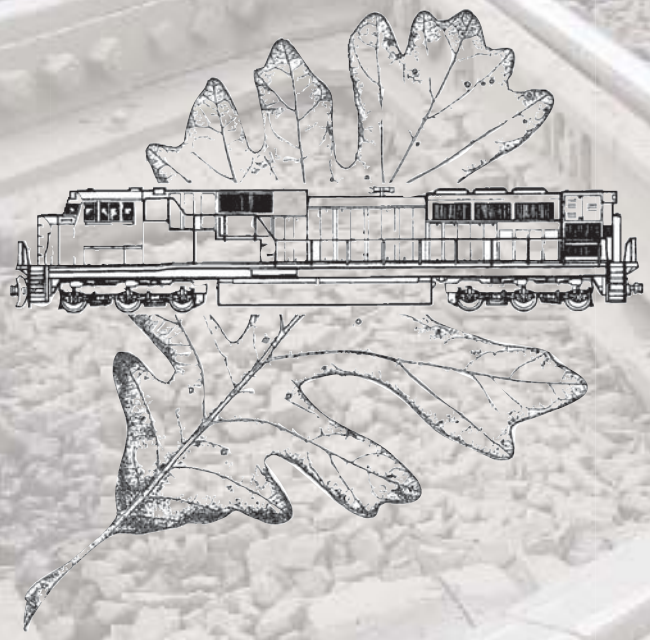
2010 Railroad Environmental Conference

October 26-27, 2010



Spoken and Poster Presentation Summaries

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Railroad Engineering Program

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AREMA
American Railway Engineering and Maintenance-of-Way Association

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Tuesday 26 October

Energy, Emissions, and Air Quality

Determining the True Benefits of Alternative Fuels

Chet Culley - Kansas City Southern Railroad
Michael Kraeski - ERM

With the current focus on fuel costs, security of supply, and reducing greenhouse gas emissions from individual companies or entire industries, a rapidly-increasing number of alternatives to conventional refined petroleum fuels are being developed and marketed to major fuel users. These alternative fuels may utilize biological feedstocks or still be fossil fuel-based, employing new production processes in order to increase national energy security and develop cleaner burning fuels. Examples of well-developed alternative fuel production processes include the Fischer- Tropsch conversion of gas or coal to liquid fuels. Other more recent developments, such as the UOP hydrotreating process, or fermentation with genetically-modified yeasts to produce various alcohols, utilize various biofeedstocks to create fuel products that may have considerable reductions in overall greenhouse gas emissions. The true environmental benefits of an alternative fuel not only depend on the production process, but also on the type of feedstock used. Whether that feedstock is a plant oil (such as jatropha, camelina, soy, or palm), plant sugars/starches, or cellulosic biomass, the carbon footprint can vary significantly according to factors which are just now being studied. The most significant of these factors for biofuels are direct and indirect land use impacts, which are quantified differently depending on the analysis methodology used and/or the potential regulation being applied. Emerging third generation alternative fuels, such as those based on halophytes or algae, are attempting to minimize these land use factors while producing a carbon-sequestering feedstock. Potential fuel production vendors are entering the industry in large numbers, each claiming various environmental, regulatory, or cost benefits to utilizing their products. Typically these startup firms are seeking investment capital and/or commitments from individual companies or industry associations to purchase fuel once production facilities are operational. But which of these companies, processes, or feedstocks truly offer a fuel that will benefit the transportation industry? ERM has been working extensively with a major international airline to evaluate various alternative fuels and vendors for potential implementation in both ground service equipment and aircraft fleets. Through this work, ERM has developed a strategic framework incorporating significant environmental life cycle, regulatory, and business factors to systematically assess alternatives. We have developed a ranking system in order to best highlight the fuels this airline should consider for potential strategic partnerships with alternative fuel producers. The Air Transportation Association (ATA) has brokered discussions with various airlines on this issue. The KCS Railroad is also developing an alternative fuel strategy, and is interested in engaging other Railroads in creating a working group to share knowledge and opinions allowing thorough evaluationof alternative fuels.

Some of the factors being considered in the development of this alternative fuel evaluation strategy include:

- Lifecycle GHG emissions including direct and indirect land use change
- Lifecycle water consumption
- Other sustainability factors
- Overall energy intensity of production
- Combustion emissions (PM, SOx, NOx)
- Biofeedstock yield and growth potential
- Compliance with CA low carbon fuel standard
- Compliance with US EPA RFS2
- Time to widespread fuel availability
- Production volume potential
- Projected future cost
- "Green" perception and potential challenges
- Major industry/organization support

A similar tool could be used to serve the goals and business considerations of railroad transportation, allowing AAR members to understand this sustainability evaluation strategy as it could apply to their own fleet and fuel purchase decisions.

Producing Amtrak's GHG Inventory and Associated Challenges

Celia Ann Prentice - Amtrak

In 2009, as part of Amtrak's effort to calculate, understand, and define its carbon footprint, Amtrak joined The Climate Registry (TCR). As a member, Amtrak is committed to the organization's comprehensive reporting standards for recording and managing greenhouse gas emissions, including those from diesel and electric locomotives, passenger rail cars, maintenance equipment, shops, stations, offices and other facilities. Amtrak's GHG Inventory is being prepared in accordance with TCR's General Reporting Protocol (GRP), which requires that the following gases be included in the Inventory: CO2, CH4, N2O, HFCs, PFCs, and SF6. Many sources must be considered such as electric use in the catenary system on the Northeast Corridor, refrigerant use for food and HVAC operations, and fuel use in all types of mobile and stationary sources.

TCR's GRP requires that each member report both direct and indirect emissions down to the facility level. The GRP defines "facility" as a single physical premises, though in some cases the GRP allows for certain sources to be grouped. Reporting at the facility level allows for tracking GHG emissions at a disaggregated level, which allows an entity to observe emission changes specifically associated with individual facility operations.

For a geographically dispersed passenger rail organization, the requirement for very detailed facility-level information has provided numerous challenges. Collecting detailed baseline fuel, refrigerant, and equipment inventories covering all of Amtrak's facilities was complicated. Determining which emissions should be included within Amtrak's operational boundaries was also difficult in some cases – for example, in the case of electricity use for leased facilities or commuter trains that run on Amtrak's catenary system. Once the data was collected and sorted, compiling it into a useable format provided the next challenge. This presentation will detail the challenges and benefits of performing the GHG Inventory process for a railroad down to the facility level.

Locomotive After-Treatment Systems for EPA Tier4 Legislation and the Benefits of Metal Substrate Technology to Meet this Challenge

Markus Downey and Claus Bruestle - Emitec Inc.

With the introduction of the EPA Tier4 locomotive emissions legislation in 2015, a large number of challenges await the rail road community. While past legislation levels have been met with engine management, the Tier4 particulate matter (PM) and nitrous oxide (NOx) limits require the use emissions control technology. Selective catalyst reduction (SCR) based on urea injection is the prime path as it has been in the heavy-duty truck industry in Europe for years and under EPA 2010 for Class 8 trucks here in the United States as of January 2010.

Based on the large engine displacements of line-haul locomotives, the emissions control systems will be equally large. Give the limited space that is available on the locomotive to add an after-treatment system packaging becomes an enormous challenge. An added complexity is the flow restriction that is introduced with an after-treatment system which directly influences the fuel consumption of the engine. Looking at all these criteria in front of the very strict durability requirements of the rail industry, it becomes clear that many challenges lie ahead.

This presentation will provide an overview of the legislation for locomotive Tier 4. The Urea SCR after-treatment technology that appears to be the prime path to meet Tier4 will be explained. The benefits of using the design flexibility of metal substrates to maximize the available cross-sectional flow area will be discussed. This maximum flow area will keep the impact on the fuel consumption as low as possible. Additionally, a novel approach to addressing the issue of limited packaging space and increased fuel consumption is illuminated. The concept of placing the after treatment system partially or as a whole in front of the turbo-charger can yield a considerable advantages in cost, weight and space savings.

Air Quality Procedures for the Chicago Region Environmental and Transportation Efficiency (CREATE) Projects

Walt Zyznieuski - Illinois Department of Transportation

CREATE is a unique Public/Private partnership between the Class I Railroads and the Association of American Railroads, Illinois Department of Transportation (IDOT), and Chicago Department of Transportation, to improve rail service through the Chicago Region. Over 70 individual projects comprise CREATE on four rail corridors in the Chicago area. These consist of simple signal projects, main line additions, rail over rail separation projects, and finally, 25 grade separation projects.
With the signing of the historic "Joint Statement of Understandings Regarding the Proposed CREATE Project" in 2003, the CREATE Program has forged ahead. The Safe, Accountable, Flexible, Efficient Transportation Equity Act initially provided $100 Million in federal funding for CREATE. In 2010, the CREATE P1 rail/rail flyover project was awarded $133 Million from the American Recovery and Reinvestment Act (ARRA), and another $100 Million was awarded for CREATE projects from the Transportation Investment Generating Economic Recovery (TIGER) grant, under ARRA. Illinois has provided another $400 million through the state Capital Bill.

The lead Federal Agency with oversight of the CREATE program is the Federal Highway Administration (FHWA). To address the CREATE projects FHWA developed the Systematic, Project Expediting, Environmental Decision-making Strategy (SPEED). Through the SPEED strategy, all projects are carefully and consistently evaluated to fulfill National Environmental Policy Act (NEPA) requirements.

SPEED consists of three steps. First, a CREATE Program Feasibility Plan was developed. See: http://www.createprogram.org/PDF/Amendment1%20CREATE%20Final%20Feasibility%20Plan%20%20&%20Final%20Preliminary%20Screening%20Plan%20November%20%202009.pdf. Second, each proposed project included a Component Project Preliminary Screening to identify logical termini and a preliminary purpose and need. Third, all stand-along projects are then processed with an Environmental Class of Action Determination (ECAD) Document, to fulfill NEPA requirements.
ECADs' are used to document environmental issues/impacts to help determine if a project should be processed as a Categorical Exclusion, Environmental Assessment, or Environmental Impact Statement. Air quality is one of the issue areas that is properly evaluated and documented for each CREATE project.

Early on, it became clear that IDOT Highway Air Quality procedures that were in-place, would not fit NEPA air quality documentation requirements clearly for the CREATE projects and, therefore, new CREATE Air Quality methodologies and procedures would need to be developed to document air quality impacts from proposed CREATE projects.
The goal of this presentation is to outline five specific air quality methodologies and/or processes that are in place for the CREATE projects. These include:

- GENERAL AND TRANSPORTATION CONFORMITY
- LOCOMOTIVE MICROSCALE ANALYSIS
- PARTICULATE MATTER HOT-SPOT ANALYSIS
- ROADWAY CARBON MONOXIDE ANALYSIS, and
- CONSTRUCTION-RELATED PARTICULATE MATTER

The processes, procedures, and methodologies for each of these specific CREATE Air Quality topics will be discussed, including how the CREATE team coordinated two specific proposed methodologies at Inter Agency Transportation Conformity Consultation Meetings at the Chicago Metropolitan Agency on Planning, to obtain approval on these CREATE specific methodologies.

In addition, documentation of CREATE air quality issues will be outlined.

Fuel Cell Locomotive Demonstration Performance and Results

Melanie Johnson - U.S. Army ERDC-CERL
Arnold R. Miller, Kris S. Hess, Timothy L. Erickson, and James L. Dippo - Vehicle Projects

MOTIVATION
Fuel cell locomotives (FCL) impact rail yard operations by providing tractive power without consuming fossil fuels. This results in zero emissions in the rail yard and very low noise levels. Rail yards and their associated poor air quality tend to be in highly populated areas. The lower emissions and noise levels will contribute significantly to the quality of life in the communities surrounding rail yards. Additionally, the FCL's ability to function as a mobile back up generator enhances energy security, which provides military depots and rail yards additional capability. In an emergency or contingency situation, the FCL becomes a clean, quiet energy source with a robust infrastructure and no fossil fuel requirements.

The fuel cell locomotive (FCL) provides innovative solutions to problems associated with traditional diesel and electric locomotives. The FCL has the ability to reduce air and noise pollution in rail yards, enhance energy security through reduced reliance on fossil fuels, and serve as a mobile back up power generation asset.

TECHNOLOGY OVERVIEW:
The fuel cell locomotive is a fuel cell battery hybrid. The FCL is powered by two 125 kW Ballard fuel cell stacks supplemented by a 1 MW lead acid battery bank. These two sources work in tandem to supply the power needed to meet the locomotive's high transient loads. During idle periods, the fuel cell power plant recharges the battery bank. The locomotive also carries on board 70 kg of compressed hydrogen. The hydrogen supply is expected to be sufficient for one eight to ten hour shift. The fuel cell system is supported by a balance of plant that incorporates a radiator module to provide cooling for all locomotive power plant systems and a power electronics module to control power output and battery charging.

In future phases of the FCL design, the hydrogen storage capacity will be expanded to increase the locomotive's range and a more advanced battery will be installed to create additional space on the locomotive for hydrogen storage. Future plans also include increasing the power output of the fuel cell prime mover, and the development of a freight locomotive design.

DEMONSTRATION
In April 2010, the FCL completed its performance demonstration in BNSF's Shelia Rail Yard in Commerce, CA. During the performance demonstration, the FCL was used in day to day operations of the Shelia Rail Yard. The goal of this completed demonstration, illustrated the FCL's ability to perform the typical tasks of a switch locomotive. Following the completion of this successful demonstration, the locomotive was moved to Hill Air Force Base, UT to complete its power export capability demonstration. The power export demonstration highlighted the FCL's ability to export electric power to the grid. This ability improves energy security and can serve emergency and contingency operations. This presentation will focus on the data and findings that resulted from these two demonstrations.

Effects of Biodiesel Blending on Exhaust Emissions from a Switching Locomotive

Jing Guo and Edward Peltier - University of Kansas

The past several years have seen an increased interest in the use of alternatives to petroleum diesel for a range of reasons, from concerns about greenhouse gas emissions and sustainability to rising energy costs. Biodiesel, a fuel composed of monoalkyl esters of vegetable oils and/or animal fats, has gained particular attention as a replacement fuel that can be used in existing diesel engines, either as a fuel replacement or mixed with petroleum diesel. Biodiesel has shown the potential to reduce exhaust emissions of regulated pollutants, including total hydrocarbons (THC) and particulate matter (PM). At the present time, however, there is minimal data available on the performance of biodiesel and biodiesel blends in locomotive

diesel engines. This study reports results from a study in which 10% (B10) and 20% (B20) biodiesel blends, created by mixing a soybean oil based biodiesel fuel with ultra-low sulfur diesel, were tested in a switching locomotive owned by the Iowa Interstate Railroad. Each blend was used in the locomotive for 90 days during standard operations, with emissions testing performed during static load tests conducted at the beginning and end of the test period. Gaseous emissions were collected using an in-line flow sampler and analyzed for nitrogen oxides, total hydrocarbons, carbon monoxide, carbon dioxide, and oxygen. Fuel consumption and power output were also monitored during each load test. The results of the static load tests showed that increased biodiesel content was associated with a reduction in partial combustion products, particularly total hydrocarbons, but an increase in total NOx. A 35% reduction in soot emissions was also observed in a single test comparing B20 and ultra-low sulfur diesel. No significant performance or maintenance issues were observed during the 90 day trials of either B10 or B20, suggesting that these biodiesel blends are viable as "drop in" substitutes for petroleum diesel in railroad switching engines from both a performance and air quality standpoint. Further tests are also suggested to determine whether changes to the biodiesel composition can help to simultaneously reduce NOx emissions.

Diesel Particulate Filter System Application on a Three Generator Switch Locomotive

Wassim Klink, Saji Pilaj, Rick Paczewiski, Penelope Markatou, and Wilson Chu - Johnson Matthey

Diesel particulate filter (DPF) systems have been successfully applied to on-road trucks, off-road equipment, and stationary diesel generators. Particulate Matter (PM) reductions of 85+% are routinely achieved. However, application of DPF technology in locomotives in the US has been limited.

