LECTURE 4
ENGINEERING REPORTS

CEEN 4812: Construction Management
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Department of Civil / Environmental & Chemical Engineering

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OUTLINE

- Types of engineering reports
- How to write engineering reports
- Components of engineering reports
- Sample reports
- Homework 4

2

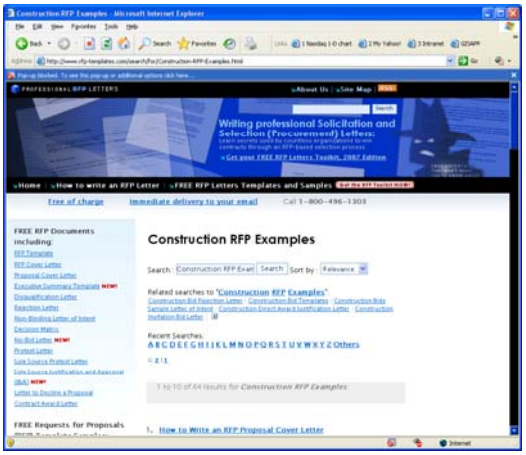
TYPES OF ENGINEERING REPORTS

1. Request for proposals/bids
2. Proposals/bids
3. Engineering reports
   - Planning reports (feasibility studies)
4. Letter reports
5. Technical memoranda
6. Design reports

3

REQUEST FOR PROPOSALS

- Already covered in Lecture 3 (Estimation and Bidding)
- How to prepare an RFP: www.rfp-templates.com
- Sample RFP: New Haven, CT, Sewer Construction project



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WHAT'S A PROPOSAL?

- A proposal is a sales document. ☑
- A <u>winning</u> proposal is a sales document that a client likes. ☒

5

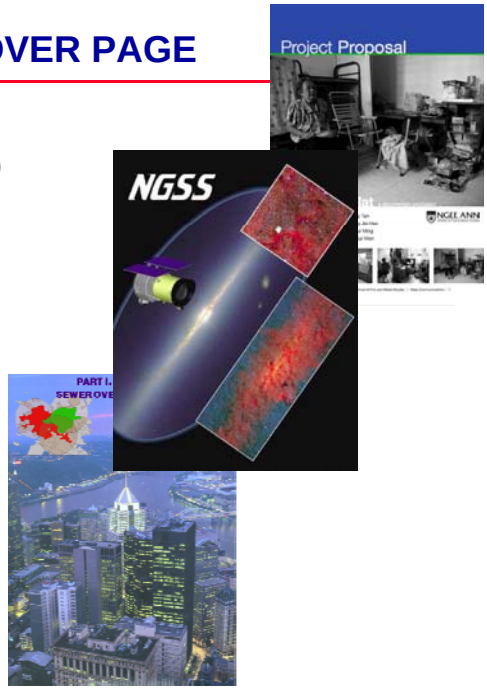
TYPICAL PROPOSAL COMPONENTS

- Cover page
- Table of Contents
- Cover letter
- Executive summary
- Company information
- Team experience (project profiles)
- Project team (not the company) organization chart
- Team member resumes
- Project cost in tabular format or as specified in the RFP
- Project schedule (bar chart / Gantt chart format)
- Terms and conditions

6

DESIGN A WINNING COVER PAGE

- Physical appearance is important (looks can be deceiving; perception is reality)
- One that will be read
  - Show stopper
  - Eye-catching
- Client specific
- Reflect project theme
  - Improve the water quality of local rivers
- Start early
  - Photo search and printing will take time.



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ASSEMBLE A WINNING TEAM

- An integrated prime-sub team to deliver scope
- Find an expert (company or person) for each project task.
- Summarize in tabular format (measles chart).

OUR WQ EXPERTISE FOR THE GREENVILLE'S PROJECT NEEDS

Firm Name	Project Task												
	A: Data Review	B: GIS/GPS	C: Field Inspections	D: Flow Monitoring	E: Water Quality Monitoring	F: Collection System Modeling	G: Receiving WQ Assessment	H: Inventory & Characterization	I: Water Quality Improvement Plan	J: Public Participation and Meetings	K: Project Management	L: Best management Practices (BMP)	M: Project Coordination
ABC Engineers					☑	☑		☑	☑	☑	☑	☑	☑
XYZ Environmental	☑	☑	☑	☑			☑						☑
Diversified Technology						☑	☑						
WBEST Inc.	☑				☑	☑	☑		☑				
Entire Team	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑

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SUMMARIZE TEAM EXPERIENCE

- Use tabular format
- List example projects
- Match examples to RFP tasks
- Include a project profile sheet for each example

TABLE 2. OUR PROJECT EXAMPLES VS. GREENVILLE'S PROJECT NEEDS

Project Name	Project Task												
	A: Data Review	B: GIS/GPS	C: Field Inspections	D: Flow Monitoring	E: Water Quality Monitoring	F: Collection System Modeling	G: Receiving WQ Assessment	H: Inventory & Characterization	I: Water Quality Improvement Plan	J: Public Participation and Meetings	K: Project Management	L: Best management Practices (BMP)	M: Project Coordination
New York City	☑	☑		☑		☑		☑			☑		☑
Portland, OR	☑	☑	☑	☑		☑		☑		☑	☑		☑
Cleveland, OH	☑	☑	☑	☑		☑		☑			☑		☑
Youngstown, OH	☑			☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Sunshine Village	☑					☑	☑		☑	☑	☑	☑	☑
Delhi, India	☑	☑	☑		☑		☑				☑		☑
All Projects	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑

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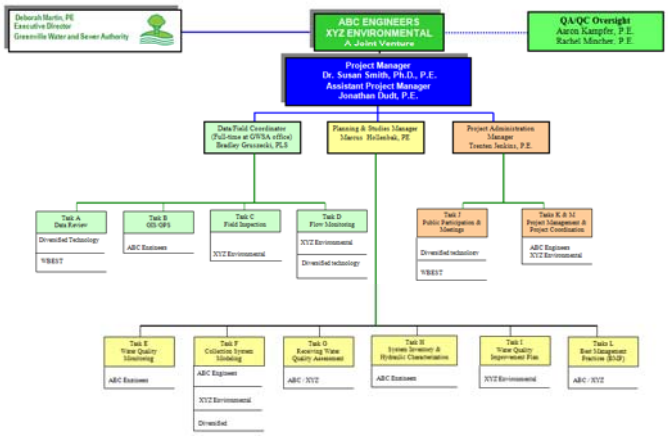
ORGANIZATION CHART

- Show who will
  - manage each task
  - work on each task
- Use color to highlight project tasks
- Print on 11x17 size

ORGANIZATION CHART BY PROJECT TASKS



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ORGANIZATION AND STAFFING

- Summarize in tabular format
- Include key team members
- Who will do what?
- Include a resume for each person in this table.

TABLE 3. PROJECT TEAM ASSIGNMENTS

Name	Project Task												
	A: Data Review	B: GIS/GPS	C: Field Inspections	D: Flow Monitoring	E: Water Quality Monitoring	F: Collection System Modeling	G: Receiving WQ Assessment	H: Inventory & Characterization	I: Water Quality Improvement Plan	J: Public Participation and Meetings	K: Project Management	L: Best Management Practices (BMP)	M: Project Coordination
Susan Smith, PhD, PE	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑	☑
Jonathan Dudt, PE	☑	☑	☑	☑	☑		☑		☑		☑		☑
Bradley Gruszecki, PE	☑	☑	☑	☑		☑	☑		☑		☑		☑
Marcus Hollenbak, PLS	☑	☑	☑										
Trenten Jenkins	☑				☑	☑	☑	☑	☑	☑	☑		
Aaron Kampfer		☑	☑	☑				☑	☑	☑			
Rachel Mincher	☑	☑	☑			☑	☑	☑					
Troy Onesti	☑	☑	☑	☑	☑	☑							
Adam Pence				☑	☑	☑							
Kyle Riffle	☑	☑	☑				☑	☑	☑				
Laura Jones			☑	☑	☑					☑	☑	☑	

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PERSONNEL QUALIFICATIONS

- Summarize in tabular format
- For key members
  - Office location
  - Major role
  - Degree
  - PE registration and state
  - Year of experience
- Include a resume for each team member

