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2016 Annual Bathymetric Monitoring Report for the Ponds within the Well Fields and Cones of Depression

METROPOLITAN UTILITIES DISTRICT

Metropolitan Utilities District

Platte West Water Production Facility Project
Project No. 92445

1/12/2017

EXECUTIVE SUMMARY

The Metropolitan Utilities District (District) in Omaha, Nebraska received a Section 404 Individual 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 in the Corps Section 404 Permit, existing ponds located in the well fields and projected cones of depression must be monitored to evaluate changes in water levels to determine the extent of any impacts to ponds that may take place as a result of Project operation. To comply with this condition, a Bathymetric Monitoring Plan was approved in 2005 and is currently being implemented (Burns & McDonnell 2005).

As part of the Bathymetric Monitoring Plan, surface water elevation monitoring of the ponds in the well fields and projected cones of depression was conducted in March, August, September, and October 2016. This sampling effort represents the eighth complete year of monitoring during operation of the water treatment plant. Data obtained during 2016 has been analyzed and compared to baseline data. The results are discussed in this annual report and included in Appendices A and B.

The majority of the monitored ponds experienced a general trend of relatively steady surface water elevations since Project operation began in August 2008; this trend continued during the 2016 monitoring events. No ponds monitored in 2016 indicated a statistically significant decrease in water level elevation when compared to the baseline data. One pond (DG-20G) had a statistically significant increase in water elevation when compared to the baseline elevation. In general, measured water level elevations were similar to 2015 monitoring year levels, and generally higher when compared to drier than normal years in 2012 and 2013.

As a result of the conditions observed at the monitored ponds in 2016, it is recommended that pond monitoring efforts in 2017 continue without changes to the methodology at this time.

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1.0 INTRODUCTION

The Metropolitan Utilities District (District) in Omaha, Nebraska received a Section 404 Individual 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 in the Corps Section 404 Permit, existing ponds located in the well fields and projected cones of depression must be monitored to evaluate changes in water levels to determine the extent of any impacts to ponds that may take place as a result of Project operation. To comply with this condition, a Bathymetric Monitoring Plan was approved in 2005 and is currently being implemented (Burns & McDonnell 2005).

As stated in Permit Condition 80, the District must "…complete a detailed study of each pond within the Platte West well field cone of depression for the purpose of acquiring detailed bathymetric data for each pond. This data will be updated annually and used to assess any declines in pond levels and surface area resulting from well field pumping." The 2005 Bathymetric Monitoring Plan presents a systematic approach to monitor seasonal pond water levels in Douglas, Saunders, and a small corner of Sarpy Counties to evaluate impacts due to the operation of the Project. For the purposes of this report, the ponds in Sarpy County are included with those in Douglas County.

Maps were developed in September 2004 by measuring each pond's surface water area, water depth, and water storage capacity. Pond monitoring from September 2004 through March 2008 was conducted to characterize the baseline surface water elevation conditions for each pond prior to the initiation of Project activities. The Project began producing water for municipal use during the summer of 2008; therefore, the monitoring efforts from August 2008 through the present are considered post-operational.

This monitoring report summarizes the data collected during the 2016 monitoring efforts (March, August, September, and October) and provides some comparisons and statistical analysis of the water level elevations for each monitored pond.

2.0 METHODS

The goal of monitoring ponds within the Douglas County and Saunders County well fields and associated cones of depression (Figures 2-1 and 2-2) is to evaluate the impact that Project operation may have on the existing ponds, specifically any fluctuations in surface water elevation. The pond monitoring approach, as described in the 2005 Bathymetric Monitoring Plan and in the following sections, has been approved and implemented.

Pond monitoring began during the fall of 2004, prior to the initiation of Project operation. Monitoring will continue until the Corps determines that any impacts to ponds as a result of Project operation are either completely mitigated for or are not likely to occur. If the results of the monitoring program indicate that no pond impacts are occurring, long-term monitoring can either be decreased or stopped. If, however, the results of the monitoring indicate that ponds are being affected by Project operation, discussions with the Corps and pond owners will be initiated to determine what additional mitigation may be required. If a resolution of impacts or potential impacts to ponds is reached between the District and pond owners, then it is understood that monitoring of the pond(s) involved in the resolution will be complete.

2.1 Bathymetric Mapping

The initial bathymetric mapping was conducted in September 2004 for 45 ponds in the Project well fields and cones of depression in Douglas and Saunders Counties. Three additional ponds were mapped in 2005 and 2006 either at the request of a landowner or because they were inadvertently overlooked during the initial bathymetric surveys. Ponds located in Douglas and Sarpy Counties have a "DG" designation before the pond number, while those in Saunders County have a "SN" designation.

Bathymetric mapping was completed using a boat-mounted, strip-chart recording sonar (Unimetrics model SH 20/20A) for all ponds except SN-16, SN-34, and DG-09, which were mapped using a boat-mounted, integrated depth sounder with one-centimeter precision (Seafloor System model Hydrolite). Both methods of bathymetric survey also used a Global Positioning System (GPS) with sub-meter accuracy. In most cases, each bathymetric cross-section was recorded as the boat was piloted across a pond at a constant speed using an electric motor. If a pond was too shallow to easily use the boat and record sonar, cross-section transects were waded on foot and water depths were recorded at fixed intervals along the transect using a water depth pole. These bathymetric data were used to develop water depth contour maps (Burns & McDonnell 2005, 2006).

Using the collected bathymetric data, the total surface area and water storage volume (area capacity) for each pond were estimated. The point at which each pond's surface water elevation was equal to zero was

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Figure 2-1
Locations of Monitoring Wells, Monitored Ponds and Permanent Benchmarks in Douglas County
Platte West Water Production Facilities Project
Douglas County, Nebraska

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Legend

- Monitored Ponds
- Permanent Benchmark
- Monitoring Well (MW)
- Cone of Depression
- Wellfield Boundary

0 0.25 0.5 0.75 1 Miles

N

Source: Wilson & Company 2013 Aerial Photography

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Figure 2-2
Locations of Monitoring Wells, Monitored Ponds and Permanent Benchmarks in Saunders County
Platte West Water Production Facilities Project
Saunders County, Nebraska

adjusted to correspond to the measured ordinary high water mark (OHWM) to provide a standard from which each pond's normal fluctuation in surface water elevation (pre-Project operation), surface area, and water storage volume are based. The OHWM was used because it is a repeatedly identifiable elevation for any pond.

2.2 Water Level Elevation Monitoring

The types of data that were collected, the methods used, and the analyses completed during the pond monitoring process in the well fields and cones of depression are described in the following paragraphs.

2.2.1 Staff Gauge Monitoring

Staff gauges were initially installed in each pond in 2004 to facilitate the seasonal acquisition of surface water elevations. In early 2005, it became apparent that the staff gauges could undergo shifts in position or orientation due to a variety of events, including pond freezing and thawing, ice movement during the winter months, siltation, or strong prevailing winds. During the 2006 to 2009 period, most of the staff gauges fell over or shifted due to winter weather conditions and were removed. In March 2010, all remaining staff gauges were manually removed.

2.2.2 Permanent Benchmark Monitoring

Permanent benchmarks were established in June 2005, adjacent to each pond, to compensate for the shifting staff gauges. Each benchmark is a permanent concrete marker placed in the ground near the edge of the pond above the OHWM. The location and elevation of each permanent benchmark was recorded using a survey-grade GPS (Trimble 5700 RTK). In some cases, one benchmark was used for multiple ponds that were in close proximity to each other.

Surface water elevations are measured four times annually (March, August, September, and October) using the permanent benchmarks according to the methods described in the 2005 Bathymetric Monitoring Report that was approved by the Corps (Burns & McDonnell 2006). The surface water elevation at each pond is calculated using a surveyor's level. Measurements are taken at the benchmark and at the current edge of standing water in the pond on a telescoping rod.

Since 2008, the surface water elevations of 45 ponds have been monitored using the permanent benchmark method. SN-33 was removed from monitoring in March 2008 at the request of the landowner. DG-11 was added at the request of the landowner in 2009 and is being monitored, at this time, by photographic documentation only. DG-02A was added at the request of the landowner in 2011; its surface water elevation is being monitored from an existing permanent benchmark. SN-17 was removed from

monitoring in 2012 due to safety issues on the property. SN-03 and SN-04 were removed from monitoring in March 2013 due to conversion to row crop agriculture. Due to these changes, 44 ponds are currently monitored and discussed in this annual report.

The seasonal variation in surface water elevation of the 44 ponds under baseline and operational conditions will be evaluated in concert with the other hydrologic data that are being collected. The water level elevations and bathymetric data collected from the ponds will be used to indicate if water level fluctuations are occurring at a specific pond or ponds and if these fluctuations are different than what was observed during baseline monitoring. Any observed water level fluctuations will be analyzed to determine if they are attributable to Project operation or the result of the pond's natural responses to climate and precipitation variation.

2.3 Hydrological Monitoring

Several different types of hydrological data are being collected and analyzed, in addition to the pond water level elevations. This hydrological data is used to document the potential effect Project operation may have on the existing water table and subsequently the surface water elevations of the monitored ponds.

2.3.1 Groundwater Monitoring Wells

Permanent monitoring wells designed to measure groundwater levels before and during Project operation have been installed at specific locations in and around the Douglas County and Saunders County well fields and cones of depression (Figures 2-1 through 2-2). The location of these groundwater monitoring wells was recorded using GPS. Data loggers have been installed at the monitoring wells to measure and record daily groundwater levels. Groundwater data from the monitoring wells will be correlated with the other collected hydrological data to identify and evaluate if any Project-induced groundwater system changes are occurring.

2.3.2 Production Wells

During Project operation, production wells located in the Douglas County and Saunders County well fields are pumped to provide raw water to the water treatment plant (Figures 2-3 and 2-4). These water production wells are fitted with data loggers that measure and record the depth to the water table at each well head, whether or not the well is actively being pumped. The rate at which each well is being pumped is measured in millions of gallons per day (MGD). The location of these water production wells was recorded using GPS. Groundwater data from the water production wells (production rate, drawdown, cone

of depression, etc.) during Project operation will be correlated with the other hydrological data being collected to evaluate if Project-induced changes to ponds are occurring.

2.3.3 Other Hydrological Data

Additional hydrological data collected during the annual monitoring effort includes monthly total precipitation, monthly average ambient air temperature, and stream gauge data for the Platte and Elkhorn Rivers.

