

ABSTRACT

REBECCA LEE TOOLY. Environmental Auditing in the Public Sector. (Under the direction of DR. RICHARD N. ANDREWS)

The environmental auditing concept is widely used in the private sector but rarely used in the public sector. A comparison is made of environmental auditing in the private industrial setting with environmental management in the public sector. Many of the potential benefits from implementing an audit program are shared by the private and public sectors. The benefits of environmental auditing in the public sector are outlined. This investigation examines the suitability of applying the environmental auditing concept to a water and wastewater utility. The results of the analysis are generalized to the public sector in general.

TABLE OF CONTENTS

	Page
LIST OF TABLES	vi
I. INTRODUCTION	1
Environmental Auditing in Historical Perspective . .	1
Basic Elements of an Auditing Program	4
Application of the Environmental Auditing Concept in the Public Sector	5
II. POTENTIAL BENEFITS OF AN ENVIRONMENTAL AUDITING PROGRAM IN THE PUBLIC SECTOR	6
III. COMPARISON OF ENVIRONMENTAL AUDITING IN THE PRIVATE INDUSTRIAL SETTING WITH ENVIRONMENTAL MANAGEMENT IN THE PUBLIC SECTOR	10
IV. INSTITUTIONAL ORGANIZATION IN WATER SUPPLY AND WASTEWATER UTILITIES	16
V. CONCEPTUAL FRAMEWORK OF AN ENVIRONMENTAL AUDITING PROGRAM.	21
Management Functions	21
Selecting the Audit Team	21
Defining the Scope of the Audit - Audit Protocol .	23
On-Site Auditing Activities	26
(1) Understanding Internal Management Systems and Procedures	26
(2) Assessing Strengths and Weaknesses	27
(3) Gathering Audit Evidence	27

(4) Evaluating Audit Findings	28
(5) Reporting Audit Findings	28
Follow-Up	29
VI. ENVIRONMENTAL AUDITING APPLIED TO A PUBLIC WATER SUPPLY AND WASTEWATER FACILITY	30
Environmental Regulations That Affect the Operations of a North Carolina Municipal Water and Wastewater Utility	30
Case Example - Orange Water and Sewer Authority, Chapel Hill, N.C.	35
(1) North Carolina Water Resource Legislation That Affects OWASA's Operations	35
(2) Focus of an Environmental Audit Program for OWASA-Regulatory Compliance and Performance Evaluation	35
(3) Assessing Existing Internal Environmental Management Systems	39
(4) Direction the Audit for OWASA Would Take as a Result of Assessing Existing Management Practices	39
VII. POSSIBLE CONCERNS FOR A PUBLIC WATER SUPPLY AND WASTEWATER UTILITY TO CONSIDER IN APPLYING THE ENVIRONMENTAL AUDITING CONCEPT TO ITS OPERATIONS	48
Exogenous Environmental Impacts That Could Be Encom- passed Within the Scope of an Environmental Auditing Program	51
VIII. CONCLUDING REMARKS	53

APPENDICES	57
A. Enviromental Auditing in the Public Sector - Perspec- tives from Professionals in the Environmental Community	58
B. Environmental Auditing in Raleigh, N.C.	60
C. Organizational Chart of Orange Water and Sewer Authority	63
D. Environmental Audit Protocol for OWASA's Water Supply and Wastewater Treatment Facility	64
E. Enviromental Audit Checklist for OWASA's Water Supply and Wastewater Treatment Facilities	64
REFERENCES	85

LIST OF TABLES

Table		Page
1	Local Government-Owned and Operated Utility	17
2	Authority-Operated Utility	20
3	Staffing and Organizing Your Environmental Audit Team-- Advantages and Disadvantages of Several Alternatives Existing at the Local Government Level	24
4	Environmental Regulations That May Affect the Operations of a North Carolina Municipal Water and Wastewater Utility	31
5	Water Resource Legislation Affecting the Environmental Operations of the Orange Water and Sewer Authority (OWASA)	36
6	Existing Management Practices of OWASA's Water Supply and Wastewater Treatment Facilities Which Help Assure Regulatory Compliance and Evaluate Performance of Environmental Management Systems	40

CHAPTER I

INTRODUCTION

Environmental Auditing in Historical Perspective

Auditing is often defined as an examination, verification, or correction of accounts, records, or claims. This process has been adopted by corporations to verify their compliance with environmental laws and regulations. It is also often used to evaluate the performance of the corporate environmental management system. Used in this way auditing provides quality control on routine environmental activities such as inspection, monitoring, and reporting. Environmental auditing has increased in popularity with a large number of major industrial and manufacturing corporations across the country. The trend toward increased application of the management audit concept in the area of environmental quality control appears to be the outcome of several factors. One early impetus was a Securities and Exchange Commission requirement that several large corporations undertake internal corporate audits for substantiating disclosure information on the potential financial impacts of environmental regulations. Other companies have voluntarily adopted environmental auditing procedures following environmental incidents resulting in lawsuits, government fines, costly remedial actions, and bad publicity. In some instances, corporate managers have decided internal environmental auditing was necessary to provide greater compliance assurance as laws became more numerous and complex, and as a

consequence, corporate risks and liabilities grew more worrisome.

The U.S. Environmental Protection Agency (EPA) began to take an interest in environmental auditing toward the end of the 1970's as the agency recognized that resources would never be sufficient to monitor on a continuing basis all environmentally regulated activities of companies and other organizations. EPA is promoting environmental auditing as a beneficial management tool, and is providing information and assistance to interested organizations. A number of states, among them North Carolina, Michigan, New Mexico and Pennsylvania, also became interested in the environmental auditing concept in the early 1980s. North Carolina began an effort in 1982 to encourage both private businesses and government organizations to consider adopting environmental auditing practices on a voluntary basis (16). Aside from testing or verifying the environmental regulatory compliance status of an organization, environmental auditing programs are being used to:

- (1) Assist managers in performance evaluation - Measuring the efficiency and day to day operations of environmental systems, activities, and programs against corporate goals and objectives;
- (2) Provide ongoing comprehensive management information - Establishes an early warning system that may identify product safety hazards and hidden liabilities and alerts top corporate officials of potentially devastating risks associated with company operations before major harm is done to people or to the environment;
- (3) Sensitize employees to potential problems and to report such occurrences to appropriate management in adequate time to take

responsive action;

- (4) Help personnel better understand their job and its purpose (20);
- (5) Train employees to follow environmentally acceptable procedures - Helps employees understand the environmental consequences of their actions (4);
- (6) Identify problem areas of which management was not previously aware, that would require significant future expenditures - Identifying such areas may avoid greater commitments in the future thus allowing for a more cost-efficient development (4);
- (7) Provide management with sound information that can be used in public and employee relations - Gives the organization an opportunity to demonstrate increased sensitivity to the needs of its employees and the community at large.

There are many examples of private businesses undertaking environmental auditing programs, such as General Motors, Ford, Allied Corporation, ARCO, Pacific Gas and Electric, Pennsylvania Power and Light (10), Olin Corporation, and Polaroid Corporation (7). In addition, North Carolina firms such as ITT Telecom, Duke Power Company, TexasGulf Chemicals, Burlington Industries and R.J. Reynolds Tobacco Company have also used this approach (16).

Each corporation's approach to auditing has often been quite distinctive, depending on the company's type of business, leadership, and management philosophy. Despite these differences regulatory compliance has remained the central reason for developing an audit program.

Basic Elements of an Auditing Program

Though approaches to environmental auditing may vary with the program objectives, the following basic elements are common to most audit programs (3):

- (1) Goal or mission statement prepared by appropriate level of management - This statement usually reflects the importance of the audit and the importance of submitting accurate information to the audit team (20).
- (2) Audit Operations - Facilities to be audited, Background information (previous audit reports, regulatory requirements, permits, corporate policies, facility layout, process, organization).
- (3) Description of Internal Management Systems and Procedures - Formal and informal actions taken by the facility to assist in regulating and directing its activities that can impact the environment.
- (4) Assessment of Internal Management Systems for Strengths and Weaknesses - The auditor looks for clearly defined responsibilities, an adequate system of authorizations, awareness and capability of personnel, and documentation and record - keeping.
- (5) Collection and Evaluation of Audit Data - Formulation of audit opinion. Format may be formal questionnaires, informal discussions, observation or testing.
- (6) Audit Report - Documentation of audit results (and possibly recommendations) given to appropriate facility management.
- (7) Follow-up - Ensures that all deficiencies have been corrected.

Application of the Environmental Auditing Concept in the Public Sector

While the environmental auditing concept has been widely applied in the private sector, it has been rarely used in the public sector. The purpose of this investigation is to examine its suitability for a water utility system, the Orange Water and Sewer Authority in Chapel Hill, N.C. The results of this analysis will be generalized to the public sector in general.

CHAPTER II

POTENTIAL BENEFITS OF AN ENVIRONMENTAL AUDITING PROGRAM IN THE PUBLIC SECTOR

Though environmental auditing is largely a creature of the private sector, it may have potential in the public sector as a management tool for assuring compliance with environmental laws and regulations, increasing environmental awareness, and evaluating and adjusting the performance of environmental management systems. Local governmental units are involved in many environmentally significant operations. For instance, a municipality may engage in operations that could affect the environment due to:

- surface water discharges (POTW, NPDES),
- waste treatment activities,
- ground water use,
- possible ground water contamination,
- PCB equipment/fluid use,
- fuel oil use and/or management,
- storage of fuels, solvents, or oil in above or underground tanks,
- solid waste management activities,
- landfill operations,
- past waste disposal activities,
- toxics use and/or management;
- hazardous materials use and/or management,

pesticide use and/or management,
noise generation,
chemical spills, and
construction and maintenance activities (10).

Environmental auditing is a routine internal management review that can document inadequate management control over environmental protection responsibilities. Compliance status is determined and an assessment made of strengths and weaknesses of the environmental management system. These elements of the audit identify areas or potential areas of non-compliance and attribute the cause to the performance of environmental management activities. Therefore, efforts toward solving problems can focus on the cause of the problem instead of just the occurrence of the problem. Adverse consequences of inadequate environmental management control can include fines and penalties, tort liability, and bad publicity.

Risks resulting from environmental hazards can be decreased by environmental auditing. Questions and information directed toward employees may improve employee sensitivity to environmental concerns. As a result, the likelihood of environmental accidents and emergencies due to negligence may be reduced. Internal communication is improved when employees are given the opportunity to report environmental deficiencies so that they may be corrected before they grow into large and expensive problems or result in sudden catastrophies. Auditing relates management expectations to different operating levels and helps to convey the seriousness of the municipality's commitment to environmental quality.

Another benefit from environmental auditing in the public sector is economic payoff. Companies experienced in auditing indicate a

growing potential for recognizing cost-saving opportunities as auditing systems are refined and improved over time. The economic payoff in the public sector may be protection of investments in pollution control equipment by ensuring proper maintenance and operation; development of environmental cost information for financial planning; and determination of the most cost-effective allocation of resources.

There is agreement among different professional segments of the environmental community about the potential benefits attained from applying the environmental auditing concept to local government operations (see Appendix A). Few instances though are cited in the literature of environmental auditing programs being implemented in the public sector.

The Air Force's Aeronautical Systems Division (ASD), under the mandate of Executive Order 12088, was perhaps the first federal entity to develop a comprehensive multi-media environmental auditing program. ASD and the Navy, with an earlier but less comprehensive program, have been followed by other branches of the service. Compliance assurance, hazard management, waste reduction, and efficiency were included as goals of the audit programs. ASD also sought to identify resource recovery and energy conservation opportunities and to use the data gathered during their environmental audit for budget planning purposes (10).

In 1984, the U.S. Environmental Protection Agency began promoting the environmental auditing concept to other agencies of the federal government. A few federal agencies had already initiated internal environmental auditing programs, such as the above examples in the Department of Defense (3).

At the government level, only one instance of implementing an environmental auditing program was found. The case cited is for the city of Raleigh, North Carolina. Appendix B is an account given by Raleigh's City Manager of how the auditing concept is being applied to some of the city's environmental operations.

