QUAKER RUN Stream and Wetland Restoration

As-Built Completion Report
and First Year Monitoring Data

Coal Township
NORTHUMBERLAND COUNTY, PA

Upstream Before

Upstream After

Prepared for:

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Executive Summary

The Quaker Run stream and wetlands restoration project, by the Reinhart Foods facility in Coal Township, PA, was completed in October, 2006. The project restored 2,000 linear feet of stream and created 3 new acres of wetlands. An as-built survey was performed July, 2007. Also at this time, permanent monitoring stations were installed.

Some maintenance was performed in July, 2007. Two principle locations that required attention were the steeper upstream section (B-channel) and the middle third of the lower section. The steep upstream channel section required additional bed and bank armoring near to structures. The middle third of the downstream section exhibited water loss, and was therefore overexcavated and refilled with onsite clay material taken from the floodplain.

The site was found to be richly vegetated in wetlands and floodplains. The live willow stakes planted in spring 2006 exhibited a very high survival. The floodplains supported dozens of dove, and the wetlands supported large populations of frogs, toads, and dragonfly. Killdeer were marginalized to higher elevations that were not part of this project.

Permanent monitoring locations and bank pins placed upstream of the projects continue to exhibit channel widening and downcutting.

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Introduction

In the fall of 2005 the Memorandum of Understanding language for stream and wetlands restorations services, between Coal Township and the US Fish & Wildlife Service (USFWS), was agreed upon. To that end, USFWS was charged to: (1) design and implement stream restoration plans for approximately 2,315 feet of Quaker Run in Northumberland County; and (2) to design and implement several wetland restorations totaling approximately 40,000 square feet. Both parties agreed that the tasks must have the approval of the Corps of Engineers to be considered complete.

The project Scope of Work was divided into five tasks. Work commenced in July, 2006 and was completed in October, 2006. Some additional live stake plantings were made in April, 2007. The site was inspected in June, 2007, and based upon this inspection some minor maintenance was performed in July, 2007. During this same time, monitoring was performed at the permanent cross section as well as in stream sections upstream of the site.

The restored stream appears very stable, and exhibits little general scour (bed or bank erosion). There were two locations of concern: the steep upstream channel at structures, and the middle third of the downstream channel where there was water loss. Both of these issues were addressed with the maintenance.

Quaker Run Reconstruction

Figures 1 through 6 display before and after shots of different vantage points of the site. Figures 1 and 2 depict the first item that was addressed: the outlet to the two 5-ft concrete culverts in the middle of the site. The existing site had a severe scour hole that had developed and threatened the Kulpmont/Marion Heights Joint Sewer Authority (KMHJSA) sewer line at that location. The culverts could not be moved or replaced, and therefore they served as significant constraints to the restoration designs. The solution was a classic rip rap, energy dissipation pool. The outlet to this pool was set to an elevation slightly higher than that of the pipe inverts at their outlets. This was to back up water into the pipes at low flows in order to preserve some connectivity for aquatic wildlife at low flows. When the pipes flow at the median Quaker Run flows and higher, there is no backwater effect due to the energy dissipator, and therefore water and sediment can easily pass through the entire lengths of the culverts.

Figures 3 and 4 depict the upstream section, where in addition to reconstructing a geomorphically-designed stream, new wetlands were also created. Figures 5 and 6 depict the downstream section. New wetlands, created by this project, were so successful; the Shamokin Creek Watershed Association took some tadpoles from these wetlands for introduction to other sites (Leanne Bjorklund, personal communication). Some instabilities (erosion) were detected close to the structures on the steep channel section in the upper part (Figure 7). The lower, steep section is basically a rip rap channel (Figure 8), and appears very stable.

Figure 1. Energy Dissipator 30 November 2005.

Figure 2. Energy Dissipator 28 February 2006.

Figure 3. Existing Upstream Section 11 May 2006.

Figure 4. Restored Upstream Section 5 September 2006.

Figure 5. Existing Downstream Section 11 May 2006.

Figure 6. Restored Downstream Section 30 June 2007.

Figure 7. Erosion at Vane 30 June 2007 (yellow circle).

Figure 8. Steep B-channel at lower end 30 June 2007.

Performance of the Restored Quaker Run

On November 16, 2007, 1.5 inches of rain fell in the general area. This precipitation created a bankfull event (Figures 9 and 10). The stream performed remarkably well: velocities were acceptable; structures performed well; and the stream used its floodplain.