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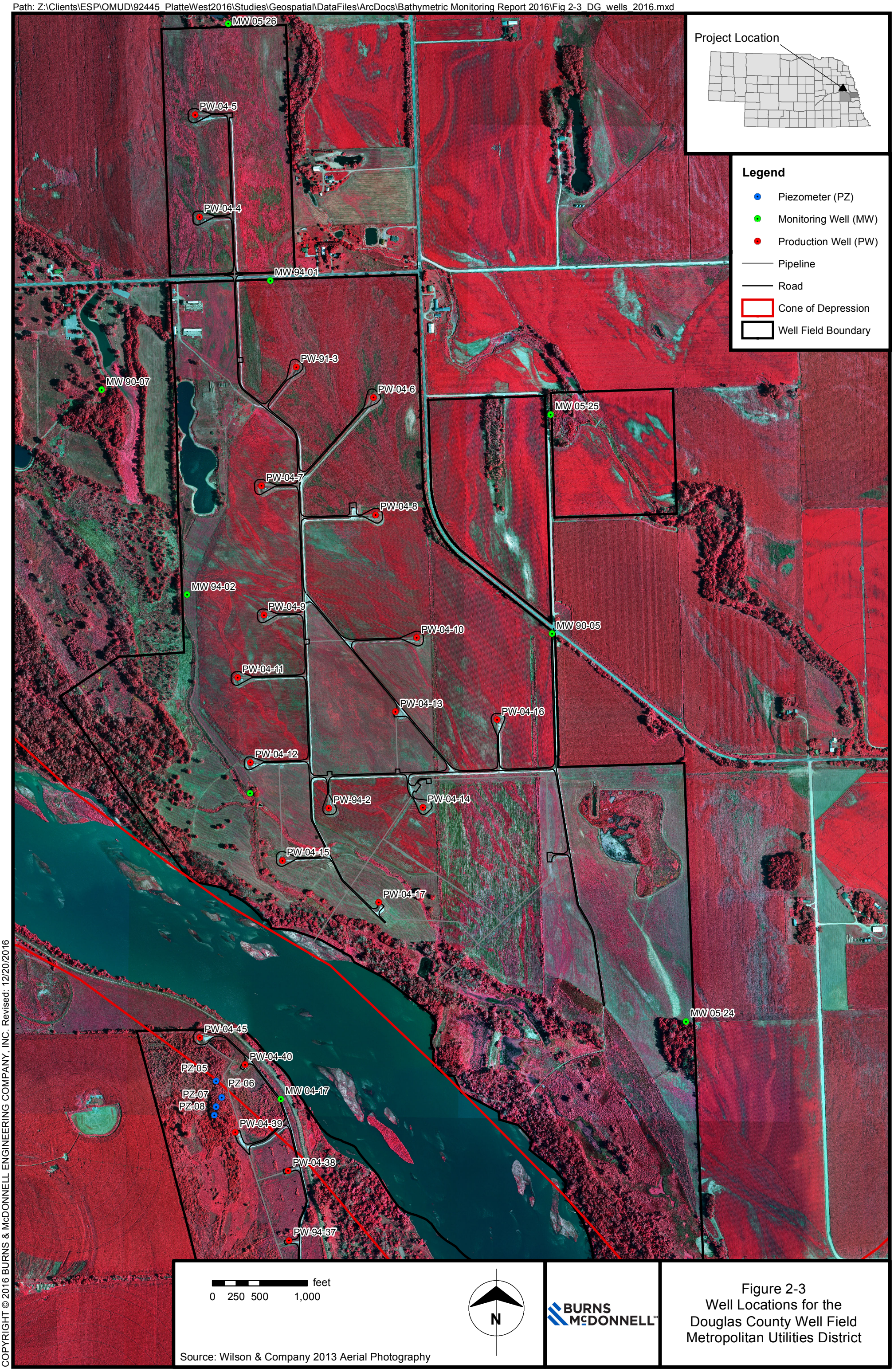

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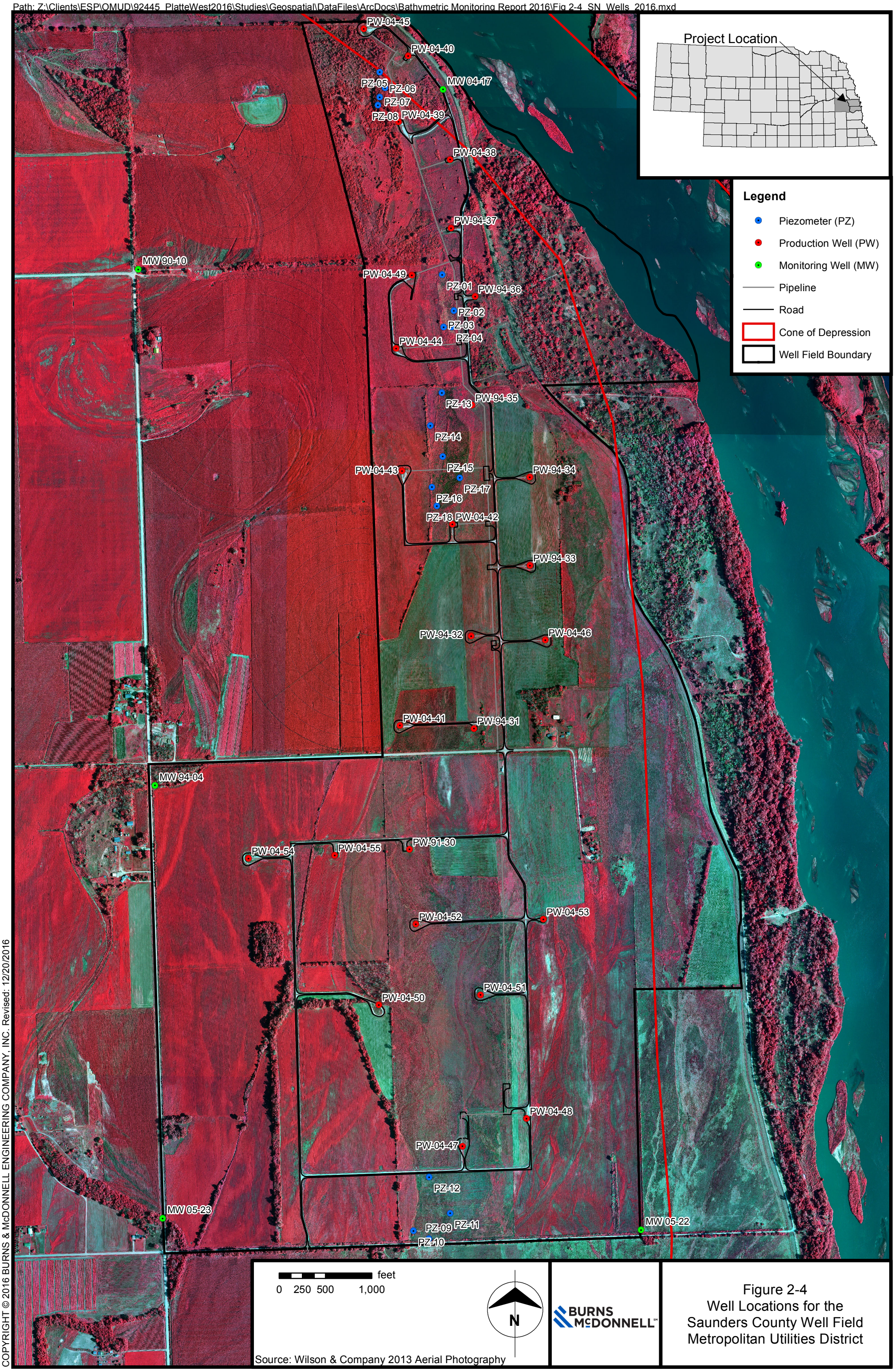

3.0 DATA ANALYSIS

The following sections provide a brief discussion of the data analysis completed to interpret the results of the 2016 pond monitoring effort.

3.1 Bathymetric Monitoring Data

The 2016 bathymetric monitoring data reflects operational Project conditions for the ponds being monitored in the well fields and cones of depression. Data collected are used to determine the seasonal and annual variation in surface water elevation of the monitored ponds under pre-Project conditions and during Project operation. All bathymetric data is input into a Microsoft® Access database, which is designed specifically for this Project to accommodate seasons and years of data.

Fluctuations in surface water elevation are plotted in graphical form for the March through October 2016 monitoring period and for the duration of monitoring from 2005 through 2016 (Appendices A and B). This data is also displayed to show the fluctuations relative to the maximum and minimum baseline surface water elevations.

3.2 Statistical Analysis

To determine whether any observed changes in the water level elevation data are significant, a statistical analysis was conducted to compare the baseline data, which captured some of the natural variation in the pond water level elevations, to the operational data to determine if Project operation is having a significant effect on the ponds' water levels. The Repeated Measures Analysis of Variance (ANOVA) was used for the first time in 2013; in previous years a paired t-test was used. The Repeated Measures ANOVA was used in lieu of the t-test because the Repeated Measures ANOVA allows for a yearly comparison of elevation data; the t-test relies on operational and baseline averages, which are easily distorted by atypical years. The statistical add-on package to Microsoft Excel that was utilized for this analysis is the EZAnalyze program (www.ezanalyze.com). The Repeated Measures ANOVA is able to compare multiple sampling seasons of data against the baseline elevation for a given pond. A post-hoc analysis is also included when a significant difference is detected to determine which sampling efforts were significantly different. A Bonferroni correction is then applied to the p-values to decrease the error that may occur when comparing multiple data sets. The final p-Bonferroni values are reviewed to determine if any of the sampling efforts are significantly different from the baseline average value.

A significant difference indicates a mathematical difference, but not necessarily a biological change. For example, a significant difference in water level elevation of one foot between baseline and operational averages may have very little biological effect in a pond that is 20 feet deep. However, a one foot

difference in water level elevation between baseline and operational averages, even though mathematically non-significant, may be biologically significant to a pond that is only three feet deep. The analysis of the pond water level elevation data will take into account both the mathematical significance of a difference as well as the biological significance of any difference in pond water level elevations.

The pond elevations throughout the entire monitoring period were graphed and a trendline was calculated to characterize the change in elevation over time for each pond. The slope of the trend line represents the rate at which each pond elevation has changed and it can be used to predict the pond elevation for future dates. The R^2 value indicates the strength of the correlation between time and pond elevation; a value close to one indicates a strong relationship between time and pond elevation and a value close to zero indicates a weak relationship.

3.3 Hydrological Data

Several different types of hydrological data were collected during the 2016 monitoring effort to supplement the bathymetric monitoring data.

3.3.1 Groundwater Monitoring Wells

Twenty-one permanent monitoring wells are located and monitored in the Project area. These wells are equipped with data loggers designed to measure groundwater levels before and during Project operation. Water level readings were measured and recorded on a daily basis in 2016. The collected 2016 data have been graphed over time and are presented for each monitoring well in Appendix III – Section A. Readings from these monitoring wells were analyzed to provide additional data on the relationship between groundwater fluctuations and changes in the surface water elevation for each monitored pond.

3.3.2 Production Wells

The Project production wells that provide raw water to the water treatment facility during Project operation are monitored using installed data loggers. These wells are located in the Douglas County and Saunders County well fields (Figures 2-3 and 2-4). Groundwater data from the production wells was analyzed to provide additional data to help explain any changes detected in the other monitoring data (Section 2, Appendix C).

3.3.3 Other Hydrological Data

Additional hydrological data collected during the 2016 monitoring efforts included monthly total precipitation, monthly average ambient air temperature, and local stream gauge data. The 2016 monthly total precipitation and monthly average ambient air temperature data were obtained from the weather

station at Fremont Municipal Airport in Fremont, Nebraska (Weather Underground 2016). The 2016 monthly data and the historical average monthly precipitation and temperature data (The Weather Channel 2016) have been graphed over time; the graphs are included in Figures 1 and 2 (Appendix III – Section C).

4.0 RESULTS

The following sections provide the results of the data analysis for each of the ponds monitored during the 2016 efforts. The complete set of data (figures, data sheets, ground photographs) for each monitored pond in the well fields and cones of depression are available in Appendices A and B.

The surface water elevation for each monitored pond and other supporting hydrological data have been analyzed to compare 2016 data to baseline averages. The data presented in the following sections may be used by the District to determine mitigation measures on a pond-by-pond basis if it is determined that Project operations are having an effect on an individual pond.

4.1 Ponds Monitored

The 2016 pond monitoring effort documented the seasonal variation of 44 ponds within the Project well fields and cones of depression.

4.2 Pond Alterations

Occasionally individual landowners dredge or otherwise alter a pond, resulting in changes to the pond's surface water area and elevation, water storage capacity, or other bathymetric characteristics. Additionally, the bathymetric characteristics of ponds may be altered by natural occurrences. When such alterations occur, the pond's bathymetric characteristics may be resurveyed. These needs will be handled on a case-by-case basis with the concurrence of the landowner, the District, and the Corps. No alterations to monitored ponds were reported by landowners in 2016. Any alterations, reported or not, were done without Burns & McDonnell's or the District's consultation. No alterations were discovered during 2016 routine monitoring visits.

