

FINAL REPORT

STORMWATER PROGRAM MASTER PLAN PHASE 1 – PROGRAM DEFINITION

PREPARED FOR:



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LIST OF ACRONYMS AND ABBREVIATIONS

AAMM	Advanced Assessment Management Module
ADAMS	Aurora Document Access Management System
ADF	ESRI Web Application Developer Framework
API	Application Programming Interface
Aurora	City of Aurora
AW	City of Aurora Water Department
CCBWQA	Cherry Creek Basin Water Quality Authority
CCTV	closed circuit television
CDPHE	Colorado Department of Public Health and Environment
CIP	Capital Improvements Program
CLOMRs	Conditional Letter of Map Revision
CWCB	Colorado Water Conservation Board
DOW	Division of Wildlife
EPA	Environmental Protection Agency
ESRI 10.0	Environmental Systems Research Institute – GIS Software Developer
FEMA	Federal Emergency Management Agency
FIRMs	Flood Insurance Rate Maps
GIS	geographical information system
ID	Identification
IFAS	Integrated Fund Accounting System
IGAs	Intergovernmental Agreements
IT	information technology
JS	JavaScript – web/html scripting language, file extension
LOMRs	Letters of Map Revision
MS4	Municipal Separate Storm Sewer Systems
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
ODBC	Open Database Connectivity
Ops	Aurora Water Operations
pdf	portable document format
POSM	City of Aurora’s CCTV software

SD	Stormwater Development
SDE	Secure Data Exchange
SEMSWA	Southeast Metro Storm Water Authority
SFE	Single Family Equivalent
SI	Stormwater Improvement
SP1	Service Pack 1 (Microsoft)
SQL	Search and Query Language
SSRS	SQL Server Reporting Services
SWPMP	Stormwater Program Master Plan
SWPPPs	Stormwater Pollution Prevention Plans
TAC	Technical Advisory Committee
tif	tagged image file
UAT	User Acceptance Testing
UDFCD	Urban Drainage and Flood Control District
UI	User interface
URL	user resource link (internet shortcut)
URS	URS Corporation
USACE	United States Army Corps of Engineers

SECTION ONE

INTRODUCTION

1.1 AUTHORIZATION

This report documents Phase 1 – Program Development of a planning study that is intended to guide development of a Stormwater Program Master Plan (SWPMP) for the City of Aurora, Colorado (Aurora or City). This study has been authorized by the City, in an agreement with URS Corporation (URS) dated June 21, 2011. The study area is the area within the Aurora City limits and the urban planning boundary, which extends outside the current City limits, as shown on the Basin Map, Figure 1.1. The sponsoring agency is the City of Aurora Water Department (AW). Aurora’s Stormwater Program stakeholders and community members include the Aurora Public Works Department; Parks, Recreation and Open Space Department; other internal Aurora staff and Stormwater Program rate payers within the community.

1.2 PURPOSE & SCOPE

The SWPMP will be a comprehensive plan for Aurora’s Stormwater Capital Improvement Program to assist in evaluation and planning of new capital projects, infrastructure maintenance and rehabilitation, and asset management based on risk reduction and “triple bottom line” service delivery. The SWPMP will assist Aurora in providing the greatest reduction of regional and localized flood risks with available funding, and in preparing for future capital and maintenance funding needs, which is the stated objective for the project. The SWPMP will develop a framework for screening project alternatives.

The SWPMP will also assist Aurora in developing the GIS stormwater infrastructure database and ultimately will provide a tool compatible with existing City systems for finding records and data associated with stormwater assets. All processes and procedures developed during this project will be documented in a report that will allow Aurora to maintain consistency in management of the Stormwater Capital Improvement Program throughout the various departments and divisions, and whenever there are staff changes.

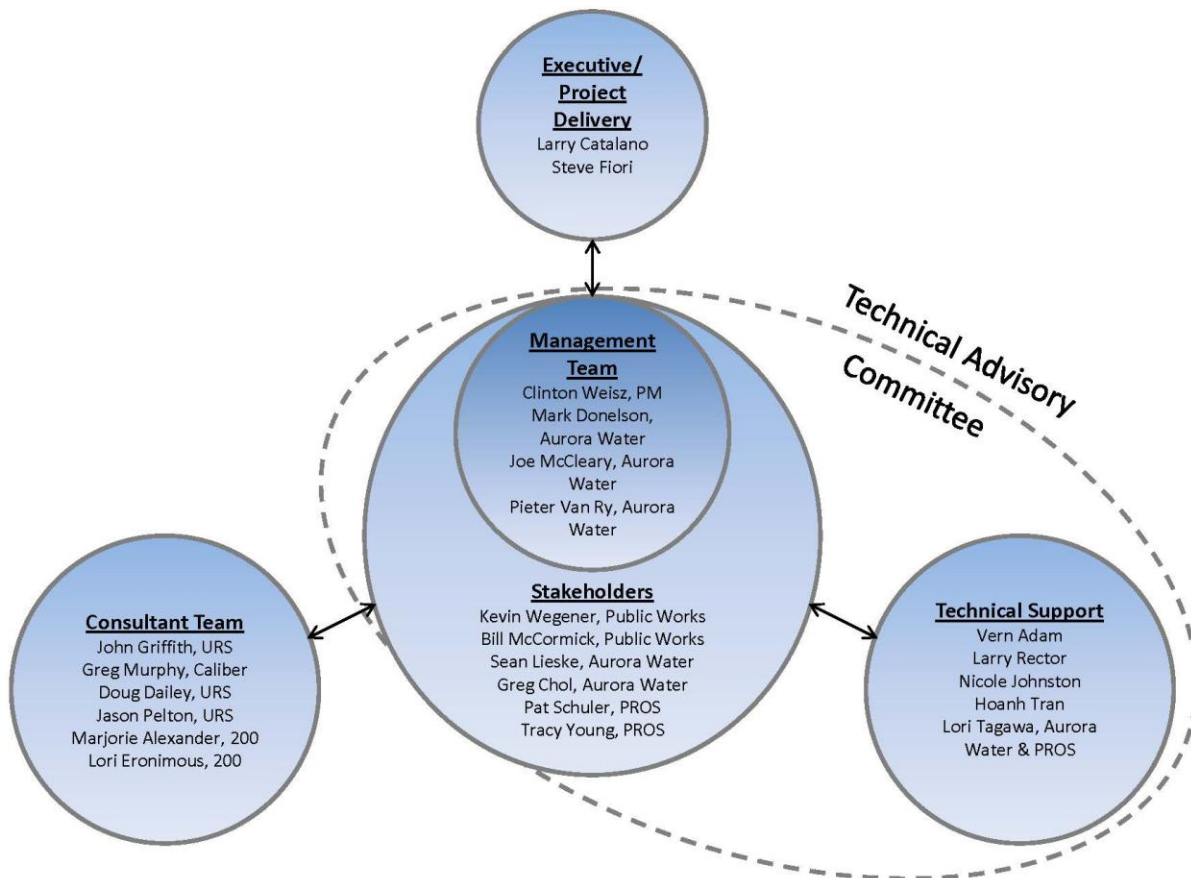
The URS Team’s approach to completing this project involves three phases: 1) Program Definition, 2) Program Development and 3) Program Deployment. The first phase, Project Definition, involved setting up a Technical Advisory Committee (TAC) and conducting a series of workshops aimed at establishing existing processes and procedures, the status and location of stormwater infrastructure documents and data, and objectives of the Stormwater Program Master Plan project as determined by the TAC members. This report documents the findings of Phase 1, i.e., the status of Aurora’s current Stormwater Capital Improvement Program as determined through the information provided by Aurora, and provides recommendations of the URS Team for subsequent tasks in Phases 2 and 3. These tasks include building the stormwater infrastructure database, developing procedures for planning new capital project and maintenance operations, and determining how and when GIS integration and Program Deployment (Phase 3) will be accomplished.

1.3 PHASE 1 – PROGRAM DEFINITION PROCESS

This SWPMP project began by creating a TAC consisting of representatives of various Aurora Departments and Divisions who have some level of contact and responsibility with the City’s

Stormwater Program and its associated capital improvements and maintenance. The TAC organization and members are shown in Figure 1.2.

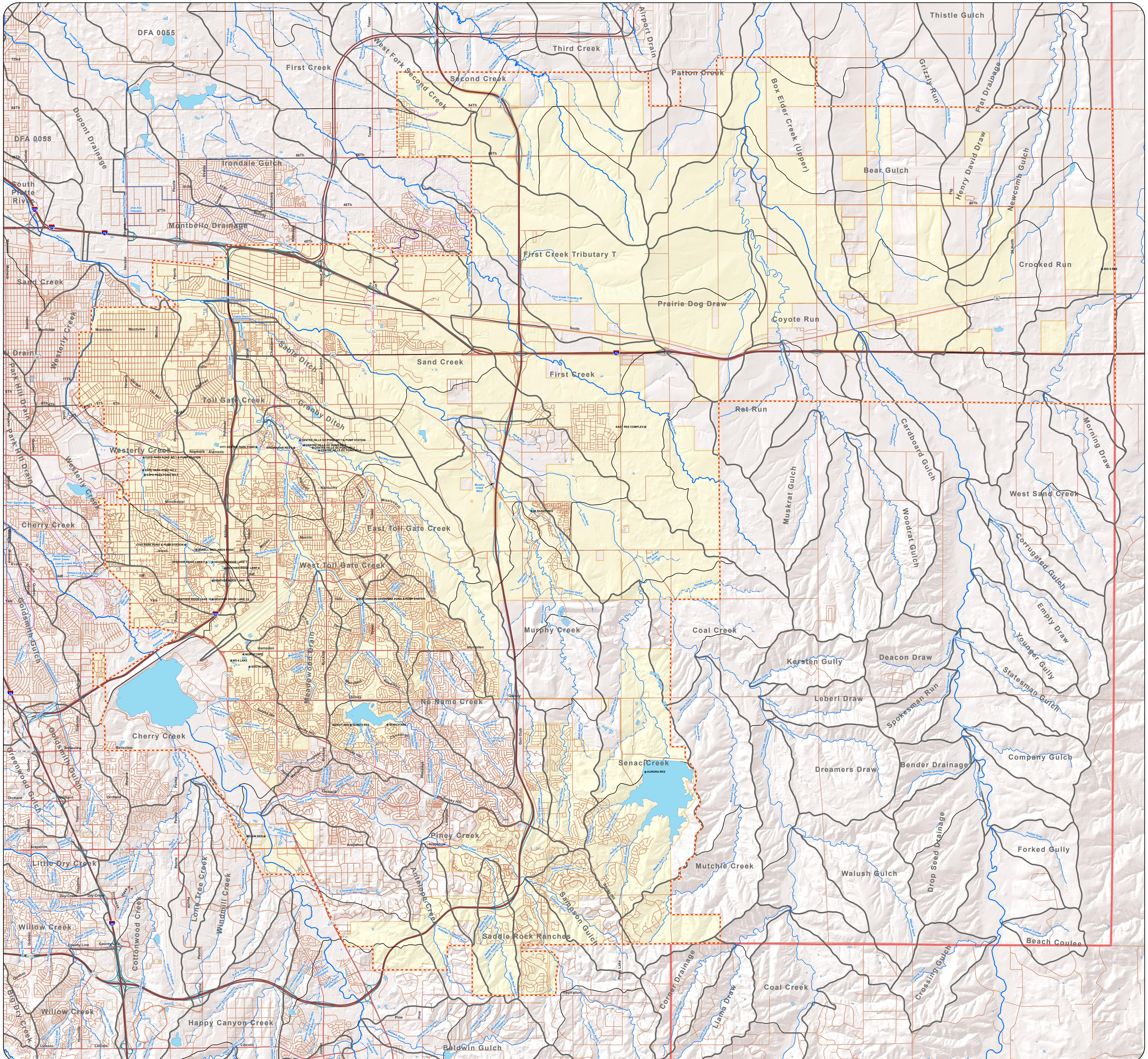
**Figure 1.2
Technical Advisory Committee**



The URS Team collaborated with the TAC through a series of workshops and meetings to develop a baseline of the current program and establish best appropriate practice goals and priorities to guide development of the SWPMP. The objective of Program Definition (Phase 1) is to align the goals and objectives of the SWPMP with specific (Phase 2) Program Development tasks to meet Aurora’s needs in the most cost-effective manner. The TAC provided assistance in collecting data and information, considered the issues and technical details related to development of the SWPMP, and reached consensus on the subsequent tasks and deliverables that would be required in Phase 2.

The following workshops were conducted:

- **Project Kick-off (July 9, 2012)** – A project kick-off meeting was conducted with the TAC to explain the project approach, project management and schedule, and program definition process.
- **Priorities and Plan Objectives (August 21, 2012)** – Prior to this workshop, a questionnaire was prepared and distributed to the TAC, which was used to help the consultant team gain understanding of:



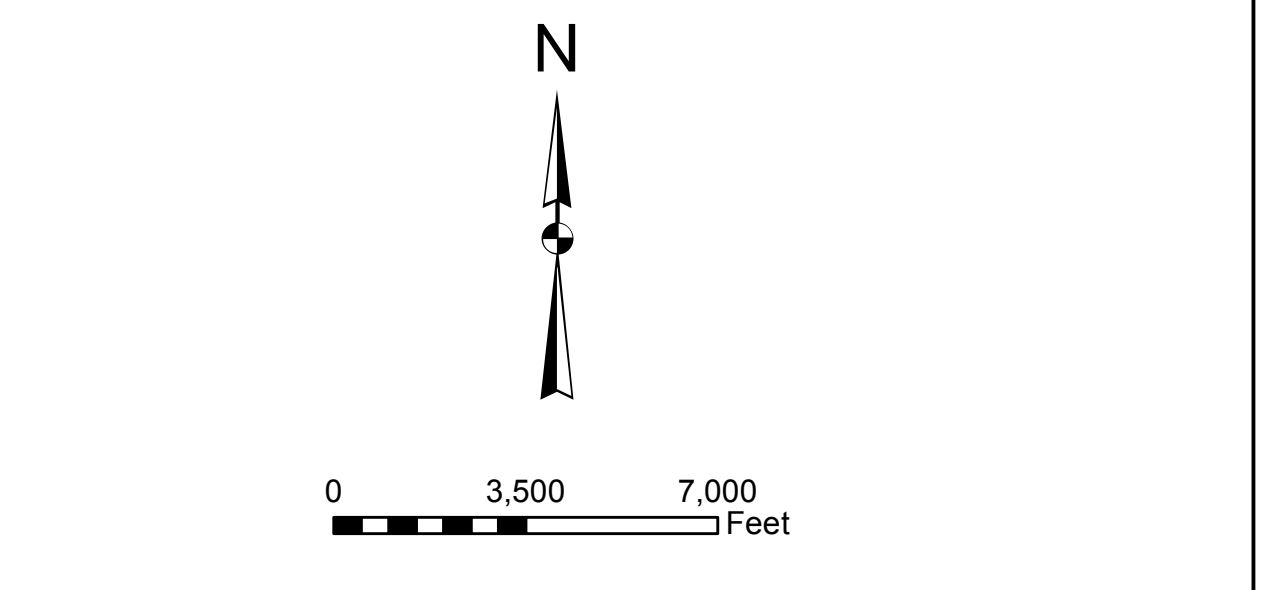
UDFCD Basins Within The City of Aurora

Antelope Creek	Mutchie Creek
Bear Gulch	Newcomb Gulch
Box Elder Creek (Upper)	No Name Creek
Cardboard Gulch	Patton Creek
Cherry Creek	Piney Creek
Coal Creek	Prarie Dog Draw
Corner Drainage	Rat Run
Coyote Run	Sable Ditch
Crooked Run	Saddle Rock Ranches
East Toll Gate Creek	Sampson Gulch
First Creek	Sand Creek
First Creek Tributary T	Second Creek
Grandy Ditch	Senac Creek
Grizzly Run	Third Creek
Henry David Draw	Toll Gate Creek
Irondale Gulch	West Fork Second Creek
Llama Draw	West Sand Creek
Meadowood Drain	West Toll Gate Creek
Montbello Drainage	Westerly Creek
Murphy Creek	Windmill Creek

Reservoir Diversion Structures (DWR, locations approximate)

Structure Name	Source	UDFCD Major Basin
48 RANCHES	MURPHY CREEK	Murphy Creek
AURORA RES	SOUTH PLATTE RIVER	Senac Creek
BIG 5 RES	BOXELDER CREEK	(Outside Crooked Run)
BRESNAHAN RES 1	TOLL GATE CREEK	East Toll Gate Creek
CENTRE HILLS GC POND NO 1	EAST TOLLGATE CREEK	East Toll Gate Creek
CENTRE HILLS GC POND NO 2	EAST TOLLGATE CREEK	East Toll Gate Creek
CENTRE HILLS GC POND NO 3	EAST TOLLGATE CREEK	East Toll Gate Creek
CENTRE HILLS GC POND NO 4	EAST TOLLGATE CREEK	East Toll Gate Creek
CITY CENTER PARK POND	WEST TOLLGATE CREEK	West Toll Gate Creek
EAST RES COMPLEX	SOUTH PLATTE RIVER	First Creek
EXPO PARK POND NO 1	WESTERLY CREEK	Westerly Creek
EXPO PARK POND NO 2	WESTERLY CREEK	Westerly Creek
EXPO PARK POND NO 3	WESTERLY CREEK	Westerly Creek
HEATHER RIDGE LAKE 1	GROUNDWATER	Westerly Creek
HEATHER RIDGE LAKE 11	GROUNDWATER	Westerly Creek
HEATHER RIDGE LAKE 13	GROUNDWATER	Westerly Creek
HEATHER RIDGE LAKE 18	GROUNDWATER	Westerly Creek
HEATHER RIDGE LAKE 4	GROUNDWATER	Westerly Creek
HEATHER RIDGE LAKE 7	GROUNDWATER	Westerly Creek
HUTCHINSON GREENWAY POND	WEST TOLLGATE CREEK	West Toll Gate Creek
JEWELL WETLANDS POND	WESTERLY CREEK	Westerly Creek
MELVIN RES	CHERRY CREEK	Cherry Creek
NO 4 LAKE	SEEPAGE	Cherry Creek
NORTH LAKE	SEEPAGE	Cherry Creek
QUINCY RES	SOUTH PLATTE RIVER	West Toll Gate Creek
SOUTH LAKE	SEEPAGE	Cherry Creek
UTAH PARK POND	WESTERLY CREEK	Westerly Creek

- Legend**
- * Reservoir Diversion Structures (DWR)
 - Major Drainageway (UDFCD)
 - Tributary (UDFCD)
 - Other Drainage (UDFCD)
 - Highline Canal (USGS NHD)
 - Waterbody (USGS NHD)
 - Major Basins (UDFCD)
 - Subbasins (UDFCD)
 - UDFCD District Boundary (UDFCD)
 - Planning Area Ord# 2006-38 (City of Aurora)
 - City Limits (City of Aurora)



Aurora Stormwater Program Master Plan

Major Basins

- Each TAC member’s responsibilities with respect to stormwater management.
- How the City’s current Stormwater Program is organized, and what knowledge, systems and administrative processes/practices are in place.
- Each TAC member’s estimation of the level of importance of various engineering, operations and maintenance activities, systems, and administrative processes/practices to the SWPMP and to the stated objective of “reducing flood risk”.

Information obtained from the questionnaires was processed and reviewed with the TAC at this workshop.

- **Data Collection Needs and Priorities (August 27, 2012)** – Prior to this workshop, another questionnaire was prepared and distributed to the TAC, which was used to help the consultant team confirm available records and data sets, their locations and formats, and how they could be utilized to accomplish project objectives and integrated into the database in Phase 2.
- **Condition Assessment Workshop No. 1 (September 6, 2012)** – This workshop was used to present processes for determining the condition and risk associated with existing drainage infrastructure, and level of risk associated with the watersheds within Aurora. This information was used to prioritize collection and integration of data for each type of asset and to set a prioritized list of condition assessment tasks to be accomplished in Phase 2.
- **Program Planning and Funding Workshop (October 1, 2012)** – This workshop focused on collecting financial data available from Aurora, including the current 20-year capital improvement plan, and then on discussing and reaching consensus on acceptable risk associated with the City’s stormwater infrastructure based on a triple bottom line approach.
- **IT/GIS Integration Workshop (October 11, 2012)** – This workshop was used to confirm Aurora’s geographical information systems (GIS) and information technology (IT) platforms, develop concepts for user interface, and determine requirements for integration of documents and tools into the City’s GIS, asset management and document management databases.
- **Condition Assessment Workshop No. 2 (November 28, 2012)** – This workshop was a follow-up to the first Condition Assessment Workshop. The TAC reached consensus on failure risk modes for stormwater assets and general probability of failure/consequence rankings for asset types. It also provided input on the confidence level of existing asset condition data. This information was used to establish study priorities and objectives, and to set a prioritized list of assets for condition assessment tasks to be accomplished in Phase 2.
- **Program Definition Workshop (December 10, 2012)** – This workshop was used to present the results and recommendations of the Phase 1 process to the TAC. We also reviewed and discussed the scope of work for the tasks in the Program Development phase.

During the course of Phase 1, the consultant team also led the following meetings with other Aurora staff and individual stakeholders to discuss the City’s assets, issues, data needs, budgets and financial plans, document management and GIS systems and requirements. These meetings

were used to identify activities that support and promote the Stormwater Program, policies, and financial plan requirements, which were reviewed with the TAC during the various workshops.

- **IT Meeting (September 6, 2012)** – Focused on Aurora’s AMANDA, Oracle, Aurora Document Access Management System (ADAMS), and GIPSE document management systems.
- **Finance Meeting (September 6, 2012)** – Focused on the Aurora Stormwater Program rate structure and Capital Improvements Program (CIP) budgets.
- **GIS Meeting (September 17, 2012)** – Aurora gave the consultant team an overview of the stormwater GIS technologies, Hansen capabilities, and the GIPSE system tool.
- **Hansen Meeting (September 17, 2012)** – Aurora gave the consultant team an overview of their stormwater GIS technologies, the GIPSE viewing tool, and Hansen capabilities.
- **CIP Planning Meeting (October 15, 2012)** – This meeting focused on Aurora’s current 20-year stormwater CIP, and the processes Aurora uses to prioritize projects. Potential alternative methods of ranking projects were also discussed.
- **Management Team Meeting (November 7, 2012)** – At this meeting, the consultant team presented preliminary results of project findings, and suggested Phase 2 tasks and Program Development procedures.

Meeting minutes and materials for these workshops and meetings are included in Appendix A.

SECTION TWO

SUMMARY OF PHASE 1 PROJECT INVESTIGATIONS

2.1 PROGRAM PRIORITIES & OBJECTIVES

After the project kick-off meeting, a questionnaire was prepared by the consultant team and distributed to the TAC. The questionnaire was set up to determine each respondent's role in and assessment of the current Aurora Stormwater Program, by whom various activities are carried out, and what practices and procedures are most important not only to the program, but to this SWPMP project. The results of the responses to the questionnaires were reviewed with the TAC at the "Program Priorities and Objectives" workshop held on August 21, 2012.