Reference Cross Sections

Three reference cross sections were established for the restored Quaker Run. In addition, there are three reference cross sections on Quaker Run upstream of the restoration as well as four locations of bank erosion pins in the upstream Quaker Run. Two of the reference reach cross sections (Figures 11 and 12) in the restored Quaker Run are on the upstream portion (one in the steep and one in the flatter reaches), and one reference cross section is on the downstream portion (Figure 13).

The reference reaches have a 4-ft length of re-bar driven in at each end, and the cross section will be periodically surveyed between these pins.

It is interesting to point-out that Quaker Run upstream of the restored reach is impaired (that is why it could not serve as a reference reach). Although it is in a forest setting, the banks and bed are unstable and have demonstrated these instabilities with the erosion pins that were installed in 2006. Bank pins exhibit 0.2 to 2 feet of lateral erosion, and bed pins 0.0 to 0.3 ft of bed erosion. One cross section Station 2+47, Figure 16) suffered a large slump failure of bank material. A comparison of a typical riffle cross section in the restored and upstream impaired Quaker Run appears in Figure 14. In this Figure, the impairment characteristics of entrenchment and steep banks are apparent (Figures 15 and 16). The impaired channel is widening (eroding its banks) to create a suitable floodplain. This upstream reach of Quaker Run should be targeted as a future restoration project.

As Built-Plans

In July 2007, an as-built survey was conducted. The as-built plans may be found in Figures17 through 21.

Conclusions

The restored Quaker Run has held very well in its first year. The created wetlands are very healthy, and could be considered for a wetland banking program. Upstream of the restored stream, Quaker Run is in need of restoration efforts.

Figure 9. Bankfull event, upstream section 16 November 2007.

Figure 10. Bankfull event, downstream section 16 November 2007.

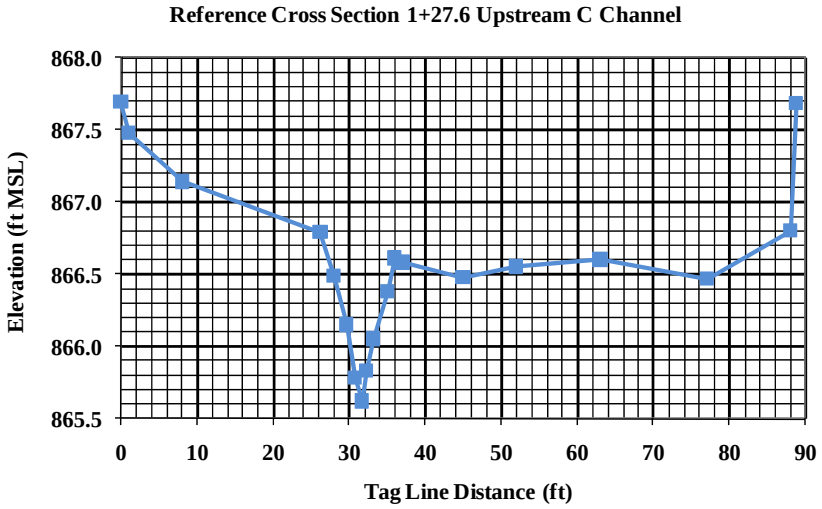

Figure 11. Reference Cross Section 1+27.6 Upstream.

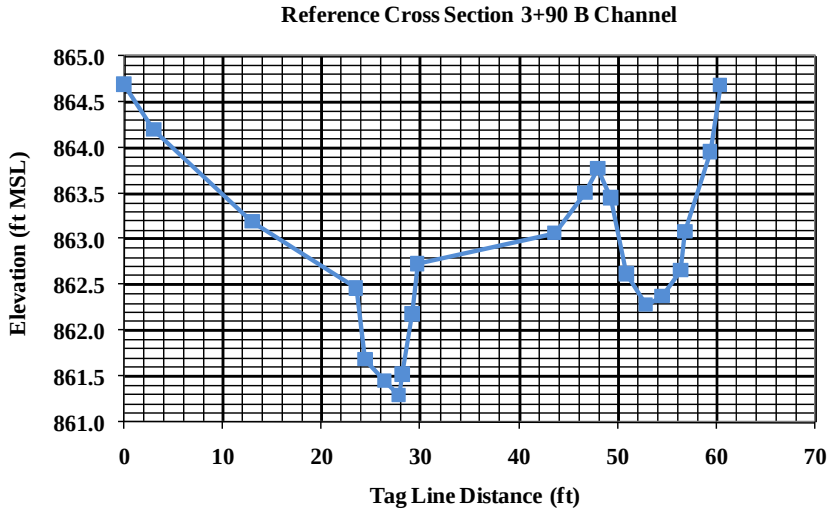

Figure 12. Reference Cross Section 3+90 Upstream.

