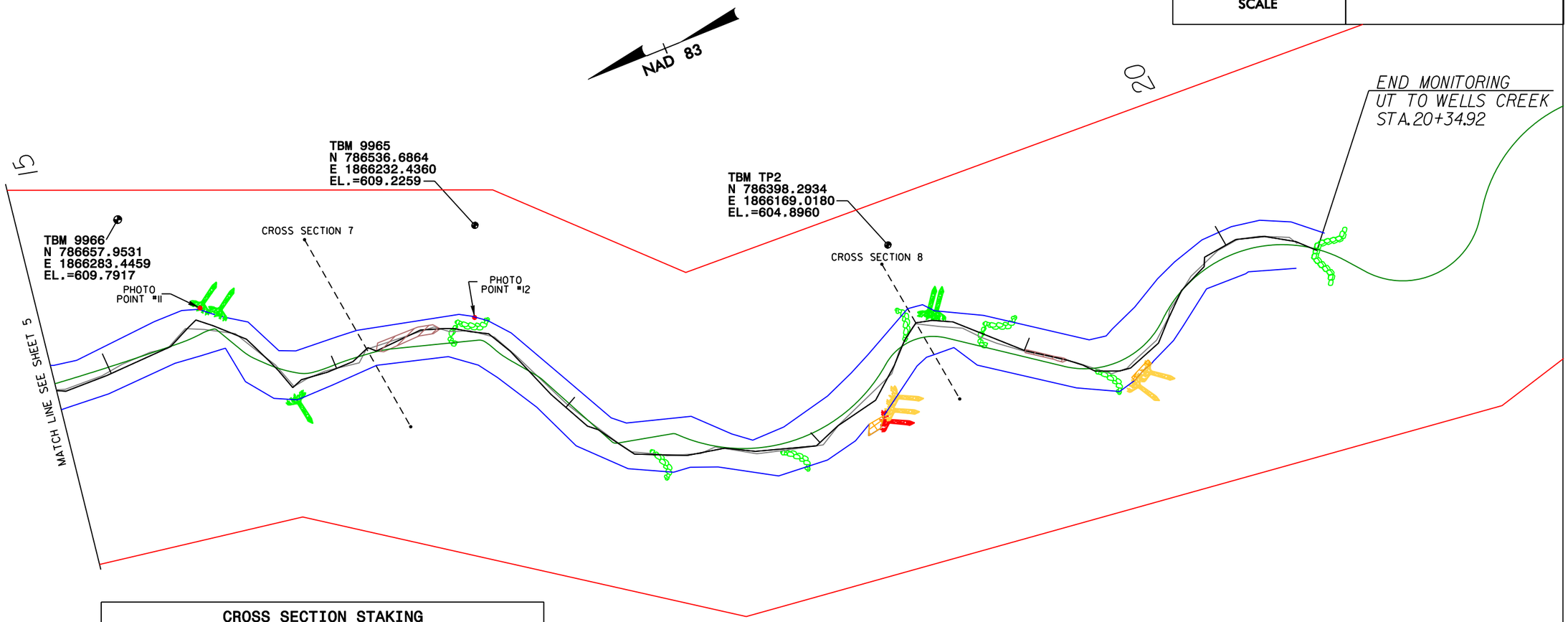

CROSS SECTION STAKING			
	NORTHING	EASTING	ELEVATION
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XSC 8 LEFT	786403.0018	1866163.2910	604.9927
XSC 8 RIGHT	786394.8939	1866106.6040	604.3983

LEGEND

STREAM FEATURES
- THALWEG AS-BUILT
- THALWEG 2008
- THALWEG 2009
- BANKFULL 2009
- BANK EROSION
- SEVERE BANK EROSION
- UNDERCUT BANK
- BAR FORMATION

PROJECT ELEMENTS
- CROSS-SECTIONS
- CONTROL POINT/ BENCHMARK (TBM)
- PHOTO POINT
- EASEMENT BOUNDARY

•SEPI was unable to locate quality aerial photographs for this figure. The old photographs were omitted due to poor quality.

STRUCTURE TYPES
- ROCK CROSS VANE
- J-HOOK VANE
- ROOTWAD
- ROCK VANE

COLOR CODE FOR STRUCTURES
- GOOD STRUCTURE
- STRUCTURE WITH POTENTIAL PROBLEM
- FAILING STRUCTURE

UT TO WELLS CREEK

Ecosystem Enhancement PROGRAM

LOCATION: WELLS CREEK
CURRENT CONDITIONS PLAN VIEW
FINAL STREAM - YEAR 5

PROJ #: 414
COUNTY: ALAMANCE
PREPARED BY: IPJ
CHECKED BY: PDB
DATE: 5/26/2009

*Invasive *Lonicera japonica* is commonly found along project corridor.

*Invasive *Microstegium virmineum* is commonly found along project corridor.

**Festuca spp.* (fescue) is commonly found along project corridor. This species is sometimes considered invasive and appears to be limiting colonization by native vegetation within the project easement.

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RALEIGH, NC 27605
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PROJECT REFERENCE NO.	SHEET NO.
414	1
PROJECT ENGINEER	

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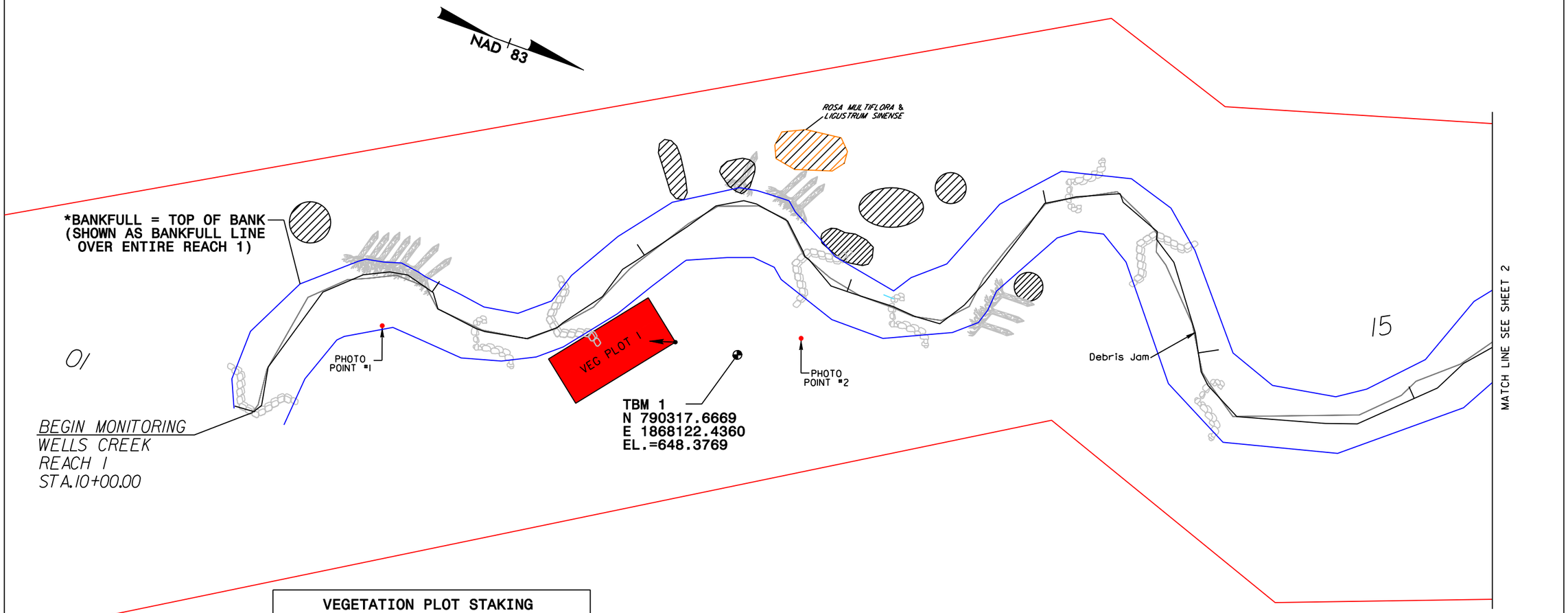
SCALE



VEGETATION PLOT STAKING		
	NORTHING	EASTING
VP 1	790341.4193	1868127.8295

LEGEND

THALWEG 2009
BANKFULL 2009
PHOTO POINT
VEGETATION PLOT WITH PHOTO CORNER
VEGETATION PLOT NOT MEETING SUCCESS REQUIREMENTS

STRUCTURE TYPES
ROCK CROSS VANE
J-HOOK VANE
ROOTWAD
ROCK VANE

BARE BENCH/BANK
BARE FLOODPLAIN
ROSA MULTIFLORA PRESENT
LIGUSTRUM SINENSE PRESENT
AILANTHUS ALTISSIMA PRESENT

WELLS CREEK - REACH 1

Ecosystem Enhancement PROGRAM

LOCATION:	WELLS CREEK CURRENT CONDITIONS PLAN VIEW FINAL VEGETATION- YEAR 5
PROJ #: 414	COUNTY: ALAMANCE
MONITORED BY:	IPJ
CHECKED BY: PDB	DATE: 5/26/2009

*Invasive *Lonicera japonica* is commonly found along project corridor.

*Invasive *Microstegium virmineum* is commonly found along project corridor.

**Festuca spp.* (fescue) is commonly found along project corridor. This species is sometimes considered invasive and appears to be limiting colonization by native vegetation within the project easement.

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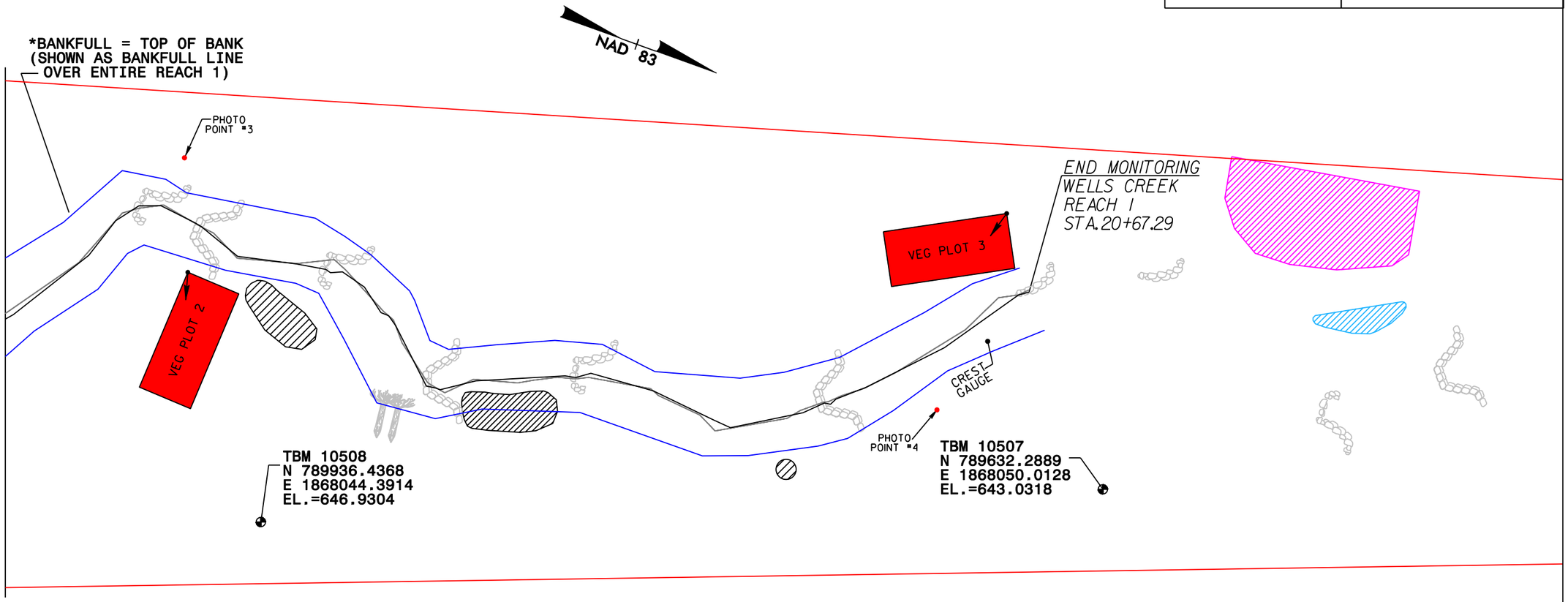
PROJECT REFERENCE NO.	SHEET NO.
414	2
PROJECT ENGINEER	

10 0 20
SCALE



VEGETATION PLOT STAKING		
	NORTHING	EASTING
VP 2	789960.9694	1868135.0301
VP 3	789665.0116	1868150.2452

LEGEND

THALWEG 2009
BANKFULL 2009
PHOTO POINT
VEGETATION PLOT WITH PHOTO CORNER
VEGETATION PLOT NOT MEETING SUCCESS REQUIREMENTS

STRUCTURE TYPES
ROCK CROSS VANE
J-HOOK VANE
ROOTWAD
ROCK VANE

BARE BENCH/BANK
BARE FLOODPLAIN
ROSA MULTIFLORA PRESENT
LIGUSTRUM SINENSE PRESENT
AILANTHUS ALTISSIMA PRESENT

WELLS CREEK - REACH 1

Ecosystem Enhancement PROGRAM

LOCATION:	WELLS CREEK CURRENT CONDITIONS PLAN VIEW FINAL VEGETATION- YEAR 5
PROJ #: 414	COUNTY: ALAMANCE
MONITORED BY:	IPJ
CHECKED BY: PDB	DATE: 5/26/2009

*It was observed on April 7, 2009 that multiple cattle had accessed the easement in the recent past, but had since been removed. This occurred after January 8 as no cattle damage was observed during that site visit. Fresh hoof prints were observed at all locations, forming trails along the top of bank and over other areas of the floodplain. Minimal hoof-shear was observed at a couple of locations along the top of bank. It was obvious that much of the herbaceous understory had been grazed, although the buffer health does not appear to have been negatively impacted from this grazing.

*Invasive *Microstegium virmineum* is commonly found along project corridor.

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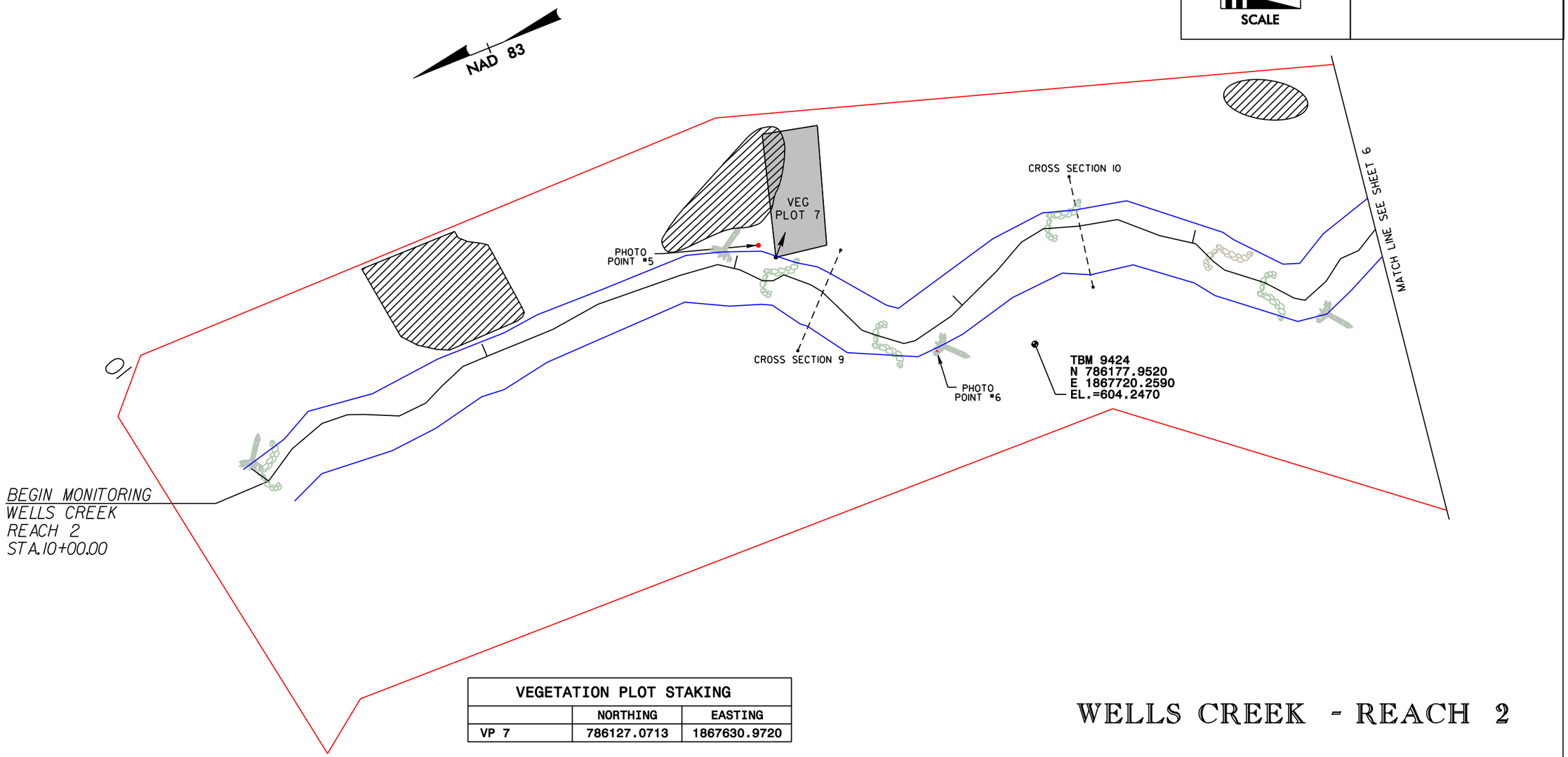
PROJECT REFERENCE NO.	SHEET NO.
414	3
PROJECT ENGINEER	

10 0 20
SCALE



VEGETATION PLOT STAKING		
	NORTHING	EASTING
VP 7	786127.0713	1867630.9720

WELLS CREEK - REACH 2

LEGEND

THALWEG 2009
BANKFULL 2009
PHOTO POINT
VEGETATION PLOT WITH PHOTO CORNER
VEGETATION PLOT NOT MEETING SUCCESS REQUIREMENTS

STRUCTURE TYPES
ROCK CROSS VANE
J-HOOK VANE
ROOTWAD
ROCK VANE

BARE BENCH/BANK
BARE FLOODPLAIN
ROSA MULTIFLORA PRESENT
LIGUSTRUM SINENSE PRESENT
AILANTHUS ALTISSIMA PRESENT

Ecosystem Enhancement PROGRAM

LOCATION:	WELLS CREEK CURRENT CONDITIONS PLAN VIEW FINAL VEGETATION- YEAR 5
PROJ #: 414	COUNTY: ALAMANCE
MONITORED BY:	IPJ
CHECKED BY: PDB	DATE: 5/26/2009