CHAPTER III

COMPARISON OF ENVIRONMENTAL AUDITING IN THE PRIVATE INDUSTRIAL SETTING WITH ENVIRONMENTAL MANAGEMENT IN THE PUBLIC SECTOR

Like corporations, municipalities often differ in their approach to environmental management. Environmental health concerns may for instance, be addressed within a county health department or may exist as its own separate department. Size, geographic area, budget concerns and political concerns all act to shape management philosophies and the goals and objectives of an environmental management program. Yet both industry and the public sector share similar concerns such as cost/benefits, costs of operation/compliance, risk, and liability.

Cost/Benefits (3)

The costs of an audit program include both direct and hidden costs. The direct costs include the salary and benefits of the program staff and all related travel and living expenses. The hidden costs include the time plant personnel devote before, during, and after the audit and the time others contribute such as plant staff and perhaps engineering staff who may serve as audit team members.

Environmental auditing can provide two significant benefits to an organization: increased management effectiveness and a feeling of increased comfort or security. To some extent, environmental management effectiveness can be quantitatively measured over time. Some basic measures include an improved compliance record, reduction in the number

and size of legal actions, improved accident statistics, and reduced number of environmental hazards. However, some measures of environmental management effectiveness, such as improved reputation or favorable publicity, are generally not quantifiable.

Another significant benefit of such programs is to provide top management with a sense of increased comfort or security that the organization's potential exposure to regulatory compliance problems is being reduced. The feeling of comfort is generally nonquantifiable and stems from the knowledge that operations are consistent with good practices, that control systems are in place and operating, and that legal and ethical responsibilities are being met.

Cost of Operation/Compliance(3)

Audit programs may be designed to optimize environmental resources in terms of both personnel and capital expenditures. Such programs, in addition to assuring compliance, may identify current and anticipated environmental costs, recommend ways of reducing those costs, and identify potential longer-term savings.

Audit programs that are aimed at optimizing resources tend to focus on environmental cost savings and other economies available to the organization. This type of audit program may help to define the roles of facility personnel as they relate to environmental quality and their job responsibilities necessary for carrying out those roles. It can define gaps in job responsibilities where no responsibilities have been assigned or assignments that have not been communicated properly. Similarly, such programs can identify efficient and cost-effective means of achieving compliance--for example, by identifying less costly yet more efficient pollution control equipment, and possibly recognizing

less stringent permits for a facility to comply with applicable regulations.

Also, higher quality control assurance resulting from the review of facility operations may allow for increased savings in the area of operations and maintenance.

Risk (3)

Audit programs, which include risk assessment, are not confined to comparing facility performance against known standards (regulations). They may examine potential hazards for which standards do not currently exist. These programs may identify conditions at the facility that may have an adverse impact on the organization, and the risks associated with such hazards as well as determine courses of action for reducing those risks.

A strong emphasis would be placed on verifying that management systems are in place to identify and assess environmental hazards and risks. For example, in looking at the management system for controlling polychlorinated biphenyls (PCBs), an auditor may examine the procedures in place for handling, storage, marking, cleaning up spills, inspections, record-keeping, and an annual inventory. Environmental auditing can thus be used to verify the process by which the company manages or seeks to identify unregulated or soon-to-be-discovered risks.

Liability

As do private corporations, municipalities also seek to reduce any environmental risks and liabilities that may be associated with their activities. There is a new form of insurance policy, environmental liability insurance, that, though in its infancy, may augment the

traditional pollution liability coverage for "sudden" or accidental incidents. The environmental impairment liability insurance covers non-sudden pollution incidents.

Several of the relatively few insurance carriers that offer non-sudden pollution coverage require an outside "audit" of sorts to be conducted to assist them in deciding whether to underwrite the environmental risk associated with the organization which is applying for the coverage. These insurance audits differ from many of the individual environmental audit programs both in the nature of the audit examination and the level of effort that is expended (3). In considering whether or not to extend coverage to an organization, insurance companies generally feel that environmental auditing is an asset in the organization's favor because implementing such a program helps the organization determine its risks. Thus the organization is less of a business risk to the insurance company since it is actively taking steps to control its environmental risks and liabilities. Also, it may hold up better in a court of law if the organization can show that a solid effort was made to gain knowledge of any environmental risks associated with its activities so that the risks could be controlled (15). As both environmental auditing and environmental impairment liability insurance continue to develop, there are likely to be more interfaces and greater linkages between the two (3). Environmental auditing will hopefully serve to prevent a loss due to a detrimental environmental occurrence, something which insurance in itself is not designed to do.

Though environmental auditing is a concept borrowed from the private sector, many of the same reasons for its application encourage

its use in the public sector. There are also some distinct differences in its application at the local government level. The city or county manager is subjected to intense public scrutiny while dependent upon a highly politicized resource base, frequently leading to simultaneous demands for both greater performance and reduced expenditures. Compliance failures can result in public outcry, inquisition from concerned local elected officials; penalties and pressure from higher levels of government; and decreased effort toward compliance on the part of industry which points to public sector noncompliance as an example (17).

The implementation of an environmental auditing program in the public arena is influenced by some distinct organizational characteristics but these differences also exist in the private sector. Management systems and philosophies are going to dictate the goals and design of an auditing program intended for use in a particular organization, private or public. An environmental auditing program can be incorporated into the environmental management system and molded into a form that will make the most realistic fit.

How the organization (private industry or local government unit) is structured will affect:

- Goals of the audit - What is the program trying to accomplish?
Why? and for whose benefit?
Who will use the information?
- Design of the audit - What is the scope and focus of the audit?
Should it include all operating units?
What functional areas should be included?
Who will be responsible for the audit

protocol?

How will evidence be documented and gathered?

* Implementation of

the audit -

Who will be responsible for the audit team?

What will be the audit team characteristics?

Will the audit be internal or external?

Which facilities are to be reviewed?
How often?

These organizational and institutional constraints must be considered in the application of the environmental auditing concept to a municipal water supply and wastewater utility.

CHAPTER IV

INSTITUTIONAL ORGANIZATION IN WATER SUPPLY AND WASTEWATER UTILITIES

The institutional organization of a utility will affect who controls the utility; how the utility is managed; and how capital operating revenues are generated. Such structures are generally variations or combinations of the following (1):

- 1) Local government-owned and operated facilities;
- 2) A municipal authority or commission under which the local government owns the facilities but management and operations are separated from general municipal activities; and
- 3) An independent authority or commission, fully autonomous from the local municipality, with its own appointed or elected governing board.

The design of an environmental auditing program for a utility (or any department in local government) must be a realistic reflection of the resources available to the program. Financial and political constraints influence allocation of time, availability of manpower, who should conduct the audit, scope of the audit, actual audit procedure, as well as management commitment.

Advantages and disadvantages of each type of institutional organization in terms of control and accountability, management, and finance must be considered when formulating an environmental auditing

Table 1. Local Government-Owned and Operated Utility (1).

	Advantages	Disadvantages
Control & Accountability	• maximum control by local government • closely accountable to elected officials	• policy issues are subject to political pressures that are not utility-oriented • key activities may be controlled by other departments (e.g., finance, billing) • rate setting is political and may not address utility needs
Management	• supported by other municipal departments and avoids duplication of functions (e.g., separate finance or purchasing functions)	• constrained by local government rules and regulations (e.g., salary, staffing, etc.) • may be too reliant on other local government departments for key services (e.g., finance, billing, etc.) • management subject to override for political reasons
Finances	• raising capital can be done without general obligation bonds • short-term financial assistance may come from the general fund	• utility is less likely to be self-sustaining, requiring subsidies between utility and general fund • investors may be less willing to purchase bonds because of potential political pressures

program for a water utility.

Table 1 suggests that if the utility is local government-owned and operated, justification for an environmental auditing program may be subjected to many levels of inquisition by public officials who have political and financial stakes in the matter. Many different departments and programs have to be considered when dividing and appropriating pieces of revenue pie. Thus, the need and costs of an environmental auditing program must be clearly defined. The more realistic and measurable the objectives of the auditing program, the more easily those in positions of authority will be able to understand the reasons for the program and provide program support (16). This political and financial reality emphasizes the importance of the goal or mission statement that must be issued by the appropriate source (i.e., the City Manager or Executive Director) to gain program acceptance and support.

Municipal Authority

A municipal authority is typically operated by a governing board or commission which is appointed by the chief executive of the municipality. The terms of those serving on the board or commission frequently overlap and generally do not terminate jointly with the term of the chief executive. Financial and accounting systems are separate from the city's and the authority is vested with the power to establish its own budget and to set utility rates without municipal approval. The authority may also be vested with the power to issue debt, though voter referendums or council approval of such bond issues may be required. This type of arrangement offers the advantage of operational autonomy which provides protection from political pressure on budgets and rates (1).

Independent Authority

An independent authority also has operational autonomy but it also assumes ownership of the utility. This type of authority is usually created by an act of the state legislature which defines how the authority is to be structured and operated. A municipality's degree of control over the authority depends on the enabling legislation. Control over the governing board appointment process, terms of office, provisions concerning use of surplus revenues, and the like are all mechanisms by which a municipality can assure accountability to municipal interests.

Table 2 illustrates some of the advantages and disadvantages of an authority-operated utility. The operational autonomy and protection from political pressure that is characteristic of the municipal or independent authority implies that there may be less bureaucratic red tape to wade through in justifying an environmental auditing program as compared to what may be encountered by a local government-owned and operated utility. A goal or mission statement setting forth approval and support is still of utmost importance and the appropriate source within the authority to issue such a statement may be the Executive Director.

Table 2. Authority-Operated Utility (1).

	Advantages	Disadvantages
Control & Accountability	• control is independent of other local issues/politics • relieves local government from political burden of establishing a self-sustaining utility	• not accountable to general government and local officials • loss of local government control of a major functional area • local government loss of a policy-making area • creates another level of "government"
Management	• utility has complete management system--not dependent on local government • utility can organize in best manner for operations, management only deals with utility issues • investors prefer independence from local politics	• replicates existing support system • may expand beyond need, when not accountable to local government • loss of the use of generally cheaper general obligation bonds
Finance	• financial issues not mixed with local government financial issues • rate setting is not constrained by "other" political issues • utility is self-sustaining	• capital funding may be more expensive because it is primarily dependent upon revenue bonds • has no taxing power to act as a financial backup to user charges

CHAPTER V

CONCEPTUAL FRAMEWORK OF AN ENVIRONMENTAL AUDITING PROGRAM

Management Functions

Perhaps the first consideration is management commitment. Regardless of the form upper management support may take, the continued backing of those at top levels of the organization is critical to guarantee that the program receives the necessary resources and cooperation, and that any deficiencies identified by an environmental audit are given proper attention. In the case of a government organization (as for a municipal water and wastewater utility), the authority may be derived from an agency secretary or from a local government council or City Manager (16). In the case of an authority-operated utility, such an endorsement may come from the Executive Director's office.

Selecting the Audit Team

An environmental audit involves having a team of individuals conduct a field assessment, gather information, analyze information, make judgements about the facility's environmental compliance status, and report audit findings. The audit process begins with the selection of the audit team and the development of an audit plan which includes defining the scope of the audit and selecting priority operations.

The audit program manager needs to be sure that the staffing objectives are supportive of, and consistent with, the overall goals of

the audit program. Areas of expertise must include: knowledge of the laws, regulations, and permits that apply to the facility; understanding of environmental control technologies; recognition of potential operational hazards; understanding of the facility operations and processes; ability to relate to facility personnel; and understanding of management systems--both environmental and facility (knowledge of how work is planned, implemented, controlled, roles and responsibilities and how information flows within the facility and upward in local government) (8).

It is important that there be some form of training for the team members. They should be prepared to conduct an audit efficiently and effectively. Actual on-the-job experience may prove to be the best teacher.