In the event of alterations to ponds being monitored, the potential need to resurvey ponds will be evaluated through discussions between Burns & McDonnell, the District, the landowners, and the Corps.

4.3 Baseline Data

According to baseline conditions, a majority of the ponds typically experience surface water elevation trends that include relatively high levels in March, a water level elevation decrease in August and September, followed by an increase in October. The water level elevation increase in October typically does not rise to the annual highest level recorded in March.

4.4 2016 Douglas County Bathymetric Monitoring Results

The following sections present the 2016 pond monitoring results for those ponds located in Douglas County and Sarpy County.

4.4.1 Pond DG-01

DG-01 is located approximately 650 feet east of the Platte River in northern Sarpy County and is included with the ponds from Douglas County for the purposes of the bathymetric monitoring (Figure 2-1). Mapping conducted at the start of baseline monitoring determined that the surface area at DG-01 was 11.98 acres and volume was 70.32 acre-feet in 2005. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have altered the storage capacity of the pond over time. In the summer of 2012, evidence of dredging was noted at the east end of the pond. The highest 2016 surface water elevation at DG-01 was recorded in March (1,095.79 feet) and the lowest surface water elevation was recorded in August (1,095.07 feet). Surface water elevation was recorded at 1,095.64 feet in August and September (Appendix I – DG-01, Figure 1). All pond level readings fell between the maximum (1,096.07 feet) and minimum (1,094.31 feet) baseline surface water elevations for DG-01. Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-01.

In general, water elevations at DG-01 did not correspond closely with local precipitation. Pond levels followed water patterns of the Platte River (Appendix I – DG-01, Figure 2) and the groundwater elevations from nearby Groundwater Monitoring Well MW 06-29 (Appendix III, Section C). DG-01 is likely influenced by the local fluctuations in groundwater levels. The recorded water level elevations and the local precipitation amounts were graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-01, Figure 2). Additionally, a trendline has been applied to the DG-01 data (Figure 2) to indicate the general trend of the water level elevation in the pond. The 2016 seasonal fluctuation of water elevations at DG-01 was different from the seasonal fluctuations seen in baseline monitoring (Appendix I – DG-01, Figure 2). The trendline indicates that the average pond water level elevation has remained fairly consistent, although the R^2 value, 0.0056, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

As previously mentioned, the east end of DG-01 was dredged during the summer of 2012. The subsequent changes to the bathymetric characteristics of DG-01 will be taken into consideration during future pond level evaluations.

4.4.2 Pond DG-02

DG-02 is located in northern Sarpy County approximately 350 feet east of the Platte River (Figure 2-1). Mapping conducted at the start of baseline monitoring determined that the surface area at DG-02 was 10.02 acres and the volume was 18.50 acre-feet in 2005. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have altered the storage capacity of the pond over time. DG-02 is connected to DG-03 by a culvert to the north when water levels are sufficient for flow and is also hydrologically connected to DG-02A to the south. In 2016, DG-02 was hydrologically connected to DG-02A and DG-03 during all monitoring events. The highest 2016 surface water elevation at DG-02 was recorded in March (1,096.68 feet) and the lowest surface water elevation was recorded in August (1,095.63 feet). Surface water elevation was recorded at 1,096.12 feet in September and 1,096.60 feet in October (Appendix I – DG-02, Figure 1). All pond level readings were between the minimum (1,095.33 feet) and maximum (1,096.73 feet) baseline surface water elevations. Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-02.

In 2016, the surface water elevations at DG-02 did not closely correspond with local precipitation levels. However, DG-02 water elevations did correspond to Platte River water elevation (Appendix III, Section C). Based on the available 2016 groundwater readings from nearby Groundwater Monitoring Well (MW 06-29), the surface water elevations at DG-02 also corresponded with groundwater elevations (Appendix III, Section A). Due to the proximity of DG-02 to the Platte River, this pond is likely influenced by a year-round groundwater connection with the Platte River as well as by local groundwater fluctuations. The recorded water level elevations and the local precipitation amounts were graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-02, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-02 was different from the seasonal fluctuations seen in baseline monitoring. Additionally, a trendline has been applied to the DG-02 data (Figure 2) to indicate the general trend of the water level elevation in the pond. The trendline indicates that the average pond water level elevation is decreasing slightly each year, although the R^2 value, 0.0056, indicates that the trendline is a weak predictor of change in water elevation. This general trend could be related to the low water levels observed during the droughts of 2012 and 2013. Trendlines will be recalculated each year in order to capture annual variation.

4.4.3 Pond DG-02A

In 2010, the landowner requested the establishment of a second monitoring location at DG-02 due to seasonal low water conditions. This second location is DG-02A. During the August 2015 monitoring event, minor moving of sand in the shallow areas and the removal of trees was observed at DG-02A. DG-

02A is located south of DG-02 and was hydrologically connected to DG-02 during all 2016 monitoring events (Figure 2-1). The highest 2016 surface water elevation at DG-02A was recorded in March (1,096.64 feet) and the lowest surface water elevation was recorded in August (1,095.65 feet). Surface water elevation was recorded at 1,096.16 feet in September and 1,096.62 feet in October (Appendix I – DG-02A, Figure 1). No statistical analysis was conducted for DG-02A data because baseline elevations were not collected at this location; therefore, a comparison between baseline and operational conditions cannot be made.

In 2016, surface water level fluctuations at DG-02A did not correspond with local precipitation levels. However, surface water level fluctuations did correspond with Platte River levels. Due to its proximity to the Platte River and results from previous years, this pond is likely influenced by a year-round groundwater connection with the Platte River as well as by local groundwater fluctuations. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of the 2011-2016 operational monitoring periods (Appendix I – DG-02A, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-02A was similar to seasonal fluctuations seen in previous years.

4.4.4 Pond DG-03

DG-03 is located approximately 600 feet east of the Platte River in northern Sarpy County (Figure 2-1). It is connected to the south to DG-02 by a culvert when water levels are sufficient for flow (Appendix I – DG-03, Figure 1). The surface area and volume of DG-03, as determined during baseline monitoring, were 1.86 acres and 3.59 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. Based on site observations, DG-03 was dredged between the August and September 2012 monitoring events. In August 2014, a beaver dam was observed in DG-03 at the culvert outlet connecting DG-02. The beaver dam was removed from DG-03 by a tenant in October 2015. DG-03 is close in proximity to Production Well PW 04-15, and it is likely that the production well had an impact on DG-03 water elevations during 2016 (Appendix III, Section B). DG-03 was hydrologically connected to DG-02 during all 2016 monitoring events. The highest 2016 surface water elevation at DG-03 was recorded in September (1,096.88 feet) and the lowest surface water elevation was recorded in August (1,095.43 feet). Surface water elevation was recorded at 1,096.50 feet in March, and 1,096.72 feet in October (Appendix I – DG-03, Figure 1). All 2016 monthly surface water elevation readings were within the range of the baseline surface water elevations (1,094.70 and 1,098.92 feet) (Appendix I – DG-03, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-03.

The 2016 surface water level elevations at DG-03 did not correspond with the local precipitation levels (Appendix III, Section C). Water level fluctuations of the Platte River and groundwater levels collected in 2016 from nearby Groundwater Monitoring Well MW 06-29 correlated with pond levels at DG-03 (Appendix III, Section A). This pond is likely influenced by a year-round groundwater connection with the Platte River as well as local groundwater fluctuations. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-03, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-03 was not similar to seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water elevation is decreasing slightly each year, although the R^2 value, 0.0116, indicates that the trendline is a weak predictor of change in water elevation. This general trend could be related to the low water levels during the droughts of 2012 and 2013. Trendlines will be recalculated each year in order to capture annual variation.

4.4.5 Pond DG-04

DG-04 is located in northern Sarpy County approximately 1,200 feet east of the Platte River (Figure 2-1). The surface area and volume of DG-04, as determined during baseline monitoring, were 3.9 acres and 23.96 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The north and west ends of DG-04 were dredged between the August and September 2012 monitoring events. The highest 2016 water elevation at DG-04 was recorded in March (1,095.07 feet) and the lowest surface water elevation was recorded in September (1,094.04 feet). Surface water elevation was recorded at 1,094.47 feet in August and 1,094.97 feet in October (Appendix I – DG-04, Figure 1). All 2016 monthly surface water elevation readings were between the minimum and maximum baseline surface water elevations (1,093.16 and 1,095.78 feet) (Appendix I – DG-04, Figure 1). Differences between the 2016 operational readings and baseline elevations were not statistically significant for DG-04.

The 2016 water level readings at DG-04 did not correspond to the 2016 precipitation data. However, surface water level readings did correlate with the water level fluctuations of the Platte River (Appendix III, Section C). Data from nearby Groundwater Monitoring Well MW 06-29 correlates to the 2016 pond levels at DG-04 (Appendix III, Section A). This pond is likely influenced by a year-round groundwater connection with the Platte River as well as local groundwater fluctuations. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-04, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-04 was not similar to seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is remaining fairly consistent, although the R^2 value,

0.0059, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

As previously mentioned, the north and west ends of DG-04 were dredged during 2012 between the August and September monitoring events. The subsequent changes to the bathymetric characteristics of DG-04 will be taken into consideration during future pond level evaluations.

4.4.6 Pond DG-04A

DG-04A is located approximately 1,800 feet from the Platte River and 1,900 feet from the Elkhorn River in northern Sarpy County (Figure 2-1). The surface area and volume of DG-04A, as determined during baseline monitoring, were 0.54 acre and 1.08 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The west end of DG-04A was dredged during 2012 between the August and September monitoring event. The highest 2016 surface water elevation at DG-04A was recorded in September (1,093.93 feet) and the lowest surface water elevation was recorded in August (1,093.07 feet). Surface elevation was recorded at 1,093.79 feet in March and 1,093.50 feet in October (Appendix I – DG-04A, Figure 1). All 2016 monthly surface water elevation readings were between the minimum and maximum baseline surface water elevations (1,092.19 and 1,094.74 feet) (Appendix I – DG-04A, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-04A.

The general trend in 2016 surface water elevations at DG-04A did follow that of the Elkhorn and Platte Rivers (Appendix III, Section C). DG-04A levels were not correlated with local precipitation levels. This pond is within the same surface watershed as DG-04 and may be subjected to similar circumstances, including a groundwater influence from the Platte River. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-04A, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-04A was not similar to seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is decreasing slightly over time, although the R^2 value, 0.0229, indicates that the trendline is a weak predictor of change in water elevation. This general trend could be related to the low water levels during the droughts of 2012 and 2013. Trendlines will be recalculated each year in order to capture annual variation.

As previously mentioned, the west end of DG-04A was dredged during 2012 between the August and September monitoring events. The subsequent changes to the bathymetric characteristics of DG-04A will be taken into consideration during future pond level evaluations.

4.4.7 Pond DG-04B

DG-04B is located in northern Sarpy County approximately 1,350 feet from the Platte River and 2,450 feet from the Elkhorn River (Figure 2-1). The surface area and volume of DG-04B, as determined during baseline monitoring, were 0.85 acre and 4.44 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The north end of DG-04B was dredged during 2012 between the August and September monitoring events. The highest 2016 surface water elevations at DG-04B was recorded in March (1,095.00 feet) and the lowest surface water elevations was recorded in August (1,094.11 feet). Surface water elevation was recorded at 1,094.73 feet in September and 1,094.69 feet in October (Appendix I – DG-04B, Figure 1). The 2016 surface water elevations recorded in March, August, September and October were between the maximum and minimum baseline elevations (1,095.58 and 1,092.72 feet) (Appendix I – DG-04B, Figure 1). Differences between the 2016 operational readings and baseline elevations were not statistically significant for DG-04B.

