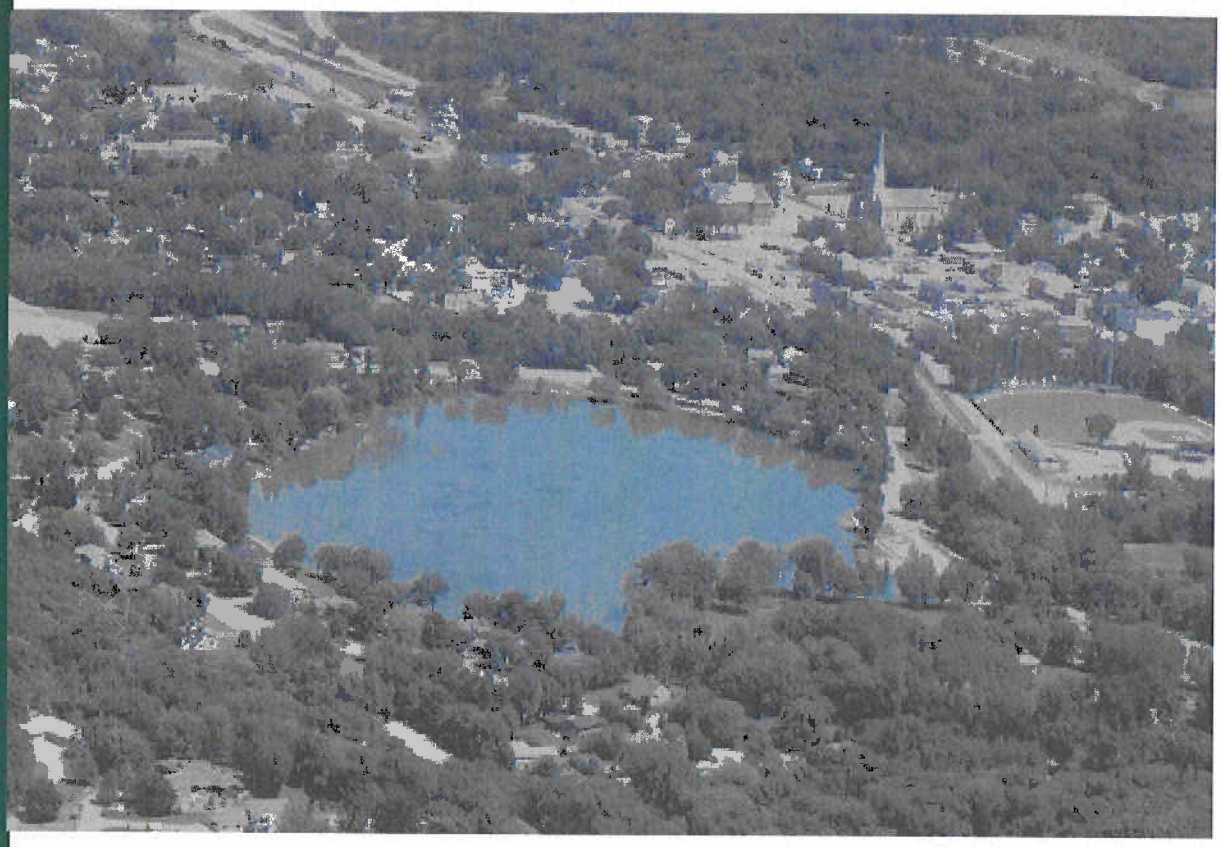

Appendix A
Surface Water Plan

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November 2007

Comprehensive Surface Water Management Plan

Jordan, Minnesota

Project No. T17.22216

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision, and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

By: _____

Carol J. Caron
Registration No. 25554

Date: November 7, 2007

BOLTON & MENK, INC.
CONSULTING ENGINEERS & SURVEYORS
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EXECUTIVE SUMMARY

The City of Jordan's Comprehensive Surface Water Management Plan (Plan) was prepared, in part, as an update to the previous Surface Water Comprehensive Plan (Adopted August 2006). The intent of this revised Plan is adoption in conjunction with the Scott Watershed Management Organization (Scott WMO) Comprehensive Water Resource Management Plan (CWRMP) and accompanying Rules, as amended, to meet the requirements of the Scott WMO regulations as well as applicable regulations specific to the State of Minnesota and Scott County. The City of Jordan (City) will utilize this Plan, the accompanying Rules, and existing and new Ordinances as the basis for managing wetlands, surface, storm, flood, and groundwater within the municipal boundary. The Plan incorporates hydrologic surface water modeling not only for the area within the existing municipal boundary but also for the area extending out to the City's ultimate growth boundary.

This Plan, accompanying Rules, and revised Ordinance, when adopted in conjunction with the Scott CWRMP and Rules, as amended, will provide the management goals, policies, and objectives the City will implement to protect, improve, and preserve wetlands, surface, storm, flood, and groundwater resources within the City. It will also address the topics required to meet Scott WMO criteria for a Local Water Plan for submittal, acceptance, and approval under Minnesota Statutes 103B and Minnesota Rule 8410.

The Plan has been prepared with cooperation of the City of Jordan Staff and the Jordan City Council to address the concern for the City's bluffs, wetlands, surface, storm, flood, and groundwater impacts resulting from continued development and growth both in and adjacent to the City of Jordan.

This Plan addresses various methods of ensuring that continued growth and development does not adversely affect the City's natural resources as well as the existing storm sewer, open channel, and regional pond networks. Acceptance of this Plan by the Scott WMO identifies the City of Jordan as the Local Government Unit (LGU) for matters related to protection, preservation, use, and regulation of surface and groundwater resources. In addition, this Plan includes a review of the surface water related costs associated with continued development in the City. It identifies a basis and a methodology for storm sewer infrastructure related charges associated with the corresponding development and provides a framework for managing the City's natural resources in relation to continued development and urban growth. The costs and regulatory efforts are proportional to the burdens that urban developments place on existing and future public infrastructure as well as the City's natural resources. Given this information, the findings and goals of this Plan are summarized as follows:

A. The majority of the existing storm sewer and regional detention basin networks serving the developed portion of the City is adequately sized to accommodate the design storm runoff from the existing service area given current land use data. Please refer to the hydrologic model included in Appendix B of this Plan for further information.

B. The existing storm sewer conveyance and regional detention systems do not have capacity to accommodate future development within the City's ultimate growth boundary.

C. The existing natural resources within the City must be preserved while accommodating the projected growth and development. The City's goal for wetland management is for "no net loss" of wetland area. The City anticipates working with Scott WMO and the Minnesota Pollution Control Agency

(MPCA) in developing the Total Maximum Daily Load (TMDL) Implementation Plan for Sand Creek. The City's ordinance and permitting process will ensure that development in the vicinity of the creek and bluffs will be completed in a responsible and safe manner. The groundwater resources in the City will be managed in conjunction with Minnesota Department of Health (MDH) through the Wellhead Protection Plan (WHPP).

D. Although there are numerous alternative methods of accommodating future development and growth, the City is advocating the continued design and construction of upstream regional and localized stormwater detention basins as the preferred BMPs for water quality and rate control associated with future development within the City's ultimate growth boundary.

E. Regional and localized detention basins are advocated because of a number of benefits. They are the most easily adapted to unforeseen changes in development design and layout. They can accommodate changes in the rate and location of development. Regional ponding also reduces the number of individual ponds constructed. This will reduce the number of ponds that will require future operation and maintenance support by City staff. The construction of upland regional detention basins will compensate for increased flow volumes and rates (due to continued development) to the existing downstream system. This approach has the additional benefit of decreased long-term maintenance and capitol costs associated with public infrastructure improvements.

F. The U.S. Army Corps of Engineers (USACE) has prepared flood management plan alternatives for Sand Creek. When their plan alternatives are accepted by the City Council, those recommendations and proposed improvements will be incorporated into the existing floodplain regulations. This Plan references the City floodplain regulations and compliance will be addressed during the Ordinance updating and codification process. Because the existing City storm sewer infrastructure network has been identified to be adequate for the area in the vicinity of Sand Creek, and because the USACE has already reported on this aspect of Jordan flood management, the primary focus of this plan is on the future development corridors within the City and extending out to the ultimate growth boundary.

G. Due to the amount of data contained in the Hydrologic modeling files (StormNET), only the summaries are included in Appendix B. Detailed information including proposed pond locations, surface areas, storage volumes, and estimated flow rates into and out of the proposed ponds for both the existing and developed conditions, etc. will be available upon request and modified as required to account for future development and to provide the required level of service.

H. An estimate of the costs associated with the design and construction of the proposed regional pond network has been included in this Plan. These estimated costs were used to formulate a City Storm Area Charge (SAC). The SAC is a per-acre fee that is collected from developers based on 2006 undeveloped land values. A multiplier has been developed to account for proposed land-use. Because of the extreme variability in land values and rapidly increasing mean value paid for undeveloped land in Scott County, the SAC will be reviewed and adjusted on an annual basis. This annual review will also account for changes in construction costs, materials costs, bonding costs, legal costs, etc.

I. The proposed land use type is the primary component of the SAC fee because higher density land use types, with more impervious area, create more stormwater runoff. The three identified land use rate categories are: 1) Single Family Residential, 2) High Density Residential, and 3)

Commercial/Industrial.

J. This Plan is a document-in-progress and will be amended as required. Annually, as development occurs, the hydrologic model will be reviewed and modified to account for the differences between the actual (developed) and the modeled hydrologic conditions. It is anticipated that, as development layouts are submitted for review, the proposed storm sewer and detention pond improvements can be temporarily entered into the hydrologic model and analyzed for possible adverse effects on the area hydrology. If accepted and constructed, these improvements will then be permanently entered into the comprehensive hydraulic and hydrologic model as an existing condition.

K. The goal of this Plan is to provide and compile information relative to the current surface water planning needs, to protect the natural resources with in the municipal boundary, and to some extent propose and predict sustainable methods of accommodating continued growth and development within the ultimate growth boundary. This Plan will also ensure that future development is in compliance with the associated Rules, for the management of urban stormwater and protection of natural resources within the City.

1. PURPOSE

This Plan, in conjunction with the Scott WMO Comprehensive Water Resource Management Plan satisfies the requirements of MN Statute 103B.231-Surface Water Planning and MN Rule-8410.0100 to 8410.0180 – Local Water Management.

The overall purpose of this plan is to protect, preserve, and manage surface and groundwater systems within the City while accommodating rapid municipal, residential, commercial development, and agricultural activity. This Plan outlines sustainable and equitable means to effectively reach this goal. This Plan provides goals, policies, guidance, and specific standards for decision-makers, residents, landowners, and City personnel.

This submittal is a culmination of many months of research, mapping, land use analysis, planning, and hydrologic and hydraulic design. The end product is a comprehensive design tool that may be used by City staff for managing growth and planning and for future public infrastructure construction. Approximately 250 City subwatersheds were identified and modeled as part of this Plan and are available to City staff for reference during future development plan reviews. This Plan is not a "stand-alone" document and should only be utilized in conjunction with the Scott WMO Comprehensive Water Resource Management Plan.

This Plan represents a technical report and includes a large amount of detailed hydrologic, hydraulic, and design data. The accompanying overall City map (Figure No. 5) identifies six major watershed boundaries and major water bodies while the various Watershed District maps (Figure Nos. 6 - 9) identify minor subwatersheds, proposed storm sewer improvements, and regional and private development detention basin locations. These maps serve as an overview of the entire system and required municipal improvements.

Because of the difficulty in showing such a large amount of detail on small maps of the City, one larger scale map has been developed and included in Appendix A. This map shows the extent of the ultimate growth boundary for development including major watershed boundaries, interior subwatersheds and other topographic data utilized to develop the hydrologic model in greater detail.

The maps identify the present land use conditions and the proposed drainage conditions required to accommodate anticipated development within the City defined ultimate growth boundary. A summary of the hydrologic modeling data for the 2-, 10- and 100-year, 24-hour storm events is included in Appendix B.

2. WATER RESOURCE MANAGEMENT RESPONSIBILITIES AND RELATED REGULATORY RESPONSIBILITIES

The City of Jordan (City) will be assuming regulatory authority for land use development while recognizing the role of other local, state, and federal entities. Several entities will have administrative responsibilities within the planning area. For a local water management effort to be successful, each entity's commitment and role must be clearly understood. The agencies currently having some level of administration responsibility include the City, Scott Watershed Management Organization (WMO), Scott County, Minnesota Department of Natural Resources (Mn/DNR), Minnesota Pollution Control Agency (MPCA), the U.S. Army Corps of Engineers (USACE), the Minnesota Board of Water and Soil Resources (BWSR), and Scott County Soil and Water Conservation District (Scott SWCD). It has been recognized that regulatory agencies can achieve common goals by joining together to combine already scarce financial and regulatory resources.

Intergovernmental cooperation is an excellent tool to address natural resource protection. This is due to the fact that natural resources do not recognize political boundaries and are often located across local, state, and/or federal regulatory boundaries. The City is ultimately responsible for planning, permitting, construction, maintenance, and other aspects related to the City's surface water and ground water infrastructure and will work in conjunction with all state and federal agencies to achieve its goal of sound and sustainable resource management. The City anticipates and looks forward to cooperating with intergovernmental agencies in the future if the need should arise.

The major task of administering this Plan will be in the permitting process. It is the intent of the City to assume the role of permitting for all land alteration, thereby enforcing the policies and standards of this Plan. The City's existing permit procedures include surface water management elements outlined in this Plan and the current Subdivision Ordinance (Chapter 12). Surface water management elements will be reviewed concurrently as all other land-use and zoning permits are reviewed. The reviewed surface water elements will meet the requirements of existing City Ordinance, design standards of this plan, and the associated Rules.

