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**Office of the City Auditor**

**Audit Report**

**AUDIT OF SELECTED CLIENT SERVER  
GENERAL CONTROLS**  
(Report No. A08-010 )

**May 2, 2008**

**City Auditor**

Craig D. Kinton

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## Executive Summary

Information Technology (IT) general controls are inadequate because the City has not fully developed or implemented policies and procedures addressing these controls in the client server computing environment. Of the seventeen IT general control objectives tested:

- Communication and Information Services Department (CIS) passed three or 18 percent
- Dallas Water Utilities (DWU) passed two or 12 percent
- Park and Recreation (PKR) passed two or 12 percent

Examples of IT General Control areas tested included:

- Physical Security over the data center
- Security Administration requirements, such as,
  - Periodic password changes
  - Periodic review of logs and reports to determine if there were security violations
  - Installation and use of anti-virus software
- Database Administration policies and procedures for maintenance, security, and operations
- Hardware/Software Inventory Management

Without adequate IT general controls, there is no assurance that financial and operational data, residing within the client server computing environment, is adequately processed and protected.

Although CIS is the primary provider of computing technology to the City, CIS is not responsible for all client server operations within the City. For example, the

### Background Summary

#### IT General Control Areas Reviewed

- Organization and management
- Computer operations
- Physical security
- Security administration
- System software support
- Change management
- Database administration
- Inventory management

The City manages over 500 servers and over 7,000 desktop computers in the Client Server environment. CIS, the Information Technology department of the City, fully manages the client server computing environment for many City departments including Court and Detention Services, Library, and CIS. For other departments, such as DWU and PKR, client-server operations are either partially managed by CIS or are completely managed by the department itself.

Supervisory Control and Data Acquisition (SCADA) water distribution system in DWU is exclusively managed by DWU. Certain administrative directives, such as Administrative Directive (AD) 2-24, Computer Security, assign CIS City-wide computing responsibilities. Individual departments, however, retain the responsibility for adhering to the standards outlined in AD 2-24, Computer Security.

The Library and the Department of Court and Detention Services (CTS) rely on CIS for most computer support services. Although CIS provides computer support to these departments, each department is still responsible for ensuring that IT general controls are implemented on their behalf. These departments, however, do not have Service Level Agreements (SLAs) with CIS to ensure that IT general controls are in place. Although DWU and PKR receive more limited CIS computer support services, DWU and PKR also did not have SLAs in place.

IT general controls are the policies, procedures, practices, and organizational structures designed to provide reasonable assurance that business objectives will be achieved and undesired events will be prevented or detected and corrected.

In April 2002, the City Auditor's Office issued *An Audit of the Procedures Governing the Local Area Network and the Wide Area Network*, Report Number 357. Many of the same issues identified in the 2002 report remain unresolved.

## **Summary of Recommendations**

We recommend the Directors of CIS, DWU, and PKR develop and implement policies and procedures that address the seventeen IT general control objectives tested. (See Appendix II – Summary Results of the Review of Selected Client Server General Controls). We also recommend the Directors of CIS, DWU, PKR, Library, and CTS develop and execute SLAs and that the SLAs include provisions to ensure that IT general controls are adequate.

## **Summary of Management's Response**

The Director of CIS prepared the responses for the two recommendations identified in this report. CIS partially agreed with the two recommendations and provided comments with corrective action plans, as well as implementation dates. The complete response is included as Appendix IV to this report.

## **Summary of Objective, Scope and Methodology**

The audit objective was to evaluate selected IT general controls over the City's client server computing environment.

The scope of the audit covered selected IT general control objectives in CIS, DWU, PKR, Library, and CTS. The audit methodology included defining the following IT general control areas: IT organization and management, computer operations, physical security, security administration, system software support, change management, database administration, and inventory management. The audit methodology also included contracting with a certified public accounting firm (firm) to further define how these control areas would be audited. In addition, the firm:

- Interviewed managers and staff from each department to determine the existence and adequacy of controls within their respective departments
- Performed various tests to assess the adequacy of the controls in the areas noted above
- Reviewed policies, procedures, and other documents for evidence of IT general controls

The City Auditor's Office conducted certain audit procedures and supervised the work of the firm.

