



ENGINEERING AND TECHNOLOGY  
IMPROVEMENT PROGRAM



**Engineering and Technology Master Plan Update  
November, 2006**

**Henrico County  
Department of Public Utilities**



Westin Engineering, Inc.  
12108 Valleybrook Drive  
Richmond, VA. 23233  
Phone: (804) 364-4657  
Web Address: [www.westinsolutions.com](http://www.westinsolutions.com)

# Engineering and Technology Improvement Program 2006 Engineering and Technology Master Plan Update

for the

Henrico County Department of Public Utilities

November, 2006

WESTIN PROJECT 7231

Submitted to:

Prepared by Westin staff:

Henrico County  
Department of Public Utilities  
P.O. Box 27032  
Parham & Hungary Spring Roads  
Richmond, Virginia 23273-7032

(Original Signed)	
<u>William A. Lloyd</u>	11/14/06
Project Manager	Date

(Original Signed)	
<u>Rod van Buskirk</u>	11/14/06
Quality Control	Date

The contents of this document are proprietary to Westin Engineering, Inc. and the Henrico County Department of Public Utilities and shall not be disseminated without prior approval.

## Table of Contents

1	Acknowledgements .....	1
2	Background, Purpose and Mission.....	2
2.1	Background of Change .....	2
2.2	DPU Strategic Business Objectives.....	2
2.3	DPU Strategic Engineering and Technology Objectives .....	3
2.4	ETMP Project Mission Statement .....	3
2.5	Desired Outcomes from this Planning Project .....	3
3	Master Planning Process.....	4
3.1	Overview of the Master Planning Process .....	4
3.2	Advantages of the Process .....	4
4	Key Strategies .....	6
4.1	Strategy #1: Leverage Recent DPU Technology Implementations .....	6
4.2	Strategy #2: Develop DPU Staff Computer Skills.....	7
4.3	Strategy #3: Capitalize on DPU GIS investments .....	7
4.4	Strategy #4: Enhance Citizen Access to DPU Through Technology.....	8
4.5	Strategy #5: Implement DPU-specific Applications for Electronic Document Management .....	9
4.6	Strategy #6: Extend Value of Existing DPU Applications .....	9
4.7	Strategy #7: Provide Technology to DPU Mobile Workers.....	10
4.8	Strategy #8: Implement DPU-wide Performance Metrics .....	11
4.9	Strategy #9: Implement DPU-wide Integrated Budgeting & Planning System .....	11
4.10	Strategy #10: Implement Technology in Construction Division .....	12
4.11	Strategy #11: Modernize and Integrate SCADA.....	12
4.12	Strategy #12: Implement Technology for Solid Waste Division.....	13
4.13	Strategy #13: Develop DPU IT Maturity .....	13
4.14	Strategy #14: Enhance Technology in Support of DPU Laboratories .....	14
4.15	Strategy #15: Enhance DPU Intranet Site .....	15
4.16	Strategy # 16: Maintain the Integrated Engineering & Technology Program .....	16
5	Architectural, Organizational and Implementation Recommendations .....	17
5.1	Architectural Recommendations .....	17
5.1.1	Henrico DPU Information Technology Solution Architecture.....	17
5.1.2	Adapt Architectural Principles.....	17
5.1.3	Support the Architectural Review Process .....	19

---

5.1.4	Quantify Benefits of the IT Solutions Architecture .....	19
5.1.5	Adopt and Adapt Architecture Best Practices .....	19
5.2	Organizational Recommendations .....	20
5.3	Implementation Recommendations .....	20
6	PROJECT DEFINITIONS .....	23
6.1	Information Technology Solution Architecture .....	23
6.2	Program Design Principles .....	24
6.3	Recommended Projects .....	26
6.4	Technology Life Cycle Projects .....	26
6.5	On-Going Projects .....	37
7	Strategy and Tactical Plan .....	40
7.1	Strategic Alignment .....	40
7.2	Project Budget Estimates .....	41
7.3	Tactical Plan .....	46
7.4	Implementation Schedule .....	47

# 1 Acknowledgements

The successful completion of this 2006 Engineering and Technology Master Plan Update project was the result of a consistent, collaborative effort of both Department of Public Utilities (DPU) staff and Westin consultants. The work of all of the following individuals is greatly appreciated. Thank you!

## ETMP Update Committee Members

ART PETRINI, P.E.  
Director

KIM HUFFMAN  
DPU Information Technology Manager

EVELYN McGUIRE  
Senior Controller

LEE MADDOX, P.E.  
Construction Division Director

MARK PRENTICE, P.E.  
Water Reclamation Division Director

WILLIAM MAWYER, P.E.  
Assistant Director

RALPH CLAYTOR, P.E.  
Design Division Director

TOM ALFORD  
Operations Division Director

STEVE YOB, P.E.  
Solid Waste Division Director

RUSS NAVRATIL  
Water Treatment Division Director

## Westin Contributors

DOUG HARP, P.E.  
President & CEO

BILL LLOYD  
Principal Consultant

ROD van BUSKIRK, PhD  
Quality Assurance

RICH GOODDEN  
East Region Vice President

STEVE ARNETT  
East Region Consulting Manager

RON DYE  
Regional Account Manager

## 2 Background, Purpose and Mission

### 2.1 Background of Change

This Engineering and Technology Master Plan (ETMP) Update provides the guiding principles and a basic road map for the application of technology to improve management and operations at the Henrico County Department of Public Utilities (DPU, or Department). It highlights the technology vision and business priorities, including the resources and expenditures that will be required over the next several years to execute the plan. This Master Plan is an update of DPU's original Engineering and Technology Master Plan, which was developed in 2002.

The 2002 Plan was the foundation for a significant expansion of DPU's use, deployment, and support of technology, which is now producing meaningful results. All technology master plans need to be updated on a regular basis to reflect current accomplishments, to adjust for the inevitable changes in the Department's business environment, to incorporate new opportunities, and to take advantage of emerging technologies.

Technology master plans create a bridge between business strategies and the information systems that are necessary to support the strategies. This Master Plan identifies a strategic approach to technology that is carefully aligned with the Department's business objectives, as well as the pragmatic tactical measures needed to reach these strategic goals. The motivation for improving DPU's application of technology was provided by a series of strategic business challenges. DPU's challenges are similar to those facing most public utilities today, including:

- Higher customer expectations (better service, quality, and value)
- Continued improvements mandated by regulatory agencies
- Resource constraints
- Changing work force
- Anticipated changes in DPU's business.

These challenges require the DPU to deliver solid strategic responses, and the DPU has determined to respond through the following:

- Streamlined way of working
- Integrated and unified approach to providing DPU's services to the community
- Changing the way the DPU does business

### 2.2 DPU Strategic Business Objectives

The Department of Public Utilities (DPU) has the following strategic business objectives:

- Provide high quality, reliability, and responsive services to DPU customers within the rates approved by the Henrico County Board of Supervisors
- Fully meet and exceed regulatory requirements for water and wastewater quality, capacity planning, management effectiveness, operational reliability, and maintenance efficiency
- Manage and sustain DPU's infrastructure assets and equipment with high effectiveness and efficiency
- Effectively manage the growth of the DPU

- Manage the DPU to the standards prevalent in the municipal water/wastewater/solid waste industries; including implementing performance benchmarking to support improvement efforts
- Effectively and efficiently coordinate with other Henrico County departments, external agencies, outside contractors, and developers on construction projects
- Expand the knowledge of DPU employees, thereby improving productivity and decision making

## 2.3 DPU Strategic Engineering and Technology Objectives

The following DPU strategic engineering and technology objectives are aligned with the Department's business objectives:

- Use technology to improve customer service internally and externally
- Use technology to provide cost effective service to customers (internal and external)
- Use information resource management technologies and methods to improve decision support
- Deliver the right information in a timely manner to managers and staff regardless of where they are located
- Use technology to monitor and control operations (in the plants and in the field)
- Implement performance benchmarking
- Improve teamwork through the use of technology for communication, coordination, and decision support

## 2.4 ETMP Project Mission Statement

The mission for this project is to create a comprehensive engineering and technology strategy that will integrate the goals and objectives of all DPU Divisions.

## 2.5 Desired Outcomes from this Planning Project

The desired business outcomes from applying technology to DPU's operations and management by implementing the program defined by this master plan include improvements in the following areas:

- Streamlining business processes
- Improving access and sharing of information
- Improving operational efficiencies and decision making
- Increasing staff productivity
- Enabling citizens to access DPU by using technology
- Enhancing coordination and communications within DPU and with other Henrico County departments and agencies
- Optimizing the value of current and future technology investments
- Assuring security
- Integrating all DPU Divisions
- Supporting Henrico County technology initiatives and complying with County-wide technology standards.

## 3 Master Planning Process

### 3.1 Overview of the Master Planning Process

DPU has recognized the value of systematically developing a practical plan for technology acquisition and deployment. Since the initial Engineering and Technology Master Plan was developed in 2002, this plan has provided a strong foundation for deploying information systems in support of DPU's business objectives. This 2006 ETMP Update provides technology guidance for the next 3 to 5 years. It reflects the accomplishments that have resulted from implementing projects recommended in the initial ETMP.

The methodology utilized for the 2006 ETMP Update utilizes proven best practices for Information Systems Strategic Planning. This methodology has been modified to leverage the consultants' familiarity with DPU's existing requirements, systems, and the Henrico County environment and standards. The master planning methodology consists of the following steps:

Review of DPU's Strategic Objectives – Through a series of workshops with DPU executives, the project committee, and DPU participants, the business challenges and strategic objectives of the Department (which were stated earlier in this report) were updated.

- 1) **Identification of Opportunities** – DPU's business, engineering, and technology needs were addressed in a series of workshops with DPU managers, supervisors, and staff. These established a mutual understanding of how technology needs to support DPU's business improvement objectives, and identified new needs, as well as opportunities to extend the value of existing systems.
- 2) **Strategic Recommendations** – A set of recommended strategies for supporting DPU's business objectives was developed and reviewed with the project team. The final set of strategies is described below in Section 4.
- 3) **Technology Recommendations** – This process included the development of technology architecture principles and best practices, recommendations for the DPU IT organization, and technology implementation recommendations. These expand upon current DPU technology practices and architecture.
- 4) **Project Definitions** – The Master Plan was constructed from a set of recommended projects that reflect DPU's priorities and overall approach to technology acquisition and implementation. The project definitions, which include descriptions, benefits, budgets, schedules, and dependencies, are summarized in Section 6 of this Master Plan.
- 5) **Develop Master Plan and Tactical Plans** – The Master Plan reflects business priorities, project interdependencies, and resource constraints for DPU technology projects to be implemented over the next 3 to 5 years. To allow DPU to begin immediately, a 2006-07 Tactical Plan and budget have also been developed.

### 3.2 Advantages of the Process

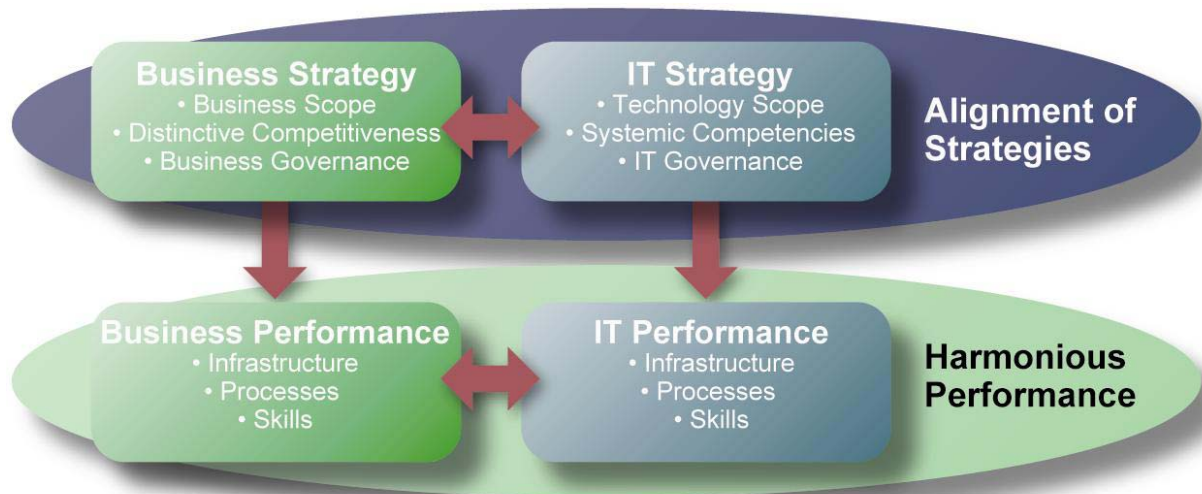
Strategic planning – for both business and information technology aspects of government – is critical. It has become even more important with the rapid pace of change in the environment – political, cultural, business, regulatory, and technical – within which government must operate today.

