**A PROJECT REPORT**

***Submitted by***

**[NAME OF THE CANDIDATE(S)]**

***in partial fulfillment for the award of the degree of***

**[NAME OF THE DEGREE]**

IN  
[BRANCH OF STUDY]



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**BONAFIDE CERTIFICATE**

Certified that this project report "sewage monitoring system" is the **sewage monitoring system**" is the bonafide work of "**[NAME OF THE CANDIDATE(S)]**" who carried out the project work under my/our supervision.

**SIGNATURE SIGNATURE**

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Submitted for the project viva-voce examination held on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**INTERNAL EXAMINER EXTERNAL EXAMINER**

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**CHAPTER 1. INTRODUCTION**

**1.1. Identification of Client/Need/Relevant Contemporary Issue**

The World Health Organization (WHO) estimates that 2.1 billion people globally use a source of drinking water contaminated with feces, putting them at risk of contracting diseases such as cholera, dysentery, and typhoid fever. In the United States alone, the Environmental Protection Agency (EPA) reports that 1.2 trillion gallons of sewage and industrial waste are discharged into the nation's waters each year. According to a survey conducted by the American Society of Civil Engineers, 43% of Americans are concerned about the safety of their tap water.

The client for this project is the local municipality, which is facing issues with sewage overflow and contamination of water sources. The problem is exacerbated by the lack of a real-time monitoring system to detect anomalies in sewage flow and water quality.

**1.2. Identification of Problem**

The problem requiring resolution is the lack of an effective sewage monitoring system to detect anomalies in sewage flow and water quality in real-time, leading to contamination of water sources and risk to public health.

**1.3. Identification of Tasks**

The tasks for identifying, building, and testing the solution include:

\* Conducting a literature review to identify existing solutions and their limitations

\* Designing and developing a real-time sewage monitoring system

\* Testing and validating the system in a pilot study

\* Analyzing the results and making recommendations for implementation

**1.4. Timeline**

The project timeline is as follows:

\* Literature review: 2 weeks

\* System design and development: 8 weeks

\* Testing and validation: 4 weeks

\* Analysis and reporting: 2 weeks

**1.5. Organization of the Report**

This report is organized into five chapters. Chapter 1 provides an introduction to the problem and the project. Chapter 2 presents a literature review of existing solutions and their limitations. Chapter 3 describes the design flow and process for the sewage monitoring system. Chapter 4 presents the results of the testing and validation of the system. Chapter 5 concludes the report and provides recommendations for future work.

**CHAPTER 2. LITERATURE REVIEW/BACKGROUND STUDY**

**2.1. Timeline of the reported problem**

The issue of sewage contamination has been documented globally since the 19th century. In the United States, the first federal water pollution control act was passed in 1948. Since then, there have been numerous incidents of sewage contamination, including the 1993 Milwaukee cryptosporidiosis outbreak that affected over 400,000 people.

**2.2. Existing solutions**

Existing solutions for sewage monitoring include manual sampling, laboratory analysis, and real-time monitoring systems using sensors and IoT technology. These solutions have limitations, including high cost, labor-intensive sampling, and limited spatial and temporal coverage.

**2.3. Bibliometric analysis**

A bibliometric analysis of existing solutions reveals that most studies focus on water quality monitoring, with limited attention to sewage flow monitoring. The analysis also highlights the need for real-time monitoring systems that can detect anomalies in sewage flow and water quality.

**2.4. Review Summary**

The literature review highlights the need for a real-time sewage monitoring system that can detect anomalies in sewage flow and water quality. The system should be cost-effective, easy to deploy, and provide real-time data for decision-making.

**2.5. Problem Definition**

The problem to be addressed is the lack of an effective sewage monitoring system that can detect anomalies in sewage flow and water quality in real-time, leading to contamination of water sources and risk to public health.

**2.6. Goals/Objectives**

The objectives of the project are to design, develop, and test a real-time sewage monitoring system that can:

\* Detect anomalies in sewage flow and water quality in real-time

\* Provide early warning systems for sewage overflow and contamination

\* Reduce the risk of waterborne diseases

\* Improve the efficiency of sewage management systems

**CHAPTER 3. DESIGN FLOW/PROCESS**

**3.1. Evaluation & Selection of Specifications/Features**

The literature review and problem definition identified the need for a real-time sewage monitoring system that can detect anomalies in sewage flow and water quality. The system should have the following features:

\* Real-time monitoring of sewage flow and water quality

\* Early warning systems for sewage overflow and contamination

\* Cost-effective and easy to deploy

\* Ability to integrate with existing sewage management systems

**3.2. Design Constraints**

The design of the system is constrained by the following factors:

\* Regulatory requirements for water quality monitoring

\* Economic factors, including cost of sensors and IoT technology

\* Environmental concerns, including the impact of sensors on aquatic life

\* Health considerations, including the need for early warning systems for waterborne diseases

\* Professional/ethical issues, including data privacy and security

**3.3. Analysis of Features and finalization subject to constraints**

The system will use a combination of sensors and IoT technology to monitor sewage flow and water quality in real-time. The system will be designed to be cost-effective and easy to deploy, with consideration for environmental and health concerns.

**3.4. Design Flow**

Two alternative designs were considered:

\* Design 1: A sensor-based system using IoT technology to monitor sewage flow and water quality in real-time

\* Design 2: A machine learning-based system using historical data to predict anomalies in sewage flow and water quality

**3.5. Design selection**

The sensor-based system using IoT technology was selected as the best design due to its ability to provide real-time data and early warning systems for sewage overflow and contamination.

**CHAPTER 4. RESULTS ANALYSIS AND VALIDATION**

**4.1. Implementation of solution**

The system was implemented in a pilot study in a local municipality. The system consisted of sensors to monitor sewage flow and water quality, IoT technology to transmit data in real-time, and a machine learning-based algorithm to detect anomalies.

**4.2. Testing/characterization**

The system was tested over a period of 6 months, with data collected on sewage flow, water quality, and system performance.

**4.3. Data validation**

The data collected was validated using statistical analysis and comparison with historical data.

**4.4. Project management aspects**

The project was managed using agile methodologies, with regular meetings and communication with stakeholders.

**4.5. Communication methods**

Communication with stakeholders was maintained through regular meetings, reports, and email updates.

**CHAPTER 5. CONCLUSION AND FUTURE WORK**

**5.1. Conclusion**

The project successfully designed, developed, and tested a real-time sewage monitoring system that can detect anomalies in sewage flow and water quality. The system was shown to be effective in providing early warning systems for sewage overflow and contamination.

**5.2. Future work**

Future work includes:

\* Scaling up the system for city-wide implementation

\* Integrating the system with existing sewage management systems

\* Developing a mobile application for real-time monitoring and alert systems

\* Conducting further research on the use of machine learning algorithms for anomaly detection in sewage flow and water quality.