National University Rail Transportation Center (NURail) Tier 1 – Final Report

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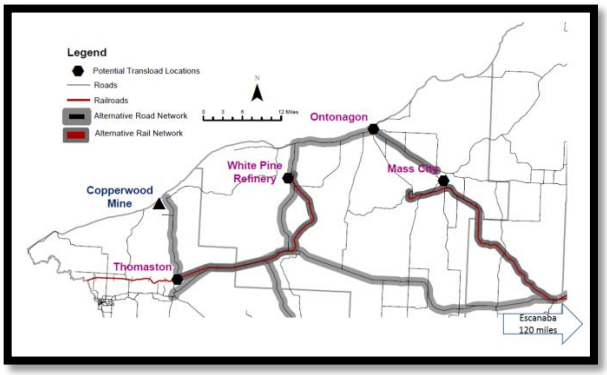

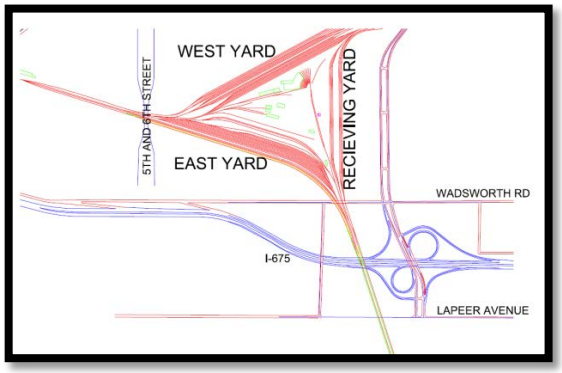

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16. Abstract

This project was a collaborative effort between Michigan Tech's Rail Transportation Program (RTP), a member of the National University Rail Center (NURail) and the Michigan Dept of Transportation (MDOT), Office of Rail to advance rail transportation related activities in the State of Michigan. Three major activities that were conducted under the grant included:

1. **Life Cycle (LCA) and Life Cycle Cost (LCCA) Analysis of Freight Transportation Alternatives to Copperwood Mine Project** – This activity concentrated on conducting Life Cycle Assessment (LCA) of a freight transportation project and investigating the integration of outcomes into economic analysis. Planned Copperwood Mine was used as a case study for the analysis. The project found that there were significant differences between emission levels from different transportation alternatives. The multimodal (truck/rail) option offered the lowest total emissions for both ore and concentrate movements. The study also found that conducting a detailed LCA is fairly resource intensive process and as such may be challenging to conduct by MDOT as part of the preferred alternative selection. from economical perspective, it is possible to convert LCA results into LCC analysis, but proper unit values must be determined. The supplementary analysis conducted on State of Michigan support mechanisms for highway/rail projects related to economic development found that the current MDOT programs provide support for both road and rail improvements, based on specific criteria provided by the legislature. However, these programs are modally separated, so it could be questioned whether a structure that disregarded the modal boundaries would be preferable to meet the MDOT mission.
2. **Lake State Railway Company Saginaw Yard Improvements** – This project involved 32 senior level civil and environmental engineering students in the planning and design of improvements to the Lake State Railway Company (LSRC) Saginaw railyard. The student project provided a "first look" at alternatives for improving the track layout, creating an enclosed wash facility, and improving the drainage across the site.
3. **Michigan Rail Transportation Conference –** This tasks continued the development of Michigan Rail Conference, founded in 2013 by the Michigan Tech and MDOT. The 2015-2016 conferences brought together over 300 participants and almost 60 speakers to discuss the rail development in the State of Michigan and nationwide.

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    - Mr. Tom Sullivan MHF Services
    - Mr. Darren Pionk, Gogebic County Road Commission
    - Mr. Jim Iwanicki, Marquette County Road Commission
    - Mr. Jim Delmont of M.J. VanDamme Trucking
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    - City of Saginaw Engineering Staff
- **Michigan Rail Conference**
    - Michigan Rail Conference Organizing Committee members
    - Michigan Rail Conference Sponsors and Speakers