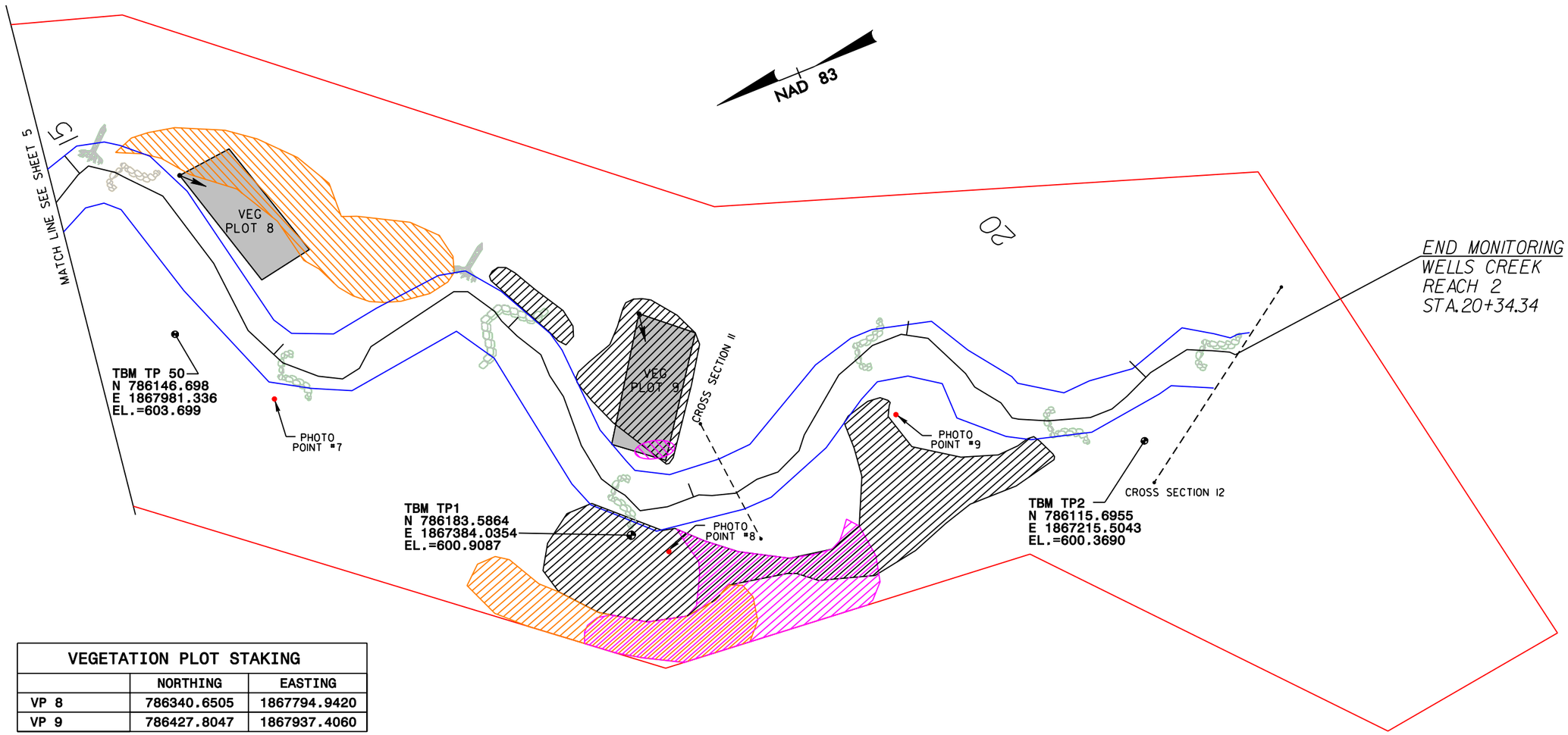
*It was observed on April 7, 2009 that multiple cattle had accessed the easement in the recent past, but had since been removed. This occurred after January 8 as no cattle damage was observed during that site visit. Fresh hoof prints were observed at all locations, forming trails along the top of bank and over other areas of the floodplain. Minimal hoof-shear was observed at a couple of locations along the top of bank. It was obvious that much of the herbaceous understory had been grazed, although the buffer health does not appear to have been negatively impacted from this grazing.

*Invasive *Microstegium virmineum* is commonly found along project corridor.

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
414	4
PROJECT ENGINEER	

10 0 20
SCALE



VEGETATION PLOT STAKING		
	NORTHING	EASTING
VP 8	786340.6505	1867794.9420
VP 9	786427.8047	1867937.4060

LEGEND

THALWEG 2009
BANKFULL 2009
PHOTO POINT
VEGETATION PLOT WITH PHOTO CORNER
VEGETATION PLOT NOT MEETING SUCCESS REQUIREMENTS

STRUCTURE TYPES

ROCK CROSS VANE
J-HOOK VANE
ROOTWAD
ROCK VANE

BARE BENCH/BANK
BARE FLOODPLAIN
ROSA MULTIFLORA PRESENT
LIGUSTRUM SINENSE PRESENT
AILANTHUS ALTISSIMA PRESENT

WELLS CREEK - REACH 2

Ecosystem Enhancement PROGRAM

LOCATION:	WELLS CREEK CURRENT CONDITIONS PLAN VIEW FINAL VEGETATION- YEAR 5
PROJ #: 414	COUNTY: ALAMANCE
MONITORED BY: IPJ	
CHECKED BY: PDB	DATE: 5/26/2009

*Invasive *Microstegium virmineum* is commonly found along project corridor.

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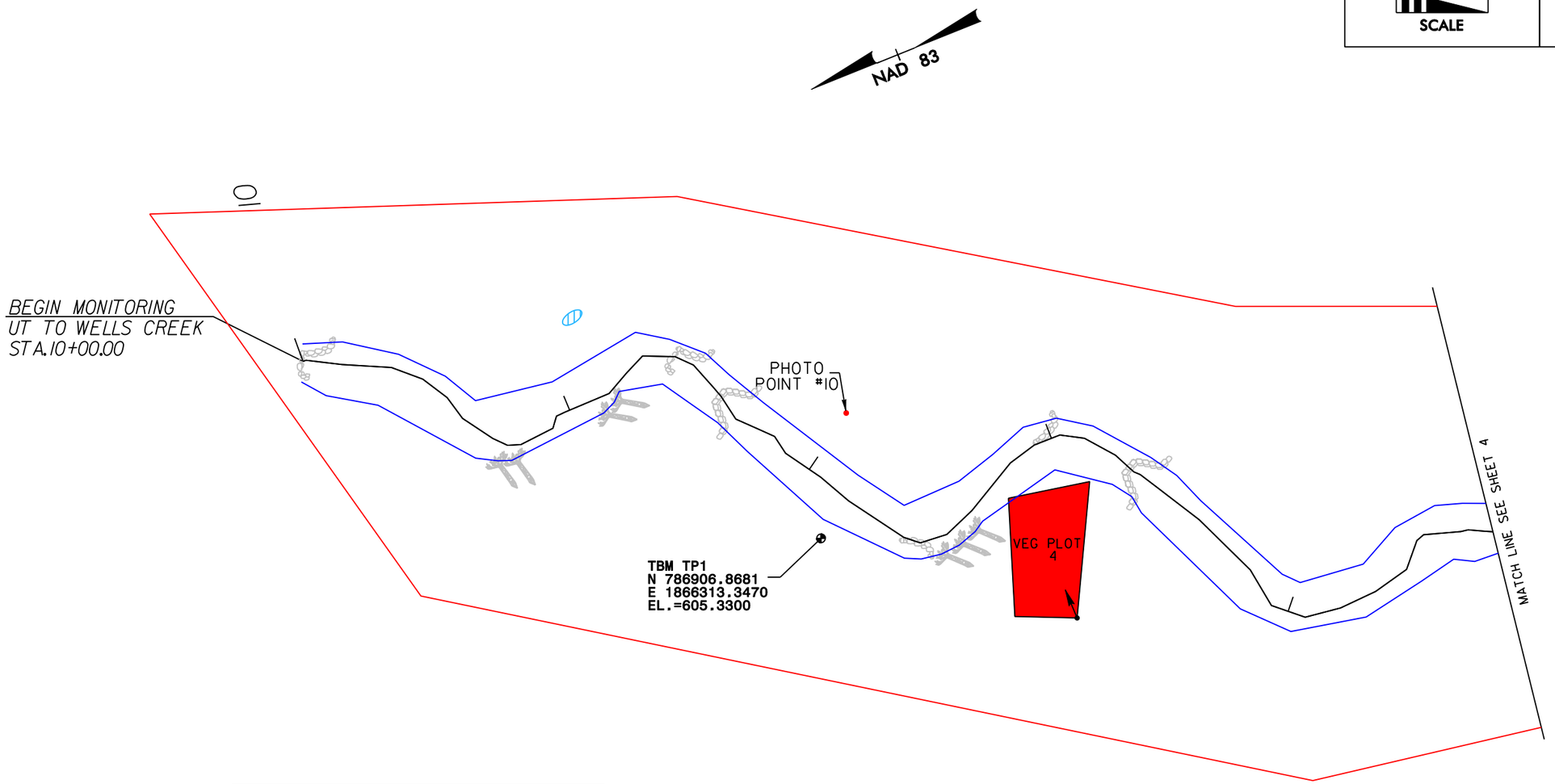
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
414	5
PROJECT ENGINEER	

10 0 20
SCALE



VEGETATION PLOT STAKING		
	NORTHING	EASTING
VP 4	786838.9045	1866257.9760

LEGEND

THALWEG 2009
BANKFULL 2009
PHOTO POINT
VEGETATION PLOT WITH PHOTO CORNER
VEGETATION PLOT NOT MEETING SUCCESS REQUIREMENTS

STRUCTURE TYPES
ROCK CROSS VANE
J-HOOK VANE
ROOTWAD
ROCK VANE

BARE BENCH/BANK
BARE FLOODPLAIN
ROSA MULTIFLORA PRESENT
LIGUSTRUM SINENSE PRESENT
AILANTHUS ALTISSIMA PRESENT

UT TO WELLS CREEK

Ecosystem Enhancement PROGRAM

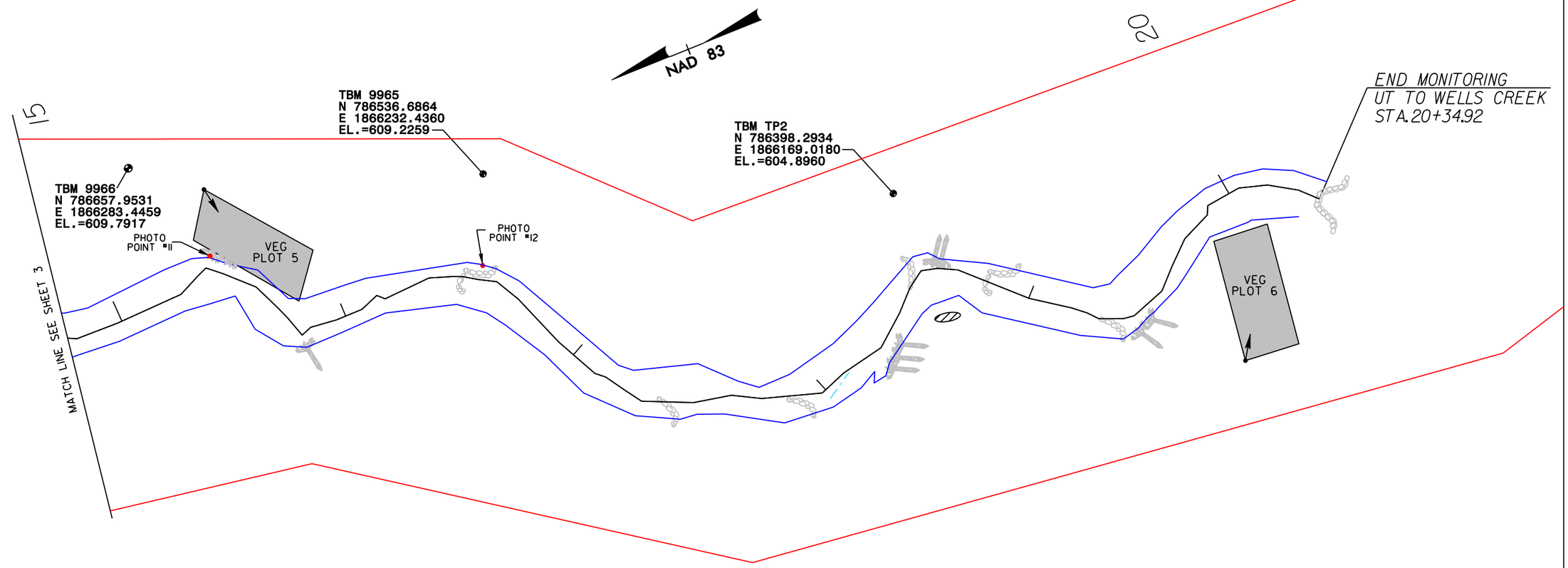
LOCATION:	WELLS CREEK CURRENT CONDITIONS PLAN VIEW FINAL VEGETATION- YEAR 5
PROJ #: 414	COUNTY: ALAMANCE
MONITORED BY:	IPJ
CHECKED BY: PDB	DATE: 5/26/2009

*Invasive *Microstegium virmineum* is commonly found along project corridor.

SEPI ENGINEERING GROUP
1025 WADE AVENUE
RALEIGH, NC 27605
TEL: 919-789-9977 FAX: 789-9591

PROJECT REFERENCE NO.	SHEET NO.
414	6
PROJECT ENGINEER	

10 0 20
SCALE



VEGETATION PLOT STAKING		
	NORTHING	EASTING
VP 5	786634.8714	1866265.6880
VP 6	786300.2329	1866062.8870

LEGEND

THALWEG 2009
BANKFULL 2009
PHOTO POINT
VEGETATION PLOT WITH PHOTO CORNER
VEGETATION PLOT NOT MEETING SUCCESS REQUIREMENTS

STRUCTURE TYPES
ROCK CROSS VANE
J-HOOK VANE
ROOTWAD
ROCK VANE

BARE BENCH/BANK
BARE FLOODPLAIN
ROSA MULTIFLORA PRESENT
LIGUSTRUM SINENSE PRESENT
AILANTHUS ALTISSIMA PRESENT

UT TO WELLS CREEK

Ecosystem Enhancement PROGRAM

LOCATION: WELLS CREEK
CURRENT CONDITIONS PLAN VIEW
FINAL VEGETATION- YEAR 5

PROJ #:	COUNTY:
414	ALAMANCE
MONITORED BY: IPJ	
CHECKED BY: PDB	DATE: 5/26/2009

APPENDIX B

GENERAL PROJECT TABLES

Table I. Project Restoration Components Wells Creek/EEP Project Number 414				
Project Segment or Reach ID	**Type**	**Approach**	**As-Built Footage***	**As-Built Stationing**
Reach 1	R EI	PI, PII, and PIII**	3,006	17+10 – 26+00 26+00 – 47+16
Reach 2	R	PI, PII, and PIII**	1,244	11+06 – 23+50
Unnamed Tributary	R	PI, PII, and PIII**	1,493	11+52 - 26+45

*Reach lengths are longer than previously because earlier reports listed only lengths surveyed during monitoring data collection rather than the entire constructed lengths.

Table II. Project Activity and Reporting History Wells Creek/EEP Project Number 414			
Activity or Report	**Scheduled Completion**	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration Plan			August 1, 2002
Final Design - 90%			unknown
Construction			August 2003-April 2004
Temporary S&E mix applies to entire project area			August 2003-April 2004
Permanent seed mix applies to reach/segments 1&2			August 2003-April 2005
Containerized and B&B plantings for reach/segments 1&2			August 2003-April 2006
Mitigation Plan/ As-built (Year 0 Monitoring - baseline)		Dec-04	December 2004/July 2004
Year 1 monitoring			Sep-05
Year 2 monitoring		Apr-06	Nov-06
Year 3 monitoring		Oct-07	Dec-07
Year 4 monitoring	Apr-08	Nov-08	December 15, 2008
Year 5 monitoring	Apr-09	Oct-09	November 15, 2009

Table III. Project Contact Table	
Wells Creek/EEP Project Number 414	
Designer	ARCADIS G&M of North Carolina 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607
Construction Contractor	A&D Environmental and Industrial Services, Inc. Gerald Walker 2718 Uwharrie Road Archdale, NC 27263 336-434-7750
Planting Contractor	Seal Brothers Contracting Eddie Tobler PO BOX 86 Dobson, NC 27017 336-786-8863
Seeding Contractor	A&D Environmental and Industrial Services, Inc. Gerald Walker 2718 Uwharrie Road Archdale, NC 27263 336-434-7750
2005 Monitoring Performers	ARCADIS G&M of North Carolina 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607
2006 - 2009 Monitoring Performers	SEPI Engineering Group 1025 Wade Avenue Raleigh, NC 27605 Phillip Todd (919) 789-9977
Stream Monitoring POC	Ira Poplar-Jeffers (919) 573-9914
Vegetation Monitoring POC	Phil Beach (919) 573-9936
Wetland Monitoring POC	N/A

Table IV. Project Background Table	
Wells Creek/EEP Project Number 414	
Project County	Alamance
Drainage Area	Reach 1: 1.63 sq mi Reach 2: 2.23 sq mi and UT: 0.71 sq. mi
Drainage impervious cover estimate (%) For example	Wells Creek Reach 1 & 2 ~3%; Unnamed Tributary <1%
Stream Order	Wells Creek Reach 1: 2nd Order
	Wells Creek Reach 2: 3rd Order
	Unnamed Tributary: 1st Order
Physiographic Region	Piedmont
Ecoregion	Southern Outer Piedmont Carolina Slate Belt
Rosgen Classification of As-built	C 4/1
Cowardin Classification	Disturbed Cattle Pasture
Dominant soil types	Colfax, Lignum, Georgeville, Tarrus, Herndon, Local Alluvial Land, and Vance
Reference site ID	UT to Wells Creek, Cane Creek Mountains, Alamance County and UT to Varnals Creek
USGS HUC for Project and Reference	03030002 Haw River
NCDWQ Sub-basin for Project and Reference	03-06-04
NCDWQ classification for Project and Reference	Project and reference are Class C, NSW
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	100%
% of project easement demarcated with bollards (if fencing absent)	NA

APPENDIX C

VEGETATION ASSESSMENT DATA

Table 5. Vegetation Plot Mitigation Success Summary Table			
Tract	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean (Stems per Acre)**
Wells Creek Monitoring Reach 1	1	No	97
	2	No	
	3	No	
Wells Creek Monitoring Reach UT	4	No	361
	5	Yes	
	6	Yes	
Wells Creek Monitoring Reach 2	7	Yes	510
	8	Yes	
	9	Yes	

APPENDIX C
PHOTOLOG - WELLS CREEK
VEGETATION PLOTS


Photo 1: Vegetation Plot 1


Photo 2: Vegetation Plot 2


Photo 3: Vegetation Plot 3


Photo 4: Vegetation Plot 4


Photo 5: Vegetation Plot 5


Photo 6: Vegetation Plot 6

Photo 7: Vegetation Plot 7

Photo 8: Vegetation Plot 8

Photo 9: Vegetation Plot 9

Table VII. Stem counts for each species arranged by plot (Wells Creek)

Species	Plots									Year 1 Totals	Year 2 Totals	Year 3 Totals	Year 4 Totals	Year 5 Totals	Survival %
	1	2	3	4	5	6	7	8	9						
Shrubs															
Cornus ammomum			2	1	(7 LS)				(1 LS)	11 (12 LS)	4 (13 LS)	3 (11 LS)	3 (8 LS)	3 (7 LS)	47.8%
Trees															
Betula nigra					2			2	1	10	9	9	5	5	50.0%
Carpinus caroliniana					3	2		2		11	10	8	8	7	63.6%
Diospyros virginiana										0	2	0	0	0	0.0%
Fraxinus pennsylvanica							2		3	2	6	3	5	5	83.0%
Juglans nigra			1			2				12	13	10	4	3	25.0%
Nyssa sylvatica										1	0	0	0	0	0.0%
Platanus occidentalis	1	1		1		3	1	3		22	16	16	10	10	45.5%
Salix nigra							13			13	17	17	16	13	100.0%
Sambucus canandensis										1	0	0	0	0	0.0%
Quercus michauxii						1	3		1	16	9	6	5	5	31.3%
Quercus rubra										2	2	0	0	0	0.0%
Quercus alba		1			1					5	4	4	2	2	40.0%
Quercus marilandica										1	1	0	0	0	0.0%
Total including live stake	1	2	3	2	13	8	19	7	6	119	102	87	61	61	51.3%
Stems per acre	48	97	145	90	665	366	895	347	283						
Total exluding live stake	1	2	3	2	6	8	19	7	5	107	89	76	53	53	49.5%
Stems per acre	48	97	145	90	307	366	895	346	236						

Note: Survival was calculated between Monitoring Year 1 and Monitoring Year 5 totals.

