DESIGN AND PERMITTING: BELLEVUE YARD EXPANSION PROJECT

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ABSTRACT

Bellevue Yard is a railroad transportation facility owned by the Norfolk Southern Railway Company (NS) encompassing approximately 620 acres, located in an unincorporated area in Huron and Erie Counties, Ohio, northeast of the town of Bellevue, near Toledo, Ohio.

The community of Bellevue has been a railroading center since the late 19th century, when NS' Nickel Plate Road predecessor line came to town. The classification yard was opened in 1967 by NS' predecessor Norfolk and Western Railway (merged with the Nickel Plate in 1964). NS uses the yard for the classification and movement of freight.

The yard expansion project provides increased capacity. NS proposes to add 38 classification tracks and 12 support yard tracks allowing NS to increase the number of cars classified from 1,800 to 3,600 a day. Additional improvements include a pedestrian
tunnel under existing tracks, a new vehicle access road bridge, drainage, lighting, road improvements, and new support buildings with a yard tower. When completed, Bellevue will be the largest classification yard on the NS system.

The majority of the expansion is in a central portion of the facility adjacent to existing classification yard operations in an area previously graded and planned for this expansion in 1966. During the design of the project, the team encountered unique challenges in designing the structures, overcoming existing site conditions, and environmental constraints. These challenges required re-evaluation and redesign to avoid and minimize impacts to waters of the United States.

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History

Ohio was admitted to the union as the seventeenth state in 1803. Huron County was formed on February 7, 1809 and organized in 1815. The county lies in the former Connecticut Western Reserve and more specifically, in a sub-region called the Firelands. (1). It was reduced in size by the formation of Sandusky County to the west on February 12, 1820 and was reduced in size again in 1838 by the formation of Erie County to the north (1).

The Development of Bellevue, Ohio, And Early Railroads

The first settlers in the Bellevue area arrived in 1815, building log houses near the Huron/Sandusky County line. One of the primary roads leading to this area was West Road (now called North West and South West Road) which was the boundary line between the Connecticut Western Reserve and the Firelands. (2)

In 1839, the Mad River & Lake Erie Railroad was completed to Bellevue. Authorized to name the station, railroad engineer James H. Bell named the place after himself, hence Bellevue. By 1841, the railroad expanded to Republic and Tiffin, and then to Springfield. In 1851 Bellevue town was incorporated by an act of the state legislature. (3)

In 1852, the Toledo, Norwalk & Cleveland Railroad arrived at Bellevue, helping to grow the small community of 800 to over 3,000 by 1888. (3)

The Nickel Plate Road

In 1882, the New York, Chicago and St. Louis Railroad Company began operating the “Nickel Plate” road from Buffalo to Chicago, through Bellevue, Ohio. That same year, William Vanderbilt purchased a controlling interest in the railroad to lessen any competition to his own rail line, the adjacent Lake Shore & Michigan Southern. As a consequence of the Vanderbilt purchase, the Nickel Plate railroad faltered until it was bought by the Van Swearingen brothers in 1916. Looking for a transit line from their Shaker Heights development to Cleveland, they rehabilitated, modernized, and added
to the line until it had eventually over 1,700 miles of profitable operating lines between Buffalo, Wheeling, Chicago, and St. Louis. (4)

Figure 1: Nickel Plate Road Branch Map (5)

Figure 2: 1888 Bellevue Bird’s Eye View Map (6)
The New York, Chicago & St. Louis Railroad (Nickel Plate) was a medium sized Class I operation specializing in excellent freight service. The railroad obtained its name from a Norwalk, Ohio newspaper column that complemented the newly opened railroad by calling it a “double-track nickel-plated railroad”. (5)

In 1964, the Nickel Plate Road merged with the Norfolk & Western, providing the latter with a network of track extending from the Atlantic to the Great Lakes. (4) At the same time, the Wabash, Akron, Canton & Youngstown line, and the Pittsburgh & West Virginia line also merged with the Norfolk & Western. (5)

The rail yard northeast of Bellevue does not appear on the 1901 U.S. Geological Survey quadrangle map, but does appear on the 1967 quad map. The project area became a “Classification Yard” in 1967, after the Nickel Plate Railroad merged with the Norfolk & Western Railroad. Similarly, the rail yard does not appear on the 1964 aerial photograph of the area, but does appear on the 1971 aerial photograph. With a construction date of 1967, the rail yard is 46 years old (in 2013).

