LEVEL II HYDROGEOLOGIC CHARACTERIZATION REPORT
Potential Wetland Compensation Site 6W, West Freeport Bypass

Stephenson County, Illinois
(Federal Aid Project 301, Sequence Number 10487)

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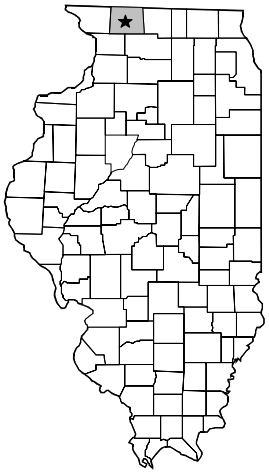

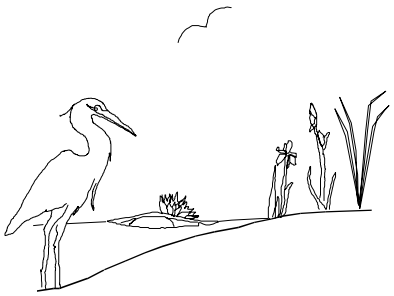

EXECUTIVE SUMMARY

In August 2003, the Illinois Department of Transportation (IDOT) tasked the Wetlands Geology Section of the Illinois State Geological Survey (ISGS) to conduct a hydrogeologic characterization of Site 6W, a potential wetland compensation site for the West Freeport Bypass near the city of Freeport, in Stephenson County, Illinois.

Results of this investigation indicate that 2.3 hectares (ha) [5.7 acres (ac)] of the site currently meets jurisdictional wetland hydrology criteria, while 1.7 ha (4.3 ac) of the site already satisfy the 3-parameter definition of wetlands. The existing wetland areas are located within and adjacent to the shallow drainage ditches at the site.

Portions of the site have been flooded by the Pecatonica River during the growing season in 13 of the last 22 years, but in only 9 of the last 22 years has the duration of flooding lasted for greater than 5% of the growing season. Prior to September 2006, the ditch system at Site 6W allowed for effective drainage of the site, especially for areas higher than 230.7 meters (m) [757.0 feet (ft)]. In April 2006, the ISGS advised IDOT to construct a berm across the western end of the central drainage ditch to restrict drainage of short-duration flood events in order to extend the duration of saturation on site, thereby restoring and creating additional wetland areas at the site.

Based on a flood history analysis of the Pecatonica River, and with the addition in September 2006 of an IDOT-constructed berm with a maximum elevation of 231.0 m (758.0 ft) near the western end of the central drainage ditch, it is expected that the area satisfying wetland hydrology criteria could be increased by approximately 4.4 ha (10.8 ac), or up to 70% of the total site area. A maximum of 3.2 ha (7.9 ac) of wetland may be restored in areas where hydrophytic vegetation and/or hydric soils are already present. Additionally, 1.7 ha (4.3 ac) of wetland may be created in areas underlain by non-hydric soils where no hydrophytic plants are present.

An additional 2.1 ha (5.1 ac) of the site could potentially satisfy wetland hydrology criteria depending on the ability of flooding along with other undocumented water sources (overland flow, capillary fringe, and ground-water discharge) to maintain saturation adjacent to the area discussed above. Approximately 0.8 ha (2.0 ac), or 8% of the site will likely not meet wetland hydrology criteria due to the elevated positions of these portions of the site and/or due to the proximity of these areas to the steep bank of the seasonally-flooded oxbow lake that would cause rapid drainage.

It is doubtful that the berm will interrupt the current drainage network enough to negatively impact the surrounding land parcels.

CONTENTS

EXECUTIVE SUMMARY ii

INTRODUCTION 1

SUMMARY 1

WETLAND CREATION AND SITE DESIGN 5

METHODS 10
- Geology 10
- Hydrology 11
  - Ground-Water Hydrology 11
  - Surface-Water Hydrology 11
- Site Monitoring and Surveying 11

SITE CHARACTERIZATION 12
- Setting 12
- Topography 12
- Regional and Local Drainage Patterns 15
- Geology 15
  - Bedrock Geology 15
  - Unlithified Sediments 15
- Soils 15
- Vegetation 16
- Precipitation 16
- Hydrology 16
  - Pecatonica River Flood History Analysis 16
  - Ground-Water Hydrology 17
  - Wetland Hydrology 17

CONCLUSIONS AND RECOMMENDATIONS 18

ACKNOWLEDGMENTS 19

REFERENCES 19

HISTORICAL AERIAL PHOTOGRAPHS 21

APPENDIX A Geologic Descriptions of Borings 22

APPENDIX B Well Construction Information 28

APPENDIX C Water-Level Elevations and Depths to Water Graphs 29

APPENDIX D Water-Level Elevations and Depths to Water Tables 31

APPENDIX E Precipitation Data 38

APPENDIX F Areas Exhibiting Wetland Hydrology During the Period of Record 40

APPENDIX G Water-Level Elevations During Pecatonica River Flood Events 43

APPENDIX H Flood History Analysis 47

FIGURES

1 Location of Site 6W 2

2 Summary of areas at Site 6W that exhibited wetland hydrology in two out of three growing seasons between 2004 and 2006 3

3 Summary of areas at Site 6W that exhibited wetland hydrology in 2004 4

4 Hydrologic alterations present at Site 6W 6

5 Preliminary assessment of hydric and non-hydric soils at Site 6W 7

6 Preliminary assessment of hydrophytic vegetation at Site 6W 8

7 Potential mitigation areas at Site 6W 9

8 Total monthly precipitation recorded at the Freeport Wastewater Treatment Plant weather station and on site 13

9 Topography at Site 6W 14

INTRODUCTION

This report was prepared by the Illinois State Geological Survey (ISGS) to provide the Illinois Department of Transportation (IDOT) with observations regarding the hydrogeologic conditions at Site 6W, a 9.6-ha (23.6-ac) potential wetland compensation site for the West Freeport Bypass, located northwest of the city of Freeport in Stephenson County, Illinois (W ½, SW 1/4, Section 14, T27N, R7E). The site is bounded by the raised roadbed of U.S. 20 to the south, the Jane Addams Trail to the east, fallow fields to the north and northwest, and a seasonally-flooded oxbow lake to the southwest (Figure 1).

The purpose of this report is to provide IDOT with recommendations regarding the suitability of the site for wetland compensation. Therefore, wetland compensation recommendations are presented first, followed by a discussion of the methods and the supporting data. The supporting data include ground- and surface-water levels and precipitation data (January 2004 through December 2006), observations made during a preliminary site evaluation in Fall 2003 (Weaver et al. 2003), and the geologic data collected during the installation of monitoring wells in December 2003. Soils and vegetation information in this report are based on a preliminary assessment of the site that was carried out by the Illinois Natural History Survey (INHS) in January 2006. This information is presented for hydrogeologic purposes, and further consultation with qualified soil scientists and botanists from the INHS should be considered if a more detailed assessment of these specific parameters is required for this project.

Data collection at the site is ongoing and will continue until terminated by IDOT. The data currently being collected will be used to compare the pre- and post-construction hydrology of the site, to determine the impact of hydrologic alterations on the area, and to measure the duration and extent of wetland hydrology.

SUMMARY

The following factors indicate that the potential for wetland preservation/enhancement, restoration, and creation at this compensation site is **HIGH**:

- Water-level data collected from January 2004 through December 2006 indicated that 2.3 ha (5.7 ac), or 24% of the site, satisfied jurisdictional wetland hydrology criteria for at least 5% of the growing season in 2 out of 3 years (Figure 2). The same acreage also satisfied jurisdictional wetland hydrology criteria for at least 12.5% of the growing season in 2 out of 3 years.

- Flooding from the Pecatonica River provides the single largest hydrologic input to the site. In 2004, following flooding of the site by the Pecatonica River, 9.2 ha (22.8 ac), or 97% of the site, satisfied jurisdictional wetland hydrology criteria for at least 5% of the growing season, and 9.1 ha (22.6 ac), or 96% of the site, satisfied jurisdictional wetland hydrology criteria for at least 12.5% of the growing season (Figure 3).

- Results from a flood-history analysis of the Pecatonica River at Freeport indicate that the river has flooded to an elevation sufficient to cause localized flooding at the site during the growing season in 13 of the last 22 years. Additionally, the analysis showed that the site is sometimes flooded multiple times during the growing season as well as prior to the beginning of the growing season, in some years. However, in only 9 of the last 22 years did flood waters stay above 230.73 m (757.00 ft) (the elevation at which flood waters begin to enter the site) for a duration of at least 5% of the growing season.

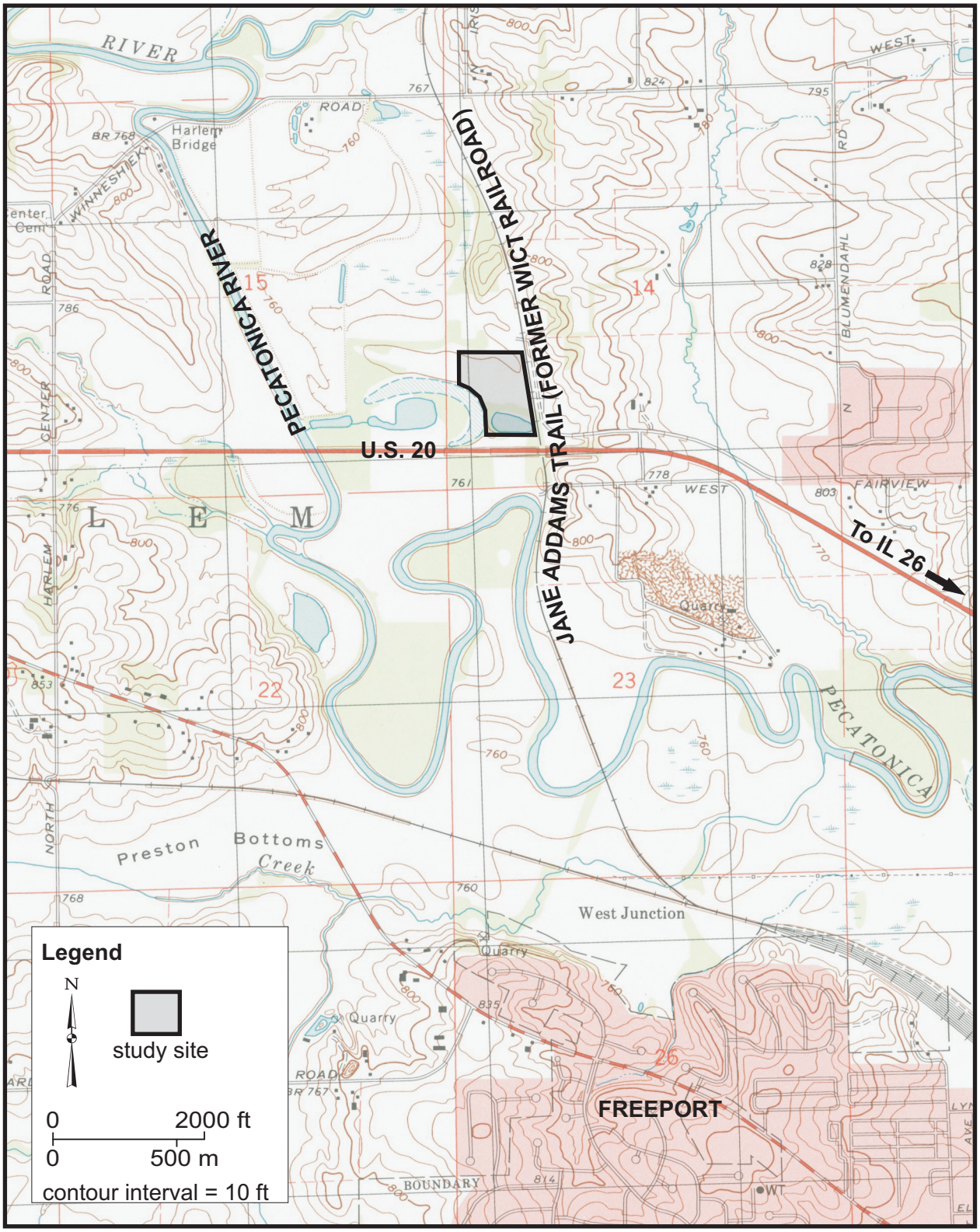

Figure 1 Location of Site 6W, a potential wetland compensation site for the West Freeport Bypass (FAP 301) near the city of Freeport, Stephenson County, Illinois. Figure modified from the Freeport West, IL 7.5-minute U.S. Geological Survey (USGS) Quadrangle (USGS 1998).

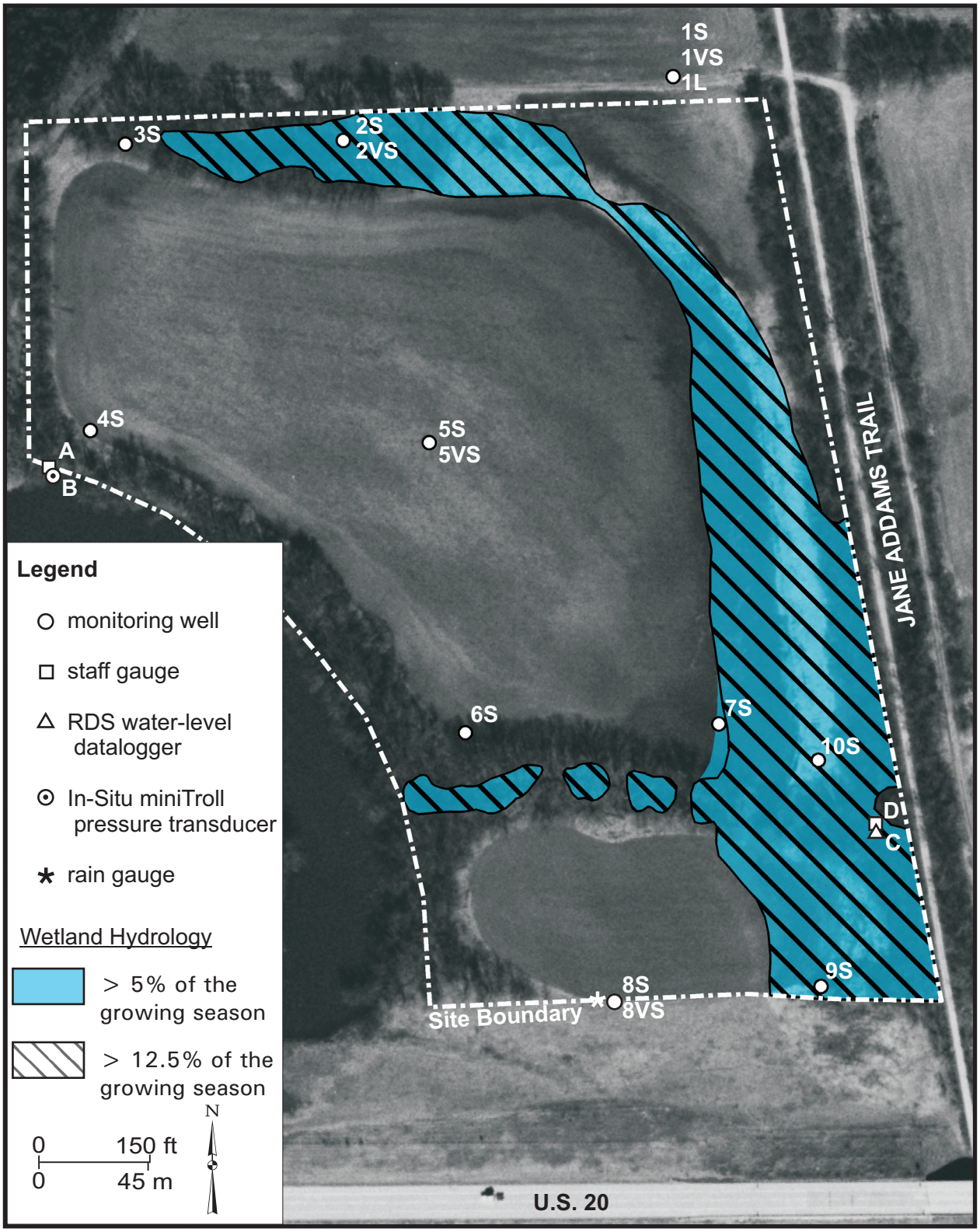

Figure 2 Summary of areas at Site 6W that exhibited wetland hydrology in two out of three growing seasons between 2004 and 2006 (figure based on ISGS 2004, 2005b, and 2006).