Because of the unrelenting pressure to provide more service with fewer dollars, governments have found new and innovative methods of improving business processes. It has become increasingly obvious that information technologies are a significant contributor to nearly every business process improvement effort. On the one hand, information technologies enable business process innovation that is not possible any other



way. On the other, process improvement often results in corresponding improvements in how information technology is utilized. This synergy of information technology with business process improvement is both stimulating and facilitating the implementation of e-Government and e-Business capabilities.

Along with the growth of e-Government and e-Business initiatives, the value of alignment between IT and business has become increasingly important. The alignment of IT and business is not a single dimension to be worked out by any one group or committee. As illustrated below, the effective alignment of business and IT strategies contributes significantly to ways in which business and IT performance contribute to one another to produce organizational improvements.



The real challenge is not in persuading government leaders – both those in IT and those working in business units – that IT alignment with business is critical; rather, it is how to do it. This is where an Engineering and Technology Master Planning emerges as a critical tool.

The Engineering and Technology Methodology utilized for this project utilizes the best practices in information systems strategic planning. The methodology has a proven track record of success due to these specific benefits:

- Ensures alignment of business and technology goals and objectives
- Promotes partnership among managers, staff, and consultants throughout the process
- Identifies both short-range and long-range technology needs and objectives
- Identifies the means of reducing “islands of automation” and “islands of information”
- Constructs an integrated program focused on supporting the goals and objectives of the DPU
- Integrates with and complements existing DPU and County-wide initiatives
- Defines an effective technology management approach for implementation, maintenance, and support of DPU engineering and technology initiatives

## 4 Key Strategies

This section presents a set of recommended strategies for applying technology to support DPU's business objectives. These strategies reflect identified needs for using technology to support DPU's business improvement objectives, as well as opportunities to extend the value of existing systems. For each strategy, the following were established:

- A series of objectives
- A set of tactics – that is, actions to be taken to fulfill the strategic objectives
- A list of benefits expected from achieving the strategic objectives.

The Strategies are numbered for convenience and reference purposes only; the numbering does not reflect the priorities or the sequence for implementation of those Strategies.

### 4.1 Strategy #1: Leverage Recent DPU Technology Implementations

#### Objectives

Refine the deployments of recent DPU technology implementations (including Datastream, Flexidata, PACS 2000, RouteSmart, and GIS map posting) to maximize their return on investment.

#### Tactics

- Provide additional support to assist recent IT system implementations to achieve their full potential through identified post-implementation refinements.
- Improve DPU management processes through continued application of available technology in support of best practices for the using DPU operations.
- Implement the Key Performance Indicators (KPIs) identified during the Datastream implementation.
- Develop a strategy and action plan to provide improved or enhanced communications related to IT projects enterprise-wide to include projects underway and projected completion dates.
- Define a “stabilization” period where existing enterprise applications are given supplementary support to become fully accepted and utilized by their stakeholders. During this period, process, technical, training and cultural issues are identified, documented, understood and activities are implemented to close these issues before any major upgrades or changes are attempted.
- Assign resources to update application-centric SOPs to reflect “fine tuning” of business processes, vendor functionality enhancements, and needs identified during post-implementation support.
- Establish procedures to ensure that GIS Mapper users have the most current version of the data and application, and that they are pointed to the correct files with the standard views readily available when workspaces are opened.

#### Benefits

- Maximize return on recent investments in Henrico DPU IT systems.
- Increase efficiency and operational effectiveness in the Operations, WTF, WRF, and Solid Waste divisions.
- Improve customer service.

## 4.2 Strategy #2: Develop DPU Staff Computer Skills

### Objectives

Improve the application competency and skill levels of DPU staff to maximize the return on investment in DPU IT systems.

### Tactics

- Provide additional training in all DPU applications, including the Hansen CMMS, GIS Mapper, Flexi-data, Datastream, FileNet, GIS, and new CIS systems. The training should include:
  - Training for new hires
  - Basic training for field employees
  - Workshops with training “tailored” to job specific tasks
  - On-going training in computer technology.
- Work with Henrico County’s Human Resources professionals to develop programs that will close the gaps between current DPU staff computer skills and the skills required to competently operate DPU’s IT systems.

### Benefits

- Maximize the return on investments in Henrico DPU technology systems.
- Increased confidence in computer skills enhances employee satisfaction, work output, and quality.

## 4.3 Strategy #3: Capitalize on DPU GIS investments

### Objectives

- Continue to exploit the Henrico County GIS in support of DPU’s business processes
- Expand the application of GIS technology to “spatially enable” DPU’s operational applications to maximize the return on DPU’s investment in GIS.

### Tactics

- Move forward with planned GIS upgrades and enhancements including the following:
  - Standardization for GIS maps provided to customers
  - Integrations with Operations CMMS, Electronic Document Management, Customer Information System, Monitoring and Compliance, CCTV Inspections, Water and Sewer Modeling, Water Quality Data, and SCADA.
  - In-house maintenance of water and sewer asset data using GIS technology.
  - Valve isolation application and integration with the County’s IVR for customer notifications.
  - Broader deployment of GIS to field employees.
  - Utilize the County’s web-based GIS to disseminate DPU spatial data to other County departments, and link GIS with the DPU Intranet-based information portal.
- Continue developing GIS expertise within DPU, including GIS staff that understands the application of this technology to water and sewer utility operations.

- Use GPS technology to collect improved location data during construction inspections, television inspections, valve preventive maintenance, and hydrant inspections.
- Create a Hydraulic Grade Line (HGL) layer in GIS.
- Monitor GIS staff workload and assure that adequate staff resources are available to meet DPU's needs.

### **Benefits**

- Increase efficiency and operational effectiveness
- Improve customer service
- Improve decision making with regard to customer issues, asset management, and maintenance management
- Increase accuracy and completeness of DPU asset data.

## **4.4 Strategy #4: Enhance Citizen Access to DPU Through Technology**

### **Objectives**

Enable Henrico County citizens to access applicable DPU services utilizing a “citizen self-service” capability on the Internet. The technology must provide quick and easy to use access to DPU services.

### **Tactics**

- Develop and implement an eGovernment/eBusiness strategy that provides Henrico citizens with a “customer self service” capability to access DPU for requesting services, placing orders, notifying DPU of problems, and obtaining answers to questions.
- Support and take maximum advantage of the Henrico County CRM/3-1-1 implementation to enhance citizen/customer access to DPU.
- Evaluate using the Internet to share data with (and possibly collect data from) business partners and external shareholders such as:
  - Organizations constructing DPU assets
  - Industrial waste customers
  - Keep Henrico Beautiful volunteers
- Explore ways to incorporate additional IVR functionality into DPU customer-facing processes for customer notifications.

### **Benefits**

- Improve customer service quality
- Improve staff productivity .
- An eGovernment capability will support customer’s perceptions of a more “responsive government”

## 4.5 Strategy #5: Implement DPU-specific Applications for Electronic Document Management

### Objectives

- Enhance the efficiency and operational effectiveness of DPU's Divisions by providing timely and appropriate access to documents throughout DPU
- Utilize the capabilities of the County's FileNet Electronic Document Management System to the fullest extent possible for improving DPU's services.
- Improve DPU's focus on content and document management, and utilize these to streamline DPU's business processes and improve decision making.

### Tactics

- Move forward with planned technology initiatives to leverage electronic document management technology to improve the efficiency and effectiveness of DPU Divisions.
  - Continue the current plan to implement Engineering Drawing Management.
  - Evaluate the cost effectiveness of providing access to electronic O&M manuals in the field.
  - Continue the current plan to have the older "As Builts" made available through FileNet.
  - Continue the current plan to migrate all existing shared data files to FileNet.
- Develop user expertise by engaging one representative from each using organization to participate in electronic document management deployments and related business process improvement.

### Benefits

- Increased efficiency and operational effectiveness especially through decreased reliance on paper and paper-based business processes.
- Increased customer service
- Supports efforts to move from reactive to proactive mode with regard to decision making, thereby improving management productivity and producing better decisions.

## 4.6 Strategy #6: Extend Value of Existing DPU Applications

### Objectives

Provide enhanced technology, improved business processes, and systems integration to extend the value of existing DPU IT operational applications.

### Tactics

- Refine the business processes associated with the Operations division CMMS, to accomplish the following:
  - Determine whether the Hansen CMMS meets DPU's future asset management requirements
  - Assist management in using CMMS data for improved decision support
  - Improve the usability of the CMMS for use in the field
  - Evaluate integrations with CIS, timesheets, and images

- Implement bar coding in support of materials management “best practices”
- Increase the level of system administration support provided for the Operations division CMMS.
- Utilize business process analysis to document the “end to end” processes for DPU’s involvement in POD and subdivision project planning, permitting, design, through construction; and identify opportunities and recommendations for process improvements.
- Implement improvements in producing the weekly call center phone statistical reports.
- Implement tracking meter inventory using bar-coding technology.
- Prior to implementing extensive enhancements in the Hansen CMMS, evaluate whether standardizing on just one CMMS will be the best course for meeting DPU’s future asset management requirements.

### **Benefits**

- A streamlined, documented process can enhance customer service, is more easily automated and can increase efficiency and productivity.
- Ability to better manage meter stock for customer installs.
- Increased accountability for DPU assets.

## **4.7 Strategy #7: Provide Technology to DPU Mobile Workers**

### **Objectives**

Utilize mobile computing solutions to streamline business processes and increase the efficiency and effectiveness of DPU workers who perform work at remote locations in Henrico County.

### **Tactics**

- Assess the mobile computing needs and benefits within all DPU divisions.
- Develop a DPU-wide mobile worker technology strategy and implementation plan.
- Determine mobile computing policies for DPU consistent with County standards, policies, and practices.
- Select and implement mobile computing solutions to fulfill the identified needs, including wireless access to DPU IT systems.

### **Benefits**

- Data entry as close as possible to the source (best practice).
- Improve efficiency, productivity and customer service
- Improve field-based decision making
- A strategy and plan will take an enterprise-wide view of the needs of DPU’s mobile work force.
- Cost avoidance, implementing mobile technology piecemeal without a plan can be costly and inefficient.

## 4.8 Strategy #8: Implement DPU-wide Performance Metrics

### Objectives

- Implement continuous improvement initiatives for all Divisions.
- Position DPU for long-term productivity improvements.

### Tactics

- Develop performance metrics and standards for core water and wastewater system processes.
- Implement analytical and statistical applications – Performance Metrics applications – to automate the calculation and trending of metrics associated with water and wastewater system processes.
- Implement a data repository for capturing and formatting system process performance data from such sources as Operations SCADA, WRF plant control systems, WTF plant control systems, Automated Call Distribution (ACD) system, and from the DPU Intranet.
- Provide capabilities to track relevant external metrics, including contractor performance and KHB volunteer activities.

### Benefits

- Improved ability to formulate long-range engineering design plans to improve or upgrade water and wastewater systems
- Improved ability to analyze issues and problems associated with the operations of water and wastewater systems
- Enables benchmarking to other utilities and agencies to encourage new ideas for engineering design improvements and to validate existing efforts.

## 4.9 Strategy #9: Implement DPU-wide Integrated Budgeting & Planning System

### Objectives

Enhance the business processes and provide easier-to-use tools for developing budgets and plans for both CIP and operational budgets.

### Tactics

- Analyze DPU's business processes for budgeting and planning, in comparison with industry best practices.
- Develop a requirements specification for an Integrated Budgeting and Planning System to support improved business processes for DPU budgeting and planning.
- Implement a DPU Integrated Budgeting and Planning System to manage both CIP and non-CIP budget (operating) formulation and tracking.

### Benefits

- Improve ability to develop long range plans
- Improve ability to analyze issues, problems, and alternatives associated with water and sewer operations

- Support benchmarking with other utilities and agencies to encourage new ideas and to validate existing efforts
- Streamline budgeting process
- Increase management and budget staff productivity
- Increase accuracy of budgets

## 4.10 Strategy #10: Implement Technology in Construction Division

### Objectives

- Enhance the efficiency and operational effectiveness of the Construction Division through the timely and appropriate application of technology solutions.
- Implement the means to more widely share construction inspection data
- Improve technology support for the coordination of construction projects

### Tactics

- Complete the deployment of the County's Tidemark permitting application in DPU for automating the Plan of Development (POD) process, including interactions with other County departments.
- Utilize business process analysis to document the "end to end" processes for DPU's involvement in POD and subdivision project planning, permitting, design, through construction; and identify opportunities and recommendations for process improvements.
- Identify and implement a solution to support the financial reporting and analysis aspects of managing capital projects..
- Migrate the existing Construction Inspection Database (currently on Microsoft Access) to a DPU-wide accessible database (such as the relational database products that are supported by the County – either Microsoft SQL Server or Oracle).