Table 3-1. Project *Team* Key Personnel

No.	Name	Company	Office Location	Major Role	Registration/ States[2]	Degree	Years of Experience
1	Susan Smith, PhD, PE	ABC Eng.	Greenville	Project Manager	PE/PA,WV,OH	Ph.D.	20
2	Jonathan Dudt, PE	XYZ Env.	Cleveland	Asst. Project Manager	PE/VA,MD	M.S.	15
3	Bradley Gruszecki, PE	Diversified	Pittsburgh	Data/Field coordinator	PE/PA,OH,WV	B.S.	23
4	Marcus Hollenbak, PLS	XYZ Env	Greenville	Mgr., Planning & Studies	PLS/PA,OH	M.S.	30
5	Trenten Jenkins	ABC Eng.	Greenville	Mgr., Project Admin	PE/PA,NC	B.S.	17
6	Aaron Kampfer	ABC Eng.	Greenville	QA/QC	PE/PA	M.S.	28
7	Rachel Mincher	XYZ Env	Greenville	QA/QC	PE/NY	M.E.	26
8	Troy Onesti	XYZ Env	Cleveland	Field Tech.	PE/NY,NJ	M.E.	10
9	Adam Pence	MBEST	New York	Project Manager	PE/PA	B.S.	10
10	Kyle Riffle	ABC Eng.	Youngstown	Data/Field coordination	PE/PA	B.S.	10
11	Laura Jones	ABC Eng.	Greenville	Survey Task Leader	EIT/OH	A.S.	5
					Average years of experience		18

2: PE: Professional Engineer, PLS: Professional Land Surveyor, PH: Professional Hydrologist

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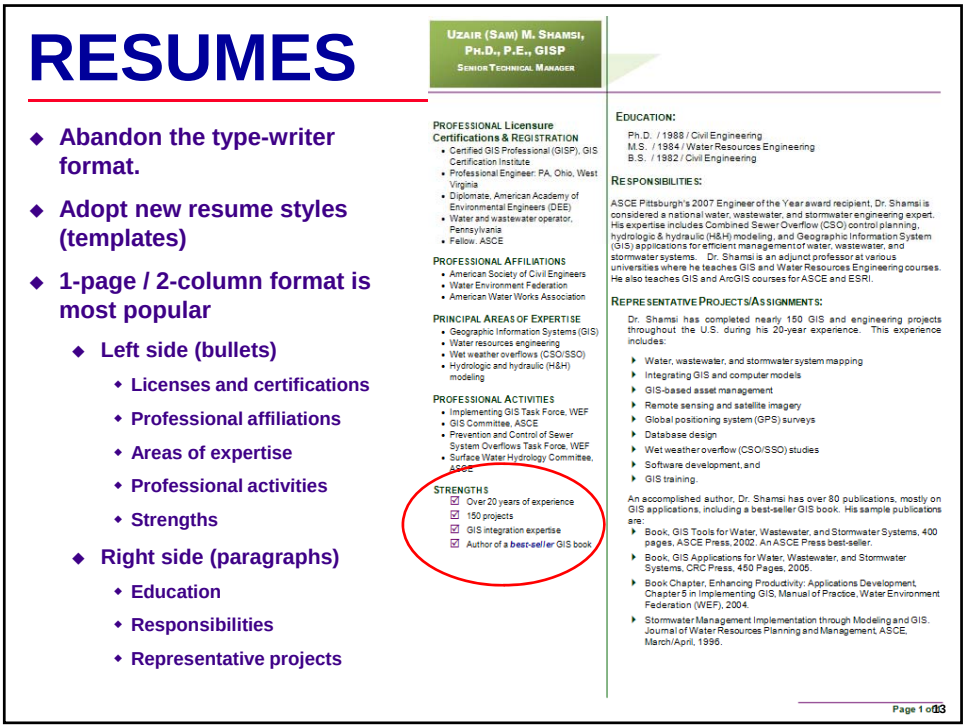
RESUMES

- Abandon the type-writer format.
- Adopt new resume styles (templates)
- 1-page / 2-column format is most popular
  - Left side (bullets)
    - Licenses and certifications
    - Professional affiliations
    - Areas of expertise
    - Professional activities
    - Strengths
  - Right side (paragraphs)
    - Education
    - Responsibilities
    - Representative projects



UZAIR (SAM) M. SHAMSI, PH.D., P.E., GISP
SENIOR TECHNICAL MANAGER

PROFESSIONAL LICENSURE CERTIFICATIONS & REGISTRATION
- Certified GIS Professional (GISP), GIS Certification Institute
- Professional Engineer: PA, Ohio, West Virginia
- Diplomate, American Academy of Environmental Engineers (DEE)
- Water and wastewater operator, Pennsylvania
- Fellow, ASCE

PROFESSIONAL AFFILIATIONS
- American Society of Civil Engineers
- Water Environment Federation
- American Water Works Association

PRINCIPAL AREAS OF EXPERTISE
- Geographic Information Systems (GIS)
- Water resources engineering
- Wet weather overflows (CSO/SSO)
- Hydrologic and hydraulic (H&H) modeling

PROFESSIONAL ACTIVITIES
- Implementing GIS Task Force, WEF
- GIS Committee, ASCE
- Prevention and Control of Sewer System Overflows Task Force, WEF
- Surface Water Hydrology Committee, ASCE

STRENGTHS
- ☑ Over 20 years of experience
- ☑ 150 projects
- ☑ GIS integration expertise
- ☑ Author of a best-seller GIS book

EDUCATION:

Ph.D. / 1988 / Civil Engineering
M.S. / 1984 / Water Resources Engineering
B.S. / 1982 / Civil Engineering

RESPONSIBILITIES:

ASCE Pittsburgh's 2007 Engineer of the Year award recipient, Dr. Shamsi is considered a national water, wastewater, and stormwater engineering expert. His expertise includes Combined Sewer Overflow (CSO) control planning, hydrologic & hydraulic (H&H) modeling, and Geographic Information System (GIS) applications for efficient management of water, wastewater, and stormwater systems. Dr. Shamsi is an adjunct professor at various universities where he teaches GIS and Water Resources Engineering courses. He also teaches GIS and ArcGIS courses for ASCE and ESRI.

REPRESENTATIVE PROJECTS/ASSIGNMENTS:

Dr. Shamsi has completed nearly 150 GIS and engineering projects throughout the U.S. during his 20-year experience. This experience includes:

- Water, wastewater, and stormwater system mapping
- Integrating GIS and computer models
- GIS-based asset management
- Remote sensing and satellite imagery
- Global positioning system (GPS) surveys
- Database design
- Wet weather overflow (CSO/SSO) studies
- Software development, and
- GIS training.

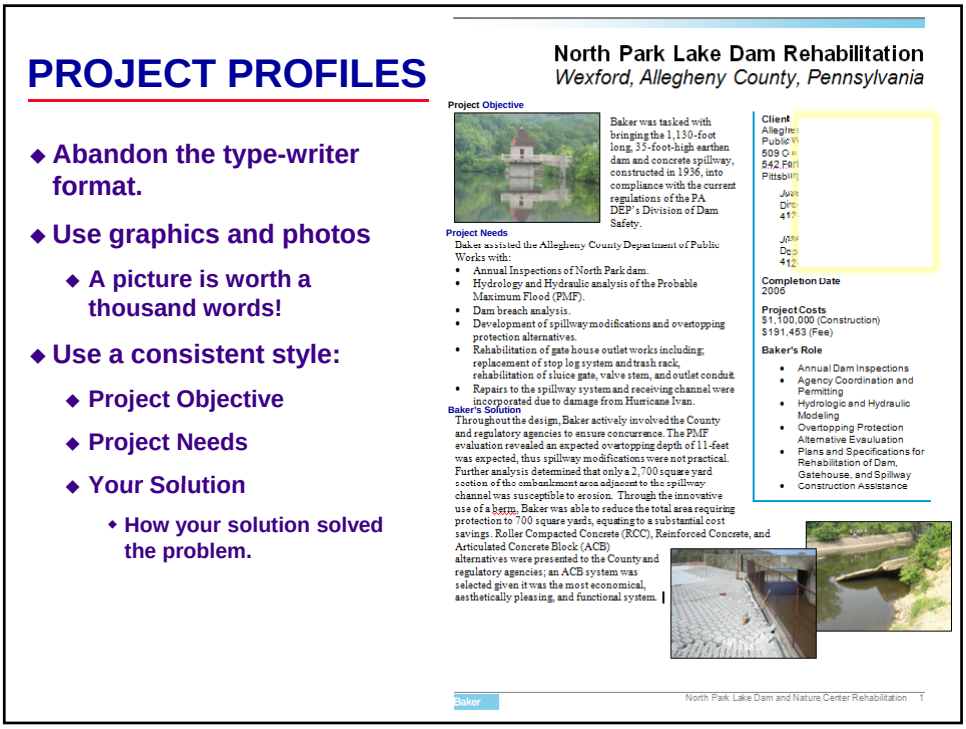
An accomplished author, Dr. Shamsi has over 80 publications, mostly on GIS applications, including a best-seller GIS book. His sample publications are:

- Book, GIS Tools for Water, Wastewater, and Stormwater Systems, 400 pages, ASCE Press, 2002. An ASCE Press best-seller.
- Book, GIS Applications for Water, Wastewater, and Stormwater Systems, CRC Press, 450 Pages, 2005.
- Book Chapter, Enhancing Productivity: Applications Development, Chapter 5 in Implementing GIS, Manual of Practice, Water Environment Federation (WEF), 2004.
- Stormwater Management Implementation through Modeling and GIS. Journal of Water Resources Planning and Management, ASCE, March/April, 1998.