To ensure conformance to this Plan and the associated Rules, the City's preliminary and final platting, and site plan approval process will require additional detailed information. Erosion control, water quality, and other pertinent information such as stormwater rate and volume control calculation, regarding local plan standards are among the elements that will be addressed on preliminary and final plans and/or site plan approval. Conditional approvals by the Planning Commission and/or City Council must require the incorporation of conditional elements into the submitted plan to ensure compliance.

The revised plan will then be re-distributed to City staff to confirm the inclusion of the provisions under which the plans were approved. The Building Permit issuance process can be the check-point for staff to review final plans for compliance with this Plan and associated Rules while holding the condition of building permit issuance as the incentive. Engineering staff will have a sign-off procedure prior to permit issuance.

The City's administrative responsibilities include, but are not limited to the following:

- Comprehensive Plan update(s);
- Land use regulation;
- Ordinance review and amendment;

- Local plat review and amendments;
- Building Permits;
- Wetland Management as LGU;
- Sediment and erosion control (Ordinance);
- Groundwater - wells;
- Participation and cooperation with the programs of the Scott WMO, Minnesota DNR, and Scott County;
- Hydrologic model update with comprehensive plan changes;
- Financing Alternatives;
- Capital improvements; and
- Conveyance system and detention pond maintenance;

Scott WMO responsibilities and authorities may include but are not limited to the following:

- Monitoring;
- Establishing land use or ordinance requirements;
- Local plan review and approval;
- Administering a permit program;
- Projects of regional significance; and
- Verification of Plan implementation.

Metropolitan Council: Comprehensive Plan Amendment
Metropolitan Council has a regional review authority regarding surface water management including:

- Local Plan review; and
- Regional controls related to point and nonpoint source pollution.

This Plan and all subsequent amendments will become part of the City's Comprehensive Plan (adopted by reference), in accordance with Minnesota Statutes 103B.235, Subd. 3A and 473.859, Subd. 2 (Chapter 176, Laws of Minnesota 1995), as part of the adoption process for this Plan.

This Plan does not have to be re-submitted as a formal comprehensive plan amendment, subject to additional review, at a latter date. The adopted City Plan and associated Rules will satisfy Metropolitan Council's requirements and will be thereby recognized as an amendment to the City's Comprehensive Plan.

3. GIS COMPATIBILITY

Geographic Information System (GIS) is a computerized user-friendly mapping tool that has becoming commonplace in municipalities of all sizes across the nation. Purchase of this tool, by the City, would allow staff to view a computerized map and query various types of background information (metadata) stored either in a remote or a local database relative to a selected location on the map. The GIS program (ArcGIS) may then display all available information.

The migration of the hydraulic modeling data from the HydroCAD platform to StormNET aids in the comprehensiveness of the GIS/hydrologic package. StormNET functionality allows direct export of hydrologic and hydraulic information to a GIS format. City staff will be able to view culvert information including invert elevations, pipe material, and length. In addition, staff will have the capacity to review culvert and pipe capacity information based on desired storm event models.

Bolton & Menk, Inc. (BMI) has compiled this Plan, and the supporting data, in a format that will allow the City to take full advantage of the vast extent of publicly available GIS data (Scott County, MnDNR, BWSR, Federal Emergency Management Agency (FEMA), MetCouncil, Land Management Information Center (LMIC), etc). During the development of this plan, BMI utilized all applicable data and completed all Plan mapping in a format which allows for future use in a GIS system.

The GIS compatible maps included in the Plan are as follows:

1. Scott County Wetlands and Bluff Areas Map ..... Figure No. 1
2. Scott County Soils Map ..... Figure No. 2
3. General Land Use Map ..... Figure No. 3
4. Digital Aerial Photographic Map ..... Figure No. 4
5. Watershed Drainage District Map ..... Figure No. 5
6. Drainage District A & B Map ..... Figure No. 6
7. Drainage District C Map ..... Figure No. 7
8. Drainage District D Map ..... Figure No. 8
9. Drainage District E & F Map ..... Figure No. 9
10. DNR Sand Creek Erosion Inventory Map ..... Figure No. 10

Reduce-size maps (11" x 17") are included in Appendix A of this report. Full-size maps are available upon request from the City Planning Department.

4. LAND AND WATER RESOURCE INVENTORY

The accompanying Scott WMO Comprehensive Water Resource Management Plan – Section 1, Land and Water Resource Inventory, as amended, contains the most current and comprehensive resource inventory for the City. Please reference Section 1, page 9, of the Scott WMO Comprehensive Water Resource Management Plan for further information.

5. ESTABLISHMENT OF GOALS AND POLICIES

The primary goal of the City's Plan and associated Rules is to provide the framework for the management of all forms of surface water as development occurs both within and adjacent to the City in the area defined as the City's ultimate growth boundary. This Plan provides clear guidance on how the City will manage surface water both in terms of quantity and quality and preserving existing surface drainage patterns. The goals and policies stated in this Plan are complimentary to the goals and policies stated in the Scott WMO CSWMP.

Much has changed since the City prepared its first SWMP. Since that time the city has seen a marked increase in residential and commercial development. Population growth, natural resource education, and increasing regulation of surface water at the State, County, and Federal levels necessitate that the City's surface water management goals evolve over time.

The goals and policies detailed in this Plan focus equally on future development and existing hydrology/drainage patterns and infrastructure. The City conducts construction plan reviews "as development occurs" as part of the preliminary plat submittal and approval process. This emphasis on future requirements ensures that future development augments the City's amenities rather than diminishes the complex environments that have been created by the City and its population.

GOAL 1: WATER QUANTITY

The purpose of this goal is to control flooding and minimize related public capital and maintenance expenditure necessary to control excessive volumes and rates of surface water runoff, in accordance with the Scott WMO CSWMP, as amended. Traditional surface water management deals with just one component of the hydrologic cycle; surface runoff. Large amounts of energy are directed towards alleviating significant negative impacts of surface runoff and flooding for the cultural, water, and natural resources.

The primary management strategy is shifting from detention in both existing natural and constructed basins, to Low Impact Development (LID) techniques and Integrated Management Practices (IMPs). These techniques emphasize reduction of runoff volume and on-site runoff control via infiltration and small volume-storage facilities to mimic predevelopment hydrology for smaller, more frequent rainfall events. This trend will help remedy the negative impacts of stormwater runoff on water quality. With increased value placed on natural wetlands, the number and extent to which wetlands can be used for water quality and runoff rate control is already in decline. The approach to sound water quantity management relates directly to water quality, wetland management, erosion control, and land development strategies. By comprehensively managing the quantity and quality of surface water runoff, the other goals of this Plan are more efficiently achieved.

Subject: Surface Water Runoff (Rate and Volume) Management
Purpose: Control post-development stormwater runoff
Goal: Control flooding, protect human life, protect public and private property, minimize related public capital and maintenance expenditures necessary to control excessive (post-development) volumes and rates of surface water runoff, and maintain or improve the downstream conveyance system, natural or man-made.

Water Quantity Policies

Policy 1.1: Utilize LID site design techniques where applicable, along with conventional constructed regional detention ponds for large, infrequent rainfall events. These design techniques will be relied upon to help mimic pre-development hydrology and to control downstream flooding. Pre-developed peak flow rates for the 2-yr, 10-yr, and 100-yr, 24-hour, storm events cannot be exceeded by new development.

Policy 1.2: Increases in the volume of runoff should be minimized by utilizing LID practices to control the runoff volume from the 0.5-inch rainfall event to existing levels. In areas where soils and site constraints are favorable and/or where sensitive downstream water bodies are present the City may require development to achieve zero runoff for the 0.5-inch rainfall event.

Policy 1.3: Where LID techniques are not feasible, the City will require regional detention areas to small, on-site ponds for larger (infrequent) storm event runoff rate and volume control. The BMP selection requirement will be based on the existing hydrologic model completed for the City (see Appendix B).

Policy 1.4: Emergency overflows or outlets for drainage systems are required and shall be provided to prevent flood damages and overtopping of constructed basins. The emergency outlets shall be a minimum of 1.5-feet below the Low Floor Elevation (LFE) of adjacent structures, stormwater basin berms, or other provisions designed to minimize flooding,

Policy 1.5: The minimum building elevation shall be set/designed to prevent flood damage from the established 100-year, 24-hour, storm event in accordance with established City Ordinances and the standards of this Plan, and associated Rules.

Policy 1.6: The City encourages the use of alternative landscape techniques and materials to reduce rates and volumes of stormwater runoff.

Policy 1.7: The City shall require stormwater ponds, natural or constructed wetlands, flood plains, and ditches to be located in outlots as part of the land development approval process.

The City of Jordan Subdivision Ordinance (Chapter 12) addresses the current water quantity requirements. When this Plan is adopted the Ordinance will be revised to incorporate and reflect the new policies, goals, and accompanying Rules.

GOAL 2: WATER QUALITY

The purpose of this goal is to achieve water quality standards in lakes, creeks, and wetlands consistent with the intended use and classification, in accordance with the Scott WMO CSWMP, as amended. Water quality is often directly related to the level of excess nutrients in the water body. While nutrients comprise only one category of substances that can affect water quality, excess nutrients, principally phosphorous, must be controlled to achieve the water quality goals of this Plan. Phosphorous is generally the limiting factor to plant growth. An increase in phosphorous will cause the plant species dominating the lakeshore, open water, or marsh, to shift in favor those plants that can best take advantage of the increased supply of the nutrient.

Controlling nutrients through housekeeping practices are an efficient way for City residents to make a difference. According to the Minneapolis Chain of Lakes Clean Water Partnership, many people do not realize that organic materials like leaves, grass clippings, fertilizers, pesticides, and pet waste can disrupt the fragile ecosystem of a lake or creek.

Leaves and grass clippings that make their way into lakes and creeks are doing more damage than fertilizers, pesticides, or motor oils, according to the Minneapolis Chain of Lakes Clean Water Partnership. Once in the lakes and creeks, these organic materials decay, and subsequently release nutrients. These excess nutrients increase algae growth, which inhibits the growth of other aquatic plants and animals. When algae die and decay, they exert a biological oxygen demand on the lake or waterbody, depleting available oxygen for fish. Algae growth due to nutrient loading can damage or even kill a lake's ecosystem.

Fertilizer application may be necessary for a healthy lawn, but the nutrients in fertilizer can be harmful to lakes, creeks, and wetlands. Excess nutrients from fertilizers run off lawns and ultimately discharge to area lakes, creeks, and wetlands. Effective January 1, 2005, in Minnesota, fertilizers containing phosphorous cannot be used on lawns. Refer to the Minnesota Department of Agriculture (www.mda.state.mn.us/appd/ace/phoslaw.htm) website for additional information. Applying the proper fertilizer, in the right amount, ensures a healthier lawn and healthier lakes, creeks, and wetlands.

Mill Pond, the only water body in the City, is currently not identified by the MPCA as a state impaired water. The MPCA has listed Sand Creek as a state impaired water in the 2006 Final Total Maximum Daily Load (TMDL) List of Impaired Waters and the Draft 2008 TMDL list. The TMDL represents the maximum amount of a pollutant that a water body can receive and still meet federal and state water quality standards. TMDL also refers to the process of allocating pollutant loadings among point and non-point sources.

Sand Creek has been listed for aquatic life under the invertebrate Index of Biotic Integrity (IBI) and turbidity and assigned a 5A classification in the 2006 TMDL List. The IBI is a regionally based index used to measure the integrity of rivers and streams, and to determine the level of their impairment. The IBI relies on multiple parameters based on fish community structure, and function, to evaluate a complex biotic system. The 5A classification indicates the listed water is impaired by one or more pollutant. Although a TMDL concentration is required, no study plan has been approved by the U.S. EPA at this time. The target start date of the TMDL study is 2006 with a projected completion date of 2010. The City looks forward to working with the MPCA and Scott WMO when a Implementation Plan for the TMDL listing of Sand Creek has been approved by the EPA.

The City has also reviewed the Sand Creek erosion identification efforts that were conducted by Scott SWCD in summer 2005. Identification, documentation, and survey are the initial steps required to understand the dynamic nature of Sand Creek and the possible impact the population may be having on it. Although all of the erosion sites were classified as slight by the Scott SWCD the City will continue to annually monitor these locations in an effort to better understand its effect on Sand Creek. We have included the Scott SWCD information in this Plan; please see Figure 10 in Appendix A, for further information.

Subject: Water quality in lakes, creeks, and wetlands.
Purpose: To protect and improve water quality.
Goal: Achieve water quality standards in lakes, creeks, and wetlands consistent with their intended use and established classification.

Water Quality Policies

Policy 2.1: Development that disturbs more than one acre, or creates more than one acre of additional impervious surface, shall demonstrate that phosphorus and Total Suspended Solids (TSS) reduction in discharge runoff meets National Urban Runoff Program (NURP) levels described in this Plan and the accompanying Rules.

Policy 2.2: Public road and utility projects that disturb greater than one acre must include temporary BMPs to control water quality; if more than one acre of additional impervious surface is created, the project shall include permanent water quality BMPs to meet the requirements of the State of Minnesota NPDES/SDS Permit, this Plan, and the accompanying Rules.

Policy 2.3: Proposed developments must identify all reasonable steps taken to avoid surface water quality impacts. They must also mitigate unavoidable impacts with appropriate BMPs to meet City erosion control Ordinance standards and to prevent water quality in receiving waters from falling below established standards including TMDLs.

Policy 2.4: The City shall supplement its regulatory approach with an education-based approach to achieve appropriate yard care measures. This will reduce nutrient loading to City lakes, creeks, and wetlands, and will reduce the impacts of domestic animal waste.

