2016 Annual Mitigation Site Monitoring Report

Metropolitan Utilities District

Platte West Water Production Facility Project
Project No. 92445

1/12/2017

2016 Annual Mitigation Site Monitoring Report

prepared for

Metropolitan Utilities District
Platte West Water Production Facility Project
Omaha, NE

Project No. 92445

1/12/2017

prepared by

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EXECUTIVE SUMMARY

The Metropolitan Utilities District (District), Omaha, Nebraska, was issued a Section 404 Individual Permit (Permit) on May 16, 2003, from the U.S. Army Corps of Engineers, Omaha District (Corps), for the Platte West Water Production Facilities Project (Project; U.S. Army Corps of Engineers 2003). As part of the terms and conditions included with the Section 404 Permit and an Environmental Impact Statement completed by the District in 2002, the District has agreed to provide mitigation for both direct and indirect impacts to wetlands and watercourses that may result from the Project. Direct impacts result from the construction of the Project facilities; indirect impacts could occur due to groundwater drawdown during the operation of the Project.

The mitigation for direct impacts resulting from construction of the District's new water treatment plant in Douglas County has been accomplished onsite at the Wet Meadow Mitigation Site (WM-1) and at six wetland cells located at the water treatment plant site (Water Treatment Plant mitigation sites, WM-4 through WM-9). Mitigation for indirect impacts to wetlands that was predicted to occur in the well fields was accomplished at two separate locations- the Wet Meadow Expansion Mitigation Site (WM-2) and the Douglas County Backwash Drain Line Mitigation Site (WM-3).

Monitoring of WM-1, WM-2, and WM-4 through WM-9 was completed prior to 2016. Monitoring activities at WM-3 were conducted in June and September of 2016. The results of this monitoring show that WM-3 meets the criteria for success for hydrophytic vegetation and wetland hydrology and the 2014 wetland delineation effort confirms the presence of hydric soils. A request for sign-off on the completion of monitoring at WM-3 will be submitted to regulatory agencies.

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1.0 INTRODUCTION

The Metropolitan Utilities District (District), Omaha, Nebraska, received a Section 404 Individual Permit (Permit) on May 16, 2003, from the U.S. Army Corps of Engineers, Omaha District (Corps), for the Platte West Water Production Facilities Project (Project; U.S. Army Corps of Engineers 2003). The terms and conditions included in the Permit were based to a large degree on the impact analysis and the conceptual mitigation plan included in the Environmental Impact Statement (EIS) completed by the District in 2002 (Burns & McDonnell 2002a and 2002b). As part of the terms and conditions included with the Section 404 Permit, the District has agreed to provide mitigation for both direct and indirect impacts to wetlands and watercourses that may result from the Project. Direct impacts result from the construction of the Project facilities; indirect impacts could occur due to groundwater drawdown during the operation of the Project.

The District, with concurrence from the Corps, decided to pursue wetland mitigation in phases. At least three phases of wetland mitigation were originally planned. Phase I of the mitigation effort provided measures to compensate for upfront construction impacts (direct impacts). Phase II provided mitigation for anticipated indirect impacts to wetlands in the two well fields due to groundwater drawdown. As currently planned, Phase III mitigation will address any impacts or alterations to wetlands that may occur as a result of drawdown outside of the two well fields in the projected Project cones of depression. Groundwater modeling in the 2002 EIS estimated that a drawdown in the groundwater levels of one foot or more would impact most wetlands. Therefore, the potential cones of depression are the areas predicted to experience a one-foot-or-greater drawdown of the local water table as a result of Project operation. The anticipated boundaries of the potential cones of depression are shown in Figure 1-1.

In the 2002 EIS, wetland impacts in the well fields due to construction and operation of Project facilities were predicted to total 14.6 acres. Approximately 0.3 acre of wetlands would be impacted due to construction, while Project operation was estimated to impact 14.3 acres of wetlands in the two well fields. These 14.6 acres included both direct and indirect impacts that would occur in the well fields (Phases I and II). According to the Section 404 permit conditions, the 14.6 acres predicted to be impacted were to be mitigated at a ratio of 1.5:1.0 (wetlands created to wetlands impacted); this amounts to a total of 21.9 acres of replacement wetlands required. In addition, another 141.6 acres of wetland alteration (conversion to a drier wetland type by drawdown of the water table) were estimated to potentially occur in the cones of depression at some time in the future due to Project operation. Since the issuance of the 2002 EIS, a Mitigation Site Selection Study was prepared and finalized (Burns & McDonnell 2007a). This site selection study evaluated a total of 16 separate potential wetland mitigation sites that

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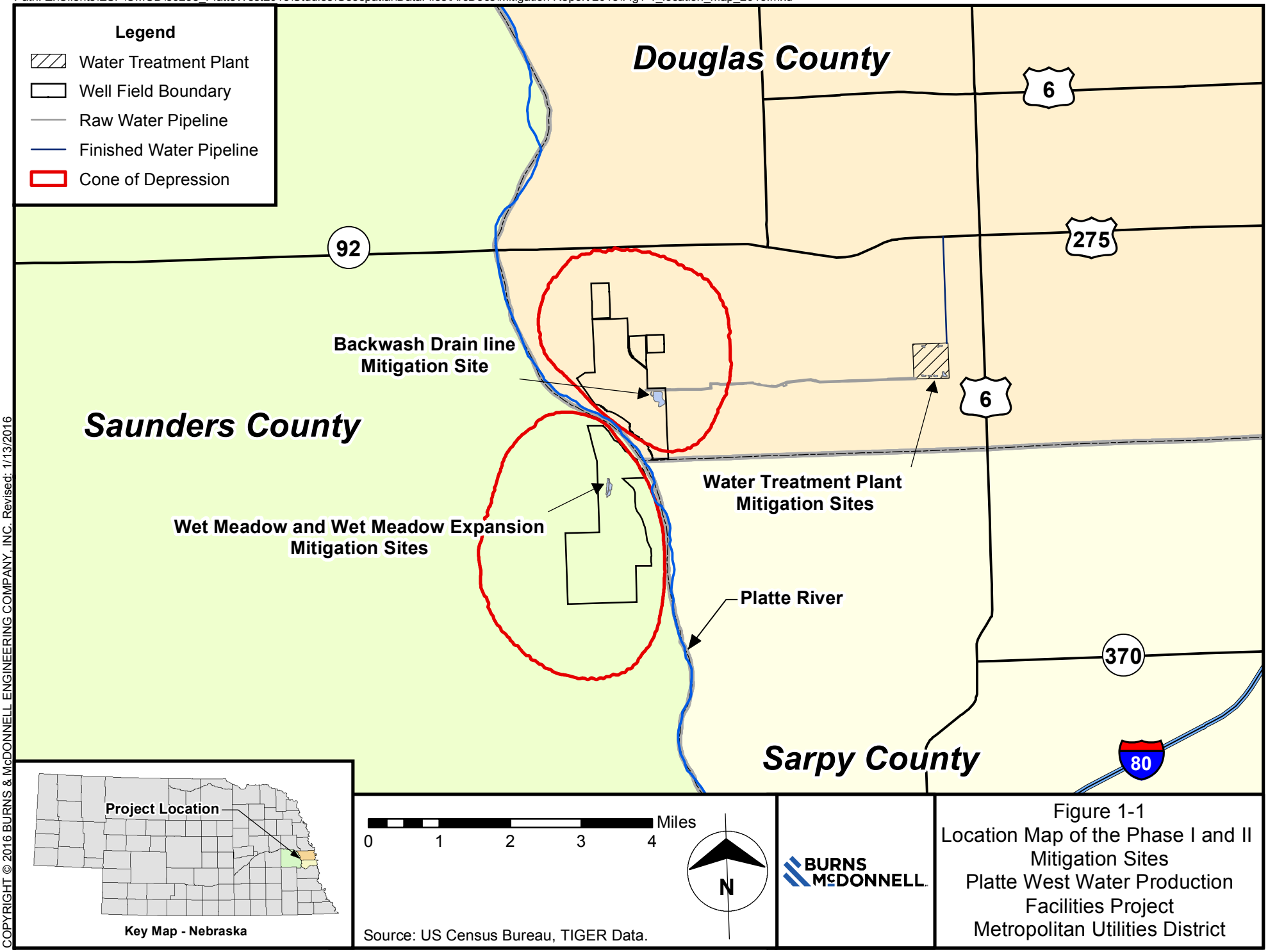

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Figure 1-1
Location Map of the Phase I and II Mitigation Sites
Platte West Water Production Facilities Project
Metropolitan Utilities District

could be pursued by the District to provide wetland mitigation to compensate for impacts as a result of Project construction and operation.

1.1 MITIGATION SITES

Phase I and Phase II mitigation have been implemented as described above. Phase I mitigation for direct impacts to wetlands was accomplished at two separate locations – the Wet Meadow Mitigation Site (WM-1) and the Water Treatment Plant Mitigation Sites (WM-4 through WM-9) (Figure 1-1). The *Mitigation Plan for Phase I Impacts* (Phase I Mitigation Plan; Burns & McDonnell 2005c) was approved in 2005 and provides details of the Phase I mitigation efforts.

Phase II mitigation for indirect impacts to wetlands in the well fields was accomplished at two separate locations – the Wet Meadow Expansion Mitigation Site (WM-2) and the Douglas County Backwash Drain Line Mitigation Site (WM-3) (Figure 1-1). As stated above, Phase II mitigation has been implemented to address potential indirect impacts which may occur within the well fields as the result of Project operation. Details of the Phase II mitigation efforts are provided in the *Mitigation Plan for Wetland Impacts* – Phase II (Phase II Mitigation Plan; Burns & McDonnell 2007b), which was approved in 2007.

1.1.1 Wet Meadow Mitigation Site

Phase I mitigation for construction-related impacts from all aspects of the Project, except for the new water treatment plant, was completed in the Saunders County well field near the 95-acre area known as the Wet Meadow (Wet Meadow Mitigation Site, WM-1). A total of 0.3 acre of wetland was permanently impacted due to the construction of the facilities in the two well fields required for this Project. As described above, these impacts were mitigated at a 1.5:1.0 (created wetlands to impacted wetlands) ratio. As a result, approximately 0.45 acre of wetland was required as mitigation for up-front Project construction-related impacts in the well fields.

In 2005, WM-1 was constructed on approximately 22 acres of cropland owned by the District (Figure 1-2). WM-1 is an approximately 3.3-acre emergent wetland constructed in a formerly farmed wetland. The surrounding upland area was seeded with native vegetation to create an upland buffer. WM-1 provided wetland mitigation in excess of what is required for Phase I construction-related impacts. This excess wetland acreage created was applied to Phase II mitigation for indirect impacts that would occur during Project operation. As mentioned above, construction of WM-1 began late in the summer of 2005; grading of the created wetland and seeding with native vegetation was completed in December 2005. The *As-Built Report for the Wet Meadow Mitigation Site* documents the construction of the mitigation site

(Burns & McDonnell 2007c). Monitoring requirements at WM-1 were completed in 2012. A completion letter summarizing the data collected during the six full years of monitoring at WM-1 was prepared by Burns & McDonnell and submitted to the District and the Corps on June 4, 2013 (Appendix III).

1.1.2 Wet Meadow Expansion Mitigation Site

The Wet Meadow Expansion Mitigation Site (WM-2) was constructed in the winter of 2007-2008, east of existing WM-1 in the upland buffer area (Figure 1-2). The two wet meadow mitigation sites (WM-1 and WM-2) are hydrologically connected at the north and south ends, but are otherwise separated by a narrow upland buffer. WM-2 consists of an approximately 4.7-acre emergent wetland divided into two separate wetland cells. Upon the completion of the construction of WM-2, approximately 13.7 acres of upland buffer area have been created surrounding the two wet meadow mitigation sites. The *As-Built Report for Phase II Wetland Mitigation Sites* documents the construction of the mitigation site (Burns & McDonnell 2008a).

1.1.3 Douglas County Backwash Drain Line Mitigation Site

The Backwash Drain Line Mitigation Site (WM-3) was constructed in the Douglas County well field as part of the Phase II mitigation effort in the winter of 2007-2008. WM-3 is located at the outlet of the backwash drain line west of the Elkhorn River (Figure 1-3). The drain line outlet was configured to discharge water into the mitigation site. The backwash water is of suitable quality for discharge into the Elkhorn River; therefore, the quality of water is also suitable for the creation and establishment of an emergent wetland for mitigation. WM-3 is located in an 80-acre former crop field in the southeastern portion of the Douglas County well field (Figure 1-3). Based on the as-built survey, 15.42 acres of emergent wetland were created at WM-3. In addition, 2.78 acres of drainage swales at the site have the potential to develop into wetland swales and an additional 58.04 acres of upland buffer were developed. The *As-Built Report for Phase II Wetland Mitigation Sites* documents the construction of the mitigation site (Burns & McDonnell 2008a). Modifications occurred at WM-3 in July 2011. The mitigation site was re-graded to lower the elevation in the center of the site and to improve hydrological connections throughout the site in an effort to increase the wetland acreage. Much of the central portion of the site was first lowered one to two feet from existing elevations, then a native wetland seed mix was hand-broadcast over the graded areas.

1.1.4 Water Treatment Plant Mitigation Sites

The mitigation for impacts resulting from construction of the District's new water treatment plant in Douglas County has been accomplished onsite at six wetland cells located at the water treatment plant site (Water Treatment Plant mitigation sites, WM-4 through WM-9, Figure 1-4). A total of 3.78 acres of

wetlands and 175 feet of intermittent stream were created. Construction of the wetlands and intermittent stream was completed in May 2009. The *As-Built Report for the Phase I Water Treatment Plant Wetland Mitigation Site* was prepared after construction and planting was completed (Burns & McDonnell 2009).

1.2 MONITORING GOALS

The goal of the wetland mitigation monitoring program is to measure the establishment of the wetland mitigation sites and to observe whether the mitigation sites develop similar functions and values as those wetlands and waters of the United States affected by Project construction and operation. According to the EIS, a total of 21.9 acres of wetland mitigation are necessary as a result of direct and indirect Project impacts. Mitigation efforts will be considered successful at a given site if the following criteria occur:

1. Eighty percent cover of native wetland vegetation will be established in the created emergent wetlands and along the banks of the created stream channel.

2. Positive indicators of hydric soils such as low chroma dominant colors, redoximorphic features, or oxidized rhizospheres are found in the created emergent wetlands.

3. Positive indicators of wetland hydrology such as inundation, saturation in the upper 12 inches of the soil, watermarks, and drift lines are found in the created emergent wetlands.

This report summarizes the 2016 monitoring efforts. Monitoring of Phase I mitigation site WM-1 was initiated in September 2006 and completed in 2012. Monitoring at Phase II mitigation sites WM-2 and WM-3 first took place in the fall of 2008. Monitoring of WM-2 was completed in 2014; monitoring of WM-3 continued in 2016. Finally, monitoring at the Phase I Water Treatment Plant mitigation sites (WM-4 through WM-9) began during the fall sampling period in 2009 and were completed in 2014. Monitoring efforts at the mitigation sites will be conducted twice per year for a period of five years from the initial monitoring effort or until mitigation goals have been met. No Phase III mitigation sites have been developed to date or are planned for development without mutual agreement between the Corps and the District.