Page 1 of 13

PROJECT PROFILES

- Abandon the type-writer format.
- Use graphics and photos
  - A picture is worth a thousand words!
- Use a consistent style:
  - Project Objective
  - Project Needs
  - Your Solution
    - How your solution solved the problem.



North Park Lake Dam Rehabilitation
Wexford, Allegheny County, Pennsylvania

Project Objective

Baker was tasked with bringing the 1,130-foot long, 35-foot-high earthen dam and concrete spillway, constructed in 1936, into compliance with the current regulations of the PA DEP's Division of Dam Safety.

Project Needs

Baker assisted the Allegheny County Department of Public Works with:
- Annual Inspections of North Park dam.
- Hydrology and Hydraulic analysis of the Probable Maximum Flood (PMF).
- Dam breach analysis.
- Development of spillway modifications and overtopping protection alternatives.
- Rehabilitation of gate house outlet works including; replacement of stop log system and trash rack, rehabilitation of sluice gate, valve stem, and outlet conduit.
- Repairs to the spillway system and receiving channel were incorporated due to damage from Hurricane Ivan.

Baker's Solution

Throughout the design, Baker actively involved the County and regulatory agencies to ensure concurrence. The PMF evaluation revealed an expected overtopping depth of 11-feet was expected, thus spillway modifications were not practical. Further analysis determined that only a 2,700 square yard section of the embankment area adjacent to the spillway channel was susceptible to erosion. Through the innovative use of a berm, Baker was able to reduce the total area requiring protection to 700 square yards, equating to a substantial cost savings. Roller Compacted Concrete (RCC), Reinforced Concrete, and Articulated Concrete Block (ACB) alternatives were presented to the County and regulatory agencies; an ACB system was selected given it was the most economical, aesthetically pleasing, and functional system.

Client
Allegh
Public W
509 C
542 For
Pittsbu

Jus
Dire
412

Jas
Dep
412

Completion Date
2006

Project Costs
$1,100,000 (Construction)
$191,453 (Fee)

Baker's Role
- Annual Dam Inspections
- Agency Coordination and Permitting
- Hydrologic and Hydraulic Modeling
- Overtopping Protection Alternative Evaluation
- Plans and Specifications for Rehabilitation of Dam, Gatehouse, and Spillway
- Construction Assistance

Baker

North Park Lake Dam and Nature Center Rehabilitation 1

TERMS AND CONDITIONS

- Generally written by an attorney. Typical sections are described below:
- Compensation
  - Owner agrees to compensate Contractor in accordance with Contractor's billing rates in effect on the date when the services are performed.
- Invoice and payment
  - Invoices will be generally delivered once a month and payment will be due within thirty (30) days of the invoice.
- Warranty
- Indemnity
- Liability
- Insurance
- Confidentiality
- Protection of information
- Documentation, records, audit
- Reports, documents, and information

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TERMS AND CONDITIONS

- Force Majeure
  - Neither party shall be responsible or liable to the other for delay in the performance of any of its obligations by war, riot, fire, explosion or acts of God. In the event of delay in performance due to any such cause, the time for completion will be extended accordingly.
- Construction Work (Generally in Consulting Company T&Cs)
  - Consultant shall not be responsible during the construction phase for the construction means, methods, techniques, sequences, safety or procedures of construction contractors.
- Estimates
  - The cost estimates (for example, estimates for the cost of construction, financing, acquisition of land or rights-of-way), shall be prepared in accordance with good engineering practice and procedure. However, Contractor does not control construction costs, competitive bidding and market conditions, costs of financing, acquisition of land or rights-of-way and Contractor does not guarantee the accuracy of such cost estimates as compared to actual costs or contractors' bids.

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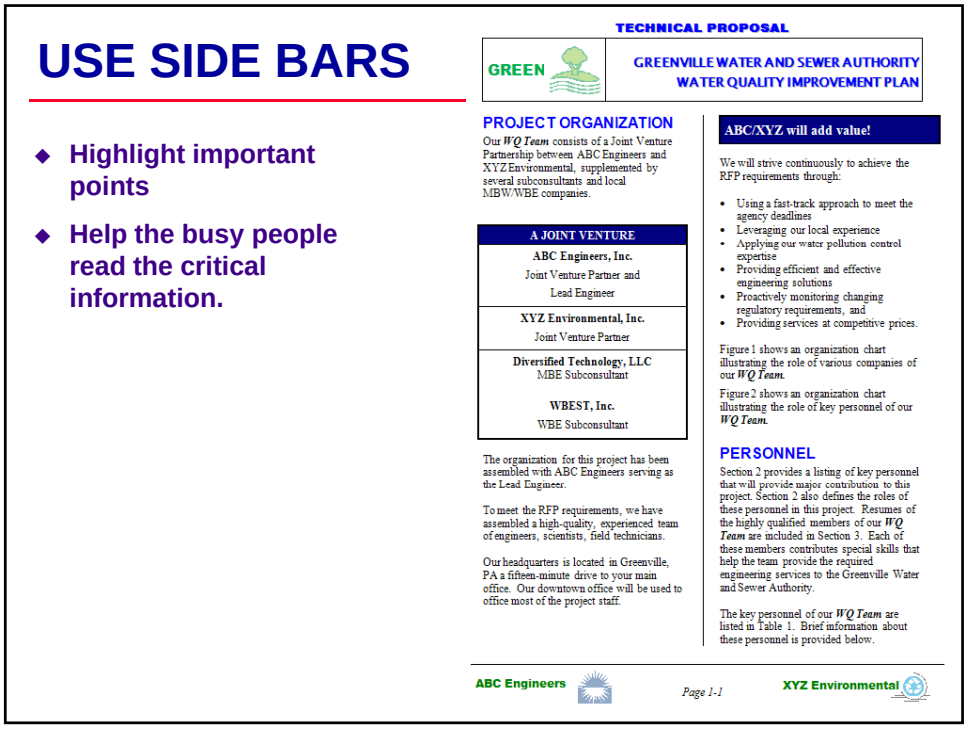
USE SIDE BARS

- Highlight important points
- Help the busy people read the critical information.



TECHNICAL PROPOSAL

GREEN

GREENVILLE WATER AND SEWER AUTHORITY
WATER QUALITY IMPROVEMENT PLAN

PROJECT ORGANIZATION

Our *WQ Team* consists of a Joint Venture Partnership between ABC Engineers and XYZ Environmental, supplemented by several subconsultants and local MBW/WBE companies.

A JOINT VENTURE
ABC Engineers, Inc. Joint Venture Partner and Lead Engineer
XYZ Environmental, Inc. Joint Venture Partner
Diversified Technology, LLC MBE Subconsultant
WBEST, Inc. WBE Subconsultant

The organization for this project has been assembled with ABC Engineers serving as the Lead Engineer.

To meet the RFP requirements, we have assembled a high-quality, experienced team of engineers, scientists, field technicians.

Our headquarters is located in Greenville, PA a fifteen-minute drive to your main office. Our downtown office will be used to office most of the project staff.

ABC/XYZ will add value!

We will strive continuously to achieve the RFP requirements through:

- Using a fast-track approach to meet the agency deadlines
- Leveraging our local experience
- Applying our water pollution control expertise
- Providing efficient and effective engineering solutions
- Proactively monitoring changing regulatory requirements, and
- Providing services at competitive prices.