Policy 2.5: The City shall promote the reduction or minimization of hard surfaced areas, where applicable.

Policy 2.6: The City will balance protection of natural wetlands, based on Mn/RAM 3.0 wetland classification, and utilization of constructed wetlands to protect the water quality of other surface water resources (i.e., wetlands, lakes, creeks).

Policy 2.7: The City encourages the use of alternative landscape techniques and materials, and LID IMPs to reduce and mitigate water quality impacts. For its part the City will obtain usable data for road salt management and review storage practices for road salt.

Policy 2.8: The City will manage public properties in accordance with the appropriate BMPs. The City of Jordan Subdivision Ordinance (Chapter 12) addresses the current stormwater runoff rate control and water quality treatment requirements. When this Plan is adopted the Ordinance will be revised to incorporate and reflect the new policies, goals, and accompanying Rules.

GOAL 3: EROSION CONTROL

The purpose of this goal is to minimize soil erosion through increased education and enforcement, in accordance with the Scott WMO CSWMP, as amended. Water quality problems are frequently linked to high phosphorus concentrations. Phosphorus is often transported to surface water through soil erosion but can also be transported to surface waters by a variety of other mechanical and chemical mechanisms. Nevertheless, erosion control is an important factor in the effort to improve surface water quality. Soil erosion and sediment deposition can also decrease pond and drainage-way performance and create maintenance issues.

Ponds and drainage facilities may be impacted by erosion and sedimentation from a variety of sources including construction sites and winter street sanding. The coarse sediment accumulates in ditches and ponds where runoff velocities are low. When a sand delta appears at a storm sewer outfall it is a visible indication of the effectiveness of erosion and sediment control measures and road maintenance activities of the past winter. As the sediment builds up over time, it reduces the capacity of the drainage system and the pollutant removal capabilities of ponds by reducing storage volume below the outlet. This accumulation also reduces the infiltration rates for stormwater facilities that are designed to infiltrate thereby limiting the effective lifespan of the facilities. Extending the life of facilities involves source control and elimination of the fine-grained material that causes the problem. Regulatory actions will control a major portion of the sediment. Timely street maintenance and an effective sweeping program will also have a positive impact.

Creek and riverbank erosion occurs as a result of increasing peak flow-rates and sustained high flows. These issues can severely damage stream bank vegetation, cause bottom scour, and accelerate the erosion and deposition processes. The Scott SWCD has surveyed Sand Creek and identified areas currently experiencing localized erosion. The City will continue to monitor these locations and control the rates of discharge from developments in its efforts to provide adequate control. The City will consider opportunities to implement bioengineering practices and approaches to help stabilize the creek bank and reduce bank erosion along the Minnesota River where appropriate.

Subject: Erosion control
Purpose: To control erosion and sedimentation
Goal: Minimize soil erosion through increased education and enforcement

Erosion Control Policies

Policy 3.1: Surface Water Pollution Prevention Plans (SWPPP's) shall be reviewed and enforced by the City for all land disturbing activities exceeding the MPCA threshold requirements. These plans shall conform to the general criteria set forth by the City's erosion and sediment control Ordinance and applicable NPDES Construction Site Erosion Control Permits (MPCA Permit MN R100001).

Policy 3.2: The City will implement an erosion control ordinance to extend the effective life of water resource facilities and reduce and mitigate pollutant loading in to lakes, creeks, and wetlands.

Policy 3.3: The City will develop and adopt proactive measures such as education, incentives, and recognition of erosion control efforts to prevent soil erosion and encourage responsible site development.

Policy 3.4: Construction site inspection by the City must be completed prior to commencing earthwork activities to ensure the proper BMPs are in place and operational.

Policy 3.5: Horizontal, terrestrial buffer zones between fifty and twenty feet are required around existing wetlands based on the corresponding MnRAM rating. Stormwater ponds shall have a minimum 10-foot building setback. New development or redevelopment projects must provide the appropriate buffer zone around new and existing wetlands and are encouraged to provide 20-foot buffers around existing stormwater ponds. Buffers shall be maintained in a native vegetative state, to provide habitat for wildlife.

Policy 3.6: The City will maximize the use of bioengineering approaches whenever possible for all slope stabilization and permanent erosion control projects. This includes consideration of utilizing bioengineering approaches to reduce bank erosion along Sand Creek.

The City of Jordan Erosion Control Ordinance addresses the current erosion control requirements. When this Plan is adopted the Ordinance will be revised to incorporate and reflect the new policies, goals, and accompanying Rules.

GOAL 4: WETLANDS

The purpose of this goal is to maintain or increase the amount of wetland acreage, and increase the wetland functions and values within the City, in accordance with the Scott WMO CSWMP, as amended. The City is the LGU for the Wetland Conservation Act (WCA). The City has not completed a Comprehensive Wetland Management Plan. The City's wetland inventory is based on the wetlands in the National Wetland Inventory (NWI) and Scott County's records and most likely does not include all of the wetlands and aquatic resources within the City's ultimate growth boundary. The City does not have the resources to survey all of the wetlands at this time. Field delineation, Mn/RAM Classification, assessment of hydrology, identification of plant species, characterizations of soils, and restoration are generally completed and reviewed on an "as development occurs" basis. This approach places the financial burden for identification, delineation, and possible restoration on the land developer and has worked well for the City in the past.

The policies below will be used to achieve the City's wetland management goals. The strategies will apply to new development and redevelopment projects submitted to the City for review and approval. Any wetland habitat on property to be developed will be subject to the following management strategies, as well as the rules and requirements of the WCA and other City, State, and Federal regulations as applicable.

Proper implementation of creek, bluff, and wetland buffers in new developments is paramount. Without proper implementation of buffers; creek and wetland water temperatures increase, sediment deposition increases, creek and bluff bank erosion and collapse are more severe, and riparian habitats are destroyed.

Subject: Wetland Management
Purpose: To utilize, protect, preserve, and enhance existing natural wetlands.
Goal: Maintain or increase the amount of wetland acreage, and increase the wetland functions and values within the City, in accordance with the WCA, USACE, and Scott WMO CWRMP.

Wetland Policies

Policy 4.1: The City shall administer wetland protection and mitigation as the LGU for the WCA in accordance with the Minnesota WCA and the Scott WMO CWRMP Rules.

Policy 4.2: The artificial water level fluctuation (bounce) in wetlands resulting from stormwater runoff will be managed in accordance with the WCA and Scott WMO Rules and as stated in the accompanying Rules.

Policy 4.3: Where open water areas have been permitted to be excavated in wetlands for the purpose of creating habitat diversity, the excavation shall be done in conformance with City ordinance, DNR regulations, the Minnesota WCA, USACE, Scott SWCD, and the Scott WMO CWRMP rules and guidence.

Policy 4.4: The City will require the establishment of a vegetative buffer strip at the shoreline of wetlands between all adjacent property owners as prescribed in the Minnesota WCA and Scott WMO CWRMP Rules. Development or redevelopment of an area adjacent to a wetland will require the establishment of the appropriate buffer.

Policy 4.5: The City may utilize the available technical resources of outside agencies, such as the Minnesota DNR, USACE, Scott SWCD, the Board of Water and Soil Resources and/or the Scott WMO, for review of private developments and City-proposed projects that may affect wetland resources.

Policy 4.6: Developers must provide field delineation in accordance with applicable rules and regulations to determine the jurisdictional boundaries of wetlands, including a report of the results of the field delineation, detailing the methodology and findings of the delineation. A printed and electronic copy (.dwg) of the approved delineation boundary will be required to be submitted to the City.

Policy 4.7: Prior to any site development activities, the City will verify, through a wetland boundary delineation review, the location and extent of all wetlands present. The results of the wetland boundary delineation will be compared to the field delineation data provided by the developer.

Policy 4.8: Any review of a proposed wetland encroachment will first address the issue of avoidance and project alternatives. Prior to allowing any wetland encroachment, all reasonable attempts to avoid such alteration must be demonstrated. This avoidance must also consider the reasonableness of the no-build alternative.

Policy 4.9: Replacement for unavoidable wetland impacts will be provided by the developer (if possible, within the same subwatershed), in accordance with the requirements of the Scott WMO and Minnesota WCA.

Policy 4.10: The City will not allow excavation, or other non-filling related alterations to an existing wetland without the expressed written approval of the City Administrator or designee.

Policy 4.11: The developer shall provide pretreatment of stormwater runoff discharged directly into wetlands having no existing direct discharges of stormwater. Treatment will be required to meet or exceed N.U.R.P. efficiencies for remoal of TSS and total phosphorous prior to discharge. Outflow rates and elevations must be controlled to avoid water elevations that may permanently affect the character of the resource. Changes in elevation greater than 12-inches during a 10-year, 24-hour, storm event will not be permitted.

Policy 4.12: The City supports the use of banking wetland credits for the mitigation of unavoidable wetland impacts. Those proposing banking projects are encouraged to locate mitigation banks in those subwatersheds within the City having lost significant wetland habitat and at sites approved by the City. Restoration of wetland habitat is preferred to wetland creation. Priorities for wetland banking include interspersion of wetland types, successful revegetation with diverse native species; areas greater than 10-acres in size and locations within a watershed that provides needed functions.

Policy 4.13: The City will encourage developers to include wetland restoration as well as wetland protection strategies in proposed development and redevelopment projects. Public Value Credits (PVCs) may be provided for improvement of existing wetland habitat associated with development and/or wetland replacement projects, in accordance with established WCA rules.

The City of Jordan Subdivision Ordinance (Chapter 12) addresses the current wetland requirements. When this Plan is adopted the Ordinance will be revised to incorporate and reflect the new policies, goals, and accompanying Rules.

GOAL 5: PUBLIC PARTICIPATION, INFORMATION & EDUCATION

The purpose of this goal is to increase public participation and knowledge in management of the City's water resources, in accordance with the Scott WMO CSWMP, as amended. Public involvement is a strategy that recognizes people want to be involved in decisions that affect any facet of their lives. It provides opportunities for the public to participate in the processes that lead to decision-making.

Website Availability - http://www.jordan.govoffice.com/. The website is an alternative medium to provide municipal information to both City residents and those people who live outside Jordan. An electronic version of this Plan will ultimately be accessible on the website. Because the Plan has such a wide audience from engineers, planners, developers, citizens, scientists, and educators, electronic access to the text and mapping creates a better understanding of the goals, policies, and activities of this Plan.

The City will continue to distribute information on pertinent water and wetland management issues via the City of Jordan Quarterly Newsletter (Jordan City News). The newsletter will promote opportunities for residents to participate in water resources management activities. The City will make an ongoing effort on both a City-wide and watershed level toward educating the public by distributing information to its residents on responsible practices they should employ to protect water resources within the community. The program will also educate residents on the benefits of using phosphorus-free fertilizer.

Subject: Enhancement of Public Participation, Information and Education
Purpose: Encourage active community involvement in water resources management.
Goal: Increase public participation and knowledge in management of the water resources of the community.

Public Involvement Policies

Policy 5.1: The City will use a public involvement process in resource management decision-making (i.e., the Parks and Recreation Commission, and the Planning Commission).

Policy 5.2: The City will use a variety of media, including newsletters, local cable television and the City's Website, to inform the community about water resource issue programs. The possible programs include alternative landscapes, phosphorus free fertilizer, aquatic plant management, etc. The City will make an ongoing effort on both a local and municipal level to distribute information to residents on responsible practices to protect water resources in the City. Educational information will also be provided regarding the proper use of a wide range of lawn chemicals and proper disposal of hazardous household materials.

Policy 5.3: The City will work with all available resources to increase public participation in water resources management.

Policy 5.4: The City will establish model interpretive sites for public education.

The City of Jordan Ordinance does not currently address public education. When this Plan is adopted the City Ordinance will be revised to incorporate and reflect the new policies, goals, and accompanying Rules.

GOAL 6: GROUNDWATER MANAGEMENT

The City's groundwater resources are identified in the City of Jordan-Wellhead Protection Plan (September 2003). The City's aquifers have been assigned a "Not Vulnerable" rating. This rating indicates "..there is not a hydraulic connection between surface waters and the aquifer serving the water supply system for the City".

The City of Jordan-Wellhead Protection Plan currently outlines requirements for continued groundwater protection and well management. The report can be obtained directly from the City of Jordan and will soon be made available on the City's Website.

Subject: Groundwater Management
Purpose: To protect groundwater quality and improve groundwater supplies through effective management.
Goal: Provide clean and safe drinking water to the residents of the City while managing increased development and population.

Groundwater Management Policies

***Policy 6.1*:** Promote ongoing evaluation of land-use impacts on groundwater quality and quantity.

***Policy 6.2*:** Provide information to the residents of the City by revising and updating the City Wellhead Protection Plan as required by the Minnesota Department of Health.

***Policy 6.3*:** Support identification and reduction of groundwater contamination from both point and non-point sources.

***Policy 6.4*:** Promote water conservation efforts to reduce water use and conserve the City's groundwater resources.

The City of Jordan Municipal and Public Utilities Ordinance (Chapter 3) addresses the current municipal and private water supply management requirements. When this Plan is adopted the Ordinance will be revised to incorporate and reflect the new policies and goals of this Plan, and accompanying Rules.

6. ASSESSMENT OF PROBLEMS

The assessment of problems in the Plan includes reviewing possible adverse effects of surface water that have been identified by state and federal agencies, in research, literature, and other stormwater management materials. The assessments were divided into three potential sources of problems (Source Areas).