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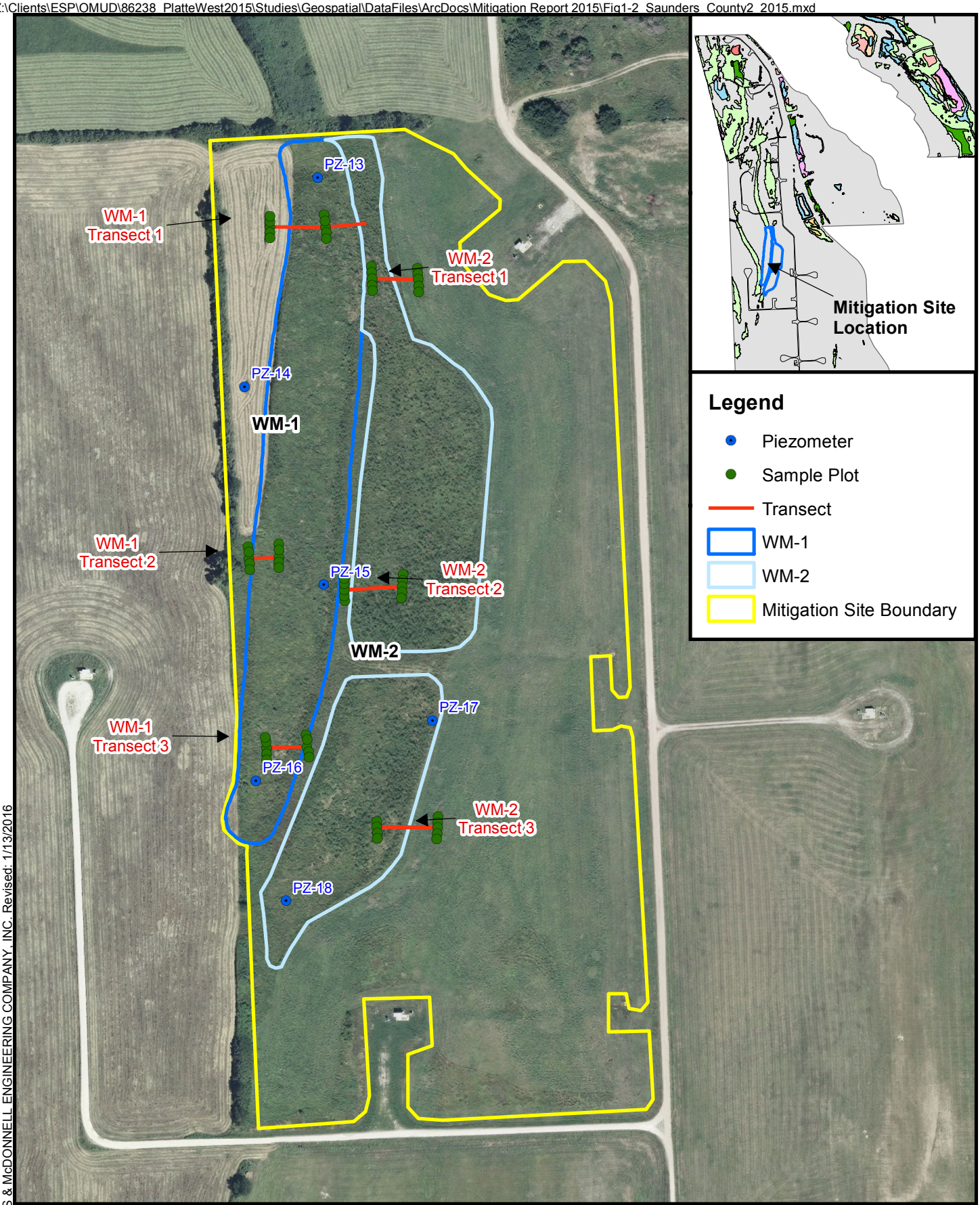

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Figure 1-2
Location Map for
WM-1 and WM-2
Saunders County Well Field
Metropolitan Utilities District

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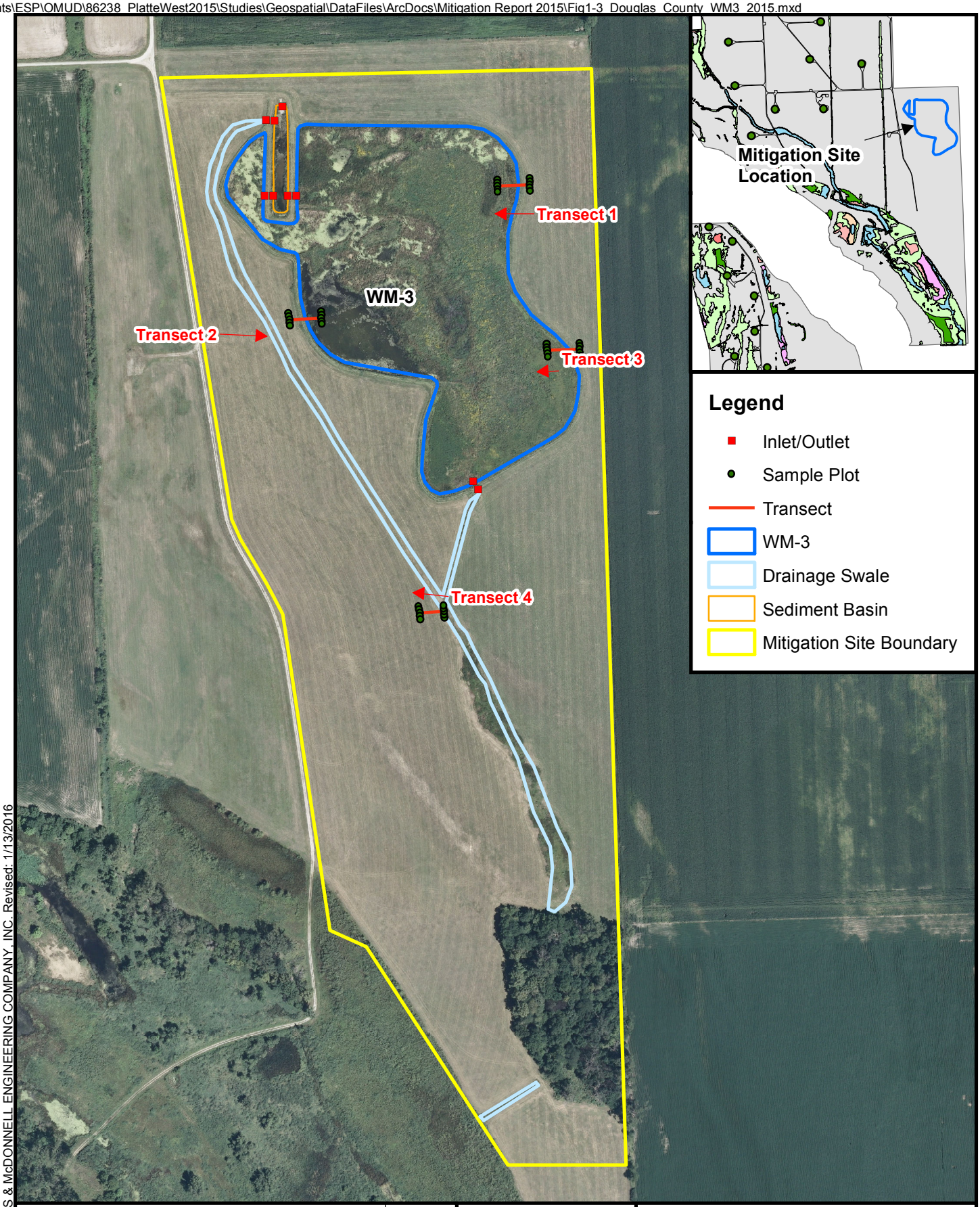

Source: Wilson & Company 2015 Aerial Photography

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Figure 1-3
Location Map for
WM-3
Douglas County Well Field
Metropolitan Utilities District

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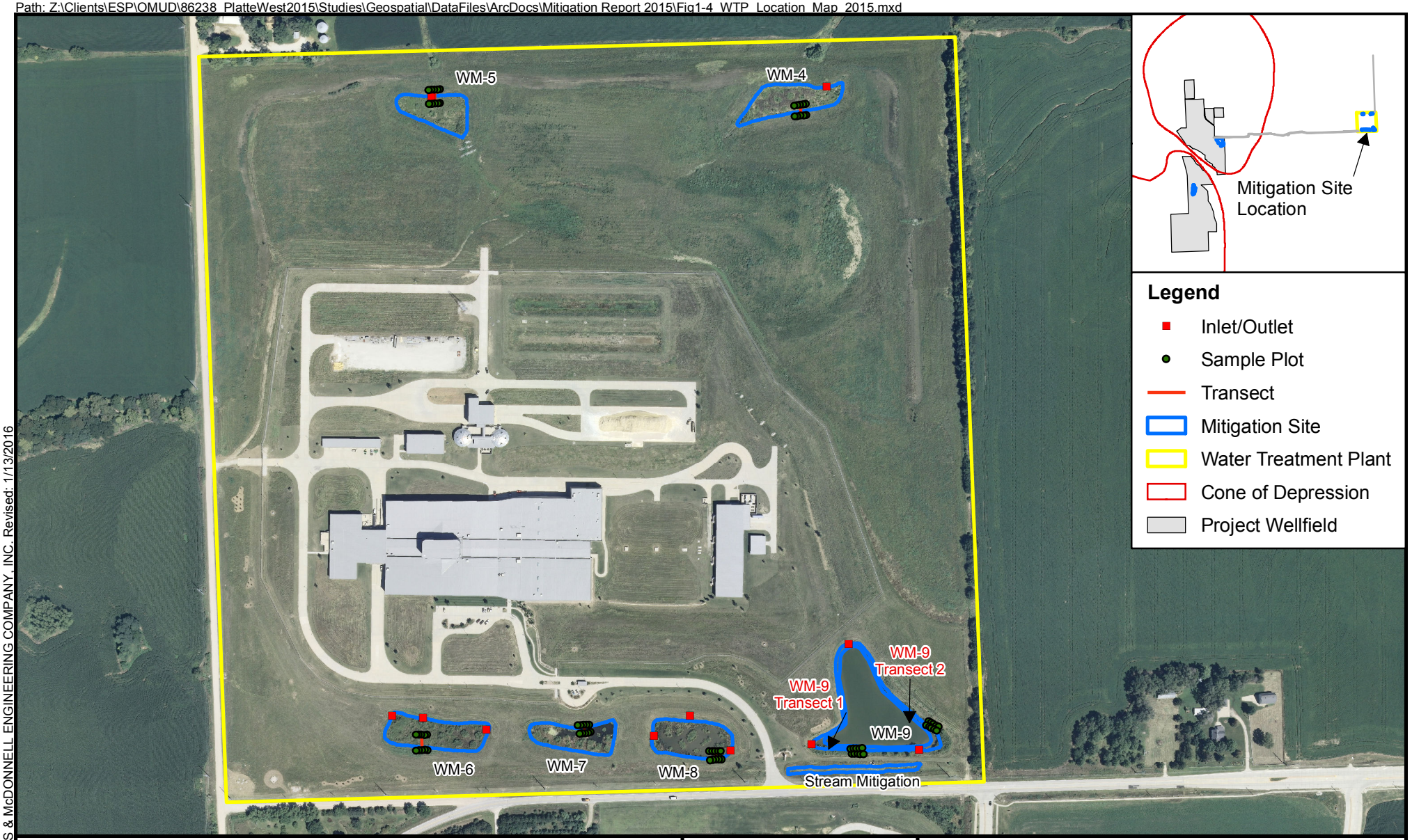

Source: Wilson & Company 2015 Aerial Photography

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Figure 1-4
Location Map of the
Water Treatment Plant Mitigation Sites
Douglas County
Metropolitan Utilities District

2.0 SAMPLING METHODOLOGY

A wetland monitoring approach consisting of a systematic, multi-tiered, vegetation sampling procedure has been developed and implemented based on the methodology outlined in the Phase I Mitigation Plan. In developing this vegetation sampling procedure, numerous literature sources and references were reviewed. Several discussions with personnel from the Corps and the District occurred during the preparation of this plan and the synthesis of the approach. Some of the references and sources used included:

- 1987 Corps and 1989 Federal wetland delineation manuals (Environmental Laboratory 1987 and Federal Interagency Committee for Wetland Delineation 1989)
- performance standards for wetland creation and restoration found in Streever 1999 and Environmental Law Institute 2004
- vegetation sampling methodologies found in U.S. Environmental Protection Agency 2002 and Tiner 1999
- wetland mitigation guidelines found in Taylor and Krueger 1997

Phase I wetland monitoring, as stated above and described in the following paragraphs, began in 2006 at WM-1. In 2008, two Phase II wetland mitigation sites were completed and monitored (WM-2 and WM-3). In 2009, monitoring began at the six wetland mitigation sites located at the water treatment plant (WM-4 through WM-9), as well as the stream mitigation site. Wetland monitoring is required at these sites for a period of five years from the initial monitoring season or until mitigation goals are met.

2.1 VEGETATION SAMPLING

Herbaceous plant species at the mitigation sites are sampled using gradient-oriented transects, or "gradsects". A gradsect is defined as a transect that is placed perpendicular to the baseline transect along the ecotone gradient. The ecotone is the distinct area where one plant community changes or intergrades into another separate, distinct plant community. Sampling units are located in the center of each vegetation community and at each ecotone. The sampling unit consists of five, three-foot diameter circular sample plots placed along the gradsect.

During the first sampling period at each mitigation site, the placement of each permanent transect, gradsect, and sample plot was established and recorded using a global positioning system (GPS; Trimble® Pro XRS sub-meter GPS unit). The beginning and end of each transect and gradsect were permanently marked using two-foot sections of 3/8- or 1/2-inch rebar, painted orange and flagged. These permanent

markers also serve as photograph stations. A photographic record is maintained for each sampling period at each gradsect and transect. This photographic documentation provides a repetitive visual record that corresponds to the wetland vegetation monitoring during seasons and over years.

Vegetation and plant species data that were collected during the annual wetland vegetation monitoring effort include the identification, to species when possible, of each plant located within the three-foot-diameter sample plot. In 2012, the Corps issued an update to the National Wetland Plant List (NWPL; Lichvar and Kartesz 2009), which resulted in changes to some of the wetland indicator statuses and nomenclature. This list was again updated in 2016. For consistency and because at least three full years of monitoring have taken place at the mitigation sites, nomenclature and plant characteristics were again obtained from the USDA PLANTS Database (USDA NRCS 2016). The percent cover for each plant species occurring in a sample plot was estimated using a modified Daubenmire cover-class method. In this methodology, percent canopy cover is visually estimated for each plant species either rooted within or extending into each three-foot diameter plot. The plant species is placed into one of a series of cover classes using the estimated percent canopy cover. These classes are based on the mid-point of canopy coverage per the modified Daubenmire canopy cover method shown in Table 2-1 (Daubenmire 1959; Bailey and Poulton 1968).

Table 2-1: Modified Daubenmire Cover Class Scale

Cover Class	1	2	3	4	5	6	7
Range (%)	0-1	1-5	5-25	25-50	50-75	75-95	95-100
Midpoint (%)	0.5	3.0	15.0	37.5	62.5	85.0	97.5

A cover class was also estimated for the non-vegetated area in the three-foot-diameter plot because sample plots are often not completely vegetated. Non-vegetated areas can include bare soil, rocky surface, open water, or litter. Quantifying the bare areas allows for the determination of the total percent cover of vegetation in the plot by subtracting the percent bare area from 100 percent, the maximum surface area possible in the plot. Even with bare areas in a plot, the total cover of vegetation may be greater than 100 percent, because plants often overlap in a plot. If standing water was present, the water depth was recorded in the center of each plot along a given gradsect.

2.2 HYDROLOGICAL MONITORING

The following sections detail the various types of hydrological data that were collected as part of the monitoring effort.

2.2.1 Piezometers

Four piezometers were installed in the Wet Meadow mitigation site (WM-1) as described in the Phase I Mitigation Plan. The locations of the installed piezometers have been recorded using GPS. Two additional piezometers were installed in WM-2 in 2009. The locations of these piezometers are identified on Figure 1-2.

Each installed piezometer is monitored on a monthly basis during the growing season to assess the seasonal and annual fluctuation in the shallow water table, and the variation between years. For additional information on the installation and monitoring of the piezometers, please refer to the Phase I and Phase II Mitigation Plans.

2.2.2 Other Hydrological Data

Additional hydrological data is also being collected during the annual monitoring effort each year. This additional data includes monthly total precipitation, monthly average ambient air temperature, and stream gauge data for the Platte and Elkhorn rivers.

