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Scaling Utility Environmental Permitting and Compliance with Structured Workflows, Centralized Communications, and Auditability in Software

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Background

McCormick Taylor, Inc. is a full-service civil engineering firm that has also been building custom software solutions for various clients in the transportation and utility energy industries for over fifteen years, primarily focusing on supporting environmental compliance inspections and permit application and tracking. Our application development team works with clients' subject matter experts and our internal engineers and scientists to design custom processes or workflows that will best meet all applicable regulatory and program needs and then to model that resulting process and workflow into fully featured data driven applications.

Executive Summary

Our experience in working with numerous large utility and energy corporates has shown us that effective environmental permitting and regulatory compliance programs greatly benefit from using software tools and applications designed and tailored to their specific needs and workflows, specifically in the areas of environmental permit screening, environmental permit process tracking, and regulatory compliance inspections and corrective actions. Organizations that use unstructured file- and email-based processes, such as sharing uncontrolled spreadsheet form files via email, often experience issues with process consistency, missed information handoffs, and weak audit trails. Others that use more generic asset- or project-management software solutions for the fine details of their environmental programs often struggle with implementing the tools in a way that is fit-for-purpose. A modern environmental permitting and regulatory compliance program for a utility company is complex enough to warrant a carefully and intentionally designed software tool or tools to support the full environmental project life cycle. There are common features that these tools should implement, such as security, auditability, and data validation and workflow control.

Increasing Demands on Environmental Management Programs

The constantly changing regulatory environment presents significant challenges for utilities to efficiently and effectively deliver projects and operational compliance on time and on budget while also maintaining compliance with all applicable environmental rules and regulations. Utilities are also facing increasing attention on environmental performance and costs from regulators and the public. Large utility organizations need to repeat this performance across hundreds or thousands of projects and sites each year across the full project life cycle.

Environmental compliance organizations often face high expectations and standards by their corporate leadership. Many of these organizations target 100% compliance with zero missed permits and zero incidents or Notice of Violations across their full portfolio.

These expectations are driven in part by the high potential impacts an environmental management program can have on business performance. Obvious business impacts would be direct monetary fines attached with Notice of Violations or environmental lawsuits, but negative environmental performance or outcomes also cause reputational damage.

However, environmental permitting plays a significant yet often undervalued role in business performance. Permitting is complex and takes time, and an effective environmental management program can provide realistic and accurate line-of-site of ongoing permitting schedules. This information informs construction or operations groups and keeps project and power delivery schedules realistic, so that insufficient or infeasible permitting schedules are caught and communicated early.

The Status Quo - Unstructured or Uncontrolled Environmental Management

In our work, we have seen many unstructured or uncontrolled environmental management approaches. These often rely on using standard office communication software to directly pass files and communications back and forth, likely via some combination of email, direct messages, shared project folders or similar.

Oftentimes, these approaches start with template files or forms that the environmental management team creates and distributes to project designers or consultants to complete and submit as needed, such as a project screening checklist. Various small process changes may be made over time to try to control this process. Updated versions of template files are sent out to replace old files or provided in a shared Templates folder. Group email addresses are created to accept submittals in a central location. File naming conventions are established to help clarify all of the submitted files and their versions.

This approach may work for smaller organizations, but it does not scale effectively as your project count grows, and the number of designers, inspectors, and consultants grow with it. Since the files are just files and the emails are just emails, there is no ability to enforce a particular workflow. Common failures or pain points include:

- Outdated template file versions being used (poor version control)
- Template files not being properly completed or being customized by end users in ways contrary to the original design (poor data validation)
- Submittals and communications being sent to the wrong person, such as directly to an environmental contact person instead of a shared email (inconsistent communications)
- Personnel not responding to updates or changes in the process and instead continuing “the old way” (insufficient workflow controls)

- Email records being used as your work log and audit trail, with no central historical record for each project's records (poor auditing)

It is important to note that the environmental compliance **contents** of these programs may be well thought out and robust:

- Forms, questionnaires, and template files in use may be well designed and demonstrate compliance.
- Documentation such as Process Guides, Quick Reference Guides, Desk Manuals, and more may clearly set expectations.
- Inspections may be thorough, accurate, and documented.