Figure 3: 1964 Aerial Image of Project Area (7)
The Norfolk & Western Rail Yard, northeast of Bellevue, is sometimes called a “Hump Yard.” A hump yard is “a regional gathering point where freight is classified and forwarded to final destinations. The three components are a receiving yard, a classification yard (where railcars are pushed over a hump to various classification tracks) and a forwarding yard”. (9)

In 1982, the Norfolk & Western merged with the Southern Railway, but retained its name until 1997 when the company became known as the Norfolk Southern Railway. Many of the Nickel Plate Road’s original lines continue to be used as part of NS’ system.
Today, the NS Lake Division Cleveland, Fostoria, and Toledo Districts (all formerly Nickel Plate), and the Sandusky District (formerly Pennsylvania Railroad), come together at Bellevue, resulting in approximately 70 trains entering and leaving Bellevue every 24 hours. (10)

Figure 6: Current Aerial image of the Project Area.

Figure 7: 2012 Aerial image of the Classification Yard
Original Yard Design

The existing facility (constructed prior to 1888) consisted of an eastbound and westbound main and a roundhouse. The site was expanded with the “E” and “W” yards before the 1930’s.

The classification yard was constructed in 1967. The yard was planned for a classification yard with 80 tracks, an eastbound forwarding yard with 3 tracks, a westbound forwarding yard with 8 tracks, and a receiving yard with 12 tracks. The eastbound and westbound forwarding yards also included a running track in each yard. The site was configured with the receiving yard and hump in the center with the forwarding yards to the north and south for approximately forty classification yard tracks on each side of the original main alignment. At the time of construction only 43 of the planned classification yard tracks, 2 of the eastbound forwarding yard tracks, 6 of the westbound forwarding tracks and 10 of the receiving yard tracks had been constructed along with the running tracks.
A major surface water tributary traveled from southwest to northeast bisecting the mainline between Bragg Road and SR 4. (Figure 5) The tributary was rerouted to the east and west around the proposed yard through a series of ditches, culverts and ponds. The site was re-graded to drain to the relocated tributaries via a system of catch basins, culverts, channels, and ditches to the outer perimeter of the eastbound and westbound forwarding yards.

The central portion of the yard is between Bragg Road to SR 4. It includes the classification yard, locomotive shop and portions of the forwarding yards. The drainage in these locations pass through four oil water separators prior to entering the tributary. An Individual NPDES Industrial Discharge Permit and a Storm Water Pollution Prevention Plan covered this configuration and the storm water outfall to the north is monitored prior to outletting into the existing tributary alignment. (Figure 9)

Figure 9: An Individual NPDES Industrial Discharge Permit and Storm Water Pollution Prevention Plan are on file for the existing yard as shown in the figure.

Expansion Project

The expansion project will double the classification yard capacity with the addition of 38 classification tracks including a master and five group retarders with a dual cross over at the top of the hump, a new air compressor building with 4 new air compressors and back-up generators for the hump operations. The new hump includes a vehicle access road bridge from the main facility access road to the car shop. The
leads to the car shop from the crest of the hump to the car shop were realigned. The yard office and tower at the pullout end (Bragg Road) were demolished and new facilities constructed on the south side of the yard.

Figure 10: Design Layout (West)
Figure 11: Design Layout (Classification Yard)

Figure 12: Design Layout (East)
The vehicle access road bridge was a design challenge due to the close proximity of the existing active master retarder, the existing hump, the existing soils, proposed road geometry, utilities and the requirement to limit deflection in the retaining structures to ensure existing track and retarder stability. The structure was designed to utilize top down construction to maintain operations. The rear abutment was constructed with 3’ diameter secant shafts with rock bolts anchored into bedrock and 4’ diameter secant shaft wingwalls. The rear wingwalls and abutment are 400’ in length. The forward abutment and south wingwall were constructed conventionally. The north wingwalls were braced across the roadway with overhead struts.

The westbound forwarding yard was expanded by adding two tracks and a 10 car set-off track, and two existing tracks were realigned. The access road to the locomotive shop was relocated, a new access road was constructed on the north side, and one access road under SR 4 was realigned. The north access road under the SR 4 Bridge will be constructed between the existing pier and abutment. A soil nail wall was determined to be the best option due to the vertical constraints and soil conditions. The wall is approximately 180’ in length with a 12’-6” maximum exposed face.
The eastbound forwarding yard was expanded by adding one yard track, a 10 car set-off track, the south bypass track, and an existing track was realigned. A pedestrian tunnel was replaced and some access roads were relocated and paved.

The pedestrian tunnel was originally proposed to be a structure over the tracks but was changed to a tunnel replacement at the beginning of design. To accelerate construction, the tunnel was designed utilizing 10.5’ high x 8’ wide precast segmental boxes. Due to the close proximity of bedrock to the bottom of the structure, the boxes were post-tensioned.