Two overarching Stormwater Program activities emerged from the responses as points of focus for this SWPMP project: 1) Capital Projects Planning and Funding and, 2) Data Management and Communication.

Other objectives of the *Stormwater Program Master Plan* were identified:

- Stormwater Program priorities should be based on a "triple bottom line" (economic/environmental/social costs) approach.
- The SWPMP should present work flow options for achieving MS-4 permit compliance, and sharing data with other agencies.
- The SWPMP should raise awareness regarding elements in the City code or policy related stormwater practices that the City may want to consider revising in order to facilitate a more effective overall stormwater program/business plan include recommendations regarding potential changes to City code that would address recurring issues with lot drainage, water quality, appearance and functionality of drainage facilities.
- The SWPMP should incorporate institutional knowledge such that there is a "succession" process for continuity of the program when staff changes.

Regarding capital projects planning and funding for stormwater, Aurora currently does annual, 5-year, 10-year and 20-year capital project projections, but the process is "ad hoc." The TAC agreed there needs to be a strategic approach to organizing information and prioritizing capital projects and maintenance activities for program planning and funding purposes, including recurring maintenance items with significant costs such as sediment removal. Developing strategic procedures (decision making tools) for regularly and consistently evaluating and planning overall Stormwater maintenance and improvements funding and sustainability requirements was identified as a SWPMP objective. The procedures (tools) should address Stormwater Program level of service and be in a format that is user friendly, flexible, adaptable and robust, sensitive to current workflows, and will serve AW well into the future.

Regarding data management and communication, the TAC agreed Aurora's stormwater database in GIS has data gaps and quality issues and needs improvement to be fully useful to the Stormwater Program. Therefore, another SWPMP objective is to determine what stormwater system attributes and Stormwater Program information could be displayed in a map-based database on layers with dots/points that display features and their details, rate the attributes and prioritize development of the stormwater infrastructure "data management system." The TAC expressed a desire to have a data management system that has all stormwater infrastructure information, including documents, records and asset data, drainage complaints, MS4 documents

and so forth, accessible from one place with the ability to share information internally and externally.

Some requirements for such a stormwater data management system were discussed:

- The system must integrate and link to existing data management systems, such as AMANDA and Hansen, and be user friendly.
- Integration and maintenance are essential and requirements must be documented.
- Data management solutions need to be well defined, and there must be funds for creating new information, updating it, and training staff to use it.
- The system will need to incorporate existing conditions as well as projects targeted at new development.
- Aurora would like to incorporate a basin connectivity aspect to the GIS information so conditions within each basin can be correlated with other parts of that basin.
- The system should support interdepartmental communication and sharing project location, schedule and budgets.

Another objective of this SWPMP is to document what the City is currently doing, how the City's Stormwater Program is organized across multiple departments, and to identify roles and responsibilities. A stated goal for the Stormwater Program is centralization and coordination of stormwater activities. A clear definition of roles and responsibilities should be outlined in the SWPMP.

The TAC put forth the following as additional drivers for development of the SWPMP:

- Vulnerability – Current staff have accumulated a vast amount of institutional knowledge that is difficult to access when people terminate their employment with Aurora. Current Stormwater Program history and processes are not well documented. This knowledge needs to be incorporated into the SWPMP such that there is a “succession” process for continuity of the program when there are staff changes.
- Future regulations, statewide and national, will become more rigorous. The SWPMP should address options for achieving compliance and sharing data with other agencies.
- Level of Service – Is Aurora's Stormwater Program providing the highest and most cost-effective level of service to rate payers and stakeholders? The SWPMP should address level of service and associated costs.

2.2 PROGRAM ORGANIZATION

The team put together a modified City organization chart, Figure 2.1, which shows how the current Stormwater Program is managed within Aurora's organizational structure.

As shown on Figure 2.1, there are five Stormwater Program Managers, including the City Manager who is named as Aurora's Stormwater Program Manager on the MS4 permit. Other staff who oversee Capital Planning/Design/Construction, Maintenance and Operations, Floodplain Administration and MS4 activities are in different divisions in four departments. It was noted that, when Aurora Water reorganized in 2004, stormwater functions were purposely distributed among the various departments.

**Figure 2.1
Stormwater Program Organization**

STORMWATER PROGRAM ORGANIZATION



- KEY**
- Direct Management of Stormwater Program
 - ① Capital Planning / Design / Construction
 - ② Maintenance
 - ③ Emergency Response

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Primary functions of the Stormwater Program are:

1. Administration
2. Operations and Maintenance
3. Planning
4. Regulations and Enforcement
5. Water Quantity, Floodplain Management
6. Water Quality, NPDES (National Pollutant Discharge Elimination System) MS4 (Municipal Separate Storm Sewer Systems) Programs
7. Capital Improvements Program
8. Asset Management

Current TAC members' roles and responsibilities for the primary functions of Aurora's Stormwater Program are listed in Table 2.1.

2.3 CURRENT DOCUMENT MANAGEMENT PROCEDURES

Information regarding documents important to the Stormwater Program was collected through a "Community Data Needs" questionnaire, a consolidated version of which is Table B-1 in Appendix B.

2.3.1 Relevant Stormwater Program Documents

At the Data Collection Needs and Priorities Workshop, the consultant team presented the results of a Data Needs questionnaire to confirm available records, data sets, and then utilized established study objectives to prioritize data sets for collection and integration in Phase 2.

Documents important to the Stormwater Program, their locations and formats, and their relative priorities are listed in Appendix B, Table B-1. The documents' relative importance to each step in the Environmental Protection Agency's (EPA) "ten-step asset management process" is shown on Figure 2.2.

Aurora stores most documents of record in Oracle. Many documents necessary for the Stormwater Program are not in the Oracle database, as shown in Table B-1 in Appendix B, but in other locations or systems within various departments. Follow up discussions with the TAC indicated there are also other current and on-going project documents, which are in another SharePoint site, CPDNet, and another document management program, EaDocs, that need to be integrated into the document management system.

Goals and requirements for the document management system identified by the TAC include:

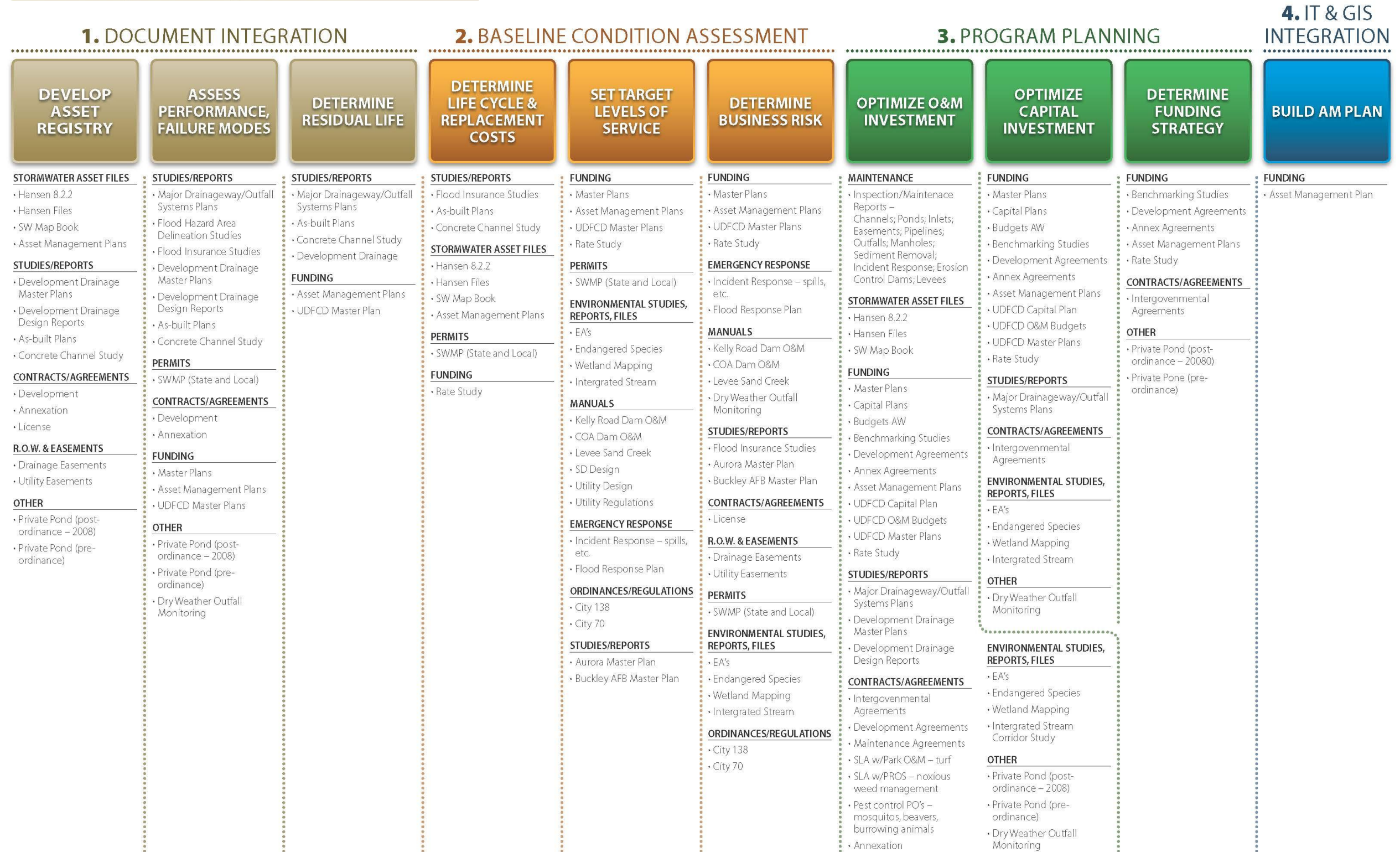
- The preference is to not incorporate the Urban Drainage and Flood Control District (UDFCD) studies into Aurora's system, but to link to the UDFCD website.
- Establish an easy way to get to Federal Emergency Management Agency (FEMA) information. Public Works is tracking conditional letter of map revisions (CLOMRs), and is maintaining letters of map revisions (LOMRs) and elevation certificates.

**Table 2.1
TAC Roles and Responsibilities**

Stormwater Program Management and Staff	Stormwater Program Functions								Role
	Administration	Operations & Maintenance	Planning	Regulations & Enforcement	Water Quantity, Floodplain Management	Water Quality, MS4 Permit	Capital Improvements Program	Asset Management	
George Noe, City Manager	X								Overall Program Administration
Kevin Wegener, City Engineer Public Works Department	X			X	X				City Engineer, Floodplain Administrator
Mark Donelson, Aurora Water	X	X	X			X	X	X	Manager of Wastewater/Stormwater Operations
Pieter Van Ry, Aurora Water	X		X	X		X	X	X	Manager of Water Engineering
Clint Weisz, Aurora Water			X				X		CIP Project Manager
Sean Lieske, Aurora Water	X			X		X			Environmental Permitting Manager
Joe McCleary, Aurora Water	X	X				X	X	X	Stormwater Superintendent – Operations
Bill McCormick, Public Works Department			X	X	X		X		Associate City Engineer, Floodplain Administrator
Greg Chol, Aurora Water		X	X					X	Asset Manager
Vern Adam, Aurora Water							X		Stormwater Project Manager
Larry Rector, Aurora Water								X	GIS System Manager
Nicole Johnston, Aurora Water			X	X					Stormwater Engineer – Development Review
Lori Tagawa, Aurora Water and PROS			X						PROS Project Manager
Tracy Young, Aurora Water and PROS			X					X	Manager of PROS Planning, Design and Construction
Pat Schuler, PROS				X		X		X	Manager of Open Space and Natural Resources

Figure 2.2
USEPA Ten-Step Asset Management Process

USEPA Ten Step Asset Management Process



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- Aurora is currently defining a process for storing record drawings (as-builts) and there may be a new process in place by the end of 2012. This process will include records concerning public improvements for new development.
- A link to water and sewer data might be developed later as a module of the data management system and should not be precluded.
- All individual stormwater pollution prevention plans (SWPPPs) and 404 permits should be documented in GIS eventually. It was suggested to consider a way to link to the USACE database.
- “Enforced actions” should be added to the GIS and possibly incorporate Division of Wildlife (DOW) information and wetland mapping. An Integrated Stream Corridor Management Plan should also be integrated into the system.
- The UDFCD Five-Year Plan should be incorporated into the system.
- Annexation, Developer, and Intergovernmental Agreements (IGAs) that require some level of funding should be incorporated.
- A method should be set forth within the SWPMP that gives the City the ability to train new employees to find relevant stormwater documents and asset information.

Much of Aurora’s Stormwater Program information has been developed in collaboration with the UDFCD, and reports and documents for projects on which Aurora was a sponsor are listed by watershed in Table 2.2. These documents are available on the UDFCD website. Yellow highlighted watersheds are high priority watersheds for initial Phase 2 Tasks.

**Table 2.2
UDFCD Documents by Watershed**

Document Type	Year	Document Title	Watershed
Flood Hazard Area Delineation	1995	Coyote Run and Box Elder Creek Upper FHAD 1995	Box Elder Creek
Hydrology Report	1994	Box Elder Creek Upper Hydrology 1994	Box Elder Creek
Outfall Systems Planning	1994	Box Elder Creek Upper OSP Ph A 1994	Box Elder Creek
Outfall Systems Planning	1995	Box Elder Creek Upper OSP Ph B 1995	Box Elder Creek
As Built	1990	Parker Iliff Basin Drainage Improvements	Cherry Creek
As Built	1999	Valley Club Acres Outfall Storm Sewer and Channel Improv.	Cherry Creek
Design Report	1999	Cherry Creek Corridor Reservoir to County Line OSP 1999 DR	Cherry Creek
Flood Hazard Area Delineation	2003	Cherry Creek Corridor Reservoir to Scott Rd FHAD 2003	Cherry Creek
Major Drainageway Planning	2002	Cherry Creek Res to Scott Rd MDP Ph A 2002	Cherry Creek
Major Drainageway Planning	2004	Cherry Creek Res to Scott Rd MDP Ph B 2004	Cherry Creek
Outfall Systems Planning	1981	Parker Mexico OSP 1981	Cherry Creek

Table 2.2
UDFCD Documents by Watershed

Document Type	Year	Document Title	Watershed
Outfall Systems Planning	1981	Parker Mexico OSP Addendum 1981	Cherry Creek
Outfall Systems Planning	1985	Quincy Drainage Shop Creek OSP 1985	Cherry Creek
Outfall Systems Planning	1998	Cherry Creek Reservoir to County Line OSP Ph A 1998	Cherry Creek
Outfall Systems Planning	1999	Cherry Creek Reservoir to County Line OSP Ph B 1999	Cherry Creek
Special Report	1997	Cherry Creek Corridor Reservoir to County Line 1997	Cherry Creek
As Built	2002	East Toll Gate Uravan Tributary Channel Improv	East Toll Gate Creek
Design Report	2009	Side Creek and East Toll Gate Creek Tributary Uravan Channel Erosion Abatement Final DR	East Toll Gate Creek
Flood Hazard Area Delineation	2010	East Toll Gate Creek Upper 2010	East Toll Gate Creek
Major Drainageway Planning	2011	East Toll Gate Creek Upper MDP Ph B 2011	East Toll Gate Creek
Flood Hazard Area Delineation	2011	First Creek Upper DFHAD 2011	First Creek
Major Drainageway Planning	1974	First Creek MDP Ph A 1974	First Creek
Major Drainageway Planning	1977	First Creek MDP Ph B 1977	First Creek
Major Drainageway Planning	2010	First Creek Upper MDP 2010	First Creek
Outfall Systems Planning	1988	First Creek Irondale Gulch and DFA 0055 OSP Ph A 1988	First Creek
Outfall Systems Planning	1990	First Creek and DFA 0055 OSP Ph B 1990	First Creek
Special Report	1996	First Creek Bald Eagle Shallows 1996	First Creek
As Built	1971	Aurora Drainage Improvements Ponds A B	General
As Built	1986	Four Star Park	General
As Built	1986	Huntington Estates Storm Drainage as built	General
Design Report	2001	Aurora Jewell Wetlands 2001 DR	General
Hydrology Report	1985	Aurora Annexation Area Drainage Masterplan Hydrology 1985	General
Outfall Systems Planning	1985	Four Square Mile OSP 1985	General
Special Report	1981	Sandy Soil Design Guidelines and Criteria	General
Special Report	1982	Aurora Storm Sewer Plans 1982	General
As Built	2006	Granby Ditch Inlet I 225 at Colfax Ave 2006	Granby Ditch
Design Report	2001	Granby and Sable Ditch DR	Granby Ditch
Flood Hazard Area Delineation	1977	Granby and Sable Ditch FHAD 1977	Granby Ditch
Flood Hazard Area Delineation	1990	Granby and Sable Drainageways FHAD 1990	Granby Ditch

Table 2.2
UDFCD Documents by Watershed

Document Type	Year	Document Title	Watershed
Major Drainageway Planning	1990	Granby and Sable MDP Ph A 1990	Granby Ditch
Major Drainageway Planning	1991	Granby and Sable MDP Ph B 1991	Granby Ditch
As Built	2006	Irondale Gulch Bolling Tributary Silverado II Detention Facility	Irondale
As Built	1982	Meadowood Drainageway Remedial Maint	Meadowood
As Built	1983	Meadowood Drainageway Rehab Maint Ph II	Meadowood
As Built	1985	Meadowood Drainageway Rehab Maint Ph III	Meadowood
As Built	1985	Meadowood Drainageway Rehab Maint Ph IV	Meadowood
As Built	1986	Meadowood Drainageway Rehab Maint Ph V	Meadowood
As Built	2000	Meadowood Creek Drainage and Waterline Improv	Meadowood
Hydrology Report	1999	Meadowood Creek Drainage & Utility Improvements	Meadowood
Design Report	1999	Meadowood Creek Drainage and Waterline Improv DR	Meadowood
Flood Hazard Area Delineation	2006	Murphy Creek FHAD 2006	Murphy Creek
Flood Hazard Area Delineation	2008	Murphy Creek FHAD 2006 Revised 2008	Murphy Creek
Hydrology Report	2006	Murphy Creek OSP Hydrology Report 2006	Murphy Creek
Outfall Systems Planning	2007	Murphy Creek OSP Ph A 2007	Murphy Creek
Outfall Systems Planning	2008	Murphy Creek OSP Ph B 2008	Murphy Creek
As Built	2008	Piney Creek Sampson Gulch Stream Stab Ph I Gartrell Rd to Aurora Pkwy	Piney Creek
Flood Hazard Area Delineation	2011	Piney Creek and Antelope Creek FHAD 2011	Piney Creek
Major Drainageway Planning	2012	Piney Creek MDP 2012	Piney Creek
Outfall Systems Planning	2002	Piney Creek Upper OSP Ph A 2002	Piney Creek
Outfall Systems Planning	2003	Piney Creek Upper OSP Ph B 2003	Piney Creek
As Built	2009	Sable Ditch Detention Pond Colfax Ave and Jasper St	Sable Ditch
Design Report	2009	Sable Ditch Detention Pond 2009 DR	Sable Ditch
As Built	1985	Sand Creek Channel Improv Ph I	Sand Creek
As Built	1986	Sand Creek Channel Improvements Chambers Rd Bridge Floodwall	Sand Creek
As Built	1986	Sand Creek Channel Improvements Misc.	Sand Creek
As Built	1987	Sand Creek Channel Improv Ph II	Sand Creek
As Built	1989	Sand Creek Channel Improv Ph III	Sand Creek
As Built	1993	Sand Creek Channel Improv Buckley to Colfax	Sand Creek
As Built	2003	Sand Creek Park Improv Project	Sand Creek
Flood Hazard Area Delineation	1977	Sand Creek FHAD 1977	Sand Creek

Table 2.2
UDFCD Documents by Watershed

Document Type	Year	Document Title	Watershed
Major Drainageway Planning	1983	Sand Creek MDP Ph A 1983	Sand Creek
Major Drainageway Planning	1984	Sand Creek MDP Ph B 1984	Sand Creek
Outfall Systems Planning	1990	Sand Creek Upper Basin OSP Ph B 1990	Sand Creek
Outfall Systems Planning	2009	Baranmor Ditch OSP Ph A 2009	Sand Creek
Outfall Systems Planning	2010	Baranmor Ditch OSP Ph B 2010	Sand Creek
Special Report	1986	Sand Creek Basin Plan for Aurora Annex 1986	Sand Creek
Flood Hazard Area Delineation	2011	Second Creek Upstream of DIA FHAD 2011	Second Creek
Hydrology Report	1989	Second Creek Third Creek DFA 0053 and Barr Lake Hydrology 1989	Second Creek
Major Drainageway Planning	2011	Second Creek Upstream of DIA MDP 2011	Second Creek
Outfall Systems Planning	1989	Second Third Creek DFA 0053 Barr Lake OSP Ph A 1989	Second Creek
Outfall Systems Planning	1990	Second Creek DFA 0053 OSP Ph B 1990	Second Creek
Outfall Systems Planning	1990	Third Creek Barr Lake OSP Ph B 1990	Third Creek
Hydrology Report	2006	Toll Gate Creek Watershed Hydrology 2006	Toll Gate Creek
Outfall Systems Planning	1990	Toll Gate Creek Basin Upper OSP Ph B 1990	Toll Gate Creek
Special Report	1973	Toll Gate Creek Upper and Tribs Special Flood Hazard Report 1973	Toll Gate Creek
As Built	1988	West Toll Gate Creek Rehab Maint Sch 1	West Toll Gate Creek
As Built	1990	Summer Valley Ranch Tributary Rehab Maint Sch I	West Toll Gate Creek
As Built	1991	Summer Valley Ranch Tributary Rehab Maint Sch II	West Toll Gate Creek
As Built	1993	Summer Valley Ranch Tributary Rehab Maint Sch III	West Toll Gate Creek
As Built	1997	West Toll Gate Creek Rehab Maint Sch 2	West Toll Gate Creek
As Built	2009	West Toll Gate Creek Bank Improvements 2009	West Toll Gate Creek
Design Report	2002	Quincy Reservoir South Diversion Channel Improvements DR	West Toll Gate Creek
Design Report	2011	West Toll Gate Creek Hampden to Mansfield DR 2011	West Toll Gate Creek
Outfall Systems Planning	1998	Quincy Reservoir OSP Ph A 1998	West Toll Gate Creek
Outfall Systems Planning	1999	Quincy Reservoir OSP Ph B 1999	West Toll Gate Creek