In this presentation we will discuss the application of a passively regenerating diesel particulate filter system on a switch locomotive. The system consists of an array of diesel oxidation catalysts upstream of an array of coated filters and has been tested on one of the engines of a 3-engine switch locomotive. Very high Particulate, CO, and HC reduction were achieved. The system is capable of regenerating passively under various Notch conditions. Field testing of the unit is now underway

Sustainability

Environmental Sustainability, Rail Facilities, and GIS Modeling – Developing a Decision Making Tool for the Environmentally Sustainable Placement of Rail Facilities

Michael Laas, Aaron Quesada,and Robert McMullen - Gannett Fleming
David Gilbert - GeoDecisions, a Division of Gannett Fleming

Environmental sustainability is becoming more ubiquitous within our culture, corporate culture, and governmental policies. New laws and regulations are dealing with elements of environmental sustainability and are being implemented at a federal, state, and local level. The laws' ubiquity lies with their undetermined impact on overall decision making. Elements of environmental sustainability include green building practices, energy conservation, greenhouse gas emissions reductions, and urban-land planning. Executive Order 13514, Federal Leadership in Environmental, Energy, and Economic Performance, lays out environmental sustainability goals within the NEPA process. During the project planning and design phase of a railway project, transit or freight, it is advantageous to screen project alternative elements based on the criteria of environmental sustainability so that those decisions can be preserved into the NEPA process and reported as part of the overall alternative selection processes. This report/paper presents the findings of a GIS spatial model that utilizes environmental sustainability criteria to screen specific project alternatives, passenger stations and operations and maintenance facilities (O&M), for a typical regional rail transit project. Ultimately, the GIS model can be used as a tool by decision makers to determine the best site selection and location of planned transit facilities, based on unique criteria related to environmental sustainability and other criteria. The model utilizes the GIS-based ModelBuilder© application and guidance from the US Green Building Council (USGBC) Leadership in Efficient Energy Design (LEED) Green Building Rating System for New Construction (Version 2.0), Site Selection process. This includes guidance on: development density; brownfield redevelopment; public access to alternative transportation, affordable housing, and retail/commercial facilities; preservation of natural lands, parklands, and farmlands; and the protection of water bodies and threatened and/or endangered species. The project team assigned relative numeric weights to unique environmental resources based on their LEED significance to calculate a final quantitative score for each alternative station and O&M facility site location. The score indicates a site's potential to satisfy environmental sustainability criteria that are now part of the NEPA process and may be part of local and state regulations in the project area. For the case study, a regional rail transit project in South Florida, the model was run on proposed site locations for passenger stations and O&M facilities. The model results provided a relative score indicating which alternative site areas are best suited for development based on environmental sustainability. The model also provides a visual, hot-to- cold schema of the project area to allow decision makers make observational determinations. As a first attempt, the model provides intriguing results and highlights the potential to utilize GIS as a tool in the planning and design of rail facilitates as it relates to environmental sustainability. The next step in the evolution of the GIS model will be to incorporate new criteria from the USGBC LEED Neighborhood Development Rating System and refine the previous methodology based on sensitivity analysis.

Noise and Vibration

Noise Challenges Facing Europe

Lisette Mortensen - International Union of Railways (UIC)

Railways are a sustainable and climate friendly means of transport. Rail presents a low carbon mode of transport, and continued energy efficiency improvements and increases in modal shift to rail from road and air are crucial to support transitions to low carbon mobility. The International Union of Railways (UIC) supports its members by technical cooperation and best practice exchange to continuously improve their sustainability performance.

Nonetheless, railways have an impact on the environment. The most important effect is noise, especially the noise emitted from freight trains. In Europe the relevance of railway noise varies from one geographic region to another. It is highly relevant in Western Europe and along the main freight corridors.

The European Union policy supports noise reduction and has addressed the issue in interoperability directives and corresponding technical specifications. The Environmental Noise Directive (END) requires member states to submit noise maps and noise reduction action plans. The EU is mostly responsible for noise creation aspects, while member states may additionally enact specific legislation for noise reception. In these cases, noise reception values usually concern only new and upgraded lines; however some countries such as Italy or Switzerland also have noise reception limits for existing lines.

The European railways have a long history of noise control. Numerous projects have developed and analysed different abatement possibilities. The noise control measures most often implemented are noise barriers or insulated windows. However, the largest potential to reduce noise lies in silent vehicles. European Technical Specifications for Interoperability (TSIs) therefore require new rolling stock to be silent. The existing freight fleet can also be made silent by removing cast-iron brake blocks and retrofitting the wagons with composite brake blocks. There are two types of composite brake block: the K-block is available, though a more expensive solution than the LL-block which has not yet been homologated due to technical difficulties. Finally, in specific cases, special solutions such as track and wheel absorbers or acoustic rail grinding are possible.

In order to encourage retrofitting the European Union is considering noise differentiated track access charges as an incentive. This approach is supported by the governments of some member states. Since the railway business is complicated and many different players are involved, it is unclear if this incentive will have an effect. The railway sector therefore proposes either direct subsidies as an alternative, or that wagon owners can claim a mileage-based bonus instead of the operators. Several individual countries are also studying or implementing different means of promoting retrofitting. The Netherlands have introduced noise differentiated track access charges. Switzerland directly subsidises the retrofitting of the freight fleet in addition to using noise differentiated track access charges.

The technical noise issues:

Many activities promoting silent railways are currently ongoing. The immediate challenges are to complete the homologation (certification of a product or specification to indicate that it meets regulatory standards) of the LL-brake block, to find suitable incentive schemes as well as appropriate funding for these without harming the railway sector as a whole.

The strategically noise issues:
Parallel with solving the technical noise issues strategically noise subject are also discussed and investigated in Europe. Subjects as e.g. collection, implementation, communication and financial studies or discussion papers have a high priority and different noise projects within these topics are for the moment on going or have been suggested to the members.

Noise and Vibration Considerations on Shared-Use Rail Corridors

Lance Meister - Harris Miller Miller & Hanson Inc.

Increasingly, freight railroads are being asked to share either their tracks or their rights-of-way with transit, commuter or intercity passenger rail projects. There are a number of complicated factors railroads must deal with on shared-use corridor projects, and in some cases noise and vibration can be major issues on these types of projects. Shared-use corridors can include increased traffic volumes, different modes of vehicles operating within the right-of-way, moving or sharing tracks, horn sounding or temporal separations, all of which can have effects on the noise and vibration levels and impacts associated with a shared-use corridor project. In addition, it may not be clear who is responsible for any noise or vibration mitigation that might be required, or if mitigation is even possible. This presentation outlines some of the issues associated with noise and vibration on shared-use corridor projects and presents case studies illustrating some of the potential issues railroads and project sponsors might encounter.

"The Sounds of Transit" Hearing is Believing

Ahmed El-Aassar - Environmental Acoustics Inc./Gannett Fleming Inc.

In order to comply with the NEPA process, the author has created an innovative way to integrate the noise topic into public involvement framework. The acoustic presentation was developed as a public planning tool to compare existing freight train sound levels to the sounds of an array of proposed rail technologies. The audio-visual presentation included interactive videos and computer animations; allowing proposed transit and rail modes to be heard at different distances and in outdoor or indoor settings. The authors will explain how community groups and decision makers in Florida responded to a presentation system providing direct acoustic experience of over a dozen transit modes, from light rail guideway transit to commuter railways.

The presentation was included as part of 12 public community presentations. One feature of the program that was particularly suited for community interaction was the ability to modify the distance from the listener to the source with appropriate distance attenuation. This made it possible to deliver, "What if?" transit comparisons tailored to individual locations. People could experience the very substantial differences between the noise from freight and transit operations and appreciate why adding the transit has a minimal effect on the decibel arithmetic. At the same time, people could apply their own standards to what they were hearing as well as the formal FRA/FTA standard.

Passenger Rail

The Challenges of Implementing a Recycling Program for Amtrak Passenger Trains and Stations

Joanne Maxwell and Emma Cattafi - Amtrak

A growing segment of rail passengers has the expectation that train service will be "green" as well as fast and convenient. One basic and highly visible example is providing recycling services on trains and in stations. Amtrak has long recycled industrial materials such as steel parts, used oil and cardboard at our mechanical shops and other facilities, but providing recycling services for passengers on trains and at far-flung stations has proved a more challenging goal. The existing fleet of coach cars and food service cars has a limited number and limited size of trash receptacles, and each station and layover facility maintains its own trash contracts with local vendors. In order to drive progress, in early 2009 Amtrak set a goal of having recycling service on all regional and long distance routes that provide food service, which make up the vast majority of Amtrak routes, by adding a recycling receptacle to each food service car. This paper will address the challenges, successes and future plans in providing the necessary equipment, vendor arrangements, employee training, and communications to passengers on recycling. In addition, we will discuss the importance of a cross-departmental team in driving this process, and the need for establishing good data collection in order to measure our progress and be able to tell our story about the results of the program.

Risk Management

Railroad Bridges and Lead-Based Paint: An Environmental Hazard?

Paul Kurzanski - CSX Transportation
Stephen Blair and Pat Harrison - AMEC Earth and Environmental, Inc.
Mike Feamster and Casey Harbison - CTEH
Jaime Krejsa and Joe Papineau - EnviroScience, Inc.

On average, there is one railroad bridge for every 1.4 miles of track. As a matter of rail safety, the FRA does not require the railroads to paint bridges; subsequently railroad bridges are not routinely painted. However, deteriorating paint on railroad bridges occasionally becomes an aesthetic or environmental concern for the general public. In response to public concerns regarding weathering and flaking paint falling from the bridge into the river and onto river banks, CSX Transportation, Inc. (CSXT) is conducting a comprehensive study of the environment surrounding its Barren River Bridge in Bowling Green, Kentucky. Analyses of paint from the bridge indicated that lead was the primary metal of concern.

CSXT is conducting air and soil sampling around the bridge and is sampling sediment and surface water in the Barren River upstream and downstream of the bridge for the presence of lead. CSXT is also conducting a comprehensive ecological survey of the Barren River in the vicinity of the bridge. The biological study includes a freshwater mussel and benthic macroinvertebrate survey to better characterize the biological conditions upstream and downstream of the bridge. Additionally, CSXT is completing a detailed substrate characterization of the Barren River to evaluate the biological communities' relationship to habitat vs. potential environmental concerns from the bridge. The results of these biological studies and analytical data will be presented and used to characterize the potential human health and ecological risks of weathering lead based paint from the bridge. The human health risk assessment will focus on lead exposures potentially resulting from recreational activities and fishing near the bridge. This study will be discussed in the context of how the results may be extrapolated to other railroad bridge sites as well as how future bridge studies may be streamlined to address relevant environmental concerns.

Environmental Laws, Natural Resource Damages Matters, and Remediation Cases Impacting Railroads and Associated Issues
John Gilmour - Jackson Gilmour & Dobbs, PC

Environmental litigation comes in many shapes and sizes and can have significant impacts upon railroads. Governmental claims may seek remediation, cost recovery, and/or natural resource damages, and be based upon state or federal statutes, and even the common law. Similarly, private parties may bring claims seeking cost recovery or contribution, also based upon state or federal statutes, as well as the common law. Railroads have particular exposures, responsibilities and opportunities due to their operations and vast property holdings. Often times, environmental issues result from historical operations associated with tenants and prior owners. Lawyers at Jackson Gilmour & Dobbs, PC have represented railroads in environmental and property damage matters across the country for over 10 years. This presentation will focus upon the current state of certain environmental laws, natural resource damages matters, and remediation cases impacting railroads and associated issues. Additionally, the presentation will address some groundbreaking environmental decisions issued in the last year by the United States Supreme Court involving railroads that will impact CERCLA litigation and Superfund sites across the country. Likewise, significant developments in State litigation regarding natural resource damages and property damage cases will be touched upon. All of these issues affect the environmental affairs, operations, maintenance and contracts of railroads. A question and answer session will follow the presentation, time permitting.

Liability Management Associated with Un-Used Buildings – Railroad Issues
Angela Cook and John Wise - Golder Associates Inc.

Historical Rail Yards and Car Shop complexes carry long term building and structure issues. Based on historical information, older rail sites have structures that were built in the early 1900's with various additions and subtractions to the complexes occurring over the years, and some buildings being inactive for years.

Inactive buildings can be a magnet for vandals and vandalism including arson. These buildings can become environmental, legal, and public relation liabilities, and a target of local enforcement action - municipal condemnation. In addition, potential liability issues such as safety hazards to trespassers, environmental spills, asbestos emissions, leaks from electrical equipment, and RCRA considerations. These issues must be continually managed by the railroad, at a cost.

Rail Companies embarking on initiating a long term asset management strategy plan must consider complex and integrated issues. When deciding whether to decommissioning and demolish former facilities, the capital costs must be weighed against the holding costs related to building taxes, security, insurance, and ongoing maintenance, which can be abated and amortized over time to offset the cost of removing structures. Asset / liability management aspects of rail properties include the following major elements:

1) Planning
- End use scenarios / exit strategies
- Project estimating / value-understanding
- Funding and decision-making
- Asset evaluation - redeployment or sale
- Historical use research - site use history
- Public Relation issues
- Permitting and contracts
- Prioritization of real estate portfolio sites

2) Pre-Work Preparation
- "Regulated Materials" Survey (aka "haz-mat survey")
- Engineering: Utilities, storm water management, permitting, etc.
- Contract documents and technical specifications for work ("performance-based")
- Contractor procurement
- Evaluation of contractor bids
- Understand governing laws and ordinances
- Develop integrated plan for remedial actions

3) Execution and Documentation
- Contractor submittal review (not approval)
- Document contractor compliance with specifications and regulations
- Construction Management
- Liaise with agencies and public on behalf of owner
- Review of waste management records
- Administrative assistance and data management
- Inspections: environmental clearance and general completion
- Final reporting

Real Estate Leased Property Audit Program
Norfolk Southern Corporation

Judy Nash - Norfolk Southern
Scott Keating and Rob Wallace - AECOM

Norfolk Southern Corporation (NS) and AECOM cooperatively manage an environmental audit program for NS-owned real property assets. The program was developed in 2001 with the objective of proactively inspecting current or recently leased properties for existing and/or potential environmental liability. The program also accomplishes the goal of verifying that tenant usage of the property is consistent with the lease agreement. To date, approximately 700 audits and re-inspections have been conducted within NS's 22-State operating system, with approximately 100-125 new audits being conducted each year. Under this program, leased properties are screened and prioritized for audit using bilateral selection criteria. The first is based upon the nature of the tenants' business and the resulting inherent potential for environmental liability. The second is predicated on the proximity of the lease termination/renewal date. Audits are proactively conducted while current tenant is working on-site or when tenants notify of their desire to terminate the agreement. Selected sites are then dispatched to AECOM to coordinate with the lessee and NS Real Estate field agents to complete the audit. The audits consist of a lease agreement document review, physical site inspection and subsequent reporting. If exceptions are noted during the site inspection, recommendations are made to NS detailing necessary corrective or mitigative actions. NS, in turn, communicates the required corrective actions to the lessee. In some cases, re-inspection of the property is required to ensure compliance with these terms. In a few instances, audits have revealed state-regulated remedial actions on the property without any notification to NS. Such audits require extensive document reviews of applicable environmental assessment information available from the State in order to develop meaningful recommendations. This presentation will describe the audit program, its corresponding benefits to NS, and also highlight some site examples where environmental issues were observed and actions were taken to mitigate liability.

Environmental Response

Storm Response Preparedness: Applying Lessons of the Past to the Responses of the Future

Jeffrey LaRock - AMEC Earth and Environmental, Inc.
Richard K. Nath - CSX Transportation

In 2005 CSX Transportation's operations were severely hindered by Hurricane Katrina. Following the widespread damage caused by Hurricane Katrina, the response was hindered not only by damage to infrastructure but also by difficulty in securing resources such as roll offs, hotel rooms and equipment for the response teams.

In the ensuing years, CSXT with AMEC's assistance have developed a Storm Readiness and Response program to help deploy responders and equipment in advance of approaching Tropical Storms or Hurricanes and ensure rapid response following the passage of these storms. The Storm Response and Readiness team includes CSXT Environmental Field Services, Facilities and, HAZMAT personnel along with a network of qualified response contractors and consultants. By integrating and communicating with these groups prior to the landfall of a storm, a coordinated effective response can be achieved where resources are shared and concerns between groups can be more readily discussed prior to any damage occurring.

Three alert stages have been developed and implemented to prepare for storm events. Stage 1 is initiated when a Tropical Storm develops and that storm has the potential to impact CSXT's territory. Conference calls are initiated and the responders in the areas of potential landfall are notified to begin preparations. Stage 2 begins when a storm is within 36 hours of landfall and it is anticipated the storm will impact CSXT's operating territory. Teams prepare to mobilize, including securing hotels in the projected areas of landfall, putting response equipment in place and waste containers on standby. Stage 3 is initiated following landfall of a tropical storm or hurricane and includes mobilizing coordinated response teams to the affected areas with reserve personnel and equipment put on standby. Storm abatement and restoration teams begin building assessments and cleanup activities.

To assist in the planning and coordinated response effort to storm response, CSXT and AMEC have developed a web-site to act as a clearing house of information for weather updates on approaching storms, maps detailing asset locations, and contact information.
The Storm Response Website provides teams in the field with information regarding previous asbestos assessments, PCB concentrations of electrical equipment in the field and the locations of the nearest response contractors to the affected areas including real-time updates to weather information and changes in personnel availability.

By coordinating efforts and resources in advance of approaching storms, CSXT has been able to decrease its response time to assess and abate storm damage and minimize disruption to services. The integration of different departments into the team has minimized overlap between departments while increasing efficiency in response. The Storm Response Website has proven to be a useful tool to link field and support personnel during a response and provide critical information to support recovery efforts.