The receiving yard was expanded by adding two tracks, converting the manual turnouts to power, and installing approximately 22,000 track feet (TF) of continuous welded rail (CWR).

The “W” Yard and “E” Yard will be upgraded by replacing 28 turnouts and installing approximately 30,000 TF of CWR on thirteen tracks. A new 3,600’ long Repair in Place (RIP) track will be constructed in the “W” yard and a third Pullback track will be added from the classification yard to the west end. A new mechanical building and garage were built to support the RIP track.

A new south bypass track was constructed from the “E” Yard to the eastbound forwarding yard. It required the relocation of the access road and MW&S building. The
tracks and interlocking connecting the classification yard, pullbacks, eastbound forwarding yard and south bypass track were reconfigured and any remaining manual turnouts were powered.

The project began in the fall of 2010 with the survey, geotechnical investigation and environmental field work. Upon completion of the environmental field work, the design team submitted the jurisdictional determination (JD) request to the United States Army Corps of Engineers in December 2010. The design team coordinated with the Army Corps to schedule the site visit. Due to the considerable size of the site, it was decided that a proactive approach in coordinating with the agency was necessary. NS, with Baker and Balch and Bingham, met with the Army Corps to review the project in March 2011. The wetland data was presented with the conceptual design. The importance of the project was discussed, along with the existing storm water discharge permit and supporting legislation.

Due to weather conditions and the need to determine growth of vegetation the Army Corps did not schedule the site visit associated with the jurisdictional determination until mid-April. Two days were planned for the entire site. Unfortunately, it had been raining for quite some time prior to and during their visit. The weather was not cooperating with the project. The spring of 2011 was one of the wettest springs in Ohio history.

The Army Corps confirmed our wetland delineation as jurisdictional waters and preliminarily added a significant length of the parallel storm water management ditches around the perimeter of the facility east of SR 4 and west of Bragg Road, denoting these as linear wetlands. The storm water management ditches were part of the original design and continued to be used for stormwater drainage from the yard. Although linear and man-made, rail ditches often appear to be jurisdictional waters of the United States. Due to their typically flat grade, they tend to collect water. That coupled with the hydric soils from the area make them suitable for water-dependent vegetation growth. Planned impacts to the storm water management ditches, if considered jurisdictional waters of the United States, would require an Individual 404 Permit. This would add a minimum of one year to the schedule and require extensive coordination with the Corps and possibly other agencies. (11) NS and the design team worked to significantly reduce the footprint of their project in order to avoid and minimize impacts to potentially jurisdictional streams and wetlands present on this previously disturbed site. The impacts to the waters of the United States needed to be under 0.5 acres of wetlands and 250 feet of stream for a nationwide permit. The original design impacted 0.62 acres of wetlands and 7,249 lineal feet of streams. Through design and avoidance and minimization, reductions were made to original impacts. (Figures 15 and 16)
Figure 15: Environmental Resources

Figure 16: Environmental Resources
Figure 15 and 16 show the Jurisdictional (green) and non-Jurisdictional (orange) ditches and swales and Jurisdictional (blue) streams shown with planned track and access road work prior to redesign.

In addition to significant reductions in impacts to the areas the Corps considered jurisdictional, the Corps ultimately agreed that storm water management systems were not jurisdictional waters. This determination took time, involving internal Corps deliberation and several site visits by Corps personnel. In addition to the linear, man-made nature of many of the features the Corps originally considered jurisdictional, Clean Water Act regulations exclude storm water management systems from being required to obtain certain permits. The yard had obtained a storm water permit and was using and managing the ditches as storm water systems. The Corps agreed that these areas did not qualify as jurisdictional waters requiring additional permits.

The following is a summary of the efforts made to avoid and minimize impacts:
Tracks were added on the inside of the westbound forwarding yard instead of on the outside of the yard as preferred to allow the proposed north road to be shifted to the south. The proposed access road on the north side was narrowed. In the WB Forwarding Yard, track W1 was planned to be realigned north and an 18’ wide road built 9’ parallel to this track. A design change realigned track W1 south and moved the 18’ wide access road starting where track W1 was previously (9’ from realigned W1) in order to avoid “linear wetland” ditches.

The South Bypass track was proposed as a brand new track, south of the existing tracks, for the entire length starting from SR 99 to the “E” Yard. From SR 99 to the eastbound forwarding yard, the South Bypass Track was built between the Eastbound Main and the Receiving Yard. An existing track in the Eastbound Forwarding yard was used east of SR 4 versus constructing a new South Bypass track. This change eliminated impacts to parallel and perpendicular ditches, streams and linear wetlands east of SR 4.