**Volunteers of the following species, not initially recorded as planted, were counted: Ailanthus altissima (VP 2,9), Acer rubrum (VP 1,5,6,8), Betula nigra (VP 4,5,6,7,8,9), Carpinus caroliniana (VP 5), Cephalanthus occidentalis (VP 1,6), Cercis canadensis (VP 5), Cornus amomum (VP 3,4,8), Diospyros virginiana (VP 5,9), Fraxinus americana (VP 3,6,7,9), Juglans nigra (VP 7,8,9), Liquidambar styraciflua (VP 1,3,4,5,6,7,8,9), Liriodendron tulipifera (VP 5,6), Platanus occidentalis (VP 1,2,5,6,9), Quercus alba (VP 1,2,5), Quercus michauxii (VP 4,5,7,8,9), and Quercus rubra (VP 5).*

** Liquidambar styraciflua were too numerous to count where new volunteers were noted.*

APPENDIX D

STREAM ASSESSMENT DATA

APPENDIX D
PHOTOLOG WELLS CREEK (REACH 2)

CROSS-SECTIONS & PHOTOPOINTS


Cross-Section 9: View Downstream (5-12-2009).


Cross-Section 9: View Upstream (5-12-2009).


Cross-Section 10: View Downstream (5-12-2009).


Cross-Section 10: View Upstream (5-12-2009).


Cross-Section 11: View Downstream (5-12-2009).


Cross-Section 11: View Upstream (5-12-2009).

Cross-Section 12: View Downstream (5-12-2009).

Photo point 5: View Downstream (5-12-2009).

Cross-Section 12: View Upstream (5-12-2009).

Photo point 5: View Upstream (5-12-2009).

Photo point 5: Facing Channel (5-12-2009).

Photo point 6: View Downstream (5-12-2009).

Photo point 7: View Downstream (5-12-2009).

Photo point 6: View Upstream (5-12-2009).

Photo point 7: View Upstream (5-12-2009).

Photo point 6: Facing Channel (5-12-2009).

Photo point 7: Facing Channel (5-12-2009).

Photo point 8: View Downstream (5-12-2009).

Photo point 9: View Downstream (10-8-2009).

Photo point 8: View Upstream (5-12-2009).

Photo point 9: View Upstream (10-8-2009).

Photo point 8: Facing Channel (5-12-2009).

Photo point 9: Facing Channel (10-8-2009).

APPENDIX D
PHOTOLOG – WELLS CREEK (REACH 1)

CROSS-SECTIONS & PHOTOPOINTS


Cross-Section 1: View Downstream (3-12-2009).


Cross-Section 1: View Upstream (3-12-2009).


Cross-Section 2: View Downstream (3-12-2009).


Cross-Section 2: View Upstream (3-12-2009).


Cross-Section 3: View Downstream (3-18-2009).


Cross-Section 3: View Upstream (3-18-2009).

Cross-Section 4: View Downstream (3-18-2009).

Cross-Section 4: View Upstream (11-6-2008).


Photo point 1: View Upstream (3-12-2009).


Photo point 2: View Upstream (3-12-2009).


Photo point 1: View Downstream (3-12-2009).


Photo point 2: View Downstream (3-12-2009).


Photo point 1: Facing Channel (3-12-2009).


Photo point 2: Facing Channel (3-12-2009).


Photo point 3: View Upstream (3-18-2009).


Photo point 4: View Upstream (3-18-2009).


Photo point 3: View Downstream (3-18-2009).


Photo point 4: View Downstream (3-18-2009).


Photo point 3: Facing Channel (3-18-2009).


Photo point 4: Facing Channel (3-18-2009).

APPENDIX D
PHOTOLOG WELLS CREEK (UT)

CROSS SECTIONS AND PHOTO POINTS

Cross-Section 5: View Downstream (3-24-2009).

Cross-Section 5: View Upstream (3-24-2009).

Cross-Section 6: View Downstream (3-24-2009).

Cross-Section 6: View Upstream (3-24-2009).

Cross-Section 7: View Downstream (3-25-2009).

Cross-Section 7: View Upstream (3-25-2009).

Cross-Section 8: View Downstream (3-25-2009).

Cross-Section 8: View Upstream (3-25-2009).

Photo point 10: View Downstream (3-24-2009).

Photo point 11: View Downstream (3-24-2009).

Photo point 10: View Upstream (3-24-2009).

Photo point 11: View Upstream (3-24-2009).

Photo point 10: Facing Channel (3-24-2009).

Photo point 11: Facing Channel (3-24-2009).

Photo point 12: View Downstream (3-24-2009).

Photo point 12: View Upstream (3-24-2009).

Photo point 12: Facing Channel (3-24-2009).

Table 8a. Visual Morphological Stability Assessment

Wells Creek

Segment/Reach: 1 (1241 feet)

Feature Category	Metric (per As-built and reference baselines)	(#Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performance Mean or Total
A. Riffles	1. Present	12	15	NA	80%	
	2. Armor stable	12	15	NA	80%	
	3. Facet grade appears stable	12	15	NA	80%	
	4. Minimal evidence of embedding/fining	7	15	NA	47%	
	5. Length appropriate	12	15	NA	80%	**73%**
B. Pools	1. Present	16	18	NA	89%	
	2. Sufficiently deep	16	18	NA	89%	
	3. Length appropriate	16	18	NA	89%	**89%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering	5	6	NA	83%	
	2. Downstream of meander (glide/inflection) centering	5	5	NA	100%	**92%**
D. Meanders	1. Outer bend in state of limited/controlled erosion	9	10	NA	90%	
	2. Of those eroding, # w/concomitant point bar formation	1	1	NA	100%	
	3. Apparent Rc within specifications	7	10	NA	70%	
	4. Sufficient floodplain access and relief	10	10	NA	100%	**90%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	4/112.9	89%	
	2. Channel bed degradation - areas of increasing down cutting or head cutting	NA	NA	0/0	100%	**95%**
F. Bank Condition	1. Actively eroding, wasting, or slumping bank	NA	NA	2/39.9	98%	**98%**
G. Vanes / J Hooks etc.	1. Free of back or arm scour	14	14	NA	100%	
	2. Height appropriate	14	14	NA	100%	
	3. Angle and geometry appear appropriate	14	14	NA	100%	
	4. Free of piping or other structural failures	13	14	NA	93%	**98%**
H. Wads and Boulders	1. Free of scour	15	16	NA	94%	
	2. Footing stable	16	16	NA	100%	**97%**

Table 8b. Visual Morphological Stability Assessment

Wells Creek

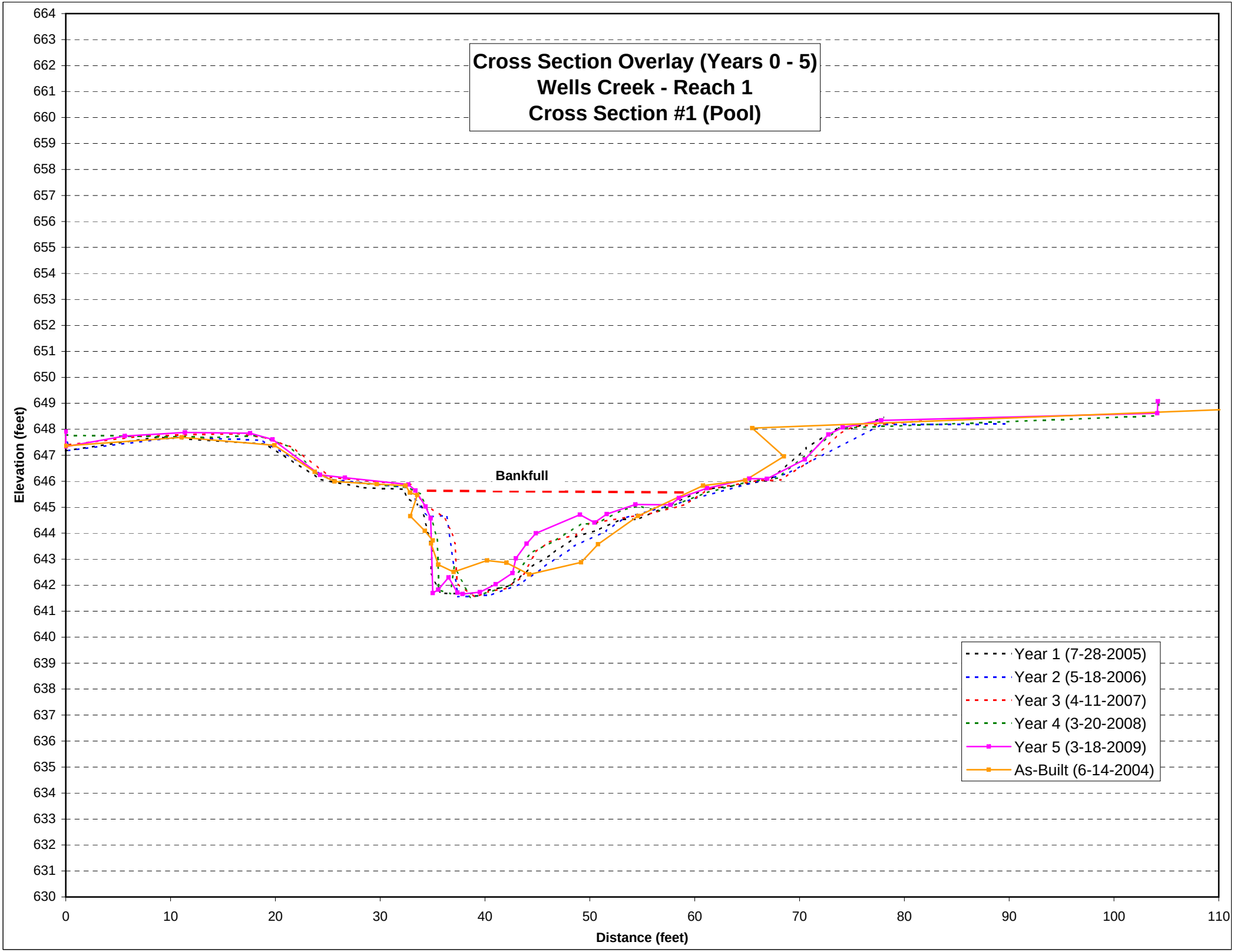
Segment/Reach: 2 (1153 feet)

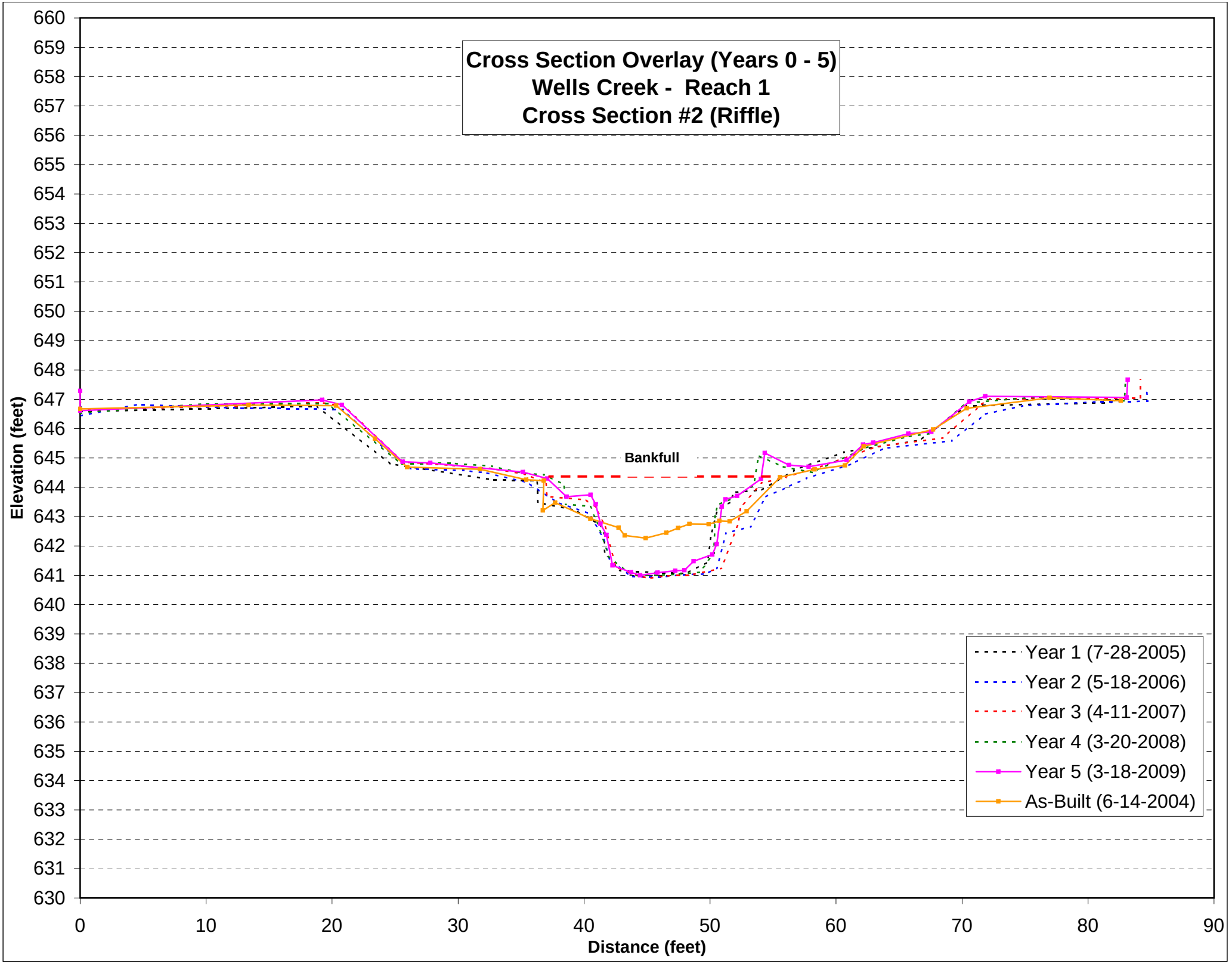
Feature Category	Metric (per As-built and reference baselines)	(#Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performance Mean or Total
A. Riffles	1. Present	10	10	NA	100%	
	2. Armor stable	10	10	NA	100%	
	3. Facet grade appears stable	9	10	NA	90%	
	4. Minimal evidence of embedding/fining	10	10	NA	100%	
	5. Length appropriate	6	10	NA	60%	**90%**
B. Pools	1. Present	12	13	NA	92%	
	2. Sufficiently deep	12	13	NA	92%	
	3. Length appropriate	11	13	NA	85%	**90%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering	6	6	NA	100%	
	2. Downstream of meander (glide/inflection) centering	5	5	NA	100%	**100%**
D. Meanders	1. Outer bend in state of limited/controlled erosion	6	10	NA	60%	
	2. Of those eroding, # w/concomitant point bar formation	2	4	NA	50%	
	3. Apparent Rc within specifications	9	10	NA	90%	
	4. Sufficient floodplain access and relief	10	10	NA	100%	**75%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	0/0	100%	
	2. Channel bed degradation - areas of increasing down cutting or head cutting	NA	NA	0/0	100%	**100%**
F. Bank Condition	1. Actively eroding, wasting, or slumping bank	NA	NA	11/162.7	92%	**92%**
G. Vanes / J Hooks etc.	1. Free of back or arm scour	11	13	NA	85%	
	2. Height appropriate	13	13	NA	100%	
	3. Angle and geometry appear appropriate	11	13	NA	85%	
	4. Free of piping or other structural failures	11	13	NA	85%	**88%**
H. Wads and Boulders	1. Free of scour	4	6	NA	67%	
	2. Footing stable	6	6	NA	100%	**83%**

Table 8c. Visual Morphological Stability Assessment						
Wells Creek						
Segment/Reach: UT (1013 feet)						
Feature Category	**Metric (per As-built and reference baselines)**	**(#Stable) Number Performing as Intended**	**Total Number per As-built**	**Total Number / feet in unstable state**	**% Performing in Stable Condition**	**Feature Performance Mean or Total**
A. Riffles	1. Present	15	15	NA	100%	
	2. Armor stable	15	15	NA	100%	
	3. Facet grade appears stable	12	15	NA	80%	
	4. Minimal evidence of embedding/fining	12	15	NA	80%	
	5. Length appropriate	12	15	NA	80%	**88%**
B. Pools	1. Present	17	17	NA	100%	
	2. Sufficiently deep	17	17	NA	100%	
	3. Length appropriate	16	17	NA	94%	**98%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering	6	6	NA	100%	
	2. Downstream of meander (glide/inflection) centering	6	6	NA	100%	**100%**
D. Meanders	1. Outer bend in state of limited/controlled erosion	12	13	NA	92%	
	2. Of those eroding, # w/concomitant point bar formation	1	1	NA	100%	
	3. Apparent Rc within specifications	10	11	NA	91%	
	4. Sufficient floodplain access and relief	13	13	NA	100%	**96%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	5/93.1	91%	
	2. Channel bed degradation - areas of increasing down cutting or head cutting	NA	NA	0/0	100%	**96%**
F. Bank Condition	1. Actively eroding, wasting, or slumping bank	NA	NA	3/24.5	99%	**99%**
G. Vanes / J Hooks etc.	1. Free of back or arm scour	13	13	NA	100%	
	2. Height appropriate	13	13	NA	100%	
	3. Angle and geometry appear appropriate	12	13	NA	92%	
	4. Free of piping or other structural failures	13	13	NA	100%	**98%**
H. Wads and Boulders	1. Free of scour	13	16	NA	81%	
	2. Footing stable	13	16	NA	81%	**81%**