2.3 SOIL SAMPLING

The presence of hydric soils in the created wetlands is one of the monitoring goals to document the success of the mitigation sites. Mitigation sites that have been monitored for the required five years or that are meeting the other monitoring goals and are nearing the completion of monitoring requirements will be investigated to determine if hydric soil characteristics are present. Sample plots will be established along each transect in the mitigation site near the central or third plot on the wetland gradsect or at representative locations within each mitigation site. The soils will be sampled in accordance with the 2010 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region* (Regional Supplement). Hydric soil indicators, as well as indicators of hydrology, will be recorded on Wetland Determination Data Forms from the Regional Supplement.

2.4 WETLAND DELINEATION

In August 2014, wetland scientists from Burns & McDonnell conducted a formal wetland delineation of the wetland mitigation sites and adjacent areas to identify and quantify wetlands and other water bodies associated with the Project. Each of the created wetland mitigation sites was delineated in accordance with the guidelines of the *1987 Corps of Engineers Wetlands Delineation Manual* (1987 Manual) and the Regional Supplement. Burns & McDonnell also delineated additional wetlands and other water bodies in the vicinity of these sites that have formed either as a result of Project requirements (floodway mitigation)

or by natural means. A summary report of these findings was prepared and presented to the District and the Corps in January 2015 (Burns & McDonnell 2015).

3.0 DATA ANALYSIS AND RESULTS

The following sections provide a brief discussion of the data analysis and the results of the 2016 annual wetland monitoring efforts at the mitigation sites.

3.1 VEGETATION SAMPLING DATA ANALYSIS

Vegetation monitoring at WM-3 was conducted in June and September 2016 to characterize major wetland and upland plant communities and the variation between them. Vegetation sampling took place in sample plots established along permanent transects and gradsects. Data obtained during the 2016 sampling efforts have been analyzed and the results are discussed below and included in Appendix I.

All of the vegetation data was input into a Microsoft Access database that has been designed specifically to accommodate seasons and years of data. The database was also designed for the rapid comparative assessment of selected vegetative characteristics. The vegetative characteristics that were analyzed are described below.

During the data collection process in the field, the percent cover for each plant species observed in each sample plot is estimated. As explained in the following paragraphs, this collected vegetative data is used to calculate a mean weighted average (WA_M) for each sampling unit in addition to calculating the percent native species; the percent invasive species; the percentage of perennial, biennial, and annual species; species richness; species diversity; the mean coefficient of conservatism (c-value); and the Floristic Quality Index (FQI).

3.1.1 Average Percent Cover

The average percent cover for a given herbaceous species in a given sampling unit (wetland, transect, gradsect, sample plot) equals the sum of the midpoint values (Table 2-1) of that species for that particular sampling unit divided by the total number of wetland sample plots in that sampling unit. The total number of sample plots is used instead of the count of the cover values. The number of sample plots is a constant at the wetland level. There are additional upland sample plots adjacent to the emergent wetlands; however, the data from these plots has not been included in this analysis. These data are available should further investigations into the wetland system be necessary.

3.1.2 Percent Native Species

The percent native species value is the count, or number, of all species listed as “native” or “native and introduced” in that wetland during that sampling effort divided by the total count of species recorded in that wetland during that same sampling effort.

3.1.3 Percent Invasive Species

The percent invasive species value is the count of species listed as "invasive" in that wetland during that sampling effort divided by the total count of species recorded in that wetland during that same sampling effort.

3.1.4 Frequency

Frequency is defined as the total number of plots in which a given species occurs for a given sampling effort. The frequency will be a whole number greater than zero.

3.1.5 Species Richness

Species richness is the count of different herbaceous, shrub, and tree species identified in a given community for a given sampling effort. The species richness will be a whole number greater than zero.

3.1.6 Species Diversity (D)

Species diversity is the number of different species in an area (i.e.: species richness) weighted by a measure of abundance. For this analysis, the frequency is the measure of abundance. In general, species diversity increases with increasing heterogeneity; therefore, the higher the species diversity value, the more diverse the plant community.

The methodology for calculating the species diversity is included below. The formula for species diversity follows Simpson (1949):

$$Species\ Diversity\,(D) = \frac{N(N-1)}{\sum n(n-1)}$$

where N = total number of occurrences for all species in all plots.

n = number of occurrences (or frequency) for each individual species. This value combines data from all strata (herbaceous, shrubs, and trees) of the same species into a single value for that species.

3.1.7 Floristic Quality Assessment (FQA)

A Floristic Quality Analysis (FQA) for each mitigation site is also conducted annually. The FQA is comprised of two different calculations: the mean c-value and the FQI. The mean c-value is the average of the c-values from the plant species identified in the sampling unit. The mean c-value provides a measure of the botanical quality of a site that can be compared from year to year. However, it does not

take into account the size of the site or the quality of the surrounding area. Therefore, the FQI is calculated to combine the mean c-value with the total number of species identified in the sampling unit.

Higher mean c-values and FQI numbers correspond to more natural sites that have a higher quality and species diversity. Lower mean c-values and FQI numbers imply a more disturbed or lower quality site.

FQI is calculated using the following formula:

$$Floristic\ Quality\ Index\ (FQI) = \bar{c}\sqrt{n}$$

where $\bar{c}$ = mean or average c-value.

n = count or number of native species in a given area.

3.1.8 Mean Weighted Average (WA_M)

The mean weighted average (WA_M) provides an indication of the wetness of an area and can be used to determine if that area has the hydrophytic vegetation necessary to qualify as a wetland. The calculated WA_M will be a value between zero and five. It should be equal to or less than 3.0 in order for a specific site to meet the criteria for wetland vegetation. In transitional areas, a WA_M may approach 3.5, depending on landscape position, hydrology, and other related features. A WA_M greater than 3.5 is likely an upland area.

The WA_M is calculated using the following formula:

$$\text{Mean Weighted Average}\,(WA_M) = \frac{\sum I\,E}{\sum I}$$

where I = the importance value for the species – for this Project, the importance value is the percent cover for the species in the sample plot.

E = the ecological index for the species – for this Project, the ecological index is a value between one and five that corresponds to the wetland indicator status for the given species. (An ecological index value of one corresponds to an obligate or wetland plant and a value of five corresponds to an upland plant.)

3.2 SAMPLING RESULTS

The following sections provide a discussion of the data analysis results for the 2016 monitoring efforts. The complete set of data (figures, summary tables, ground photographs, and raw data sheets) is contained in Appendix I.

3.2.1 Wet Meadow Mitigation Site (WM-1)

The Wet Meadow mitigation site, when combined with the adjacent WM-2, consists of approximately 22 acres of former cropland located in the District's Saunders County well field (Figure 1-2). Within the 22 acres, 3.3 acres have been restored to emergent wetland WM-1; 4.7 acres have been converted to emergent wetland WM-2; and the remaining 14.0 acres have been converted to a native prairie upland buffer.

Monitoring requirements at WM-1 were completed in 2012. A completion letter summarizing the data collected during the six full years of monitoring at WM-1 was prepared by Burns & McDonnell and submitted to the District and the Corps on June 4, 2013 (Appendix III). As a result, no monitoring has taken place at WM-1 since 2012.

3.2.2 Wet Meadow Expansion Mitigation Site (WM-2)

The Wet Meadow Expansion mitigation site (WM-2) is an approximately 4.7-acre emergent wetland created adjacent to WM-1 in the District's Saunders County well field (Figure 1-2). A 14.0-acre upland buffer has been established around WM-2 and WM-1.

Monitoring requirements for WM-2 were completed in 2014 and closeout of this site was discussed during the 2015 meeting with the Corps and the District. A completion letter summarizing the data collected during the full six years of monitoring at WM-2 was prepared by Burns & McDonnell on March 25, 2015; as a result, no monitoring took place at WM-2 in 2016.

3.2.3 Backwash Drain Line Mitigation Site (WM-3)

The Backwash Drain Line mitigation site (WM-3) is located on approximately 80 acres of former cropland in the District's Douglas County well field (Figure 1, Section A, Appendix I). Of the 80 acres, 15.42 acres have been converted to emergent wetland and 64.6 acres to upland buffer. Within the upland buffer, a series of drainage swales were developed to direct water around the wetland when necessary. Due to the regularity of water being diverted around WM-3, portions of these drainage swales are developing into wetland swales. In an effort to create additional wetland acreage within the original WM-3 boundary and more closely reflect the original design of 15.4 acres of wetland at the site, modifications occurred to WM-3 in July 2011. The mitigation site was re-graded to lower the elevation in the center of the site and to improve hydrological connections throughout the site in an effort to increase the wetland acreage. Much of the central portion of the site was lowered one- to two-feet from existing elevations. A native wetland seed mix was hand-broadcast following grading. The wetland acreage was reevaluated in 2014 and the delineated area of WM-3 totaled 11.86 acres.

3.2.3.1 Vegetation Results

Monitoring of this wetland took place in 2016. The vegetation in WM-3 was sampled using a total of 4 transects, 8 gradsects, and 20 wetland sample plots. The dominant species in this wetland were broadleaf cattail (*Typha latifolia*) and switchgrass (*Panicum virgatum)*. The dominant species in the upland buffer adjacent to WM-3 were Kentucky bluegrass (*Poa pratensis*), smooth brome (*Bromus inermis*), and big bluestem (*Andropogon gerardii*).

WM-3 (excluding the upland gradsects) had a WA_M of 2.04 in the spring and 2.12 in the fall of 2016 (Table 3-2). This wetland contained an average of 92.5 percent native species and 26.5 percent invasive species. The average FQI for this wetland was a value of 19.25, which is higher than the previous year. The mean c-value at WM-3 was 3.62 in the spring and 4.11 in the fall. The mean percent cover of native wetland vegetation in WM-3 in 2015 was 108.15 percent. The variation in the mean percent cover of native wetland vegetation for WM-3 was graphed over time and is included as Figure 2 in Appendix I.

Table 3-1: Data Analysis Summary for WM-3 in 2016

	Spring 2016	Fall 2016
Mean Weighted Average (WA_M)	2.04	2.12
Species Richness	29	25
Species Diversity (D)	28.79	24.48
Floristic Quality Index (FQI)	18.81	19.69
Mean c-value	3.62	4.11
Percent Cover of Native Wetland Vegetation	112.88	103.41

During the spring 2014 monitoring effort, the percent native hydrophytic vegetation cover dropped below the 80 percent threshold for the first time since the fall of 2011 before recovering to 84 percent during the fall 2014 monitoring (Figure 2; Appendix I). Since 2014, native percent cover has increased to over 100 percent in 2015 and 2016. Overall, the WA_M has remained consistently below the 3.0 threshold, indicating a community dominated by wetland vegetation.

No invasive species control was required at WM-3 in 2016. Tables 1 and 2 in Appendix I contain a summary of the monitoring data and the complete species list from the 2016 monitoring effort. Monitoring at WM-3 supports the achievement of success criteria and request for sign-off will be submitted to regulatory agencies.

3.2.4 Water Treatment Plant Mitigation Sites

The District completed the construction of the Water Treatment Plant mitigation sites in May 2009. The Water Treatment Plant mitigation sites consist of six emergent wetland areas that total 3.78 acres of wetlands. At the time of the development of the Water Treatment Plant mitigation site, the District also created 175 linear feet of stream mitigation to compensate for the 38 feet of ephemeral stream impacts resulting from construction of the water treatment plant. This will allow for additional stream mitigation beyond what is required for known stream impacts at this point.

Monitoring efforts at the Water Treatment Plant mitigation sites began in fall 2009. Monitoring requirements for the water treatment plant sites were completed in 2014 and closeout of this site was discussed during the 2015 meeting with the Corps and the District. A completion letter summarizing the data collected during the six years of monitoring was prepared by Burns & McDonnell on March 25, 2015; as a result no monitoring took place at these wetlands in 2016 (Appendix III).

3.2.4.1 Water Treatment Plant Mitigation Site WM-4

Wetland mitigation site WM-4 is located near the northeast corner of the water treatment plant property (Figure 1-4). The constructed area of WM-4 was measured using GPS in June 2009 and calculated to be 0.69 acre. The wetland acreage was reevaluated in 2014 and the delineated area of WM-4 totaled 0.72 acre. Monitoring requirements for WM-4 were completed in 2014. As a result, no monitoring has taken place at WM-4 since 2014.

3.2.4.2 Water Treatment Plant Mitigation Site WM-5

Wetland mitigation site WM-5 is located in the north-central portion of the water treatment plant property (Figure 1-4). The constructed area of WM-5 was measured using GPS in June 2009 and calculated to be 0.57 acre. The wetland acreage was reevaluated in 2014 and the delineated acreage totaled 0.40 acre. Monitoring requirements for WM-5 were completed in 2014. As a result, no monitoring has taken place at WM-5 since 2014.

3.2.4.3 Water Treatment Plant Mitigation Site WM-6

Wetland mitigation site WM-6 is located in the southwest corner of the water treatment plant property (Figure 1-4). The constructed area of WM-6 was measured using GPS in June 2009 and calculated to be 0.78 acre. The wetland acreage was reevaluated in 2014 and the delineated acreage totaled 0.42 acre. Monitoring requirements for WM-6 were completed 2014. As a result, no monitoring has taken place at WM-6 since 2014.

3.2.4.4 Water Treatment Plant Mitigation Site WM-7

Wetland mitigation site WM-7 is located in the southwest portion of the water treatment plant property, immediately east of WM-6 (Figure 1-4). The constructed area of WM-7 was measured using GPS in June 2009 and calculated to be 0.58 acre. The wetland acreage was reevaluated in 2014 and the delineated acreage totaled 0.56 acre. Monitoring requirements for WM-7 were completed in 2014. As a result, no monitoring has taken place at WM-7 since 2014.

3.2.4.5 Water Treatment Plant Mitigation Site WM-8

Wetland mitigation site WM-8 is located in the south-central portion of the water treatment plant property, immediately east of WM-7 (Figure 1-4). The constructed area of WM-8 was measured using GPS in June 2009 and calculated to be 0.74 acre. The wetland acreage was reevaluated in 2014 and the delineated acreage totaled 0.77 acre. Monitoring requirements for WM-8 were completed in 2014. As a result, no monitoring has taken place at WM-8 since 2014.

3.2.4.6 Water Treatment Plant Mitigation Site WM-9

Wetland mitigation site WM-9 is located in the southeast corner of the water treatment plant property (Figure 1-4). The constructed area of WM-9 was measured using GPS in June 2009 and calculated to be 1.90 acres. Of the 1.90 acres, 1.48 acres are open water habitat while 0.42 acre was constructed as emergent wetland and was included in the total acreage of the Water Treatment Plant mitigation sites. The emergent wetland acreage was reevaluated in 2014 and the delineated acreage of the emergent portion totaled 0.28 acre. Monitoring requirements for WM-9 were completed in 2014. As a result, no monitoring has taken place at WM-9 since 2014.

3.2.4.7 Water Treatment Plant Stream Mitigation Site

As mentioned above, approximately 175 feet of stream mitigation was created as part of the Water Treatment Plant mitigation sites. The stream mitigation site (SM-1) is located in the southeast corner of the water treatment plant property, immediately south of WM-9 (Figure 1-4). Hydrology at the stream mitigation site is provided by connection with WM-9 via a culvert as well as via surface water runoff from portions of the property. Shrubs consisting of dogwood (*Cornus* sp.) and pussy willow (*Salix discolor*) were planted on the northern bank of the stream channel during 2009. The delineation conducted during 2014 determined that SM-1 is an ephemeral stream totaling 199.87 feet in length. No quantitative monitoring efforts are conducted at the SM-1 and no future monitoring is anticipated to occur.

3.3 HYDROLOGICAL MONITORING

Several different types of hydrological data were collected as part of the 2016 monitoring effort. These collected data have been analyzed; the results are discussed below and included in Appendix II.