There are a variety of options to consider in determining who should conduct environmental audits of municipal water supply and treatment utilities. A local government, for instance, may decide to assign someone in the City Manager's office to make periodic audits of municipal environmental quality control activities, which would include some operations of the water and wastewater utility. Alternatively, such audits could be performed by personnel from the city utility, public works, or environmental health department. A local government could also contract with an outside consultant to conduct the environmental audits or possibly to assist in developing the audit program or related checklist or to accompany the audit team. In the case of an authority-operated water and wastewater utility, which is operationally autonomous from local government and quite self-sustaining, the audit would be performed by staff within the authority or by a

consultant firm or with the assistance of a consulting firm. It will not always be possible to achieve complete independence, especially in an organization such as a local municipality where resources are typically very limited. Alternative methods may be employed such as limited sampling of self-audits conducted by those directly responsible or periodic use of outside consultants (16). Table 3 outlines some of the advantages and disadvantages of each of the possible alternatives.

Defining the Scope of the Environmental Audit - Audit Protocol

The scope of an environmental audit of a municipal water supply and wastewater utility must be a realistic reflection of resources and management commitment available to the program. Assuming that municipal resources are generally quite limited, the priority elements of an audit program for a local government-owned and operated utility may be narrowed down to achieve a more realistic fit. An authority-operated utility may be able to broaden the scope of its environmental audit program as it generally has a more self-sustaining and less political resource base. The scope of an environmental audit program for a water supply and wastewater utility may include:

- * Review of facility operations - What are the environmentally significant operations?

What regulatory requirements are associated with these operations?

What is the preventive maintenance schedule? Who reviews it?

Is the laboratory certified? Does it contract out some of its testing to a private lab?

Are there regulatory and hazard problems associated with operations?

Table 3. Staffing and Organizing Your Environmental Audit Team (10) -- Advantages and Disadvantages of Several Alternatives Existing at the Local Government Level.

	Advantages	Disadvantages
Audited Operations Within the Facility	• Familiar with operations and procedures • Good training for employees • Familiar with information needed and information in on-site files	• May not be very self-critical (especially on regulatory compliance issues) • Takes time away from routine activities • May overemphasize problems to gain additional resources
Audited Operations From Other Departments	• Knowledgeable about operations but independent from impacts of audit results • Good benefit for on-line personnel • Staff training	• More costly to transfer the audit team • More difficult to assemble and send all information prior to the audit
Consultant	• Expertise in wide variety of auditing situations • Fresh perspective on problem areas • Consistency of results over multi-departmental environmental activities • Ability to compare practices with perttainable industry	• More costly to transfer audit team • Unfamiliarity with audited operations
Combination In-House and Consultant	• Good for initial training of in-house audit staff personnel • Immediate audit of facility(s) plus long-term staff expertise development • Long-term costs reduced	• Higher short-term costs

- Environmental Management System -

Are policies adequate to ensure compliance with applicable environmental regulations?

Does performance evaluation of environmental organization show that environmental risks and hazards are trying to be identified and controlled?

Is environmental data and information being disseminated to appropriate management within the utility?

- Compliance Issuance

What is the current status of compliance with applicable environmental laws and regulations?

Defining the scope of the audit and selecting priority elements can be accomplished by preparing an audit protocol. An audit protocol represents a plan of what the auditor is to do to satisfy the objectives of the audit. It serves as the auditor's guide to collecting evidence as well as a record of the audit procedures that have been performed by the audit team.

Audit protocols organize audit procedures into sequential steps and describe them in terms of specific actions to be taken by the auditor. References to regulatory requirements or internal standards may be included depending on the level of training of the audit team. An audit protocol may take the form of a topical outline listing the areas of operation to be covered during the environmental audit. It serves as a checklist of the subjects to be included in the audit but does not specify the exact manner by which to review them. Use of a topical outline relies a great deal on the experience and judgement of the auditor.

Basic elements in most audit protocols include:

- Objectives - The objectives of the audit program should be included and defined as clearly as possible. The objectives should also be realistic and measurable;
- Scope - The scope of the environmental audit should be clearly defined so a good understanding exists of what is to be included in the audit, i.e., examination and verification of compliance with regulations, laws, and management policies, hazard identification and hazard control procedures, review of facility activities, facility records, etc.;
- Subjects to be audited - The audit protocol identifies the operational areas to be covered by the audit that are to be reviewed (8).

A suggested audit protocol for the Orange Water and Sewer Authority (OWASA) is included in Appendix D.

On-Site Audit Activities

(1) Understanding Internal Management Systems and Procedures

The audit team must have an accurate understanding of the formal and informal actions taken by the facility to assist in regulating and directing those activities which may have an environmental impact. Information on the facility and its operations must be reviewed (e.g., process flow diagrams, plant layout diagrams, policies and procedures, operating manuals, permits and regulations applicable to the facility, etc.). The auditors' understanding may also be enhanced by staff discussions, questionnaires and plant tours. The auditor may record his/her understanding in a flow chart, narrative description, or combination of the two (9).

The intensity of this review may depend on the knowledge and background of the audit team members. Regardless of the members' levels of expertise, this exercise can assure that audit team members have a

similar baseline perception of the internal management systems against which to audit.

(2) Assessing Strengths and Weaknesses

An assessment is made of the strengths and weaknesses of those internal management procedures and systems identified and described above. Areas of consideration should include clearly defined responsibilities, an adequate system of authorizations, awareness and capability of personnel, documentation and recordkeeping, and internal verification. The emphasis here is on how the environmental audit can augment and strengthen existing management practices at the water supply and wastewater utility.

In situations where internal environmental management systems are assessed as sound, the subsequent steps of the audit can focus on the effectiveness with which these systems are implemented and the extent to which the system performs as intended. If the design of internal management systems do not appear sound enough to assure the desired results, subsequent steps must focus on the environmental results (compliance status) rather than on the internal management system (9).

(3) Gathering Audit Evidence

Gathering audit evidence determines compliance with environmental regulations and policies and can verify that systems or procedures are in place to identify and control environmental hazards and risks at the facility. Audit evidence may be gathered through formal questionnaires, informal discussions, observations, and testing (9). For a water supply and wastewater utility, an audit checklist should be designed with the scope of the audit program in mind; namely, a review of facility operations, a review of the environmental management system, and assurance

that regulatory compliance status is satisfactory.

A suggested environmental audit checklist for the Orange Water and Sewer Authority is included in Appendix E. The audit checklist is divided into five areas: laboratory; operations and maintenance; hazardous/chemical substances; emergency plans; and compliance assurance. Water supply operations vs. wastewater treatment operations receive separate attention in each area as needed. Records retention and other self-monitoring concerns are included, as applicable, in each section.

(4) Evaluating Audit Findings

In this step, the findings and observations of each audit team member are evaluated and integrated to determine whether there are common findings which, when viewed as a group, have greater significance than when viewed individually. In preparing his/her own list of findings, the auditor must ask the question, "Have I gathered sufficient evidence to substantiate this finding?" The auditors should point out deficiencies to the facility environmental staff as those deficiencies are observed. Communication of potential problems and deficiencies should be an ongoing process between the auditors and facility staff.

(5) Reporting Audit Findings

The purpose and uses of the audit report include providing management with information, initiating corrective action, and providing documentation of the audit. A formal written report summarizing and documenting audit findings may be prepared by the audit team leader from the input received from team members (8). An oral presentation to facility management of audit findings may accompany a written report. The audit report should include a listing of the operational areas audited and any conclusions that were reached. Specific findings should

be listed including existing practices that were found to be effective contributions to the environmental management system. If appropriate, recommendations to correct deficiencies can be listed and include areas which warrant improvements.

The audit findings for the water and wastewater utility may be reported to the plant's Manager with the Executive Director or Head of Environmental Affairs in attendance, and also with copies going to the Board of Directors and/or the City Manager's office, whichever is appropriate.

(6) Follow-Up

Audit follow-up procedures are essential to the overall effectiveness of the audit program. Identified deficiencies must be reviewed and a decision made regarding corrective action.

The action plan will indicate what actions will be (or have been) taken to correct any unsatisfactory conditions, who is responsible for ensuring that action is taken, and the deadlines set for completing the actions. At a water and wastewater utility, the action plan may be issued by the Plants Manager and given to the operating management such as facility superintendents. Copies of the action plan will go to those who received the audit report (such as Head of Environmental Affairs, City Manager/Executive Director). The Plants Manager who issues the action plan would typically have follow-up authority which includes scheduled checks on the status of action plans (3).

CHAPTER VI

ENVIRONMENTAL AUDITING APPLIED TO A PUBLIC WATER SUPPLY AND WASTEWATER FACILITY

Environmental Regulations That Affect the Operations of a North Carolina Municipal Water and Wastewater Utility

Water is an essential natural resource to the people of the State and the maintenance of the integrity of this resource is one of the important responsibilities of State government. This safeguarding role is reflected in the laws and programs relating to water quality, ground water management, sedimentation control, and control of consumptive uses (6). Table 4 lists major North Carolina water resource legislation that may potentially affect the public use of a water resource by a municipal water supply and wastewater utility.

Table 4. Environmental Regulations That May Affect the Operations of a North Carolina Municipal Water and Wastewater Utility (14,18).

<u>Permit Name</u>	<u>Statutory Authority</u>	<u>Examples of Water Supply & Wastewater Utility Activities Affected</u>	<u>Regulated Activities</u>
NPDES - National Pollution Discharge Elimination System	N.C. General Statute Chapter 141, Article 21, paragraph 1	Sewer system; treatment works; wastewater or backwash filter and basin cleaning from water plant	Construction, alteration, or extension and/or operation of any sewer system, treatment works or disposal system which would result in a discharge into surface waters.
Water not Discharged to Surface Waters (Non-Discharge)	N.C. General Statute Chapter 143, Article 21; Chapter 130, Article 13	Sewer extensions; pumping stations, septic tanks, land application of sludge or wastewater.	Construction, alteration, or extension and/or operation of any sewer system, treatment works or disposal system which does not result in discharge into surface waters.
Water Use	N.C. General Statute Chapter 143, Article 21; Part 2	Drainages; well and mining excavation, applies to "capacity use" area where too much water is being withdrawn.	Construction or installation of works of improvement where withdrawal or utilization of surface water and/or groundwater is in excess of 100,000 gallons per day in an area designated as a "capacity use area."
Clean Water Act - Section 401 Water Quality Certification (State's required comment on 404 permit)	N.C. General Statute Chapter 143, Article 21; Part 1	Discharge to navigable waters; usually used when filling in wetlands or dredging streams, canals	Activity which may result in a discharge to navigable waters and requires Section 404 federal permit; must obtain a certification that such discharge will be in compliance with applicable state water quality standards.

Table 4 (continued)

<u>Permit Name</u>	<u>Statutory Authority</u>	<u>Examples of Water Supply & Waste-water Utility Activities Affected</u>	<u>Regulated Activities</u>
Well Construction	N.C. General Statute Chapter 87, Article 7	Well recharge, injection or disposal; well drilled for public water supply, monitoring wells around sites for land application of sludge or around lagoon sites	Constructing a well with a design capacity of 100,000 gallons per day or greater, or any well added to an existing well system if the combined system capacity is 100,000 gallons per day or greater.
Open Burning	N.C. General Statute Chapter 143, Article 21B; Subsection 215.3	Open burning during construction clearing (for reservoir or facility)	Special permits are required for burning windrows in the counties of Beaufort, Bertie, Camden, Carteret, Chowan, Currituck, Dare, Gates, Hyde, Pasquotank, Perquimans, Terrell, and Washington.
Burning	N.C. General Statute Chapter 14, Article 22; Subsection 139	Woodland fires between 12:00 midnight and 4:00 p.m. during construction clearing (for reservoir or facility)	A permit is required to start a fire in woodlands or within 500 ft. of woodlands under the protection of the Division of Forest Resources between hours of 12:00 midnight and 4:00 p.m. Special permits are required in Dare, Hyde, Terrell and Washington counties.
Dam Safety	N.C. General Statute Chapter 143, Article 21; Part 3	Dam repair; removal or modifications; also the construction of	Construction, repair, modification or removal of a dam that is 15 ft. or greater in height or the impoundment is 10 acre ft. or greater at the top of the dam.