# Audit Results

## **Overall Conclusions**

The City's client server computing environment manages over 500 servers and over 7,000 desktop computers without adequate Information Technology (IT) general controls because the City has not fully developed or implemented policies and procedures addressing these controls. Without adequate IT general controls, there is no assurance that financial and operational data, residing within the client server computing environment, is adequately processed and protected.

Service level agreements (SLAs) were not executed to ensure IT general controls were in place. Without executed SLAs, there is no basis for ensuring that CIS will provide adequate IT general controls for the departments CIS serves.

## **Section 1: Information Technology general controls are inadequate**

Policies and procedures, which form the basis for effective IT general controls, have not been fully developed or implemented. As a result, the City has no assurance that financial and operational data, residing within the City's client server computing environment, is adequately processed and protected. CIS provides client server support, including IT general controls, for four of the five City departments audited. Although CIS provides IT support to these departments, each department is responsible for ensuring that IT general controls are implemented on their behalf.

Of the seventeen IT general controls tested:

- Communication and Information Services Department (CIS) passed three or 18 percent
- Dallas Water Utilities (DWU) passed two or 12 percent
- Park and Recreation (PKR) passed two or 12 percent

Examples of IT General Control areas tested included:

- Physical Security over the data center
- Security Administration requirements, such as:
  - Periodic password changes

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- Periodic review of logs and reports to determine if there were security violations
- Installation and use of anti-virus software
- Database Administration policies and procedures for maintenance, security, and operations
- Hardware/software Inventory Management

**The detailed results for each control by department are shown in - (Appendix II - Summary Results of the Review of Selected Client Server General Controls.)**

Many of the same issues identified in *An Audit of the Procedures Governing the Local Area Network and the Wide Area Network*, Report Number 357, issued in April of 2002, remain unresolved. The objectives of that audit were to determine the adequacy of the following CIS procedures and controls: environmental and physical security, data security, Local Area Network and Wide Area Network (LAN / WAN) operations, disaster recovery, and change management. The City Auditor's Office recommended that policies and procedures be defined and implemented in several operational areas within CIS.

**Recommendation I:**

We recommend the Directors of CIS, DWU, and PKR develop and implement policies and procedures that address the seventeen IT general control objectives tested. (See Appendix II – Summary Results of the Review of Selected Client Server General Controls). These policies and procedures should follow industry accepted standards, such as Control Objectives for Information and Related Technology (COBIT) and be included in an Administrative Directive (AD).

**Management's Response**

Partially Agree. CIS has fully documented and implemented 11 of the 17 audit controls. CIS will complete the implementation of all accepted COBIT IT general controls by February 2009. CIS has completed formal documentation and implemented industry standard policies and procedures in the areas of:

- Database Management
- Server Build and Maintenance
- Physical Security over the Data Center

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For example, one IT general control objective for computer operations requires critical server data to be backed up to tape or other media and tested to prove recoverability. The City has fully documented and implemented disaster recovery policies and procedures. These policies and procedures are tested semi-annually and include testing tape back-ups for recoverability. CIS's semi-annual disaster recovery test includes critical systems, such as the City's financial and billing systems and the Computer Aided Dispatch (CAD) system. The disaster recovery test also includes file servers and operational data. This testing is conducted offsite as recommended by accepted standards.

In addition, CIS executes certain industry IT controls that protect and manage over 500 servers ensuring the financial and operational data residing within this client server computing environment.

CIS has partnered with DWU to review policies and procedures utilized to support the daily operations of the SCADA system. DWU is in the process of acquiring a new SCADA system because the current system is obsolete. The current SCADA system was never designed to accommodate many of the IT general controls that are customary in newer systems and recommended by COBIT.

When the new SCADA system is implemented, CIS will work with DWU to ensure IT general controls are in place and operating appropriately. CIS will also assist DWU with the implementation of Administrative Directive (AD) 2.24, Computer Security, which assigns CIS citywide computing responsibilities.

CIS has partnered with PKR to review the Parks information management system policies and procedures to ensure that proper IT general controls are in place. CIS will also assist PKR with the implementation of AD 2-24, Computer Security, which assigns CIS citywide computing responsibilities.

## Section 2: Departmental service level agreements have not been executed

The five departments audited have not developed and implemented SLAs to ensure IT general controls are in place and that departmental service level requirements are defined. The table below shows the various levels of computer support CIS provides to each department.

