



REPORT TO THE CITY COUNCIL BY THE CITY INTERNAL AUDITOR

AUDIT OF THE DEPARTMENT OF ENGINEERING AND ENVIRONMENTAL SERVICES, GEOGRAPHIC INFORMATION SYSTEMS (GIS) SECTION

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INTERNAL AUDIT REPORT (IAR) 100021-02

March 31, 2021



Leanis L. Steward
City Internal Auditor

Report Highlights	Page(s)
• Review user list quarterly	7
• Improve dataset layers	9
• Implement performance measures	11



The Council
City of Shreveport

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March 31, 2021

Councilman James Flurry
Chairman, Shreveport City Council

Dear Councilman Flurry:

Subject: IAR 100021-02 – Audit of the Department of Engineering and Environmental Services, Geographic Information System (GIS) Section

Attached please find the report mentioned above. Management comments are included in the report.

Sincerely,

Leanis L. Steward, CPA, CIA
City Internal Auditor

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EXECUTIVE SUMMARY

AUDIT OF THE DEPARTMENT OF ENGINEERING AND ENVIRONMENTAL SERVICES, GEOGRAPHIC INFORMATION SYSTEMS (GIS) INTERNAL AUDIT REPORT (IAR) 100021-02

Why We Did This Audit

We have completed an audit of the Geographic Information Systems (GIS) Section within the Engineering and Environmental Services Department. This audit was conducted as one of our regularly scheduled audits included in the Annual Audit Plan developed by the City Internal Auditor. Our objectives were to determine if controls are effective to prevent unauthorized access, determine compliance with policies and procedures, and evaluate that operations are efficient and effective regarding utilizing GIS.

What We Recommended

We recommend that GIS:

- Review user list quarterly
- Create internal policies and procedures
- Create a citywide data policy
- Improve dataset layer list
- Implement performance measures
- Update webpage

Performance Audit: Engineering and Environmental Services, Geographic Information Systems (GIS)

What We Found

Geographic Information Systems (GIS) is a computer system tool that allows geographic and spatial data to be viewed visually using maps and 3D scenes. The GIS Section was established to help manage government resources and city projects efficiently and effectively. The GIS Section layers information (e.g., police districts, council districts) in a map-based environment to provide a visual image of locations, patterns, and relationships. Maps are produced on a request basis. From 2019-2020, the GIS Section produced 77 maps delivered in digital or printed format for city staff and citizens.

In conducting this audit, we have identified the following areas that need improvement:

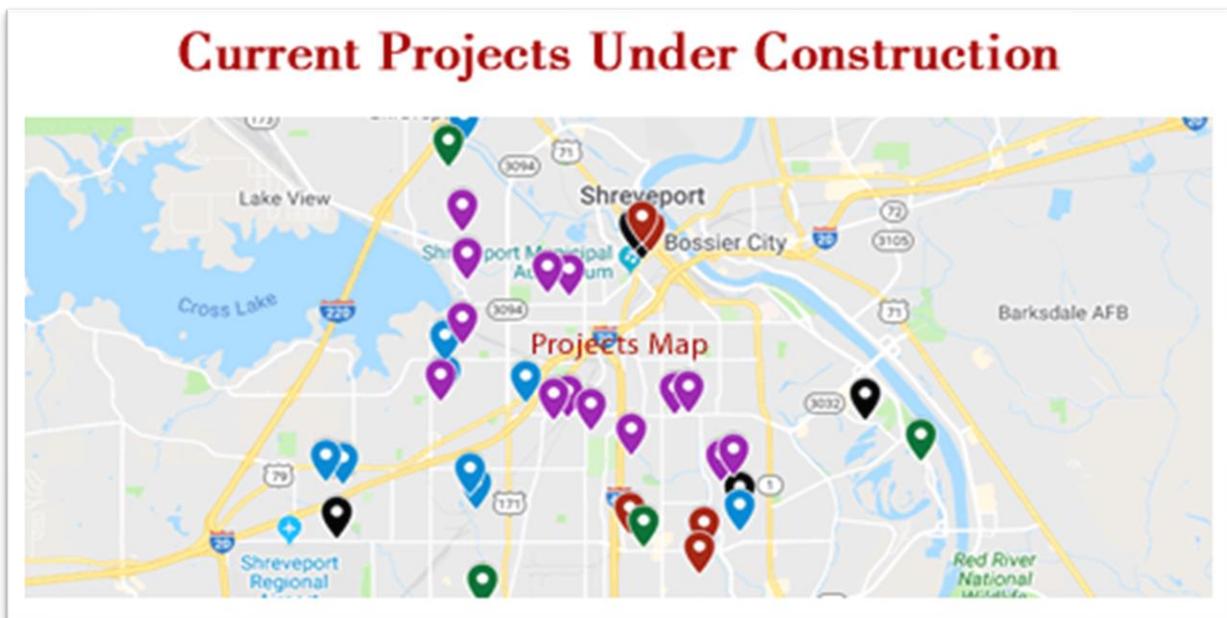
- **The user list should be reviewed more frequently**
- **There are no policies and procedures**
- **There are no performance measures**
- **GIS website interface could be improved**