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Executive Summary

The National University Rail Center (NURail) is a rail-focused, Tier-1 University Transportation Center (UTC) under the US Department of Transportation (DOT) Office of the Assistant Secretary for Research & Technology (OST) program. Michigan Tech's Rail Transportation Program (RTP) is one of the seven members of this university consortium led by the Rail Transportation and Engineering Center (RailTEC) at the University of Illinois at Urbana-Champaign (UIUC). In addition to UIUC and Michigan Tech, NURail also includes University of Illinois-Chicago, University of Kentucky, University of Tennessee, Knoxville, Rose-Hulman Institute of Technology and Massachusetts Institute of Technology. The central theme of NURail is *shared rail corridors.*

The primary objective of the NURail Center is to improve and expand rail education, research, workforce development, and technology transfer in the US. This collaborative grant from the MDOT through Michigan Tech has provided match funding for the NURail related activities in the State of Michigan. Three major activities that were conducted under this collaborative grant from MDOT include:

1. **Life Cycle (LCA) and Life Cycle Cost (LCCA) Analysis of Freight Transportation Alternatives to Copperwood Mine Project**; This activity concentrated on conducting Life Cycle Assessment (LCA) of a freight transportation project and investigating the integration of outcomes into economic analysis. The LCA was conducted to compare the emissions between three alternative strategies to transport the copper ore and concentrate from a Copperwood mine under development by Highland Copper. The analysis was conducted for multiple mine lives to determine its effect on overall emissions. The project also investigated the alternative tools available for economic assessment and how those could be applied by the Michigan Department of Transportation (MDOT) as part of their evaluation process for highway/railway infrastructure support for the specific project. The complete technical report of the LCA process, its application in the Copperwood project, analysis outcomes and its integration with economic analysis is provided under **Section 1.** The complimentary report on economic analysis tools and MDOT funding programs is provided in **Section 2**.
2. **Undergraduate Student Project – Lake State Railway Company Saginaw Yard Improvements;** One of the greatest challenges for rail transportation is the lack of visibility among current university students and their limited understanding of career opportunities in the field. It has been proven in several researches that the learning styles of today's students favor hands-on activities over lectures and literature. This project involved 32 senior level civil and environmental engineering students in the planning and design of improvements to the Lake State Railway Company (LSRC) Saginaw railyard. It provided an opportunity to 1) introduce numerous students from various disciplines to the field, 2) introduce the field to the supervising faculty, increasing their expertise and understanding of the field, and 3) encourage communication and collaboration between external stakeholders and university students/faculty. The Saginaw railyard itself is a facility inherited from CSX and has long suffered from drainage issues that make track maintenance and operations difficult. It has a locomotive wash facility, but that facility is an open air operation, which creates operational issues during the winter months. LSRC is following the industry trend towards longer unit trains, but the constrained yard layout

lacks a lead track long enough to build a unit train. The student project provided a "first look" at some alternatives for improving the track layout, creating an enclosed wash facility, and improving the drainage across the site. The completed technical reports of all student work were submitted to LSRC. Study outcomes and final posters of each student team are provided in **Section 3**.

3. **Michigan Rail Transportation Conference;** In 2013, Michigan Tech and MDOT led the organization of the first Michigan Rail Conference. This task continued Michigan Tech's commitment to provide the leadership and coordination/logistics support for the 3rd and 4th annual conferences in 2015 and 2016. The objective was to direct the conference toward self-sustained operation and investigate potential added activities, such as increased inclusion of students. The 2015 and 2016 conferences were successfully organized, both from participation and financial perspectives. A summary of conference development, participant feedback, and copies of final programs are provided under **Section 4**.

Since there are limited connections between each activity completed under the project, the methodology, findings, discussion, conclusions, and related bibliography are included separately for each activity under appropriate section.

SECTION 1: Comparative Life Cycle Assessment of Road and Multimodal Transportation Options – A Case Study of Copperwood Project

(submitted as a separate document)

SECTION 2: Addendum to Copperwood Project – State Support Mechanisms for Transportation Projects and Available Tools for Economic Analysis

2. Introduction

Chapter 6 of the LCA report (Section 1) discussed the integration of LCA outcomes with the economic analysis and provided example calculations for the Copperwood Project. It also introduced LCCA as one of the economic methodologies for the integration. This chapter will continue the discussion, but will specifically attempt to highlight three different aspects included in the scope of work.