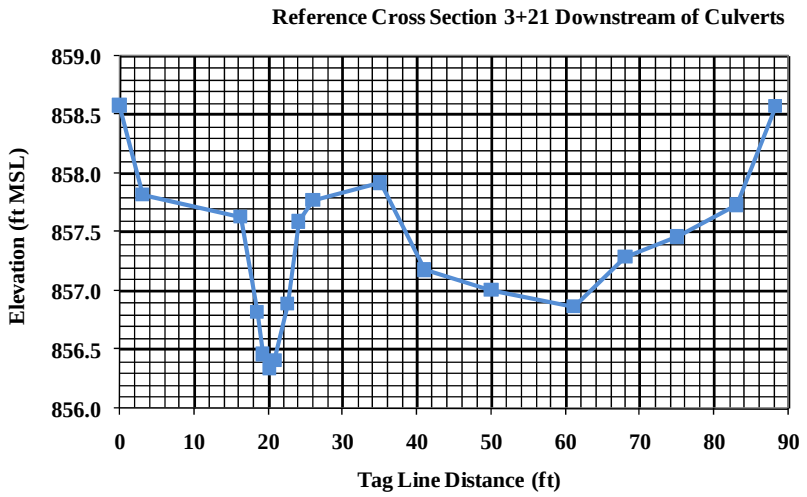

Figure 13. Reference Cross Section 3+21 Downstream.

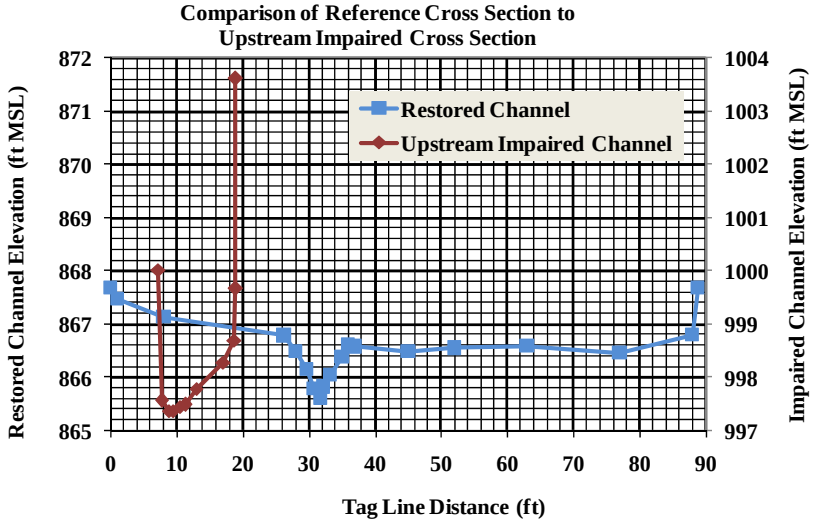

Figure 14. Comparison of restored and impaired cross sections.

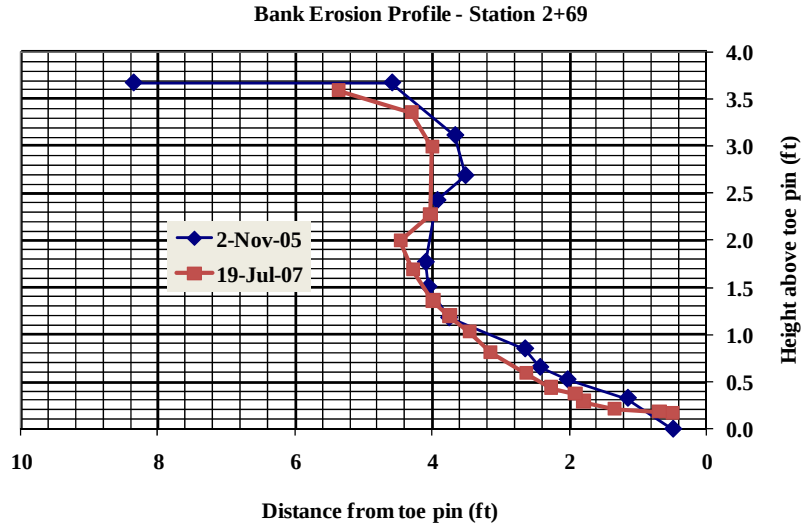

Figure 15. Bank erosion at upstream station 2+69.