What is unstructured is the system *managing* that information and communication, and what is uncontrolled is the multiple ways in which involved personnel can, inadvertently and unintentionally, step outside of the goals that system.

These systems have difficulties scaling efficiently as projects grow, have a higher risk of program failure, and are harder to mine for historical data or prove compliance during an audit or review. Because of that, we recommend implementing some type of application or software specifically designed to support environmental management programs.

Application Architecture and System Design

There are a wide range of options for technologies, frameworks, programming languages, and architectures that could be used to develop successful, robust environmental management applications. No-Code or Low-Code technologies such as Microsoft's Power Apps can even be used to create tools up to a certain complexity that may be adequate. Selection, design, and technical development of the application architecture itself is not the focus of this white paper. If the chosen architecture can implement the required feature set and qualified developers can readily be found to efficiently build or maintain the application, there are many options that could be used successfully.

That said, our application development team currently prefers building Blazor Server web apps using Microsoft's .Net framework backed with Azure cloud-based services for application hosting, file storage, and SQL Server relational databases. In our experience it allows for fast, secure development of modern, fully featured web applications that can leverage advanced security monitoring tools for cloud resources.

Key Features for a Robust Application

Regardless of the underlying framework, a robust application should provide:

- Security and Authentication
    - Data security is paramount and needs to be discussed up front with the appropriate IT groups to ensure that the application meets all requirements based on the sensitivity of the data that it will house.
    - Access should be restricted to only authenticated users via a secure sign-in process.

    - Most environmental work is generally non-sensitive and is often ultimately submitted for public review anyway. Smart isolation between non-sensitive data systems and restricted/confidential data systems can meet data security needs but also open an environmental application to a wider audience of users. This allows more personnel to complete their work in a more open environment with less application development and user monitoring overhead.
- Complex Authorization Rules
    - Data visibility and editability should be controlled to ensure that users can only see data that they are authorized to see and only edit those records to the extent appropriate for their role in the process.
    - Authorization logic will be multifaceted, typically based on factors like:
        User Role (environmental manager, inspection consultant, design engineer, etc.)
        - User's Company
        - Directly Assigned projects/records
- Repeatable, consistent data validation
    - Complex validation rules ensure that all data entered on records meets base expectations. This is more than just having basic required versus optional fields. A proper system can enforce start/end dates are properly ordered, numerical responses fall in expected ranges, text responses meet minimum lengths, and more. The system should also present the users with clear feedback clarifying what is failing validation and why.
- Enforceable data statuses and processing workflows
    - Data records pass through various statuses in their specific workflows, such as an environmental inspection going from Draft to Submitted for QA Review to Finalized or a permitting project going from Planning to Permitting to Ready for Construction.
    - A robust application should control the movement of a record through its workflow. Each of the states in the workflow can also impact the data validation and authorization rules.
    - All state changes should be clearly logged and reported to show what user advanced a record forward (or backward) and when.
- Data auditing and traceability
    - Various levels of data logging can be implemented as appropriate, from simple update/updated by audit columns attached to specific key records to full blown temporal databases tracking every change to every record over time.
    - Depending on development time and budget, user interfaces can be created to show this information directly in the application or it can simply be stored and accessible to administrators through one-off database queries as needed.
- Centralized and logged communications and notifications
    - In-app dashboards/summary displays
    - Automated outgoing email communications and send receipts
    - Text or SMS notifications
- Secure data import/export with external sources via API endpoints
    - A modern application should, if desired, have the technical capabilities to fetch data from or push updated data to external sources directly, such as a client's global Asset Management program.

These communications require a degree of coordination beyond environmental management application itself, and so they do increase complexity. However, this can greatly reduce administrative workload and potential errors or inconsistencies with data entry activities.

- Integrated file storage and handling
- Various report generation options
    - The application should be able to generate a variety of files such as PDF, Excel, comma-separated values, or others as appropriate. This ensures that outputs are systematic and repeatable. These outputs can be used for internal or external reporting purposes or even for direct submittal to regulators.