The first portion concentrates on the State agency (MDOT) decision making perspective. It will first briefly discuss the general objectives of the MDOT when determining support for transportation alternatives, followed by a review of two specific DOT programs available to support projects similar to Copperwood, namely Transportation Economic Development Fund (TEDF) – Category-A, and Freight Economic Development Program (FEDP).

The second section provides a requested review of software currently available for conducting economic analysis of transportation projects in the U.S. From the reviewed tools, TREDIS is explained in more detail, as it seemed to be most applicable for multimodal freight development projects. However, even TREDIS seemed oriented toward larger scale projects with macro level effects and as such may not be directly applicable to analysis of smaller individual projects, such as Copperwood. The objective is not to recommend any specific tool for application by the MDOT (or other entities), but simply to review what types of resources are available. While it was recognized that none of the tools seem to be developed toward evaluating individual projects.

The final section includes a brief discussion on the economic analysis considerations for Copperwood project, including MDOT support mechanisms. It is recognized that the current programs covered in the report are guided by the underlying legislation and some of the suggestions presented may not be consistent or implementable with the current language. As such, suggestions should not be considered as recommendations for immediate changes, but rather as an initiation for open discussion on types of changes that could be considered by MDOT and the State. These discussions would be most valid, if there was an interest toward policies and programs that also considered selection of preferred modal alternatives for particular developments, based on economic analysis and/or emissions.

2.1 Modal Selection and MDOT Support Mechanisms

The preferred alternative for a specific freight transportation project may not be the same from every stakeholder's perspective. Table 2-1 reviews the main objective and core criteria for both Highland Copper and MDOT when selecting from alternatives.

Table 2-1: Mode selection criteria for Highland Copper and MDOT in Copperwood Project

Mode Selection Criteria		
	Highland Copper	**MDOT**
Main Objective	• To minimize life cycle costs	• To provide the highest quality integrated transportation services for economic benefit and improved quality of life
Criteria	• Capital/Operational/Maintenance Cost • Available capital • Available State Support (MDOT)	• Project Cost • Economic Impacts • Environmental Impacts • Societal Impacts

From Highland Copper perspective, transportation is a necessity for moving the product to markets. As such, there are no direct "benefits" from the action and the objective concentrates on minimizing the costs over the life time. The main criteria for decision making is the capital (construction), operational, and maintenance investment required to move the ore and concentrate. While the preferred alternative from long term perspective should be the one with lowest cost over the project life time, other factors, such as lack of available capital, or unavailability of public funding for a specific solution, are also considered in the decision making process.

From MDOT's point of view the main mission is "*providing the highest quality integrated transportation services for economic benefit and improved quality of life*." [1] MDOT supports the transportation infrastructure improvements under transportation improvement loan/grant programs. These programs are different for road and rail projects and projects must meet certain eligibility criteria under each program.

Figure 2-1 shows a general outline of the two state funding options for alternative modes in Copperwood project and Table 2-2 provides a side-by-side comparison of the two programs. *Transportation Economic Development Fund (TEDF)* is the applicable grant program to meet economic development demands placed on highways, roads, and streets as outlined in P.A. 231 of 1987 (TEDF act) [2]. State, County and City road agencies are eligible to apply for funds through this program. There are five different categories (A,C,D,E,F) under which an agency can request for funds depending on the eligibility criteria (MDOT 2016) [3]. In case of Copperwood project the Gogebic county road commission requested for funds for road improvements under Category A, the only category that is directed toward a specific development. In order for a transportation development to qualify under this category, it should relate to an immediate non speculative economic development project in one of the listed target industries (mining is included in the list).

Category A focuses on removing the transportation impediments to the creation and retention of jobs and increasing the tax base in the region [2].

The *Freight Economic Development Program (FEDP)* helps new or expanding businesses connect to the rail network by providing low-interest loans that can be converted to grants, if shipping quotas are met. Both shippers and businesses (including railroads) are eligible applicants for the program. [4].