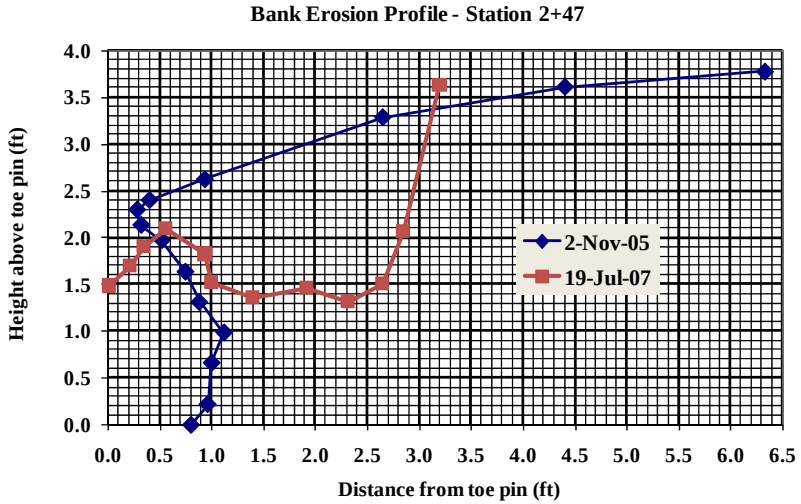

Figure 16. Bank erosion at upstream station 2+27.