### Benefits

- Increase efficiency and operational effectiveness of the construction process – from planning through inspection and completion.
- Improve construction project efficiency, helping to constrain construction costs
- Increase customer service

## 4.11 Strategy #11: Modernize and Integrate SCADA

### Objectives

Increase overall DPU operational effectiveness by enhancing functionality, increasing ease of use, updating hardware, and providing access to SCADA information by DPU staff in the Operations Division and the DPU Water Reclamation and Treatment Facilities.

### Tactics

- Assess DPU's current and future control system requirements, particularly for the Operations division SCADA, and develop strategies that address DPU-wide control system objectives.



- Update the WRF SCADA to remove obsolete points, increase user friendliness, and enhance the usefulness of SCADA data in making operational decisions.
- Enable DPU divisions to view other divisions' SCADA systems in real-time or near real-time basis.
- Implement user-friendly access to SCADA historian data, along with tools for analysis.
- Integrate SCADA data with LIMS, CMMS, and other relevant DPU applications.
- Develop and implement a plan to enhance DPU IT's ability to support DPU's SCADA systems.
- Assure that DPU's SCADA systems are secure by building security considerations into all SCADA designs and conducting periodic vulnerability assessments.

**Benefits**

- Improve efficiency, productivity and customer service
- Support hydraulic modeling
- Provide data mining capabilities to support Design division decisions
- Provide SCADA data to consultants
- Respond to emergencies and ad hoc inquiries

## 4.12 Strategy #12: Implement Technology for Solid Waste Division

**Objectives**

Provide enhanced technology, improved business processes, and systems integration to support the efficient operation of Solid Waste Division.

**Tactics**

- Implement software update to current Landfill Point-of-Sale (POS) System to support new technology and reporting capability.
- Integrate the updated Landfill POS system with the planned CIS system.
- Review the Solid Waste Division's business processes to determine where non-value added processes and activities can be eliminated and manual processes can be automated.

**Benefits**

- Improved customer service
- Improved employee efficiency
- Reduced errors
- Increased return on investment for current and planned technology.

## 4.13 Strategy #13: Develop DPU IT Maturity

**Objectives**

- Enhance level of customer service supplied by DPU IT.
- Reduce risk to DPU operations during emergencies (e.g., natural disasters, power outages, etc.).

- Significantly reduce or eliminate the proliferation of isolated databases.

### Tactics

- Identify and implement alternative solutions to provide IT support for technology on which DPU IT has limited staffing resources or knowledge (e.g., Oracle database administration, SCADA, etc.)
- Develop and maintain a separate test environment that “mirrors” DPU’s production environment so that upgrades and patches can be fully tested before they are deployed in production; mitigating the risk of prolonged production system(s) downtime and enhancing production system reliability.
- Perform a DPU IT disaster recovery assessment and gap analysis to fully understand the risks and potential risk mitigation strategies needed at this time. This analysis should include the technology necessary to support DPU’s Emergency Operations Center (EOC) at Woodman Road and its EOC backup at the WTF.
- Monitor DPU IT staff workload and assure that adequate staff resources are available to meet DPU’s needs.
- Identify IT systems DPU staff are employing as their own solutions to performing their job functions in the absence of current or planned department-wide technical solutions.
- Seek alternative solutions using currently or planned technology to replace the undocumented systems.

### Benefits

- Improve customer service and customer satisfaction
- Increase return on investment for current and planned technology.
- Allow DPU IT to focus on DPU IT supported software and tools
- Eliminate burden on DPU IT’s limited resources from attempting to support undocumented systems.
- Reduce time required to locate, assemble, format, reconcile, and report information
- Cost savings

## 4.14 Strategy #14: Enhance Technology in Support of DPU Laboratories

### Objectives

- Enhance the value of the existing laboratory transactions tracking system (LabWorks) through technology upgrades, training, improved business processes, and systems integration.
- Improve the publication and distribution of laboratory information as appropriate throughout DPU and to external stakeholders.

### Tactics

- Provide support to the LIMS staff to research available upgrades, to analyze gaps, and to plan and implement functionality that is present in the current software; assure that these deployments include optimization of business processes, and adequate attention to configuration and training.
- Utilize technology to improve sharing of results with the laboratory’s customers, considering quality assurance and security requirements, including the following:

- Integration with the WRF SCADA and PACS 2000
- Automated notification if water quality results are out of specification
- Easy DPU-wide access to water quality data
- Automation of WTF laboratory reports.
- Integrate LIMS water quality data with sampling locations using GIS and document management to facilitate rapid analysis of water quality results.
- Implement remote (wireless) access to LIMS to support remote data collection of field samples.

### **Benefits**

- Improve staff productivity through more efficient and timely distribution of water quality data throughout DPU
- Improve laboratory quality assurance effectiveness
- Enhance the return on investments already made by DPU.
- Remote access to LIMS will support both internal and external requirements and customer requests.

## **4.15 Strategy #15: Enhance DPU Intranet Site**

### **Objectives**

- Provide enhanced communications, customer service, information access, and collaboration through the implementation of a DPU-wide intranet (internal web site).
- Manage all DPU data, DPU databases, and DPU data-generating applications for the benefit of Department as a whole; treat DPU data, databases, and applications as DPU-wide information resources.
- Make relevant data widely available and readily accessible.
- Significantly reduce or eliminate the proliferation of isolated databases.

### **Tactics**

- Implement the piloted intranet site (formerly known as the Department-wide Operational Reporting System, or DORS) as the DPU-wide intranet site.
- Develop and implement processes for content maintenance, quality assurance, governance, and system administration.
- As feasible, integrate most of the data used by DPU executives and managers for decision support.

### **Benefits**

- Improved capture of the knowledge of DPU staff, the history of events, and actions taken over time
- Reduced isolation of Divisions and workgroups within DPU
- Reduced use of manual, paper-based processes and isolated databases to assemble information for making decisions

- Improved productivity of decision makers, including supervisors, managers, and executives
- Improved customer service
- Improved reporting
  - Reduced time required to locate, assemble, format, and report information
  - Reduced time required to reconcile information
  - Moves decision making efforts from reactive mode to proactive mode

## **4.16 Strategy # 16: Maintain the Integrated Engineering & Technology Program**

### **Objectives**

- Continue to implement the Engineering and Technology Master Plan (ETMP) through a program – an integrated set of projects that implement the ETMP Strategies and Tactics.
- Refer to the program as the Engineering and Technology Improvements Program, signifying focus on continuous improvement.

### **Tactics**

- Review the DPU Engineering and Technology Improvements Program governance and decision-making structure, and update to reflect DPU organizational changes and practical refinements.
- Utilize the Program Management Office within DPU to perform the following:
  - Primary responsibility for all engineering and technology requirements specification, design, and implementation planning efforts
  - Implementation oversight for all significant engineering and technology projects initiated by the DPU
  - Primary technical advisor to the Engineering and Technology Improvements Steering Committee
  - Maintains and updates the DPU Engineering and Technology Master Plan
  - Transfers project management skills to appropriate DPU managers
- Review and update the program standards, business processes, and practices within DPU for IT project management, IT acquisition, and IT implementation.

### **Benefits**

- Improved return value on technology investments
- Lowered overall IT lifecycle costs
- Improved staff productivity and internal DPU resources.

## 5 Architectural, Organizational and Implementation Recommendations

This section provides summarized observations, comments and recommendations in the areas of technology architecture, the DPU IT organization and project implementation. Going forward, it is hoped that these recommendations will be considered, tailored and adapted to support the continued maturity of the DPU IT organization and will serve to enhance the levels of service required by DPU IT's customers.

### 5.1 Architectural Recommendations

#### 5.1.1 Henrico DPU Information Technology Solution Architecture

The following are updated recommendations regarding the Henrico County DPU IT solution architecture based upon the recommendations from the 2002 Henrico DPU Engineering and Technology Master Plan combined with observations and information gathered during the ETMP Update Project. The recommendations are as follows:

#### 5.1.2 Adapt Architectural Principles

The following are draft enterprise architectural principles for the design and use of information systems at Henrico DPU. Review and adapt the following Henrico County DPU IT architectural principals and apply them when considering, building, enhancing or acquiring technology solutions

- Minimize integration complexity
  - Keeping integration complexity to a minimum will enable integration and interoperability of information systems, not only within and across Henrico DPU organizations, but also across jurisdictions. This ensures that information systems, or parts of information systems, will be reusable by other County organizations.
- Holistic approach
  - Promote a whole of Henrico County approach to the use of data, so that it can be used across county organizations, taking into account any legislative and privacy requirements.
- Business event-driven systems
  - Information systems must be designed to be business event-driven. This may involve consideration of business processes that may cross traditional organizational boundaries.
- Defined authoritative sources
  - Henrico DPU held data needs to be made available in a timely and accurate form and therefore must be captured and validated **once**, at the source. These sources, known as 'authoritative sources' will act as information stewards. The authorized data must be accessible and available for reuse by any entitled system and/or business process. This will ensure that DPU organizations will be accountable for the definition and the quality of the data.
- Security, confidentiality, privacy and protection of information
  - Information systems must be implemented in compliance with Henrico County and DPU IT security, confidentiality and privacy legislation and policies. Information must be protected against unauthorized access, denial of service and both intentional and incidental modifica-

- tion. This will safeguard client/citizen information and ensures that it is used as the client/citizen has requested.
- Proven standards and technology
    - IT products must, wherever possible, use commercially viable standards based technologies. IT products used by Henrico DPU should adhere to industry standards and open architecture, for example, interoperability standards. This will reduce the risk for Henrico DPU and allows flexibility and adaptability in product replacement.
  - Total cost of ownership (TCO)
    - TCO for IT must balance development, support, disaster recovery and retirement costs along with the costs of flexibility, scalability, ease of use/support over the life cycle of the technology or application. It needs to include the costs and benefits to the whole of Henrico DPU, recognizing that the costs may be incurred by one DPU organization but the benefits by accrue to another. This will enable improved planning and budget decision making.
  - Adopt standard methodologies
    - Henrico DPU must employ formal practices, methods and tools for all stages of a business project, including the design, construction and implementation of IT systems and the Henrico County IT project management methodology. This will ensure quality assurance, repeatability and consistency for business projects with an IT component.
  - Extended information and services environment
    - To the maximum extent possible, information systems should enable and enhance the provision of Henrico DPU information and services to citizens, business, and other jurisdictions. This will enhance the integration of services to the community from all Henrico DPU organizations.
  - Multiple delivery channels
    - Information systems must support multiple delivery channels to the community as already occurs with the Henrico DPU website. This will mean that the community can continue to access Henrico DPU products and services in a variety of ways.
  - Accessible government(services)
    - Henrico DPU has a responsibility to ensure it can provide services to an increasingly diverse community. On this basis information systems must adopt a wide range of principles to promote accessibility.
  - Robustness
    - Information systems that support business activities must be robust, responsive and reliable, with appropriate redundancy to protect against failure. This will ensure that expected business service levels can be maintained, especially during times of crisis.
  - Plan for growth
    - Henrico DPU should plan, design and construct for growth and expansions of services. This will be enable a quicker response to growth and change, and in the longer term be more cost effective.

### 5.1.3 Support the Architectural Review Process

Support the architectural review process as a part of the IT planning process to periodically review the current status of each of DPU IT's architecture components in terms of their status in the technology system life-cycle (current, emerging, retiring) and to evaluate the impact of coordinate planned DPU IT changes with the County IT department.