1. The first potential Source Area addresses public lands or areas that are managed by public agencies (i.e., public streets, parking lots, sewer lines, parks, public facilities, etc.). The identified potential problems in this source area include but are not limited to:

   a) Existing and potential flooding problems associated with Sand Creek and the Minnesota River at various locations within the City. The City has reviewed and included the Sand Creek erosion identification efforts that have been conducted by the Scott SWCD. Identification and documentation are the initial steps required to understand the dynamic nature of Sand Creek and the possible impact increased development may be having on it. These locations will be monitored and assessed annually by the City. See Appendix A, Figure 10, for the Sand Creek erosion areas map.
   b) The need to maintain high quality recreational use of the City's lakes and creeks, whether it is for waterfowl habitat, canoeing, fishing, etc. The MPCA has listed Sand Creek as a state impaired water in the 2006 Final TMDL List of Impaired Waters and the Draft 2008 TMDL list.
   c) The need for community education programs regarding sustainable water resource management.
   d) The need for an adequate road salt management program.
   e) The importance of maintaining the City's surface water management system and overall goals while encouraging private development.

2. The second potential Source Area addresses existing development on privately owned lands (i.e., private homes, small businesses, large commercial areas, industrial areas, private parking lots, and private streets, etc.). The identified potential problems in this source area include but are not limited to:

   a) Soil erosion from site disturbances (construction) on private lands.
   b) Private lawn and garden maintenance (phosphorous and nitrogen loading).
   c) Landscaping of stream banks on private land.
   d) Litter accumulation on private lands.
   e) Stream buffer degradation on private lands.
   f) Stream bank erosion and collapse on private lands.
   g) Private vehicle and equipment storage sites.
   h) Snow and ice removal methods from private parking lots and streets.
   i) Impervious surface management (private streets and parking lots).
   j) Illicit discharge to storm sewers.

3. The third potential source area focuses on new residential, commercial, and industrial development. Possible surface water problems in this section are directly associated with the construction process and how new developments may impact local natural resources and public infrastructure both during construction and after they are completed.

   A major source of concern for the City is the projected development rate and associated stormwater

volume, rate, and pollutant loading increases. In addition, problems caused by development in environmentally sensitive areas are also a concern (i.e., bluffs, buffers, and wetlands). The identified potential problems in this Source Area include but are not limited to:

a) Concern about excessive nutrient contamination of Sand Creek and public conveyance networks with sediment from construction sites and improper use of BMPs in new developments (e.g., detention basins, grass swales, etc.).

b) Proper implementation of creek, bluff, and wetland buffers in new developments. Without proper implementation of buffers, creek and wetland water temperatures increase, sediment deposition increases, creek and bluff bank erosion and collapse are more severe, and riparian habitats are destroyed. See Appendix A, for the applicable area maps. As part of the development permitting process the City will determine, based on accurate topographical maps, whether development will be permitted in any particular bluff, creek, or wetland area.

7. CORRECTIVE ACTIONS

Programmatic improvements and implementations will be required to manage the water resources within the City more effectively. For the area within the City's defined ultimate growth boundary where there has been increased development and larger stormwater runoff systems have been/are being planned, corrective actions may include but are not be limited to:

a) Development of a comprehensive operations and maintenance plan (O & M Plan), including a funding mechanism for ongoing costs (both capital and non-capital). A comprehensive O & M Plan will improve the likelihood of possible federal, state, and County funding for various City projects.

b) When the O & M Plan is complete modifications and revisions would be considered for inclusion provided they increase the speed or cost effectiveness of an existing or planned stormwater system improvement.

c) Implement City programs to target developer and resident education efforts. The programs will outline what residents and developers can do to improve the efficiency of nutrient (nitrogen and phosphorus) reduction from existing and proposed surface water runoff.

d) Review of proposed development submittals to verify the requirements stated in the City Comprehensive Surface Water Management Plan Rules and existing City Ordinances have been met prior to approval. This will ensure that the approved BMPs have been selected and the City is engaged in a pattern of sustainable growth.

8. FINANCIAL CONSIDERATIONS

As with all improvements, there is a cost associated with prudent stormwater management. To that end, we have prepared a cursory estimate of the costs for:

a) Mainline storm sewer pipe construction to deliver the runoff to each regional pond.
b) Projected pond construction.
c) Turf restoration.
d) Piped outfall construction.
e) Ravine stabilization.
f) Regional pond land acquisition costs.
g) Estimated engineering services.
h) 15% Contingency.

The following table summarizes the costs associated with each drainage district within the proposed ultimate growth boundary. **As with all estimates of this nature, they are based on current construction costs and should be adjusted annually to account for inflation, bonding costs, legal costs, interest costs, etc.**

Stormwater Management System Approximate Expected Costs		
District	**Total**	**Area Served (acres)**
A	$18,635,370	6,213
B	$19,511,553	2,428
C	$21,493,420	3,831
D	$18,455,883	2,824
E	$2,231.580	1,153
F	$2,705,589	1,649
Total	**$83,033,395**	**18,098**

It is the current policy of the City to charge new land development a Stormwater Area Charge (SAC) to finance storm drainage improvements on a per-acre basis, taking into account the proposed land use type. The amount of imperviousness on a parcel is directly related to the water quality, quantity, and conveyance impacts on the downstream stormwater conveyance system. Commercial, industrial, and high-density residential developments contribute significantly more to increased stormwater runoff than single-family residential development. Given this, it is recommended that the City charge proportionally higher SAC fees for those areas that contribute more runoff.

For determining a land-use based charge, the runoff from a 10-year, 24-hour storm event was compared for three land-use categories, as shown in the following table. Based on this information a runoff multiplier was calculated by comparing the runoff amount for a particular land use to that from single-

family residential land use. The equivalent number of acres was calculated and the resulting SAC fee per acre of development was calculated for each land use.

Stormwater Area Charge (SAC) Cost Summary

Land Use	Developable Acres	Curve Number	10-Year 24-Hour Runoff	Multiplier	Equivalent Acres	Area Charge
Single/Medium Family Residential	17,244	72	1.60"	1	17,244	$4,400
High Density Residential	105	85	2.64"	1.65	173	$7,260
Commercial/ Industrial	749	90	3.11"	1.94	1,453	$8,536
Total	18,098				18,870	
Total Stormwater Management System Cost = $83,033,395						
Cost Per Equivalent Acre = $4,400						

Adopting the land-use based SAC enables the construction of, and provides for, the effective management and financing of the recommended regional ponding storm sewer system within the projected ultimate growth boundary area of the City. Existing areas of development, large wetland areas, trunk highway rights-of-way and the areas shown on the watershed drainage district map that require further analysis have been excluded from the calculation for developable acres. It is recommended that these areas be excluded in the future when computing the SAC for new development.

Because of the extreme variance in land values and rapidly changing value paid for land in Scott County, along with increasing construction costs, the SAC should be reviewed on an annual basis to account for land value variability and adjusted accordingly.

9. IMPLEMENTATION PRIORITIES

The criteria, considerations, and constraints used to prioritize City surface water improvements and maintenance activities reflect the City's values, goals, and policies, the City's understanding of surface water systems and solutions, and the fiscal and political reality of the environment in which surface water management activities are carried out. Changes in any one of these factors can result in a change in project priority. The City's stormwater management program has evolved significantly over time, and in view of recent challenges, the future will bring even more significant change. The breadth and extent of these changes, at present, are largely unknown.

Some factors that influence the City's stormwater management programs do not lend themselves to a quantitative system of prioritization. For example, deciding the exact projects to include in each year's Capital Improvement Plan (CIP) requires a high level of professional judgment based upon the best available knowledge and awareness of the local political climate toward cost-effective surface water improvements. Many projects that are included in an annual improvement package most likely will have surface water sub-components although the project focus is not surface water. Though difficult to quantify, these components and influences play an important part in deciding the inclusion of selected projects into the following CIP.

The City of Jordan will continue to conduct private development project reviews on a "project-by-project" basis. Based on when individual property owners choose to develop the City will take that opportunity to implement the following priorities. The City will also implement the following components of possible CIP projects;

SURFACE WATER QUANTITY MANAGEMENT
Prioritize City projects that provide storm water runoff quantity management. The purpose is to control post-development surface water runoff within the defined ultimate growth boundary. The goal is to promote projects that control flooding and minimize related public capital and maintenance expenditure necessary to control excessive volumes and rates of runoff.

SURFACE WATER QUALITY MANAGEMENT
Prioritize projects that provide water quality improvements in lakes, creeks, and wetlands within the City. The purpose is to protect and improve surface water quality in the City's lakes and creeks. The goal is to achieve water quality standards in lakes, creeks, and wetlands consistent with their intended use and established classification.

EROSION CONTROL MANAGEMENT
Prioritize projects that minimize the mobilization of sediment and enhance site erosion control requirements. The purpose is to control erosion and sedimentation on private developments and in public drainage systems. The goal is to minimize soil erosion through increased education and enforcement of the existing BMP Ordinance.

WETLAND MANAGEMENT
Prioritize projects that enhance the City's wetland habitats. The purpose is to utilize, protect, preserve, and enhance the existing natural wetland habitats within the City. The goal is to maintain or increase the amount of wetland acreage, and increase the wetland function, value, and classification, within the City, in accordance with the Scott WMO CWRMP and the WCA.

PUBLIC PARTICIPATION AND EDUCATION

Prioritize projects that enhance the current level of public participation, information, and education on City projects. The purpose is to encourage active community involvement in all aspects of surface water resources management. The goal is to increase public assistance, participation, and knowledge in management of the water resources of the community.

GROUNDWATER MANAGEMENT

Prioritize projects that provide sound, long-term groundwater and public water supply aquifer management. The purpose is to protect groundwater quality and improve groundwater supplies through effective management. The goal is to provide clean and safe drinking water for the City while managing increased development and population.

10. IMPLEMENTATION PROGRAM

The primary means the City will use to implement the standards of this Plan and the Scott WMO CSWMP is through the adoption and implementation of the City of Jordan Plan, associated Rules, and Ordinances. Private development projects within the City are reviewed on a "project-by-project" basis and it is during this review the City has the opportunity to implement the goals, policies, and priorities developed in the Plan.

The annual City improvement projects provide another opportunity for the City to implement the goals, policies, and priorities developed in this Plan. Most CIP projects generally have a surface water component. The City has recently adopted its first CIP. As the CIP is further defined it will be a useful planning tool for City sponsored surface water projects.

There are also specific development-independent implementation goals that the City will continue to develop on a parallel administrative track to the general goals listed above. The City will finance these goals either directly or by specific development related review and construction inspection budgets.

The following is an implementation process list of the recommended actions, timings, responsible parties, and the cost or funding sources which are presented for the City Council's consideration based upon the data compiled in this report. Actions are listed in order of priority, from highest to lowest.

Action	Timing	Responsible Party	Funding Source
Maintain and implement Capital Improvement Program	On-going, updated on a 5 year period	City of Jordan	Stormwater Area Charge and project specific engineering budgets
Stormwater maintenance program be developed to ensure the successful operation of the drainage system.	On-going	City of Jordan	Stormwater Area Charge and annual engineering and maintenance budgets
Corrective actions for storm water problems developed and implemented	On-going, as problems are brought to the attention of Staff	City of Jordan	Stormwater Area Charge and project specific engineering budgets
Enforcement of the erosion and sedimentation control ordinance for new developments	On-going, as development projects are submitted to the City for approval	City of Jordan	Funding by developer's fees, building permits and fines collected for non-compliance

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Action	Timing	Responsible Party	Funding Source
Encourage low impact development and better site design components for new development projects	On-going, as development projects are submitted to the City for approval	City of Jordan	Funding by developer's fees and project specific engineering budgets
Established modeled ponding areas and maximum flow rates as shown in Figure 5 and Appendix B referenced during initial phases of development projects	On-going, as developments are submitted to the City for approval	City of Jordan	Cost sharing with Scott County
Review procedures be established to ensure all Construction projects within the City are in compliance with erosion control ordinance	On-going	City of Jordan	Funding by developer's fees and annual engineering budget
Update the City detailed hydrologic analysis during final design of all ponding areas.	Currently in place. Update as necessary.	City of Jordan	Funding by developer's fees and project specific engineering budgets
High water elevations governing building Finish floor elevations adjacent to ponding areas and floodplains be established per this Plan, Rules, and Ordinance	On-going, as development projects are submitted to the City for approval	City of Jordan	Funding by developer's fees and building permits.
Emergency overflow routes be established and maintained to provide stabilized relief during extreme storm events, which exceed design conditions.	On-going, as development projects are submitted to the City for approval	City of Jordan	Funding by developer's fees and project specific engineering budgets

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Action	Timing	Responsible Party	Funding Source
An education program for City residents, staff, and development community developed and implemented	On-going	City of Jordan	City of Jordan, with assistance from Scott WMO, DNR, U of M Extension Service, SWCD, NRCS
Amendments to the SWMP be adopted and implemented and the SWMP be updated.	As warranted by future standards or regulations – by 2010 or earlier if needed	City of Jordan	Stormwater Area Charge and annual engineering budgets
Regulate construction and land uses along the bluffs, to prevent erosion and bluff destabilization	On-going, as developments are submitted to the City for approval	City of Jordan	Funding by developer's fees and project specific engineering budgets
Encourage landowners to retain areas of native vegetation, and to plant species native to the area, to protect and improve wildlife habitat and maintain the historic ecological role and appearance of the bluffs within the City. The existing housing developments along the bluffs have addressed retention of native vegetation in one of two ways: platting of the property in an outlot and deeding that to the City or through a conservation easement.	On-going, as developments are submitted to the City for approval	City of Jordan	Funding by developer's fees and project specific engineering budgets
Develop an implementation strategy for Sand Creek TMDL when study is complete	After EPA has approved study and TMDL has been developed	City of Jordan, MPCA, Scott WMO	MPCA, Scott WMO, BWSR, DNR, etc.