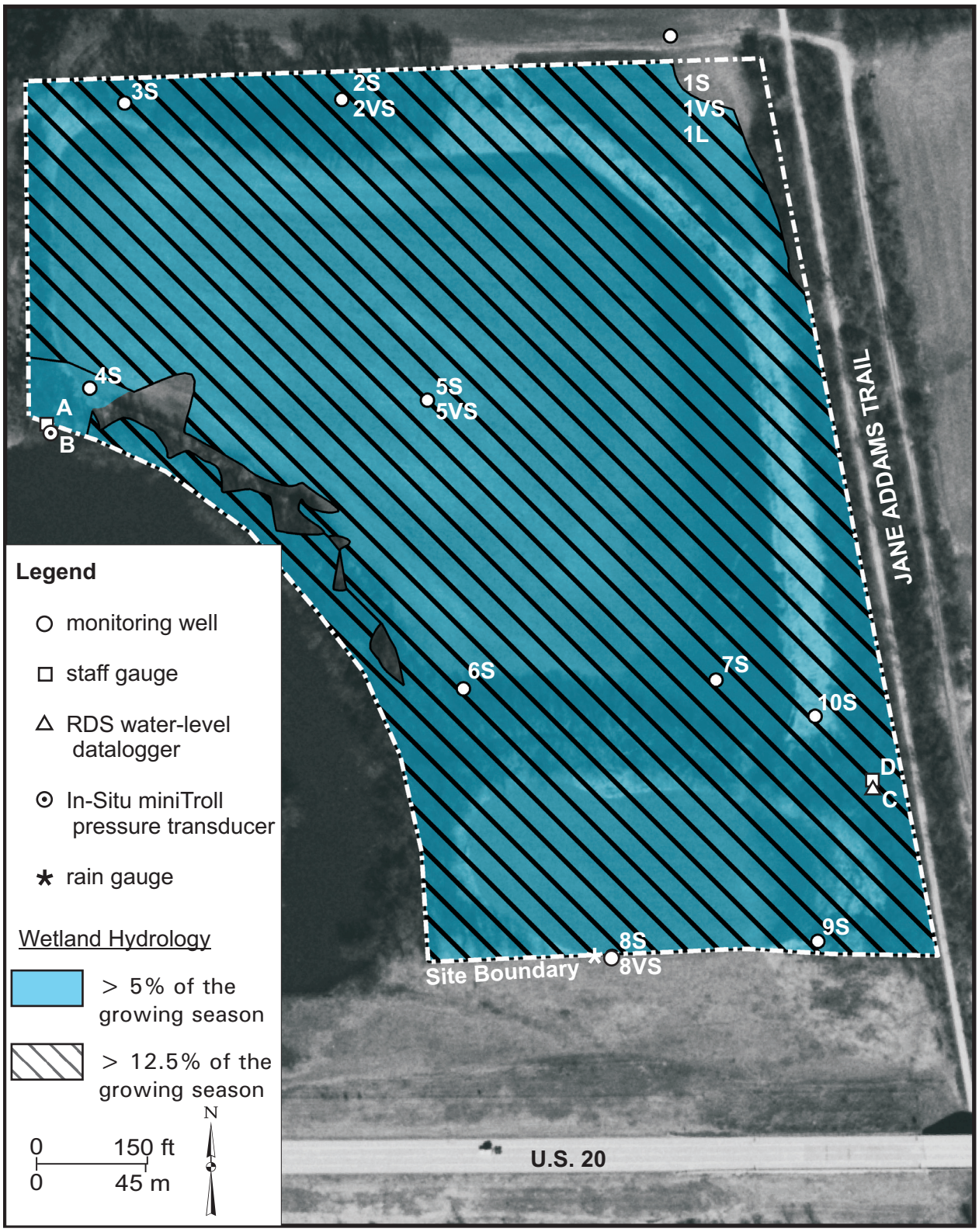

Figure 3 Summary of areas at Site 6W that exhibited wetland hydrology in 2004, following flooding of the site by the Pecatonica River (figure based on ISGS 2004, 2005b).

- Hydrologic alterations at the site include drainage ditches along the northwestern, northern, and eastern site boundaries, in addition to one bisecting the center of the site from east to west (Figure 4). The northern and eastern ditches direct surface-water off the site by channeling it into the central ditch where it then flows westward into the oxbow lake. However, during flood events, the central ditch is the primary pathway by which flood water enters the site as the oxbow lake floods. In addition to the drainage ditches, a culvert is located near the southeastern corner of the site (Figure 4). During heavy rainfall events, the culvert diverts runoff onto the site from the uplands to the east.

- Water sources other than flooding from the Pecatonica River also provide hydrologic inputs to the site. During large precipitation events, overland flow from uplands to the north and east may be significant, causing water to enter the site along the northern drainage ditch and through the culvert in the southeast corner of the site, as noted above. Direct precipitation and ground-water discharge may also help support wetland hydrology in the lower portions of the site.

- Based on a preliminary assessment of soils at the site by the INHS, hydric soil (Otter silt loam) is mapped over approximately 50% of the site (Figure 5) (D. Keene pers. comm. 2006). Additionally, mapping at the site by the INHS indicated that the vegetation along field margins and within the broad, shallow ditches at the site is dominated by hydrophytic plant communities (Figure 6) (A. Plocher pers. comm. 2006).

- Based on the preliminary assessment of hydric soils and hydrophytic vegetation by the INHS, and on water-level data collected by the ISGS during the growing seasons in 2004, 2005, and 2006, 1.7 ha (4.3 ac) of the site currently satisfies all three criteria for jurisdictional wetland (Figure 7).

WETLAND CREATION AND SITE DESIGN

There is **HIGH** potential for wetland mitigation at Site 6W of the West Freeport Bypass project (Figure 7). Preservation and/or enhancement is possible for 1.7 ha (4.3 ac) that currently satisfy the 3-parameter definition of wetlands. A flood-history analysis of the Pecatonica River suggests that an additional 4.4 ha (10.8 ac) of the site may meet wetland hydrology criteria in 12 of 22 years with the addition of a berm that would help retain water on the site. This berm was installed by IDOT in September 2006. At the site, approximately 1.7 ha (4.3 ac) of wetland will be created where no hydric soils are mapped, and 3.2 ha (7.9 ac) of wetland will be restored in those areas where hydric soils exist. An additional 2.1 ha (5.1 ac) of the site has the potential for wetland creation, but will depend on the hydrologic effects of the berm and the ability of documented and undocumented water sources to maintain saturation. Approximately 0.8 ha (2.0 ac) of the site, including areas located immediately adjacent to the oxbow lake in the north field, and in the extreme northeastern corner of the site, are topographically the highest portions of the site and are unlikely to meet wetland hydrology criteria after mitigation activities.

In order to maximize the amount of wetland mitigation to be earned at Site 6W, the following design elements have been implemented by IDOT:

- As recommended by the ISGS on April 24, 2006 (Plankell 2006), hydrologic alterations at the site have been reversed in order to increase the extent and duration of wetland hydrology at the site. Specifically, drainage of water from the eastern half of the site

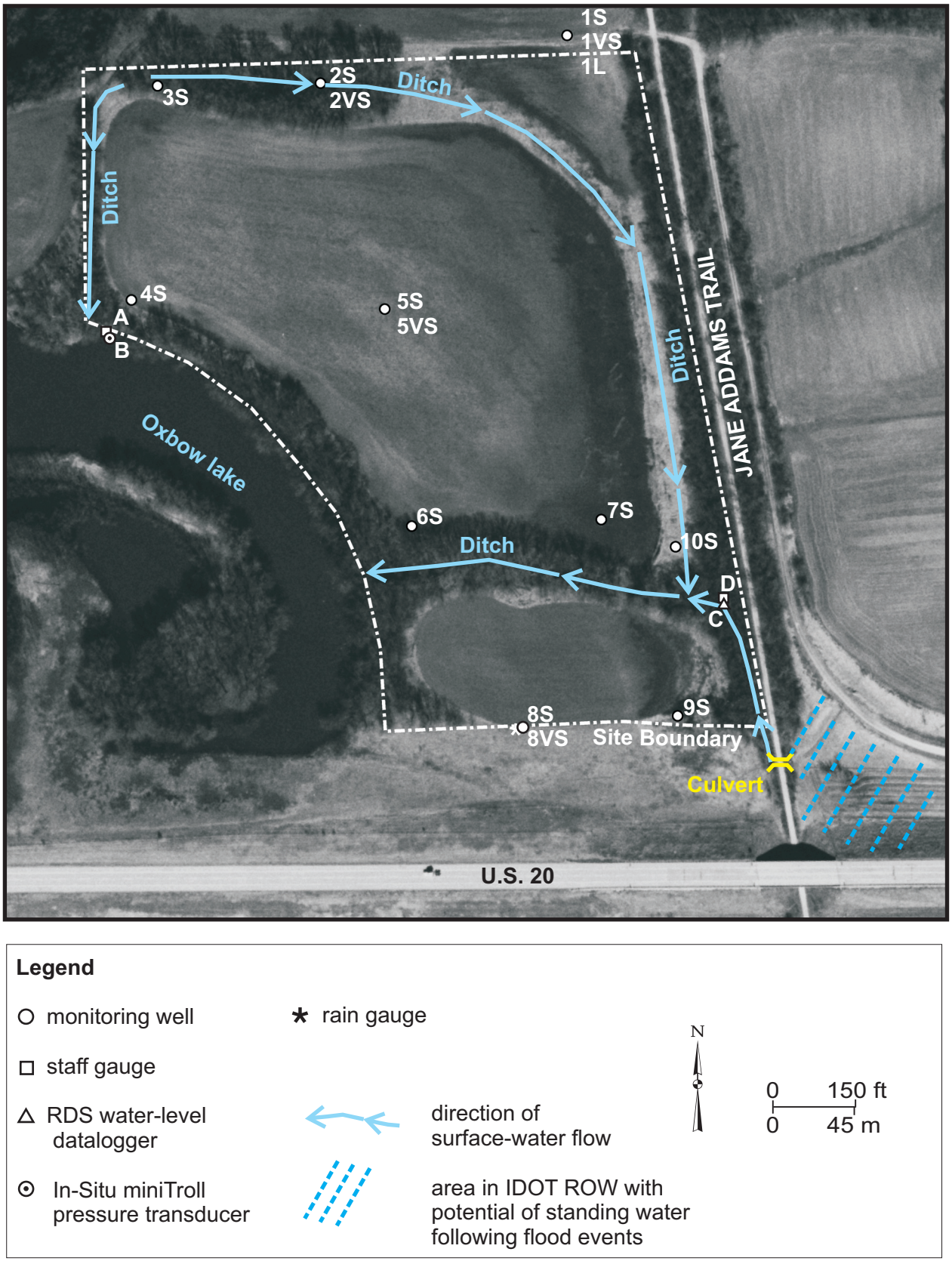

Figure 4 Hydrologic alterations present at Site 6W (figure drawn on ISGS 2005b).

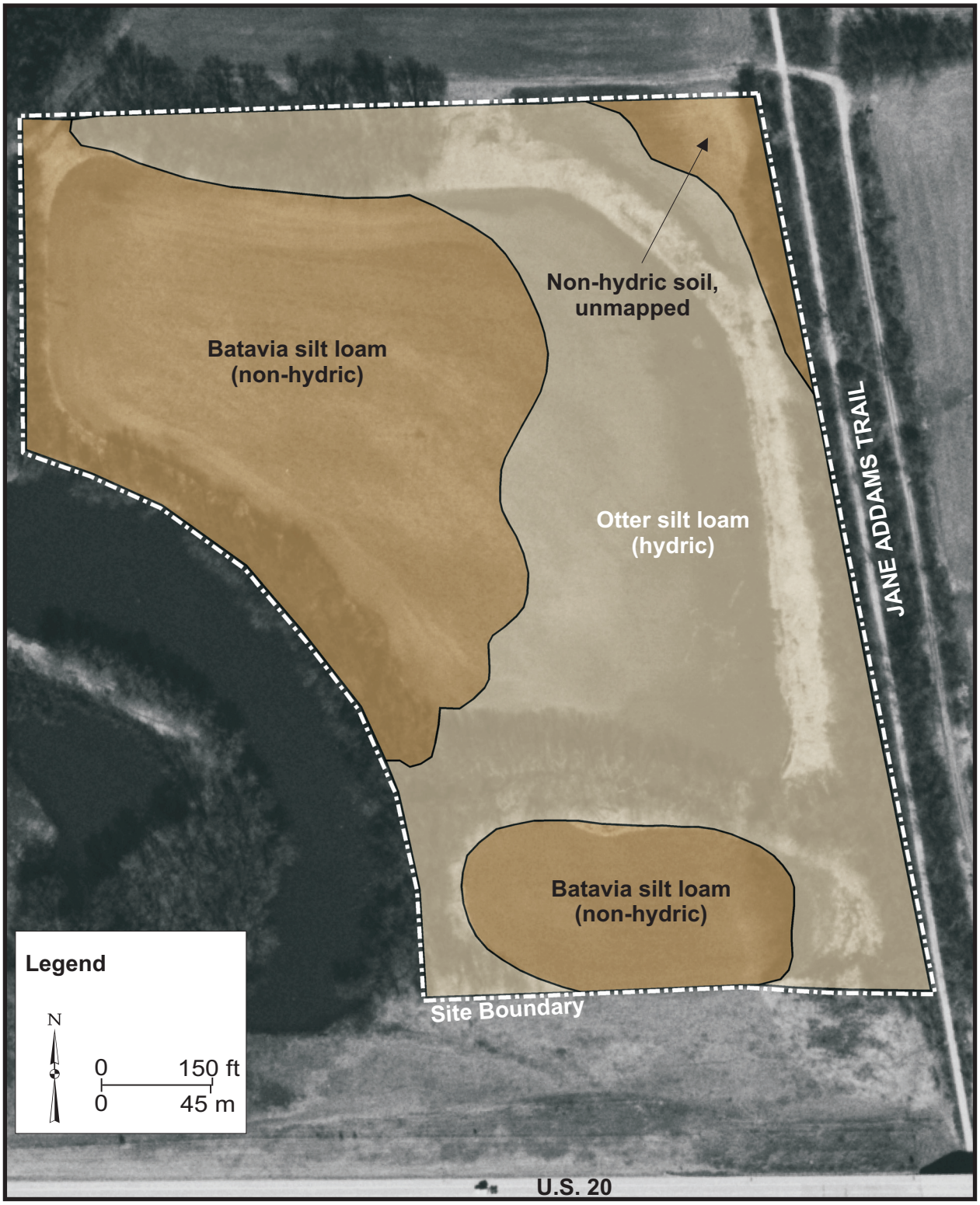

Figure 5 Preliminary assessment of hydric and non-hydric soils at Site 6W (figure based on D. Keene, pers. comm. 2006, figure drawn on ISGS 2005b).

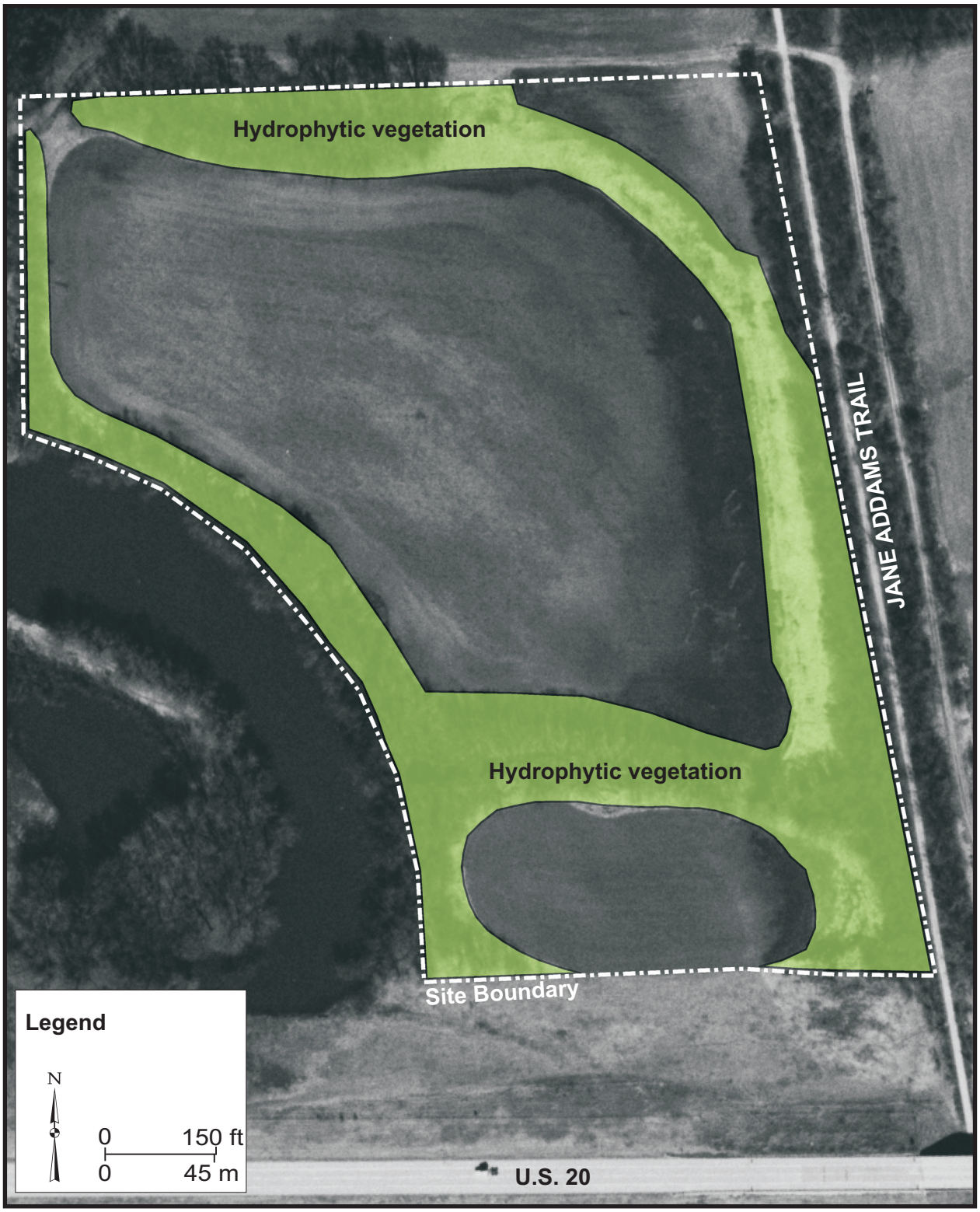

Figure 6 Preliminary assessment of hydrophytic vegetation at Site 6W (figure based on A. Plocher pers. comm. 2006, figure drawn on ISGS 2005b).