Emergency Response Plan for Railroads in Sole-Source Aquifer Areas

Jeff Bonsteel and Marc Sanford - ARCADIS
Paul Kurzanski - CSX Transportation

The Schenectady-Niskayuna Aquifer covers approximately 25 square miles in Schenectady County, New York. The USEPA designated the Schenectady-Niskayuna Aquifer as a sole-source aquifer (or SSA). The USEPA defines a SSA as one which supplies at least 50% of the drinking water in the area overlying the aquifer. These areas may have no alternative drinking water source(s). Five high production well fields in Schenectady County withdraw approximately 30 million gallons of water per day from the aquifer and provide drinking water to over 150,000 residents within nine communities. Major rail lines (including CSX) are located above the aquifer and in close proximity to the five well fields. In most locations, the aquifer is unconfined and susceptible to surface contamination. Therefore, a future derailment or spill associated with these rail lines represents a potential threat to the regional water supply.

CSX, in cooperation with the Schenectady County Department of Emergency Management and County Local Emergency Planning Committee (LEPC), proactively developed an "Emergency Response Plan" (or ERP) for the Schenectady-Niskayuna Aquifer. CSX initiated an intensive field reconnaissance of the SSA and surrounding area, and completed an analysis of local hydrology, topography, and drainage patterns as they related to the CSX tracks and the SSA. The results of the analysis established areas of potential vulnerability in the event of an incident and prioritized specific sections of the track for emergency response activities.
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The final ERP included:

- Aquifer maps showing areas where the CSX tracks overlay the aquifer;
- Identification of culverts, surface water bodies, or other sensitive areas along the affected area;
- Procedures and contacts for notification and communications in the event of an incident; and,
- Annual review process for CSX to confirm that conditions have not changed.

The ERP is a one-stop document that provides emergency responders with the basic information and protocols should an event occur within the boundaries of the aquifer, and specifically at the prioritized sections. It also integrates local emergency management responders into the CSX response procedures and chain-of-command definitions.

CSX facilitated roll out of the plan by attending a monthly LEPC meeting to present an overview of the ERP and key emergency actions and protocols developed by CSX. Together the meeting and distribution of the ERP to the communities have elevated general awareness regarding the presence of the SSA and potential impacts to the aquifer should an incident occur.

Due in part to the success of the ERP process with Schenectady County, CSX is currently engaging other Counties within new York State (and across their rail network) to provide similar documents and services related to soil-source aquifers. Currently in development are ERPs for the Tug Hill Aquifer (located in central New York) and the Michindoh Aquifer (located in south-central Michigan, northeastern Indiana, and northwestern Ohio).

Environmental Response and Restoration of the CSXT Glencoe Derailment Site

Jamie Krejsa - EnviroScience, Inc.
Joe Riepenhoff - ARCADIS
Michael M. Austin and Keith Brinker - CSX Transportation

On February 6th, 2010, CSX Transportation had a derailment in Glencoe, Pennsylvania, involving 113 coal cars and approximately 11,300 tons of coal. This derailment is recorded as the most cars involved in a derailment in CSXT history. The derailment occurred as a major snow storm deposited 24-36 inches of snow in the remote mountainous area with temperatures near 0 degrees Fahrenheit. These conditions presented unique challenges to CSXT response activities. The derailment occurred adjacent to and on CSXT Bridge 24 over Wills Creek that is designated as a high quality coldwater habitat and is stocked with trout for recreational fishing. Arcadis and EnviroScience responded with Mike Austin, CSXT HAZMAT and Keith Brinker, CSXT Environmental Remediation. The CSXT project team worked closely with regulators and site contractors to assess potential impacts during coal removal, obtain permits, railcar scrapping and removal operations, community considerations, stabilize the area and prepare for the final restoration.

The integrated project team was comprised of CSXT representatives from HAZMAT, Environmental Remediation. L.E.A.D.S., Asset Recovery, Claims, Engineering, Field Services, Train Control, and multiple consultants and contractors. This team developed and implemented a coherent response and recovery plan which relied on the best and most efficient use of the limited space and resources to complete tasks and lead the community to recovery. A furious pace engulfed the site which required a unified effort to achieve project goals and assure site health and safety.

Due to the amount of coal and large footprint of the incident, a large scale sediment and erosion control plan was developed and implemented which encompassed all incident activities. Coal removal within the stream was completed over a short period of time with limited disruption to the stream in preparation for upcoming high water events which were inevitable

due to the amount of snow cover, pending warmer temperatures, and rain. The Project Team worked with local contractors to stabilized the stream banks and re-install a gravel bar in the channel with natural river stone. Meanwhile, CSXT work trains supported over road trucking efforts to remove coal, scrap and debris. As predicted, a major flood event occurred at the site the weekend of March 13, 2010 which resulted in the 5th highest annual flow event recorded in the 42 year USGS record for Wills Creek. The sediment controls and site stabilization measures helped to mitigated potential impacts to Wills Creek during the flood The proactive approach and realization by CSXT that a sensitive natural resource was involved in the incident resulted in only minor temporary impacts despite adverse site conditions. Regulatory agencies were impressed with the proactive approach to the derailment and will most likely consider the final restoration of the Wills Creek stream bank as mitigation for the incident. This derailment response resulted in a positive outcome for CSXT, regulatory agencies and the environment.

Environmental Response to a Sodium Hydroxide Release

Sherry Eaton and Phillip Moddle - Golder Associates Ltd.
Alexandre Borges - CN

For CN, responding to the release of a hazardous material at their bulk transfer facility would typically be a straight forward and simple process given the procedures in place and experience in dealing with such an incident. However, when a release of 8,000 gallons of sodium hydroxide occurred at their Cargoflo facility located in Vaughan, Ontario on February 11, 2008, a compounding series of events resulted in the need for extensive spill response, environmental monitoring and mitigation measures.

The sodium hydroxide was released at the Cargoflo facility from a rail car that was being pressurized in preparation for unloading. However, as a result of a suspected valve failure, the sodium hydroxide was released under pressure from the top of the tank car and was carried by strong winds across portions of the yard. As a result, the sodium hydroxide could not easily be contained by the existing spill containment infrastructure in place at the site.

The released sodium hydroxide mixed quickly with melt water and rain, and migrated to the on-Site storm water pond within hours of the release. Due to the low dilution potential of sodium hydroxide, the pH of the water in the pond rapidly increased rendering it unsuitable for discharge to the creek. Monitoring of the water indicated that the almost 500,000 litres of storm water in the pond was characterized by pH levels ranging from 10 to 13.

An attempt was made to manage the impacted water in the pond via removal for off-site disposal and on-site neutralization, however, the continued flow of storm water into the pond caused by ongoing snow melt and rain fall events created a situation where the volume of material to be remediated was changing almost daily. This required a constant re-evaluation of the remedial approach to adapt to the changing site conditions. Additionally, the ongoing generation of run-off at the site resulted in a continuous threat of discharge of impacted water to the creek from the pond which reached near capacity on several occasions, and presented a frequent threat of flooding of the yard given the reduced storm water containment capacity at the site.

Initially, it was hoped that the regulatory agency would permit the discharge of impacted storm water, once neutralized, to the adjacent creek. However, after some consideration, the agency decided that discharge would not be permitted and, as a result, all impacted and neutralized storm water was subsequently required to be managed off-site.

In total, over 594,000 gallons of pH impacted storm water was trucked for off-site treatment and disposal, and over 286,000 gallons of pH impacted storm water was neutralized on-site and discharged to the regional sanitary sewer system. Through the concerted efforts of CN, it's response contractor and environmental consultant, sodium hydroxide impacted materials, including over 880,000 gallons of impacted storm water, were successfully managed with minimal impact to the natural environment.

Wednesday 27 October

Compliance

Preparing for an Enforcement Audit: Demonstrating Current Compliance with New Air Rules and Regulations

Bruce Dumdei - ENVIRON International Corp.
J. Jay Grove - GATX Corporation

The passage of several new air rules and regulations has required not only diligence in developing strategies to meet the new requirements emissions limits, but also development of new and better methods of monitoring, recordkeeping and reporting to demonstrate your compliance. The presentation will summarize some of the new air regulations such as the area source NESHPA (hazardous air pollutant) standards that affect even minor emission source facilities. The USEPA and

local authorities are targeting NESHAP regulations and other recent rules in their enforcement priorities and the railcar manufacturing, servicing and maintenance facilities may for the first time be subject to targeted air compliance audits. The presentation will show how to prepare non-applicability or compliance determinations for these and similar rules and prepare for possible enforcement audits. Lessons learned from the petroleum and chemical industries' NESHAP audits will be shared with the attendees. Attendees will leave the presentation with a better understanding of new air regulations and the level of detail expected to defend their compliance determinations of these rules.

The Art of Assessing Your Laboratory's Performance Through Performance Test Sample Studies
Ruth Forman and Rock J. Vitale - Environmental Standards, Inc.

Commercial environmental laboratories analyze performance test (PT) samples on an annual basis in order to maintain certification for most laboratory accreditation programs. Clients often select laboratories based solely upon the fact that laboratories are certified. Just what exactly can you learn from these performance test round robins and how meaningful are the laboratory scores? This interactive session will test your knowledge of laboratory and method performance based upon certification test sample results. In addition, example case studies of custom-made, client-supplied round robin test samples will be presented to provide additional ways that your laboratory's performance can be assessed.

Review of Environmental Issues Affecting the North American Railroads
Robert Fronczak - Association of American Railroads

The Association of American Railroads (AAR) represents the freight railroads in North America. AAR members include the railroads that operate 72 percent of the line-haul mileage, employ 92 percent of the workers, and account for 95 percent of the freight revenue of all railroads in the United States; and passenger railroads that operate intercity passenger trains and provide commuter rail service. AAR also represents the Canadian railroads through the Railway Association of Canada, and two Mexican railroads including Ferromex, and KCS DeMexico. This presentation will discuss current regulatory, legislative, environmental awareness, and pollution prevention initiatives at AAR. Regulatory activities include Construction and Development Effluent Limitation Guidelines, EPA requested stakeholder input on stormwater management including discharges from new development and redevelopment, proposed changes to the definition of solid waste used for combustion, a petition for rulemaking to reduce greenhouse gas and black carbon emissions from locomotives by several environmental groups, AAR's involvement on an EPA document entitled Relative Potency Factor for Polycyclic Aromatic Hydrocarbons, the status of EPA electronic hazardous waste manifest, the status of EPA restrictions on sulfometuron methyl (a key weed control ingredient), State of Wisconsin legislation on herbicides applied by railroads, an update on the status of global climate legislation, the status of EPA's National Environmental Justice Advisory Council's report on goods movement, as well as a brief summary of other issues.

PANEL: Railroads and Historic Preservation Compliance – Understanding Your Historic Property
Michael Madson and Joe Trnka - HDR Engineering, Inc.
Michelle Terrell - Two Pines Resource Group
Andrew Schmidt - Summit Envirosolutions

Railroads own some of the most continuously used, single-purpose real estate in the county. Rights-of-way, culverts, bridges, maintenance and repair facilities, passenger depots, warehouses, and commercial storage structures reflect decades, and sometimes a century of use for a single purpose, which is the local, regional, and national transportation of goods and commerce. Because of their age, their integrity, and their importance locally, regionally and nationally, railroad facilities are often subjected to review under historic preservation regulations, most commonly at the federal level. While this review is sometimes initiated by a railroad-sponsored project, often it is the planning activities of other parties that includes railroad property and subsequently results in decisions of that can affect a railroad's continued activity. It behooves railroads to be aware of the historic status of their property and be engaged in agency decisions that may affect a railroad's long-term viability.

The panel discussants will discuss recent examples of cultural resources compliance and planning activities that involve railroad properties. Topics will likely include: federal and state historic preservation regulations, the advantages of taking a programmatic approach to evaluating railroad properties for potential historic significance, and development of management plans. The panel discussants will present strategies that railroads can use to better understand their property in light of state and federal preservation legislation and compliance activities of others.

Positioning for Shovel Ready Expansion - National Gateway Clearance Initiative
Hadley Stamm - ARCADIS
Marty Marchaterre and Troy Neisz - AMEC Earth and Environmental, Inc.
Keith Brinker - CSX Transportation

The National Gateway is a plan to create a more efficient rail route linking Mid-Atlantic ports with Midwestern markets. In order to complete this CSX Transportation, Inc.'s (CSXT) must obtain a minimum 21-foot of clearance along their rail corridor to accommodate doublestack intermodal railcars. This public-private partnership is expected to cost $842 million. CSXT is funding track, equipment and facility upgrades ($395 million for new state of the art intermodal terminals), while seeking

Federal ($258 million) and State ($189 million) funding to complete the clearance projects. Completion of this initiative better positions America's rail infrastructure to handle projected increases in domestic and international freight, and better serve the needs of the nation's markets and consumers.

To allow this plan to come to fruition and achieve these benefits, CSXT's Engineering and Environmental Departments were tasked with completing the important and time critical leg work in order to position the National Gateway Clearance Projects as shovel ready and competitive for a portion of stimulus dollars. Together their team of Engineering and Environmental Consultants developed a strategy to meet the shovel ready protocol of the stimulus funding, in less than a year's time. This resulted in a team effort on the design, site acquisition, permitting, and utilities relocating for all 61 of the clearance obstructions (track lowering, bridge replacement, tunnel notching), located in 5 States and the District of Columbia. Due to public funding, all work completed on the rail obstructions need to meet requirements of the National Environmental Policy Act (NEPA). Environmental values were used at every step of the decision making processes by considering the environmental and community impacts of the proposed actions and reasonable alternatives to those actions. The environmental permitting team worked with the design engineers, local, state, and federal agencies. This involved submitting documents under NEPA, obtaining waterway permits, including 401 and 404 water quality permitting, and ensuring commitments under NEPA were carried through. Each obstruction had unique challenges and were as varied as the Harpers Ferry Mountain Tunnel in a National Park, on the West Virginia/ Maryland border to a closed pedestrian bridge workers once used to access a glass plant in Coraopolis, Pennsylvania, to the Virginia Avenue Tunnel located blocks from the Nation's Capitol.

Meetings were held with the state environmental, transportation, and historic preservation offices to confirm permit requirements including NEPA documentation and to streamline submittals whenever possible. The National Gateway Initiative is a dynamic, time critical action for CSXT; the environmental efforts to date have supported their receipt of stimulus funding. Coordination is ongoing while permit applications and NEPA documents are under review. Work with the historic preservation offices to complete the cultural resource coordination continues.

Streamlined Approach to Permitting Expansion of the BNSF Railway Memphis Intermodal Facility

Douglas Dorsey and Jennifer Sunley - Hanson Professional Services Inc.

Obtaining environmental clearances and permits can become a significant problem on any large scale rail project, often resulting in significant delays and increased costs. The 185-acre expansion of the BNSF Intermodal Facility in Memphis, Tennessee allowed BNSF to double the facility capacity. The project required the issuance of 31 various federal, state and local permits, including permits for the installation of a 3-span 104-foot x 570-foot arch culvert structure within John's Creek. Developing a streamlined approach to handle all permitting and regulatory issues allowed Hanson Professional Services, Inc., on behalf of BNSF to effectively manage the complexities of coordinating with multiple federal, state and local regulatory agencies, resolve conflicts quickly, avoid project delays and decrease costs. This presentation will specifically address the following:

1. The development and practice of the streamlined approach to project permitting.
2. Importance of early due diligence and agency coordination.
3. Innovative and cost effective mitigation measures.
4. Resolution of conflicting permit requirements and restrictions.

Stormwater and Wastewater

Quality Assurance of Erosion Prevention & Sediment Control from a Design Engineer Perspective

Robin Hagerty - AMEC Earth and Environmental, Inc.
Paul J. Kurzanski - CSX Transportation

Why QA the EPSC Measures of a Construction Site?

The designer's responsibility should not stop when completing the Stormwater Pollution Prevention Plan (SWPPP) or adding Erosion Prevention and Sediment Control (EPSC) symbols on the construction drawings. In several States, the design profession has the responsibility to verify EPSC measures are being adequately addressed in the field and that the construction project is following regulatory requirements. But even if the regulatory agencies do not require the design professional to verify the condition of the construction site, the concept of having the designer conduct EPSC Quality Assurance (QA) site visits can add value to the client. The designer provides a set of eyes reviewing the construction site, which is not involved in the day-to-day construction activities and sees the site from an environmental requirements perspective. The designer's review can assist the client in fulfilling the requirements accepted when signing the Notice of Intent (NOI). Most regulatory agencies hold the owner (our client) liable to know and follow all of the rules and regulations involved in erosion and sediment control. Currently, regulatory agencies are not staffed adequately to inspect every site, unless there is a complaint. Waiting for the regulator to tell the owner that something is wrong on the site is inadequate. If the regulator does visit the site and finds problems, the owner could be issued a stop-work order, a notice of violation, and/ or fines. Addressing any potential issues before issuance of a stop-work order is a better solution for all parties. To assist the client to stay in compliance, the design professional can verify that the contractor is following the regulatory rules and regulations. This means actually going out to the construction site and the field office to validate the construction site is in

a condition to pass a regulator's inspection. To discuss the necessary part of this process, the EPSC QA is broken down to include: actions prior to construction site visit, construction site visit, documenting your site visit, and follow-up.