Table 9. Verification of Bankfull Events

Date of Data Collection	Date of Occurrence	Method	Photo # (if available)
7/19/2006	Unknown	Bankfull event recorded: evident by crest stage gauge (0.6" wet on the measuring stick).	no photo
1/19/2007	Unknown	Bankfull event recorded: evident by crest stage gauge (7.0" wet on the measuring stick).	no photo
4/5/2007	Unknown	Crest gauge reading of 4.75 inches over bankfull (located at 0.00 inches on gauge).	no photo
6/4/2007	6/3/2007	Bankfull event observed as a result of ~1.5 inch rainfall event. Wrack lines noted.	no photo
2/1/2008	Unknown	Crest gauge reading of 5.0 inches over bankfull (located at 0.00 inches on gauge). Wrack lines noted.	no photo
9/1/2008	8/27/2008 - 8/28/2008	According to NCDC Station Coop ID 313555 - Graham ENE, NC , 6.58 inches of precipitation fell on this day. It was assumed, but not verified, that this rainfall produced a bankfull event.	no photo
9/8/2008	Unknown	Bankfull evidence found on 9/8/2008. Actual date of storm event unknown. Note wrack lines located above the top of bank elevation in photo.	Photo 6 in Monitoring Year 4 SR-1 SPA Photolog
3/12/2009	Unknown	Bankfull evidence found on 3/12/2009. Actual date of storm event unknown. Note wrack lines located at left of center in photo.	Photo 5 in Monitoring Year 5 SR-1 SPA Photolog


Cross Section Overlay (Years 0 - 5)
Wells Creek - Reach 1
Cross Section #1 (Pool)
Bankfull
Elevation (feet)
Distance (feet)
664
663
662
661
660
659
658
657
656
655
654
653
652
651
650
649
648
647
646
645
644
643
642
641
640
639
638
637
636
635
634
633
632
631
630
0
10
20
30
40
50
60
70
80
90
100
110
Year 1 (7-28-2005)
Year 2 (5-18-2006)
Year 3 (4-11-2007)
Year 4 (3-20-2008)
Year 5 (3-18-2009)
As-Built (6-14-2004)


Cross Section Overlay (Years 0 - 5)
Wells Creek - Reach 1
Cross Section #2 (Riffle)
Bankfull
Elevation (feet)
Distance (feet)
660
659
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636
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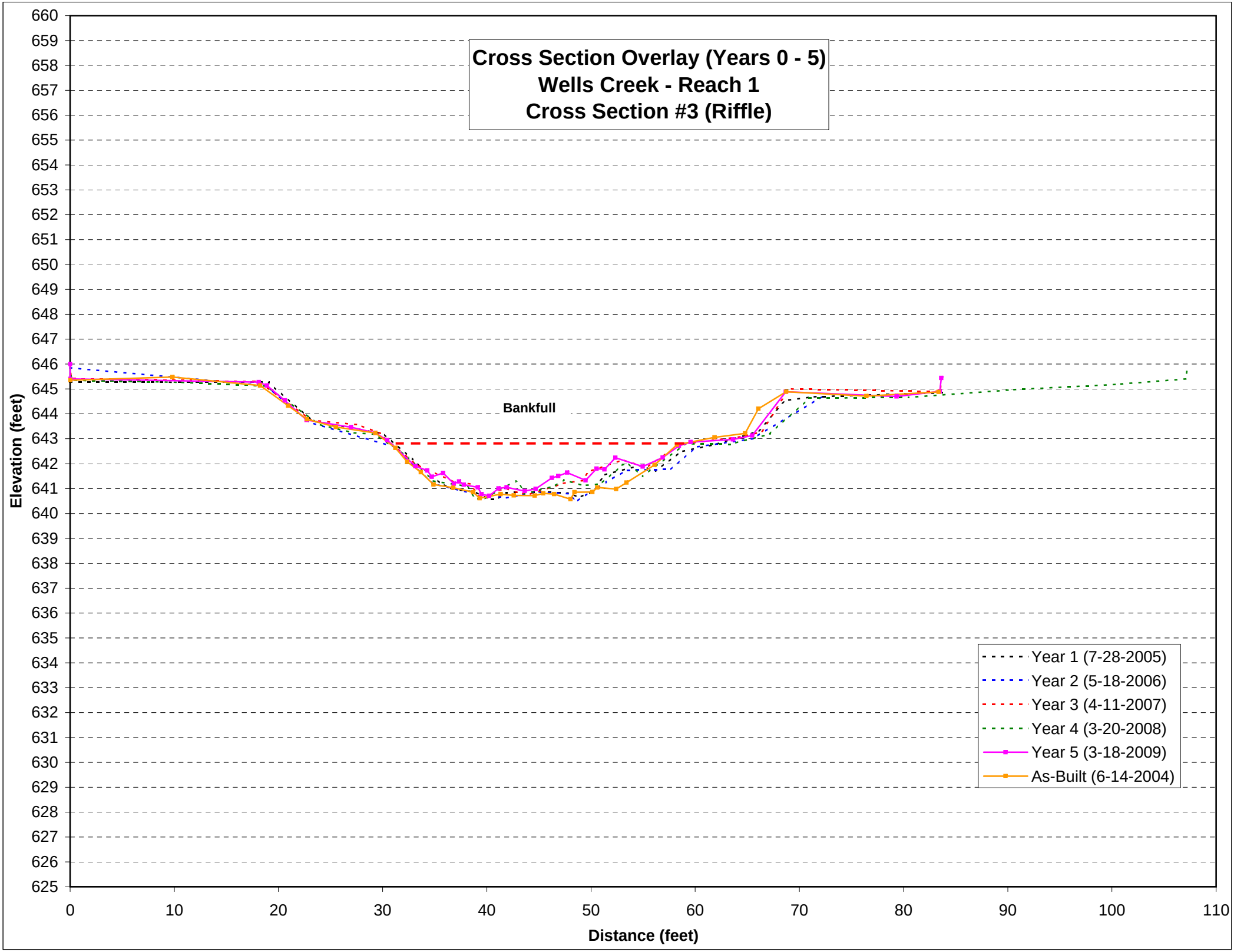
634
633
632
631
630
0
10
20
30
40
50
60
70
80
90
Year 1 (7-28-2005)
Year 2 (5-18-2006)
Year 3 (4-11-2007)
Year 4 (3-20-2008)
Year 5 (3-18-2009)
As-Built (6-14-2004)


Cross Section Overlay (Years 0 - 5)
Wells Creek - Reach 1
Cross Section #3 (Riffle)
Bankfull
Elevation (feet)
Distance (feet)
660
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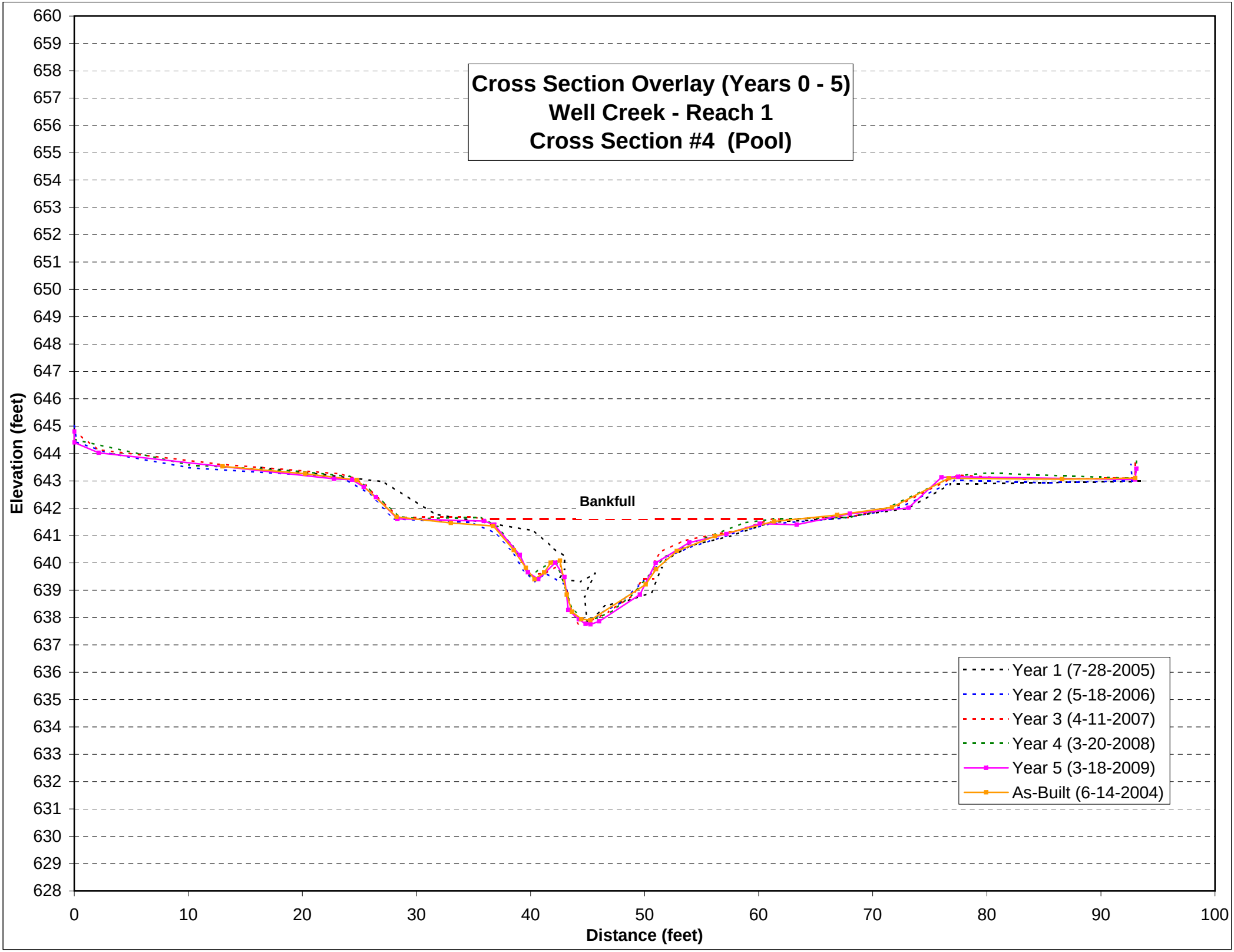
631
630
629
628
627
626
625
0
10
20
30
40
50
60
70
80
90
100
110
Year 1 (7-28-2005)
Year 2 (5-18-2006)
Year 3 (4-11-2007)
Year 4 (3-20-2008)
Year 5 (3-18-2009)
As-Built (6-14-2004)


Cross Section Overlay (Years 0 - 5)
Well Creek - Reach 1
Cross Section #4 (Pool)
Elevation (feet)
660
659
658
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653
652
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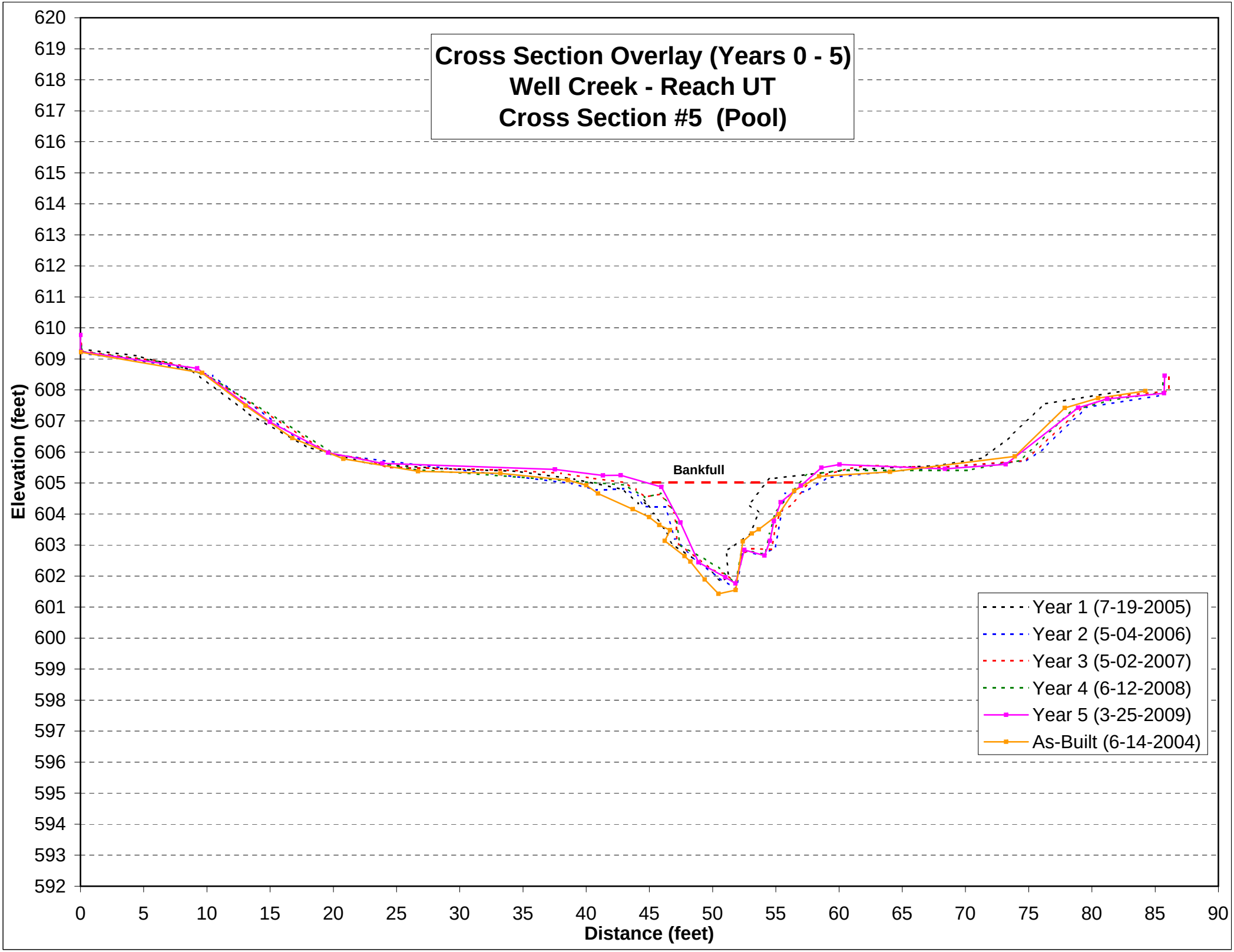
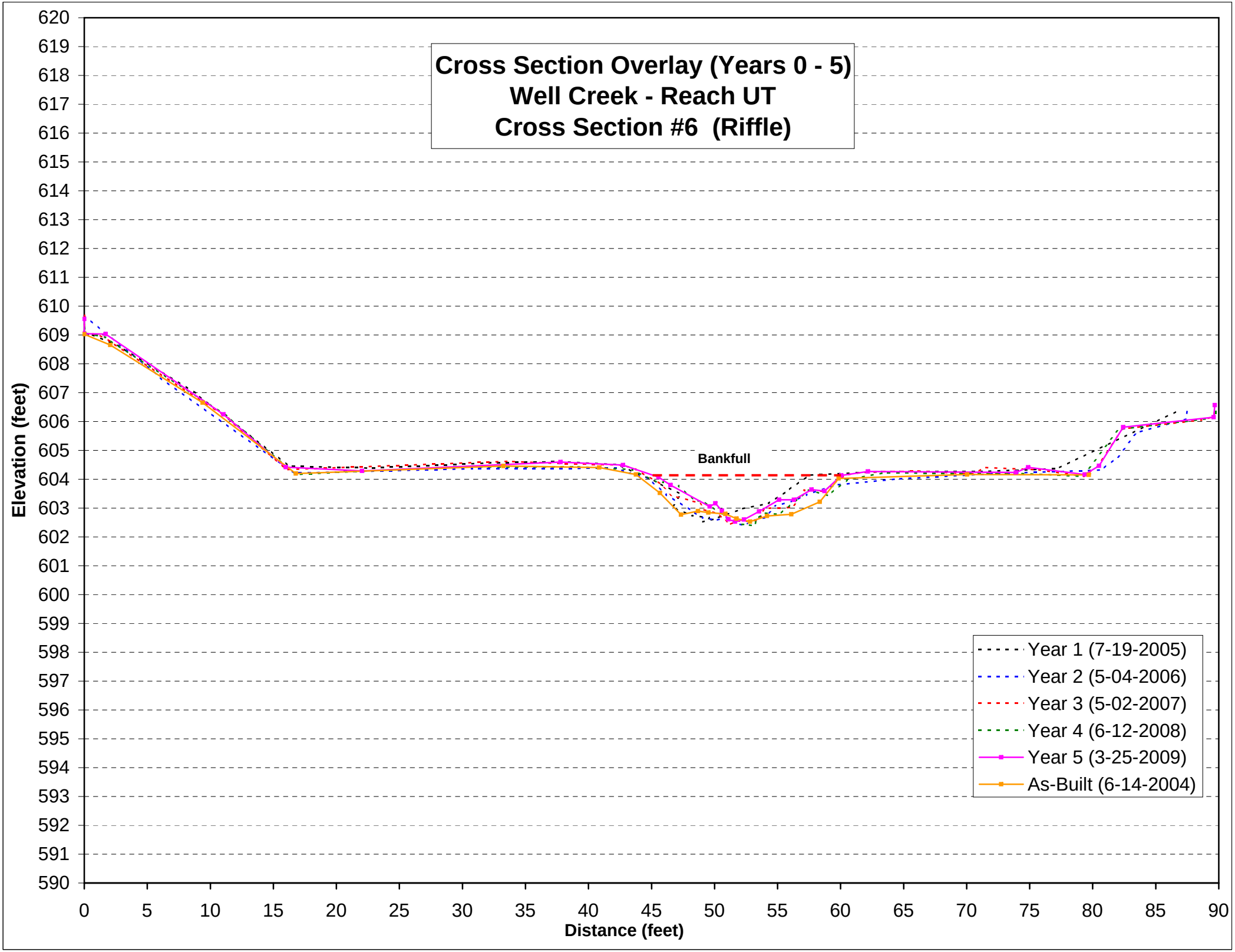
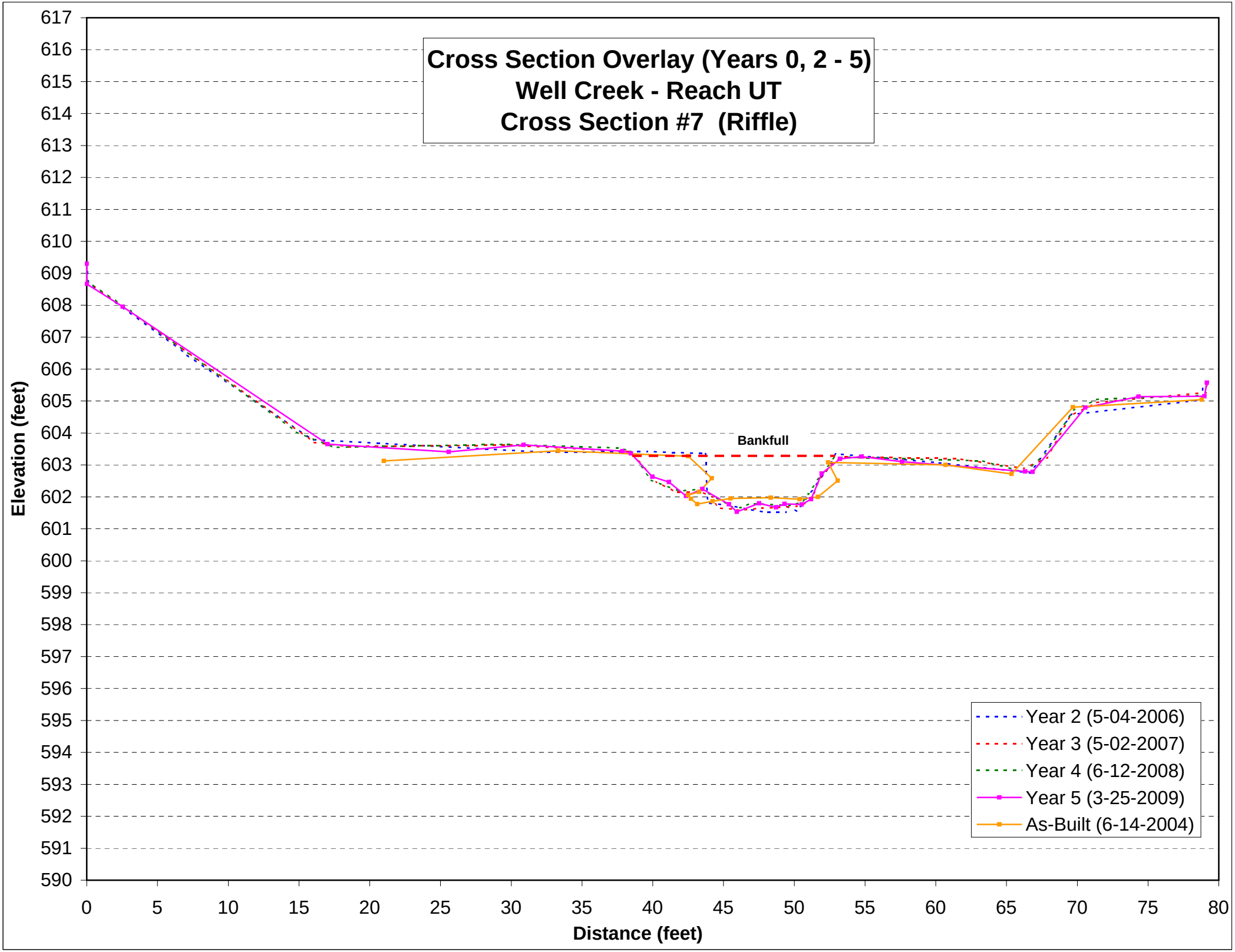
650
649
648
647
646
645
644
643
642
641
640
639
638
637
636
635
634
633
632
631
630
629
628
Bankfull
0
10
20
30
40
50
60
70
80
90
100
Distance (feet)
Year 1 (7-28-2005)
Year 2 (5-18-2006)
Year 3 (4-11-2007)
Year 4 (3-20-2008)
Year 5 (3-18-2009)
As-Built (6-14-2004)