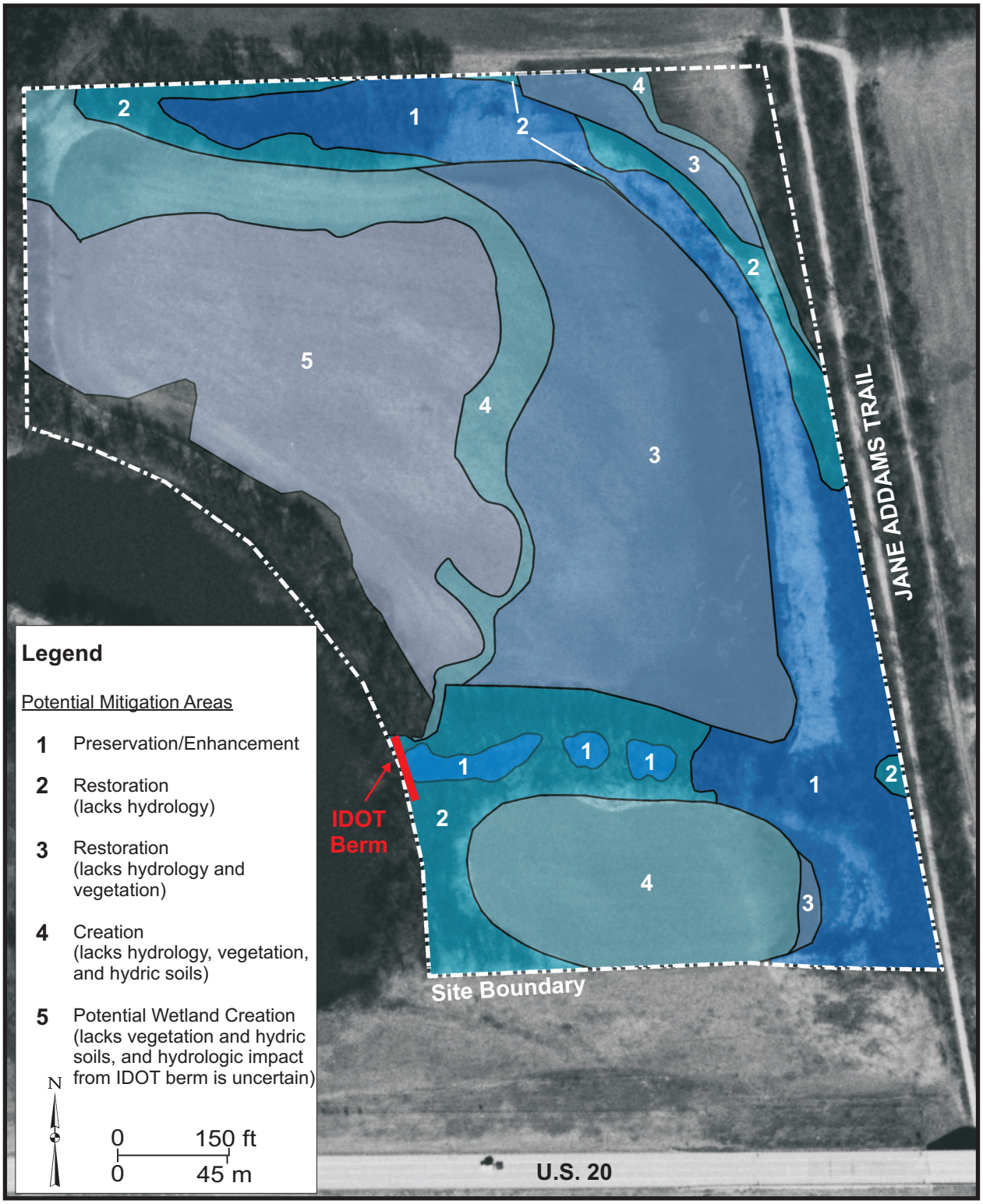

Figure 7 Potential mitigation areas at Site 6W (figure drawn on ISGS 2005b).

has been restricted by construction of a berm with a maximum elevation of 231.0 m (758.0 ft) near the western end of the central drainage ditch (Figure 7). This berm should allow flood water from the Pecatonica River and overland flow from the adjacent uplands to back up over approximately 3.4 ha (8.3 ac) of the site, thereby potentially restoring or creating wetland hydrology over much of the site (as described above and as shown in Figure 7), while reducing drainage of the current wetland areas. Water should still be able to backflood onto the site from the northwest and southwest corners of the site, as well as over the berm itself, yet the berm will retain water on site after flood waters have receded, thereby increasing the area of wetland hydrology over the eastern half of the site. With a sufficiently low profile as constructed, this alteration should not significantly reduce the frequency of flooding on site.

- The addition of the berm at the west end of the central drainage ditch will increase the duration that portions of the site will remain inundated or saturated. The length of time it will take for this standing water to completely recede from the site is unknown, but it is expected that the low-lying areas of the site, particularly in and around the drainage ditches, may be under standing water for periods of several weeks or months, depending on the time of year the flooding occurs. Vegetation planted in the lower regions of the site should therefore include species that are able to tolerate prolonged inundation.

- Any compensation site design that interrupts the current drainage network must provide a continued means of drainage for adjacent agricultural areas immediately north, east, and west of the site. The constructed berm should not have any adverse offsite impacts, with the exception that water may back up at the culvert near the southeast corner of the site. This may cause water to temporarily stand in the strip of land between the access road to the site and U.S. 20, which may already be IDOT right-of-way (Figure 4).

METHODS

The base map utilized throughout the preparation of this report is based upon the figure entitled Wetland Mitigation Concept that was included with IDOT's Conceptual Wetland Compensation Plan, dated March 2005 (IDOT 2005). The site boundary and calculated site area for this base map differ from those used for the 2004 and 2005 versions of the ISGS Annual Report to IDOT, which were based upon a boundary line that had been drawn on a previous IDOT aerial photograph. Total site area reported in the 2004 and 2005 versions of the Annual Report was 10.9 ha (27.0 ac), while the total site area calculated for the purpose of this report is 9.6 ha (23.6 ac). Wetland hydrology acreages for 2004 and 2005 were recalculated using the new base map for this report. As a result, the numbers presented in this report are lower than those reported in previous annual reports. However, the percentages of the total site area that these polygons represent are identical to the percentages calculated for the annual reports.

Geology

Surface sediments were described from hand-augered borings made during the installation of the ten monitoring well stations, with borings ranging in depth from 0.74 to 2.84 m (2.4 to 9.3 ft). Materials were described in the field, noting such properties as Munsell color, texture, sedimentary structures, redoximorphic features, and saturation (Weaver et al. 2003). Sediment descriptions are provided in Appendix A.

Hydrology

Surface-water and shallow ground-water levels have been monitored on site by ISGS since January 2004.

Ground-Water Hydrology

A total of 14 monitoring wells were installed at ten locations throughout the compensation site to monitor near-surface ground-water levels (Figure 2). Water-level data from these wells were used to map the extent of wetland hydrology, to identify water sources, and to help design the wetland mitigation plans.

The deepest well on site (Well 1L) was installed near the northeast corner of the site to a depth of 2.84 m (9.3 ft) below land surface. This well has a screen length of 1.39 m (4.5 ft), and was installed to determine if a vertical hydraulic gradient is present at that location, thus indicating the potential for ground-water discharge.

Soil-zone wells (S-wells) were installed at each of the ten locations. These wells are generally 0.75-m (2.5-ft) deep with screens 0.30 m (1.0 ft) in length. Very shallow wells (VS-wells) were installed at three of the ten locations. These wells are generally 0.40-m (1.3-ft) deep with screens 0.15 m (0.5 ft) in length. S- and VS-wells are designed to monitor saturation in the near-surface sediments for the purpose of delineating areas of wetland hydrology.

All well screens have a slip-on bottom cap with a single drainage hole. Well screens were packed with quartz sand with a grain size of 0.9 mm (0.038 inch), typically #5 Global silica filter pack or equivalent. The annulus was then back-filled to land surface with medium bentonite chips. Well-construction details are provided in Appendix B.

Surface-Water Hydrology

A Remote Data Systems (RDS) water-level data logger (Gauge C) was installed near the eastern end of the central drainage ditch, and an In-Situ pressure transducer (Gauge B) was installed in the oxbow lake near Well 4S (Figure 2). These two instruments are used to record surface-water fluctuations in these locations at more closely spaced intervals than can be achieved by manual water-level measurements.

One staff gauge (Gauge A) was installed at the location of the In-Situ pressure transducer, and a second staff gauge (Gauge D) was installed at the location of the RDS water-level data logger (Figure 2). These staff gauges are used as quality control for the adjacent data loggers.

Site Monitoring and Surveying

The wells, data loggers, and staff gauges are monitored twice per month during spring (April to June), and monthly thereafter. The complete records of surface-water elevations from staff gauges and depth to water in wells are reported in graph form in Appendix C and as tabular data in Appendix D.

The In-Situ pressure transducer (Gauge B) was programmed to monitor water levels at a 3-hour interval. The original RDS water-level data logger (Gauge C) was also programmed to monitor water levels at a 3-hour interval. However, the RDS data logger was replaced on January 12, 2005 with a new RDS data logger that was programmed to monitor water levels at a 1-hour interval. These loggers helped identify short-term events that might not have been detected by the monthly or biweekly readings.

On-site precipitation data were measured with a Davis Instruments tipping-bucket rain gauge equipped with a data logger (Figure 2). The on-site data supplemented regional precipitation data recorded at the Wastewater Treatment Plant Weather Station in Freeport, Illinois (Station 113262) (Figure 8). These data were obtained from the National Water and Climate Center (NWCC) of the Natural Resources Conservation Service (NRCS) and the Midwestern Regional Climate Center (MRCC) at the Illinois State Water Survey (ISWS). The precipitation data were used to determine the effect of monthly, seasonal, and annual precipitation trends on surface- and ground-water levels.

Air-temperature data recorded at the Wastewater Treatment Plant Weather Station in Freeport, Illinois (Station 113262) were used to determine the length of the growing season for the region. The growing season is defined as the period between the last occurrence of -2.2°Celsius (C) [28°Fahrenheit (F)] temperatures in the spring and the first occurrence in the fall (Environmental Laboratory 1987). The median length (5 out of 10 years) of the growing season for the region is 183 days, starting on April 13 and ending on October 13 (MRCC 2006).

The elevations of the monitoring wells, staff gauges, and data loggers are surveyed every spring with a Sokkia B1 Automatic Level and/or Leica TC702 total station using the North American Vertical Datum (NAVD) 1988 datum plane. Instrument locations were surveyed using a Trimble Pathfinder ProXR GPS unit in December 2003, and again in January 2006. To increase position accuracy, these locations were differentially corrected using Trimble Pathfinder software.

SITE CHARACTERIZATION

Setting

Site 6W of the West Freeport Bypass lies within the floodplain of the Pecatonica River, approximately two miles (3.2 km) northwest of the intersection of U.S. 20 and IL 26 near the town of Freeport, Illinois (Figure 1). The 9.6-ha (23.6-ac) site is bounded by the raised roadbed of U.S. 20 to the south, the Jane Addams Trail (a former railroad grade) to the east, agricultural fields to the north and northwest, and an intermittent oxbow lake to the southwest (Figure 1). Broad, shallow drainage ditches are present along the northwestern, northern and eastern edges of the site, and an east-west trending drainage ditch bisects the center of the site (Figure 4).

Historic aerial photographs indicate that the cental drainage ditch separating the southern field from the remainder of the site has been in place since at least 1958. These photographs also show that the site was farmed since at least 1939. Farming at the site ceased in 2006 when IDOT planted trees in the former agricultural fields.

Topography

According to topographic data collected by IDOT and ISGS, the site ranges in elevation from approximately 229.5 m (753 ft) near the west end of the central drainage ditch to a maximum of approximately 232.3 m (762 ft) in the extreme northeast corner of the site (Figure 9). Regionally, the site is situated at the base of the western flank of a north–south trending ridge (Figure 1). Locally, site topography slopes down from the northeastern corner to a broad, shallow ditch connecting the northern and eastern ditches, and then rises gradually to the southwest, reaching 231.6 m (760 ft) along the forest east of the oxbow lake, where it then quickly drops down approximately 1.8 m (6 ft) to the lake bed.

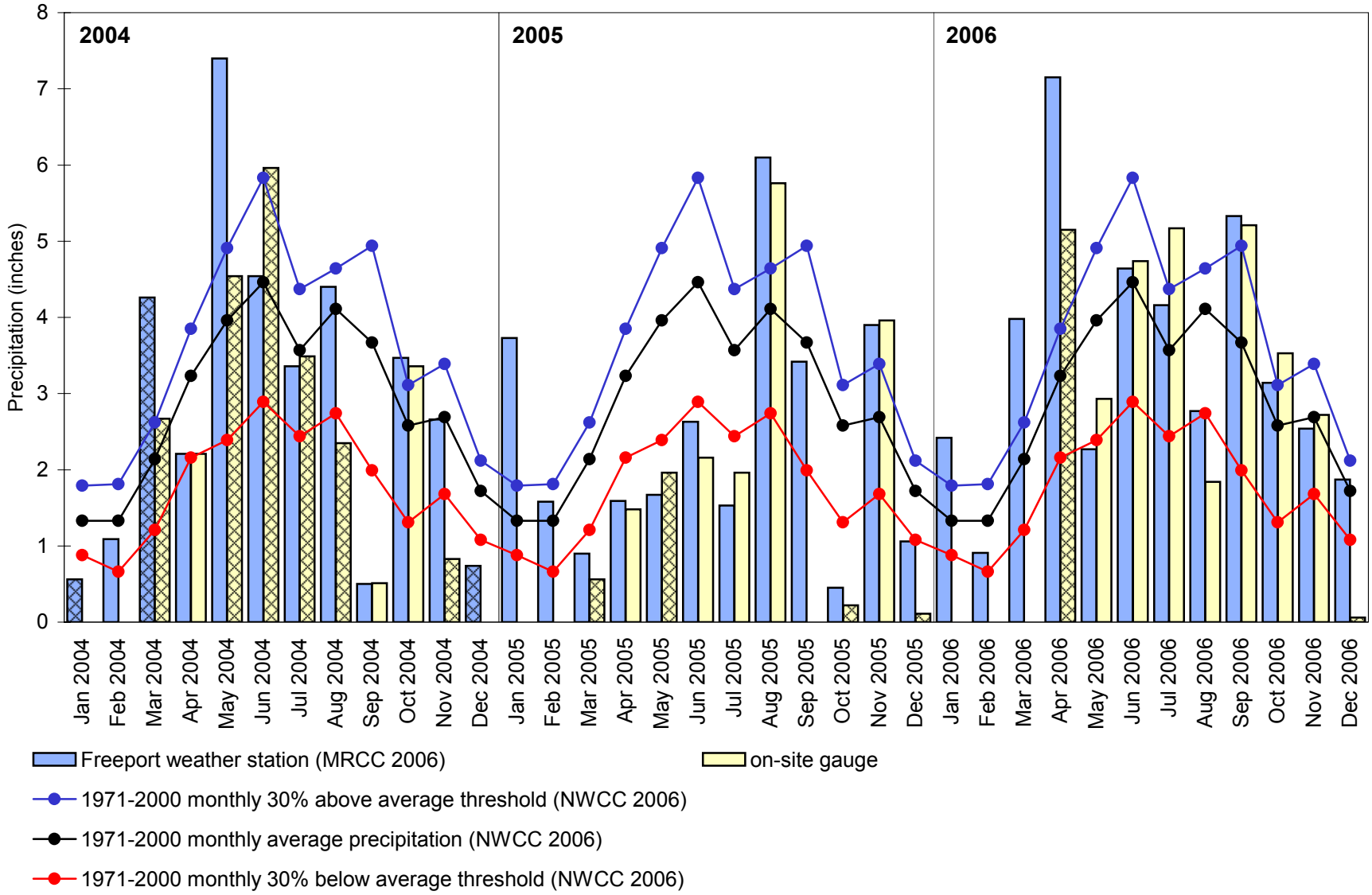

Figure 8 Total monthly precipitation recorded at the Freeport Wastewater Treatment Plant weather station and on site. Incomplete data are indicated with cross-hatching.

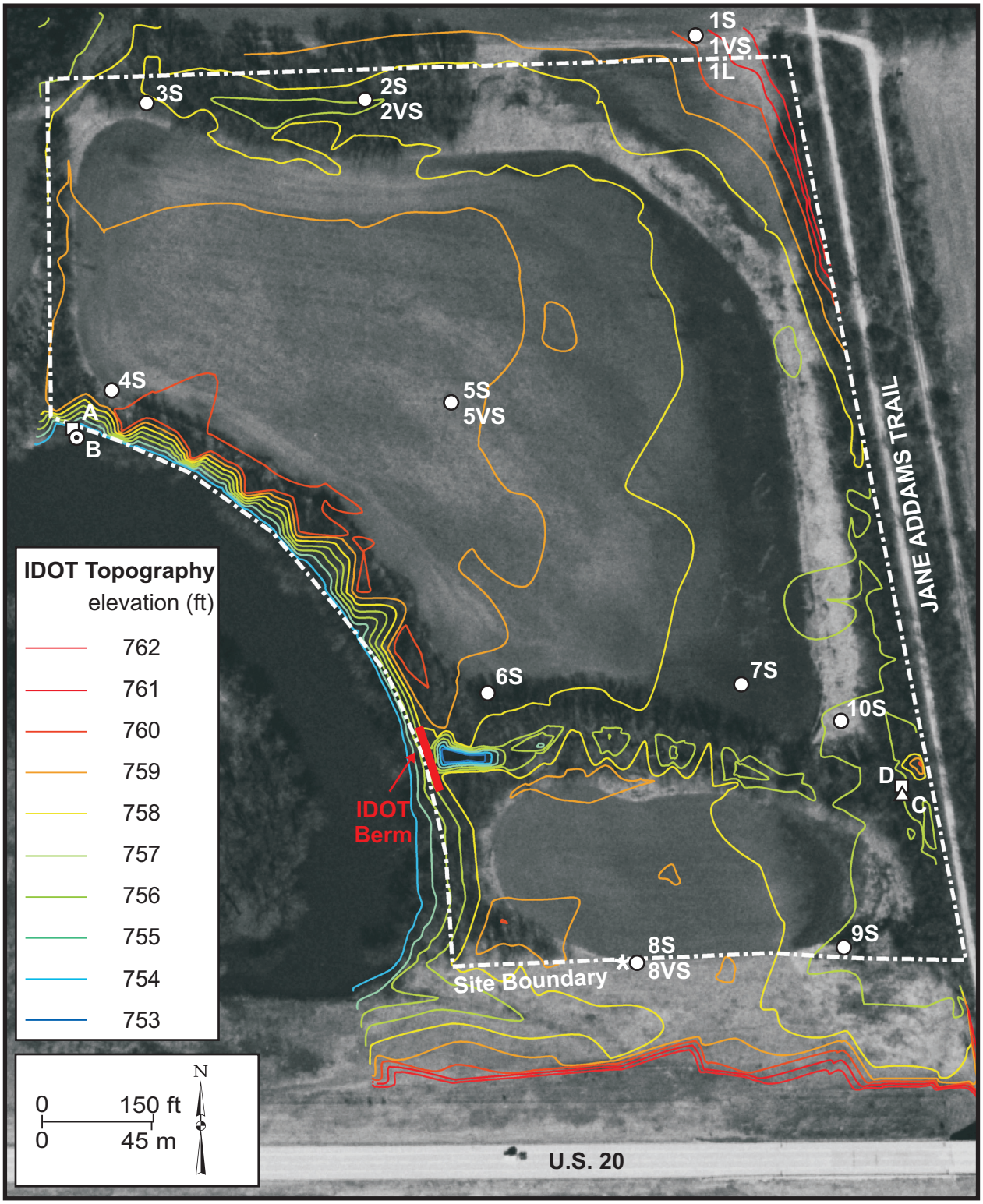

Figure 9 Topography at Site 6W (figure drawn on ISGS 2005b using data provided by IDOT).