Department	Client Server	Desktop Support	Exceptions
CIS	Complete	Complete	
Library	Complete	Complete	
CTS	Complete	Complete	
DWU	Partial	Complete	SCADA (a)
PKR	None	Partial	Helpdesk only

(a) Supervisory Control and Data Acquisition System (SCADA) that controls the distribution and delivery of treated water throughout the City of Dallas.

Without executed SLAs, there is no basis for ensuring that CIS will provide adequate IT general controls for the departments CIS serves. Also, there is not a clear understanding between the departments and CIS as to the level of service CIS will provide for computing services.

CIS personnel have experience in developing and implementing SLAs; therefore, user departments can request CIS assistance in developing SLAs that ensure that user departments' IT general controls and service delivery requirements are adequately addressed. Departmental SLAs should contain, at a minimum, the following requirements specific to each user department:

- Description of services to be provided (scope of work)
- Percent of time that the service will be provided
- Time period coverage is provided
- Monitoring and reporting of service levels
- Strategy to respond to service level degradation (problem management)
- Change management procedures
- Define penalties for not meeting SLA performance
- User department duties and responsibilities
- Department computing service costs

After the SLA is written, each department must review and approve the SLA to ensure that departmental requirements, including IT general controls, are adequately addressed. The SLAs of all user departments define the level of

support that must be met by the hardware, software, and personnel resources within CIS.

**Recommendation II:**

We recommend the Director of CIS work with the departments to execute SLAs to ensure IT general controls are in place and that departmental service level requirements are defined.

**Management's Response**

Partially Agree. CIS has established Service Level Agreements (SLA) with all City of Dallas Departments in the areas of Desktop Support and Voice / Data services through contracts with CompuCom and AT&T.

CIS is currently performing the following two major initiatives which effect the development of SLAs:

- Consolidating computer support services into CIS
- Replacing mainframe systems

As these initiatives progress, CIS will develop SLAs with the departments as client server systems are acquired and when department computing services are consolidated with CIS. For example, CIS is currently developing an SLA with DWU for SAP (Pay1) and with Dallas Police Department (DPD) and Dallas Fire-Rescue (DFR) for CAD. Each SLA will record a common understanding between CIS and the department regarding services, priorities, responsibilities, and the **level of service** to be provided. These SLAs will address IT general controls and set clear customer relationships and goals, as well as establish a framework for continuous quality improvement.

The full implementation of SLA throughout the City is dependant on the completion of the consolidation and the migration from the mainframe. The migration from the mainframe is dependant on when the financial resources are available to implement those migrations. Therefore, the complete implementation of the SLAs will not be accomplished if these financial resources are not available.

**City Auditor's Follow-Up Comment**

Management states that complete implementation of SLAs will not be accomplished if financial resources are not available for consolidation of computing resources under CIS and migration from the mainframe and, therefore, has not stated a timeline for implementation of this recommendation.

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However, CIS is currently providing support services to departments without clear delineation of roles and responsibilities for establishing and maintaining effective IT general controls. We strongly encourage the timely development of SLAs with departments for existing services. SLAs should be modified as roles and responsibilities or the computing environment change.

## Appendix I

### Background, Objective, Scope and Methodology

#### Background

The City manages over 500 servers and over 7,000 desktop computers that support critical day-to-day operations, including water treatment and distribution, police, and fire services. Additionally, the City's client server computing environment processes thousands of transactions on a daily basis, many of which are secured and protected by various state and federal laws such as the Health Insurance Portability and Accountability Act (HIPAA). To ensure the integrity and reliability of the data that traverses the client server computing environment, controls must be in place to protect and safeguard the data.