Table 4 (continued)

<u>Permit Name</u>	<u>Statutory Authority</u>	<u>Examples of Water Supply & Wastewater Utility Activities Affected</u>	<u>Regulated Activities</u>
Sedimentation (State approval of erosion control plan not required where there is an approved local ordinance)	N.C. General Statute Chapter 113A, Article 4	Land disturbing activity such as construction clearing	Any land disturbing activity when the proposed activity is to be undertaken on a tract comprising one or more acres
Depredation	N.C. General Statute Chapter 113, Article 27	Killing or removing wildlife injurious to City property, possibly during construction of facility or reservoir	The taking, destruction, transfer, removal, transplanting, or driving away of undesirable, harmful, predatory, excess or surplus wildlife or wildlife resources.
Draining Impounded Public Waters	N.C. General Statute Chapter 44A, Article 113-275; 113-304	Lowering public impounded waters for dam repairs or removal, clearing of excessive growths, installation of water intake	Lowering of any impounded public waters to a level which would concentrate fish populations in pockets or otherwise endanger their survival.
Hazardous Waste Facilities	N.C. General Statute Chapter 130, Article 13B, Title 40, Chapter 250 of CFR-Federal Resources and Conservation and Recovery Act	Recovering of hazardous waste, some of old water supply and wastewater facilities may have old capacitors with PCB's in them which must be disposed of or if accidental spill/incident occurred where hazardous wastes were in the water source, these could have to be disposed of in the regulated manner	Standards must be met regarding contingency plans, emergency procedures monitoring and recordkeeping, personnel training, financial responsibility, and post-closure plans for the storage, collection, processing, treatment, recycling, recovering or disposal of hazardous wastes.

Table 4 (continued)

<u>Permit Name</u>	<u>Statutory Authority</u>	<u>Examples of Water Supply & Waste-water Utility Activities Affected</u>	<u>Regulated Activities</u>
Water Systems Plans and Specifications Approval	N.C. General Statute Chapter 130, Article 13	Expanding a public water supply	Constructing, altering or expanding a public water supply.
Fluoridation Approval Letter	N.C. General Statute Chapter 130, Article 2	Fluoridation of water supply	Fluoridation of public water supply.
N.C. Environmental Impact Statement of Negative Declaration (Finding of no significant impact-FONSI)	N.C. General Statute Chapter 113A, Article 1	State grant funds affecting environment - construction of facility, reservoir; running pipelines through wildlife areas	Any project involving expenditure of state monies for actions which might significantly affect the quality of the state's environment.
Easement to Fill	N.C. General Statute Chapter 143, Article 36; Subsection 341	Navigable waters above normal high water mark, possibly during construction of gravity sewer - building up the land to reduce pumping requirement	All filling activities in navigable waters where land is raised above the normal high water mark. Easements are also required for cable or pipeline corridors in or on lands below navigable waters.
Fertilizer Reporting	N.C. General Statute Chapter 106, Article 2	Sale or distribution of commercial fertilizer for tobacco, specialty fertilizer, fertilizer materials, manipulated manure and fortified mulch; possibly affects use of sludge as fertilizer	Manufacture, distribution, and sale of fertilizer.

Case Example - Orange Water and Sewer Authority, Chapel Hill, N.C.

(1) North Carolina Water Resource Legislation That Affects OWASA's Operations

The previous table lists major North Carolina water resource legislation that may potentially affect the public use of a water resource by a municipal water supply and wastewater utility. Table 5 summarizes the water resource legislation that may particularly affect the Orange Water and Sewer Authority.

(2) Focus of an Environmental Audit Program for OWASA - Regulatory Compliance and Performance Evaluation

The focus of an environmental audit program for any organization must realistically reflect management objectives, management commitment, and the resources available. Some characteristics unique to the organizational setting of the local government arena have already been discussed. These included the existence of intense public scrutiny, dependence upon a highly politicized resource base, and simultaneous demands for both better performance and reduced expenditures (17). With these distinct characteristics in mind, the most appropriate type of environmental audit for a municipal water and wastewater utility would probably involve a less extensive auditing effort than that used in the private sector but still achieve significant positive results. The scale of environmental operations at a water and wastewater utility, whether it be a municipal or independent utility, is less than that of larger private corporations from which the environmental auditing concept is borrowed. Consider for example ITT Corporation, and its divisions like ITT Telecom headquartered in Raleigh, N.C. Their environmental auditing program, one of the oldest in the nation, was

Table 5. Water Resource Legislation Affecting the Environmental Operations of the Orange Water and Sewer Authority (OWASA)(21).

<u>Permit Name</u>	<u>OWASA Activities Affected</u>
NPDES	Discharge into surface waters by wastewater treatment plant
Non-Discharge	Sewer line extensions and land application of sludge
Clean Water Act - Section 401 Water Quality Certification (State's required comment on 404 permit)	Construction of Cane Creek reservoir which requires a 404 permit
Well Construction	Groundwater monitoring wells at site of land-applied sludge
Open Burning	For construction purposes - OWASA writes this into contract specifications
Burning	For construction purposes - OWASA writes this into contract specifications
Dam Safety	OWASA is to provide any routine maintenance on dam at University Lake - also must have an inspector, who is certified under the Dam Safety Permit, to inspect the dam
Sedimentation and Erosion Control	Construction clearing - OWASA writes this into contract specifications (State of N.C. controls Sedimentation and Erosion Control in Orange County with Orange County having an office that inspects sites concerning sedimentation and erosion)
Depredation	When developing the new water source of Cane Creek reservoir, mitigation lands had to be provided for displaced wildlife
Draining Impounded Public Water	May eventually affect OWASA as Cane Creek is tapped as water source and University Lake is possibly lowered
Hazardous Waste Facilities	Continuous monitoring program (pretreatment program as specified in NPDES permit) due to potential of hazardous waste constituents occurring in influent at the wastewater treatment plant (though the wastewater treatment plant does not handle the hazardous waste to be considered a hazardous waste facility)

Table 5 (continued)

<u>Permit Name</u>	<u>OWASA Activities Affected</u>
Impoundment	Construction and excavation of Cane Creek reservoir with resulting obstruction of stream flow
Location and Protection of Public Water Supplies	Sanitary survey (relating to potential of water supply contamination) was done when considering Cane Creek as a water source
Water Systems Plans and Specifications Approval	Applies to water supply and sewer extensions
Fluoridation Approval Letter	Fluoridation of water supply
N.C.Environmental Impact Statement of Negative Declaration (Finding of no significant impact - FONSI)	Applies to 201 projects (Clean Water Act Section 201 - federal grant monies to OWASA)--OWASA filed a FONSI for publically-owned land purchased with grant money on which sludge was to be applied
Easement to Fill	Development of Cane Creek reservoir
Public Operator/Ground Equipment	Will get involved in the application of pesticide on crop to be grown on the site of the land-applied sludge
Archeological Survey	Development of Cane Creek reservoir and site of land-applied sludge, both of which involved State or Federal 201 funding
Laboratory Certification	Performance of analytical laboratory tests for which the State requires certification
<u>Other Statutory Authority</u>	
Safe Drinking Water Act of 1979	Production of drinking water
Sanitarians and Water Treatment/Wastewater Treatment Facility Operators	Certification of water supply and wastewater utility operators

intended to ensure the accuracy of information submitted to the Securities and Exchange Commission regarding the costs of meeting environmental regulations. An extensive group of sub-policies and operating procedures have been developed for each division to implement corporate environmental policy. The environmental auditing program instituted by ITT was designed to fit the size and wide product diversity of the corporation. The self-audit questionnaire for ITT is divided into several sections including policy, organization, awareness and training, records and recordkeeping, external relations, and problem handling (16).

As for the Orange Water and Sewer Authority, the focus of an environmental auditing program for its facilities could typically be limited to two aspects of the environmental auditing concept -- regulatory compliance and performance evaluation. Regulatory compliance would address such issues as: what regulations apply to which environmentally-significant operations; adequacy of compliance assurance personnel; identification of non-compliance areas; identification of improvements that can be made for non-compliance resolution; needed permits; historical compliance problems; ability of personnel and systems to respond to noted violations; and how regulatory agencies view the facility (10). Performance evaluation would involve verification that management systems are in place to identify and assess environmental hazards and risks. Other issues which could be addressed include: tracking monitoring and analysis activities with respect to reporting deadlines; planning for obtaining necessary permits before modifications are made to processes or equipment or prior to expansion; monitoring training requirements for staff; and tracking regulatory

changes to anticipate additional requirements (10).

(3) Assessing Existing Internal Environmental Management Systems

In applying the environmental auditing concept to OWASA's operations, an assessment must be made of the formal and informal actions taken by the facility to assist in regulating and directing its activities that can impact the environment. Information on the facility and its processes must be reviewed in order to assess the strengths and weaknesses of those internal environmental management systems and procedures. This assessment will direct the subsequent steps of the audit (9).

Informal discussions with OWASA's plant superintendents at the water supply and wastewater treatment facility provided a review of existing management practices which help assure compliance with environmental regulations and evaluation of environmental performance. Table 6 summarizes some of these existing environmental management practices.

(4) Direction Audit for OWASA Would Take as a Result of Assessing Existing Management Practices

The environmental auditing program that is being considered here for OWASA is committed to focusing on regulatory compliance and performance evaluation. By reviewing internal management systems and activities currently in place that reflect this focus (see Table 6), the next step was to consider the direction the EA program should take to strengthen the internal environmental management system that has been identified.

Table 6. Existing Management Practices at OWASA's Water Supply and Wastewater Treatment Facilities Which Help Assure Regulatory Compliance and Evaluate Performance of Environmental Management Systems (2,19).

<u>Water Supply</u>	<u>Wastewater Treatment</u>
Regulatory Compliance	Regulatory Compliance
• Use of yearly on-site evaluation performed by the State (N.C. Division of Health Services) for procedural compliance and quality assurance in the laboratory (lab certification testing program - Also a quarterly State inspection of operational components. • Use of feedback from the State regarding weekly and monthly forms sent to the State regulatory agency to satisfy drinking water and operational regulations. • Laboratory and operations information that is logged in by operators is doublechecked (for task completion and questionable data) by the chemical analyst and Plant Superintendent - May reveal technical problems along with the need to train personnel in their compliance responsibilities. • Additional process control testing done for which the lab is not certified or required to report (i.e., periodic testing of water quality at household taps in the distribution system. • Quality assurance schedule kept and charted by the chemical analyst for the laboratory equipment.	• Use of semi-annual State inspection of the facility. • Periodic testing schedules maintained, i.e., 24 hr. composite sample of influent and effluent taken and tested daily, 8 hr. check of residual chlorine, hourly flow monitoring, daily measure of sludge in sedimentation tanks, and daily laboratory and maintenance logs recorded - This data and other records of regulatory compliance (State-required reports) are retained in a computer system on-site. • Quality control program in the laboratory based on most recent issue of <u>Standard Methods</u> - A document on methods to be used and what to do if there is a problem with analysis is being put together to satisfy newly developed State wastewater lab certification guidelines. • Laboratory data and reports are reviewed daily by the Plant Superintendent.

Table 6 (continued)

	<u>Water Supply</u>		<u>Wastewater Treatment</u>
Regulatory Compliance	• A procedural notebook for the laboratory is being updated and compiled by the chemical analyst by using the most recent issue of <u>Standard Methods</u>. • Calibration schedule on operational components, i.e., filter controls and turbidimeters. • Plants Manager receives and reviews a copy of most all reports (State-required and others). • Executive Director receives a copy of monthly State-required reports.	Regulatory Compliance	• Reports of violations and action taken are recorded if called for in the State guidelines (State guidelines exist which rate the severity of the violation and the consequent need for reporting). • Preventive maintenance program is scheduled with intent of preventing violations. • Joint effort is made by the Executive Director, Plants Manager, and Plant Superintendent to ensure that provisions of NPDES permit is updated as necessary, i.e., maintenance of compliance schedule or a change in discharge limits.