Regional and Local Drainage Patterns

Overland flow resulting from precipitation is directed toward the site from the uplands on the north and east. Flow from the east enters the site through a culvert located near the southeast corner of the property (Figure 4). This water begins to pond along the southeastern site boundary until it eventually overflows into the central drainage ditch and continues westward toward the oxbow lake. Overland flow from the north is believed to flow directly into the northern drainage ditch, where it is contained until it overflows from the ditch to the southeast and/or west. ISGS investigations at the site have not uncovered any evidence for the presence of drainage tile at the site.

Geology

Bedrock Geology

The site lies along the floodplain of the Pecatonica River in the rolling hills of the Rock River Hill Country of the Till Plains Section of the Central Lowland Province (Leighton et al. 1948). The uppermost bedrock units underlying the site are mapped as the Galena and Platteville Groups of the Ordovician System (Kolata 2005). In northern Illinois, the Platteville Group is composed largely of blue-gray, lithographic limestone that is sometimes mottled with dolomite, and the Galena Group consists entirely of dolomite (Willman et al. 1975). Depth to bedrock is mapped at 7.6–15.2 m (25–50 ft) (Piskin and Bergstrom 1975), and the site is situated over a northwest–southeast trending arm of the buried Pecatonica Bedrock Valley (Herzog et al. 1994).

Unlithified Sediments

Unlithified sediments in the eastern half of the site are mapped as less than 6.1 m (20 ft) of Peoria Loess and Roxana Silt, overlying less than 6.1 m (20 ft) of the Ogle Till Member of the Glasford Formation (Berg and Kempton 1988). Surficial deposits in the western half of the site are mapped as less than 6.1 m (20 ft) of poorly sorted sand, silt, and clay of the Cahokia Formation, overlying less than 6.1 m (20 ft) of the Ogle Till Member of the Glasford Formation (Berg and Kempton 1988, Willman et al. 1975). The Ogle Till Member of the Glasford Formation consists of thin and discontinuous tan to gray-brown sandy and silty till (Willman et al. 1975).

Samples taken in ISGS soil borings, with depths ranging between 0.74 and 2.84 m (2.4 and 9.3 ft), consisted predominantly of clayey silt to silt over the entire site (Weaver et al. 2003), likely belonging to the Cahokia Formation. ISGS borehole logs are presented in Appendix A.

Soils

A preliminary assessment of the soils at the site, conducted by the INHS on January 23, 2006, differs from published U.S. Department of Agriculture (USDA) maps. The INHS identified those soils that were hydric as Otter silt loam (D. Keene pers. comm. 2006). Soils of the Otter series are poorly drained and subject to frequent flooding and ponding (Ray et al. 1976). These soils occupy the lower regions of the site, and it is estimated that they account for approximately 50% of the soil at the site (Figure 5). Additionally, the INHS described the non-hydric soil present at the site as Batavia silt loam (D. Keene pers. comm. 2006). Soils of the Batavia series are well- to moderately-well drained soils (Ray et al. 1976). These soils are found in the upper portions of the site, and they account for the remainder of the soil mapped at the site, not including an unmapped area in the northeast corner of the site that is assumed to be hydric based on its topographic position (Figure 5). The INHS should be consulted if a more detailed inventory of the soils at the site is required.

Vegetation

A preliminary assessment of the vegetation bordering the former agricultural fields and within the adjacent broad, shallow ditches was performed at the site by INHS personnel on January 23, 2006. According to the INHS, vegetation along the field margins and in the grass waterway connecting the northern and eastern ditches is predominantly hydrophytic (Figure 6), being dominated by either *Phalaris sp.*, *Elymus virginicus*, and/or *Polygonum amphibium* and *Scirpus fluviatilis* (A. Plocher pers. comm. 2006). The forested areas occupying the broad shallow ditches contain typical wetland species including *Populus deltoides*, *Acer saccharinum*, and *Fraxinus pennsylvanica* (A. Plocher pers. comm. 2006). The INHS should be consulted if a more detailed discussion of the vegetation at the site is required.

Precipitation

Average annual precipitation at the nearby Wastewater Treatment Plant Weather Station in Freeport, Illinois, is 88.39 centimeters (cm) (34.80 inches) (NWCC 2006) (Appendix E, Table E1). Precipitation at this station is typically highest between April and September, peaking in June. Precipitation recorded at the weather station was below average in 2003 and 2005, was average in 2002 and 2004, and was above average in 2001 and 2006 (MRCC 2006).

The ISGS has been collecting precipitation data on site since March 2004 (Appendix E, Table E2). Figure 8 shows the correlation between precipitation data collected at the Wastewater Treatment Plant Weather Station in Freeport versus the data collected on site. In general, there is good agreement between the two data sets. Since the on-site rain gauge is removed for the winter months, it cannot be used to show yearly trends.

Precipitation itself is not believed to have an appreciable effect on water levels recorded at the site except when regional totals are high enough to cause flooding along the Pecatonica River. However, precipitation may help support limited areas of wetland hydrology at the site, both directly and indirectly through overland flow coming onto the site from uplands to the north and east. However, given the somewhat domed topography of the north and south fields, precipitation falling on the site and overland flow entering the site from the north and east are most likely to support wetland hydrology within the low-lying ditches at the site.

Hydrology

Pecatonica River Flood History Analysis

According to data collected and on-site observations made thus far at Site 6W, flooding from the Pecatonica River is the major hydrologic input observed at the site. In 2004, water levels recorded at ISGS Gauges B and C indicated that water levels on the Pecatonica River reached an elevation sufficient to flood all but the extreme northeastern corner of the site during the growing season. In 2005, Site 6W was again inundated by a flood of similar magnitude but of shorter duration, whose waters began receding from the site on March 12, prior to the start of the growing season. On April 17, 2006, the site was inundated during the growing season, but this time by a flood of much lower magnitude that resulted in only the wells at the lowest elevations of the site being affected. Flood waters from the 2006 flood began to recede from the site on April 20.

Results from a flood history analysis of the Pecatonica River at Freeport indicate that the Pecatonica River has flooded to an elevation sufficient to cause localized flooding at the site during the growing season in 13 of the last 22 years, or 59% of the time (Appendix H). Additionally, these data indicate that the site is sometimes flooded multiple times during the growing season, as well as prior to the beginning of the growing season in some years. However, flood events impacting

the site with durations greater than 5% of the growing season have occurred in only 9 of the last 22 years, or 41% of the time (Appendix H).

Ground-Water Hydrology

Shallow ground-water levels measured in this study are presented in both graphical and tabular form in Appendix C and D, respectively. The shallow ground water shows an annual fluctuation with water levels peaking in spring and dropping to their lowest levels in summer and fall. Measurable water levels were most persistent in Wells 2S, 2VS, 9S (satisfied wetland hydrology criteria for greater than 5% of growing season in 3 of 3 years), and 10S (satisfied wetland hydrology criteria for greater than 5% of growing season in 2 of 3 years), reflecting their positions along or near the low-lying ditches at the site, while water levels recorded in the remaining wells, located at higher elevations across the site, dropped off much more rapidly.

Water levels recorded in Well 1L have at times been greater than those recorded in Well 1S/1SR (Appendix D, Table D1), suggesting upward groundwater flow. The maximum water-level elevation recorded in Well 1L during a period when it was greater than the water-level recorded in Well 1S was 231.78 m (760.43 ft), recorded on June 3, 2004. This elevation is higher than the highest known land-surface elevation at the site, and therefore suggests that at times there may be limited ground-water discharge to the eastern regions of the site. This discharge in turn might help support limited areas of wetland hydrology in the lower portions of the site, especially along the low-lying ditches along the northern and eastern margins of the site. Specifically, water-level data collected from Wells 1S/1SR and 1L on March 29, 2005 and on April 12, April 21, and May 17, 2006 suggested that ground-water discharge may have helped support wetland hydrology in these lower regions of the site during the 2005 and 2006 growing seasons (Appendix D, Table D1).

Wetland Hydrology

Inundation and/or saturation to land surface must occur for at least 5 percent of the growing season to satisfy wetland hydrology criteria as outlined in the 1987 U.S. Army Corps of Engineers Wetland Delineation Manual (Environmental Laboratory 1987). Water levels within 30 cm (1 ft) of land surface in wells are interpreted to show saturation to land surface due to the presence of a capillary fringe, as suggested by informal Corps guidance. Interpolation and/or extrapolation were performed to determine the duration of saturation for wells where manual water-level measurements were collected.

As a result of the 2004 flood, 9.2 ha (22.8 ac), or 97% of the site satisfied jurisdictional wetland hydrology criteria for at least 5% of the growing season (Appendix F, Figure F1). Additionally, 9.2 ha (22.6 ac), or 96% of the site satisfied jurisdictional wetland hydrology criteria for at least 12.5% of the 2004 growing season.

In 2005, two small areas of the site, in the eastern and northern ditches and totaling 0.4 ha (0.9 ac), retained water long enough to meet jurisdictional wetland hydrology criteria for 5% of the growing season (Appendix F, Figure F2).

A total of 2.3 ha (5.7 ac) satisfied jurisdictional wetland hydrology criteria for greater than 5% of the 2006 growing season (Appendix F, Figure F3). An area of equal size also satisfied jurisdictional wetland hydrology criteria for greater than 12.5% of the 2006 growing season.

In summary, water-level data collected from January 2004 through December 2006 indicated that 2.3 ha (5.7 ac), or 24% of the site, satisfied jurisdictional wetland hydrology criteria for at least 5%

of the growing season in 2 out of 3 years (Figure 2). The same acreage also satisfied jurisdictional wetland hydrology criteria for at least 12.5% of the growing season in 2 out of 3 years. While an extended period of flooding at the site in 2004 resulted in 9.2 ha (22.8 ac) of the site meeting the criteria for jurisdictional wetland hydrology in that year (Figure 2), no flooding occurred at the site during the 2005 growing season, and only a small-magnitude flood of short duration impacted the site in 2006.

The results of a flood history analysis for the Pecatonica River indicate that in only 9 of the last 22 years have flood events impacted the site with durations greater than 5% of the growing season (Appendix H). While the soils at the site likely remain saturated for a period of time following the drainage of flood waters, the presence of non-hydric soils over approximately 50% of the site (Figure 5) indicates that significant portions of the site do not currently meet wetland hydrology criteria. The current ditch system efficiently drains water from the site following flooding, thereby reducing the original extent of wetland hydrology at the site. Flood waters must be retained on-site for a longer period of time if larger portions of the site are to meet wetland hydrology criteria.

CONCLUSIONS AND RECOMMENDATIONS

Flooding from the Pecatonica River is the major hydrologic input at the site. Portions of the site have been flooded by the Pecatonica River during the growing season in 13 of the last 22 years, but in only 9 of the last 22 years has the duration of flooding lasted for greater than 5% of the growing season (Appendix H). Comparison of the hydrograph from ISGS Gauge C at Site 6W to USGS Stream Gauge 05435500, located on the Pecatonica River at Freeport, show that flood waters at Site 6W rise and fall in unison with the flood waters on the Pecatonica River once the water level on the Pecatonica River has risen over a threshold of approximately 230.7 m (757.0 ft) at Site 6W (Appendix G).

Overland flow from uplands to the north and east of the site also likely provides water to the site, but this water would be mainly confined to the low-lying ditches near the northern border and the southeastern corner of the site. Direct precipitation and ground-water discharge have been shown to help support existing areas of wetland hydrology at the site, especially along the northern and eastern drainage ditches.

Currently, 2.3 ha (5.7 ac) of the site meet jurisdictional wetland hydrology criteria, while 1.7 ha (4.3 ac) satisfy the 3-parameter definition of wetlands (Figure 7). Increasing wetland area requires that flood waters and other water sources be retained on site at higher elevations and for greater durations. Prior to September 2006, the ditch system at Site 6W allowed for effective drainage of the site, especially for areas higher than 230.7 m (757.0) ft.

In April 2006, the ISGS advised IDOT to construct the berm with an elevation of 231.0 m (758.0 ft) (Plankell 2006), an elevation that would maximize the amount of water retained on site while preventing significant off-site flooding to the north and east. This recommendation was based on a 20-year flood history analysis of the Pecatonica River from 1986 through 2005 (mistakenly referred to as 1987–2006 in the letter).

Subsequent to the April 2006 recommendation, and for the purposes of this report, the flood frequency analysis of the Pecatonica River was modified in the following ways: 1) River stage data from the USGS gauge at Freeport were added from 1985 and 2006 in order that the entire 22-year period of record could be analyzed. 2) A previous surveying error, revealed during the June 2006 survey of Site 6W, resulted in a slight recalculation of the average elevation difference in river stage between the Pecatonica River at the USGS Gauge at Freeport versus that recorded at

Site 6W. 3) River stage data recorded at the USGS Gauge in Freeport were converted from the National Geodetic Vertical Datum (NGVD) of 1929 to the North American Vertical Datum (NAVD) of 1988 to correspond with the geodetic datum used by the ISGS at Site 6W.

Taking the above changes into consideration, an updated flood history analysis of the Pecatonica River indicates that the site has flooded higher than 231.04 m (758.00 ft) in 10 of the last 22 years during the growing season (Appendix H). However, in two additional years the site was flooded over 231.04 m (758.00 ft) within 30 days of the start of the growing season, and it is expected that the berm would retain these floods for a duration long enough to impact wetland hydrology at the site at the beginning of the growing season in these years. Therefore no changes to the recommended berm elevation of 231.0 m (758.0 ft) are needed.

On September 27, 2006, IDOT installed a berm across the western end of the central drainage ditch to help retain water (Figure 7). This berm should limit the drainage of water from the eastern portion of the site following flooding of the site by the Pecatonica River. At maximum, water retained by this berm could allow up to 70% of the site to satisfy the wetland hydrology criteria (Figure 7). Of this area, approximately 1.7 ha (4.3 ac) of wetland will be created, and 3.2 ha (7.9 ac) of wetland will be restored. An additional 2.1 ha (5.1 ac) (up to 92% of total site area) of created wetland adjacent to the area that will be inundated may develop through lateral translation of shallow ground-water (Figure 7), though monitoring of actual post-construction conditions at the site will be necessary to verify this.

Non-hydric soils were mapped over approximately 50% of Site 6W (Figure 5). The presence of non-hydric soil suggests that significant portions of the site currently lack the hydrology necessary to form hydric soils. However, it is expected that approximately 1.7 ha (4.3 ac) of wetlands will be created where non-hydric soils are present once wetland hydrology to these areas is established (Figure 7).

Excavation in order to increase surface inundation was not recommended because it appears likely that a combination of flooding from the Pecatonica River, overland flow from the north and east, direct precipitation and ground-water discharge will cause sufficient saturation of the majority of the site when waters are retained by the IDOT-constructed berm. Portions that are likely not to become wetlands would need significant excavation, which may not be feasible.

Any compensation site design that interrupts the current drainage network must provide a continued means of drainage for adjacent areas. The IDOT-constructed berm was built to specifications which, while retaining more water on Site 6W, should not adversely affect drainage from the agricultural areas immediately north, east, and west of the site.

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HISTORICAL AERIAL PHOTOGRAPHS

(available for viewing at the Map and Geography Library, University of Illinois at Urbana-Champaign)

Markhurd Corporation

Year	Flight Line	Photo Number
1988,1994,1995, 1998	37 and 38	IL 587

U.S. Department of Agriculture

Year	Flight Line	Photo Number
1939	9	2-54
1958	155	BXH-1V
1964	136	BXH-1EE
1970	223	BXH-3LL

APPENDIX A Geologic Descriptions of Borings

Table A1 Soil Boring 1

Boring	SB 1
Location	northeast corner of site, at the location of Well 1L
Date	12/17/03
Field Crew	Jim Miner, Kelli Weaver
Comments	hand auger
Well Construction	(see Appendix B)

Depth	**Unit Descriptions**	
0 - 0.50 m (0 - 1.6 ft)	*Geologic material:* **silty to clayey silt**	*Color of matrix:* very dark grayish brown (10YR 3/2)
	Notes: Very faint mottles. Color change at bottom of section.	
0.50 - 1.00 m (1.6 - 3.3 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* dark brown to dark yellowish brown (10YR 3/3 to 4/4)
	Notes: Clay component increased with depth. Contains either small organic blebs or blebs of darker colored overlying sediments. Some red mottles present.	
1.00 - ~2.50 m (3.3 - ~8.2 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* dark gray to dark grayish brown (10YR 4/1 to 4/2)
	Notes: Increase in clay content and in mottles. Sediments wet at 1.03 m (3.4 ft). Standing water at 1.9 m (6.2 ft).	
2.50 m (8.2 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* yellowish brown (10YR 5/8)
	Notes: Increase in clay content and medium-grained sand. Approximately 2 cm of very strong redoximorphic indicators and organic material.	
2.84 m (9.3 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* yellowish brown (10YR 5/8)
	Notes: Decrease in sand component and moisture. Smaller redoximorphic mottles. Manganese nodules present.	