A general controls review attempts to gain an overall impression of the controls that are present in the environment surrounding the information systems (IS). These include the organizational and administrative structure of the IS function, the existence of policies and procedures for day-to-day operations, availability of skilled staff, and the overall control environment. It is important for the auditor to obtain an understanding of these foundational controls as they are the basis upon which other controls reside.<sup>1</sup>

Information Technology (IT) general controls assure the proper operation of IT applications and automated controls, as well as controls that help to protect data and programs from unauthorized change. The assessment of key IT general controls is critical to organizations because failures can lead to significant operations disruption, an inability to deliver functionality to support the departments, and could lead to material errors in financial statements.<sup>2</sup>

**Communication and Information Services (CIS).** CIS is an internal services department of the City of Dallas. CIS has three divisions: Communication Services, Information Services, and Business Administration. These divisions provide the following services to City departments:

- Radio, telephone and paging equipment, related maintenance and repair, as well as 9-1-1 / 3-1-1 support services coordination, security, and networks
- Programming, data processing, Local Area Network (LAN), mainframe and client server support, desktop and web support
- Computer system disaster recovery, quality assurance of production programs and production control, budget, and billing

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<sup>1</sup> Information Systems Control Journal, Volume 5, 2002

<sup>2</sup> Guide to the Assessment of IT General Controls Scope Based on Risk

**Court and Detention Services (CTS).** CTS manages and operates the Dallas Municipal Court that adjudicates Class C misdemeanors, provides support as Official Clerk of the Court of Record, directs and manages the activity of the Municipal Court, the Office of the Dallas Marshal and Detention Center, and the incarceration of City of Dallas prisoners at the Dallas County Lew Sterrett Justice Center Facility. CTS has outsourced its client server operations to CIS.

**Water Utilities (DWU).** DWU manages and supports the Supervisory Control and Data Acquisition (SCADA) system that controls the distribution and delivery of treated water throughout the City of Dallas. While DWU has outsourced most of its client server operations to CIS, DWU internally operates and manages all SCADA operations.

**Library.** The Library informs, entertains, enriches, and fosters the self-learning process by facilitating access to its collections, services, and facilities to all members of the community. The Library has outsourced its client server operations to CIS.

**Park and Recreation (PKR).** PKR maintains more than 23,018 park acres, including 13 lakes with 4,400 surface acres of water, 18,618 acres of parkland and 85.5 miles of jogging and bike trails. The information technology section within PKR operates and exclusively manages PKR's client server computing environment.

### **Objective, Scope and Methodology**

This audit was conducted under authority of the City Charter, Chapter IX, Section 3, and in accordance with generally accepted government auditing standards. The audit covered the period of May through July 2007.

The audit objective was to evaluate selected IT general controls over the City's client server computing environment.

The scope of the audit covered selected IT general controls in CIS, DWU, PKR, Library, and CTS. These IT general controls were derived from the industry-accepted Control Objectives for Information and Related Technology (COBIT), Version 4.1, published by the IT Governance Institute.

The audit methodology included defining the following IT general control areas: IT organization and management, computer operation, physical security, security administration, system software support, change management, database administration, and inventory management.

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To assess the condition of the controls implemented in departmental computing environments, we defined the seventeen controls as shown in Appendix II – Summary Results of the Review of the Client Server General Controls.

The audit methodology also included contracting with a certified public accounting firm (firm) to further define how these control areas would be audited. The firm:

- Interviewed managers and staff from each selected department to determine the existence and adequacy of controls within each selected department
- Performed various tests to assess the adequacy of the control in the areas noted above
- Performed a security scan on five servers managed by CIS and on one server each for the Library, CTS, and PKR. Due to technical limitations, a scan of the SCADA system was not performed
- Reviewed policies, procedures, and other documents for evidence of IT general controls

The City Auditor's Office conducted certain audit procedures and supervised the work of the firm.

Appendix II

Summary Results of the Review of Selected Client Server General Controls

		City Departments				
		Dallas Water Utilities	Park and Recreation	CIS	Library	Court and Detention Services
IT General Control Area	IT Control Objective	IT Services Provided In-House by Department			IT Services Outsourced to CIS <sup>1</sup>	
Organization and Management	All IT Department roles and responsibilities should be clearly defined to ensure proper segregation of duties and management oversight.	Fail	Fail	Fail	Fail	Fail
Computer Operations	The IT Department should have current, detailed policies and procedures that provide guidance on operations, management expectations, and common equipment standards.	Fail	Fail	Fail	Fail	Fail
Computer Operations	The IT Department should utilize performance measurement and tuning, system availability, or capacity planning tools and utilities.	Fail	Fail	Fail	Fail	Fail

<sup>1</sup> Services are outsourced to CIS. Results are based on the CIS Pass / Fail test results.