3.3.1 Piezometers

Four piezometers were installed in WM-1 in the Saunders County well field in October 2005. The elevation of the local water table at each piezometer was graphed over time to allow for comparison amongst the piezometers and with other monitoring data. Two additional piezometers were installed in WM-2 in May 2009. The piezometer data from the 2016 monitoring effort is included as Figure 1, Appendix II.

3.3.2 Other Hydrological Data

Additional hydrological data collected as part of the 2016 monitoring effort includes monthly total precipitation, monthly average ambient air temperature, and stream gauge data. The 2016 monthly total precipitation and monthly average ambient air temperature are both obtained from the weather station at Fremont Municipal Airport in Fremont, Nebraska located approximately 20 miles northwest of the well fields. The 2016 precipitation and temperature data and the historical average monthly precipitation and temperature were graphed over time; the graphs are included as Figures 2 and 3 in Appendix II.

Stream gauge data is obtained from the USGS stream gauge stations on the Platte and Elkhorn Rivers. Platte River data is obtained approximately three miles upstream of the well fields from the stream gauge near Venice, Nebraska (USGS Stream Gauge No. 06796550). The installation of this stream gauge took place at the request of, and through funding by, the District. Data collected from this stream gauge is presented in Figure 4, Appendix II. The Elkhorn River data is obtained approximately seven miles upstream of the well fields at the stream gauge near Waterloo, Nebraska (USGS Stream Gauge No. 06800500). Data collected from this stream gauge is presented in Figure 5, Appendix II.

The Project production wells operated throughout 2016, completing the eighth full year of operation. As in past years, pumping on an annual basis was well below regulated capacity. Above normal precipitation for the Omaha area along with minor mechanical issues in the Plant resulted in full-year annual production levels being the second lowest in the history of the wellfield. Annual production for 2016 increased from 10,310 MG in 2015 (the lowest full-year production level) to 10,599 MG in 2016. The 2016 Annual production was significantly below the record high full-year of 13,379 MG in 2011 and the regulated annual capacity of 19,000 MG (52 MGD).

4.0 DISCUSSION AND RECOMMENDATIONS

The goal of the monitoring program is to document the establishment of the wetland mitigation sites and to observe whether the mitigation sites develop similar functions and values as those wetlands and waters of the United States affected by Project construction and operation. A summary of the 2016 monitoring effort as it pertains to the successful establishment of the mitigation sites as well as recommendations for future monitoring are included below.

4.1 MAINTENANCE EFFORTS

Maintenance efforts did not occur at the mitigation sites in 2016. These areas will continue to be observed as part of Project monitoring efforts and recommendations will be made as necessary to the District and the Corps.

4.2 INVASIVE SPECIES CONTROL

No invasive species control was required in 2016. Due to completion of monitoring activities in 2016, no further invasive species control is anticipated. However, if invasive species are observed during routine visits to the well fields, efforts to control their growth will be implemented as appropriate.

4.3 MONITORING GOALS ACCOMPLISHED

As outlined in the Mitigation Plans, mitigation efforts will be considered successful at a given mitigation site if the following criteria occur:

1. Eighty percent cover of native wetland vegetation will be established in the created emergent wetlands and along the banks of the created stream channel.

2. Positive indicators of hydric soils such as low chroma dominant colors, redoximorphic features, or oxidized rhizospheres are found in the created emergent wetlands.

3. Positive indicators of wetland hydrology such as inundation, saturation in the upper 12 inches of the soil, watermarks, and drift lines are found in the created emergent wetlands.

WM-3 was the only mitigation site that was monitored in 2016. Due to the regrading required for this mitigation site and the effects from the drought in 2012, it was determined that an additional year of monitoring should be conducted during 2016. Following the 2016 monitoring, all nine of the created mitigation wetlands have met these success criteria outlined in the monitoring goals above and monitoring has been completed (Table 4-1).

Table 4-1: 2016 Mitigation Site Summary

Wetland	Design Acreage	Delineated Acreage	Success Criteria Met (Y/N)			Monitoring Completed
			Vegetation	Soils	Hydrology	
WM-1	3.60	3.30	Y	Y	Y	2012
WM-2	5.50	3.93	Y	Y	Y	2014
WM-3	15.00	11.86	Y	Y*	Y	2016
WM-4	0.54	0.72	Y	Y	Y	2014
WM-5	0.52	0.40	N	Y	Y	2014
WM-6	0.95	0.42	Y	Y	Y	2014
WM-7	0.60	0.56	Y	Y	Y	2014
WM-8	0.70	0.77	Y	Y	Y	2014
WM-9	0.60	0.28	Y	Y	Y	2014
Total:	**28.01**	**22.28**				

* Hydric soil sample points were completed during the 2014 wetland delineation effort.

4.4 2016 MONITORING

Monitoring of WM-3 was conducted in the spring and fall of 2016. WM-3 met success criteria for the presence of wetland hydrology and hydrophytic vegetation. Soil sampling occurred during the 2014 wetland delineation effort. Hydric soil was indicated at WM-3 by the presence of a redoximorphic dark surface and hydrogen sulfide (Burns & McDonnell 2015). Since WM-3 meets success criteria for vegetation, soils, and hydrology, request for signoff on the completion of monitoring will be submitted to regulatory agencies.

5.0 REFERENCES

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APPENDIX I

DOUGLAS COUNTY BACKWASH DRAIN LINE MITIGATION SITE

(WM-3 MONITORING DATA)

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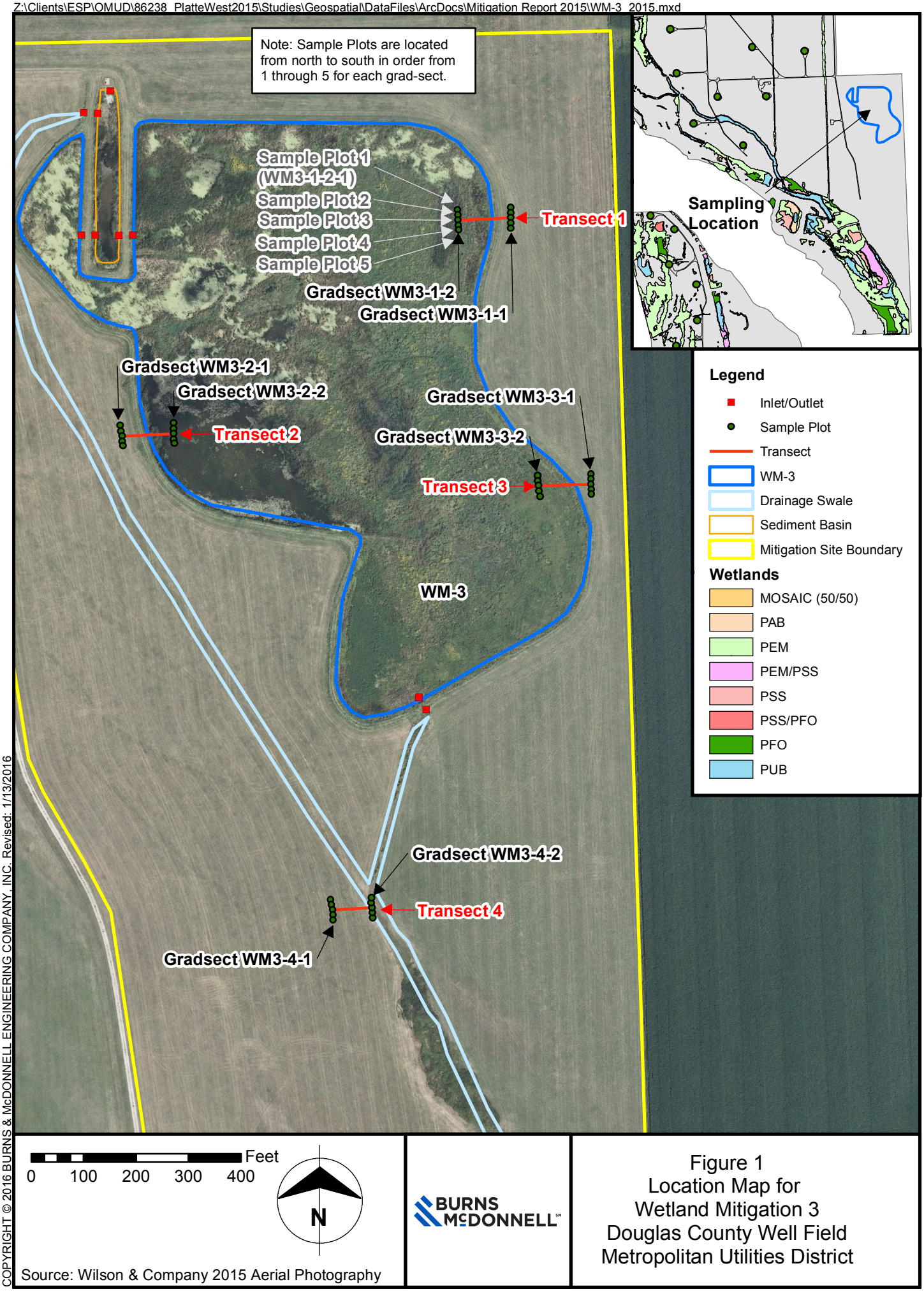
SECTION A

FIGURES

Z:\Clients\ESP\OMUD\86238_PlatteWest2015\Studies\Geospatial\DataFiles\ArcDocs\Mitigation Report 2015\WM-3_2015.mxd



Source: Wilson & Company 2015 Aerial Photography

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Figure 1
Location Map for
Wetland Mitigation 3
Douglas County Well Field
Metropolitan Utilities District

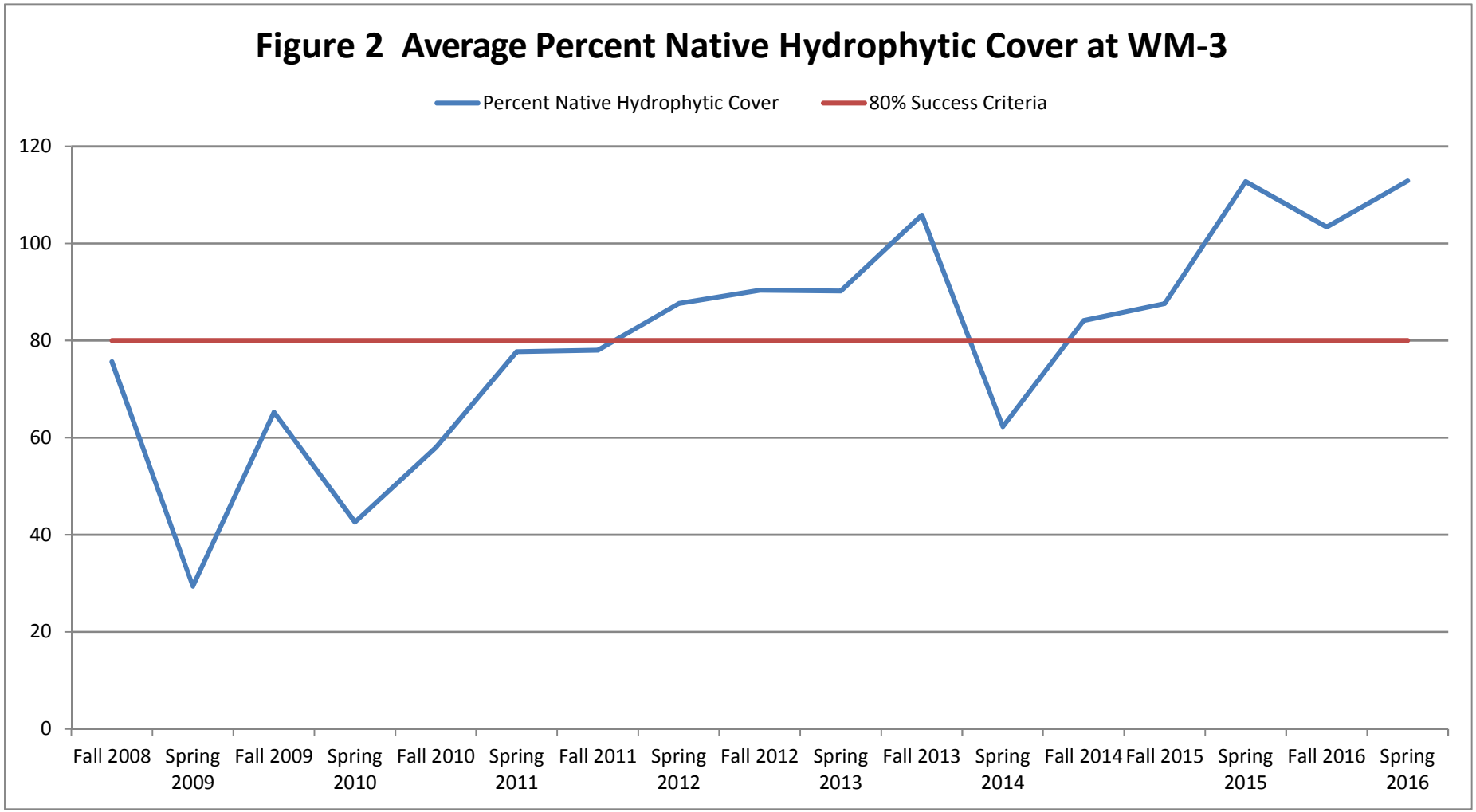
Figure 2 Average Percent Native Hydrophytic Cover at WM-3
Percent Native Hydrophytic Cover
80% Success Criteria
120
100
80
60
40
20
0
Fall 2008
Spring 2009
Fall 2009
Spring 2010
Fall 2010
Spring 2011
Fall 2011
Spring 2012
Fall 2012
Spring 2013
Fall 2013
Spring 2014
Fall 2014
Fall 2015
Spring 2015
Fall 2016
Spring 2016

SECTION B

TABLES

Table 1 Summary of Wetland Monitoring Data for Wetland 3

Wetland Name: **WM-3**
Wetland Type: **PEM**
County: **Douglas**

Number of Transects/Macroplots: **4**
Number of Gradsects: **8**
Number of Sample Plots: **40**
Number of Wetland Sample Plots: **20**

Sampling Effort: **2016 Fall**

Weighted Average: **2.12**
Species Richness: **25**
Species Diversity: **24.48**
FQI: **19.69**

Percent Native Species: **92**
Percent Invasive Species: **32**
Percent Perennial/Biennial/Annual Species **92 / 4 / 8**
Mean C-Value: **4.11**

Dominant Species:

Scientific Name	Common Name	Wetland Indicator Status	Percent Cover per Wetland
Boltonia asteroides	White Doll's Daisy	FACW	10.62
Panicum virgatum	Switchgrass	FAC	14.62
Poa pratensis	Kentucky bluegrass	FACU	13.38
Typha latifolia	Broadleaf cattail	OBL	22.5

Sampling Effort: **2016 Spring**

Weighted Average: **2.04**
Species Richness: **29**
Species Diversity: **28.79**
FQI: **18.81**

Percent Native Species: **93**
Percent Invasive Species: **21**
Percent Perennial/Biennial/Annual Species **93 / 3 / 3**
Mean C-Value: **3.62**

Dominant Species:

Scientific Name	Common Name	Wetland Indicator Status	Percent Cover per Wetland
Eleocharis erythropoda	Bald spikerush	OBL	13.12
Hordeum jubatum	Foxtail barley	FACW	10.75
Panicum virgatum	Switchgrass	FAC	10.75
Typha latifolia	Broadleaf cattail	OBL	17.88

Table 2 Species List and Vegetative Characteristics for Wetland 3

Report generated:
Tuesday, November 22, 2016

Sampling Effort: **2016 Fall**

Scientific Name	Common Name	Wetland Indicator Status[1]	Ecological Index[2]	C-Value	Native Status	Invasive?	Frequency[3]	Average Percent Cover[4]
Andropogon gerardii	Big bluestem	FAC-	3	5	Native	☐	6	7.25
Bidens aristosa	Bearded beggartick	FACW	2		Native	☐	3	4.62
Boltonia asteroides	White Doll's Daisy	FACW	2	3	Native	☐	4	10.62
Bromus inermis	Smooth brome	NL	3		Native & Introduced	☑	4	3.00
Carex grayi	Gray's sedge	FACW	2	0	Native	☐	1	0.75
Carex lupulina	Hop sedge	FACW+	2	8	Native	☐	1	1.88
Carex vulpinoidea	Fox sedge	OBL	1	4	Native	☐	3	3.38
Cyperus esculentus	Yellow nutsedge	FACW	2	0	Native & Introduced	☑	1	0.75
Desmanthus illinoensis	Illinois bundleflower	FACU	4	5	Native	☐	2	0.88
Echinochloa crus-galli	Barnyardgrass	FACW	2		Introduced	☑	4	8.75
Eleocharis compressa	Flatstem spikerush	FACW	2	6	Native	☐	4	5.25
Eleocharis erythropoda	Bald spikerush	OBL	1	5	Native	☐	5	10.12
Festuca arundinacea	Tall fescue	FACU	4		Introduced	☑	2	2.00
Helenium autumnale	Common sneezeweed	FACW	2	6	Native	☑	1	0.75
Helianthus maximiliani	Maxilian sunflower	UPL	5	4	Native	☐	2	2.00
Iris virginica	Virginia iris	OBL	1	8	Native	☐	2	1.50
Juncus effusus	Common rush	OBL	1	6	Native	☐	4	6.50
Lemna minor	Common duckweed	OBL	1	0	Native	☐	5	1.05

1 = OBL - obligate; FACW - facultative wet; FAC - facultative; FACU - facultative upland; UPL - upland; NI - no indicator

2 = Ecological Index values correspond to the wetland indicator status for each species

3 = Frequency is the total number of plots in which the species was identified

4 = Average percent cover is calcuated from the coverages estimated during this monitoring effort.

