

AUDIT REPORT

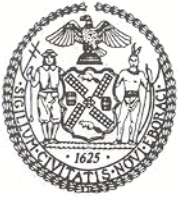


CITY OF NEW YORK
OFFICE OF THE COMPTROLLER
BUREAU OF FINANCIAL AUDIT
WILLIAM C. THOMPSON, JR., COMPTROLLER

Audit Report on the Development and Implementation of the West Nile Virus Integrated Data Management System By the Department of Health

7A03-072

April 2, 2003



THE CITY OF NEW YORK
OFFICE OF THE COMPTROLLER
1 CENTRE STREET
NEW YORK, N.Y. 10007-2341

WILLIAM C. THOMPSON, JR.
COMPTROLLER

To the Citizens of the City of New York

Ladies and Gentlemen:

Pursuant to Chapter 5, Section 93 of the New York City Charter, we have performed an audit on the development and implementation of the Department of Health and Mental Hygiene's West Nile Virus Integrated Data Management System. The system supports the Department's programs responsible for the surveillance and control of the West Nile virus and is the first component of a two-phase comprehensive disease control management system, which will support other environmental disease related surveillance activities. The results of our audit, which are presented in this report, have been discussed with officials from Department of Health and Mental Hygiene, and their comments have been considered in preparing this report.

Audits such as this provide a means of ensuring that City agencies are developing computer applications in an efficient, timely and cost-effective manner.

I trust that this report contains information that is of interest to you. If you have any questions concerning this report, please contact my audit bureau at 212-669-8929 or e-mail us at audit@Comptroller.nyc.gov.

Very truly yours,

A handwritten signature in cursive script that reads 'William C. Thompson, Jr.'.

William C. Thompson, Jr.

WCT/GR

Report: #7A03-072
Filed: April 2, 2003

*The City of New York
Office of the Comptroller
Bureau of Financial Audit
EDP Audit Division*

**Audit Report on the
Development and Implementation of the
West Nile Virus Integrated Data Management System
By the Department of Health**

7A03-072

Audit Report in Brief

The Comptroller's Office performed an audit on the development and implementation of the Department of Health and Mental Hygiene's West Nile Virus Integrated Data Management System. The system supports the Department's programs responsible for the surveillance and control of the West Nile virus and is the first component of a two-phase comprehensive disease control management system, which will support other environmental disease related surveillance activities.

Audit Findings and Conclusions

Our audit found that the West Nile Data System allows for future enhancements and upgrades; and the Department satisfactorily complied with PPB procurement regulations. However, despite the Department's following a system development methodology and using a quality assurance procedure during the development of West Nile Data System:

- six out of the 58 initial business and system requirements were not met;
- one module is now being developed as part of another system; and
- eight of the ten users who responded to our user satisfaction survey stated that they would like to see changes made to the system.

Audit Recommendations

To address these issues, we recommend that the Department should:

- Ensure all remaining initial requirements are completed at no more than the allotted cost; and
- Meet with system users to assess their needs and to ensure that their concerns are addressed.

INTRODUCTION

Background

The Department of Health and Mental Hygiene (the Department) was created in 2002 by a merger of the City's Department of Health and Department of Mental Health, Mental Retardation and Alcoholism Services. The Department's mission is to promote and protect the health and mental health of all City residents through enforcement of City health regulations.

In April 1999, when the first major outbreaks of the West Nile virus appeared in New York City, the Department began the process of creating a comprehensive disease control management system. The West Nile Virus Integrated Data Management System (West Nile Data System), the focus of this audit, is the first component of the proposed two-phase system. The Disease Surveillance System, which will be developed during the second and final phase of this effort, will support other environmental disease related surveillance activities. In 2001, the Department hired Environmental Systems Research Institute, Inc. (ESRI) to develop the West Nile Data System.

The West Nile Data System supports the efforts of the Department's programs responsible for the surveillance and control of the West Nile virus. The West Nile Data System facilitates the complex workflow of mosquito and bird surveillance, collection and testing, as well as efforts to eliminate standing water. The system's geographic information systems component uses the citywide NYCMap, a geographic computer program assembled by the Department of Information Technology and Telecommunications, to automatically map each report of a dead bird or standing water. This enables the Department to quickly respond to such reports, thereby, reducing the potential risk to the public.

