MONITORING YEAR 3 ANNUAL REPORT
Final

NORKETT BRANCH STREAM MITIGATION SITE
Union County, NC
DEQ Contract 004673
DMS Project Number 95360

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EXECUTIVE SUMMARY

Wildlands Engineering (Wildlands) restored and enhanced a total of 10,706 linear feet (LF) of stream on a full-delivery mitigation site in Union County, NC. The project streams consist of Norkett Branch, a third order stream, two unnamed first order tributaries to Norkett Branch (UT1 and UT2), and two intermittent tributaries to Norkett Branch (UT2A and UT3). Water quality treatment Best Management Practices (BMPs) were installed to treat water quality on the non-jurisdictional headwaters of UT3 and an adjacent ephemeral drainage feature. The project is expected to provide 10,098 stream mitigation units (SMUs).

The Norkett Branch Stream Mitigation Site (Site) is located in southeastern Union County, NC, approximately ten miles southeast of the City of Monroe and five miles north of the South Carolina state line. The Site is located in the Yadkin River Basin; eight-digit Cataloging Unit (CU) 03040105 and the 14-digit Hydrologic Unit Code (HUC) 03040105081020 (Figure 1). This CU was identified as a targeted local watershed in the *2009 Lower Yadkin- Pee Dee River Basin Restoration Priority* (RBRP) plan. This plan identifies agricultural practices and runoff as the probable major sources of water quality impairment in the Middle Lanes Creek watershed. The 2008 North Carolina Division of Water Resources' (NCDWR) Basinwide Water Quality Plan (BWQP) lists turbidity and nutrient concentrations of nitrogen and phosphorus as specific concerns in the Rocky River watershed portion of the Yadkin- Pee Dee River basin. Other pollutants of concern cited in this report are fecal coliform bacteria, iron, and copper. The project reaches flow off-site, directly into Lanes Creek, which is included on the NCDWR 303d list of impaired streams. The section of Lanes Creek downstream of the project Site is listed as impaired due to turbidity (NCDWR, 2012). The project goals established in the Mitigation Plan (Wildlands, 2013) were completed with careful consideration of goals and objectives that were described in the RBRP and NCDWR BWQR and to meet the North Carolina Division of Mitigation Services (DMS) mitigation needs while maximizing the ecological and water quality uplift within the watershed.

The following project goals were established to address the watershed and project Site stressors:

- Improve aquatic and terrestrial habitat within the riparian corridor and provide habitat corridor extension from adjacent downstream forested habitat;
- Improve additional water quality aspects within stream channels on Site;
- Decrease sediment inputs to the stream channels and decrease turbidity in receiving Lanes Creek; and
- Decrease phosphorus, nitrogen, and fecal coliform inputs to the stream channels.

Stream restoration and enhancement, water quality treatment BMP construction, and planting efforts were completed between November 2013 and April 2014. Baseline as-built monitoring activities were completed between April and May 2014. A conservation easement is in place on the 31.6 acres of riparian corridor and stream resources to protect them in perpetuity.

Overall, the Site has met the required stream and vegetation mitigation success criteria for MY3. The average planted stem density for the site is 456 stems per acre and is on track to meet upcoming density criteria. Visual assessment revealed vegetation problem areas with poor herbaceous cover, low vigor and density of planted stems, bare banks, and invasive plant populations. Planned maintenance in the upcoming monitoring year will address these areas of concern. Geomorphically, the stability of each restored and enhanced stream remains in good standing, with cross section dimensions falling within the range of parameters for the appropriate Rosgen (1996) stream type. Visual assessment suggests the channels show little sign of instability within the bed, bank, or engineered structures, excepting isolated instances of bank erosion. All restored reaches recorded at least one bankfull or greater event during MY3 and the MY7 hydrological success criteria for the Site has been met. Water quality monitoring results indicate improvement in the pollutant removal capacity of both storm water BMPs.

NORKETT BRANCH STREAM MITIGATION SITE

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APPENDICES

Section 1: PROJECT OVERVIEW

The Site is located in southeastern Union County, NC, approximately ten miles southeast of the City of Monroe and five miles north of the South Carolina state line. The Site is located in the Yadkin River Basin; eight-digit Cataloging Unit (CU) 03040105 and the 14-digit Hydrologic Unit Code (HUC) 03040105081020 (Figure 1). The Site is located in the Carolina Slate Belt of the Piedmont physiographic province (USGS, 1998). The project watershed consists primarily of agricultural land, pasture, and forest. The Site is located on agricultural tracts owned by Marie S. Autry (PIN 03060001A), Kay A. and Lane Haigler (PIN 03081007C; PIN 03081013; PIN 03081014), The Cox Farms Irrevocable Trust (PIN 03081010), John H. and Peggy S. Autry (PIN 3081007D), and Marion, Delano, Ruth, and John (Sr.) Cox (PIN 03081012). A conservation easement was recorded on 31.6 acres within the seven parcels (Deed Book 06095, Pages 0530-0589).

The Site is located within the North Carolina Division of Water Resources (NCDWR) subbasin 03-07-14. The project streams consist of Norkett Branch, a third order stream, two unnamed first order tributaries to Norkett Branch (UT1 and UT2), and two intermittent tributaries to Norkett Branch (UT2A and UT3). Norkett Branch (DWQ Index No. 13-17-40-8) is the main tributary of the project and is classified as WS-V waters. Class WS-V waters are protected as water supplies draining to Class WS-IV waters or waters used by industry to supply drinking water or waters formerly used as water supply, and are protected for secondary recreation, fishing, wildlife and aquatic life, maintenance of biotic integrity, and agriculture. The drainage area for the project Site is 2,034 acres (3.18 sq mi) at the lower end of Norkett Branch Reach 2.

Mitigation work at the Site included restoration on Norkett Branch, UT1, and UT2. Enhancement II was implemented on UT2A and UT3. Water quality treatment BMPs were also implemented to treat agricultural drainage upstream of UT3 and agricultural drainage in the right floodplain of Norkett Branch Reach 2. All onsite riparian areas were planted with native species. Construction and planting activities were completed in April 2014. Directions and a map of the Site are provided in Figure 1 and project components are illustrated in Figure 2.

1.1 Project Goals and Objectives

Prior to construction activities, the streams were routinely maintained to provide drainage for agricultural purposes. Impacts to the stream included straightening and ditching, eroding banks, and a lack of stabilizing riparian vegetation. The streams were used as a water source for cattle in some areas, resulting in over-widened, unstable trampled banks. Algal blooms, presumably from agricultural nutrient loading, were observed during Site visits. Trampled stream banks, over-widened channels, and banks illustrating signs of instability were a common occurrence throughout the Site. The alterations of the Site to promote farming resulted in impairment of the ecological function of Site's streams. Specific functional losses at the Site include degraded aquatic habitat, altered hydrology, and reduction of quality of in-stream and riparian wetland habitats and related water quality benefits. Table 4 in Appendix 1 and Tables 11 a-c in Appendix 4 present the Site's pre-restoration conditions in detail.

The mitigation project is intended to provide numerous ecological benefits such as pollutant removal and improved aquatic and terrestrial habitat. Expected improvements to water quality and ecological processes are outlined below as project goals and objectives. The agricultural stressors and pollutants have been specifically addressed by the Site design. The major goals of the stream mitigation project are to provide ecological and water quality enhancements to the Norkett Branch, Lane's Creek, Rocky River and Yadkin River Basins while creating a functional riparian corridor at the Site level and restoring a Piedmont Bottomland Forest as described by Schafale and Weakley (1990). These project goals were established with careful consideration of goals and objectives that were described in the RBRP and to

meet the North Carolina Division of Mitigation Services (DMS) mitigation needs while maximizing the ecological and water quality uplift within the watershed.

The following project goals and objectives were established and listed in the Mitigation Plan (Wildlands, 2013) to address the effects listed above:

- *Improve aquatic and terrestrial habitat within the riparian corridor and provide habitat corridor extension from adjacent downstream forested habitat.* By restoring appropriate channel cross section and profile, including riffle and pool sequences, coarse substrate zones for macroinvertebrates and deep pool habitat for fish will also be restored. Introduction of large woody debris, rock structures, brush toe, and native stream bank vegetation will provide additional habitat and cover for both fish and macroinvertebrates. Adjacent buffer areas will be restored by planting native vegetation which will provide habitat and forage for terrestrial species. These areas will be allowed to receive more regular inundating flows, and vernal pools may develop over time increasing habitat diversity. A watershed approach, restoring riparian corridor functions on multiple interconnected tributaries as well as treating agricultural drainage from headwater features with Best Management Practices (BMPs), will allow for large-scale riparian corridor connectivity.
- *Improve additional water quality aspects within stream channels on Site.* Riffle/pool sequences will be restored to provide re-aeration allowing for oxygen levels to be maintained in the perennial reaches. Creation of deep pool zones will lower temperature, helping to maintain dissolved oxygen concentrations. Establishment and maintenance of riparian buffers will create long-term shading of the stream to minimize thermal heating. Water quality BMPs situated in the headwaters upstream of jurisdictional streams will treat agricultural runoff before it reaches project streams.
- *Decrease sediment inputs to the stream channels and decrease turbidity in receiving Lanes Creek.* Cattle will be fenced out of the riparian corridor, eliminating bank trampling. Sediment input from eroding stream banks will be reduced by bioengineering and installing in-stream structures while creating a stable channel form using geomorphic design principles. Sediment from off-site sources will be captured by deposition on restored floodplain areas where native vegetation will slow overland flow velocities. By allowing for more overbank flooding and by increasing channel roughness, in-channel velocities can be reduced. This will lower bank shear stress and decrease bank erosion.
- *Decrease phosphorus, nitrogen, and fecal coliform inputs to the stream channels.* Nitrogen and phosphorus chemical fertilizers, pesticides, and cattle waste will be decreased by buffering adjacent agricultural operations from the restored channels. Cattle will be fenced out to eliminate in-channel fecal pollution. Off-site nutrient input will be absorbed on-site by filtering flood flows through restored floodplain areas, water quality BMPs, and vernal pools positioned to treat concentrated overland flow. Flood flows will be allowed to disperse through native vegetation across the reconnected floodplain. Increased surface water residency time will provide contact treatment time and groundwater recharge potential.

1.2 Monitoring Year 3 Data Assessment

Annual monitoring was conducted between April and October 2016 to assess the condition of the project. The stream restoration success criteria for the Site follows the approved success criteria presented in the Mitigation Plan (Wildlands, 2013).

1.2.1 Vegetative Assessment

A total of 26 vegetation plots were established during the baseline monitoring within the project easement area using standard 10 meter by 10-meter vegetation monitoring plots. Plots were randomly established within planted portions of the stream restoration and enhancement areas to capture the heterogeneity of the designed vegetative communities. The plot corners were marked and are recoverable either through field identification or with the use of a GPS unit. Reference photographs were taken at the plot origin looking diagonally across the plot to the opposite corner to capture the same reference photograph locations as the as-built. The final vegetative success criteria will be the survival of 210 planted stems per acre in the riparian corridor along restored and enhanced reaches at the end of the seventh year of monitoring (MY7). Planted vegetation must average 10 feet in height in each plot by MY7. The interim measure of vegetative success for the Site will be the survival of at least 320 planted stems per acre at the end of the third year of monitoring (MY3) and at least 260 stems per acre at the end of the fifth year of monitoring (MY5). If this performance standard is met by MY5 and stem density is trending towards success (i.e., no less than 260 five-year-old stems per acre), monitoring of vegetation on the Site may be terminated provided written approval is provided by the USACE in consultation with the NC Interagency Review Team.

The MY3 vegetation survey was completed in June 2016 and resulted in 24 out of 26 vegetation plots meeting the year three interim success criteria (320 stems per acre). Overall, the Site's average planted stem density resulted in 456 stems per acre which also exceeds the year three interim success criteria. The average woody stem density of the Site with volunteers included is 534 stems per acre. A supplemental planting occurred on all reaches east of Philadelphia Church Road in February 2015. Thus, some species within the monitoring plots showed an increase in planted stem densities between MY0 and MY3. Although the Site meets the overall stem density requirement, one vegetation plot (plot 5) has a stem density of 283 stems per acre and another vegetation plot (plot 7) has a stem density of 202 stems per acre. These two plots do not meet the interim success criteria for MY3 and plot 7 does not exceed the 260 stems per acre required by MY5. The low stem survival in these plots is presumably due to a combination of drought stress and low soil fertility, which is described in further detail in section 1.2.2.

Woody stem vigor greatly improved in MY3, with 81% of observed stems receiving a rating of three or more (indicating that the stem is healthy or more likely to survive), and 14% of observed stems receiving a rating of 1 or less (indicating that the stem is dead or unlikely to survive). The improvement in vigor indicates that the drought stress and planting stress evident in MY1-MY2 is becoming less of a factor in the survival of stems remaining in MY3.

Refer to Appendix 3 for vegetation summary tables and raw data tables and Appendix 2 for vegetation plot photographs, the Current Condition Plan View (CCPV) maps, and the vegetation condition assessment table.

1.2.2 Vegetation Problem Areas

The MY3 vegetation monitoring and visual assessment identified areas with of "Bare/Poor Herbaceous Cover" which are noted in the Figures 3.0-3.6 and in Table 7. Areas identified with poor establishment of herbaceous cover in MY1 persist through MY3, but have shown signs of improvement. There are still areas where floodplain vegetation has not become established. These areas are primarily downstream from culvert crossings where topsoil has been lost due to overbank flow events. The total area

designated as “Bare/Poor Herbaceous Cover” in MY3 is approximately 1.8 acres or 6% of the planted area of the Site, which is similar to the area reported in MY2. Maintenance activities to improve soil fertility and water infiltration in these areas are proposed for the spring of MY4.

Several vegetation problem areas of invasive plant populations have been identified in MY3, consisting of discrete dense patches of groundsel tree (*Baccharis halimifolia)*; an aggressive coastal plain native shrub. This species is not typically considered a species of high concern for DMS-required monitoring, however the high density of this shrub layer is competing with planted woody and herbaceous vegetation in the areas of infestation, which covers approximately 9% of the planted acreage. Other areas of undesirable species were noted on site including: cattail (*Typha latifolia*), parrot feather (*Myriophyllum aquaticum*), Chinese privet (*Ligustrum sinense*), and Chinaberry tree (*Melia azedarach*); however these areas did not meet the mapping threshold in MY3. Herbicide treatment of these species were performed during MY3 and will be monitored during subsequent monitoring efforts.

Maintenance Plan

Additional maintenance activities will be employed in MY4 with the goal of improving herbaceous vegetative cover and improving the growth rates and vigor of planted woody stems. Organic matter will be incorporated into floodplain soils in targeted areas of the Norkett Branch Reach 2 floodplain with the goal of increasing water infiltration in these locations, thereby encouraging more herbaceous growth in bare areas. Supplemental planting of container plants will be installed with soil amendments over 2 acres at a density of 100 stems per acre to improve the standing stock of diverse, healthy, woody stems. Foliar fertilization will occur in the spring to enhance the vigor and growth rates of planted woody stems. Areas noted with invasive plant populations will be treated in accordance with recommended maintenance guidance, not to exceed label prescribed application rates. Winter application of a broadleaf-selective herbicide will be used to control the population of groundsel tree (an evergreen species), which will minimize risk to planted herbaceous and woody vegetation. Vegetative problem areas will continue to be monitored and will be addressed as needed.

1.2.3 Stream Assessment

Morphological surveys for MY3 were conducted in April 2016. All streams within the Site appear stable and have met the success criteria for MY3. Riffle cross-sections surveyed along the restoration reaches appear stable and typically show little change in the bankfull area, maximum depth ratio, or width-to-depth ratio. Riffle cross section 15 on UT2 Reach 2 has down cut slightly on the left edge of the channel. This minor adjustment is not currently an area of concern, but it will be watched in upcoming monitoring years for progress. All surveyed riffle cross-section dimensions fell within the parameters defined for channels of the appropriate Rosgen stream type (Rosgen 1996). In-stream structures used to enhance channel habitat and stability on the outside bank of meander bends; such as brush toe, are providing stability and habitat as designed. Pattern data will only be completed in MY7 if there are indicators from the dimensions that significant geomorphic adjustments have occurred. No changes were observed that indicated a change in the radius of curvature or channel belt width; therefore, pattern data is not included in the MY3 report. Visual assessment during MY3 revealed a few instances of bank scour and eroding banks, primarily downstream from culvert structures. These are discussed in more detail in section 1.2.4.

In general, substrate materials in the restoration reaches indicate maintenance of coarser materials in the riffle features and finer particles in the pool features. A significant increase in the silt/clay particle size class was observed in Norkett Branch Reach 1 reachwide count, which is possibly due to ongoing agricultural activities in the watershed upstream and adjacent to the project area, or low flow drought conditions reducing transport capacity during this monitoring year. A significant increase in the silt/clay and sand particle class sizes was also observed in reachwide counts for UT2 Reach 2, and UT2 Reach 3b,

primarily noted in pool habitat units. Pool features are expected to be comprised of finer material, and may not demonstrate an increase in substrate size during subsequent monitoring years.

Please refer to Appendix 2 for the stream visual assessment tables, the CCPV map, and stream reference photographs. Refer to Appendix 4 for the morphological data and plots.

1.2.4 Stream Problem Areas

There were three stream problem areas with seven instances of eroding banks identified in MY3:

Area 1 begins in the upper portion of Norkett Branch Reach 1. Eroding banks were observed on the right bank of Norkett Branch Reach 1 at station 104+00 and continue for approximately 100 LF, after which bare banks are observed on the left bank, continuing for approximately 53 LF.

Area 2 begins downstream of a culvert on Norkett Branch Reach 1 and continues past the reach break with Norkett Branch Reach 2 and the confluence with UT2. Erosive flows over part of the floodplain was observed in this area. Eroding banks were begin on the right bank of Norkett Branch Reach 1 at station 120+00 and continue for approximately 145 LF. Eroding banks begin again on the right bank at station 122+40 and continue for approximately 115 LF through the reach break with Norkett Branch Reach 2. After this, the left bank is eroding beginning at station 124+75 and continues for approximately 80 LF.

Area 3 begins downstream of a culvert on Norkett Branch Reach 2. Eroding banks persist along Norkett Branch Reach 2 near station 133+00 on the right bank for approximately 83 LF and 80 LF on the left bank.

Maintenance Plan

Areas noted with eroding banks will be closely watched for advancement in the upcoming monitoring years. Wildlands is implementing an appropriate maintenance plan to stabilize banks in the winter 2016 to spring 2017 dormant season. This is expected to include seeding, and installing matting and live stakes. Refer to Appendix 2 for the stream visual assessment tables, the CCPV map, reference photographs, and photographs of the stream problem areas.

1.2.5 Hydrology Assessment

Hydrologic monitoring was accomplished using both manual crest gauge readings and In-situ Rugged Troll100 pressure transducers installed at three surveyed cross-sections throughout the site (XS6 on Norkett Branch Reach 2, XS9 on UT1, and XS18 on UT2 Reach 3a). The Onset HOBO rain gauge located at the Site was not functioning properly, so data from a nearby weather station at the Monroe, NC Airport (KEQY) was used to supplement the rainfall record. To meet hydrological success criteria, two or more bankfull events must occur in separate years within the restored reaches by the end of MY7. In MY2, the success criteria had already been met for the seven-year monitoring period. During MY3, at least one bankfull or greater event was recorded in all reaches. Please refer to Appendix 5 for hydrology data.

1.2.6 Water Quality BMPs

Water quality grab samples were collected during the monitoring period to assess the functionality of the Step Pool Storm Conveyance BMP (SPSC BMP) and the Pocket Wetland BMP (PW BMP). This sampling is not part of the success criteria for the project. The following expected rates for pollutant removal were established in the Mitigation Plan (Wildlands, 2013) and in accordance with published rates of removal from similar BMP approaches. The SPSC BMP is expected to provide similar pollutant removal rates as the published removal rates of a bioretention area with internal water storage (NCDWQ, 2007), which are 85% TSS removal, 40% TN removal, and 40% TP removal. The PW BMP is expected to provide 60% TSS removal, 20% TN removal, and 45% TP removal, which is similar to extended detention wetlands (Center for Watershed Protection, 2000 and United States Environmental Protection Agency, 2012).

Inflow and outflow was sampled at each BMP on 9/03/2016, after hurricane Hermine dropped between 0.5 and 3 inches of rain in a 24 hour period. Very little measurable rainfall was recorded for 23 days prior to this event. First flush style sample bottles were used to capture stormflow, which filled during the rain event at a pre-determined stage height, and were retrieved within 24 hours. Sample volume was insufficient to measure chemistry from the PW BMP outlet due to low outlet flow. The monitoring plan calls for quarterly sampling, but drought conditions limited the opportunities for BMP sampling. Samples were unable to be obtained during Q1, or Q2 due to the timing and intensity of rain events. In MY3, samples were analyzed for total suspended solids (TSS), phosphorus as total phosphorus (TP), nitrogen as total nitrogen (TN) Nitrate/Nitrite (NO_x), and Total Kjeldahl Nitrogen (TKN), by Prism Laboratories Inc. Refer to in Appendix 6 for water quality sampling results and pollutant removal rates.

Total Nitrogen

Nitrogen sources in the SPSC BMP watershed fluctuate greatly by sampling date. The variation covers two orders of magnitude with the lowest sampled value on 3/30/2015 at 1.2 mg/L and the highest sampled values on 5/15/2014 at 100 mg/L. When inlet concentrations are above 5 mg/L, the SPSC BMP appears to effectively reduce the concentration of TN in outlet samples. The data shows insignificant reduction when inlet concentrations are below this value. On the 9/03/2016 sampling event, total nitrogen concentration in the inlet sample was 13 mg/L. This was reduced by 35% to 8.5 mg/L in the outlet sample. The proportion of nitrogen species represented by nitrate in the inlet sample tripled (increased by 225%) in the outlet sample, while the proportion of organic nitrogen and ammonia in the inlet sample had a 75% reduction in the outlet sample concentration. The SPSC BMP was dry prior to this sampling event. This suggests that inlet sources of nitrogen are being transformed via nitrification in the BMP soils during dry spells in-between rain events, which is then mobilized as the SPSC BMP fills with water. The SPSC BMP has measured increased N concentrations in the outlet on more than one occasion, likely because of this nitrate soil flushing effect.

Nitrogen sources from the PW BMP watershed appear to be more consistent than those sampled at the SPSC BMP, with PW BMP inlet concentrations typically measured between 2-3 mg/L. Results show no significant measurable reduction in the PW BMP on outflow concentrations at these lower levels. It appears that the most consistent improvements in water quality are being achieved with the volume attenuation of storm flows. It is important to note that the established sampling methods do not account for mass balance of nutrient inputs and exports. While pollutant removal values cannot be calculated due to insufficient outflow, it can be deduced that the PW BMP is effectively reducing the export of dissolved and particulate nitrogen species through volume reduction.

Total Phosphorus

Phosphorus concentrations in the SPSC BMP outlet fluctuated greatly by sampling date, with the lowest sampled value measured on 3/30/2015 at 0.32 mg/L and the highest sampled values on 5/15/2014 at 19 mg/L. At times, significant reductions of TP concentrations in the outlet have been observed, and on occasion no significant measurable reduction was observed. Where significant reductions in TP were achieved, a corresponding significant reduction in TSS was also observed on the same date. Additional data collection may provide further insight into this correlation. No seasonal or concentration dependent pattern of phosphorus reduction is apparent in the data at this point. On the 9/03/2016 sampling event, total phosphorus concentration in the inlet sample was 5.2 mg/L. This was reduced by 52% to 2.5 mg/L in the outlet sample.

Phosphorus sources form the PW BMP watershed appear to be minimal in comparison to the SPSC BMP, as inlet concentrations have consistently measured lower than 1 mg/L. No observable trend in phosphorus reduction by the BMP is apparent in the data at this time. The PW BMP produced a small increase of phosphorus concentration in the outlet sample in comparison to the inlet sample on 11/26/2015. While TP phosphorus retention in the PW BMP is likely due to both adsorption of

orthophosphate to sediment and retention of organically bound P in TSS, there was no measurable increase in TSS in the outlet on this date. Therefore, the increase in outlet concentration TP may have occurred due to desorption of orthophosphate from sediment; as soil, water, pH, and anoxia can influence P solubility in the BMP sediments. On 9/03/2016, the inlet concentration of TP was 0.9 mg/L, which was effectively retained in the PW BMP due to the storm water volume attenuation.

Total Suspended Solids

The SPSC BMP has not been consistent in removing TSS. In the current monitoring year, the SPSC BMP inlet TSS was 140 mg/L, which was reduced to below detection limits in the outlet in the 9/03/2016 event. Apart from the very first storm sampling on 5/15/2014 (herbaceous plants were not fully established at that time), TSS has been consistently reduced in the PW BMP outlet concentrations. On 9/03/2016, the inlet concentration of 6.7 mg/L TSS was effectively retained in the PW BMP due to the storm water volume attenuation.

Discussion of Monitoring Results

In the Q3 sampling event on 9/03/2016, SPSC BMP came close to meeting the expected pollutant removal rates of TN (35% measured removal versus 40% expected). The pollutant removal standard of TP (52% measured removal versus 40% removal) was achieved. The SPSC BMP effectively reduced TSS beyond the 85% removal rate due to the outlet concentrations being below detection limits. Results from the PW BMP are not provided for the outlet concentrations due to minimal outflow, so a percent reduction cannot be calculated. However, all storm water pollutants could be considered effectively retained due to volume attenuation.

1.2.7 Existing Wetland Monitoring

A permanent photo station (photo point #16) was established in the stream to wetland conversion area in Norkett Branch Reach 1 near station 104+00 on the left floodplain. The former channel area appears to be maintaining wetland hydrology and supports a wetland plant community composition. Groundsel tree abundance is increasing in this wetland area and is visible from the photo point. The photo point (#16) is included in the Stream Photographs section of Appendix 2.

1.3 Monitoring Year 3 Summary

Overall, the Site has met the required stream and vegetation mitigation success criteria for MY3. The average planted stem density for the site is 456 stems per acre and is on track to meet upcoming density criteria. Visual assessment revealed vegetation problem areas with poor herbaceous cover, low vigor and density of planted stems, bare banks, and invasive plant populations. Planned maintenance in the upcoming monitoring year will address these areas of concern. Geomorphically, the stability of each restored and enhanced stream remains in good standing, with cross section dimensions falling within the range of parameters for the appropriate Rosgen (1996) stream type. Visual assessment suggests the channels show little sign of instability within the bed, bank, or engineered structures, excepting isolated instances of bank erosion. All restored reaches recorded at least one bankfull or greater event during MY3 and the MY7 hydrological success criteria for the Site has been met. Water quality monitoring results indicate improvement in the pollutant removal capacity of both storm water BMPs. Summary information/data related to various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting can be found in the Mitigation Plan documents available on the DMS website. All raw data supporting the tables and figures in the appendices is available upon request.

Section 2: METHODOLOGY

Geomorphic data collected followed the standards outlined in *The Stream Channel Reference Site: An Illustrated Guide to Field Techniques* (Harrelson et al., 1994) and in the *Stream Restoration: A Natural Channel Design Handbook* (Doll et al., 2003). Longitudinal and cross-sectional data were collected using a total station and were georeferenced to established benchmarks and NC State Plane coordinates. Morphological surveys were conducted using a total station tied to these geo-referenced (control) points. Reachwide pebble counts were conducted along each restored reach for channel classification. Cross-section substrate analyses conducted in each surveyed riffle followed the 100 count wetted perimeter methodology to characterize pavement. All CCPV mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using was Pathfinder and ArcView. Crest gauges were installed during the baseline monitoring period in surveyed riffle cross-sections and are monitored quarterly. Hydrology attainment installation and monitoring methods are in accordance with the USACE (2003) standards. Vegetation monitoring protocols followed the Carolina Vegetation Survey-NCEEP Level 2 Protocol (Lee et al., 2008).

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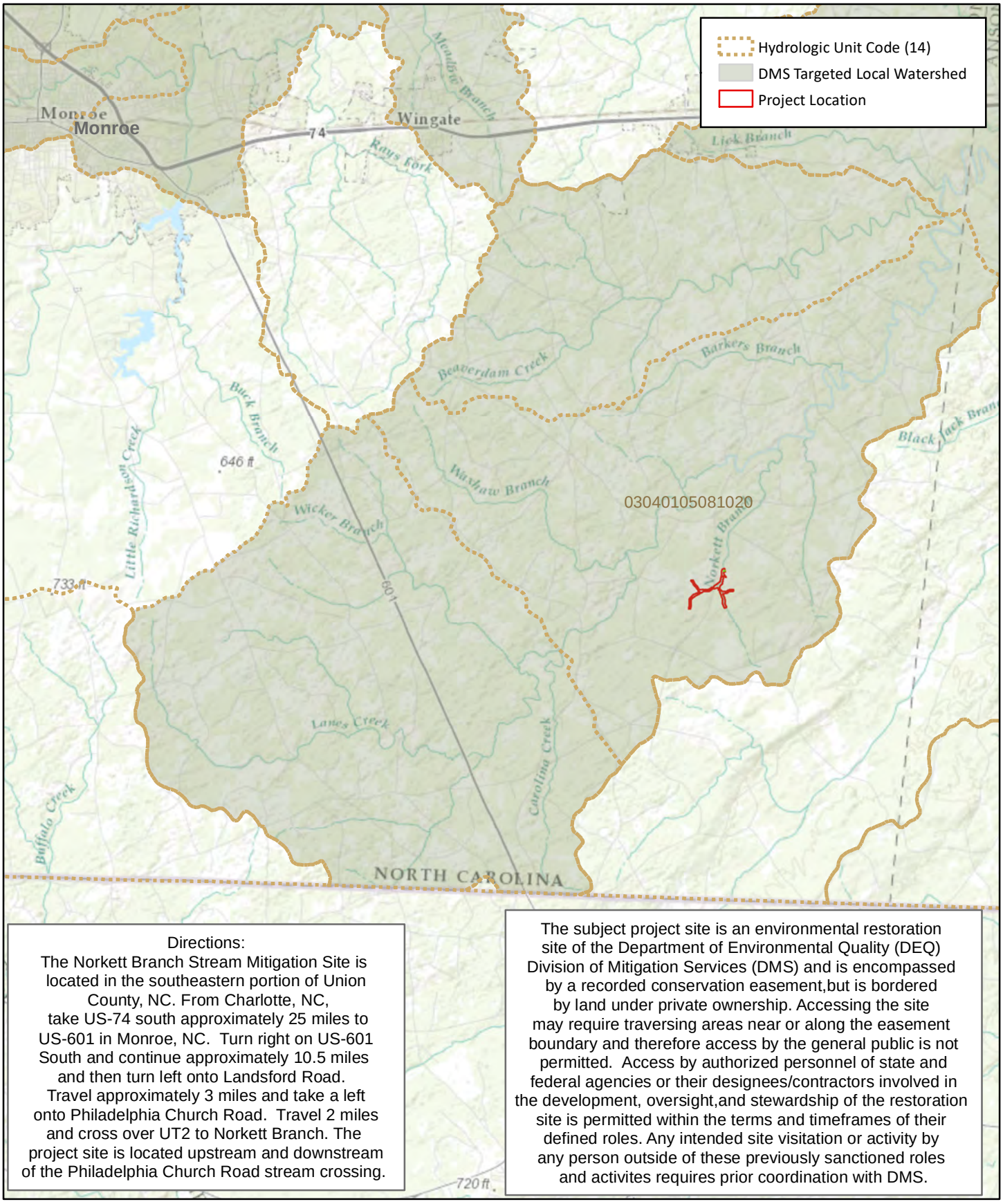
APPENDIX 1. General Tables and Figures



Directions:
The Norkett Branch Stream Mitigation Site is located in the southeastern portion of Union County, NC. From Charlotte, NC, take US-74 south approximately 25 miles to US-601 in Monroe, NC. Turn right on US-601 South and continue approximately 10.5 miles and then turn left onto Landsford Road. Travel approximately 3 miles and take a left onto Philadelphia Church Road. Travel 2 miles and cross over UT2 to Norkett Branch. The project site is located upstream and downstream of the Philadelphia Church Road stream crossing.

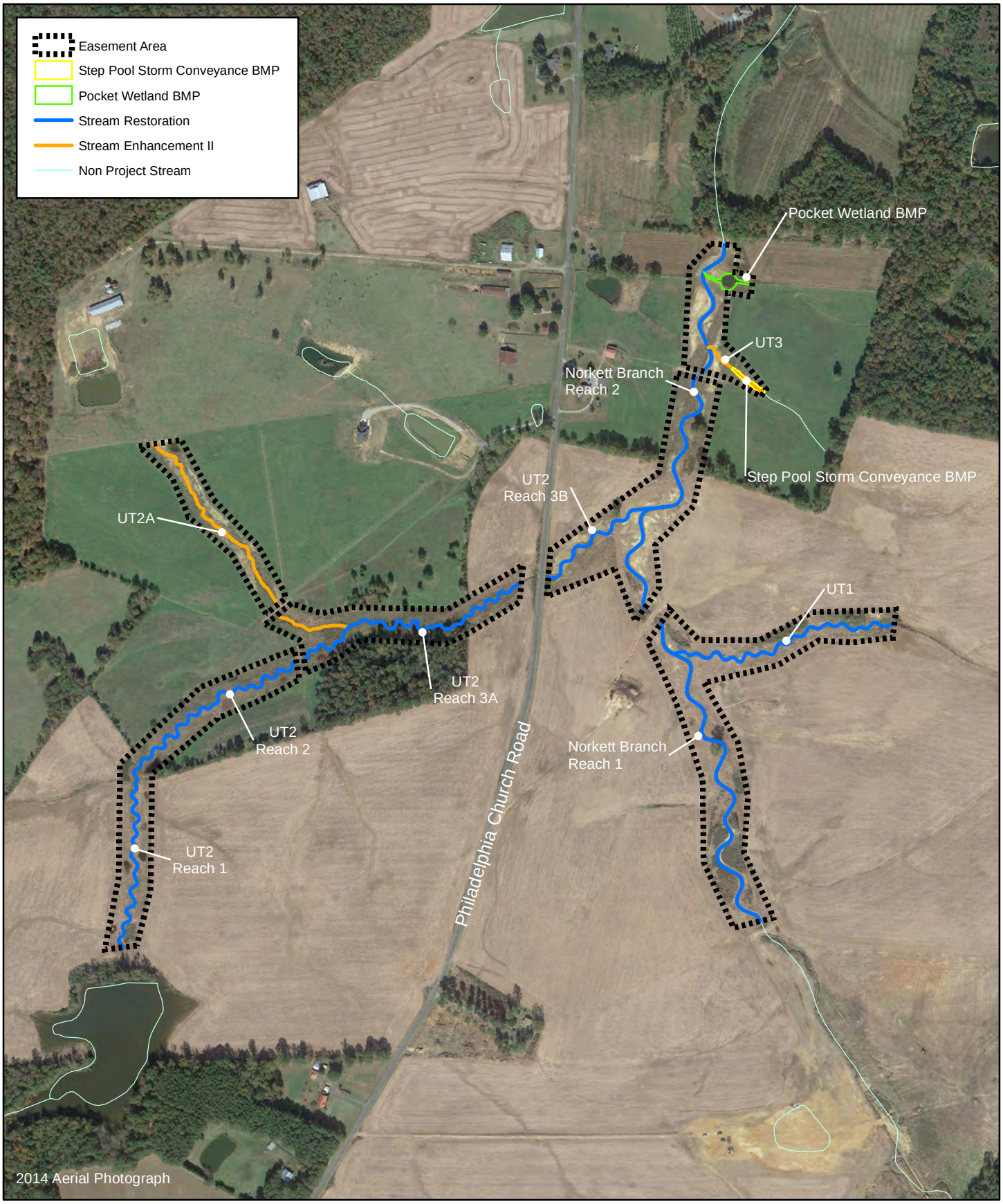
The subject project site is an environmental restoration site of the Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS) and is encompassed by a recorded conservation easement,but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight,and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activites requires prior coordination with DMS.