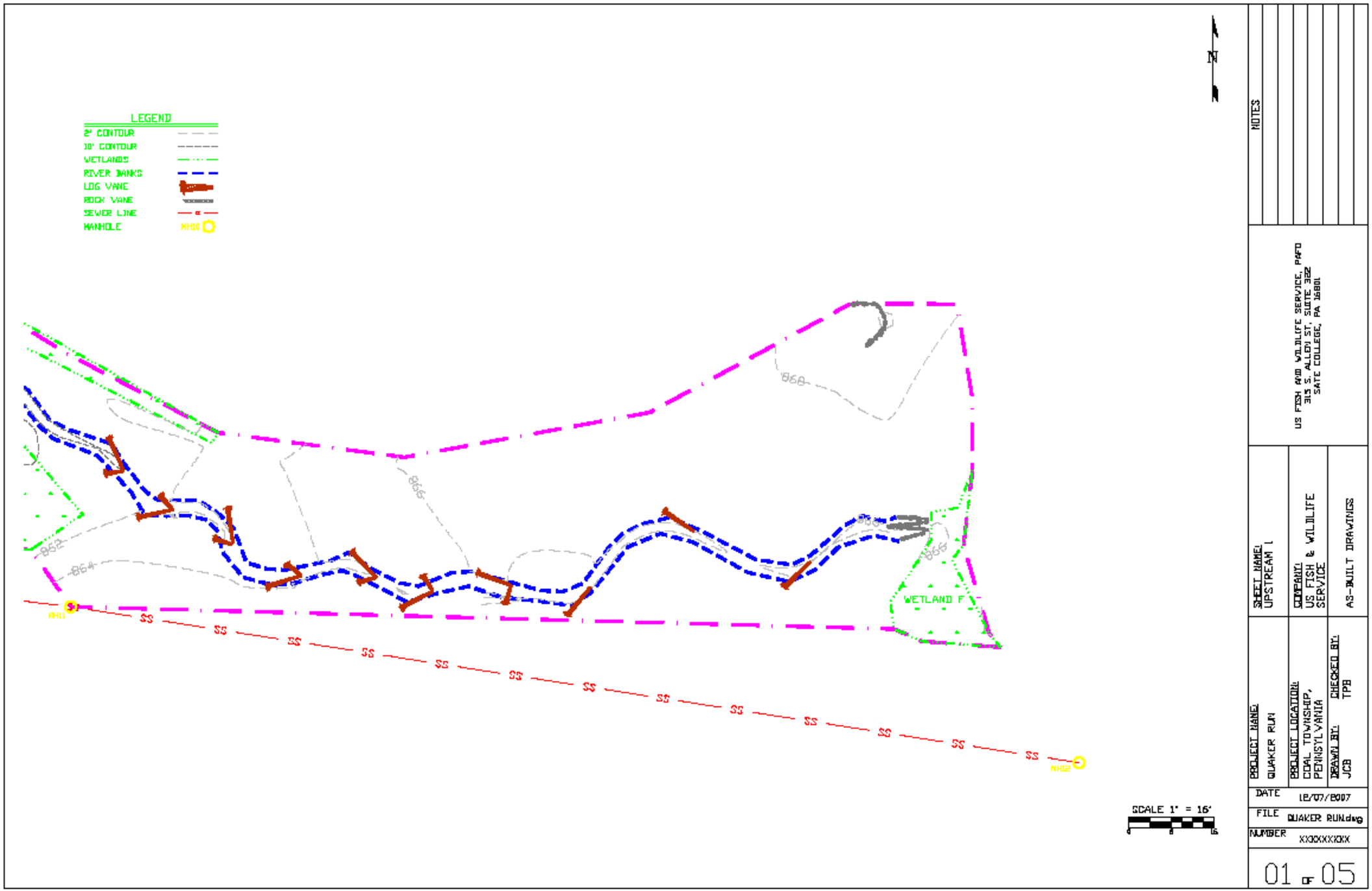

Figure 17. As-Built Upper Quaker Run Stream Alignment – part 1.