APPENDIX A Geologic Descriptions of Borings

Table A2 Soil Boring 2

Boring	SB 2	
Location	north-central wooded portion of site, at the location of Well 2S	
Date	12/17/03	
Field Crew	Jim Miner, Kelli Weaver	
Comments	hand auger	
Well Construction	(see Appendix B)	
Depth	**Unit Descriptions**	
0 - 0.45 m (0 - 1.5 ft)	*Geologic material:* **slightly clayey silt**	*Color of matrix:* black (10YR 2/1)
	Notes: Very few mottles.	
~0.50 - 0.60 m (~1.6 - 2.0 ft)	*Geologic material:* **slightly clayey silt**	*Color of matrix:* black (10YR 2/1)
	Notes: Water encountered in borehole.	
0.60 - 0.75 m (2.0 - 2.5 ft)	*Geologic material:* **silt** with few sand grains and low clay content	*Color of matrix:* very dark grayish brown (10YR 3/2)
	Notes:	

Table A3 Soil Boring 3

Boring	SB 3	
Location	northwest corner in wooded portion of site, at the location of Well 3S	
Date	12/17/03	
Field Crew	Jim Miner, Kelli Weaver	
Comments	hand auger	
Well Construction	(see Appendix B)	
Depth	**Unit Descriptions**	
0 - ~0.60 m (0 - ~2.0 ft)	*Geologic material:* **silt** with possibly very slight clay content	*Color of matrix:* very dark gray to very dark grayish brown (10YR 3/1 to 3/2)
	Notes:	
0.60 - 0.75 m (2.0 - 2.5 ft)	*Geologic material:* **silt**	*Color of matrix:* dark brown to dark yellowish brown to brown (10YR 3/3 to 3/6 to 4/3)
	Notes: Faint redoximorphic concentrations.	

APPENDIX A Geologic Descriptions of Borings

Table A4 Soil Boring 4

Boring	SB 4	
Location	west-central border of site, at the edge of northern agricultural field and just north of the oxbow lake, at the location of Well 4S	
Date	12/17/03	
Field Crew	Jim Miner, Kelli Weaver	
Comments	hand auger	
Well Construction	(see Appendix B)	
Depth	**Unit Descriptions**	
0 - 0.25 m (0 - 0.8 ft)	*Geologic material:* **silt**	*Color of matrix:* very dark gray to very dark grayish brown (10YR 3/1 to 3/2)
	Notes:	
0.25 - 0.75 m (0.8 - 2.5 ft)	*Geologic material:* **clayey silt** (silty clay, with a possible very fine sand component)	*Color of matrix:* brown to dark yellowish brown (10YR 4/3 to 4/4)
	Notes:	

Table A5 Soil Boring 5

Boring	SB 5	
Location	center of northern agricultural field, at the location of Well 5S	
Date	12/17/03	
Field Crew	Jim Miner, Kelli Weaver	
Comments	hand auger	
Well Construction	(see Appendix B)	
Depth	**Unit Descriptions**	
0 - 0.30 m (0 - 1.0 ft)	*Geologic material:* **silt** (with a slight clay component)	*Color of matrix:* very dark gray (10YR 3/1)
	Notes: Plowed zone. No redox concentrations.	
0.30 - 0.75 m (1.0 - 2.5 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* dark yellowish brown (10YR 3/4 to 4/4)
	Notes:	

APPENDIX A Geologic Descriptions of Borings

Table A6 Soil Boring 6

Boring	SB 6	
Location	southwest corner of northern agricultural field, at the location of Well 6S	
Date	12/17/03	
Field Crew	Jim Miner, Kelli Weaver	
Comments	hand auger	
Well Construction	(see Appendix B)	
Depth	**Unit Descriptions**	
0 - 0.24 m (0 - 0.8 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* very dark grayish brown (10YR 3/2)
	Notes:	
0.24 - 0.75 m (0.8 - 2.5 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* brown to dark yellowish brown (10YR 4/3 to 3/4)
	Notes: Increase in diffuse mottles with depth.	

Table A7 Soil Boring 7

Boring	SB 7	
Location	southeast corner of northern agricultural field, at the location of Well 7S	
Date	12/17/03	
Field Crew	Jim Miner, Kelli Weaver	
Comments	hand auger	
Well Construction	(see Appendix B)	
Depth	**Unit Descriptions**	
0 - ~0.50 m (0 - 1.6 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* very dark gray (10YR 3/1)
	Notes: Increasing clay with depth.	
0.50 - 0.75 m (1.6 - 2.5 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* dark brown (10YR 3/3)
	Notes: Increasing clay with depth.	

APPENDIX A Geologic Descriptions of Borings

Table A8 Soil Boring 8

Boring	SB 8	
Location	south-central border of the site, at the location of Well 8S	
Date	12/17/03	
Field Crew	Jim Miner, Kelli Weaver	
Comments	hand auger	
Well Construction	(see Appendix B)	
Depth	**Unit Descriptions**	
0 - ~0.50 m (0 - 1.6 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* very dark grayish brown (10YR 3/2)
	Notes:	
0.50 - 0.75 m (1.6 - 2.5 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* brown (10YR 4/3)
	Notes:	

Table A9 Soil Boring 9

Boring	SB 9	
Location	southeast corner of the site, at the location of Well 9S	
Date	12/17/03	
Field Crew	Jim Miner, Kelli Weaver	
Comments	hand auger	
Well Construction	(see Appendix B)	
Depth	**Unit Descriptions**	
0 - 0.74 m (0 - 2.4 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* very dark gray (10YR 3/1)
	Notes: Boring completed in standing water. Very slight mottles at 0.74 m (2.4 ft). River Bulrush, Reed Canarygrass, and Smartweed present at boring location.	

APPENDIX A Geologic Descriptions of Borings

Table A10 Soil Boring 10

Boring	SB 10
Location	southeast corner of the northern agricultural field, at the location of Well 10S
Date	12/18/03
Field Crew	Jim Miner, Kelli Weaver
Comments	hand auger
Well Construction	(see Appendix B)

Depth	**Unit Descriptions**	
0 - 0.77 m (0 - 2.5 ft)	*Geologic material:* **clayey silt**	*Color of matrix:* very dark gray (10YR 3/1)
	Notes: Faint mottling ~5mm in diameter at depth. Saturated materials encountered at ~0.69 m (2.3 ft).	

APPENDIX B Well Construction Information

Table B1 Construction Information for Monitoring Wells

Well Construction Information	1S	1SR	1L	2S	2VS	3S	4S	5S	5VS
Total length of well (m)	1.89	1.91	4.63	1.90	0.99	1.91	1.90	1.90	0.97
Screen length (m)	0.28	0.30	1.39	0.28	0.16	0.28	0.28	0.28	0.16
Depth of borehole (m) *	0.76	0.75	2.84	0.75	0.39	0.75	0.77	0.75	0.38
Bentonite seal - top (m) *	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sand pack - top (m) *	0.30	0.30	1.30	0.30	0.15	0.30	0.30	0.30	0.15
Sand pack - bottom (m) *	0.74	0.75	2.84	0.78	0.39	0.77	0.78	0.74	0.36
Depth to top of screen (m) *	0.44	0.42	1.41	0.47	0.19	0.46	0.47	0.43	0.17
Depth to bottom of screen (m) *	0.71	0.71	2.79	0.75	0.36	0.73	0.75	0.71	0.33

* referenced to land surface

Table B1 Construction Information for Monitoring Wells *(continued)*

Well Construction Information	6S	7S	8S	8VS	9S	10S
Total length of well (m)	1.89	1.90	1.89	0.96	1.88	1.89
Screen length (m)	0.29	0.28	0.28	0.16	0.29	0.28
Depth of borehole (m) *	0.77	0.76	0.75	0.38	0.75	0.77
Bentonite seal - top (m) *	0.00	0.00	0.00	0.00	0.00	0.00
Sand pack - top (m) *	0.30	0.30	0.30	0.15	0.32	0.30
Sand pack - bottom (m) *	0.76	0.76	0.75	0.38	0.69	0.76
Depth to top of screen (m) *	0.44	0.45	0.43	0.19	0.37	0.45
Depth to bottom of screen (m) *	0.72	0.73	0.71	0.34	0.66	0.73

* referenced to land surface

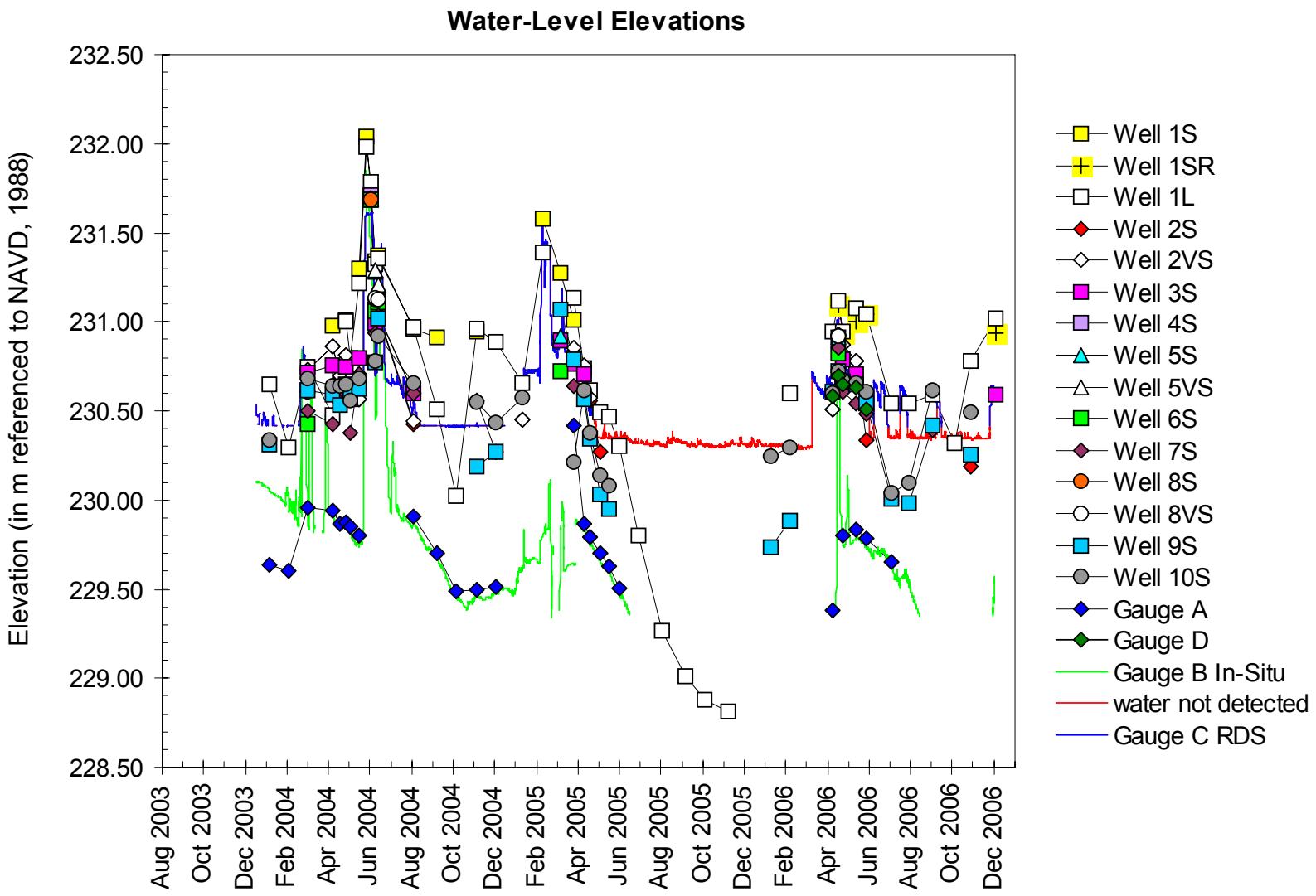

Figure C1 Water-level elevations at monitoring instruments at the West Freeport Bypass Site 6W.

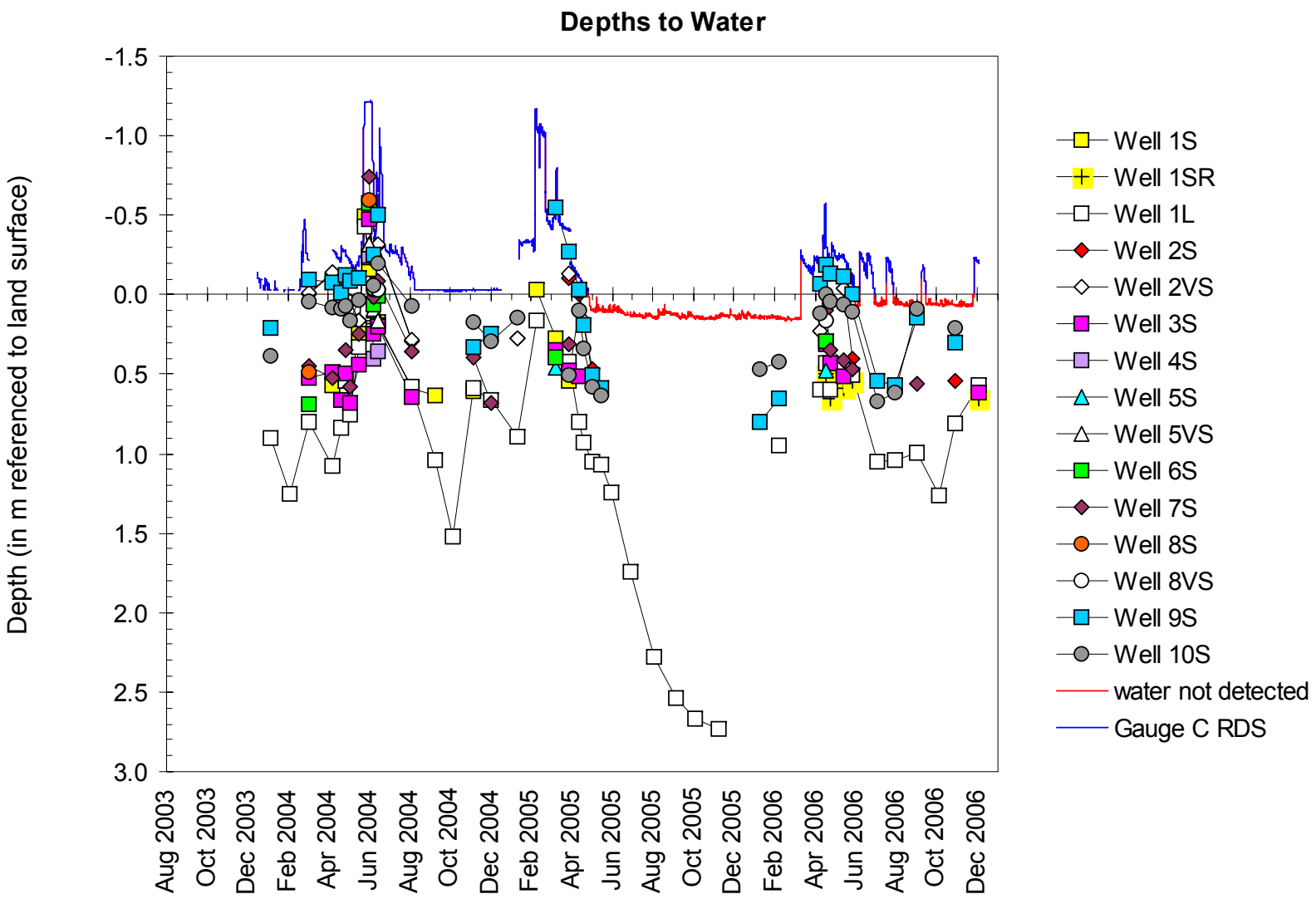

Figure C2 Depths to water in monitoring instruments at the West Freeport Bypass Site 6W.

APPENDIX D Water-Level Elevations and Depths to Water Tables

Table D1 Water-Level Elevations

	Water-Level Elevations (in m referenced to NAVD, 1988)							
Date	01/06/04	02/04/04	03/03/04	04/08/04	04/20/04	04/27/04	04/28/04	05/04/04
Well 1S	dry	dry	dry	230.98	dry	*	231.01	dry
Well 1SR	**	**	**	**	**	**	**	**
Well 1L	230.65	230.29	230.75	230.47	230.71	*	231.00	230.80
Well 2S	dry	dry	230.73	230.86	230.69	*	230.81	230.68
Well 2VS	dry	dry	230.73	230.86	230.70	*	230.81	230.68
Well 3S	dry	dry	230.72	230.76	230.58	*	230.75	230.57
Well 4S	dry	dry	dry	dry	dry	*	dry	dry
Well 5S	dry	dry	dry	dry	dry	dry	*	dry
Well 5VS	dry	dry	dry	dry	dry	dry	*	dry
Well 6S	dry	dry	230.42	dry	dry	dry	*	dry
Well 7S	dry	dry	230.50	230.43	dry	230.60	*	230.38
Well 8S	dry	dry	230.60	dry	dry	dry	*	dry
Well 8VS	dry	dry	dry	dry	dry	dry	*	dry
Well 9S	230.31	dry	230.61	230.59	230.53	230.65	*	230.60
Well 10S	230.33	dry	230.68	230.64	230.64	230.65	*	230.56
Gauge A	229.64	229.60	229.96	229.94	229.86	229.88	*	229.85
Gauge D	**	**	**	**	**	**	**	**

Table D1 Water-Level Elevations *(continued)*

	Water-Level Elevations (in m referenced to NAVD, 1988)							
Date	05/18/04	05/27/04	06/03/04	06/09/04	06/15/04	08/05/04	09/09/04	10/06/04
Well 1S	231.30	232.04	231.71	231.34	231.37	230.96	230.91	dry
Well 1SR	**	**	**	**	**	**	**	**
Well 1L	231.22	231.98	231.78	231.32	231.36	230.97	230.51	230.02
Well 2S	230.57	flooded	flooded	230.94	231.04	230.43	dry	dry
Well 2VS	230.57	flooded	flooded	230.95	231.04	230.44	dry	dry
Well 3S	230.80	flooded	231.71	231.00	231.05	230.60	dry	dry
Well 4S	dry	flooded	231.71	231.07	231.12	dry	dry	dry
Well 5S	dry	flooded	231.69	231.28	231.21	dry	dry	dry
Well 5VS	dry	flooded	231.69	231.29	231.21	dry	dry	dry
Well 6S	dry	flooded	231.69	231.06	231.11	dry	dry	dry
Well 7S	230.71	flooded	231.69	230.94	231.03	230.60	dry	dry
Well 8S	dry	flooded	231.68	231.12	231.13	dry	dry	dry
Well 8VS	dry	flooded	flooded	231.13	231.12	dry	dry	dry
Well 9S	230.62	flooded	flooded	230.77	231.02	*	dry	dry
Well 10S	230.68	flooded	flooded	230.78	230.92	230.65	dry	dry
Gauge A	229.80	flooded	flooded	*	flooded	229.91	229.70	229.49
Gauge D	**	**	**	**	**	**	**	**