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		City Departments				
		Dallas Water Utilities	Park and Recreation	CIS	Library	Court and Detention Services
IT General Control Area	IT Control Objective	IT Services Provided In-House by Department			IT Services Outsourced to CIS <sup>1</sup>	
Computer Operations-Operations Logs / Audit Trails / Alarms	The IT Department should have a method for logging server errors and the correlating corrective actions taken.	Pass	Fail	Fail	Fail	Fail
Computer Operations	The critical server data should be backed up to tape or other media and tested to prove recoverability.	Fail	Fail	Fail	Fail	Fail
Physical Security	Data center access should be restricted and under the exclusive control of the City.	Fail	Pass	Fail	Fail	Fail
Organization and Management	The critical systems and data ownership responsibility should be assigned for the City's applications and system data.	Fail	Fail	Fail	Fail	Fail

<sup>1</sup> Services are outsourced to CIS. Results are based on the CIS Pass / Fail test results.

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		City Departments				
		Dallas Water Utilities	Park and Recreation	CIS	Library	Court and Detention Services
IT General Control Area	IT Control Objective	IT Services Provided In-House by Department			IT Services Outsourced to CIS <sup>1</sup>	
Security Administration	User passwords should be set to expire in 60 days or less. Administrator or root passwords should be changed every 30 days, if a person leaves employment with the City, or if it is suspected the password has been compromised.	Fail	Fail	Fail	Fail	Fail
Security Administration	Approved / Authorized administrators should be the only personnel with the ability / permission to create and delete accounts.	Fail	Fail	Fail	Fail	Fail
Security Administration	The IT Department should have a recurring practice of reviewing audit trails / reports for security violations.	Fail	Fail	Fail	Fail	Fail

<sup>1</sup> Services are outsourced to CIS. Results are based on the CIS Pass / Fail test results.

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		City Departments				
		Dallas Water Utilities	Park and Recreation	CIS	Library	Court and Detention Services
IT General Control Area	IT Control Objective	IT Services Provided In-House by Department			IT Services Outsourced to CIS <sup>1</sup>	
Security Administration	Standards for server building should be documented, or an automated process should be utilized, to install standard configuration in a secure manner.	Fail	Fail	Fail	Fail	Fail
Security Administration	The City should have a process in place to communicate security practices, changes, and concerns to its users.	Fail	Fail	Fail	Fail	Fail
Security Administration	Anti-virus software should be installed and utilized on all computer and server equipment.	Fail	Fail	Pass	Pass	Pass
System Software Support	A documented procedure should be implemented defining the individuals authorized to install production software updates and the steps that must be completed prior to these updates being installed.	Fail	Fail	Fail	Fail	Fail

<sup>1</sup> Services are outsourced to CIS. Results are based on the CIS Pass / Fail test results.

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		City Departments				
		Dallas Water Utilities	Park and Recreation	CIS	Library	Court and Detention Services
IT General Control Area	IT Control Objective	IT Services Provided In-House by Department			IT Services Outsourced to CIS <sup>1</sup>	
Change Management	A change policy should be implemented to ensure the involvement or notification of operating departments in the implementation of applications and system changes / updates / patches.	Fail	Fail	Pass	Pass	Pass
Database Administration	Policies and procedures for database management should address maintenance, security, and operations.	Fail	Fail	Fail	Fail	Fail
Hardware / Software Inventory Management	Procedures should be implemented to monitor software inventory and review authorization / use of all licenses.	Pass	Pass	Pass	Pass	Pass
Number of Servers Scanned		Due to technical limitations, a scan of the SCADA system was not performed.	One	Five	One	One

<sup>1</sup> Services are outsourced to CIS. Results are based on the CIS Pass / Fail test results.

## Appendix III

### Major Contributors to this Report

Carol Smith, CPA, CIA, CFE, Audit Manager  
Paul T. Garner, Assistant City Auditor  
Tony Aguilar, CISA, Project Manager  
Theresa Doan, Auditor  
Theresa Hampden, CPA, Quality Control Manager

## Management's Response to the Draft Report

**Memorandum**

RECEIVED  
APR 25 2008  
CITY AUDITOR'S OFFICE



DATE: April 23, 2008

TO: Craig D. Kinton, City Auditor

SUBJECT: Audit Report Response – Audit of Selected Client Server General Controls

The Communication and Information Services Department was requested to provide a response to the audit report of selected client server general controls. Our responses to the audit recommendations are as follows:

**Recommendation 1:**

We recommend the Directors of CIS, DWU, and PKR develop and implement policies and procedures that address the seventeen IT general control objectives tested. (See Appendix II – Summary Results of the Review of Selected Client Server General Controls). These policies and procedures should follow industry accepted standards, such as Control Objectives for Information and Related Technology (COBIT) and be included in an Administrative Directive (AD).