### 5.1.4 Quantify Benefits of the IT Solutions Architecture

Henrico DPU IT should continue to support quantifying the benefits of utilizing IT Solutions Architectures. Both "Hard" and "Soft" benefits should be considered. "Hard" benefits equate to hard dollar and visible savings derived from an IT solution. "Soft" benefits (hard to measure) are not easily quantified. Examples of soft benefits are savings due using the IT Solution Architecture to support:

- Standardizing data;
- Eliminating work-arounds;
- Sharing resources (IT staff, software);
- Using standard tools and methods (rather than spending time developing new tools and methods), and;
- Supports efficient integration of systems (eliminating time spent reconciling data from disparate systems)
- Enhances the communication alignment between business / organizational units and IT and provides for the following benefits:
  - Traceability between business intent and enabling technology
  - Linking architecture planning to strategic planning
  - Support for impact analysis
- Supports quantifying the benefits of an IT project across the enterprise including life-cycle costs

### 5.1.5 Adopt and Adapt Architecture Best Practices

Adopt and adapt industry best practices in Architecture to support the continued development of the Henrico DPU IT solutions architecture. These best practices include:

- Continue to seek leadership and commitment from Henrico DPU management
- Focus on business and technology integration
- Manage inter-divisional/organizational collaboration
- Provide resources to support Architecture and eGovernment initiatives
- Provide easy and secure access to information
- Provide for choices for architecture strategies and implementation
- Support citizen engagement with IT solutions
- Respect for privacy legislation in the deployment of IT solutions
- Accountability for process and content
- Continuous monitoring and evaluation of IT solutions

## 5.2 Organizational Recommendations

### Henrico DPU IT Organization

The DPU IT section is making steady progress working closely with the DPU divisions on supporting their technology needs. The Henrico Program Governance model also provides a support structure to support both the needs of DPU IT and the DPU divisions as a whole.

As stated in the overall findings of this ETMP update, although DPU IT has made good progress, DPU IT is continuing to work through the following organizational challenges:

- Need for technical training (system administration) and functional training for all DPU IT support staff in all Henrico DPU enterprise applications.
- Lack of technical capability within DPU IT to support the following areas:
  - SCADA support (need clarification in the scope of DPU IT responsibilities and potential training)
  - Oracle Database Administration (DBA) support
  - Number of available technical resources to support DPU IT customers
- Managing end-user expectations in terms of DPU IT's ability to support all technology in place at DPU
- Developing, presenting and communicating the business case for additional technical resources
- Gaining additional support from the Henrico County Communications organization (within the General Services Department)
- The current DPU IT Support structure is not optimal to provide level of service expected by DPU IT customers in terms of :
  - Number of support resources
  - Training of support resources
  - Lack of support resource tools
- DPU IT has a need to identify and implement additional IT support processes that will evolve to become repeatable processes to improve the overall process maturity and efficiency of the IT organization.

## 5.3 Implementation Recommendations

A common thread that was echoed during the ETMP Update Project department interviews was that there should be a "stabilization" period in which DPU focuses on fully implementing, enhancing and institutionalizing the IT system investments already made. While it is an understandable position, change with regards to technology is unending. It is the manner in which you manage and control change that is the crux of the issue and fully supports the periodic update of the ETMP.

Henrico DPU is now fully gaining an understanding of the impact and subsequent ripple effect of the introduction of technology. The importance of comprehensive training and post-implementation support and auditing has also been highlighted. These are areas which continue to have challenges and must be refined to support the continued successful implementation of technology. Technology systems follow a life-cycle process: they are conceived, delivered and implemented, operated and maintained, and subse-



quently retired. As such, DPU IT and its stakeholders must be cognizant of their inventory of technology systems as well as current life-cycle stage of all enterprise and department-level technology systems. This information will provide valuable input to future long and short term technology planning and budgeting efforts.

The following are implementation recommendations to be considered:

- Increased emphasis on training both end-users and technical support staff
  - Training should be focused on specific job-skills
    - A basic course in how to navigate in the software for everyone should be followed by more job specific training tailored for specific functional groups
    - Integration of software training with training on business processes and operating procedures
  - Competency testing on each trainee's understanding and level of absorption of the materials should also be considered
  - Follow-up/remedial training should be planned for and made available to those who have identified needs
  - Organize "mock" process "walk-thru's" with affected staff as part of the training plan
  - Project team training in "how to work as a team" may also be advised.
- Organizational and operational readiness assessments should also be instituted prior to implementation especially for large, complex enterprise-wide technology implementations and the results provided to Henrico DPU management and key project stakeholders to aid in managing risk.
- External vendors should be managed by Henrico DPU IT with formal project oversight provided by the Henrico DPU IT PMO.
- External vendor contracts for enterprise-wide technology implementations should provide for on-site support for a specified period of time following "go-live" to address any implementation issues including bug-fixes, integration issues and additional training.
- A post-implementation stabilization period of up to three months or more for enterprise-wide implementations is typically required.
- For smaller implementations, a "scaled-down" or "tailored" version of the above recommendations should also be planned for and instituted.
- Continued executive sponsorship and involvement throughout the life of the project
- Project responsibilities must be shared between DPU IT and the functional area in which the software is being implemented (not just an IT project).
- Implementation teams must consist of functional and IT people
- Senior management must be cognizant of the organization's ability to adapt to the organizational changes that may occur when the software project is implemented.
- Senior management and staff must be cognizant that they may need to change their processes in order to fit the software to be implemented.
- Senior management must be cognizant of the total time to benefit (TTB) metric which implies that there is a period of time following implementation where there may be little or no perceived bene-

fit (“shock period”) and perhaps a loss in productivity until the period after the system stabilizes and benefits from the system implementation can be fully recognized.

- Implementation teams must be made cognizant of the “shock period” that follows implementation “go live” and mobilized to address not only technical issues with the system implementation but also organizational and cultural issues that may arise.
- Project team members’ normal job responsibilities may need to be reassigned to other employees for the project duration. Replacements and/or temporaries are to be trained prior to the implementation.
- A separate dedicated environment for the implementation project team is sometimes needed to build a sense of teamwork and to minimize distractions.
- A post-implementation (after “go live”) help desk is also recommended to manage and document implementation specific issues.
- Implementation information including status should be regularly communicated throughout the organization.
- Conversion of data from the legacy system(s) to the new system being implemented should begin early in the implementation of the project.
- Care should be taken in the selection of the implementation model chosen for the implementation as each has its advantages and disadvantages depending upon the scope, scale and complexity of the project. Selection of the implementation model must happen during project planning. Example implementation models include:
  - **“Big bang” approach** – is that of a complete changeover from the old system to the new system at a specific point in time (i.e. on 31st July, the organization uses the old system for the last time and on 1st August, it uses the new system).
  - **Parallel approach** – implementing the new system while still operating the legacy system for a period of time to ensure stability and accuracy before cutting over completely to the new system.
  - **Phased approach** – implementing a new system or project in stages and gaining approval from stakeholders before proceed to the next phase of the implementation.
  - **Pilot approach** – developing an initial pilot version of the system for testing and evaluation serving as “proof of concept” before undertaking a full development or implementation of a system.
  - **Hybrid Implementation approach** – that is a combination of approaches such as Phased and Big Bang.

## 6 Project Definitions

The Henrico County DPU Engineering and Technology Master Plan consists of a group of interrelated projects that define the Engineering and Technology Improvements Program. Through these projects, the Engineering and Technology Improvements Program is implementing a technology vision that addresses DPU's business needs. The projects within the Program are defined in this section. The background and approach for these projects is discussed in the next several paragraphs.

### 6.1 Information Technology Solution Architecture

The projects comprising the Engineering and Technology Improvements Program are directed to the design, implementation, and deployment of a DPU-wide information management solution. The DPU-wide information management solution is based upon an industry-standard solution architecture. This architecture is being used by other progressive water and wastewater utilities to improve the effectiveness of their information management solutions.

The IT Solution Architecture consists of several sub-architectures – including the Business Architecture, the Information Architecture, the Applications Architecture, and the Infrastructure Architecture. These sub-architectures are summarized in Figure 6-1 below. Each of the architectures “rests upon” the ones below it. The Infrastructure Architecture is the hardware and system software foundation upon which all the other architectures depend as they are implemented and as they perform. On the other hand, each of the architectures is dependent on the ones above it for their performance requirements. The Business Architecture is obviously the starting point for determining the requirements for all of the other three architectures.

Since the applications seen by DPU's end users are the primary focus of this Master Plan, only the Applications Architecture will be described further in the section that follows. The Business Architecture and Information Architecture are commonly developed during the process of implementing a program like the Engineering and Technology Improvements Program. The requirements for the Infrastructure Architecture will also be defined further during implementation, since the technical infrastructure requirements are determined by the support needs of the three architectures that rest on that infrastructure.

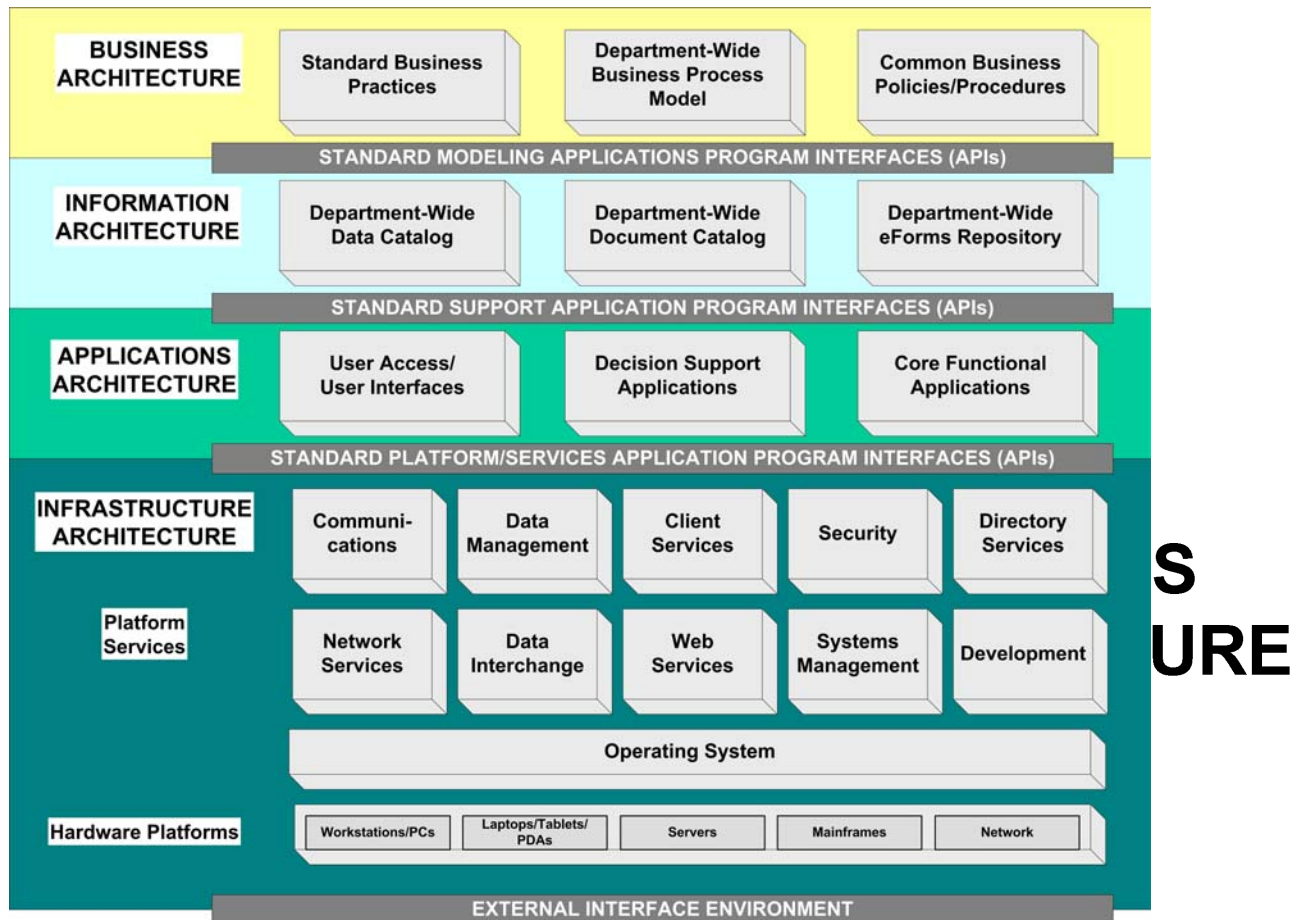


Figure 6-1: IT Solution Architecture

## 6.2 Program Design Principles

Information technology projects are inherently complex and require professional, extended information technology project management. Since the 2002 ETMP, a number of best practices have been applied to planning and guiding DPU's management of information technology projects. Some of these program management principles, which have been adhered to in this plan, are reiterated as follows:

**Utilize a Program Management Office (PMO).** In order to ensure that systems are not implemented in isolation, a PMO is included in the Program. The PMO directs both the project management and technical resources engaged by DPU to implement the Program.

**Buy rather than Build.** Wherever possible, technology is to be acquired through a sound technology selection process rather than building it from scratch. This places a premium on professional program management and systems integration services to direct the technology vendors, configure the technology appropriately to DPU, and fit all the pieces together to meet DPU's business needs.