11. AMENDMENTS TO THE PLAN

AMENDMENT PROCEDURES

For the Plan to remain a dynamic, effective document, a system must be identified and available to update information and implement new ideas, methods, standards, management practices, and any other changes, which may affect the intent and/or results of the Plan. This Plan shall remain in effect for five years from its adoption by the Council or until an amended Plan is adopted, not to exceed 10 years from the date of initial adoption. Any person or persons either residing or having business within the City can request amendment proposals at any time. The City itself may amend this Plan at any time if changes are required or if issues or opportunities arise that are not currently addressed. All amendments shall be in accordance with Minnesota Rules 8410.0170 Subp. 11 and Minnesota Statutes 103b.235 Subd. 5.

REQUEST FOR AMENDMENT

The amendment process begins when a written request for a plan amendment is submitted to the City administrator. The request must outline the need for the specified amendment as well as additional materials that the City will need to consider before making its decision.

CITY STAFF REVIEW

A decision is made as to the validity of the request. Two options exist;

- Accept the amendment as a minor issue, with minor issues collectively added to the Plan during the annual review process; and
- Accept the amendment as a major issue, and refer the matter to the City Council for consideration. In acting on an amendment request, staff shall recommend to the City Council whether or not a public hearing is warranted.

COUNCIL CONSIDERATION

The amendment and the need for a public hearing shall be considered at a regular or special City Council meeting. Staff recommendations should also be considered before decisions on appropriate action(s) are made.

PUBLIC HEARING AND COUNCIL APPROVAL

This step allows for public input based on public interest. The City Council shall determine when the public hearing should occur in the process. Based on the Public hearing, the City Council will approve or reject the amendment.

12. EXISTING DRAINAGE PATTERNS

The total hydrologic study area includes over 21,000 acres of watershed and is shown in Figure No. 5. As shown in the figure, the area of the study lies both within and outside of the current City limits and generally terminated at the ultimate growth boundary. It has been assumed that growth around Jordan will continue to the south and along the northeast and southwest approaches of U.S. Highway 169. The overall flow characteristics of the Jordan watersheds include a trend for stormwater runoff to flow toward Sand Creek and from there Sand Creek flows to the Minnesota River, northeast of the City. The stormwater runoff begins in the upper-most basins as sheet and shallow concentrated flow. This flow follows existing contours and steep ravines and develops into intermittent surface flows and creeks, directed to the relatively flat area adjacent to Sand Creek and the Minnesota River.

Project specific stormwater detention basin design procedure requires ponds to be sized to ensure there is no net increase in off-site flow rates for specific storm events. This procedure will minimize adverse effects to downstream properties. Unfortunately, when this procedure is applied to individual development sites without comprehensive review of regional drainage patterns the cumulative effect may be to inadvertently increase downstream flow conditions and possibly cause flooding at some locations. The use of large regional detention ponds has been proposed as a comprehensive stormwater management tool. This will better coordinate the possible development design changes and avoid, as much as possible, numerous smaller upstream localized ponds that would be provided on a project-by-project basis.

Based on our analysis, the existing regional pond and culvert system will function properly for storm events less than or equal to the 100-year, 24-hour storm. However, for future detention and water quality ponds the 100-year storm events will need to be managed to prevent damage to the downstream properties. This may be accomplished by proper siting of improvements, consideration and protection of natural resources, constructing emergency spillways, providing larger interconnecting conveyance systems, diversion piping, increased pond storage volume, and/or adoption of low-impact site design practices. All of these options can be implemented while protecting the existing natural features of the City. These improvements should be coordinated with the USACE study of the Sand Creek corridor through the City to ensure hazard conditions are not created as a result of City improvements.

It is the primary objectives of this Section to:

- Map and evaluate the existing City storm drainage conveyance network.
- Identify problem areas where the existing system should be modified or upgraded.
- Define requirements to improve the existing storm sewer conveyance, water quality, and detention system.
- Define surface water requirements associated with continued upstream development.
- Coordinate the design requirements of the proposed stormwater conveyance system with the most recent USACE report to minimize flooding of the Sand Creek corridor (when accepted by the Council).
- Require BMPs to accommodate continued development within the City's ultimate growth boundary while minimizing effects on water quantity and water quality.

13. WATERSHED DELINEATION

The scope of this section of the Plan is the development of a design document intended to size and locate future storm sewers, regional and localized detention basins, and other drainage facilities within the City as dictated by development in the ultimate growth boundary area of the City. Preparation of the Plan follows traditional storm sewer modeling and design procedures. The following summarizes the major activities associated with Plan development:

a) Existing City utility maps were reviewed to determine overall drainage patterns (major and sub-watersheds), catch basin locations, culverts, and other applicable drainage features.

b) Scott County 2-foot contour maps covering the area within the ultimate growth boundary were used to delineate major and sub-watersheds.

c) Field inspections of selected areas of concern, identified on the topographic map, were made to verify the accuracy of the model. When development in these areas occurs, a more detailed topographic survey will be required from the developer to verify the existing drainage conditions and existing and proposed structures.

d) Each drainage area flowing to a low point, natural agricultural depressions, or existing storage areas upstream from roadway culverts; was identified and mapped. Over 250 individual subwatershed collection areas were identified.

e) All major watershed and subwatershed boundaries were exported to a GIS mapping program (ArcGIS) and drainage areas were computed.

f) Existing public storm sewer data was compiled and included.

g) Approximately 250 interior subwatersheds were delineated within the six major watersheds.

h) Subwatershed maps were developed for each major drainage area within the City's ultimate growth boundary. These maps were used to review existing drainage patterns and develop reasonable alternatives for future storm sewer improvements. Many factors were considered in this planning/design process including, but not limited to:

   1. Verification and inclusion of the most recent storm sewer improvements into the model.

   2. Incorporation of detention BMPs for flood protection and cost effective pipe sizing wherever public open space or future development accommodated such facilities.

   3. Rerouting of sections of major watersheds to provide cost effective storm sewer improvements and to reduce existing flooding issues.

   4. Rerouting of subwatershed areas into detention basins to assist in stormwater quality management.

i) Surface runoff and storm sewer conveyance design is dependent upon the permeability of existing surfaces. Representative runoff coefficients ("C factors") for the rational method

(CIA) of stormwater conveyance modeling and Curve Numbers for the SCS method were computed for each major watershed to reasonably reflect the degree of existing residential, commercial, agriculture, and industrial development. Undeveloped areas were modeled using runoff coefficients and curve numbers representative of the existing land use and soil type.

j) Based on subwatershed routing analysis as well as existing and proposed public ROW a proposed future storm sewer conveyance system was developed.

k) For each proposed detention basin site, Soil Conservation Service (SCS), Technical Release (TR), TR-20 and TR-55 methods were used to design basins to meet rate control and water quality requirements. StormNET and HydroCAD were used as a hydologic modeling tool for detention basin sizing. Preliminary basin sizing was based on the Guidelines recommended by the Minnesota Pollution Control Agency *"Protecting Water Quality in Urban Areas"* and also in accordance with the recommendations of the Minnesota Board of Water and Soil Resources (BWSR) for wet detention basins and water quality enhancement. Finally, the *Minnesota Urban Small Sites BMP Manual* as prepared for the Metropolitan Council was consulted for recommendations relative to meeting additional NPDES stormwater management requirements, which may be required.

l) Storm sewer conveyance pipe sizing upstream and downstream of detention basins was integrated into the model. Such integration is intended to reduce the possibility of oversizing conveyance pipe and reduce the likelihood of surface and street flooding from large storm events.

m) As each downstream subwatershed design was completed, the proposed storm sewer pipe sizes, drainage swales, and regional ponds were added to the topographic map. Preliminary locations for localized treatment basins have been shown on the maps in areas that will likely require ponding when development occurs.

n) Printed reports (StormNET and HydroCAD) for each drainage area and corresponding detention basin design have not been prepared. Copies of the report summaries are available by contacting the City Planning Department.

o) The stormwater management system costs, which are needed to assist the City in calculating the StormwaterArea Charge (SAC), have been included in the Economic Considerations, of this report. SACs have been calculated for three different land use types, based upon the amount of runoff generated from each area. The more impervious area in a given land use, the more runoff that is generated. This justifies charging a higher SAC fee for the land use that produces greater amounts of runoff. The three area charge categories are: 1) single family residential, 2) high density residential, and 3) commercial/industrial.

14. HYDROLOGIC METHODOLOGY

The existing conditions hydrologic analysis utilized in this Plan has been performed using the StormNET Modeling Software as developed by Boss International, Inc. The model is based on the EPA Stormwater Management Model (SWMM). The EPA Storm Water Management Model (SWMM) is a dynamic rainfall-runoff simulation model used for single event or long-term (continuous) simulation of runoff quantity and quality from primarily urban areas. The runoff component of SWMM operates on a collection of subcatchment areas that receive precipitation and generate runoff and pollutant loads. The routing portion of SWMM transports this runoff through a system of pipes, channels, storage/treatment devices, pumps, and regulators. SWMM tracks the quantity and quality of runoff generated within each subcatchment, and the flow rate, flow depth, and quality of water in each pipe and channel during a simulation period comprised of multiple time steps. This methodology is widely accepted among water resource engineers across the United States.

The SWMM engine accounts for various hydrologic processes that produce runoff from urban areas. These include:

- time-varying rainfall
- evaporation of standing surface water
- snow accumulation and melting
- rainfall interception from depression storage
- infiltration of rainfall into unsaturated soil layers
- percolation of infiltrated water into groundwater layers
- interflow between groundwater and the drainage system
- and nonlinear reservoir routing of overland flow.

Information such as existing and proposed pond storage volumes, runoff slopes, drainage areas and ditch locations were compiled directly from the topographic maps. Topographic slope information in conjunction with the "equivalent width" factor were used to calculate the time of concentration for each sub-watershed, a critical parameter in the hydrological analysis. Soil cover was compiled from review of aerial photos obtained from Scott County.

The SCS defines the time of concentration as the total travel time of a particle of water from the hydraulically most distant point in the watershed to the outlet itself. The time of concentration was tabulated for each sub-basin by utilizing the Kirpich Method. The Kirpich Method is the recommended method when using the EPA SWMM hydrologic engine.

Stormwater detention and water quality ponds were modeled using an elevation, storage, and discharge relationship. A storage volume was determined for incremental elevations in each proposed pond. The outlet devices for each proposed pond were sized based on downstream conveyance capacity and located either by review of topographic maps and/or field verification. In the proposed condition the detention basins were modeled to mitigate the effects of continued development and increased runoff by increasing the storage capacity.

For purposes of this report, we analyzed the effects of a 2.8-in, 4.2-in, and a 6.1-in storm event. These events have probabilities of occurring once every 2-years, 10-years, and 100-years, respectively. Conceptually, the 2-year storm event has a 50 percent chance of occurring in any given year. Similarly,

the 10-year storm event has a 10 percent chance of occurring in any given year and the 100-year storm event has a 1 percent chance of occurring in any given year.

15. FUTURE CONSIDERATIONS

As noted in the Watershed Delineation section, Item h, numerous factors were considered in developing the proposed future storm sewer plan for the City. Because of the intricacies of the planned improvements, this summary report will the not discuss every detail. The enclosed StormNET and HydroCAD data sheets of the existing and proposed conditions can be compared with existing storm sewer data as necessary to address specific issues. However, we wish to highlight several key design features and recommendations.

a) Proposed regional and localized detention/water quality ponds are shown on the proposed conditions map (Figure No. 5). Ponds have been located in strategic low areas on or near the watershed or subwatershed perimeter and upstream to accommodate future development (generally residential). These locations are intended to provide water quality enhancement and serve as protection for existing developments from upstream agricultural runoff.

Key design criteria have been noted on the map and are documented in greater detail in the design calculations. Upstream basins have been sized to accommodate ultimate watershed development and have been preliminarily sited to suit existing closed depressions. The actual shape and location of the constructed ponds may differ from what is shown provided that the controlling design conditions are maintained (storage volume, maximum elevation, MPCA and BWSR requirements). In the event the development characteristics of any of the subwatersheds change significantly, pond design and storm sewer conveyance design will need to be modified accordingly.

Siting of detention basins was based on existing open space and individual subwatershed hydraulic requirements. Cursory consideration has been given to land use, development potential, property boundaries, etc. Many of the recommended detention sites are already prone to intermittent flooding and would require substantial grading for development.

b) Unfortunately, in the older, more densely developed areas of the community, such as the originally platted areas and the historic downtown business and residential district, the possibility of acquiring space for regional or localized detention basin construction is improbable. Throughout most of this area, new detention basin construction would require site clearing and re-plating of developed properties.

Consequently, in these developed areas, water quality and detention requirements will be complicated and may require construction of storm sewer interceptors. The hydrologic analyses of these areas may be reviewed on a case-by-case basis, as required.

To meet the future Scott County or possible NPDES Phase III requirements, it may be necessary to construct and/or install some form of in-line treatment that does not require a large amount of open space. *Stormwater Management, Inc., Bay Saver* and *Stormceptor* are a few of the many of in-line treatment systems being presently being incorporated into existing developed areas across the southern Metro area.

c) The floodplain areas adjacent to the Minnesota River and the corridor along Sand Creek, which consists of steep slopes and benches, have not been included in the watershed model. These regions are typically protected from future development by zoning, floodplain, and/or Bluff ordinances. If areas within these regions are developed in the future, hydrologic analyses may be completed on a case-by-case basis, as required.