WILDLANDS ENGINEERING

0 1 2 Miles

N

Figure 1 Project Vicinity Map
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016
Union County, NC



WILDLANDS ENGINEERING

0 300 600 Feet

N

Figure 2 Project Component/Asset Map
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016
Union County, NC

Table 1. Project Components and Mitigation Credits

Norkett Branch Stream Mitigation Site

DMS Project No. 95360

Monitoring Year 3 - 2016

Mitigation Credits										
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset	
Type	R	RE	R	RE	R	RE				
Totals	9,196	902	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Project Components							
Reach ID	As-Built Stationing[1]	Existing Footage/ Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage/ Acreage[2]	Mitigation Ratio	Credits (SMU)[2]
STREAMS							
Norkett Branch Reach 1	100+31-117+60 & 118+60-124+00	1,980 LF	P1	R	2,313	1:1	2,313
Norkett Branch Reach 2	124+00-131+84 & 132+25-138+99	1,505 LF	P1	R	1,513	1:1	1,513
UT1	200+00-211+98	840 LF	P1	R	1,212	1:1	1,212
UT2 Reach 1	300+41-310+80	820 LF	P1	R	1,033	1:1	1,033
UT2 Reach 2	310+80-321+71 & 322+06-325+20	1,272 LF	P1	R	1,416	1:1	1,416
UT2 Reach 3A	325+20-335+58	923 LF	P1	R	1,041	1:1	1,041
UT2 Reach 3B	336+90-343+48	380 LF	P1/2	R	668	1:1	668
UT2A	401+53-411+46 & 411+84-415+31	1,296 LF	EII	EII	1,340	2.5:1	536
UT3	505+42-507+12	163 LF	EII	EII	170	2.5:1	68
SPSC BMP	Upstream of UT3 intermittent drainage		Step Pool Storm Conveyance	WQ BMP	29.7 ac treated	1:8	238[3]
PW BMP	non-jurisdictional drainage in eastern Norkett Branch floodplain		Pocket Wetland	WQ BMP	19.9 ac treated	1:3	60[3]

Component Summation						
Restoration Level	Stream (LF)	Riparian Wetland (acres)		Non-Riparian Wetland	Buffer (square feet)	Upland (acres)
Restoration	9,196					
Enhancement						
Enhancement I						
Enhancement II	1,510					
Creation						
Preservation						
High Quality Preservation						
Alternative Mitigation	49.6 ac treated					

N/A: not applicable

1. Stationing based off of centerline as-built alignment which matched with the design alignment.
2. Credits are based off of the as-built thalweg alignment.
3. Credits determined for the BMPs were established in the mitigation plan (2013).

Table 2. Project Activity and Reporting History

Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Activity or Report	Data Collection Complete	Completion or Scheduled Delivery
Mitigation Plan	July 2012 - October 2012	July 2013
Final Design - Construction Plans	July 2013 - November 2013	November 2013
Construction	December 2013 - April 2014	April 2014
Temporary S&E mix applied to entire project area[1]	December 2013 - April 2014	April 2014
Permanent seed mix applied to reach/segments	December 2013 - April 2014	April 2014
Bare root and live stake plantings for reach/segments	March 2014 - April 2014	April 2014
Baseline Monitoring Document (Year 0)	April 2014 - May 2014	June 2014
Year 1 Monitoring	September 2014 - October 2014	December 2014
Maintenance and Replanting	October 2014 - January 2014	February 2015
Year 2 Monitoring	April 2015 - October 2015	December 2015
Year 3 Monitoring	April 2016 - October 2016	December 2016
Invasive Treatment	July 2016	December 2016
Year 4 Monitoring	2017	December 2017
Year 5 Monitoring	2018	December 2018
Year 6 Monitoring	2019	December 2019
Year 7 Monitoring	2020	December 2020

[1]Seed and mulch is added as each section of construction is completed.

Table 3. Project Contact Table

Norkett Branch Stream Mitigation Site
DMS Project No.95360
Monitoring Year 3 - 2016

Designer Emily Reinicker, PE, CFM	**Wildlands Engineering, Inc.** 1430 S Mint St. Suite 104 Charlotte, NC 28203 704.332.7754
Construction Contractor	**Land Mechanic Designs, Inc.** 126 Circle G Lane Willow Spring, NC 27592
Planting Contractor	**Bruton Natural Systems, Inc** P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	**Bruton Natural Systems, Inc** P.O. Box 1197 Fremont, NC 27830
Seed Mix Sources	**Green Resource, Colfax, NC**
Nursery Stock Suppliers **Bare Roots** **Live Stakes**	**Bruton Natural Systems, Inc** **Dykes and Son Nursery, McMinnville, TN** **Foggy Bottom Nursery, Lansing, NC**
Monitoring Performers	**Wildlands Engineering, Inc.**
Monitoring, POC	Kirsten Gimbert 704.332.7754, ext. 110

Table 4. Project Information and Attributes

Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Project Information						
Project Name	Norkett Branch Stream Mitigation Site					
County	Union County					
Project Area (acres)	31.6					
Project Coordinates (latitude and longitude)	34°52'47.56"N, 80°22'9.19"W					
Project Watershed Summary Information						
Physiographic Province	Carolina Slate Belt of the Piedmont Physiographic Province					
River Basin	Yadkin					
USGS Hydrologic Unit 8-digit	03040105					
USGS Hydrologic Unit 14-digit	03040105081020					
DWQ Sub-basin	03-07-14					
Project Drainage Area (acres)	2,034					
Project Drainage Area Percentage of Impervious Area	<1%					
CGIA Land Use Classification	43% forested, 29% managed herbaceous cover, 28% cultivated land					
Reach Summary Information						
Parameters	**Norkett Branch Reach 1**	**Norkett Branch Reach 2**	**UT1**	**UT2**	**UT2A**	**UT3**
Length of reach (linear feet) - Post-Restoration[1]	2,369	1,499	1,198	4,175	1,378	170
Drainage area (acres)	1490	2034	48	457	72	28
Drainage area (sqmi)	2.3	3.2	0.08	0.72	0.11	0.04
NCDWQ stream identification score	43.75	41.5	32.25	35.75	23;30.75	25.75
NCDWQ Water Quality Classification	WS-V					
Morphological Desription (stream type)	P	P	P	P	I	I
Evolutionary trend (Simon's Model) - Pre- Restoration	III	III/IV	II/III	II, IV	IV	II/ III
Underlying mapped soils	Floodplain Soil Types for Site					
	Badin channery silt loam		Badin channery silt clay loam		Cid channery silt loam	Secrest-Cid complex
Drainage class	well-drained		well-drained		well-drained with moderate shrink-swell potential	well-drained
Soil Hydric status	N		N		N	Y
Slope	2-8%		2-8%		1-5%	0-3%
FEMA classification	AE	AE	N/A	N/A	N/A	N/A
Native vegetation community	Piedmont Bottomland Forest					
Percent composition exotic invasive vegetation - Post-Restoration	0%					

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States - Section 404	X	X	USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3885.
Waters of the United States - Section 401	X	X	
Division of Land Quality (Dam Safety)	N/A	N/A	N/A
Endangered Species Act	X	X	Norkett Branch Mitigation Plan; Wildlands determined "no effect" on Union County listed endangered species.
Historic Preservation Act	X	X	No historic resources were found to be impacted (letter from SHPO dated 8/20/2012).
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	N/A	N/A	N/A
FEMA Floodplain Compliance	X	X	CLOMR and LOMR Approved
Essential Fisheries Habitat	N/A	N/A	N/A

1. Total stream length does not exclude easement crossings.

Table 5. Monitoring Component Summary
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Parameter	Monitoring Feature	Quantity/ Length by Reach									Frequency
		Norkett Branch Reach 1	Norkett Branch Reach 2	UT1	UT2 Reach 1	UT2 Reach 2	UT2 Reach 3A	UT2 Reach 3B	UT3	Storm Water BMPs	
	Riffle Cross Section	3	2	1	1	2	1	1	N/A	N/A	Annual
	Pool Cross Section	2	1	1	1	2	1	1	N/A	N/A	
Pattern	Pattern	N/A									N/A
Profile	Longitudinal Profile	N/A									N/A
Substrate	Reach Wide (RW) / Riffle (RF) 100 Pebble Count	RW-1, RF-3	RW-1, RF-2	RW-1, RF-1	RW-1, RF-1	RW-1, RF-2	RW-1, RF-1	RW-1, RF-1	N/A	N/A	Annual
Stream Hydrology	Crest Gage	1		1	1				N/A	N/A	Quarterly
Wetland Hydrology	Groundwater Gages	N/A									N/A
Vegetation[1]	CVS Level 2	26									Annual
Visual Assessment	All Streams	Y	Y	Y	Y	Y	Y	Y	Y	Y	Annual
Exotic and nuisance vegetation											
Project Boundary											
Reference Photos[2]	Photographs	51									Annual

[1]A deviation from the vegetation plot quantity indicated in the Mitigation Plan is due to a smaller than expected planted area.
[2]Additional reference photo locations were added for site documentation to exceed quantity indicated in the Mitigation Plan.

APPENDIX 2. Visual Assessment Data

Table 6a. Visual Stream Morphology Stability Assessment Table
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Norkett Branch Reach 1 - 2,313 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	17	17			100%			
	3. Meander Pool Condition	Depth Sufficient	16	16			100%			
		Length Appropriate	16	16			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	17	17			100%			
		Thalweg centering at downstream of meander bend (Glide)	17	17			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			3	297.5	94%	100%	100%	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	100%	100%	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	100%	100%	100%
				Totals	3	297.5	94%	100%	100%	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	2	2			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6b. Visual Stream Morphology Stability Assessment Table
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Norkett Branch Reach 2 - 1,513 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	10	10			100%			
	3. Meander Pool Condition	Depth Sufficient	11	11			100%			
		Length Appropriate	11	11			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	12	12			100%			
		Thalweg centering at downstream of meander bend (Glide)	12	12			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			4	357.5	88%	100%	100%	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	100%	100%	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	100%	100%	100%
				Totals	4	357.5	88%	100%	100%	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	1	1			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	1	1			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	1	1			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	1	1			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6c. Visual Stream Morphology Stability Assessment Table

Norkett Branch Stream Mitigation Site

DMS Project No. 95360

Monitoring Year 3 - 2016

UT1 - 1,212 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	27	27			100%			
	3. Meander Pool Condition	Depth Sufficient	26	26			100%			
		Length Appropriate	27	27			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	27	27			100%			
		Thalweg centering at downstream of meander bend (Glide)	27	27			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	100%	100%	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	100%	100%	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	100%	100%	100%
				Totals	0	0	100%	100%	100%	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	1	1			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	1	1			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	1	1			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	1	1			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6d. Visual Stream Morphology Stability Assessment Table
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

UT2 Reach 1 - 1,033 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	24	24			100%			
	3. Meander Pool Condition	Depth Sufficient	24	24			100%			
		Length Appropriate	24	24			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	25	25			100%			
		Thalweg centering at downstream of meander bend (Glide)	25	25			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	100%	100%	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	100%	100%	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	100%	100%	100%
				Totals	0	0	100%	100%	100%	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	2	2			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6e. Visual Stream Morphology Stability Assessment Table
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

UT2 Reach 2 - 1,416 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	31	31			100%			
	3. Meander Pool Condition	Depth Sufficient	31	31			100%			
		Length Appropriate	33	33			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	34	34			100%			
		Thalweg centering at downstream of meander bend (Glide)	34	34			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	100%	100%	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	100%	100%	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	100%	100%	100%
				Totals	0	0	100%	100%	100%	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	4	4			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	4	4			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	4	4			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6f. Visual Stream Morphology Stability Assessment Table
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

UT2 Reach 3A - 1,041 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	25	25			100%			
	3. Meander Pool Condition	Depth Sufficient	24	24			100%			
		Length Appropriate	24	24			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	25	25			100%			
		Thalweg centering at downstream of meander bend (Glide)	25	25			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	100%	100%	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	100%	100%	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	100%	100%	100%
				Totals	0	0	100%	100%	100%	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	1	1			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	1	1			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	1	1			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	1	1			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 6g. Visual Stream Morphology Stability Assessment Table
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

UT2 Reach 3B - 668 LF

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	10	10			100%			
	3. Meander Pool Condition	Depth Sufficient	10	10			100%			
		Length Appropriate	10	10			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	11	11			100%			
		Thalweg centering at downstream of meander bend (Glide)	11	11			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	100%	100%	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	100%	100%	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	100%	100%	100%
				Totals	0	0	100%	100%	100%	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	2	2			100%			

[1]Excludes constructed riffles since they are evaluated in section 1.

Table 7. Vegetation Condition Assessment Table

Norkett Branch Stream Mitigation Site

DMS Project No. 95360

Monitoring Year 3 - 2016

Planted Acreage **29.9**

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	14	1.8	6%
Low Stem Density Areas[1]	Woody stem densities clearly below target levels based on MY3, 4, 5, or 7 stem count criteria.	0.1	2	0.1	0%
		Total	**16**	**1.9**	**6%**
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0	0	0.0	0%
		Cumulative Total	**16**	**1.9**	**6%**

Easement Acreage **31.6**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Planted Acreage
Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000	12	2.8	9%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	0	0	0%

[1]Acreage calculated from vegetation plots monitored for site.

Easement Area
Step Pool Storm Conveyance BMP
Pocket Wetland BMP
Stream Restoration
Stream Enhancement II
Non Project Stream
Cross Section (XS)
Photo Point
Crest Gage (CG)
Rain Gage and Barotroll
Water Quality Sampling Location

Vegetation Plot Condition- MY3

Criteria Not Met
Criteria Met

Vegetation Problem Area- MY3

Invasive Plant Population
Bare/Poor Herbaceous Cover

Stream Problem Area- MY3

Bank Scour/Eroded

Sheet 1
Sheet 2
Sheet 3
Sheet 4
Sheet 5
Sheet 6

Pocket Wetland BMP
Norkett Branch Reach 2
Step Pool Storm Conveyance BMP
UT3
UT2A
UT1
UT2 Reach 3B
UT2 Reach 3A
UT2 Reach 2
UT2 Reach 1
Philadelphia Church Road
Norkett Branch Reach 1

XS 1
XS 2
XS 3
XS 4
XS 5
XS 6
XS 7
XS 8
XS 9
XS 10
XS 11
XS 12
XS 13
XS 14
XS 15
XS 16
XS 17
XS 18
XS 19
XS 20

2014 Aerial Photograph

0 500 1,000 Feet

N

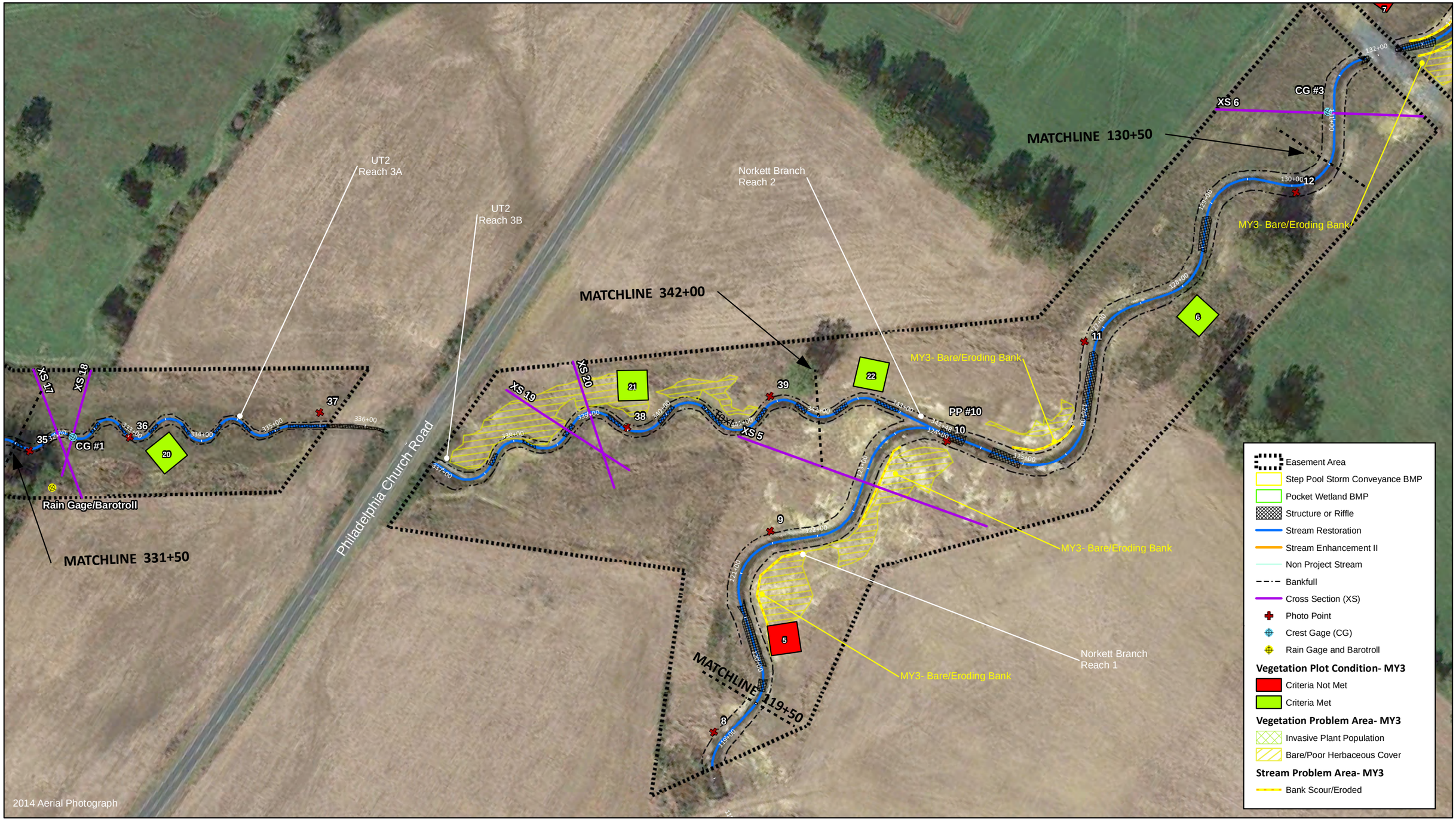
Figure 3.0 Integrated Current Condition Plan View (Key)
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016
Union County, NC

0 100 200 Feet

Figure 3.1 Integrated Current Condition Plan View (Sheet 1 of 6)
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016
Union County, NC

0 100 200 Feet

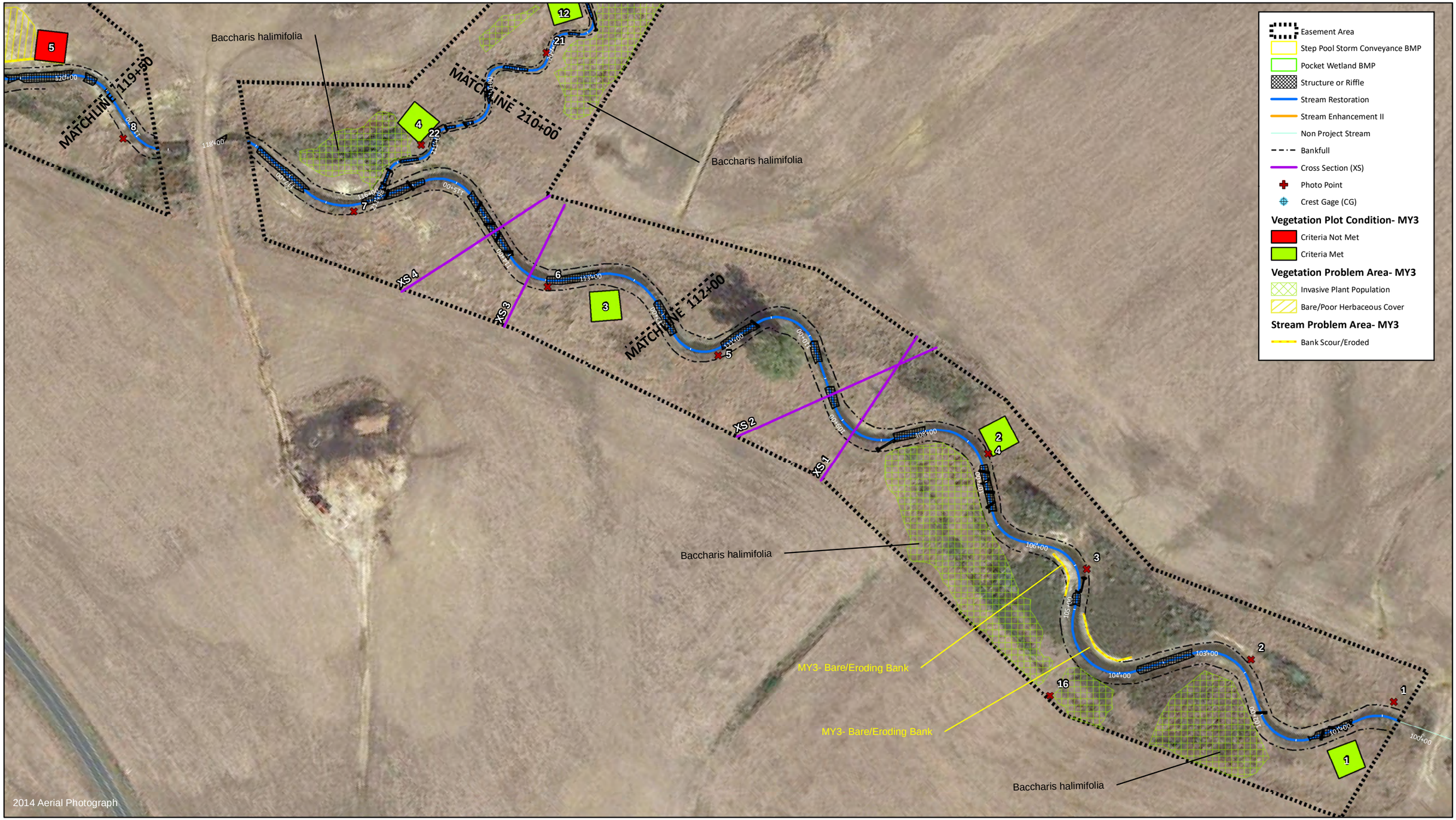
Figure 3.2 Integrated Current Condition Plan View (Sheet 2 of 6)
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016
Union County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

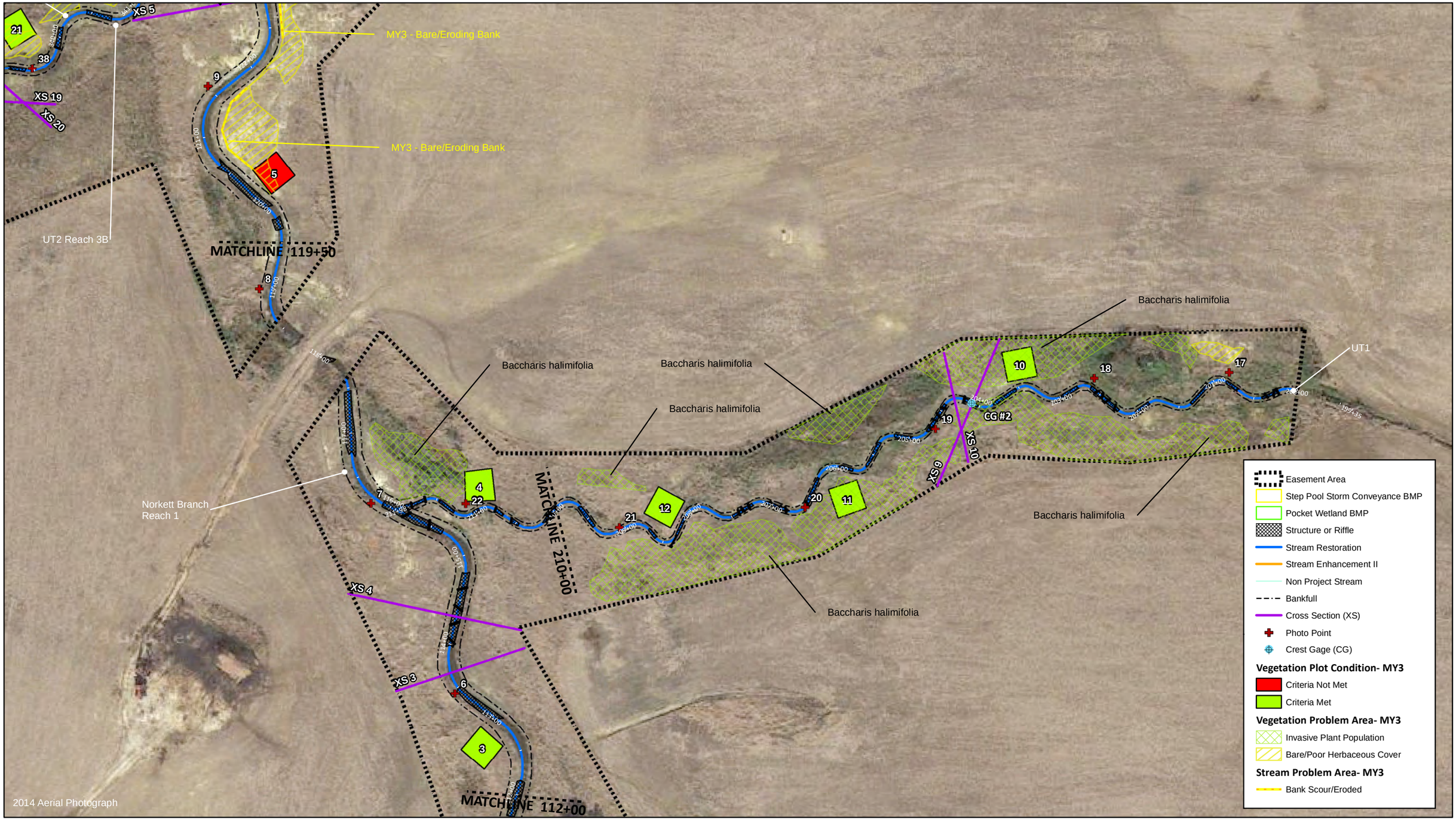
Figure 3.3 Integrated Current Condition Plan View (Sheet 3 of 6)
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016
Union County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

Figure 3.4 Integrated Current Condition Plan View (Sheet 4 of 6)
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016
Union County, NC

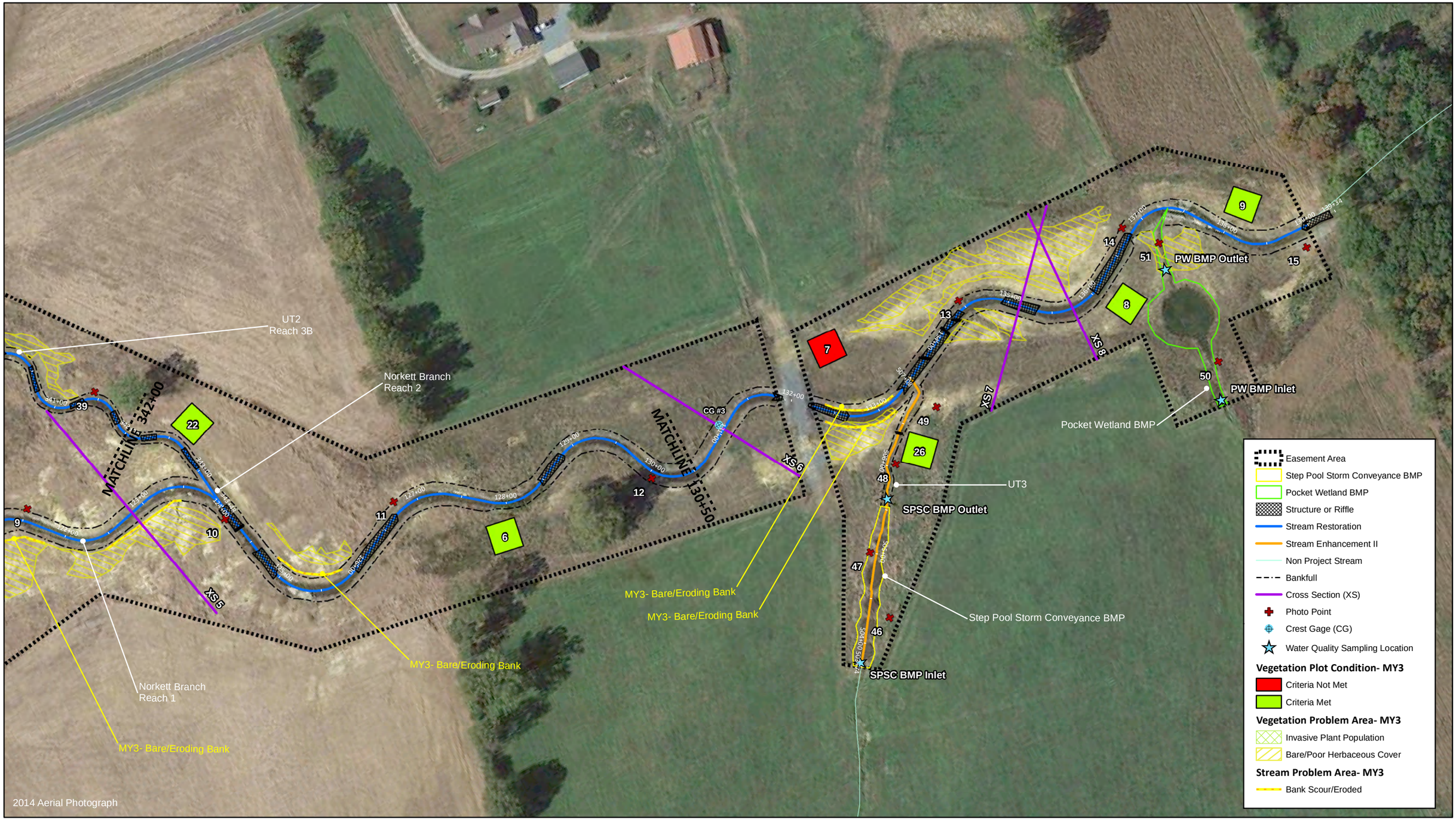


WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 3.5 Integrated Current Condition Plan View (Sheet 5 of 6)
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016
Union County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

Figure 3.6 Integrated Current Condition Plan View (Sheet 6 of 6)
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016
Union County, NC

Stream Photographs

	
Photo Point 1 – looking upstream *(06/08/2016)*	**Photo Point 1** – looking downstream *(06/08/2016)*
	
Photo Point 2 – looking upstream *(06/08/2016)*	**Photo Point 2** – looking downstream *(06/08/2016)*
	
Photo Point 3 – looking upstream *(06/08/2016)*	**Photo Point 3** – looking downstream *(06/08/2016)*

	
Photo Point 4 – looking upstream *(06/08/2016)*	**Photo Point 4** – looking downstream *(06/08/2016)*
	
Photo Point 5 – looking upstream *(06/08/2016)*	**Photo Point 5** – looking downstream *(06/08/2016)*
	
Photo Point 6 – looking upstream *(06/08/2016)*	**Photo Point 6** – looking downstream *(06/08/2016)*

	
Photo Point 7 – looking upstream *(06/08/2016)*	**Photo Point 7** – looking downstream *(06/08/2016)*
	
Photo Point 8 – looking upstream *(06/08/2016)*	**Photo Point 8** – looking downstream *(06/08/2016)*
	
Photo Point 9 – looking upstream *(06/08/2016)*	**Photo Point 9** – looking downstream *(06/08/2016)*

	
Photo Point 10 – looking upstream *(06/08/2016)*	**Photo Point 10** – looking downstream *(06/08/2016)*
	
Photo Point 11 – looking upstream *(06/08/2016)*	**Photo Point 11** – looking downstream *(06/08/2016)*
	
Photo Point 12 – looking upstream *(06/08/2016)*	**Photo Point 12** – looking downstream *(06/08/2016)*

	
Photo Point 13 – looking upstream *(06/08/2016)*	**Photo Point 13** – looking downstream *(06/08/2016)*
	
Photo Point 14 – looking upstream *(06/08/2016)*	**Photo Point 14** – looking downstream *(06/08/2016)*
	
Photo Point 15 – looking upstream *(06/08/2016)*	**Photo Point 15** – looking downstream *(06/08/2016)*

	
Photo Point 16 – looking upstream *(06/08/2016)*	**Photo Point 16** – looking downstream *(06/08/2016)*
	
Photo Point 17 – looking upstream *(04/22/2016)*	**Photo Point 17** – looking downstream *(04/22/2016)*
	
Photo Point 18 – looking upstream *(04/22/2016)*	**Photo Point 18** – looking downstream *(04/22/2016)*

	
Photo Point 19 – looking upstream *(04/22/2016)*	**Photo Point 19** – looking downstream *(04/22/2016)*
	
Photo Point 20 – looking upstream *(04/22/2016)*	**Photo Point 20** – looking downstream *(04/22/2016)*
	
Photo Point 21 – looking upstream *(04/22/2016)*	**Photo Point 21** – looking downstream *(04/22/2016)*

	
Photo Point 22 – looking upstream *(04/22/2016)*	**Photo Point 22** – looking downstream *(04/22/2016)*
	
Photo Point 23 – looking upstream *(04/22/2016)*	**Photo Point 23** – looking downstream *(04/22/2016)*
	
Photo Point 24 – looking upstream *(04/22/2016)*	**Photo Point 24** – looking downstream *(04/22/2016)*

	
Photo Point 25 – looking upstream *(04/22/2016)*	**Photo Point 25** – looking downstream *(04/22/2016)*
	
Photo Point 26 – looking upstream *(04/22/2016)*	**Photo Point 26** – looking downstream *(04/22/2016)*
	
Photo Point 27 – looking upstream *(04/25/2016)*	**Photo Point 27** – looking downstream *(04/25/2016)*

	
Photo Point 28 – looking upstream *(04/25/2016)*	**Photo Point 28** – looking downstream *(04/25/2016)*
	
Photo Point 29 – looking upstream *(04/25/2016)*	**Photo Point 29** – looking downstream *(04/25/2016)*
	
Photo Point 30 – looking upstream *(04/25/2016)*	**Photo Point 30** – looking downstream *(04/25/2016)*

	
Photo Point 31 – looking upstream *(04/25/2016)*	**Photo Point 31** – looking downstream *(04/25/2016)*
	
Photo Point 32 – looking upstream *(04/25/2016)*	**Photo Point 32** – looking downstream *(04/25/2016)*
	
Photo Point 33 – looking upstream *(04/25/2016)*	**Photo Point 33** – looking downstream *(04/25/2016)*

	
Photo Point 34 – looking upstream *(04/25/2016)*	**Photo Point 34** – looking downstream *(04/25/2016)*
	