Mitigation of Stormwater Impacts from a Rail Yard

Wayne Amber - Geosyntec Consultants
Paul Kurzanski - CSX Transportation

Residents raised concerns about possible petroleum impacts at their properties associated with operations at a Rail Yard. Site investigation activities were performed to characterize and delineate possible petroleum impacts in soil and groundwater east of the Rail Yard, on both CSX Transportation, Inc. (CSXT) property and on adjacent private residential properties. During the investigation work, pooled water, oily sheens, stressed vegetation, and stained soil were noted in areas east of the Rail Yard. After heavy rain events, water was observed flowing east from the Rail Yard and adjacent gravel service road to the adjacent residential properties. Petroleum constituents were detected in shallow soil samples collected from the nearby residential properties. The investigation concluded that petroleum impacts on residential properties, located adjacent to the Rail Yard, likely occurred as the result of surface water transport of contaminated stormwater.

Excavation and off-site disposal was conducted to remediate the residential shallow petroleum-impacted soils. A total of approximately 350 tons of soil was removed from areas of the residential properties where investigation results showed evidence of petroleum impact. Soils were excavated to a maximum depth of approximately 0.5 ft, backfilled with clean soil, and sprayed with hydroseed to promote re-vegetation.

A stormwater management system was designed to reduce the flow of stormwater from the Rail Yard to nearby residential properties and the city stormwater sewers. The stormwater management system uses grading, a French drain, and a storm sewer pipe culvert to capture stormwater. The stormwater management system was designed to follow topographical low points at a 0.3% slope, thus eliminating the need for excessive cut and fill on private property. The French drain consists of a trench, lined with filter fabric, with a perforated pipe surrounded by aggregate. The aggregate fills the trench to grade and the perforated pipe consists of an 8-inch diameter perforated smooth bore corrugated high density polyethylene (HDPE) pipe with soil tight bell connections.

The installed system conveys the captured stormwater to an existing onsite Waste Water Treatment Facility (WWTF) for treatment. Observations during heavy rain events, occurring after installation of the stormwater management system, showed less pooling water in areas of the residential properties, indicating that stormwater was diverted away from these properties. The stormwater management system appears to effectively reduce potential liabilities associated with off-site stormwater migration from the Rail Yard.

Union Pacific Railroad's Wastewater Treatment Plant Instrumentation, Networking And Control System - WINC

Mark Ross - Union Pacific Railroad

Maintaining compliance with regulatory discharge permits is the primary goal at Union Pacific's wastewater treatment facilities. Additionally, the realities of the current business environment require that these facilities be operated as efficiently and economically as possible. The art of balancing these two requirements is the task that continually faces operation managers.

Union Pacific Railroad has implemented the Wastewater Treatment Plant Instrumentation, Networking, and Control (WINC) system at many of it's industrial wastewater treatment plants. UPRR's WINC system is a powerful tool which will help to accomplish this delicate balance.

Plant automation, remote monitoring, and remote control capabilities are features of WINC that allow managers to maintain compliance and maximize their available personnel resources. WINC allows managers and operators to remotely monitor the critical control points (CCP) in the water treatment process to help ensure that process parameters are continuously being met. If a CCP parameter should go out of an acceptable range, notification is made and/or a fail-safe shut down process is instituted to safely ensure effluent parameter compliance.

Union Pacific has instituted the WINC system to help accomplish these goals. The WINC system provides automatic control of the entire water treatment process through programmable logic controllers (PLC). WINC will make immediate notifications of alarm or out-of-compliance process conditions by either telephone or by computer screen. WINC will shut down any process so identified for a fail-safe condition. WINC can automatically log WWTP process data, such as daily flow rates or pump run times, for reporting or maintenance purposes. WINC allows an easy access of remote monitoring and control of all WWTP's connected through UPRR's intranet network.

This presentation will include an overview of:

- Union Pacific's objectives for a WINC system (efficient, cost effective, compliant operation)
- An overview of UPRR's WWTP computer networking
- A typical industrial WWTP process with CCP's identified
- An overview of a WINC alarm notification diagram
- A real-time, on-screen display of a WINC controlled WWTP

Wastewater Treatment Plant Improvements at a Norfolk Southern Railyard – Going Green

Charles Brown - AECOM

The Norfolk Southern Railway Company (Norfolk Southern) is re-examining traditional ways of doing business with a view toward sustainability.

The newly designed replacement wastewater treatment plant (WWTP) at the Norfolk Southern Sheffield Yard in Muscle Shoals, Alabama afforded the opportunity to increase plant efficiency, lessen the impact on the environment, reduce energy use, require less maintenance and provide facilities that will outlast previous standard designs for this type of facility.

This project included the design and construction of a control building that incorporates green building techniques. Evaluating the materials and methods of construction that were used will help establish green and sustainable design approaches into future Norfolk Southern work. This facility will serve as a demonstration project as part of a broader push to bring such things as green building designs, recycling programs, and similar initiatives into the railroad's sustainability business model. Sustainable design elements implemented included the use of glass blocks in the walls for natural lighting, and masonry blocks made of recycled material with the inclusion of pigment – eliminating the need to paint the walls.

The completed WWTP doubled the capacity to treat stormwater when compared to the former plant and increased the useful life of the filter media in the sludge drying beds from six months to more than three years before change-out of the media is required.

This presentation will discuss the new WWTP with special emphasis to inform the audience on details of the design incorporated to greatly improve the efficiency and life of the sludge drying beds, the design of the control and maintenance building facility incorporating green and sustainable materials using LEED Guidelines and also reveal a green initiative, that through a paradigm shift, has the potential to reduce operating and maintenance costs for the railroad.

Managing Storm Water and Industrial Wastewater

E.W. Chambers - Norfolk Southern
Travis Cantley - Marshall Miller

Due to increasingly stringent Federal Regulations, publicly operated treatment works (POTW's) are adamant about keeping storm water out of sanitary sewer systems. Many industrial and commercial sites discharge wastewater from on-site treatment systems to a POTW, which is advantageous to industry, as many POTW's allow hydrocarbon concentrations as high as 200 parts per million (ppm). POTW's insist that storm water not be a component of discharge though and regulations are present in many jurisdictions limiting the allowable discharge concentrations of hydrocarbons to only 10 ppm. The goal is to keep storm water and wastewater discharges separated while complying with the mandated contaminate limits for both.

Many facilities have are structurally open to the atmosphere (example: equipment maintenance pads) which are impacted by storm water and wastewater. Analyzing an equipment maintenance pad, most of the water that falls on these structures is from rainfall, which should be diverted as storm water after appropriate treatment. When industrial wastewater is generated at the pads, from equipment maintenance, for example, the hydrocarbon concentration may exceed low discharge limits imposed on storm water even after on-site treatment. Implementing a system to automatically divert wastewater to the POTW and monitor surface water discharge concentrations at these point source inputs solves this dilemma. An automated valving system in the wastewater pipelines can be implemented; this includes a flow switch in the wash water supply piping that signals wastewater diversion valves to reposition themselves from a "storm mode" to a "wastewater mode" during washing operations, diverting the hydrocarbon enriched waste stream to the POTW. A time delay feature can be incorporated to ensure that water from washing operations has time to flow through the on-site treatment unit and to the POTW discharge prior to the valves repositioning themselves to the "storm mode". Further protection can be achieved by installing a hydrocarbon monitor. These sensitive devices monitor hydrocarbon ranges from 0 to 300 ppm and are capable of triggering the "wastewater mode" valving if a flushing situation occurred at an installation, temporally exceeding hydrocarbon limits for storm water. Once concentration return to an acceptable level the monitoring system will divert flow back to the "storm mode" discharge setting. These systems, once implemented, allow storm water and wastewater to be segregated and mandated contaminant limit to be achieved.

The Design and Construction of the Near Zero Discharge Stormwater Reuse System For CSX Transportation's Baltimore, MD – Chesapeake Bay Piers

John Calhoun - CSX Transportation
Greg Menniti - Geosyntec

CSX Transportation, Inc. (CSXT) is committed to environmental stewardship. As part of this commitment, CSXT has identified potential facilities where green projects can be of significant benefit. During 2009, a study was conducted at the Coal Handling Facility at the Chesapeake Bay Piers to determine if stormwater could be utilized as the water source for the existing dust suppression system. The benefit of this arrangement would be twofold, in that it would reduce the amount of

municipal water used by the facility and reduce/eliminate the discharge of stormwater from the facility into the Chesapeake Bay.

Stormwater at the site is collected and transferred to an existing treatment system consisting of a settling pond, lime addition and a polishing pond for the purpose of neutralizing the pH and removing the gross coal fines prior to discharge. The study determined that with additional treatment, the stormwater could be re-used for the coal storage dust suppression system. Based upon the results of the evaluation, the design of treatment facility modifications and additions were undertaken to allow for the re-use of the stormwater. The additions and modifications include the replacement of the pump station in the primary settling pond to transfer water to the polishing pond, a new pH control system to maximize the effectiveness of the lime addition system, and a sand filter system for additional solids removal. The treated water is then chlorinated and pumped to a storage tank. This storage tank is sized to provide several days worth of water for the dust suppression system. New pumps were designed to transfer water from the storage tank to the dust suppression system. This project serves to make the Chesapeake Bay Piers a near-zero discharge facility for stormwater. In order to allow for flexibility in variable weather conditions, the design allowed for keeping the existing municipal water connection and polishing pond emergency overflow intact. These allowances enable the system to utilize municipal water during dry periods and maintain a mechanism for discharge during extremely wet conditions.

The presentation will discuss the evaluation process as well as the treatment, storage and existing dust suppression connection challenges encountered during the design and construction of the stormwater reuse project.

Environmental Management Systems

GIS Technologies for Railroad Environmental Resource Management - Data at Your Fingertips

Julie Kloss - EMR, Inc.
Charlie Duffy - Canadian Pacific Railway

Canadian Pacific Railway (CP) and EMR, Inc. (EMR) have developed a spatial data storage system of selected aspects of CP's operating properties in Minnesota and North Dakota. The goal of developing the system was to create a central data storage solution for structures based projects within CP's St. Paul Service Area that would also offer data analysis functions. Currant applications of this system include the storage of structure related data, repair and maintenance project tracking, environmental permit compliance, and monitoring the potential for structural integrity issues during environmental events such as seasonal flooding.

The system offers the ability to store and display structure specific data, as well as displaying and analyzing the spatial relationship between the structures and pertinent environmental resources, including, wetlands and waterways, threatened and endangered species habitat, and cultural resources. CP's GIS system is used to streamline the environmental permitting process and ensure that all required permits and clearances are obtained. The system also serves to store relevant documentation such as photographs, construction plans, and permits in the form of feature links. In this capacity, the system acts as an interface to quickly and easily access important information and to serve as a historic record of CP properties.

This presentation will begin with a discussion of basic concepts behind the creation of a GIS database system and the types of data sources, both private and publicly available, that can be used to populate the system. The presentation will also explore various system applications and demonstrate how CP is using the system to make their data available for multiple uses, effectively manage their structures, and manage their impact on environmental resources.

Building Environmental Engagement in Your Company

Bob Toy - Union Pacific Railroad

Businesses are in the midst of a cultural shift to make a positive impact on the environment. The railroad industry is no different. Gone are the days when a few team members from an environmental group carry the weight of the organization's environmental responsibilities. Every employee carries the opportunity and obligation to protect the environment. Ensuring every employee understands – and accepts – that role presents a challenge. Engaging employees is a fundamental task, and this presentation explores steps Union Pacific has taken to make engagement a reality.

This presentation provides context for the importance of employee engagement on environmental matters. From senior levels to the newest member of the organization, a company's reputation and financial well-being are at stake. Everyone is watching – governments, shareholders, external organizations, the communities we serve, and employees themselves – to verify that the company's actions match its words.

Rail industry engagement has inherent issues: thousands of employees spread across as many miles, a mobile workforce, a work product that requires handoffs that can lead to reduced personal accountability, and operational requirements to satisfy customer needs. UP's stewardship engagement strategy addresses each through a bottoms-up and top-down approach. Done well, engagement not only results in increased environmental awareness and action, it's also fiscally responsible.

The presentation details strategies to create this cultural change. It profiles UP's branding of stewardship for work and home. The presentation profiles the company's internal environmental stewardship website, which provides a multitude of

tools. The site has generated several hundred environmental suggestions and success stories. The engagement strategy ties in well-timed events, promotions, and giveaways to keep the stewardship subject relevant.

Tying everything together is a database that tracks engagement. Mining the database allows the company's environmental team to identify leaders, direct messages, group tangible opportunities, and further engage others. It also helps track the success and limitations of the program. The presentation shows how the database can predict engagement while still delivering frequent surprises -- both on hot-button issues and those that fall flat.

The UP team knows it doesn't have a corner on the market of good ideas. This presentation opens the floor for sharing of ideas, dialogue on effective and ineffective strategies, and brainstorming concerning engagement opportunities across the industry. That discussion is especially critical as railroads interchange a large amount of traffic between each other and as the industry positions itself to be part of America's transportation solution through reduced emissions and a sizable fuel-efficiency advantage over truck.

Environmental Metrics in the Rail Industry

Norman Parker - Parker & Associates, Inc.

Environmental metrics in the rail industry are an interesting read. There are the environmental metrics of the annual reports, there are those metrics tracked by the corporate staff, and there are those metrics relied on by those in the field. The author critically analyzes the use of environmental metrics in the rail industry and suggests metrics, both used and unused, which are of the most value.

The presentation keys on examples from waste and wastewater management and remediation. Analyses are presented in the context of "Six Sigma" and critically reviewed from the perspective of the costs and benefits of selecting sound metrics. The analyses are based on a review of two years of data from class 1 rail carriers. The paper's theme is that metrics are misused and that instructive metrics are often not used. The case is also made that environmental hazard and risk metrics are particularly misused and inappropriately applied. This is particularly true with respect to the assessment of economic, asset, and reputation damages.

The paper presents a classification system and hierarchy of metrics and the associated costs and benefits for each metric approach The paper also provides rail environmental personnel a fresh approach for implementing beneficial and creative metrics. A strong case is made that in the rail industry metrics are often unintentionally based on forcing statistical tools to tell a story rather than allowing the real story to be told by sound information gathering and analyses.

Environmental Management Information Systems (EMIS) Implementation for the Transportation Sector

Jason Samus and Chris Kerlish - EA Engineering

The ability to quickly adapt, implement, and support customized Environmental Management Systems solutions is a key to keeping transportation sector managers up-to-date with system-wide environmental developments and regulatory compliance requirements. EA Engineering, Science and Technology, Inc., is currently supporting Maryland Aviation Administration and Maryland State Highway Administration with the development and implementation of Environmental Management Systems (EMS) and related compliance program support. EA is working with each agency's compliance and facilities groups to develop comprehensive multimedia compliance programs from the ground up, including development, modification, or review of permits and plans; development and implementation of procedures; training of employees; development and implementation of a comprehensive, but simplified facility inspection program, moderation and technical leadership of an environmental compliance steering committee; site investigation and remediation; and a variety of other services.

In conjunction with the development of the two Maryland Department of Transportation (MDOT) EMSs, EA is also leading the development and implementation of a web-based Environmental Management Information System (EMIS) at each agency. The respective EMISs serve as the central repository for all environmental compliance data, documents, and records enabling each Agency to effectively manage, monitor and track all aspects of environmental compliance. The systems function as the primary program environmental program management tool for coordinating efforts of project team members, various contractors, and agency staff. Additionally, the systems also facilitate compliance with environmental regulations by assigning responsibility for specific compliance tasks to individuals within each organization and tracking and reporting the completion of each task.

Each of the web-based EMIS systems includes an Environmental Regulations module to track all applicable regulations for each agency and provide details about each regulation to all levels of staff. The systems also include an Environmental Inventories module to track and manage information related to assets such as tanks, wells, permits and facilities. For example, the Tank Inventory contains detailed information for each tank, such as the registration number, contents, primary use, system components and their test and/or inspection history and alerts responsible parties of upcoming compliance tasks. The Compliance Task Tracking and Notification module of each system brings together in one list all of the upcoming and outstanding compliance tasks to be performed and includes the location and description of the task, the required completion date, whether it is a routine or emergency task and the individual within each agency that is responsible for completing the task. The module allows managers to quickly and easily assess what actions need to be completed within a given time period and highlights those tasks that are past due and require immediate response.