Figure 1 shows an organization chart illustrating the role of various companies of our *WQ Team.*

Figure 2 shows an organization chart illustrating the role of key personnel of our *WQ Team.*

PERSONNEL

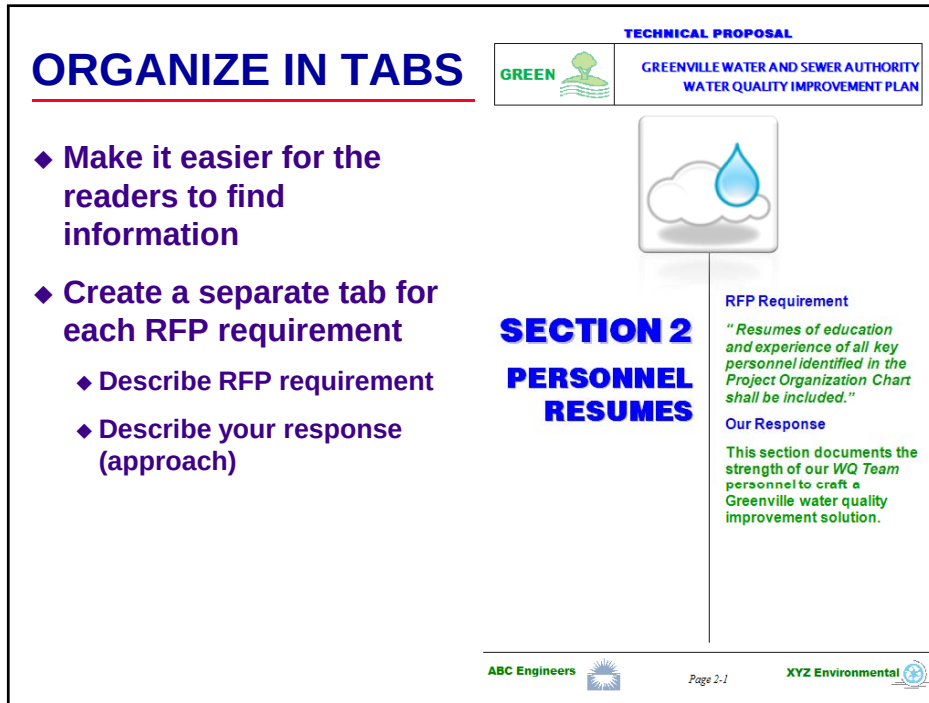
Section 2 provides a listing of key personnel that will provide major contribution to this project. Section 2 also defines the roles of these personnel in this project. Resumes of the highly qualified members of our *WQ Team* are included in Section 3. Each of these members contributes special skills that help the team provide the required engineering services to the Greenville Water and Sewer Authority.

The key personnel of our *WQ Team* are listed in Table 1. Brief information about these personnel is provided below.

ABC Engineers *Page 1-1* XYZ Environmental

ORGANIZE IN TABS

- Make it easier for the readers to find information
- Create a separate tab for each RFP requirement
  - Describe RFP requirement
  - Describe your response (approach)



TECHNICAL PROPOSAL

GREEN

GREENVILLE WATER AND SEWER AUTHORITY
WATER QUALITY IMPROVEMENT PLAN

SECTION 2

PERSONNEL RESUMES

RFP Requirement

"Resumes of education and experience of all key personnel identified in the Project Organization Chart shall be included."

Our Response

This section documents the strength of our *WQ Team* personnel to craft a Greenville water quality improvement solution.

ABC Engineers *Page 2-1* XYZ Environmental

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USE REFERENCES CAREFULLY

- Call each reference before using their name
  - Ask their permission
  - Explain scope
  - Ask for a favorable reference
- Do not use a reference who has any reservations or cannot promise a positive reference.

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SOFTWARE RESOURCES

- If your proposal creation process
  - Is a frantic search for information, or
  - If your proposals are not the best you know they could be.
- You can use “proposal software” that can make your proposals sizzle.
  - Store the project and personnel information in a centralized database
  - Integrate with accounting database
    - Automatically updated the resume / personnel experience from the project entries on time sheets
  - Create forms SF254/SF255 or SF330 (forms required to bid on federal projects) in a few hours
  - L. Robert Kimball reduced the time required to create government proposals from 3-4 days to just 2-3 hours.
- Examples:
  - Deltek, Pragmatech
  - $500-$10,000 per user

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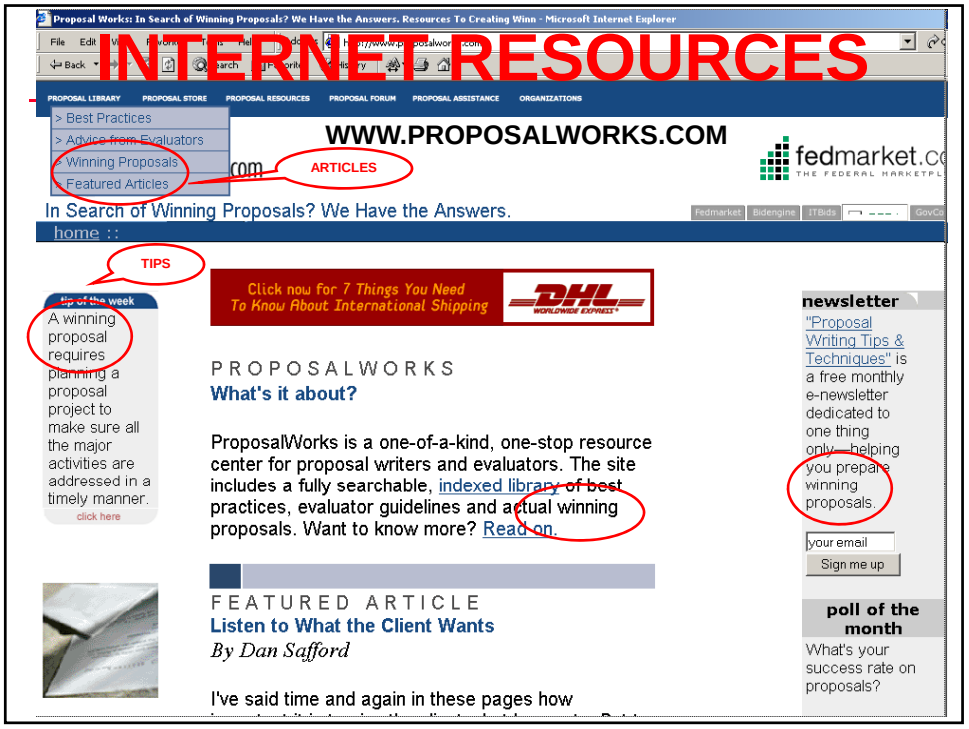

ENGINEERING REPORTS

This section provides general guidelines for writing engineering reports.

- **Outline**
  - **Report purpose and planning**
  - **Report format and organization**
  - **Headings and language**
  - **Visual design**
  - **Source documentation**
  - **Finishing touches**

Thanks to: http://owl.english.purdue.edu/

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REPORT PURPOSE

- Describe project
  - **Explain problem or issue studied**
  - **Discuss project methodology**
  - **Describe data collected**
  - **Describe project findings**
  - **Explain implications**
- Inform readers of project results precisely, concisely, and specifically
  - **They shouldn't have to read whole report to get essential points**

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REPORT PLANNING

- Before writing, consider:
  - **Why you are writing**
  - **What you hope to achieve**
  - **Who you are writing for**

These considerations will determine your report's content, organization, textual and visual design

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REPORT FORMAT AND ORGANIZATION

- Reports generally include these sections in this order:
  - **Title page**
  - **Cover letter or transmittal letter on letterhead**
  - **Table of Content**
  - **Executive Summary**
  - **Introduction**
  - **Literature Review (if applicable)**
  - **Methodology**
  - **Results**
  - **Discussion**
  - **Conclusion**
  - **References**
- Section order is flexible in that sections can be combined
  - **Combine results and discussion**
- Figures and tables are inserted within the text; large maps or drawings are attached at the end as Appendix.
- Written on plane paper with organizations logo in header or footer
- Spiral bound or 3-ring binders

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TITLE PAGE

- **Report title**
- **Report recipient**
- **Project number**
- **Report writer**
- **Report approver (optional): should be a P.E.**
- **Report date**
- **Graphics (optional)**
- **Organization logo**

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TABLE OF CONTENTS

- Sections or Chapters
- Appendices
- Also includes list of tables and figures

TABLE OF CONTENTS

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REPORT FORMAT AND ORGANIZATION
EXECUTIVE SUMMARY

- Always comes first.
- Summary of entire study – contains key info from each section
  - Contains essential information only – it is brief!
  - Covers project highlights
  - Describes the problem studied and/or main objective of the project
  - Indicates the methodology used
  - Presents the main findings and conclusions

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SAMPLE EXECUTIVE SUMMARY

- 1-2 pages for busy executives who do not have time to read the whole report.
- Similar to the abstract of a thesis or term paper

RUST HARZA

EXECUTIVE SUMMARY

PRELIMINARY ENGINEERING REPORT
EMMBER LANE SIPHON PROJECT

The Emmber Lane Siphon is part of the Central Metropolitan Interceptor Sewer (MIS) located in the central part of Milwaukee in Basin "D". The siphon is a single-barrel design consisting of an 18-in diameter ductile iron pipe that was initially constructed in 1919. According to MMSD records, the siphon was repaired in 1986 by replacing the entire length of pipe and associated fittings.