Photo Point 35 – looking upstream *(04/25/2016)*	**Photo Point 35** – looking downstream *(04/25/2016)*
	
Photo Point 36 – looking upstream *(04/25/2016)*	**Photo Point 36** – looking downstream *(04/25/2016)*

	
Photo Point 37 – looking upstream *(04/25/2016)*	**Photo Point 37** – looking downstream *(04/25/2016)*
	
Photo Point 38 – looking upstream *(04/25/2016)*	**Photo Point 38** – looking downstream *(04/25/2016)*
	
Photo Point 39 – looking upstream *(04/25/2016)*	**Photo Point 39** – looking downstream *(04/25/2016)*

	
Photo Point 40 – looking upstream *(04/25/2016)*	**Photo Point 40** – looking downstream *(04/25/2016)*
	
Photo Point 41 – looking upstream *(04/25/2016)*	**Photo Point 41** – looking downstream *(04/25/2016)*
	
Photo Point 42 – looking upstream *(04/25/2016)*	**Photo Point 42** – looking downstream *(04/25/2016)*

	
Photo Point 43 – looking upstream *(04/25/2016)*	**Photo Point 43** – looking downstream *(04/25/2016)*
	
Photo Point 44 – looking upstream *(04/25/2016)*	**Photo Point 44** – looking downstream *(04/25/2016)*
	
Photo Point 45 – looking upstream *(04/25/2016)*	**Photo Point 45** – looking downstream *(04/25/2016)*

	
Photo Point 46 – looking upstream *(06/08/2016)*	**Photo Point 46** – looking downstream *(06/08/2016)*
	
Photo Point 47 – looking upstream *(06/08/2016)*	**Photo Point 47** – looking downstream *(06/08/2016)*
	
Photo Point 48 – looking upstream *(06/08/2016)*	**Photo Point 48** – looking downstream *(06/08/2016)*

	
Photo Point 49 – looking upstream *(06/08/2016)*	**Photo Point 49** – looking downstream *(06/08/2016)*
	
Photo Point 50 – looking downstream *(06/08/2016)*	**Photo Point 50** – looking upstream *(06/08/2016)*

Vegetation Photographs

Vegetation Plot 1 – *(06/14/2016)*

Vegetation Plot 2 – *(06/14/2016)*

Vegetation Plot 3 – *(06/14/2016)*

Vegetation Plot 4 – *(06/14/2016)*

Vegetation Plot 5 – *(06/14/2016)*

Vegetation Plot 6 – *(06/15/2016)*

Vegetation Plot 7 – *(06/15/2016)*

Vegetation Plot 8 – *(06/15/2016)*

Vegetation Plot 9 – *(06/15/2016)*

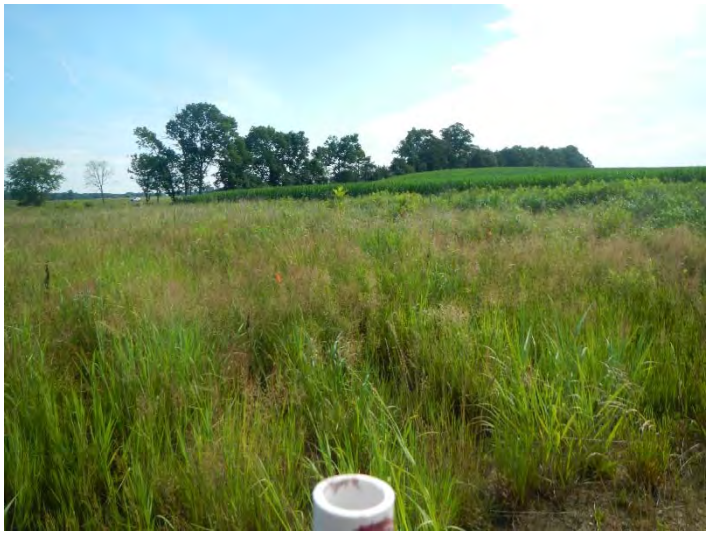
Vegetation Plot 10 – *(06/14/2016)*

Vegetation Plot 11 – *(06/14/2016)*

Vegetation Plot 12 – *(06/14/2016)*

Vegetation Plot 13 – *(06/16/2016)*

Vegetation Plot 14 – *(06/16/2016)*



Vegetation Plot 15 – *(06/16/2016)*

Vegetation Plot 16 – *(06/16/2016)*

Vegetation Plot 17 – *(06/16/2016)*

Vegetation Plot 18 – *(06/16/2016)*

Vegetation Plot 19 – *(06/15/2016)*

Vegetation Plot 20 – *(06/15/2016)*

Vegetation Plot 21 – *(06/14/2016)*

Vegetation Plot 22 – *(06/14/2016)*

Vegetation Plot 23 – *(06/15/2016)*

Vegetation Plot 24 – *(06/15/2016)*

	
Vegetation Plot 25 – *(06/15/2016)*	**Vegetation Plot 26** – *(06/15/2016)*

Areas of Concern

Invasive Plant Population – Norkett Branch R1 *(06/08/2016)*

Bare / Poor Herbaceous Cover – Norkett Branch R2 *(06/15/2016)*

Bare / Poor Herbaceous Cover – Norkett Branch R2 *(06/15/2016)*

Bare Banks: Area 1 – Norkett Branch R1 *(06/08/2016)*

Bare Banks: Area 2 – Norkett Branch R1 *(06/08/2016)*

Bare Banks: Area 3 – Norkett Branch R2 *(06/08/2016)*

APPENDIX 3. Vegetation Plot Data

Table 8. Vegetation Plot Criteria Attainment
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Plot	MY3 Success Criteria Met (Y/N)	Tract Mean
1	Y	92%
2	Y	
3	Y	
4	Y	
5	N	
6	Y	
7	N	
8	Y	
9	Y	
10	Y	
11	Y	
12	Y	
13	Y	
14	Y	
15	Y	
16	Y	
17	Y	
18	Y	
19	Y	
20	Y	
21	Y	
22	Y	
23	Y	
24	Y	
25	Y	
26	Y	

Table 9. CVS Vegetation Plot Metadata
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Report Prepared By	Alea Tuttle
Date Prepared	11/2/2016 11:15
database name	cvs-eep-entrytool-v2.3.1 MY3.mdb
database location	Q:\ActiveProjects\005-02134 Norkett Branch FDP\Monitoring\Monitoring Year 3\Vegetation Assessment
computer name	ALEA
file size	46403584
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	95360
project Name	Norkett Branch Stream Mitigation Site
Description	
River Basin	
length(ft)	10706
stream-to-edge width (ft)	50
area (sq m)	127880.66
Required Plots (calculated)	22
Sampled Plots	26

Table 10. Planted and Total Stem Counts (Species by Plot with Annual Means)
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Scientific Name	Common Name	Species Type	Current Plot Data (MY3 2016)																							
			95360-WEI-0001			95360-WEI-0002			95360-WEI-0003			95360-WEI-0004			95360-WEI-0005			95360-WEI-0006			95360-WEI-0007			95360-WEI-0008		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree				1	1	1	1	1	1	2	2	2												
Betula nigra	river birch	Tree	3	3	3	1	1	1	1	1	1				2	2	2	2	2	2	1	1	1	3	3	3
Carya sp.	hickory	Tree																								
Celtis laevigata	sugarberry	Tree																								
Cephalanthus occidentalis	common buttonbush	Shrub	1	1	1																					
Cercis canadensis	eastern redbud	Tree													2	2	2									
Cornus florida	flowering dogwood	Tree																								
Diospyros virginiana	common persimmon	Tree						2																		
Fraxinus pennsylvanica	green ash	Tree	2	2	2	5	5	5							1	1	1	4	4	4	3	3	3	5	5	6
Hamamelis virginiana	American witchhazel	Tree																								
Liquidambar styraciflua	sweetgum	Tree																								
Liriodendron tulipifera	tuliptree	Tree																		1				1	1	1
Platanus occidentalis	American sycamore	Tree	5	5	5	6	6	6	7	7	7	8	8	8	2	2	2	3	3	3	1	1	1	4	4	4
Populus deltoides	eastern cottonwood	Tree									1															
Quercus michauxii	swamp chestnut oak	Tree																						1	1	1
Quercus phellos	willow oak	Tree																1	1	1						
Quercus rubra	northern red oak	Tree	1	1	1				3	3	3	1	1	1										1	1	1
Salix nigra	black willow	Tree																		5						
Sambucus canadensis	Common Elderberry	Shrub										1	1	2												
Taxodium distichum	bald cypress	Tree																								
Ulmus alata	winged elm	Tree												1												
Unknown		Shrub or Tree																								
Stem count			12	12	12	13	13	15	12	12	13	12	12	14	7	7	7	10	10	16	5	5	5	15	15	16
size (ares)			1			1			1			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
Species count			5	5	5	4	4	5	4	4	5	4	4	5	4	4	4	4	4	6	3	3	3	6	6	6
Stems per ACRE			486	486	486	526	526	607	486	486	526	486	486	567	283	283	283	405	405	647	202	202	202	607	607	647

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

PnoLS: Planted Stems excluding live stakes
P-all: All planted stems
T: Total stems including volunteers

Table 10. Planted and Total Stem Counts (Species by Plot with Annual Me
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Scientific Name	Common Name	Species Type	Current Plot Data (MY3 2016)																												
			95360-WEI-0009			95360-WEI-0010			95360-WEI-0011			95360-WEI-0012			95360-WEI-0013			95360-WEI-0014			95360-WEI-0015			95360-WEI-0016			95360-WEI-0017			95360-WEI-0018		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree			1			1																							
Betula nigra	river birch	Tree				2	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				1	1	1			
Carya sp.	hickory	Tree																													
Celtis laevigata	sugarberry	Tree																													
Cephalanthus occidentalis	common buttonbush	Shrub																													
Cercis canadensis	eastern redbud	Tree				1	1	1										1	1	1				1	1	1					
Cornus florida	flowering dogwood	Tree	1	1	1																			1	1	1					
Diospyros virginiana	common persimmon	Tree																													
Fraxinus pennsylvanica	green ash	Tree	2	2	7	3	3	3	6	6	6	1	1	1	2	2	2	3	3	3	4	4	4	3	3	3	3	3	3	3	3	3
Hamamelis virginiana	American witchhazel	Tree																													
Liquidambar styraciflua	sweetgum	Tree																													
Liriodendron tulipifera	tuliptree	Tree				1	1	1																					5			
Platanus occidentalis	American sycamore	Tree	6	6	7	1	1	1	4	4	4	7	7	7	4	4	4	2	2	2	3	3	3	2	2	2	4	4	4	4	4	4
Populus deltoides	eastern cottonwood	Tree																													
Quercus michauxii	swamp chestnut oak	Tree																												1	1	1
Quercus phellos	willow oak	Tree	2	2	2	1	1	1				1	1	1	1	1	1				1	1	1	1	1	1	2	2	2	1	1	1
Quercus rubra	northern red oak	Tree										1	1	1	2	2	2	1	1	1	1	1	1	1	1	1	2	2	2			
Salix nigra	black willow	Tree									2																					
Sambucus canadensis	Common Elderberry	Shrub																													
Taxodium distichum	bald cypress	Tree																													
Ulmus alata	winged elm	Tree			7												1												1			
Unknown		Shrub or Tree																													
Stem count			11	11	25	9	9	10	11	11	13	11	11	11	10	10	11	8	8	8	10	10	10	9	9	9	12	12	18	9	9	9
size (ares)			1			1			1			1			1			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
Species count			4	4	6	6	6	7	3	3	4	5	5	5	5	5	6	5	5	5	5	5	5	6	6	6	5	5	7	4	4	4
Stems per ACRE			445	445	1012	364	364	405	445	445	526	445	445	445	405	405	445	324	324	324	405	405	405	364	364	364	486	486	728	364	364	364

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

PnoLS: Planted Stems excluding live stakes
P-all: All planted stems
T: Total stems including volunteers

Table 10. Planted and Total Stem Counts (Species by Plot with Annual Me
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Scientific Name	Common Name	Species Type	Current Plot Data (MY3 2016)																							Annual Sumarry											
			95360-WEI-0019			95360-WEI-0020			95360-WEI-0021			95360-WEI-0022			95360-WEI-0023			95360-WEI-0024			95360-WEI-0025			95360-WEI-0026			MY3 (2016)			MY2 (2015)			MY1 (2014)			MY0 (2014)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree																								4	4	6	4	4	4						
Betula nigra	river birch	Tree	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	1				27	27	27	27	27	27	25	25	25	32	32	32
Carya sp.	hickory	Tree			6																							6									
Celtis laevigata	sugarberry	Tree																														1	1	1	7	7	7
Cephalanthus occidentalis	common buttonbush	Shrub																								1	1	1	1	1	2						
Cercis canadensis	eastern redbud	Tree				1	1	1	4	4	4				1	1	1				1	1	1				12	12	12	14	14	14	25	25	25	42	42	42
Cornus florida	flowering dogwood	Tree							2	2	2	1	1	1	1	1	1	1	1	1	1	1	1				8	8	8	10	10	10	48	48	48	75	75	75
Diospyros virginiana	common persimmon	Tree																										2			3						
Fraxinus pennsylvanica	green ash	Tree	3	3	3	3	3	3				6	6	6	3	3	3	3	3	3	3	3	3	5	5	5	76	76	82	73	73	75	63	63	63	67	67	67
Hamamelis virginiana	American witchhazel	Tree							2	2	2													1	1	1	3	3	3	3	3	3	7	7	7	8	8	8
Liquidambar styraciflua	sweetgum	Tree																													5						
Liriodendron tulipifera	tuliptree	Tree	1	1	1	1	1	2	1	1	1				1	1	1				2	2	2	1	1	1	9	9	16	11	11	11	24	24	24	59	59	59
Platanus occidentalis	American sycamore	Tree	4	4	4	4	4	4	6	6	6	5	5	5	4	4	4	4	4	4	3	3	3	2	2	2	105	105	106	106	106	106	67	67	67	57	57	57
Populus deltoides	eastern cottonwood	Tree																										1			1						
Quercus michauxii	swamp chestnut oak	Tree	1	1	1	1	1	1							1	1	1	1	1	1	1	1	1				7	7	7	7	7	7	18	18	18	36	36	36
Quercus phellos	willow oak	Tree	1	1	1	1	1	1	1	1	1	2	2	2	1	1	1	1	1	1	1	1	1				19	19	19	20	20	20	34	34	34	27	27	27
Quercus rubra	northern red oak	Tree	1	1	1				1	1	1				1	1	1				1	1	1	2	2	2	20	20	20	23	23	23	24	24	24	24	24	24
Salix nigra	black willow	Tree																										7			1						
Sambucus canadensis	Common Elderberry	Shrub										1	1	1													2	2	3	2	2	2	10	10	11	13	13	13
Taxodium distichum	bald cypress	Tree																											1	1	1						
Ulmus alata	winged elm	Tree			4			2									1											17			6						
Unknown		Shrub or Tree																																			
Stem count			12	12	22	12	12	15	17	17	17	16	16	16	14	14	15	11	11	11	14	14	14	11	11	11	293	293	343	302	302	321	346	346	347	447	447	447
size (ares)			1			1			1			1			1			1			1			1			26			26			26			26		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.64			0.64			0.64			0.64		
Species count			7	7	9	7	7	8	7	7	7	6	6	6	9	9	10	6	6	6	9	9	9	5	5	5	13	13	18	14	14	19	12	12	12	12	12	12
Stems per ACRE			486	486	890	486	486	607	688	688	688	647	647	647	567	567	607	445	445	445	567	567	567	445	445	445	456	456	534	470	470	500	539	539	540	696	696	696

Color for Density

Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%

PnoLS: Planted Stems excluding live stakes
P-all: All planted stems
T: Total stems including volunteers

APPENDIX 4. Morphological Summary Data and Plots

Table 11a. Baseline Stream Data Summary

Norkett Branch Stream Mitigation Site

DMS Project No. 95360

Monitoring Year 3 - 2016

Norkett Branch Reaches 1 and 2

		PRE-RESTORATION CONDITION				REFERENCE REACHES						DESIGN				AS-BUILT/BASELINE			
Parameter	**Gage**	**Norkett Branch Reach 1**		**Norkett Branch Reach 2**		**Spencer Creek**		**UT to Spencer Creek**		**UT Richland Creek Reach 2**		**Norkett Branch Reach 1**		**Norkett Branch Reach 2**		**Norkett Branch Reach 1**		**Norkett Branch Reach 2**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																			
Bankfull Width (ft)		12.8	21.5	22.0	29.5	10.7	11.2	7.0		13.3	15.2	22.0		23.0		22.5	26.6	25.6	25.7
Floodprone Width (ft)		35	58	72	85	60	114+	>81		>50		48	>110	61	>115	>200	>200	>200	>200
Bankfull Mean Depth		1.7	1.8	1.4	2.4	1.6	1.8	2.0		1.1	1.3	1.8		1.9		1.6	1.8	1.8	2.0
Bankfull Max Depth		3.1	3.2	2.3	2.9	2.1	2.6	1.1		1.8	2.1	2.8		2.8		2.6	3.3	3.0	3.3
Bankfull Cross-sectional Area (ft^2)	n/a	28.1	35.6	40.6	52.8	17.8	19.7	7.7		16.5	17.5	40.6		43.2		38.8	44.6	46.7	50.8
Width/Depth Ratio		5.9	13.0	9.2	21.4	5.8	7.1	6.4		10.1	13.9	11.9		12.2		13.1	16.7	13.0	14.1
Entrenchment Ratio		2.1	4.5	2.9	3.3	5.5	10.2	>11.6		>2.5		2.2	>5.0	2.2	>5.0	>2.2		>2.2	
Bank Height Ratio		1.0	1.4	1.3	1.6	1.0		1.0		1.0		1.0		1.0		1.0		1.0	
D50 (mm)		8.6		0.4								---		---		18.4	59.6	7.3	9.9
Profile																			
Riffle Length (ft)						---		---		---		---		---		14	84	19	111
Riffle Slope (ft/ft)		0.0036	0.0039	0.0032	0.0120	0.0130		0.0140		0.0183	0.0355	0.0018	0.0120	0.0023	0.0180	0.0000	0.0152	0.0009	0.0163
Pool Length (ft)	n/a					---		---		---		---		---		12	88	51	102
Pool Max Depth (ft)		4.0	4.0	2.9	4.0	3.3		2.5		1.8		2.8	7.8	2.8	7.9	3.3	5.1	3.5	4.8
Pool Spacing (ft)^		62	300	60	300	71.0		19	42	33.0	93.0	29	163	30	170	67	183	98	172
Pool Volume (ft^3)																			
Pattern																			
Channel Beltwidth (ft)		N/A		N/A		38	41	11	27	N/A		35	161	37	168	38	147	38	155
Radius of Curvature (ft)		N/A		N/A		11	15	6	16	N/A		40	66	41	69	38	65	40	64
Rc:Bankfull Width (ft/ft)	n/a	N/A		N/A		1.0	1.3	0.8	2.3	N/A		1.8	3.0	1.8	3.0	1.7	2.4	1.6	2.5
Meander Length (ft)		N/A		N/A		46	48	37.7	43	N/A		66	264	69	276	167	263	181	277
Meander Width Ratio		N/A		N/A		3.6	3.7	1.6	3.8	N/A		1.6	7.3	1.6	7.3	1.7	5.5	1.5	6.0
Substrate, Bed and Transport Parameters																			
Ri%/Ru%/P%/G%/S%																			
SC%/Sa%/G%/C%/B%/Be%																			
d16/d35/d50/d84/d95/d100	n/a	SC/4.6/8.7/28.5/64/2048		SC/SC/0.4/21.1/>2048/>2048		---		---		---						0.4/3.6/7.4/52.3/139.4/362		2.6/6.7/13.0/62.6/210.9/>2048	
Reach Shear Stress (Competency) lb/ft^2		0.41	0.44	0.17	0.38							0.28		0.40		0.27	0.29	0.30	0.32
Max part size (mm) mobilized at bankfull												15-25		20-35		15-25		20-35	
Stream Power (Capacity) W/m^2																			
Additional Reach Parameters																			
Drainage Area (SM)		2.3		3.2		0.96		0.01		0.28		2.3		3.2		2.3		3.2	
Watershed Impervious Cover Estimate (%)		<1% [1]		<1% [1]		---		---		---		<1% [1]		<1% [1]		<1% [1]		<1% [1]	
Rosgen Classification		E4		C/E5		E4		E5		C4/E4		C4		C5		C4		C4/E4	
Bankfull Velocity (fps)		3.5	4.0	2.5	3.5	4.9	5.4	3.2		3.5	4.1	2.8		3.3		2.6	2.8	2.8	2.9
Bankfull Discharge (cfs)		110		140		97		25		29	32	110		140		105	124	130	148
Q-NFF regression																			
Q-USGS extrapolation	n/a																		
Q-Mannings																			
Valley Length (ft)		---		---		---		---		---		1,910		1,249		1,910		1,249	
Channel Thalweg Length (ft^2)		1,980		1,505		---		---		---		2,369		1,499		2,369		1,499	
Sinuosity (ft^3)		1.10		1.10		2.30		2.50		1.00		1.24		1.20		1.24		1.20	
Water Surface Slope (ft/ft^2)		0.0039		0.0013	0.0046	---		---		---		0.0025		0.0036		0.0031		0.0033	
Bankfull Slope (ft/ft)		---		---		---		---		---		---		---		0.0029		0.0034	

[1] No impervious land use is present within the project watershed per the CGIA Land Use Classification data set.

[2] Channel Length represented does not include easement breaks.

(---): Data was not provided

N/A: Not Applicable

SC: Silt/Clay

Table 11b. Baseline Stream Data Summary

Norkett Branch Stream Mitigation Site

DMS Project No. 95360

Monitoring Year 3 - 2016

UT1 and UT2 Reaches 1 and 2

		PRE-RESTORATION CONDITION						REFERENCE REACHES	DESIGN						AS BUILT/ BASELINE					
Parameter	**Gage**	**UT1**		**UT2 Reach 1**		**UT2 Reach 2**		**See Table 11a**	**UT1**		**UT2 Reach 1**		**UT2 Reach 2**		**UT1**		**UT2 Reach 1**		**UT2 Reach 2**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																				
Bankfull Width (ft)	n/a	2.9	8.2	13.6		7.1		See Table 11a	7.5		8.0		8.0		10.5		9.4		9.0	9.6
Floodprone Width (ft)		6	40	29		53			16.5	>38	>40		>40		136		144		>200	>200
Bankfull Mean Depth		0.9	1	0.6		0.7			0.6		0.6		0.7		0.4		0.5		0.5	0.6
Bankfull Max Depth		1.2	2	1		1.5			0.9		0.9		1.0		0.8		1.2		1.1	1.2
Bankfull Cross-sectional Area (ft^2)		2.6	8.6	7.9		5.1			4.6		4.6		5.3		4.5		4.5		5.2	5.3
Width/Depth Ratio		2.6	8.6	23.4		9.8			12.2		13.9		12.1		24.5		19.8		15.3	17.6
Entrenchment Ratio		2.2	4.9	>7		>8			2.2	>5	>5		>5		>2.2		>2.2		>2.2	
Bank Height Ratio		1.5	2.4	1		1	1.7		1.0		1.0		1.0		1.0		1.0		1.0	
D50 (mm)		SC		7.3		7.3									20.9		19.5		20.1	27.4
Profile																				
Riffle Length (ft)	n/a							See Table 11a	---		---		---		7	39	7	34	6	27
Riffle Slope (ft/ft)		0.017	0.054	0.009	0.032	0.006			0.013	0.045	0.01	0.032	0.013	0.028	0.007	0.044	0.006	0.037	0.009	0.039
Pool Length (ft)									---		---		---		12	69	11	35	11	45
Pool Max Depth (ft)		1.4	1.7	1.3		2.5			0.9	2.6	0.9	2.4	1.0	2.8	1.2	2.5	1.5	2.6	1.5	2.5
Pool Spacing (ft)^		61	295	190		51	130		10	56	10	56	10	56	30	58	21	64	22	71
Pool Volume (ft^3)																				
Pattern																				
Channel Beltwidth (ft)	n/a	N/A		N/A	N/A	26.9	49.5	See Table 11a	12	55	13	44	13	44	13	49	10	42	12	52
Radius of Curvature (ft)		N/A		N/A	N/A	6.92	33.39		12	23	13.0	24.0	13	24	14	23	15	21	14	22
Rc:Bankfull Width (ft/ft)		N/A		N/A	N/A	0.98	4.73		1.6	3	1.6	3.0	1.6	3	1.3	2.2	1.6	2.2	1.6	2.3
Meander Length (ft)		N/A		N/A	N/A	83.5	141.4		23	90	24.0	96.0	24	96	61	88	45	92	44	83
Meander Width Ratio		N/A		N/A	N/A	3.8	7.01		1.6	7.3	1.6	5.5	1.6	5.5	1.2	4.7	1.0	4.4	1.3	5.4
Substrate, Bed and Transport Parameters																				
Ri%/Ru%/P%/G%/S%	n/a																			
SC%/Sa%/G%/C%/B%/Be%																				
d16/d35/d50/d84/d95/d100		SC/SC/SC/SC/0.77/9.38/>2048		SC/SC/7.3/47.7/85.7/>2048		SC/SC/7.3/47.7/85.7/>2048		See Table 11a							SC/1.0/12.7/55.3/90/256		SC/7.1/12.2/28.5/42.9/90		2.4/11.6/20.7/56.1/86.7/180	
Reach Shear Stress (Competency) lb/ft^2		0.57	0.82	0.14		0.42			0.38		0.18		0.27		0.27		0.16		0.21	0.23
Max part size (mm) mobilized at bankfull									20-35		10-20		15-25		15-25		10-20		15-25	
Stream Power (Capacity) W/m^2																				
Additional Reach Parameters																				
Drainage Area (SM)	n/a	0.08		0.40		0.48		See Table 5a	0.08		0.15		0.22		0.08		0.15		0.22	
Watershed Impervious Cover Estimate (%)		<1% [1]		<1% [1]		<1% [1]			<1% [1]		<1% [1]		<1% [1]		<1% [1]		<1% [1]		<1% [1]	
Rosgen Classification		E6		C/E4		E4			C/E6		C/E4		C/E4		C4		C4		C4	
Bankfull Velocity (fps)		3.3	4.2	1.4		3.4			2.6		2.4		3.2		2.1		1.6		1.9	2.0
Bankfull Discharge (cfs)		12		11		17			12		11		17		10		7		10	11
Q-NFF regression																				
Q-USGS extrapolation																				
Q-Mannings																				
Valley Length (ft)		840		820		1156		See Table 5a	998		866		1108		998		866		1108	
Channel Thalweg Length (ft^2)		840		820		1,272			1,198		1,039		1,440		1,198		1,039		1,440	
Sinuosity (ft^3)		1.0		1.0		1.1			1.20		1.20		1.30		1.20		1.20		1.30	
Water Surface Slope (ft/ft^2)		0.15		0.004		0.012			0.010		0.005		0.007		0.011		0.006		0.007	
Bankfull Slope (ft/ft)									---		---		---		0.011		0.006		0.007	

[1] No impervious land use is present within the project watershed per the CGIA Land Use Classification data set.

[2] Channel Length represented does not include easement breaks.

(---): Data was not provided

N/A: Not Applicable

SC: Silt/Clay

Table 11c. Baseline Stream Data Summary
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

UT2 Reaches 3A and 3B

		RE-RESTORATION CONDITION		REFERENCE REACHES		DESIGN				AS BUILT/BASELINE			
Parameter	**Gage**	**UT2 Reach 3**		**See Table 11a**		**UT2 Reach 3A**		**UT2 Reach 3B**		**UT2 Reach 3A**		**UT2 Reach 3B**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle													
Bankfull Width (ft)		7.5				9.0		11.0		10.5		13.9	
Floodprone Width (ft)		24				45+		55+		>200		130	
Bankfull Mean Depth		1.1				0.8		1.0		0.7		0.8	
Bankfull Max Depth		1.6				1.2		1.5		1.2		1.6	
Bankfull Cross-sectional Area (ft^2)	n/a	8.3		See Table 11a		6.9		10.8		7.2		11.8	
Width/Depth Ratio		6.7				11.7		11.2		15.3		16.5	
Entrenchment Ratio		3.2				5.0+		5.0+		>2.2		>2.2	
Bank Height Ratio		1.3	1.8			1.0		1.0		1.0		1.0	
D50 (mm)		7.32								32.0		33.4	
Profile													
Riffle Length (ft)						---		---		8	25	13	28
Riffle Slope (ft/ft)		0.014	0.025			0.011	0.032	0.008	0.017	0.010	0.046	0.001	0.024
Pool Length (ft)				See Table 11a		---		---		10	42	32	45
Pool Max Depth (ft)	n/a	2				1.20	3.20	1.50	4.10	1.77	2.98	2.45	3.32
Pool Spacing (ft)^		26	53			12	63	14	77	26	66	38	72
Pool Volume (ft^3)													
Pattern													
Channel Beltwidth (ft)		N/A	N/A			14	50	18	61	8	37	20	61
Radius of Curvature (ft)		15	63.4			14	27	20	33	14	27	24	31
Rc:Bankfull Width (ft/ft)	n/a	2	8.45	See Table 11a		1.6	3.0	1.8	3.0	1.3	2.6	1.7	2.2
Meander Length (ft)		N/A	N/A			27	108	33	132	58	88	87	105
Meander Width Ratio		N/A	N/A			1.6	5.5	1.6	5.5	0.8	3.5	1.4	4.4
Substrate, Bed and Transport Parameters													
Ri%/Ru%/P%/G%/S%													
SC%/Sa%/G%/C%/B%/Be%													
d16/d35/d50/d84/d95/d100		SC/SC/7.3/47.7/85.7/>2048		See Table 11a						22.6/27.4/32/53.7/69.7/128		SC/4.9/13.3/67.2/89.9/128	
Reach Shear Stress (Competency) lb/ft^2	n/a					0.29		0.23		0.23		0.14	
Max part size (mm) mobilized at bankfull						15	25	12	20	17		10	
Stream Power (Capacity) W/m^2													
Additional Reach Parameters													
Drainage Area (SM)		0.71				0.46		0.46		0.46		0.46	
Watershed Impervious Cover Estimate (%)		<1% [1]				<1% [1]		<1% [1]		<1% [1]		<1% [1]	
Rosgen Classification		E4		See Table 5a		C/E4		C/E4		E4		C4	
Bankfull Velocity (fps)		3.7				3.7		3.0		2.1		1.7	
Bankfull Discharge (cfs)		26	33			26		33		15		20	
Q-NFF regression													
Q-USGS extrapolation	n/a												
Q-Mannings													
Valley Length (ft)		1184				830		548		830		548	
Channel Thalweg Length (ft)[2]		1,303				1,038		658		1,038		658	
Sinuosity (ft)[3]		1.1		See Table 5a		1.25		1.20		1.25		1.20	
Water Surface Slope (ft/ft)[2]		0.009				0.006		0.004		0.006		0.003	
Bankfull Slope (ft/ft)						---		---		0.007		0.002	

[1] No impervious land use is present within the project watershed per the CGIA Land Use Classification data set.
[2] Channel Length represented does not include easement breaks.
(---): Data was not provided
N/A: Not Applicable
SC: Silt/Clay

Table 12a. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Norkett Branch Reach 1 and 2

	Cross-Section 1, Norkett Branch Reach 1 (Pool)						Cross-Section 2, Norkett Branch Reach 1, (Riffle)						Cross-Section 3, Norkett Branch Reach 1, (Pool)						Cross-Section 4, Norkett Branch Reach 1, (Riffle)					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation																								
Bankfull Width (ft)	33.2	34.1	34.3	29.1			26.6	23.2	23.4	22.8			26.7	29.2	25.8	24.3			25.1	23.1	26.2	22.4		
Floodprone Width (ft)	---	---	---	---			>200	>200	>200	>200			---	---	---	---			>200	>200	>200	>200		
Bankfull Mean Depth (ft)	1.8	2.0	2.0	2.2			1.6	2.0	2.0	1.9			2.3	2.3	2.4	2.7			1.8	2.1	1.9	2.0		
Bankfull Max Depth (ft)	3.6	3.7	3.8	3.7			2.9	3.0	3.0	2.9			3.9	4.4	4.6	5.0			3.3	3.4	3.4	3.3		
Bankfull Cross-Sectional Area (ft^2)	58.4	68.3	68.7	64.3			42.6	45.5	48.0	44.1			60.3	67.5	62.9	64.9			44.6	47.7	48.8	44.0		
Bankfull Width/Depth Ratio	18.9	17.1	17.1	13.2			16.7	11.9	11.4	11.8			11.8	12.7	10.6	9.1			14.1	11.1	14.1	11.4		
Bankfull Entrenchment Ratio	---	---	---	---			>7.5	>12	>8.5	>8.8			---	---	---	---			>8	>9	>7.6	>8.9		
Bankfull Bank Height Ratio	---	---	---	---			1.0	1.0	1.0	1.0			---	---	---	---			1.0	1.0	1.0	1.0		
	Cross-Section 5, Norkett Branch Reach 1 (Riffle)						**Cross-Section 6, Norkett Branch Reach 2, (Riffle)**						**Cross-Section 7, Norkett Branch Reach 2, (Riffle)**						**Cross-Section 8, Norkett Branch Reach 2, (Pool)**					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation																								
Bankfull Width (ft)	22.5	23.5	23.3	22.3			25.7	26.0	25.6	25.0			25.6	24.9	25.6	23.2			30.1	26.8	29.1	26.1		
Floodprone Width (ft)	>200	>200	>200	>200			>200	>200	>200	>200			>200	>200	>200	>200			---	---	---	---		
Bankfull Mean Depth (ft)	1.7	1.8	1.7	1.7			2.0	2.0	2.1	2.0			1.8	2.0	1.9	1.9			2.4	2.7	2.5	2.5		
Bankfull Max Depth (ft)	2.6	3.0	2.9	2.7			3.3	3.3	3.6	3.2			3.0	3.2	3.1	3.1			4.5	4.4	4.5	4.6		
Bankfull Cross-Sectional Area (ft^2)	38.8	42.3	40.5	37.4			50.8	52.0	53.4	49.6			46.7	48.7	48.5	44.6			72.5	71.0	73.2	64.9		
Bankfull Width/Depth Ratio	13.1	13.1	13.3	13.2			13.0	13.0	12.3	12.6			14.1	12.7	13.6	12.1			12.5	10.1	11.6	10.5		
Bankfull Entrenchment Ratio	>9	>9	>8.6	>9.0			>8	>8	>7.8	>8.0			>8	>8	>7.8	>8.6			---	---	---	---		
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0			---	---	---	---		