*	no measurement	S	indicates soil-zone monitoring well
**	not yet installed	L	indicates lower monitoring well
***	frozen and flooded	VS	indicates very shallow monitoring well
****	inaccessible due to flooding	R	indicates replacement well

APPENDIX D Water-Level Elevations and Depths to Water Tables

Table D1 Water-Level Elevations *(continued)*

	Water-Level Elevations (in m referenced to NAVD, 1988)							
Date	11/05/04	12/03/04	01/12/05	02/10/05	03/09/05	03/29/05	04/13/05	04/21/05
Well 1S	230.95	dry	dry	231.58	231.27	231.01	dry	dry
Well 1SR	**	**	**	**	**	**	**	**
Well 1L	230.96	230.89	230.66	231.39	frozen	231.13	230.74	230.61
Well 2S	dry	dry	230.45	***	frozen	230.83	230.74	230.56
Well 2VS	dry	dry	230.45	***	frozen	230.86	230.76	230.57
Well 3S	dry	dry	dry	****	230.90	230.76	230.70	dry
Well 4S	dry	dry	dry	****	dry	dry	dry	dry
Well 5S	dry	dry	dry	****	230.92	dry	dry	dry
Well 5VS	dry	dry	dry	****	dry	dry	dry	dry
Well 6S	dry	dry	dry	****	230.72	dry	dry	dry
Well 7S	230.56	230.27	dry	***	frozen	230.64	dry	dry
Well 8S	dry	dry	dry	***	frozen	dry	dry	dry
Well 8VS	dry	dry	dry	***	dry	dry	dry	dry
Well 9S	230.19	230.27	frozen	***	231.07	230.79	230.57	230.34
Well 10S	230.55	230.43	230.58	***	frozen	230.21	230.61	230.38
Gauge A	229.50	229.51	frozen	****	***	230.42	229.87	229.79
Gauge D	**	**	**	**	**	**	**	**

Table D1 Water-Level Elevations *(continued)*

	Water-Level Elevations (in m referenced to NAVD, 1988)							
Date	05/05/05	05/18/05	06/02/05	07/01/05	08/04/05	09/08/05	10/06/05	11/09/05
Well 1S	dry	dry	dry	dry	dry	dry	dry	dry
Well 1SR	**	**	**	**	**	**	**	**
Well 1L	230.50	230.47	230.30	229.80	229.26	229.01	228.88	228.81
Well 2S	230.27	dry	dry	dry	dry	dry	dry	dry
Well 2VS	dry	dry	dry	dry	dry	dry	dry	dry
Well 3S	dry	dry	dry	dry	dry	dry	dry	dry
Well 4S	dry	dry	dry	dry	dry	dry	dry	dry
Well 5S	dry	dry	dry	dry	dry	dry	dry	dry
Well 5VS	dry	dry	dry	dry	dry	dry	dry	dry
Well 6S	dry	dry	dry	dry	dry	dry	dry	dry
Well 7S	dry	dry	dry	dry	dry	dry	dry	dry
Well 8S	dry	dry	dry	dry	dry	dry	dry	dry
Well 8VS	dry	dry	dry	dry	dry	dry	dry	dry
Well 9S	230.03	229.95	dry	dry	dry	dry	dry	dry
Well 10S	230.14	230.08	dry	dry	dry	dry	dry	dry
Gauge A	229.70	229.63	229.51	dry	dry	dry	dry	dry
Gauge D	**	**	**	**	**	**	dry	dry

*	no measurement	S	indicates soil-zone monitoring well
**	not yet installed	L	indicates lower monitoring well
***	frozen and flooded	VS	indicates very shallow monitoring well
****	inaccessible due to flooding	R	indicates replacement well

APPENDIX D Water-Level Elevations and Depths to Water Tables

Table D1 Water-Level Elevations *(continued)*

	Water-Level Elevations (in m referenced to NAVD, 1988)							
Date	12/07/05	01/11/06	02/08/06	03/08/06	04/12/06	04/21/06	04/26/06	05/17/06
Well 1S	dry	dry	damaged	damaged	damaged	damaged	damaged	damaged
Well 1SR	**	**	**	**	dry	231.09	230.94	231.00
Well 1L	dry	dry	230.60	*	230.94	231.12	230.94	231.08
Well 2S	dry	dry	dry	*	230.51	230.93	230.87	230.78
Well 2VS	dry	dry	dry	*	230.51	230.93	230.87	230.78
Well 3S	dry	dry	dry	*	dry	230.91	230.79	230.70
Well 4S	dry	dry	dry	*	dry	dry	dry	dry
Well 5S	dry	dry	dry	*	dry	230.91	dry	dry
Well 5VS	dry	dry	dry	*	dry	dry	dry	dry
Well 6S	dry	dry	dry	*	dry	230.82	dry	dry
Well 7S	dry	dry	dry	*	dry	230.85	230.60	230.54
Well 8S	dry	dry	dry	*	dry	230.92	dry	dry
Well 8VS	dry	dry	dry	*	dry	230.92	dry	dry
Well 9S	dry	229.74	229.89	*	230.60	230.72	230.66	230.65
Well 10S	dry	230.25	230.30	*	230.60	230.72	230.67	230.66
Gauge A	dry	dry	dry	dry	229.38	flooded	230.80	229.83
Gauge D	dry	dry	dry	dry	230.59	230.70	230.65	230.63

*	no measurement	S	indicates soil-zone monitoring well
**	not yet installed	L	indicates lower monitoring well
***	frozen and flooded	VS	indicates very shallow monitoring well
****	inaccessible due to flooding	R	indicates replacement well

APPENDIX D Water-Level Elevations and Depths to Water Tables

Table D1 Water-Level Elevations *(continued)*

	Water-Level Elevations (in m referenced to NAVD, 1988)						
Date	05/31/06	07/06/06	08/02/06	09/05/06	10/08/06	11/01/06	12/06/06
Well 1S	damaged	damaged	damaged	damaged	damaged	damaged	damaged
Well 1SR	231.04	dry	dry	dry	dry	dry	230.94
Well 1L	231.04	230.54	230.54	230.59	230.32	230.78	231.02
Well 2S	230.34	dry	dry	dry	dry	230.18	frozen
Well 2VS	dry	dry	dry	dry	dry	dry	frozen
Well 3S	dry	dry	dry	dry	dry	dry	230.59
Well 4S	dry	dry	dry	dry	dry	dry	dry
Well 5S	dry	dry	dry	dry	dry	dry	dry
Well 5VS	dry	dry	dry	dry	damaged	damaged	damaged
Well 6S	dry	dry	dry	dry	dry	dry	dry
Well 7S	230.48	dry	dry	230.40	dry	dry	frozen
Well 8S	dry	dry	dry	dry	dry	dry	dry
Well 8VS	dry	dry	dry	dry	dry	dry	dry
Well 9S	230.54	230.01	229.98	234.41	dry	230.26	frozen
Well 10S	230.61	230.04	230.10	230.62	dry	230.50	frozen
Gauge A	229.79	229.65	damaged	damaged	damaged	damaged	damaged
Gauge AR	**	**	**	**	dry	dry	frozen
Gauge D	230.51	dry	dry	dry	dry	dry	frozen

*	no measurement	S	indicates soil-zone monitoring well
**	not yet installed	L	indicates lower monitoring well
***	frozen and flooded	VS	indicates very shallow monitoring well
****	inaccessible due to flooding	R	indicates replacement well

APPENDIX D Water-Level Elevations and Depths to Water Tables

Table D2 Depths to Water

	Depths to Water (in m referenced to land surface)							
Date	01/06/04	02/04/04	03/03/04	04/08/04	04/20/04	04/27/04	04/28/04	05/04/04
Well 1S	dry	dry	dry	0.57	dry	*	0.54	dry
Well 1SR	**	**	**	**	**	**	**	**
Well 1L	0.90	1.26	0.80	1.08	0.84	*	0.55	0.75
Well 2S	dry	dry	**-0.01**	**-0.14**	**0.03**	*	**-0.09**	**0.05**
Well 2VS	dry	dry	**-0.01**	**-0.14**	**0.03**	*	**-0.09**	**0.04**
Well 3S	dry	dry	0.53	0.48	0.66	*	0.49	0.68
Well 4S	dry	dry	dry	dry	dry	*	dry	dry
Well 5S	dry	dry	dry	dry	dry	dry	*	dry
Well 5VS	dry	dry	dry	dry	dry	dry	*	dry
Well 6S	dry	dry	0.69	dry	dry	dry	*	dry
Well 7S	dry	dry	0.45	0.53	dry	0.35	*	0.58
Well 8S	dry	dry	0.49	dry	dry	dry	*	dry
Well 8VS	dry	dry	dry	dry	dry	dry	*	dry
Well 9S	**0.21**	dry	**-0.10**	**-0.07**	**-0.01**	**-0.13**	*	**-0.08**
Well 10S	0.39	dry	**0.04**	**0.08**	**0.09**	**0.07**	*	**0.16**

Table D2 Depths to Water *(continued)*

	Depths to Water (in m referenced to land surface)							
Date	05/18/04	05/27/04	06/03/04	06/09/04	06/15/04	08/05/04	09/09/04	10/06/04
Well 1S	**0.25**	**-0.49**	**-0.16**	**0.21**	**0.17**	0.59	0.64	dry
Well 1SR	**	**	**	**	**	**	**	**
Well 1L	0.33	**-0.43**	**-0.23**	**0.23**	**0.19**	0.58	1.04	1.53
Well 2S	**0.16**	**flooded**	**flooded**	**-0.21**	**-0.31**	**0.30**	dry	dry
Well 2VS	**0.16**	**flooded**	**flooded**	**-0.22**	**-0.31**	**0.28**	dry	dry
Well 3S	0.45	**flooded**	**-0.47**	**0.25**	**0.20**	0.64	dry	dry
Well 4S	dry	**flooded**	**-0.24**	0.40	0.35	dry	dry	dry
Well 5S	dry	**flooded**	**-0.32**	**0.10**	**0.17**	dry	dry	dry
Well 5VS	dry	**flooded**	**-0.31**	**0.08**	**0.16**	dry	dry	dry
Well 6S	dry	**flooded**	**-0.57**	**0.06**	**0.01**	dry	dry	dry
Well 7S	**0.25**	**flooded**	**-0.74**	**0.01**	**-0.08**	0.35	dry	dry
Well 8S	dry	**flooded**	**-0.59**	**-0.03**	**-0.03**	dry	dry	dry
Well 8VS	dry	**flooded**	**flooded**	**-0.04**	**-0.03**	dry	dry	dry
Well 9S	**-0.10**	**flooded**	**flooded**	**-0.26**	**-0.50**	*	dry	dry
Well 10S	**0.04**	**flooded**	**flooded**	**-0.06**	**-0.20**	**0.07**	dry	dry

* no measurement
** not yet installed
*** frozen and flooded
**** inaccessible due to flooding

– indicates water above land surface
S indicates soil-zone monitoring well
L indicates lower monitoring well
VS indicates very shallow monitoring well
R indicates replacement well
bold values less than or equal to 0.30 m

APPENDIX D Water-Level Elevations and Depths to Water Tables

Table D2 Depths to Water *(continued)*

	Depths to Water (in m referenced to land surface)							
Date	11/05/04	12/03/04	01/12/05	02/10/05	03/09/05	03/29/05	04/13/05	04/21/05
Well 1S	0.60	dry	dry	**-0.03**	**0.27**	0.54	dry	dry
Well 1SR	**	**	**	**	**	**	**	**
Well 1L	0.59	0.66	0.89	**0.16**	frozen	0.42	0.80	0.93
Well 2S	dry	dry	**0.27**	***	frozen	**-0.11**	**0.00**	**0.18**
Well 2VS	dry	dry	**0.27**	***	frozen	**-0.13**	**-0.02**	**0.17**
Well 3S	dry	dry	dry	****	0.35	0.48	0.52	dry
Well 4S	dry	dry	dry	****	dry	dry	dry	dry
Well 5S	dry	dry	dry	****	0.46	dry	dry	dry
Well 5VS	dry	dry	dry	****	dry	dry	dry	dry
Well 6S	dry	dry	dry	****	0.39	dry	dry	dry
Well 7S	0.39	0.68	dry	***	frozen	0.31	dry	dry
Well 8S	dry	dry	dry	***	frozen	dry	dry	dry
Well 8VS	dry	dry	dry	***	dry	dry	dry	dry
Well 9S	0.33	**0.25**	frozen	***	**-0.55**	**-0.27**	**-0.03**	**0.19**
Well 10S	**0.18**	**0.29**	**0.14**	***	frozen	0.51	**0.10**	0.34

Table D2 Depths to Water *(continued)*

	Depths to Water (in m referenced to land surface)							
Date	05/05/05	05/18/05	06/02/05	07/01/05	08/04/05	09/08/05	10/06/05	11/09/05
Well 1S	dry	dry	dry	dry	dry	dry	dry	dry
Well 1SR	**	**	**	**	**	**	**	**
Well 1L	1.05	1.07	1.24	1.74	2.28	2.54	2.66	2.73
Well 2S	0.47	dry	dry	dry	dry	dry	dry	dry
Well 2VS	dry	dry	dry	dry	dry	dry	dry	dry
Well 3S	dry	dry	dry	dry	dry	dry	dry	dry
Well 4S	dry	dry	dry	dry	dry	dry	dry	dry
Well 5S	dry	dry	dry	dry	dry	dry	dry	dry
Well 5VS	dry	dry	dry	dry	dry	dry	dry	dry
Well 6S	dry	dry	dry	dry	dry	dry	dry	dry
Well 7S	dry	dry	dry	dry	dry	dry	dry	dry
Well 8S	dry	dry	dry	dry	dry	dry	dry	dry
Well 8VS	dry	dry	dry	dry	dry	dry	dry	dry
Well 9S	0.50	0.59	dry	dry	dry	dry	dry	dry
Well 10S	0.58	0.64	dry	dry	dry	dry	dry	dry

* no measurement
** not yet installed
*** frozen and flooded
**** inaccessible due to flooding

– indicates water above land surface
S indicates soil-zone monitoring well
L indicates lower monitoring well
VS indicates very shallow monitoring well
R indicates replacement well
bold values less than or equal to 0.30 m

APPENDIX D Water-Level Elevations and Depths to Water Tables

Table D2 Depths to Water *(continued)*

	Depths to Water (in m referenced to land surface)							
Date	12/07/05	01/11/06	02/08/06	03/08/06	04/12/06	04/21/06	04/26/06	05/17/06
Well 1S	dry	dry	damaged	damaged	damaged	damaged	damaged	damaged
Well 1SR	**	**	**	**	dry	0.50	0.65	0.59
Well 1L	dry	dry	0.95	*	0.60	0.43	0.60	0.46
Well 2S	dry	dry	dry	*	**0.23**	**-0.19**	**-0.13**	**-0.04**
Well 2VS	dry	dry	dry	*	**0.23**	**-0.19**	**-0.13**	**-0.04**
Well 3S	dry	dry	dry	*	dry	0.31	0.43	0.52
Well 4S	dry	dry	dry	*	dry	dry	dry	dry
Well 5S	dry	dry	dry	*	dry	0.48	dry	dry
Well 5VS	dry	dry	dry	*	dry	dry	dry	dry
Well 6S	dry	dry	dry	*	dry	**0.29**	dry	dry
Well 7S	dry	dry	dry	*	dry	**0.10**	0.35	0.41
Well 8S	dry	dry	dry	*	dry	**0.17**	dry	dry
Well 8VS	dry	dry	dry	*	dry	**0.17**	dry	dry
Well 9S	dry	0.80	0.65	*	**-0.07**	**-0.19**	**-0.13**	**-0.11**
Well 10S	dry	0.47	0.42	*	**0.12**	**0.00**	**0.04**	**0.06**

Table D2 Depths to Water *(continued)*

	Depths to Water (in m referenced to land surface)						
Date	05/31/06	07/06/06	08/02/06	09/05/06	10/08/06	11/01/06	12/06/06
Well 1S	damaged	damaged	damaged	damaged	damaged	damaged	damaged
Well 1SR	0.54	dry	dry	dry	dry	dry	0.65
Well 1L	0.50	1.05	1.05	1.00	1.27	0.81	0.57
Well 2S	0.40	dry	dry	dry	dry	0.54	frozen
Well 2VS	dry	dry	dry	dry	dry	dry	frozen
Well 3S	dry	dry	dry	dry	dry	dry	0.62
Well 4S	dry	dry	dry	dry	dry	dry	dry
Well 5S	dry	dry	dry	dry	dry	dry	dry
Well 5VS	dry	dry	dry	dry	damaged	damaged	damaged
Well 6S	dry	dry	dry	dry	dry	dry	dry
Well 7S	0.47	dry	dry	0.56	dry	dry	frozen
Well 8S	dry	dry	dry	dry	dry	dry	dry
Well 8VS	dry	dry	dry	dry	dry	dry	dry
Well 9S	**-0.01**	0.55	0.57	**0.14**	dry	**0.30**	frozen
Well 10S	**0.11**	0.67	0.61	**0.09**	dry	**0.21**	frozen

* no measurement
** not yet installed
*** frozen and flooded
**** inaccessible due to flooding

– indicates water above land surface
S indicates soil-zone monitoring well
L indicates lower monitoring well
VS indicates very shallow monitoring well
R indicates replacement well
bold values less than or equal to 0.30 m

APPENDIX E Precipitation Data

Table E1 Monthly and annual normal precipitation totals recorded at the Freeport, Illinois Waste Water Treatment Plant weather station number 113262. Normal and above- and below-normal thresholds are calculated from data collected during the 30-year period between 1971 and 2000 (NWCC 2006).

	Precipitation Totals (in inches)		
Month	**1971–2000 below normal threshold**	**1971–2000 normal**	**1971–2000 above normal threshold**
January	0.88	1.33	1.79
February	0.66	1.33	1.81
March	1.21	2.14	2.62
April	2.16	3.23	3.85
May	2.39	3.96	4.91
June	2.89	4.46	5.83
July	2.44	3.57	4.37
August	2.74	4.11	4.64
September	1.99	3.67	4.94
October	1.31	2.58	3.11
November	1.68	2.69	3.39
December	1.08	1.72	2.12
Annual Total	31.79	34.80	38.70

APPENDIX E Precipitation Data

Table E2 Monthly and annual precipitation totals recorded at the Freeport, Illinois Waste Water Treatment Plant weather station number 113262 (MRCC 2006) and on site by ISGS.