The EMISs were designed specifically for each agency, but the information, modules and functionality would be useful tools for any organization with environmental compliance requirements and the respective systems can easily be adapted to other transportation sectors.

Remediation

LNAPL Mobility Tracer Testing

Andrew Pennington, Jonathon Smith, Brad Koons, Kevin Peterburs - ARCADIS
Geoff Reeder - Union Pacific Railroad

Light non-aqueous phase liquid (LNAPL) mobility is widely used to characterize risk associated with LNAPL plumes. A stable or minimally mobile LNAPL plume supports risk-based management of LNAPL impacts. There are several qualitative and quantitative methods for assessing LNAPL plume velocity. However, commonly-used modeling methods employed to quantitatively characterize LNAPL plume mobility are based on assumed soil and hydraulic conditions. While the models estimate the theoretical range of LNAPL pore velocities that may be observed at a site, the influence of soil heterogeneities on LNAPL mobility cannot be fully accounted for using modeling methods. A new LNAPL mobility assessment technique was recently developed that directly measures LNAPL flux using single-well LNAPL tracer testing. The method, which is intuitive and straightforward to implement, involves the addition of an LNAPL-soluble fluorescent tracer dye to LNAPL present in selected site monitoring wells. Over the course of several months, the LNAPL fluorescence (i.e., tracer concentration) is measured in situ with a field spectrophotometer, and compared to in-well initial and background fluorescence standards. The observed decline in tracer concentration is a result of LNAPL movement through the well (i.e., flux). LNAPL flux values are calculated using a well-known solution for point-dilution single-well tracer tests. To-date, this technique has only been applied at a handful of sites, and the results of these applications have not yet been widely published. This LNAPL mobility tracer test was implemented in five monitoring wells an LNAPL site in the Chicago area. The testing demonstrated that the flux of LNAPL through these wells was low and below generally accepted LNAPL mobility thresholds. Certain difficulties were consistently encountered in the implementation of the test and interpretation of data; these difficulties, and potential solutions, will be presented. Other, more familiar procedures used to characterize LNAPL mobility, including LNAPL bail-down testing and undisturbed LNAPL soil core collection, were also employed, and the results of these analyses will be discussed. The field study confirmed that the LNAPL mobility tracer test process is readily implementable and can provide a helpful empirical supplement to widely used theoretical mobility assessment tools.

Cost Saving Measures and Liability Management during Remediation of a Former CCA Wood Treating Facility

Duane Graves and Ky Palmore - Geosyntec Consultants
Paul Kurzanski - CSX Transportation

The United States Environmental Protection Agency and the Kentucky Depart of Environmental Protection regulated the remediation of chromated copper arsenate (CCA) at a former wood treating facility owned by CSX Transportation, Inc. (CSX) or its predecessors since the early 1990s. CSX achieved a cost effective remedy for the site through application of cost saving remediation technologies, eliminated off-site liabilities by minimizing the amount of hazardous and non-hazardous materials removed from the site, regained control of the site by repurchasing and fencing the perimeter, and managed potential future human-health exposure liabilities through a state issued land use covenant. This remediation project demonstrated the value of technology selection, cost avoidance during materials disposal, and strategic property management to control project costs and reduce environmental liabilities.

Key elements of the project are summarized:

- Approximately 3200 tons of CCA contaminated soil and concrete were remediated. A total of 70 tons of soil visually contaminated with CCA and 100 tons of concrete Soil in the wood treating area were disposed as F035-listed waste at a secure treatment, storage, and disposal facility. The remainder of the soil was treated in place by blending with Portland cement and ferric sulfate. The selection of in place soil stabilization resulted in a project cost savings of up to $1,000,000 if all the soil had been characterized as F035-listed waste.
- Sediment removal from the stream was accomplished with a low impact modified vacuum dredging process. This gentle approach eliminated damage and subsequent costly repair to the riparian corridor and stream bank, caused minimal disruption to ecological niches in the stream and generated a small quantity of contaminated sediment that required disposal.
- Scrap steel, wood milling, and office equipment was decontaminated and sold or recycled. Rolling stock was sold for reuse or at salvage value.
- The property was purchased from the lien holder to provide CSX with full control of property access and use. This allowed the use of industrial clean-up standards and the application of land use controls to provide a protective but not excessive remediation of the site.
- Other environmental concerns included demolition debris, universal wastes, various containerized chemicals and solvents, and two sealed radioactive sources which were disposed by recycling or disposal at approved disposal facilities.

Through planning and judicious use of remediation technologies, CSX achieved site remediation with minimal off-site disposal of hazardous materials, cost effective soil treatment, low-impact sediment removal, and long-term liability management.

Leaving LNAPL in Place – A Risk Based Site Closure Approach

Kevin Peterburs and Martina Schlauch Jones - ARCADIS
Geoffrey Reeder - Union Pacific Railroad

The Illinois Tiered Approach to Corrective Action (TACO) regulations require that LNAPL be removed to the maximum extent practicable. The conventional definition used by the Illinois Environmental Protection Agency (Illinois EPA) of practicable recovery is 1/8 inch or greater of light nonaqueous phase liquid (LNAPL) in a monitoring well. However, observation of LNAPL in monitoring wells alone does not indicate that there is an unacceptable human-health or environmental risk associated with the LNAPL. Weathered diesel-fuel LNAPL plumes are generally immobile and do not cause groundwater impacts in excess of applicable risk criteria.

A case study is presented that describes a risk-based project closure approach for LNAPL impacts. The site is the active Proviso Yard Fueling Facility located in Melrose Park, Illinois. A detailed LNAPL mobility assessment was completed to establish a site-specific risk-based LNAPL remediation objective as an alternate to the conventional Illinois EPA definition based on LNAPL thicknesses in site monitoring wells. LNAPL samples and undisturbed soil cores collected in the LNAPL smear zone were submitted to a specialty laboratory for petrophysical analyses. The data were used to develop a multi-faceted LNAPL mobility assessment that included calculation of site-specific and location-specific LNAPL pore velocities as a measure of LNAPL mobility at the site. Demonstration that the LNAPL plume is immobile or minimally mobile at the site supported a risk-based evaluation of the necessity for LNAPL recovery.

As a part of the closure strategy, the project team reached out to the Illinois EPA to initiate discussion of LNAPL mobility concepts and applicability of LNAPL mobility assessment under TACO. Core LNAPL mobility concepts were presented to the Illinois EPA via a technical training session that included concepts from recent published technical primers and guidance materials on LNAPL mobility from the American Petroleum Institute and the Interstate Technical and Regulatory Council's LNAPL Team. The project team has facilitated a series of project-specific meetings with the Illinois EPA project managers to discuss how the results of the site-specific LNAPL mobility assessments will support development of risk-based LNAPL remediation objectives.

The mobility assessment will be presented as an alternative approach under TACO Tier 3 regulations and submitted to the Illinois EPA as a part of the Remediation Objectives Report (ROR). A site-specific risk-based LNAPL remediation objective is proposed, which consists of four criteria that must be met in order to achieve compliance with the remediation objective. The site data indicate that compliance with the LNAPL remediation objective has been achieved. The ROR will be submitted to the Illinois EPA in April 2010. It is anticipated that the Illinois EPA's decision and requested conditions will be available to present at the time of the conference in October 2010. Regardless of the outcome of the Illinois EPA's decision, the lessons learned on this project are beneficial to other LNAPL sites in and outside of Illinois.

Using a Well Defined Conceptual Site Model to Select the Most Appropriate Remedial Technology

Hélène Richer, Bernard LeFrançois, Phil Moddle, and Sherry Eaton - Golder Associates
Stella Karnis - CN

Golder Associates Ltd. (Golder) has been monitoring groundwater and the presence of LNAPL with observable LNAPL thicknesses of up to 2.0 meters measured in several wells at the CN Belleville site since 2001. Measured LNAPL variations have displayed erratic behaviour since the start of the monitoring program in 2001, but exhibit occasional seasonal trends. In general, measured LNAPL thickness is greater in July and August and lower in November and December.

An evaluation of potential remedial options indicated that oxygenation and multi-phase extraction (MPE) could be used to treat/recover and arrest migration of LNAPL. In 2008 pilot testing for both options was conducted to collect the necessary data to evaluate the feasibility of these two remedial options for the hydrocarbon plume at the site, and to aid in the design of the selected remedial system.

The stratigraphy at the Belleville site, generally consists of variable fill, underlain in some locations by native silt to clayey silt, silty sand and/or native gravelly sand till, underlain by limestone bedrock. The depth to bedrock ranges from 1.6 m to 3.1 m bgs. Groundwater levels vary significantly throughout the year resulting in groundwater levels being present sometimes in the overburden and sometimes within the bedrock. Sub-horizontal fractures along or parallel to bedding planes have dip angles (with respect to the core axis) that were measured to generally range from 75o to 900 . The presence of fractures was observed in several boreholes to a depth of at least 5 m.

The analysis of the data collected during the MPE test indicated that natural attenuation is occurring at the site. In fact, concentrations of dissolved oxygen, SO4 and NO3- were identified in groundwater upgradient of the impacted area, but depleted within and rebounded downgradient of the impacted area. In addition, the concentrations of Fe 2+ upgradient of the impacted zone were below the detection limits but rose within the plume and then decreased again downstream. Methane concentrations were significant in the impacted area and CO2 concentrations increased downgradient.

The volume of LNAPL is difficult to estimate in the CN Belleville yard. However, regular product recovery in the past 9 years, bail down testing, MPE testing and groundwater pumping testing have shown that very little mobile and recoverable free product is likely to be present on site. This is related to the study findings which indicate that the free product is present primarily in fractures which limit its total quantity. The results of a geophysical survey suggest a correlation between the occurrence of zones of relatively higher bedrock fracturing and the presence of LNAPL.

Based on all of these results, four remedial options (status quo, MPE, Oxygenation and Monitored Natural Attenuation (MNA)) were evaluated with respect to overall sustainability principles using Gold-Set SR. The results clearly indicate that MNA is the remedial option that bests incorporates environmental, social, and economic considerations.

Are You Sure You Are Chasing Your Diesel Release? Using Forensics to Close Diesel Releases at Rail Sites in Illinois

Todd O'Brien and Eric Cherry - ARCADIS
Geoffrey Reeder - Union Pacific Railroad

Polyaromatic hydrocarbon (PAH) compounds are found in diesel fuel. They typically serve as indicator contaminants for diesel contamination and used to define the extent of impacts associated with a diesel release. However, these compounds are also components of many other manufactured products found in industrial and urban environments. Therefore, the potential exists at rail sites for PAH compounds to be present in site soils attributable to a source other than diesel resulting in a more expansive corrective action requirement.

A forensics evaluation can assess whether observed PAHs at a site are related to a diesel release or other anthropogenic sources. The PAH sources can be differentiated on the basis of their PAH profiles, or relative distribution of PAHs within a sample. In such a case when a diesel release has occurred in an area where elevated PAH concentrations already exist, a successful demonstration of different PAH sources can result in significant savings of both time and money by focusing the characterization and remediation of the PAHs associated with the diesel incident.

Two case studies illustrating the implementation of this forensics approach will be presented. One site is currently managed in the Illinois Environmental Protection Agency's (EPA) voluntary Site Remediation Program (SRP) and the other site is managed by the Office of Emergency Response (OER). Both case studies have received verbal acknowledgement from the Illinois EPA approving the conceptual approach for using forensics evaluations to support adequate characterization of the diesel releases.

The SRP project is located along elevated main line commuter tracks where a diesel release occurred and ultimately spilled down the embankment into a small stream. The relative distribution PAHs observed in the release area is consistent with a diesel profile. The relative distribution PAHs observed within the rail bed is different. Isolation of the PAHs associated with the diesel release may eliminate the need for additional invasive activities under the mainline tracks, which are very difficult to access. The Illinois EPA is currently reviewing a closure request that presents a forensics argument illustrating that the distribution of PAHs in the track bed is not consistent with a diesel profile, and therefore, are not associated with this diesel incident.

The other case study is similar to the first example in that a diesel release occurred along a stretch of mainline tracks; however in this example elevated PAHs were observed on a leased property and in an area where diesel impacts were not expected to exist. This area is beyond the extent of the derailment. A forensics evaluation revealed that the distribution of PAHs in this area does not match a diesel profile. This observation was presented to the Illinois EPA during an in-person project meeting. The Illinois EPA project manager conceptually agreed with the forensics approach discussed and requested the submittal of a formal forensics presentation for consideration as part of a comprehensive site characterization report.

In both cases, the use of forensics analyses coupled with proactive communication with the Illinois EPA will likely reduce project costs and accelerate project velocity by negotiating a focused and streamlined approach to site characterization and remediation.

CN Harrison Yard: An Eye to the Future, Responsibility to the Past

Riaz Ahmed - TRC Environmental
Bob Strong - CN

Large-scale capital improvements and yard reconfiguration projects always prove challenging when conducted within the confines of an active multi-functional rail yard. However, when coupled with the requirements placed on the railroad by an ongoing Remedial Investigation/Feasibility Study being conducted under CERCLA's Superfund Alternative Approach program and the auspices of the USEPA, the challenges are magnified. This is the situation that arose at the Canadian National (CN) Johnston Yard (now known as the Harrison Yard) in Memphis, Tennessee in 2005, as CN prepared to begin a multi-million dollar renovation of the yard. The challenges facing CN included shallow soils impacted with inorganic constituents at concentrations greater than the USEPA Region IX Preliminary Remediation Goals (PRGs) in the maintenance and fueling areas of the yard, shallow groundwater impacted with petroleum hydrocarbons beneath the former fueling facility infrastructure, and the uncertainty of potential impacts to the shallow soils beneath the active classification yard, which had not been previously investigated due to operational logistics and safety concerns. Compounding these challenges was the fact that the expansion project was on a time-sensitive schedule and numerous contractors would be potentially exposed to impacted soils.

Historical data collected over the course of several investigations indicated that several hundred-thousand cubic yards of shallow soils beneath the Site exceeded the Region IX PRGs. These soils required excavation to accommodate the final site grading plan. The projected cost of off-site disposal was estimated at $8-10MM. Leveraging their strong cooperative relationship with the USEPA and the Tennessee Department of Environment and Conservation, CN and TRC adopted a concise and efficient risk-based approach to the management of several key environmental concerns including the suitability of on-site soils for use as backfill material in low-lying areas, the disposition of lead-impacted soils located within the construction footprint of the new locomotive repair center, and the disposition of arsenic-impacted soils located across a large portion of the active classification yard. Based upon the results of a robust sampling program and the various risk assessments, CN was able to use unimpacted on-site soils as borrow material for filling low-lying areas adjacent to Nonconnah Creek, north of the yard. These borrow areas in turn provided CN the unique opportunity to manage over 200,000 cubic yards of arsenic-impacted soils on-site, saving the company an estimated $8-10MM in off-site disposal costs, as well as the cost of importing fill material. As a result of CN's risk-based approach, only 5,000 cubic yards of lead-impacted material was disposed of off-site at a permitted landfill. In the fall of 2009, the ribbon was cut on the new state-of-the-art CN Harrison Yard with no significant project delays caused by the environmental concerns. Today, CN continues to address the localized petroleum impacts to the groundwater at the Site, while at the same time providing quality service to its customers in an environmentally responsible manner.

Special Considerations for Remediating a Former Wood-Treating Facility in Karst Terrain

Keith White - ARCADIS
Paul Kurzanski - CSX Transportation

Remediating contaminated sites requires a thorough characterization of the nature, extent, fate, and transport properties of the contamination. Sites located in karst terranes require a special approach to properly characterize them. Furthermore, karst terranes are not uncommon. Twenty percent of the United States is underlain by bedrock that is potentially karstic.

This presentation describes karst-specific elements of an ongoing environmental characterization being performed at a former wood-treating site in Bloomington, Indiana. Specifically, the means by which groundwater and contaminant movement are being characterized, using a combination of monitoring-well data and a tracer study, is described. Findings show that monitoring-well data alone were not sufficient to predict groundwater flow directions and velocities. A conceptual model that includes the special aspects of karst is presented, and the remedial implications related to creosote, a dense nonaqueous phase liquid or "DNAPL", in karstic bedrock are discussed.
Specifically, groundwater movement was found to be governed by solution-enhancement of available pathways in the bedrock, which, in this case, led to groundwater migrating beneath and across a local discharge boundary (stream), rather than discharging into it near the site, as would have been concluded if available groundwater and surface-water elevation data alone were used to assess movement. Regarding the creosote, it has been determined that the factors governing migration are more complex due to the extreme heterogeneity of the bedrock's permeability structure, and that karstic development has resulted in significantly more storage capacity in the bedrock. Creosote recovery has only recently begun to be evaluated; however, initial efforts have produced approximately 250 gallons and suggest that the potential exists to recover considerably more.