--- : Not Applicable

Table 12b. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

UT1 and UT2 Reaches 1 and 2

	Cross-Section 9, UT1, (Riffle)						Cross-Section 10, UT1, (Pool)						Cross-Section 11, UT2 Reach 1, (Pool)						Cross-Section 12, UT2 Reach 1, (Riffle)					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation																								
Bankfull Width (ft)	10.5	11.6	11.1	10.2			18.1	15.9	17.3	13.5			10.6	11.1	11.3	12.1			9.4	11.1	9.5	10.8		
Floodprone Width (ft)	136	136	138	131			---	---	---	---			---	---	---	---			144	151	155	146.5		
Bankfull Mean Depth (ft)	0.4	0.5	0.6	0.4			0.5	0.9	0.9	0.8			0.7	0.8	0.8	0.6			0.5	0.5	0.6	0.4		
Bankfull Max Depth (ft)	0.8	1.1	0.9	0.6			1.8	2.0	2.1	1.9			1.9	2.0	0.8	1.7			1.2	1.1	1.2	1.0		
Bankfull Cross-Sectional Area (ft^2)	4.5	6.2	6.7	4.0			9.8	14.0	12.7	10.3			7.5	9.4	8.8	6.7			4.5	5.6	5.5	3.9		
Bankfull Width/Depth Ratio	24.5	21.7	18.5	20.8			33.3	18.0	23.5	17.7			15.2	13.2	14.6	21.9			19.8	22.0	16.4	29.6		
Bankfull Entrenchment Ratio	13.0	11.7	12.4	14.4			---	---	---	---			---	---	---	---			15.2	13.6	16.3	13.6		
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0			---	---	---	---			---	---	---	---			1.0	1.0	1.0	1.0		
	Cross-Section 13, UT2 Reach 2, (Riffle)						**Cross-Section 14, UT2 Reach 2, (Pool)**						**Cross-Section 15, UT2 Reach 2, (Riffle)**						**Cross-Section 16, UT2 Reach 2, (Pool)**					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation																								
Bankfull Width (ft)	9.0	9.5	9.1	8.9			13.9	13.7	14.8	12.9			9.6	10.5	11.5	11.9			9.6	9.4	7.9	9.6		
Floodprone Width (ft)	>200	>200	>200	>200			---	---	---	---			>200	>200	>200	>200			---	---	---	---		
Bankfull Mean Depth (ft)	0.6	0.7	0.7	0.6			0.8	1.0	0.8	0.9			0.5	0.7	0.8	0.7			0.7	0.9	1.0	1.0		
Bankfull Max Depth (ft)	1.2	1.2	1.2	1.1			2.1	2.2	2.0	2.0			1.1	1.4	1.3	1.6			1.8	1.9	1.9	2.0		
Bankfull Cross-Sectional Area (ft^2)	5.3	7.1	6.4	5.6			11.7	14.1	12.0	11.3			5.2	7.6	8.7	8.8			7.0	8.1	8.1	9.2		
Bankfull Width/Depth Ratio	15.3	12.8	13.0	14.1			16.4	13.2	18.2	14.7			17.6	14.5	15.4	15.9			13.3	10.9	7.7	10.1		
Bankfull Entrenchment Ratio	>22	>21	>22	>22.5			---	---	---	---			>15	>19	>17.3	>16.9			---	---	---	---		
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0			---	---	---	---			1.0	1.0	1.0	1.0			---	---	---	---		

---: Not Applicable

Table 12c. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)

Norkett Branch Stream Mitigation Site

DMS Project No. 95360

Monitoring Year 3 - 2016

UT2 Reaches 3A and 3B

	Cross-Section 17, UT2 Reach 3A, (Pool)						Cross-Section 18, UT2 Reach 3A, (Riffle)						Cross-Section 19, UT2 Reach 3B, (Riffle)						Cross-Section 20, UT2 Reach 3B, (Pool)					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation																								
Bankfull Width (ft)	10.5	10.9	11.3	10.1			10.5	11.1	10.1	10.5			13.9	12.6	14.3	13.6			14.7	15.0	15.5	14.5		
Floodprone Width (ft)	---	---	---	---			>200	>200	>200	>200			130	130	146	131.9			---	---	---	---		
Bankfull Mean Depth (ft)	1.0	1.2	1.1	1.3			0.7	0.7	0.7	0.9			0.8	1.2	1.0	0.9			1.4	1.5	1.5	1.5		
Bankfull Max Depth (ft)	2.0	2.0	2.2	2.1			1.2	1.3	1.4	1.5			1.6	1.8	1.8	1.7			2.6	2.7	2.7	2.8		
Bankfull Cross-Sectional Area (ft^2)	10.7	12.9	12.1	13.0			7.2	7.6	7.6	9.3			11.8	14.9	14.3	12.6			21.2	22.7	23.0	21.3		
Bankfull Width/Depth Ratio	10.2	9.2	10.5	7.8			15.3	16.2	13.6	11.9			16.5	10.6	14.4	14.7			10.2	9.9	10.4	9.8		
Bankfull Entrenchment Ratio	---	---	---	---			>19	>18	>9.3	>19.0			9.3	10.3	10.2	9.7			---	---	---	---		
Bankfull Bank Height Ratio	---	---	---	---			1.0	1.0	1.0	1.0			1.0	1.0	1.0	1.0			---	---	---	---		

---: Not Applicable

Table 13a. Monitoring Data - Stream Reach Data Summary
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Norkett Branch Reach 1

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	22.5	26.6	23.1	23.5	23.3	26.2	22.3	22.8				
Floodprone Width (ft)	>200		>200		>200		>200					
Bankfull Mean Depth	1.6	1.8	1.8	2.1	1.7	2.0	1.7	2.0				
Bankfull Max Depth	2.6	3.3	3.0	3.4	2.9	3.4	2.7	3.3				
Bankfull Cross-sectional Area (ft^2)	38.8	44.6	42.3	47.7	40.5	48.8	37.4	44.1				
Width/Depth Ratio	13.1	16.7	11.1	13.1	11.4	14.1	11.4	13.2				
Entrenchment Ratio	>2.2		>2.2		>2.2		>2.2					
Bank Height Ratio	1.0		1.0		1.0		1.0					
D50 (mm)	18.4	59.6	13.3	26.9	24.7	90.0	20.9	51.8				
Profile												
Riffle Length (ft)	14	84										
Riffle Slope (ft/ft)	0.0000	0.0152										
Pool Length (ft)	12	88										
Pool Max Depth (ft)	3.3	5.1										
Pool Spacing (ft)	67	183										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	38	147										
Radius of Curvature (ft)	38	65										
Rc:Bankfull Width (ft/ft)	1.7	2.4										
Meander Wave Length (ft)	167	263										
Meander Width Ratio	1.7	5.5										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4					
Channel Thalweg Length (ft)	2,369											
Sinuosity (ft)	1.24											
Water Surface Slope (ft/ft)	0.003											
Bankfull Slope (ft/ft)	0.003											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.4/3.6/7.4/52.3/139.4/362		1.0/8.0/16.7/50.6/90/1024		0.3/11.0/29.3/121.7/180/1024		SC/0.79/18.4/132.0/214.7/>2048					
% of Reach with Eroding Banks			6%		0%		6%					

Table 13b. Monitoring Data - Stream Reach Data Summary

Norkett Branch Stream Mitigation Site

DMS Project No. 95360

Monitoring Year 3 - 2016

Norkett Branch Reach 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	25.6	25.7	24.9	26.0	25.6	25.6	23.2	25.0				
Floodprone Width (ft)	>200		>200		>200		>200					
Bankfull Mean Depth	1.8	2.0	2.0	2.0	1.9	2.1	1.9	2.0				
Bankfull Max Depth	3.0	3.3	3.2	3.3	3.1	3.6	3.1	3.2				
Bankfull Cross-sectional Area (ft^2)	46.7	50.8	48.7	52.0	48.5	53.4	44.6	49.6				
Width/Depth Ratio	13.0	14.1	12.7	13.0	12.3	13.6	12.1	12.6				
Entrenchment Ratio	>2.2		>2.2		>2.2		>2.2					
Bank Height Ratio	1.0		1.0		1.0		1.0					
D50 (mm)	7.3	9.9	3.6	12.1	1.0	27.8	4.4	11.0				
Profile												
Riffle Length (ft)	19	111										
Riffle Slope (ft/ft)	0.0009	0.0163										
Pool Length (ft)	51	102										
Pool Max Depth (ft)	3.5	4.8										
Pool Spacing (ft)	98	172										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	38	155										
Radius of Curvature (ft)	40	64										
Rc:Bankfull Width (ft/ft)	1.6	2.5										
Meander Wave Length (ft)	181	277										
Meander Width Ratio	1.5	6.0										
Additional Reach Parameters												
Rosgen Classification	C4/E4		C4/E4		C4/E4		C4/E4					
Channel Thalweg Length (ft)	1,499											
Sinuosity (ft)	1.20											
Water Surface Slope (ft/ft)	0.003											
Bankfull Slope (ft/ft)	0.003											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	2.6/6.7/13.0/62.6/210.9/>2048		0.3/10.4/15.3/49.1/90/362		4.2/16/24.9/83.4/151.8/362		SC/6.7/17.6/52.6/101.2/256.0					
% of Reach with Eroding Banks			7%		5%		12%					

Table 13c. Monitoring Data - Stream Reach Data Summary
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

UT1

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	10.5		11.6		11.1		10.2					
Floodprone Width (ft)	136		136		138		131					
Bankfull Mean Depth	0.4		0.5		0.6		0.4					
Bankfull Max Depth	0.8		1.1		0.9		0.6					
Bankfull Cross-sectional Area (ft^2)	4.5		6.2		6.7		4.0					
Width/Depth Ratio	24.5		21.7		18.5		20.8					
Entrenchment Ratio	13.0		11.7		12.4		14.4					
Bank Height Ratio	1.0		1.0		1.0		1.0					
D50 (mm)	20.9		48.3		21.9		68.2					
Profile												
Riffle Length (ft)	7	39										
Riffle Slope (ft/ft)	0.007	0.044										
Pool Length (ft)	12	69										
Pool Max Depth (ft)	1.2	2.5										
Pool Spacing (ft)	30	58										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	13	49										
Radius of Curvature (ft)	14	23										
Rc:Bankfull Width (ft/ft)	1.3	2.2										
Meander Wave Length (ft)	61	88										
Meander Width Ratio	1.2	4.7										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4					
Channel Thalweg Length (ft)	1,198											
Sinuosity (ft)	1.20											
Water Surface Slope (ft/ft)	0.011											
Bankfull Slope (ft/ft)	0.011											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/1.0/12.7/55.3/90/256		SC/2.4/9.4/61.2/139.4/256.0		SC/0.1/8.6/82.6/139.4/256		SC/SC/5.6/49.8/107.3/>2048					
% of Reach with Eroding Banks			0%		0%		0%					

Table 13d. Monitoring Data - Stream Reach Data Summary
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

UT2 Reach 1

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	9.4		11.1		9.5		10.8					
Floodprone Width (ft)	144		151		155		147					
Bankfull Mean Depth	0.5		0.5		0.6		0.4					
Bankfull Max Depth	1.2		1.1		1.2		1.0					
Bankfull Cross-sectional Area (ft^2)	4.5		5.6		5.5		3.9					
Width/Depth Ratio	19.8		22.0		16.4		29.6					
Entrenchment Ratio	15.2		13.6		16.3		13.6					
Bank Height Ratio	1.0		1.0		1.0		1.0					
D50 (mm)	19.5		32.0		37.9		49.8					
Profile												
Riffle Length (ft)	7	34										
Riffle Slope (ft/ft)	0.006	0.037										
Pool Length (ft)	11	35										
Pool Max Depth (ft)	1.5	2.6										
Pool Spacing (ft)	21	64										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	10	42										
Radius of Curvature (ft)	15	21										
Rc:Bankfull Width (ft/ft)	1.6	2.2										
Meander Wave Length (ft)	45	92										
Meander Width Ratio	1.0	4.4										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4					
Channel Thalweg Length (ft)	1,039											
Sinuosity (ft)	1.20											
Water Surface Slope (ft/ft)	0.006											
Bankfull Slope (ft/ft)	0.006											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/7.1/12.2/28.5/42.9/90		SC/12/20.6/58.1/111.2/256		SC/5.6/16.7/57.4/107.3/362		SC/0.25/12.9/69.7/120.7/362.0					
% of Reach with Eroding Banks			0%		0%		0%					

Table 13e. Monitoring Data - Stream Reach Data Summary
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

UT2 Reach 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	9.0	9.6	9.5	10.5	9.1	11.5	8.9	11.9				
Floodprone Width (ft)	>200		>200		>200		>200					
Bankfull Mean Depth	0.5	0.6	0.7	0.7	0.7	0.8	0.6	0.7				
Bankfull Max Depth	1.1	1.2	1.2	1.4	1.2	1.3	1.1	1.6				
Bankfull Cross-sectional Area (ft^2)	5.2	5.3	7.1	7.6	6.4	8.7	5.6	8.8				
Width/Depth Ratio	15.3	17.6	12.8	14.5	13.0	15.4	14.1	15.9				
Entrenchment Ratio	>2.2		>2.2		>2.2		>2.2					
Bank Height Ratio	1.0		1.0		1.0		1.0					
D50 (mm)	20.1	27.4	41.3	50.6	39.0	39.3	35.4	51.4				
Profile												
Riffle Length (ft)	6	27										
Riffle Slope (ft/ft)	0.009	0.039										
Pool Length (ft)	11	45										
Pool Max Depth (ft)	1.5	2.5										
Pool Spacing (ft)	22	71										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	12	52										
Radius of Curvature (ft)	14	22										
Rc:Bankfull Width (ft/ft)	1.6	2.3										
Meander Wave Length (ft)	44	83										
Meander Width Ratio	1.3	5.4										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4					
Channel Thalweg Length (ft)	1,440											
Sinuosity (ft)	1.30											
Water Surface Slope (ft/ft)	0.007											
Bankfull Slope (ft/ft)	0.007											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	2.4/11.6/20.7/56.1/86.7/180		8.5/20.1/32/90/160.7/512		0.3/18.4/45/119.3/196.6/1024		SC/SC/SC/73.4/118.9/180.0					
% of Reach with Eroding Banks			0%		0%		0%					

Table 13f. Monitoring Data - Stream Reach Data Summary
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

UT2 Reach 3A

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	10.5		11.1		10.1		10.5					
Floodprone Width (ft)	>200		>200		>200		>200					
Bankfull Mean Depth	0.7		0.7		0.7		0.9					
Bankfull Max Depth	1.2		1.3		1.4		1.5					
Bankfull Cross-sectional Area (ft^2)	7.2		7.6		7.6		9.3					
Width/Depth Ratio	15.3		16.2		13.6		11.9					
Entrenchment Ratio	>2.2		>2.2		>2.2		>2.2					
Bank Height Ratio	1.0		1.0		1.0		1.0					
D50 (mm)	32.0		45.0		25.7		40.8					
Profile												
Riffle Length (ft)	8	25										
Riffle Slope (ft/ft)	0.010	0.046										
Pool Length (ft)	10	42										
Pool Max Depth (ft)	1.77	2.98										
Pool Spacing (ft)	26	66										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	8	37										
Radius of Curvature (ft)	14	27										
Rc:Bankfull Width (ft/ft)	1.3	2.6										
Meander Wave Length (ft)	58	88										
Meander Width Ratio	0.8	3.5										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4					
Channel Thalweg Length (ft)	658											
Sinuosity (ft)	1.20											
Water Surface Slope (ft/ft)	0.003											
Bankfull Slope (ft/ft)	0.002											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	22.6/27.4/32/53.7/69.7/128		16.0/30.3/41.5/87.0/202.4/362.0		6.7/24.8/40.6/116.3/173.3/1024		12.8/27.8/41.3/85.7/128.0/180.0					
% of Reach with Eroding Banks			0%		0%		0%					

Table 13g. Monitoring Data - Stream Reach Data Summary
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

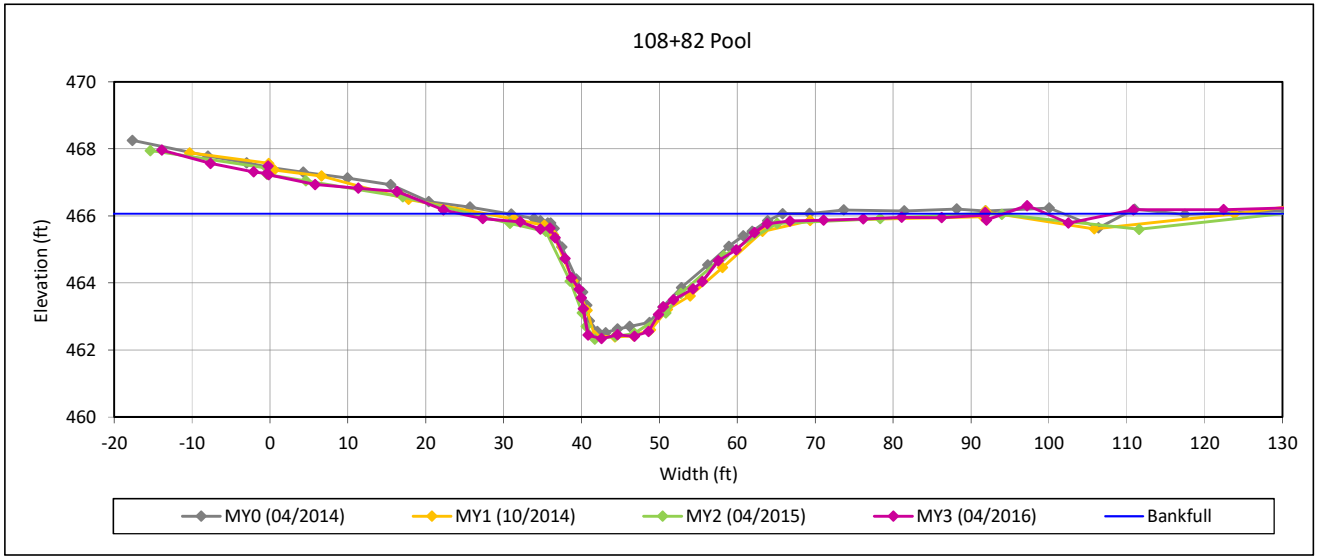
UT2 Reach 3B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	13.9		12.6		14.3		13.6					
Floodprone Width (ft)	130		130		146		132					
Bankfull Mean Depth	0.8		1.2		1.0		0.9					
Bankfull Max Depth	1.6		1.8		1.8		1.7					
Bankfull Cross-sectional Area (ft^2)	11.8		14.9		14.3		12.6					
Width/Depth Ratio	16.5		10.6		14.4		14.7					
Entrenchment Ratio	9.3		10.3		10.2		9.7					
Bank Height Ratio	1.0		1.0		1.0		1.0					
D50 (mm)	33.4		30.6		68.5		48.3					
Profile												
Riffle Length (ft)	13	28										
Riffle Slope (ft/ft)	0.001	0.024										
Pool Length (ft)	32	45										
Pool Max Depth (ft)	2.45	3.32										
Pool Spacing (ft)	38	72										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	20	61										
Radius of Curvature (ft)	24	31										
Rc:Bankfull Width (ft/ft)	1.7	2.2										
Meander Wave Length (ft)	87	105										
Meander Width Ratio	1.4	4.4										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4					
Channel Thalweg Length (ft)	658											
Sinuosity (ft)	1.20											
Water Surface Slope (ft/ft)	0.003											
Bankfull Slope (ft/ft)	0.002											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/4.9/13.3/67.2/89.9/128		SC/4.5/14.8/60.0/98.3/180.0		SC/0.7/12.7/71.7/128/362		SC/SC/SC/60.4/107.3/180.0					
% of Reach with Eroding Banks			3%		0%		0%					

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 1-Norkett Branch Reach 1



Bankfull Dimensions

64.3	x-section area (ft.sq.)
29.1	width (ft)
2.2	mean depth (ft)
3.7	max depth (ft)
30.6	wetted parimeter (ft)
2.1	hyd radi (ft)
13.2	width-depth ratio

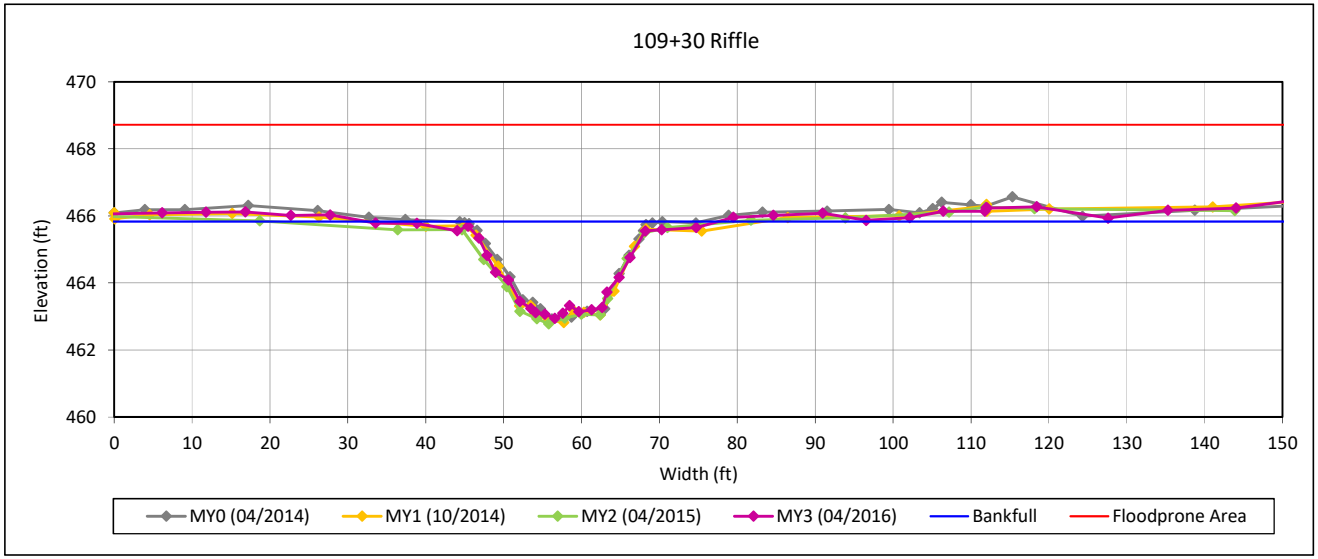
Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 2-Norkett Branch Reach 1



Bankfull Dimensions

44.1	x-section area (ft.sq.)
22.8	width (ft)
1.9	mean depth (ft)
2.9	max depth (ft)
23.8	wetted parimeter (ft)
1.9	hyd radi (ft)
11.8	width-depth ratio
>200	W flood prone area (ft)
8.8	entrenchment ratio
1.0	low bank height ratio

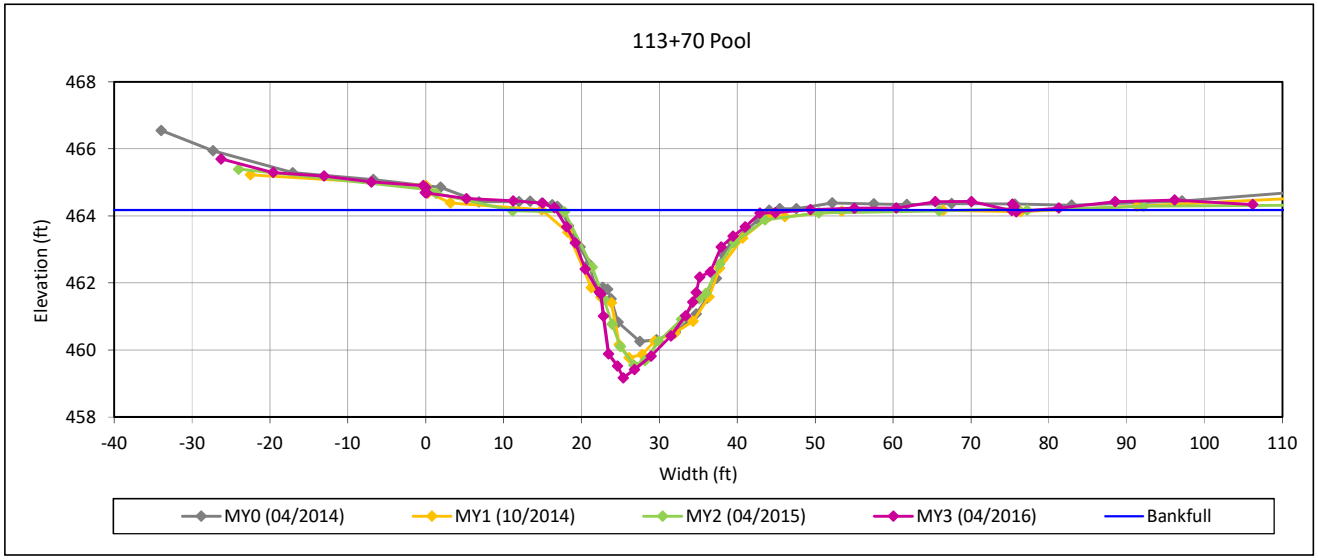
Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 3-Norkett Branch Reach 1



Bankfull Dimensions

64.9	x-section area (ft.sq.)
24.3	width (ft)
2.7	mean depth (ft)
5.0	max depth (ft)
26.8	wetted parimeter (ft)
2.4	hyd radi (ft)
9.1	width-depth ratio

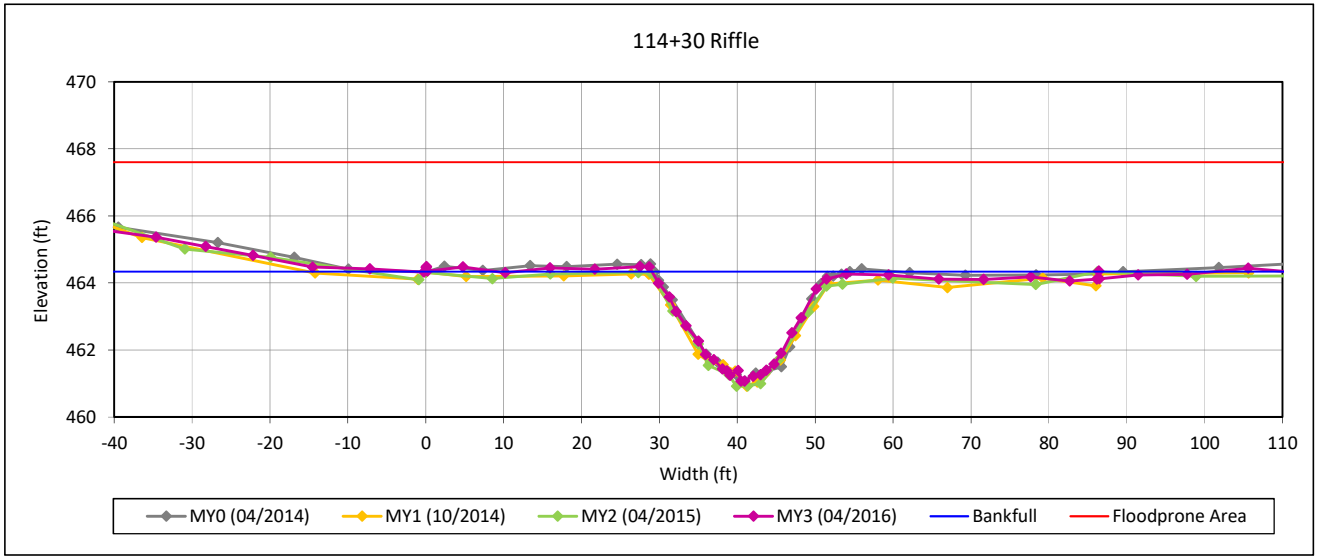
Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 4-Norkett Branch Reach 1



Bankfull Dimensions

44.0	x-section area (ft.sq.)
22.4	width (ft)
2.0	mean depth (ft)
3.3	max depth (ft)
23.6	wetted parimeter (ft)
1.9	hyd radi (ft)
11.4	width-depth ratio
>200	W flood prone area (ft)
8.9	entrenchment ratio
1.0	low bank height ratio

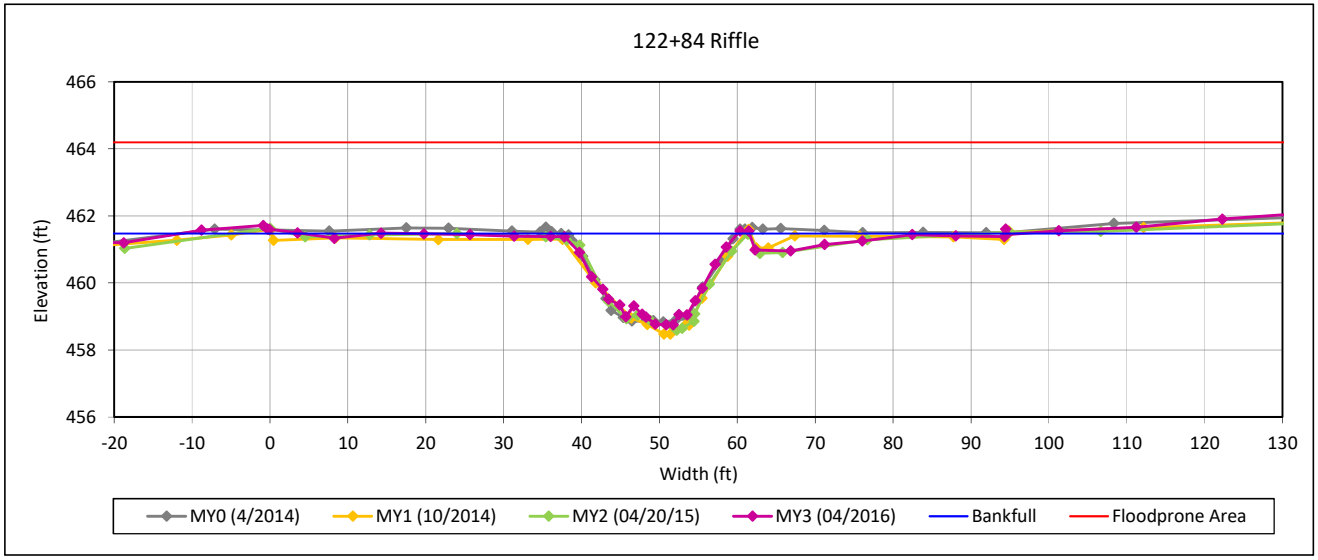
Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 5-Norkett Branch Reach 1



Bankfull Dimensions

37.4	x-section area (ft.sq.)
22.3	width (ft)
1.7	mean depth (ft)
2.7	max depth (ft)
23.3	wetted parimeter (ft)
1.6	hyd radi (ft)
13.2	width-depth ratio
>200	W flood prone area (ft)
9.0	entrenchment ratio
1.0	low bank height ratio

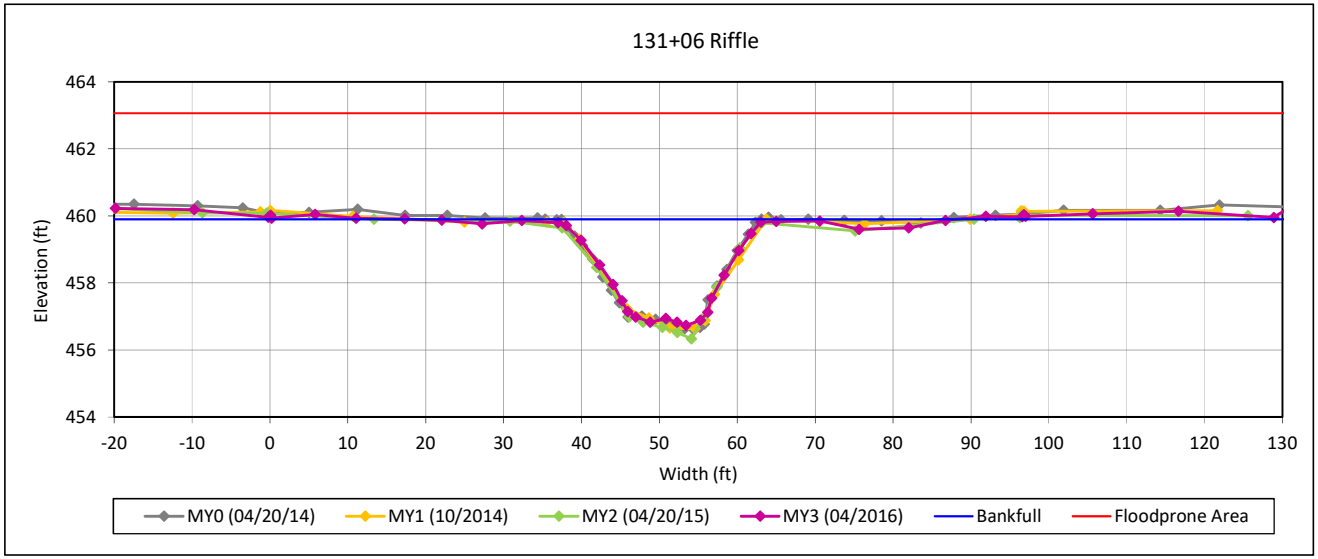
Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 6-Norkett Branch Reach 2



Bankfull Dimensions

49.6	x-section area (ft.sq.)
25.0	width (ft)
2.0	mean depth (ft)
3.2	max depth (ft)
26.1	wetted parimeter (ft)
1.9	hyd radi (ft)
12.6	width-depth ratio
>200	W flood prone area (ft)
8.0	entrenchment ratio
1.0	low bank height ratio

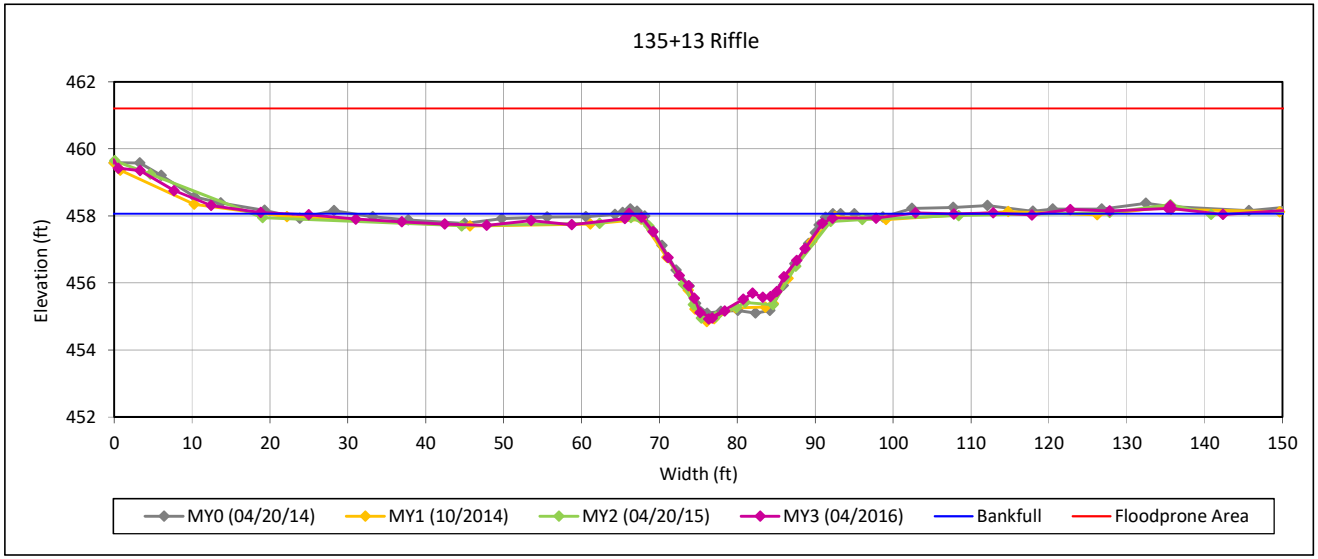
Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 7-Norkett Branch Reach 2