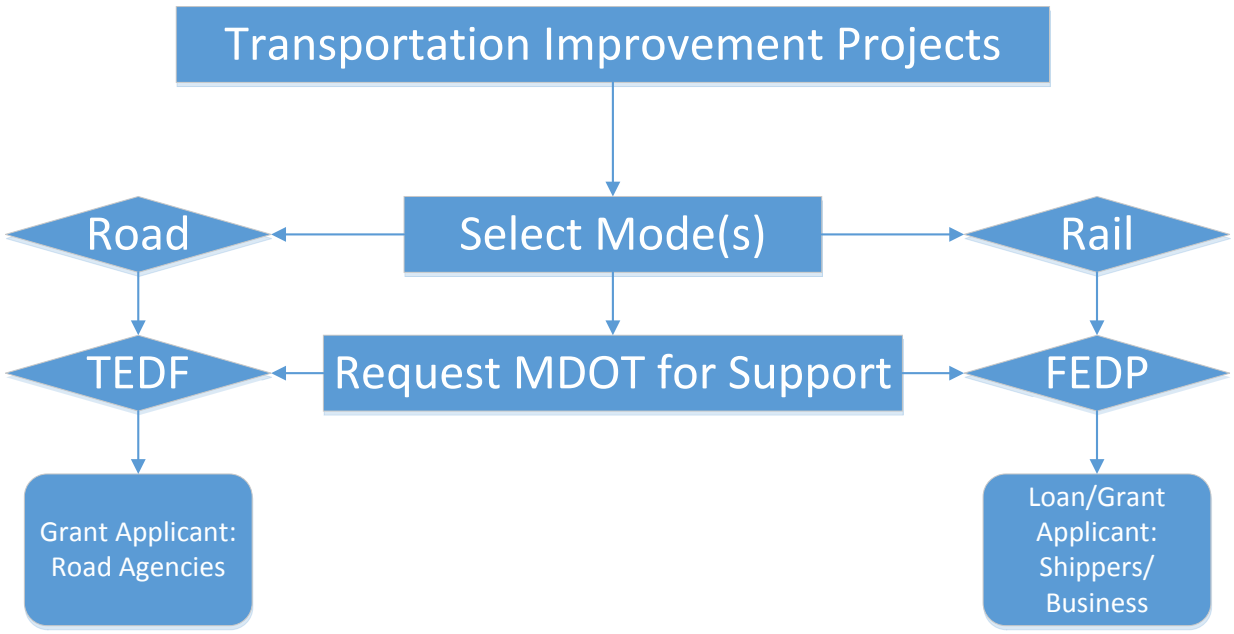

Figure 2-1: MDOT Road and Rail Improvement Grant programs

Table 2-2: Comparison of TEDF versus FEDP Programs

Criteria	TEDF	FEDP
Eligible activity	Various types of roadway projects in urban and rural environments.	Development of rail infrastructure to support freight transportation needs of Industries.
Applicant type	Public (to support public/private target industries)	Private (or public entity controlling the infrastructure)
Program type	Grant	Loan/Grant
Annual funding level (average and range)*	$11 million ($7.1-18.7 million)	$2 million ($0.46-3.9 million)
Matching requirement	20%	50%
Main selection criteria	Transportation need and Improvements (several criteria under each)	Economic impact (jobs, other user potential, car loads and cost, viability of other alternatives)
Evaluation method	Quantitative (per scoring guidelines)	Qualitative (per past projects and perceived cost/benefits)
Analysis method (BCA, EIA, LCCA)	No specific methodology	No specific methodology

* Approximate annual average appropriations for years 2012-2016. Annual awards ranged between $10.5-17.9 million in 2012-2016. Additional funding was provided from a combination of revenue from the original bonds that were issued to fund the TEDF in 1987 and bid/construction project savings.

There are significant similarities, but also differences between the TEDF and FEDP. The main similarity is that they are both dedicated specifically toward economic development/improvement of transportation infrastructure (road and rail, respectively) and attempt to prioritize the projects to gain maximum benefits for the State. Both programs are funded on annual basis, although at different levels, and have a match requirement (20% and 50%,

respectively) [3, 4]. Both programs also place high emphasis on their economic impact, especially as it relates to job creation.