The 2016 general trend in surface water elevation for DG-04B did not correlate with the 2016 monthly precipitation values. The general surface water elevation correlated with the 2016 groundwater level data from nearby Groundwater Monitoring Well MW 06-29 and with monthly mean water elevations of the Platte River (Appendix III, Sections A and C). Similar to DG-04 and DG-04A, this pond likely experiences surface water elevation changes resulting from a groundwater connection with the Platte River and with groundwater fluctuations. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-04B, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-04B was not similar to seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is remaining fairly consistent over time, although the R^2 value, 0.0043, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

As previously mentioned, the north end of DG-04B was dredged in 2012 between the August and September monitoring events. The subsequent changes to the bathymetric characteristics of DG-04B will be taken into consideration during future pond level evaluations.

4.4.8 Pond DG-05

DG-05 is one of the easternmost monitored ponds in Douglas County and is located approximately 3,400 feet west of the Elkhorn River (Figure 2-1). The surface area and volume of DG-05, as determined during baseline monitoring, were 2.72 acres and 18.04 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-05 was recorded in March (1,095.92 feet) and the lowest surface water elevation was recorded in October (1,095.61 feet). Surface water elevation was recorded at 1,095.70 feet in August and 1,095.87 feet in September (Appendix I – DG-05, Figure 1). All 2016 monthly measurements fell below the minimum baseline surface water elevation of 1,096.42 feet for DG-05 (Appendix I – DG-05, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-05.

The surface water elevation trend for DG-05 correlated to the groundwater level fluctuations measured from nearby Groundwater Monitoring Well MW 90-06 and water fluctuations of the Elkhorn River (Appendix III, Sections A and C). The pond's elevation readings corresponded to local precipitation data. It is likely that this pond experiences surface water elevation changes resulting from both localized groundwater and fluctuations in precipitation. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-05, Figure 2). The seasonal fluctuations for DG-05 differed from previous years. The trendline indicates that the average pond water level elevation is decreasing slightly over time, although the R^2 value, 0.2618, indicates that the trendline is a weak predictor of change in water elevation. This general trend could be related to the low water levels during the droughts of 2012 and 2013, and the low water levels that have been recorded in 2015 and 2016. Trendlines will be recalculated each year in order to capture annual variation.

4.4.9 Pond DG-09

DG-09 is the easternmost monitored pond in Douglas County and is located approximately 3,900 feet from the Elkhorn River (Figure 2-1). The surface area and volume of DG-09, as determined during baseline monitoring, were 2.59 acres and 16.54 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-09 was recorded in September (1,101.24 feet) and the lowest surface water elevation was recorded in August (1,099.68 feet). Surface water elevation was recorded at 1,100.56 feet in March and 1,100.69 feet in October (Appendix I – DG-09, Figure 1). All 2016 monthly surface water elevation readings fell between the minimum and maximum baseline surface water elevations (1,099.13 and 1,102.11 feet) (Appendix I – DG-09, Figure 1).

Differences between 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-09.

The seasonal fluctuation in surface water elevation for DG-09 followed water levels of the Elkhorn River and the groundwater level fluctuation readings from nearby Groundwater Monitoring Well MW 90-06. The 2016 elevation readings for DG-09 do not correspond to local precipitation data. These relationships indicate that DG-09 is likely influenced more strongly by groundwater than by precipitation. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-09, Figure 2). The trendline indicates that the average pond water level elevation is decreasing slightly each year, although R^2 value, 0.0635, indicates that the trendline is a weak predictor of change in water elevation. This general trend could be related to the low water levels during the droughts of 2012 and 2013. Trendlines will be recalculated each year in order to capture annual variation.

4.4.10 Pond DG-11

DG-11 is located approximately 1.2 miles northwest of the Elkhorn River and approximately 1,600 feet north of two Groundwater Monitoring Wells, MW 90-06 and MW 94-12 (Figure 2-1). Water was observed being pumped into DG-11 during the 2012 monitoring events. Photo documentation of DG-11 was initiated in September 2009 at the request of the landowner, but this pond has not been quantitatively monitored.

DG-11 was monitored by photographic documentation during each monitoring effort. Photographs from the 2016 monitoring efforts are included in Appendix A – DG-11. At present, attempts at correlating qualitative photographic documentation of DG-11 to data from the two nearby groundwater monitoring wells have not be made.

4.4.11 Pond DG-13

DG-13 is approximately 1.7 miles northwest of the Elkhorn River and 1.6 miles northeast of the Platte River (Figure 2-1) and is located between Groundwater Monitoring Wells MW 90-06 and MW 94-01. The surface area and volume of DG-13, as determined during baseline monitoring, were 4.12 acres and 28.25 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-13 was recorded in August (1,107.41 feet) and the lowest surface water elevation was recorded in October (1,106.27 feet). Surface water elevation was recorded at 1,106.53 feet in March and 1,106.46 feet in September (Appendix I – DG-13, Figure 1). All 2016 monthly elevation readings fell between the

minimum and maximum baseline surface water elevations for DG-13 (1,104.15 and 1107.63 feet) (Appendix I – DG-13, Figure 2). Differences between 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-13.

In 2016, precipitation levels did correlate to the observed surface water elevation readings of DG-13. Water elevations at DG-13 did, however, did not correlate with the water levels of the Platte River and groundwater level readings for Groundwater Monitoring Well MW 90-06 (Appendix III, Sections A and C). These relationships indicate that DG-13 is likely influenced more strongly by precipitation than by groundwater. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-13, Figure 2). The trendline indicates that the average pond water level elevation is remaining relatively consistent over time, although the R^2 value, 0.0014, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.12 Pond DG-15

DG-15 is located in the northern portion of the Douglas County cone of depression, approximately 2,100 feet north of Groundwater Monitoring Well MW 05-26 (Figure 2-1). The surface area and volume of DG-15, as determined during baseline monitoring, were 2.02 acres and 10.02 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-15 was recorded in September (1,110.38 feet) and the lowest surface water elevation was recorded in August (1,109.62 feet). Surface water elevation was recorded at 1,110.29 feet in March and 1,110.17 feet in October (Appendix I – DG-15, Figure 1). All 2016 monthly surface water elevations fell between the minimum and maximum baseline elevations for DG-15 (1,108.27 and 1,111.33 feet) (Appendix I – DG-15, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-15.

In 2016, precipitation levels and water levels of the Platte River did not directly correlate to the observed surface water elevation readings of DG-15. DG-15 also did not have a strong correlation with the recorded groundwater levels at Groundwater Monitoring Well MW 05-26 (Appendix III, Sections A and C). The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-15, Figure 2). The trendline indicates that the average pond water level elevation is relatively consistent over time, although the R^2 value, 0.00006, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.13 Pond DG-17

DG-17 is one of the northernmost monitored ponds in Douglas County (Figure 2-1). The Platte and Elkhorn rivers are 1.5 miles west and 2.6 miles southeast of DG-17, respectively. The surface area and volume of DG-17, as determined during baseline monitoring, were 0.59 acre and 1.74 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-17 was recorded in October (1,110.87 feet) and the lowest surface water elevation was recorded in August (1,109.93 feet). Surface water elevation was recorded at 1,110.44 feet in March and 1,110.48 feet in September (Appendix I – DG-17, Figure 1). All 2016 surface water elevation readings were between the maximum (1,111.57 feet) and minimum (1,108.51 feet) values for baseline surface water elevations (Appendix I – DG-17, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-17.

In 2016, precipitation levels and the water levels of the Elkhorn River did not directly correlate to the observed surface water elevation readings of DG-17. However, Platte River water elevations did correlate with DG-17 water levels. Groundwater Monitoring Well MW 05-26 is located approximately 4,350 feet southwest of DG-17, and groundwater level readings from this well also correlate to surface water elevation readings for DG-17 (Appendix III, Sections A and C). This pond is likely influenced by groundwater connectivity. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-17, Figure 2). The trendline indicates that the average pond water level elevation is relatively consistent over time and the R^2 value, 0.0027, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.14 Pond DG-19

DG-19 is located approximately one mile east of the Platte River and is in close proximity to numerous other monitored ponds (Figure 2-1). The surface area and volume of DG-19, as determined during baseline monitoring, were 2.40 acres and 23.64 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. In 2012, a well was installed adjacent to DG-19 that pumps groundwater into the pond. The highest 2016 surface water elevations at DG-19 were recorded in March and September (1,110.73 feet) and the lowest surface water elevation was recorded in August (1,110.45 feet). Surface water elevation was recorded at 1,110.55 feet in October (Appendix I – DG-19, Figure 1). All 2016 surface water elevation readings fell between the minimum (1,107.78 feet) and maximum (1,112.46 feet) baseline

elevations (Appendix I – DG-19, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-19.

The observed surface water elevations of DG-19 did not correlate with the 2016 precipitation levels or the Platte River stream gauge readings. Atypical from most monitoring years, the observed surface water elevations of DG-19 did not correlated with data from Groundwater Monitoring Well MW 05-26, located approximately 2,200 feet south of DG-19 (Appendix III, Sections A and C), but stayed relatively consistent throughout the 2016 monitoring season. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-19, Figure 2). The trendline indicates that the average pond water level elevation is increasing slightly over time, although the R^2 value, 0.0525, indicates that the trendline is a weak predictor of change in water elevation.

4.4.15 Pond DG-20

DG-20 is located in close proximity to several other monitored ponds and is hydrologically connected to DG-20A during periods of high water (Figure 2-1). The surface area and volume of DG-20, as determined during baseline monitoring, were 1.38 acres and 6.76 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. In 2016, DG-20 and DG-20A were hydrologically connected during all monitoring events. The highest 2016 surface water elevation at DG-20 was recorded in March (1,110.10 feet) and the lowest surface water elevation reading was recorded in August (1,109.30 feet). Surface water elevation was recorded at 1,110.02 feet in September and 1,109.93 feet in October (Appendix I – DG-20, Figure 1). All 2016 surface water elevation readings fell between the minimum (1,108.09 feet) and maximum (1,110.87 feet) baseline elevations (Appendix I – DG-20, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-20.

There was not a direct relationship between precipitation levels and the surface water elevation readings of DG-20 in 2016. However, data for Groundwater Monitoring Well MW 05-26, located approximately 1,300 feet south of DG-20, did correspond with the 2016 readings (Appendix III, Sections A and C). These relationships indicate that DG-20 is likely influenced by localized groundwater. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-20, Figure 2). Seasonal fluctuations in pond level were different from seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is decreasing slightly over time, although the R^2 value, 0.0109, indicates that the trendline is a weak predictor of change in water elevation. This general trend could be related to the

low water levels during the droughts of 2012 and 2013. Trendlines will be recalculated each year in order to capture annual variation.

4.4.16 Pond DG-20A

DG-20A is located in close proximity to several other monitored ponds and is hydrologically connected to DG-20 during periods of high water (Figure 2-1). The surface area and volume of DG-20A, as determined during baseline monitoring, were 0.57 acre and 1.82 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. In 2016, DG-20A was hydrologically connected to DG-20 during all monitoring events. The highest 2016 surface water elevation at DG-20A was recorded in September (1,109.98 feet) and the lowest surface water elevation was recorded in August (1,109.31 feet). Surface water elevation was recorded at 1,109.93 feet in March and 1,109.75 feet in October (Appendix I – DG-20A, Figure 1). All of the 2016 recorded elevations for DG-20A fell between the minimum (1,108.27 feet) and maximum (1,110.73 feet) baseline surface water elevations (Appendix I – DG-20A, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-20A.