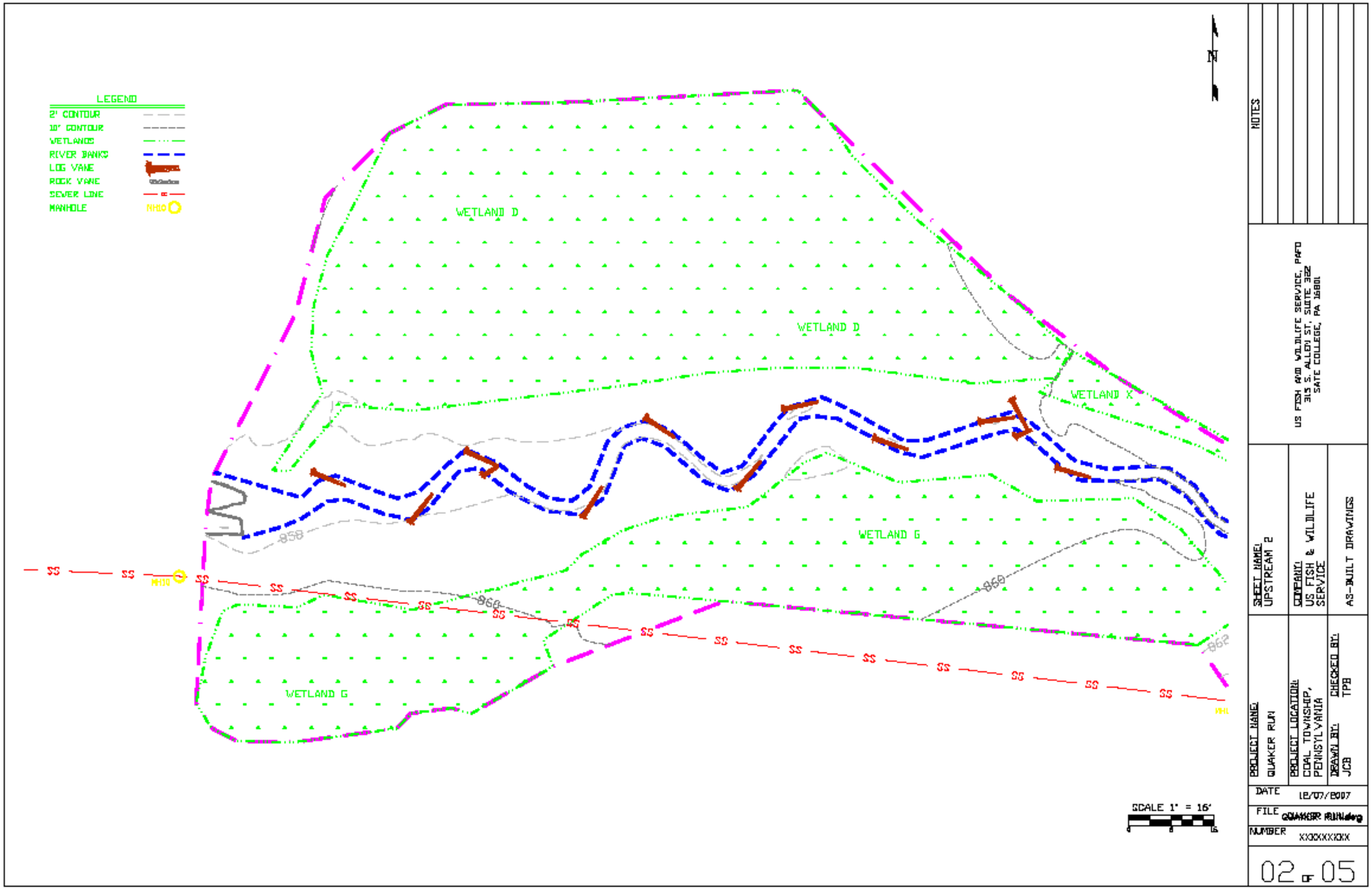

Figure 18. As-Built Upper Quaker Run Stream Alignment – part 2.