Perhaps the greatest difference between the programs is the agency applying for a grant, namely public (local road authority) versus private entity (typically shipper/business, but could also be economic development agency). Another difference is the form of support, which in case of FEDP is a loan, instead of a grant, although it may be converted into a grant once performance metrics (shipping quotas) identified in the award are met. While there are no specific limits for individual project sizes, the annual funding levels are significantly higher for the TEDF that FEDP. On the other hand, the annual funding level for the programs is not fixed, but rather fluctuates based on annual appropriations. There is also a difference in the potential benefits gained by other users from the investment. In TEDF case, the public nature of the facility makes improvements available to all users immediately. FEDP pays also attention on the public use of the facility, the facility is still limited to rail users only. There are also differences in the criteria and evaluation of grant applications. TEDF provides extensive project eligibility and selection criteria for Category A, together with fairly detailed scoring guidelines and a vigorous economic model behind it that not only takes into account the economic benefit to the area, but combines it with evaluation of a specific transportation need to producing scoring and ranking of potential grants. On the other hand, FEDP provides brief eligibility criteria and specific guidelines (must produce jobs and/or car loads), but doesn't possess economic model/analysis, at least not in similar level of detail as TEDF [4, 6]. One of the notable differences between the programs is that FEDP requires evaluation of viable modal (road) alternatives. Since TEDF legislation allows funds to be used for roadway improvements only, comparison of other modal alternatives is not relevant for TEDF.

2.2. Available Tools for Economic Analysis

While TEDF already incorporates economic analysis as part of the evaluation process, the scope of this project included a review of current methods/tools for the economic analysis of freight transportation alternatives. The most commonly used methods are the Benefit Cost Analysis (BCA), Economic Impact Analysis (EIA) and Life Cycle Cost Analysis (LCCA), as briefly introduced in Chapter 6 of Section 1. In 2015, the Federal Highway Administration (FHWA) published a compendium of the different benefit cost analysis tools for transportation systems management and operations [7]. The list included most widely distributed tools, used by Federal, state or regional transportation agencies. Table 2-3 lists the tools, their developers, and provides a brief overview of each tool.

Table 2-3: Existing Benefit Cost Analysis Tools and Methods for Transportation Systems

Tool / Method	Developed By	Summary
BCA.net	FHWA	Web based tool to support highway project decision making. Performs BCA for alternative strategies
CAL-BC	Caltrans	Excel spreadsheet based tool. Originally designed to conduct highway improvements BCA. Improved to analyze operational improvements, ITS and transit projects. **Several agencies adopted CAL_BC as a basis for their tools**. Can provide corridor and network wide analysis.
Clear Roads BC Toolkit	Montana State University (under contract to Clear Roads Consortium)	BCA for winter weather maintenance practices. Also conveys the costs to the decision makers outside the maintenance region.
COMMUTER Model	U.S. EPA	Spreadsheet based tool to estimate emissions benefits of different travel demand management strategies available for employers
EMFITS	New York State DOT	State's BCA tool
The Florida ITS Evaluation (FITSEVAL) Tool	Florida DOT	Currently under development. Designed to estimate B/C of ITS form the states standardized model structure
Highway Economic Requirements Systems – State version (HERS – ST)	FHWA	An engineering/economic analysis (EEA) tool that uses engineering standards to identify highway deficiencies, and then applies economic criteria to select the most cost-effective mix of improvements for system-wide implementation. Designed to evaluate the implications of alternative programs and policies on the conditions, performance, and user cost levels associated with highway systems.
HOT-BC	Managed Lanes Pool Fund Study	Analyses of societal benefits and costs associated with value pricing projects for managed lanes. Helps in defining the cost-effectiveness of the value priced lanes in congestion mitigation.

Tool / Method	Developed By	Summary
IDAS	FHWA	A travel demand modelling tool that estimates the changes in modal, route, and temporal decisions of travelers.
IMPACTS	FHWA	Screening level evaluation of multimodal corridor alternatives, passenger oriented.
Multimodal Benefit Cost Analysis MBCA	TREDIS Software	**Covers both passenger and freight transportation**. Designed in consistent with USDOT guidelines, making it useful for multimodal project assessment, grant applications and education programs.
Tool for Operations Benefit Cost Analysis (TOPS –BC)	FHWA	Provides guidance and a selection tool for users to identify appropriate B/C methods and tools based on the input needs of their analysis. Also can calculate life cycle costs.
Trip Reduction Impacts of Mobility Management Strategies (TRIMMS)	Centre for Urban Transport Research (CUTR) at the University of South Florida	Quantifies the net social benefits of wide range of transportation demand management in terms of emission reductions, accident reductions, congestion reductions, excess fuel consumption, and adverse global climate change impacts.