	Precipitation Totals (in inches)					
	2004		**2005**		**2006**	
Month	**station**	**on site**	**station**	**on site**	**station**	**on site**
January	***0.56***	*	3.73	*	2.42	*
February	1.09	*	1.58	*	0.91	*
March	***4.26***	***2.67***	0.90	***0.56***	3.98	*
April	2.21	2.21	1.59	1.48	7.15	***5.15***
May	7.40	***4.54***	1.67	***1.96***	2.27	2.93
June	4.54	***5.96***	2.63	2.16	4.64	4.74
July	3.36	***3.49***	1.53	1.96	4.16	5.17
August	4.40	***2.35***	6.10	5.76	2.77	1.84
September	0.50	0.51	3.42	***0.00***	5.33	5.21
October	3.47	3.36	0.45	***0.22***	3.14	3.53
November	2.66	***0.83***	3.90	3.96	3.01	2.72
December	***0.74***	*	1.06	***0.11***	1.87	***0.06***
Total	35.19	25.92	28.56	18.17	41.65	31.35
Δ from average	+0.39		-6.24		+6.85	

* no data ***bold italic*** data incomplete

APPENDIX F Areas Exhibiting Wetland Hydrology During the Period of Record

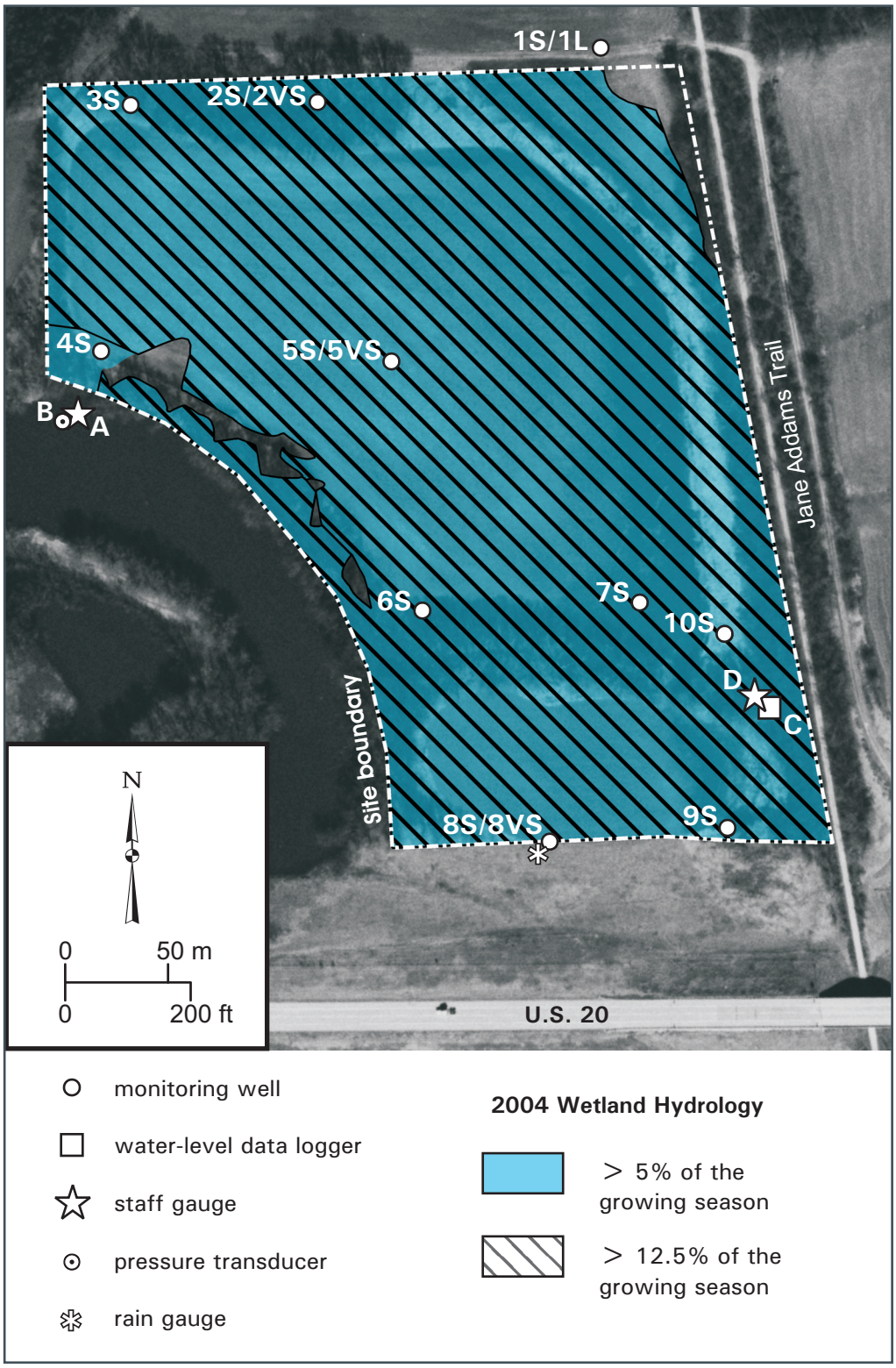

Figure F1 Areas exhibiting wetland hydrology in 2004 (map based on ISGS 2004).

APPENDIX F Areas Exhibiting Wetland Hydrology During the Period of Record

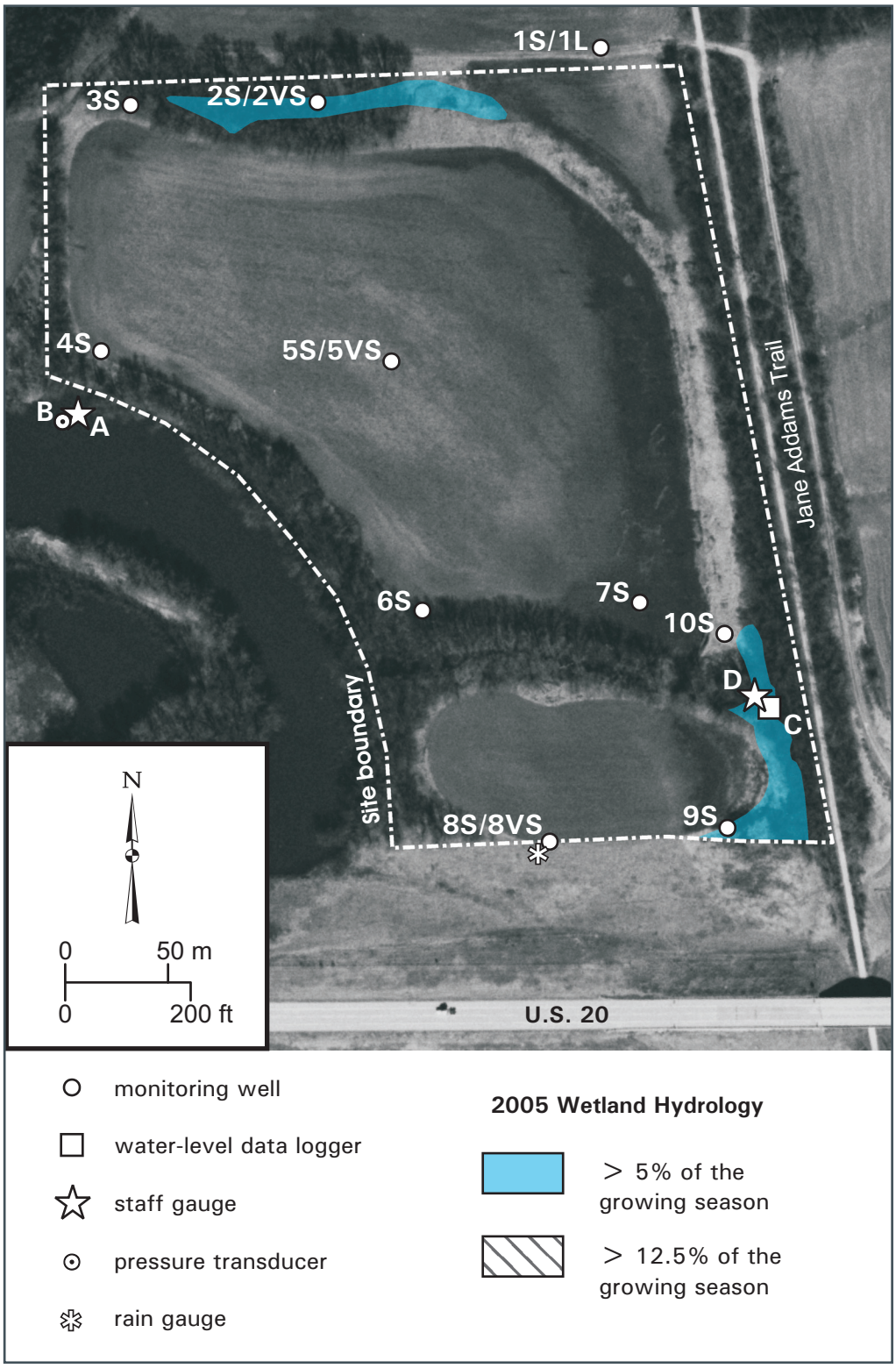

Figure F2 Areas exhibiting wetland hydrology in 2005 (map based on ISGS 2005a).

APPENDIX F Areas Exhibiting Wetland Hydrology During the Period of Record

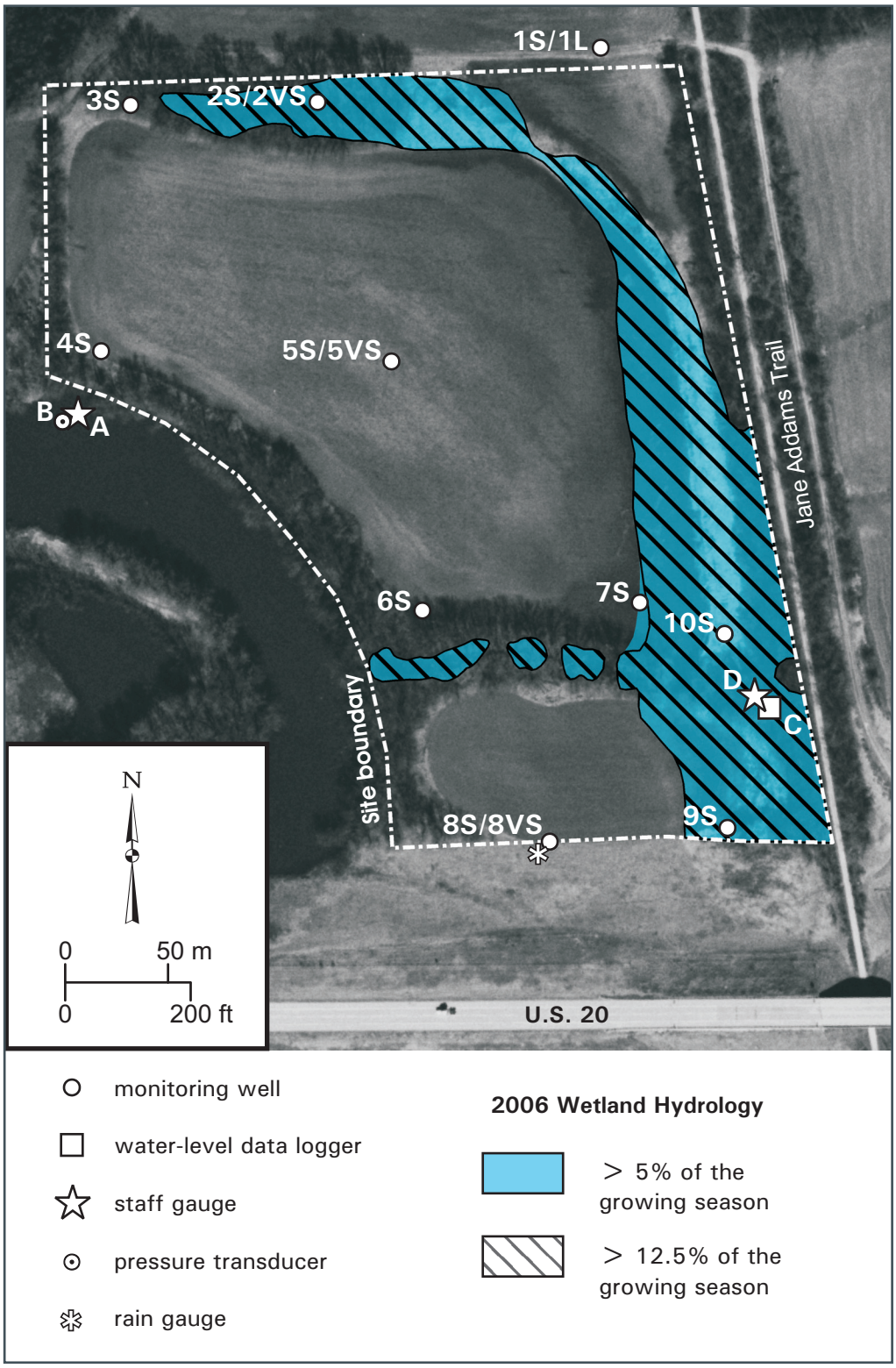

Figure F3 Areas exhibiting wetland hydrology in 2006 (map based on ISGS 2006).

APPENDIX G Water-Level Elevations During Pecatonica River Flood Events

Table G1 Water-Level Elevations (referenced to NAVD 1988) during the 2004 flood event

2004 Flood									
Water Level Elevation of Pecatonica River at Freeport, IL USGS Stream Gauge 05435500 (USACE 2006)				Water Level Elevation of Pecatonica River at Site 6W ISGS Gauge C				ISGS Gauge C minus USGS Gauge	
date	time	ft.	m	date	time	ft.	m	ft.	m
05/17/04	07:00	748.23	228.06	05/17/04	06:00	756.48	230.58	8.25	2.52
05/18/04	07:00	748.16	228.04	05/18/04	06:00	756.65	230.63	8.49	2.59
05/19/04	07:00	748.39	228.11	05/19/04	06:00	756.65	230.63	8.26	2.52
05/20/04	07:00	748.34	228.09	05/20/04	06:00	756.65	230.63	8.31	2.53
05/21/04	07:00	748.50	228.14	05/21/04	06:00	756.60	230.61	8.10	2.47
05/22/04	07:00	749.20	228.36	05/22/04	06:00	756.94	230.72	7.74	2.36
05/23/04	**07:00**	**753.56**	**229.68**	**05/23/04**	**06:00**	**757.18**	**230.79**	**3.62**	**1.10**
05/24/04	**07:00**	**754.74**	**230.04**	**05/24/04**	**06:00**	**758.85**	**231.30**	**4.11**	**1.25**
05/25/04	**07:00**	**755.18**	**230.18**	**05/25/04**	**06:00**	**759.31**	**231.44**	**4.13**	**1.26**
05/26/04	07:00	755.48	230.27	*05/26/04*	06:00	*759.82*	*231.59*	*4.34*	*1.32*
05/27/04	07:00	756.02	230.43	*05/27/04*	06:00	*759.83*	*231.60*	*3.81*	*1.16*
05/28/04	07:00	756.66	230.63	*05/28/04*	06:00	*759.84*	*231.60*	*3.18*	*0.97*
05/29/04	07:00	756.86	230.69	*05/29/04*	06:00	*759.85*	*231.60*	*2.99*	*0.91*
05/30/04	07:00	756.69	230.64	*05/30/04*	06:00	*759.85*	*231.60*	*3.16*	*0.96*
05/31/04	07:00	756.56	230.60	*05/31/04*	06:00	*759.85*	*231.60*	*3.29*	*1.00*
06/01/04	07:00	756.42	230.56	*06/01/04*	06:00	*759.84*	*231.60*	*3.42*	*1.04*
06/02/04	07:00	756.11	230.46	*06/02/04*	06:00	*759.84*	*231.60*	*3.73*	*1.14*
06/03/04	07:00	755.88	230.39	*06/03/04*	06:00	*759.84*	*231.60*	*3.96*	*1.21*
06/04/04	07:00	755.80	230.37	*06/04/04*	06:00	*759.85*	*231.60*	*4.05*	*1.23*
06/05/04	07:00	755.72	230.34	*06/05/04*	06:00	*759.85*	*231.60*	*4.13*	*1.26*
06/06/04	**07:00**	**755.58**	**230.30**	**06/06/04**	**06:00**	**759.62**	**231.53**	**4.04**	**1.23**
06/07/04	**07:00**	**755.25**	**230.20**	**06/07/04**	**06:00**	**758.89**	**231.31**	**3.64**	**1.11**
06/08/04	**07:00**	**754.68**	**230.03**	**06/08/04**	**06:00**	**758.09**	**231.07**	**3.41**	**1.04**
06/09/04	**07:00**	**753.95**	**229.80**	**06/09/04**	**06:00**	**757.28**	**230.82**	**3.33**	**1.02**
06/10/04	**07:00**	**753.12**	**229.55**	**06/10/04**	**06:00**	**756.89**	**230.70**	**3.77**	**1.15**
06/11/04	**07:00**	**753.18**	**229.57**	**06/11/04**	**06:00**	**757.06**	**230.75**	**3.88**	**1.18**
06/12/04	**07:00**	**753.85**	**229.77**	**06/12/04**	**06:00**	**757.59**	**230.91**	**3.74**	**1.14**
06/13/04	**07:00**	**754.66**	**230.02**	**06/13/04**	**06:00**	**758.41**	**231.16**	**3.75**	**1.14**
06/14/04	**07:00**	**754.59**	**230.00**	**06/14/04**	**06:00**	**758.27**	**231.12**	**3.69**	**1.12**
06/15/04	**07:00**	**754.39**	**229.94**	**06/15/04**	**06:00**	**758.03**	**231.05**	**3.64**	**1.11**
06/16/04	**07:00**	**754.06**	**229.84**	**06/16/04**	**06:00**	**757.63**	**230.93**	**3.57**	**1.09**
06/17/04	**07:00**	**754.54**	**229.98**	**06/17/04**	**06:00**	**759.16**	**231.39**	**4.62**	**1.41**
06/18/04	**07:00**	**755.08**	**230.15**	**06/18/04**	**06:00**	**759.04**	**231.36**	**3.96**	**1.21**
06/19/04	**07:00**	**755.04**	**230.14**	**06/19/04**	**06:00**	**758.73**	**231.26**	**3.69**	**1.13**
06/20/04	**07:00**	**754.84**	**230.07**	**06/20/04**	**06:00**	**758.54**	**231.20**	**3.70**	**1.13**
06/21/04	**07:00**	**754.57**	**229.99**	**06/21/04**	**06:00**	**758.16**	**231.09**	**3.59**	**1.09**
06/22/04	**07:00**	**754.34**	**229.92**	**06/22/04**	**06:00**	**757.86**	**230.99**	**3.52**	**1.07**
06/23/04	**07:00**	**753.94**	**229.80**	**06/23/04**	**06:00**	**757.37**	**230.85**	**3.43**	**1.04**
06/24/04	**07:00**	**753.41**	**229.64**	**06/24/04**	**06:00**	**756.94**	**230.72**	**3.53**	**1.08**
06/25/04	07:00	752.91	229.49	06/25/04	06:00	756.86	230.69	3.95	1.20
06/26/04	07:00	752.36	229.32	06/26/04	06:00	756.82	230.68	4.46	1.36
06/27/04	07:00	751.94	229.19	06/27/04	06:00	756.79	230.67	4.85	1.48
06/28/04	07:00	751.55	229.07	06/28/04	06:00	756.79	230.67	5.24	1.60
06/29/04	07:00	751.18	228.96	06/29/04	06:00	756.77	230.66	5.59	1.70
06/30/04	07:00	750.90	228.87	06/30/04	06:00	756.75	230.66	5.85	1.78

bold indicates when the Pecatonica River affects the site hydrology
italic indicates when ISGS Gauge C was overtopped, maximum recording height of logger