Cross Section Overlay (Years 0 - 5)
Well Creek - Reach UT
Cross Section #5 (Pool)
Elevation (feet)
Distance (feet)
Bankfull
Year 1 (7-19-2005)
Year 2 (5-04-2006)
Year 3 (5-02-2007)
Year 4 (6-12-2008)
Year 5 (3-25-2009)
As-Built (6-14-2004)


Cross Section Overlay (Years 0 - 5)
Well Creek - Reach UT
Cross Section #6 (Riffle)
Elevation (feet)
Distance (feet)
Bankfull
Year 1 (7-19-2005)
Year 2 (5-04-2006)
Year 3 (5-02-2007)
Year 4 (6-12-2008)
Year 5 (3-25-2009)
As-Built (6-14-2004)


Cross Section Overlay (Years 0, 2 - 5)
Well Creek - Reach UT
Cross Section #7 (Riffle)
Bankfull
Year 2 (5-04-2006)
Year 3 (5-02-2007)
Year 4 (6-12-2008)
Year 5 (3-25-2009)
As-Built (6-14-2004)
Elevation (feet)
Distance (feet)
617
616
615
614
613
612
611
610
609
608
607
606
605
604
603
602
601
600
599
598
597
596
595
594
593
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10
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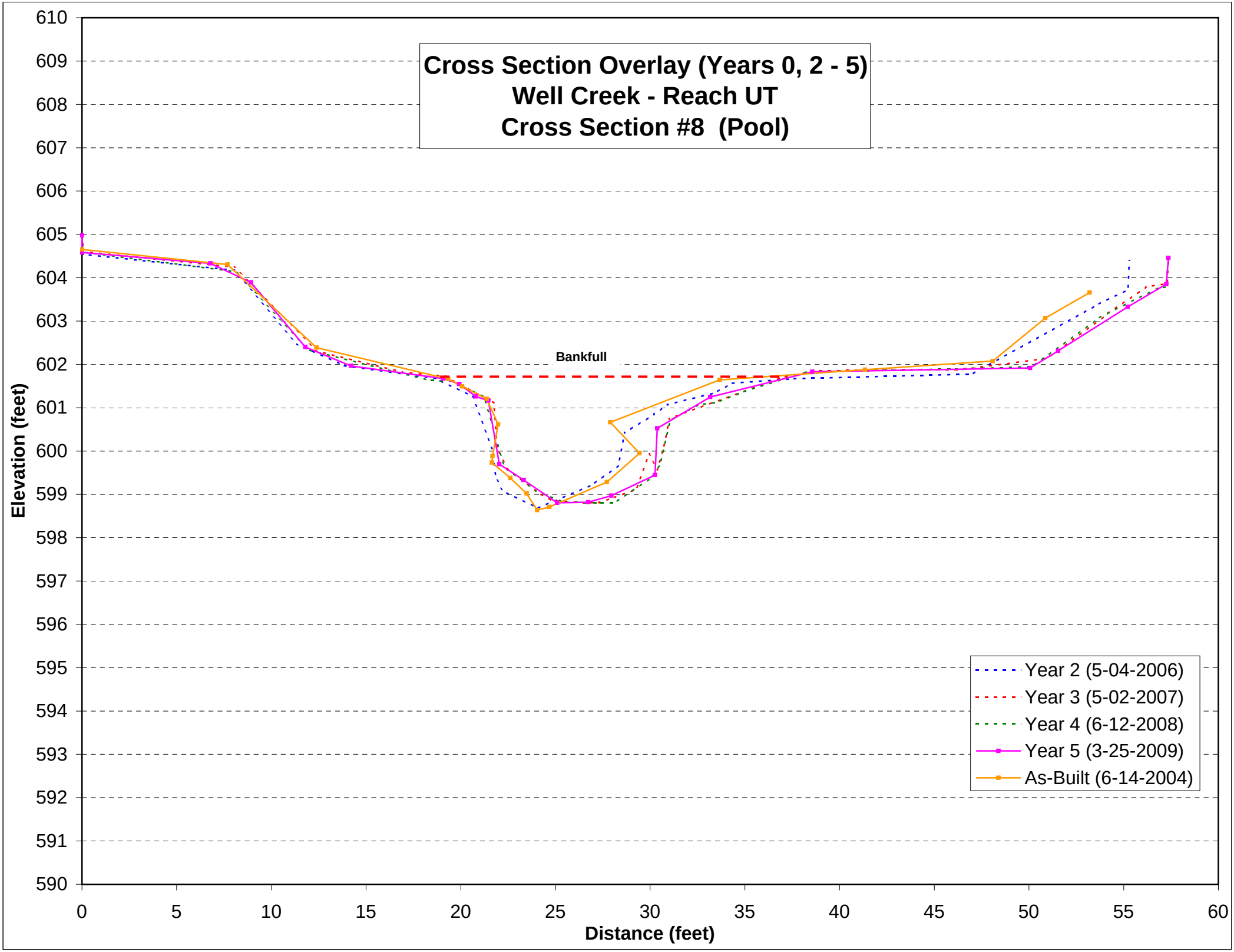
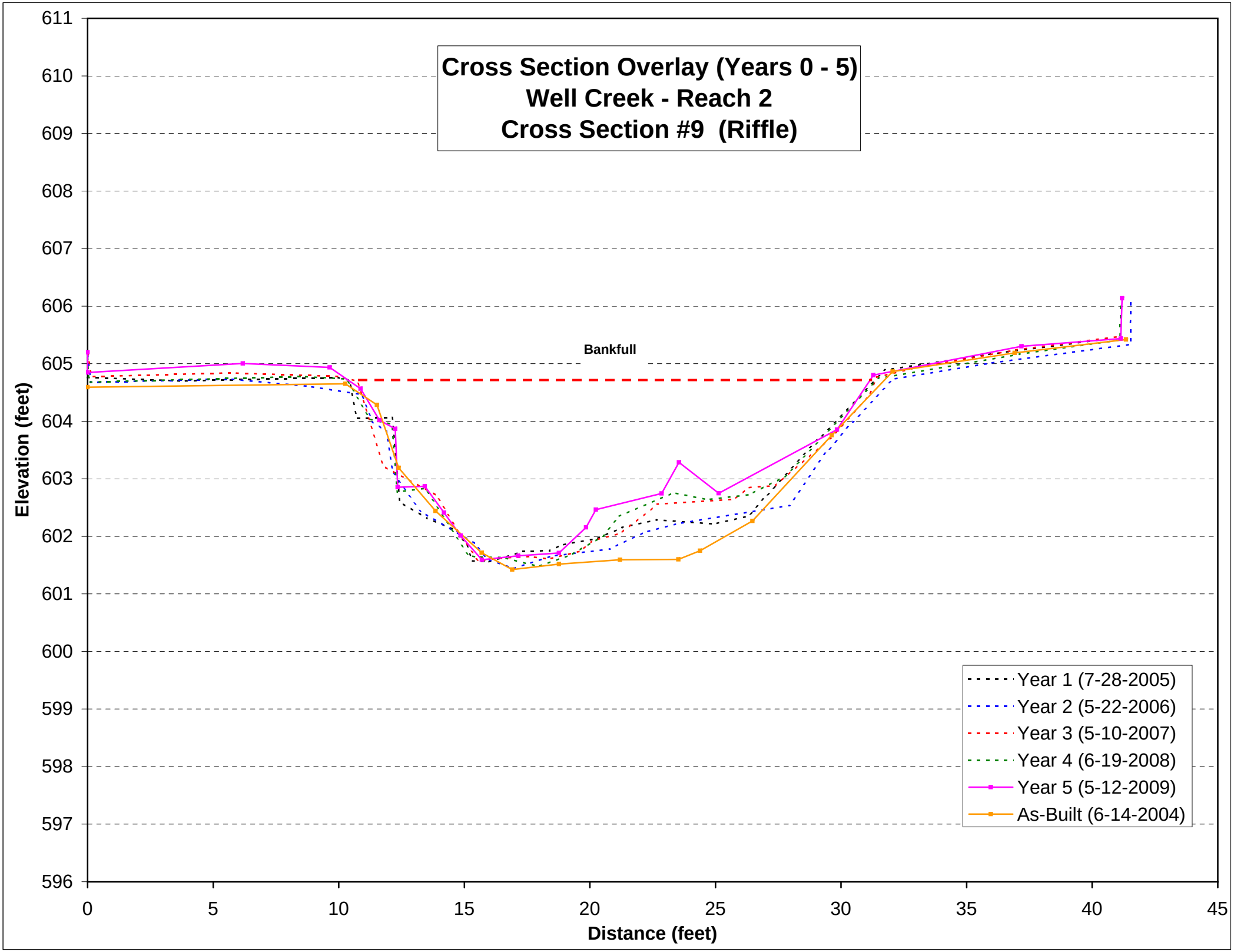
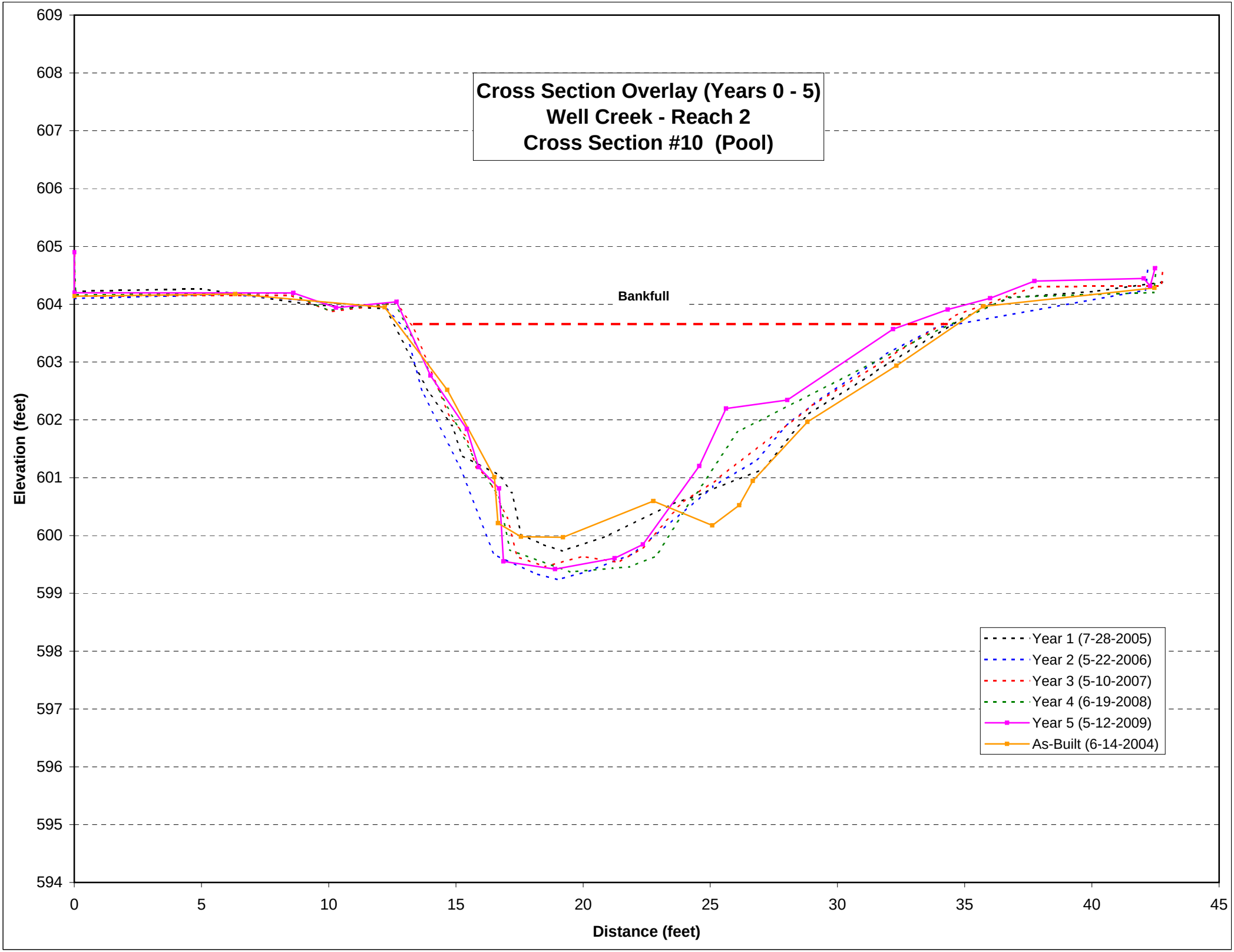
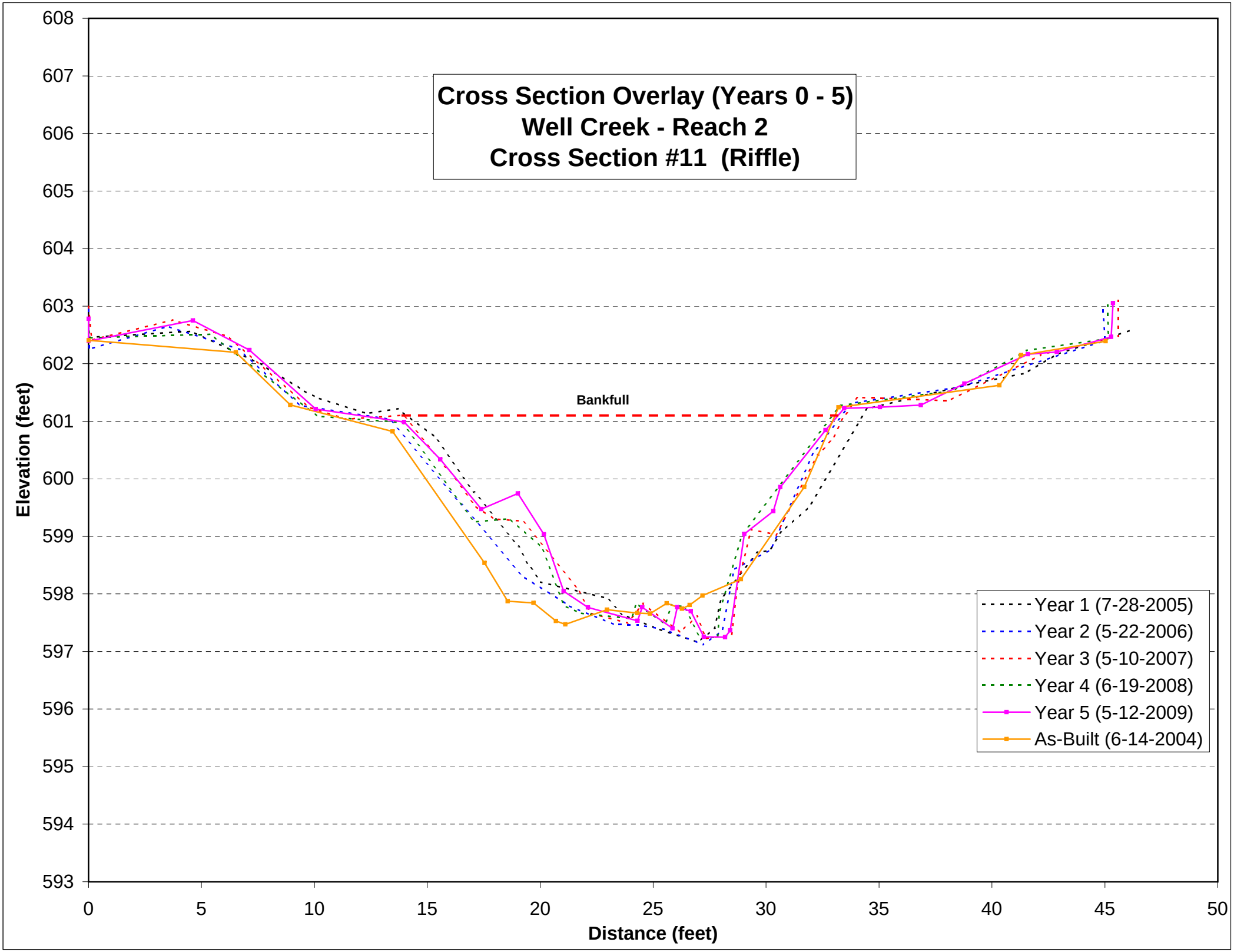
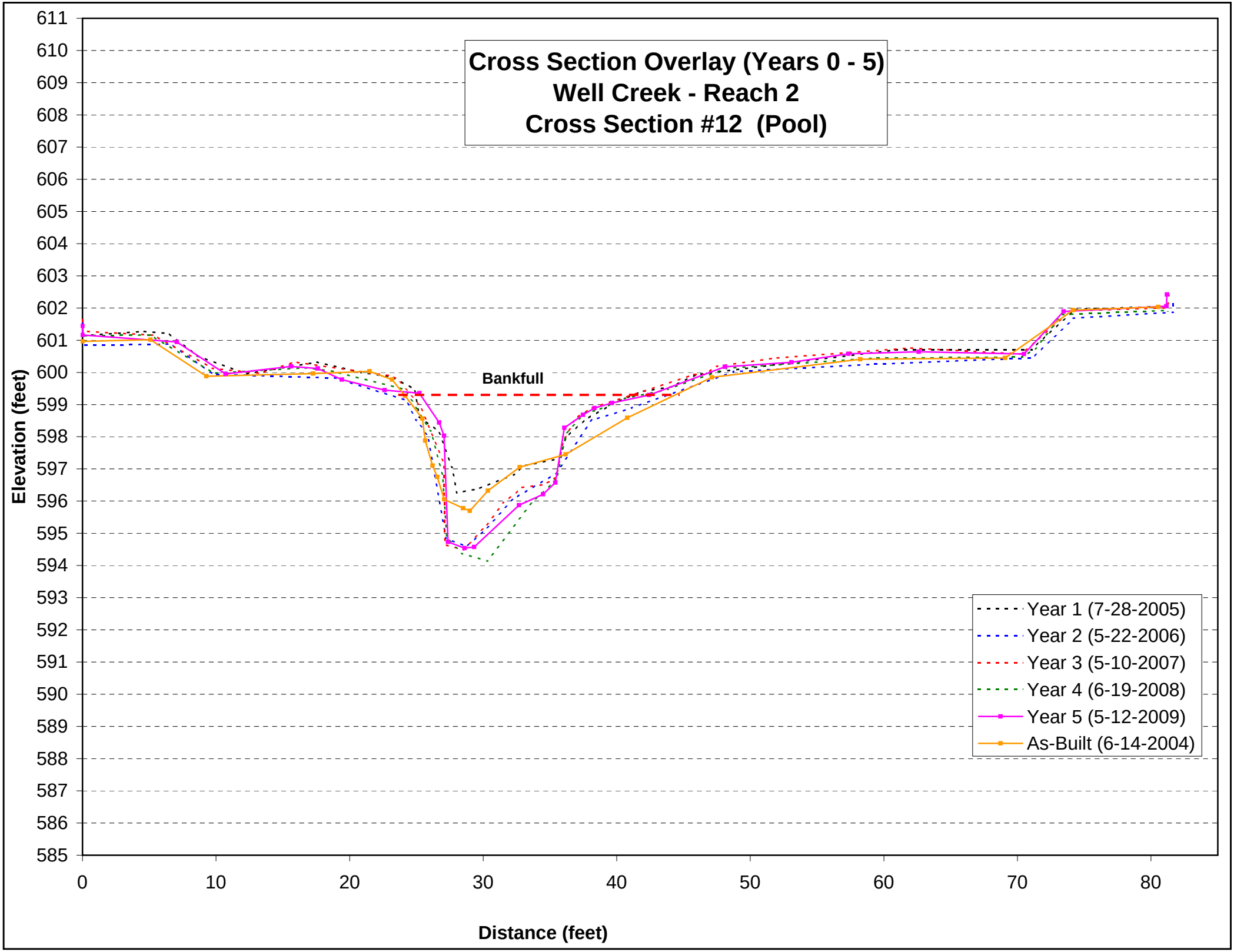
35
40
45
50
55
60
65
70
75
80