Award Winning Remediation Project – Seven Year Performance Record

Cameron Patterson, William Donald and Donald Bryant - Keystone Environmental Ltd.
Stella Karnis - CN

Koppers International Canada Limited operated for some 50 years a wood preservation plant on land owned by Canadian National Railway Company (CN). The property is located on the banks of one of Canada's most important fisheries, the Fraser River. The plant produced railway ties and poles using creosote, CCA, and pentachlorophenol. In 2003, the Meadow Avenue Remediation Project (MARP) was an innovative approach to the remediation of upland and foreshore creosote contamination that received regulatory approval and public awards.

Discovery of residual contamination, in the mid 1990s, persisted in the foreshore areas following initial remediation work in the 1980s and the complex circumstances surrounding the allocation of environmental clean up responsibilities, caused the Site to become the subject of a prescriptive Remediation Order imposed by the British Columbia provincial Ministry of Environment. The ministry Ordered responsible parties to undertake a traditional cleanup agenda. This agenda consisted of extensive excavation and sediment dredging in a tidally influenced major river, removal of free creosote DNAPL from depth in foreshore areas, and collection of dissolved phase contaminants, predominantly PAH compounds associated with creosote, by groundwater pump, treat and discharge. This approach was projected to cost upwards of $70 million.

After significant arguments, environmental appeals and expert opinions were exchanged, the project proponents offered an innovative solution with a reasonable implementation schedule. The solution was to integrate sustainability elements of future industrial/commercial uses, habitat enhancement, community requirements, and contaminant remediation into an elegant remediation plan that won approval from regulators, and led to a settlement with all parties. The design employed a combination of innovative technologies and processes including

- installation of 1,000 ft long sealed sheet pile walls for creosote containment, groundwater flow diversion and structural support for reclaimed land for a new wharf,
- limited application of the novel Caisson Dredging method, and
- construction of a low-permeability cap covered by topsoil and vegetated to provide habitat enhancement for the local fishery.

All these features and other supporting elements were completed according to schedule for approximately $35 million or half the cost of the ordered traditional approach to remediation. The project received recognition and awards for innovation and sustainability in 2004 from the Association of Professional Engineers and Geoscientists of BC and the Consulting Engineers of British Columbia, and was the subject of many presentations and articles heralding the benefits of monitored natural attenuation (MNA) as a viable alternative to pump and treat.

Seven years later, this presentation discusses the results of performance monitoring implemented on the remediation activities, successes and learning experiences. It also presents results of groundwater quality monitoring, structural, geotechnical, and corrosion studies, and the progress of marsh/habitat development at this landmark site. Recent monitoring overcame the challenges associated with tidal influences at this near-coast river. The extensive influence of tidal fluctuations were filtered to confirm the model-predicted effects of the system on groundwater flow and to validate the basis for performance monitoring well locations. The confirmation of post-construction flow conditions in turn enhances the reliability of the favourable groundwater chemistry monitoring results. The project is presently on track to be removed from Ministry Order status.

Migration Pathway Assessment for a Chlorinated Solvent Plume, Windsor, Vermont

James Peace - Golder Associates Yves Decoste - CN

As part of a Brownfields grant, the Vermont Department of Environmental Conservation (VTDEC) commissioned several environmental assessments of the Windsor, Vermont downtown area. The assessments identified a chlorinated volatile organic compound (CVOC)-impacted groundwater plume in the downtown Windsor area which included several Canadian National Railroad (CN)-owned properties. Specifically, the assessments revealed tetrachloroethene (PCE)-impacted groundwater at a concentration of two orders of magnitude above VTDEC standards on a CN property. The assessments concluded that a former dry cleaner as the most likely source of the PCE.

To assess groundwater conditions near the former dry cleaner, VTDEC commissioned another consultant to characterize groundwater conditions near this site. The assessment revealed low (2 micrograms per liter) concentrations of CVOCs in one groundwater sample collected adjacent to the former dry cleaner. Because the investigation did not reveal "concentrations of chlorinated solvents in soil or groundwater" which would indicate a past release of dry cleaning chemicals, this consultant concluded that CVOCs detected in groundwater samples downgradient of the dry cleaner (i.e., in the downtown area) could not be attributed to a release from the former dry cleaner.

On August 11, 2006, VTDEC notified CN that they were considered a Responsible Party for the PCE-impacted groundwater plume in the Windsor, Vermont downtown area. CN voluntarily agreed to perform an assessment and commissioned Golder Associates Inc. (Golder) to prepare an assessment work plan. CN maintained that the PCE source was not located on the properties currently or formerly owned by CN and that the PCE-impacted groundwater originated from an upgradient source.

To identify potential CVOC source areas in the downtown Windsor area, Golder reviewed previous environmental reports, conducted a file review at the VTDEC office, and reviewed historical documentation including Sanborn Fire Insurance Maps, city directories, and municipal files and maps. Golder identified several potential upgradient CVOC source areas including the former dry cleaner.

Due to the shallow groundwater elevations upgradient of the CN properties (i.e., within three to four feet of ground surface), Golder considered utility corridors as potential preferential pathways for the migration of CVOCs. Golder commissioned a utility contractor to assess and map the sanitary and stormwater lines on and near the CN properties in May 2007. Utility personnel used remote cameras and dyes to assess the condition and location of the sanitary and storm drain lines. In addition, the Town of Windsor Department of Public Works (DPW) personnel assisted Golder with mapping the water lines near the CN properties. The utility survey identified several sanitary and stormwater lines in the right-of-way between the former dry cleaner and the CN properties. Several of these utility lines were previously unknown to the DPW. Following the utility survey, Golder installed six monitoring wells between the CN property and the dry cleaner (i.e., upgradient) in and near the utility corridors. Golder collected groundwater samples from the newly installed monitoring wells. Golder's laboratory detected the highest PCE concentrations in the groundwater samples collected within the utility corridor and adjacent to the former dry cleaner (i.e., higher concentrations than on the CN property). The analytical data indicated that the CVOC-impacted groundwater was following the sanitary lines emanating from the former dry cleaner. Golder calculated the groundwater flow direction to the east, which paralleled the sanitary line between the former dry cleaner and the CN property. Golder discovered that the CVOC-impacted groundwater plume originated near the former dry cleaner and was concentrated within approximately seven to ten feet on either side of the sanitary line. Golder's assessment concluded that the CVOC-impacted groundwater was emanating from an upgradient source and not from a CN property. Golder submitted a Limited Phase II Assessment Report to VTDEC, dated October 27, 2007, summarizing the information obtained during the assessment activities.

Golder was able to demonstrate that CN was not responsible for the CVOC-impacted groundwater plume in the Windsor downtown area. VTDEC concurred with Golder's findings and is no longer pursuing CN as a Responsible Party for the PCE-impacted groundwater in the Windsor downtown area. VTDEC issued CN a Site Management Activity Complete (SMAC) Letter, dated September 1, 2009, indicating that no further action is required at the CN properties.

In-Situ Remediation of Dissolved Chlorinated Hydrocarbons Via Enhanced Reductive Dechlorination - A Rail Yard Case Study

Dawn Gabardi and Ed Buc - ARCADIS
LeeAnn Thomas - Canadian Pacific Railway

Site investigation activities conducted on behalf of Canadian Pacific at a 60-acre rail yard facility in western Wisconsin indicated trichloroethene (TCE) was present in a shallow, saturated sand formation at concentrations up to 600 micrograms per liter. The initial investigation suggested the TCE plume was limited to the rail yard property and extended approximately 100 feet from the source. However, subsequent investigation work using vertical site characterization methods indicated the TCE plume extended at least ½ mile laterally and 50 feet vertically, and had migrated off-site beneath neighboring commercial, industrial, and residential properties.
ARCADIS developed a site conceptual model (SCM) incorporating the site geology, hydrogeology, and geochemistry of the affected aquifer. An accurate SCM was crucial for the development of an effective remedial action plan. Based on the investigation data, Canadian Pacific proactively decided to engage in a voluntary remediation program to address the plume.

In-situ remediation using enhanced reductive dechlorination (ERD) was implemented at this site to remediate the TCE plume. The ERD technology involves the injection of a carbon-rich solution within the contaminated area to enhance the natural microbial community and stimulate biodegradation of the chlorinated hydrocarbons. Biodegradation can occur through metabolic (bacteria directly utilize chlorinated alkenes as electron acceptors) and/or cometabolic (enzymes and cofactors produced by aquifer bacteria dechlorinate the alkenes) processes. Through sequential reductive dechlorination, TCE and its daughter products are destroyed.

A pilot study was conducted in 2004 prior to full-scale remedy implementation to assess the design parameters for a full scale system. The pilot study data was used to determine the initial radius of influence of the injected material, the proper injection well spacing for full-scale implementation, the frequency of injections, and the appropriate carbon solution.

Full-scale remediation was initiated at the site in May 2005. Vertical injection wells were installed in four treatment areas at various depths to deliver the carbon solution to the impacted aquifer. Piezometers were installed near the injection wells to monitor increases in organic carbon and decreases in TCE and the associated daughter products over time. Data collected since 2005 indicate TCE concentrations in the four treatment areas have decreased 95 to 100% since implementation of the full-scale remediation. Furthermore, the data confirms that the daughter products produced from reductive dechlorination of TCE are sequentially degrading to innocuous end products as treatment proceeds to completion.

The success of this technology has been dependent on several factors, including the ability to deliver the injected solution to the contaminant mass within the subsurface, maintaining sufficient carbon loading rates to sustain the microbial population that will destroy the contaminant mass, and balancing the pH of the system to maintain conditions favorable to the anaerobic microbial population. A summary of the remedial performance data collected to date and lessons learned for treatment success will be presented. The cooperative relationship between the client, consultant, and regulatory agency has also been a key factor in achieving success and positioning the site for regulatory closure.

Non-Aqueous Phase Liquid (NAPL) Mobility Assessment

Kevin Hauschildt - Norfolk Southern
Chuck Cline - Marshall Miller

A NAPL mobility assessment was conducted at an active rail yard operating in a mixed industrial/residential area of Virginia where previous remedial efforts had proven ineffective at remediating petroleum impacts. Perched and semi-confined aquifers resulted in varying hydraulic pressures at depths further complicated the understanding of contaminant transport. Utilizing a combination of analytical testing procedures including petroleum finger-printing, core scanning, grain-size analysis, pore-fluid saturation, and fluid mobility; combined with mobility and recovery modeling; followed by in-situ pilot test MM&A was able to generate a multi-phase flow model which predicted minimal product recovery rates underpinned by concurring results from a free product recovery pilot test.

Both the predicted and measured results provided the final evidence necessary for the state to accept a request for no further action while leaving a stable NAPL plume on-site.

Poster Presentations

Compliance

2010 Environmental Training for Transportation Employees

Richard K. Nath - CSX Transportation

CSX Transportation provides a computer based Environmental Training Program for Transportation Operation employees. This is a proven time efficient method to deliver quality environmental training for employees within Transportation Operations: Engineers, Trainman, Yardmasters, Clerks and Managment employees thorughout 23 States and two Provinces within Canada. Within approximatley 30 minutes, the Transportation employee is navigated at a progressive pace through Four Key Environmental Responsibility areas of training: I. Environmental Policy and Management explaining how it is that Transportation Operation employees contribute to their Company's environmental managment sytem, II. Environmental Regulatory Review of they can best manage their daily operations with care and regard of the Clean Air Act, Clean Water Act and Sold Waste Management, III. Environmental Responsibility providing guidnace how to best peform their jobs with protecting the environment and IV. Environmental Reputation and how they may promote and positivly contribute to our reputation. We focus in on how all of these training topics are very relevant to their employment as Transportation Operation employees at CSX and within the Rail Industry.

Painless Permitting 101

Jennifer Thiemann - EMR, Inc.
Charlie Duffy - Canadian Pacific Railway

Do you dread getting environmental and construction-related permits for your projects? Do you wonder what triggers permit requirements? Have you had a construction schedule delayed at the last minute due to unanticipated permit problems? Have you had to incorporate permit conditions into your project design that resulted in major cost overruns or schedule delays? Do you rely on the "railroad was here before the State" approach and avoid permitting altogether? Would you rather pay fines than go through the hassle of permitting?
If any of these situations sound familiar, this presentation is for you. This session will provide a clear outline of a proven, simplified cost-effective approach to project permitting. This presentation is aimed at typical railroad operations and maintenance projects including bridge/culvert replacement, embankment stabilization, and other sub-grade repairs. Example projects and permit requirements will be discussed, and an efficient, cost-effective, common-sense approach to obtaining permits will be presented. This approach emphasizes being proactive, maintaining positive relationships with regulators, and incorporating environmentally preferable options into the project design upfront. Cost savings are realized by avoiding last-minute permitting sprees, fines, major project changes late in design, construction delays associated with failure to obtain permits, and stand-by costs associated with a regulatory shut-down of a project.

Railroad Equipment Negative Exposure Assessments related to Asbestos Containing Components

Dan Podraza - ENVIRON International

Asbestos was used historically in a number of components can still found in railroad equipment today. These components include friction devices, wire and cable, insulators, and mounting boards. Most of these components are classifiable as encapsulated non-friable materials while some are not. One challenge facing an operating railroad is not being able to visually distinguish an old asbestos containing component from a newer non-asbestos containing component. A series of negative exposure assessments were performed while experienced signal maintainers performed their normal activities. These activities included adjusting and maintaining switch machine clutches, cutting and splicing cable, handling "bakelite" terminal strips, and rewiring motor mounting boards. Bulk samples confirmed the materials were asbestos containing. Both 8-hr TWA personal samples as well as 30-min STEL personal samples were collected during a reasonable maximum number of events and worst case scenarios. Analyses were performed in accordance with OSHA ID-160 for total fibers and NIOSH 7402 for asbestos fibers. In all the scenarios evaluated, the data showed the airborne concentrations of asbestos fibers were either non-quantifiable or significantly below the 8-hour Occupational Safety and Health Administration (OSHA) permissible exposure limit of 0.1 f/cc and the 30-minute excursion limit of 1 f/cc.

Clean Water Act Permitting and Compliance

Mark Willobee, Chriso Petropoulou, and Mark Willobee
Geosyntec Consultants

Paul Kurzanski - CSX Transportation

As part of the Chicago Regional Environmental and Transportation Efficiency (CREATE) Program, CSX Transportation, Inc. (CSXT) made railway improvements at a site in Cook County, Illinois. An open drainage ditch was located adjacent to the proposed rail line, and CSXT retained Geosyntec to assist with U.S. Army Corps of Engineers (USACE) wetland permitting, since rail improvements had the potential to impact the ditch from a USACE regulatory perspective. Additionally, as construction of the proposed improvements began, CSXT retained Geosyntec to also conduct construction inspections in accordance with Illinois' General NPDES Construction Permit (ILR10).

Prior to construction, Geosyntec performed a wetland delineation within the proposed project limits and along the adjacent drainage ditch that ultimately discharges to the Des Plaines River. Based on delineation results, Geosyntec prepared the USACE's "Request for a Jurisdictional Determination" form and its supporting documentation. Geosyntec also presented CSXT and its design engineer with an assessment of potential impacts that the delineation may have on design alternatives. In addition, Geosyntec performed a cursory review of local, state and federal regulatory requirements (as they relate to stormwater) and provided an initial assessment of the requirements that potentially needed to be met as part of the project.

During construction, Geosyntec conducted construction inspections in accordance with Illinois' General NPDES Construction Permit. CSXT and Geosyntec also coordinated with the Illinois Environmental Protection Agency and the USACE regarding permit compliance associated with site activities.

At the time the "Request for Jurisdictional Determination" form was being submitted, the USACE was in the process of modifying its procedures and requirements in response to the Rapanos decision. Geosyntec coordinated closely with the USACE concerning the results of the wetland delineation and the reporting that was required. CSXT was able to obtain a timely response from the USACE within a short period of time and proceed with its proposed construction schedule.

Energy, Emissions, and Air Quality

Survey of Current Diesel Locomotive Emission Control Technologies

Curtis Miller - JHU - EP Program

In March 2008, the United States Environmental Protection Agency (EPA) announced it was adopting new standards that were aimed at significantly reducing particulate matter (PM) and nitrogen oxides NOx) from locomotive and marine diesel engines. According to EPA document number EPA420-F-08-004 the new standards aim to:

1.Tighten emissions standards for existing locomotives and large marine diesel engines when they are remanufactured;

2.Set near-term engine-out emissions standards, referred to as Tier 3 standards, for newly-built locomotives and marine diesel engines; and

3.Set longer-term standards, referred to as Tier 4 standards, for newly-built locomotives and marine diesel engines that reflect the application of high-efficiency aftertreatment technology.

Many of the new diesel locomotives are meeting Tier 3 standards through better diesel engine controls and cleaner fuels (i.e., low sulfur diesel). However, the Tier 4 threshold will most likely require some sort of "tail pipe" treatment to achieve the 90 percent PM reductions required by the Tier 4 standards.