Bankfull Dimensions

44.6	x-section area (ft.sq.)
23.2	width (ft)
1.9	mean depth (ft)
3.1	max depth (ft)
28.3	wetted parimeter (ft)
1.6	hyd radi (ft)
12.1	width-depth ratio
>200	W flood prone area (ft)
8.6	entrenchment ratio
1.0	low bank height ratio

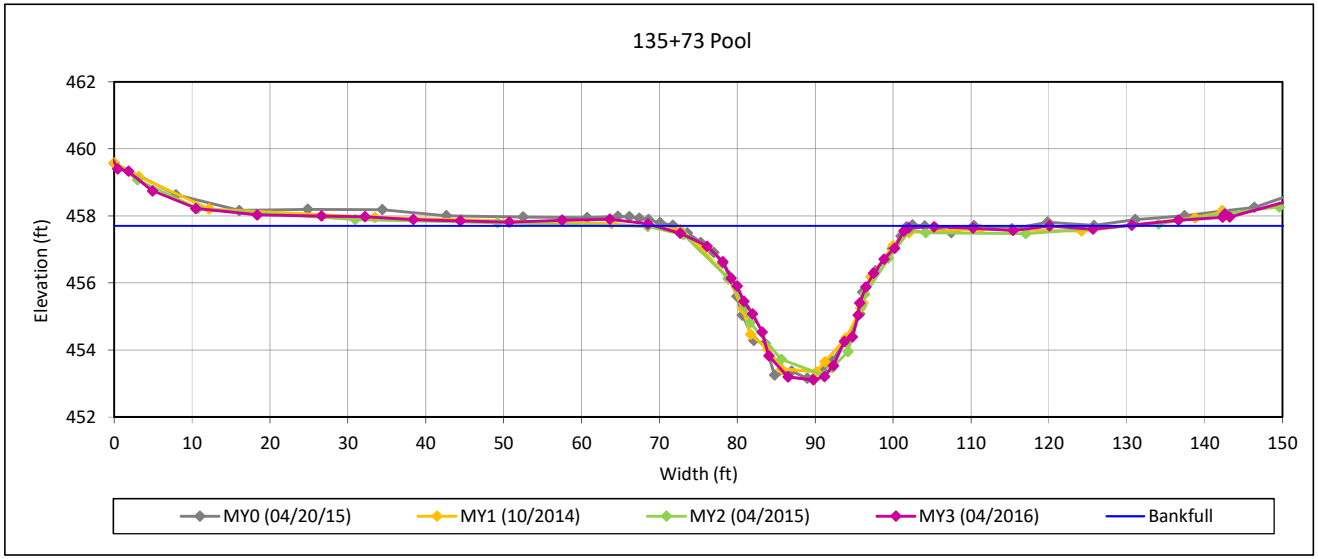
Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 8-Norkett Branch Reach 2



Bankfull Dimensions

64.9	x-section area (ft.sq.)
26.1	width (ft)
2.5	mean depth (ft)
4.6	max depth (ft)
27.4	wetted parimeter (ft)
2.4	hyd radi (ft)
10.5	width-depth ratio

Survey Date: 04/2016
Field Crew: Wildlands Engineering

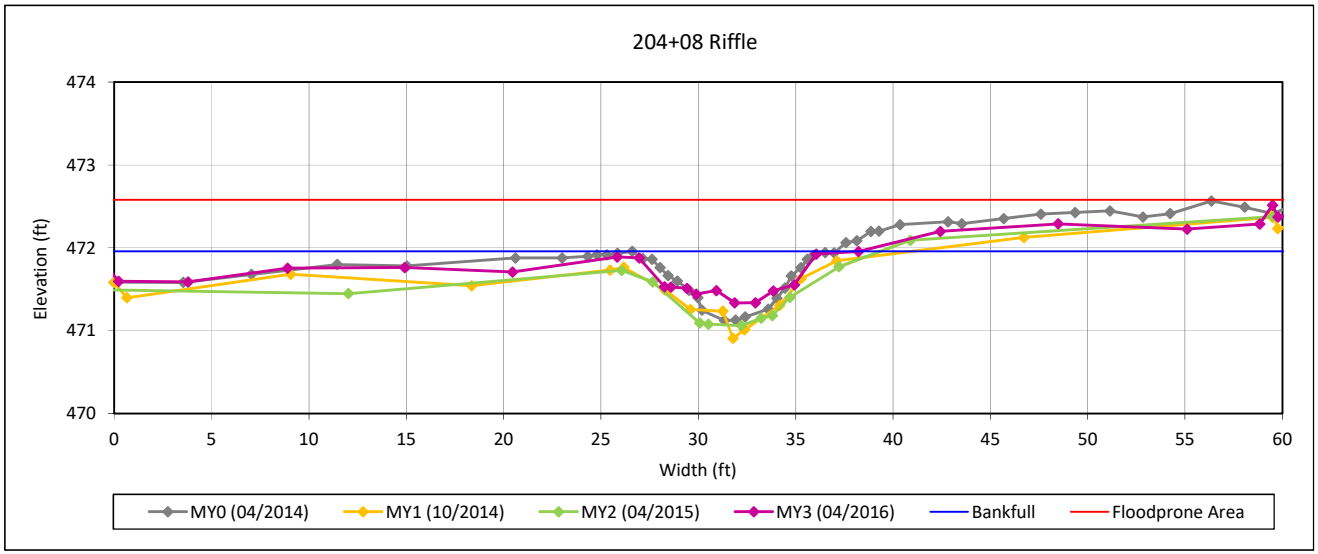
View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360

Monitoring Year 3 - 2016

Cross Section 9-UT1



Bankfull Dimensions

4.0	x-section area (ft.sq.)
10.2	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
10.3	wetted parimeter (ft)
0.4	hyd radi (ft)
25.7	width-depth ratio
131.2	W flood prone area (ft)
12.9	entrenchment ratio
1.0	low bank height ratio

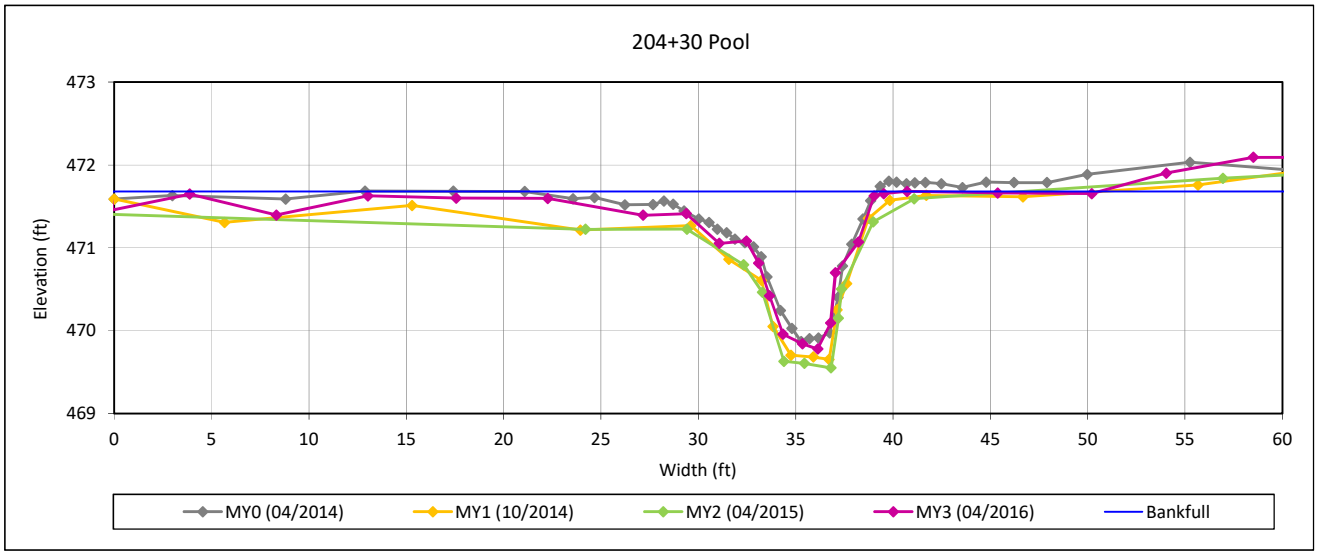
Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 10-UT1



Bankfull Dimensions

10.3	x-section area (ft.sq.)
13.5	width (ft)
0.8	mean depth (ft)
1.9	max depth (ft)
14.5	wetted parimeter (ft)
0.7	hyd radi (ft)
17.7	width-depth ratio

Survey Date: 04/2016
Field Crew: Wildlands Engineering

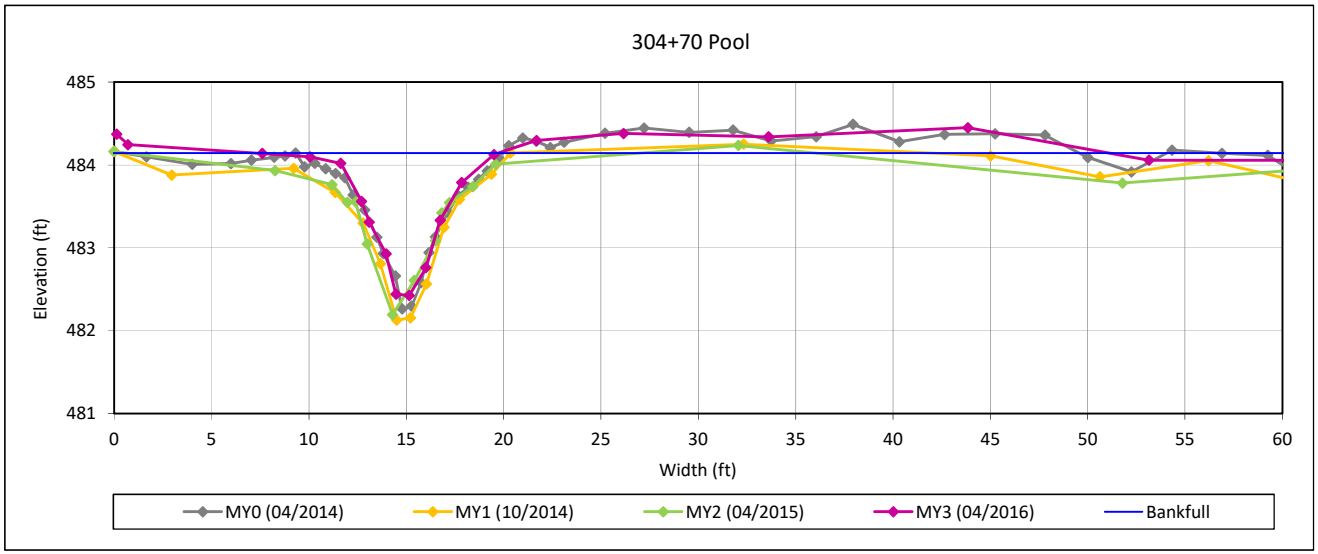
View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360

Monitoring Year 3 - 2016

Cross Section 11-UT2 Reach 1



Bankfull Dimensions

6.7	x-section area (ft.sq.)
12.1	width (ft)
0.6	mean depth (ft)
1.7	max depth (ft)
13.0	wetted parimeter (ft)
0.5	hyd radi (ft)
21.9	width-depth ratio

Survey Date: 04/2016
Field Crew: Wildlands Engineering

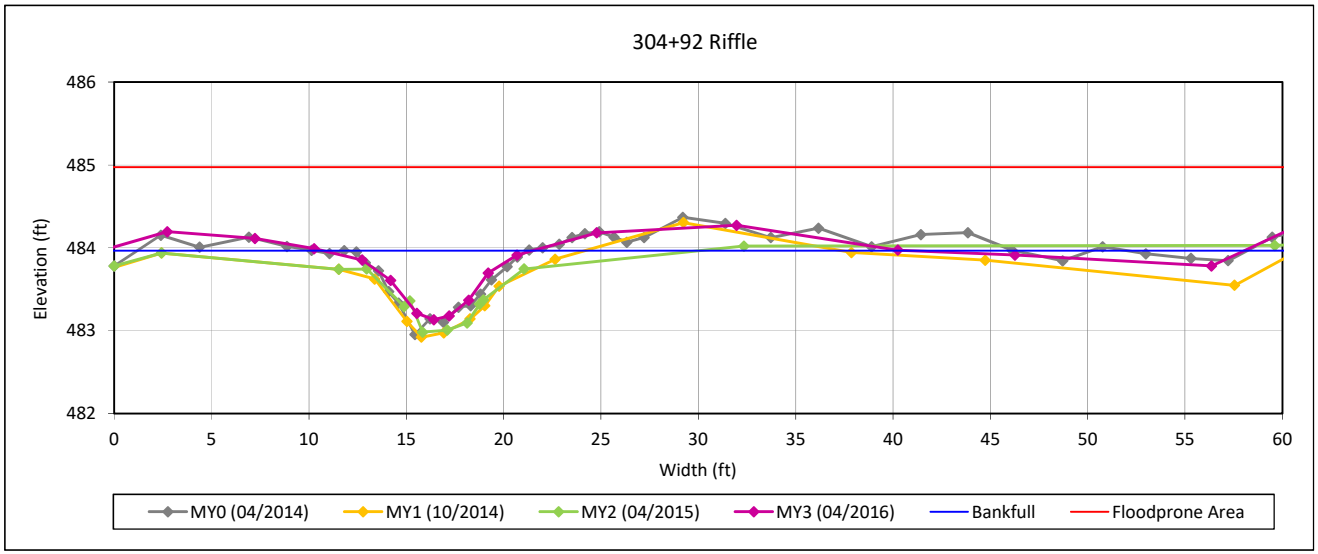
View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360

Monitoring Year 3 - 2016

Cross Section 12-UT2 Reach 1



Bankfull Dimensions

3.9	x-section area (ft.sq.)
10.8	width (ft)
0.4	mean depth (ft)
1.0	max depth (ft)
11.0	wetted parimeter (ft)
0.4	hyd radi (ft)
29.6	width-depth ratio
146.5	W flood prone area (ft)
13.6	entrenchment ratio
1.0	low bank height ratio

Survey Date: 04/2016
Field Crew: Wildlands Engineering

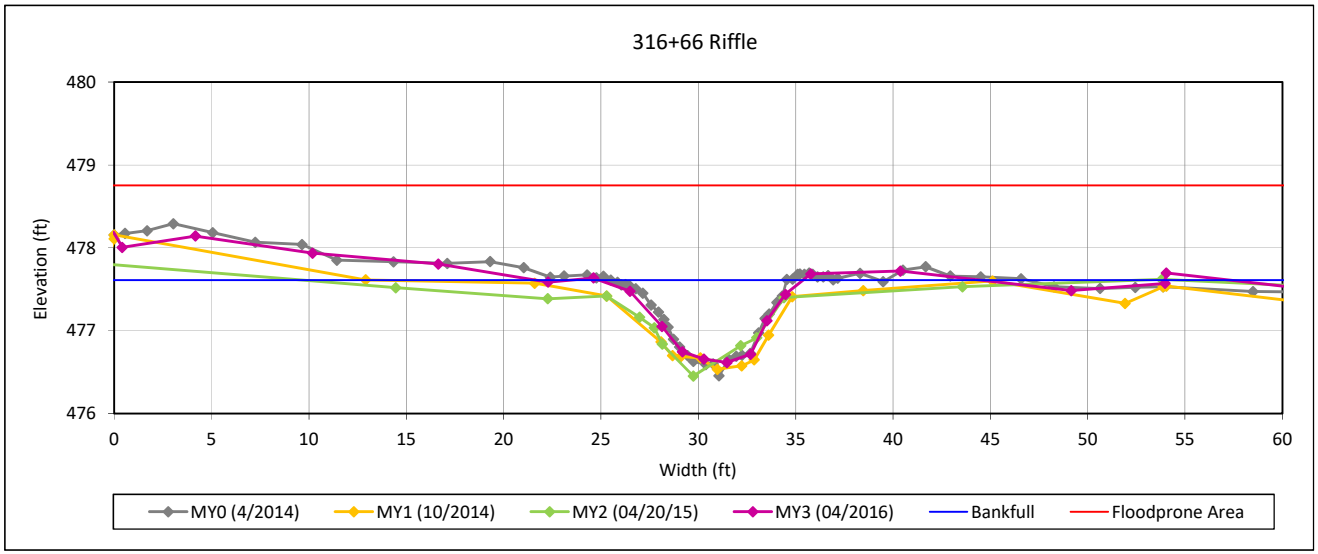
View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360

Monitoring Year 3 - 2016

Cross Section 13-UT2 Reach 2



Bankfull Dimensions

5.6	x-section area (ft.sq.)
8.9	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
9.2	wetted parimeter (ft)
0.6	hyd radi (ft)
14.1	width-depth ratio
>200	W flood prone area (ft)
22.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 04/2016
Field Crew: Wildlands Engineering

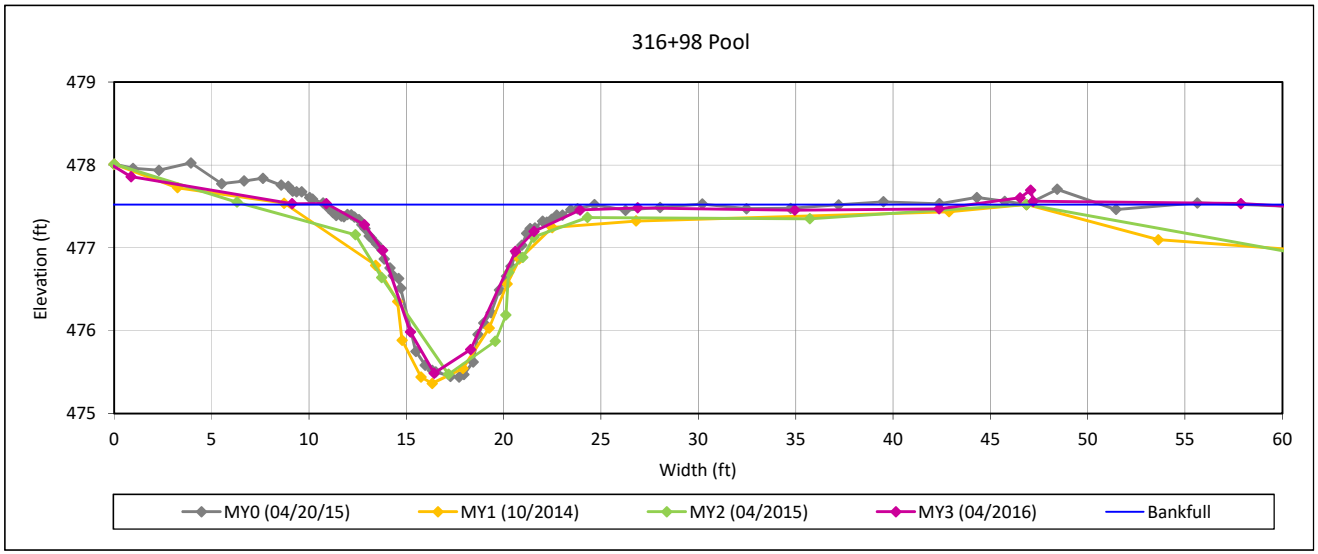
View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360

Monitoring Year 3 - 2016

Cross Section 14-UT2 Reach 2



Bankfull Dimensions

11.3	x-section area (ft.sq.)
12.9	width (ft)
0.9	mean depth (ft)
2.0	max depth (ft)
13.8	wetted parimeter (ft)
0.8	hyd radi (ft)
14.7	width-depth ratio

Survey Date: 04/2016
Field Crew: Wildlands Engineering

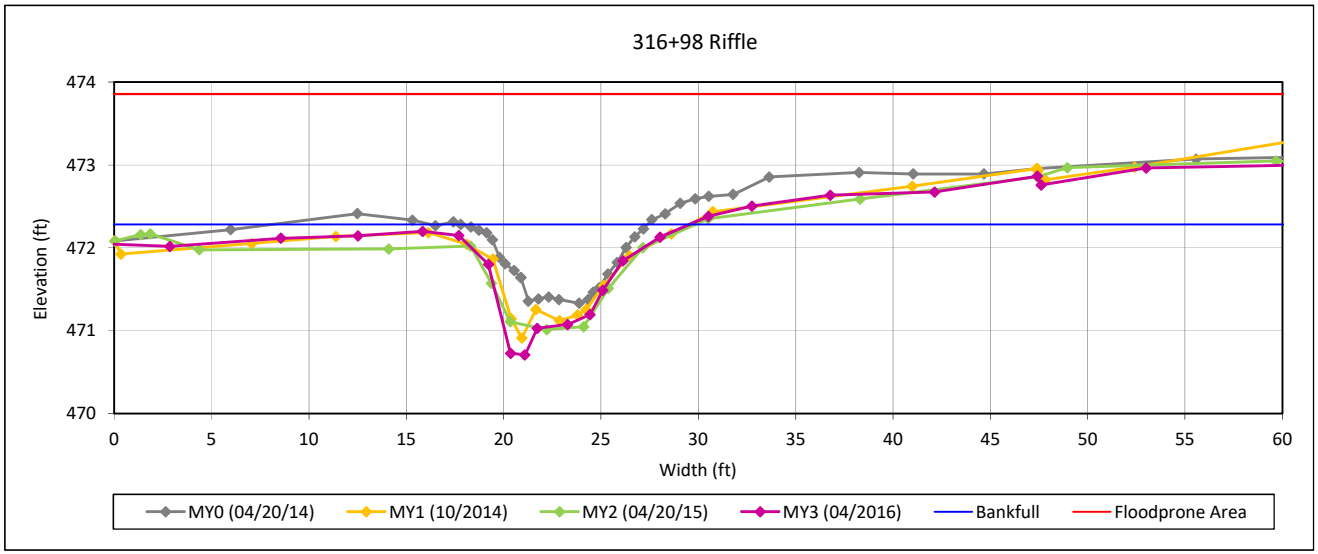
View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360

Monitoring Year 3 - 2016

Cross Section 15-UT2 Reach 2



Bankfull Dimensions

8.8	x-section area (ft.sq.)
11.9	width (ft)
0.7	mean depth (ft)
1.6	max depth (ft)
12.6	wetted parimeter (ft)
0.7	hyd radi (ft)
15.9	width-depth ratio
>200	W flood prone area (ft)
16.9	entrenchment ratio
1.0	low bank height ratio

Survey Date: 04/2016
Field Crew: Wildlands Engineering

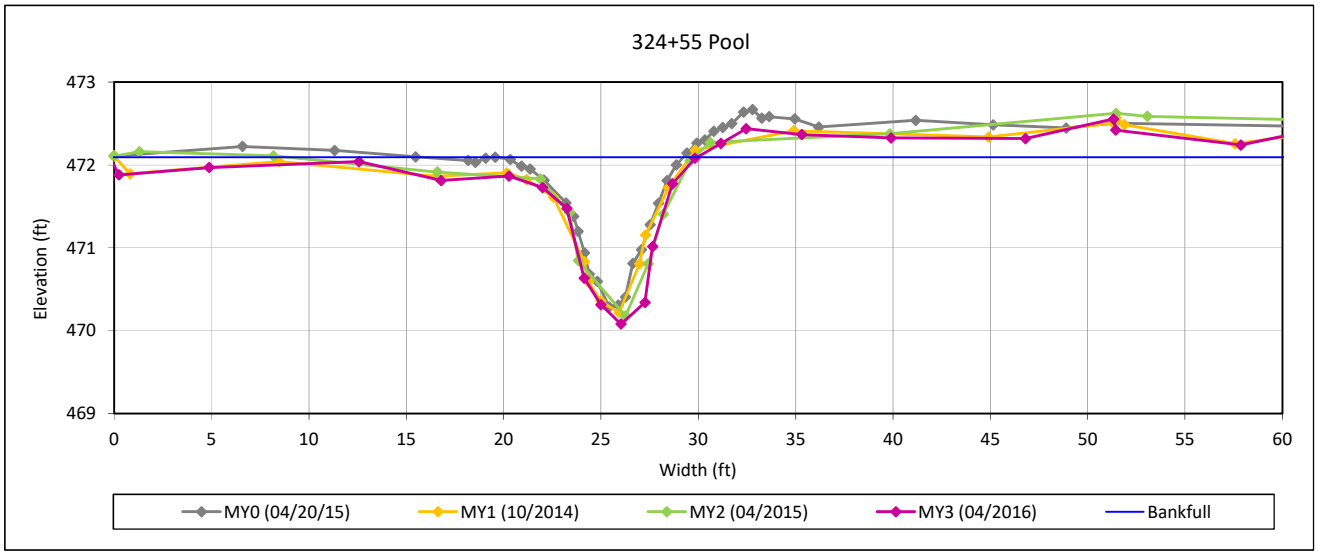
View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360

Monitoring Year 3 - 2016

Cross Section 16-UT2 Reach 2



Bankfull Dimensions

9.2	x-section area (ft.sq.)
9.6	width (ft)
1.0	mean depth (ft)
2.0	max depth (ft)
10.8	wetted parimeter (ft)
0.9	hyd radi (ft)
10.1	width-depth ratio

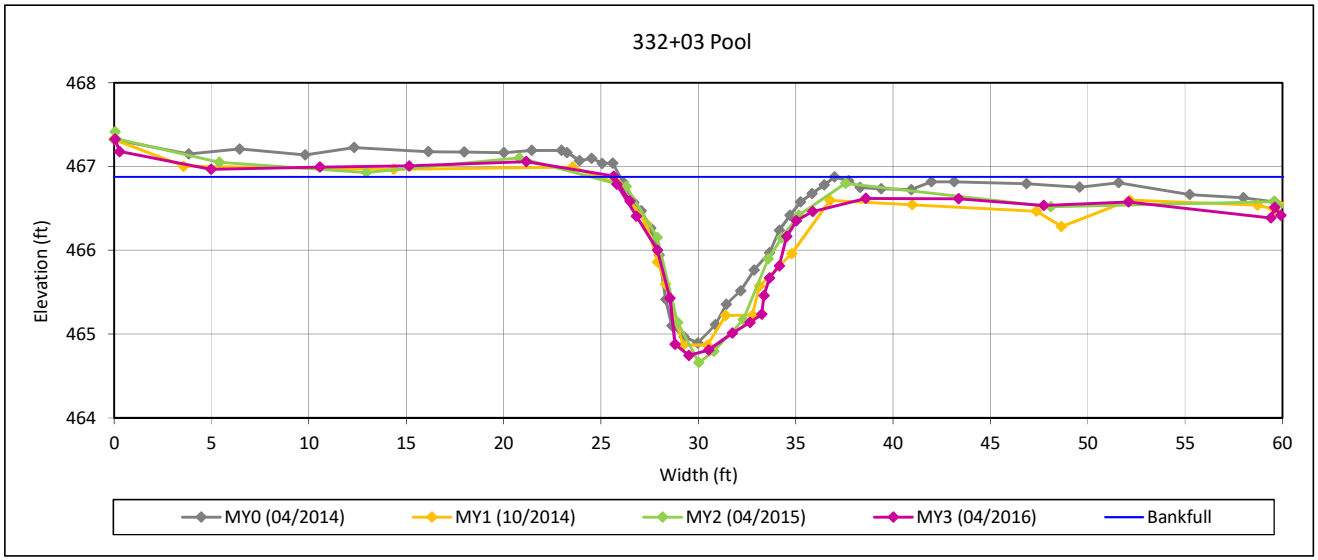
Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 17-UT2 Reach 3A



Bankfull Dimensions

13.0	x-section area (ft.sq.)
10.1	width (ft)
1.3	mean depth (ft)
2.1	max depth (ft)
11.2	wetted parimeter (ft)
1.2	hyd radi (ft)
7.8	width-depth ratio

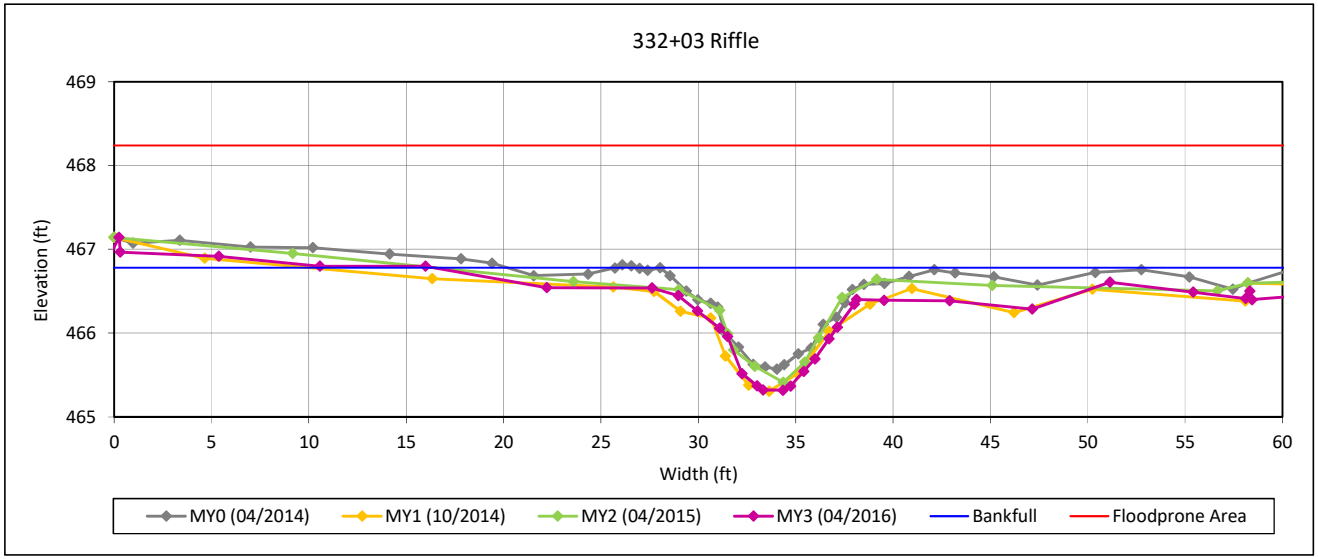
Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 18-UT2 Reach 3A



Bankfull Dimensions

9.3	x-section area (ft.sq.)
10.5	width (ft)
0.9	mean depth (ft)
1.5	max depth (ft)
10.9	wetted parimeter (ft)
0.9	hyd radi (ft)
11.9	width-depth ratio
>200	W flood prone area (ft)
19.0	entrenchment ratio
1.0	low bank height ratio

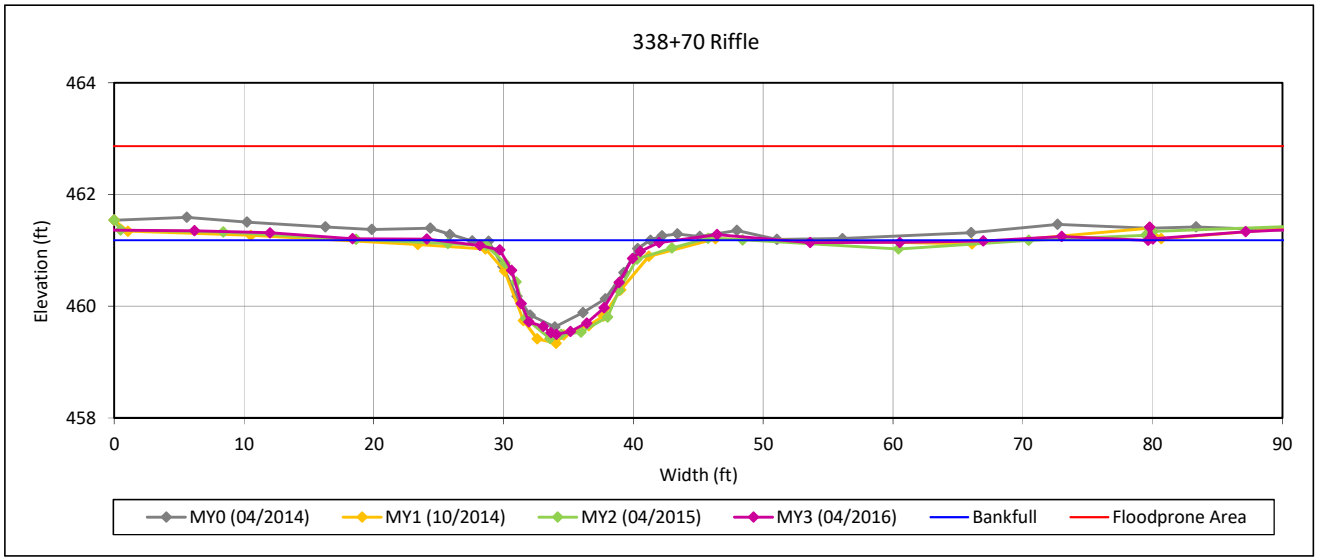
Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 19-UT2 Reach 3B



Bankfull Dimensions

12.6	x-section area (ft.sq.)
13.6	width (ft)
0.9	mean depth (ft)
1.7	max depth (ft)
14.2	wetted parimeter (ft)
0.9	hyd radi (ft)
14.7	width-depth ratio
131.9	W flood prone area (ft)
9.7	entrenchment ratio
1.0	low bank height ratio

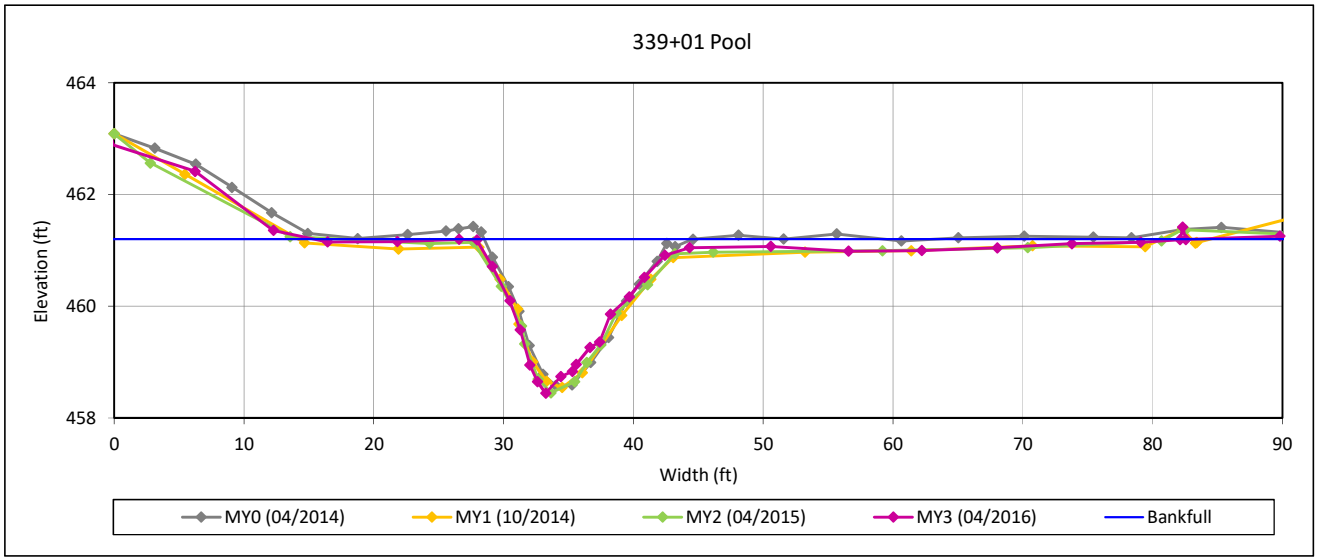
Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Norkett Branch Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Cross Section 20-UT2 Reach 3B