There was not a direct relationship between precipitation levels and the surface water elevation readings of DG-20A in 2016. As in previous years, however, the surface water elevation readings of DG-20A correlated to the groundwater level readings of Groundwater Monitoring Well MW 05-26, which is located approximately 1,600 feet south of DG-20A (Appendix III, Sections A and C). DG-20A is likely influenced by localized groundwater. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-20A, Figure 2). The trendline indicates that the average pond water level elevation is remaining fairly consistent over time, although the R^2 value, 0.0001, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.17 Pond DG-20B

DG-20B is located adjacent to DG-20A and DG-20C (Figure 2-1). The surface area and volume of DG-20B, as determined during baseline monitoring, were 0.08 acre and 0.23 acre-foot, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. DG-20A and DG-20B were hydrologically connected during the entire 2016 monitoring season. The highest 2016 surface water elevation at DG-20B was recorded in March (1,109.97 feet) and the lowest surface water elevation was recorded in August (1,109.28 feet). Surface water

elevation was recorded at 1,109.94 feet in September and 1,109.80 feet in October (Appendix I – DG-20B, Figure 1). All 2016 surface water elevation readings were between the minimum (1,108.19 feet) and maximum (1,110.73 feet) baseline surface water elevations for DG-20B. The difference between the 2016 operational surface water elevation reading and baseline elevation is not statistically significant for DG-20B.

Precipitation levels did not correlate to the surface water elevation readings of DG-20B. However, groundwater level data from Groundwater Monitoring Well MW 05-26, located approximately 1,750 feet south of DG-20B, did correlate to the surface water elevation readings of DG-20B (Appendix III, Sections A and C). Similar to the other nearby ponds, DG-20B may be reliant on localized groundwater. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-20B, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-20B was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is relatively consistent over time, although the R^2 value, 0.0018, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.18 Pond DG-20C

DG-20C is located adjacent to DG-20A, DG-20B, and DG-20D (Figure 2-1). The surface area and volume of DG-20C, as determined during baseline monitoring, were 0.04 acre and 0.08 acre-foot, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. DG-20C was connected to DG-20A during the entire 2016 monitoring period. The highest 2016 surface water elevation at DG-20C was recorded in March (1,110.00 feet) and the lowest surface water elevation was recorded in August (1,109.31 feet). Surface water elevation was recorded at 1,109.97 feet in September and 1,109.77 feet in October (Appendix I – DG-20C, Figure 1). All 2016 readings were between the minimum (1,108.17 feet) and maximum (1,110.73 feet) baseline surface water elevations (Appendix I – DG-20C, Figure 1). The difference between the 2016 operational surface water elevation reading and baseline elevation is not statistically significant for DG-20C.

Precipitation levels did not directly correlate to the surface water elevation readings of DG-20C. However, data from Groundwater Monitoring Well MW 05-26, located approximately 1,700 feet south of DG-20C, did correlate to the surface water elevation readings of DG-20C (Appendix III, Sections A and C). DG-20C may be reliant on localized groundwater. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring

(Appendix I – DG-20C, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-20C different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is relatively consistent over time, although the R^2 value, 0.00002, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.19 Pond DG-20D

DG-20D is located in the northwest portion of the Douglas County cone of depression near DG-20A, DG-20B, and DG-20C. The surface area and volume of DG-20D, as determined during baseline monitoring, were 0.02 acre and 0.05 acre-foot, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. DG-20D was connected to DG-20A and DG-20E during the entire 2016 monitoring period (Figure 2-1). The highest 2016 surface water elevation at DG-20D was recorded in March (1,110.06 feet) and the lowest surface water elevation was recorded in August (1,109.61 feet). Surface water elevation was recorded at 1,109.92 feet in September and 1,109.86 feet in October (Appendix I – DG-20D, Figure 1). All 2016 readings were between the minimum (1,107.96 feet) and maximum (1,110.73 feet) baseline surface water elevations (Appendix I – DG-20D, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-20D.

Precipitation levels did not directly correlate to the surface water elevation readings of DG-20D. Groundwater Monitoring Well MW 05-26 is the closest groundwater well to DG-20D, located approximately 1,675 feet to the south. The 2016 groundwater readings from MW 05-26 did correlate to the surface water elevation readings of DG-20D (Appendix III, Sections A and C). DG-20D may be reliant on localized groundwater. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-20D, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-20D was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is relatively consistent over time, although the R^2 value, 0.00001, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.20 Pond DG-20E

DG-20E is located in the northwest portion of the Douglas County cone of depression near DG-20A, DG-20B, DG-20C, and DG-20D. During periods of high water, DG-20E is hydrologically connected to DG-20A. The surface area and volume of DG-20E, as determined during baseline monitoring, were 0.05 acre

and 0.11 acre-foot, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. DG-20E was hydrologically connected to DG-20A during the entire 2016 monitoring period (Figure 2-1). The highest 2016 surface water elevation at DG-20E was recorded in March (1,109.98 feet) and the lowest surface water elevation was recorded in August (1,109.64 feet). Surface water elevation was recorded at 1,109.89 feet in September and October (Appendix I – DG-20E, Figure 1). All pond water elevations during 2016 were between the minimum and maximum baseline surface water elevations (1,108.07 and 1,110.73 feet) (Appendix I – DG-20E, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-20E.

The 2016 water level elevation trend at DG-20E did not directly correspond to the 2016 precipitation levels for the area. However, groundwater fluctuation readings from Groundwater Monitoring Well MW 05-26, located approximately 1,575 feet south of DG-20E, did correlate to the surface water elevation readings of DG-20E (Appendix III, Sections A and C). Similar to the other nearby ponds, DG-20E may be reliant on localized groundwater. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-20E, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-20E was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is relatively consistent over time, although the R^2 value, 0.0001, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.21 Pond DG-20F

Although DG-20F is located near ponds DG-19 through DG-23A, this incised pond is relatively isolated within the area (Figure 2-1). The surface area and volume of DG-20F, as determined during baseline monitoring, were 0.07 acre and 0.20 acre-foot, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation for DG-20F was recorded in September (1,110.09 feet) and the lowest surface water elevation was recorded in August (1,109.35 feet). Surface water elevation was recorded at 1,109.92 feet in March and 1,109.76 feet in October (Appendix I – DG-20F, Figure 1). All 2016 readings for DG-20F were between the minimum (1,107.07 feet) and maximum (1,110.64 feet) baseline surface water elevations (Appendix I – DG-20F, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-20F.

The 2016 precipitation levels did not correlate to the surface water elevation readings of DG-20F. The trend shown by the groundwater level data from Groundwater Monitoring Well MW 05-26, located approximately 1,500 feet south of DG-20F, also does not correspond with the surface water elevation data (Appendix III, Sections A and C). The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-20F, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-20F was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is relatively consistent over time, although the R^2 value, 0.0005, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.22 Pond DG-20G

DG-20G is located in close proximity to DG-20 and DG-20A, and Groundwater Monitoring Well MW 05-26 is located approximately 1,575 feet to the south (Figure 2-1). The surface area and volume of DG-20G, as determined during baseline monitoring, were 0.04 acre and 0.09 acre-foot, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-20G was recorded in August (1,113.22 feet) and the lowest surface water elevation was recorded in March (1,112.58 feet). Surface water elevation was recorded at 1,113.17 feet in September and 1,113.13 feet in October (Appendix I – DG-20G, Figure 1). All 2016 elevation readings were above the maximum (1,110.78 feet) baseline surface water elevations (Appendix I – DG-20G, Figure 1). The difference between the 2016 operational surface water elevation reading and 2005 baseline elevation is statistically significant ($P = 0.008$), whereas, the difference between the 2016 operational surface water elevation reading and 2006 and 2007 baseline elevations were not statistically significant DG-20G. It is important to note that DG-20G is statistically higher in water level elevation compared to the 2005 baseline data.

Precipitation levels in 2016 did not correlate with the surface water elevation readings of DG-20G. The trend shown by the groundwater level data for Groundwater Monitoring Well MW 05-26 also does not correspond with the 2016 DG-20G surface water elevation data (Appendix III, Sections A and C). The DG-20G surface water elevations were recorded to be relatively constant throughout the 2016 monitoring season. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-20G, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-20G was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level is slightly increasing over

time, although the R^2 value, 0.0333, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.23 Pond DG-21

DG-21 is a relatively large pond in close proximity to numerous other ponds monitored within the Project area. The surface area and volume of DG-21, as determined during baseline monitoring, were 4.40 acres and 44.35 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. DG-21 is hydrologically connected to DG-23, except during extremely low water events; DG-21 and DG-23 were hydrologically connected during the entire 2016 monitoring period (Figure 2-1). Groundwater Monitoring Well MW 05-26 is located approximately 750 feet south of DG-21. The highest 2016 surface water elevation at DG-21 was recorded in March (1,109.24 feet) and the lowest surface water elevation was recorded in September (1,108.77 feet). Surface water elevation was recorded at 1,108.89 feet in August and 1,109.16 feet in October (Appendix I – DG-21, Figure 1). All 2016 monthly elevation readings were between the minimum (1,107.33 feet) and the maximum (1,110.21 feet) baseline surface water elevations for DG-21 (Appendix I – DG-21, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-21.

Precipitation levels in 2016 did not correlate with the surface water elevation readings of DG-21. The trend shown by the groundwater level data for Groundwater Monitoring Well MW 05-26 did correlate with the surface water elevation data for DG-21 (Appendix III, Sections A and C). The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-21, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-21 was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is relatively consistent over time and the R^2 value, 0.0013, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.24 Pond DG-22

DG-22 is located adjacent to DG-23 with a ten-foot-wide levee separating the two ponds (Figure 2-1). The surface area and volume of DG-22, as determined during baseline monitoring, were 0.66 acre and 2.30 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-22 was recorded in September (1,109.34 feet) and the lowest surface water elevations was recorded in August (1,108.67 feet). Surface water elevation were recorded at 1,109.23 feet in March and 1,109.28

feet in October (Appendix I – DG-22, Figure 1). All elevation readings were between the minimum (1,107.53 feet) and maximum (1,110.78 feet) baseline surface water elevation for DG-22 (Appendix I – DG-22, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-22.

Groundwater Monitoring Well MW 05-26 is located approximately 1,100 feet south of DG-22. The 2016 trend shown by the groundwater level data for MW 05-26 correlates to the surface water elevation data for DG-22 (Appendix III, Sections A and C) indicating that DG-22 is likely influenced by localized groundwater. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-22, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-22 was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is remaining relatively consistent over time, although the R^2 value, 0.00002, indicates that the trendline is a weak predictor of change in water elevation. This general trend could be related to the low water levels during the droughts of 2012 and 2013. Trendlines will be recalculated each year in order to capture annual variation.

4.4.25 Pond DG-23

DG-23 is hydrologically connected to DG-21 except during extremely low water events and is separated from DG-22 by a narrow berm or levee (Figure 2-1). The surface area and volume of DG-23, as determined during baseline monitoring, were 4.34 acres and 79.32 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. DG-23 and DG-21 were hydrologically connected during the entire 2016 monitoring season. Groundwater Monitoring Well MW 05-26 is located approximately 500 feet southeast of DG-23. The highest 2016 surface water elevation at DG-23 was recorded in March (1,109.40 feet) and the lowest surface water elevation was recorded in August (1,108.62 feet). Surface water elevation were recorded at 1,109.28 feet in September and 1,109.31 feet in October (Appendix I – DG-23, Figure 1). All readings were within the range of the minimum (1,107.33 feet) and maximum (1,110.53 feet) baseline surface water elevations for DG-23 (Appendix I – DG-23, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-23.