This presentation is designed to provide the Railroad Environmental Manager with a general understanding of; (1) EPA's current locomotive emission regulations, (2) the regulatory timeline for implementing these regulations, and then (3) present a survey of several technologies that have shown promise in the control of diesel locomotive exhaust emissions. The author's advantage is that he is not affiliated with any particular emissions control technology manufacturer or manufacturer association and, as such, is able to impartially compare the benefits and costs of each technology evaluated.

Diesel engine exhaust is a highly complex and variable mixture of gases, vapors and fine particles. The amount and composition of the exhaust can vary greatly, depending on factors such as fuel and engine type, maintenance schedule, engine tuning, typical workload, and exhaust gas treatment. Diesel Oxidation Catalyst (DOC) exhaust manifold kits have shown promise, allowing operators of diesel locomotives retro-fit existing locomotives and meet or exceed current EPA standards for emissions. Other technologies such as high-temperature Diesel Particulate Filters (DPF) have also shown promise in reducing PM emissions through regenerative processes and Selective Catalytic Reduction (SCR) technology, using ammonia injection systems, has already been incorporated into new over-the-road truck tractor design. These technologies, as well as a brief discussion on alternative fuels, will be presented as the core of the oral presentation.

As stated above, the goal of this presentation will be to give the Railroad Environmental Manager a basic understanding of the regulatory challenges that EPA's tiered emissions standards impose on their current locomotive fleet. The presentation will include unbiased information on current technologies and techniques that they can provide to decision-makers within

their organization about the environmental cost of upgrading existing locomotives and/or purchasing and operating new Tier 4 compliant units.

Impact of EPA's Greenhouse Gas Tailoring Rule on the Rail Industry

Stacy Carr and Jessica Coleman - Trinity Consultants

On October 27, 2009, EPA published the proposed Prevention of Significant Deterioration (PSD) and Title V Greenhouse Gas (GHG) Tailoring Rule in the Federal Register. The issuance of the proposed rule is an effort to decrease the number of sources subject to major source permitting for GHGs under the Clean Air Act (CAA), based on the permitting thresholds proposed. Because GHGs are emitted at significantly higher rates than the criteria pollutants currently regulated under the CAA, standard CAA threshold limitations are not tenable or practical for these pollutants. Without streamlining the permitting process before the light duty vehicle rule is finalized, thousands of facilities could become PSD or Title V major sources. Additional permitting streamlining efforts under consideration include defining presumptive Best Available Control Technology (BACT) and potentially using general permits. The rule is expected to be finalized March 2010, but the implementation timing is as yet unknown pending EPA guidance to state agencies upon publishing the final rule. The implementation in each state will be affected by the state's respective delegation or SIP-approved status for each of the PSD and Title V programs. The major source threshold is currently anticipated between 25,000 short tons per year and 75,000 short tons per year, on a potential basis. The majority of CO2e emissions from railyards are from combustion sources. A sample cross section of representative railyard emissions estimates resulted in CO2e greater than 25,000 short tons per year, with some facilities in excess of 70,000 short tons per year. Railyards should consider the potential emissions on a facility-wide basis and potential permitting implications, in order to determine a go-forward strategy. This could include accepting limitations to become synthetic minor sources of emissions, which should be considered concurrently with review of future plans for each facility to determine growth opportunities. Major facilities will have to address PSD requirements for each new project, potentially for all criteria pollutants, not just CO2e. Based on the complexities of addressing BACT for GHGs, a state agency may take from 12 to 24 months to review and issue a PSD permit which includes GHGs. In addition, Title V reporting will include CO2e emissions estimates with the potential for future fee collection. Therefore, it is advisable for railyards to understand existing facility emission rates to determine potential implications of the Greenhouse Gas Tailoring Rule.

A Summary of Applicable Requirements under MACT Subpart ZZZZ to Owners and Operators of Stationary Engines

Jessica Coleman and Stacy Carr - Trinity Consultants

The United States Environmental Protection Agency (U.S. EPA) recently finalized National Emission Standards for Hazardous Air Pollutants (NESHAP) to control hazardous air pollutant (HAP) emissions from existing diesel powered stationary reciprocating internal combustion engines (RICE), that are located at many railroad and other industrial facilities. Existing diesel powered stationary RICE now subject to NESHAP requirements include emergency and non-emergency RICE of any power rating located at HAP area sources, emergency and non-emergency RICE with a site rating of less than or equal to 500 HP located at HAP major sources, and non-emergency RICE with a site rating greater than 500 HP located at HAP major sources. A major source of HAP emissions is a stationary source that emits or has the potential to emit any single HAP at a rate of 10 tpy or more or any combination of HAP at a rate of 25 tpy or more. An area source of HAP emissions is a stationary source that is not a major source. The requirements have been promulgated as revisions to 40 CFR Part 63 Subpart ZZZZ, which contains Maximum Achievable Control Technology (MACT) standards for stationary RICE (aka, RICE MACT). Many previously unregulated engines at railroad facilities may now be subject to federal regulation under the new requirements, including but not limited to following work practices and maintenance schedules outlined by the rule, installing emissions control equipment on stationary non-emergency engines with a site rating greater than 300 HP, performing emissions tests to demonstrate engine performance and compliance with rule requirements, and burning ultra-low sulfur fuel in stationary non-emergency engines with a site rating greater than 300 HP. The compliance date for the sources affected by the rule revisions is May 3, 2013. Sources with affected RICE should review the final rule carefully to determine compliance requirements.

Modeling Impacts of Freight Transportation on Global, Regional and Urban Air Quality

Taesung Hwang, Fan Yan, Yanfeng Ouyang, Bumsoo Lee, Tami Bond and Chris Barkan
University of Illinois at Urbana-Champaign

This research is developing an innovative integrated modeling framework that incorporates state-of-the-art transportation demand models and air quality models to project future emissions from freight systems at global, regional, and urban levels. We explore the role of rail as an option for minimizing the future atmospheric impact of freight delivery. The first step of research compares air pollutant emissions in two different scenarios—low-growth and high-growth.— between present-day and 2030. Emissions from rail operations and trucking are presented separately.

Global economic forecasts are being used to generate global and inter-regional North American freight transportation demand under different economic scenarios. Given the commodity growth, inter-regional freight transportation demand, and projected fuel prices under the two scenarios, a commodity-dependent model forecasts freight movements among regions. This freight transportation demand is split across major transport modes (such as railroad and highway

transportation) and modeled using respective transportation networks. The presentation will also briefly discuss the next stages of the project. Detailed local freight demand analysis will be conducted through models on urban forms and optimal logistics deliveries. The required delivery will be linked with emissions, and atmospheric models will be used to estimate impacts on urban air quality and the global atmosphere. The presented work lays the foundation for fleet inventory and emission models to estimate urban, regional, and global air quality and the potential effects of modal shifts of freight transportation.

Environmental Management Systems

Six Proven Ways to Supercharge Your Environmental Liability Management Performance

Roger Well - ENFOS, Inc.

Current techniques for managing remediation liability programs were developed prior to the emergence of modern Internet technology. This old model is heavily dependent on individual performance and is subject to high levels of variability caused by pockets of "knowledge" not shared. The underlying thread in performance has resulted in a state of "perpetual liability" where remediation reserve balances stay flat or grow through time.

Supercharging your liability management performance is about harnessing the collective power of your people (including consultants) and leveraging technology to exploit every possible efficiency. Read on for six principles taken by world-class organizations resulting in sustained value creation.

Scale-up success: Performance variability has been a way of life in the remediation industry. Variables can be attributed to many factors such as management methodology, personnel, regulations, consultants, remedial approach, contaminants, or hydrogeology. But whatever the case may be, you have had successful projects. If you could replicate your successes and eliminate your failures, performance would improve substantially. To scale-up, you must have the ability to identify and institutionalize success.

Communication is an information asset: The remediation business requires a tremendous amount of communication and huge numbers of transactions. These take place across business functions within the organization as well as externally between various stakeholders. In today's high tech environment, almost all communications are digital. Expand the value of your communication network by capturing, storing, retrieving, and analyzing this information in a common digital platform.

Anticipatory systems: Give your people early warning of high risk conditions or potential changes that impact the business. Provide alerts, notifications, dashboards, and visual aids to catch issues before they become a problem such as an impacted receptor, accrual increase, missed deadline, or blown budget.

Eliminate low value added costs: Studies have shown that up to 60 percent of total remediation costs are attributed to information management. These include activities such as project planning and management, lifecycle estimating, field/laboratory analysis, reporting, and financial transactions just to name a few.

Low value added costs can be reduced or eliminated by automating the mundane data entry, number crunching, rollups, and reporting functions. Each individual improvement may seem small, but when replicated on many projects over many years, the savings are huge.

Manage with a data-in-context philosophy: Everything you do to remediate a site or manage a large program is related, one way or another. The sampling network impacts the budget, the presence of a receptor impacts the reserve forecast, and the compliance violation impacts the expenditures. Empower your people to leverage the interrelationships of seemingly disparate data types—lab data and cost to closure, risk data and reserve balance, and so on.

Integrate processes: Seamless workflow can only take place when core processes are integrated (i.e., the reserve management process is related to the purchasing process and purchasing is related to the invoicing process). Lags in time and information dissemination can only cause problems for the project team. Real-time, instantaneous information and feedback greatly enhances the decision-making process.

Rational Application of Natural Resources and Environment Protection at Railway Transport Development

Manana Moistsrapishvili, Nugzar Rurua, Gocha Enuqidze, and Luka Balavadze
Georgian Technical University

In the article is considered problem regards to providing of system of actions for rational application of natural resources at railway transport development and preservation of population health. Is mentioned that at railway design, construction and operation is necessary to satisfy the requirements of nature management, that are included in nature protection legislation, sanitary norms and standards.

By group of authors is stimulated an interest in rational arrangement of required for railway construction buildings on ground area; dependence of expended by rolling stock fuel on it's kind, power, operation mode and technical state; criteria's of artificial buildings selection; also on air and water pollution by railway objects; questions of resource-saving technologies at construction of railway objects. Proceeding from this in necessary at railway design, construction and operation

environment protection actions, that implicate carrying out the system of actions for preserving the wildlife (flora and fauna) and abiocoen (water, soil, air climate, etc.), for easing of results of direct and non-direct negative human influence.
At the same time in the article is considered the problem of environment protection in extremal conditions and definition of qualitative and quantitive criteria of their results as well as for point of view of easing the of extremal conditions results the necessary qualitative parameters of nature's protection system: openness, universality, operationability, mobility and normativeability.
In the article is stated various aspects of railway development influence on natural environment and are offered the necessary organizational actions for providing its complex protection, by the basis of confluence of ecological and economical scientifically proved interests for carrying out questions of environment state monitoring and ecological appraisal execution for providing the admissible normative loading on nature.

Recovery Trench Installation Lessons Learned

Jeremy Seibert, Kevin Hendricks, and Craig Niedermeier - AECOM
Charles Thomas - BNSF Railway
Carey Neal - Conestoga-Rovers & Associates, Inc.

A groundwater recovery trench and treatment system was installed at a site to recovery and treat impacted groundwater and DNAPL. The site was historically utilized for wood preserving operations that resulted in a release of creosote compounds that are migrating off-site to an adjacent golf course property. The recovery and treatment system was installed to prevent the continued migration of impacted groundwater and DNAPL into a small creek located downgradient of the site. During installation of the trench and startup operation of the treatment system, the project team faced several challenges that had to be overcome. Some of the major challenges included disrupting golf course operations for installation of the recovery trench, numerous weather delays, failure of initial trench installation method, and discovery of an analyte that after treatment exceeded the POTW permit limits. Field modifications made by the project team in response to challenges encountered resulted in a functioning recovery trench and associated groundwater treatment system that met the overall goal of the remedial design. The objective of this presentation is to present the lessons learned and best practices of the design, construction, and initial operation of the groundwater recovery trench and treatment system that may be incorporated into the design and planning of future projects.

Remediation

Multi-Dimensional Approach to a RCRA Corrective Action for Lead Impacted Soils at an Active Car Shop

Bertisabel M. Custer and J. Todd McFarland
AMEC Earth and Environmental, Inc.
Paul Kurzanski - CSX Transportation

The Raceland Car Shops is a railcar reconditioning facility located in Raceland, Kentucky. Operations began in 1929 until 1988. CSXT previously performed sandblasting and painting of railcars at the Site. As a result of historical activities, soil above applicable screening criteria was encountered. Site assessment activities were performed from July 1998 until March 2000 which indicated lead impacted soils at depths up to six feet below ground.

In 2006, the facility was purchased by Progress Rail Services (PRS). CSXT retained responsibility for completing corrective measures at the Site. To expedite the remedial process, Interim Corrective Measures (ICM) versus a formal corrective measure process was proposed and approved by KDEP. ICM included excavation, stabilization and disposal of lead-impacted soils.

Remedial activities were conducted at the Site from July 2008 to January 2009. Logistical issues during remedial activities included extensive coordination with PRS representatives to assure remedial activities did not impact daily activities at the yard, coordination of multiple contractors working concurrently and having limited work space for equipment storage, and stockpiles area for in-situ remediation.

Due to the flat elevation of the Site, stormwater management became an important part of the project. Following heavy rainfall events during initial Site activities, stormwater management was required due to the excessive ponding of surface water runoff in the proposed staging areas. AMEC installed temporary stormwater underground collection trenches and piping to divert stormwater from the waste staging area to prevent contact with lead impacted waste and keep the staging areas dry.

The use of a field screening instrument - a hand-held X-Ray fluorescence analyzer - was essential to evaluating concentrations on the excavation walls and floor prior to performing confirmatory sampling. The field screening process assisted with keeping the project schedule and bringing active areas to working conditions without experiencing additional delays.

To avoid jeopardizing track stability and as an alternative to removing and replacing approximately 5,000 feet of tracks and ties within the active facility, a 12-inch cap within the track system was proposed to KDEP. Soil removal within the tracks was conducted with a modified mini-excavator and hand tools to loosen the impacted material. Impacted material between the tracks and ties was then removed with a high torque vacuum truck. This non-traditional process allowed PRS to operate continuously during remedial activities, generated project cost savings over $1M and satisfied KDEP requirement of preventing human health exposure by installing a cap.

Remediation of soils was performed in situ prior to disposal. This process allowed Site soils to be disposed as non-hazardous waste. Stockpiles with TCLP lead concentrations exceeding 5 mg/L were stabilized prior to disposal by mixing Portland cement on a per weight basis, with a minimum mixture ratio of eight percent Portland cement by weight. The stabilized material was then sampled for analysis of lead by TCLP and transported to the disposal facility. Approximately 27,786 tons of solids were removed from the Site with no reportable or lost time injuries and no significant delays to PRS operations.

Green and Sustainable Remediation of a Former Bulk Oil Facility, Evansville, IN

Bertisabel M. Custer and J. Todd McFarland
AMEC Earth and Environmental, Inc.
Paul Kurzanski - CSX Transportation

The Former Hahn Oil facility (Site) is located in Evansville, Indiana. The Site consists of a 1.6 acre parcel of land that was formerly used as a bulk petroleum distribution and storage facility beginning in the 1930s until 1997. The property was part of the leased properties by CSX Transportation, Inc. (CSXT); therefore, CSXT retained responsibility of the property and all materials remaining such as abandoned buildings, waste drums and petroleum storage tanks. Environmental Site Assessments conducted at the Site in 1998 encountered soil and groundwater impacted by petroleum hydrocarbons. CSXT submitted a Voluntary Remediation Program (VRP) Application to the Indiana Department of Environmental Management (IDEM) in February 1999 and entered into a Voluntary Remediation Agreement in October 1999.

From 1999 through 2002, initial Site assessment and remedial efforts included removal of waste material left at the Site, demolition of Site buildings, removal of underground storage tanks, and Site grading. Several remedial options such as soil excavation, active soil venting, and phytoremediation were considered to address the residual petroleum constituents that remained at the Site. Phytoremediation was selected as the best available option to address the remaining petroleum concentrations due to its social benefit to the area, low impact, low cost for operation and maintenance, and passive remediation.

Advantages of phytoremediation at the Site included the potential to offer a permanent, in situ method of addressing residual hydrocarbon concentrations at reasonable costs and a more sustainable option in comparison to traditional remediation technologies. Phytoremediation also reduced handling concerns associated with the excavation and removal of soil and created a new permanent green space in the community. The Site was the first facility in the IDEM-VRP to be approved for phytoremediation in the State of Indiana.

The phytoremediation project was designed to reduce the impacts to groundwater by enhanced bioremediation, sorption to roots and root exudates, petroleum compound uptake, and reduced groundwater flow rates. By stabilizing the surface soil, absorbing precipitation, and increasing organic degradation, the Ecolotree® Buffer will better protect the neighboring human population and surrounding environment. The phytoremediation project utilized a deep-rooted Ebuffer® consisting of hybrid poplar trees and grasses. In 2004, 980 trees were planted at the site and the areas between tree rows and surrounding the perimeter of the site were seeded with grasses.