Table 2 Species List and Vegetative Characteristics for Wetland 3

Report generated:
Tuesday, November 22, 2016

Panicum virgatum	Switchgrass	FAC	3	4	Native	☐	7	14.62
Phragmites australis	Common reed	FACW	2		Native	☑	2	2.62
Poa pratensis	Kentucky bluegrass	FACU	4		Native & Introduced	☑	7	13.38
Populus deltoides	Eastern cottonwood	FAC	3	3	Native	☐	2	1.50
Potamogeton foliosus	Leafy pondweed	OBL	1	5	Native	☐	5	7.75
Sorghastrum nutans	Indiangrass	FACU	4	5	Native	☐	1	1.88
Typha latifolia	Broadleaf cattail	OBL	1	1	Native	☑	5	22.50

Sampling Effort: **2016 Spring**

Scientific Name	Common Name	Wetland Indicator Status[1]	Ecological Index[2]	C-Value	Native Status	Invasive?	Frequency[3]	Average Percent Cover[4]
Andropogon gerardii	Big bluestem	FAC-	3	5	Native	☐	2	2.62
Bidens aristosa	Bearded beggartick	FACW	2		Native	☐	4	6.50
Boltonia asteroides	White Doll's Daisy	FACW	2	3	Native	☐	3	6.88
Bromus inermis	Smooth brome	NL	3		Native & Introduced	☑	1	0.75
Carex grayi	Gray's sedge	FACW	2	0	Native	☐	1	0.75
Carex lupulina	Hop sedge	FACW+	2	8	Native	☐	1	1.88
Carex vulpinoidea	Fox sedge	OBL	1	4	Native	☐	2	3.75
Desmanthus illinoensis	Illinois bundleflower	FACU	4	5	Native	☐	1	0.75
Eleocharis compressa	Flatstem spikerush	FACW	2	6	Native	☐	1	0.75
Eleocharis erythropoda	Bald spikerush	OBL	1	5	Native	☐	5	13.12

1 = OBL - obligate; FACW - facultative wet; FAC - facultative; FACU - facultative upland; UPL - upland; NI - no indicator

2 = Ecological Index values correspond to the wetland indicator status for each species

3 = Frequency is the total number of plots in which the species was identified

4 = Average percent cover is calcuated from the coverages estimated during this monitoring effort.

Table 2 Species List and Vegetative Characteristics for Wetland 3

Report generated:
Tuesday, November 22, 2016

Festuca arundinacea	Tall fescue	FACU	4		Introduced	☑	3	4.50
Hordeum jubatum	Foxtail barley	FACW	2	1	Native	☑	5	10.75
Juncus effusus	Common rush	OBL	1	6	Native	☐	4	6.50
Juncus sp.	Rush	--	3		Native	☐	2	2.62
Juncus torreyi	Torrey's rush	FACW	2	4	Native	☐	3	3.38
Lemna minor	Common duckweed	OBL	1	0	Native	☐	5	3.75
Panicum virgatum	Switchgrass	FAC	3	4	Native	☐	5	10.75
Pascopyrum smithii	Western wheatgrass	NL	3		Native	☐	1	0.75
Phalaris arundinacea	Reed canarygrass	FACW+	2	0	Native	☑	1	1.88
Phleum pratense	Timothy	FACU	4		Introduced	☐	5	9.50
Poa pratensis	Kentucky bluegrass	FACU	4		Native & Introduced	☑	5	7.25
Populus deltoides	Eastern cottonwood	FAC	3	3	Native	☐	2	2.62
Potamogeton foliosus	Leafy pondweed	OBL	1	5	Native	☐	5	9.62
Salix interior	Sandbar willow	NL	3	3	Native	☐	1	0.75
Schoenoplectus fluviatilis	River bulrush	OBL	1		Native	☐	1	0.75
Schoenoplectus tabernaemont	Softstem bulrush	OBL	1	5	Native	☐	1	1.88
Scirpus atrovirens	Green bulrush	OBL	1	5	Native	☐	2	1.50
Solidago gigantea	Giant goldenrod	FACW	2	3	Native	☐	2	2.00
Typha latifolia	Broadleaf cattail	OBL	1	1	Native	☑	5	17.88

1 = OBL - obligate; FACW - facultative wet; FAC - facultative; FACU - facultative upland; UPL - upland; NI - no indicator

2 = Ecological Index values correspond to the wetland indicator status for each species

3 = Frequency is the total number of plots in which the species was identified

4 = Average percent cover is calcuated from the coverages estimated during this monitoring effort.

SECTION C

MITIGATION SITE WM-3 GROUND PHOTOGRAPHS

Photograph C-1: View west of Transect 1 in WM-3 (June 2016).

Photograph C-2: View north of Gradsect 1 on Transect 1 in WM-3 (June 2016).

Photograph C-3: View north of Gradsect 2 on Transect 1 in WM-3 (June 2016).

Photograph C-4: View east of Transect 3 in WM-3 (June 2016).

Photograph C-5: View north of Gradsect 1 on Transect 3 in WM-3 (June 2016).

Photograph C-6: View north of Gradsect 2 on Transect 3 in WM-3 (June 2016).

Photograph C-7: View west of Transect 2 in WM-3 (June 2016).

Photograph C-8: View north of Gradsect 1 on Transect 2 in WM-3 (June 2016).

Photograph C-9: View north of Gradsect 2 on Transect 2 in WM-3 (June 2016).

Photograph C-10: View east of Transect 4 in WM-3 (June 2016).

Photograph C-11: View north of Gradsect 1 on Transect 4 in WM-3 (June 2016).

Photograph C-12: View north of Gradsect 2 on Transect 4 in WM-3 (June 2016).

Photograph C-13: View west of Transect 1 in WM-3 (September 2016).

Photograph C-14: View north of Gradsect 1 on Transect 1 in WM-3 (September 2016).

Photograph C-15: View north of Gradsect 2 on Transect 1 in WM-3 (September 2016).

Photograph C-16: View east of Transect 3 in WM-3 (September 2016).

Photograph C-17: View north of Gradsect 1 on Transect 3 in WM-3 (September 2016).

Photograph C-18: View north of Gradsect 2 on Transect 3 in WM-3 (September 2016).

Photograph C-19: View west of Transect 2 in WM-3 (September 2016).

Photograph C-20: View north of Gradsect 1 on Transect 2 in WM-3 (September 2016).

Photograph C-21: View north of Gradsect 2 on Transect 2 in WM-3 (September 2016).

Photograph C-22: View east of Transect 4 in WM-3 (September 2016).

Photograph C-23: View north of Gradsect 1 on Transect 4 in WM-3 (September 2016).

Photograph C-24: View north of Gradsect 2 on Transect 4 in WM-3 (September 2016).

SECTION D
WETLAND VEGETATION COVER AND WATER DEPTH RAW DATA SHEETS

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-1-1

Sampling Date: 6/23/2016 **Last Rain Date:** 6/21/2016 **Last Rain Amount (in):** 0.01

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):					
Open Water (in):					
Bare Soil (in):	6	6	6	6	6
Andropogon gerardii	5	4		5	4
Bromus inermis	4	4	4	5	4
Eryngium yuccifolium var. yu					3
Festuca arundinacea	3	3	5	3	5
Panicum virgatum		4	4	4	4
Poa pratensis	4	4	4	3	4

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-1-2

Sampling Date: 6/23/2016 **Last Rain Date:** 6/21/2016 **Last Rain Amount (in):** 0.01

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):	5	8	8	8	9
Open Water (in):	7	7	7	7	7
Bare Soil (in):	6	6	6	7	6
Eleocharis compressa					3
Eleocharis erythropoda	5		3		
Juncus effusus	4	3	5	3	
Juncus sp.				4	3
Juncus torreyi	3		4	3	
Lemna minor	3	3	3	3	3
Schoenoplectus tabernaemont					4
Scirpus atrovirens	3				3
Typha latifolia	5	5	6	6	5

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-2-1

Sampling Date: 6/23/2016 **Last Rain Date:** 6/21/2016 **Last Rain Amount (in):** 0.01

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):					
Open Water (in):					
Bare Soil (in):	6	7	6	6	6
Andropogon gerardii	5	3	5	5	5
Bromus inermis	3	4	4	4	
Eryngium yuccifolium var. yu		3			
Festuca arundinacea	3	3	4	4	4
Panicum virgatum				4	
Poa pratensis	5	4	5	5	4
Schizachyrium scoparium		4			

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-2-2

Sampling Date: 6/23/2016 **Last Rain Date:** 6/21/2016 **Last Rain Amount (in):** 0.01

Canopy Coverage Analysis	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Depth of Standing Water (in):	23	24	22	24	20
Open Water (in):	7	7	7	7	7
Bare Soil (in):	7	7	7	7	7
Potamogeton foliosus	5	5	4	3	3

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-3-1

Sampling Date: 6/23/2016 **Last Rain Date:** 6/21/2016 **Last Rain Amount (in):** 0.01

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):					
Open Water (in):					
Bare Soil (in):	6	6	6	6	6
Agrostis gigantea			4		
Andropogon gerardii	7	4	4	6	5
Bromus inermis		4			4
Festuca arundinacea	3	6	4	4	4
Panicum virgatum			3	3	4
Poa pratensis	4	4	5	4	4
Schizachyrium scoparium					4

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-3-2

Sampling Date: 6/23/2016 **Last Rain Date:** 6/21/2016 **Last Rain Amount (in):** 0.01

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):	10	6	5	2.5	0
Open Water (in):	7	7	7	7	2
Bare Soil (in):	7	6	6	6	6
Andropogon gerardii				3	
Bidens aristosa		3	5	3	4
Boltonia asteroides	5	4	4		
Carex grayi			3		
Carex lupulina		4			
Carex vulpinoidea				4	4
Desmanthus illinoensis					3
Eleocharis erythropoda	4				
Festuca arundinacea					4
Hordeum jubatum			3		
Panicum virgatum			4		5
Pascopyrum smithii				3	
Poa pratensis		3	3		5
Populus deltoides			3	4	
Salix interior				3	
Solidago gigantea	2	4			

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-4-1

Sampling Date: 6/23/2016 **Last Rain Date:** 6/21/2016 **Last Rain Amount (in):** 0.01

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):					
Open Water (in):					
Bare Soil (in):	6	6	6	6	6
Andropogon gerardii	5	5	6	3	4
Bromus inermis	3	3	4		
Eryngium yuccifolium var. yu	3				
Festuca arundinacea	4	5	4	5	4
Poa pratensis	5	5	4	3	5
Schizachyrium scoparium		3	3	3	4

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-4-2

Sampling Date: 6/23/2016 **Last Rain Date:** 6/21/2016 **Last Rain Amount (in):** 0.01

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):	0			0.25	0.5
Open Water (in):			3	6	5
Bare Soil (in):	6	6	6	6	6
Andropogon gerardii		4			
Bromus inermis	3				
Eleocharis erythropoda			5	6	
Festuca arundinacea	4				3
Hordeum jubatum	3	4	6	5	
Panicum virgatum	5	3	4		
Phalaris arundinacea				4	
Phleum pratense	4	4	3	3	6
Poa pratensis	3	4			
Schoenoplectus fluviatilis					3

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-1-1

Sampling Date: 9/6/2016 **Last Rain Date:** 9/6/2016 **Last Rain Amount (in):** 0.05

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):					
Open Water (in):					
Bare Soil (in):	6	6	7	7	7
Andropogon gerardii	5	5	3	4	5
Asclepias tuberosa		3	2		
Bromus inermis	3				
Festuca arundinacea	4	5	6	5	4
Panicum virgatum		3	3		
Poa pratensis	4	4	4	4	3
Setaria verticillata	4				

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-1-2

Sampling Date: 9/6/2016 **Last Rain Date:** 9/6/2016 **Last Rain Amount (in):** 0.05

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):	2	0.5	0.5	0	2
Open Water (in):	6	6	5	4	5
Bare Soil (in):	7	7	7	6	6
Carex vulpinoidea					3
Eleocharis compressa				4	4
Eleocharis erythropoda	2		4		
Iris virginica					3
Juncus effusus		3	4	5	3
Lemna minor	2	1		2	1
Phragmites australis				3	4
Typha latifolia	6	6	6	7	7

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-2-1

Sampling Date: 9/6/2016 **Last Rain Date:** 9/6/2016 **Last Rain Amount (in):** 0.05

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):					
Open Water (in):					
Bare Soil (in):	6	6	6	5	6
Andropogon gerardii		4	4	4	
Bromus inermis				5	4
Echinochloa crus-galli				3	
Festuca arundinacea	6				5
Melilotus officinalis	4	3			
Panicum virgatum		4	6	4	5
Poa pratensis		5	4	3	4
Salix amygdaloides					3
Setaria pumila ssp. pumila				5	
Sorghastrum nutans		4			

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-2-2

Sampling Date: 9/6/2016 **Last Rain Date:** 9/6/2016 **Last Rain Amount (in):** 0.05

Canopy Coverage Analysis	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5
Depth of Standing Water (in):	16	19.5	19	18	18
Open Water (in):	7	7	7	7	7
Bare Soil (in):	7	7	7	7	7
Lemna minor	3				
Potamogeton foliosus	4	5	2	4	3

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-3-1

Sampling Date: 9/6/2016 **Last Rain Date:** 9/6/2016 **Last Rain Amount (in):** 0.05

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):					
Open Water (in):					
Bare Soil (in):	5	6	6	6	6
Andropogon gerardii	5	4	5	5	6
Festuca arundinacea	6	6	5	4	4
Panicum virgatum	2	3	4	4	3
Poa pratensis	5	4	4	4	4
Rudbeckia hirta			3	3	
Schizachyrium scoparium			3	4	
Sorghastrum nutans	3				

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-3-2

Sampling Date: 9/6/2016 **Last Rain Date:** 9/6/2016 **Last Rain Amount (in):** 0.05

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):					
Open Water (in):					
Bare Soil (in):	7	7	7	6	6
Andropogon gerardii				4	
Bidens aristosa			5	3	3
Boltonia asteroides	6	5	5	2	
Bromus inermis				3	
Carex grayi		3			
Carex lupulina		4			
Carex vulpinoidea			3	4	
Cyperus esculentus				3	
Desmanthus illinoensis			2		3
Eleocharis compressa	3	3			
Eleocharis erythropoda	5				
Helenium autumnale		3			
Helianthus maximiliani				2	4
Iris virginica			3		
Panicum virgatum		3	4		3
Poa pratensis			3	4	5
Populus deltoides			3	3	
Sorghastrum nutans					4