Bankfull Dimensions

21.3	x-section area (ft.sq.)
14.5	width (ft)
1.5	mean depth (ft)
2.8	max depth (ft)
15.6	wetted parimeter (ft)
1.4	hyd radi (ft)
9.8	width-depth ratio

Survey Date: 04/2016
Field Crew: Wildlands Engineering

View Downstream

Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

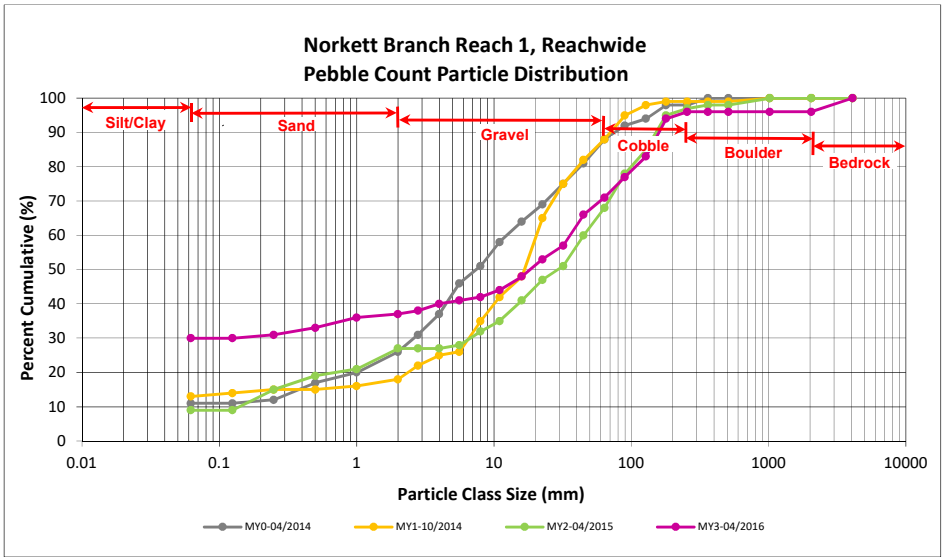
DMS Project No. 95360

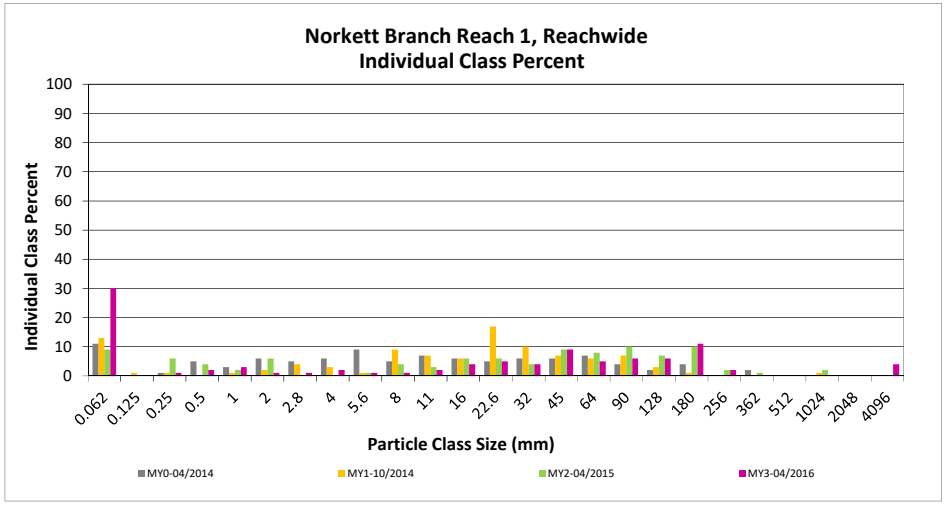
Monitoring Year 3 - 2016

Norkett Branch Reach 1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	10	20	30	30	30
SAND	Very fine	0.062	0.125					30
	Fine	0.125	0.250		1	1	1	31
	Medium	0.25	0.50	2		2	2	33
	Coarse	0.5	1.0		3	3	3	36
	Very Coarse	1.0	2.0		1	1	1	37
GRAVEL	Very Fine	2.0	2.8	1		1	1	38
	Very Fine	2.8	4.0	1	1	2	2	40
	Fine	4.0	5.6		1	1	1	41
	Fine	5.6	8.0		1	1	1	42
	Medium	8.0	11.0	1	1	2	2	44
	Medium	11.0	16.0	2	2	4	4	48
	Coarse	16.0	22.6	3	2	5	5	53
	Coarse	22.6	32	1	3	4	4	57
	Very Coarse	32	45	4	5	9	9	66
	Very Coarse	45	64	4	1	5	5	71
COBBLE	Small	64	90	4	2	6	6	77
	Small	90	128	5	1	6	6	83
	Large	128	180	10	1	11	11	94
	Large	180	256	2		2	2	96
BOULDER	Small	256	362					96
	Small	362	512					96
	Medium	512	1024					96
	Large/Very Large	1024	2048					96
BEDROCK	Bedrock	2048	>2048		4	4	4	100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.79
D_{50} =	18.4
D_{84} =	132.0
D_{95} =	214.7
D_{100} =	>2048





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

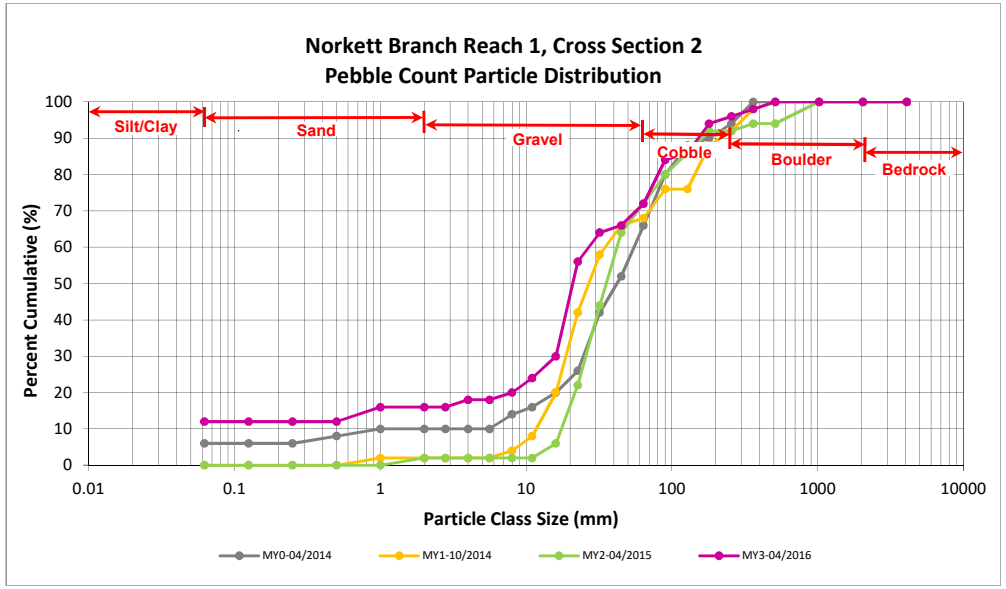
DMS Project No. 95360

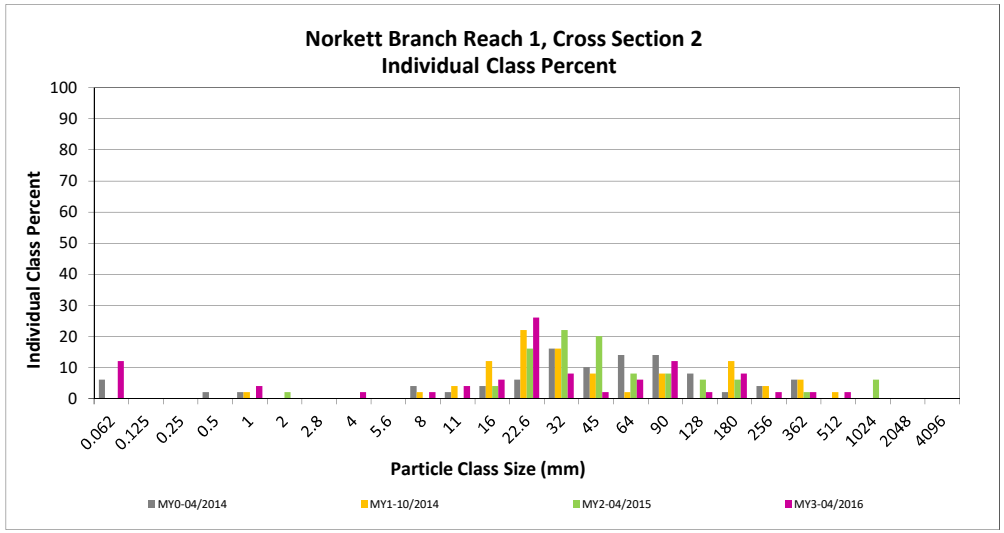
Monitoring Year 3 - 2016

Norkett Branch Reach 1, Cross Section 2

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	12	12	12
SAND	Very fine	0.062	0.125			12
	Fine	0.125	0.250			12
	Medium	0.25	0.50			12
	Coarse	0.5	1.0	4	4	16
	Very Coarse	1.0	2.0			16
GRAVEL	Very Fine	2.0	2.8			16
	Very Fine	2.8	4.0	2	2	18
	Fine	4.0	5.6			18
	Fine	5.6	8.0	2	2	20
	Medium	8.0	11.0	4	4	24
	Medium	11.0	16.0	6	6	30
	Coarse	16.0	22.6	26	26	56
	Coarse	22.6	32	8	8	64
	Very Coarse	32	45	2	2	66
	Very Coarse	45	64	6	6	72
COBBLE	Small	64	90	12	12	84
	Small	90	128	2	2	86
	Large	128	180	8	8	94
	Large	180	256	2	2	96
BOULDER	Small	256	362	2	2	98
	Small	362	512	2	2	100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 2	
Channel materials (mm)	
D_{16} =	1.00
D_{35} =	17.10
D_{50} =	20.9
D_{84} =	90.0
D_{95} =	214.7
D_{100} =	512.0





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

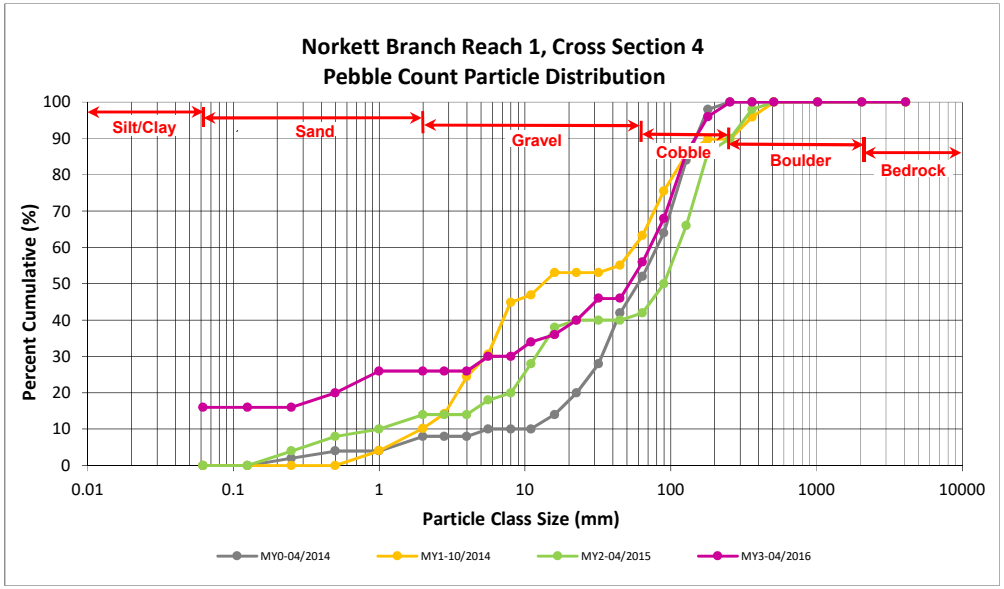
DMS Project No. 95360

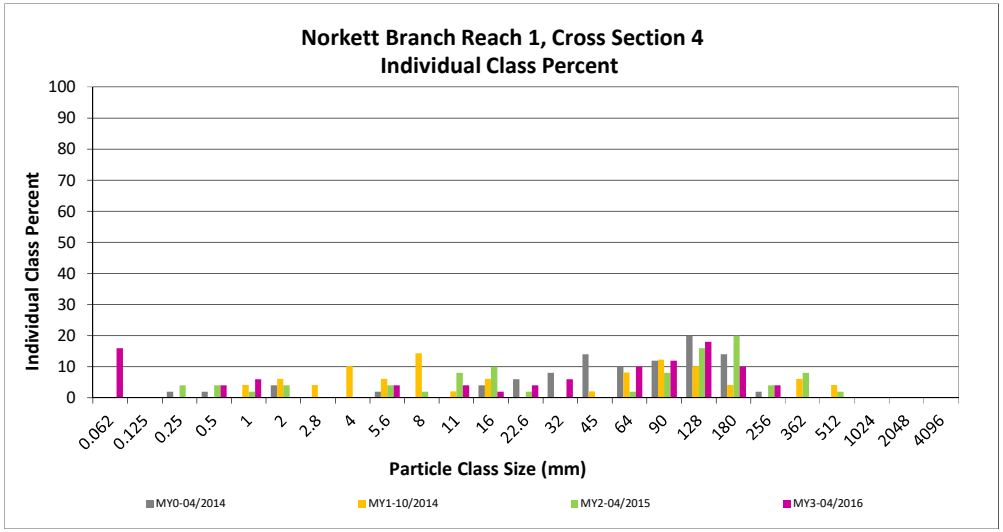
Monitoring Year 3 - 2016

Norkett Branch Reach 1, Cross Section 4

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	16	16	16
SAND	Very fine	0.062	0.125			16
	Fine	0.125	0.250			16
	Medium	0.25	0.50	4	4	20
	Coarse	0.5	1.0	6	6	26
	Very Coarse	1.0	2.0			26
GRAVEL	Very Fine	2.0	2.8			26
	Very Fine	2.8	4.0			26
	Fine	4.0	5.6	4	4	30
	Fine	5.6	8.0			30
	Medium	8.0	11.0	4	4	34
	Medium	11.0	16.0	2	2	36
	Coarse	16.0	22.6	4	4	40
	Coarse	22.6	32	6	6	46
	Very Coarse	32	45			46
	Very Coarse	45	64	10	10	56
COBBLE	Small	64	90	12	12	68
	Small	90	128	18	18	86
	Large	128	180	10	10	96
	Large	180	256	4	4	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 4	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	13.27
D_{50} =	51.8
D_{84} =	123.1
D_{95} =	174.0
D_{100} =	256.0





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

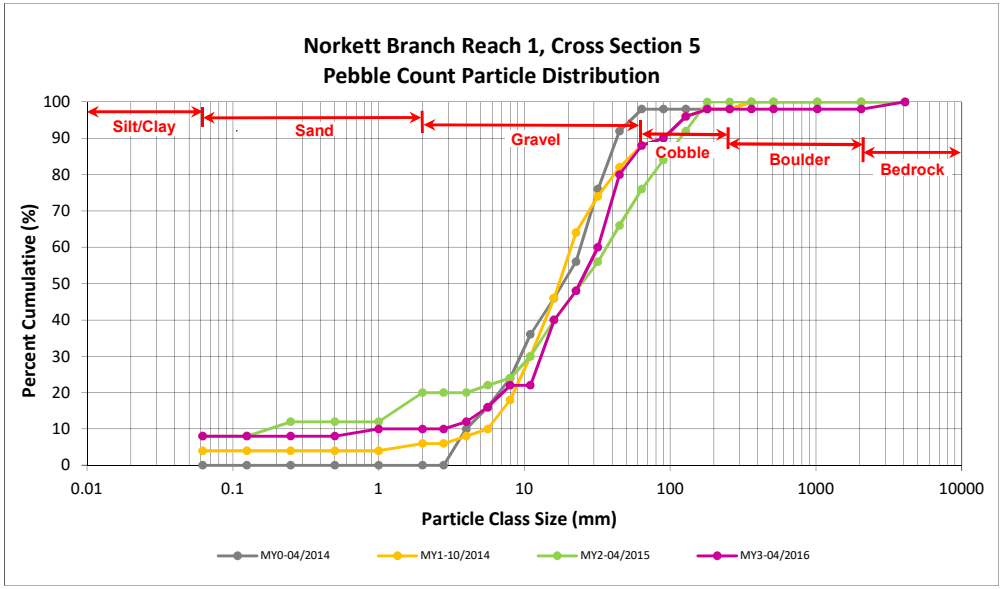
DMS Project No. 95360

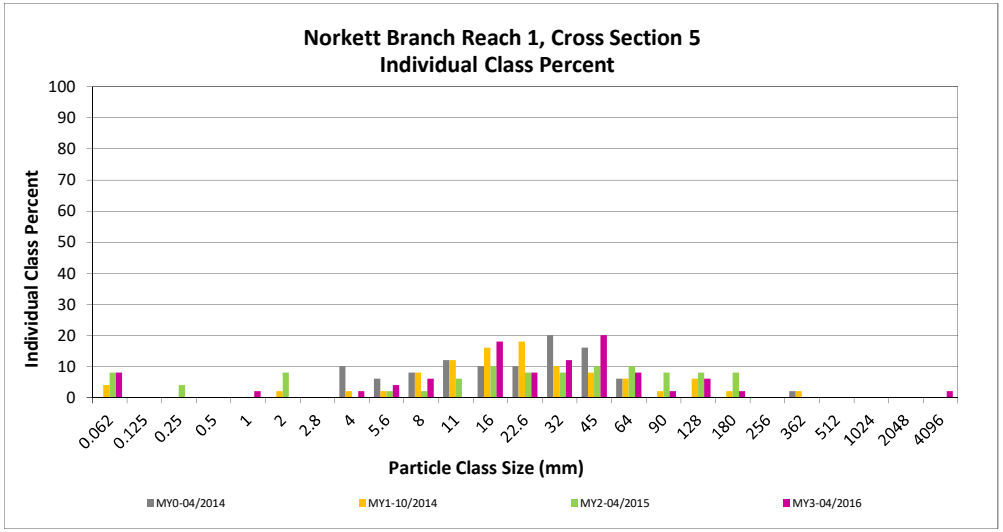
Monitoring Year 3 - 2016

Norkett Branch Reach 1, Cross Section 5

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	8	8	8
SAND	Very fine	0.062	0.125			8
	Fine	0.125	0.250			8
	Medium	0.25	0.50			8
	Coarse	0.5	1.0	2	2	10
	Very Coarse	1.0	2.0			10
GRAVEL	Very Fine	2.0	2.8			10
	Very Fine	2.8	4.0	2	2	12
	Fine	4.0	5.6	4	4	16
	Fine	5.6	8.0	6	6	22
	Medium	8.0	11.0			22
	Medium	11.0	16.0	18	18	40
	Coarse	16.0	22.6	8	8	48
	Coarse	22.6	32	12	12	60
	Very Coarse	32	45	20	20	80
	Very Coarse	45	64	8	8	88
COBBLE	Small	64	90	2	2	90
	Small	90	128	6	6	96
	Large	128	180	2	2	98
	Large	180	256			98
BOULDER	Small	256	362			98
	Small	362	512			98
	Medium	512	1024			98
	Large/Very Large	1024	2048			98
BEDROCK	Bedrock	2048	>2048	2	2	100
			Total	**100**	**100**	**100**

Cross Section 5	
Channel materials (mm)	
D_{16} =	5.60
D_{35} =	14.42
D_{50} =	23.9
D_{84} =	53.7
D_{95} =	120.7
D_{100} =	>2048





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

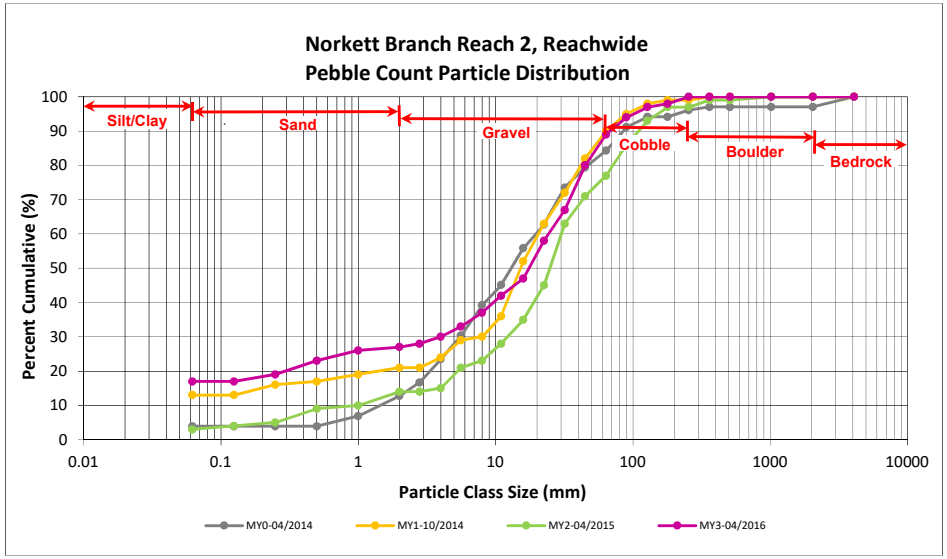
DMS Project No. 95360

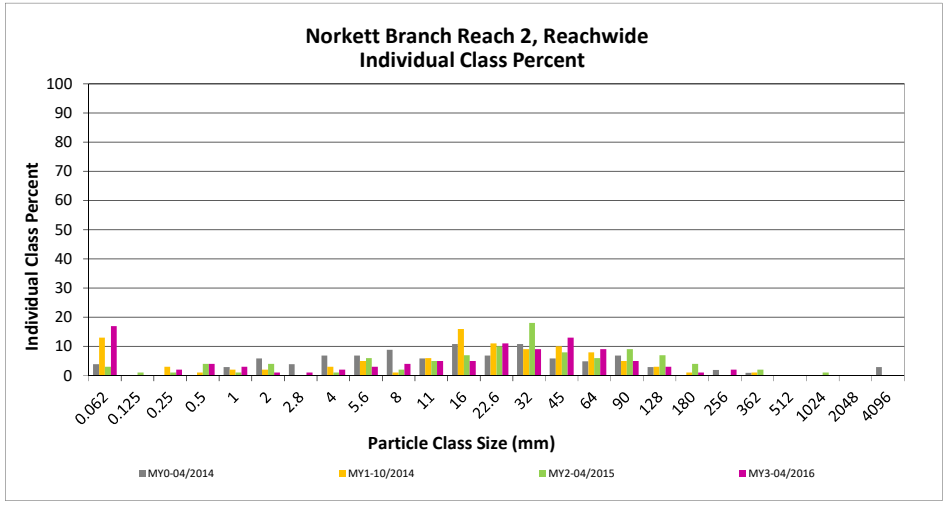
Monitoring Year 3 - 2016

Norkett Branch Reach 2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	7	10	17	17	17
SAND	Very fine	0.062	0.125					17
	Fine	0.125	0.250	1	1	2	2	19
	Medium	0.25	0.50	3	1	4	4	23
	Coarse	0.5	1.0	1	2	3	3	26
	Very Coarse	1.0	2.0		1	1	1	27
GRAVEL	Very Fine	2.0	2.8	1		1	1	28
	Very Fine	2.8	4.0	1	1	2	2	30
	Fine	4.0	5.6	3		3	3	33
	Fine	5.6	8.0	3	1	4	4	37
	Medium	8.0	11.0	1	4	5	5	42
	Medium	11.0	16.0	2	3	5	5	47
	Coarse	16.0	22.6	8	3	11	11	58
	Coarse	22.6	32	3	6	9	9	67
	Very Coarse	32	45	5	8	13	13	80
	Very Coarse	45	64	7	2	9	9	89
COBBLE	Small	64	90		5	5	5	94
	Small	90	128	1	2	3	3	97
	Large	128	180	1		1	1	98
	Large	180	256	2		2	2	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	6.69
D_{50} =	17.6
D_{84} =	52.6
D_{95} =	101.2
D_{100} =	256.0





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

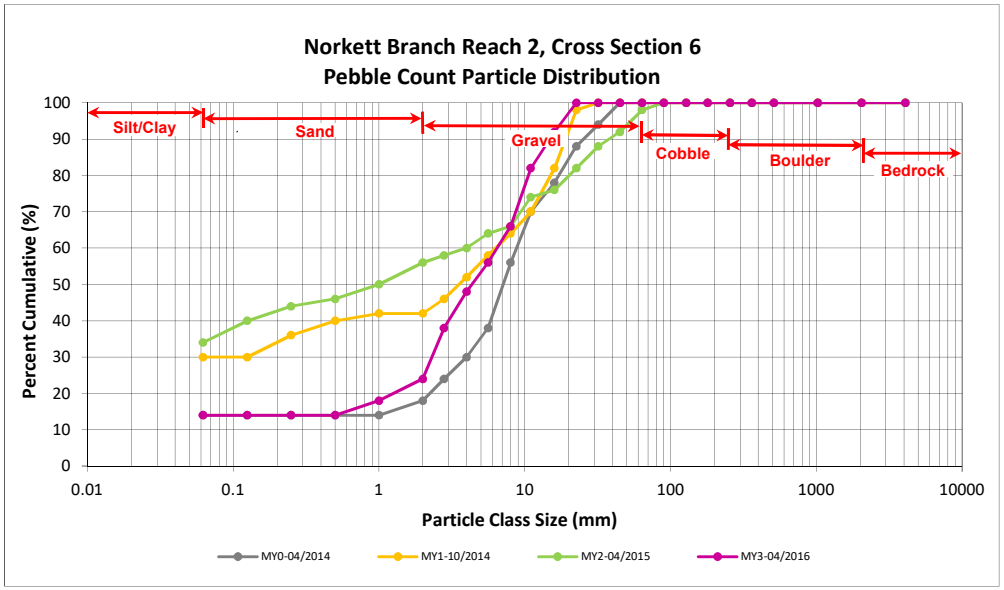
DMS Project No. 95360

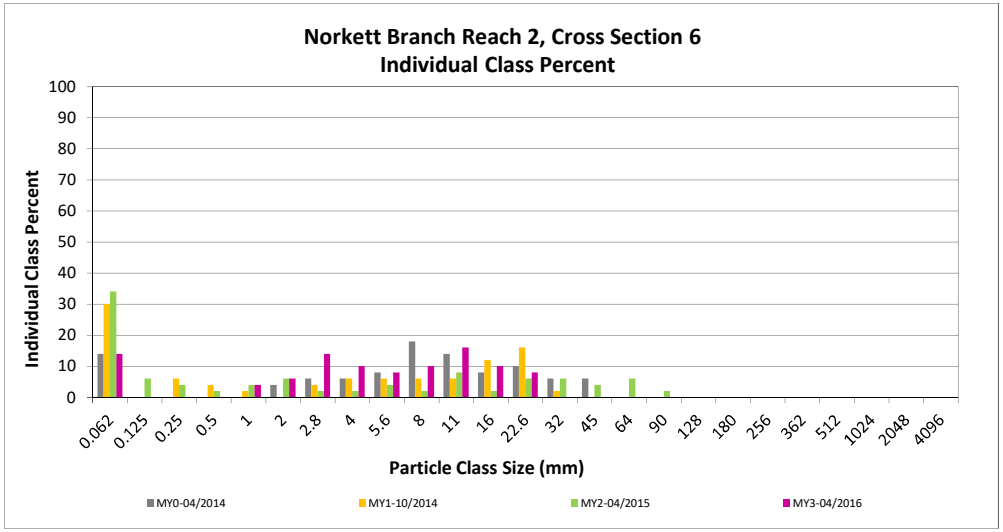
Monitoring Year 3 - 2016

Norkett Branch Reach 2, Cross Section 6

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	14	14	14
SAND	Very fine	0.062	0.125			14
	Fine	0.125	0.250			14
	Medium	0.25	0.50			14
	Coarse	0.5	1.0	4	4	18
	Very Coarse	1.0	2.0	6	6	24
GRAVEL	Very Fine	2.0	2.8	14	14	38
	Very Fine	2.8	4.0	10	10	48
	Fine	4.0	5.6	8	8	56
	Fine	5.6	8.0	10	10	66
	Medium	8.0	11.0	16	16	82
	Medium	11.0	16.0	10	10	92
	Coarse	16.0	22.6	8	8	100
	Coarse	22.6	32			100
	Very Coarse	32	45			100
	Very Coarse	45	64			100
COBBLE	Small	64	90			100
	Small	90	128			100
	Large	128	180			100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 6	
Channel materials (mm)	
D_{16} =	0.71
D_{35} =	2.61
D_{50} =	4.4
D_{84} =	11.9
D_{95} =	18.2
D_{100} =	22.6





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

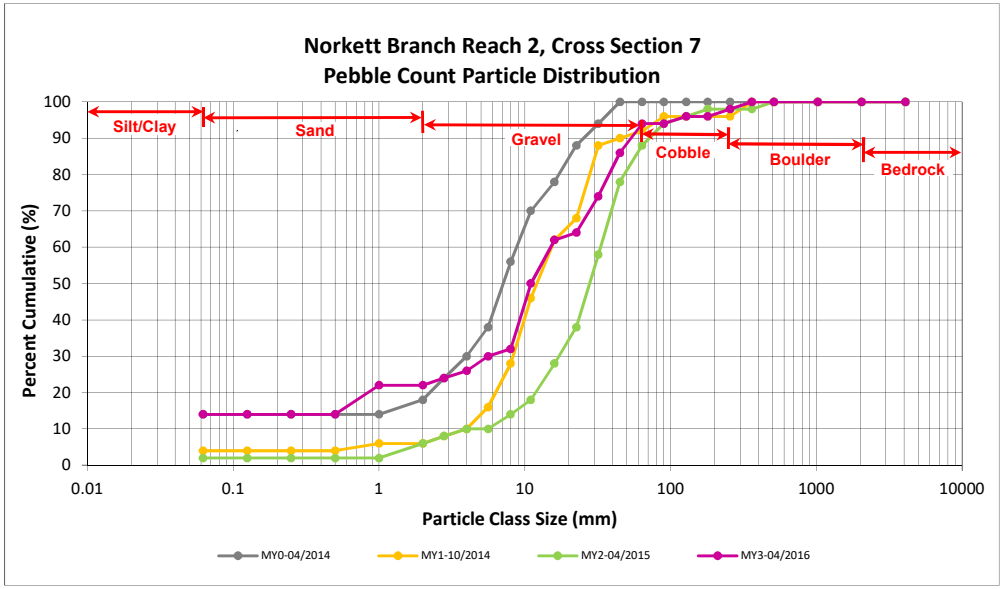
DMS Project No. 95360

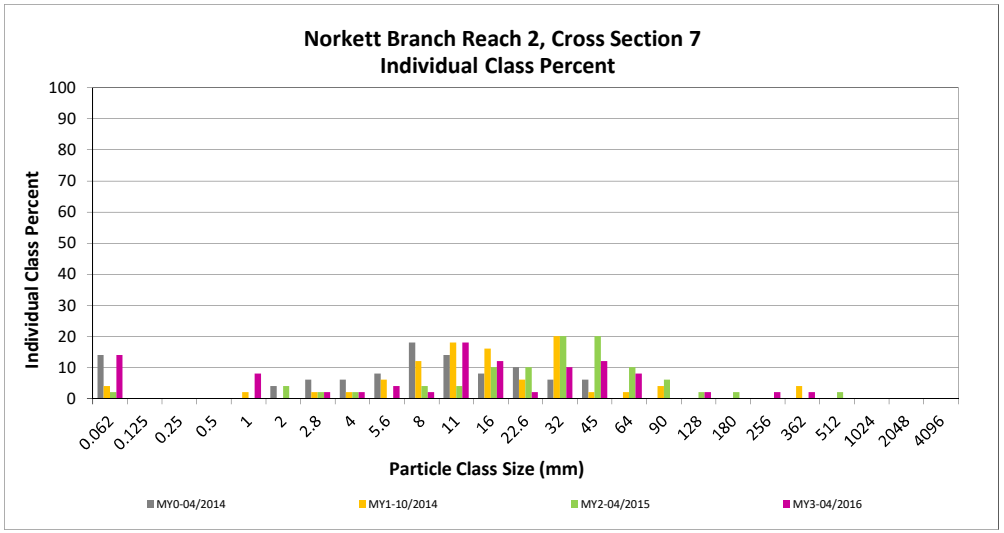
Monitoring Year 3 - 2016

Norkett Branch Reach 2, Cross Section 7

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	14	14	14
SAND	Very fine	0.062	0.125			14
	Fine	0.125	0.250			14
	Medium	0.25	0.50			14
	Coarse	0.5	1.0	8	8	22
	Very Coarse	1.0	2.0			22
GRAVEL	Very Fine	2.0	2.8	2	2	24
	Very Fine	2.8	4.0	2	2	26
	Fine	4.0	5.6	4	4	30
	Fine	5.6	8.0	2	2	32
	Medium	8.0	11.0	18	18	50
	Medium	11.0	16.0	12	12	62
	Coarse	16.0	22.6	2	2	64
	Coarse	22.6	32	10	10	74
	Very Coarse	32	45	12	12	86
	Very Coarse	45	64	8	8	94
COBBLE	Small	64	90			94
	Small	90	128	2	2	96
	Large	128	180			96
	Large	180	256	2	2	98
BOULDER	Small	256	362	2	2	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 7	
Channel materials (mm)	
D_{16} =	0.59
D_{35} =	8.44
D_{50} =	11.0
D_{84} =	42.5
D_{95} =	107.3
D_{100} =	362.0