Semi-annually groundwater analytical results indicate that constituents of concerns have declined since the initial 2004 sampling event prior to installation of the Ecolotree® Buffer. Benzene is the only compound detected above Indiana Closure Levels for residential sites.

To evaluate the phytoremediation success, a soil sampling program was conducted in April 2009 and the analysis results were compared to samples collected at similar depths during the 1998 and 2000. The 2009 soil assessment program indicates that TPH-DRO concentrations decreased 86 percent and TPH-GRO concentrations decreased 76 percent when compared to samples collected at similar depths in 1998. Samples collected in 2009 also reported maximum benzene concentrations decreased 95 percent when compared to samples collected at similar depths in 2000.

Strategies for Long-Term Groundwater Monitoring Projects

Todd Carignan and Jeff Bonsteel - ARCADIS
Paul Kurzanski - CSX Transportation

Many environmentally-impacted sites are required to follow standard regulatory long term monitoring plans. However statistical analysis and regulatory communication can be used to avoid sampling for unnecessary analytical parameters, which results in substantial cost savings for the life of any project.

One example of this is at the CSXT A&A Landfill, located in Staten Island, New York. The former Landfill occupies approximately 36 acres and is bordered to the south by Goethals Pond and associated wetlands. Surrounding properties to north, east and west are under residential, commercial and industrial usage. The project is in the early stages of a 30-year post-closure period, which includes a quarterly sampling program for groundwater and surface water for routine and baseline leachate indicator parameters.

A historical review and statistical analysis of the landfill analytical parameters was completed for all media with an objective of reducing the typical laundry list of regulatory required sampling parameters. The required monitoring parameters included volatile organic compounds, semi-volatile organic compounds, leachate indicator parameters (wet chemistry), pesticides/PCBs, and inorganic compounds. The data review and statistical analysis indicated:

- Several inorganic compound concentrations in the landfill detection monitoring wells were within the range of background groundwater chemistry;
- Organic compounds were no longer present with the landfill leachate and were not detected in groundwater above detection limits within the past several years;
- Wet chemistry analytical parameters did not require sampling and analysis of both filtered and unfiltered samples, and,
- Surface water adjacent to the site was affected by local runoff and not the landfill, and did not require quarterly monitoring.

Based on these technical arguments, the regulatory agency approved a modified environmental monitoring program for the site that resulted in over $1,200,000 reduction in long-term sampling and analytical costs.

It's OK to Change – Adapting Your Remedial Approach to Evolving Regulatory Guidance

Michael Potter - ARCADIS
Paul Kurzanski - CSX Transportation

CSX Transportation (CSXT) employed an adaptive corrective action approach for closure of an Indiana site due to evolving Indiana Department of Environmental Management (IDEM) regulatory guidance. The leased site property was an active gasoline station from 1936 until 1982 that had multiple owners. The former gasoline station operations impacted soil and groundwater resulting in separate and dissolved-phase petroleum hydrocarbon impacts.

Three underground storage tanks were removed in 1992; impacts were encountered at that time and the site was placed in the IDEM Leaking Underground Storage Tank section. In the 1990's IDEM required proactive and aggressive remediation without evaluating risk associated with impacts at sites. Various remedial methods were employed at the site from 1995 to 2001, including Low Temperature Thermal Desorption, Oxygen Release Compound (ORC) injection, and phytoremediation to satisfy IDEM requirements. However, residual impacts remained that prevented clean closure.

In 2001, IDEM introduced the first version of the Risk Integrated System of Closures (RISC) guidance program that combined the various state regulatory departments under one guidance document and program. This program, more importantly, made it obligatory for the various IDEM departments to allow the use of risk-based cleanup goals at sites. Though the RISC Guidance Program allowed for risk-based cleanups, IDEM was functionally resistant to the new approach and continued to require more active remedial measures at many sites.

In 2005, at the request of IDEM, strategic hot-spot ORC injections and vac-truck remedial actions were conducted in an area that continued to cause concern for IDEM. However, CSX endorsed parallel site risk characterization through performance of various risk assessment tasks between 2005 and 2008. Mann-Kendall statistical analysis of groundwater quality data indicated that the groundwater plume was not only stable, but decreasing. Groundwater TPH fractionation and a limited risk assessment showed there was no unacceptable risk related to residual impacts remaining at the site. Still not completely satisfied, IDEM requested an environmental restrictive covenant (ERC) be placed on the property.

In January 2009, an ERC was submitted to IDEM for their review. However, due to the lack of agency experience with ERCs, IDEM delayed approval of the ERC until the winter of 2009, when the Indiana state legislature passed House Enrolled Act 1162 clarifying the ERC process. This evolution in the regulatory guidance allowed IDEM to approve the ERC and the site has been given a No Further Action determination. CSXT's strategic decision to invest in risk characterization positioned the site for closure in a manner which was acceptable to both parties shortly after the 2009 rule clarification.

Sustainable Groundwater Remediation

Michael Kinder - Marshall Miller & Associates, Inc.

MM&A is contracted by the Metropolitan Washington Airport Authority (MWAA) to mitigate discoveries of contaminated soil and groundwater in the path of the new Silver Line construction. One portion of the new light rail line runs underground, and the tunnel includes a submerged station. Investigation of the area identified chlorinated solvent contamination in the groundwater above Clean Water Act levels. The construction area is in the middle of Route 7, one of the busiest 6-lane roads in Virginia, with a significant number of businesses, construction activity, and foot traffic in the area. Therefore, removing the impacted groundwater has to be done in a manner that:

- Protect personnel, businesses, and construction workers in the area;
- Maintain traffic patterns;
- Reduce the impact to the environment from greenhouse gas emissions and potential releases; and
- Minimize energy usage to reduce cost.

To address these issues, MM&A designed and installed a subsurface horizontal well recovery system that has no impact to existing businesses and traffic. In addition, the recovery of over 1 million gallons of water with well pumps eliminates the fuel usage, emissions, potential for release, and traffic impact associated with the use of over 2000 vacuum tankers. This presentation will provide empirical data, comparing the carbon footprint and fuel usage of the approach utilized by MM&A to the traditional approach.

Regulatory Negotiations to Improve RR Site Remedy

Edward Roberts and Marc Sandford - ARCADIS
Paul Kurzanski - CSX Transportation

The New York State Department of Environmental Conservation (NYSDEC) was initially directing CSX Transnportation (CSXT) toward a remedy of removing all stained soils within the former refueling area at the former Salamanca Rail Yard site. This would have involved excavation and off-site disposal of more than 30,000 tons of petroleum hydrocarbon impacted soil from several acres of land and depth greater than 30 feet (ft) below land service (bls). This remedial approach would have required significant engineering controls to adequately address the depth of excavation and introduced significant associated safety hazards, which would have resulted in substantial capital costs.

An alternative remedial strategy was developed to substantially minimize soil excavation and disposal, resulting in significant cost savings and energy footprint reductions, while still achieving the Remedial Action Objectives for the Site. The extent of the petroleum hydrocarbon impacts in the soil were thoroughly delineated, and depicted in a three-dimensional model layout to allow for the detail evaluation of patterns, relationships, trends. Based on a thorough analysis of the data and Site conditions (geology, hydrogeology, analytical data, setting, and present / future land use), a three-phased alternative remedial strategy was developed. The first phase consisted of surgical source removal in the shallow zone; the second phase consisted of an in-situ soil vapor extraction (SVE) treatment system to address the majority of impacts in the vadose zone (intermediate and deep zones); the third phase involves a passive bioventing system to further aerate the soils in the vadose zone, stimulate the indigenous aerobic microbial population, and promote the biodegradation of the remaining residual hydrocarbons.

Successfully negotiating a hybrid strategy with the NYSDEC that combined surgical shallow source removal and in situ treatment at depth, resulted in significant projected remedial cost savings (over $500,000). Therefore, the renegotiated alternative remedy provided "Green Value" to the project by reducing the quantity of impacted soil removed and transported off-site for disposal (e.g., landfill) and by limiting the energy footprint (transitioning to an insitu passive system), ultimately to be followed by Site restoration and closure.

Risk and Liability Management

Pipeline Leak Detection – The Application of API 4716 to Railroad Facilities

Gary Crawford and Dan Frank - Argus Consulting

Railroad facilities often include buried piping systems which convey diesel fuel, lube oil, and used oil from the point of receipt to storage and from storage to dispensing. Piping may be direct buried or contained in utilidors, and can include single wall or double wall systems. Flow rates may range from 300 gallons per minute for single tank car or truck load/ offload stations, to over 1000 gallons per minute for multiple locomotive dispensing points. Other buried piping systems include pipeline deliveries and day tank transfers. Potential leaks from these types of piping systems may create adverse environmental impacts that are very difficult and costly to mitigate.

Pipeline leak detection can be an effective pollution prevention measure when it is incorporated as an integral part of a single wall or double wall piping system. API 4716 "Buried Pressurized Piping Systems Leak Detection Guide" was developed by the authors of this presentation as commissioned by API (American Petroleum Institute) and the ATA (Air Transport Association of America). API 4716 identifies and then analyzes the performance of several different categories and types of commercially available leak detection technologies that can be applied to buried pressurized piping systems. Although the language of API 4716 implies application to aviation and pipeline terminals, the information contained therein and the lessons learned from its development can aid the railroad industry by providing guidance in the selection and utilization of leak detection technologies.

This presentation will provide an overview of the development and conclusions of API 4716, as well as discussions of advantages and disadvantages of several leak detection methods, both automated and manual. The applicability of API 4716 to the Railroad industry will also be discussed. This discussion will aid railroad managers of buried pressurized piping systems select leak detection options that allow the performance of effective and efficient routine integrity testing. The

authors of this presentation have extensive experience in aviation and railroad fueling facility design, and will share real world examples of the application of API 4716 for several systems that have been constructed.

Abandonment of Underground Levee Wall Piping Penetrations, BNSF Railway Property, Omaha, Nebraska

Jeffrey Humenik - EMR, Inc.

Devastation to the cities of New Orleans and Metairie, Louisiana caused by levee failures following Hurricane Katrina in 2005, resulted in the establishment of the Levee Safety Act in November, 2007, by the U.S. Army Corps of Engineers (USACE). The mission of the Levee Safety Program is to implement a robust inspection system to assess the integrity and viability of levees and recommend actions to assure that levee systems do not present unacceptable risks.

Thousands of miles of railway and levees run closely parallel to rivers across the U.S. Implementation of the Levee Safety Act and the National Weather Service's predictions of increased flooding throughout the country will likely result in increased inspection efforts by the USACE. These inspections are intended to identify critical risks to levees and levee walls; however, where rail is present, such risks may fall under the railroad's responsibility to correct.

Recently, a USACE inspection of the Missouri River levee wall in Omaha, Nebraska identified underground piping penetrations of the wall that could negatively affect levee performance during a high-flow event. The City of Omaha was the designated sponsor tasked with levee wall maintenance. However, the levee wall and underground piping penetrations were located on BNSF Railway property. As the property owner, BNSF was liable for all planning and costs associated with piping penetration abandonment. Coordinated efforts by the USACE, the City of Omaha, property owner, and contractor resulted in the successful in-place abandonment of penetration piping and a consequent reduction in risks to levee performance.

Stormwater and Wastewater

Green and Sustainable Wastewater Treatment Facility Upgrade at CSXT Corbin Yard

Paul Zaimes - AMEC
John Calhoun - CSX Transportation

CSX Transportation invited AMEC E&E to develop an innovative, sustainable and cost effective system to treat industrial wastewater for reuse in the CSXT locomotive maintenance shop in Corbin, Kentucky. The existing industrial wastewater treatment facility [WWTF], in need of a major overhaul, was located about 0.6 miles from the locomotive shop, and was built to treat up to 300 GPM flows and discharge up to 300,000 GPD to the Corbin sanitary sewer system. Investigation of flow data to the WWTF indicated the actual average daily industrial wastewater flow was actually less than 5,000 GPD, or about 4 GPM average.

A design was developed for a new industrial WWTF located near the locomotive shop to produce reusable-quality non-potable effluent water using Electrocoagulation [EC] and Dissolved Air Floatation [DAF] without adding conventional (polymer) chemicals. The reusable effluent water is polished through two granulated activated carbon filters before storage for reuse. Depending on the demand for non-potable water, up to 90% water reuse is possible.

Innovative Designs:
A side-stream EC unit generates powerful, low-pH metal hydroxide coagulant from reclaimed effluent non-potable water. This configuration makes the EC process virtually maintenance free, except for semi-annual electrode replacement. Used steel electrode plates are recycled. The coagulant is dosed into the process water ahead of the DAF, where oil emulsions and dissolved metals break from the aerated water, and form a floating sludge that is continuously separated from the water.

DAF sludge is dewatered on-site via innovative use of a geotextile tube [GeoTube™] and polymer injection system. When a small volume of polymer is mixed with the DAF sludge, clear water separates from the sludge, filters through the tube, and drains back to the WWTF for reprocessing. Dried DAF sludge collects in the tube for periodic disposal. This eliminates the cost of storing and hauling large volumes of wet sludge to an off-site treatment facility. The tube sits in a dedicated roll-off which is set on a containment pad to simplify dewatering and hauling.

Sustainable Green Benefits:
Improved WWTF process efficiencies reduce water consumption, sanitary sewer discharge, and power consumption by more than 90%, resulting in dramatic reductions in the water footprint, carbon footprint, energy consumption and environmental impact. Small amounts of acid and caustic are used for pH adjustments, and a small pail of polymer is used for sludge dewatering.

Cost Benefits:
The new system is designed for 25 GPM flow rate, or 36,000 GPD maximum capacity, reflecting the current WWTF demand. The cost of EC generated coagulant is projected to be less than 1/10th of the cost of conventional chemicals. Operation and maintenance costs are projected to be dramatically reduced resulting from:

- Reduced flows, lower power consumption and very low consumable costs.
- Small Infrastructure – Small submersible pumps, tanks and piping.
- Less city water consumed and discharged - Lower water and sewer costs.
- Treated and reclaimed wastewater for locomotive washing and other non-potable use.
- EC coagulant cost less than 1/10 the purchase cost of equivalent treatment chemicals.
- Eliminated transportation, handling and storage of conventional polymer chemicals.
- Eliminated storage and hauling of large volume of wet DAF sludge for offsite processing.
- Reduced operator attention - Lower operation and maintenance costs.

Save Operating Costs by Modifying Permit Conditions

Kevin Peterburs and Martina Schlauch Jones- ARCADIS
Geoffrey Reeder - Union Pacific Railroad

Most rail yards have National Pollutant Discharge Elimination System (NPDES) permits for storm water discharge. In some cases, these are long-standing permits that include sampling requirements that are no longer applicable, resulting in unnecessary permit fees and associated operating costs. Evaluation of the permit classification and sampling requirements to ensure that the permit parameters are consistent with current site conditions may identify significant savings.

A case study is presented that describes a NPDES permit modification request for a permit classification change that will significantly decrease the $15,000 annual permit fee. The site is the active Union Pacific Railroad (UPRR) Dupo MP Yard located in Dupo, Illinois. The Dupo MP Yard current NPDES classification is an industrial minor facility with toxics, due to historical observation of cyanide surface soil concentrations in the permitted drainage area above Illinois Tiered Approach to Corrective Action (TACO) remediation objectives. In accordance with the requirements of the permit, a storm water sample was collected during each discharge event for total and weak dissociable cyanide for comparison to permit limits. While the permit also requires storm water analysis for pH, BOD, Total Suspended Solids, arsenic, lead, and oil and grease, no established permit limits exist for these additional constituents.

The project team completed a surface soil investigation for cyanide to assess current site conditions and to determine whether surface soils still have the potential to unacceptably impact storm water with cyanide. Soil analytical results showed that cyanide concentrations were below TACO remediation objectives. The project team also analyzed 5 years of cyanide data associated with Discharge Monitoring Reports (DMRs) that are submitted to the Illinois EPA on a monthly basis. Both total and weak acid dissociable cyanide concentrations from the last 5 years were below the permit limits.

These two lines of evidence satisfied the agency's requirement for revising the permit in UPRR's favor (i.e., removing the "minor facility with toxics" designation) and UPRR received verbal agreement to this approach during a December 2009 meeting. The formal NPDES Permit Modification Request was submitted to the Illinois EPA Bureau of Water in February 2010. The submittal requested that the permit be combined with an existing General NPDES Permit for Storm Water Discharges from Industrial Activities already in place for different drainage areas at the MP Yard, since current site data demonstrate no potential for unacceptable cyanide discharge in storm water. Upon approval of the permit modification, UPRR will realize a $14,500 savings in annual permit fees, plus lower operating costs due to a reduction in discharge monitoring requirements.