16. POND DESIGN GOALS AND CRITERIA

For the most part, the upper area surrounding Jordan consists of sandy-clayey nonporous soils. Although some areas have high sand content with high infiltration, a large percentage of the soils found within the study area were classified as being SCS, type B and/or type C, which are known to have moderate to low infiltration capabilities. The entire watershed soil classification may be viewed in Figure No. 2.

Whenever possible, regional detention/water quality ponds will meet N.U.R.P standards and City requirements. Wet settling basins are an accepted and proven BMP technique widely accepted for stormwater quality treatment prior to discharge. All regional and localized detention/water quality pond design parameters will need to be carefully considered to ensure that there is no impact to existing downstream properties. It is imperative not to increase the groundwater gradient and the potential for basement seepage associated with regional or localized detention/water quality ponds.

Every attempt has been made to strategically locate regional and localized detention/water quality ponds in existing closed depressions within a given watershed or subwatershed. Steps have been taken to avoid wetlands and DNR waters in every case. The intent is to minimize the excavation required and to optimize the volume and size of storm sewer conveyance piping associated with pond construction.

In some areas, smaller upgradient ponds have been proposed to minimize additional erosion of existing ravines due to the increased runoff associated with urban development. The smaller upstream ponds are proposed to manage stormwater volumes equal to the runoff from a 2-year, 24-hour rainfall event (2.8-in). The smaller ponds will treat the runoff through sedimentation and minimize peak discharge flow rates into existing ravine(s) en route to larger, downstream regional ponds.

The proposed conveyance network utilizes the natural drainage routes wherever feasible. An advantage of incorporating large, detention/water quality ponds is the associated multi-functional recreational uses for these areas. A buffer zone encompassing each regional pond may be used for greenway, walking trails, parks, conservation areas, and wildlife habitat.

Similarly, the regional basins may be designed to reduce the quantity of large diameter trunk storm sewer pipe that would be required for stormwater conveyance. The proposed detention/water quality ponds may be designed as non-uniform meandering waterways, creating a more natural appearance while maintaining the design intent and providing cost savings by reducing the length of large diameter pipe.

When reviewing development plans the SCS runoff curve number (CN) for the existing agricultural areas and the minimum CN's for developed conditions should be limited to the values the following table:

Maximum existing	CN = 70
Minimum residential development	CN = 72
Minimum high density residential development	CN = 85
Minimum commercial development	CN = 90
Minimum industrial development	CN = 90

These values are general in nature and typically apply to the urban development of existing agricultural area. We anticipate instances in which the existing land use is pasture, wetland, or ungrazed meadows, etc., which will require appropriate curve number adjustment in accordance with standard SCS methodology.

17. EXISTING WATERSHEDS AND REQUIRED IMPROVEMENTS

The following is brief description of the various major watershed areas studied. At present, the descriptions are limited to the ultimate growth boundary of the City of Jordan. The areas and pond numbers described correspond to the numbers shown in Figure Nos. 5 through 9.

A. Drainage District A

Drainage District A, as shown in Figure No. 6, is located in the southwest of the regional growth boundary area. District A is approximately 7,000 acres in size. District A generally slopes down from the south to the north with runoff collecting in one of two centrally located ravines and discharging into a large DNR protected wetland (DNR #220w) located in the southwest quadrant of the U.S. Highway 169 (US 169) and State Highway 282 (TH 282) intersection. This wetland discharges into Sand Creek north of US 169. The soils in this area are typically sandy-clayey, as shown in Figure No. 2. This district is currently farmed with sparse residential development.

The regional and localized pond network, as shown in Figure 6, is proposed as an economical and effective method of managing the increased runoff rates and volumes projected from continued urban development in District A. This proposed stormwater detention/water quality pond network includes fourteen regional ponds, with each basin located along an existing drainage route. Each proposed pond would be designed to NURP standards and City regulations prior to discharging stormwater to the north of CR 66. The existing culverts crossing CR 66 will be utilized as outlet conveyance. In the upland areas, where runoff is presently discharged directly into ravines, the use of localized stormwater detention/water quality ponds is proposed to minimize erosion.

The benefits of the required District A regional and localized stormwater detention/water quality pond systems are

- The reduction of the developed property runoff rates and volumes to pre-developed levels.
- Treatment of stormwater quality to NURP standards and City regulations prior to discharge.
- Improved flood control management in the vicinity of CR 66 and US 169.
- Utilization of existing infrastructure and flow paths when practical.

B. Drainage District B

Drainage District B is located in the south central section of the regional growth boundary area as shown in Figure No. 5. District B is approximately 2,850 acres in size. The general slope of District B is from the south to the north toward the Jordan Mill Pond and/or east toward Sand Creek. District B is has been further subdivided into two major subdistricts with CR 21 as the internal boundary. The area east of CR 21 and Delmar Avenue drains into Sand Creek, to the east. The area west of CR 21 and Delmar Avenue drains to the north into the Jordan Mill Pond (DNR #113p) and across a concrete weir into Sand Creek (see Figure No. 6).

The soils within District B are typically sandy-clayey as shown on Figure No. 2. The dominant existing land use is row crop production with areas of development to the north and south of CR 66.

The regional and localized pond network, as shown in Figure 6, is proposed as an economical and effective method of managing the increased runoff rates and volumes projected from continued urban development in District A. This network includes nine regional and nineteen localized stormwater detention/water quality ponds. Each proposed pond will be designed to NURP standards and City regulations prior to discharging stormwater. For the portion of District B that drains easterly toward Sand Creek, localized ponds are proposed along the east side of TH 21. These localized ponds would be located upstream of the existing ravines to minimize possible erosion due to increased flow rates and volumes. The remainder of District B will to be served by localized ponds as growth dictates. See Figure No. 6 for further details.

The benefits of the required District B regional and localized stormwater detention/water quality pond systems are:

- The dampening of the developed property runoff rates to match pre-developed flow rates.
- Treatment of stormwater to NURP standards and City regulations prior to discharge.
- The post-development runoff velocities can be controlled upstream of the existing ravines to minimize additional erosion and better manage the runoff rate and volume prior to it entering the regional pond system.
- Improved flood control management adjacent to CR 66.
- Proposed pond locations utilize existing closed depressions and outlet conveyances.
- Improved flood control management adjacent to Hillside Drive and the existing development in the vicinity of Stuart Drive.

C. Drainage District C

Drainage District C is located in the southeastern regional growth boundary area as shown in Figure No. 7. District C is approximately 4,250 acres in size. The soils are found to be a sandy-clayey (see Figure No. 2). The general slope of District C is from the east down to the west. The district land use is primarily agricultural with a few scattered wetlands and some isolated areas of development (see Figure 1).

The regional and localized pond network, as shown in Figure No. 7, is proposed as an economical and effective method of managing the increased stormwater runoff rates and volumes projected from continued urban development in District C. This network includes thirteen regional and forty-six localized stormwater detention/water quality ponds. Each proposed pond will be designed to NURP standards and applicable City regulations prior to discharging stormwater.

The benefits of the required District C regional and localized stormwater detention/water quality pond systems are:

- The dampening of the developed property runoff rates to match pre-developed flow rates.

- Treatment of stormwater to NURP standards and City regulations prior to discharge.
- The post-development runoff velocities can be controlled upstream of the existing ravines to minimize additional erosion and better manage the runoff prior to it entering the regional pond conveyance system.
- The regional ponds manage both on-site stormwater and agricultural stormwater drainage from off-site sources with a single pond, eliminating the need for multiple localized ponds.

D. Drainage District D

Drainage District D is located in the northeastern regional growth boundary area as shown in Figure No. 8. District D includes approximately 3,260 acres in size. District D is comprised of relatively flat highlands sloping from the east down to the west toward steep bluffs abutting the western and northern district boundary. The soils in this district are typically a sandy-clayey mix (see Figure No. 2). The land use is primarily agricultural. Wetlands are scattered throughout the district, as shown in Figure No. 1, and there is limited residential development.

The regional and localized pond network, as shown in Figure No. 8, is proposed as an economical and effective method of managing the increased stormwater runoff rates and volumes projected from continued urban development in District D. This network includes seven regional and twenty-four localized stormwater detention/water quality ponds. Each proposed pond will be designed to NURP standards and City regulations prior to discharging stormwater.

The benefits of the required District D regional and localized stormwater detention/water quality pond systems are:

- The dampening of the developed property runoff rates to match pre-developed flow rates.
- Treatment of stormwater to NURP standards and City regulations prior to discharge.
- The post-development runoff velocities can be controlled upstream of the existing ravines to minimize additional erosion and better manage the runoff prior to it entering the regional pond system.
- Improved flood control management adjacent to TH 282 and in the vicinity of Morlock Drive.

E. Drainage District E

Drainage District E is located on the northwest side of the city and is bordered by the Minnesota River on the north as shown in Figure No. 9. District E is approximately 1,330 acres in size. The general slope of the land is from the south down to the north, toward the Minnesota River. The soils are characterized as sandy-loam, as shown in Figure No. 2. These soils are a moderately porous soil. The land use is primarily agricultural. Wetlands are scattered throughout the district, as shown in Figure No. 1. There is an area of large rural residential parcels and a number of high-density residential developments.

The regional pond network, as shown in Figure No. 9, is proposed as an economical and effective method of managing the increased stormwater runoff rates and volumes projected from continued urban development in District E. This network includes five regional stormwater detention/water quality ponds. Each proposed pond will be designed to NURP standards and City regulations prior to discharging stormwater. A number of smaller localized stormwater detention/water quality ponds will be required as urban development continues. The regional pond system will accommodate the anticipated development from approximately 680 acres. Localized development ponds will accommodate the remaining area as required by the patterns of future urban development.

The benefits of the required District E regional and localized stormwater detention/water quality pond systems are:

- The dampening of the developed property runoff rates to match pre-developed flow rates.
- Treatment of stormwater to NURP standards and City regulations prior to discharge.
- Improved stormwater quality prior to discharge into the Minnesota River.
- Improved flood control management adjacent to the Minnesota River and in areas of the Minnesota River floodplain.

F. Drainage District F

Drainage District F is located in the area immediately north and west of the intersection of US 169 and TH 282 as shown in Figure No. 9. District F is approximately 2,050 acres in size. US 169 is the southern boundary of this area. The general slope of the land is from the northwest down to the southeast toward the US 169 intersection with TH 282. Stormwater runoff is presently discharged to the northeast of TH 282 into Sand Creek. The soils are characterized as sandy-loam which are found to be porous as shown on Figure No. 2.

The regional and localized pond network, as shown in Figure No. 9, is proposed as an economical and effective method of managing the increased stormwater runoff rates and volumes projected from continued urban development in District F. This network includes seven regional and ten localized stormwater detention/water quality ponds. Each proposed pond will be designed to NURP standards and City regulations prior to discharging stormwater. The regional pond system will accommodate the anticipated development from approximately 510 acres. Localized development ponds will accommodate the remaining area as required by the patterns of future urban development.

The benefits of the required District F regional and localized stormwater detention/water quality pond systems are:

- The dampening of the developed property runoff rates to match pre-developed flow rates.
- Treatment of stormwater to NURP standards and City regulations prior to discharge.
- Improved stormwater quality prior to discharge into Sand Creek.

18. CONCLUSIONS

The City's existing storm sewer treatment and conveyance system cannot accommodate continued development within the ultimate growth boundary area. If development in this area continues as predicted and the existing treatment and conveyance system is utilized, it will require major improvements to serve the existing and future community without exacerbating intermittent flooding issues.

The regional and localized stormwater detention/water quality pond model presented in this Plan is one approach to accommodate the predicted urban development in the regional growth boundary area of the City. Further enhancement of this model must include scheduled updates on an annual basis, at a minimum, and coordination with proposed development on a project-by-project basis particularly in the event a private development will be constructing a regional pond as a condition of their permit. These updates will ensure that adjustments, due to new construction and urban development, can be coordinated with the model and regional flow rates and volumes can continually be reviewed, verified, and updated. The components of the proposed SAC should also be reviewed and updated annually. These reviews will ensure that the associated City's costs and accurate land values, are accounted for, appropriately financed, and the developers are being accurately assessed for the improvements.

As stated earlier, this model is predominantly based on information obtained from available Scott County GIS mapping data, aerial and topographic maps, field verification of accurate watershed boundaries, and discussions with City staff relative to the historical flooding areas. Based on all available information the modeled system closely matches qualitative descriptions given by individual observation. We believe this Comprehensive Surface Water Management Plan has significant benefit as a planning, engineering, and design tool. However, this Plan and the regional and localized stormwater and water quality pond network model is not necessarily the only method of accomplishing the goal of comprehensive surface water management within the City. The quality and accuracy of this model may be further validated with more detailed survey data at the time of proposed development in the ultimate growth boundary of the City.