**Modify Business Processes.** A key objective of each project within the Program is to change existing DPU business processes to fully exploit the technologies' capabilities. Much of the technology that is being implemented in the Program has proven to be effective in instilling industry-wide best practices into an organization. Openness to changing business processes avoids programming changes to the core software and the resultant loss of software vendor support and upgradability.

**Utilize a standard technology selection approach.** A consistently successful approach to information technology selection efforts is to be applied within each of the projects in the Program. That selection approach includes all of the following tasks to an appropriate extent depending on the particular project:

- Plan for the project by articulating the project vision, objectives, business justification, metrics, activities, sequence, dependencies, milestones, completion criteria and team members' roles and responsibilities.
- Develop an understanding of current business processes, organizational structure, and systems – i.e., how work actually occurs.
- Document functional and non-functional business requirements for new technology solutions.
- Articulate prioritized requirements in a procurement specification, along with selection criteria, evaluation scenarios, and data that can minimize risks.
- Work with DPU's selection committee to determine a "short-list" of qualified Offerors.
- Develop demonstration scripts and check references to evaluate short-listed Offerors.
- Select and justify Successful Offeror.
- Complete DPU's procurement process to result in an enforceable contract that complies with County standards.

**Utilize a successful and standard implementation approach.** A consistently successful approach to information technology implementation efforts is to be applied within each of the projects in the Program. That approach includes all of the following tasks to an appropriate extent depending on the particular project:

- System Integration Model Formulation.
- Application Platform Installation.
- Application Software Installation.
- Pilot Deployment.
- System Configuration (in the case of systems integration, includes the configuration of the integration interfaces).
- Business Process Modification – Design and Implementation
- Acceptance Testing (in the case of systems integration, includes testing of the fully integrated system).
- Training in Technology and Business Processes– End Users.
- Training in Technology – Support Personnel.
- Final Acceptance.
- Full Operation.
- Business Process and Configuration Refinement.
- Post Implementation Support and Review.

**Early successes.** Projects are defined to promote the factors of success (i.e., on time, on budget, expected functionality). This rewards team members and demonstrates the factors that engender success.

**Useful results.** Projects are defined to provide an easily demonstrable service to DPU at their conclusion. This creates a sense of payback for the investment and project momentum because users can directly perceive the value of the project. This is to be achieved largely through systems integration and business process change, so as to ensure the system becomes a critical part of DPU's new culture and operations.

**Involvement of DPU personnel.** These projects will involve significant commitments of DPU staff time. To provide support for DPU staff in these endeavors, most of the projects include budget estimates for significant contracted resources from a system integrator. All the projects assume that DPU personnel will be involved for the entire project, working closely with the system integrator. By working alongside the system integrator, DPU staff will become familiar with the project design and implementation and will acquire valuable skills and experience in using and maintaining the new systems.

**Project interdependencies.** Where possible, projects are defined to take advantage of efforts accomplished in other projects, thereby ensuring good synergy among all program elements. The projects are designed to build on one another. Instead of one massive project to implement all of the new systems, a number of interrelated projects are used to achieve the program objective. This results in faster realization of benefits and less costly adjustments over the course of system implementations.

## 6.3 Recommended Projects

The Engineering and Technology Improvements Program is to be implemented through a series of inter-related projects planned for implementation during the next five years. While most of these projects follow a standard technology life cycle, additional recommended on-going activities have also been described. The following explains this differentiation among the recommended projects:

- **Technology Life Cycle Projects** – These projects involve planning, defining, designing, constructing, deploying, and supporting new technology capabilities. In some cases (e.g., mobile worker support, GIS enhancements, enhancing citizen access), the construction and/or deployment may occur in multiple Phases over more than one year.
- **On-Going Projects** – These recommended activities require expenditures annually to maximize DPU's return on its investment in information technology, and include department-wide computer training, ongoing post implementation reviews and support, and the program management office.

The remainder of this Section summarizes the 21 recommended projects, including objectives, scope, and interdependencies with other projects. Section 7 contains the master plan for the overall Engineering and Technology Improvements Program, reflecting project priorities and interdependencies. The estimated costs and recommended timing for these projects are included in Section 7.

## 6.4 Technology Life Cycle Projects

### Project 1.1- Maximize Datastream Value to the WRF and WTF

This project supports implementation of applicable asset management best practices, refinement of business processes, revisions to the Standard Operating Procedures (SOPs), updates of training material, refresher training, and other post implementation activities related to the Datastream 7i implementations at the Water Reclamation Facility (WRF) and the Water Treatment Facility (WTF).

Project Objectives:

- Provide support for utilizing the Datastream 7i CMMS in support of applicable asset management best practices to address the maintenance needs of the plants.

#### Project Scope:

- Continue to identify Datastream configuration enhancements that will streamline workflow, provide easier access to work history, simplify searches for equipment IDs, and view data on multiple screens
- Refine business processes and Key Performance Indicators (KPIs) to improve their effectiveness
- Update the Datastream 7i CMMS SOP and training material to reflect modified processes and practices
- Support users of the Datastream 7i CMMS to implement applicable asset management best practices
- Document changes to DPU application architecture including application integrations
- Perform post implementation assessments and provide support for implementing their recommendations
- Obtain additional system administration training and familiarity with the application, so users may be provided with a higher level of support
- Design an integration of part numbers between Datastream and Oracle Financials for large purchases. If the integration is justified, proceed with the integration.

#### Project Interdependencies:

- Integration of Datastream with Oracle Financials is dependent on the results from the business process review.

### **Project 1.2- GIS Enhancements**

This project has the goal of leveraging the Henrico County GIS in support of DPU's business processes and "spatially enabling" DPU's operational applications to maximize the return on DPU's investment in GIS. Specific integrations (that are not in process as of this date) include Customer Information System, Industrial Waste Management, CCTV Inspections, Water Quality Data, Operations SCADA, the Valve isolation application, and the County's IVR for customer notifications.

#### Project Objectives:

- Expand the use of GIS technology to "spatially enable" DPU's operational applications to maximize the return on DPU's investment in GIS.

#### Project Scope:

- Standardize GIS Maps for DPU customers
- Implement and deploy valve isolation application
- Integrate GIS with CCTV inspection results
- Integrate GIS with WRF laboratory results from water quality testing
- Link GIS with DPU's Intranet-based information portal
- Integrate GIS with Customer Information System
- Integrate GIS with Operations SCADA
- Integrate GIS with County IVR for customer notifications
- Replace Design division front counter application and business processes

- General GIS programming and tools development

Project Interdependencies:

- This project builds upon in-process GIS enhancement projects that include a water and sewer spatial data model, in-house maintenance of water and sewer asset data in GIS, integration with Operations CMMS, and integration with water and sewer modeling.

### **Project 1.3- Enhance Citizen Access to DPU**

This project is designed to enable Henrico County citizens to access applicable DPU services utilizing a “citizen self-service” capability on the Internet.

Project Objectives:

- Enable Henrico County citizens to access applicable DPU services utilizing a “citizen self-service” capability on the Internet. The technology must provide quick and easy-to-use access to DPU services, and must integrate with CRM and other County eGovernment activities.

Project Scope:

- Develop a DPU eGovernment/eBusiness strategy that identifies potential “customer self service” capabilities such as requesting services, placing orders, notifying DPU of problems, and obtaining answers to questions
- Evaluate using the Internet to share data with (and possibly collect data from) business partners and external stakeholders
- Explore ways to incorporate additional IVR functionality into DPU customer-facing processes for customer notifications
- Determine which capabilities will be addressed by County CRM, other County eGovernment activities, and DPU’s new Customer Information System.
- Prioritize and plan a phased approach to implement unfilled needs
- Implement the specific technology components needed to deliver the planned functionality.

Project Interdependencies:

- This project needs to reflect the capabilities and implementation decisions of the new CIS
- This project must be coordinated with the County’s CRM and other County eGovernment activities

### **Project 1.4- Mobile Worker Support**

This project has the goal of utilizing mobile computing solutions to streamline business processes and increase the efficiency and effectiveness of DPU workers who perform work at remote locations in Henrico County. It is DPU’s intention to standardize on one mobile solution (that includes wireless capability when justified) for all mobile computing needs, including Operations CMMS work orders, CIS service orders, Construction Inspectors, GIS field deployment, Monitoring and Compliance field collectors, and line locations.

Project Objectives:

- Implement a mobile computing solution that will streamline business processes and support all DPU mobile computing requirements. This solution will support secure wireless capability when justified by the business requirements.



**Project Scope:**

- Document and assess the mobile computing needs within all DPU divisions
- Develop a DPU-wide mobile worker technology strategy, implementation plan, and specifications
- Develop mobile computing policies for DPU consistent with County standards, policies, and practices
- Formulate a security strategy for mobile computing and wireless connectivity
- Identify and select DPU's standard mobile computing solution
- Integrate the selected mobile computing solution with the following DPU applications and deploy:
  - Operations CMMS (Hansen) work orders
  - CIS service orders
  - Construction inspection data
  - GIS field access
  - Monitoring and Compliance field collectors
  - Other DPU IT systems (e.g., FileNet, LabWorks).

**Project Interdependencies:**

- Final scope of the mobile solution will be based upon the results of the DPU-wide needs assessment
- Construction inspection integration with the mobile solution is dependent upon the Construction Inspection Data Management System
- GIS field access integration should be coordinated with future technology upgrades and/or replacement of the existing "GIS Lite" application
- It is desired that the mobile solution and its integration with CIS service orders be in place in time to support the deployment of the new CIS
- Communications capabilities of the mobile solution will conform to the County's policies and network capabilities.

**Project 1.5- Leverage Document Management Technology**

This project adds electronic O&M manuals to the documents being made available using FileNet, and implements field access to all DPU FileNet content.

**Project Objectives:**

- Utilize the capabilities of the County's FileNet Electronic Document Management System to the fullest extent possible for improving DPU's services, building upon existing projects for Engineering Drawing Management and DPU-wide FileNet implementation.

**Project Scope:**

- Migrate existing electronic O&M manuals into FileNet, and convert paper O&M manuals
- Provide DPU-wide (including field) access to all DPU documents that are stored in FileNet.

**Project Interdependencies:**

- Dependent upon completion of the current projects for Engineering Drawing Management and DPU-wide FileNet implementation.

### **Project 1.6- Performance Metrics**

This project will implement a system of measuring department-wide performance that will provide all levels of management with vital operational information.

Project Objectives:

- Provide DPU management with the information needed to evaluate progress in improving customer service, maintaining quality, enhancing productivity, and preparing for major changes

Project Scope:

- Define performance measures at the department level, and design a system of division, section, workgroup, and individual measures that support the departmental metrics
- Implement performance measures and analytical applications to automate the calculation and trending of DPU's metrics.
- Implement interfaces to transfer performance data from such sources as Operations SCADA, WRF plant control systems, WTF plant control systems, Automated Call Distribution (ACD) system, and from the DPU Information Portal.
- Provide capabilities to track relevant external metrics, including contractor performance and KHB volunteer activities.

Project Interdependencies:

- Availability of metrics from newly implemented systems, enhancements and initiatives.

### **Project 1.7- New Budget Planning System**

This project will result in implementation of a Budget Planning System that supports preparation of both operational and CIP budgets, as well as an interface with the DPU Rate Model and Oracle Financials.

Project Objectives:

- Enhance the business processes for preparing CIP and operations budgets by implementing tools that are easier to use, support desired analyses, and meet County submittal requirements.

Project Scope:

- Analyze and document DPU's business processes for operations and CIP budgeting, and perform a gap analysis in comparison with industry best practices
- Develop requirements for an integrated budget planning system
- Issue a Request for Proposal and select a COTS software package
- Perform configuration, training, implementation and integration of the selected budget planning system

Project Interdependencies:

- Coordinate with County Finance Department to assure that Oracle Financials configuration is stable

### **Project 1.8- Operations CMMS Enhancements**

This project has the goal of improving asset management by extending the value of existing technology and improving business processes in the Operations division.

Project Objectives:

- Provide enhanced technology, improved business processes, refresher training, and systems integration to support the efficient operation of the Operations Division.

Project Scope:

- Identify and implement enhancements to the Operations division CMMS's configuration to streamline workflow and fully support desired asset management best practices
- Assist management in using CMMS data for improved decision support
- Increase the level of system administration support provided for the Operations division CMMS
- Improve the usability of the CMMS for use in the field
- Evaluate the feasibility of integrating field CMMS usage with as-built images, GIS, CIS, time-sheets, and SPIDMS
- Update training materials and execute refresher training on using the CMMS to support applicable asset management best practices
- Interface Operations CMMS data with the DPU Information Portal
- Implement warehouse inventory bar coding in support of materials management "best practices"
- Interface equipment usage data from the Operations division SCADA to the Operations CMMS to support preventive maintenance planning
- Evaluate the feasibility of integrating the Operations CMMS with the proposed County-wide CRM system.