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

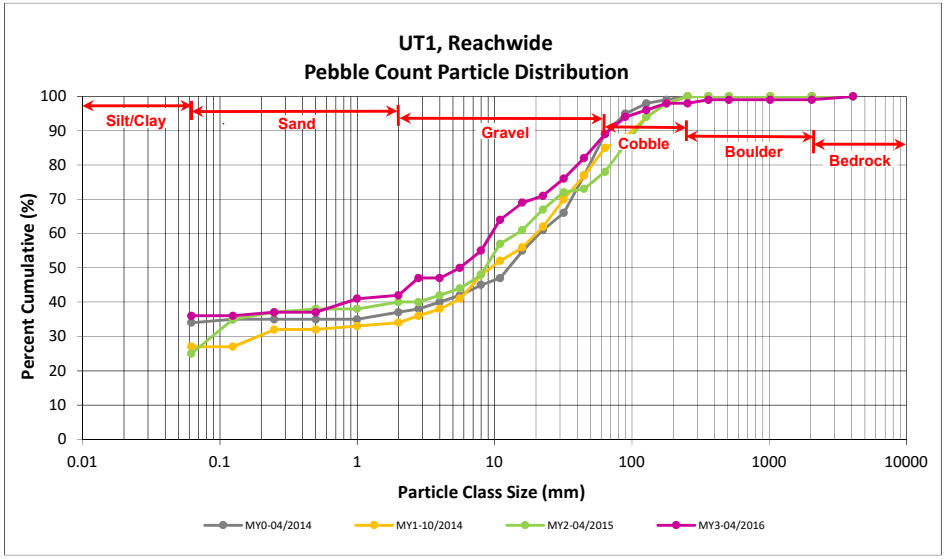
DMS Project No. 95360

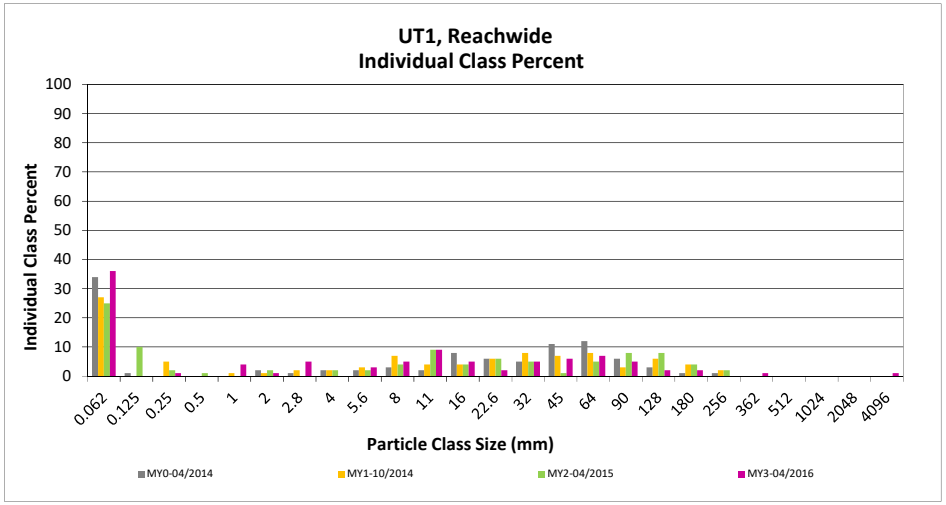
Monitoring Year 3 - 2016

UT1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	8	28	36	36	36
SAND	Very fine	0.062	0.125					36
	Fine	0.125	0.250		1	1	1	37
	Medium	0.25	0.50					37
	Coarse	0.5	1.0	1	3	4	4	41
	Very Coarse	1.0	2.0		1	1	1	42
GRAVEL	Very Fine	2.0	2.8	4	1	5	5	47
	Very Fine	2.8	4.0					47
	Fine	4.0	5.6	2	1	3	3	50
	Fine	5.6	8.0	1	4	5	5	55
	Medium	8.0	11.0	5	4	9	9	64
	Medium	11.0	16.0	2	3	5	5	69
	Coarse	16.0	22.6	1	1	2	2	71
	Coarse	22.6	32	4	1	5	5	76
	Very Coarse	32	45	5	1	6	6	82
	Very Coarse	45	64	7		7	7	89
COBBLE	Small	64	90	4	1	5	5	94
	Small	90	128	2		2	2	96
	Large	128	180	2		2	2	98
	Large	180	256					98
BOULDER	Small	256	362	1		1	1	99
	Small	362	512					99
	Medium	512	1024					99
	Large/Very Large	1024	2048					99
BEDROCK	Bedrock	2048	>2048	1		1	1	100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	5.6
D_{84} =	49.8
D_{95} =	107.3
D_{100} =	>2048





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

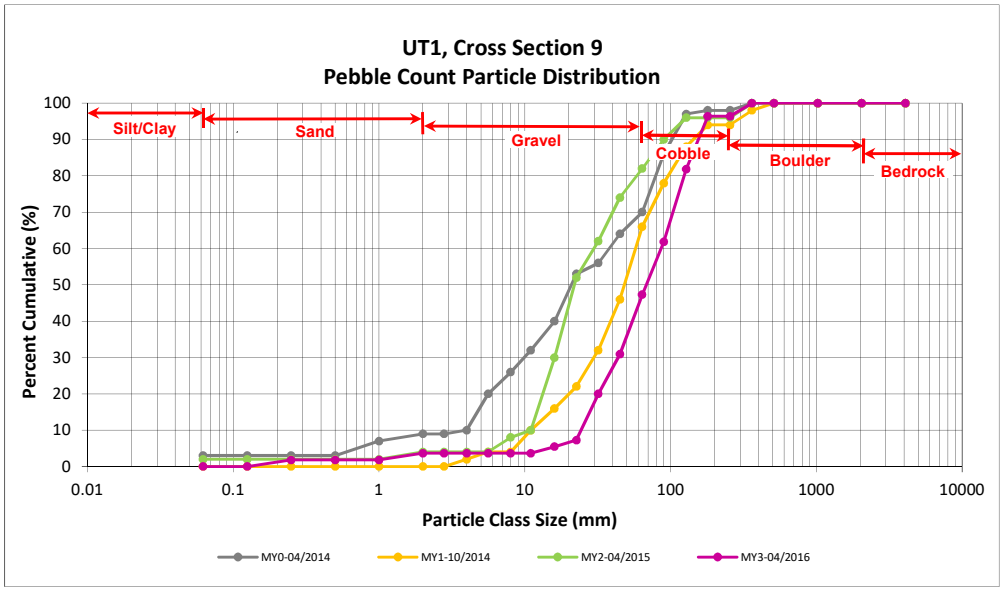
DMS Project No. 95360

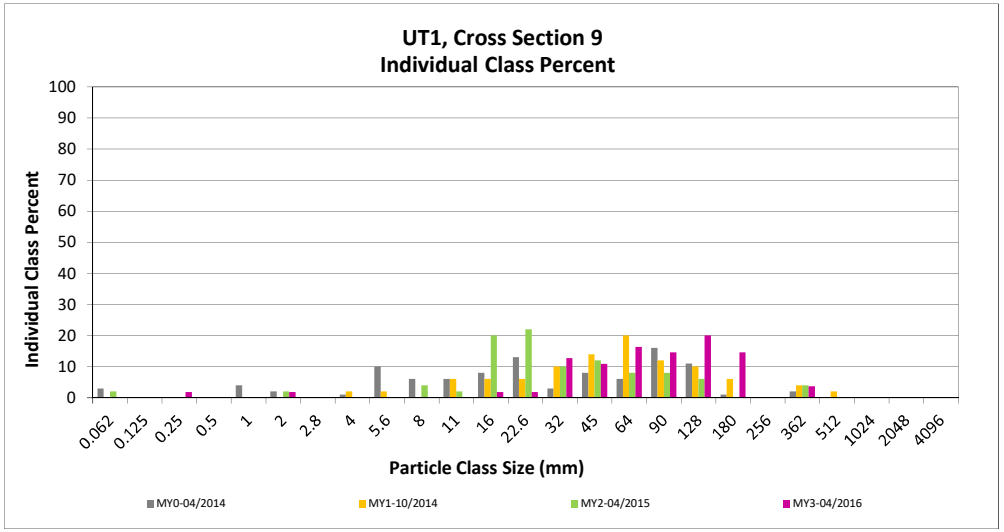
Monitoring Year 3 - 2016

UT1, Cross Section 9

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	2	2	2
	Medium	0.25	0.50			2
	Coarse	0.5	1.0			2
	Very Coarse	1.0	2.0	2	2	4
GRAVEL	Very Fine	2.0	2.8			4
	Very Fine	2.8	4.0			4
	Fine	4.0	5.6			4
	Fine	5.6	8.0			4
	Medium	8.0	11.0			4
	Medium	11.0	16.0	2	2	5
	Coarse	16.0	22.6	2	2	7
	Coarse	22.6	32	13	13	20
	Very Coarse	32	45	11	11	31
	Very Coarse	45	64	16	16	47
COBBLE	Small	64	90	15	15	62
	Small	90	128	20	20	82
	Large	128	180	15	15	96
	Large	180	256			96
BOULDER	Small	256	362	4	4	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 9	
Channel materials (mm)	
D_{16} =	28.69
D_{35} =	49.14
D_{50} =	68.2
D_{84} =	134.7
D_{95} =	174.3
D_{100} =	362.0





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

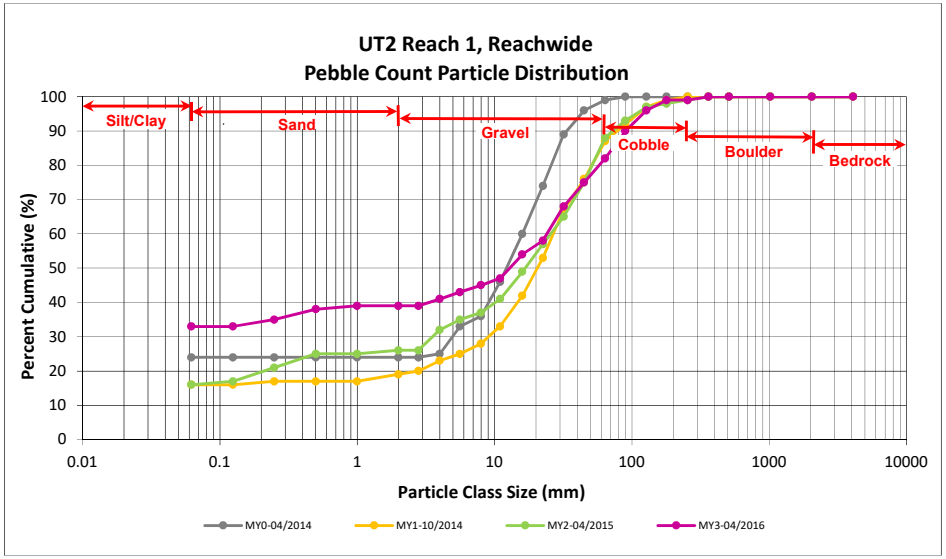
DMS Project No. 95360

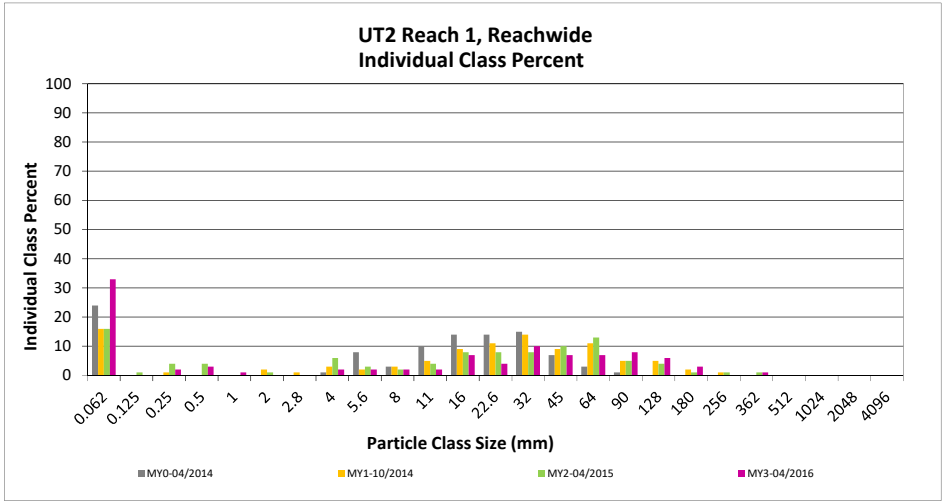
Monitoring Year 3 - 2016

UT2 Reach 1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	6	27	33	33	33
SAND	Very fine	0.062	0.125					33
	Fine	0.125	0.250		2	2	2	35
	Medium	0.25	0.50		3	3	3	38
	Coarse	0.5	1.0		1	1	1	39
	Very Coarse	1.0	2.0					39
GRAVEL	Very Fine	2.0	2.8					39
	Very Fine	2.8	4.0		2	2	2	41
	Fine	4.0	5.6		2	2	2	43
	Fine	5.6	8.0		2	2	2	45
	Medium	8.0	11.0	1	1	2	2	47
	Medium	11.0	16.0	6	1	7	7	54
	Coarse	16.0	22.6	2	2	4	4	58
	Coarse	22.6	32	6	4	10	10	68
	Very Coarse	32	45	6	1	7	7	75
	Very Coarse	45	64	5	2	7	7	82
COBBLE	Small	64	90	8		8	8	90
	Small	90	128	6		6	6	96
	Large	128	180	3		3	3	99
	Large	180	256					99
BOULDER	Small	256	362	1		1	1	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.25
D_{50} =	12.9
D_{84} =	69.7
D_{95} =	120.7
D_{100} =	362.0





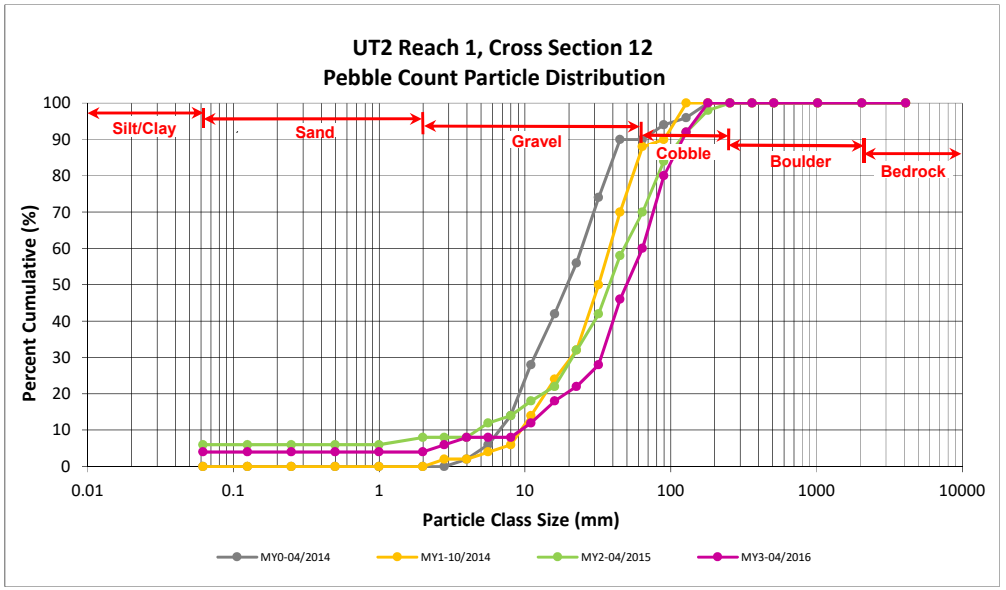
Reachwide and Cross Section Pebble Count Plots

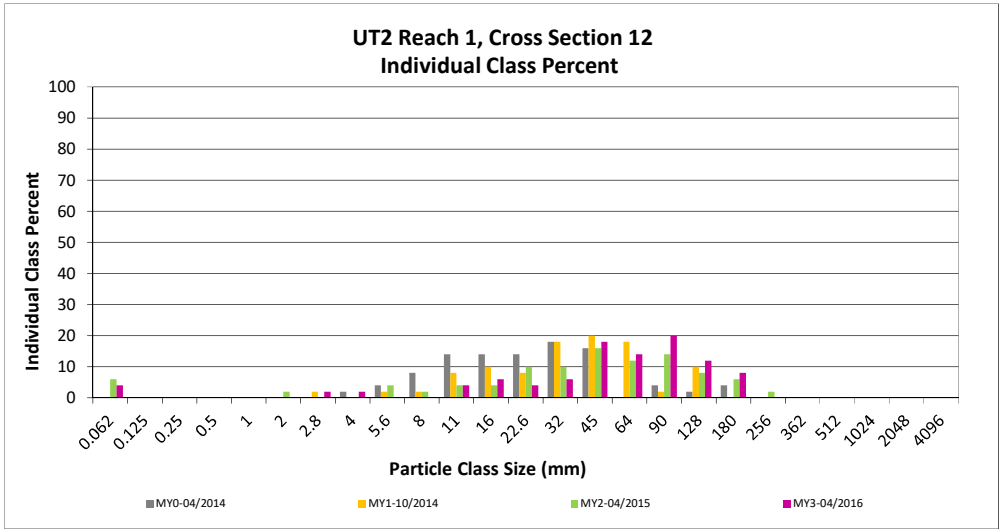
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

UT2 Reach 1, Cross Section 12

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	4	4	4
SAND	Very fine	0.062	0.125			4
	Fine	0.125	0.250			4
	Medium	0.25	0.50			4
	Coarse	0.5	1.0			4
	Very Coarse	1.0	2.0			4
GRAVEL	Very Fine	2.0	2.8	2	2	6
	Very Fine	2.8	4.0	2	2	8
	Fine	4.0	5.6			8
	Fine	5.6	8.0			8
	Medium	8.0	11.0	4	4	12
	Medium	11.0	16.0	6	6	18
	Coarse	16.0	22.6	4	4	22
	Coarse	22.6	32	6	6	28
	Very Coarse	32	45	18	18	46
	Very Coarse	45	64	14	14	60
COBBLE	Small	64	90	20	20	80
	Small	90	128	12	12	92
	Large	128	180	8	8	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 12	
Channel materials (mm)	
D_{16} =	14.12
D_{35} =	36.54
D_{50} =	49.8
D_{84} =	101.2
D_{95} =	145.5
D_{100} =	180.0





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

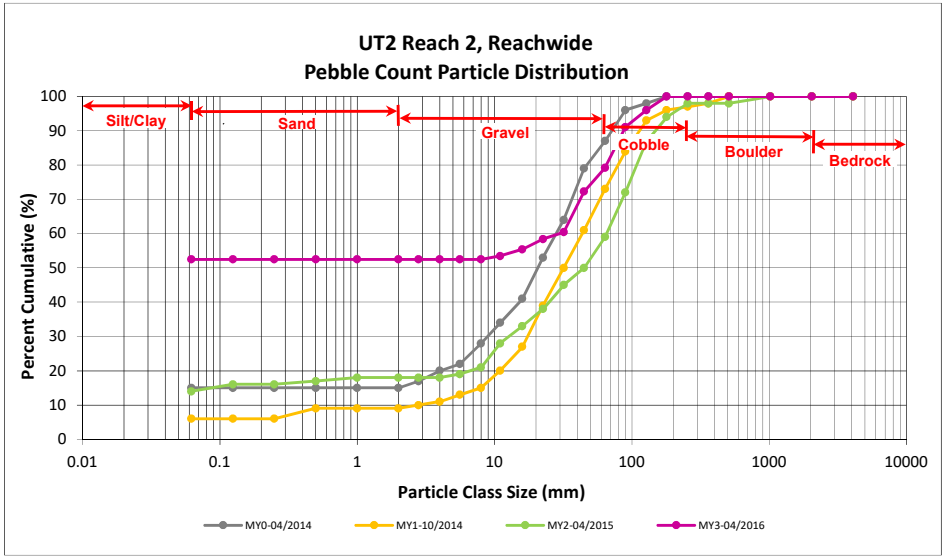
DMS Project No. 95360

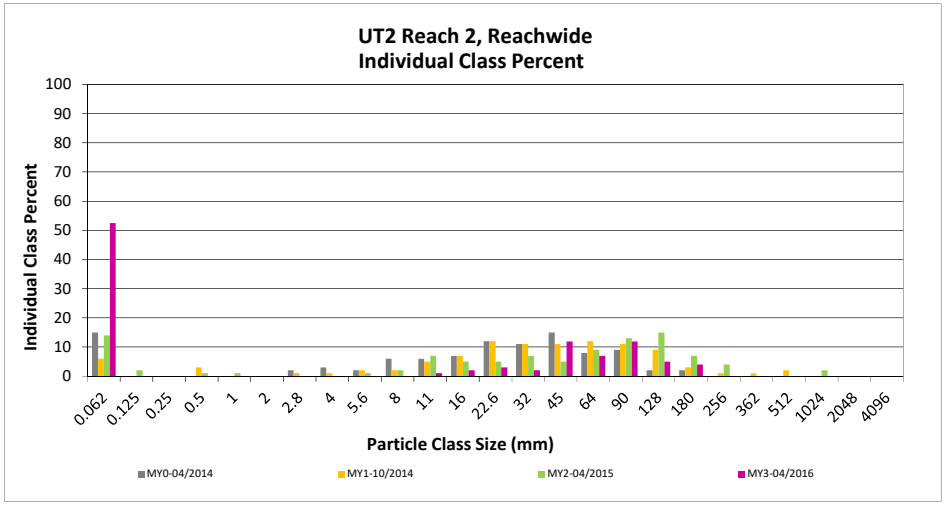
Monitoring Year 3 - 2016

UT2 Reach 2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	6	47	53	52	52
SAND	Very fine	0.062	0.125					52
	Fine	0.125	0.250					52
	Medium	0.25	0.50					52
	Coarse	0.5	1.0					52
	Very Coarse	1.0	2.0					52
GRAVEL	Very Fine	2.0	2.8					52
	Very Fine	2.8	4.0					52
	Fine	4.0	5.6					52
	Fine	5.6	8.0					52
	Medium	8.0	11.0		1	1	1	53
	Medium	11.0	16.0	2		2	2	55
	Coarse	16.0	22.6	3		3	3	58
	Coarse	22.6	32	2		2	2	60
	Very Coarse	32	45	11	1	12	12	72
	Very Coarse	45	64	7		7	7	79
COBBLE	Small	64	90	11	1	12	12	91
	Small	90	128	4	1	5	5	96
	Large	128	180	4		4	4	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**51**	**101**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	Silt/Clay
D_{84} =	73.4
D_{95} =	118.9
D_{100} =	180.0





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

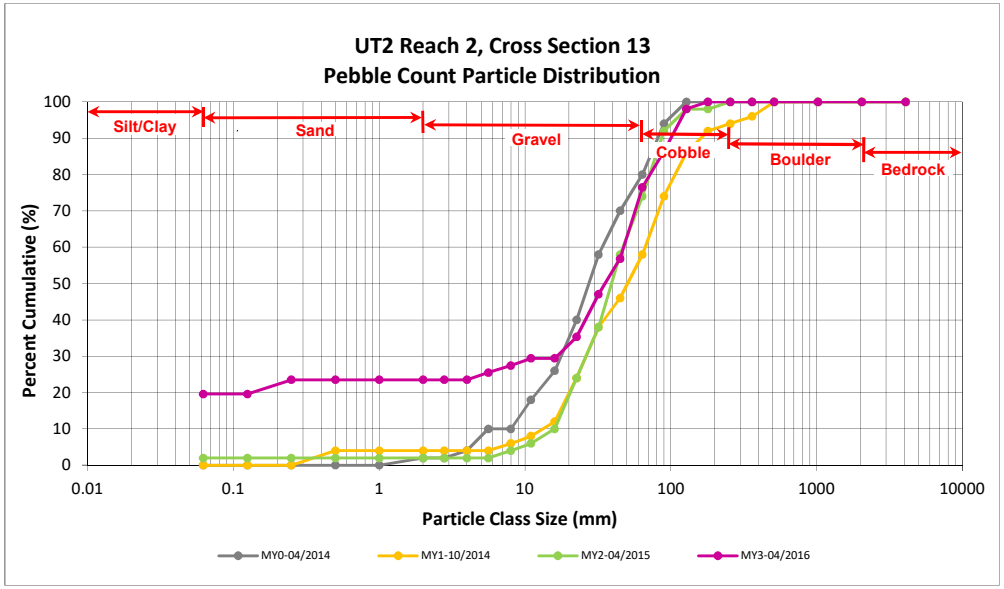
DMS Project No. 95360

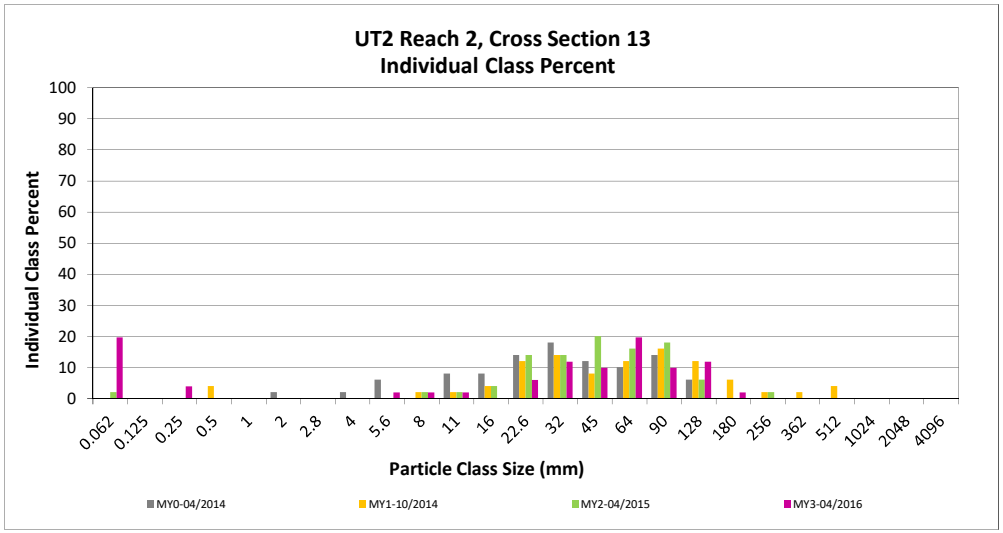
Monitoring Year 3 - 2016

UT2 Reach 2, Cross Section 13

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	20	20	20
SAND	Very fine	0.062	0.125			20
	Fine	0.125	0.250	4	4	24
	Medium	0.25	0.50			24
	Coarse	0.5	1.0			24
	Very Coarse	1.0	2.0			24
GRAVEL	Very Fine	2.0	2.8			24
	Very Fine	2.8	4.0			24
	Fine	4.0	5.6	2	2	25
	Fine	5.6	8.0	2	2	27
	Medium	8.0	11.0	2	2	29
	Medium	11.0	16.0			29
	Coarse	16.0	22.6	6	6	35
	Coarse	22.6	32	12	12	47
	Very Coarse	32	45	10	10	57
	Very Coarse	45	64	20	20	76
COBBLE	Small	64	90	10	10	86
	Small	90	128	12	12	98
	Large	128	180	2	2	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 13	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	22.21
D_{50} =	35.4
D_{84} =	83.2
D_{95} =	116.9
D_{100} =	180.0





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

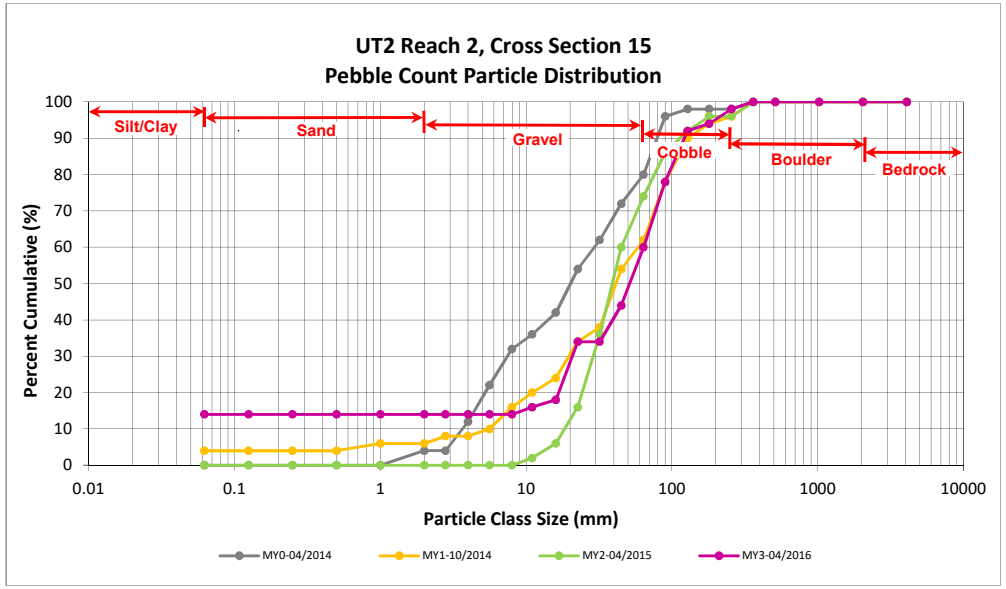
DMS Project No. 95360

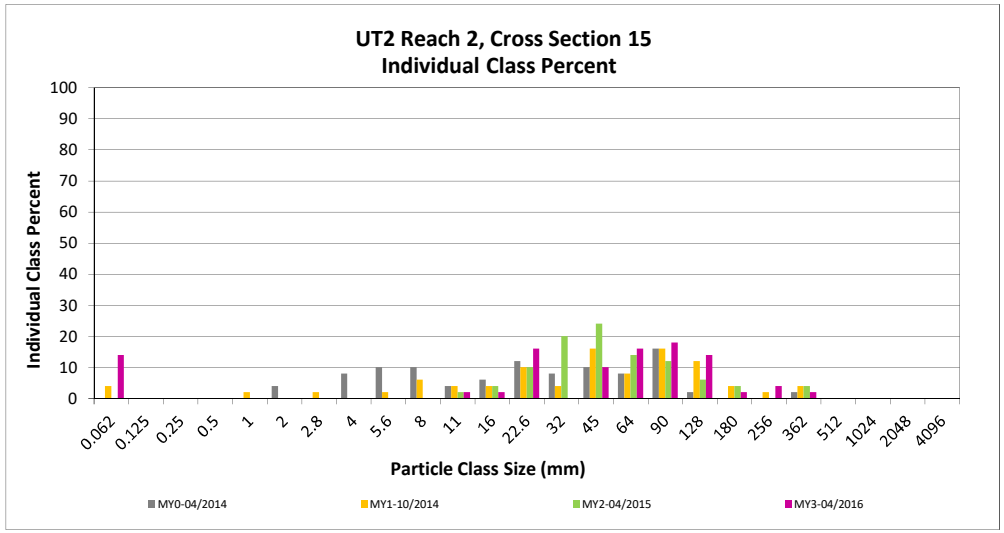
Monitoring Year 3 - 2016

UT2 Reach 2, Cross Section 15

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	14	14	14
SAND	Very fine	0.062	0.125			14
	Fine	0.125	0.250			14
	Medium	0.25	0.50			14
	Coarse	0.5	1.0			14
	Very Coarse	1.0	2.0			14
GRAVEL	Very Fine	2.0	2.8			14
	Very Fine	2.8	4.0			14
	Fine	4.0	5.6			14
	Fine	5.6	8.0			14
	Medium	8.0	11.0	2	2	16
	Medium	11.0	16.0	2	2	18
	Coarse	16.0	22.6	16	16	34
	Coarse	22.6	32			34
	Very Coarse	32	45	10	10	44
	Very Coarse	45	64	16	16	60
COBBLE	Small	64	90	18	18	78
	Small	90	128	14	14	92
	Large	128	180	2	2	94
	Large	180	256	4	4	98
BOULDER	Small	256	362	2	2	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 15	
Channel materials (mm)	
D_{16} =	11.00
D_{35} =	33.11
D_{50} =	51.4
D_{84} =	104.7
D_{95} =	196.6
D_{100} =	362.0





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

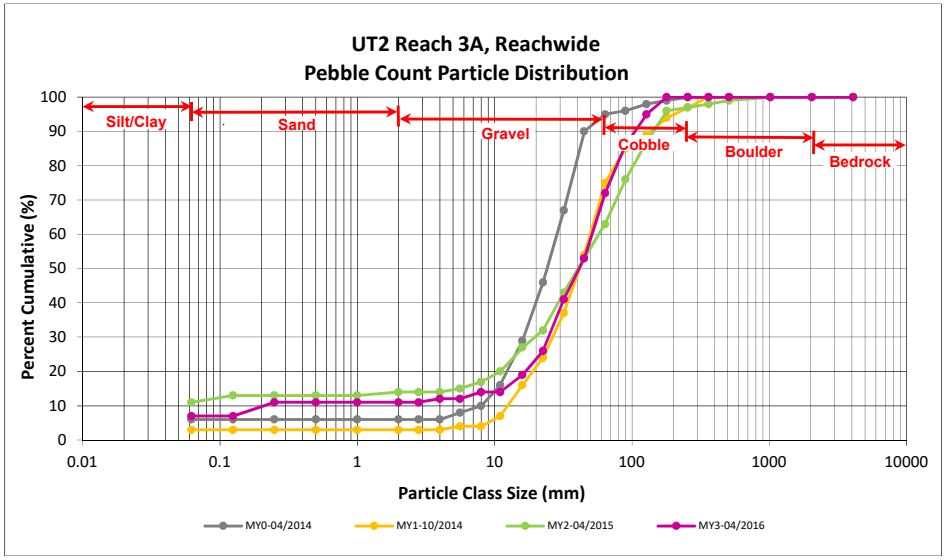
DMS Project No. 95360

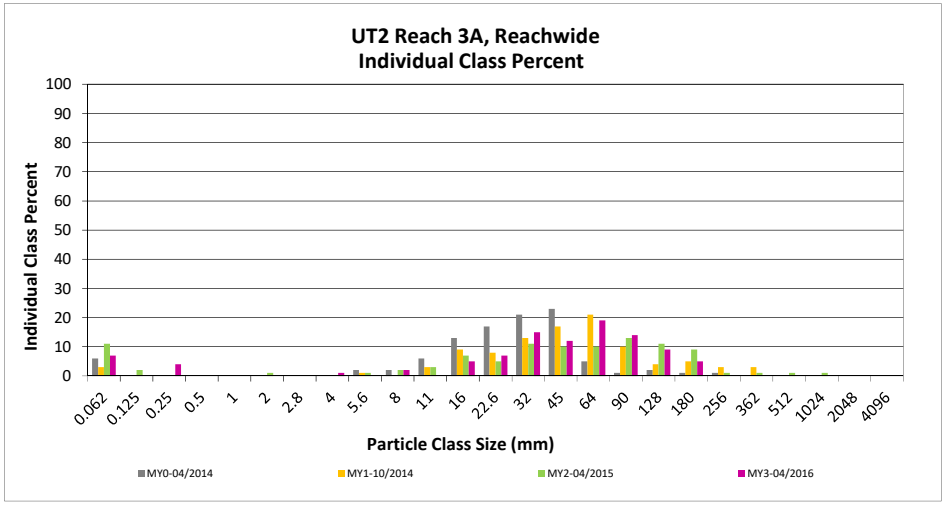
Monitoring Year 3 - 2016

UT2 Reach 3A, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	6	7	7	7
SAND	Very fine	0.062	0.125					7
	Fine	0.125	0.250		4	4	4	11
	Medium	0.25	0.50					11
	Coarse	0.5	1.0					11
	Very Coarse	1.0	2.0					11
GRAVEL	Very Fine	2.0	2.8					11
	Very Fine	2.8	4.0		1	1	1	12
	Fine	4.0	5.6					12
	Fine	5.6	8.0	1	1	2	2	14
	Medium	8.0	11.0					14
	Medium	11.0	16.0	4	1	5	5	19
	Coarse	16.0	22.6	4	3	7	7	26
	Coarse	22.6	32	4	11	15	15	41
	Very Coarse	32	45	8	4	12	12	53
	Very Coarse	45	64	12	7	19	19	72
COBBLE	Small	64	90	6	8	14	14	86
	Small	90	128	7	2	9	9	95
	Large	128	180	3	2	5	5	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	12.78
D_{35} =	27.84
D_{50} =	41.3
D_{84} =	85.7
D_{95} =	128.0
D_{100} =	180.0