The West Nile Data System also enables the Department to respond more quickly to reports of dead birds and standing water from the general public. The customer service component of the system generates work orders to City agencies and letters or e-mails of response to the public, keeping New Yorkers informed about the status of their reports. In addition, electronic reporting of laboratory tests and standing water work orders facilitate quicker tracking and response to the public.

The West Nile Data System is web-based and is accessible to various interacting federal, State, and City agencies, including the New York State Department of Health, the New York State Department of Environmental Conservation, and federal Centers for Disease Control and Prevention (CDC).

The total cost for the comprehensive disease control management system was projected at \$3 million. The cost for the West Nile Data System phase was estimated at \$1.8 million of which \$1,767,411 has been spent, to date.

Objectives

The audit's objectives were to determine whether the West Nile Data System:

- was developed in accordance with a structured systems development methodology;
- meets the initial business and system requirements;
- is designed to allow for future enhancements and upgrades;
- as a finished product, will meet overall goals as stated in the system justification; and,
- was procured in compliance with Procurement Policy Board (PPB) Rules.

Scope and Methodology

Audit fieldwork was conducted from August 2002 through November 2002. To achieve our audit objectives we toured the data center, interviewed Department staff and observed various entries and inquiries being made, conducted a user survey, and reviewed and analyzed the West Nile System specifications, procedures, and other System documentation.

We used Comptroller's Internal Control and Accountability Directive 18, *Guidelines for the Management, Protection and Control of Agency Information and Information Processing Systems*, and New York City Procurement Policy Board Rules as criteria for this audit. As the City does not have a formal System Development Methodology, we also used the National Institute of Standards and Technology Special Publication #500-233, *A Framework for the Development and Assurance of High Integrity Software*, to assess whether a system development methodology had been followed.

This audit was conducted in accordance with Generally Accepted Government Auditing Standards (GAGAS) and included tests of the records and other auditing procedures considered necessary. This audit was performed in accordance with the City Comptroller's audit responsibilities, as set forth in Chapter 5, § 93, of the New York City Charter.

Agency Response

The matters covered in this report were discussed with Department officials during and at the conclusion of this audit. A preliminary draft report was sent to Department officials and discussed at an exit conference held on January 30, 2003. On February 20, 2003, we submitted a draft report to Department officials with a request for comments. We received a written response from the Department on March 6, 2003. The Department agreed with the audit's findings and recommendations stating:

“We are pleased with this report. It confirms that the system allows for future enhancements and upgrades, was procured in compliance with PPB regulations, and used a system development methodology and a quality assurance procedure. Most significant for a project of this urgency, complexity and importance, the audit found that 52 of 58 business requirements were met. As the auditors were informed, the remaining requirements are either being met in other ways or are in the process of being delivered.”

The full text of the Department’s comments is included as an Addendum to this final report.

**OFFICE OF THE CITY COMPTROLLER
NEW YORK CITY
DATE FILED: April 2, 2003**

Findings

The West Nile Data System allows for future enhancements and upgrades; and the Department satisfactorily complied with PPB procurement regulations. However, despite the Department's following a system development methodology and using a quality assurance procedure during the development of West Nile Data System, six out of the 58 initial business and system requirements were not met, and one module is now being developed as part of another system. In addition, eight of the ten users who responded to our user satisfaction survey stated that they would like to see changes made to the system.

Not All System Requirements Were Delivered

The Department accepted the West Nile Data System and paid ESRI \$1.767 of the \$1.8 million contracted despite the fact that ESRI did not deliver four of the 58 requirements. These components are part of the Veterinary Surveillance Module, which according to the vendor's proposal should have been completed by November 2001.

In addition, the original project definition and the vendor's proposal included plans to connect the West Nile Data System with NYC.GOV. The remaining two undelivered requirements dealt with this connection. The purpose was to allow the general public to report sightings of dead birds and standing water, and to check City plans for spraying at specific sites. However, the Department could not obtain Department of Investigation approval of the Internet connection in time for the release date of the system. Instead, the Department manually posts current announcements and spray zone maps on the Internet and the public can contact the Department through its web site to report sightings of dead birds and standing water.

Furthermore, the human surveillance module, as described in the project definition for phase one, was intended to have New York City hospitals interact with the West Nile Data System to report potential human West Nile virus cases. These reports would enhance the tracking of the virus and prompt testing and spraying at pertinent sites. According to the vendor, the specifications for this component were "too vague to provide a scope for at this time." At the exit conference, Department officials stated that although this module was included in the project definition, they did not intend for it to be developed with the rest of the West Nile Data System. According to Department officials, this module is currently being developed for the Communicable Disease Surveillance System (formerly PRIME).