Project Interdependencies:

- Supports projects in mobile, SCADA, and performance metrics.
- SCADA integration will depend on Operations SCADA historian and/or upgrades.

### **Project 1.9- Construction Inspection Data Management System**

This project will design and implement a replacement for "Ray Barnett's Database". This solution will support the management needs of the Construction division, including status information on Plan of Development (POD), Capitol Improvement Program (CIP), and Annual Contract projects which must be inspected by this division. The migration/re-design of the existing Construction Inspection (i.e., "Ray's") Database may include enhancements, if justified, to meet the needs of other DPU and County stakeholders. Such enhancements could include assumptions, estimates, maps, budget, change orders, and/or other project status documentation. The Construction Inspection Data Management System should integrate with DPU's business processes and technology support for project planning, execution, inspection, and acceptance, and should be accessible from mobile units and through the DPU information portal.

Project Objectives:

- Replacement of "Ray Barnett's Database", used to track construction project status and inspection activities, with a more technically robust and expandable solution

- Support the integration of the Construction Inspection Data Management System with DPU's business processes and systems, including the DPU Information Portal; mobile access; and project planning, execution, inspection, and acceptance.

Project Scope:

- Define DPU construction inspection data management requirements and construction inspection business processes
- Select and implement the Construction Inspection Data Management System's data repository
- Integrate with DPU's mobile computing standard for construction inspection
- Provide access to construction inspection data through the DPU Information Portal and mobile computing
- Integrate with the County's POD software package.

Project Interdependencies:

- Dependent upon deployment of DPU Information Portal and mobile solution.

### **Project 1.10- Integrate SCADA and Laboratory Data**

This project will integrate WRF SCADA data with laboratory data resulting in automated calculation of regulatory reports and increased access to SCADA data and Laboratory data throughout DPU.

Project Objectives:

- Integrate laboratory results (from LIMS) with flow data (from SCADA) to enhance monitoring and to automatically generate data contained in the monthly Virginia DEQ regulatory reports.

Project Scope:

- Document requirements and identify potential COTS solutions
- Select software package and develop an implementation plan
- Acquire software and implementation resources
- Implement and deploy SCADA integration

Project Interdependencies:

- Must address security concerns resulting from connecting SCADA and business networks, and provide technical resources for support
- Coordinate with project(s) for LIMS enhancements and support
- Coordinate with project(s) for DPU SCADA enhancements

### **Project 1.11- Enhance DPU SCADA**

This project's goal is to increase the accessibility and usefulness of data from DPU's three SCADA systems in making operational decisions. The project includes providing user-friendly access to SCADA historian data throughout DPU; removing obsolete points (primarily at the WRF); and upgrading hardware, software, and applications for all three DPU SCADA systems. As a result, this project will enable DPU divisions to share SCADA data and view other divisions' SCADA systems in real-time or near real-time basis.

Project Objectives:

- Increase overall DPU operational effectiveness by enhancing SCADA functionality, simplifying use, updating hardware, and broadening access to SCADA information by DPU staff in other divisions.

Project Scope:

- Assess the current and future control system requirements for DPU's Operations division SCADA, and develop a strategy for replacing the Operations division SCADA in a manner that is consistent with DPU-wide control system objectives
- Implement SCADA Data Historian(s)
- Provide appropriate DPU users with Read-Only or Historian access
- Implement SCADA enhancements at WRF and WTF
- Implement the Operations division SCADA Update/Replacement

Project Interdependencies:

- The Operations division SCADA strategy development should proceed additional implementations

### **Project 1.12- Enhance Technology for Solid Waste Division**

This project's major tasks include improving business processes, improving the technology at the Landfill, integrating with other DPU technology, and preparing for the eventual closing of the Landfill.

Project Objectives:

- Provide enhanced technology, improved business processes, and systems integration to support the efficient operation of Solid Waste Division.

Project Scope:

- Business process review of the Solid Waste Division's activities (e.g., customer service, landfill activities) to determine where non-value added processes and activities can be eliminated and manual processes can be automated
- Implement software update to current Landfill Point-of-Sale (POS) System to support new technology and reporting capability
- Evaluate adding the landfill to the County's business network
- Integrate the updated Landfill POS system with the planned CIS system
- Develop the plan to apply technology for the information reporting requirements after the landfill is closed.
- Integrate container bar code readers with CIS to promote quality of service and billing

Project Interdependencies:

- The business process review task should precede all other activities

### **Project 1.13- DPU IT Test "Lab" Environment**

This project will implement and maintain a separate test environment that "mirrors" DPU's production environment. This will mitigate current risks to the DPU production environment so that upgrades and patches can be fully tested before they are deployed.

Project Objectives:

- Reduce risk to DPU's production technology systems by maintaining a separate test environment for testing software upgrades and patches before they are deployed in productions
- Provide a "hands on" training environment.

Project Scope:

- Implementation Planning
- Solution Acquisition
- Hardware and software installation and configuration
- Testing
- Development of procedures for maintaining synchronization between the test and production environments
- Review and refine configuration, and implement hardware or software configurations

Project Interdependencies:

- Development of specific hardware and software configuration for acquisition.

### **Project 1.14- DPU IT Disaster Recovery Assessment**

This project is to perform a DPU IT disaster recovery assessment and gap analysis to fully understand the risks and potential risk mitigation strategies needed at this time. This analysis will include the technology necessary to support DPU's Emergency Operations Center (EOC) at Woodman Road and its EOC backup at the WTF.

Project Objectives:

- Reduce risk to DPU operations during emergencies (e.g., natural disasters, power outages, etc.).

Project Scope:

- Assessment, gap analysis and recommendations
- Implementation Plan and Execution

Project Interdependencies:

- None

### **Project 1.15- LIMS Enhancements and Support**

This project utilizes technology to improve sharing of results with the laboratory's customers, including the following:

- Automated notification if water quality results are out of specification
- Provide easy DPU-wide access to water quality data
- Automation of WTF laboratory reports.

In addition, the project will integrate LIMS water quality data with sampling locations using GIS and document management to facilitate rapid analysis of water quality results and integrate LIMS with DPU's mobile (wireless) solution to support remote data collection of field samples.

A short term initiative that can be accomplished to add value and enhance the existing LIMS application would be to provide support to the LIMS staff to research available upgrades, analyze gaps, and plan and

implement functionality that is present in the current software; assure that these deployments include optimization of business processes; and support configuration and training.

**Project Objectives:**

- Enhance the value of the existing laboratory transactions tracking system (LabWorks) through technology upgrades, training, improved business processes, and systems integration.
- Improve the publication and distribution of laboratory information as appropriate throughout DPU and to external stakeholders.

**Project Scope:**

- Review current LIMS business processes against LIMS software capabilities; identify gaps.
- Develop plan to implement measures to close gaps to ensure more complete utilization of LIMS.
- Plan LIMS integration and data sharing projects
- Implement LIMS integration and data sharing projects, including:
  - a. Bar coding (sample containers going out, samples as they come in, samples at “the bench” so that ID is scanned in and not knuckled in. Most errors come from data entry (keying) mistakes.
  - b. Easier creation and modification of custom reports, to provide outputs that are more usable by customers
  - c. Go “paperless” with last remaining hand written bench sheets
  - d. Interface additional Excel data entry sheets with LIMS
  - e. Interface “simple” instruments like analytical balances and meters directly to LIMS
  - f. Link lab results with GIS

**Project Interdependencies:**

- This project should be coordinated with LIMS/SCADA integration, with deployment of DPU’s mobile solution, and with GIS enhancements

**Project 1.16 - DPU Information Portal**

This project implements the “foundation” technologies necessary to either implement other new systems or upgrade existing ones. The implementation of the DPU Information Portal includes the implementation of the Department’s Intranet, operational reporting, forms automation software, as well as relational database and analytical reporting technologies. The Portal project integrations for reporting may include:

- Operations CMMS
- WTF CMMS
- WRF CMMS
- SPIDMS
- SCADA
- Lab Water Quality Data (LIMS)
- FileNet (Access to documents: drawings, SOPs)
- GIS

**Project Objectives:**

- Provide enhanced communications, customer service, information access, and collaboration through the implementation of a DPU-wide intranet (internal web site).
- Manage all DPU data, DPU databases, and DPU data-generating applications for the benefit of Department as a whole; treat DPU data, databases, and applications as DPU-wide information resources.
- Make relevant data widely available and readily accessible.
- Significantly reduce or eliminate the proliferation of isolated databases.

**Project Scope:**

- Implement the piloted intranet site (formerly known as the Department-wide Operational Reporting System, or DORS) as the DPU-wide intranet site.
- Develop and implement processes for content maintenance, quality assurance, governance, and system administration.
- As feasible, integrate most of the data used by DPU executives and managers for decision support, including currently isolated databases such as desktop Access and Excel files

**Project Interdependencies:**

- Coordination with enhancements of all applications that are integrated with the Portal

**Project 1.17 - Project Management System**

This project implements tools and processes for managing schedules and progress on Capitol Improvement Program (CIP), and Annual Contract projects. Technology capabilities will include multi-user access to project scheduling software, forecasting of resource costs and “estimates to complete”, and tracking projects against a “baseline”. Potential integrations include Oracle Financials (for actual project costs) and the Construction Inspection Data Management System (for project information). Deployment will include DPU-specific templates, processes, and training to support consistent use across the Design, Construction, and Business divisions. Potential enhancements include access to other County and external stakeholders, and use of the DPU Information Portal to facilitate the desired integrations.

**Project Objectives:**

- Provide automated support to all DPU participants in CIP and Annual Contract projects.

**Project Scope:**

- Definition of DPU requirements for project scheduling, cost forecasting, and management reporting
- Design project scope and technical approach
- Select and implement a Project Management software solution
- Develop DPU-specific processes, templates, standard reports, and training materials
- Implement integrations with DPU Information Portal, Oracle Financials, and/or Construction Inspection Data Management System
- Deploy and support Project Management System.

**Project Interdependencies:**



- Potentially dependent on DPU Information Portal and/or Construction Inspection Data Management System

### **Project 1.18- Knowledge Management Program**

This project will design and establish a DPU-wide Knowledge Management Program that supplements technology with the development of a culture of capturing, categorizing, and sharing knowledge throughout the enterprise. This will include existing technology capabilities (e.g., document management, DPU Information Portal), augmented with organizational development to broaden the knowledge that can be accessed intuitively and from anywhere by all DPU employees.

Project Objectives:

- To develop a culture of capturing and organizing key employee knowledge so that it can be accessed intuitively and from anywhere by all DPU employees.

Project Scope:

- Define a structure for sorting knowledge (or a “taxonomy”)
- Design and implement a DPU-wide knowledge repository with a structure that facilitates future growth
- Develop and deploy processes for the easy storage and retrieval of documents and other DPU knowledge from any DPU employee’s office or field location
- Implement connections from personal databases and third party applications to the knowledge repository.

Project Interdependencies:

- Builds upon capabilities being provided by document management and DPU Information Portal activities.

## **6.5 On-Going Projects**

### **Project 2.1- Program Management Office**

This project continues the operation of the Program Management Office, or PMO, to execute all of the projects defined in this Plan. The PMO provide effective communications including status of current, planned and future IT projects, program monitoring, and budget control. It also maintains consistent change and risk management and establishes common program management tools, policies, and procedures.

Project Objectives:

- Continue the Program Management Office within DPU to manage the entire Engineering and Technology Improvements Program.
- Utilize the Program Management Office to integrate all of the projects in the Program.
- Ensure the achievement of program objectives.

Project Scope:

- Program and project management.
- Implementation oversight.
- Inter-Project coordination.

- Project staff coordination.
- Program administrative support.
- DPU Staff Mentoring.
- Establish project management standards and processes.
- Establish standard process for software selection.
- Establish standard process for software implementation and deployment.

Project Interdependencies:

- Project Management services are included in the scope and budget for each of the other projects in the Program. The PMO establishes project management standards and coordinates all of those Project Management services to ensure attainment of all Program objectives.

### **Project 2.2- DPU-wide Computer Training**

This project will establish a DPU-wide application training program to improve the computer competency and skill levels of DPU staff to maximize the return on investment in DPU IT systems.

Project Objectives:

- Enhance the computer application specific training agenda for new employees.