Environmental Project Lifecycle Management

Modern environmental management programs need to cover the entire project lifecycle, which includes environmental impact and permit screening, environmental permit application tracking, various compliance inspections, addressing corrective actions, creating regulatory and/or internal reports, permit reviews/renewals, and final project and permit closeout.

Below we discuss some specific design characteristics for software tools throughout this lifecycle.

Environmental Impact and Permit Screening

Since all projects must have some level of screening, this initial step has the highest volume of project data that must be reviewed. One state-wide utility organization that we work with screens between 5,000 and 10,0000 projects each year. Most of these projects should screen out early as no or low impact projects, however this scale is difficult or impossible to effectively manage with an unstructured approach.

Instead, our experience building tools would encourage a screening application focused on efficiency and consistency to ensure that:

- Screening checklists used for projects are always current and interactively tailored to specific concerns for that organization or project details. These checklist customizations could vary depending on things like:
    - project jurisdiction (such as city or county specific permits),
    - key areas of sensitivity (such as local wetlands, critical habitats, or non-attainment zones),
    - environmental media programs (air, water, waste concerns)
- Low impact, low priority projects screen out early with minimal effort. These records are preserved and available for spot-checks by qualified environmental staff to ensure quality.
- High impact or uncertain projects require thorough review by knowledgeable environmental specialists. They make the determination on which projects require inclusion in a full permit tracking effort.
- All communications regarding a project's screening results are clearly preserved and auditable.
    - A central audit trail logs project movement through the screening workflow.

    - Comments and feedback between designers and environmental staff are integrated and accessible alongside the project files
    - Emails are used for convenience notifications only– they are **not** reference documents and you don't need to dig through your inbox to find some comment
- Managers can develop high-level reporting and statistics on screening performance and quality/accuracy monitoring of the designers or consultant organizations submitting records into the system.

Environmental Permit Tracking

Critical projects identified during screening move into permit tracking. Proper controls over complex permit tracking improves project scheduling and line-of-sight into permitting bottlenecks.

Environmental permitting is commonly seen as a source of project delays, but many project design and construction schedules leave inadequate time for permitting before the permitting process can even start. In our experience, many environmental organizations may know this instinctively or experientially, but uncontrolled management programs cannot track project performance data well enough to demonstrate schedule impacts or improve estimates over time.

Below are some key concerns that we highlight for permitting applications or tools:

- Environmental permits aren't prepared or received independently
    - Some of our less successful permit tracking efforts treated permits individually, where each permit application had its own process to track. Even if the steps for each permit were customizable, this overall model is inaccurate since permits aren't received in isolation.
    - A better model for permitting complex projects recognizes a single, interrelated process to receive collections of multiple permits (e.g., a county-specific grading permit, an SEC plan, and a JPA).
    - Many projects require the same collections of permits, and the process for each of these collections of permits can be recorded as a template for that specific permitting scenario. This can be laid out as a standard Gannt chart and each of the steps assigned to a responsible party or group.
- Environmental Managers need to be able to efficiently apply the applicable permitting template to a project based on that project's permitting needs. Performance of that project versus the initial template expectations should be tracked. Over time, this performance knowledge can be used to refine the template's steps and timeline and improve future scheduling estimates.
- Templates are required for consistency and performance tracking, but projects must also be customizable to handle unexpected steps or changes due to redesigns.
- Process steps should be directly assigned to an individual so that someone is responsible for each step along the way.
    - The application also functions as a control over Organizational and Change Management. When a user is removed from the system, their assigned steps can be flagged for review and reassignment so nothing is dropped.
- Overall visibility is key
    - Users should be able to see at-a-glance what is assigned to them and where they are on the schedule
    - Priority or overdue steps should be identified and escalated
    - In-application dashboards show real-time data, so no one falls behind.