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-4-1

Sampling Date: 9/6/2016 **Last Rain Date:** 9/6/2016 **Last Rain Amount (in):** 0.05

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):					
Open Water (in):					
Bare Soil (in):	6	6	6	6	6
Andropogon gerardii	6	5	6	5	6
Bromus inermis	3	5	4	4	
Eryngium yuccifolium var. yu				4	4
Festuca arundinacea	3	3		4	2
Panicum virgatum		3			
Poa pratensis	6	4	5	6	6
Schizachyrium scoparium		4	3	5	

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

Wetland Vegetation Cover and Water Depth at Wetland Mitigation 3

Wetland Name: **WM-3**

Wetland Transect/Gradsect #: WM3-4-2

Sampling Date: 9/6/2016 **Last Rain Date:** 9/6/2016 **Last Rain Amount (in):** 0.05

Canopy Coverage Analysis	**Plot 1**	**Plot 2**	**Plot 3**	**Plot 4**	**Plot 5**
Depth of Standing Water (in):					
Open Water (in):					
Bare Soil (in):	6	7	6	6	6
Andropogon gerardii	2	3	4	4	3
Bromus inermis	3	3			3
Echinochloa crus-galli	6	4		4	3
Eleocharis erythropoda		5	4		
Festuca arundinacea				2	4
Panicum virgatum	4		5	5	5
Poa pratensis	5		3	4	4

Class 1: 0-1%; Class 2: 1-5%; Class 3: 5-25%; Class 4: 25-50%; Class 5: 50-75%; Class 6: 75-95%; Class 7: 95-100%

APPENDIX II

HYDROLOGICAL DATA

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Figure 1 2016 Piezometer Readings at the Phase I and Phase II Wet Meadow Mitigation Sites (WM-1 and WM-2)

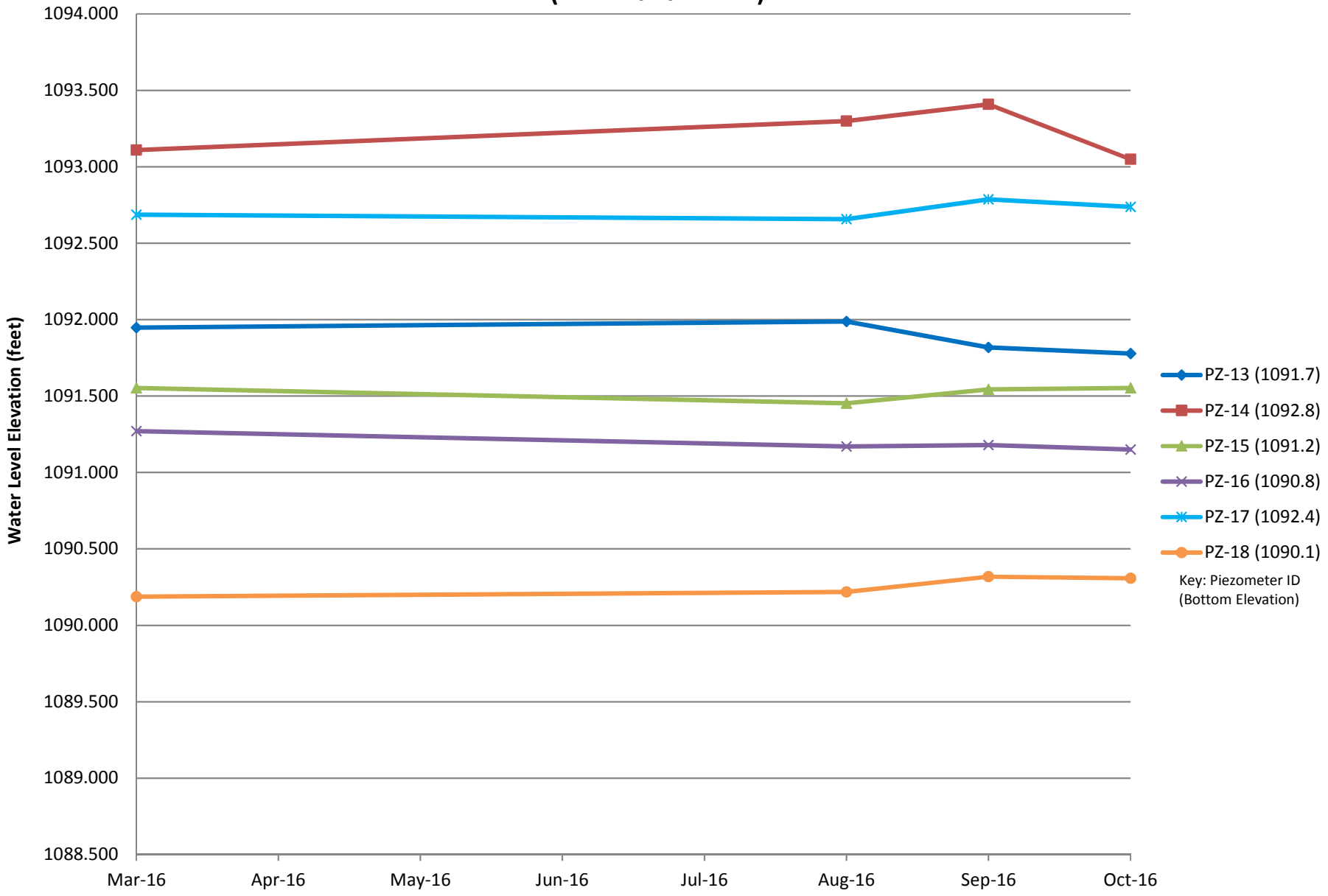


Figure 2 2016 Total Monthly Precipitation
Fremont, NE

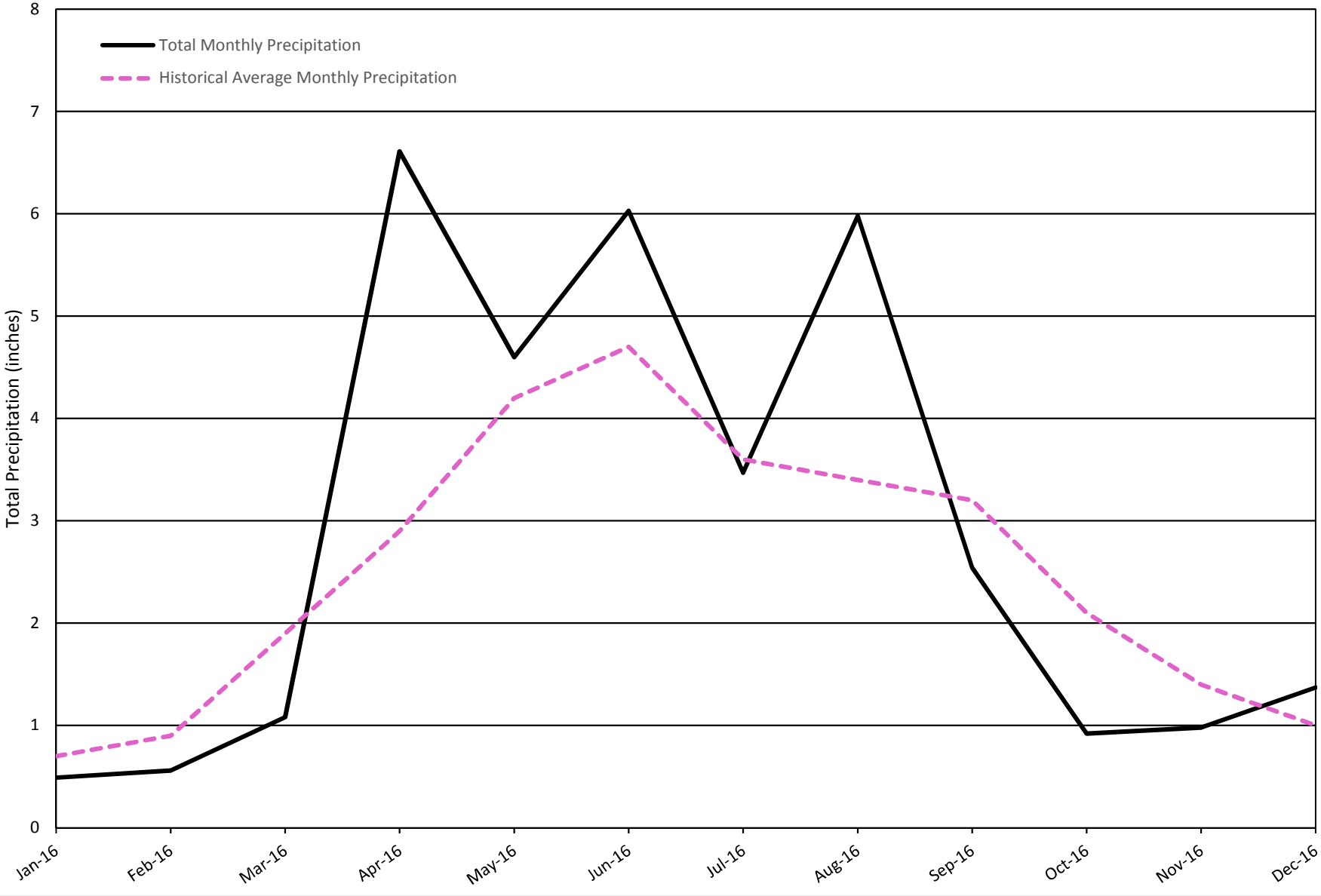


Figure 3 2016 Monthly Average Ambient Air Temperature
Fremont, NE

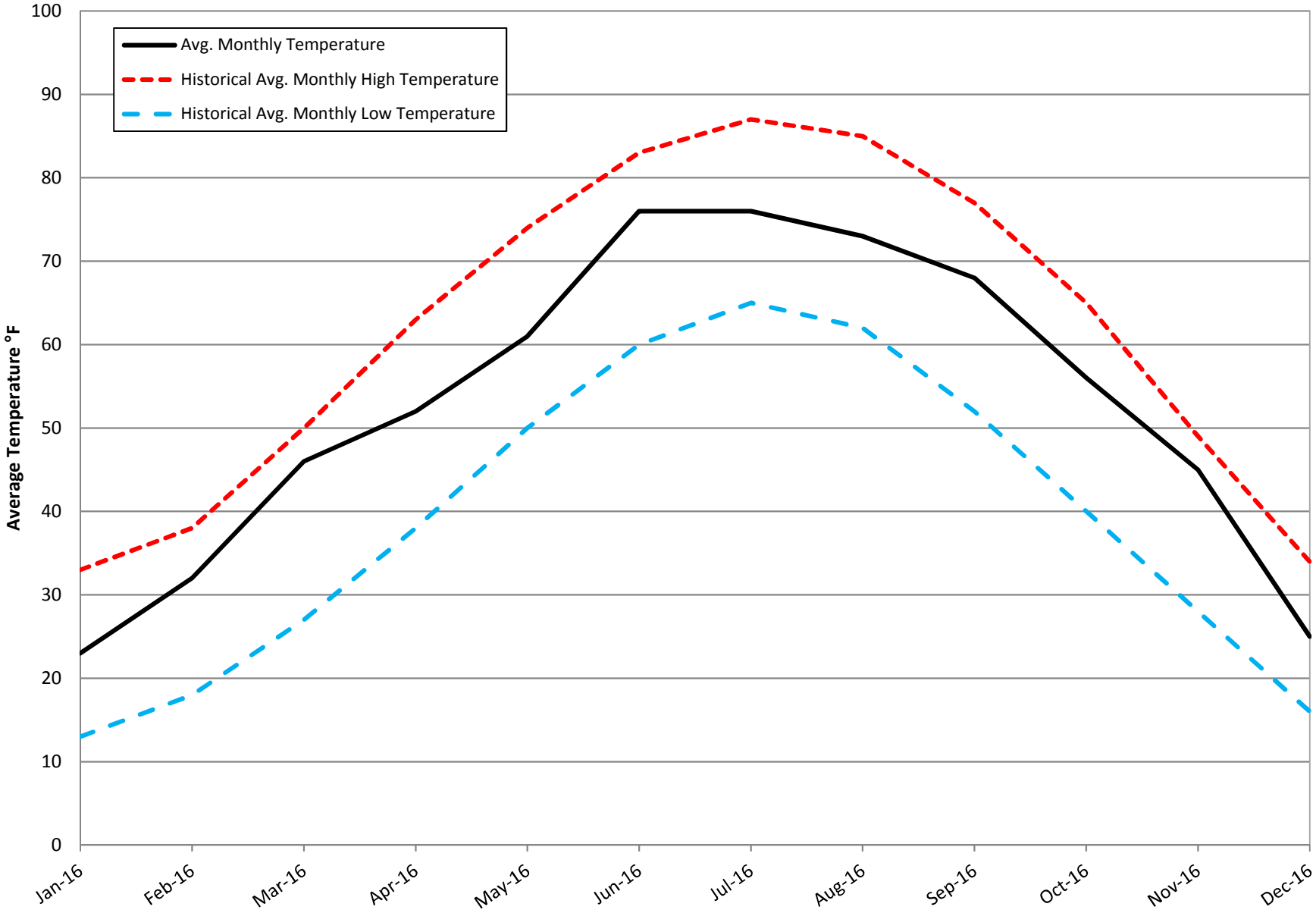
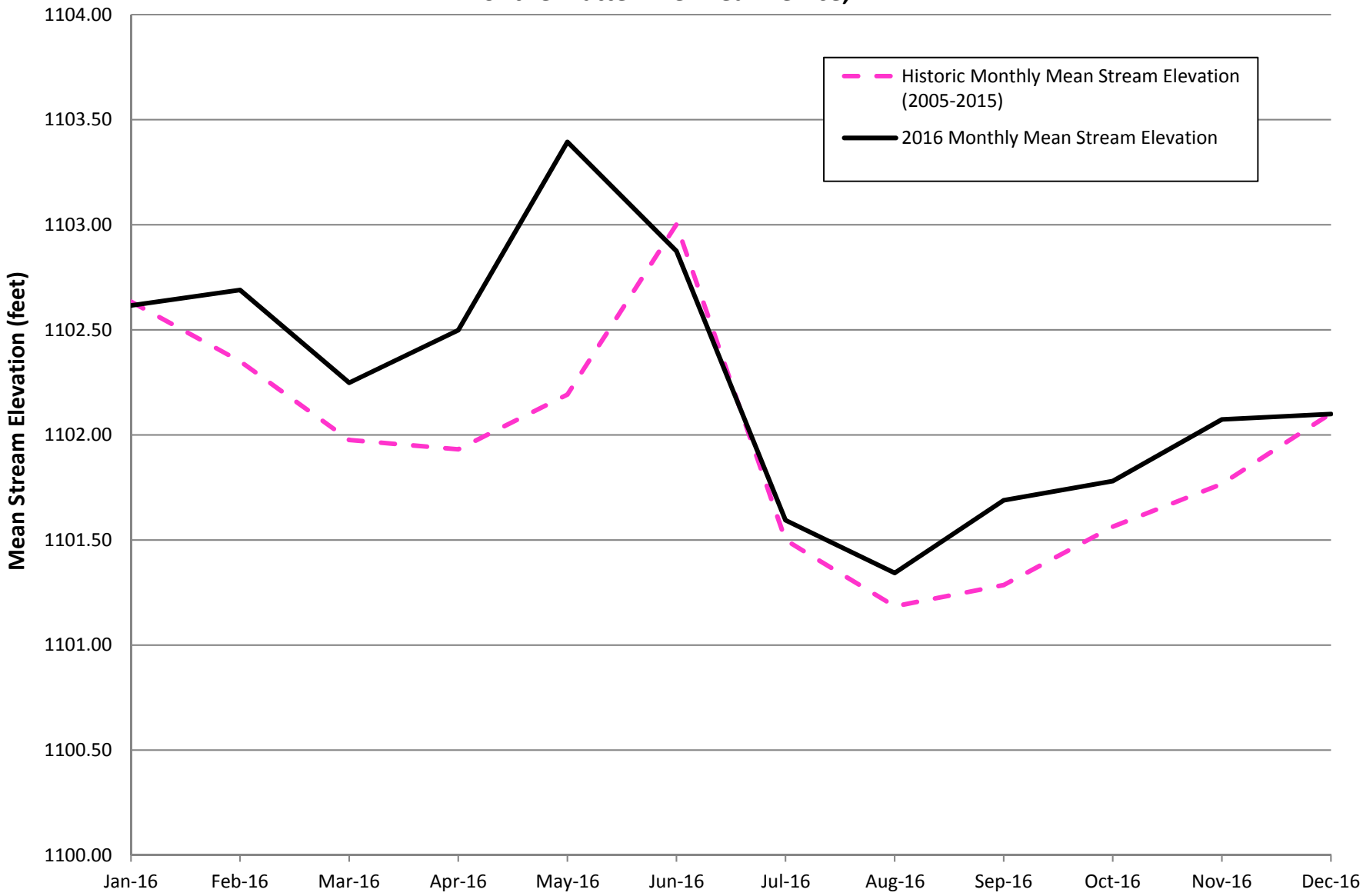
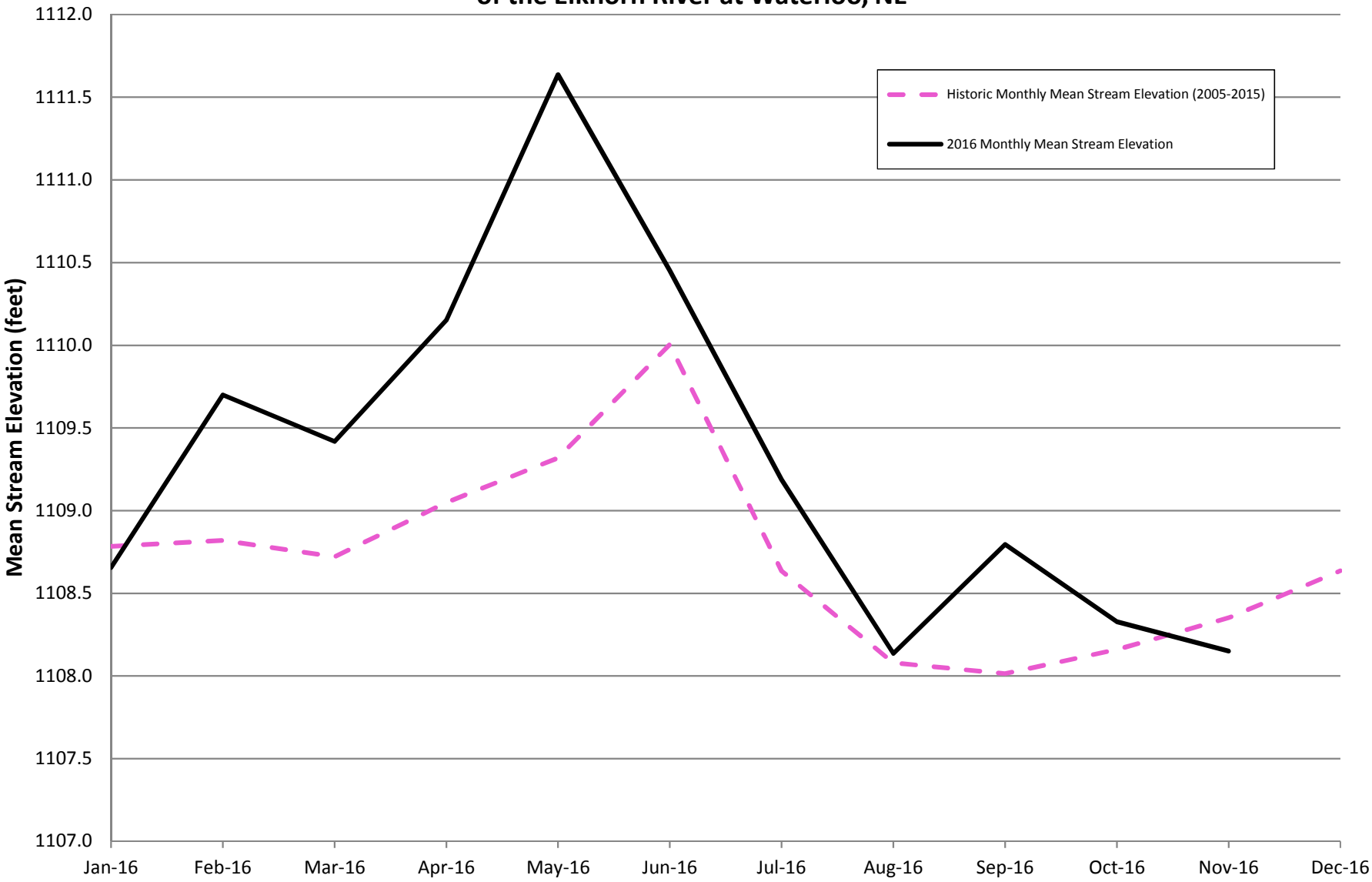