Table 6 (continued)

	<u>Water Supply</u>		<u>Wastewater Treatment</u>
Performance Evaluation	• 2-hour checks and testing by operators - Readings recorded of water quality parameters and operational parameters such as tank levels, pumping and flow information, and chemical feeds. • Additional process control testing for which the lab is not certified or not required to report, i.e., periodic testing of water quality at household taps in the distribution system. • Yearly State on-site evaluation of laboratory and quarterly inspection of operations. • Yearly operations and maintenance study is done by a private contractor - Done to ensure bondholders that their investment is properly protected, also looks at facility operational efficiency and evaluates if present rates are adequate. • Preventive maintenance program scheduled to cover all equipment with routine log forms reviewed by the maintenance supervisor. • Informational logs kept on new lines, leaks, and wells.	Performance Evaluation	• Process control testing other than that which is State-required, is done on a daily basis, i.e., monitoring of dissolved oxygen, solids concentration turbidity, grab sample monitoring, and field monitoring of process units - These are not written into operating procedure and though they are not State-required, the State will periodically (during semi-annual inspection of the facility) ask what process control testing is being done beyond the required discharge testing. • The State will without warning split samples with the wastewater lab to test the effluent and doublecheck reported results. • Yearly operations and maintenance study is done by a private contractor. Done to ensure bondholders that their investment is properly protected, also looks at facility operational efficiency and evaluates if present rates are adequate. • Preventive maintenance program scheduled with plant operators turning in inspection sheets daily. Chief mechanic monitors the results and then reports them to the Plant Superintendent.

Table 6 (continued)

	<u>Water Supply</u>		<u>Wastewater Treatment</u>
Performance Evaluation	• Chemical inventory taken at the end of the month and balanced against daily usage records. • Use of State-required monthly tabulation of costs of operation. • Cross-connection program for those facilities that get water from OWASA but also operate a groundwater well. • Safety meetings: weekly maintenance "tailgate" meetings to answer questions and concerns; monthly film with everyone in attendance; and monthly safety checklist performed by employees (may help sensitize employees to potential problems and to report such occurrences to appropriate management in adequate time to take responsive action). • Indexed emergency information is updated as material is received. • SOP manual for emergency situations is being put together. • Records retained of complaints received and action taken.	Performance Evaluation	• Operations and Maintenance manual exists and is updated by the Plant Superintendent as new equipment is received or as processes change. The O & M manual also serves as the emergency manual and generally covers mechanics of process units, mechanical breakdown, preventive maintenance, and it helps troubleshoot problems. Copies are kept in operator's office, documents room, maintenance room, and with the State. • An SOP manual is being compiled. • Memos are sent by Plant Superintendent or Plants Manager to all operators involved concerning a change in operational procedure. • Opportunities are offered to employees for continued education - Employees may go to training schools (State-sponsored Training and Operators Certification Program) to advance their certification. • Informal "tailgate" sessions are held for employees with their immediate supervisor to give opportunity to voice concerns and/or problems.

Table 6 (continued)

	<u>Water Supply</u>		<u>Wastewater Treatment</u>
Performance Evaluation	• Plants Manager receives and reviews a copy of most all reports (State-required and other). • Executive Director receives a copy of monthly State-required reports. • Monthly planning sessions are held and are representative of all four divisions at the water plant: laboratory; maintenance; lakes; and operations - An operational summary and any concerns are voiced by each division head. • Board of Directors hold planning sessions twice a month at which Plant Superintendent and Plants Manager may attend - Gives an opportunity to voice concerns and/or problems. • Monthly meeting held (Plant Superintendents and Plants Manager may attend) at which votes are made and action is taken on the concerns and/or problems discussed at the previous Board of Directors meeting.	Performance Evaluation	• Monthly safety meetings are held with all employees in attendance - Emergency procedures are also covered in operator training (given by OWASA). • Employees are made aware of potential hazard of stored chemicals at safety meetings and through training sessions given by OWASA and the State - Plant Superintendent authorizes only certain people to handle hazardous material. • Hazardous materials stored on-site (chlorine, gas, liquid caustic) are stored in new state-of-the-art storage facilities - Valves, pipelines, tanks, etc. are routinely checked in preventive maintenance schedule. • Periodic inventory is taken by Plant Superintendent of stored chemicals and other hazardous materials - Usage is noted on a daily basis as in the preventive maintenance program, also monthly reports are done for chemical usage.

Table 6 (continued)

	<u>Water Supply</u>	<u>Wastewater Treatment</u>
Performance Evaluation		Performance Evaluation • A monitoring system exists for hazardous constituents that may occur in the wastewater to be treated - This is the pretreatment program as in the NPDES permit and also a requirement in order to achieve federal grant money. The State approves the pretreatment program and specifies what to look for. • A regular sampling program exists for possible hazardous constituents in the sludge that is to be land-applied, especially for heavy metals binding. • Groundwater monitoring wells are in place (State requirement) on the site of the land-applied sludge. • Monthly staff meetings are held with all supervisors in attendance as well as the Plants Manager. • Board of Directors meetings are held bimonthly and offer the Plant Superintendent the opportunity to voice any concerns and/or problems.

Table 6 documents that many management practices exist which help assure regulatory compliance and evaluation of environmental performance. For instance, Table 6 lists activities and systems that:

Help monitor the adequacy of compliance assurance personnel, such as: Laboratory and operations information that is logged in by operators is doublechecked by the chemical analyst and Plant Superintendent for task completion and questionable data; State on-site evaluations especially of the laboratory for procedural compliance and quality assurance; Periodic "tailgate" sessions held for employees with their immediate supervisor to give an opportunity to voice concerns and/or problems; and monthly staff meetings of supervisors to voice concerns and/or problems.

Identify non-compliance areas, such as: On-site inspections of the facilities performed by the State; Maintenance of periodic testing and monitoring schedules; Uses of feedback from the State regarding weekly and monthly forms sent to the State regulatory agency; Additional process control testing; Laboratory and operational data and reports are reviewed daily by the Plant Superintendent; Existence of a monitoring system for potential hazardous constituents that may occur in the wastewater to be treated and for the sludge that is to be land-applied; and Monthly safety checklists performed by employees.

Track monitoring and analysis activities with respect to reporting deadlines, such as: Laboratory and operations information that is logged in by operators is doublechecked by the chemical analyst and Plant Superintendent for task completion and questionable data; Maintenance of periodic testing and monitoring schedules (data on regulatory compliance is retained by a computer at the wastewater treatment plant); Plants Manager receives and reviews a copy of most all reports (State-required and others); Executive Director receives a copy of monthly State-required reports; and a joint effort is made by the Executive Director, Plants Manager and Plant Superintendent to ensure that the provisions of the NPDES permit (for the wastewater treatment plant) is updated as necessary.

If these management activities are sound, the environmental results (e.g., compliance status, safety practices, and records retention) would be considered satisfactory. Subsequent audit steps therefore should focus on the effectiveness with which these systems are implemented and the extent to which they perform as intended.

There are a few issues which are not addressed by existing internal management practices listed in Table 6. These include: needed

permits, planning for obtaining necessary permits before modifications are made to processes or equipment or prior to expansion; tracking regulatory changes to anticipate additional requirements and consideration of the ability of personnel and systems to respond to noted violations. Increased emphasis should be placed on a more exhaustive review of environmental management practices (if necessary) to pinpoint those activities that may address these issues, but more especially, emphasis should turn to environmental results that could possibly be a consequence of the nonexistence of such management practices and activities. Taking this approach will provide documentation that may help management formulate any corrective steps that are necessary.

Another issue is that of verifying that management systems are in place to identify and assess environmental hazards and risks. Though there appears to exist management practices that do this, there does not seem to be any verification of it. The auditing program itself could serve as such verification by documenting those management systems in existence which help identify and assess environmental hazards and risks.

Examples of an audit protocol and audit checklist which incorporate these issues is included in Appendix D and E.

Though many aspects of the internal environmental management system at OWASA may be assessed as sound, there does appear to exist some areas that could be effectively improved with the implementation of an environmental auditing program tailored to meet OWASA's needs.

CHAPTER VII

POSSIBLE CONCERNS FOR A PUBLIC WATER SUPPLY AND WASTEWATER UTILITY TO CONSIDER IN APPLYING THE ENVIRONMENTAL AUDITING CONCEPT TO ITS OPERATIONS

In establishing an internal environmental audit program for a municipal water and wastewater utility, there are some important factors which should receive careful consideration.

One factor of utmost importance concerns management commitment. Almost all organizations with existing audit programs report that their auditing efforts would not be successful without the continuing approval and support of upper management. In the case of a municipal organization, the authority may be derived from an agency secretary or executive director, or from a local government council or manager. Regardless of the form upper management support may take, the continued backing of those at top levels of the organization is critical to guarantee that the program receives the necessary resources and cooperation, and that any deficiencies identified by an environmental audit are given proper attention (16).

The desired objectives should be clearly stated and clearly defined in the implementation of an environmental auditing program. This is important both in designing an effective audit program and in assuring continued management support. The boundaries of the program must correspond to the stated objectives (16). Experience suggests that

the learning curve for environmental auditing is relatively steep, and that significant learning occurs during the first several audits. For this reason, it is important that the objectives for the initial audits be achievable (3). It is not possible to be auditing everything, everywhere, at all times. The more realistic and measurable the objectives of the environmental auditing program are, the more easily those in positions of authority within the organization will be able to understand the reasons for the program, review the accomplishments of the program, and provide the support the program requires (16).

It is critical that the specific goals of the audit program be consistent with the culture, values, norms and overall environmental management philosophy of the organization. With a public water supply and wastewater treatment utility, specific standards and procedures are likely to have been developed either for monitoring and recording environmental data or for taking extra steps to assure that operations are consistently conducted in an environmentally acceptable manner. For this reason, the basic focus of the audit program shifts from being mostly an assessment of the facility's potential environmental problems to managing compliance and developing a system of policies and procedures to help ensure that desired compliance levels are being achieved. An environmental audit program can provide feedback on how compliance is being managed.

Another aspect of the overall environmental management philosophy of a public municipality deals with delivering public services while accepting the ethical responsibility of protecting public environmental resources. With this, the focus of the audit shifts to assessing how the management systems control environmental risks - not only those

risks associated with noncompliance, but also those environmental risks not covered by specific regulations (3).

In applying the environmental auditing concept to a public water and wastewater utility, the purpose of the EA program should be considered from the perspective of its long-term and short-term goals (3). Envisioning the potential overall roles of the environmental audit program over the long term must be tempered with the political forces operating in the public arena which may require the attainment of ends within the current political planning term. It may be that focusing on short-term goals that can be achieved by an environmental auditing program would be more practical given the political nature of a public organization. This means, for example, that a short-term goal of confirming that systems are in place and functioning to identify and manage environmental hazards may be established as opposed to a long-term goal such as developing an overall environmental performance tracking system that would be periodically audited. Another possible short-term goal, for example, could be the confirmation that all emission sources are properly registered as required by applicable federal, state, and local requirements. Whatever the short-term or long-term goals, it is important to emphasize the specific measurable objectives which must be met to fulfill these stated goals (3) (i.e., identifying and documenting compliance status, assessment of environmental risks, or the development and attainment of internal standards that would be confirmed by a periodic audit).

Another essential factor which must be considered in applying the EA concept to the operations of a public water and wastewater utility (or to any municipal environmental operation) is that proper follow-up

actions are critical to achieving the intended program benefits. The development of good reporting procedures and the institution of a problem follow-up system are of primary importance in implementing an effective program. Audit findings may be summarized on an annual or other routine schedule for presentation to top officials such as the city manager and city council. Problem follow-up systems may consist of a compliance plan with specific actions and target schedules (16).