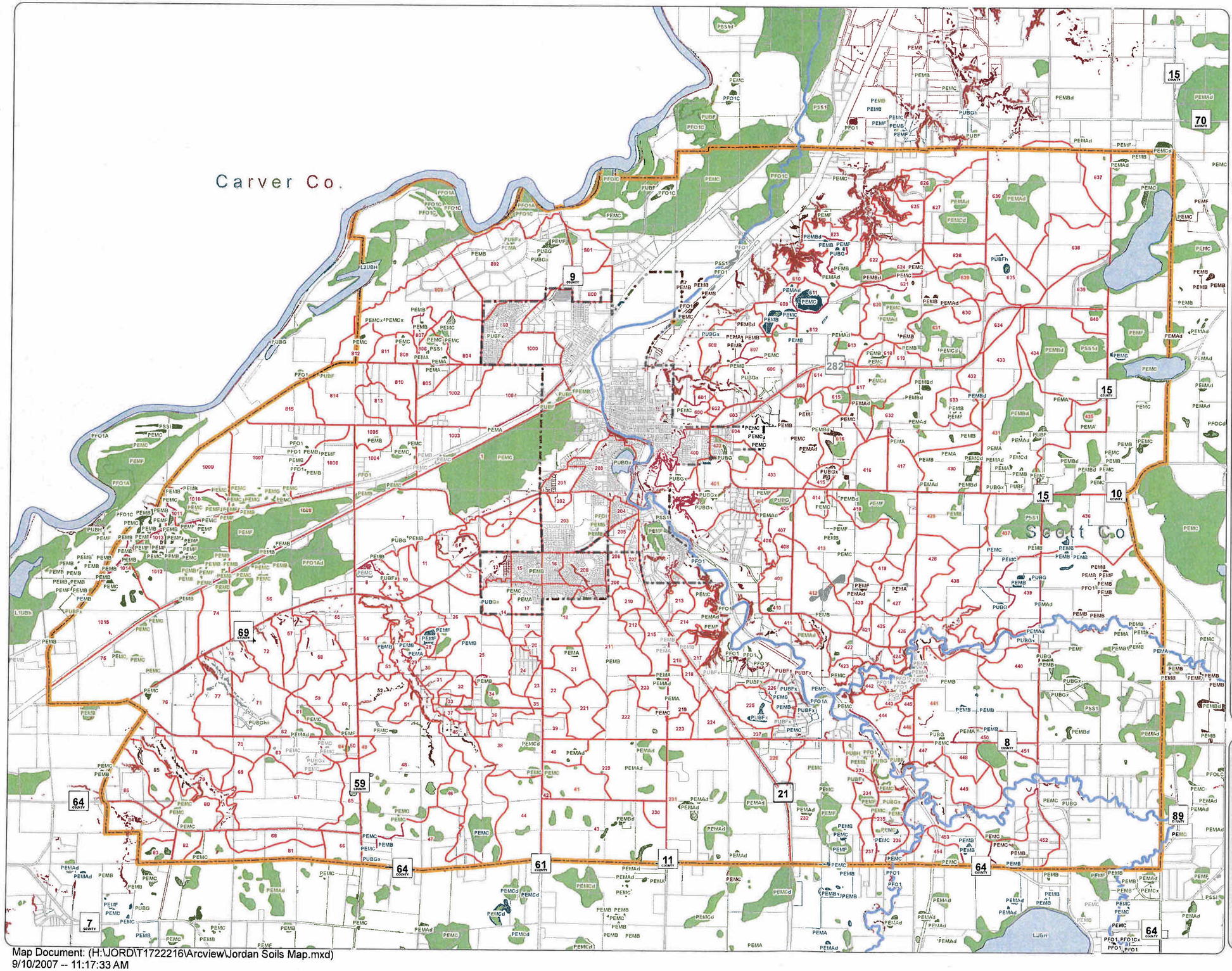
Appendix A

Maps:

CITY OF JORDAN
COMPREHENSIVE SURFACE WATER MANAGEMENT PLAN

SCOTT COUNTY WETLAND & BLUFF AREAS MAP

FIGURE NO. 1
NOVEMBER, 2007



Legend

- Watersheds
- Scott County Wetlands
- 30% Bluffs
- Scott County Streams
- Scott County Lakes
- Jordan City Limits
- Ultimate Growth Boundary

Source:
Municipal Development Group. Scott County, MnDNR

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Map Document: (H:\JORD\T1722216\Arcview\Jordan Soils Map.mxd)
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CITY OF JORDAN
COMPREHENSIVE SURFACE WATER MANAGEMENT PLAN

SOILS MAP

FIGURE NO. 2
NOVEMBER, 2007

Carver Co.

Scott Co

Legend

Scott County Soils

- No Data
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Watersheds
- Jordan City Limits
- Ultimate Growth Boundary

Source:
Municipal Development Group, Scott County, Ssurgo

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CITY OF JORDAN
COMPREHENSIVE SURFACE WATER MANAGEMENT PLAN

GENERAL LAND USE MAP

FIGURE NO. 3
NOVEMBER, 2007

Carver Co.

Scott Co.

Legend

2008 Future Land Use

- Single Family Residential
- Medium Density Residential
- High Density Residential
- Commercial
- Commercial-Highway
- Commercial-Nieghborhood
- Industrial
- Public Institutional
- Park
- Assumed Single Family Residential
- Watersheds
- Jordan City Limits
- Ultimate Growth Boundary

Source:
Municipal Development Group, Scott County, FSA

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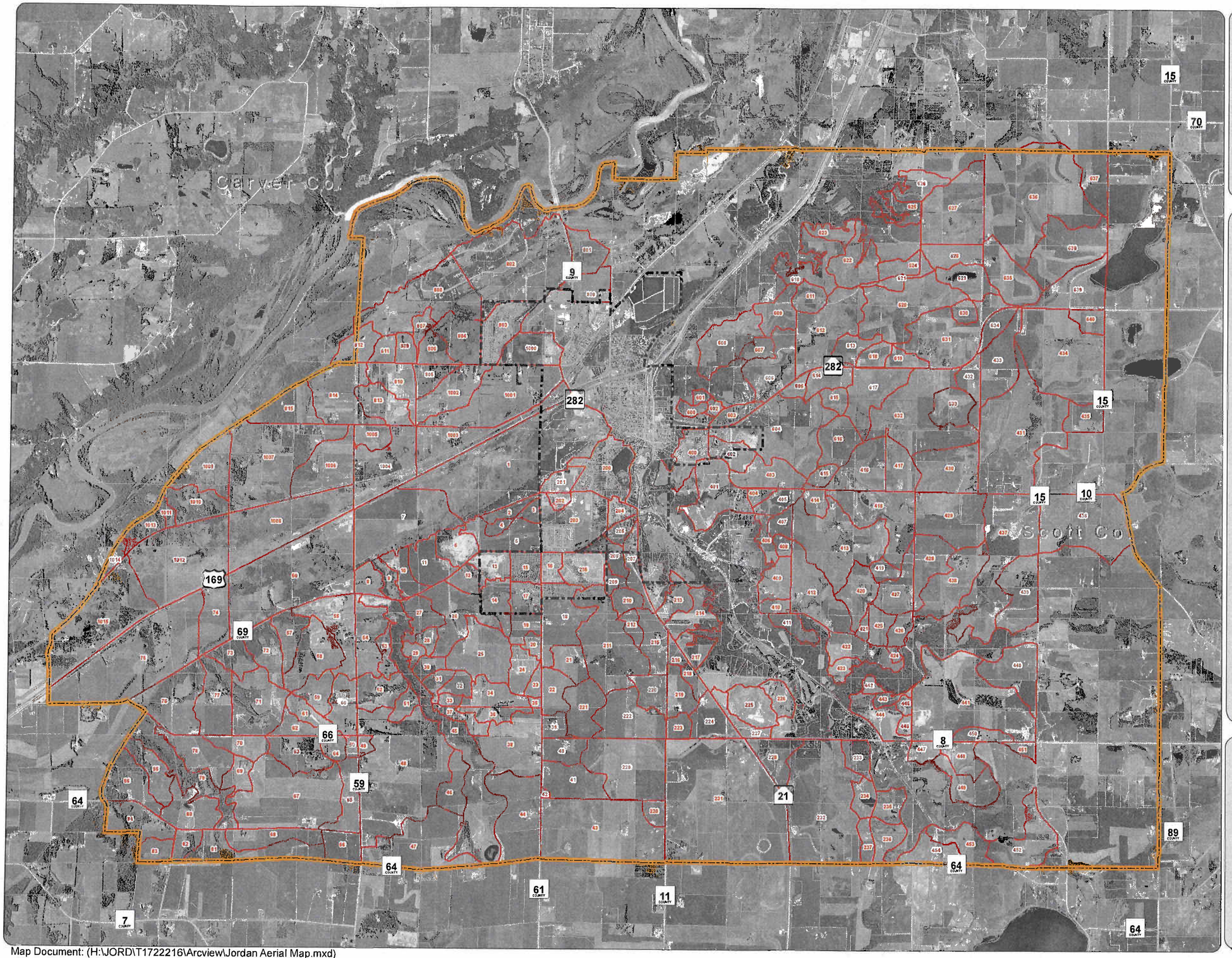
CITY OF JORDAN
COMPREHENSIVE SURFACE WATER MANAGEMENT PLAN

DIGITAL AERIAL PHOTOGRAPHIC MAP

FIGURE NO. 4
NOVEMBER, 2007



Legend

- Watersheds
- Jordan City Limits
- Ultimate Growth Boundary

Source:
Municipal Development Group, Scott County, 2003 FSA

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CITY OF JORDAN
COMPREHENSIVE SURFACE WATER MANAGEMENT PLAN

WATERSHED DRAINAGE DISTRICT MAP

FIGURE NO. 5
NOVEMBER, 2007

Carver Co.

Scott Co.

Legend

Watershed Boundary

- A
- B
- C
- D
- E
- F
- Watersheds
- Local Ponds
- Regional Ponds
- Ponds
- Areas to be Served by Regional Ponds
- Drainage Flow Arrows
- Scott County Streams
- Scott County Lakes
- Jordan City Limits
- Ultimate Growth Boundary

Source:
Municipal Development Group, Scott County, MnDNR

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CITY OF JORDAN
COMPREHENSIVE SURFACE WATER MANAGEMENT PLAN

WATERSHED DRAINAGE DISTRICT A & B MAP

FIGURE NO. 6
NOVEMBER, 2007

Legend

Watershed Boundary

- A
- B
- Watersheds
- Local Ponds
- Regional Ponds
- Ponds
- Areas to be Served by Regional Ponds
- Drainage Flow Arrows
- Scott County Streams
- Scott County Lakes
- 10' Contours
- Jordan City Limits
- Ultimate Growth Boundary

Source:
Municipal Development Group. Scott County, MnDNR

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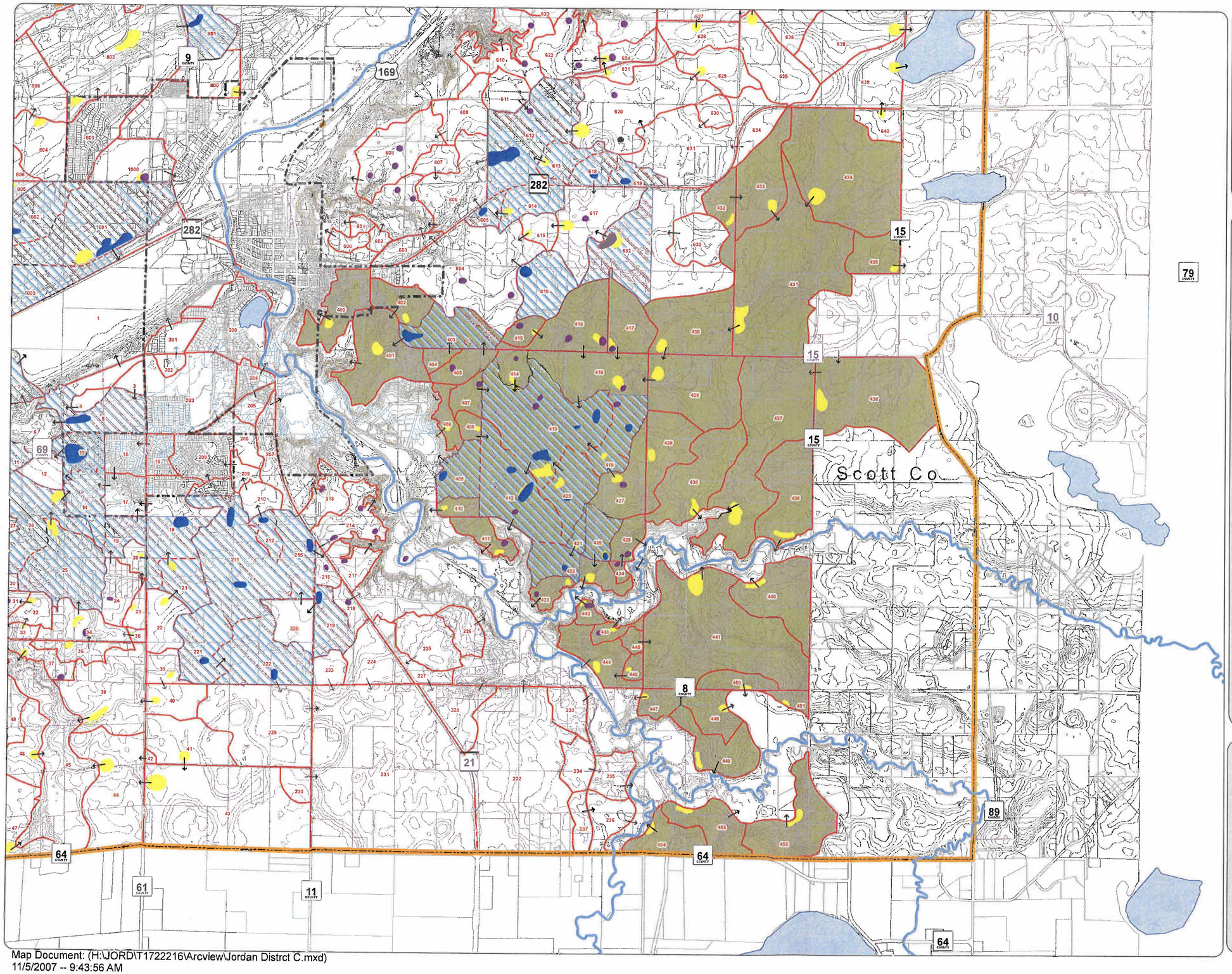
CITY OF JORDAN COMPREHENSIVE SURFACE WATER MANAGEMENT PLAN