Additional siphon barrel is needed at this location for several reasons including:

- The need to comply with the MMSD policy of having siphons with at least two barrels.
- The siphon barrel has never been inspected for structural damage. Internal deterioration from natural wear and grit abrasion is likely with normal aging.
- The siphon cannot be maintained without diverting flow to the Inline Storage System (ISS) for extended periods.

RUST/HARZA performed a study as part of the Emmber Lane Siphon Project to identify potential repair and replacement alternatives for the siphon. The various investigations included inspection of gate chamber and clean-out manholes; hydraulic analysis; cost analysis; subsurface investigation review and preparation of a geotechnical overview report; review of available topographic, geotechnical, and property information; easements and utilities; a Phase I Environmental Site Assessment; and an Archaeological Reconnaissance Survey.

The Geotechnical Overview Report, Phase I Environmental Site Assessment and Archaeological Reconnaissance Survey were prepared as part of the preliminary engineering process for the Basin "D" Branch Sewers MIS Project [1].

The alternatives considered for the Emmber Lane siphon are as follows:

- No action alternative.
- New double barrel siphon and the abandonment of the existing siphon.
- New single barrel siphon in the existing siphon shaft and tunnel and use of the existing siphon as standby.

Preliminary Engineering Report *ES-1* *January 2001*
Emmber Lane Siphon Project

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REPORT FORMAT AND ORGANIZATION
EXECUTIVE SUMMARY EXAMPLE

This report presents a Combined Sewer Overflow (CSO) Long-Term Control Plan (LTCP) required to meet the stipulations of the National CSO Policy and National Pollutant Discharge Elimination System (NPDES) permit requirements of City of Greenville, Ohio.

Section 1, "Introduction," provides information about the study area, history of the City's CSO activities and corrective measures, summary of the past CSO reports, and regulatory framework. Section 2, "Geographic Information System (GIS)," presents a GIS that was created to develop the City's LTCP using a sewer separation approach. The GIS database was used to determine the elements and cost of a total sewer separation program for the City. Section 3, "Sewer Separation Plan," provides information about the City's LTCP. Based on the "Presumption Approach" of the National CSO Policy, the proposed LTCP consists of a long-term, 20-year sewer separation plan.

Four control options were compared to recommend a sewer separation program that was most cost-effective and provided maximum environmental benefits. The proposed sewer separation plan consists of constructing both sanitary and storm sewers. However, the majority of separation will consist of separate sanitary sewers. The proposed CSO abatement program includes the installation of new sanitary sewers and the reuse of the existing combined sewers as storm drains. This CSO abatement program for total sewer separation is the generally accepted practice for the separation of existing combined sewers. The proposed total sewer separation abatement program will eliminate all overflows to the Ohio River. When fully implemented, the overflow frequency will be reduced to zero overflows per year except under extreme weather or emergency conditions. When this condition is achieved, the LTCP will meet the CSO control criterion of less then four overflows per year on an annual average basis under the demonstration approach.

The entire sewer separation project has been divided in five phases. The sewer separation construction cost is estimated to be approximately $3.0 million. Assuming a construction contingency of 25 percent and non-construction (engineering, legal, and administrative) cost of 20 percent, the total project cost is estimated to be $4.5 million. A 20-year implementation schedule spanning 2002-2022 is also provided.

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REPORT FORMAT AND ORGANIZATION

BACKGROUND/INTRODUCTION

- Explains the problem and its context
  - Explains importance of the problem being studied (Why does it matter? Why is more information needed?)
  - Explains reason and goals for study
  - Explains the limitations (if any) of the work performed

You want your reader to fully understand the significance of your project

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REPORT FORMAT AND ORGANIZATION

LITERATURE REVIEW

- Summarizes and evaluates the literature that you have used in your study:
  - Previous reports
  - The strengths and weaknesses of previous studies.
  - How the literature contributed to your own study.

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REPORT FORMAT AND ORGANIZATION

METHODOLOGY

- Explains how data was gathered or generated
- Explains how data was analyzed
- Assumes reader understands material
  - Does not include explanatory material
- Is in past tense and passive voice
  - Pipe "P300" was constructed"
    - The research has been carried out

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REPORT FORMAT AND ORGANIZATION

RESULTS

- Visually *and* textually represents study findings
  - Visual representation of results:
    - Graphs, tables, diagrams, charts
  - Explanatory text:
    - Text points out the most significant portions of study findings
    - Indicates key trends or relationships
    - Highlights expected and/or unexpected findings

34

REPORT FORMAT AND ORGANIZATION

DISCUSSION

- Assesses and comments on results
- Includes:
  - Explanation of Results
    - Comments on unexpected results, offering hypothesis for them
  - Comparison to literature
    - Does your research confirm previous studies? Deviate from them?
  - Explanation for how info can be applied in broader context

35

REPORT FORMAT AND ORGANIZATION

SUMMARY

- Discusses:
  - What was learned through this study
  - What remains to be learned
  - Strengths of study
  - Weaknesses and shortcomings of study
  - Possible applications of study (how it can be used)
  - Recommendations

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ORGANIZATIONAL CONSIDERATIONS

- Your audience, purpose, and contents should influence your report organization and format
  - **Example: your client may have very specific guidelines**
- Carefully consider your decisions

37

HEADINGS AND SUBHEADINGS

- Headings and subheadings guide readers' attention
- Can be used to keep track of various parts of project:
  - **For example: GIS Mapping, Flow Monitoring, Hydraulic Modeling.**
- They should be:
  - **Specific and helpful**
  - **Used to break up text and "chunk" information**
  - **Used to guide readers' attention**

38

LANGUAGE AND VOCABULARY

- Reports should be easily accessible
  - **Be straightforward and concise**
  - **Use simple terms, not jargon and technical terms**
  - **Keep sentences short and simple (20 words max)**
  - **Be specific and not general**
    - **Use concrete numbers**

39

VISUAL DESIGN

- A report's visual design can make or break its communication success
- Visual Design includes:
  - **Use of graphs and other graphics**
  - **Use of white space**

40

VISUAL DESIGN

- Graphics:
  - **Should be used to illustrate specific points**
  - **Should be incorporated in a way that is natural to report's content/context**
  - **Should be explained fully in text using references such as "Fig. 1 shows…"**
  - **Should be cited if taken from a source**
- **Graphics – a caveat**
  - **Graphics *do not* speak for themselves!**
  - **For this reason, textual information should come *before* graphics.**

INTRODUCTION

The Allegheny County Department of Public Works (DPW) has replaced their existing work order and asset management system due to the lack of developer support for their previous asset management software. The new system utilizes Azteca System's Cityworks CMMS software package in conjunction with Environmental System Research Institute's (ESRI) latest ArcGIS platform to provide a GIS-centric and enterprise geodatabase-connected Management Information System. The overall goals of this project include establishing a replacement maintenance management system that addresses the following components: Service Request Module, Work Order Management Module, Asset Management Module, and a Pavement Management Module. The central focus of the new system is the maintenance of the following five assets: roads, roadside assets, bridges, parks, and buildings. The initial implementation was completed in record time frame of six months. The implementation is broken down into three phases and will aid in Allegheny County's pursuit of the American Public Works Association (APWA) accreditation.

As shown in Figure 1, Allegheny County is located in southwestern Pennsylvania. It's 2000 census population is 1.3 million and area is 745 square miles (water 2%). The county was founded on January 22, 1800. It's the home of three championship professional sports teams including Pittsburgh Steelers, Pittsburgh Pirates, and Pittsburgh Penguins. Allegheny County is also the home to eight Fortune 500 firms. The elevation in the county varies from 700 to 1,400 above mean sea level. There are three major rivers (Ohio, Allegheny, and Monongahela) and over 2000 bridges in the county.

Figure 1. Study Area Location Map

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VISUAL DESIGN

- General layout should focus readers on key information
  - **Use white space to guide readers' attention**
    - **Created through use of headings, subheadings, and visuals**

WHITE SPACE

shown in the figure on the first page of this chapter (Shamir, 1998). The interface adds a SWMM menu to the main menu of ESRI's ArcView GIS software. The SWMM menu has the following options: Make Input File, Read Output, Join Results, Unjoin Results. These options allow a user to create a model input file, import an output file, join output results to the GIS themes, and remove the results joined to the themes.

SWMMTools, a free and open-source SWMM extension for the ArcView GIS extension described above, is another example of the interface method (Heineman, 2000).

HEC GEO-HMS AND GEO-RAS INTERFACES

U.S. Army Corps of Engineers' Hydrologic Engineering Center (HEC) has developed HEC Geo-HMS and HEC Geo-RAS as geospatial hydrology toolkits for HEC-HMS and HEC-RAS users, respectively, who have limited GIS experience. These toolkits—developed as ArcView GIS extensions—allow users to expediently create hydrologic input data for HEC-HMS and HEC-RAS models. Additional HEC Geo-HMS and HEC Geo-RAS information is available in Chapter 3 (GIS Applications Software).