Exogenous Environmental Impacts That Could Be Encompassed Within the Scope of an Environmental Auditing Program

Exogenous environmental impacts are external factors which may affect the operations of a water and wastewater utility but which the utility can not directly control. One such impact that could be encompassed within the scope of an environmental audit program deals with being aware of the quality of the incoming water or wastewater that is to be treated. The quality of the water source will influence the treatment process (3). North Carolina tests its rivers for only 10 chemicals out of an estimated 55,000 in use in the state. There is not an adequate system for controlling or even for identifying and monitoring many of these potential hazards (13). The environmental audit may be focused to include the assurance or verification that a reliable system is in place to detect potential sources of contamination before they show up at the treatment plant (water supply treatment or wastewater treatment). At the wastewater treatment plant, this would involve an evaluation of the pretreatment program, as required by the facility's NPDES permit. Other concerns may be: Are there any unpermitted discharges from point sources into surface waters? Does all process wastewater and draining from manufacturing areas discharge from

the point sources that have been permitted? Are there any leachates from present or previous landfills, process operations, or storage areas entering surface waters or likely to enter surface waters in underground water flows? Have samples been obtained of these leachates and analyzed for pollutants of concern? Does incoming water contain pollutants specified in permits? If so, is the incoming water periodically analyzed for these pollutants? Are permits based on these incremental additions from the source (3)?

CHAPTER VIII

CONCLUDING REMARKS

The scale of environmental operations at a water and wastewater utility, whether it be municipal or independent, generally is less than that of the larger private corporations from which the environmental auditing concept is borrowed. There are also some characteristics unique to the organizational structure of the local government which influence management objectives, management commitment, and available resources. These include the existence of intense public scrutiny, dependence upon a highly politicized resource base, and simultaneous demands for both improved performance and reduced expenditures. Due to these factors, the most appropriate type of environmental audit for a municipal water and wastewater utility would usually involve a less extensive auditing effort than has been used in the private sector while still achieving significant positive results. This could be accomplished by limiting the focus of the program to regulatory compliance and performance evaluation.

It has been shown that there are many environmental management systems and activities in place at OWASA's water and wastewater facilities which reflect these two goals - assurance of regulatory compliance and evaluation of environmental performance. Some management activities and systems were identified which indicate non-compliance areas, track monitoring and analysis activities with respect to

reporting deadlines, and help monitor the adequacy of compliance assurance personnel. Subsequent audit steps, such as gathering audit evidence (see Appendix E for example audit checklist), should focus on the effectiveness with which these systems are implemented and the extent to which they perform as intended.

There are some practices which are not addressed by internal management systems. These include: needed permits; planning for obtaining necessary permits before modifications are made to processes or equipment or prior to expansion; tracking regulatory changes to anticipate additional requirements; and consideration of the ability of personnel and systems to respond to noted violations. In this case, subsequent audit steps should emphasize environmental results that could possibly be a consequence of the absence of such management practices and activities.

Another issue which should be addressed by an environmental audit for OWASA is that of verifying that management systems are in place to identify and assess environmental hazards and risks. The auditing program itself can serve as such verification by documenting those management systems in existence which help identify and assess environmental hazards and risks.

Though many aspects of the internal environmental management system at OWASA may be assessed as sound, there does appear to exist some areas that may be effectively improved with the implementation of an environmental auditing program tailored to meet OWASA's needs.

This model has potential application to other water and wastewater utilities. The mode of operation and the effectiveness of environmental management systems can vary among different utilities depending on such factors as size, management commitment, and resources available. By

considering the potential and feasibility of implementing an environmental auditing program at OWASA, the groundwork has been laid for other utilities (bigger/smaller, better/worse off than OWASA) to consider how the EA concept may fit their particular circumstances.

One of the strong appeals of the environmental auditing concept is that it can be modified to achieve the most logical and realistic fit given the environmental management needs and objectives of the organization. Size, geographic area, budget concerns, and political concerns all act to shape management philosophy and the goals and objectives of an environmental management program for a municipality. Despite the possible differences in such respects between municipalities, there is similar reasoning local governments may share for implementing an environmental auditing program. These include:

- Increased environmental management effectiveness - Measured by an improved compliance, reduced number of and size of fines, improved accident statistics, reduced number of environmental hazards, improved reputation, and favorable publicity;
- Identification of more efficient and cost-effective means of achieving compliance - Identifying less costly yet more efficient pollution control equipment and allowing increased savings in the area of operations and maintenance due to higher quality control assurance;
- Assessment of risks associated with hazardous conditions - An environmental audit can help a municipality determine and control its environmental risks and liabilities;
- Public accountability - A voluntary environmental audit program can provide evidence of due diligence, that is, that management

is exercising appropriate care and attention in discharging its duties (3).

One of the recommendations made by the Commission on the Future of North Carolina, in the N.C. 2000 Report, was that North Carolina should establish an environmental indicators program providing regular and systematic monitoring information on changes in the quantities and qualities of its environmental conditions, accurate to the county level. Changes in the quantities and qualities of environmental conditions may be a consequence of a municipality's many environmental operations, such as: water and wastewater treatment; solid waste management activities; landfill operations; toxics use and/or management; and construction and maintenance activities. An environmental auditing program could verify what internal management practices are in place to assure regulatory compliance and distinguish those areas requiring improvement in order to achieve better compliance results. Perhaps such an auditing program should be initiated by the State regulatory agency for implementation at the local government level. Such an effort may provide an environmental indicators program which gives regular and systematic feedback on how municipal environmental management systems and activities are performing against what is trying to be done and what needs to be done better. In addition to knowing if appropriate management systems exist, it can be demonstrated if the systems are functioning properly. Such information could educate the public as to the improvement or deterioration of their environment and help public officials make informed and responsible decisions.

APPENDICES

A. ENVIRONMENTAL AUDITING IN THE PUBLIC SECTOR - PERSPECTIVES FROM PROFESSIONALS IN THE ENVIRONMENTAL COMMUNITY

A Perspective from North Carolina's Environmental Community

Bill Holman, Lobbyist, Conservation Council of North Carolina and N.C. Sierra Club

"North Carolina conservation organizations such as the Conservation Council of North Carolina and the Sierra Club strongly support environmental auditing by industries and local governments. Our state depends on businesses, industries, and local governments to manage their environmental programs responsibly and to back up that attitude with internal policies, procedures and commitment. The legal system of a free society cannot function without respect for laws including environmental laws. Environmental auditing is an excellent way that industries and local governments can demonstrate their commitment to environmental quality Environmental auditing is one idea that can be supported by all sectors - industry, environmentalists, and government - and one that may herald a new era in voluntary environmental awareness, commitment and action by industry and local governments."

Environmental Auditing From the Perspective of an Environmental Lawyer

William G. Ross, Jr., Greensboro, North Carolina

"Without such a program (which would assess a facility's environmental performance and provide corrective action where needed), businesses and industries are destined for problems. What they do not know or choose to ignore about their environmental protection responsibilities can and frequently does hurt them. In many cases the hurt has been severe and multifaceted: civil penalties or fines in the thousands or millions of dollars; criminal prosecution; civil liability to injured parties; punitive damages; a badly tarnished public image; and expensive and time-consuming clean-up and corrective actions Auditing is effective because it concentrates the necessary levels of organizational commitment, resources and structure on the difficult tasks of maintaining compliance and managing risks. Industries and local governments that have established auditing programs report that the benefits of environmental auditing outweigh the risks and costs. The proven effectiveness of environmental auditing is causing many lawyers to suggest its use to the industries and local governments they represent."

Perspective of Local Government

David Reynolds, Director of Intergovernmental Programs, North Carolina League of Municipalities

"A concept new to the local government arena, called environmental auditing could help local government managers to be better aware of the status of environmental control activities in their local government....

Very often, local government managers are unaware of the details of environmental compliance by local government facilities and the first notice of a problem is received from the regulatory agency. In a time of limited local government resources, it is best to be aware of environmental operational problems early on, in order to be able to correct them while they are inexpensive or to gain a longer lead time to plan and implement more costly solutions.

For those government managers who find it difficult to have a complete handle on all of their environmental responsibilities, all of the potential areas of liability, and the current and projected status of all local government environmental operations, I would recommend a review of the environmental auditing technique with an eye toward assigning a principal staff member the responsibility of providing some assurance that your city or town is doing well. Environmental auditing can be applied to a broad range of local government activities. These include the obvious water and wastewater facilities, and solid and hazardous waste disposal and transportation, but also include more routine things such as the handling and storage of dangerous chemicals. Some of the benefits of an environmental auditing effort include independent verification of compliance, the assurance to management that adequate operating procedures exist to safeguard the environment, assistance to lower-level managers to help understand and interpret regulatory requirements and to identify potential problems; identifying responsible ways to save money, reducing the risk of potential legal liabilities, and developing improved relations with the regulatory community and the public-at-large.

The private sector has been using environmental auditing for some time, finding that the technique is definitely to their advantage. Local governments can clearly use the technique and can devote as much time as appropriate to it. Obviously, an environmental auditing effort could be very extensive, but local governments may also be able to use a less extensive environmental auditing effort and still achieve significant positive results"

B. ENVIRONMENTAL AUDITING IN RALEIGH, N.C.

Case Study (16):

CITY OF RALEIGH

with Dempsey Benton
City Manager

In the early 1980s the City of Raleigh experienced several problems which resulted in environmental damage, including a caustic spill and a chemical spill. The problems stimulated the city to begin developing one of the first environmental auditing programs ever instituted by a local government. As has been the case for many private sector companies that employ environmental auditing as a management tool, Raleigh's efforts have been effective in reducing further problems.

Raleigh, the capital of North Carolina, is the state's second largest city. Management initiatives undertaken by the city are often monitored by other local governments in the state, and thus Raleigh may serve as a model for improving municipal environmental quality control in other localities. In the summer of 1982, the city decided to undertake an environmental auditing program, which, when complete, will include:

1. An official policy issued by the City Manager dealing with environmental quality,
2. An on-going program to review regulatory requirements affecting the city, with an annual briefing session on all permit requirements,
3. A chemical spill control program, and
4. Staff inspection teams separate from the operational activity being evaluated.

At present, Raleigh has formulated and distributed Management Policy No. 100-23 (see Exhibit 4) which states "it is essential that those departments with construction projects and/or property management duties give specific attention to activities which can have an environmental impact." The city considers environmental auditing as an extension of its municipal government efforts to protect and enhance the local environment, recognizing that cities have been in the environmental protection business for many years. Raleigh has also completed a review of state government regulations and governmental permits which affect its operations. The review resulted in a report (see Exhibit 5) that documents these requirements and assists municipal personnel in carrying out their responsibilities in an environmentally-sensitive fashion.

A consultant specializing in chemicals control and work-place safety was retained by the city and has completed a study of city facilities where chemicals are stored or used. The study will provide the basis for routine assessment of the city's operating procedures and individual facilities themselves. Staff audit teams have already conducted a series of initial inspections. The city has also developed an inventory and record-keeping system to track hazardous materials, and has improved its emergency response plans.

The City of Raleigh believes that the environmental auditing approach provides an opportunity to take positive action rather than being forced to react to problems. This approach also permits management to communicate its concern over environmental issues, facilitate contact among field personnel, and assign responsibilities in a more orderly manner. Although environmental auditing cannot guarantee an end to all environmental management problems, Raleigh has already seen a positive effect on overall attitudes within the organization as well as a marked decrease in incidents of environmental harm.



CITY OF RALEIGH, N.C.

POLICY NO. 100-23
 DATE December 6, 1982
 PAGE 1 OF 2

Management Policy

TITLE ENVIRONMENTAL CONCERNS

- A. The City has many projects and properties which must be managed to prevent adverse impact on the environment. To accomplish this purpose, it is essential that those departments with construction projects and/or property management duties give specific attention to activities which can have an environmental impact.
- B. The following should receive specific attention:
 1. If we disturb land, soil erosion control and safety requirements exist which must be met.
 2. If we affect lakes, there are applicable regulations when fluctuating water levels may affect wildlife and water quality in the lake and downstream.
 3. If we work in or near streams, there is potential for water quality degradation and regulations exist which affect this type of work.
- C. The City is undertaking a program which is oriented toward assuring that the City's projects and programs enhance and protect the environmental surroundings. Elements of this program include the following:
 1. Permits Review

The state and federal governments have regulations which affect how the City conducts its programs in this area. We must understand these regulations and be informed of any permits which may be necessary. There will be an on-going program to review regulatory programs affecting us and an annual briefing session on permit requirements. It is the City's objective to follow all applicable governmental regulations and obtain permits as required.
 2. Chemical Spill Sites Assessment

This assessment of chemical spill sites shall be undertaken as a means of identifying potential spill sites, steps to prevent such spills, and measures to be undertaken in the event of such spills. Particular focus will be on chemical control sites such as at the water treatment plants, wastewater treatment plants, and swimming pools.