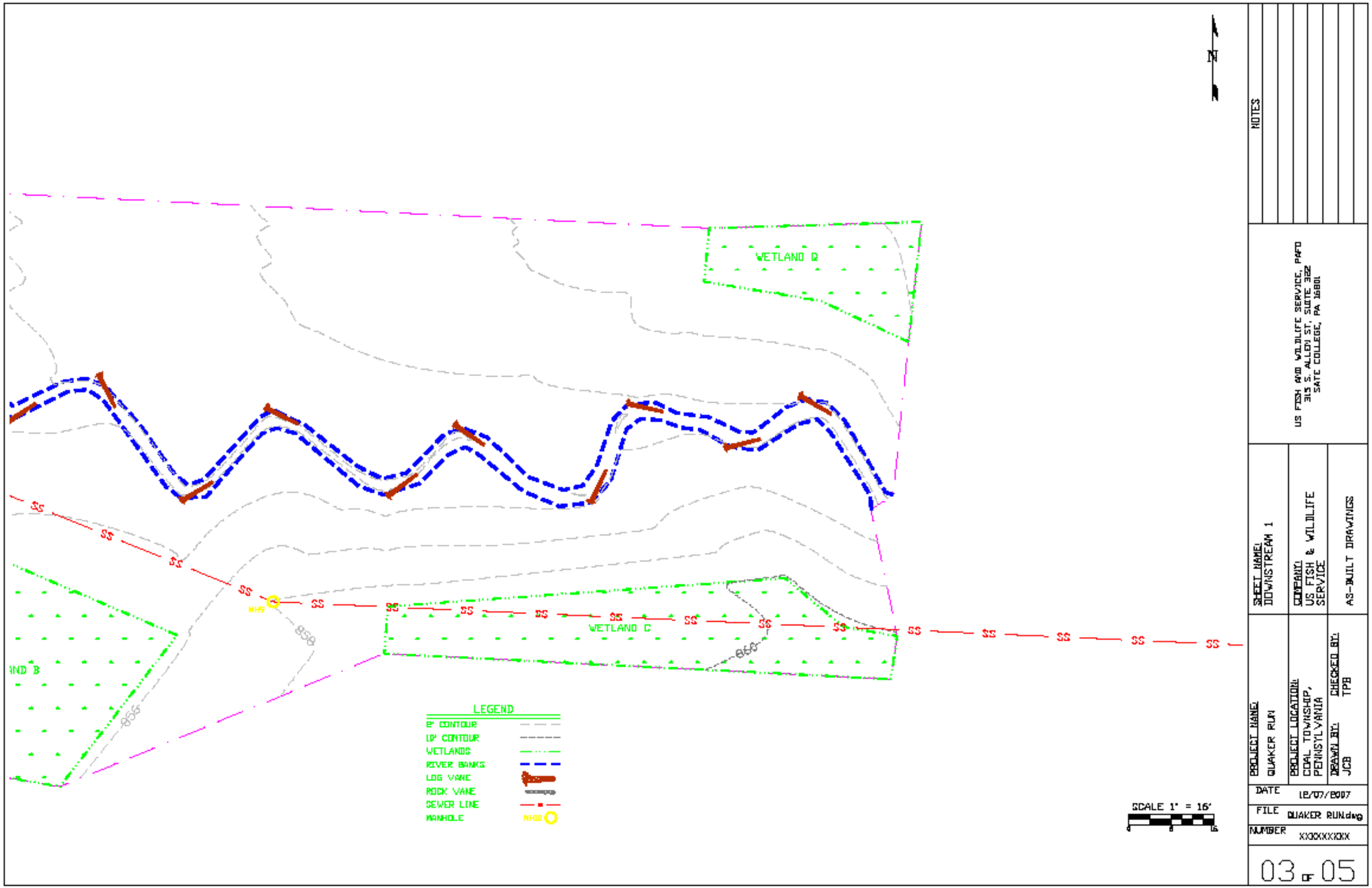

Figure 19. As-Built Lower Quaker Run Stream Alignment – part 1.

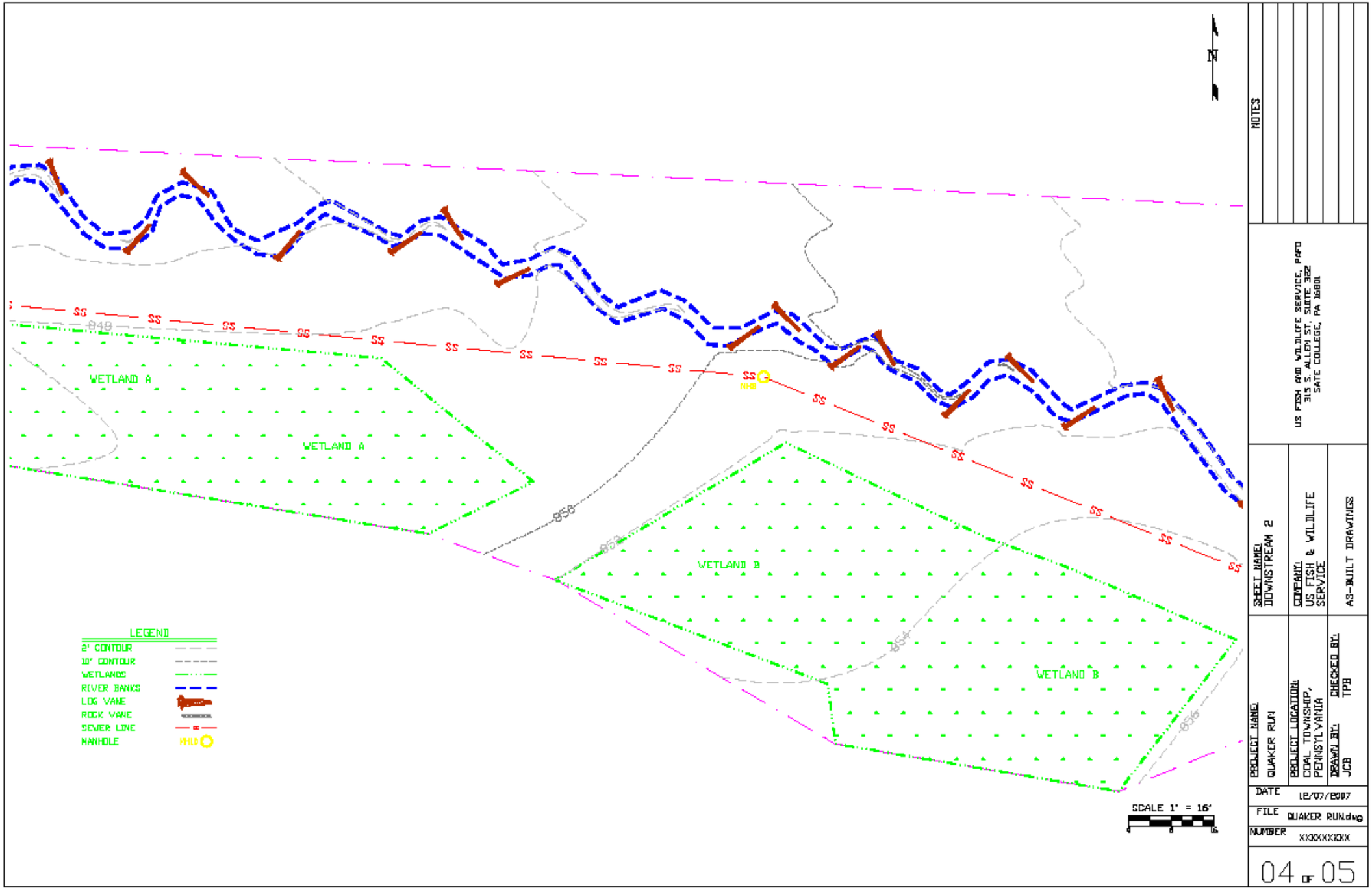

Figure 20. As-Built Lower Quaker Run Stream Alignment – part 2.