Precipitation levels in 2016 did not directly correlate to the surface water elevation readings of DG-23. However, the trend shown by the groundwater level data for nearby Groundwater Monitoring Well MW 05-26 corresponds with the DG-23 surface water elevation data (Appendix III, Sections A and C). These relationships indicate that DG-23 may be influenced by localized groundwater. The general trend

for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-23, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-23 was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is remaining fairly consistent over time, although the R^2 value, 0.0007, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.26 Pond DG-23A

DG-23A is located southeast of DG-21, DG-22, and DG-23 (Figure 2-1). Groundwater Monitoring Well MW 05-26 is located approximately 100 feet southeast of DG-23A. The surface area and volume of DG-23A, as determined during baseline monitoring, were 0.90 acre and 2.40 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-23A was recorded in March (1,109.02 feet) and the lowest surface water elevation was recorded in August (1,108.20 feet). Surface water elevation was recorded at 1,108.98 feet in August and 1,108.93 feet in October (Appendix I – DG-23A, Figure 1). All 2016 monthly elevation levels fell between the minimum (1,107.09 feet) and maximum (1,109.62 feet) baseline surface water elevation (Appendix I – DG-23A, Figure 1). Differences between the operational surface water elevation readings and baseline elevations were not statistically significant for DG-23A.

The pond level fluctuations of DG-23A did not correlate with 2016 precipitation levels. The trend shown by the groundwater level data from nearby Groundwater Monitoring Well MW 05-26 does, however, correspond with the DG-23A surface water elevation data (Appendix III, Sections A and C). DG-23A may be influenced by localized groundwater. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-23A, Figure 2). The 2016 seasonal fluctuations were different from the seasonal fluctuations measured in baseline monitoring. The trendline indicates that the average pond water level elevation is remaining fairly consistent over time, although the R^2 value, 0.006, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.27 Pond DG-26

DG-26 is located in the Two Rivers State Recreation Area, approximately 900 feet east of the Platte River (Figure 2-1). No Project groundwater monitoring wells are located within 0.5 mile of DG-26. The surface area and volume of DG-26, as determined during baseline monitoring, were 0.99 acre and 5.73 acre-feet,

respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-26 was recorded in March (1,111.75 feet) and the lowest surface water elevation was recorded in August (1,110.84 feet). Surface water elevation was recorded at 1,111.66 feet in September and 1,111.70 feet in October (Appendix I – DG-26, Figure 1). Each 2016 reading was between the minimum (1,111.38 feet) and maximum (1,111.96 feet) baseline surface water elevation except August, which fell below the minimum surface water elevation (Appendix I – DG-26, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-26.

In 2016, the observed surface water elevations at DG-26 did not correspond with precipitation (Appendix III, Section C). Pond levels did, however, correlate with the Platte River water levels. Given its proximity to the Platte River and the silty substrate of DG-26, it is likely that this pond is influenced by local seasonal runoff, the Platte River, and localized groundwater levels. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-26, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-26 different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is slightly increasing over time, although the R^2 value, 0.0232, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.28 Pond DG-27

DG-27 is located in the Two Rivers State Recreation Area, approximately 500 feet east of the Platte River (Figure 2-1). No Project groundwater monitoring wells are located within 0.5 mile of DG-27. The surface area and volume of DG-27, as determined during baseline monitoring, were 9.48 acres and 151.67 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-27 was recorded in September (1,111.54 feet) and the lowest surface water elevation was recorded in August (1,110.17 feet). Surface water elevation was recorded at 1,110.82 feet in March and 1,110.73 feet in October (Appendix I – DG-27, Figure 1). Each 2016 monthly reading was between the minimum (1,109.34 feet) and maximum (1,110.87 feet) baseline surface water elevations, except for September which was above the maximum baseline reading (Appendix I – DG-27, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-27.

The 2016 pond level data for DG-27 did not correspond with the 2016 precipitation data. Atypical of DG-27, 2016 water levels also did not collectively correspond with the Platte River levels (Appendix III, Section C). Given the proximity of DG-27 to the Platte River and their typical correlation in surface water elevation, water levels at DG-27 are still likely influenced considerably by the Platte River. A number of influences can cause the observed inconsistencies between Platte River and DG-27 water elevations, including agricultural drawdown from pivot irrigation and high rates of evapotranspiration during summer months. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-27, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-27 was similar to seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is increasing slightly over time, although the R^2 value, 0.048, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.29 Pond DG-28

DG-28 is located in the Two Rivers State Recreational Area, approximately 1,350 feet east of the Platte River (Figure 2-1). No Project groundwater monitoring wells are located within 0.5 mile of DG-28. The surface area and volume of DG-28, as determined during baseline monitoring, were 4.15 acres and 27.18 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-28 was recorded in September (1,108.47 feet) and the lowest surface water elevation was recorded in August (1,107.37 feet). Surface water elevation was recorded at 1,107.61 feet in March and 1,108.00 feet in October (see Appendix I – DG-28, Figure 1). Each 2016 monthly reading was between the maximum (1,108.14 feet) and minimum (1,106.34 feet) baseline surface water elevations except the September reading, exceeding the maximum elevation (Appendix I – DG-28, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-28.

Precipitation levels in 2016 did not correlate to the surface water elevation readings at DG-28. However, the surface water elevation reading at DG-28 roughly correlated to water levels for the Platte River (Appendix III, Section C). Given its proximity to the Platte River, DG-28 is normally strongly influenced by a groundwater connection to the Platte River. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-28, Figure 3). Throughout most of the monitoring period, the DG-28 pond level has not fluctuated significantly. The trendline indicates that the average pond water level elevation is remaining fairly

consistent over time, although the R^2 value, 0.0058, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.30 Pond DG-29

DG-29 is located in the Two Rivers State Recreational Area, approximately 1,850 feet east of the Platte River (Figure 2-1). Groundwater Monitoring Well MW 90-07 is located approximately 2,050 feet southeast of DG-29. The surface area and volume of DG-29, as determined during baseline monitoring, were 7.02 acres and 91.54 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-29 was recorded September (1,108.08 feet) and the lowest surface water elevation was recorded in August (1,107.81 feet). Surface water elevation was recorded at 1,107.96 feet in March and 1,107.92 feet in October (Appendix I – DG-29, Figure 1). Each 2016 surface water elevation reading was between the minimum (1,106.27 feet) and maximum (1,107.93 feet) baseline elevations except the September reading, exceeding the maximum surface water elevation (Appendix I – DG-29, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-29.

The 2016 surface water elevations at DG-29 did not correspond with the precipitation levels. Water elevations did roughly correlate with the Platte River water levels (Appendix III, Section C). The groundwater level trend shown by the data for Groundwater Monitoring Well MW 90-07 corresponded with DG-29 surface water elevation data (Appendix III, Section A). Given the proximity of DG-29 to the Platte River, DG-29 is likely influenced by the Platte River in addition to fluctuations in local groundwater levels. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-29, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-29 was similar to seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is remaining fairly consistent over time, although the R^2 value, 0.0021, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.31 Pond DG-30

DG-30 is located in the Two Rivers State Recreational Area, approximately 1,900 feet east of the Platte River (Figure 2-1). The surface area and volume of DG-30, as determined during baseline monitoring, were 4.83 acres and 37.21 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. DG-30 and DG-31 are

hydrologically connected except during extremely low water events; these ponds were connected during the entire 2016 monitoring period. The highest 2016 surface water elevation at DG-30 was recorded in March (1,107.51 feet) and the lowest surface water elevation was recorded in August (1,106.29 feet). Surface water elevation was recorded at 1,107.29 feet in September and 1,107.41 feet in October (Appendix I – DG-30, Figure 1). All 2016 monthly surface water elevations for DG-30 fell between the baseline minimum (1,105.81 feet) and maximum (1,107.57 feet) (Appendix I – DG-30, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-30.

In 2016, the observed surface water elevations at DG-30 did not closely correspond with precipitation levels. Pond levels did, however, correspond with the Platte River levels and with the groundwater level data from Groundwater Monitoring Well MW 90-07, located approximately 1,175 feet east of DG-30 (Appendix III, Section C; Appendix III, Section A). DG-30 is likely influenced by local fluctuations in groundwater levels and by the Platte River. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-30, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-30 was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is decreasing slightly over time, although the R^2 value, 0.015, indicates that the trendline is a weak predictor of change in water elevation. This general trend could be related to the low water levels during the droughts of 2012 and 2013. Trendlines will be recalculated each year in order to capture annual variation.

4.4.32 Pond DG-31

DG-31 is located in the Two Rivers State Recreational Area, approximately 1,500 feet east of the Platte River (Figure 2-1). The surface area and volume of DG-31, as determined during baseline monitoring, were 8.09 acres and 75.35 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. DG-30 and DG-31 are hydrologically connected except during extreme low water events; these ponds were connected during the entire 2016 monitoring period. The highest 2016 surface water elevation at DG-31 was record in March (1,107.54 feet) and the lowest surface water elevation was recorded in August (1,106.31 feet). Surface water elevation was recorded at 1,107.32 feet in September and 1,107.44 feet in October (Appendix I – DG-31, Figure 1). All 2016 monthly surface water elevations for DG-31 were between the baseline minimum (1,105.83 feet) and maximum (1,107.57 feet) readings (Appendix I – DG-31, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-31.

In 2016, the observed surface water elevations at DG-31 did not correspond with local precipitation data (Appendix III, Section C). Observed surface water elevations at DG-31 did, however, correspond with Platte River levels The groundwater level trend shown by the data for Groundwater Monitoring Well MW 90-07, located approximately 975 feet east of DG-31, also corresponds with DG-31 surface water elevation data in 2016 (Appendix III, Section A). DG-31 is likely influenced by local fluctuations in groundwater levels and by the Platte River. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-31, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-31 was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is decreasing slightly over time, although the R^2 value, 0.016, indicates that the trendline is a weak predictor of change in water elevation. This general trend could be related to the low water levels during the droughts of 2012 and 2013. Trendlines will be recalculated each year in order to capture annual variation.

4.4.33 Pond DG-32

DG-32 is located in Two Rivers State Recreational Area, approximately 3,100 feet east of the Platte River (Figure 2-1). Groundwater Monitoring Wells MW 90-07, MW 94-01, and MW 94-02 are approximately 120 feet west, 1,800 feet east, and 1,100 feet southeast of DG-32, respectively. The surface area and volume of DG-32, as determined during baseline monitoring, were 7.90 acres and 14.82 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-32 was recorded in March (1,106.61 feet) and the lowest surface water elevation was recorded in August (1,105.09 feet). Surface water elevation was recorded at 1,105.99 feet in September and 1,106.06 feet in October (Appendix I – DG-32, Figure 1). All 2016 monthly readings fell between the minimum (1,104.75 feet) and maximum (1,106.98 feet) baseline surface water elevations (Appendix I – DG-32, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-32.

In 2016, the observed surface water elevations at DG-32 did not correlate to precipitation. However, the Platte River levels and the nearby Groundwater Monitoring Well MW 90-07 corresponded with the surface water elevations at DG-32 (Appendix III, Sections A and C). The water level at DG-32 is likely influenced by groundwater connections and by the Platte River. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-32, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-32 different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the

average pond water level elevation is decreasing slightly over time, although the R^2 value, 0.0157, indicates that the trendline is a weak predictor of change in water elevation. This general trend could be related to the low water levels during the droughts of 2012 and 2013. Trendlines will be recalculated each year in order to capture annual variation.

4.4.34 Pond DG-34

DG-34 is located approximately 1.3 miles east of the Platte River, 1,425 feet northeast of Groundwater Monitoring Well MW 94-01, and 1,775 feet southeast of MW 05-26 (Figure 2-1). The surface area and volume of DG-34, as determined during baseline monitoring, were 0.87 acre and 1.99 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. During 2012, DG-34 was dredged. The highest 2016 surface water elevation at DG-34 was recorded in March (1,107.25 feet) and the lowest surface water elevation was recorded in August (1,106.31 feet). Surface water elevation was recorded at 1,107.06 feet in September and 1,107.16 feet in October (Appendix I –DG-34, Figure 1). All 2016 monthly elevation readings were between the minimum (1,105.03 feet) and maximum (1,107.93 feet) baseline surface water elevations (Appendix I – DG-34, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-34.