Exhibit 4

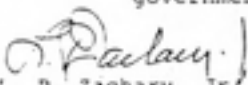
Page 2 of 2

3. Standard Procedure on Lakes Management

A Standard Procedure identifying the responsibility of city and other agencies in the management of lakes will be developed and distributed to all personnel.

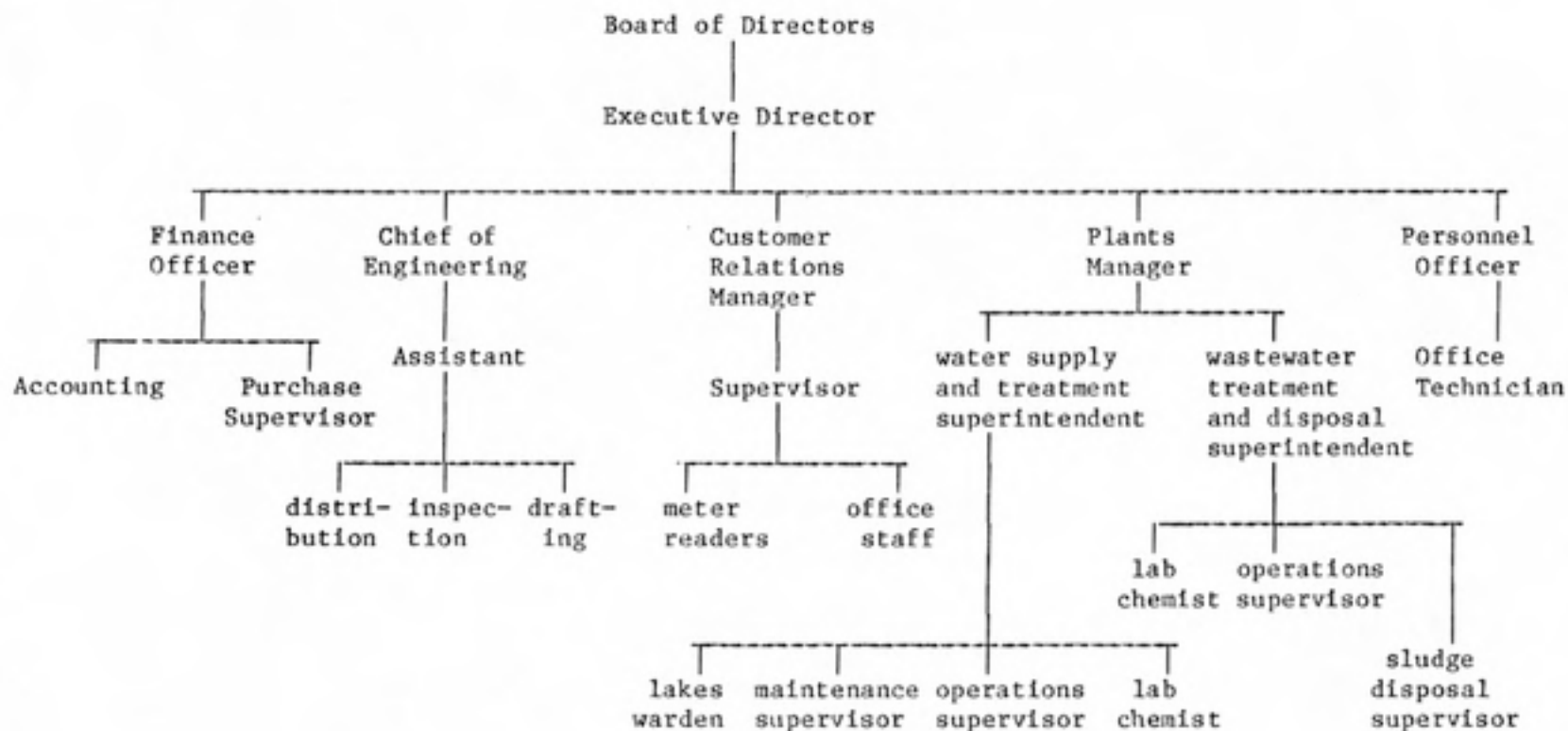
4. On-going Awareness of Management

All management staff of the City will need to be diligent in identifying new regulations and permits which may affect the City organization. Any new items which are identified by a department manager should be communicated to the Assistant City Manager for Operations for consideration of application to other areas of City government.


L. P. Zachary, Jr.
City Manager

jt/WED/6

C. ORGANIZATIONAL CHART OF ORANGE WATER AND SEWER AUTHORITY (19)



D. ENVIRONMENTAL AUDIT PROTOCOL FOR OWASA'S WATER SUPPLY AND WASTEWATER TREATMENT FACILITIES (4,5,12)

OBJECTIVES: An environmental audit of OWASA's facilities will evaluate the effectiveness of procedures and controls implemented to ensure compliance with applicable environmental laws and regulations. Compliance with management policies and procedures will be evaluated as well. The audit shall also serve as documentation that the facility is operating in an environmentally sound manner.

SCOPE: Verification by examination and inspection that reports submitted to governmental agencies are accurately prepared; Determination that analytical tests are performed in accordance with EPA standards; Determination that sampling devices, recording instruments, and other mechanical devices are operating correctly and are adequately maintained; Collection of samples; Records retention; Employee information; Health and safety procedures; Chemical inventory; Emergency plans; Preventive maintenance; Self-monitoring programs; and Chemicals/hazardous waste disposal.

Facility:

Evaluator(s):

Location:

Date:

- | | Space for
Comments |
|--|-----------------------|
| 1. Review the following (from data supplied by the audit team leader): | |
| a. Facility layout including treatment system flow diagrams | |
| b. Regulations that apply to the facility - federal, state, and local | |
| c. Water quality standards required for effluent (N.C. Drinking Water Standards, National Secondary Drinking Water Regulations, 40 CFR Part 143 for the water plant and the NPDES permit for the wastewater treatment plant) | |
| d. Water quality standards required for influent | |

Space for
Comments

- e. Plant policies and procedures (ex.: self-monitoring schedule, safety inspections, preventive and operational maintenance schedules)
 - f. Emergency plans
2. Develop an understanding of the process of communication within the structure of the facility and upward to the Board of Directors (How and When are problems discussed? How is action planned? initiated? Who participates in the discussions?)
 3. Review plans and programs for compliance with published regulatory requirements and confirm that dates of compliance are consistent with requirements.
 4. Determine if compliance with all reporting procedures has been carried out; if not, list exceptions or mitigating circumstances. (Must find out what reports are required for submittal).
 5. Establish responsible parties for sampling, analysis, record maintenance and regulatory reporting.
 6. Confirm the operation of the data collection and reporting system:
 - a. Observe the procedure of plant personnel for sample collection, analysis, and data recording.
 - b. Test of reporting procedure -
 - Select a report indicating noncompliance with environmental standards (if appropriate) and a report reflecting compliance -
 - Review reports submitted to the State regulatory agency to confirm their completeness and accuracy in submittal within specified time period.
 - For the noncompliance period, review file material to ascertain basis for non-compliance incident report.
 - Determine that corrective action was effected promptly.
 7. Evaluate the adequacy of self-monitoring programs (in laboratory, preventive maintenance, operations).
 8. Evaluate sampling locations as to collection of representative samples in the distribution system:

Space for
Comments

- a. Determine if samples are collected consistent with regulation requirements and the frequency of sample collection.
9. Evaluate laboratory analytical procedures including the following:
- a. Determine which tests the lab is certified for
 - b. Preservation and holding time of samples
 - c. Determine if approved analyses are used
 - d. Adequacy of instrument calibration and state of repair
 - e. Adequacy of quality assurance program for all analyses
 - f. Recordkeeping and calculations in the lab
 - g. Self-monitoring report forms going to the State regulatory agency
 - h. Extent and capability of outside contract laboratories
10. Observe if vital treatment unit may be out of service and causes:
- a. If there is excess accumulation of solids, scum, and floating materials in the treatment units
 - b. If odors, excessive growths, etc. are present
 - c. Obtain design data and startup dates for new treatment units or devices
 - d. Determine efficiency of removal for primary and secondary pollutants and toxic and hazardous substances
11. Assess handling, treatment, and disposal of any wastes generated from processes at the water supply and wastewater treatment facilities.
12. Visually inspect equipment and chemical storage areas. Observe equipment during operation.
13. Establish who has responsibility for adding chemicals and updating chemical inventory.

Space for
Comments

14. Establish the adequacy of recordkeeping for chemical spill prevention and control (responsibility for initiating corrective actions, regulatory reporting, record maintenance):
 - a. Determine that materials and construction of tanks are compatible with materials stored and conditions of storage (from engineering and purchasing specifications)
 - b. Based on observations made during plant tour, determine if all preventive systems are capable of preventing spills from entering surface waters (water supply)
 - c. Review facility maintenance and test records on storage tanks, tank supports and valves and piping
 - d. For loading/unloading facilities, determine adequacy of signs/procedures for warning vehicular traffic, insuring that vehicles cannot depart before complete disconnect
 - e. Ascertain that catchment basin is adequate to hold at least maximum capacity of a single compartment of a tank truck or servicing vehicle.
 - f. Record frequency of spill prevention briefings, attendees, and records of meetings
15. Locate and observe indicating or recording instrumentation available to monitor and control devices:
 - a. Conclude whether devices are operating normally or abnormally
 - b. Identify any operating problems and their causes
16. Evaluate if acceptable levels of operations and maintenance are being attained:
 - a. Determine for each process and treatment center whether operational maintenance conforms to good and acceptable practice
17. Determine what plans the facility has to expand existing treatment facilities or install new treatment units:
 - a. What, if any, additional treatment may be required to meet existing regulations or other requirements?

Space for
Comments

- b. Determine if construction schedules are being met, and if applicable, reasons for the delay
- 18. Record outside consultant work that has been or will be done (private or State) and the scope of those projects.
- 19. Determine employee training requirements (degrees, licenses, certifications, recertification requirements, etc.):
 - a. Establish adequacy of updating employees on new technique, methods

E. ENVIRONMENTAL AUDIT CHECKLIST FOR OWASA'S WATER SUPPLY AND WASTEWATER TREATMENT FACILITIES (3,5,7,12,16)

Facility:

Evaluator(s):

Location:

Date:

Part I - COMPLIANCE ASSURANCE

Yes No N/A

1. Has the facility identified all processes and all hazardous materials that are subject to "environmental standards"?
2. Does the facility have knowledge of the "environmental standards" applicable to each waste, emission, discharge, or regulated hazardous materials?
3. If the requirements of such "environmental standards" are not met, does facility procedure require the preparation of an Improvement Plan and Implementation Schedule to identify and monitor corrective action?
4. Are reliable regulatory update sources available, (and where could they be found) such as:
 - a. Code of Federal Regulations (CFR)
 - b. State regulatory agency registers
 - c. Local regulatory agency registers
5. Is (or was) the facility on a compliance schedule prior to specification of regulatory limits?
 - a. Were the specified dates met?
 - b. Were required reports submitted in accordance with schedules?

Yes No N/A

6. Have there been changes that would result in changing the terms of permits, and have these been reported to the appropriate agency? For example,
 - a. Facility expansion, modification, or shut down
 - b. Process modification
 - c. Quantity and type of pollutants
 - d. Establishment of water quality parameter for receiving waters
7. Have the facility's existing permits been revoked, suspended, or modified by the issuing agencies at any time since issuance?
8. Have appropriate renewal applications been filed in a manner consistent with regulatory requirements?
 - a. Does the facility maintain files on all information resulting from permit monitoring activities?
 - b. Does the facility retain records for at least three years on all monitoring activities and results, including original dated strip charts, calibration, and maintenance records?
 - c. Are the records kept in such a manner that they are readily retrievable for examination?
9. Does a summary report of laboratory, O & M activities, and performance status of the environmental management system go to upper management?
 - a. How often is such a report submitted?