Project Scope:

- Determination of training and resource needs
- Identification of available courses and resources
- Develop new hire training agenda and collateral materials
- Training scheduling and/or Acquisition
- Review job descriptions to assure that appropriate computer literacy requirements are documented

Project Interdependencies:

- Prerequisite for extending DPU's use of technology.

### **Project 2.3- Post Implementation Support**

This initiative will assign resources to support "fine tuning" of business processes, updates of application-centric SOPs, vendor functionality enhancements, post implementation assessments, application specific training collateral material and needs identified during post implementation support. FileNet will be utilized to store the SOPs, to facilitate their updating, and to make them available to DPU using the Information Portal.

Project Objectives:

- Provide ongoing post implementation support to maximize the value of newly-deployed technology systems.

Project Scope:

- "Fine tuning" of business processes
- Identify and implement configuration enhancements that will streamline workflow

- Vendor functionality enhancements
- Documentation of changes to DPU application architecture including application integrations
- Monthly and on-going updates of application-centric SOPs and training collateral material
- Post implementation assessments
- Support for implementing recommendations from post implementation assessments
- Business unit ownership of SOPs and business process improvements

Project Interdependencies:

- None

## 7 Strategy and Tactical Plan

The overall Engineering and Technology Improvements Program is divided into two distinct sets of recommended projects – termed the Technology Life Cycle Projects and the On-Going Projects. The Technology Life Cycle Projects are focused on the implementation of the most critical and urgent aspects of the overall Program. The On-Going Projects are focused on the activities that require expenditures annually to maximize DPU's return on its investment in information technology. This plan will outline the projects, budget and proposed implementation schedule needed to achieve the expected outcomes from these projects.

The strategic portion of the plan provides the framework in which the tactical initiatives (projects) reside. The Strategic and Tactical Plan relies on DPU's recommended strategies for applying technology aligned with DPU's business objectives as a foundation.

### 7.1 Strategic Alignment

Alignment of DPU's business drivers, strategies and IT projects are fundamental to the success of future IT initiatives. The following tables illustrate the alignment of the recommended projects and DPU's IT Strategies.

Strategy	Project(s)
<b>1: Leverage Recent DPU Technology Implementations</b>	Project 1.1 – Maximize Datastream Value to the WRF and WTF
	Project 1.8 – Operations CMMS Enhancements
	Project 2.1 –Program Management Office
	Project 2.3 – Post Implementation Support
<b>2: Develop DPU Staff Computer Skills</b>	Project 2.2 – DPU-wide Computer Training
<b>3: Capitalize on DPU GIS investments</b>	Project 1.2 – GIS Enhancements
<b>4: Enhance Citizen Access to DPU Through Technology</b>	Project 1.3 – Enhance Citizen Access to DPU
<b>5: Implement DPU-specific Applications for Electronic Document Management</b>	Project 1.5– Leverage Document Management Technology
<b>6: Extend Value of Existing DPU Applications</b>	Project 1.1 – Maximize Datastream Value to the WRF and WTF
	Project 1.8 – Operations CMMS Enhancements
	Project 1.18 – Knowledge Management Program
	Project 2.2 – DPU-wide Computer Training
	Project 2.3 – Post Implementation Support

Strategy	Project(s)
<b>7: Provide Technology to DPU Mobile Workers</b>	Project 1.4 – Mobile Worker Support
<b>8: Implement DPU-wide Performance Metrics</b>	Project 1.6 – Performance Metrics
<b>9: Implement DPU-wide Integrated Budgeting &amp; Planning</b>	Project 1.7 – New Budget Planning System
<b>10: Implement Technology in Construction Division</b>	Project 1.9 – Construction Inspection Data Management System
	Project 1.17 – Project Management System
<b>11: Modernize and Integrate SCADA</b>	Project 1.10 – Integrate SCADA and Laboratory Data
	Project 1.11 – Enhance DPU SCADA
<b>12: Implement Technology for Solid Waste Division</b>	Project 1.12 – Enhance Technology for Solid Waste Division
<b>13: Develop DPU IT Maturity</b>	Project 1.13 – DPU IT Test "Lab" Environment
	Project 1.14 – DPU IT Disaster Recovery Assessment
	Project 2.1 – Program Management Office
	Project 2.3 – Post Implementation Support
<b>14: Enhance Technology in Support of DPU Laboratories</b>	Project 1.15 – LIMS Enhancements and Support
	Project 1.10 – Integrate SCADA and Laboratory Data
<b>15: Enhance DPU Intranet Site</b>	Project 1.16 – DPU Information Portal
	Project 1.18 – Knowledge Management Program
<b>16: Maintain the Integrated Engineering &amp; Technology Program</b>	Project 2.1 – Program Management Office

## 7.2 Project Budget Estimates

The project budget estimates are based upon the following assumptions:

**Appropriateness of Technology Products.** The technology product categories (i.e., the types of hardware and/or software) are appropriate to DPU's business requirements. The products scale to the types of processes used by DPU. They are designed to not be strained by the size of DPU's business, nor are they over-featured for DPU's requirements.

**Order-of-magnitude.** The cost estimates are order-of-magnitude (plus or minus 25%). Westin has attempted to make sure that the costs are fairly representative of the technology and services costs, but newer versions may result in changes to these costs. In some instances combinations of software within a project may be required to complete a solution, and the cost estimates have taken this into consideration.

**Time value of money.** Time value of money factors – such as the cost of funding or inflation – are not included in the budget estimates. Costs are in terms of Year 2006 dollars.

**Straight-line budget extensions.** In defining these projects, the contracted professional services resources assume an expected duration of the project. To the extent that a project timeline is extended, the professional services expenditures can be expected to increase.

Many of these projects have overlapping needs. To the extent that projects with overlapping hardware and software requirements are undertaken, it may be possible to incrementally reduce the amount of software and hardware acquired, and consequently reduce the total cost of the set of projects. These kinds of project synergies will not be known until implementation efforts are underway.

**Years 0 through 5.** DPU's 2006-07 fiscal year will be more than half finished before any of these projects can begin. Therefore, the budget estimates consider this partial year as "Year 0", and provide budget estimates for the succeeding 5 years (1 through 5, or 2007 through 2012, respectively).

**Short Range Plan.** The implementation plan for Years 0 through 3 has been designated the "Short Range Plan". During this time, the Engineering and Technology Improvement Program should focus on the implementation of the most critical and urgent aspects of the overall program. These include leveraging existing investments in technology, improving decision support, and providing all staff with access to DPU's enterprise data.

**Long Range Plan.** The plan for Years 4 and 5 is designated the "Long Range Plan". This includes projects that address future requirements that are important and necessary, but less well defined today, as well as projects that are dependent upon County-wide initiatives that are in their early Phases, such as Citizen Requests for Service (3-1-1).

The budget estimates for the Technology Life Cycle and the On-going Projects for Years 0 through 5 are provided on the following pages 4 and 5.

### ETMP Update Project Cost Estimates

Projects	FY 2006/7 Year 0	FY 2007/8 Year 1	FY 2007/9 Year 3	FY 2009/10 Year 3	FY 2010/11 Year 4	FY 2011/12 Year 5	Totals
<b>1.1 - Maximize Datastream Value to the WRF and WTF</b>							
Hardware	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Software	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Professional Services	\$ 85,000	\$ 50,000	\$ 35,000	\$ -	\$ -	\$ -	\$170,000
<b>Project Total:</b>	<b>\$ 85,000</b>	<b>\$ 50,000</b>	<b>\$ 35,000</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$170,000</b>
<b>1.2 - GIS Enhancements</b>							
Hardware	\$ -	\$ -	\$ -	\$ -	\$ 25,000	\$ -	\$ 25,000
Software	\$ -	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 50,000
Professional Services	\$ -	\$125,000	\$125,000	\$125,000	\$125,000	\$125,000	\$625,000
<b>Project Total:</b>	<b>\$ -</b>	<b>\$135,000</b>	<b>\$135,000</b>	<b>\$135,000</b>	<b>\$160,000</b>	<b>\$135,000</b>	<b>\$700,000</b>
<b>1.3 - Enhance Citizen Access to DPU</b>							
Hardware	\$ -	\$ -	\$ -	\$ 25,000	\$ -	\$ 25,000	\$ 50,000
Software	\$ -	\$ -	\$ -	\$ 50,000	\$ -	\$ 25,000	\$ 75,000
Professional Services	\$ -	\$ 25,000	\$ 75,000	\$ 75,000	\$ 75,000	\$ 75,000	\$325,000
<b>Project Total:</b>	<b>\$ -</b>	<b>\$ 25,000</b>	<b>\$ 75,000</b>	<b>\$150,000</b>	<b>\$ 75,000</b>	<b>\$125,000</b>	<b>\$ 450,000</b>
<b>1.4 - Mobile Worker Support</b>							
Hardware	\$ -	\$ 75,000	\$ 35,000	\$ 25,000	\$ 25,000	\$ 25,000	\$185,000
Software	\$ -	\$ 50,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$150,000
Professional Services	\$125,000	\$100,000	\$ 50,000	\$ 30,000	\$ 30,000	\$ 30,000	\$365,000
<b>Project Total:</b>	<b>\$125,000</b>	<b>\$225,000</b>	<b>\$110,000</b>	<b>\$ 80,000</b>	<b>\$ 80,000</b>	<b>\$ 80,000</b>	<b>\$700,000</b>
<b>1.5 - Leverage Document Management Technology</b>							
Hardware	\$ -	\$ -	\$ -	\$ 25,000	\$ -	\$ -	\$ 25,000
Software	\$ -	\$ -	\$ -	\$ 50,000	\$ -	\$ -	\$ 50,000
Professional Services	\$ -	\$ 35,000	\$ 35,000	\$ 75,000	\$ 50,000	\$ 50,000	\$245,000
<b>Project Total:</b>	<b>\$ -</b>	<b>\$ 35,000</b>	<b>\$ 35,000</b>	<b>\$150,000</b>	<b>\$ 50,000</b>	<b>\$ 50,000</b>	<b>\$320,000</b>
<b>1.6 - Performance Metrics</b>							
Hardware	\$ -	\$ 15,000	\$ -	\$ -	\$ -	\$ -	\$ 15,000
Software	\$ -	\$ 50,000	\$ -	\$ -	\$ -	\$ -	\$ 50,000
Professional Services	\$ 75,000	\$ 50,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$225,000
<b>Project Total:</b>	<b>\$ 75,000</b>	<b>\$115,000</b>	<b>\$ 25,000</b>	<b>\$ 25,000</b>	<b>\$ 25,000</b>	<b>\$ 25,000</b>	<b>\$290,000</b>
<b>1.7 - New Budget Planning System</b>							
Hardware	\$ -	\$ 25,000	\$ -	\$ -	\$ -	\$ -	\$ 25,000
Software	\$ -	\$200,000	\$ -	\$ -	\$ -	\$ -	\$200,000
Professional Services	\$ 125,000	\$125,000	\$ 50,000	\$ 50,000	\$ 50,000	\$ -	\$400,000
<b>Project Total:</b>	<b>\$ 125,000</b>	<b>\$350,000</b>	<b>\$ 50,000</b>	<b>\$ 50,000</b>	<b>\$ 50,000</b>	<b>\$ -</b>	<b>\$625,000</b>