Figure 4 2016 Monthly Mean Stream Elevation of the Platte River near Venice, NE



Source: USGS. 2016b. National Water Information System: Platte River near Venice, Nebraska 06796550

Figure 5 2016 Monthly Mean Stream Elevation of the Elkhorn River at Waterloo, NE



Source: USGS. 2016a. National Water Information System: Elkhorn River at Waterloo, Nebraska 06800500

APPENDIX III

COMPLETION DOCUMENTATION

WM-1 COMPLETION LETTER

WM-2 AND WM-4 THORUGH WM-9 COMPLETION LETTER

June 4, 2013

Mr. John P. Snowdon
U.S. Army Corps of Engineers, Omaha District
Wehrspann Field Office
8901 South 154th Street, Suite 1
Omaha, NE 68138-3621

Re: Completion of Monitoring Requirements at Wetland Mitigation Site WM-1
Metropolitan Utilities District
Platte West Water Production Facilities Project
Burns & McDonnell Project No.: 60787

Dear Mr. Snowdon:

Burns & McDonnell Engineering Company, Inc. (Burns & McDonnell), on behalf of the Metropolitan Utilities District (District), would like to respectfully request confirmation of the completion of monitoring requirements at the Wet Meadow Mitigation Site (WM-1) located in the Saunders County well field, Saunders County, Nebraska. Burns & McDonnell has completed six full years of monitoring at WM-1 and the site is meeting all success criteria established in the Mitigation Plan for Wetland Impacts – Phase I (Mitigation Plan) prepared by Burns & McDonnell in 2005 and approved by the U.S. Army Corps of Engineers (USACE). For a detailed account of the most recent monitoring effort at WM-1, please refer to the 2012 Annual Mitigation Site Monitoring Report (Burns & McDonnell 2013).

Mitigation Site Requirements

A total of 0.3 acre of wetlands were permanently impacted due to the construction of the Project in the two well fields. These impacts were mitigated at a 1.5 to 1.0 (created wetlands to impacted wetlands) ratio. As a result, approximately 0.45 acre of wetlands was required for up-front well field construction mitigation. The 3.3-acre WM-1 mitigation site was constructed in 2005 in agricultural land adjacent to the wet meadow in the Saunders County well field. This is approximately 2.85 acres of wetlands more than is currently required for mitigation. The acreage of wetland created above the required 0.45 acre will be retained as mitigation credit and applied towards any necessary Phase II mitigation requirements.

Success Criteria

The Mitigation Plan included specific requirements that needed to be accomplished. The mitigation efforts will be considered successful at a given mitigation site if the following criteria occur:

1. Eighty percent cover of native wetland vegetation will be established in the created emergent wetlands and along the banks of the created stream channel.
2. Positive indicators of hydric soils such as low chroma dominant colors, redoximorphic features, or oxidized rhizospheres are found in the created emergent wetlands.

3. Positive indicators of wetland hydrology such as inundation, saturation in the upper 12 inches of the soil, watermarks, and drift lines are found in the created emergent wetlands.

Monitoring Results

WM-1 has been monitored twice each year since construction completion in 2005 following the protocols outlined in the Mitigation Plan. WM-1 meets all three of the success criteria described above.

1. The mean percent cover of native wetland vegetation was 90.0 percent in 2012 (a drought year). In 2011, the percent cover of native wetland vegetation was 115.4.
2. The soils sampled at each of the sample plots in WM-1 demonstrated hydric soil characteristics with low chroma matrix colors and prominent, distinct mottling. Hydric soil indicators F3 Depleted (Gray) Matrix and F7 Depleted Dark Surface were met.
3. Indicators of hydrology in WM-1 included drainage patterns, the FAC Neutral Test, and geomorphic position.

A total of approximately 3.3 acres of emergent wetland has been created at WM-1. Because WM-1 meets all three monitoring goals and has been successfully established, it should not require additional monitoring. This letter has been prepared to formally request a signed letter of compliance for the completion of mitigation monitoring requirements at WM-1.

If you have any questions or require any additional information to process this request, please do not hesitate to contact me by telephone at (816) 822-4330 or by email at ssoard@burnsmcd.com.

Sincerely,

Sarah Soard, PWS
Project Manager

cc: Kevin Tobin, Metropolitan Utilities District
Mike Gilbert, USACE

March 25, 2015

Mr. John P. Snowdon
U.S. Army Corps of Engineers
Wehrspann Field Office
8901 South 154th Street, Suite 1
Omaha, NE 68138-3621

Re: Mitigation Site Completion of Monitoring Requirements at the Platte West Water Production Facilities Project

Dear Mr. Snowdon:

Mitigation for construction-related wetland impacts from all aspects of the Metropolitan Utilities District's (District) Platte West Water Production Facilities Project (Project) was proposed using a phased approach. A minimum of three phases of wetland mitigation were originally planned and approved by the Corps. Phase I of the mitigation effort provided measures to compensate for upfront construction impacts (direct impacts). Approximately 0.3 acre of direct wetland impacts would be impacted due to construction according to the 2002 EIS. Phase II provided mitigation for anticipated indirect impacts to wetlands in the two well fields due to groundwater drawdown. Project operation was estimated to impact 14.3 acres of wetlands in the two well fields (indirect impacts). Finally, as currently planned, Phase III mitigation will address any impacts or alterations to wetlands that may occur as a result of drawdown outside of the two well fields in the modeled Project cones of depression.

To compensate for direct and indirect impacts, mitigation sites were constructed in multiple locations for the Project. These locations included the Saunders County well field near the 95-acre area known as the Wet Meadow (Wet Meadow Mitigation Site, WM-1 and Wet Meadow Mitigation Expansion Site, WM-2), the Douglas County well field (Backwash Wetland Mitigation Site, WM-3), and on the water treatment plant property (Water Treatment Plant Sites, WM-4 through WM-9).

In accordance with the EIS, impacts were mitigated at a 1.5:1.0 (created wetlands to impacted wetlands) ratio. As a result, mitigation requirements due to direct and indirect impacts totaled 21.9 acres (approximately 0.45 acre of wetland was required for direct impacts and 21.45 acres for indirect impacts). In 2012, mitigation requirements at WM-1 in the Saunders County well field were completed and approved by the Corps. The final approved wetland mitigation acreage at WM-1 was 3.6 acres. Table 1 below shows a summary of the Project mitigation requirements and currently approved wetland mitigation acreage.

9400 Ward Parkway \ Kansas City, MO 64114
O 816-333-9400 \ F 816-333-3690 \ burnsmcd.com

Table 1 Wetland Mitigation Requirements and Phase I Acreage Ledger

Impacts Summary	Acreage Totals
Estimate of Wetland Impacts due to Construction and Operation in Well Fields (2002 EIS)	14.6
Multiply by the Mitigation Ratio (1.5:1.0)	x 1.5
Wetland Mitigation Required for Construction and Operation According to Section 404 Permit Conditions	= **21.9 acres**
Phase I Mitigation Developed (subtract from total)	-3.6
Additional Wetland Mitigation Required after Phase I	= **18.3 acres**

WM-2 was constructed in the winter of 2007-2008, east of WM-1 in the 22 acre upland buffer area surrounding the mitigation wetlands. The two wet meadow mitigation sites (WM-1 and WM-2) are hydrologically connected at the north and south ends, but are otherwise separated by a narrow upland buffer.

The mitigation for impacts resulting from construction of the District's new water treatment plant in Douglas County has been accomplished onsite at six wetland cells located at the water treatment plant site (WM-4 through WM-9). A total of 3.78 acres of wetlands and 175 feet of intermittent stream were designed at these sites. Construction of the wetlands and intermittent stream was completed in May 2009.

An account of WM-3 is not included in this report. Design alterations are still being considered at the site; as a result, the District is not yet ready to consider WM-3 for possible completion.

SUCCESS CRITERIA

Success criteria were established for the mitigation wetlands as part of the Phase I and Phase II Mitigation Plans. The success criteria were developed to measure the establishment of the wetland mitigation sites and to observe whether the mitigation sites develop similar functions and values as those wetlands and waters of the U.S. affected by Project construction and operation. According to the Mitigation Plans, efforts will be considered successful at a given site if the following criteria occur:

1. Eighty percent cover of native wetland vegetation will be established in the created emergent wetlands and along the banks of the created stream channel.
2. Positive indicators of hydric soils such as low chroma dominant colors, redoximorphic features, or oxidized rhizospheres are found in the created emergent wetlands.
3. Positive indicators of wetland hydrology such as inundation, saturation in the upper 12 inches of the soil, watermarks, and drift lines are found in the created emergent wetlands.

WETLAND DELINEATION

To supplement the annual monitoring and verify wetland boundaries, a wetland delineation of the mitigation sites and surrounding areas was conducted on August 18th through 20th, 2014 by Burns & McDonnell wetland scientists. The methods and results from the survey are detailed in the wetland delineation report dated January 12, 2015. Findings from this delineation were used to document the delineated wetland acreages and to supplement the monitoring data collected the last 5 to 6 years. Sampling locations set up in 2008 and 2009 to capture vegetation establishment at the mitigation sites aren't always the most representative of the sites in their current condition. The delineation data, therefore, provides valuable information about the existing wetland vegetation, soils, and hydrology at the sites and is the focus of this summary.

RESULTS

Mitigation Sites

WM-2

Annual monitoring at Palustrine Emergent (PEM) wetland WM-2 began in September of 2008 and was completed each following June and September through 2014 for a total of 13 monitoring efforts over 6 and a half years. Additionally, WM-2 was formally delineated as part of the field survey effort in August 2014.

The design acreage at WM-2 was 5.50 acres, and the constructed acreage was 4.70 acres. The delineated acreage at WM-2 was 3.93 acres. Vegetation in WM-2 was dominated by yellow sweet clover (*Melilotus officinalis*), freshwater cordgrass (*Spartina pectinata*), Illinois bundleflower (*Desmanthus illinoensis*), Kentucky blue grass (*Poa pratensis*), Canadian goldenrod (*Solidago canadensis*), and rough-leaf thimbleweed (*Anemone canadensis*). Hydric soil was indicated by the presence of a depleted matrix (F3) and a depleted dark surface (F6). Wetland hydrology was indicated by saturation visible on aerial imagery, geomorphic position, and a positive FAC-Neutral test. Data forms detailing the observed vegetation, soil, and hydrology characteristics at each sample plot were provided with the Wetland Delineation Report. Table 2 below shows the total percent cover of native, hydrophytic vegetation at WM-2 observed during the 2014 delineation and summarizes all success criteria. Based on the data collected during the 2014 delineation, WM-2 meets the criteria for successful wetland formation.