Cross Section Overlay (Years 0, 2 - 5)
Well Creek - Reach UT
Cross Section #8 (Pool)
Bankfull
Elevation (feet)
Distance (feet)
610
609
608
607
606
605
604
603
602
601
600
599
598
597
596
595
594
593
592
591
590
0
5
10
15
20
25
30
35
40
45
50
55
60
Year 2 (5-04-2006)
Year 3 (5-02-2007)
Year 4 (6-12-2008)
Year 5 (3-25-2009)
As-Built (6-14-2004)


Cross Section Overlay (Years 0 - 5)
Well Creek - Reach 2
Cross Section #9 (Riffle)
Bankfull
Elevation (feet)
Distance (feet)
611
610
609
608
607
606
605
604
603
602
601
600
599
598
597
596
0
5
10
15
20
25
30
35
40
45
Year 1 (7-28-2005)
Year 2 (5-22-2006)
Year 3 (5-10-2007)
Year 4 (6-19-2008)
Year 5 (5-12-2009)
As-Built (6-14-2004)


Cross Section Overlay (Years 0 - 5)
Well Creek - Reach 2
Cross Section #10 (Pool)
Bankfull
Elevation (feet)
Distance (feet)
609
608
607
606
605
604
603
602
601
600
599
598
597
596
595
594
0
5
10
15
20
25
30
35
40
45
Year 1 (7-28-2005)
Year 2 (5-22-2006)
Year 3 (5-10-2007)
Year 4 (6-19-2008)
Year 5 (5-12-2009)
As-Built (6-14-2004)


Cross Section Overlay (Years 0 - 5)
Well Creek - Reach 2
Cross Section #11 (Riffle)
Bankfull
Elevation (feet)
Distance (feet)
608
607
606
605
604
603
602
601
600
599
598
597
596
595
594
593
0
5
10
15
20
25
30
35
40
45
50
Year 1 (7-28-2005)
Year 2 (5-22-2006)
Year 3 (5-10-2007)
Year 4 (6-19-2008)
Year 5 (5-12-2009)
As-Built (6-14-2004)


Cross Section Overlay (Years 0 - 5)
Well Creek - Reach 2
Cross Section #12 (Pool)
Bankfull
Elevation (feet)
Distance (feet)
611
610
609
608
607
606
605
604
603
602
601
600
599
598
597
596
595
594
593
592
591
590
589
588
587
586
585
0
10
20
30
40
50
60
70
80
Year 1 (7-28-2005)
Year 2 (5-22-2006)
Year 3 (5-10-2007)
Year 4 (6-19-2008)
Year 5 (5-12-2009)
As-Built (6-14-2004)

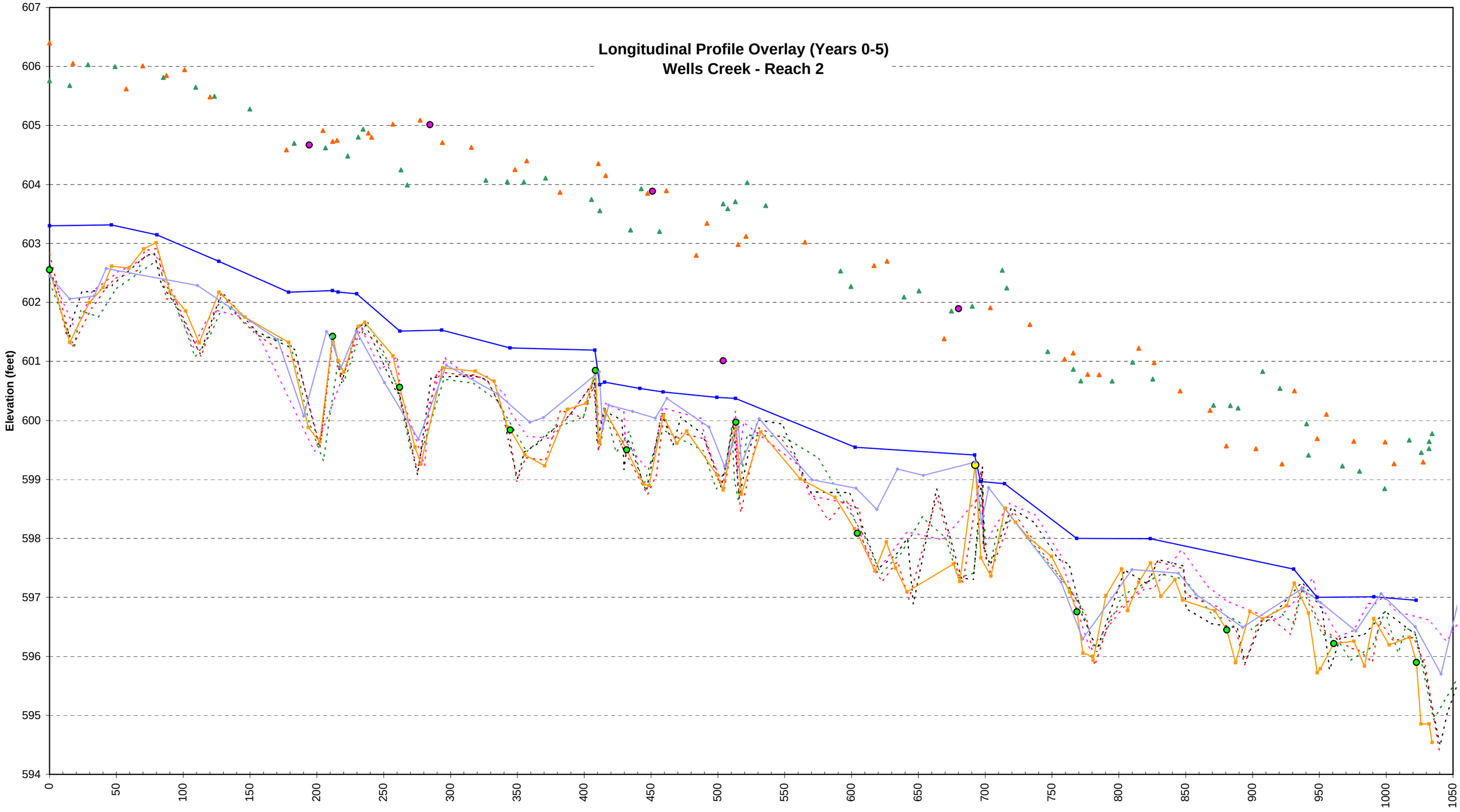
Longitudinal Profile Overlay (Years 0-5)
Wells Creek - Reach 1

Elevation (feet)

Channel Distance (feet)

Thalweg Year 1 (7-28-2005)
Thalweg Year 2 (5-18-2006)
Thalweg Year 3 (4-11-2007)
Thalweg Year 4 (3-20-2008)
Thalweg Year 5 (3-18-2009)
Water Surface Year 5
Left Bankfull Year 5
Right Bankfull Year 5
Crossvane
J-hook
Rootwad
Single Vane
Thalweg As-Built (6-14-2004)

Longitudinal Profile Overlay (Years 0-5)
Wells Creek - Reach 2



Longitudinal Profile Overlay (Years 0-5)
Wells Creek - Reach UT

Elevation (feet)

607
606
605
604
603
602
601
600
599
598
597

0 50 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000 1050

Channel Distance (feet)

Thalweg Year 1 (7-19-2005)
Thalweg Year 2 (5-04-2006)
Thalweg Year 3 (5-02-2007)
Thalweg Year 4 (6-12-2008)
Thalweg Year 5 (3-25-2009)
Water Surface Year 5
Left Bankfull Year 5
Right Bankfull Year 5
Crossvane
J-hook
Rootwad
As-Built (6-14-2004)

PEBBLE COUNT

Site: Wells Creek

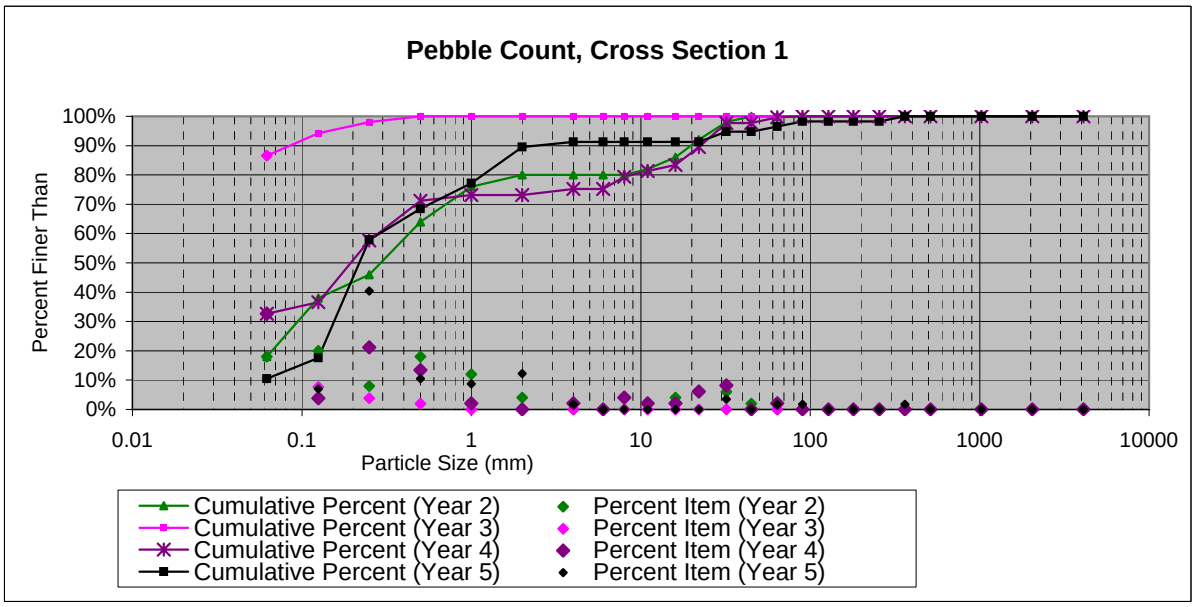
Party: IPJ & PDB

Date: 10/7/09

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 1	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	6	6	11%	11%
	Very Fine	.062-.125	SAND	4	4	7%	18%
	Fine	.125-.25	SAND	23	23	40%	58%
	Medium	.25-.50	SAND	6	6	11%	68%
	Coarse	.50-1.0	SAND	5	5	9%	77%
.04-.08	Very Coarse	1.0-2	SAND	7	7	12%	89%
.08-.16	Very Fine	2.0-4.0	GRAVEL	1	1	2%	91%
.16-.22	Fine	4-5.7	GRAVEL		0	0%	91%
.22-.31	Fine	5.7-8	GRAVEL		0	0%	91%
.31-.44	Medium	8-11.3	GRAVEL		0	0%	91%
.44-.63	Medium	11.3-16	GRAVEL		0	0%	91%
.63-.89	Coarse	16-22.6	GRAVEL		0	0%	91%
.89-1.26	Coarse	22.6-32	GRAVEL	2	2	4%	95%
1.26-1.77	Very Coarse	32-45	GRAVEL		0	0%	95%
1.77-2.5	Very Coarse	45-64	GRAVEL	1	1	2%	96%
2.5-3.5	Small	64-90	COBBLE	1	1	2%	98%
3.5-5.0	Small	90-128	COBBLE		0	0%	98%
5.0-7.1	Large	128-180	COBBLE		0	0%	98%
7.1-10.1	Large	180-256	COBBLE		0	0%	98%
10.1-14.3	Small	256-362	BOULDER	1	1	2%	100%
14.3-20	Small	362-512	BOULDER		0	0%	100%
20-40	Medium	512-1024	BOULDER		0	0%	100%
40-80	Large	1024-2048	BOULDER		0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	57	**100%**	**100%**



PEBBLE COUNT

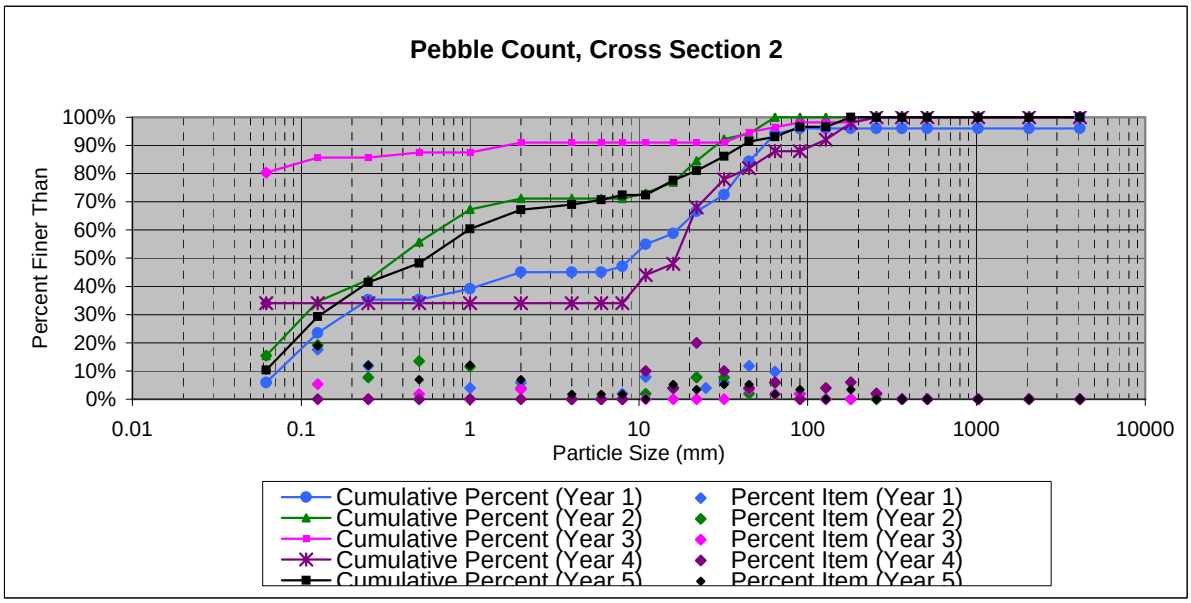
Site: Wells Creek

Party: IPJ & PDB

Date: 10/7/09

SEPI ENGINEERING GROUP

Inches	Particle	Millimeters		PARTICLE COUNT CS 2	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	6	6	10%	10%
	Very Fine	.062-.125	SAND	11	11	19%	29%
	Fine	.125-.25		7	7	12%	41%
	Medium	.25-.50		4	4	7%	48%
	Coarse	.50-1.0		7	7	12%	60%
.04-.08	Very Coarse	1.0-2		4	4	7%	67%
.08-.16	Very Fine	2.0-4.0	GRAVEL	1	1	2%	69%
.16-.22	Fine	4-5.7		1	1	2%	71%
.22-.31	Fine	5.7-8		1	1	2%	72%
.31-.44	Medium	8-11.3			0	0%	72%
.44-.63	Medium	11.3-16		3	3	5%	78%
.63-.89	Coarse	16-22.6		2	2	3%	81%
.89-1.26	Coarse	22.6-32		3	3	5%	86%
1.26-1.77	Very Coarse	32-45		3	3	5%	91%
1.77-2.5	Very Coarse	45-64		1	1	2%	93%
2.5-3.5	Small	64-90	COBBLE	2	2	3%	97%
3.5-5.0	Small	90-128			0	0%	97%
5.0-7.1	Large	128-180		2	2	3%	100%
7.1-10.1	Large	180-256			0	0%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512			0	0%	100%
20-40	Medium	512-1024			0	0%	100%
40-80	Large	1024-2048			0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	58	**100%**	**100%**