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Introduction

Geographic Information System (GIS) is a computer information system that allows data to be visualized through maps and integrated based on geographic landscapes. The GIS Section utilizes Esri ArcGIS software to prepare and create different layers, to add to basemaps. The software is utilized not only in the GIS Section but also in various departments across the City for uses such as mapping information regarding annexations, flood zones, garbage collection routes, parks, police districts, neighborhoods, sewer, etc. The Geographic Information System (GIS) Section within the Engineering and Environmental Services Department is responsible for reviewing, analyzing, and managing the data layers. The GIS Section creates standard and custom maps on request and maintains intranet and internet interactive map services for internal staff and the public. Also, the GIS Section creates updates and maintains all city GIS utilities and political boundaries, educates other city departments in the use of GIS technology, creates custom applications for other departments (e.g., Water & Sewerage, Public Works, Fire), and acts as a GIS liaison between IT and other city departments. The GIS tool can support various work processes that allow departments to digest information quickly. For example, Engineering utilizes GIS software to track the locations of numerous drainage and roadway projects within the City; see below the current project list created by GIS staff:



Source: City of Shreveport Website

The objectives of this audit were to:

- Determine if controls are effective to prevent unauthorized access
- Determine compliance with policies and procedures
- Evaluate if operations are efficient and effective regarding utilizing GIS



Recommendation Evaluation Risk Criteria

This report contains five findings with six recommendations. The chart below summarizes our evaluation of risk for the recommendations outlined in the report. Each recommendation was assessed a high, medium, or low risk level based on a qualitative assessment of exposure and/or corrective action priority.

Risk Levels	Recommendations
<p>High Risk</p> <p>Represents a significant level of risk exposure to city assets, public safety, or achievement of objectives or mission. Corrective action should have the highest priority.</p>	<ul style="list-style-type: none"> ➤ Establish adequate internal controls to prevent unauthorized online access. <u>(Finding: Online User unauthorized access)</u>
<p>Medium Risk</p> <p>Represents a moderate level of risk exposure to the city from extensive operating inefficiencies or high-level non-compliance issues. Corrective action should occur expeditiously.</p>	<ul style="list-style-type: none"> ➤ Implement policies and procedures to reflect current operations. <u>(Finding: Implement policies and procedures)</u> ➤ Create citywide policy regarding data creation, collection, and maintenance. <u>(Finding: Improve dataset layers information)</u> ➤ Improve dataset layers list to include essential information. <u>(Finding: Improve dataset layers information)</u> ➤ Establish and track performance measures to determine the efficiency and effectiveness of the utilization of the GIS system. <u>(Finding: Implement performance measures)</u>
<p>Low Risk</p> <p>Represents a minimal level of risk exposure to the city from inefficiencies or low-level non-compliance issues. Corrective action should occur as appropriate.</p>	<ul style="list-style-type: none"> ➤ Update GIS webpage user interface. <u>(Finding: Enhance GIS webpage)</u>



Scope and Methodology

The scope of this audit was limited to the Engineering and Environmental Service Geographic Information System (GIS) Section. The period reviewed was January 2019 – December 2020. To answer our objectives, we reviewed relevant internal controls and developed audit procedures that included, but were not limited to, the following:

- Interviewing GIS staff to enhance understanding of the process
- Interacting with ArcGIS software
- Reviewing City Ordinances and regulations
- Reviewing and performing test work on files and any other applicable documentation

We conducted this performance audit in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

The Internal Audit Office expresses appreciation to the management and personnel of the Engineering and Environmental Services, Department GIS Section for their cooperation and assistance provided during the audit.