 - b. Prepared by whom?

 - c. Who in top management receives it?

10. Does the facility properly prepare and submit reports required to be filed with government agencies in a timely fashion?

<u>Yes</u>	<u>No</u>	<u>N/A</u>
------------	-----------	------------

11. Does the facility have procedures for advising top management of notices from government agencies of violations or non-compliance? If so, explain:

12. Does the facility have a procedure for advising top management of unauthorized released to the environment required to be reported to a governmental agency? If so, explain:

13. Waste/Emission/Discharge Inventory: (See Form 1)

14. Waste/Emission/Discharge - Permit/Contract Inventory: (See Form 2)

Form 1

WASTE/EMISSION/DISCHARGE (W/E/D) INVENTORY:

[illegible]

WASTE/EMISSION/DISCHARGE - PERMIT/CONTRACT INVENTORY:

[illegible]

Part II - LABORATORY

<u>Yes</u>	<u>No</u>	<u>N/A</u>
------------	-----------	------------

1. Is the environmental laboratory certified?
2. Are adequate records maintained of:
 - a. Sampling dates, time, exact location
 - b. Analyses dates, times
 - c. Individual performing analysis
 - d. Analytical methods/techniques used
 - e. Analytical result
 - f. Monitoring records (e.g., physical, chemical, bacteriological tests)
 - g. Calibration and maintenance on lab equipment
3. Are EPA-approved analytical testing procedures used?
4. If alternate analytical procedures are used, proper approval has been obtained?
5. Parameters other than required by environmental regulation (Safe Drinking Water Act/NPDES permit) being analyzed?
6. Is sample collection adequate?
7. Are proper preservation techniques used?
8. Duplicate samples are analyzed? _____% of time?
9. Spiked samples are used? _____% of time?
10. Commercial laboratory used?
11. Commercial laboratory state certified?

Lab name:
Lab address:
12. Satisfactory calibration and maintenance of instruments and equipment?
13. Quality control procedures used?

Yes No N/A

14. Is the schedule for periodic calibration and maintenance of all monitoring equipment adequate for quality control?
15. Are daily laboratory records reviewed?
16. How often? _____
By whom? _____
17. Is this periodic record review adequate in alleviating inaccurate reporting?
18. Are monthly monitoring report forms mailed to the Division of Health Services (water supply) or Division of Environmental Management (wastewater treatment) in time to meet submitted deadline?

General Comments on Laboratory Procedures

Part III - OPERATIONS AND MAINTENANCE

A. Inspections and Records

<u>Yes</u>	<u>No</u>	<u>N/A</u>
------------	-----------	------------

1. Does a written schedule exist for inspecting:

- a) Monitoring equipment
- b) Safety and emergency equipment
- c) Operating and structural equipment (including new lines, leaks, wells, etc.)
- d) Recording charts and logs

2. Does the schedule or plan identify the types of problems to be looked for during inspection?

- a) Malfunction or deterioration (e.g., leaking fitting, corroding pipes or tanks, etc.)
- b) Operator error
- c) Discharges (leaks from valves or pipes, joint breaks, etc.)

3. Is a written schedule for these inspections maintained at the facility?:

- a) Are the inspections conducted?
- b) Is a record of these inspections maintained in an inspection log?
- c) Including date and time of inspection, name of inspector, notation of observations, date and nature of repairs or remedial action?
- d) Who receives copies of these inspection sheets?

 4. Are any malfunctions or other deficiencies noted in the inspection log that remain uncorrected? (Use narrative explanation sheet.)

5. How many years are the records of the inspection logs maintained at the facility? _____

Comments:

B. Operational Components and Records

<u>Yes</u>	<u>No</u>	<u>N/A</u>
------------	-----------	------------

1. Standby power or other equivalent provisions provided?
2. Record of alternate source of power available?
3. Adequate alarm system for power or equipment failures available?
4. All treatment units in service?
5. Any hydraulic and/or organic overloads experienced?
6. Qualified operating staff provided?
7. Files maintained on spare parts inventory, major equipment specifications, parts and equipment suppliers?
8. Instructions files kept for operation and maintenance of each item of major equipment?
9. Consulting engineer retained or available for consultation on operation and maintenance problems?
10. Operation and maintenance manual maintained?
Updated how often? _____
11. Flow management records properly maintained?
Method (automatic, manual, etc.): _____
12. Primary flow measurement device properly operated and maintained?
13. Flow measurement equipment adequate to handle expected ranges of flow rates?
14. Facility operating records kept, including operating logs for each treatment unit?
15. Daily operating records reviewed?
How often? _____
By whom? _____
16. Is this periodic review of daily operating records adequate in revealing:
Operational deficiencies?
Potential operational deficiencies?
Inaccurate reporting?

Yes No N/A

17. Quality assurance records kept?
18. Records maintained of complaints received about quality of drinking water/treated wastewater effluent or odors?
19. Records maintained of actions taken on complaints received regarding drinking water quality/treated wastewater effluent or odors?
20. Does a preventive maintenance schedule exist?
21. Is it reviewed periodically?
- How often? _____
- By whom? _____
22. Is the schedule for periodic calibration and maintenance of all monitoring equipment adequate for quality control?
23. Is there a periodic reporting on the costs of operations?
24. Are sludges and solids adequately disposed of?
25. Does the facility have a separate storm sewer system?
26. Are any of the following wastewaters discharged into a separate storm sewer?
- a. Process wastewater
 - b. Storm water from raw materials storage, process areas, pollution contaminated sludges, etc.
 - c. Sanitary wastewaters

C. Personnel Training and Records

<u>Yes</u>	<u>No</u>	<u>N/A</u>
------------	-----------	------------

1. Is there a personnel training program for:

- a) Emergency situations?
 - b) Safety and health?
 - c) Update on technical methods, operational techniques?
 - d) Other? _____
- _____

2. Is a training review provided?

How often? _____

3. Do records exist for:

- a) Job title and written job description for each position?
- b) Description of the type and amount of introductory and continuing training?
- c) Documentation that employees have received training? (i.e., degrees, certifications, licenses, etc. received)

4. Are these records maintained at the facility?

5. Are personnel familiar with operating restrictions and proper operation of equipment and/or instrumentation?

Comments:

Part IV - HAZARDOUS/CHEMICAL SUBSTANCES

1. a) List all important hazardous/toxic substances used at the facility site:

_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

- b) Include safety data sheet for each substance.

Yes No N/A

2. a) Do special procedures exist for handling all the above substances?
- b) Are inventory controls adequate?
- c) Are all facility employees informed concerning these substances?
- d) Are all raw materials containers accurately labelled?
- e) Are waste disposal procedures followed?
- f) Are appropriate individuals aware of special spill procedures?
- g) Do these substances discharge to the air?
- Surface water?
- h) Are measures in effect to prevent rubbish/trash contamination?
3. Is there an inventory of spill clean up materials and equipment?
4. Is the current inventory of spill cleanup materials and equipment adequate?

Yes No N/A

5. Does the facility contain in service, stored for future use, or disposal, any PCB items (high or low-voltage PCB capacitors, PCB transformers, PCB chemicals, electromagnets, hydraulic systems, etc.)?

If yes, list number and type of item; whether it is in service, storage, or sent to disposal; and if it is properly marked.

6. Does the facility have its own storage site for PCB articles?

If storage site is not within the boundary of the facility, give the site's name and address.

7. Storage site:

- a. Does storage site provide protection from rainfall?
- b. Does the floor have six inch continuous curbing?
- c. Is the area within the curbed area void of drains, valves, expansion joints, or other openings?
- d. What is the total containment volume of storage site? (length x width x height) _____
- e. What is the internal volume of the largest PCB article or container stored within? _____

Yes No N/A

f. What is the total internal volume of all PCB articles and containers within the storage site? _____

g. Is item d greater than two times item e?
or 25% of item f?

8. Are storage areas adequately marked?

Comments on Hazardous/Chemical Substances:

Part V - EMERGENCY PLANS

<u>Yes</u>	<u>No</u>	<u>N/A</u>
------------	-----------	------------

1. Is there a copy of a formal emergency plan (covering hazardous spills, emergency power supply, electrical system, fire and evacuation, etc.) existing for the facility?
2. Is there a designated person responsible for maintaining and updating the facility's emergency plans?
3. Is there a listing of all chemical suppliers with addresses and phone numbers?
4. Has the emergency plan been reviewed and updated within the last 2 years?
5. Are employees knowledgeable of the contents of the emergency plan?
6. Are local support facilities (police, fire, medical, etc.) aware of their role in emergency plans?
7. Has there been an emergency incident since the last reporting?

If yes, describe the incident and how it was handled.

Comments on Emergency Plans:

REFERENCES

1. "Comprehensive Diagnostic Evaluation and Selected Management Issues", EPA - 430/9-82-003, Office of Water Programs Operations, U.S. EPA, Feb., 1983, p. II - 2,5,7,9.
2. Godschalk, Walter, Plant Superintendent of wastewater treatment facility, Orange Water and Sewer Authority, Chapel Hill, N.C., Personal communications.
3. Greeno, J. Ladd, Hedstrom, Gilbert S., DiBerto, Maryanne - Center for Environmental Assurance, Arthur D. Little, Inc., Environmental Auditing Fundamentals and Techniques, Wiley and Sons, Inc., 1985.
4. Harrison, Lee, ed., Environmental Auditing Handbook, McGraw Hill Publishing Co., 1984, pp. 28-29.
5. _____, Industry Guide to Environmental Compliance, Harrison Publications, 1984, p. 52, 138.
6. Hufschmidt, Maynard M., "State Water Resource Planning and Policy in North Carolina", UNC-CH Water Resource Institute, Feb., 1979, pp. 33-34, 75.
7. Little, Arthur D., Inc., "Current Practice in Environmental Auditing", EPA-230-09083-006, U.S. EPA, Feb. 1984, pp. 53-56, 59-60.
8. _____, Environmental Auditing Workbook, Edison Electric Institute, 1983, pp. 19, 48-50, 91-93.
9. _____, "Benefits to Industry of Environmental Auditing", EPA-23-008-83-005, U.S. EPA.
10. Margolis, Joshua D., Strutz, Dennis E., Krouse, Richard S., "Environmental Audit Program Development", RMT, Inc., Madison, Wisconsin, pp. 1-3, 7-8, 14-15.
11. Moreau, David H. "Water Management--A Tenuous State/Local Partnership", North Carolina Insight, June, 1984, p. 68.
12. "Multi-Media Compliance Audit-Inspection Procedures", Office of Enforcement, U.S. EPA, National Enforcement Investigations Center, Denver, Colorado, Feb., 1983.
13. "N.C. 2000", Natural Resources Chapter, Commission on the Future of North Carolina, revised 12/30/82, p. 9,36.

14. Ramsey, Dennis, N.C. Division Environmental Management - Water Quality Management, Natural Resources and Community Development, Personal communications, July 29, 1985.
15. Roberts, Herman, w/Montgomery and Collins, Charlotte, N.C. served as insurance representative on N.C. Environmental Auditing Roundtable, Personal communications, Aug. 6, 1985.
16. Smith, Martin A., Institute for Environmental Studies, UNC-Chapel Hill, A Handbook of Environmental Auditing Practices and Perspectives in North Carolina, N.C. Environmental Auditing Roundtable, 1985.
17. _____, Institute for Environmental Studies, UNC-Chapel Hill, "Proposal for a Forum on Environmental Auditing Applications in the Local Government Setting", April 17, 1984, p. 1.
18. "State Permits Affecting City Departments", City of Raleigh reference manual, Raleigh, N.C., March 1983.
19. Terry, Doug, Plant Superintendent of water supply facility, Orange Water and Sewer Authority, Chapel Hill, N.C., Personal communications.
20. Truitt et al., Environmental Audit Handbook - Basic Principles of Environmental Compliance Auditing, 2nd edition, Executive Enterprises Publication Company, Inc., 1983, pp. 27-28, 95.
21. Williamson, Ron, Plants Manager of Orange Water and Sewer Authority, Chapel Hill, N.C., Personal communications, July 26, 1985.