PEBBLE COUNT

Site: Wells Creek

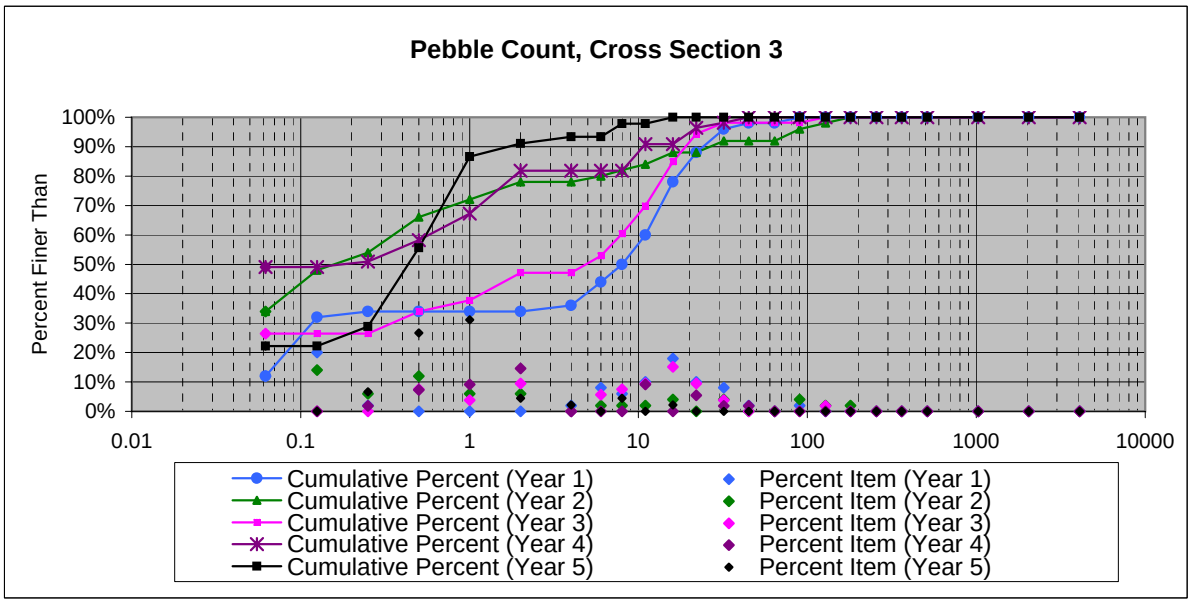
Party: IPJ & PDB

Date: 10/7/09

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 3	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	10	10	22%	22%
	Very Fine	.062-.125	SAND		0	0%	22%
	Fine	.125-.25	SAND	3	3	7%	29%
	Medium	.25-.50	SAND	12	12	27%	56%
	Coarse	.50-1.0	SAND	14	14	31%	87%
.04-.08	Very Coarse	1.0-2	SAND	2	2	4%	91%
.08-.16	Very Fine	2.0-4.0	GRAVEL	1	1	2%	93%
.16-.22	Fine	4-5.7	GRAVEL		0	0%	93%
.22-.31	Fine	5.7-8	GRAVEL	2	2	4%	98%
.31-.44	Medium	8-11.3	GRAVEL		0	0%	98%
.44-.63	Medium	11.3-16	GRAVEL	1	1	2%	100%
.63-.89	Coarse	16-22.6	GRAVEL		0	0%	100%
.89-1.26	Coarse	22.6-32	GRAVEL		0	0%	100%
1.26-1.77	Very Coarse	32-45	GRAVEL		0	0%	100%
1.77-2.5	Very Coarse	45-64	GRAVEL		0	0%	100%
2.5-3.5	Small	64-90	COBBLE		0	0%	100%
3.5-5.0	Small	90-128	COBBLE		0	0%	100%
5.0-7.1	Large	128-180	COBBLE		0	0%	100%
7.1-10.1	Large	180-256	COBBLE		0	0%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512	BOULDER		0	0%	100%
20-40	Medium	512-1024	BOULDER		0	0%	100%
40-80	Large	1024-2048	BOULDER		0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	45	**100%**	**100%**



PEBBLE COUNT

Site: Wells Creek

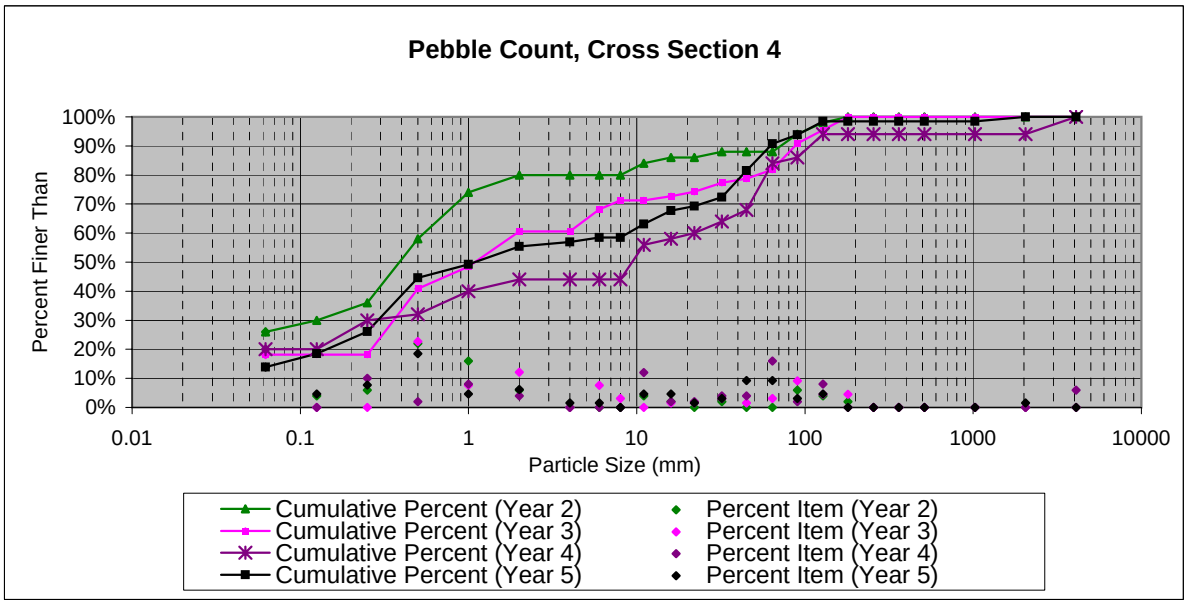
Party: IPJ & PDB

Date: 10/7/09

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 4	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	9	9	14%	14%
	Very Fine	.062-.125	SAND	3	3	5%	18%
	Fine	.125-.25		5	5	8%	26%
	Medium	.25-.50		12	12	18%	45%
	Coarse	.50-1.0		3	3	5%	49%
.04-.08	Very Coarse	1.0-2		4	4	6%	55%
.08-.16	Very Fine	2.0-4.0	GRAVEL	1	1	2%	57%
.16-.22	Fine	4-5.7		1	1	2%	58%
.22-.31	Fine	5.7-8			0	0%	58%
.31-.44	Medium	8-11.3		3	3	5%	63%
.44-.63	Medium	11.3-16		3	3	5%	68%
.63-.89	Coarse	16-22.6		1	1	2%	69%
.89-1.26	Coarse	22.6-32		2	2	3%	72%
1.26-1.77	Very Coarse	32-45		6	6	9%	82%
1.77-2.5	Very Coarse	45-64		6	6	9%	91%
2.5-3.5	Small	64-90	COBBLE	2	2	3%	94%
3.5-5.0	Small	90-128		3	3	5%	98%
5.0-7.1	Large	128-180			0	0%	98%
7.1-10.1	Large	180-256			0	0%	98%
10.1-14.3	Small	256-362	BOULDER		0	0%	98%
14.3-20	Small	362-512			0	0%	98%
20-40	Medium	512-1024			0	0%	98%
40-80	Large	1024-2048		1	1	2%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	65	**100%**	**100%**



PEBBLE COUNT

Site: Wells Creek

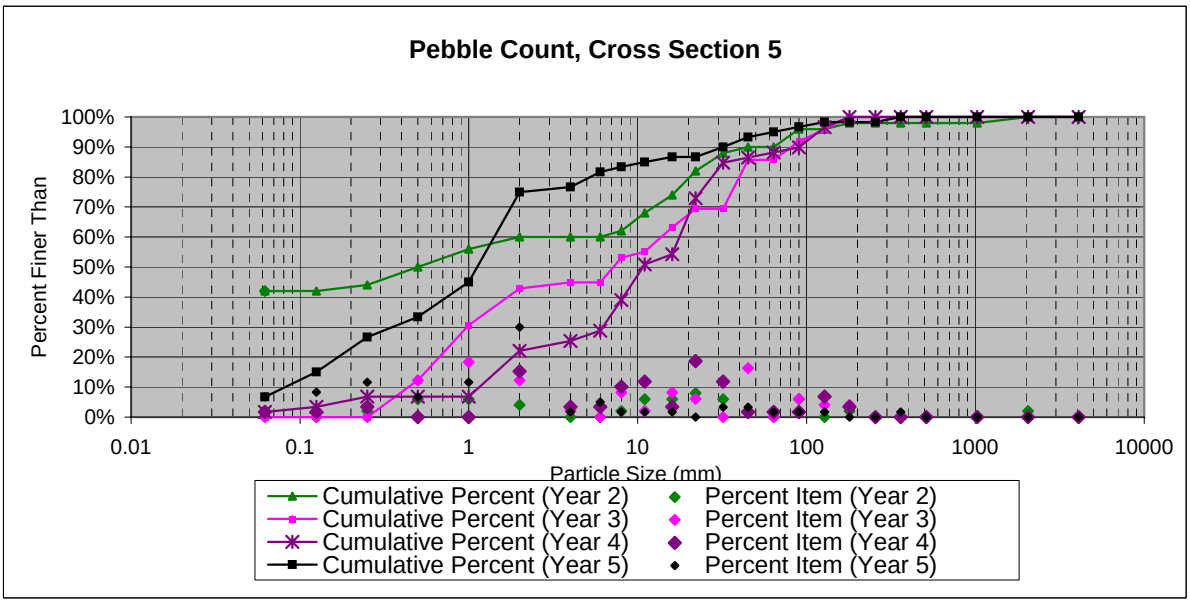
Party: IPJ & PDB

Date: 10/7/09

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 5	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	4	4	7%	7%
	Very Fine	.062-.125	SAND	1	5	8%	15%
	Fine	.125-.25	SAND	2	7	12%	27%
	Medium	.25-.50	SAND	4	4	7%	33%
	Coarse	.50-1.0	SAND	7	7	12%	45%
.04-.08	Very Coarse	1.0-2	SAND	18	18	30%	75%
.08-.16	Very Fine	2.0-4.0	GRAVEL	1	1	2%	77%
.16-.22	Fine	4-5.7	GRAVEL	3	3	5%	82%
.22-.31	Fine	5.7-8	GRAVEL	1	1	2%	83%
.31-.44	Medium	8-11.3	GRAVEL	1	1	2%	85%
.44-.63	Medium	11.3-16	GRAVEL	1	1	2%	87%
.63-.89	Coarse	16-22.6	GRAVEL		0	0%	87%
.89-1.26	Coarse	22.6-32	GRAVEL	2	2	3%	90%
1.26-1.77	Very Coarse	32-45	GRAVEL	2	2	3%	93%
1.77-2.5	Very Coarse	45-64	GRAVEL	1	1	2%	95%
2.5-3.5	Small	64-90	COBBLE	1	1	2%	97%
3.5-5.0	Small	90-128	COBBLE	1	1	2%	98%
5.0-7.1	Large	128-180	COBBLE		0	0%	98%
7.1-10.1	Large	180-256	COBBLE		0	0%	98%
10.1-14.3	Small	256-362	BOULDER	1	1	2%	100%
14.3-20	Small	362-512	BOULDER		0	0%	100%
20-40	Medium	512-1024	BOULDER		0	0%	100%
40-80	Large	1024-2048	BOULDER		0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	60	**100%**	**100%**



PEBBLE COUNT

Site: Wells Creek

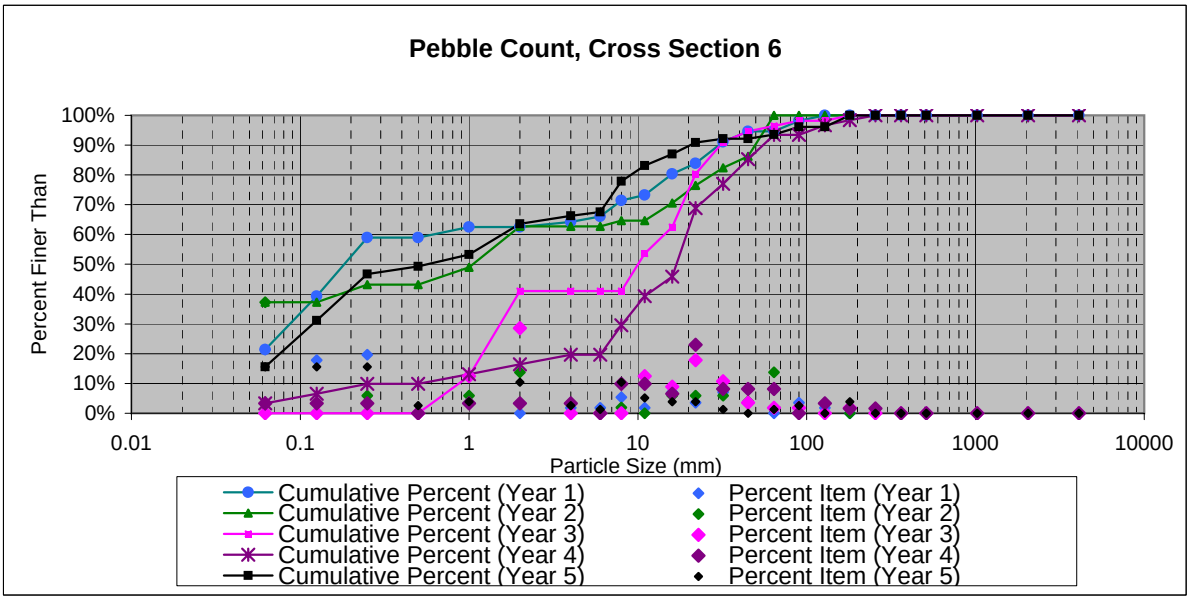
Party: IPJ & PDB

Date: 10/7/09

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 6	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	12	12	16%	16%
	Very Fine	.062-.125	SAND		12	16%	31%
	Fine	.125-.25	SAND		12	16%	47%
	Medium	.25-.50	SAND	2	2	3%	49%
	Coarse	.50-1.0	SAND	3	3	4%	53%
.04-.08	Very Coarse	1.0-2	SAND	8	8	10%	64%
.08-.16	Very Fine	2.0-4.0	GRAVEL	2	2	3%	66%
.16-.22	Fine	4-5.7	GRAVEL	1	1	1%	68%
.22-.31	Fine	5.7-8	GRAVEL	8	8	10%	78%
.31-.44	Medium	8-11.3	GRAVEL	4	4	5%	83%
.44-.63	Medium	11.3-16	GRAVEL	3	3	4%	87%
.63-.89	Coarse	16-22.6	GRAVEL	3	3	4%	91%
.89-1.26	Coarse	22.6-32	GRAVEL	1	1	1%	92%
1.26-1.77	Very Coarse	32-45	GRAVEL		0	0%	92%
1.77-2.5	Very Coarse	45-64	GRAVEL	1	1	1%	94%
2.5-3.5	Small	64-90	COBBLE	2	2	3%	96%
3.5-5.0	Small	90-128	COBBLE		0	0%	96%
5.0-7.1	Large	128-180	COBBLE	3	3	4%	100%
7.1-10.1	Large	180-256	COBBLE		0	0%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512	BOULDER		0	0%	100%
20-40	Medium	512-1024	BOULDER		0	0%	100%
40-80	Large	1024-2048	BOULDER		0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	77	**100%**	**100%**



PEBBLE COUNT

Site: Wells Creek

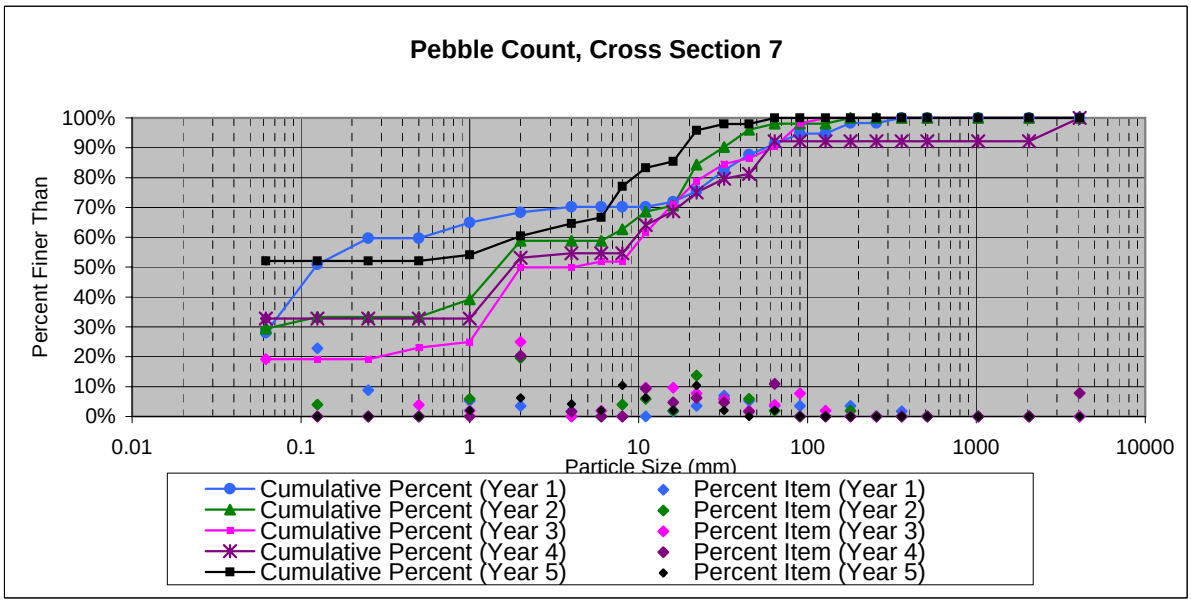
Party: IPJ & PDB

Date: 10/7/09

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 7	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	25	25	52%	52%
	Very Fine	.062-.125	SAND		0	0%	52%
	Fine	.125-.25	SAND		0	0%	52%
	Medium	.25-.50	SAND		0	0%	52%
	Coarse	.50-1.0	SAND	1	1	2%	54%
.04-.08	Very Coarse	1.0-2	SAND	3	3	6%	60%
.08-.16	Very Fine	2.0-4.0	GRAVEL	2	2	4%	65%
.16-.22	Fine	4-5.7	GRAVEL	1	1	2%	67%
.22-.31	Fine	5.7-8	GRAVEL	5	5	10%	77%
.31-.44	Medium	8-11.3	GRAVEL	3	3	6%	83%
.44-.63	Medium	11.3-16	GRAVEL	1	1	2%	85%
.63-.89	Coarse	16-22.6	GRAVEL	5	5	10%	96%
.89-1.26	Coarse	22.6-32	GRAVEL	1	1	2%	98%
1.26-1.77	Very Coarse	32-45	GRAVEL		0	0%	98%
1.77-2.5	Very Coarse	45-64	GRAVEL	1	1	2%	100%
2.5-3.5	Small	64-90	COBBLE		0	0%	100%
3.5-5.0	Small	90-128	COBBLE		0	0%	100%
5.0-7.1	Large	128-180	COBBLE		0	0%	100%
7.1-10.1	Large	180-256	COBBLE		0	0%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512	BOULDER		0	0%	100%
20-40	Medium	512-1024	BOULDER		0	0%	100%
40-80	Large	1024-2048	BOULDER		0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	48	**100%**	**100%**