INTERFACE FOR MANAGEMENT OF RAINFALL DATA

All rainfall-runoff models obviously have a critical need for precipitation data to drive the model. Continuous simulation, now becoming more common, requires hourly or sub-hourly rainfall data for many years (1–50) (Shamir and Scally, 1998). GIS can link the rain gauge locations with the rainfall database to facilitate rain gauge selection and data retrieval. Figure 7-4 shows such a utility called GeoSelect, which consists of the following two parts (Hydrosphere Data Products, 1996):

1. Hydrodata: a standalone windows software consisting of a relational database model and interface to retrieve stations and rainfall time-series data; and
2. ArcData: GIS layers for rain gauges, rivers, lakes, watersheds, and counties; and an ArcView interface for transferring data to and from Hydrodata.

Historical rainfall and GIS data for a entire state are provided on a CD-ROM. The rainfall data correspond to the National Climatic Data Center (NCDC) archives of U.S. National Weather Service (NWS) gaging stations. The hourly data in these files date from as early as 1900, with most stations' digitized records dating from 1948. The 15-minute data are from 1971 on. GeoSelect can export rainfall data in standard NCDC formats, which can be read by many computer models. For example,

Page 7-6

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REFERENCES

- Cite sources whenever you are quoting, paraphrasing, or summarizing work that is not your own
  - Quoting directly is discouraged
- Sources include:
  - Books
  - Journal, magazine, or newspaper articles
  - Interviews
  - Conference Proceedings
  - Lectures
- Citing:
  - Shows your credibility as a researcher
  - Gives proper credit to authors and researchers
  - Protects you from accusations of plagiarism

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SOURCE DOCUMENTATION

- Use APA or other specified format for documentation
- Check online for style guides
  - http://owl.english.purdue.edu
  - http://www.apastyle.org/
- Check journals for format info

REFERENCES

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- Kvam, E. (Personal communication, June 11 2005).

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FINISHING TOUCHES

- **Usability Testing**
  - **Have a colleague read your report for clarity, organization, and visual design**
- **Check your sources for proper citations**
- **Proofread carefully – or better yet, ask someone to do it for you**

45

REPORT DESIGN CHECKLIST

Item	OK?	Comments/Recommendations
Fonts		
Is a commonly available font like Times or Arial used?		
Is the text legible (fonts no smaller than 8pt)?		
Are the header and footer in the same font?		
Is the body of the report in one font?		
Header		
*Does the title describe the scope of the data (e.g., university wide, unit specific, school/college level) and any conditions in the report (e.g., term, program, registration status)?		
Does the title state the time period covered (e.g., term, date range, as of date) for date related information?		
Does it indicate how the data is grouped or arranged?		
Is the last execution date in the upper right, labeled "Last Refreshed:"?		
*If the LastExecutionDate or UserResponse function is used, is the formula written so that it does not hardcode the name of the universe? *Note: there are two ways to do this: (1) Give the data provider a meaningful name (**not** "Query 1 with FY01") and use the syntax: LastExecutionDate ("Name of Data Provider"). (2) Base the formula on an object in the data provider using the syntax: LastExecutionDate (DataProvider(<Name of Object>)).*		
Are any dates that are included clearly labeled? (e.g. Last Execution Date, Last Load Date, Last Date Printed) *Avoid using Current Date. This prints the system date but is **not** tied to the refresh or run of the query in any way!*		
When appropriate is the user response(s) (=UserResponse) echoed in the report title or report body?		
Report Body		
Is the report block left justified?		
Is there a minimum of .5" margin on all sides?		
Are the columns of data arranged in logical order (we read left to right)?		
*Has the data been purged from the report?		
Are columns of numbers right justified?		
If a legend or annotation is used, is it understandable? In an appropriate font?		
For data that spans multiple pages, are section breaks set to keep data and titles together when possible?		
Footer		
*Is the document name (=Document Name) in the lower left corner?		
Is page number formatted as "page # of #pages" and in the center of the footer?		
Is the page number in 10pt font or less?		
Is the report revision date in the lower right, labeled "Rpt Rev," with the date formatted as month/year (e.g., Rpt Rev 12/02)?		
Readability & Accuracy		
*When prompts are used do they model how the data should be entered? For example, "Enter the term (e.g.FA 2001)"		
Is the overall report readable? (e.g., does shading print appropriately?)		
Have the title, header, footer, and any labels been checked for spelling errors?		
*Does the report name conform to BusinessObjects report naming standards? See BusinessObjects Naming Standards.doc for those standards.		

Item	OK?	Comments/Recommendations
Query Design		
*Is the data drawn from the appropriate source (e.g., does the data come from the folder(s) that provide accurate results and optimum performance)?		
*Does the query qualify on codes, ***not*** descriptions?		
*Are the query results correct? Have they been checked against an appropriate source?		
*Is the performance acceptable?		
Reports with Multiple Data Providers		
*Are the data providers linked on the appropriate dimension objects?		
*Are all data providers pointing to the appropriate environment (production or test)?		
Text Box		
*When running the report, does the user need to select an effective date or effective term option other than the default or Current Row? If so, the report contains a text box informing the user of the necessary option.		
*If there is a text box containing information about anything other than a non-default effective dating option or data from multiple universes (including data from secured tables if applicable), has the DD BusinessObjects team lead (Laura Bollettino) approved the text box?		
The text is short and similar to text boxes in other reports. For example, most text boxes begin, "In order to obtain the correct results for this report," and consist of a paragraph containing no more than two sentences followed by a second paragraph stating, "To get to the report, please click on the 'Report1' tab below."		
*The text does ***not*** include the words "Note" or "Important Note."		
*The text is left justified, Border is set to None (no lines around box), the text does not include carriage returns, and "Wrap text" is turned on.		
*The tab that contains the text box is labelled "Note" in mixed case.		
*The Note tab is the first tab in the report and the report is saved with the Note tab on top.		
Other Considerations		
Has the report been formatted using the "UM Standard" report template?		
Is the report saved so that it opens at the upper left?		
Overall Report Design		
*Has the report been reviewed by the appropriate CPU/Central Office(s)?		
Reports that Use Data from Multiple Universes		
*Is the report named according to the following standard? Begin with CMB (for Combined), then a descriptive name of the report, then the short names of the universes involved in alphabetical order. For example: CMB Grad Student Employees [HR01, PY01, SA03, SA04].rep		
*The report contains a text box with the following wording: "This report includes data from multiple universes (LIST THE UNIVERSES HERE). In order to run the report, you must have access to all of these universes." If the report uses data from secured tables in any of the universes, the text box informs the user of this.		
*Does the migration request specify categories and groups as follows? • Export to the appropriate report categories for all universes used by that report. • Export to the BusinessObjects groups for all the universes used in the report.		
*If the report uses data from multiple data areas (that is, more than one of the following: Fin/Phys, HRMS, SA, CRAS, and DAC), did the report writer specify the number of the MSR describing the report? Does the MSR contain sign-off on the report by all relevant data areas other than that of the report writer? (See Review Reports Using Multiple Data Areas.doc for details on the process to follow in reviewing such a report.)		

www.mais.umich.edu/**reporting/**download/bo_format_checklist.doc

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LETTER REPORTS

- Used for writing short reports (< 10 pages)
- Written on organization's official letterhead
- Technical content is part of the letter
- No Table of Content
- Figures, tables, maps, or drawings can be inserted within the text or attached at the end as exhibits.
- Usually stapled (not bound)

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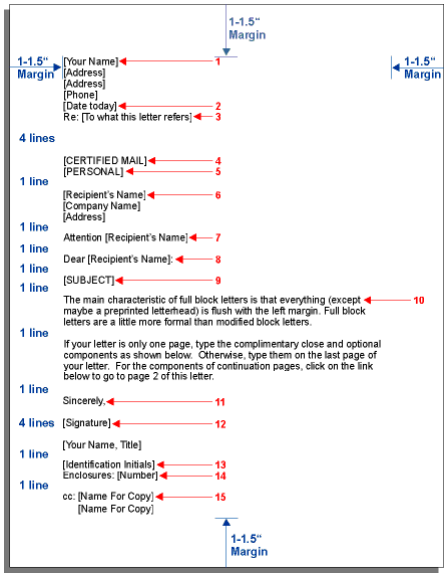
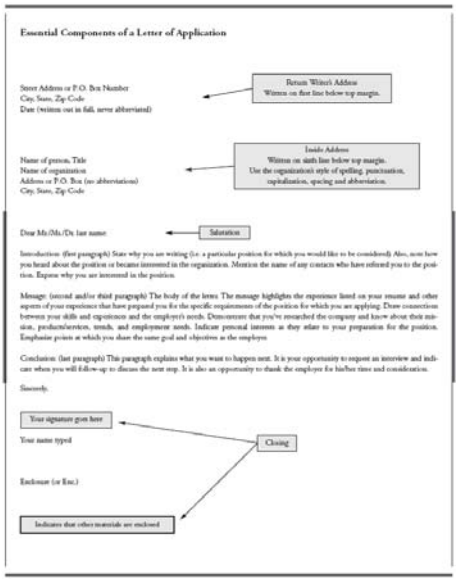
COMPONENT OF A LETTER REPORT