The 2016 local precipitation levels did not correspond to the DG-34 pond levels (Appendix III, Section C). However, the trend shown by the groundwater level data for Groundwater Monitoring Wells MW 94-01 and MW 05-26 correspond with DG-34 water level elevations (Appendix III, Section A). These relationships indicate that DG-34 is likely influenced by groundwater fluctuations. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-34, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-34 is similar to seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation remains relatively steady over time, although the R^2 value, 0.0016, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.35 Pond DG-43

DG-43 is located approximately 175 feet east of the Platte River (Figure 2-1). No Project groundwater monitoring wells are located within 0.5 mile of DG-43. The surface area and volume of DG-43, as determined during baseline monitoring, were 1.74 acres and 14.78 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water level elevation at DG-43 was recorded in March (1,114.60

feet) and the lowest surface water elevation was recorded in August (1,113.46 feet). Surface water elevation was recorded at 1,114.47 feet in September and 1,114.35 feet in October (Appendix I – DG-43, Figure 1). All 2016 monthly readings were between the minimum (1,109.97 feet) and maximum (1,114.64 feet) baseline surface water elevations (Appendix I – DG-43, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-43.

Precipitation levels in 2016 did not correlate to the observed surface water elevation readings at DG-43. However, surface water elevation readings did correspond with Platte River levels (Appendix III, Section C). The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-43, Figure 2). The surface water elevations at DG-43 remained relatively constant from 2005 through 2016 despite varying levels of precipitation from year to year. The constancy in surface water elevation at DG-43 is likely related to the pond's close proximity to the Platte River. The trendline indicates that the average pond water level elevation is increasing slightly over time, although the R^2 value, 0.0176, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.4.36 Pond DG-45

DG-45 is located approximately 575 feet south of DG-46 and 2,250 feet east of the Platte River (Figure 2-1). DG-45 is hydrologically connected to DG-46 via a small, intermittent stream that flows south from DG-46. No Project groundwater monitoring wells are located within 0.5 mile of DG-45. The surface area and volume of DG-45, as determined during baseline monitoring, were 0.96 acre and 3.38 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. During 2008, DG-45 was dredged. The highest 2016 surface water elevation at DG-45 was recorded in October (1,111.12 feet) and the lowest surface water elevation was recorded in March (1,109.95 feet). Surface water elevation was recorded at 1,110.24 feet in August and 1,110.15 feet in September (Appendix I – DG-45, Figure 1). All 2016 monthly readings were between the minimum (1,109.84 feet) and maximum (1,111.38 feet) baseline surface water elevations (Appendix I – DG-45, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-45.

In contrast to previous years, the observed surface water elevations at DG-45 did not correspond with the Platte River or local precipitation levels (Appendix III, Section C). Given its proximity to the Platte River, as well as the silty and sandy substrate of this pond, it is likely that DG-45 is influenced by seasonal

runoff and localized groundwater levels associated with the Platte River. However, given the nature of the observed 2016 levels, it may have been influenced more by human manipulation via "stoplogs" that control flow between DG-46 and DG-45 (additional discussion below). The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I – DG-45, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-45 was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is decreasing slightly over time, although the R^2 value, 0.1399, indicates that the trendline is a weak predictor of change in water elevation. This general trend could be related to the low water levels during the droughts of 2012 and 2013. Trendlines will be recalculated each year in order to capture annual variation.

Drawing conclusions about the factors that may influence surface water elevation levels at DG-45 and DG-46 is difficult due to the "stoplogs" or removable boards (water control structures) that are located between DG-46 and DG-45. This device controls the movement of water downstream from DG-46 to DG-45 and is managed by several surrounding landowners. Any manipulation of surface elevation at DG-45 and DG-46 in 2016 as a result of this device is not known.

4.4.37 Pond DG-46

DG-46 is located approximately 575 feet north of DG-45 and 1,550 feet east of the Platte River (Figure 2-1). DG-46 is hydrologically connected to DG-45 by the outflow from DG-46 into DG-45 via a small, intermittent stream. No Project groundwater monitoring wells are located within 0.5 mile of DG-46. The surface area and volume of DG-46, as determined during baseline monitoring, were 24.23 acres and 372.10 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-46 was recorded in March (1,114.52 feet) and the lowest surface water elevation was recorded in August (1,113.70 feet). Surface water elevation was recorded at 1,114.26 feet in September and 1,114.04 feet in October (Appendix I – DG-46, Figure 1). All 2016 surface water elevations were between the minimum (1,112.61 feet) and the maximum (1,115.40 feet) baseline surface water elevations (Appendix I – DG-46, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-46.

Precipitation levels in 2016 did not correlate with the surface water elevation readings of DG-46. The 2016 water elevation readings for DG-46 also did not follow a similar pattern to elevation trends for the Platte River (Appendix III, Section C). The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix I

– DG-46, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-46 was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is remaining fairly consistent over time, although the R^2 value, 0.0021, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

Drawing conclusions about the factors that may influence surface water elevation levels at DG-45 and DG-46 is difficult due to the "stoplogs" or removable boards (water control structures) that are located between DG-46 and DG-45. This device controls the movement of water between DG-46 and DG-45 and is managed by several surrounding landowners. Any manipulation of surface elevation at DG-45 and DG-46 in 2016 as a result of this device is not known.

4.4.38 Pond DG-52

DG-52 is located east of the Two Rivers State Recreational Area and within the Douglas County well field. DG-52 is approximately 3,150 feet east of the Platte River (Figure 2-1). The surface area and volume of DG-52, as determined during baseline monitoring, were 8.53 acres and 128.88 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at DG-52 was recorded in March (1,105.82 feet) and the lowest surface water elevation was recorded in August (1,103.46 feet). Surface water elevation was recorded at 1,104.74 feet in September and 1,105.13 feet in October (Appendix I – DG-52, Figure 1). Each 2016 monthly reading was between the minimum and (1,103.48 feet) and maximum (1,106.62 feet) baseline surface water elevations except for the August monthly reading which was below the minimum baseline elevation (Appendix I – DG-52, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for DG-52.

Precipitation levels in 2016 did not correlate with the surface water elevation readings of DG-52. Groundwater Monitoring Wells MW 90-07, MW 94-01, and MW 94-02 are located approximately 775 feet west, 1,350 feet northeast, and 850 feet south of DG-52, respectively. The trends shown by the groundwater level data for MW 94-01, MW 94-02, and MW 90-07 corresponded with DG-52 surface water elevation data in 2016 (Appendix III, Sections A and C). DG-52 is located in the Douglas County well field in close proximity to Project Production Wells (PW 91-3, PW 04-4, PW 04-6, PW 04-7 PW 04-8, and PW 04-9). Groundwater drawdown and subsequent fluctuations in pond water levels are likely influenced by the production well pumping rates (Appendix III, Section B). The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and

operational monitoring (Appendix I – DG-52, Figure 2). The 2016 seasonal fluctuation of water elevations at DG-52 was similar to seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is decreasing slightly over time, although the R^2 value, 0.0652, indicates that the trendline is a weak predictor of change in water elevation. This general trend could be related to the low water levels during the droughts of 2012 and 2013. Trendlines will be recalculated each year in order to capture annual variation.

4.5 2016 Saunders County Bathymetric Monitoring Data

The following sections present the 2016 pond monitoring results for those ponds located in Saunders County.

4.5.1 Pond SN-16

SN-16 is located approximately two miles west of the Platte River and 1.7 miles southwest of the Saunders County well field (Figure 2-2). Groundwater Monitoring Well MW 94-03 is approximately 2,600 feet northeast of SN-16. The surface area and volume of SN-16, as determined during baseline monitoring, were 2.55 acres and 9.79 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at SN-16 was recorded in March (1,080.91 feet) and the lowest surface water elevation was recorded in August (1,080.21 feet). Surface water elevation was recorded at 1,080.67 feet in September and 1,080.73 feet in October (Appendix II – SN-16, Figure 1). All 2016 monthly readings were between the minimum (1,078.08 feet) and maximum (1,081.63 feet) baseline elevation (Appendix II – SN-16, Figure 1). The difference between the 2016 operational surface water elevation reading and the baseline reading was not statistically significant for SN-16.

In 2016, precipitation levels did not correlate to surface water elevation readings at SN-16. The trend shown by the groundwater level data for Groundwater Monitoring Well MW 94-03 generally corresponds with the SN-16 surface water elevation data (Appendix III, Sections A and C). Given this correlation to the local groundwater monitoring well, it is likely that this pond is influenced by groundwater fluctuations. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix II – SN-16, Figure 2). The 2016 seasonal fluctuation of water elevations at SN-16 was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is relatively consistent over time, although the R^2 value, 0.0058, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.5.2 Pond SN-23

SN-23 is located approximately two miles west of the Saunders County well field. It is typically hydrologically connected to SN-24 and is located on the same property as SN-24, SN-25, and SN-26 (Figure 2-2). SN-23 is extremely silty and supports a visible vegetative community of cattails (*Typha latifolia*). No Project groundwater monitoring wells are located within 0.5 mile of SN-23. The surface area and volume of SN-23, as determined during baseline monitoring, were 0.96 acre and 1.51 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at SN-23 was recorded in October (1,088.45 feet) and the lowest surface water elevation was recorded in March (1,088.29 feet). Surface water elevation was recorded at 1,088.41 feet in August and 1,088.38 feet in September (Appendix II – SN-23, Figure 1). The recorded surface water elevation readings at SN-23 were between the minimum (1,085.75 feet) and maximum (1,088.87 feet) baseline surface water elevations (Appendix II – SN-23, Figure 1). No statistically significant differences between the 2016 elevations and baseline elevations were observed.

Because the property owner has manipulated the bathymetric characteristics of this pond throughout baseline and operational monitoring, it is difficult to draw correlations between significant changes in pond elevation and changes in precipitation or groundwater elevation. Precipitation levels in 2016 roughly correlated to the surface water elevation readings of SN-23 (Appendix III, Section C). The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix II – SN-23, Figure 2). Throughout most of the monitoring period, pond level fluctuations remained relatively constant from year to year despite fluctuations in precipitation levels. In general, pond levels appear to be increasing slightly at SN-23. In addition, the trendline indicates that the average pond water level elevation is increasing slightly over time, although the R^2 value, 0.0364, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.5.3 Pond SN-24

SN-24 is located approximately two miles west of the Saunders County well field. Ponds SN-24, SN-25, and SN-26 have been hydrologically connected during past monitoring years due to earthwork completed by the landowner, including during all 2016 monitoring events (Figure 2-2). No Project groundwater monitoring wells are located within 0.5 mile of SN-24. The surface area and volume of SN-24, as determined during baseline monitoring, were 4.50 acres and 21.71 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at SN-24 was recorded in March (1,089.25 feet)

and the lowest surface water elevation was recorded in September (1,088.45 feet). Surface water elevations were recorded at 1,088.55 feet in August and October (Appendix II – SN-24, Figure 1). All 2016 monthly readings were between the minimum (1,086.21 feet) and maximum (1,088.82 feet) baseline surface water elevations except for the March reading, which was above the maximum baseline surface water elevation (Appendix II – SN-24, Figure 1). No statistically significant differences between the 2016 elevations and baseline elevations were observed.