Table I lists the general and detailed system and business requirements and their implementation status.

Table I

West Nile Data Management System and Business Requirements

System Requirements (West Nile Project Definition)	Delivered
Capture spatial info, including geographic polygons and street route buffer zones	Yes
Tie reporting incidents to polygons, i.e., to generate polygons for new areas and to automatically layer subsequent reports within the polygon	Yes
Ability of users to add layers, define timeframes, and shift boundaries of maps as necessary	Yes
Automation of entire data transfer process (elimination of paper forms and key entry)	Yes
Ability to add and remove fields and to drop down list items	Yes
Generate reports and insert appropriate fields to create forms	Yes
Ability to populate certain fields automatically	Yes
Translate web form data directly to database	Yes
Supervisor approval buttons on all data entry forms as a prerequisite to data storage	N/A
Accommodation of up to 300 simultaneous users at diverse NYC locations	Yes
Identification of key mapping fields (building number, street name, suffix, etc.)	Yes
Ability to geo-code by all addresses submitted by longitude and latitude	Yes
Ability to share data with external entities by generating reports for response by those entities	Yes
Users to run queries	Yes
Recognition of duplicate data entry	Yes
Where applicable, archive tables with source and date of original record, including for all subsequent modifications	Yes
Role-based authentication and user security/login system	Yes
Data export and import	Yes
Table maintenance/administrative functions	Yes
The system must provide a way to store spatial data directly in the database tables	Yes
The system must be compatible with Arc View 3.2	Yes
The system must allow the use of Arc View data types (point, multi-point, polygon, and line data)	Yes
Publish maps to the Department's Intranet web site	Yes
Provide real time geo-coding of addresses using the Dept.'s ETAK database	Yes
Business Requirements (ESRI Proposal)	
Centralized GIS database: Spatially enabled SQL server	Yes
WNV project and public database	No
Lab staff to update records via project web page	Yes
Data will be exchanged with Statewide Health Info Network System and exported to CDC's secure data network for WNV	Yes
System to automatically identify when mosquito or larval control may be needed	Yes
System to generate a report/spray plan	Yes
Spray plans to also be published on public web site so citizens will be able to check a location against the plan	No
Field data samples from vets and the public into the WNV web site to track info about samples from various agencies and to provide info. Support for control and reporting to CDC	Yes
Internal maps and reporting	Yes
Data Analysis: Desktop GIS	Yes
System to provide timely info to public and to accept dead bird and standing water reports	Yes
Save time in data processing	Yes
Higher integrity of WNV surveillance and control data	Yes
Enable early response to WNV presence	Yes
Improves access to information	Yes

Dead Bird Surveillance Requirements	
Enter complaints (record) into the system.	Yes
Duplicate Checking	Yes
Lab Analyses and Control Decision	Yes
Generate a work order	Yes
Callback/Acknowledgement letter	Yes
Update records in system at anytime	Yes
Veterinary Surveillance Requirements (as of 11/02)	
Enter the record into the system	Yes
Analyze HIN Extract (Identify each record as equine/non-equine)	No
Print non-equine HIN records to a report	Yes
Analyze each of the equine HIN records to determine whether it is new or existing	No
Review data completeness, create a new record, and geo-code	Yes
Update the existing record with test results	Yes
Enter test results into the system	Yes
Vet/owner callback	No
Management reports	No
Update records in the system at any time	Yes
Management Reporting Requirements	
Daily Report	Yes
Weekly Report	Yes
Mayor's Report	Yes
Map-based reporting via web based on analysis of current WNV data and Citywide GIS data layers: User Interaction Panels, Rapid Response Toolbar, Layer Manager, Map Viewer	Yes

User Satisfaction

As of November 26, 2002, there were 11 primary system users. Ten of these users responded to our survey. Two users reported being very happy with the system, seven reported being somewhat happy, and one user was unhappy with the system. The eight users who were somewhat happy or unhappy with the system reported that the information displayed on screens is somewhat easy to work with, but that screen format and information flow could be enhanced. Five users believed that the data output of the system is mostly accurate, while the other five believe it is accurate some of the time. Only four of the users believe that the systems reporting capabilities meets their needs, while two stated that their needs are not being met. Three of the remaining four users are marginally satisfied with the systems reporting capabilities—the other user reported not using the system's reports.