    - Automated email notifications or reminders are sent as convenience but aren't the source of truth.
- Accurate permit schedules can reduce costs.
    - More efficient use of staff resources and time overall to get the permits.
    - Better timing of permit applications to match project dates and reduce fees from unnecessary permit renewals

Compliance and Inspections

Inspection processes are prime candidates for modeling with software tools. The workflow may be simpler than those required for permit screening, but inspection services are often performed by a wide range of contractors across a large geographic area, and they generate a significant number of associated photos and files that need to be categorized and stored systematically. These records need to be readily available for compliance actions maybe years in the future.

We have built a significant number of inspection tools for clients over the years. In our experience, once an organization recognizes the positive impacts of controlling one type of inspection program via an application (say, stormwater inspections), they often continue to build out applications for other inspection types (say, idle real estate or construction). However, the most successful tools are specifically focused on just one type or category of inspection as opposed to a generic, "global" inspection application.

- Digital tools provide centralized consistency and management of inspection checklists and workflow behavior
    - Managers can clearly assign roles and responsibilities to various stakeholders on a project-by-project or group-by-group basis, so everyone knows who is doing what
    - Managers can maintain inspection expectations
    - Inspectors don't ever use an out-of-date form
    - Data validation, QA/QC, and documentation process are built to match regulatory drivers and are rigidly enforced
    - Incomplete or unsubmitted inspections are highlighted and driven through the process
- Environmental Inspections invariably result in some type of Action Item for follow up. This drives Asset Management-type activities that can be almost impossible to manage effectively across a portfolio of projects without a digital tool
    - Action items need to be tracked to completion with associated documentation
    - Action Items aren't static – they need to be reassessed on subsequent inspections, facility operators may make changes between inspections, and priorities may need to be escalated over time. A centralized system will compile all of this information in one place so that managers and inspectors can see all of the history at a glance.
- Compliance inspections drive complex communications requirements that may be very time sensitive. Having a central service that automatically sends and logs all distributed communications ensures this isn't missed. These would be emails such as:
    - Inspection reports sent on completion
    - Routine open action item summaries sent to key stakeholders
    - Upcoming inspection schedules provided

    - Routine management reports with overall performance
- Long-term access to historical inspection data and photos can prove beneficial for due diligence concerns beyond the obvious initial compliance activities. Clients with robust documentation have multiple real-world examples of use of these records, such as:
    - Civil lawsuits being dismissed or abandoned because inspection records show clear examples of client's compliance with rules and regulations
    - Environmental agency fines being greatly reduced by using properly documented inspections showing compliance and site improvement over time
- Inspection applications can, and should, be built to support direct use in the field, however digital checklists for field use often aren't the largest benefit of moving towards a digital inspection.
    - We often expect to provide field inspectors with a tablet and digital checklist they can complete their inspections on in field. This can be helpful in certain contexts. However, we find that many inspectors ultimately want to use scratch paper forms in the field even if a digital version is available. Many prefer to complete the digital version on a laptop in a work truck or field office after the fact.
    - What is often reported as more beneficial than a mobile digital checklist in the field is
        - The ability to create a paper scratch copy of their site-specific inspection in advance
        - easy access to previous inspections, previous photos, and notes or comments on changes to a corrective action over time while they are in the field

Permit Renewal, Expiration, and Close Out

Getting the permits and performing inspections isn't the end of the process. Environmental permit maintenance and closeout is a non-trivial activity that needs to be closely monitored.

Fortunately, once the initial steps in the environmental life cycle are tracked in a management system, your system contains almost all information necessary to extend to track close-out activity.

Centralized tracking and reporting on upcoming permit expirations may be simple, but they prevent significant non-compliance issues. In an uncontrolled management system, these activities can easily slip through the cracks as construction or operations wrap up and project teams are disbanded.

Case Study – Baltimore Gas and Electric

For almost ten years, McCormick Taylor has been working with Baltimore Gas and Electric (BGE) to build tools and applications supporting their environmental performance. Over this time, we have focused on the topics discussed above and steadily moved from uncontrolled environmental management processes to structured tools and workflows.