The review of the tools revealed that many of them are targeted toward macro level analysis, so their applicability toward projects that attempt to address specific transportation needs at local scale (such as Copperwood) is limited. Many of the tools listed in Table 2-3 require data from travel demand models as input for the analysis and mostly perform B/C analysis or project life cycle cost estimation for passenger oriented projects. Two of the tools, CAL-BC, and TREDIS were selected for a more detailed comparison to determine if either of them would provide valuable insight for MDOT. CAL-BC has been the basis of tools developed by many agencies and has similar inputs and outputs as most other benefit-cost analysis tools. TREDIS, on the other hand, is the only tool that offers calculation of economic benefits related to freight/multimodal freight movements and as such, includes all the required parameters for the economic analysis. In addition to the tools selected from the FHWA report, a third tool, used by the State of Michigan (MDOT) was included in the comparison. The Simplified Economic Analysis Tool (SEAT) tool was developed by Southeast Michigan Council of Governments (SEMCOG) for economic analysis. The tool is focused on the six member counties of SEMCOG and its neighboring counties and it uses economic multipliers consistent with MDOT and SEMCOG data to calculate the economic impact of transportation investment on the businesses in the region. Table 2-4 and the following paragraphs discuss the three selected tools.

Table 2-4: Outline of SEAT, CAL-BC, and TREDIS Tools

	Cal B/C & companion tools (Cal B/C Corridor and Cal Net B/C)	TREDIS	SEAT
Developer	California DOT (Caltrans)	TREDIS software group	SEMCOG, MDOT
Analysis Methodologies	B/C analysis, economic analysis	Benefit costs, economic adjustments, market access, travel costs, and freight	B/C analysis, economic impact estimation
Applicable Modes	Roads, Rail (limited to passenger and transit)	Road, Rail	Road
Basic Inputs	• ***Project characteristics*****:** location, duration of construction, length of peak periods, • ***Highway design characteristics***: length of H/W segment, impacted length, avg. daily traffic, HOV/HOT lane traffic, % traffic in weave, % trucks, speeds, IRI (pavement condition) • ***Accident data*** • ***Transit data*** **(**for transit projects)**,** • ***Highway grade Crossing data*** • ***Project cost data***	• ***Travel Characteristics:*** Vehicle trips, VMT, VHT, Trip characteristics, and trip purpose. Vehicle characteristics, mode for both passenger and rail • ***Construction Average time to terminals for freight*** • ***operation and maintenance costs***	• ***Travel demand measures*****:** VMT and VHT, based on SEMCOG's travel demand modelling for build and no build scenarios and for a base and forecast year. • ***Real discount rate*** • ***Project development and construction Costs*** • ***Operations and maintenance costs***

	Cal B/C & companion tools (Cal B/C Corridor and Cal Net B/C)	TREDIS	SEAT
Computational Modules	• Travel time savings, vehicle operating cost savings, accident cost savings and emission reductions • Spreadsheet based tool that uses rate tables and other values and multipliers applicable within the State of California.	• traveler benefits, broader user benefits, wider societal benefits, economic development impacts (Benefit Cost module). • Induced and direct benefits, effects of travel time savings on industries, scope for expansions etc. (Economic module). • Macroeconomic impacts of economic development from one region to surrounding and terminal regions (Freight module).	• Uses regional economic models to estimate the economic impacts of transportation investments. • Uses multipliers that are consistent with MDOT data.
Outputs	• Life cycle costs, life cycle benefits, NPV, B/c ratio, RRI, payback period, travel time savings, VOC savings, accident cost savings, emission cost savings, total person hours saved, additional CO_2 emissions in tons, dollars.	• ***Benefit cost module outputs*****:** Present value of benefits and costs for travelers, non-monetary benefits, shipper logistics productivity, market access, social and environmental costs • ***The economic adjustment module*****:** Business output, value added to the economy, jobs and wage income per year by industry (or by occupation) and overall for the study region. • ***Commodity flow*****:** supply and demand in the study region. freight flow in terms of tons and values. Government revenue by level of government, source and year.	• ***Travel efficiency measures*****:** travel time savings, vehicle operating costs, safety improvements, emission cost savings. • Economic impacts – gross regional product, personal income, employment (total and by industry)