**Table 2.2
UDFCD Documents by Watershed**

Document Type	Year	Document Title	Watershed
Outfall Systems Planning	2001	West Toll Gate Creek Unnamed Trib OSP Ph A 2001	West Toll Gate Creek
Outfall Systems Planning	2003	West Toll Gate Creek Unnamed Trib OSP Ph B 2003	West Toll Gate Creek
Outfall Systems Planning	1993	Westerly Creek Upstream of Havana OSP Ph A 1993	Westerly Creek
As Built	1978	Westerly Creek Storm Drainage Ph I Sch I	Westerly Creek
As Built	1980	Westerly Creek Storm Drainage Ph I Sch II	Westerly Creek
As Built	1980	Westerly Creek Storm Drainage Ph I Sch IV	Westerly Creek
As Built	1981	Westerly Creek Sch I Traffic Control Details	Westerly Creek
As Built	1982	Westerly Creek Storm Drainage Ph I Sch III	Westerly Creek
As Built	1985	Westerly Creek Storm Drainage Ph I Sch V	Westerly Creek
As Built	1986	Interim Lowry Detention Alternative A and B	Westerly Creek
As Built	1986	Interim Lowry Detention System	Westerly Creek
As Built	1986	Parker Mexico Basin Drainage Improvements	Westerly Creek
As Built	1994	Kelly Rd Dam Westerly Creek Rehab	Westerly Creek
As Built	1996	Westerly Creek Channel Improv 22nd to 23rd Ave	Westerly Creek
As Built	2009	Utah Park Redevelopment Plan for Westerly Creek	Westerly Creek
Design Report	1999	Expo Park SEO Design Report Addendum DR	Westerly Creek
Design Report	2006	Utah Park 2006 DR	Westerly Creek
Flood Hazard Area Delineation	1977	Westerly Creek FHAD 1977	Westerly Creek
Flood Hazard Area Delineation	1983	Westerly Creek FHAD 1983	Westerly Creek
Major Drainageway Planning	1977	Westerly Creek MDP Ph B 1977	Westerly Creek
Major Drainageway Planning	2009	Westerly Creek MDP Ph A 2009	Westerly Creek
Major Drainageway Planning	2010	Westerly Creek MDP Ph B 2010	Westerly Creek
Outfall Systems Planning	1982	Westerly Creek Upper OSP 1982	Westerly Creek
Outfall Systems Planning	1996	Westerly Creek Upstream of Havana OSP Ph B 1996	Westerly Creek
Outfall Systems Planning	2012	Easterly Creek Phase B	Westerly Creek
Special Report	1990	Westerly Creek LOMR Montview to Kelly Road Dam 1990	Westerly Creek
Special Report	1994	Westerly Creek Above Havana St 1994	Westerly Creek

Note:

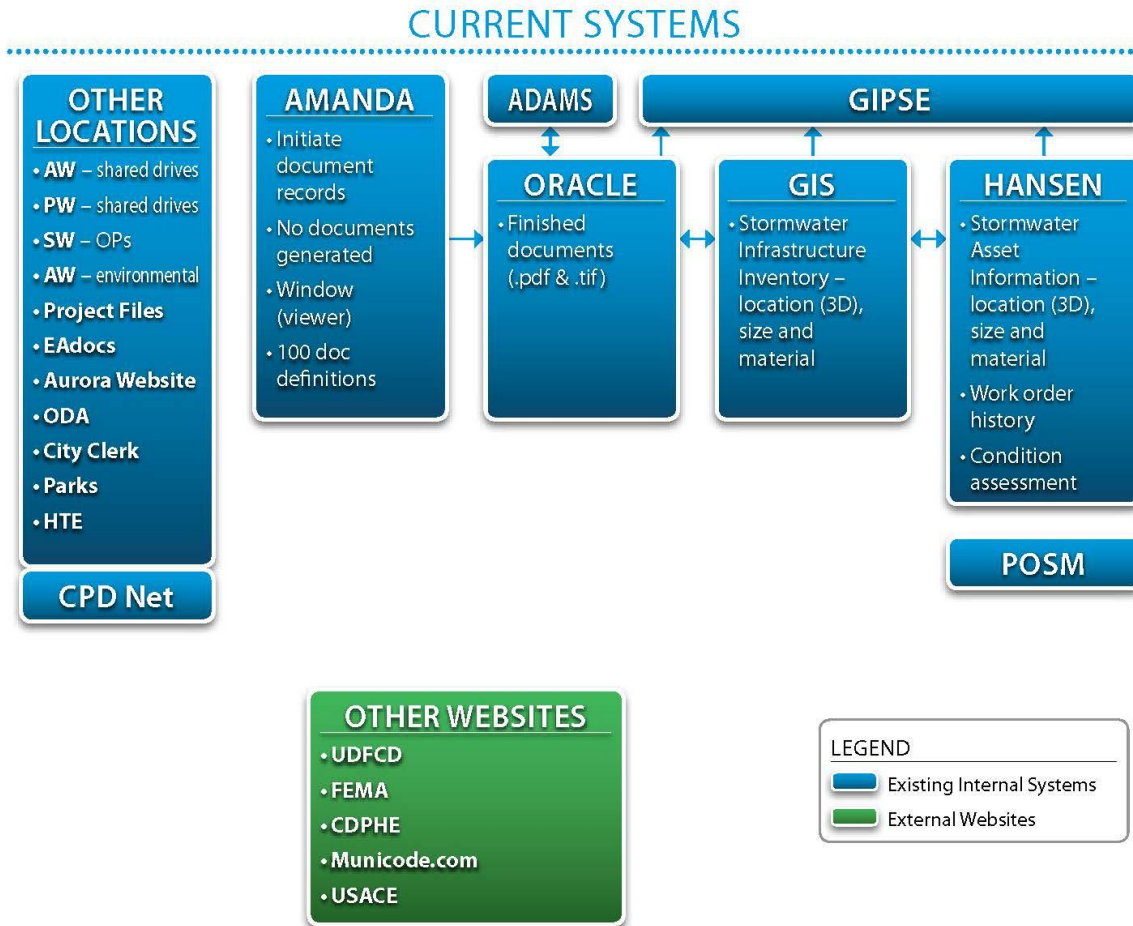
Yellow highlighted watersheds are high priority watersheds for initial Phase 2 Tasks.

2.3.2 Document and Data Management Systems

Aurora’s current document and stormwater data management systems are illustrated on Figure 2.3.

**Figure 2.3
Current Systems**

STORMWATER GIS-BASED DATA & INFORMATION MANAGEMENT SYSTEM



2.3.2.1 Oracle

Most Aurora documents of record are stored in Oracle. Features of the Oracle software include checking documents in and out, manually-assigned metadata, and system-assigned metadata. The database is the official source of Aurora records, and metadata features allows for searching. Document characteristics (core metadata) are assigned when documents are checked in. There is a retention policy to periodically remove out-of-date documents.

The Oracle content management system does adhere to standards. For the Phase 2 project, the consultant team will need to know the metadata schema, the document types, and core metadata.

A keyword search is also available to search document summaries. Aurora can update records with spatial data, but needs keys on both sides to relate the GIS location to the documents.

Oracle's native interface is not user-friendly and is infrequently used. Therefore, Aurora IT uses two systems that interface with Oracle, AMANDA and ADAMS.

2.3.2.2 AMANDA

AMANDA is a system in which a user types in an address or subdivision name and filing, and the system retrieves all documents in the database that are associated with the address or subdivision. Document types include, but are not limited to: master plan (15 types of master plan documents), civil, watershed, road and bridge. There are levels of metadata (hierarchy). When users add new content, Aurora IT checks to see if the necessary attributes exist. If new attributes are necessary, Aurora IT defines new metadata. There appears to be abundant metadata right now, core and optional.

Document "location keys" are assigned by the AMANDA system. Location keys are in the metadata for a spatial/geographical reference. Once a document is checked into Oracle, it has a user resource link (internet shortcut) (URL), which AMANDA uses to integrate with permits and licenses. AMANDA keeps a link to the URL of record in Oracle.

A hierarchy of geographical/spatial keys exists: case numbers from subdivisions, master plans, quarter sections, addresses, intersections (for signage) parcels, and more. It is indexed by quarter sections. Street addresses are the best way of targeting a specific location. Ninety percent of documents are identified by address points, some by parcel information.

The location key is used to correlate GIS with documents. AMANDA is used to maintain and generate addresses, which have an identification (ID) and a key and can match to the GIS map, not just for addresses, but for subdivisions, site plans and master plans. AMANDA has an advanced search capability, such as searching nearby and/or vertically overlapping layers from the one that was tagged for additional information.

AMANDA does not hold documents, but holds database records, and links to where the document is stored in Oracle. AMANDA is primarily used for taxes, licenses, permitting and the workflow process for business documents, e.g., liquor licenses.

The public cannot directly access documents in Oracle, but can access a subset of them defined as public through the www.auroragov.org records search box. Outside vendors also cannot access the database. Aurora uses a web service layer for external access to public records.

2.3.2.3 ADAMS

ADAMS (Aurora Document Access Management System) is a more user friendly front end system developed by Aurora IT that allows document entry into and viewing of the Oracle database. A user types in a geographic location, such as an address, and the system displays relevant documents (portable document format [pdfs], .tagged image files [tifs], etc.). Searches from other metadata can also be done from ADAMS including searches by keyword and document type.

2.3.2.4 *SharePoint Systems*

Aurora also has huge SharePoint systems, PrairieNet (fading away) and CPDNet, for project management and in-progress working documents. Once per quarter, SharePoint documents are manually migrated into the Oracle system, and old documents are archived.

2.3.2.5 *GIPSE*

GIPSE is an internal application that allows a user to choose an area on a map in GIS to select all “keys” within that area and return documents from Oracle. It has a multi-location select feature, and different keys can retrieve the same documents. The intent of this system is to make documents and GIS data discoverable for non-GIS personnel. It was built in 2008 utilizing the ESRI web application developer framework (ADF) application programming interface (API) and there is a desire to create a newer version to take advantage of newer APIs and capabilities. While it is probably the most used internal tool, the out-of-the-box ADF user interface (UI) isn’t the friendliest, as it requires a lot of “clicks.”

2.3.2.6 *EAdoc*

This system is used for management of some current projects. One of the key features is that it is an externally facing system that contractors can access and contribute content to directly. Implementation is outside of the Aurora firewall/systems and likely hosted by the vendor (<http://www.eadocsoftware.com>). Most, but probably not all, of the content in this system is transferred to CPDNet as projects are completed, but this is done manually as there is no automated or standardized process to transfer content.

2.4 STORMWATER ASSET INVENTORY AND MANAGEMENT

The following descriptions of the current stormwater asset inventory and management procedures were collected from workshops on September 6 and 17, and October 11, 2012.

2.4.1 Hansen

Aurora currently uses Hansen version 8.2.2 for stormwater (and other) asset management. The 8.2.3 upgrade is being considered for production soon. AW’s divisions have been using Hansen for at least five years, but Public Works Facilities have been using Maximo. The implementation of Hansen is all in-house, and there are three dedicated personnel who can perform system development if necessary.

Most of the Hansen modules have been purchased and are available, with the exception of the Advanced Assessment Management Module (AAMM). The information and capabilities of the AAMM such as Level of Service calculator, Risk Management and Life Cycle Costs are data intensive and provide information currently being tracked in Excel spreadsheets, or involve a person studying multiple data sets and developing an implementation plan from that.

For the most part, Hansen is used out-of-the-box; however, there are some customizations for environmental use (e.g., acid neutralization, tank detail pages). Customizations are carefully considered as there is an appropriate concern about how those may or may not work in future versions/upgrades of the core Hansen software.

Stormwater infrastructure data in Hansen includes basic asset information, including an established stormwater group hierarchy. Assets follow a naming convention of quarter, section, asset identifier; this same convention is followed in GIS to allow the datasets to link correctly.

Currently the reporting capabilities of Hansen are used, but not any of the standardized dashboard capabilities. Most of the current reports are Crystal reports; however, SQL Server Reporting Services (SSRS) is being used for newer reports and will possibly be the preferred platform in the future.

Hansen does track material costs through warehouse consumables and equipment maintenance hours. There are no CIP costs or disposal costs. There is also no direct correlation to budget costs; however, personnel do run reports that roll up these costs and then manually compare these figures to the budgets at this time.

Stormwater pump station data are stored in Hansen, and the pumping crews span multiple water groups. There are 3 treatment plants and multiple pumping stations. There are 3 stormwater pumping stations, 1 large and 2 smaller. Data is ultimately centrally recorded for all.

Data quality is considered acceptable, but there is no formal or objective level of quality for data. Data flows from GIS into Hansen, and from Hansen to GIS.

Integration with Hansen could be achieved via web services, or if necessary a direct Open Database Connectivity (ODBC) connection could be established to the Hansen database.

Aurora suggested that to build the asset database, it would be necessary to provide details on the level of data that is currently stored in Hansen; to highlight gaps where data could be, but does not currently exist in Hansen; to propose next steps to fill those gaps; and to provide suggestions as to ways the data could be but is not currently leveraged. For data gaps, describing why the data is necessary, assigning a priority, and estimating the level of cost and processes involved would be ideal. This may be where a pilot project could be done to quickly develop a showcase project for stormwater that could be used to “sell” Hansen and the processes to other departments.

The relevant points of Hansen’s mapping capabilities were demonstrated, and some are listed below:

- Map has fairly standard interface, zoom, pan, select tools, and layer list.
- Only the top most layers are available to select features.
- The UI involves many clicks and popup windows making the interface difficult to navigate.
- Currently Hansen data and GIS attributes are shown; Oracle or other systems could be linked by URL, but may not be customizable in any other way.
- Aurora has approximately 260 licenses for Hansen, so any person needing access should be able to be set up without any additional costs (view only does not require a license).

2.4.2 GIS

Aurora has the following stormwater GIS technology platforms:

- Environmental Systems Research Institute (ESRI) 10.0 is the provider and version for all Aurora's GIS software; Aurora is planning an upgrade to 10.1 after Service Pack 1 (SP1) has been released.
- An ArcGIS Server and Secure Data Exchange (SDE) geodatabases store and maintain most of the final/master datasets. There are, of course, local working datasets that may not yet be present in SDE.
- The SDE instance is running on Search and Query Language (SQL) Server 2005, but should be upgraded to SQL Server 2008 R2 by 2012.
- The SDE instance contains approximately 1,300 to 1,400 feature classes. Aurora is currently working on a data cleanup effort and revising the database schema.
- Various systems use these data, most using ESRI APIs (ADF, JavaScript [js]) and Google Maps API (js).
- Aurora's current standards and preferred technologies going forward are SQL Server, c#, .NET, and js APIs.

Aurora Connect is a public map interface, which is also old and needs to be upgraded or overhauled.

An internal vehicle mapping tool is also available that shows real time GPS locations of some Aurora vehicles and other relevant data, addresses, owner info, and more.

2.5 OPERATIONS AND MAINTENANCE

The following descriptions of the current stormwater operations and maintenance procedures, goals and objectives were determined from workshops on September 17 and November 28, 2012.

Aurora Water Operations (Ops) is responsible for operating and maintaining all Aurora wastewater and stormwater infrastructure and facilities. Ops offices are located in the WW/SW building at Aurora Central Services, 13646 E. Ellsworth Avenue.

Ops tracks most if not all of the functions and activities for stormwater maintenance within Hansen. Asset IDs have been established for every component in each basin that has been subject to maintenance. All assets such as inlets, ponds, and channels are in GIS by reaches, tied together in mother/child relationships in Hansen based on GIS data. However, many drop structures or check structures do not have asset IDs. For example, Aurora does not have IDs for check structures in Piney Creek in the Hansen asset database.

Ops inspects many stormwater assets such as inlets and public ponds every year. Each public pond receives minimum maintenance every month. These inspections eventually lead to work orders when work is needed. Complaints also lead to work orders.

Inspection forms are Word documents that have drop down pick lists built in, and there is a feedback loop that lets inspectors know what has been done for the asset in the past. Inspection crews submit reports to Joe McCleary, who then enters the information into a spreadsheet. This tracking sheet is in Excel format and has a link to problem areas and links photographs on their server. Photos are not in Hansen at this time. There are "problem codes" (high activity problem areas) that are assigned to the work orders.

For the most part, work order data is initially written on paper, and then input to Hansen by a staff member. This process is not documented and there is currently no condition assessment associated with regular work orders.

Last year Ops inspected all FEMA drainageways, plus four miles of other channels. In 2013, Ops will inspect all channels, including ones that are not FEMA regulated. Ops has a "channel inspections" folder where the original inspection forms (paper files) are kept, and they are slowly integrating the stream/tributary descriptions into the spreadsheet and bringing Hansen in line with UDFCD nomenclature. Ops wants to synchronize the spreadsheet to download data into Hansen so that whenever the maintenance crews do work, the records are stored in Hansen.

The UDFCD maintains certain major drainage channels within Aurora. In addition to being a valued funding source, Ops sees UDFCD as a contractor supporting the stormwater program. An example of this support is UDFCD's trash removal and sediment removal programs. Ops inspects the same channels UDFCD inspects; however, the maintenance reports from UDFCD are not input into Hansen and the costs UDFCD incurs on maintenance are not necessarily included in their reports. There are several regulatory reasons for these inspections.

Ops plans to continue using the inspection tracking spreadsheet, which is locked, with limited access. Joe McCleary completes the spreadsheet from the inspection reports and only he can make changes. The spreadsheet is begun new every year, but Ops is working on how to track historical information.

One goal is to increase efficiency in inspections and data management. Ops would like to start considering technologies to enhance the effectiveness and productivity of field staff. For example, tablets in the field to complete all of the field reports, and might allow maintenance workers and inspectors to see GIS, see asset numbers, have instant access to asset input forms, and have onsite ability to view historical reports. The implementation of data systems for the SWPMP will need to be able to respond to these types of technologies over the near term and into the future.

POSM is Aurora's closed circuit television (CCTV) software used for both the sanitary and storm sewer systems to record the condition of the various pipelines. There are five personnel (one storm, four sanitary) dedicated to the CCTV efforts for pipeline inspections in Aurora. The CCTV output is not in an easily usable format, but Aurora is considering a shift to a format where the video could be uploaded and then viewed with a "click." Aurora is currently working on a way to import the POSM data into Hansen. For now the two systems, POSM and Hansen, do not "talk" to each other. POSM has been in use for five years, and will remain in use long-term unless there is a very compelling reason to stop.

Ops has established their own "level of service" definition in consideration of City Council goals. For example, one goal is a 30-minute response time to a flood hazard. Another goal would be to link design storm frequency to each asset so decisions can be made based on the location of facilities that don't meet a certain storm frequency minimum.

Ops issues an annual report that combines all of their activities and expenditures for stormwater infrastructure maintenance. Assets are grouped by type. Further summaries are available on request, e.g., cost of cleaning inlets could be rolled up into how much is spent per year. The report summarizes the cost to do business, including contract support and supplemental services. Cleaning catch basins is one activity required by the MS4 program, but there is not enough activity to predict risk. Ops has tried to correlate maintenance data over time with the frequency

of inlet inspections to predict how often various locations would need to be maintained, but they have not been able to prove any correlation.

Aurora would like to the final solution to help predict operation and maintenance (O&M) costs for new projects, as a means to assist with project justification.

2.6 STORMWATER PROGRAM PLANNING AND FUNDING

The following descriptions of the current stormwater capital planning and funding procedures were collected from workshops on September 6, October 1, and November 7, 2012.

2.6.1 Capital Project Planning

The large part of CIP budgeting is done through engineering. The five-year CIP program is the best information and is used for the budget process. The twenty-year CIP program is used for rate studies and the ten-year financial plan is used to determine revenue requirements. Aurora's current twenty-year CIP is summarized in Table 2.3. The most recent rate study was performed in 2010, but the capital plan from that study is out of date.

The process Aurora uses to set capital projects in the Stormwater Program is "ad hoc," i.e., Bill McCormick, Clint Weisz, Mark Donelson, Vern Adam and Pieter Van Ry meet and decide what to include in the plan. For the UDFCD master plans, this is currently done once a year in conjunction with UDFCD requests for funding. The CIP program budget is reviewed and usually submitted internally with few adjustments.

The stormwater CIP is \$11 million per year on average through 2021. Risk is considered subjectively as part of the current project evaluation. Projects in the three- to five-year planning horizon are fairly realistic, but projects are not as realistic ten years or more into the future. Aurora is a relatively new city, and aging infrastructure has not been a major issue so far. But as the City ages, an infrastructure replacement program will need to be considered and incorporated more and more into capital planning.

There are two project funding designations: 1) Stormwater development (SD) projects are established to serve new developments, and are paid for with impact fees on new development projects, and 2) Stormwater system improvement (SI) projects are paid for with stormwater utility rates and these projects generally improve existing facilities. For projects on which both SD and SI funds are spent, the split is determined subjectively. Aurora believes there should be a more quantitative process for determining the funding source shares.

Currently, there is no document on which current projects are described and justified, and no means to determine "level of service," "consequence(s) of not doing the project," or "risk of failure." These need to be defined, and there should be a justification document for each project.

Aurora's ability to undertake capital projects has been limited by the number of projects that can be done with available project managers and staff, rather than the amount of money available. There is a sense among the TAC that Aurora's "capacity" is to do approximately \$5 million/year in stormwater capital projects. There is currently \$28,000,000 in rollover, i.e., money in the bank, for projects that were not completed over the past couple of years.

In contemplating the Stormwater projects, Aurora thought land acquisition should be tracked separately, because this does demand staff time to accomplish, and impacts staff work-hour planning and project schedules.

Many projects on a typical Aurora CIP list are driven by factors other than reducing flood risk. For example, the Alameda Avenue Storm Crossing and City Center Storm System improvement projects are associated with the light rail construction, where the need is to get new pipe in place and correct major drainage problems on Alameda Parkway before the light rail goes in. In the past, these types of projects have trumped other flood reduction type projects, and any screening process will need to take into account these types of decisions.

Aurora's objective is for the five-year CIP to have priority projects. A rate study should be done every five years to review the level of funding needed for the CIP and other program activities.

2.6.2 Stormwater Program Financing

Aurora's goal is to work within current stormwater rates. The current stormwater rate is \$8.16/mo/single family equivalent (SFE), which is high for the region and subject to complaints from rate payers. Overall, the current motivation is to minimize utility increases, because Prairie Water bumped up water rates; however, a rate increase of approximately 3 percent is projected beginning in 2016. The rates fund operations, maintenance and the CIP program. The percentage of the rates that go to capital projects can vary based on many factors that include private and intergovernmental agreements, project participation, and O&M requirements.

O&M is funded through stormwater rates, no money is transferred, and it's "pay as you go." Aurora also has development fees, and there is a separate fund for impact fees.

Engineering is paid from O&M accounts; capital project work is paid from capital project accounts. The City uses a budget development system, Integrated Fund Accounting System ("IFAS"), and some level-of-service activities are established. Some of the street sweeping cost was recently moved from the General Fund to Stormwater.

Projected development is reflected in the budget plans, and the City has a cost sharing strategy. Infrastructure rehabilitation, development, future expansion and system improvements are tracked.