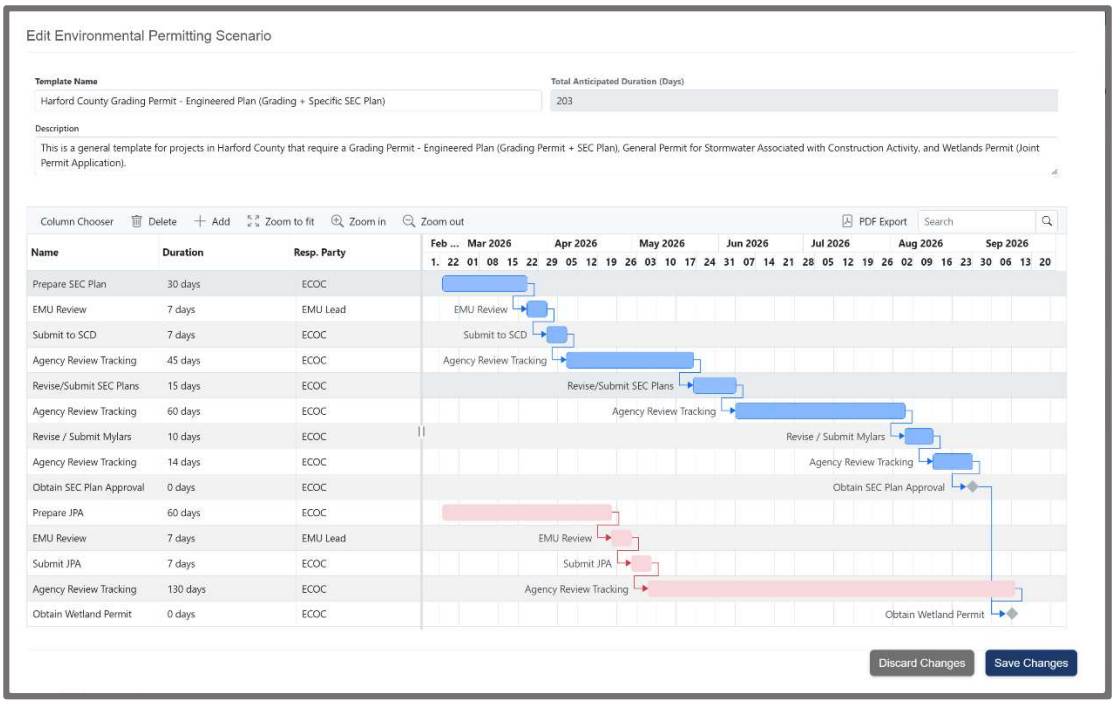
These efforts evolved into a centralized application with a growing number of specific modules for screening, permitting, various inspections, and more. These modules touch on almost all aspects of their overall environmental management program and provide the benefits and features discussed above.

In summarizing the impacts of implementing robust software for environmental management, Ron Dove, Manager of Environmental Programs for BGE, states:

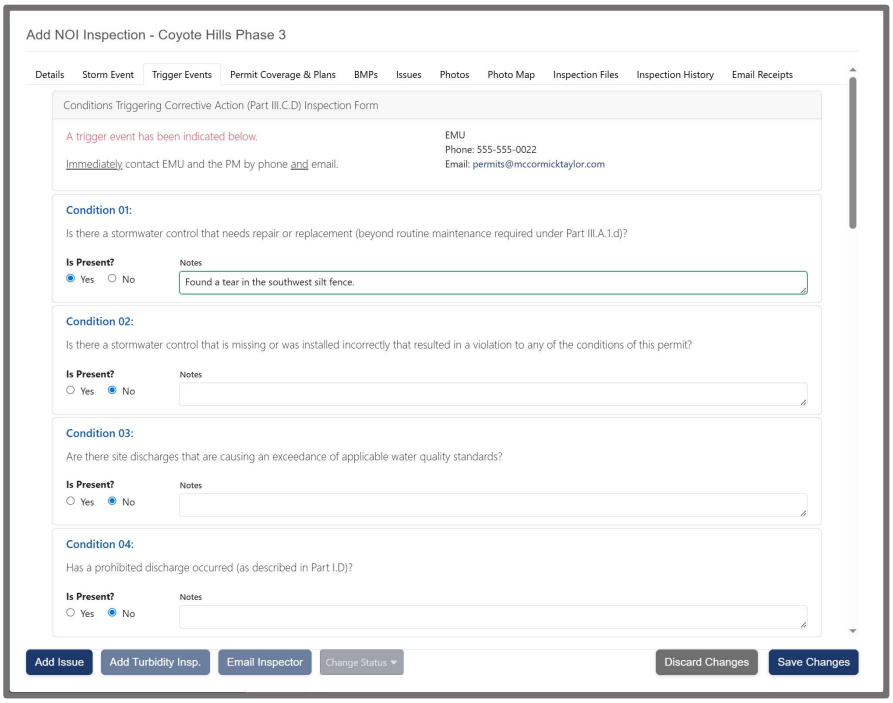
> *"A centralized Environmental Permitting and Compliance Management system strengthens our compliance, reduces risk and costs, improves incident prevention and productivity, and replaces fragmented, outdated tools with a single, efficient source of truth."*