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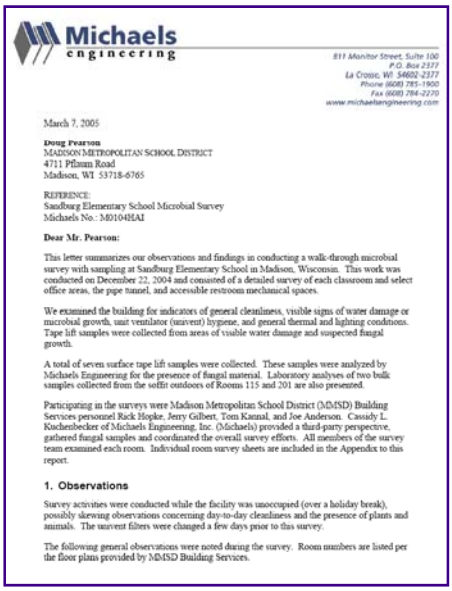
SAMPLE LETTER REPORT



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March 7, 2005

Doug Pearson
MADISON METROPOLITAN SCHOOL DISTRICT
4711 Pflaum Road
Madison, WI 53718-6765

REFERENCE:
Sandburg Elementary School Microbial Survey
Michaels No.: M0104#IAI

Dear Mr. Pearson:

This letter summarizes our observations and findings in conducting a walk-through microbial survey with sampling at Sandburg Elementary School in Madison, Wisconsin. This work was conducted on December 22, 2004 and consisted of a detailed survey of each classroom and select office areas, the pipe tunnel, and accessible restroom mechanical spaces.

We examined the building for indicators of general cleanliness, visible signs of water damage or microbial growth, unit ventilator (univent) hygiene, and general thermal and lighting conditions. Tape lift samples were collected from areas of visible water damage and suspected fungal growth.

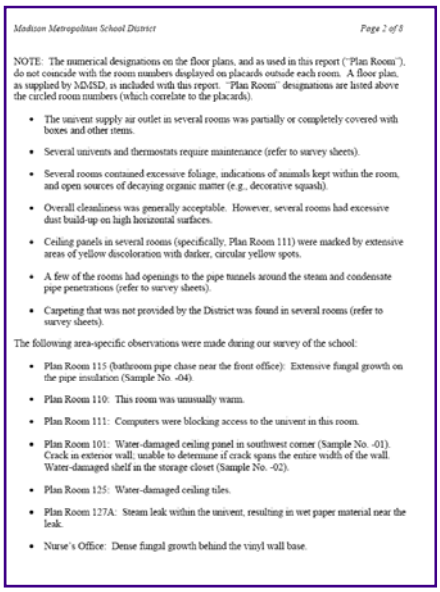
A total of seven surface tape lift samples were collected. These samples were analyzed by Michaels Engineering for the presence of fungal material. Laboratory analyses of two bulk samples collected from the soffit outdoors of Rooms 115 and 201 are also presented.

Participating in the surveys were Madison Metropolitan School District (MMSD) Building Services personnel Rick Hopke, Jerry Gilbert, Tom Kannal, and Joe Anderson. Cassidy L. Kachersbecker of Michaels Engineering, Inc. (Michaels) provided a third-party perspective, gathered fungal samples and coordinated the overall survey efforts. All members of the survey team examined each room. Individual room survey sheets are included in the Appendix to this report.

1. Observations

Survey activities were conducted while the facility was unoccupied (over a holiday break), possibly skewing observations concerning day-to-day cleanliness and the presence of plants and animals. The univent filters were changed a few days prior to this survey.

The following general observations were noted during the survey. Room numbers are listed per the floor plans provided by MMSD Building Services.



Madison Metropolitan School District *Page 2 of 8*

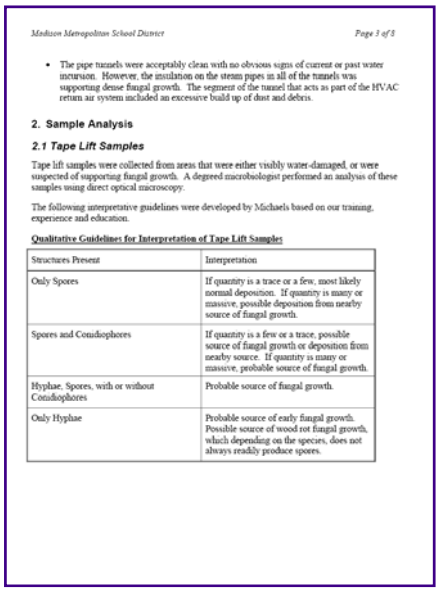
NOTE: The numerical designations on the floor plans, and as used in this report ("Plan Room"), do not coincide with the room numbers displayed on placards outside each room. A floor plan, as supplied by MMSD, is included with this report. "Plan Room" designations are listed above the circled room numbers (which correlate to the placards).

- The univent supply air outlet in several rooms was partially or completely covered with boxes and other items.
- Several univents and thermostats require maintenance (refer to survey sheets).
- Several rooms contained excessive foliage, indications of animals kept within the room, and open sources of decaying organic matter (e.g., decorative squash).
- Overall cleanliness was generally acceptable. However, several rooms had excessive dust build-up on high horizontal surfaces.
- Ceiling panels in several rooms (specifically, Plan Room 111) were marked by extensive areas of yellow discoloration with darker, circular yellow spots.
- A few of the rooms had openings to the pipe tunnels around the steam and condensate pipe penetrations (refer to survey sheets).
- Carpeting that was not provided by the District was found in several rooms (refer to survey sheets).

The following area-specific observations were made during our survey of the school:

- Plan Room 115 (bathroom pipe chase near the front office): Extensive fungal growth on the pipe insulation (Sample No. -04).
- Plan Room 110: This room was unusually warm.
- Plan Room 111: Computers were blocking access to the univent in this room.
- Plan Room 101: Water-damaged ceiling panel in southwest corner (Sample No. -01). Crack in exterior wall; unable to determine if crack spans the entire width of the wall. Water-damaged shelf in the storage closet (Sample No. -02).
- Plan Room 125: Water-damaged ceiling tiles.
- Plan Room 127A: Steam leak within the univent, resulting in wet paper material near the leak.
- Nurse's Office: Dense fungal growth behind the vinyl wall base.

SAMPLE LETTER REPORT



Madison Metropolitan School District *Page 3 of 8*

- The pipe tunnels were acceptably clean with no obvious signs of current or past water incursion. However, the insulation on the steam pipes in all of the tunnels was supporting dense fungal growth. The segment of the tunnel that acts as part of the HVAC return air system included an excessive build up of dust and debris.

2. Sample Analysis

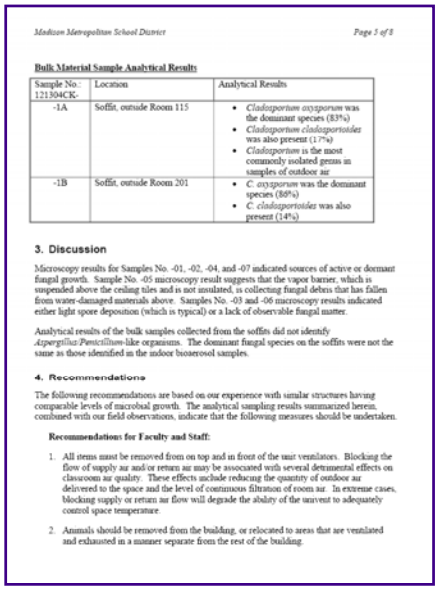
2.1 Tape Lift Samples

Tape lift samples were collected from areas that were either visibly water-damaged, or were suspected of supporting fungal growth. A degreed microbiologist performed an analysis of these samples using direct optical microscopy.

The following interpretative guidelines were developed by Michaels based on our training, experience and education.