FINDINGS AND RECOMMENDATIONS



Objective: Determine if controls are effective to prevent unauthorized access

Online user unauthorized access

According to City of Shreveport Data Security Policy User Agreement, individuals using the City of Shreveport information systems are prohibited from gaining unauthorized access to any other information systems or in any way damaging, altering, or disrupting the operations of these systems. Likewise, workers are prohibited from capturing or otherwise obtaining passwords, encryption keys, or any other access control mechanism which could permit unauthorized access.

GIS ArcGIS software can be accessed in two ways, desktop portal (intranet) and online. Having access entails the availability for users to produce or view maps on the city resources. Terminated employee's user credentials should be deactivated to limit unauthorized access. We found nonemployee's that were still listed as active on the user list for online use. Therefore, we recommend:

Recommendation 1: Implement and disseminate guidelines pertaining to user status changes and how to inform the GIS Administrator of changes so the list can be updated in real-time instead of on an annual basis. Review user list on a quarterly basis to mitigate nonemployee's still having system access.

Management Response:

Recommendation 1: Once an employee has left the City, he/she no longer has access to the GIS Portal or Desktop because they are not able to login to a City computer, which is behind the City's firewall. We do agree that the GIS Administrator needs to be informed of an employee (that has GIS access) who has left the City so he/she can be removed from the GIS system. Also, the GIS user list is now being tracked and updated more frequently (monthly).

Due Date: 1 Year or More





Objective: Determine compliance with policies and procedures

Implement Policies and Procedures

Policies and procedures are essential as they provide a roadmap for day-to-day operations within an organization. An established policies and procedures manual could be a benefit as it is utilized to provide clarity to daily workflows, staff compliance, and overall environment productivity. Some guidelines that can be included in the policy and procedure manual are, but not limited to:

- Inclusions of goals and objectives
- Daily Workflow procedures
- Data guidelines requirements
- Data Request Processes

It would be impossible to cover all situations; however, the document should be comprehensive. We found no such document in circulation within GIS. To improve workflow environment, we recommend:

Recommendation 2: Develop and implement an effective policies and procedures manual.

Management Response:

Recommendation 2: We agree and have developed a Standard Operating Procedures manual for Engineering that will include GIS workflows, data/map request processes, and data update guidelines for GIS.

Due Date: 1 Year or More



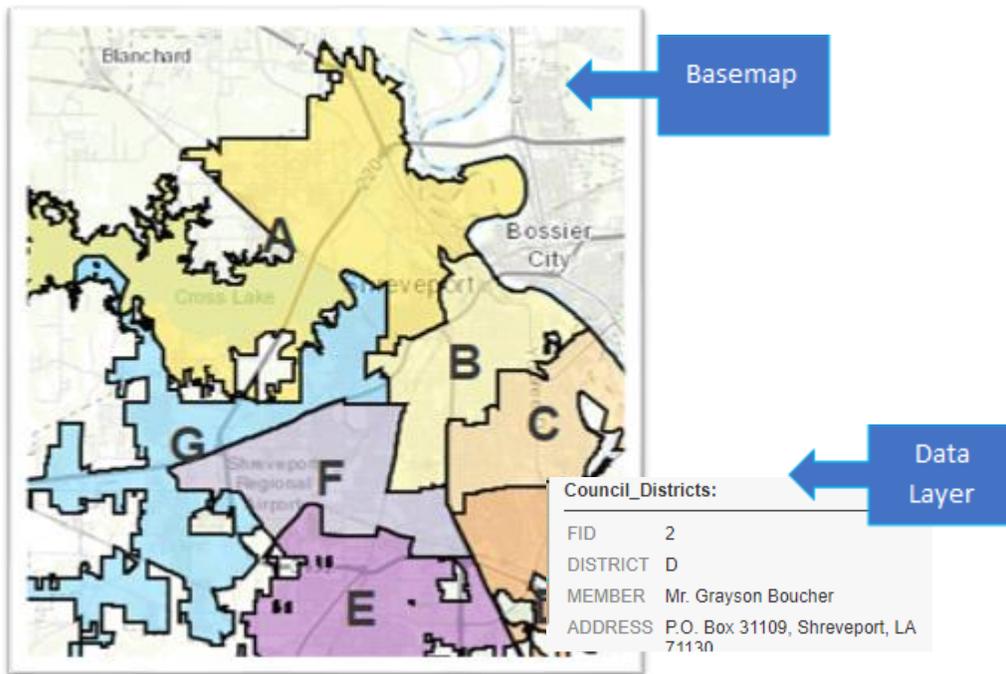


Objective: Evaluate operations are efficient and effective regarding utilizing GIS