Projects	FY 2006/7 Year 0	FY 2007/8 Year 1	FY 2007/9 Year 3	FY 2009/10 Year 3	FY 2010/11 Year 4	FY 2011/12 Year 5	Totals
<b>1.8 - Operations CMMS Enhancements</b>							
Hardware	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Software	\$ -	\$ -	\$ -	\$ -	\$ 75,000	\$ 75,000	\$150,000
Professional Services	\$ 80,000	\$ 80,000	\$ 65,000	\$ 50,000	\$ 50,000	\$ 50,000	\$375,000
Project Total:	\$ 80,000	\$ 80,000	\$ 65,000	\$ 50,000	\$125,000	\$ 125,000	\$525,000
<b>1.9 - Construction Inspection Data Management</b>							
Hardware	\$ -	\$ -	\$ -	\$ 25,000	\$ -	\$ -	\$ 25,000
Software	\$ -	\$ -	\$ -	\$ 50,000	\$ -	\$ -	\$ 50,000
Professional Services	\$ -	\$ -	\$ 50,000	\$ 85,000	\$ 75,000	\$ 50,000	\$260,000
Project Total:	\$ -	\$ -	\$ 50,000	\$160,000	\$ 75,000	\$ 50,000	\$335,000
<b>1.10 - Integrate SCADA and Laboratory Data</b>							
Hardware	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Software	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Professional Services	\$ -	\$ 75,000	\$ -	\$ -	\$ -	\$ -	\$ 75,000
Project Total:	\$ -	\$ 75,000	\$ -	\$ -	\$ -	\$ -	\$ 75,000
<b>1.11 - Enhance DPU SCADA</b>							
Hardware	\$ -	\$ -	\$ 25,000	\$ -	\$ -	\$ -	\$ 25,000
Software	\$ -	\$ -	\$ 50,000	\$ -	\$ -	\$ -	\$ 50,000
Professional Services	\$ 50,000	\$ 50,000	\$ 75,000	\$ 50,000	\$ 75,000	\$ 75,000	\$375,000
Project Total:	\$ 50,000	\$ 50,000	\$150,000	\$ 50,000	\$ 75,000	\$ 75,000	\$450,000
<b>1.12 - Enhanced Technology for Solid Waste Division</b>							
Hardware	\$ -	\$ 15,000	\$ -	\$ -	\$ 15,000	\$ 15,000	\$ 45,000
Software	\$ -	\$ 15,000	\$ -	\$ -	\$ 15,000	\$ 15,000	\$ 45,000
Professional Services	\$ -	\$ 15,000	\$ 35,000	\$ 15,000	\$ 25,000	\$ 25,000	\$115,000
Project Total:	\$ -	\$ 45,000	\$ 35,000	\$ 15,000	\$ 55,000	\$ 55,000	\$205,000
<b>1.13 - DPU-IT Test "Lab" Environment</b>							
Hardware	\$ -	\$100,000	\$ -	\$ -	\$ 50,000	\$ -	\$150,000
Software	\$ -	\$ 75,000	\$ -	\$ -	\$ 75,000	\$ -	\$150,000
Professional Services	\$ -	\$100,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$200,000
Project Total:	\$ -	\$275,000	\$ 25,000	\$ 25,000	\$150,000	\$ 25,000	\$500,000
<b>1.14 - DPU IT Disaster Recovery Assessment</b>							
Hardware	\$ -	\$ -	\$ 50,000	\$ -	\$ -	\$ -	\$ 50,000
Software	\$ -	\$ -	\$ 25,000	\$ -	\$ -	\$ -	\$ 25,000
Professional Services	\$ -	\$ -	\$ 25,000	\$ -	\$ -	\$ 75,000	\$100,000
Project Total:	\$ -	\$ -	\$100,000	\$ -	\$ -	\$ 75,000	\$175,000
<b>1.15 - LIMS Enhancements and Support</b>							
Hardware	\$ -	\$ -	\$ 25,000	\$ -	\$ 25,000	\$ -	\$ 50,000
Software	\$ -	\$ -	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$100,000
Professional Services	\$ -	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$ 25,000	\$125,000
Project Total:	\$ -	\$ 25,000	\$ 75,000	\$ 50,000	\$ 75,000	\$ 50,000	\$275,000



Projects	FY 2006/7 Year 0	FY 2007/8 Year 1	FY 2007/9 Year 3	FY 2009/10 Year 3	FY 2010/11 Year 4	FY 2011/12 Year 5	Totals
<b>1.16 - DPU Information Portal</b>							
Hardware	\$ -	\$ -	\$ -	\$ 15,000	\$ 20,000	\$ 20,000	\$ 55,000
Software	\$ -	\$ 15,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 10,000	\$ 55,000
Professional Services	\$ -	\$ 40,000	\$ 40,000	\$ 35,000	\$ 35,000	\$ 35,000	\$185,000
<b>Project Total:</b>	<b>\$ -</b>	<b>\$ 55,000</b>	<b>\$ 50,000</b>	<b>\$ 60,000</b>	<b>\$ 65,000</b>	<b>\$ 65,000</b>	<b>\$295,000</b>
<b>1.17 - Project Management System</b>							
Hardware	\$ -	\$ -	\$ -	\$ -	\$ 15,000	\$ -	\$ 15,000
Software	\$ -	\$ -	\$ -	\$ -	\$ 50,000	\$ -	\$ 50,000
Professional Services	\$ -	\$ -	\$ -	\$ -	\$ 25,000	\$ 10,000	\$ 35,000
<b>Project Total:</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 90,000</b>	<b>\$ 10,000</b>	<b>\$100,000</b>
<b>1.18 - Knowledge Management Program</b>							
Hardware	\$ -	\$ -	\$ -	\$ -	\$ 25,000	\$ 25,000	\$ 50,000
Software	\$ -	\$ -	\$ -	\$ -	\$ 40,000	\$ 40,000	\$ 80,000
Professional Services	\$ -	\$ -	\$ -	\$ 35,000	\$ 65,000	\$ 65,000	\$165,000
<b>Project Total:</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 35,000</b>	<b>\$130,000</b>	<b>\$130,000</b>	<b>\$295,000</b>
<b>2.1 - Program Management Office</b>							
Hardware	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Software	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Professional Services	\$ -	\$120,000	\$120,000	\$120,000	\$120,000	\$120,000	\$600,000
<b>Project Total:</b>	<b>\$ -</b>	<b>\$120,000</b>	<b>\$120,000</b>	<b>\$120,000</b>	<b>\$120,000</b>	<b>\$120,000</b>	<b>\$600,000</b>
<b>2.2 - DPU-wide Computer Training</b>							
Hardware	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Software	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
Professional Services	\$ -	\$ 35,000	\$ 35,000	\$ 35,000	\$ 35,000	\$ 35,000	\$175,000
<b>Project Total:</b>	<b>\$ -</b>	<b>\$ 35,000</b>	<b>\$ 35,000</b>	<b>\$ 35,000</b>	<b>\$ 35,000</b>	<b>\$ 5,000</b>	<b>\$175,000</b>
<b>2.3 - Post Implementation Support</b>							
Hardware	\$ -	\$ -	\$ -	\$ -	\$ -		\$ -
Software	\$ -	\$ -	\$ -	\$ -	\$ -		\$ -
Professional Services	\$ -	\$ 25,000	\$ 40,000	\$ 50,000	\$ 50,000	\$ 50,000	\$215,000
<b>Project Total:</b>	<b>\$ -</b>	<b>\$ 25,000</b>	<b>\$ 40,000</b>	<b>\$ 50,000</b>	<b>\$ 50,000</b>	<b>\$ 50,000</b>	<b>\$215,000</b>
<b>Annual Totals</b>	<b>\$ 40,000</b>	<b>\$1,720,000</b>	<b>\$1,210,000</b>	<b>\$ 1,240,000</b>	<b>\$1,485,000</b>	<b>\$1,280,000</b>	<b>\$7,475,000</b>
<b>Cummulative Totals</b>	<b>\$ 40,000</b>	<b>\$2,260,000</b>	<b>\$3,470,000</b>	<b>\$ 4,710,000</b>	<b>\$6,195,000</b>	<b>\$7,475,000</b>	

Hardware	\$ -	\$ 230,000	\$ 135,000	\$115,000	\$200,000	\$110,000	\$ 790,000
Software	\$ -	\$ 415,000	\$ 145,000	\$220,000	\$325,000	\$225,000	\$ 1,330,000
Professional Services	\$ 540,000	\$1,075,000	\$ 930,000	\$905,000	\$960,000	\$945,000	\$ 5,355,000
							\$ 7,475,000

### 7.3 Tactical Plan

The Tactical Plan elaborates on the projects that are recommended for the first 18 months following the completion of this plan (i.e., January, 2007 through June, 2008). From the projects described in Section 6 of this report, these specific projects were selected for early initiation due to the following reasons:

- Priorities set by the ETMP project team
- Budget availability
- Prerequisites for other high priority projects
- Organizational readiness.

This Tactical Plan includes activities and time frames for initiating these projects. The table below lists the projects recommended for initiation in this plan's "Year 0", the remainder of DPU's FY2006-07.

Project	Year	Starting Month	Project Activities	Affected Division(s)
1.1 Maximize Datastream Value to WRF and WTF	2007	February	Analysis, Workshops	WRF, WTF
1.4 Mobile Worker Support	2007	March	Needs Assessment	WRF, WTF, Operations, Construction, Solid Waste
1.6 Enhance DPU SCADA	2007	January	Needs Assessment	WRF, WTF, Operations
1.7 New Budget Planning System	2007	April	Requirements Analysis	Business
1.8 Operations CMMS Enhancements	2007	February	Business Process, Configuration	Operations

For DPU's fiscal year beginning July, 2007, it is anticipated that several other high priority projects will begin. Several of these will be funded from Operating Budget (as opposed to Capital), so cannot be initiated until the beginning of DPU's FY 2007-2008 (beginning July, 2007). The following table lists projects that are expected to begin in this plan's "Year 1", DPU's FY 2007-2008.

Project	Year	Starting Month	Project Activities	Affected Division(s)
1.2 GIS Enhancements	2007	August	Needs Assessment	WRF, WTF, Operations, Construction, Solid Waste

Project	Year	Starting Month	Project Activities	Affected Division(s)
1.6 Performance Metrics	2007	July	Analysis	WRF, WTF
1.10 Integrate SCADA and Laboratory Data	2008	April	Analysis, Acquisition Deployment	WRF, WTF
1.12 Enhanced Technology for Solid Waste Division	2008	October	Analysis, Acquisition Deployment	Solid Waste
1.13 DPU IT Test Lab Environment	2007	August	Analysis, Acquisition Deployment	DPU IT
1.15 LIMS Enhancements & Support	2008	February	Needs Assessment	DPU IT
1.16 DPU Information Portal	2007	September	Analysis, Integration, Deployment	DPU IT

Many of the projects defined for the ETMP are to be implemented in parallel. The interdependencies among projects has been taken into account during the construction of the master project schedule. All projects will utilize the DPU system implementation life cycle, including needs assessments; the gathering and analysis of requirements; acquisition of tools, software and hardware; integration of software components; and deployment and support of solutions.

## 7.4 Implementation Schedule

The list of recommended projects previously identified must each be executed in an organized and concise manner as there are project dependencies and capacity constraints (i.e., the quantity of projects that can be reasonably implemented and absorbed by DPU) that have been considered in the implementation schedule. The schedule below represents a high-level roadmap organized by quarter within fiscal year for the next five years. For each fiscal year, it is recommended that more detailed tactical plans, scopes of work, budgets, and schedules be developed for the Engineering and Technology Improvement Program. These will be elaborated in task orders, budgets, and specific schedules for each project and its component tasks.

The implementation schedule below presents each “Technology Life Cycle” project and the fiscal quarter in which it is scheduled to be active, including both the Short Range and Long Range Plans. The color coding indicates the Phase of DPU’s System Implementation Life Cycle which will be taking place, as follows:

- Yellow – Plan, define, design/select
- Orange – Construct, deploy
- Grey – Support, enhance

- Blue – Multi-year deployments and/or enhancements of existing applications

The “Ongoing Projects” are expected to have activity throughout Years 1 through 5.

### ETMP Update Project Implementation Schedule: “Technology Life Cycle” Projects

Project	Short Range Plan												Long Range Plan										
	2006-07 Year 0		2007-08 Year 1				2008-09 Year 2				2009-10 Year 3				2010-11 Year 4				2011-12 Year 5				
	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	Qtr 1	Qtr 2	Qtr 3	Qtr 4	
1.1 Maximize Datastream Value	Plan, Define, Design																						
1.2 GIS Enhancements			Plan, Define, Design	Construct, Deploy	Support, Enhance	Support, Enhance	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments
1.3 Enhance Citizen Access						Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Construct, Deploy	Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance
1.4 Mobile Worker Support	Plan, Define, Design	Plan, Define, Design	Construct, Deploy	Construct, Deploy	Support, Enhance	Support, Enhance	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments
1.5 Leverage Document Mgmt Technology						Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance
1.6 Performance Metrics			Plan, Define, Design	Plan, Define, Design	Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance
1.7 New Budget Planning System		Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Construct, Deploy	Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance
1.8 Operations CMMS Enhancements	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments
1.9 Construction Inspection Data Mgmt								Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Construct, Deploy	Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance
1.10 Integrate SCADA & Laboratory Data								Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance
1.11 Enhance DPU SCADA	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Construct, Deploy	Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance
1.12 Enhanced Technology in Solid Waste				Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance
1.13 DPU IT Test Lab			Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance
1.14 DPU IT Disaster Recovery								Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance
1.15 LIMS Enhancements					Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Construct, Deploy	Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance
1.16 DPU Information Portal			Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments	Multi-Year Deployments
1.17 Project Management System														Construct, Deploy	Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance
1.18 Knowledge Management System													Plan, Define, Design	Plan, Define, Design	Plan, Define, Design	Construct, Deploy	Construct, Deploy	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance	Support, Enhance

Plan, Define, Design
  Construct, Deploy
  Support, Enhance
  Multi-Year Deployments