Example Images

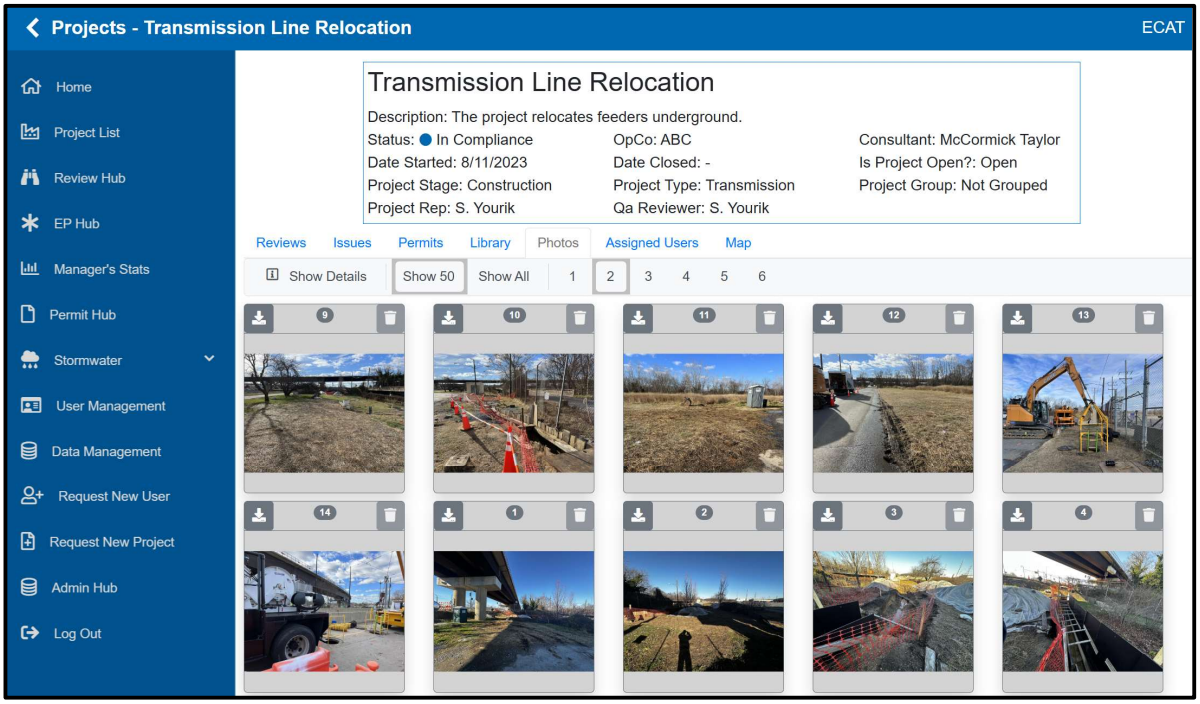
Example 1 - Developing a Permitting Scenario template for consistency across projects



Example 2 - Completing an NOI inspection utilizing accurate checklists, real-time notifications, and consistent output report formats



Example 3 - Compiling centralized inspection photos for long-term access across projects, reviews, corrective actions, and reports



Example 4 - Reviewing an interactive environmental permit screening form