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

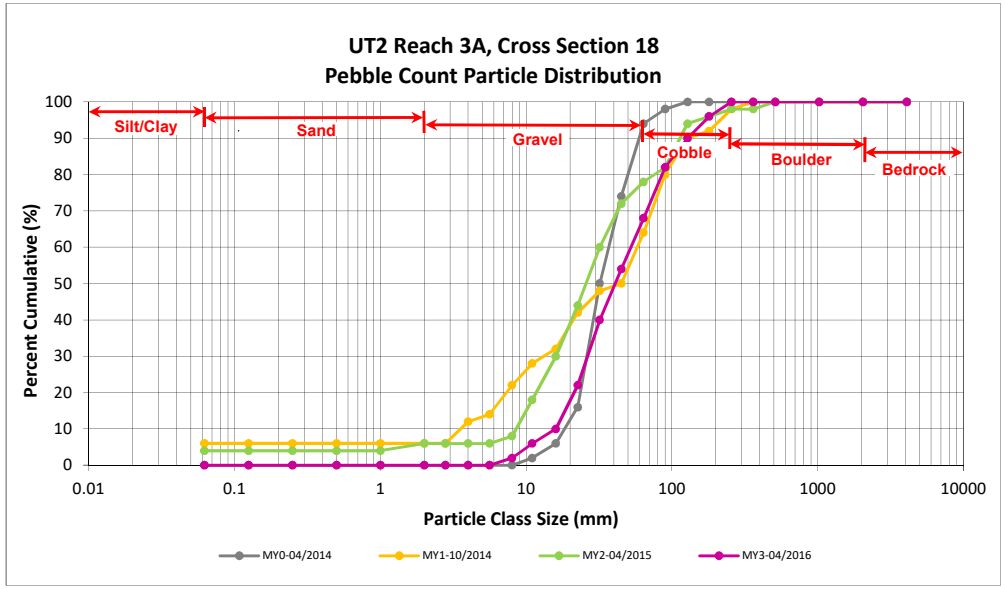
DMS Project No. 95360

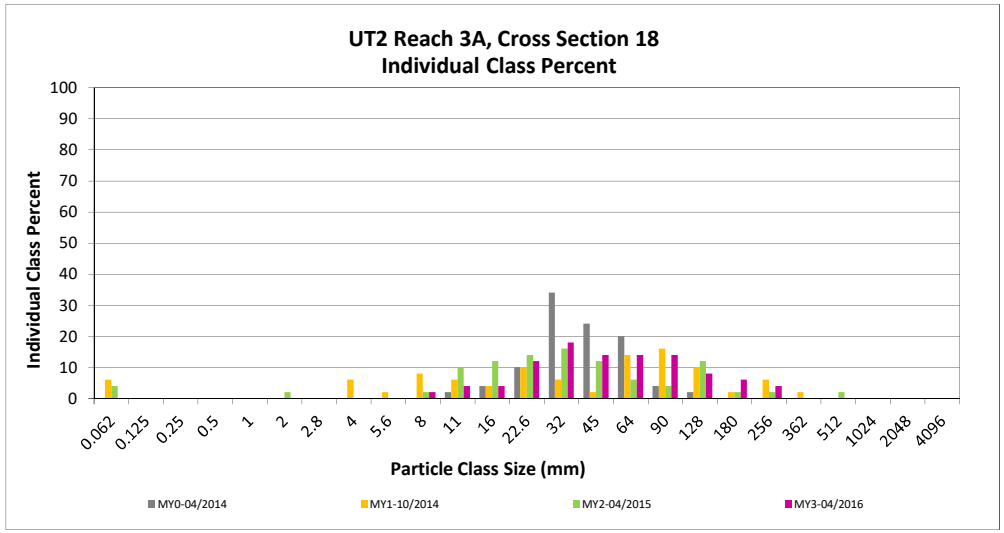
Monitoring Year 3 - 2016

UT2 Reach 3A, Cross Section 18

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.6			0
	Fine	5.6	8.0	2	2	2
	Medium	8.0	11.0	4	4	6
	Medium	11.0	16.0	4	4	10
	Coarse	16.0	22.6	12	12	22
	Coarse	22.6	32	18	18	40
	Very Coarse	32	45	14	14	54
	Very Coarse	45	64	14	14	68
COBBLE	Small	64	90	14	14	82
	Small	90	128	8	8	90
	Large	128	180	6	6	96
	Large	180	256	4	4	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 18	
Channel materials (mm)	
D_{16} =	19.02
D_{35} =	29.05
D_{50} =	40.8
D_{84} =	98.3
D_{95} =	170.1
D_{100} =	256.0





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

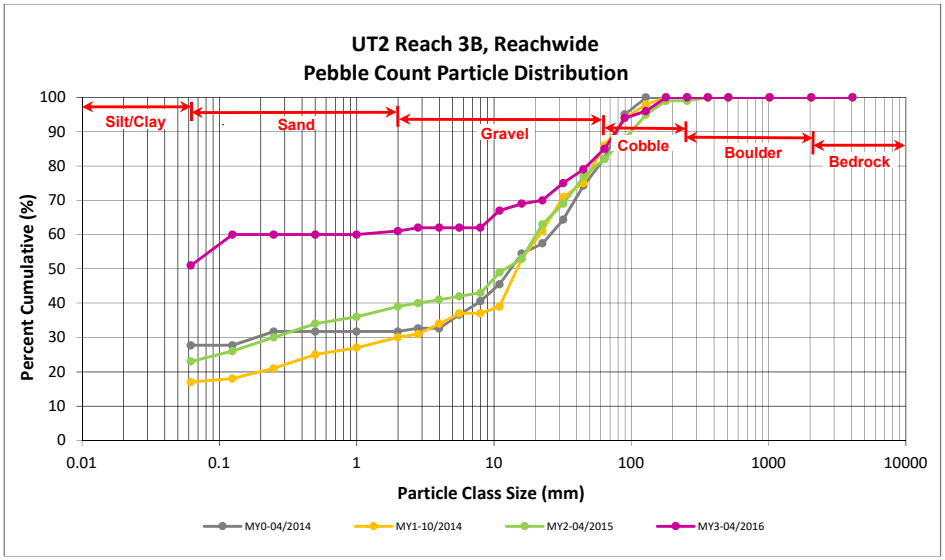
DMS Project No. 95360

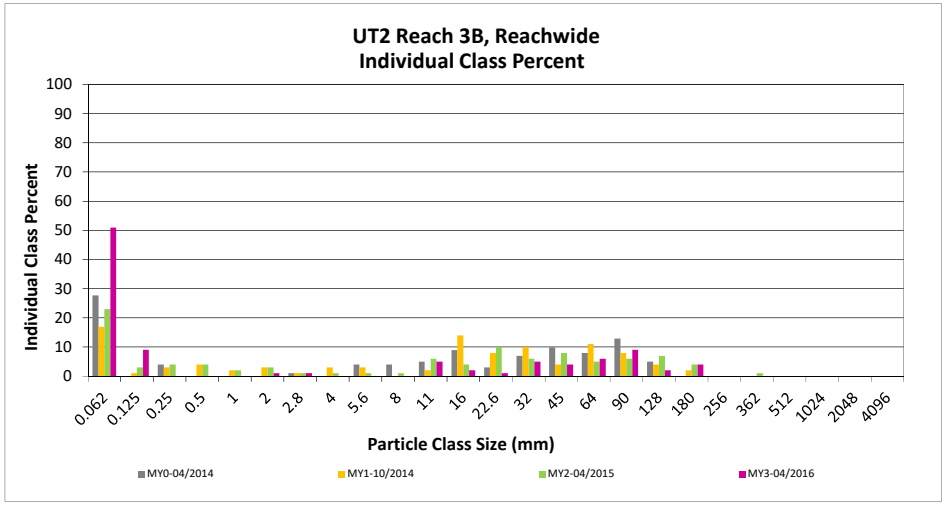
Monitoring Year 3 - 2016

UT2 Reach 3B, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	15	36	51	51	51
SAND	Very fine	0.062	0.125	9		9	9	60
	Fine	0.125	0.250					60
	Medium	0.25	0.50					60
	Coarse	0.5	1.0					60
	Very Coarse	1.0	2.0		1	1	1	61
GRAVEL	Very Fine	2.0	2.8		1	1	1	62
	Very Fine	2.8	4.0					62
	Fine	4.0	5.6					62
	Fine	5.6	8.0					62
	Medium	8.0	11.0		5	5	5	67
	Medium	11.0	16.0	2		2	2	69
	Coarse	16.0	22.6		1	1	1	70
	Coarse	22.6	32	3	2	5	5	75
	Very Coarse	32	45	3	1	4	4	79
	Very Coarse	45	64	4	2	6	6	85
COBBLE	Small	64	90	9		9	9	94
	Small	90	128	2		2	2	96
	Large	128	180	3	1	4	4	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	Silt/Clay
D_{84} =	60.4
D_{95} =	107.3
D_{100} =	180.0





Reachwide and Cross Section Pebble Count Plots

Norkett Branch Stream Mitigation Site

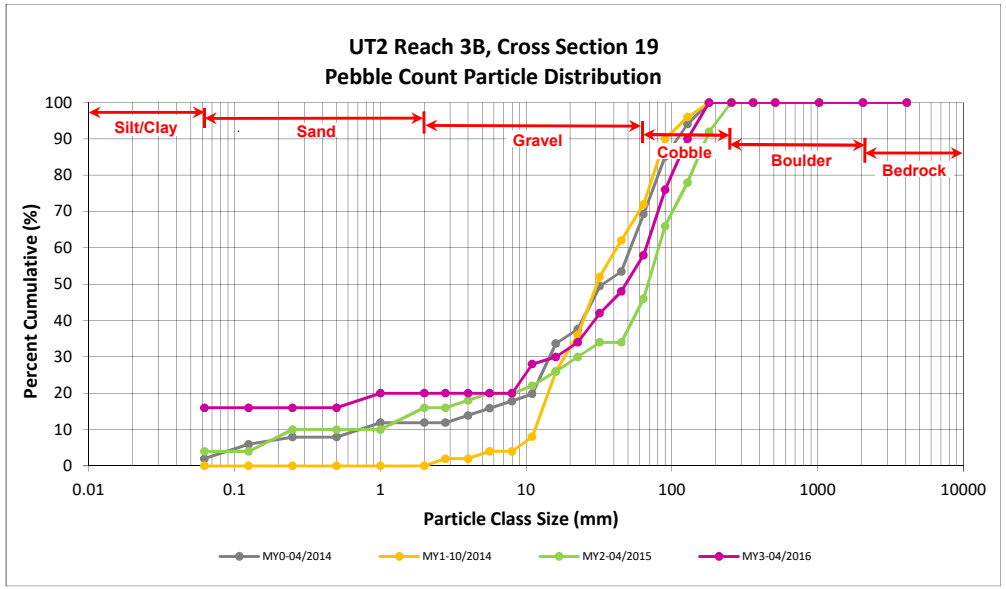
DMS Project No. 95360

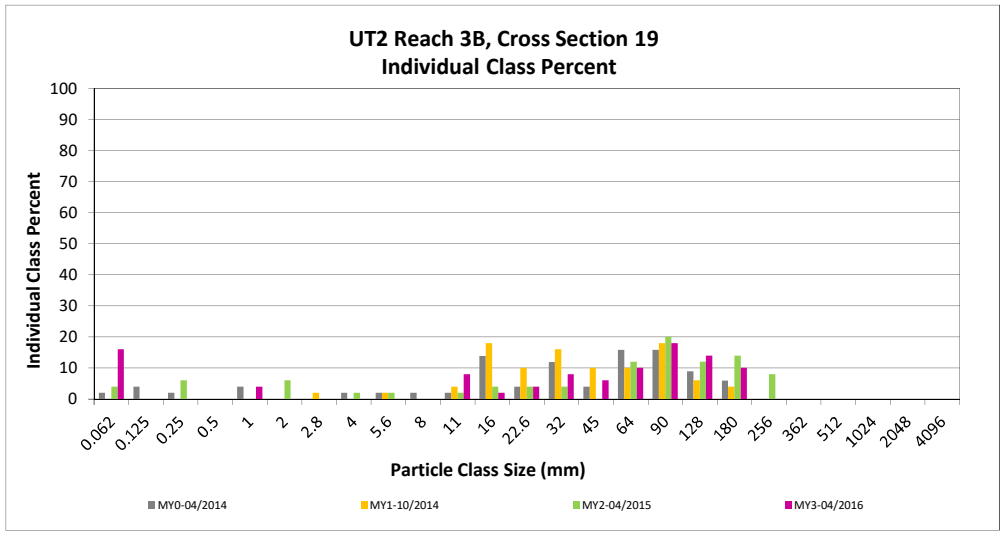
Monitoring Year 3 - 2016

UT2 Reach 3B, Cross Section 19

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	16	16	16
SAND	Very fine	0.062	0.125			16
	Fine	0.125	0.250			16
	Medium	0.25	0.50			16
	Coarse	0.5	1.0	4	4	20
	Very Coarse	1.0	2.0			20
GRAVEL	Very Fine	2.0	2.8			20
	Very Fine	2.8	4.0			20
	Fine	4.0	5.6			20
	Fine	5.6	8.0			20
	Medium	8.0	11.0	8	8	28
	Medium	11.0	16.0	2	2	30
	Coarse	16.0	22.6	4	4	34
	Coarse	22.6	32	8	8	42
	Very Coarse	32	45	6	6	48
	Very Coarse	45	64	10	10	58
COBBLE	Small	64	90	18	18	76
	Small	90	128	14	14	90
	Large	128	180	10	10	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 19	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	23.60
D_{50} =	48.3
D_{84} =	110.1
D_{95} =	151.8
D_{100} =	180.0





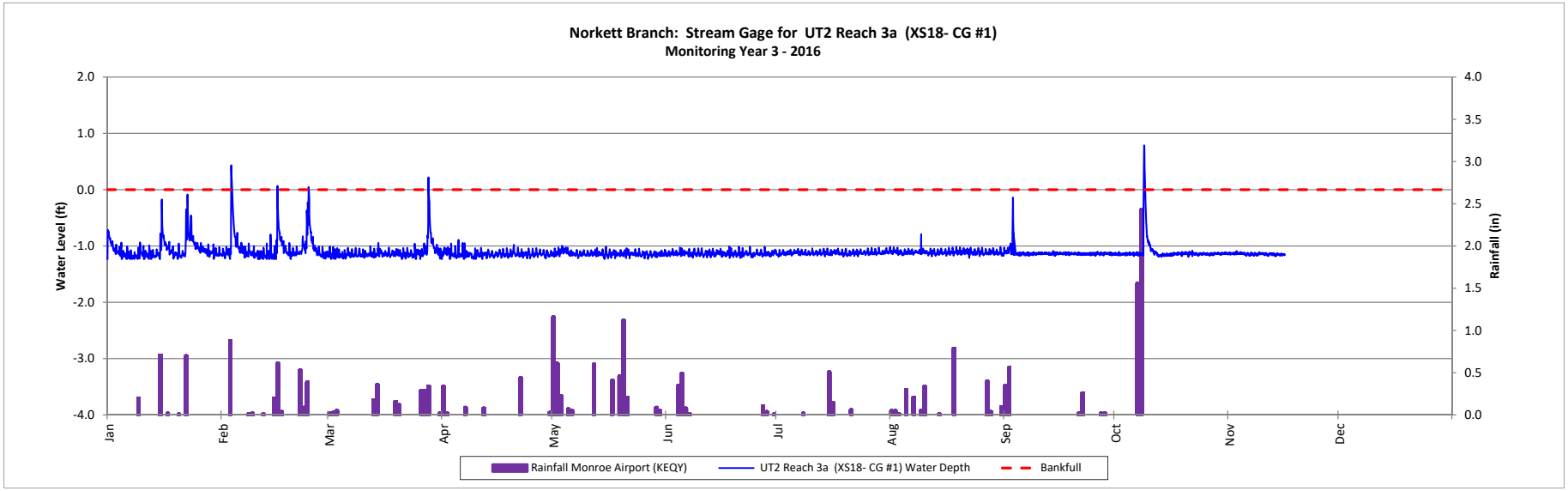
APPENDIX 5. Hydrology Data

Table 14. Verification of Bankfull Events
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Monitoring Year	Reach	Date of Data Collection	Date of Occurrence	Method
MY1	UT2 Reach 3a (CG #1 XS18)	6/3/2014	5/30/2014	Stream Gage
		9/4/2014	7/21/2014	Stream Gage
		10/17/2014	9/16/2014	Wrack Line
	UT1 (CG #2 XS9)	6/3/2014	5/30/2014	Stream Gage
		9/4/2014	7/21/2014	Stream Gage
	Norkett Branch Reach 2 (CG #3 XS6)	6/3/2014	5/30/2014	Stream Gage
		9/4/2014	7/21/2014	Stream Gage
		10/17/2014	9/16/2014	Stream Gage
MY2	UT2 Reach 3a (CG #1 XS18)	1/4/2015	1/4/2015	Stream Gage
		1/12/2015	1/12/2015	Stream Gage
		2/26/2015	2/26/2015	Stream Gage
		3/5/2015	3/5/2015	Stream Gage
		4/19/2015	4/19/2015	Stream Gage
		10/3/2015	10/3/2015	Stream Gage, Crest Gage
	Norkett Branch Reach 2 (CG #3 XS6)	1/4/2015	1/4/2015	Stream Gage
		1/12/2015	1/12/2015	Stream Gage
		2/26/2015	2/26/2015	Stream Gage
		3/5/2015	3/5/2015	Stream Gage, Crest Gage
		4/19/2015	4/19/2015	Stream Gage, Crest Gage
		10/3/2015	10/3/2015	Stream Gage, Crest Gage
MY3	UT2 Reach 3a (CG #1 XS18)	2/3/2016	2/3/2016	Stream Gage
		2/16/2016	2/16/2016	Stream Gage
		2/24/2016	2/24/2016	Stream Gage
		3/28/2016	3/28/2016	Stream Gage, Crest Gage
		10/8/2016	10/8/2016	Stream Gage
	UT1 (CG #2 XS9)	4/22/2016	Spring 2016	Crest Gage
		10/8/2016	10/8/2016	Stream Gage
	Norkett Branch Reach 2 (CG #3 XS6)	2/3/2016	2/3/2016	Stream Gage
		2/16/2016	2/16/2016	Stream Gage
		2/24/2016	2/24/2016	Stream Gage
		3/28/2016	3/28/2016	Stream Gage, Crest Gage
		10/8/2016	10/8/2016	Stream Gage

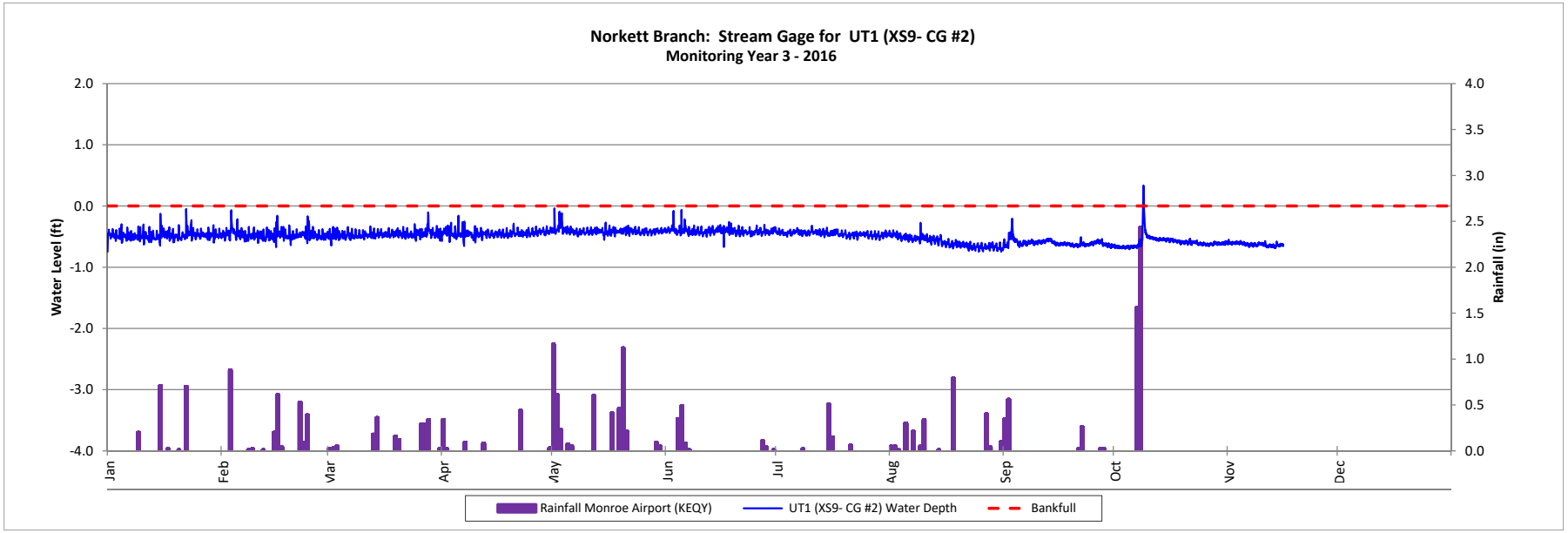
Stream Flow Gage Plots

Norkett Branch Mitigation Project
DMS Project No. 95360
Monitoring Year 3 - 2016



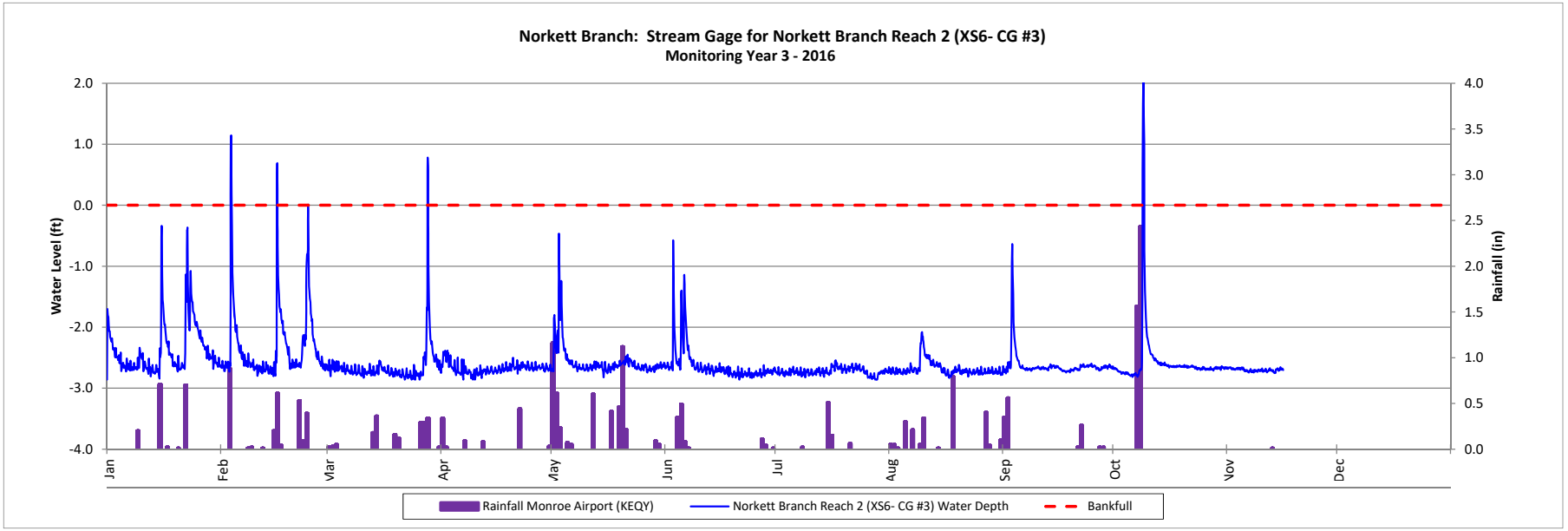
Stream Flow Gage Plots

Norkett Branch Mitigation Project
DMS Project No. 95360
Monitoring Year 3 - 2016



Stream Flow Gage Plots

Norkett Branch Mitigation Project
DMS Project No. 95360
Monitoring Year 3 - 2016



APPENDIX 6. Water Quality BMPs

Table 15. Water Quality Sampling Results
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

Monitoring Year	Location	Sample Collection Date	TN (mg/L)	NO_x (mg/L)	TKN (mg/L)	TP (mg/L)	TSS (mg/L)	FC (CFU/100mL)	Conductivity (µS/cm)	Temp °C	pH
MY1	SPSC BMP Inlet	4/22/2014 (Baseflow)	1.1	0.2	0.9	0.4	16.0	31	151.0	21.4	7.0
	SPSC BMP Outlet		0.9	DL	0.9	0.5	25.0	11	127.6	23.5	7.3
	PW BMP Inlet		DL	DL	0.5	0.2	11.0	68	65.0	25.3	7.4
	PW BMP Outlet		DL	0.1	DL	0.3	39.0	110	69.8	26.2	7.0
	SPSC BMP Inlet	5/15/2014	100.0	50.0	50.0	19.0	970.0	20000	1230.0	21.0	6.8
	SPSC BMP Outlet		47.0	18.0	29.0	7.0	410.0	20000	1185.0	21.0	6.9
	PW BMP Inlet		2.5	0.2	2.3	0.6	15.0	5600	95.5	22.9	6.9
	PW BMP Outlet		1.8	0.2	1.6	0.5	150.0	2100	11.3	23.8	6.9
	SPSC BMP Inlet	10/15/2014	5.5	1.3	4.2	5.4	27.0	490	437.0	19.8	7.1
	SPSC BMP Outlet		1.8	0.2	1.7	0.7	1.7	2300	333.0	21.0	7.1
	PW BMP Inlet		NF								
	PW BMP Outlet										
	SPSC BMP Inlet	11/26/2014	7.2	2.2	5.0	5.0	30.0	HT	201.1	10.1	7.2
	SPSC BMP Outlet		6.5	2.0	4.6	4.9	32.0		196.2	10.0	7.2
	PW BMP Inlet		2.8	1.1	1.7	0.6	6.6		57.8	11.2	6.7
	PW BMP Outlet		2.6	1.0	1.7	1.0	6.3		82.0	11.1	6.8
MY2	SPSC BMP Inlet	3/30/2015	1.2	0.16	1.0	0.3	6.2	120	277.8	10.0	7.1
	SPSC BMP Outlet		1.5	0.12	1.3	0.3	DL	DL	329.9	10.5	7.2
	PW BMP Inlet		DL	0.12	DL	0.3	16.0	120	180.0	9.5	7.3
	PW BMP Outlet		1.2	0.12	1.1	0.2	9.0	64	184.0	11.8	8.1
	SPSC BMP Inlet	10/28/2015	3.8	1.3	2.5	1.2	16.0	150.0	141.9	17.5	6.6
	SPSC BMP Outlet		4.5	2.4	2.1	1.0	20.0	140.0	154.8	17.0	6.4
	PW BMP Inlet		2.9	1.1	1.8	0.8	48.0	DL	97.7	17.1	4.2
	PW BMP Outlet		1.7	DL	1.7	0.3	7.6	DL	92.7	18.7	7.2
MY3	SPSC BMP Inlet	9/3/2016	13.0	1.6	11.0	5.2	140.0	HT	---	---	---
	SPSC BMP Outlet		8.5	5.2	3.2	2.5	DL		---	---	---
	PW BMP Inlet		2.3	1.0	1.3	0.9	6.7		---	---	---
	PW BMP Outlet		NF								

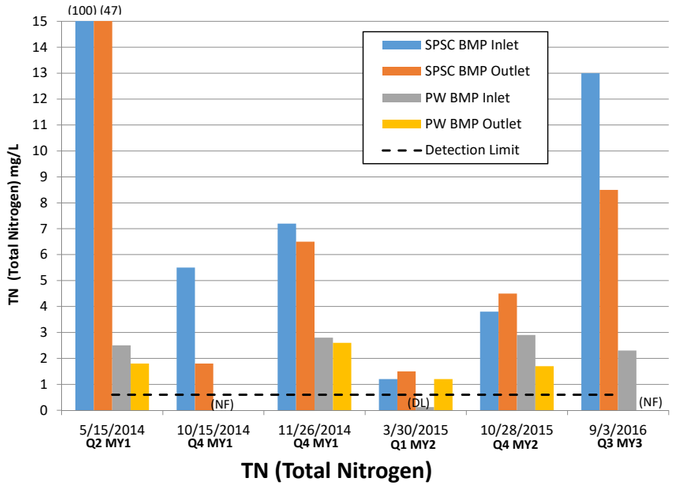
DL: Parameter was below the detection limit
NF: No flow was available for sample collection/insufficient sample volume
HT: Laboratory analysis was not available due to the short holding time for this parameter
--- : Data was not provided

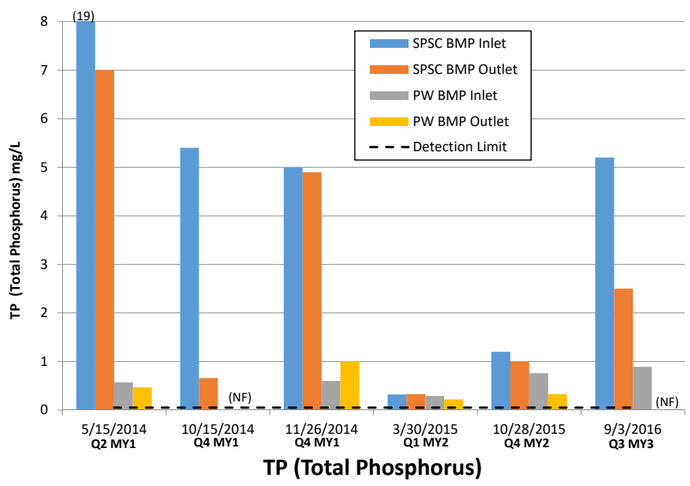
Table 16. Pollutant Removal Rates
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 - 2016

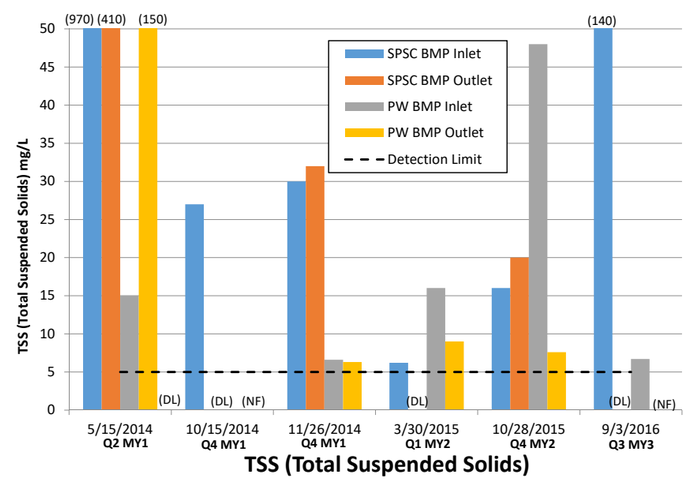
Monitoring Year	Location	Sample Collection Date	Percent Reduction[1]					
			TN	NO_x	TKN	TP	TSS	FC
MY1	SPSC BMP	4/22/2014 (Baseflow)	18%	57%	1%	-29%	-56%	65%
	PW BMP		N/A	N/A	0%	-74%	-255%	-62%
	SPSC BMP	5/15/2014	53%	64%	42%	63%	58%	0%
	PW BMP		28%	27%	30%	18%	-900%	63%
	SPSC BMP	10/15/2014	67%	88%	60%	88%	94%	-369%
	PW BMP		N/A					
	SPSC BMP	11/26/2014	10%	9%	8%	2%	-7%	N/A
	PW BMP		7%	14%	0%	-67%	5%	
MY2	SPSC BMP	3/30/2015	-25%	25%	-30%	-3%	N/A	N/A
	PW BMP		N/A	0%	N/A	24%	44%	47%
	SPSC BMP	10/28/2015	-18%	-85%	16%	17%	-25%	7%
	PW BMP		41%	N/A	6%	57%	84%	N/A
MY3	SPSC BMP	9/3/2016	35%	-225%	71%	52%	N/A	N/A
	PW BMP		N/A	N/A	N/A	N/A	N/A	N/A

[1]Positive values indicate a reduction in pollutant concentration from inlet to outlet samples, negative values indicate an increase in concentration
N/A: Metric cannot be calculated

Water Quality Data
Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 -2016

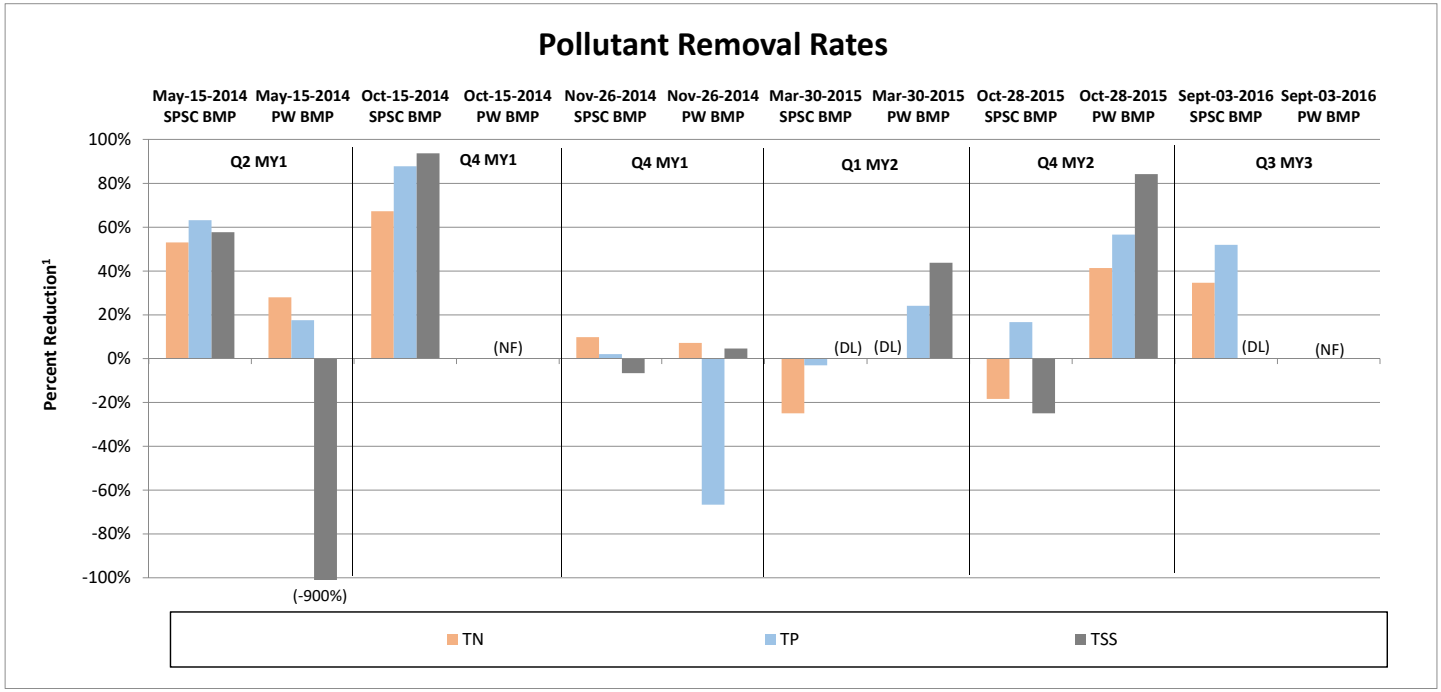






Pollutant Removal Plot

Norkett Branch Stream Mitigation Site
DMS Project No. 95360
Monitoring Year 3 -2016



DL: Parameter was below the detection limit

NF: No flow was available for sample collection/insufficient sample volume

[1]Positive values indicate a reduction in pollutant concentration from inlet to outlet samples, negative values indicate an increase in concentration