Customer and billing data is in an HTE Sunguard system that does not currently interface with Hansen. Some data such as pond ownership is entered into Hansen. Customer complaints are handled by an overarching call center, and may be input into Hansen if a work order results from the complaint. The Call Center also uses AMANDA for researching issues.

The City recently received a credit rating upgrade to AA+.

**Table 2.3
Storm Drain Capital Improvements Program 2013-2032**

Org	Project Name	2013 Proposed	2014 Planned	2015 Planned	2016 Planned	2017 Planned	2018 Planned	2019 Planned	2020 Planned	2021 Planned	2022 Planned	2023 Planned	2024 Planned	2025 Planned	2026 Planned	2027 Planned	2028 Planned	2029 Planned	2030 Planned	2031 Planned	2032 Planned
D1204	2nd Creek Drainage Improvements-SDDV		1,000,000	1,000,000	1,350,000	1,000,000	1,000,000	1,100,000													
D1203	2nd Creek Drainage Improvements-SDSI		1,000,000	1,000,000	1,350,000	1,000,000	1,000,000	1,100,000													
D1201	Alameda Avenue Storm Crossing		1,400,000																		
52437	Baranmor Ditch Imp-SDSI	3,605,732	1,731,406	844,835																	
52492	Cherry Ck @ Arap Rd Drain Impr	200,000	300,000																		
D1202	City Center Storm System Improvements	500,000																			
52892	Coal Creek Tributaries-SDDV						1,457,278	2,229,634	2,274,227												
52570	Concrete Channel Rehab	763,044					500,000														
52535	Easterly Creek Outfall Improve-SDSI					621,053	2,000,000	2,000,000		2,000,000		2,000,000		2,000,000		2,000,000		2,000,000		2,000,000	
52895	Fitzsimons Drainage Improvemt-SDSI	500,000	4,000,000	4,000,000																	
D5308	Future Maintenance Facility-SDSI		267,903	1,229,675	1,254,268																
52977	Haven Acres Outfall	350,000																			
52438	Hutch Channel Rehab-SDSI	797,556																			
52542	Kings Pointe Drainage Improvemt-SDDV								1,719,515												
52574	Laredo/11th Ave Storm Sewer-SDDV			121,350																	
52575	Laredo/11th Ave Storm Sewer-SDSI			121,350																	
52539	Lower Westerly FL Cntr Imp @ Montv-SDSI	1,286,663																			
52830	Lowry 11th Ave Outfall-SDSI				283,218	559,244															
52657	New Ops Control Center-SDSI						381,013	1,738,487													
52540	Sand Crk Trib Ofll Sys-Moline/Colfax-SDSI					2,700,087															
52465	Storm CMP Rehab-SDSI	500,000		597,026	597,026	614,937	633,385	652,387	671,958	692,117	712,880	734,267	756,295	778,984	802,353	826,424	851,217	876,753	903,056		
52580	Storm Drainage System Improvement	357,000	357,000	354,738	358,216	368,962	380,031	391,432	403,175	415,270	427,728	440,560	453,777	467,390	481,412	495,854	510,730	526,052	541,833		
52463	Storm Misc Struc Rehab-SDSI			298,514	298,513	307,468	316,693	326,193	335,979	346,058	356,440	367,133	378,147	389,492	401,177	413,212	425,608	438,377	451,528		
52452	Stormwater Management Plan-SDSI	200,000					500,000					500,000	0	0	0	0	500,000	0	0		
52464	UDFCD Commitments-SDSI	514,500	199,500	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000	800,000
52586	Upper 1st Crk Detention Ponds-SDSI		5,000,000	5,000,000	5,000,000							3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,000,000	3,500,000	0		
52456	Upper Piney Crk Stab-SDDV		2,553,691				3,000,000		4,000,000		1,500,000		4,300,000		2,000,000	2,000,000	2,000,000	1,000,000	1,000,000		
52648	Upper Senac Trib Stab/Wtr Qual-SDSI			1,415,432	1,620,051																
TOTAL		9,574,495	17,809,500	16,782,920	12,911,292	7,971,751	11,968,400	10,338,133	10,204,854	4,253,445	3,797,048	7,841,960	9,688,219	7,435,866	7,484,942	9,535,490	8,087,555	9,141,182	3,696,417	2,800,000	800,000

SECTION THREE

SUMMARY OF FINDINGS AND RECOMMENDATIONS

3.1 PHASE 2 GOAL AND OBJECTIVES

The two overarching stormwater program activities that are the focus for this SWPMP project are:

- 1) Capital Projects and Stormwater Program Planning and Funding and,
- 2) Data Management and Communication.

Although there are a number of subtasks of each activity that share common elements, the goals and objectives for each activity are best addressed with separate work plans. The consultant team recommends three separate major tasks to complete the SWPMP project:

- Task 1 – Establish Capital & Maintenance Planning Processes
- Task 2 – Build Asset Database
- Task 3 – Develop the Solution

These major tasks are illustrated graphically in Figure 3.1.

The primary objective for the Capital Projects and Stormwater Planning and Funding activity is to develop strategic procedures (decision making tools) for regularly and consistently evaluating and planning overall Stormwater Program funding and sustainability needs, and includes the following requirements:

- Program priorities should be based on a “Triple Bottom Line” (economic/financial/environmental/social costs) approach.
- The procedures (tools) should address stormwater program level of service and be in a format that is user friendly, flexible, adaptable, and robust, and will serve Aurora well into the future.
- Aurora’s stormwater program should provide the highest and most cost effective level of service to rate payers and stakeholders.

From the information received and discussions with the TAC in the workshops conducted in Phase 1, the consultant team recommends that the decision making tools for Capital Project Planning and Funding be spreadsheet based. Example spreadsheets with project ranking criteria were presented to the TAC during Phase 1 and this type of spreadsheet will be further developed in Phase 2, Task 1.

Aurora’s Stormwater Program is purposely organized across multiple departments, and a stated goal for the Stormwater Program is centralization and coordination of stormwater activities while at the same time being sensitive to the intentions of the “multiple department” organizational structure. It was also noted in Phase 1 that staffing is a constraint for capital project delivery. Staffing and coordination for critical activities are directly correlated to Stormwater Program level-of-service and will be addressed by the Phase 2 SWPMP project.

The TAC identified the following drivers for development of the SWPMP strategic procedures:

- a. Vulnerability – There is a lot of institutional knowledge wrapped up in current staff that is difficult to replace when people leave. Current stormwater program history and

processes are not well documented. This knowledge needs to be incorporated into the SWPMP such that there is a “succession” process for continuity of the program when there are staff changes.

- b. Future regulations, statewide and national, will become more rigorous. The SWPMP should clearly state compliance objectives, regulatory standards and efficient standard operating practices for achieving and reporting compliance, reducing exposure and decreasing liability.
- c. Level of Service – Is the City’s stormwater program providing the highest and most cost effective level of service to rate payers and stakeholders? The SWPMP should address level of service.

The primary Phase 2 objective for the Data Management and Communication activity is to address the deficiencies in the stormwater infrastructure database. A component of this objective is that the database will be compatible with a “data management system” tool that would be built in a later phase. It will be necessary to determine what stormwater system attributes and stormwater program information could be displayed in a map-based database on layers with dots/points that display features and their details. The stormwater asset attributes will be rated, and then the stormwater infrastructure database developed. The “data management system” tool is critical to efficiently managing the stormwater program across multiple departments and divisions, but before this tool can be effective the stormwater infrastructure database must be complete. The first step in building the “data management system” tool is to build the stormwater infrastructure database, which is proposed Task 2 for Phase 2. The “data management system” tool is proposed to be built in Phase 3 and should reflect activities underway in AMANDA, Hansen, Oracle and new compliance tracking efforts.

3.2 ESTABLISH CAPITAL PLANNING AND MAINTENANCE PROCESS

The key to Aurora’s successful strategic program planning and funding decision-making process is to optimize the use of its information systems. Integrating information systems enables the rollup or breakdown of information and provides access to the various asset data through a primary asset register approach.

The consultant team recommends establishing a primary asset register with controls defined for maintaining data quality, and making data available to users and systems. Additionally, Aurora will need to further develop processes and system interfaces to fully utilize the functionality of the information within Aurora IT systems. For Phase II it is recommended that Aurora establish the process for CIP program development that can later be embedded into IT solutions.

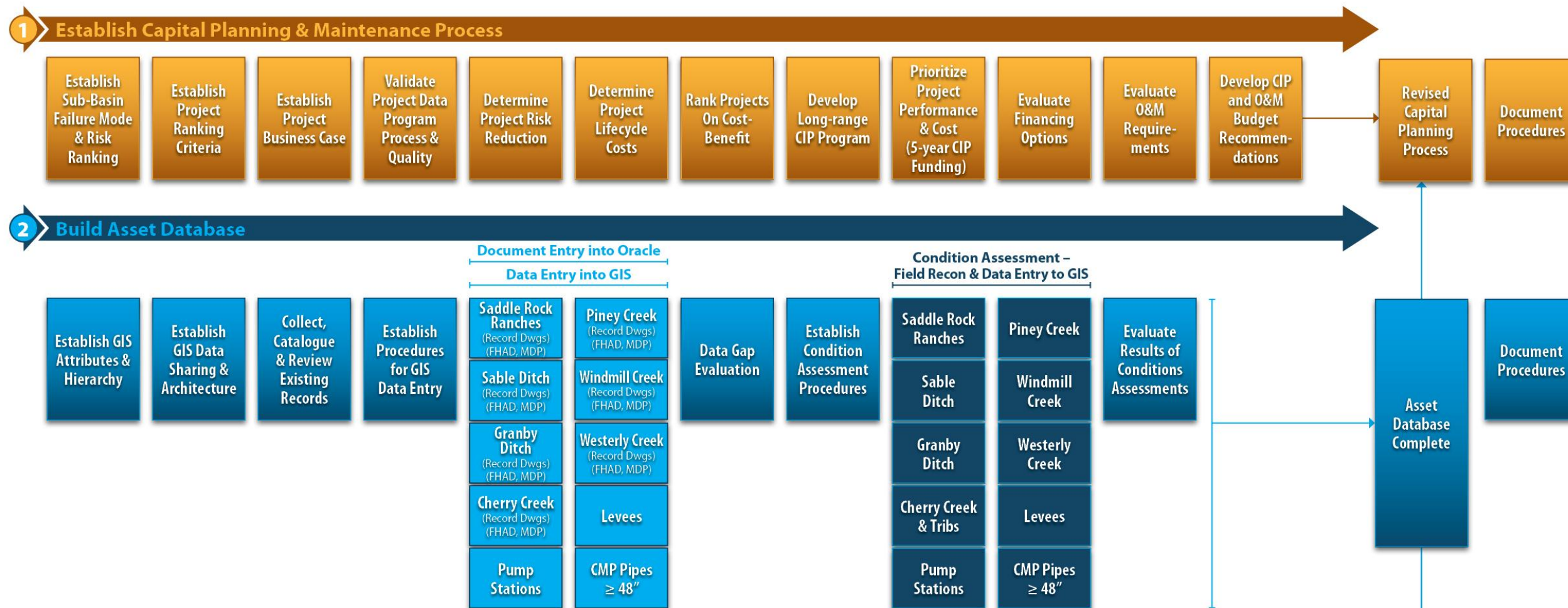
For each sub-task shown in Task 1 in Figure 3.1, “Establish Capital Planning and Maintenance Process”, improvements have been identified and prioritized to assist Aurora in moving forward with implementation. By conducting the activities recommended in this section, Aurora will begin to improve their decision-making process in areas such as identifying treatment options from risk assessments and applying these for budget rationalization.

Figure 3.1 shows the Phase 2 process improvements that will be used to establish the overall strategic CIP process with the associated asset management strategy.

Figure 3.1
Stormwater Program Master Plan – Proposed Implementation Plan

AURORA STORMWATER PROGRAM MASTER PLAN

Phase 2 – Proposed Implementation Plan



Phase 3 – Proposed Implementation Plan



KEY

Orange = Capital Planning & Funding Dark Blue = Condition Assessment
Light Blue = Document Integration Green = IT/GIS Integration



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For each of the processes, a set of improvements have been identified to move the organization forward. This set of improvements is for the processes required for strategic program planning and funding decisions, the functional development needed with the IT system, and education that needs to occur in assisting staff members to understand their role in Aurora's strategic program planning and funding processes, and adjust their workflows to support the strategic objectives.

Key findings and recommendations from the Phase I workshops and recommendations for important process improvements are discussed in the following paragraphs based on process types.

- 1) Aurora has multiple and incomplete **asset registers** and records of physical asset attributes. The consultant team recommends Aurora develop a primary asset register using GIS to contain all assets with a single controlling register or an information coordination process across the organization. The primary asset register should be built with defined metadata for maintaining data quality, and the data should be available to users and systems through the use of the GIS application.
- 2) Aurora should ultimately perform a more structured approach to **asset failure** prediction for stormwater assets in order to identify failure modes and remaining service life. Failure prediction results are not currently stored for ongoing access and review. The failure analysis and prediction processes need to be extended to all Aurora departments. Failure modes should be identified and processes developed for establishing intervention and trigger points, for identifying data sources and building appropriate system interfaces.
- 3) Building on the current inspection program, a strategic approach to collecting, reporting, managing and analyzing Aurora's **condition data** is needed for stormwater system assets. The consultant team recommends Aurora develop and implement "Condition Assessment Protocols" and provide a system and ongoing training for staff members in its use. The protocols developed should be based on the dominant failure modes identified. Responsibility for collecting, reporting, storing and analyzing condition data should be appropriately assigned.
- 4) There is no application of standardized **risk management** and Aurora should perform strategic risk assessment for all assets. The processes (including Risk Analysis for CIP Program Development, Baseline Risk Exposure for Stormwater Assets) and the associated data management should be communicated to all affected staff members.
- 5) Aurora is not performing **life cycle costing** analysis in a formal manner. The consultant team recommends Aurora begin tracking both Capital and O&M costs and refine management strategies. Life cycle costing can then be performed by staff members responsible for selecting asset treatment options, with assistance from the strategic program planning and funding manager. Additionally, these processes should be used to assist in developing project budgets prior to submitting projects for CIP funding. The process and the associated data management needs should be communicated to all staff members.
- 6) The **budget rationalization** process does not currently check for a link between Aurora Water level funding and resources. The budget should be rationalized based on risk and life cycle cost, and documented in a structured business case. Each business case should link the proposed project expenditure to the asset hierarchy and a level of service.

Training should be provided to all affected staff members. A bottom up budgeting process should be considered.

- 7) Limited **works/resource management** planning and coordination are being performed through Maintenance Planning with responsibility left to field supervisors. Large corrective tasks and programmed maintenance should be scheduled and managed by Maintenance Planning, through the provision of additional resources. The consultant team recommends establishing processes that define the various roles and responsibilities for the planning and scheduling of work. All programmed maintenance should have a task list, skills requirements, equipment and parts. This process should be implemented for all maintenance sections.
- 8) For all assets to be managed through the life cycle of creation, rehabilitation and disposal, the **CIP process** needs to be defined and specifications created. The asset register should be repopulated based on the existing historical data and the Hansen and GIS asset register, and then be maintained through the CIP process. Approved, final project information for CIP projects then could be entered into Asset Register against the affected asset.
- 9) **Training** for these processes and the **associated data management** should be communicated to multiple department staff members. Responsibility for collecting, storing and analyzing performance data should be appropriately assigned. Training should be provided to staff members who are responsible for setting, revising and managing the levels of service related to asset systems and assets.
- 10) **Strategic program planning and funding** practices should be revised so that current replacement value and depreciation are calculated at the asset level. Appropriate replacement cost valuation methodology should be identified and applied. Temporary resources may be required to perform this in conjunction with Finance.
- 11) **Levels of service** are currently documented at the maintenance section level. A strategic approach needs to be applied to identify the critical assets and the level of service of each asset. Levels of service should be defined for existing critical systems and assets by Operations and Maintenance. Engineering should be required to define the levels of service for new assets.
- 12) **Roles and responsibilities** need to be defined for the management of data for organizational use. Processes need to be built into the workflow that ensures accountability with regard to the appropriate level of accuracy and completeness of the data.

The proposed scope of work for Phase 2 Task 1, build the recommended processes, is illustrated in Figure 3.2. The Phase 2 Scope of Work for this task is described in Appendix C.

Figure 3.2
Establish Capital Planning and Maintenance Process

AURORA STORMWATER PROGRAM MASTER PLAN

Phase 2 – Proposed Implementation Plan



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3.3 BUILD THE ASSET DATABASE

As noted previously, the key to Aurora’s successful strategic program planning and funding decision-making process is to optimize the use of its information systems. The model for Aurora’s stormwater asset registry is centered in Aurora’s existing GIS system. The existing asset information database is Oracle and Aurora’s Asset Conditions Assessment database is Hansen. Asset information exists in documents in multiple locations within the organization and is not readily accessible.

Shown in Figure 3.3 are Aurora’s existing systems, and the concept for integrating existing records into Oracle, existing asset information into GIS and asset condition data into Hansen. Ultimately, all pertinent records and data would be accessible throughout the City through the use of the “GIS-based viewing tool”, which would be developed in Phase 3 and be connected to the various databases through GIS. The GIS-based viewing tool would look the same for all departments, and should be designed and built to share and access data from other stakeholders besides stormwater.

The consultant team recommends that Aurora establish the processes for asset registry development early in Phase 2 so they can later be embedded into the IT solutions developed in Phase 3.

The consultant team also recommends building the asset registry in prioritized steps, beginning with high risk watersheds and high risks assets that were identified in Phase 1. High risk watersheds and assets are indicated in Figure 3.4, Build Asset Database, work flow diagram. The procedures for screening documents for entry into Oracle and asset information into GIS need to be developed at the beginning of the project, then tested and modified as necessary to assure ease and efficiency of the process and quality of the results. The consultant team proposes to begin with the Granby/Sable Ditch watersheds and perform a “pilot project” to develop the procedures, perform the work and test the results before moving on to complete the work for each watershed.

Figure 3.3

STORMWATER GIS-BASED DATA & INFORMATION MANAGEMENT SYSTEM MODEL

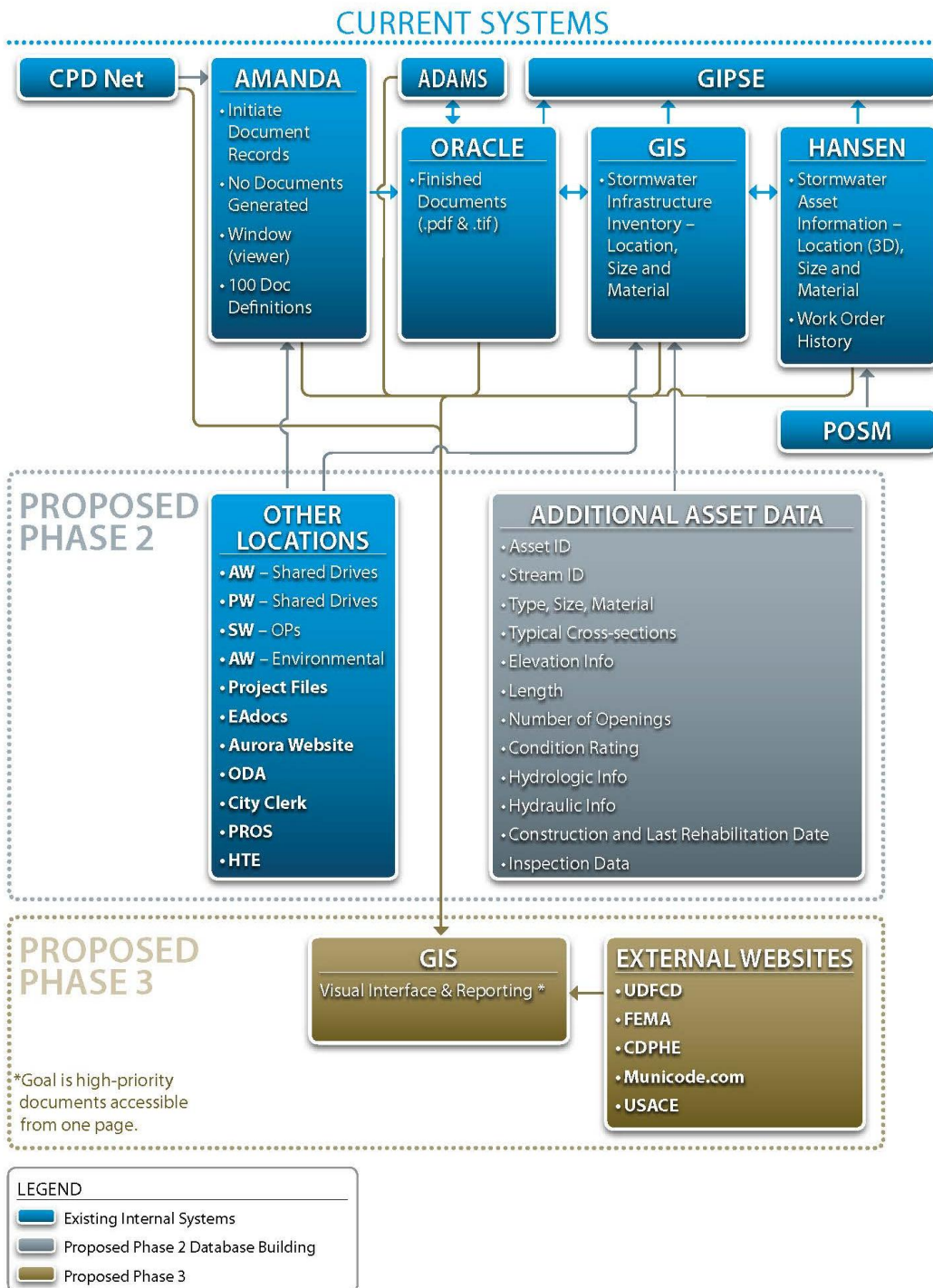
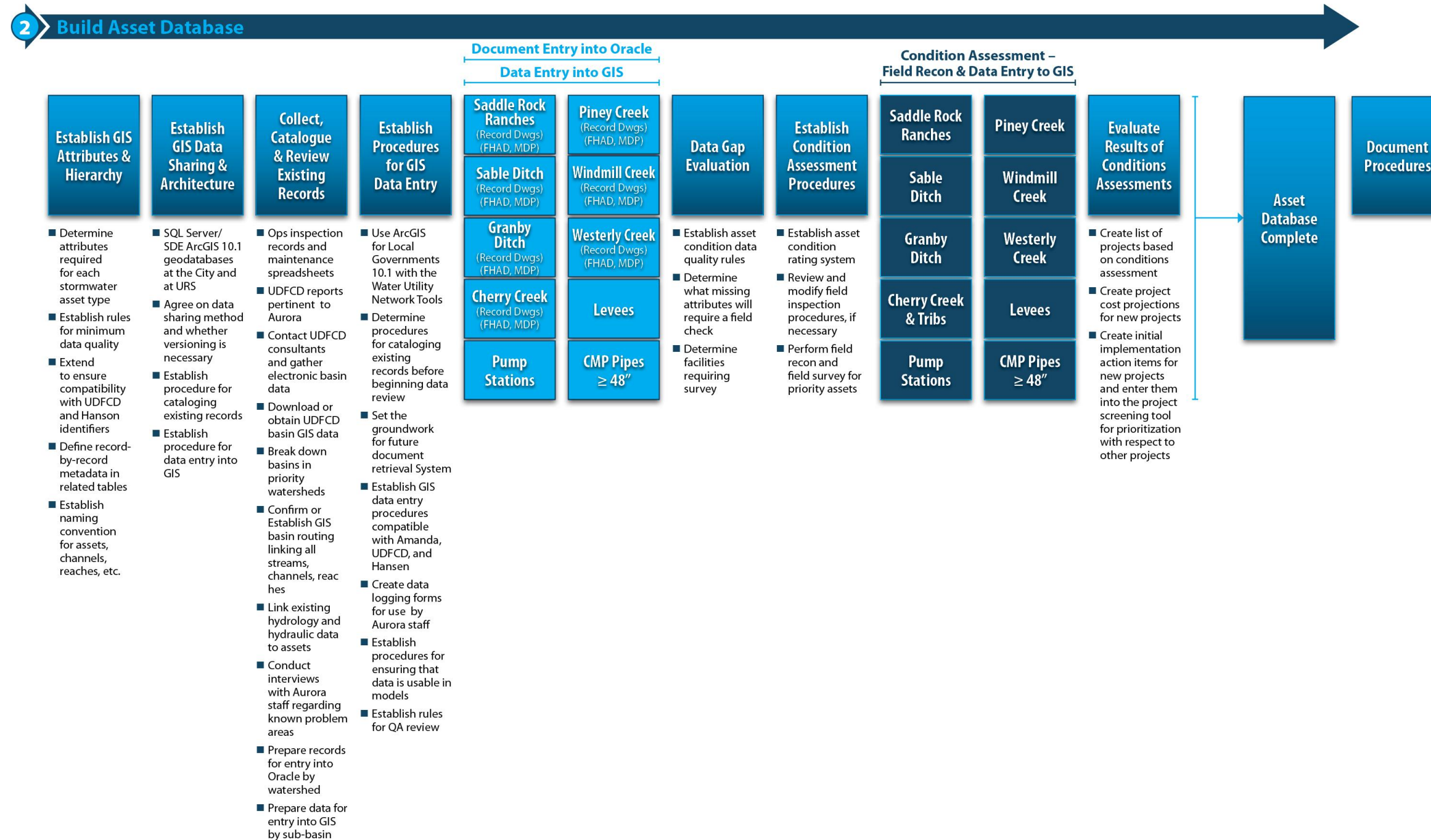


Figure 3.4
Build Asset Database

AURORA STORMWATER PROGRAM MASTER PLAN

Phase 2 – Proposed Implementation Plan



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3.4 DEVELOP THE SOLUTION

3.4.1 User Interface/Experience/Functionality Concepts

Our goal for the Aurora Stormwater Program Master Plan is to deliver a web-based solution that is usable, useful, and accessible to multiple departments. One of the first steps towards that goal is to define the users' needs and objectives by use cases.