The access road along the South Bypass was planned to be 24’ wide with its alignment shifted to the south. It was narrowed to 20’ wide from SR 99 to west of SR 4 and remained on the existing alignment.

The Pullback Track was originally going to be adjacent to and on the south side of the existing Pullback Tracks. In order to reduce wetland impacts west of Bragg Road, the Pullback Track was realigned further south approximately 50’ north of the “E” yard tracks and the profile was adjusted in this area to avoid wetlands.

Additional minor changes to access roads along the South Bypass were made to avoid wetlands. Pipe extensions were minimized with the addition of new headwalls along the south and north access roads to avoid impacts to linear wetlands.

Stormwater features, appurtenances, and best management practices (BMPs) were designed to comply with applicable local, state, and federal stormwater and
erosion control rules and regulations while avoiding impacts to waters of the United States.

Additional small changes were made to reduce the total wetland impacts to 0.18 acres of acre of Category 1 wetlands and 55 LF of stream. The project was bid in January of 2012 with construction starting in April 2012. The project authorizations were obtained in March of 2012 to get the project construction commenced while avoiding protracted permitting issues. The project is scheduled to be completed by the end of 2014.

Permitting work with the U.S. Army Corps on the proper categorization of rail ditches was critical to the success of the project. Although design changes accounted for significant reductions in impacts to jurisdictional waters, the project could not have been completed without the proper categorization of rail ditches as storm water management systems consistent with federal regulations. A critical part of the proper designation involved identifying the scope of the yard’s storm water management. The Storm Water Pollution Prevention Plan (SWPPP) prepared for the yard served as an important document demonstrating ongoing storm water management at the yard so as to invoke the federal exclusion. While actual stormwater management at the yard includes the forwarding yard tracks east of SR 4 and west of Bragg Road, because those areas were not within the SWPPP the Corps did not feel comfortable excluding lead areas, and a portion of an access road had to be removed from design plans to avoid disturbing these lead track ditch areas. Deferred maintenance in some areas had resulted in growth of water-dependent vegetation giving the Corps some pause in terms of proper categorization of waters. Ditch maintenance is important to a proper categorization of ditches, as well as ditch function, and is recommended.

REFERENCES
(1) Howe, Henry 1891 *Historical Collections of Ohio.* Volume II. Columbus, Henry Howe & Son.
(6) American-Rails.Com

(7) 1964 Historic Aerial Images. Erie County Records, Sandusky, Ohio.

(8) http://nkprr.railfan.net/yards.html 2010

(9) Norfolk Southern Corporation Website

(10) Trainorderpics.com

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Current Aerial Image of Project Area

Design Layout

Design Layout - Class Yard

Design Layout

Design Items

- Construct Track - 195,195 TF = 37 miles
- Realign Track - 49,280 TF = 9.3 miles
- #6, 8, 10 Lap Turnout - 1
- #8 Turnout - 85
- #10 Turnout - 41
- #15 Turnout - 1
- Master Retarder - 1
- Group Retarders - 5
- Skate Retarders - 38
**Design Items**

- New Utilities and Relocations
- Lighting
- New Air Compressor Building with New Air Compressors
- Modified Satellite Air Compressors
- Back-up Generators - 19
- Related Signal and Hump Control Items

**Buildings**

- Crew Building and Tower
- MWBS Building

**Aerial of Vehicle Access Road Bridge**

- Proposed Hump Lead
- Ex. Retarder
- Tower and Air Compressor Building

**Vehicle Access Road Bridge**

- Ex. Master Retarder
- Admin Bldg
Secondary Access Tunnel

Proposed Secondary Access Tunnel
Existing Pedestrian Tunnel

Soil Nail Wall Section

Project Schedule

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Individual NPDES Industrial Discharge Permit and Storm Water Pollution Prevention Plan

Environmental Resources

Jurisdictional Ditches/Swales
Non-Jurisdictional Ditches/Swales
Jurisdictional Streams
Resource Summary

Wetlands
- 31 Identified
- 6.22 acres total
- Original Design - 0.62 acres impacted
- Revised Design - 0.18 acres permanent impacts/0.05 acres temporary impacts

Streams
- 6 Identified
- 9,328 LF total within study area
- Original Design - 7,249 LF impacted
- Revised Design - 55 LF permanent impacts/20 LF temporary impacts

Waste Treatment Exemption

- Rail storm water management systems are human-made, meant for storm water control and in many cases treatment.
- Are human-made ditches which grow wetland vegetation, hold water, and accumulate hydric soils really intended for protection under the Clean Water Act?

EPA Specifications for Stormwater

Questions?

Thank You