Because the property owner has manipulated the bathymetric characteristics of this pond throughout baseline and operational monitoring, it is difficult to draw correlations between significant changes in pond elevation and changes in precipitation or groundwater elevation. Precipitation levels in 2016 did not correlate to the surface water elevation readings of SN-24 (Appendix III, Section C). The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix II – SN-24, Figure 2). The 2016 seasonal fluctuation of water elevations at SN-24 was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is slightly increasing over time, although the R^2 value, 0.0429, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.5.4 Pond SN-25

SN-25 is located approximately two miles west of the Saunders County well field. The surface area and volume of SN-25, as determined during baseline monitoring, were 2.11 acres and 5.46 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. Ponds SN-26, SN-25 and SN-24 have been hydrologically connected in past monitoring years due to earthwork completed by the landowner, including all 2016 monitoring events (Figure 2-2). No Project groundwater monitoring wells are located within 0.5 mile of SN-25. The highest 2016 surface water level at SN-25 was recorded in March (1,086.24 feet) and the lowest surface water elevation was recorded in August (1,085.71 feet). Surface water elevations were recorded at 1,085.90 feet in September and 1,085.84 feet in October (Appendix II – SN-25, Figure 1). The 2016 surface water elevation readings were between the minimum (1,081.68 feet) and maximum (1,088.41 feet) baseline surface water elevations (Appendix II – SN-25, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for SN-25.

Because SN-25 has undergone numerous alterations since September 2004, trends in surface water elevation are difficult to accurately determine. Precipitation levels in 2016 did not correlate to the surface

water elevation readings of SN-25 (Appendix III, Section C). The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix II – SN-25, Figure 2). Throughout most of the monitoring period, pond level elevations remained relatively constant from year to year, but 2016 recorded levels were lower than elevations recorded in recent years. The 2016 seasonal fluctuation of water elevations at SN-25 was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is increasing slightly over time, despite the drop in observed elevations in 2016. The R^2 value of the trend line, 0.051, indicates that the trendline is a weak predictor of change in water elevation.

4.5.5 Pond SN-26

SN-26 is hydrologically connected to SN-25 due to landowner alterations performed between August and September 2013 and is approximately two miles from the Saunders County well field (Figure 2-2). The surface area and volume of SN-26, as determined during baseline monitoring, were 4.91 acres and 19.53 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation at SN-26 was recorded in March (1,086.34 feet) and the lowest surface water elevation was recorded in August (1,085.72 feet). Surface water elevation was recorded at 1,085.83 feet in September and 1,085.84 feet in October (Appendix II – SN-26, Figure 1). All of the 2016 readings at SN-26 were between the minimum (1,085.14 feet) and maximum (1,088.38 feet) baseline surface water elevations (Appendix II – SN-26, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for SN-26.

Because SN-26 has undergone alterations, trends in surface water elevation are difficult to accurately determine. Precipitation levels in 2016 did not directly correlate with the surface water elevation readings of SN-26 (Appendix III, Section C). The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix II – SN-26, Figure 2). Throughout most of the monitoring period, pond level elevations remained relatively constant from year to year, but 2016 recorded levels were lower than elevations recorded in recent years. The 2016 seasonal fluctuation of water elevations at SN-26 was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is relatively consistent over time, despite the drop in observed elevation in 2016. The R^2 value of the trend line, 0.0025, indicates that the trendline is a weak predictor of change in water elevation.

4.5.6 Pond SN-27

SN-27 is a large, narrow pond located approximately 2.2 miles west of the Saunders County well field (Figure 2-2). The surface area and volume of SN-27, as determined during baseline monitoring, were 13.94 acres and 73.98 acre-feet, respectively. Factors such as siltation, sedimentation, groundwater drawdown, and landowner alterations may have impacted these measurements. The highest 2016 surface water elevation was recorded in August (1,088.20 feet) and the lowest surface water elevation was recorded in March (1,087.93 feet). Surface water elevation was recorded at 1,088.13 feet in September and 1,088.15 feet in October (Appendix II – SN-27, Figure 1). All surface water elevations were between the minimum (1,085.78 feet) and maximum (1,088.83 feet) baseline surface water elevations (Appendix II – SN-27, Figure 1). Differences between the 2016 operational surface water elevation readings and baseline elevations were not statistically significant for SN-27.

Precipitation levels in 2016 did not correlate to the surface water elevation readings of SN-27 (Appendix III, Section C). Based on the overall size of the pond and the lack of a consistent correlation with precipitation, it is likely that SN-27 is influenced by localized groundwater. The general trend for water level elevations, as it relates to precipitation, was graphed over time for the duration of baseline and operational monitoring (Appendix II – SN-27, Figure 2). Throughout most of the monitoring period, pond level elevations remained relatively constant from year to year despite fluctuations in precipitation levels. The 2016 seasonal fluctuation of water elevations at SN-27 was different from the seasonal fluctuations seen in baseline monitoring. The trendline indicates that the average pond water level elevation is remaining fairly constant over time, although the R^2 value, 0.004, indicates that the trendline is a weak predictor of change in water elevation. Trendlines will be recalculated each year in order to capture annual variation.

4.6 Hydrological Monitoring Data

Several different types of hydrological data have been gathered and analyzed as part of the ongoing monitoring efforts. These hydrological data include groundwater monitoring wells, monthly average precipitation, monthly average ambient air temperature, and stream gauge data for the Platte and Elkhorn Rivers. A discussion of this hydrological data is included in the following sections.

4.6.1 Groundwater Monitoring Wells

The groundwater monitoring well data collected for 2016 are presented for each monitoring well in Figures 1 through 22 in Section A of Appendix III. A review of the monitoring well data graphed over time appears to show the water level elevations experiencing normal, seasonal fluctuation. Overall, the monitored wells in Douglas County showed slightly decreasing elevations compared to elevations

recorded in 2015. In Saunders County, the monitoring wells showed higher overall elevations than those recorded in 2015. An exhaustive analysis of the monitoring well data has not been performed at this time. As impacts to ponds are identified and correlated to Project operation, the groundwater monitoring well data will continue to be used to assist in the hydrological evaluation of each pond.

4.6.2 Production Wells

The 2016 pumping rate for each production well in the Douglas and Saunders County well fields is presented in Tables 1 and 2 in Section B of Appendix III.

The Project production wells operated throughout 2016, completing the ninth year of operation. As in past years, pumping on an annual basis was well below regulated capacity. Above normal precipitation in 2016 for the Omaha area, along with minor mechanical issues in the plant, resulted in full-year annual production levels (January through December) 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).

4.6.3 Precipitation and Temperature

The monthly precipitation from January 1 through December 31, 2016 has little correlation with the monthly historical averages (Appendix III, Section C). The January through December 2016 total recorded precipitation was 34.63 inches, while the annual historical average during the same period was 28.44 inches, indicating a normal year (Weather Underground 2016). Historically, the amount of precipitation increases from January to a peak in June, declines to a plateau in late summer, and continues to decline through the end of the year. In 2016, however, precipitation spiked during May.

Average ambient air temperature in 2016 fell within the expected monthly high and low temperature range, based on historical averages (Appendix III, Section C). Average monthly temperatures ranged between 20 °F and 76 °F from January 1 through December 31, 2016.

4.6.4 Stream Gauges

Historically, stream elevations for the Platte River are highest in the spring and lowest in late summer and early fall (Appendix III, Section B). The stream elevations in 2016 followed this trend, but they were generally higher compared to the historic averages (Appendix III, Section C).

Mean stream elevations in the Elkhorn River are historically highest in the spring and early summer and lowest in the late summer and early fall. The stream elevations in 2016 followed this trend, but similar to the Platte River stream elevations, were generally higher compared to historical averages.

5.0 SUMMARY AND RECOMMENDATIONS

The goal of pond monitoring within the Douglas County and Saunders County well fields and associated cones of depression is to evaluate the impact that Project operation may have on pond surface water elevations. To accomplish this goal, a standardized procedure for monitoring the ponds has been developed and implemented. Monitoring data collected between 2005 and the 2008 spring monitoring effort represents the baseline conditions prior to Project operation. Data collected beginning in fall 2008 through the current year are considered post-operational. The 2016 data was evaluated and compared to the ranges and values established by the baseline surface water elevation data.

5.1 Trends in Pond Surface Water Elevations

Three trends in surface water elevation were observed at the 43 ponds quantitatively monitored in the Project area in 2016; DG-11 is only photographically monitored. The grouping of ponds by trend was completed by analyzing the water level elevation graphs included in Appendices A and B.

A total of 11 monitored ponds show a general trend of slightly decreasing pond level elevations throughout baseline and operational monitoring events. No ponds with decreasing elevations were located in Saunders County, and 11 ponds with decreasing elevation were located in Douglas County (DG-02, DG-03, DG-04A, DG-05, DG-09, DG-20, DG-30, DG-31, DG-32, DG-45, and DG-52). Given their proximity to the well fields, these ponds have the potential to be affected by groundwater drawdown resulting from pumping in the nearby well fields. No pond elevations in 2016 were statistically lower than elevations observed during baseline monitoring, however.

Five ponds in Douglas County (DG-19, DG-20G, DG-26, DG-27, and DG-43) and three ponds in Saunders County (SN-23, SN-24, and SN-25) have exhibited a general trend of increasing pond water level elevation. The increase observed in pond DG-20G is statistically different than the 2005 baseline levels (Bonferonni-corrected p-value=.008); all other increases were not statistically significant. The increase in pond level at DG-19 is likely the result of water being added to the pond by an adjacent well. The increase in water elevations at SN-23, SN-25, and SN-26 is likely due to manipulations made by the landowner in previous years coupled with their location at the outer extent of the cone of depression. DG-43 and DG-02A are located in close proximity to the Platte River; therefore, the increase in pond level is likely due to the fluctuations in stream elevations of the Platte River.

The majority of ponds show a general trend of fairly consistent water elevation. Nineteen ponds in Douglas County (DG-01, DG-04, DG-04B, DG-15, DG-17, DG-20A, DG-20B, DG-20C, DG-20D, DG-20E, DG-20F, DG-21, DG-22, DG-23, DG-23A, DG-28, DG-29, DG-34 and DG-46) and three ponds in

Saunders County (SN-16, SN-26, and SN-27) exhibited a general trend of pond levels remaining fairly consistent throughout the baseline and operational years. This trend seems to indicate a return to the pre-drought conditions of 2012 and 2013. Precipitation levels from 2014 to 2016 returned to levels comparable to the historical average, and many pond levels in 2015 and 2016 have largely returned to elevations comparable to elevations observed during baseline monitoring.

As previously stated, DG-01, DG-02A, DG-03, DG-04, DG-04A, DG04B, DG-34, SN-16, SN-24, SN-25, and SN-26 were dredged or otherwise altered during previous monitoring years; no alterations were noted in 2016. These activities altered the volume and surface area of these ponds. Discussions with the District and Corps have not been initiated regarding bathymetric resurveying of these ponds.

5.2 Statistical Analysis

Statistical analyses were completed to determine whether any observed changes in the operational surface water elevation data from 2016 were significantly different from the natural fluctuation observed during baseline monitoring (August 2005 through March 2008). As previously mentioned, DG-11 is only photographically monitored and baseline data for DG-02A is not available because it was not monitored prior to 2010.

One pond (DG-20G) showed a statistically significant difference in water elevations between the 2016 operational data and the baseline data. This pond exhibited significantly higher surface water elevations in 2016 than the recorded baseline surface water elevations. Comparatively, in 2015, three ponds (DG-20B, DG-20C, and DG-20G) showed a higher water elevation that was statistically different in water elevations than baseline data.

5.3 Recommendations

Continued monitoring at all of the ponds, as well as continued evaluation of other hydrological data and pumping data, will assist in determining any impacts to monitored ponds within the cones of depression. It is recommended that pond monitoring efforts in 2017 continue without changes to the methodology at this time. These efforts are scheduled to take place in March, August, September, and October of 2017 at each of the 44 remaining ponds within the Project area. Data collected in 2017 and in future years will continue to be compared to the baseline data in an attempt to determine the effects, if any, of Project operation on local pond levels. All pond elevation data will continue to be provided to each landowner following each monitoring year.

6.0 REFERENCES

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