A use case is a description of how users would perform tasks within a proposed web solution. They are a convenient way to illustrate general functionality and scope at the beginning of a project by describing the steps a user might take to reach a goal and how the web solution would respond to the user's actions.

During the Phase 1 discovery meetings with TAC, we collected informal use cases when stakeholders specifically described their desires for the solution, such as: "I want to click...", "I want to see...", or "It should be easy to..."

In order to gain consensus among stakeholders, we categorized the use cases in a survey and distributed them for prioritization. Six stakeholders responded with rankings for the use cases by assigning 1 (high-priority), 2 (medium-priority), 3 (low-priority), or 4 (not applicable). See the table "High Priority Use Cases" below for a ranking of use cases whose average score was between 1 (high) and 2 (medium).

During the course of Phase 2 tasks, we will validate these use cases with additional stakeholders, document additional use cases, and re-prioritize the list. In addition, we will enhance the high-priority use cases with details about data sources and user interface features. These become the basis for functional requirements that support development and for test scripts that are integral during the quality assurance phase. In this way, the users' needs and objectives will be integrated at each step in the process of developing the web-based solution.

3.4.2 High-Priority Use Cases

We received six responses and averaged the rankings for each use case. The following use cases were ranked the highest, with average values between 1 (high-priority) and 2 (medium-priority).

Table 3.1
High Priority Use Cases

Use Case	Priority (Average)
User selects a geographical location by clicking on a map.	1.16
A user selects location(s) on a map, and can view documents/data from a variety of categories of information.	1.16
User selects a location or locations by entering text (address, intersection, subdivision, stream name, or watershed).	1.50
User selects one or more items (streams, assets, etc.) and views them on a map.	1.50
User selects multiple locations by outlining an area on a map.	1.66
User selects layers which contain categories of data for locations on the map.	1.66

**Table 3.1
High Priority Use Cases**

Use Case	Priority (Average)
User selects a stormwater asset and reviews details about that asset, such as maintenance activity, condition, record drawing, etc.	1.66
User views 10-year stormwater capital improvement projects as pinpointed locations on a map through which they can access additional details.	1.80
Aurora staff selects a layer to view all active stormwater quality permits and inspection reports to ensure compliance with regulations.	1.80
Aurora employee searches for citizen complaints regarding drainage and flooding in a certain area of the city.	1.80
Citizen reports a backed-up storm sewer and the employee reviews the location for existing work orders to fix the problem.	1.80
Staff reviews recent reported issues as pinpoints on a map to identify problematic areas.	1.80
User locates existing stormwater assets and those that are under construction, which are highlighted and clickable.	1.83
User reviews drainage studies and citizen drainage complaints for stormwater assets within a specific location. Views drainage problem areas.	1.83

See Appendix B, Table B.2, Use Case Survey Responses, for a complete list of all survey responses.

3.4.3 IT Requirements & Recommendations

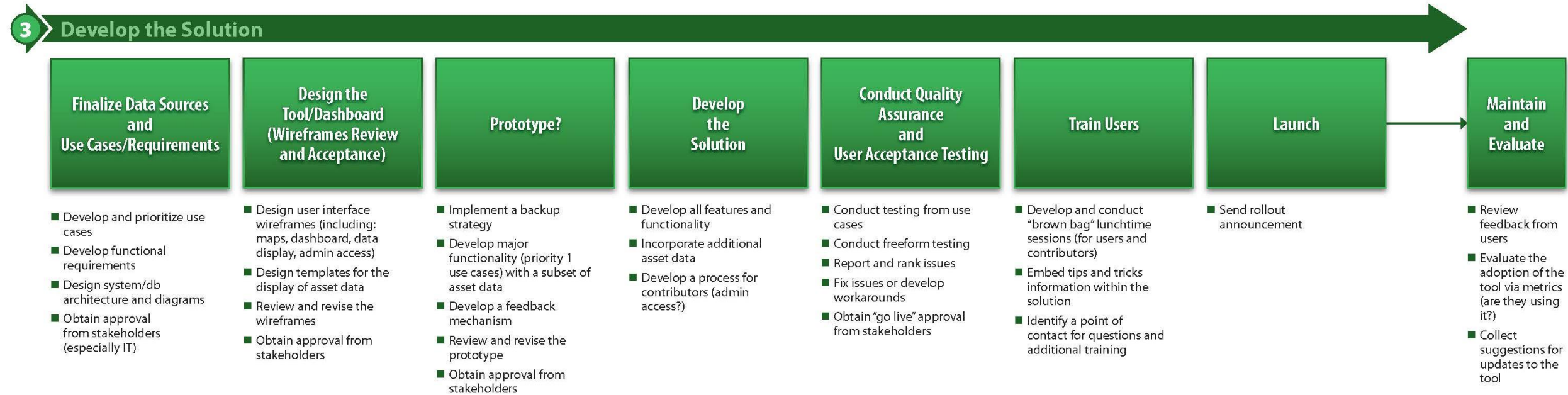
IT Requirements consist of functional requirements, what the solution will do, and non-functional requirements such as platforms and technologies, and API's. The current list of functional requirements is presented in the use cases above. The current non-functional requirements are the preferred technologies and API's referenced in Section 2.4.2.

To support the ongoing process of keeping the asset database up to date, the consultant team recommends enhancing the existing SharePoint CPDNet system to include the attributes necessary for entry into the Oracle, and developing workflows and processes to automate the migration of data and documents into the core GIS, Hansen, and Oracle systems from other systems such as CPDNet, EADocs, POSM, and HTE. Aurora IT will need to be involved in the development of the solution and all proposed system enhancements will require Aurora IT approval.

**Figure 3.5
Develop the Solution**

AURORA STORMWATER PROGRAM MASTER PLAN

Phase 3 – Proposed Implementation Plan



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Appendix A
Meeting Minutes

Appendix A, Meeting Minutes are included on CD only.

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Appendix B
Questionnaires

Table B.1
City of Aurora
Community Data Collection - Stormwater Management Plan - Phase 1

Contact: URS Corp., John Griffith (303) 796-4696, Greg Murphy (303) 730-0434

	Documents	Importance to Managing Flood Risk (1 – 5)	Importance to this Study (1 – 5)	Data Format			Location (If not on a web site) where does document reside?)	Map to 10 Step Process
				Digital	Paper Only	Web Site		Steps
<i>Studies/Reports</i>								
1	Major Drainageway/Outfall Systems Plans (16)	5, 3, 5	5, 5, 5	x	x	UDFCD	PW/AW Eng.	2,3,7,8
2	Flood Hazard Area Delineation Studies	5, 5, 5	5, 3, 5	x	x	UDFCD	PW	2
3	Flood Insurance Studies	5, 4, 5	5, 1, 5	x	x	UDFCD, FEMA	PW	2,4,6
4	Development Drainage Master Plans (16)	4, 2	4, 4			Oracle	PW	1,2,7
5	Development Drainage Design Reports (1700)	5, 1	5, 2	x	x	Oracle	PW	1,2,7
6	Record Drawings	4	4	x	?		?	1,2,3,4
7	Concrete Channel Study	5	5		x		SW OPS	1,2,3,4
<i>Contracts/Agreements</i>								
1	Intergovernmental Agreements (14)	4, 5, 3	5	x	x	COA – AW- others	Shared drives	7, 8, 9
2	Maintenance Agreements	4, 4, 3	4	?	?	COA – AW- others	Shared drives	7
3	Development Agreements (23)	3, 1,	3	?	?		ODA	1, 2, 7
<i>Maintenance</i>								
1	Channel inspection / maintenance Reports	5	5	Yes		N/A	Hansen MMS	7
2	Pond inspection / maintenance Reports	5	5	Yes		N/A	Hansen MMS	7
3	Inlet inspection/cleaning Reports	5	5	Yes		N/A	Hansen MMS	7

Table B.1
City of Aurora
Community Data Collection - Stormwater Management Plan - Phase 1

Contact: URS Corp., John Griffith (303) 796-4696, Greg Murphy (303) 730-0434

	Documents	Importance to Managing Flood Risk (1 – 5)	Importance to this Study (1 – 5)	Data Format			Location (If not on a web site) where does document reside?)	Map to 10 Step Process
				Digital	Paper Only	Web Site		Steps
4	Easement / tract inspection/ cleaning Reports	5	5	Yes		N/A	Hansen MMS	7
5	Pipeline inspection / Cleaning Records	5	5	Yes		N/A	Hansen MMS	7
6	Outfall inspection/cleaning Reports	5	5	Yes		N/A	Hansen MMS	7
7	Manhole inspection / cleaning Reports	5	5	Yes		N/A	Hansen MMS	7
8	Sediment Removal-projects Reports	5	5	Yes		N/A	Hansen MMS	7
9	Incident Response reports	3	4	Yes		N/A	Hansen MMS	7
10	Erosion Control Dam inspection reports	5	5	Yes			SW Ops	7
11	Levee inspection reports	5	5	Yes			SW Ops	7
<i>R.O.W. & Easements</i>								
1	Drainage Easements (35)	4	3	?	?		PW, IT, GIS	1, 6
2	Utility Easements (77)	4	3	?	?		PW, IT, GIS	1, 6
<i>Permits</i>								
1	NPDES (State and Local)	5	5	?	?		AW- Environmental	2, 4, 5, 6
2	404 Permits						Corps of Engineers, Proj. Files	
<i>Stormwater Asset Files</i>								
1	SW Map book	5	5	Yes			SW Ops – AW eng	1, 4, 7
2	Hansen Files	5	5	Yes			SW Ops – AW eng	1, 4, 7
3	Hansen 8.2.2	3	3			http://hansenweb/hansen/	Cross-linked to GIS	1, 4, 7

Table B.1
City of Aurora
Community Data Collection - Stormwater Management Plan - Phase 1

Contact: URS Corp., John Griffith (303) 796-4696, Greg Murphy (303) 730-0434

	Documents	Importance to Managing Flood Risk (1 – 5)	Importance to this Study (1 – 5)	Data Format			Location (If not on a web site) where does document reside?)	Map to 10 Step Process
				Digital	Paper Only	Web Site		Steps
<i>Environmental Studies, Reports, Files</i>								
1	Integrated Stream Corridor Mgmt. Plan	3	3	x				5, 6, 7, 8
<i>Funding</i>								
1	UDFCD Master Plans (5-yr UDFCD budgets)	5	5				AW/PW	2, 3, 5, 6, 7, 8
2	Capital Plans AW	5, 5	5, 5	Yes			AW	7, 8
3	Budgets AW - yearly	4, 3	5, 5	Yes			AW	7, 8
4	Benchmarking Studies	3	3				PW	7, 8, 9
5	Asset Management Plans	3	3				AW – Eng., Beginning to collect data for this	1, 2, 3, 4, 5, 6, 7, 8, 9,10
<i>Emergency Response</i>								
1	Incident Response – spills etc.	2	5	Yes			Hansen MMS	5, 6
2	Flood Response Plan	5	5	Yes			SW Ops	5, 6
<i>Manuals</i>								
1	Kelly Road Dam O&M	5	5	Yes			AW	5, 7
2	COA Dam O&M	5	5	Yes			AW	5, 7
3	Levee Sand Creek	5	5					5, 7
<i>Other</i>								
1	Private Pond (post-ordinance – 2008)	3	4	Yes			AW OPS	1, 2, 7, 9
2	Private Pond (pre-ordinance)	3	4	Yes			AW OPS	1, 2, 7, 9

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Table B.2
Use Case Survey Responses

Aurora Stormwater Program Management Plan Use Case Prioritization		Key: 1 = High 2 = Med 3 = Low 4 = Not Applicable NE = No expertise Rows highlighted in green are high priority use cases with an average priority between 1 and 2						
		Responder:	Nicole Johnston	Clint Wiesz	Larry Rector	Sean Lieske	Vern Adam	Bill McCormick
Navigation								
	User selects a geographical location by clicking on a map.	1	1	1	1	2	1	1.166667
	User selects multiple locations by outlining an area on a map.	2	1	1	1	3	2	1.666667
	User selects a location or locations by entering text (address, intersection, subdivision, stream name, or watershed).	1	1	1	2	2	2	1.5
	User selects layers which contain categories of data for locations on the map.	1	1	1	4	1	2	1.666667
	User browses a page describing the stormwater program in sections with links to relevant documents/data.	1	2	1	1	3	4	2
	User selects one or more items (streams, assets, etc.) and views them on a map.	1	1	1	2	2	2	1.5
	A user selects location(s) on a map, and can view documents/data from a variety of categories of information.	1	1	1	1	1	2	1.166667
Stormwater Assets and Elements								
	User reviews the reported existing conditions of a stormwater asset, which could include text, documents, photos, reports, or videos.	2	2	1	1	3	4	2.166667
	User reviews the current inspection reports for stormwater asset, which could include text, documents, photos, reports, or videos.	2	3	1	1	2	4	2.166667
	User locates existing stormwater assets and those that are under construction, which are highlighted and clickable.	1	2	1	1	3	3	1.833333
	User locates a pond and verifies whether it belongs to Aurora or another entity.	2	1	1	2	3	3	2
	User selects a stormwater asset and reviews details about that asset, such as maintenance activity, condition, record drawing, etc.	1	2	1	1	1	4	1.666667

Table B.2
Use Case Survey Responses

Aurora Stormwater Program Management Plan Use Case Prioritization		Key: 1 = High 2 = Med 3 = Low 4 = Not Applicable NE = No expertise Rows highlighted in green are high priority use cases with an average priority between 1 and 2							
		Responder:	Nicole Johnston	Clint Wiesz	Larry Rector	Sean Lieske	Vern Adam	Bill McCormick	Average Priority:
	User reviews an asset or map to determine where to place sandbags to protect the stormwater system from a hazardous spill.	3	3	1	3	4	4	4	3
	Aurora employee locates a pond to determine the last time it was maintained (such as mowing or dredging) and when the next maintenance is due.	2	2	1	1	3	4	4	2.166667
	User reviews drainage studies and citizen drainage complaints for stormwater assets within a specific location. Views drainage problem areas.	2	1	1	1	2	4	4	1.833333
	User selects a stormwater asset and can view video of CCTV condition assessment.	3	2	1	3	3	2	2	2.333333
	User locates a construction permit for a specific location.	2	3	NE	2	4	4	4	3
	User reviews a dashboard showing open work orders and/or maintenance activities for the day, week, month, or for a location.	2	2	NE	4	3	4	4	3
	User determines if open permits are in effect near a location at which a citizen reports an issue.	1	3	NE	2	3	4	4	2.6
	Staff locates license agreements and other business documents which pertain to railroads and the Air Force Base.	3	3	NE	3	4	3	3	3.2
	Aurora employee searches for all current construction sites in a location with implications for stormwater quality.	2	2	NE	1	3	4	4	2.4
	Customer calls Access Aurora with a complaint about a beaver dam in the creek by their house. User checks the location to determine whether the issue has been logged as a work order.	2	2	NE	2	3	4	4	2.6
	Aurora staff indicates an area on the map and views open work orders.	1	2	NE	1	2	4	4	2
	Staff selects an address/asset and views list of all enforcement actions.	2	1	NE	1	3	4	4	2.2
	Staff assigns a work order to the code enforcement officer who is nearest the location.	3	4	NE	3	4	4	4	3.6

Table B.2
Use Case Survey Responses

Aurora Stormwater Program Management Plan Use Case Prioritization		Key: 1 = High 2 = Med 3 = Low 4 = Not Applicable NE = No expertise Rows highlighted in green are high priority use cases with an average priority between 1 and 2						
		Responder:	Nicole Johnston	Clint Wiesz	Larry Rector	Sean Lieske	Vern Adam	Bill McCormick
	Staff locates liquor licenses and tax information for businesses within Aurora.	4	4	NE	3	4	4	3.8
	Employee selects an asset or asset type and views training video(s) on O&M tasks.	3	3	NE	3	4	4	3.4
	User views 10-year stormwater capital improvement projects as pinpointed locations on a map through which they can access additional details.	1	2	NE	1	2	3	1.8
	A new developer wants to build in Aurora. Aurora staff reviews water quality and stormwater asset data in the location to determine if the infrastructure can support the new project.	4	3	NE	3	2	1	2.6
	Aurora staff selects a layer to view all active stormwater quality permits and inspection reports to ensure compliance with regulations.	1	2	NE	1	1	4	1.8
	Aurora employee reviews MS4 permit program details for an area.	4	3	NE	4	3	2	3.2
	User views wetland areas within Aurora.	3	1	NE	2	4	2	2.4
Issues								
	Aurora employee searches for citizen complaints regarding drainage and flooding in a certain area of the city.	2	1	NE	3	1	2	1.8
	Citizen reports a backed-up storm sewer and the employee reviews the location for existing work orders to fix the problem.	1	1	NE	1	2	4	1.8
	Staff reviews recent reported issues as pinpoints on a map to identify problematic areas.	2	1	NE	1	1	4	1.8
	Citizen complains about construction pollution in a stream and the Aurora employee identifies construction activities in the area and whom to follow up with.	1	1	NE	3	2	4	2.2
	Staff reviews response metrics over various periods of time.	2	2	NE	4	3	4	3

Table B.2
Use Case Survey Responses

Aurora Stormwater Program Management Plan Use Case Prioritization		Key: 1 = High 2 = Med 3 = Low 4 = Not Applicable NE = No expertise Rows highlighted in green are high priority use cases with an average priority between 1 and 2							
		Responder:	Nicole Johnston	Clint Wiesz	Larry Rector	Sean Lieske	Vern Adam	Bill McCormick	Average Priority:
Other									
	User searches for documents/data in non-map based page with a list of results.	1	2	NE	NE	2	1	1.5	
	User reviews a dashboard of stormwater activity: floods, work orders, maintenance, construction, complaints, etc.	1	2	NE	2	2	4	2.2	
	For an Aurora location, users can also review assets and project details pertaining to roads/streets, wastewater, drinking water, and other facilities along with stormwater data.	4	2	NE	2	4	1	2.6	
	Aurora employee searches for all current road projects in a location with implications for stormwater quality.	4	1	NE	3	3	4	3	
	Staff views a flag on dashboard for multiple work orders scheduled for a single asset and determines whether there are conflicting work orders. For example, one work order indicates that a pond should be mowed, and another indicates that it is also scheduled for dredging, which should be performed first.	2	1	NE	1	2	4	2	
	Staff views timeline of planned projects for an area/asset to better coordinate with other departments (i.e. parks may have a project planned in 3 years that is similar to a water project planned in 2 years).	2	1	NE	1	3	4	2.2	
	A new employee reviews the information available through the system as a method to get up to speed with tasks associated with their role, which facilitates the transfer of institutional knowledge between employees.	1	3	NE	3	3	3	2.6	
	Users can review linked non-Aurora owned documents on an ongoing basis (See systems diagram/listing).	1	3	NE	3	3	1	2.2	
	User views current sewer and water bonds.	4	4	NE	3	4	4	3.8	

Table B.2
Use Case Survey Responses

Aurora Stormwater Program Management Plan Use Case Prioritization		Key: 1 = High 2 = Med 3 = Low 4 = Not Applicable NE = No expertise Rows highlighted in green are high priority use cases with an average priority between 1 and 2							
		Responder:	Nicole Johnston	Clint Wiesz	Larry Rector	Sean Lieske	Vern Adam	Bill McCormick	Average Priority:
New									
	Environmental – select a sample point and highlight all streams and pipes which contribute to that point location (Geometric Network) Map				1				1
	Include county parcel layer with link to county data (like ownership) Map				1				1
	Select all parcels of interest and export list to spreadsheet. Map				1				1
	Stormwater permit inspection reports accessible by clicking on a specified permit location					1			1
	Dashboard that shows CIP recommendations for next year, 5-years, 10-years based on specified factors such as risk, complaints, inspections, etc.					1			1
	Allow a dashboard with options defined by each individual user					1			1