WATERSHED DRAINAGE DISTRICT C MAP

FIGURE NO. 7
NOVEMBER, 2007



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Watershed Boundary

- C
- Watersheds
- Local Ponds
- Regional Ponds
- Ponds
- Areas to be Served by Regional Ponds
- Drainage Flow Arrows
- Scott County Streams
- Scott County Lakes
- 10' Contours
- Jordan City Limits
- Ultimate Growth Boundary

Source:
Municipal Development Group, Scott County, MnDNR

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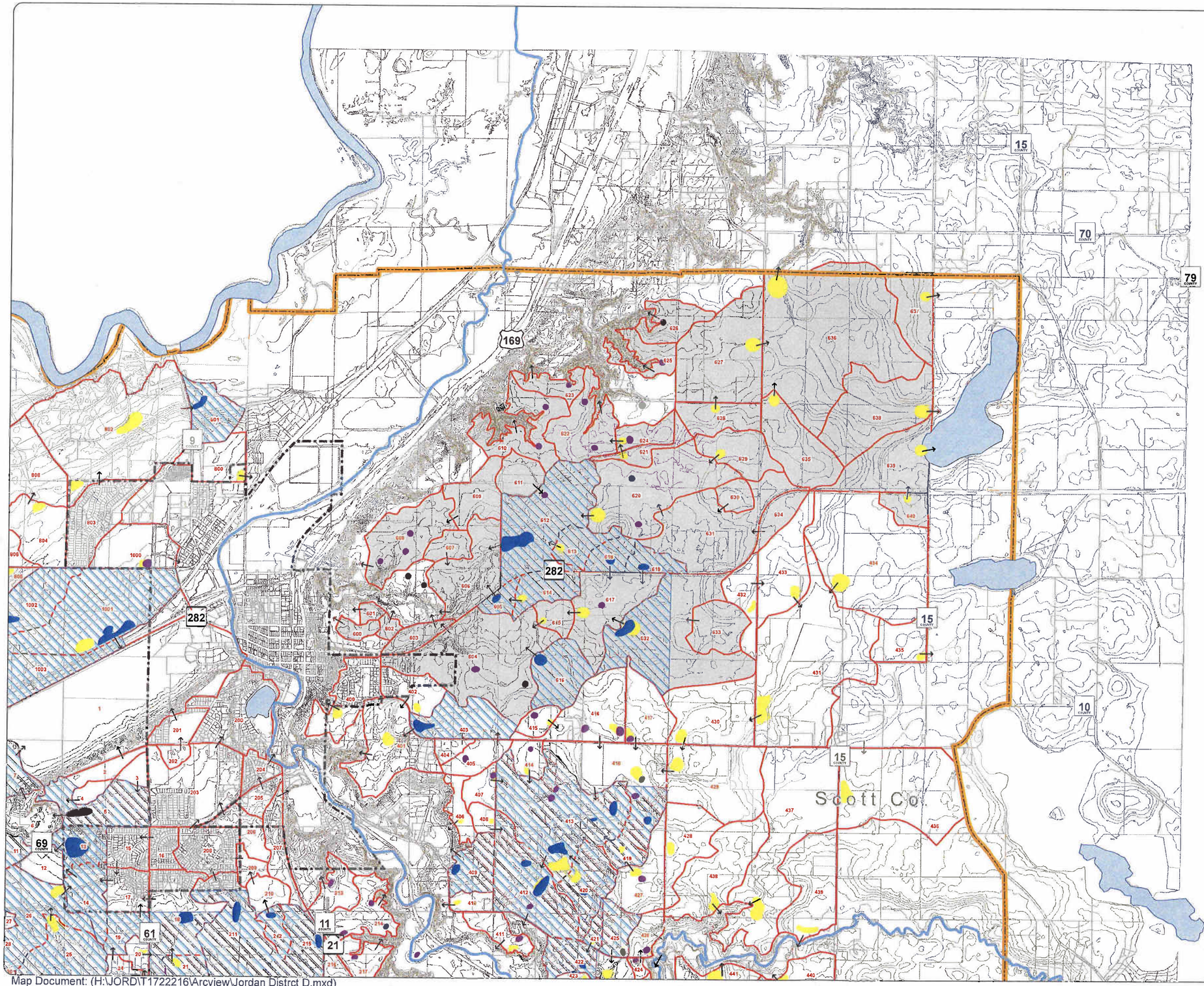
CITY OF JORDAN
COMPREHENSIVE SURFACE WATER MANAGEMENT PLAN

WATERSHED DRAINAGE DISTRICT D MAP

FIGURE NO. 8
NOVEMBER, 2007



Legend

Watershed Boundary

- D
- Watersheds
- Local Ponds
- Regional Ponds
- Ponds
- Areas to be Served by Regional Ponds
- Drainage Flow Arrows
- Scott County Streams
- Scott County Lakes
- 10' Contours
- Jordan City Limits
- Ultimate Growth Boundary

Source:
Municipal Development Group, Scott County, MnDNR

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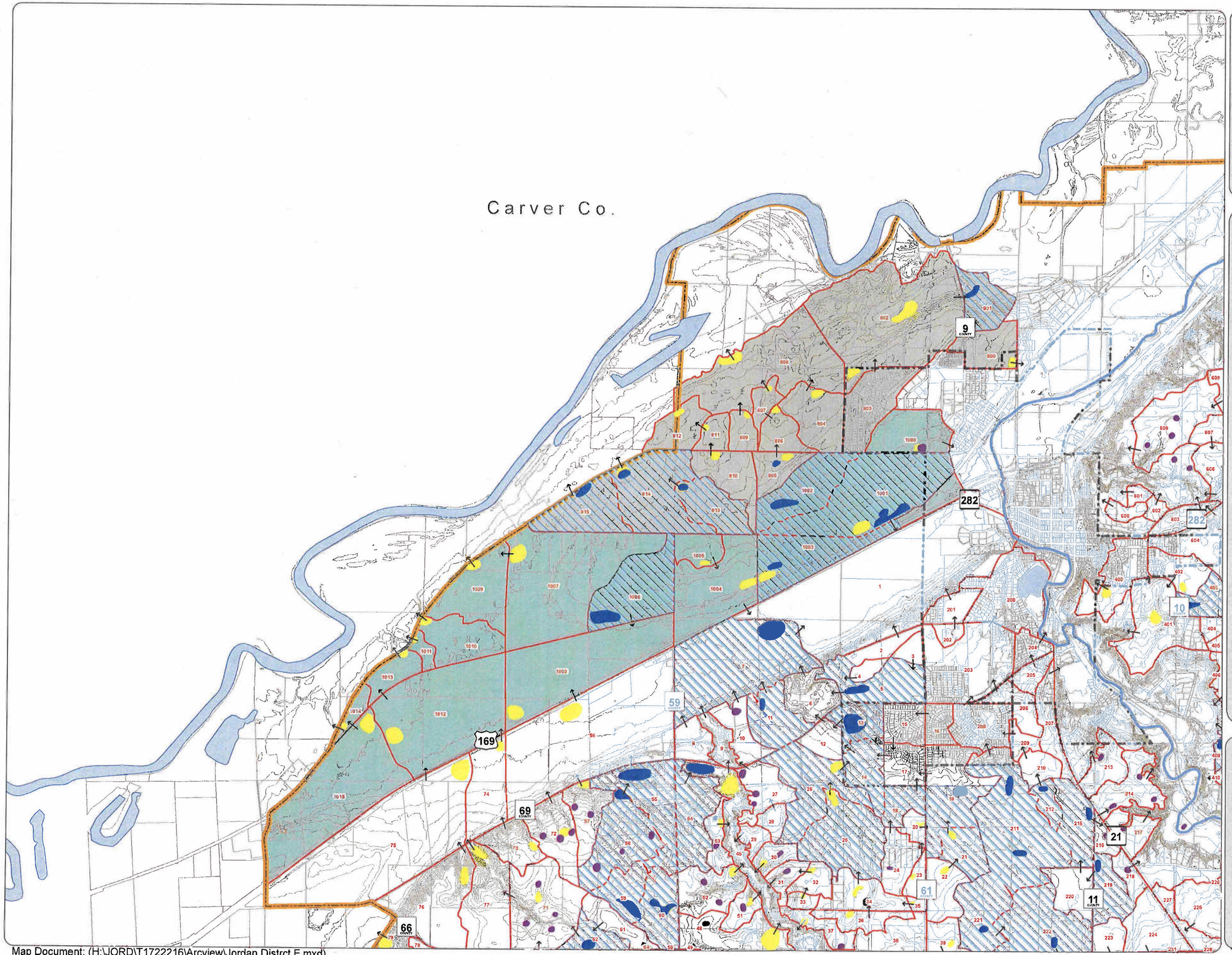
CITY OF JORDAN
COMPREHENSIVE SURFACE WATER MANAGEMENT PLAN

WATERSHED DRAINAGE DISTRICT E & F MAP

FIGURE NO. 9
NOVEMBER, 2007



Legend

Watershed Boundary

- E
- F
- Watersheds
- Local Ponds
- Regional Ponds
- Ponds
- Areas to be Served by Regional Ponds
- Drainage Flow Arrows
- Scott County Streams
- Scott County Lakes
- 10' Contours
- Jordan City Limits
- Ultimate Growth Boundary

Source:
Municipal Development Group, Scott County, MnDNR

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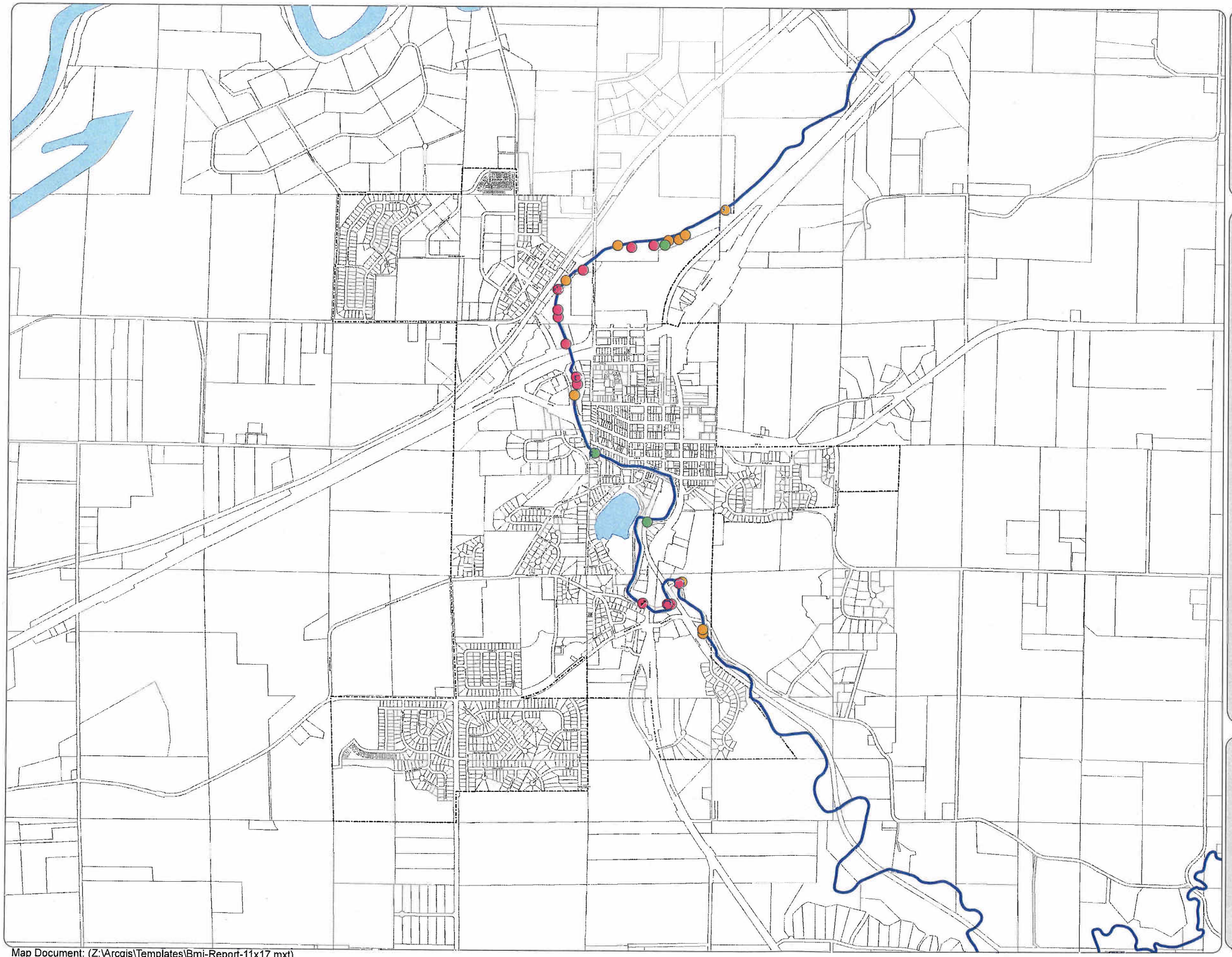
CITY OF JORDAN
COMPREHENSIVE SURFACE WATER MANAGEMENT PLAN

DNR SAND CREEK EROSION INVENTORY MAP

FIGURE NO. 10
NOVEMBER, 2007



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Erosion Inventory

- Outside Curve
- Seepage
- Other
- Streams
- Lakes

Source:
Scott County, MnDNR

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