Recommendations

The Department should:

1. Ensure all remaining initial requirements are completed at no more than the allotted cost.
2. Meet with system users to assess their needs and to ensure that their concerns are addressed.

Agency Response: “DOHMH agrees with both recommendations.”

THE CITY OF NEW YORK
DEPARTMENT OF HEALTH AND MENTAL HYGIENE
OFFICE OF THE COMMISSIONER



125 WORTH STREET, CN-28
NEW YORK, NY 10013
NYC.GOV/HEALTH

THOMAS R. FRIEDEN, M.D., M.P.H.
COMMISSIONER
TEL (212) 788-5261
FAX (212) 964-0472

March 6, 2003

Greg Brooks
Deputy Comptroller for Policy, Audits, Accountancy & Contracts
The City of New York Office of the Comptroller
Bureau of Audits
1 Centre Street, Room 530 South
New York, New York 10007-2341


Dear Mr. Brooks:

The Department of Health and Mental Hygiene (DOHMH) is responding to the draft audit report on the Development and Implementation of the West Nile Virus Integrated Data Management System.

We were pleased with this report. It confirms that the system allows for future enhancements and upgrades, was procured in compliance with PPB regulations, and used a system development methodology and a quality assurance procedure. Most significant for a project of this urgency, complexity and importance, the audit found that 52 of 58 business requirements were met. As the auditors were informed, the remaining requirements are either being met in other ways or are in the process of being delivered.

Attached is a more detailed response to the findings. We agree with the two recommendations of the auditors, that we receive all promised system components at the contract price, and that we consult with users to address their needs and increase user satisfaction with the system.

We appreciate the courtesy and professionalism of your audit staff in the performance of this audit. If you have any questions or need further information, please contact Charles Troob, Assistant Commissioner, Business Systems Improvement at (212) 788- 4757.

Sincerely,

Thomas R. Frieden, M.D., M.P.H.
Commissioner

cc: Vince Liquori, Assistant Director for Support Services

TRF/ct

Response to audit report 7A03-072

Audit Report on the Development and Implementation of the West Nile Virus Integrated Data Management System by the Department of Health

Finding: Not all system requirements were delivered

The draft report states that “the Department accepted the West Nile Data system and paid the vendor \$1.767 of the \$1.8 million contracted despite the fact that ESRI did not deliver four of the 58 requirements.” Reference is made to the vendor proposal, which stated that the four components “should have been completed by November 2001.”

- It has been mutually agreed upon by DOHMH and the vendor that the delivery of these requirements will be provided at the original contract price.
 - Three of the four modules have been delivered since the auditors completed their fieldwork.
 - With the exception of the veterinary management reports, all of the veterinary module deliverables have now been delivered and accepted.
- The November 2001 delivery date for these components was part of the vendor proposal, but was changed as a result of the negotiation process.
 - In order to have the system available in time for the 2001 WNV season, the development of the West Nile Virus Integrated Surveillance System required a rapid application development approach. The original proposal timeline submitted to DOHMH extended beyond DOHMH time requirements for several functions, notably larviciding and mosquito surveillance operations. As a result, DOHMH negotiated with the vendor for the more rapid delivery of critical components in support of these activities, in exchange for an extension in time for the completion of the veterinary modules.

The two other business requirements referenced as not being met relate to the provision of an application for public WNV reporting, to be made available through NYC.gov.

DOHMH originally planned to provide public reporting over the Internet, using a map interface containing detailed orthophotos, or digital images of New York City.

- DOHMH received these deliverables from the vendor, but did not obtain the necessary DOI approvals to implement these requirements during the 2001 WNV campaign.
- Currently, DOHMH is reviewing the overall approach, due to public security concerns related to the use of digital orthophotos of New York City.

Finding: User Satisfaction

The auditors obtained survey results from ten of eleven primary systems users. The survey indicated that most users felt that the system could be improved.

General systems development, and in particular, the West Nile Virus Surveillance System, are continually evolving to meet changing user needs, as part of a continuous improvement process. DOHMH is satisfied with the results of the user satisfaction survey conducted by the Comptroller, and will use the outcomes of this study to further identify and meet the needs of the system users.

- User group meetings for the West Nile Virus Surveillance system take place at least once a month.

Recommendations

The draft audit makes the following recommendations:

“The Department” should:

1. Ensure all remaining initial requirements are completed at no more than the allotted cost.
2. Meet with system users to assess their needs and to ensure that their concerns are addressed.”

DOHMH agrees with both recommendations.