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Table B.3
City of Aurora
Stormwater Management Master Plan, Phase 1

Questions 1 – 6		Responses			
<i>Background</i>	Clint Weisz	Donelson, McCleary	Van Ry	McCormick	
1 Describe your responsibilities with respect to Aurora’s current Stormwater Program.	Involved in major drainageway planning and project management for CIP.	My responsibilities include: oversight of all Stormwater Operations and Maintenance, UDFCD CIP, Maintenance and Master Planning coordination, and Municipal Separate Storm Sewer (MS4) compliance.	I am responsible for all master plans once completed. I will ultimately be responsible for the maintenance and upkeep of this plan once completed. I manage the plans reviewers that review all stormwater and erosion control plans for Aurora Water. I manage a developer related stormwater inspections through an inspections team I manage all cost shares with developers. I provide engineering input for the development of rates and fees. My group provides engineering input for operational stormwater issues. I am responsible for Aurora Water Asset Management and GIS.	Floodplain management and FEMA submittal reviews, drainage plan and reports reviews for general conformance with City criteria, technical support for UDFCD’s master planning projects.	
2 What is your vision for this Stormwater Management Plan? What are your expectations and how will project success be measured?	The plan will help us organize, track and file stormwater information as well as plan, chart and fund future priorities.	My vision for the SWMP is to have a planning and decision making tool that incorporates: Capital project identification, planning, prioritization, UDFCD CIP, Maintenance and planning, key maintenance integration, (sediment removal). In my opinion success will be measured when all key components of the SW program are in a format that is user friendly, flexible, adaptable, and is robust and will serve AW well into the future. Record keeping tool.	A comprehensive guidance document and associated support documents/programs that brings together all stormwater elements and outlines a strategic approach to managing the stormwater program. The document should be in a format that can be readily updated annually with a major update every 5 years. There also needs to be a strategic approach to 1, 5, 10, & 20 year CIP updates. The document should provide the foundational information required to support appropriate stormwater rates and fees. A centralization and coordination of stormwater activities is a goal. A clear definition of roles and responsibilities should be outlined in the document.	Have one data base having the storm sewer system info, drainage studies info (both private and public studies), drainage complaints data in one location, etc. In regard to expectations I do not know the project budget, but eventually I think this project should be fully operational where it is GIS based where staff could look at an area and see all existing infrastructure and studies, etc. Project success will likely be measured in stages: basic data collection, GIS data input, "vehicle" for use of the GIS data base. This "vehicle" needs to be accessed by all City staff, not just Aurora Water Department staff.	
3 What are your principal issues or concerns (flooding, lot drainage, water quality, capital needs, maintenance needs, etc.)?	Drainageway planning and capital needs.	Principal issues and concerns: water quality, capital needs and planning, timely maintenance, environmental compliance	Program financial sustainability. Capital program planning. Strategic approach to management of the SW utility.	Drainage problem areas, gaps in the studies we have, including whether the existing studies are becoming outdated and need to be updated.	
4 What other City agencies do you work with in accomplishing your stormwater responsibilities?	Primarily Operations, Public Works and PROS but also utilities, erosion control, planning, traffic, permitting, attorney’s office, real property, survey business services and purchasing	AW engineering, PW Floodplain engineering and application	Public Works, Development Services, City Manager’s Office, Finance Department, Legal Department, Parks Recreation and Open Space, Council.	Aurora Water, City Attorney’s Office, Real Property Division of Public Works, Design Engineering Division of Public Works	
5 What external organizations do you work with (e.g., Arapahoe County, Urban Drainage & Flood Control District, State of Colorado, SEMSWA, etc.)?	Urban Drainage, and SEMSWA primarily but also CDOT, Arapahoe county, Adams County, City and County of Denver, DIA, Buckley AFB, FEMA	UDFCD, Adjacent jurisdictions, FEMA (CRS program), State of Colorado, (Water Quality Control Division, WQCD) MS4 compliance., USACE, wetlands Cherry Creek Basin Authority	NPDES, State MS4 requirements, FEMA	Arapahoe County, City and County of Denver (including DIA), Adams County, Douglas County, SEMSWA, City of Centennial, UDFCD, CDOT, CWCB, FEMA, Cherry Creek Basin Water Quality Authority, U.S. Army Corps, RTD, Aurora Public School District, Cherry Creek School District, University of Colorado Health Sciences	
6 What Federal, State and local regulations affect your work?	EPA on down	FEMA- CRS program, WQCD-MS4 compliance, local ordinances (COA private pond ordinance)	NPDES, State MS4 requirements, FEMA	Water Quality Act, Endangered Species Act, State’s rules and regs. on regulating floodplains, laws regarding wetlands, i.e., 404 permits, FEMA regulations, Colo. Reg. 72, Cherry Creek Basin Water Quality Authority’s criteria	

Table B.3
City of Aurora
Stormwater Management Master Plan, Phase 1

Questions 1 – 6		Responses		
<i>Background</i>		Sean Lieske	Nicole Johnston	Larry Rector
1	Describe your responsibilities with respect to Aurora’s current Stormwater Program.	Staff includes the City’s MS4 coordinator and the erosion control inspection staff as it relates to the Stormwater Construction Sites Program requirements of the MS4 permit. More specifically, these duties are focused on ensuring compliance with the permit from a water quality perspective as opposed to a flood mitigation and/or management perspective.	Review construction plans, guide projects, review best management practices,	Supervise current GIS system. Maintain GIS and all updates to the system
2	What is your vision for this Stormwater Management Plan? What are your expectations and how will project success be measured?	The master plan should have two main objectives: 1) Development of a master planning document that provides a prioritization process for improvements and maintenance of the stormwater conveyance system based on the triple bottom line approach of considering three main factors: economic/financial (profit); environmental (pollution); and, social (people). The environmental part of this should consider Low Impact Development techniques and the use of green infrastructure. 1a) GIS mapping system that can readily show choke points, damaged areas, impervious surfaces, planning zones, etc. that will be able to assist with future prioritization processes.	I wish it would stop being referred to as a Stormwater Management Plan since we have a requirement for a stormwater management plan (SWMP) for construction and permitting (both City and State) and it is terribly confusing. If it helps our department guide development requirements for incoming projects in the city (Master Planning) and aids interdepartmental communications it will be good.	Create Stormwater GIS using current data and new data Sub-basin delineation (watersheds) – polygon boundary Detention Ponds – polygon boundary with cubic feet capacity Structures – Inlets, Culverts, Bridges, Flumes, and all features in contact with water flow Conveyance - Pipes, ditches, creeks, etc. Conveyance – Size & Capacity, CFS flow rate range Outfalls – Point of outfall, conveyance, and contributing watershed Floodplain – FEMA polygons of 100 year flood event Point feature – addresses within 100 year flood area Hyperlink – feature to document link Geometric Network – showing connectivity and direction of flow Correlate bordering jurisdictions data like City of Denver, SEMSWA, and others Deliver GIS features in ESRI geodatabase – In COA standard coordinate system
3	What are your principal issues or concerns (flooding, lot drainage, water quality, capital needs, maintenance needs, etc.)?	Lot drainage, water quality, appearance, functionality	For us all of the above are our concerns. We do our best to prevent the issues pre-development and help with correcting issues and both aspects need to involve water quality concerns.	Quality, accuracy, connectivity of current data. No link to documentation
4	What other City agencies do you work with in accomplishing your stormwater responsibilities?	Parks, Recreation and Open Space, Public Works, Planning	Storm Drain (various groups), Public Works, CPD, Asset Mgmt., GIS, Planning, PROS	All Aurora Water, Public Works Dept., IT Dept., Parks Dept.
5	What external organizations do you work with (e.g., Arapahoe County, Urban Drainage & Flood Control District, State of Colorado, SEMSWA, etc.)?	Colorado Stormwater Council, Urban Drainage and Flood Control District, South Platte Coalition for Urban River Evaluation, Colorado Department of Transportation, Southeast Metro Stormwater Authority, Arapahoe and Adams Counties (Tri-County), Colorado Department of Public Health & Environment – Water Quality Control Division, Cherry Creek Basin Water Quality Authority, Chatfield Watershed Authority, South Platte Enhancement Board, Coalition for the Upper South Platte	Those listed and Home Owners Associations, Home Builders Association	Arapahoe County, Adams County, Urban Drainage & Flood Control District, State of Colorado, SEMSWA, DrCog, City of Denver
<i>Regulatory Compliance</i>				
6	What Federal, State and local regulations affect your work?	Clean Water Act, Colorado Water Quality Control Act, Phase I MS4 permitting requirements, Total Maximum Daily Loads (TMDLs) issued by the State, Regulation 72 – Cherry Creek Reservoir Control Regulation, Regulation 85 – Nutrients, Regulation 31 – Basic Standards, Rules and Regulations Regarding Stormwater Controls for Construction Sites, City Ordinances	CWA, CDPHE, City Regs and Codes	unknown

Table B.3
City of Aurora
Stormwater Management Master Plan, Phase 1

Questions 1 – 6	Responses
<i>Background</i>	Consultant Team
1 Describe your responsibilities with respect to Aurora’s current Stormwater Program.	Project manager assisting with development and implementation of the PLAN.
2 What is your vision for this Stormwater Management Plan? What are your expectations and how will project success be measured?	<p>Stop referring to this project as a Stormwater Management Plan since we have a requirement for a stormwater management plan (SWMP) for construction and permitting (both City and State) and it is confusing. What shall we call this project? PLAN.</p> <p>The PLAN will help us organize, track and file stormwater information as well as plan, chart and fund future priorities.</p> <p>PLAN is a comprehensive guidance document and associated support documents/programs that brings together all stormwater elements and outlines a strategic approach to managing the City’s stormwater program. The document should be in a format that can be readily updated annually with a major update every 5 years.</p> <p>There needs to be a strategic approach to 1, 5, 10, & 20 year CIP updates.</p> <p>PLAN should include planning / decision making tools that incorporate: 1) Capital project identification, planning, prioritization, 2) UDFCD CIP, 3) Maintenance and planning, key maintenance integration, (sediment removal).</p> <ol style="list-style-type: none"> 1) A master planning document that provides a prioritization process for improvements and maintenance of the stormwater conveyance system based on the triple bottom line approach of considering three main factors: economic/financial (profit); environmental (pollution); and, social (people). The environmental part of this should consider Low Impact Development techniques and the use of green infrastructure. 2) A centralization and coordination of stormwater activities is a goal. A clear definition of roles and responsibilities should be outlined in the document. 3) The document should provide the foundational information required to support appropriate stormwater rates and fees. <p>Have one data base having the storm sewer system info, drainage studies info (both private and public studies), drainage complaints data in one location.</p> <p>A GIS mapping system that can readily show choke points, damaged areas, impervious surfaces, planning zones, and more that will assist with future prioritization processes.</p> <p>Create Stormwater GIS using current data and new data. A Record keeping tool.</p> <p>A guide for development requirements for incoming projects in the city (Master Planning) and aids interdepartmental communications.</p> <p>Success will be measured when all key components of the SW program are in a format that is user friendly, flexible, adaptable, and is robust and will serve AW (or the City of Aurora Stormwater Program) well into the future.</p> <p>Project success will likely be measured in stages: basic data collection, GIS data input, "vehicle" for use of the GIS data base.</p>
3 What are your principal issues or concerns (flooding, lot drainage, water quality, capital needs, maintenance needs, etc.)?	<p>Drainageway planning and capital needs, capital needs and planning, Capital program planning</p> <p>Water quality, timely maintenance, environmental compliance</p> <p>Program financial sustainability. Strategic approach to management of the SW utility.</p> <p>Lot drainage, water quality, appearance, functionality Prevent issues at pre-development and help with correcting issues, and both need to involve water quality concerns.</p> <p>Drainage problem areas, gaps in the studies we have and whether existing studies are becoming outdated and need to be updated.</p> <p>Quality, accuracy, connectivity of current GIS data. No link to documentation</p>

Table B.3
City of Aurora
Stormwater Management Master Plan, Phase 1

Questions 1 – 6	Responses
4 What other City agencies do you work with in accomplishing your stormwater responsibilities?	Primarily Operations, Public Works and PROS. Also utilities, erosion control, planning, traffic, permitting, attorney’s office, real property, survey, business services and purchasing AW Engineering, PW Floodplain engineering and application Public Works, Development Services, City Manager’s Office, Finance Department, Legal Department, PROS, Council. Aurora Water, City Attorney's Office, Real Property Division of Public Works, Design Engineering Division of Public Works PROS, Public Works, Planning Storm Drain (various groups), Public Works, CPD, Asset Mgmt., GIS, Planning, PROS All AW, Public Works, IT Dept., PROS
5 What external organizations do you work with (e.g., Arapahoe County, Urban Drainage & Flood Control District, State of Colorado, SEMSWA, etc.)?	Urban Drainage & Flood Control District, SEMSWA, Arapahoe County, Adams County, Douglas County, City and County of Denver, DIA, City of Centennial, SEMSWA, Cherry Creek Basin Water Quality Authority, Chatfield Watershed Authority, South Platte Enhancement Board, Coalition for the Upper South Platte, South Platte Coalition for Urban River Evaluation, Colorado Stormwater Council Aurora Public School District, Cherry Creek School District, University of Colorado Health Sciences Colorado Department of Transportation, Colorado Department of Public Health & Environment – Water Quality Control Division, CWCB, DRCOG, RTD Buckley AFB, FEMA, U.S. Army Corps, Home Owners Associations, Home Builders Association
6 What Federal, State and local regulations affect your work?	EPA, FEMA- CRS program, Clean Water Act (NPDES), FEMA regulations, Endangered Species Act, laws regarding wetlands, i.e., 404 permits, Colorado Water Quality Control Act Phase I MS4 permitting requirements, WQCD-MS4 compliance, Total Maximum Daily Loads (TMDLs) issued by the State, Regulation 72 – Cherry Creek Reservoir Control Regulation, Regulation 85 – Nutrients, Regulation 31 – Basic Standards, Rules and Regulations Regarding Stormwater Controls for Construction Sites, State's rules and regs on floodplains, City Ordinances, local ordinances (COA private pond ordinance),

**Table B.5
General Conditions Assessment Needs for Stormwater Assets and Risks**

This table lists existing stormwater asset types and general consensus on most likely risk level and failure mode for each asset type.

		MAJOR DRAINAGE WAYS										TRIBUTARIES & LARGE STORM DRAIN OUTFALLS (48" AND OVER)								MINOR STORM DRAINAGE CONVEYANCES						OTHER STORMWATER ASSETS					
		Drop Structures and Check Structures	Channel Section and Bank Protection	Low Flow Channels	Pipe and Ditch Outfalls	Bridges	Culverts	Maintenance Access Roads, Pedestrian Trails	Levees	Regional Detention Ponds	Vegetation	Drop Structures and Check Structures	Channel Lining and Bank Protection	Low Flow Channels	Pipe and Ditch Outfalls	Pipe Systems 48" and above (RCP)	Pipe Systems 48" and above (CMP)	Outlet Protection, Energy Dissipaters	Local Detention Ponds	Water Quality BMPs	Maintenance Access	Pipe Systems < 48" (RCP)	Pipe Systems < 48" (CMP)	Storm Drainage Inlets	Non-roadway Associated Drainage Ditches	Roadway Borrow Ditches	Outlet Protection and Energy Dissipaters	Pump Stations (3)	Wetlands	Dams - Jurisdictional	
		Check if Failure Risk is for: (Business Drivers)																													
1. Service Life																															
2. Maintenance																															
3. Hydrologic & Hydraulic Standards and Criteria																															
4. Adjacent Land Impacts																															
5. Effective Interagency/Interdepartmental Coordination																															
6. Compliance with Conditions Specified in the MS-4 Permit																															
7. Managing Wetlands and Wildlife Habitat Areas																															
8. Managing Floodplains																															
Failure risk level (A, B, C, or D) (risk=likelihood x consequence of failure) from the above asset condition information	Consensus:	C	D	A	A	C	C	B	C	C	A	C	D	A	A	C	D	C	B	B	B	A	B	B	A	A	A	D	A	C	
	Confidence rating (0-5) of asset type condition information with 5 = 100%	OPS: 4	4	4	4		3	4	5	4	3	4	4	4	4	4	2	4	2	3	3	4	2	4	4	3	4	4			
	CP:						3	5	4	1																					

**Table B.6
Drainage Basin Risk Levels**

UDFCD Basins Within the City of Aurora	Failure risk level (A, B, C, or D)	Approx. number of sub-basins	Describe known deficiencies and problem areas.
Antelope Creek		5	As development occurs in this basin the creek will need to be stabilized in accordance with the Piney Creek MDP. There may be a regional detention pond around E-470.
Bear Gulch		24	Outside of current maintenance program
Box Elder Creek (Upper)		29	UDFCD's master plan shows the use of levees to control spill, Outside of current maintenance program
Cardboard Gulch		0	Outside of current maintenance program
Cherry Creek	D	35	Creek is in transition between aggradation and degradation. Aurora's responsibility for its grade control structures are needed. I think this may already be underway. Multi-jurisdictional responsibilities. <u>Recent problems, risk to supply line form Rampart.</u>
Coal Creek	C	36	Relatively stable at the moment. Several existing road crossings are undersized for future conditions. <u>Undergoing current MDP.</u>
Corner Drainage		0	Outside of current maintenance program
Coyote Run		23	Outside of current maintenance program
Crooked Run		13	Outside of current maintenance program
East Toll Gate Creek	C	50	Some reaches are heavily incised around the Centre Hills Golf Course. The Airport Boulevard crossing is believed to overtop in a major event. Aggradation has occurred upstream from its confluence with West Toll Gate Creek. This potentially will cause adjacent development to be flooded during a major event. <u>Undergoing current MDP.</u>
First Creek	B	61	Existing conditions flow is too high for existing crossings at I-70 and downstream from there. Also, the City is not in compliance with its IGA with Denver for flow rates into Denver. Aurora Water is currently working on acquiring property for regional detention pond(s) upstream of I-70 to improve this situation. Will need to look at the MDP to see if there are any issues with First Creek's tributaries (i.e., Tributary T, etc.). Current CIP project to address D/S flow limits to Denver.
First Creek Tributary T	C	35	See First Creek's comments. Current CIP project to address D/S flow limits to Denver.
Granby Ditch	D	10	Recent project per MDP increased LOS to 100-yr, hundreds of properties removed from Floodplain.
Grizzly Run		0	Outside of current maintenance program
Henry David Draw		3	Outside of current maintenance program
Irondale Gulch		12	Need to complete the Bolling Drive Tributary channel construction from just upstream of 38th Avenue to the Majestic Commercenter's detention pond IG B. Currently Pond IG B is functioning as a retention pond. It needs to be connected to the Bolling Drive Tributary. Outside of City Jurisdiction - Denver.
Llama Draw		0	Outside of current maintenance program
Meadowood Drain	C	16	Maintenance related, debris/sediment loading.
Montbello Drainage		6	Outside of City Jurisdiction - Denver.
Murphy Creek	C	40	Risk to City golf course and development.
Mutchie Creek		8	Outside of current maintenance program
Newcomb Gulch		4	Outside of current maintenance program
No Name Creek	B	15	The Flanders Street crossing just north of Hampden Avenue needs to be stabilized. Currently, bank erosion is currently taking place, especially with larger storm events. Maintenance related, debris/sediment loading.
Patton Creek		8	Outside of current maintenance program
Piney Creek	B	22	Maintenance related, debris/sediment loading. Project in progress.
Prairie Dog Draw		29	Outside of current maintenance program
Rat Run		0	Outside of current maintenance program
Sable Ditch	D	10	Recent projects per MDP increased LOS to 100-yr. Hundreds of properties removed from Floodplain.
Saddle Rock Ranches	D	10	As the Rockinghorse development builds out the gulch will require channel stabilization measures. Low level of maintenance required to this point.
Sampson Gulch	C	9	As development occurs this gulch will require stabilization and a regional detention pond. <u>Moderate level of maintenance required to this point.</u>
Sand Creek	C	76	On-going maintenance for sediment loading. Risk to Sand Creek discharge.
Second Creek		37	As this basin develops the recommendations in the MDP need to be implemented. Outside of current maintenance program
Senac Creek	C	39	Moderate level of maintenance required to this point. Risk to Binney discharge.
Third Creek		4	Outside of current maintenance program
Toll Gate Creek	C	20	On-going maintenance for sediment loading.
West Fork Second Creek		5	Outside of current maintenance program
West Sand Creek		2	Outside of current maintenance program
West Toll Gate Creek	C	60	On-going maintenance for sediment loading.
Westerly Creek	B, D	59	Higher risk 2010 MDP - current project to remove 48 structures from the floodplain, still 50+ in floodplain. Highly visible - re-development in and around Lowry & Stapleton.
Windmill Creek	D	17	Low level of maintenance required to this point.



Table B.7
ASWPMP: Preliminary Use Cases

Preliminary Use Cases

A use case is a description of how users would perform tasks within the proposed web solution. They are a convenient way to illustrate general functionality and scope by describing the steps a user might take to reach a goal and how the web solution would respond to the user actions.

The following preliminary use cases were collected informally during the ASWPMP discovery meetings. We need your help verifying and prioritizing this list:

1. First, enter your name here : **Type Your Name Here**
2. Next, click “High”, “Medium”, “Low”, or “Not Applicable” for the use cases in the tables below. In addition, please indicate any missing use cases or comments you have.
3. When you’re finished, save this document and return it to Clint, who will forward it to URS.