Agree       Disagree       Partially Agree

**Management Response / Corrective Action Plan**

CIS has fully documented and implemented 11 of the 17 audit controls. CIS will complete the implementation of all accepted COBIT IT general controls by February 2009. CIS has completed formal documentation and implemented industry standard policies and procedures in the areas of:

- Database Management
- Server Build and Maintenance
- Physical Security over the Data Center

For example, one IT general control objective for computer operations requires critical server data to be backed up to tape or other media and tested to prove recoverability. The City has fully documented and implemented disaster recovery polices and procedures. These policies and procedures are tested semi-annually and include testing tape back-ups for recoverability. CIS's semi-annual disaster recovery test includes critical systems, such as, the City's financial and billing systems and the Computer Aided Dispatch (CAD) system. The disaster recovery test also includes file servers and operational data. This testing is conducted offsite as recommended by accepted standards.

In addition, CIS executes certain industry standard IT controls that protect and manage the over 500 servers ensuring the financial and operational data residing within this client server computing environment.

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CIS has partnered with DWU to review policies and procedures utilized to support the daily operations of the SCADA system. DWU is in the process of acquiring a new SCADA system because the current system is obsolete. The current SCADA system was never designed to accommodate many of the IT general controls that are customary in newer systems and recommended by COBIT.

When the new SCADA system is implemented, CIS will work with DWU to ensure IT general controls are in place and operating appropriately. CIS will also assist DWU with the implementation of Administrative Directive (AD) 2-24, Computer Security, which assigns CIS City-wide computing responsibilities.

CIS has partnered with PKR to review the Parks information management system policies and procedures to ensure that proper IT general controls are in place. CIS will also assist PKR with the implementation of Administrative Directive (AD) 2-24, Computer Security, which assigns CIS City-wide computing responsibilities.

**Implementation Date**

February 2009

**Responsible Manager**

CIO

**Recommendation 2:**

We recommend the Director of CIS work with the departments to execute SLAs to ensure IT general controls are in place and that departmental service level requirements are defined.

Agree       Disagree       Partially Agree

**Management Response / Corrective Action Plan**

CIS has established Service Level Agreements (SLA) with all City of Dallas Departments in the areas of Desktop Support and Voice/Data services through contracts with CompuCom and AT&T.

CIS is currently performing the following two major initiatives which effect the development of Service Level Agreements (SLAs):

- Consolidating computer support services into CIS
- Replacing mainframe systems

As these initiatives progress, CIS will develop SLAs with the departments as client server systems are acquired and when department computing services are consolidated with CIS. For example, CIS is currently developing an SLA with DWU for SAP (Pay1) and with DPD and DFR for CAD. Each SLA will record a

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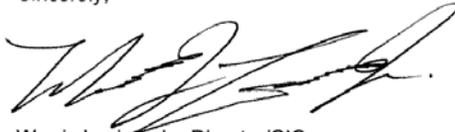
common understanding between CIS and the department regarding services, priorities, responsibilities, and the **level of service** to be provided. These SLAs will address IT general controls and set clear customer relationships and goals, as well as establish a framework for continuous quality improvement.

**Implementation Date**

The full implementation of SLA throughout the City is dependent on the completion of the consolidation and the migration from the mainframe. The migration from the mainframe is dependant on when the financial resources are available to implement those migrations. Therefore, the complete implementation of the SLAs will not be accomplished if these financial resources are not available.

**Responsible Manager**  
CIO

Sincerely,



Morris Levine, Jr., Director/CIO  
Communication and Information Services

C: Ramon Miguez, P.E., Assistant City Manager  
Jody Puckett, Director, Water Department  
Paul Dyer, Director, Parks and Recreation Department  
Gloria Carter, Director, Courts and Detention Services Department  
Laurie Evans, Director, Library

"Dallas, The City That Works: Diverse, Vibrant, and Progressive."