PEBBLE COUNT

Site: Wells Creek

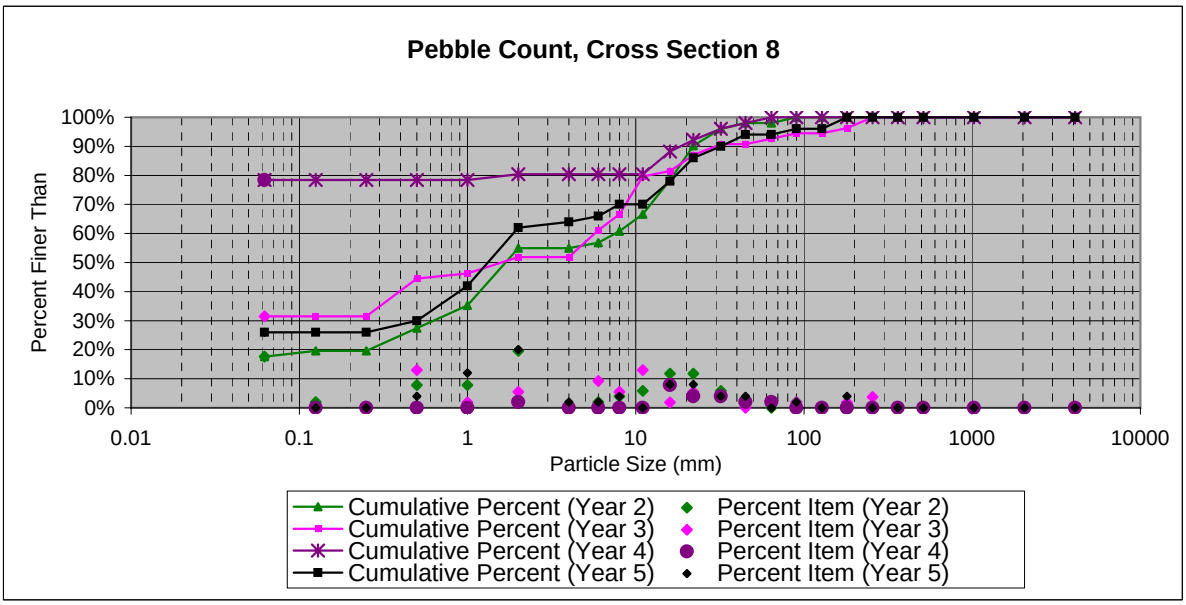
Party: IPJ & PDB

Date: 10/7/09

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 8	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	13	13	26%	26%
	Very Fine	.062-.125	SAND		0	0%	26%
	Fine	.125-.25	SAND		0	0%	26%
	Medium	.25-.50	SAND	2	2	4%	30%
	Coarse	.50-1.0	SAND	6	6	12%	42%
.04-.08	Very Coarse	1.0-2	SAND	10	10	20%	62%
.08-.16	Very Fine	2.0-4.0	GRAVEL	1	1	2%	64%
.16-.22	Fine	4-5.7	GRAVEL	1	1	2%	66%
.22-.31	Fine	5.7-8	GRAVEL	2	2	4%	70%
.31-.44	Medium	8-11.3	GRAVEL		0	0%	70%
.44-.63	Medium	11.3-16	GRAVEL	4	4	8%	78%
.63-.89	Coarse	16-22.6	GRAVEL	4	4	8%	86%
.89-1.26	Coarse	22.6-32	GRAVEL	2	2	4%	90%
1.26-1.77	Very Coarse	32-45	GRAVEL	2	2	4%	94%
1.77-2.5	Very Coarse	45-64	GRAVEL		0	0%	94%
2.5-3.5	Small	64-90	COBBLE	1	1	2%	96%
3.5-5.0	Small	90-128	COBBLE		0	0%	96%
5.0-7.1	Large	128-180	COBBLE	2	2	4%	100%
7.1-10.1	Large	180-256	COBBLE		0	0%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512	BOULDER		0	0%	100%
20-40	Medium	512-1024	BOULDER		0	0%	100%
40-80	Large	1024-2048	BOULDER		0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	50	**100%**	**100%**



PEBBLE COUNT

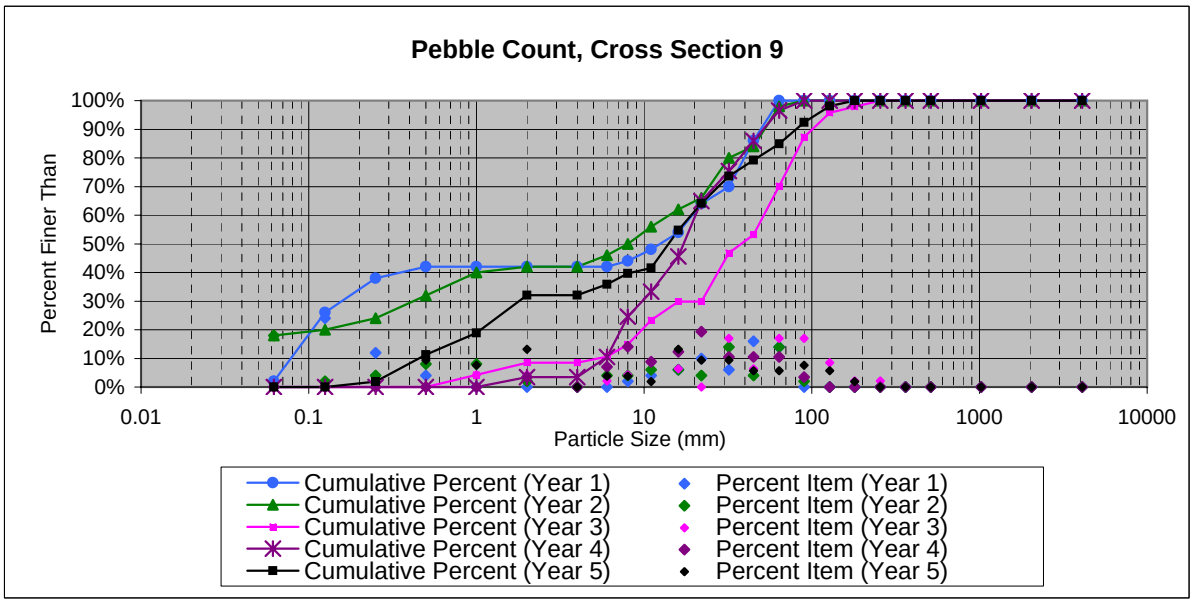
Site: Wells Creek

Party: IPJ & PDB

Date: 10/7/09

SEPI ENGINEERING GROUP

Inches	Particle	Millimeters		PARTICLE COUNT CS 9	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**		0	0%	0%
	Very Fine	.062-.125	SAND		0	0%	0%
	Fine	.125-.25	SAND	1	1	2%	2%
	Medium	.25-.50	SAND	5	5	9%	11%
	Coarse	.50-1.0	SAND	4	4	8%	19%
.04-.08	Very Coarse	1.0-2	SAND	7	7	13%	32%
.08-.16	Very Fine	2.0-4.0			0	0%	32%
.16-.22	Fine	4-5.7	GRAVEL	2	2	4%	36%
.22-.31	Fine	5.7-8	GRAVEL	2	2	4%	40%
.31-.44	Medium	8-11.3	GRAVEL	1	1	2%	42%
.44-.63	Medium	11.3-16	GRAVEL	7	7	13%	55%
.63-.89	Coarse	16-22.6	GRAVEL	5	5	9%	64%
.89-1.26	Coarse	22.6-32	GRAVEL	5	5	9%	74%
1.26-1.77	Very Coarse	32-45	GRAVEL	3	3	6%	79%
1.77-2.5	Very Coarse	45-64	GRAVEL	3	3	6%	85%
2.5-3.5	Small	64-90		4	4	8%	92%
3.5-5.0	Small	90-128	COBBLE	3	3	6%	98%
5.0-7.1	Large	128-180	COBBLE	1	1	2%	100%
7.1-10.1	Large	180-256			0	0%	100%
10.1-14.3	Small	256-362			0	0%	100%
14.3-20	Small	362-512	BOULDER		0	0%	100%
20-40	Medium	512-1024	BOULDER		0	0%	100%
40-80	Large	1024-2048	BOULDER		0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	53	**100%**	**100%**



PEBBLE COUNT

Site: Wells Creek

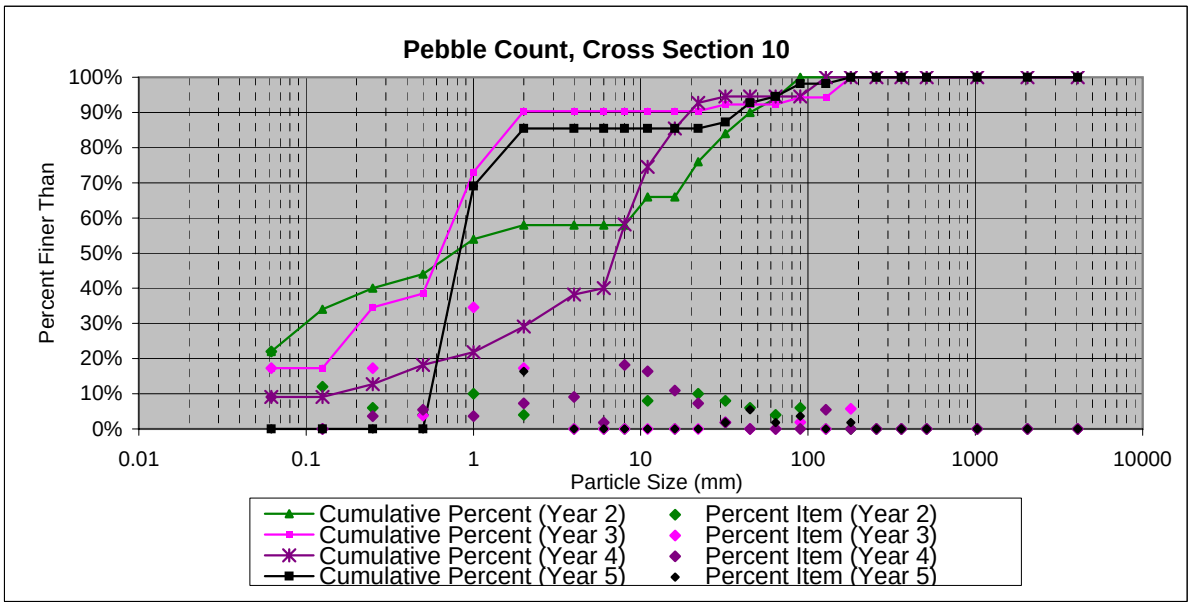
Party: IPJ & PDB

Date: 10/7/09

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 10	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**		0	0%	0%
	Very Fine	.062-.125	SAND		0	0%	0%
	Fine	.125-.25	SAND		0	0%	0%
	Medium	.25-.50	SAND		0	0%	0%
	Coarse	.50-1.0	SAND	38	38	69%	69%
.04-.08	Very Coarse	1.0-2	SAND	9	9	16%	85%
.08-.16	Very Fine	2.0-4.0	GRAVEL		0	0%	85%
.16-.22	Fine	4-5.7	GRAVEL		0	0%	85%
.22-.31	Fine	5.7-8	GRAVEL		0	0%	85%
.31-.44	Medium	8-11.3	GRAVEL		0	0%	85%
.44-.63	Medium	11.3-16	GRAVEL		0	0%	85%
.63-.89	Coarse	16-22.6	GRAVEL		0	0%	85%
.89-1.26	Coarse	22.6-32	GRAVEL	1	1	2%	87%
1.26-1.77	Very Coarse	32-45	GRAVEL	3	3	5%	93%
1.77-2.5	Very Coarse	45-64	GRAVEL	1	1	2%	95%
2.5-3.5	Small	64-90	COBBLE	2	2	4%	98%
3.5-5.0	Small	90-128	COBBLE		0	0%	98%
5.0-7.1	Large	128-180	COBBLE	1	1	2%	100%
7.1-10.1	Large	180-256	COBBLE		0	0%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512	BOULDER		0	0%	100%
20-40	Medium	512-1024	BOULDER		0	0%	100%
40-80	Large	1024-2048	BOULDER		0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	55	**100%**	**100%**



PEBBLE COUNT

Site: Wells Creek

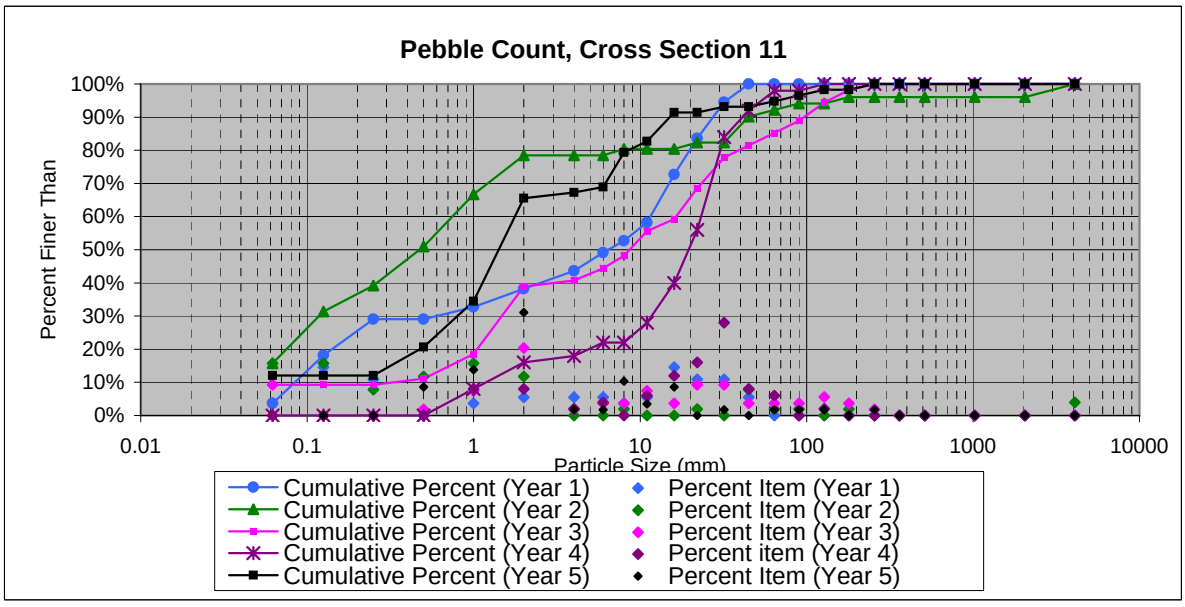
Party: IPJ & PDB

Date: 10/7/09

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 11	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	7	7	12%	12%
	Very Fine	.062-.125	SAND		0	0%	12%
	Fine	.125-.25	SAND		0	0%	12%
	Medium	.25-.50	SAND	5	5	9%	21%
	Coarse	.50-1.0	SAND	8	8	14%	34%
.04-.08	Very Coarse	1.0-2	SAND	18	18	31%	66%
.08-.16	Very Fine	2.0-4.0	GRAVEL	1	1	2%	67%
.16-.22	Fine	4-5.7	GRAVEL	1	1	2%	69%
.22-.31	Fine	5.7-8	GRAVEL	6	6	10%	79%
.31-.44	Medium	8-11.3	GRAVEL	2	2	3%	83%
.44-.63	Medium	11.3-16	GRAVEL	5	5	9%	91%
.63-.89	Coarse	16-22.6	GRAVEL		0	0%	91%
.89-1.26	Coarse	22.6-32	GRAVEL	1	1	2%	93%
1.26-1.77	Very Coarse	32-45	GRAVEL		0	0%	93%
1.77-2.5	Very Coarse	45-64	GRAVEL	1	1	2%	95%
2.5-3.5	Small	64-90	COBBLE	1	1	2%	97%
3.5-5.0	Small	90-128	COBBLE	1	1	2%	98%
5.0-7.1	Large	128-180	COBBLE		0	0%	98%
7.1-10.1	Large	180-256	COBBLE	1	1	2%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512	BOULDER		0	0%	100%
20-40	Medium	512-1024	BOULDER		0	0%	100%
40-80	Large	1024-2048	BOULDER		0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	58	**100%**	**100%**



PEBBLE COUNT

Site: Wells Creek

Party: IPJ & PDB

Date: 10/7/09

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 12	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	4	4	7%	7%
	Very Fine	.062-.125	SAND		0	0%	7%
	Fine	.125-.25	SAND		0	0%	7%
	Medium	.25-.50	SAND	6	6	11%	18%
	Coarse	.50-1.0	SAND	17	17	31%	49%
.04-.08	Very Coarse	1.0-2	SAND	13	13	24%	73%
.08-.16	Very Fine	2.0-4.0	GRAVEL		0	0%	73%
.16-.22	Fine	4-5.7	GRAVEL		0	0%	73%
.22-.31	Fine	5.7-8	GRAVEL	2	2	4%	76%
.31-.44	Medium	8-11.3	GRAVEL		0	0%	76%
.44-.63	Medium	11.3-16	GRAVEL	1	1	2%	78%
.63-.89	Coarse	16-22.6	GRAVEL	1	1	2%	80%
.89-1.26	Coarse	22.6-32	GRAVEL	2	2	4%	84%
1.26-1.77	Very Coarse	32-45	GRAVEL		0	0%	84%
1.77-2.5	Very Coarse	45-64	GRAVEL		0	0%	84%
2.5-3.5	Small	64-90	COBBLE	1	1	2%	85%
3.5-5.0	Small	90-128	COBBLE		0	0%	85%
5.0-7.1	Large	128-180	COBBLE		0	0%	85%
7.1-10.1	Large	180-256	COBBLE		0	0%	85%
10.1-14.3	Small	256-362	BOULDER		0	0%	85%
14.3-20	Small	362-512	BOULDER		0	0%	85%
20-40	Medium	512-1024	BOULDER		0	0%	85%
40-80	Large	1024-2048	BOULDER		0	0%	85%
	Bedrock		**BDRK**	8	8	15%	100%
				TOTALS →	55	**100%**	**100%**