APPENDIX G Water-Level Elevations During Pecatonica River Flood Events

Table G2 Water-Level Elevations (referenced to NAVD 1988) during the 2006 flood event

2006 Flood									
Water Level Elevation of Pecatonica River at Freeport, IL USGS Stream Gauge 05435500 (USACE 2006)				Water Level Elevation of Pecatonica River at Site 6W ISGS Gauge C				ISGS Gauge C minus USGS Gauge	
date	time	ft.	m	date	time	ft.	m	ft.	m
04/12/06	7:00	747.51	227.84	04/12/06	7:00	756.73	230.65	9.22	2.81
04/13/06	7:00	747.42	227.81	04/13/06	7:00	756.65	230.63	9.23	2.81
04/14/06	7:00	747.45	227.82	04/14/06	7:00	756.68	230.64	9.24	2.82
04/15/06	7:00	747.38	227.80	04/15/06	7:00	756.61	230.61	9.23	2.81
04/16/06	7:00	747.28	227.77	04/16/06	7:00	756.68	230.64	9.40	2.86
04/17/06	**7:00**	**752.52**	**229.37**	**04/17/06**	**7:00**	**757.10**	**230.76**	**4.58**	**1.40**
04/18/06	**7:00**	**753.40**	**229.64**	**04/18/06**	**7:00**	**757.49**	**230.88**	**4.09**	**1.25**
04/19/06	**7:00**	**753.69**	**229.72**	**04/19/06**	**7:00**	**757.92**	**231.01**	**4.23**	**1.29**
04/20/06	**7:00**	**753.68**	**229.72**	**04/20/06**	**7:00**	**757.84**	**230.99**	**4.16**	**1.27**
04/21/06	**7:00**	**753.26**	**229.59**	**04/21/06**	**7:00**	**757.16**	**230.78**	**3.90**	**1.19**
04/22/06	7:00	752.12	229.25	04/22/06	7:00	756.98	230.73	4.86	1.48
04/23/06	7:00	750.86	228.86	04/23/06	7:00	756.90	230.70	6.04	1.84
04/24/06	7:00	750.01	228.60	04/24/06	7:00	756.88	230.70	6.87	2.09
04/25/06	7:00	749.45	228.43	04/25/06	7:00	756.91	230.71	7.46	2.27
04/26/06	7:00	749.08	228.32	04/26/06	7:00	756.83	230.68	7.75	2.36
04/27/06	7:00	748.78	228.23	04/27/06	7:00	756.81	230.68	8.03	2.45
04/28/06	7:00	748.51	228.15	04/28/06	7:00	756.78	230.67	8.27	2.52
04/29/06	7:00	748.25	228.07	04/29/06	7:00	756.79	230.67	8.54	2.60

bold indicates when the Pecatonica River affects the site hydrology

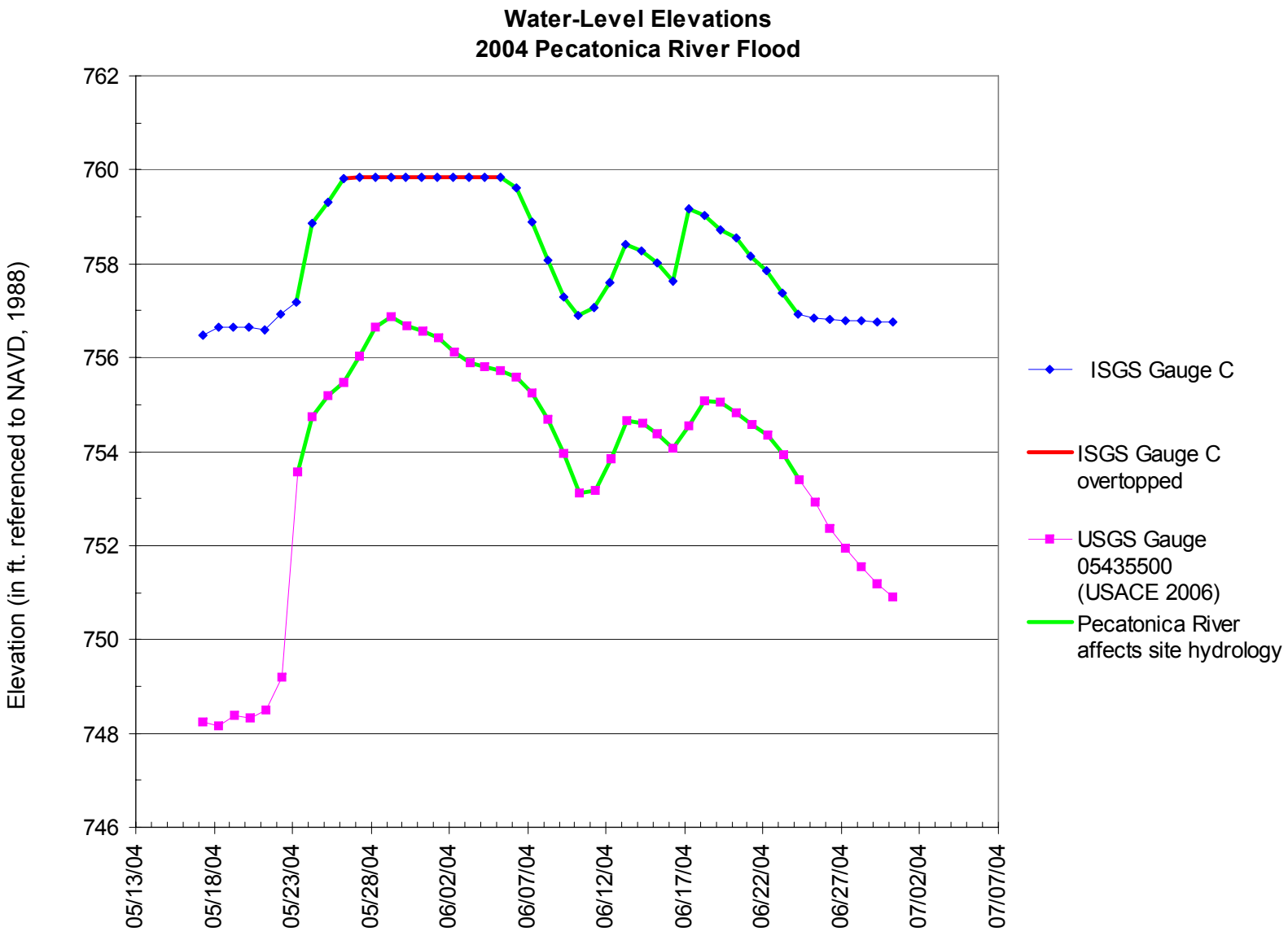

Figure G1 Water-level elevations at stage gauges during a flood in 2004.

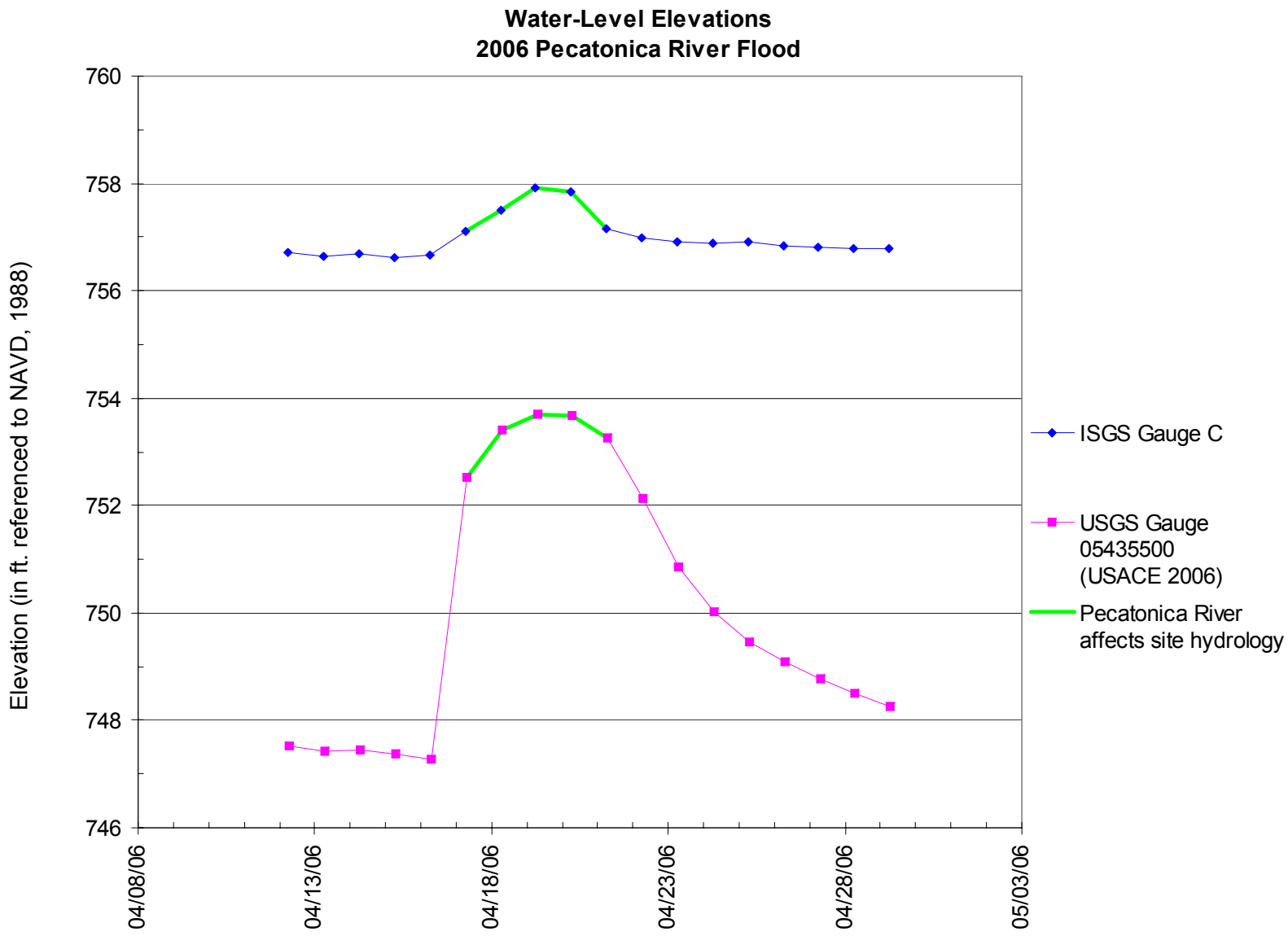

Figure G2 Water-level elevations at stage gauges during a flood in 2006.

APPENDIX H Flood History Analysis

Table H Pecatonica River at the West Freeport Bypass Site 6W, based on comparison of ISGS Gauge C to USGS Stream Gauge 05435500 (USACE 2006).

Year	Dates water level > 757.00 ft[1]	Consecutive days water level > 757.00 ft[1]	Flood during growing season?[2]	5% wetland hydrology criteria[3] satisfied?	12.5% wetland hydrology criteria[4] satisfied?	Consecutive days water level > 758.00 ft[5]
1985*	11/20 - 11/22	3	no	no	no	0
1986	3/11 - 4/2	23	no	no	no	21
	5/19	1	yes	no	no	0
	9/25 - 10/8	14	yes	yes	no	11
1987	-	0	-			0
1988	2/1 - 2/15	15	no	no	no	2
1989	3/12 - 3/18	7	no	no	no	6
1990	3/10 - 3/11	2	no	no	no	0
	3/15 - 3/17	3	no	no	no	3
	6/30 - 7/9	10	yes	yes	no	10
	8/20 - 8/28	9	yes	yes	no	8
1991	3/2 - 3/9	8	no	no	no	6
	3/28 - 3/31	4	no	no	no	0
	4/17 - 4/20	4	yes	no	no	0
	12/2	1	no	no	no	0
1992	-	0	-			0

[1] 757.00 ft = estimated elevation at which water begins to encroach onto site via the central ditch
[2] growing season at Site 6W begins on April 13, ends on October 13, and is 183 days long
[3] 5% of growing season is 9 days
[4] 12.5% of growing season is 23 days
[5] 758.00 ft = elevation of IDOT berm
* data incomplete - no data prior to 4/19/85
yes+ likely made 12.5% when combined with subsequent event

APPENDIX H Flood History Analysis

Table H Pecatonica River at the West Freeport Bypass Site 6W, based on comparison of ISGS Gauge C to USGS Stream Gauge 05435500 (USACE 2006). *(continued)*

Year	Dates water level > 757.00 ft[1]	Consecutive days water level > 757.00 ft[1]	Flood during growing season?[2]	5% wetland hydrology criteria[3] satisfied?	12.5% wetland hydrology criteria[4] satisfied?	Consecutive days water level > 758.00 ft[5]
1993	1/5 - 1/8	4	no	no	no	3
	1/23 - 1/26	4	no	no	no	2
	3/4 - 3/12	9	no	no	no	7
	3/24 - 4/12	20	no	no	no	17
	4/16 - 5/1	16	yes	yes	yes+	13
	5/3 - 5/14	12	yes	yes	no	7
	6/8 - 8/7	61	yes	yes	yes	58
	8/19 - 8/20	2	yes	no	no	0
	9/1	1	yes	no	no	0
	9/16 - 9/19	4	yes	no	no	0
	9/27 - 9/29	3	yes	no	no	0
1994	2/20 - 3/4	13	no	no	no	12
	3/6 - 3/13	8	no	no	no	7
1995	5/10 - 5/15	6	yes	no	no	2
1996	2/11 - 2/15	5	no	no	no	0
	5/29 - 6/3	6	yes	no	no	3
	6/7 - 6/13	7	yes	no	no	5
	6/18 - 6/28	11	yes	yes	no	9
	7/19 - 7/27	9	yes	yes	no	9
1997	2/20 - 3/7	16	no	no	no	16
	3/11 - 3/13	3	no	no	no	0
1998	4/1 - 4/12	12	no	no	no	12
	4/13 -4/25	13	yes	yes	no	2 and 3
	6/21 - 6/25	5	yes	no	no	0
	6/29 - 7/5	7	yes	no	no	4
	7/8 - 7/9	2	yes	no	no	0

[1] 757.00 ft = estimated elevation at which water begins to encroach onto site via the central ditch
[2] growing season at Site 6W begins on April 13, ends on October 13, and is 183 days long
[3] 5% of growing season is 9 days
[4] 12.5% of growing season is 23 days
[5] 758.00 ft = elevation of IDOT berm
* data incomplete - no data prior to 4/19/85
yes+ likely made 12.5% when combined with subsequent event

APPENDIX H Flood History Analysis

Table H Pecatonica River at the West Freeport Bypass Site 6W, based on comparison of ISGS Gauge C to USGS Stream Gauge 05435500 (USACE 2006). *(continued)*

Year	Dates water level > 757.00 ft[1]	Consecutive days water level > 757.00 ft[1]	Flood during growing season?[2]	5% wetland hydrology criteria[3] satisfied?	12.5% wetland hydrology criteria[4] satisfied?	Consecutive days water level > 758.00 ft[5]
1999	4/24 - 5/6	13	yes	yes	no	12
	5/19 - 5/29	11	yes	yes	no	9
	6/7 - 6/8	2	yes	no	no	0
	6/11 - 6/18	8	yes	no	no	4
2000	2/26 - 2/29	4	no	no	no	3
	6/2 - 6/23	22	yes	yes	yes	20
	6/25	1	yes	no	no	0
2001	2/10 - 2/13	4	no	no	no	1
	2/26 - 2/27	2	no	no	no	0
	3/16 - 3/18	3	no	no	no	0
	4/13	1	yes	no	no	0
2002	6/5 - 6/14	10	yes	yes	no	9
	8/22 - 8/26	5	yes	no	no	3
2003	-	0	-			0
2004	3/6 - 3/8	3	no	no	no	0
	5/23 - 6/9	18	yes	yes	yes+	16
	6/11 - 6/24	14	yes	yes	no	3 and 6
2005	2/8 - 2/22	15	no	no	no	15
	3/9 - 3/12	4	no	no	no	0
2006	4/18 - 4/21	4	yes	no	no	0

[1] 757.00 ft = estimated elevation at which water begins to encroach onto site via the central ditch
[2] growing season at Site 6W begins on April 13, ends on October 13, and is 183 days long
[3] 5% of growing season is 9 days
[4] 12.5% of growing season is 23 days
[5] 758.00 ft = elevation of IDOT berm
* data incomplete - no data prior to 4/19/85
yes+ likely made 12.5% when combined with subsequent event