Table 2 Monitoring Goal Criteria Summary

Wetland	Total Percent Native, Hydrophytic Vegetation Cover	Success Criteria Met (Y/N)		
		Vegetation	Soils	Hydrology
WM-2	141[1]	Y	Y	Y
WM-4	135	Y	Y	Y
WM-5	70	N	Y	Y
WM-6	135	Y	Y	Y
WM-7	140	Y	Y	Y
WM-8	85	Y	Y	Y
WM-9	125	Y	Y	Y

[1] Average of 4 sample plots in WM-2; each was 115 percent hydrophytic, native vegetation cover or above, individually

WM-4

Annual monitoring at PEM wetland WM-4 began in September of 2009 and was completed each following June and September through 2014 for a total of 11 monitoring efforts over 5 and a half years. Additionally, a formal wetland delineation occurred at WM-4 in August 2014.

The design acreage at WM-4 was 0.54 acres, and the constructed acreage was 0.69 acres. The delineated acreage at PEM WM-4 was 0.72 acre. Vegetation in W-4 was dominated by broadleaf cattail (*Typha latifolia*) and common spike-rush (*Eleocharis palustris*). Hydric soil was indicated by the presence of a depleted matrix. Wetland hydrology was indicated by drainage patterns, geomorphic position, saturation visible on aerial imagery, and a positive FAC-Neutral test. Data forms detailing the observed vegetation, soil, and hydrology characteristics at each sample plot were provided with the Wetland Delineation Report. Table 2 shows the total percent cover of native, hydrophytic vegetation at WM-4 observed during the 2014 delineation and summarizes all success criteria. Based on the data collected during the 2014 delineation, WM-4 meets the criteria for successful wetland formation.

WM-5

Annual monitoring at WM-5 began in September of 2009 and was completed each following June and September through 2014 for a total of 11 monitoring efforts over 5 and a half years. Additionally, a formal wetland delineation occurred at WM-5 in August 2014.

The design acreage at WM-5 was 0.52 acres, and the constructed acreage was 0.57 acres. The delineated acreage at PEM WM-5 was 0.40 acre. Vegetation in W-5 was dominated by redroot (*Amaranthus retroflexus*) and barnyard grass (*Echinochloa crus-galli*). Hydric soil was indicated by the presence of a depleted matrix. Wetland hydrology was indicated by geomorphic position, saturation visible on aerial imagery, and a positive FAC-Neutral test. Data forms detailing the observed vegetation, soil, and hydrology characteristics at each sample plot were provided with

the Wetland Delineation Report. Table 2 shows the total percent cover of native, hydrophytic vegetation at WM-5 observed during the 2014 delineation and summarized all success criteria. WM-5 meets the established criteria for both hydric soils and wetland hydrology. It falls just short of meeting the 80 percent native, hydrophytic vegetation cover requirement (70 percent measured during the 2014 delineation). However, WM-5 has been transition from an open water basin to a temporarily flooded, vegetated basin wetland in recent years and has seen an increase in native, hydrophytic vegetation cover. Given its position in the landscape, hydric soils, and current 70 percent cover of native, hydrophytic vegetation cover, it is anticipated that WM-5 will continue to establish and meet the success criteria similarly to nearby WM-4 (which transitioned earlier to a temporarily flooded, vegetated basin).

WM-6
Annual monitoring at WM-6 began in September of 2009 and was completed each following June and September through 2014 for a total of 11 monitoring efforts over 5 and a half years. Additionally, a formal wetland delineation occurred at WM-6 in August 2014

The design acreage at WM-6 was 0.95 acres, and the constructed acreage was 0.78 acres. The delineated acreage at PEM/PSS WM-6 was 0.42 acre. Vegetation in WM-6 was dominated by sandbar willow (*Salix interior*), broadleaf cattail, and common spike-rush. Hydric soil was indicated by the presence of a depleted matrix. Wetland hydrology was indicated by drainage patterns, saturation visible on aerial imagery, geomorphic position, and a positive FAC-Neutral test. An ephemeral drainage channel is located within the WM-6 basin. WM-6 is hydrologically connected with WM-7 via a culvert in the northeast corner of the basin. Data forms detailing the observed vegetation, soil, and hydrology characteristics at each sample plot were provided with the Wetland Delineation Report. Table 2 shows the total percent cover of native, hydrophytic vegetation at WM-6 observed during the 2014 delineation and summarized all success criteria. Based on the data collected during the 2014 delineation, WM-6 meets the established criteria for successful wetland formation.

WM-7
Annual monitoring at WM-7 began in September of 2009 and was completed each following June and September through 2014 for a total of 11 monitoring efforts over 5 and a half years. Additionally, a formal wetland delineation occurred at WM-7 in August 2014.

The design acreage at WM-7 was 0.60 acres, and the constructed acreage was 0.58 acres. The delineated acreage at PEM/PSS WM-7 was 0.56 acre. Vegetation in W-7 was dominated by sandbar willow, black willow (*Salix nigra*), broadleaf cattail, and rice cut grass (*Leersia oryzoides*). Hydric soil was indicated by the presence of a redoximorphic dark surface. Wetland hydrology was indicated by surface water, a high water table, saturation, drainage patterns, saturation visible on aerial imagery, geomorphic position, and a positive FAC-Neutral test. WM-7 is comprised of a mix of wetland islands, emergent vegetation, and open water comprising the

total 0.56-acre wetland. WM-7 is hydrologically connected to Wetland Mitigation Site 8 via a culvert in the northeast corner of the basin. Data forms detailing the observed vegetation, soil, and hydrology characteristics at each sample plot were provided with the Wetland Delineation Report. Table 2 shows the total percent cover of native, hydrophytic vegetation at WM-7 observed during the 2014 delineation and summarized all success criteria. Based on the data collected during the 2014 delineation, WM-7 meets the established criteria for successful wetland formation.

WM-8
Annual monitoring at WM-8 began in September of 2009 and was completed each following June and September through 2014 for a total of 11 monitoring efforts over 5 and a half years. Additionally, a formal wetland delineation occurred at WM-8 in August 2014

The design acreage at WM-8 was 0.70 acres, and the constructed acreage was 0.74 acres. The delineated acreage at PEM WM-8 was 0.77 acre. Vegetation in W-8 was dominated by duck potato (*Sagitaria latifolia*), rice cut grass, and common spike-rush. Hydric soil was indicated by the presence of a loamy gleyed matrix. Wetland hydrology was indicated by surface water, a high water table, saturation, a hydrogen sulfide odor, oxidized rhizospheres, saturation visible on aerial imagery, geomorphic position, and a positive FAC-Neutral test. WM-8 is comprised of a mix of wetland islands, emergent vegetation and open water making up the total 0.77 acre wetland. WM-8 is hydrologically connected to Wetland Mitigation Site 9 via a culvert in the southeast corner of the basin. Data forms detailing the observed vegetation, soil, and hydrology characteristics at each sample plot were provided with the Wetland Delineation Report. Table 2 shows the total percent cover of native, hydrophytic vegetation at WM-8 observed during the 2014 delineation and summarizes all success criteria. Based on the data collected during the 2014 delineation, WM-8 meets the established criteria for successful wetland formation.

WM-9
Annual monitoring at WM-9 began in September of 2009 and was completed each following June and September through 2014 for a total of 11 monitoring efforts over 5 and a half years. Additionally, a formal wetland delineation occurred at WM-8 in August 2014.

The design acreage at WM-4 was 0.60 acres, and the constructed acreage was 0.42 acres. The delineated acreage at PEM WM-9 was 0.28 acre, consisting of a narrow wetland fringe around a large open water basin. Vegetation in WM-9 is dominated by freshwater cordgrass and common fox sedge (*Carex vulpinoidea*). Common shrub species located along the wetland fringe include sandbar willow and peach-leaf willow (*Salix amygdaloides*). Hydric soil was indicated by the presence of a loamy gleyed matrix. Wetland hydrology was indicated by surface water, a high water table, and a positive FAC-Neutral test. Data forms detailing the observed vegetation, soil, and hydrology characteristics at each sample plot were provided with the Wetland Delineation Report. Table 2 shows the total percent cover of native, hydrophytic vegetation at WM-9

observed during the 2014 delineation and summarizes all success criteria. Based on the data collected during the 2014 delineation, WM-9 meets the established criteria for successful wetland formation.

Incidental Wetlands

Five wetlands were delineated in the vicinity of the mitigation wetlands during the August 2014 field survey. These wetlands have developed naturally due to changes in hydrology or landscape since the original delineation for the Project completed in 2002. These wetlands are described below and in the wetland delineation report dated January 12, 2015.

Wetland 1 (W-1). W-1 is a 12.37 acres PEM/PSS wetland complex formed as part of the Project's floodway mitigation. W-1 is located southeast of the Douglas County well field and south of WM-3, on the eastern side of the Platte River. Vegetation in W-1 was dominated by sandbar willow and broadleaf cattail. Hydric soil was indicated by the presence of a redoximorphic dark surface. Wetland hydrology was indicated by drainage patterns, geomorphic positon, and a positive FAC-Neutral test**.**

Wetland 2 (W-2). W-2 is a 2.79 acre PSS wetland formed within the floodway on the eastern side of the Platte River, northwest of W-1. Vegetation in W-2 was dominated by reed canary grass (*Phalaris arundinacea*) and broadleaf cattail. Hydric soil was indicated by the presence of sandy redoximorphic features. Wetland hydrology was indicated by oxidized rhizospheres, geomorphic position, and a positive FAC-Neutral test.

Wetland 3 (W-3). W-3 is a 0.10 acre PEM wetland swale located within a drainage feature that is hydrologically connected to WM-3. Vegetation in W-3 was dominated by water smartweed (*Persicaria amphibia*) and white oldfield American aster (*Symphyotrichum pilosum*). The tree canopy was dominated by eastern cottonwood (*Populus deltoides*) and green ash (*Fraxinus pennsylvanica*), but the wetland swale is classified as a PEM because the tree species are rooted outside of the swale in the upland. Hydric soil was indicated by the presence of a redoximorphic dark surface. Wetland hydrology was indicated by drift deposits, drainage patterns, geomorphic position, and a positive FAC-Neutral test.

Wetland 4 (W-4). W-4 is a 1.51 acre PEM wetland swale hydrologically connected to the southern-most water control structure at WM-3. Vegetation in W-4 was dominated by barnyard grass and river club-rush (*Schoenoplectus fluviatilis*). Hydric soil was indicated by the presence of a redoximorphic dark surface. Wetland hydrology was indicated by drainage patterns, saturation visible on aerial photography, geomorphic position, and a positive FAC-Neutral test.

Wetland 5 (W-5). W-5 is a 0.56 acre PEM wetland located east of the Platte West Production Facility and between WM-4 and WM-9. Vegetation in W-5 was dominated by broadleaf cattail.

Hydric soil was indicated by the presence of a depleted matrix and a redoximorphic dark surface. Wetland hydrology was indicated by water-stained leaves, drainage patterns, geomorphic position, and a positive FAC-Neutral test.

Stream Mitigation Site

Stream Mitigation 1 (SM-1). SM-1 is an ephemeral stream totaling 199.87 feet in length and located south of WM-9. The stream channel originates from a large concrete box culvert outlet conveying overflow from WM-9. Common riparian vegetation found along SM-1 included Kentucky bluegrass, tall fescue, and freshwater cordgrass. The substrate consisted of vegetation and silt. This stream had a well-defined bed and bank. The channel width for SM-1 averaged 4 feet and had no discernable ordinary high water mark (OHWM). The bank height was approximately 8 feet and no water was present at the time of the delineation. Five rock wing dams were installed during the creation of this stream. These wing dams have created a meandering channel during periods of ephemeral flow at SM-1.

Upland Buffers

Upland buffer areas surrounding the mitigation sites in Saunders County (WM-1 and WM-2) and Douglas County (WM-3) were designed as part of the mitigation efforts for the Project as described in the Mitigation Plans. These areas were taken out of agricultural production and planted with a native, upland prairie seed mix. Upland buffers can provide many benefits to adjacent wetlands, particularly when taking cropland out of production as a result. These benefits can include erosion and sediment control, creation wildlife habitat, invasive species control, water quality, etc.

The upland buffer area surrounding WM-1 and WM-2 was designed to cover approximately 15 acres following construction of the sites. Following the delineation efforts at WM-1 (in 2012) and WM-2 (2014), 11.24 acres of upland buffer area have been created surrounding the two wet meadow mitigation sites.

The upland buffer surrounding WM-3 was designed to total approximately 50 acres. Following the delineation efforts in 2014, the total upland buffer acreage measured surrounding WM-3 is 50.09 acres. In addition to the upland buffer at this location, 3.88 acres of mature riparian woods was also preserved. Table 3 lists these upland buffer areas as part of the mitigation accounting summary for the Project.

CONCLUSION

After 5 full years of monitoring (6 in the case of WM-2) and a formal wetland delineation of the mitigation sites and adjacent areas conducted in August of 2014, it is Burns & McDonnell's recommendation that the wetland mitigation sites discussed in this summary report be approved

as meeting mitigation requirements. Additionally, incidental wetlands formed since the original wetland delineation for the Project have been identified and included in this summary. Table 3 below shows a summary of the various wetlands including their design, constructed, and delineated acreages. This table shows a total of wetland acreages and credits based on the 2014 delineation.

Table 3: Wetland Acreage Summary Table

Wetland Number	Wetland Type[1]	Designed Acreage (from drawings)	Constructed Acreage (from as-builts)	Delineated Acreage (2014 WDR)[2]
Constructed Wetlands				
WM-1	PEM	3.60	3.60	3.30
WM-2	PEM	5.50	4.70	3.93
WM-4	PEM	0.54	0.69	0.72
WM-5	PEM	0.52	0.57	0.40
WM-6	PEM/PSS	0.95	0.78	0.42
WM-7	PEM/PSS	0.60	0.58	0.56
WM-8	PEM	0.70	0.74	0.77
WM-9	PEM	0.60	0.42	0.28
Constructed Wetlands Total:		**13.01**	**12.08**	**10.38**
Incidental Wetlands[3]				
W-1	PEM/PSS	-	-	12.37
W-2	PSS	-	-	2.79
W-3	PEM	-	-	0.10
W-4	PEM	-	-	1.51
W-5	PEM	-	-	0.56
Incidental Wetlands Total:				**17.33**
Upland Buffer[4]				
Wet Meadow Site (WM-1 & 2)		10.96 ac / 2.74 credit		11.24 acre / 2.81 credits
Backwash Site (WM-3)		53.58 ac / 13.4 credit		50.09 acre / 12.52 credits
Buffer Credits Total:				**15.33**

[1]Symbols for wetland type: PEM = palustrine emergent, PSS = palustrine scrub-shrub
[2]WM-1 was delineated and approved in 2012. All other wetlands were delineated in 2014
[3]Incidental Wetlands developed naturally as a result of new hydrology conditions near the created mitigation sites

Table 4 below shows an accounting summary of total mitigation credits created to-date compared the credits required. If the wetland and upland buffer credits summarized in this report are approved, the Project would have an excess of 21.14 credits available for use in Phase III, if needed.

Table 4: Wetland Mitigation Ledger

		Acreage Totals
Estimate of Wetland Impacts due to Construction and Operation in Well Fields: Phase I and II (1.5:1 ratio)		14.6
Wetland Mitigation Required:		**21.9**
Constructed Wetlands (1:1 ratio)		10.38
Incidental Wetland Creation (1:1 ratio)		17.33
Upland Buffer Credit (4:1 ratio)		15.33
Total Wetland Mitigation Credits:		**43.04**
Wetland Mitigation Credits Available for use in Phase III:		21.14

If you have any questions, need any additional information, or would like to schedule a site visit, please contact me by telephone at (630) 724-3300 or by email at ssoard@burnsmcd.com. We would like to request written concurrence that the mitigation requirements for the mitigation sites discussed in this letter report have been met and monitoring at this location is no longer necessary as part of the permit requirements.

Sincerely,

Sarah J. Soard, PWS
Regional Global Practice Manager

cc: Kevin Tobin, Metropolitan Utilities District
Justin Bailey, Burns & McDonnell