Navigation

	For each use case, click a priority ranking.
User selects a geographical location by clicking on a map.	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable
User selects multiple locations by outlining an area on a map.	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable
User selects a location or locations by entering text (address, intersection, subdivision, stream name, or watershed).	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable
User selects layers which contain categories of data for locations on the map.	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable
User browses a page describing the stormwater program in sections with links to relevant documents/data.	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable
User selects one or more items (streams, assets, etc.) and views them on a map.	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable
A user selects location(s) on a map, and can view documents/data from a variety of categories of information.	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable



Table B.7
ASWPMP: Preliminary Use Cases

Stormwater Assets and Elements

User reviews the reported existing conditions of a stormwater asset, which could include text, documents, photos, reports, or videos.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
User reviews the current inspection reports for stormwater asset, which could include text, documents, photos, reports, or videos.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
User locates existing stormwater assets and those that are under construction, which are highlighted and clickable.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
User locates a pond and verifies whether it belongs to Aurora or another entity.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
User selects a stormwater asset and reviews details about that asset, such as maintenance activity, condition, record drawing, etc.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
User reviews an asset or map to determine where to place sandbags to protect the stormwater system from a hazardous spill.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Aurora employee locates a pond to determine the last time it was maintained (such as mowing or dredging) and when the next maintenance is due.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
User reviews drainage studies and citizen drainage complaints for stormwater assets within a specific location. Views drainage problem areas.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
User selects a stormwater asset and can view video of CCTV condition assessment.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable



Table B.7
ASWPMP: Preliminary Use Cases

Operations and Maintenance

User locates a construction permit for a specific location.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
User reviews a dashboard showing open work orders and/or maintenance activities for the day, week, month, or for a location.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
User determines if open permits are in effect near a location at which a citizen reports an issue.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Staff locates license agreements and other business documents which pertain to railroads and the Air Force Base.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Aurora employee searches for all current construction sites in a location with implications for stormwater quality.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Customer calls Access Aurora with a complaint about a beaver dam in the creek by their house. User checks the location to determine whether the issue has been logged as a work order.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Aurora staff indicates an area on the map and views open work orders.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Staff selects an address/asset and views list of all enforcement actions.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Staff assigns a work order to the code enforcement officer who is nearest the location.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Staff locates liquor licences and tax information for businesses within Aurora.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Employee selects an asset or asset type and views training video(s) on O&M tasks.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable



Table B.7
ASWPMP: Preliminary Use Cases

Capital Planning

User views 10-year stormwater capital improvement projects as pinpointed locations on a map through which they can access additional details.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
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Environmental/Quality

A new developer wants to build in Aurora. Aurora staff reviews water quality and stormwater asset data in the location to determine if the infrastructure can support the new project.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Aurora staff selects a layer to view all active stormwater quality permits and inspection reports to ensure compliance with regulations.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Aurora employee reviews MS4 permit program details for an area.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
User views wetland areas within Aurora.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable

Issues

Aurora employee searches for citizen complaints regarding drainage and flooding in a certain area of the city.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Citizen reports a backed-up storm sewer and the employee reviews the location for existing work orders to fix the problem.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Staff reviews recent reported issues as pinpoints on a map to identify problematic areas.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Citizen complains about construction pollution in a stream and the Aurora employee identifies construction activities in the area and whom to follow up with.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Staff reviews response metrics over various periods of time.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable



Table B.7
ASWPMP: Preliminary Use Cases

Other

User searches for documents/data in non-map based page with a list of results.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
User reviews a dashboard of stormwater activity: floods, work orders, maintenance, construction, complaints, etc.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
For an Aurora location, users can also review assets and project details pertaining to roads/streets, wastewater, drinking water, and other facilities along with stormwater data.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Aurora employee searches for all current road projects in a location with implications for stormwater quality.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Staff views a flag on dashboard for multiple work orders scheduled for a single asset and determines whether there are conflicting work orders. For example, one work order indicates that a pond should be mowed, and another indicates that it is also scheduled for dredging, which should be performed first.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Staff views timeline of planned projects for an area/asset to better coordinate with other departments (i.e. parks may have a project planned in 3 years that is similar to a water project planned in 2 years).	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
A new employee reviews the information available through the system as a method to get up to speed with tasks associated with their role, which facilitates the transfer of institutional knowledge between employees.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
Users can review linked non-Aurora owned documents on an ongoing basis (See systems diagram/listing).	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable
User views current sewer and water bonds.	<input type="checkbox"/> High	<input type="checkbox"/> Medium	<input type="checkbox"/> Low	<input type="checkbox"/> Not Applicable



Table B.7
ASWPMP: Preliminary Use Cases

Add New Use Cases

Type additional use cases here.	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable
	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable
	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable
	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable
	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable
	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low <input type="checkbox"/> Not Applicable

**Table B.8
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Aurora Stormwater Program Master Plan, Phase 1 REVIEW COMMENT SUMMARY AND RESOLUTION SHEET			
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CODE			
<ol style="list-style-type: none"> 1. Correct, add, delete 2. Clarify or discuss 3. Resolution of comment in future submittal 			

Item No.	⁽¹⁾ Para. No. or Page No.	Comments	⁽³⁾ Response	⁽⁴⁾ Final Disposition	
				⁽²⁾ Code	Date
1.	TOC pg. ii	CW: There are some tables in the report missing from this list.	Table titles have been added to the TOC.		
2.	Sec. 1.1, Pg. 1-1, 1 st para.	Sean: Does study area extend outside the current City limits? If not, then we shouldn't state that here.	Study area extends outside the City limits to the urban planning boundary.		
3.	Sec. 1.1, Pg. 1-1, 1 st para.	CW: Please highlight the UDFCD and planning area boundaries so they stand out more.	Figure 1.1 has been revised.		
4.	Sec. 1.2, Pg. 1-1	<p>LT: General comments:</p> <ul style="list-style-type: none"> • The doc loses the broad focus at times, and narrows down to storm water only readers or field staff. Scrub the doc for making sure that it is "purposely organized across multiple departments" at the same time meeting coordination, etc. of storm water activities (as stated in more detail on pg. 3-1). • Reporting is an important task for compliance, should be incorporating in the various discussion, table and figures. • Storm water or stormwater? • There are some areas with very detailed goals and recommendations, and others that just skim the goals/recommendations. This should be consistent, and at a minimum Phase I should have clear recommendations to lead us into Phase 2. • Is Phase 2 funded, I am guessing this will include even more detailed recommendations to get us to Phase 3? 	<p>The focus of this project is stormwater capital planning, operations & maintenance, and stormwater asset management. While the focus is stormwater infrastructure, tools and procedures to be built in Phases 2 & 3 will be purposely developed to be applicable across multiple departments.</p> <p>Reporting will be considered and incorporated into the viewing tool to be built in Phase 3. The groundwork will be laid in Phase 2.</p> <p>Stormwater is used consistently through the document.</p> <p>Phase 2 recommendations are focused on Stormwater Capital Planning and GIS database development.</p> <p>Phase 2 is funded, and the groundwork will be laid for completion of the project in Phase 3.</p>		

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5.	Sec. 1.3, Pg. 1-2	<p>LT: Figure 1.2 – reference to Mark Donelson and Joe McCleary, as Owner – should be Aurora Water or Aurora Stormwater/Wastewater?</p> <ul style="list-style-type: none"> • Add Aurora Water after my name under Stakeholders • Add Pat Schuler, PROS under Stakeholders • Add Tracy Young, PROS under Stakeholders • Add Ron McCune, PROS under Stakeholders • Add either Sean Lieske or Deb Kula, under Technical Support (regulations) 	Figure 1.2 updated.		
6.	Sec. 1.3, Pg. 1-4	Sean: Need to be careful how this term is used in the report.	This project is called “Stormwater Program Master Plan”. Usage is consistent with the purpose of the project.		
7.	Pg. 2-2, 1 st Bullet	Mel: and possibly to the proposed “regulatory compliance” tracking system for MS4 documents.	This is the first the consultant team has heard of the proposed “Regulatory Compliance Tracking System”.		
8.	Pg. 2-2, 3 rd Bullet	Mel: funds?	I.e. the stormwater program budget must provide funds for creating and maintaining a new management system.		
9.	Pg. 2-2, 8 th Bullet	<p>Sean: Don’t know if this is an objective of the SWPMP as stated. CIP and maintenance activities will need to account for the changing Reg Env, but the SWMP will not be.</p> <p>Mel: Or link to the proposed regulatory tracking system for regulatory impact assessment and evaluation of alternatives.</p>	The TAC and consultant team will need to keep this in mind in Phases 2 and 3, while building the database and ultimately the viewing tool, which will need to link to the proposed Regulatory Compliance Tracking System.		

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				⁽²⁾ Code	Date
10.	Pg. 2-2, Last para.	Sean: This needs re-wording. Bill: Aurora Water?	Sentence revised, Aurora Water is correct.		
11.	Pg. 2-6, Sec. 2.3.1, 1 st para.	Sean: This make it sound like this has already been done. Needs re-wording.	Data sets and records were prioritized in Phase 1, as shown in Table B-1.		
12.	Pg. 2-6, Sec. 2.3.1, 2 nd para.	Sean: It this true? We are supposed to use Oracle, but don't know how much is has been used.	The consultant team understands this is true. One of the objectives of Phase 2 is to get priority stormwater documents into Oracle so they can be found and viewed across multiple departments.		
13.	Pg. 2-7, Table 2-1	LT: Should this table be consistent with Figure 1.2? Add Pat Schuler, Aurora, PROS, Manager Open Space & Natural Resources. Change my role to AW/PROS Add Ron McCune, Aurora, PROS, O&M	Table 2.1 has been revised.		
14.	Pg. 2-10, 1 st Bullet	Bill: For CIP projects? PW currently has a method for storing approved drawings. Mel: Aurora is also currently defining a process for compliance management which will necessarily address many common records and activities related to the SWMP. The two systems should be developed in coordination to reduce duplication and error.	Yes, for AW CIP projects. The proposed "Regulatory Compliance Management System" will need to be linked to other databases. Phase 2 work will need to coordinate with this proposed system.		
15.	Pg. 2-10, 4 th Bullet	Mel: Compliance and enforcement activities will be recorded in the Regulatory Compliance system as compliance points and in Oracle (eventually) as records. Including SWPPs, 404 Permits, enforcement actions, IGAs, etc.	The proposed "Regulatory Compliance Management System" will need to be linked to other databases. Phase 2 work will need to coordinate with this proposed system.		

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16.	Pg. 2-10, 6 th Bullet	Mel: All IGAs that follow the standard signatory and retention process through Council are stored in Oracle, but may not be assigned attributes according to the retrieval needs of the SWPMP and related needs.	This will be addressed in the SWPMP Phase 2 and Phase 3 projects.		
17.	Pg. 2-12, Table 2.2	Bill: Meadowood Drainageway has 9 reports list from 1977 to 2000.	Meadowood is listed, and the Table has been updated. Sand Creek 1977 FHAD applies to Meadowood and is listed in this table. Note that Aurora is not listed as sponsor for three maintenance projects on Meadowood, which is why the projects did not appear on the list we received from UDFCD. For the Phase 2 project, the consultant team will need to search UDFCD website more thoroughly.		
18.	Pg. 2-14, Table 2.2	Bill: Easterly Creek Phase B completed 12/12.	Added to table 2.2 under Westerly Creek.		
19.	Pg. 2-14, Table 2.2	Sean: Need to bring this out better rather than have it as a footnote.	Note added to text.		
20.	Pg. 2-15, Figure 2.3	Mel: development of the regulatory management compliance system means connectivity to these systems as well.	The proposed "Regulatory Compliance Management System" will need to be linked to other databases. Phase 2 work will need to coordinate with this proposed system.		
21.	Pg. 2-15, 1 st para.	Sean: Not sure this is a true statement. Mel: staff is instructed not to use this. However the purge process is not active and there is no date established for activating this purge.	Staff uses AMANDA to store documents in Oracle. The "Purge Policy" will be reviewed in Phase 2.		

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22.	Pg. 2-16, Sec. 2.3.2.2, 1 st para.	Mel: documentation stored in AMANDA and associated with the address record and documents stored in Oracle	All search methods will be reviewed and confirmed in Phase 2.		
23.	Pg. 2-16, Sec. 2.3.2.3, 1 st para.	Mel: Searches from other metadata can also be done from ADAMS including searches by keyword and document type.	Noted.		
24.	Pg. 2-16, Sec. 2.3.2.4, 1 st para.	GC: SharePoint Systems last sentence is this true that CPDNet is being imported into Oracle, I did not think that this was happening or possible at this time.	There is no automated way to do it currently. Our understanding is that CPDNet project files are manually input to Oracle approximately quarterly.		
25.	Pg. 2-17, 5 th para.	Mel: What capabilities are these?	Examples added to text.		
26.	Pg. 2-17, 6 th para.	Mel: ?	Text revised.		
27.	Pg. 2-17, last para.	GC: "dashboard capabilities" are user defined, there are no standardized dashboards being used. Mel: good to know for integration with the compliance management tracking system.	Text revised. Noted.		
28.	Pg. 2-18, 2 nd para.	CW: Is the data for storm pumping stations stored separately and able to be retrieved for data from other pumping stations? Let's be careful not to establish different criteria or processes for each station type that would complicate efforts for the operations team.	Text revised. This will be addressed in the SWPMP Phase 2 project when attributes for assets are established.		

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		LT: This should be changed - there are 3 treatment plants, But multiple pumping stations, data is ultimately centrally recorded. There should be one database for wastewater and storm water, with respect to documenting compliance.			
29.	Pg. 2-18, 4 th para.	Mel: also good to know for integration with the compliance management tracking system.	Noted.		
30.	Pg. 2-18, Sec. 2.4.2	LT: This refers to the storm water GIS. The recommendation should be more detailed and should include an upgraded City-wide GIS system to be used by multiple departments, for various purposes, including layers to pull down menus for maintenance schedules, budgeting, etc.	This project is focused on stormwater infrastructure. The goal for the SWPMP Phase 2 and Phase 3 project is to build the database and ultimate viewing tool for use on a City-wide basis, and for future application in other divisions and departments for other City infrastructure.		
31.	Pg. 2-18, Sec. 2.4.2, 3 rd bullet	Bill: Is this now complete since this is 2013?	Will verify in Phase 2.		
32.	Pg. 2-19, Sec. 2.5	LT: This section reads very differently than the rest of the document. Needs to be cleaned up. The section describes OPS and its activities, but it does not include any conversation about shared use of site as a City amenity. Discussion here is about Ops view of UDFCD as a contractor, there is not a goal/ recommendation for re-consideration of that – perhaps Ops should reconsider how they perceive them? i.e., UDFCD is more than that – on a regional scale.	Section has been revised. This report is focused on stormwater. This section reports how Ops currently works with UDFCD. The consultant team may recommend changes to how finances are budgeted and tracked in Phase 2.		

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		This discusses how the OPS group is small and limited in how they plan. This should include clear recommendations on how to correct that – or will this come in Phase 2?	O&M planning for stormwater will be addressed in Phase 2, task 1.		
33.	Pg. 2-19, 6 th para.	CW: Each pond, every month? Is this right?	Per the meeting minutes.		
34.	Pg. 2-20, 3 rd para.	LT: SharePoint development for not only field staff, but multiple departments - as part of the GIS platform, for scheduling projects, avoiding conflicts and increasing efficiencies City-wide.	This will be addressed in Phase 3.		
35.	Pg. 2-20, 4 th para.	MD: There are 8 staff in WW dedicated to pipeline inspections, no dedicated SW staff.	Text revised.		
36.	Pg. 2-20, 5 th para.	MD: the level of service was established with consideration of City Council goals.	Noted.		
		Sean: This doesn't make sense. The 2 sentences don't seem to go together.	Text revised.		
37.	Pg. 2-20, 6 th para.	These needs should be acknowledged in the Regulatory Compliance Management program as well in order to correlate the two systems and to match reporting outputs.	Noted.		
		Sean: Need more. This seems like a fragment sentence.	Text revised.		
38.	Pg. 2-21, 2 nd para.	LT: Add Pat Schuler, Lori Tagawa, Tracy Young	Not in CIP Meetings.		

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39.	Pg. 2-21, 3 rd para.	CW: I don't think this is true. LT: I think that risk is certainly a part of current project evaluation, and should be in future projections! Should include all departments on all levels so that we can predict projects, be in compliance and avoid overlap/conflicts (i.e., sediment removal in creeks, FEMA regulations, CWA, parks and/or golf and/or trail impacts) LT: Aurora is not a new city. CW: I wouldn't say is hasn't been an issue, but not a "big" issue.	Text revised. This is the goal for planning procedures to be developed in Phase 2. Text revised.		
40.	Pg. 2-21, 5 th para.	MD: The "justification" process/document is planned for 2013.	In Phase 2.		
41.	Pg. 2-21, 7 th para.	LT: land acquisition demands LOTS of staff time and impacts both schedule and budget! CW: However, it does have a big impact on project schedule and cost.	Text revised.		
42.	Pg. 2-21, last para.	LT: there needs to be a comprehensive strategic approach for 1, 5, 10, 20 –year CIP updates and projections.	This is a goal of SWPMP Phase 2 project.		
43.	Pg. 2-23, 3 rd para.	MD: I would say that some of the street sweeping costs. Sean: This doesn't flow very well. Mel: May need to revise this and be sure to evaluate any changes in process with the change in system.	Text revised.		
44.	Pg. 2-23, 5 th para.	Mel: Call center also uses Amanda for researching issues.	Noted.		

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45.	Pg. 3-2, item b.	Mel: See Compliance Management program development notes throughout	Noted.		
46.	Pg. 3-2, 1 st para.	Sean: This sentence doesn't flow right, too much information in one sentence.	Text revised.		
47.	Pg. 3-2, 1 st para.	Mel: and should reflect activities underway in Amanda, Hansen, Oracle and new compliance tracking efforts.	Text revised.		
48.	Pg. 3-3, Figure 3.1	LT: Database GIS – entry, all multiple department contributors and multiple department users. Conduct quality assurance and user acceptance testing and train user's boxes – does this consider user requirements?	To be addressed in Phase 2. Yes. User requirements are established in first sub-task.		
49.	Pg. 3-5, 2 nd para.	LT: For all bullet (Points), emphasize multiple department input and usage, not just swww and aw.	Focus of Phase 2 project is Stormwater, and the goal is multiple department usage and compatibility.		
50.	Pg. 3-5, No. 1	Mel: Oracle.	"GIS" is the intent.		
51.	Pg. 3-5, No. 2	Sean: This is restated in item 9. Only needs to be in one location.	All references to "training" moved to item 9.		
52.	Pg. 3-6, No. 7	LT: the planning and budgeting should not only include capital for replacement, but also maintenance and mitigation during maintenance. For example, costs and schedule should be included for impact to trails and revegetation related to maintenance activities.	Noted. Will be addressed in Phase 2.		
53.	Pg. 3-6, No. 10	LT: add O&M cost and schedule for mitigation during maintenance activities. CW: Can this sentence be re-worded? I don't quite follow it.	Noted. Will be addressed in Phase 2. Text revised.		

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CODE			
<ol style="list-style-type: none"> 1. Correct, add, delete 2. Clarify or discuss 3. Resolution of comment in future submittal 			

Item No.	⁽¹⁾ Para. No. or Page No.	Comments	⁽³⁾ Response	⁽⁴⁾ Final Disposition	
				⁽²⁾ Code	Date
54.	Pg. 3-6, No. 12	LT: Multiple departments. Sean: Include in item 9 above.	Text revised.		
55.	Pg. 3-7, Figure 3.2	GC: under the first box third bullet "Review Each Sub-basin for Failure Modes" only the next four sub bullets are failure modes 5th to 8th should be first order bullets.	Figure revised.		
56.	Pg. 3-10, Figure 3.3	Change Hanson to Hansen LT: Change "Parks" to PROS	Figure revised.		
57.	Pg. 3-11, Figure 3.4	Change Hanson to Hansen LT: Figure 3.4 seems to focus on getting data from UDFCD, it should equally focus on methodically getting internal existing data from other City departments.	Figure revised. Noted for Phase 2. Holly Kikel, PROS-GIS, will be contacted among others.		
58.	Pg. 3-13, Table 3.1	LT: Table – where do scheduling, budget, checking for conflicts with upcoming projects fall, build in alerts? LT: Table continued – not only a layer to view but specified limits, next/upcoming reporting times, alerts? etc.	Would be addressed in Task 1, Phase 3. Would be addressed in Task 1, Phase 3.		
59.	Pg. 3-14, last para.	CW: Also need to discuss the requirement to have IT involved for system approval.	Text revised.		
60.	Pg. 3-15, Figure 3.5	LT: again focus on the multi users, departments.	Stakeholders and users will be involved in the process as noted in Tasks 1, 2, 3, 5, 6 and 8		
61.	Pg. C-1	Sean: Should this include a cost estimate?	Fee proposal provided separately.		
62.	Pg. C-2, 5 th bullet	Sean: These are not detailed on the Gantt chart.	Called "Progress Meetings". "Workshops" added to task description.		

If no comment, write "NO COMMENT"	<ol style="list-style-type: none"> (1) Indicate paragraph # or page #, or use "G" for General Comment (2) To be filled out at Review Meeting 	<ol style="list-style-type: none"> (3) To be filled out by URS and City of Aurora (4) To be determined in subsequent meeting/discussion
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**Table B.8
Draft Report Comment Response Form**

Aurora Stormwater Program Master Plan, Phase 1 REVIEW COMMENT SUMMARY AND RESOLUTION SHEET			
Submittal: Phase 1 Report Submittal		Author: URS	Date: 2/4/13
Agency/Company: City of Aurora	Reviewers:		Page: 11 of 12
CODE			
1. Correct, add, delete 2. Clarify or discuss 3. Resolution of comment in future submittal			

Item No.	⁽¹⁾ Para. No. or Page No.	Comments	⁽³⁾ Response	⁽⁴⁾ Final Disposition	
				⁽²⁾ Code	Date
63.	Pg. C-2, 6 th bullet	CW: We currently have a Project Initiation form (or memo). Maybe this will just be an adaptation or revision.	Agree.		
64.	Pg. C-2, Task 1.1	CW: Same text twice.	Duplicate text has been deleted.		
65.	Pg. C-2, Task 1.2	Sean: What is this? Describe.	The Delphi method was developed by Gordon and Helmer in 1953 at RAND . It can be defined as a method for structuring a group communication process that is effective in allowing a group of individuals, as a whole, to deal with a complex problem.		
66.	Pg. C-2, Task 1.3	Sean: Same as above. Need more detail.	See 65.		
67.	Pg. C-2, Task 1.6	Workshops are not depicted on the Ghant chart.	See 62.		
68.	Pg. C-3, 2 nd bullet	Sean: metadata?	Asset attributes in GIS.		
69.	Pg. C-4, 3 rd subheading	CW: Please make sure these GIS scope items are updated to account for comments in the report, if any.	No comments affected to scope.		
70.	Pg. C-4, Task 2.3	Sean: Need to describe how next steps, 2.3 thru 2.9, will be alpha tested on a high priority watershed and then deployed to other watersheds after refinement of the process.	Scope states the process will be tested in the Granby/Sable Ditch watershed. All processes and deliverables will be subject to approval and acceptance by Aurora before work continues on other watersheds.		
71.	Pg. C-4, last subheading	Sean: Need to include a process refinement step in the written document and Gantt chart.	It's implicit to the process.		

If no comment, write "NO COMMENT"	(1) Indicate paragraph # or page #, or use "G" for General Comment (2) To be filled out at Review Meeting	(3) To be filled out by URS and City of Aurora (4) To be determined in subsequent meeting/discussion
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Item No.	⁽¹⁾ Para. No. or Page No.	Comments	⁽³⁾ Response	⁽⁴⁾ Final Disposition	
				⁽²⁾ Code	Date
72.	Pg. C-8, Task 3	CW: The fee schedule should be set up to better follow the scope. For instance, in the fee schedule Task 3 is Develop the Solution. Also in the fee schedule, I cannot find items such as Task 2.8, Field Recon & Data Input.	Fee proposal revised.		
73.	Pg. C-8, Task 3.3	CW: I don't think we're doing a "tool" in this Phase. Or, is this referencing something other than the dashboard?	Scope of work revised.		
74.	Pg. C-8, Phase 3	Sean: Do we want this included? If so, it may be pertinent to have a Gantt chart that outlines expected time frames for Phase 3. CW: Why is Phase 3 being discussed in the Phase 2 scope?	Scope of work revised.		
75.	Pg. C-8, Task 3.4	CW: ?	"Tool" is future project, Phase 3.		