Qualitative Guidelines for Interpretation of Tape Lift Samples

Structures Present	Interpretation
Only Spores	If quantity is a trace or a few, most likely normal deposition. If quantity is many or massive, possible deposition from nearby source of fungal growth.
Spores and Conidiophores	If quantity is a few or a trace, possible source of fungal growth or deposition from nearby source. If quantity is many or massive, probable source of fungal growth.
Hyphae, Spores, with or without Conidiophores	Probable source of fungal growth.
Only Hyphae	Probable source of early fungal growth. Possible source of wood rot fungal growth, which depending on the species, does not always readily produce spores.



Madison Metropolitan School District *Page 5 of 8*

Bulk Material Sample Analytical Results

Sample No.: 121304CK-	Location	Analytical Results
-1A	Soffit, outside Room 115	• *Cladosporium oxysporum* was the dominant species (83%) • *Cladosporium cladosporioides* was also present (17%) • *Cladosporium* is the most commonly isolated genus in samples of outdoor air
-1B	Soffit, outside Room 201	• *C. oxysporum* was the dominant species (86%) • *C. cladosporioides* was also present (14%)

3. Discussion

Microscopy results for Samples No. -01, -02, -04, and -07 indicated sources of active or dormant fungal growth. Sample No. -05 microscopy result suggests that the vapor barrier, which is suspended above the ceiling tiles and is not insulated, is collecting fungal debris that has fallen from water-damaged materials above. Samples No. -03 and -06 macroscopy results indicated either light spore deposition (which is typical) or a lack of observable fungal matter.

Analytical results of the bulk samples collected from the soffits did not identify *Aspergillus/Penicillium*-like organisms. The dominant fungal species on the soffits were not the same as those identified in the indoor bioaerosol samples.

4. Recommendations

The following recommendations are based on our experience with similar structures having comparable levels of microbial growth. The analytical sampling results summarized herein, combined with our field observations, indicate that the following measures should be undertaken.

Recommendations for Faculty and Staff:

1. All items must be removed from on top and in front of the unit ventilators. Blocking the flow of supply air and/or return air may be associated with several detrimental effects on classroom air quality. These effects include reducing the quantity of outdoor air delivered to the space and the level of continuous filtration of room air. In extreme cases, blocking supply or return air flow will degrade the ability of the univent to adequately control space temperature.
2. Animals should be removed from the building, or relocated to areas that are ventilated and exhausted in a manner separate from the rest of the building.

SAMPLE LETTER REPORT

Madison Metropolitan School District *Page 7 of 8*

- Remove gypsum wallboard behind the vinyl wall base in the Nurse's Office. Clean the exposed sole plates and wall cavities. Leave a gap (~one-half inch) between the wallboard patch and floor.

As required, the building envelope and mechanical systems should be examined to identify and correct the source of water in these areas.

5. Standard of Care

The observations and recommendations contained in this letter represent our professional opinions. Michaels Engineering arrived at these opinions in accordance with currently accepted engineering and industrial hygiene practices at this time and for this location. In our capacity as Consultants, Michaels has exercised the degree of care and skill ordinarily exercised by a duly qualified Indoor Environmental Quality Professional performing the same or similar services. Other than this, no warranty is implied or intended.

As allowed by state law, no warranties or guarantees, express or implied, are made with respect to services provided, and any implied warranties of merchantability or fitness for a particular purpose are expressly disclaimed.

Please feel free to contact me with any questions or comments you may have concerning this report.

Sincerely,

MICHAELS ENGINEERING, INC.

CASSIDY L. KUCHENBECKER

C: Wine A. Baker

Madison Metropolitan School District *Page 8 of 8*

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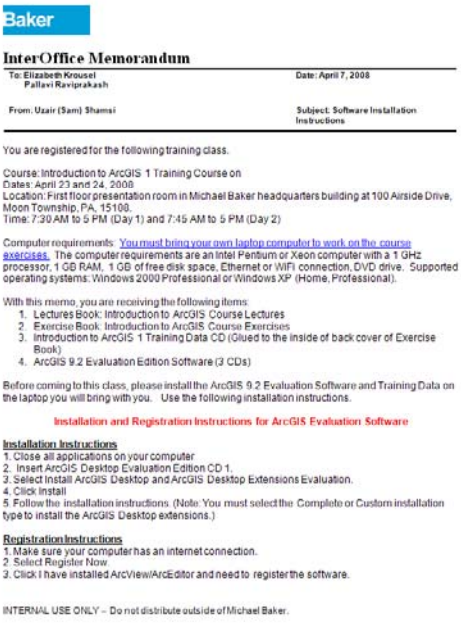
TECHNICAL MEMORANDUM

1. Same as letter reports but less formal. Almost like an Email message.
2. Often used to file or document results of a small engineering task, e.g., how a storage tank was sized.
3. Internal memoranda should be labeled or stamped with "Internal Use Only"



Baker

InterOffice Memorandum

To: Elizabeth Krousel
Pallavi Raviprakash

Date: April 7, 2008

From: Uzair (Sam) Shamsi

Subject: Software Installation Instructions

You are registered for the following training class.

Course: Introduction to ArcGIS 1 Training Course on
Dates: April 23 and 24, 2008
Location: First floor presentation room in Michael Baker headquarters building at 100 Airside Drive, Moon Township, PA, 15108.
Time: 7:30 AM to 5 PM (Day 1) and 7:45 AM to 5 PM (Day 2)

Computer requirements: You must bring your own laptop computer to work on the course exercises. The computer requirements are an Intel Pentium or Xeon computer with a 1 GHz processor, 1 GB RAM, 1 GB of free disk space, Ethernet or WiFi connection, DVD drive. Supported operating systems: Windows 2000 Professional or Windows XP (Home, Professional).

With this memo, you are receiving the following items:

1. Lectures Book: Introduction to ArcGIS Course Lectures
2. Exercise Book: Introduction to ArcGIS Course Exercises
3. Introduction to ArcGIS 1 Training Data CD (Glued to the inside of back cover of Exercise Book)
4. ArcGIS 9.2 Evaluation Edition Software (3 CDs)

Before coming to this class, please install the ArcGIS 9.2 Evaluation Software and Training Data on the laptop you will bring with you. Use the following installation instructions.

Installation and Registration Instructions for ArcGIS Evaluation Software

Installation Instructions

1. Close all applications on your computer.
2. Insert ArcGIS Desktop Evaluation Edition CD 1.
3. Select Install ArcGIS Desktop and ArcGIS Desktop Extensions Evaluation.
4. Click Install.
5. Follow the installation instructions. (Note: You must select the Complete or Custom installation type to install the ArcGIS Desktop extensions.)

Registration Instructions

1. Make sure your computer has an internet connection.
2. Select Register Now.
3. Click I have installed ArcView/ArcEditor and need to register the software.

INTERNAL USE ONLY – Do not distribute outside of Michael Baker.

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DESIGN REPORTS

- Two types:
  - Preliminary: Initial design based on rough calculations and assumed data
  - Final: Final design based on accurate calculations and measured data; ready for construction
- Basically the same as planning reports with more emphasis on design aspects of facilities
- Document "design basis" (design criteria)
  - Example: A bridge design to safely pass a 500-year flood
- Show design calculations
  - Example: Size of bridge pier openings calculated using U.S. Army Corps of Engineers' HEC-RAS flood plain modeling package
- Include specifications (specs)
  - Example: What kind of steel will be used in the bridge truss
- Include construction cost estimates
- Include construction drawings

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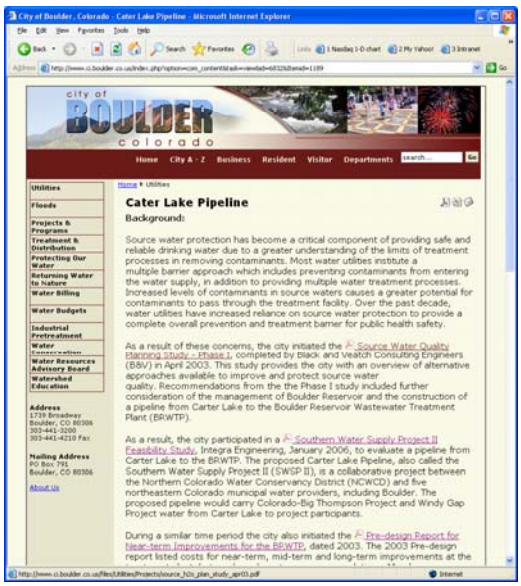
SAMPLE REPORTS

http://www.ci.boulder.co.us/index.php?option=com_content&task=view&id=6832&Itemid=1189



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HOMEWORK 4

- This is an individual homework
- Each student will submit a separate homework
- Print the Hoover Dam report from www.romanconcrete.com/docs/hooverdam/hooverdam.htm
- Create and submit a table of contents for this report.
- Write and submit a half to one page (single space) executive summary for this report
- Due date: next class

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