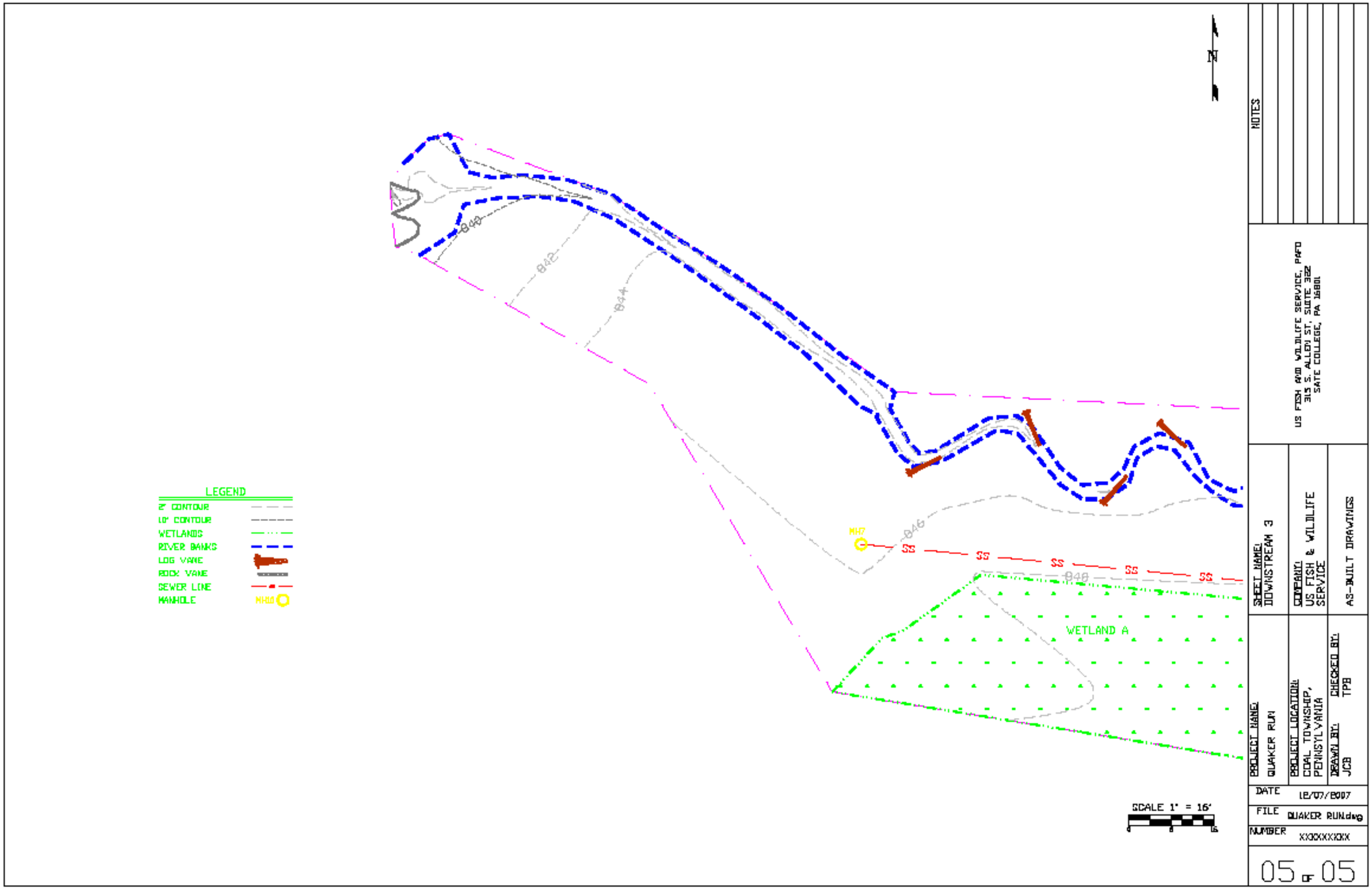

Figure 21. As-Built Lower Quaker Run Stream Alignment – part 3