If no comment, write "NO COMMENT"	(1) Indicate paragraph # or page #, or use "G" for General Comment (2) To be filled out at Review Meeting	(3) To be filled out by URS and City of Aurora (4) To be determined in subsequent meeting/discussion
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Appendix C
Phase 2 Scope of Work

Objectives

The Stormwater Program Master Plan (SWPMP) will be a comprehensive plan to assist in evaluation and planning of new capital projects, system maintenance integration, infrastructure rehabilitation and asset management based on risk reduction and triple bottom line service delivery. The SWPMP will assist the City in providing the greatest reduction of regional and localized flood risks with available funding and in preparing for future capital and maintenance funding needs. The SWPMP will provide a framework for screening alternatives, and will be a GIS based product compatible with existing City systems.

The URS Team's approach to completing this project involves three phases: 1) Program Definition, 2) Program Development and 3) Program Deployment. We began with the Project Definition Phase that set the framework for the SWPMP "product", and provided direction for subsequent tasks in Phase 2, Program Development. Building the GIS "data management tool" and Program Deployment will be accomplished later in Phase 3.

PHASE 2 - PROGRAM DEVELOPMENT

Following is the proposed Scope of Work for Phase 2, Program Development.

Task 1 – Establish Capital Planning & Maintenance Processes

Completion of this task involves evaluating historical and projected revenues and expenditures, fiscal policy, financial performance objectives, public involvement activities related to the financial plan, and how to implement financial issues related to stormwater improvements as determined from the workshops in Phase 1. Risk assessment will be used to define economic, environmental and social costs and benefits to prioritize capital and maintenance projects.

This project defines a more structured, consistent business case methodology, with related templates and case examples, for identifying and evaluating capital expenditures.

The methodology will:

- Consider levels of service, risks and costs.
- Use full life-cycle costs including costs for capital and operations and maintenance.
- Provide a consistent basis for setting expenditure priorities.
- Involve evaluation of multiple options to address the identified need (the problem definition).
- Provide more rigorous, standardized, and consistent CIP validation processes.
- Improve the ability to rank and prioritize projects, with justified timing and expenditure on projects.
- Enhance understanding of risk, allowing the organization to defer those projects with acceptable risk levels.

- Improve confidence/justification in project validity allowing better funding mechanisms for bond/funding approvals.
- Establish a more logical and justified budget setting process.

Benefits:

- More rigorous, standardized, and consistent processes validating and setting priorities for capital investments.
- Greater confidence in the costs and benefits of an investment.
- A more comprehensive basis for project implementation – pre-design, design and commissioning - and for comparing expectations with actual results.

Deliverables:

- A total of 12 workshops will be scheduled to develop, present, review and finalize the CIP Validation Methodology.
- New Tools including:
 - Project Initiation Tool (adaptation or revision of Aurora’s current Project Initiation form)
 - Project Business Case Tool
 - Project Risk Ranking and Evaluation Tool
 - An improved Business Casing methodology with related user manual
 - Case study examples for Aurora Stormwater projects

Prerequisite: Completion of Task 2.1.

- 1.1 Establish Sub-basin Failure Mode and Risk Ranking** – URS will conduct a high level risk assessment – likelihood and consequence - across the entire Aurora Watershed asset portfolio using Delphi workshop techniques. This will yield an initial risk profile for focusing efforts on the highest risk assets first. Risk concepts will also be taught to key staff in the organization as part of the initial assessment.
- 1.2 Establish Project Ranking Criteria** – A Delphi workshop will be conducted to refine existing risk frameworks and develop a framework that best suits Aurora’s culture and asset types.
- 1.3 Establish Project Business Case** – URS will present and describe in detail the CIP validation process according to Phase I Practice in a Delphi workshop using the Baranmor Outfall Watershed Systems Plan. The Phase I process for the 5 year CIP will be documented, gaps identified and issues and local constraints relative to the process discussed.
- 1.4 Validate Project Data, Program, Process and Quality** – This task included development of confidence level ratings methodology that are presented and reviewed in a workshop.
- 1.5 Determine Project Risk Reduction** – Project alternatives ranking methodology will be presented and reviewed in a workshop.

- 1.6 Determine Project Life-cycle Costs** – Perform Triple Bottom Line Costs/Benefit analysis methodology that are presented and reviewed in a workshop.
- 1.7 Rank Projects on Cost Benefit** – URS will use the “Triple Bottom Line” analysis to rank projects.
- 1.8 Develop Long Range CIP Program** – Project ranking and prioritization methodology will be presented and reviewed in a workshop.
- 1.9 Prioritize Project Performance and Cost** – Develop and present in a workshop a case study and tools for proposed methodology for Aurora’s use for current 5-year Capital projects.
- 1.10 Evaluate Finance Options** – Funding sources and cash flow methodology presented and reviewed in a workshop.
- 1.11 Evaluate O&M Requirements** – Budget impacts and benefits methodology presented and reviewed in a workshop.
- 1.12 Develop CIP and O&M Budget Recommendations** – Business case based program recommendations and format presented and reviewed in a workshop.
- 1.13 Revised Capital Planning Process** – Refine and finalize methodology according to input received.
- 1.14 Document Procedures** – The plan for implementing the improved CIP validation methodology will be documented and presented in workshop.

Task 2 – Build Asset Database

2.1 Establish GIS Attributes and Hierarchy – The URS Team will develop and present a uniform infrastructure Asset Register that is the identification and hierarchy system for Aurora-owned and maintained drainageways, storm sewer systems, regional detention ponds and related stormwater infrastructure across the City to assist with system maintenance and capital planning activities. This Asset Register will be developed with consideration for future water and wastewater asset registers.

The Asset Register will be a set of GIS attributes that Aurora desires to collect and track, and the hierarchy that will facilitate recording future stormwater data in a format that will serve the needs of the various users and stakeholders, will be reviewed and established in a workshop with the TAC. The attributes of each element will be confirmed, and the URS Team will also develop a confidence level rating criteria for determining data quality, which will be subject to review and approval by the TAC.

The Asset Register is built around two basic concepts:

- The asset hierarchy – the structured relationship among assets in the portfolio
- The record layout – the asset attributes that are recorded

An asset hierarchy provides a structured framework for organizing asset information (e.g. valuation, risk, cost) and identifies the level at which work orders are generated.

The record layout identifies the asset data to be collected.

The Asset Register provides the core, common structure to be used by all related information systems – e.g. Hansen, GIS.

Aurora currently has a no single asset register. Development of a single asset register is a vital early step towards an effective, organization-wide approach to asset management.

Benefits:

- A solid foundation for planning Hansen and GIS Systems.
- Consensus on an appropriate Asset level(s).
- A systematic list of all assets managed by Aurora Stormwater to the Asset level.
- Consistent approach to the type of asset data to be recorded and how it is to be managed.

Deliverables:

- A listing of all assets under management by Aurora down to the Asset level.
- A single, structured Asset Register (hierarchy and typical record layout) for Aurora Stormwater Assets.

Engineering/GIS sub-tasks include:

- Creating a list of rules for minimum data quality for various assets.
- Defining the process for merging and/or correlating between Aurora GIS, UDFCD, Hanson, and if necessary create supplemental attributes and data fields.
- Defining tables used to relate record by record metadata.

2.2 Establish GIS Data Sharing and Architecture – The URS Team will prepare recommendations for the architecture needed within the Hanson, Oracle, and GIS systems to enable accurate and complete sharing of data across each platform. Additionally, the URS Team will prepare a document sharing protocol for transferring data between URS and Aurora. Final system architecture and data sharing protocols will be established in a workshop with the TAC, and then documented in a Technical Memorandum.

Deliverables:

- Procedures for cataloging existing records.
- A Technical Memorandum with recommendations for system architecture and document sharing protocols.

Engineering/GIS sub-tasks include:

- Provide technician time to work through issues related to SQL Server/SDE ArcGIS 10.1 geo-database coordination, transfer, and data mirroring.
- Review existing GIS records and establish procedure for cataloging them.

2.3 Collect, Catalogue and Review Existing Records – The URS Team will coordinate with Aurora and UDFCD to identify, collect and categorize the existing documents identified during Phase 1 as high priority for development of the SWPMP. They will be catalogued for entry into Oracle, and reviewed to establish their relevance to the SWPMP and whether there is asset data available that is of good enough quality for entry into GIS. High Priority documents were

identified in Phase 1, are shown in Table B1. Further, some work will be done to create basin and sub-basin data, and to establish a conveyance network relating watersheds, assets, and reaches.

Deliverables:

- Records prepared for Entry into Oracle (entry into Oracle will be performed by Aurora IT).
- Records with data prepared for entry into GIS.

Engineering/GIS subtasks include:

- Research and Data Input
- Review Ops inspection records, prepare for input to Hanson and GIS.
- Review Maintenance Spreadsheet from Operations, assemble relevant data to prepare each for entry into Hanson, and note any new storm drainage projects that need to be established.
- Review UDFCD Reports pertinent to Priority Basins (establish a specific number of reports prior to commencing work on this scope item).
- Establish project list based on UDFCD Reports.
- Contact UDFCD and UDFCD consultants to research and enter electronic data (establish as specific number of data packages prior to commencing work on this scope item).
- For priority basins, import electronic data from UDFCD consultants or UDFCD (establish a specific number of imports prior to commencing work on this scope item).
- Provide data input for conveyance, asset and basin network.
- Prepare records for input of hydraulic parameters as well as other GIS parameters (establish a specific number of basins prior to commencing work on this scope item).
- Prepare documents such as photographs, as-built plans, maintenance records, etc. for input into Oracle.
- Research the existing Oracle and GIS systems for documents pertinent to specific reaches or assets.
- Determine where electronic data gaps exist, and research Aurora hard files and shared drives for as-built drawings, maintenance records, photos, etc. related to specific reaches or assets.
- Log missing attributes for use in Data Gap analysis.
- Log locations requiring field survey or field observation.

Assumptions: This work will be limited to the priority watersheds (Granby/Sable Ditch, Westerly Creek, Cherry Creek, and Piney Creek) in 2013. The URS Team will begin with the Granby/Sable Ditch watershed and all procedures developed will be tested in this watershed, refined and accepted by Aurora before work continues in subsequent watershed. Records will be prepared by the URS team for entry into Oracle by Aurora IT.

2.4 Establish Procedures for GIS Data Entry – The URS Team will establish clear and well documented procedure that will be used by the consultant and Aurora for data entry of current and future geo-referenced information into the GIS system. This procedure will be presented to the TAC at a workshop for review and acceptance prior to initiating work on building the GIS database.

Deliverables:

- Technical Memorandum establishing the procedure to be used by the consultant team of data entry into the GIS database.

Engineering/GIS subtasks include:

- Creating data input forms.
- Entering data into GIS and Oracle for the Granby/Sable Ditch watershed to test the process, and refine as necessary for acceptance by Aurora.

2.5 Data Entry into Oracle, GIS – Once data entry procedures have been established and successfully tested in the Granby/Sable Ditch watershed, the URS Team will prepare priority records for entry into Oracle for Westerly Creek, Cherry Creek and Piney Creek watershed and tributaries. Records to be entered into Oracle will be submitted to Aurora for processing by Aurora IT (sub-task 2.3).

Asset data that has been determined to be of sufficient quality will be entered into GIS by the URS Team by watershed. When all available asset data, including sub-basin boundaries, reaches and priority assets, such as pump stations and levees, have been built into GIS, the watershed file will be submitted to Aurora for incorporation into Aurora’s GIS and Hansen systems.

Deliverables:

- GIS databases for Granby/Sable Ditch, Westerly Creek, Cherry Creek, Piney Creek and Tributaries watersheds.

Assumptions: The URS Team will build the GIS databases for each watershed one at a time and submit to Aurora in the following order: Granby/Sable Ditch, Westerly Creek, Cherry Creek, Piney Creek and Tributaries. Field work will be performed by the consultant team using GPS equipment. Budget constraints may limit the work be done by the consultant team to major drainage infrastructure only.

2.6 Condition Assessment Methodology – The URS Team will review asset inspection forms used by Aurora and make recommendations for modification of inspection procedures based on a “triple bottom line” service delivery approach. Working with the TAC and based on input received during Phase 1, the URS Team will use current Aurora design criteria, policies and procedures to develop a process for evaluating the functionality, physical condition and capacity of existing drainage infrastructure. These recommendations will be reviewed with the TAC for agreement. Once asset condition rating forms are established, the URS Team will assess the current condition of stormwater system elements in order of priority, with the goal of assisting Aurora in identifying system maintenance needs and capital projects planning. Aurora desires that the procedures should also be established in such a way as to be compatible with similar functions in the water and wastewater utilities.

Initially, information taken from the document review and maintenance records will be used to perform a “desktop” condition assessment. A GIS-based problem area map will be developed based on information provided by Aurora. Condition assessments will be reviewed and formatted for incorporation into GIS in Task 2.6. Gaps in asset condition data will be identified.

Deliverables:

- Condition assessment criteria and recommendations for updating current forms.

2.7 Data Gap Evaluation – Using the previously established data quality ratings, the URS Team will identify and compile a list of stormwater assets within each priority watershed that require survey, field reconnaissance, engineering analysis or another form of assessment to complete the GIS database. The Team will create a document for submittal to Aurora identifying gaps in asset data in each priority watershed, and recommendations for completing the asset data as part of Phase 2 of the SWPMP.

Deliverables:

- Documentation of gaps in necessary asset data and recommendations for obtaining it.

Engineering/GIS sub-tasks include:

- Reviewing data gaps noted during the collection, cataloguing, and reviewing of existing data.
- Summarizing data gaps in a form suitable for presentation to the City.
- Determining facilities requiring survey.
- Determining facilities that require further inspection, photographing, or CCTV’ing.

Assumptions: The URS Team will identify locations where CMP exists within each watershed. It is assumed CMP pipe will be addressed in a separate project by Aurora.

2.8 Field Reconnaissance and Data Input – Upon agreement and authorization by Aurora, Field Reconnaissance and Data for additional asset condition assessments for input into GIS will be performed to provide needed data that are considered fundamental to completing the asset database. This work will be carried out initially on the Granby/Sable Ditch, Westerly Creek, Cherry Creek, Piney Creek and Tributary watersheds and priority assets, excluding CMP.

Deliverables:

- Condition assessment data for priority assets and input into GIS.

Engineering/GIS sub-tasks include:

- Field walk all priority sub-basins where needed.
- Field survey specific assets identified as gaps in the existing data.
- Perform photographic reconnaissance on priority assets.
- Field recon high probability/high consequence assets (except CMP), whether in the priority basins or not, unless recent data exists.

Engineering and Technical Work includes:

- Prepare fieldwork documentation for entry into GIS and Oracle.

- Compile list of potential new projects based on conditions assessments

Assumptions: The amount of this work cannot be defined at this time due to its indeterminate nature; therefore budget constraints may limit the work be done by the consultant team to major drainage infrastructure only.

2.9 Evaluate Results of Conditions Assessments – Once asset condition data is complete for each priority watershed, the URS Team will evaluate the results and identify problems areas and assets requiring maintenance, rehabilitation or replacement.

Deliverables:

- Technical Memorandum documenting condition assessment results and recommendations for maintenance, repair or replacement.

Engineering/GIS subtasks include:

- Create asset evaluations, recommendations and concept designs for new maintenance or capital projects.
- Create rough-order of magnitude cost estimates, and conceptual implementation plan for each new project.
- Complete project screening data sheet and enter into the overall master plan for prioritization with respect to other projects.

Task 2 Deliverables:

- Records for Granby/Sable Ditch, Westerly Creek, and Cherry Creek and Piney Creek watersheds prepared for entry into Oracle by Aurora IT.
- GIS databases for Granby/Sable Ditch, Westerly Creek, Cherry Creek and Piney Creek watersheds, including new field data and conditions assessments for priority assets.
- Documentation of all procedures.

Task 3 – IT/GIS Integration

3.1 Establish Attributes for Integration – The URS Team will prepare recommendations for the attributes needed within CPDNet, EADocs, HTE, and POSM to integrate these systems with Oracle and Hansen.

3.2 Develop Integration Workflows/Processes – The URS Team will develop workflows/processes to allow personnel to migrate data and documents from CPDNet, EADocs, HTE, and POSM into Oracle and Hansen. Where possible and recommended, these will be automatic or triggered by a user with a single button/click.

3.3 Finalize Requirements – The requirements document delivered in Phase 1 will include a list of functional requirements (capabilities) including an estimated cost to implement each capability. URS will work with the TAC to prioritize the list and determine which capabilities will be included in the first version of the IT/GIS tool. The remaining capabilities will form an initial “wish list” that will serve as a roadmap for future versions of the tool to be developed in Phase 3.

Task 3 Deliverables:

- Attribute recommendations for existing systems.
- Files, software, and documentation necessary to deploy and maintain workflows and processes develop to integrate systems.
- Final requirements and use cases.

Task 4 – Project Management, Quality Assurance & Schedule

This task includes project management, quality assurance, and quality control activities including project setup and preparation of the project execution plan, monthly billing and progress reports.

Project Management: Our project management approach consists of:

- Assigning experienced technical personnel to key positions and maintaining that continuity
- Developing a project management plan and communications procedures for the URS Team
- Maintaining regular communications with Aurora’s Project Manager and the project team on directives, schedule, and budget
- Monitoring the project throughout all phases for value engineering opportunities

Prior to beginning work on the project, the URS Project Manager will prepare a “Project Execution Plan” that details the protocols and procedures that will be used to implement the project including: staffing, schedules, project management and technical tools, all key deliverables, QA/QC procedures, health and safety protocols, and a contacts listing with communication protocols. With this plan in place, the URS Team has the road map for all team members to successfully complete each task on time, within budget, and according to the City’s requirements. Key elements of URS’ project management approach are quality control and maintaining the project schedule.

Quality Control: URS is committed to providing high-quality professional services. Quality of deliverable products will be based on our current Corporate Quality Program, which has been in place for more than 25 years. URS’ quality program has been successfully applied to thousands of engineering projects including projects for the City of Aurora. URS’ in-place quality program ensures the quality of all aspects of our work to meet our clients’ technical and contractual requirements and objectives. Quality of work items will be performed in accordance with contract and project-specific requirements, and approved quality plans. The essential components of the program are:

- A quality organization staffed with experienced personnel, with reporting lines independent of the project structure to ensure an unbiased review of each work element. Peer reviewers are assigned to each project based on their professional expertise and the nature of the work to be performed.
- Identifying and providing appropriate trained staff for accomplishing each task.

- Our corporate quality manual and standard operating procedures contain comprehensive guidance to our technical staff on all aspects of quality.
- Our project-specific instructions specify project staff roles and responsibilities, budgeted hours, review procedures, schedules, communication procedures, and other project requirements. Project Instructions are updated as necessary throughout the life of a project and have been used effectively to guide our quality program.
- Documenting activities and direction from the client.
- Following established procedures for auditing and corrective action.
- Performing Independent Technical Reviews of project deliverables.

To URS, quality is comprehensive, and our plans, procedures, and checks and balances are in place to provide confidence that our services and project deliverables are high quality and conform to the requirements and expectations of Aurora.

Project Schedule: The proposed schedule is presented on the Project Flowchart in **Figure 1** and has been developed to establish a general time frame for completion of each task. It includes the meetings, presentations, and workshops. The project would be completed sequentially and the deliverables built one step at a time. Information and deliverables developed as part of each task effort will be provided to Aurora for review. The draft deliverables would be submitted at the conclusion of each sub-task, and review time could be established by Aurora based on the size and complexity of the product.

Task 5 – Supplemental Services

Supplemental services can be provided by the URS Team at the direction of Aurora for this project. The amount budgeted for these services can be used only with the written authorization of Aurora.

PHASE 3 (FUTURE)

Note: The following Scope of Work for Phase 3 is based on a general understanding of the tasks and level of effort required to complete the analyses and evaluations required for development of the GIS Viewing Tool. These tasks and deliverables will be further defined in Phase 2 and presented in the “Requirements and Use Cases” document at the conclusion of Phase 2.

Task 1 – Develop the Solution

1.1 Finalize Requirements – The requirements document delivered in Phase 1 will include a list of functional requirements (capabilities) including an estimated cost to implement each capability. URS will work with the TAC to prioritize the list and determine which capabilities will be included in the first version of the IT/GIS tool. The remaining capabilities will form an initial “wish list” that will serve as a roadmap for future versions of the Viewing Tool.

1.2 Design – The need and level of effort for this task will be determined in Phase 1, but could include providing the TAC user interface mockups, design documents, or partially functional prototypes. Based on feedback and discussions, the design of the tool will be finalized.

1.3 Development

1.3.1 Development – Once the requirements and design are finalized, the tool will be developed.

1.3.2 Internal Testing – Developers will perform unit testing during development. After initial development, integration testing will be performed. Testing will be a combination of automated test cases which will enable regression testing in the future, as well as test personnel developing a test plan and manually testing and reviewing the site. Testing could also include other tests, such as load testing if required.

1.3.3 User Acceptance Testing (UAT) – After all issues identified in internal testing have been addressed, the tool will be provided to the TAC and other city personnel to test and review, the intent of UAT is not primarily to find system errors as internal testing should catch most of those, but to identify other issues, such as minor changes that need to be made to user permissions, text/phrasing, or issues with logic and calculations used by city personnel. High level training may be provided at the beginning of the UAT to give testers a better understanding of the tool, its capabilities, and any known limitations. Any issues identified will be discussed and addressed prior to completion of this task.

1.4 Rollout

1.4.1 Deployment – The tool will be installed and configured either in the URS hosting center, or on city servers as determined in Phase I. This will include linking to other live systems as identified in the requirements.

1.4.2 Users Account Creation – Initial user accounts will be created for all relevant city personnel, as well as other requested non-city personnel. Additional user accounts can be created by city personnel designated as Administrators in the future.

1.4.3 Training – A training session may be conducted to instruct personnel on use of the tool and allow users to ask questions. The session will be either an on-site classroom style training or

a web conference depending on the availability and location of personnel. The user experience will be an important part of the design with the goal of building an intuitive, easy to use tool that will minimize the training and documentation required.

1.5 Ongoing Maintenance & Support – As requested by the city, ongoing support can be provided to answer user questions, troubleshoot issues, provide supplemental training, and maintain the tool if hosted by URS. Development of future capabilities and new components to subsequent versions of the tool can be implemented as requested and funded.

Task 1 Deliverables:

Final requirements, use cases, design documents, test plans, and issue logs.

- Deployed live tool for personnel use.
- Training/documentation materials.

Assumptions: The requirements, as well as the level of training, documentation, and support will be determined as part of Phase 2 and Task 3.1, as such a revised estimate for the task will be submitted and capabilities and support will be implemented only within provided funding.