Improve Dataset Layers Information

GIS data quality is important “to ensure reliability of the data and avoid duplication of effort and redundancy, effective programs publish maintenance schedules describing when and how the data will be maintained.”- Federal Geographic Data Committee

The GIS tool allows an individual to visualize information on maps. The current GIS organizational structure is hybrid. It is both centralized (end-user can request data from the GIS Administrator) and decentralized (the GIS tool can be used at the departmental level). The GIS software that is used is Eris ArcGIS. The GIS Section is not responsible for the basemaps; Eris provides the basemaps, and the dataset can vary depending on the source. The dataset is displayed on the basemap as a layer. Eris ArcGIS works by allowing data to be entered into the system, which then produces data layers that are included in a basemap for visualizations. See below example of Council Districts:



Source: City of Shreveport Website

The GIS Administrator currently maintains 141 data layers. These layers can be used in the GIS application to effectively manage and coordinate several City functions such as Water and Sewerage, Land, and Public Works. The data within these layers can be provided from multiple sources. It is vital for these data layers to be updated in an attempt to keep information as accurate as possible. We noted the list provided regarding the layers did not include essential information such as update frequency, layer descriptions, or who was



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responsible for providing updates to the data. We also identified that there were no city-wide standards for data collection, creation, and maintenance.

To effectively use the GIS tool and to have information readily available, we recommend:

Recommendation 3: a) Implement city-wide standards regarding data creation, collection, and maintenance. b) We also recommend updating the layer list to include essential information to help improve and track updates regarding the GIS layers.

Management Response:

Recommendation 3:

a) We agree that city-wide standards regarding data creation, collection, and maintenance should be implemented. We have developed a Standard Operating Procedures manual for Engineering that will include GIS.

b) We agree that the GIS layers should include information about update frequency. This will need to be added to the metadata for each layer that is missing this information.

Due Date a: 1 Year or More

Due Date b: 1 Year or More





Implement Performance Measures

Establishing performance measures can help management determine the success of number of maps requested by council or citizens, staff use, and verifying if overall objectives are met. In this case, the GIS mapping tool is the tool/resource in question.

We found that there were no performance measures implemented for the years 2019-2020, so we could not determine if the GIS tool was used to its maximum capabilities. To help improve overall operations of the use of GIS, we recommend:

Recommendation 4: Create, implement, and track performance measures to help determine if the GIS system is being utilized to its maximum capabilities and if objectives are being achieved efficiently and effectively.

Management Response:

Recommendation 4: We agree that performance measures should be created and implemented to track the progress, utilization, and capabilities of GIS.

Due Date: 1 Year or More





Enhance GIS Webpage

Internet use has grown expeditiously and will continue to grow. City Governments have a fundamental role in providing useful and readily available information to citizens. And those organizations involved in optimizing service and visibility have created websites detailing information about their organizations and services within the digital space.

We identified that the GIS webpage could be more informative and the map on the site was last updated in 2016. GIS site does not include contact information, a description of GIS section, services provided such as requesting a map, or a disclaimer regarding the maps (e.g., "DISCLAIMER: The City of Shreveport assumes no responsibility or legal liability for the accuracy, completeness, reliability, timeliness, or usefulness of any information available on any map..."). A disclaimer is needed to help protect against legal claims. We also noted the accessibility is limited to the webpage. To improve public information, we recommend:

Recommendation 5: Explore ways to engage citizens such as mobile mapping or updating GIS webpage so that it is more informative and visually appealing.

Management Response:

Recommendation 5: We agree that the GIS webpage should be updated to include a GIS description, contact information, and more informative, visual appealing maps. We will research what other municipalities and organizations are doing for online GIS information, and will work to improve the webpage. Currently, the GIS disclaimer is added to all maps, and will need to be on the webpage.

Due Date: 1 Year or More

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City Internal Auditor

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- c: City Council
- Clerk of Council
- Mayor
- Chief Administrative Officer
- Carr Riggs and Ingram
- City Attorney
- Director of Engineering