	Cal B/C & companion tools (Cal B/C Corridor and Cal Net B/C)	TREDIS	SEAT
Comments/ Limitations	• Excel based tool. • Very flexible. • Works for wide range of project types. • Since the model uses % of trucks in its analysis, this tool could be useful in analyzing freight intensive corridors to some extent.	• The freight module can be more precisely related to the Copperwood project. • The economic development and the business improvements are all analyzed in detail. • Relies on data within TREDIS, built from Transearch and FAF data.	• Freight flows and freight business data for South East Michigan extended economic region only.

2.2.1. TREDIS

While none of the reviewed tools seem directly applicable to projects similar to Copperwood, it was determined that TREDIS offers the greatest potential to evaluate specific freight transportation projects, mainly due to its ability to analyze rail and multimodal options. Since the emphasis of our investigation was on economic analysis of a freight project, the *Benefit Co*st and *Economic Adjustment* modules within TREDIS were considered the most relevant and have been summarized in more detail.

2.2.1.1. TREDIS-Benefit Cost Module

In BCA, economic value of benefits is used to establish the economic efficiency of particular transportation investments. The measurement of economic impacts can show the extent to which transportation improvements lead to tangible benefits for local constituents, and it can also show movement towards addressing social equity of goals, such as the redistribution of future business growth to areas of current economic distress [8]. Under the benefit cost module, transportation benefits are categorized in four levels

- Traveler Benefits – This accounts for the benefits to the traveler due to travel time savings, reduced travel expenses, accessibility to different modes, and travel safety which occur due to the transportation improvements. These travel impacts are calculated in the Travel costs module of TREDIS.
- Broader User Benefits – Here, apart from the above factors, the benefits to the business as a result of freight transport improvements are accounted for. Benefits arise as shipping costs go down, business can increase productivity through inventory management, production scheduling, or distributional efficiencies.
- Wider Societal Benefits – The benefits to parties that are not using the transportation improvements directly fall under this. This are mainly called the externalities and may include environmental impacts like air quality, water quality, and noise impacts and also quality of

life impacts. Also the impact on standard of living due to improved market access is accounted for under this level.

- Economic Development Impact –Measures the income generated from user or non-user benefits due to direct or indirect activity related to the transportation improvements. These benefits lead to the flow of income in the economy.

Table 2-5 shows the difference between Economic Benefits and Regional Economic Impacts. It is important to identify the items in each category, as the division may be unclear and they should never be added together in order to avoid double counting. Measurement of these benefits is greatly impacted by the study area selected, as TREDIS allows for both local and total benefit calculations. Travel models do not account for the impacts of project on inter regional or interstate movements outside the area of coverage and hence may lead to underestimation of total benefits. TREDIS provides a mean for estimating the benefits associated with this "induced demand".

Table 2-5: Difference between Economic Benefits and Regional Economic Impacts (source: [8])

	Traveler Benefit	Full User Benefit	Societal Benefit	Economic Development Impact
$ Passenger Time Savings for personal travel	Yes	Yes	Yes	--
$ Passenger Time Savings for business travel	Yes	Yes	Yes	Yes
$ Travel Vehicle Operating Expense Savings	Yes	Yes	Yes	Yes
$ Shipper/Receiver Productivity Gain	--	Yes	Yes	Yes
$ Market Access Productivity Gain	--	--	Yes	Yes
$ Value of Quality of Life/Environmental Benefits	--	--	Yes	--
$ Local Income Growth from Economic Impacts	--	--	--	Yes

2.2.1.2. TREDIS-Economic Adjustment Module

The Economic Adjust module calculates the way the economies in a region adjust to changes in transportation conditions due to the project (economic impacts). It is a four step process that includes [9]:

- Step 1: Baseline - For the study region, the history and the forecasted trend of the economic growth are developed. These are based on the national averages or the regional trends and include economic growth measures (employment, wages, value added or gross domestic product, and output), as well as demographic measures (households, population, school age children, prime workforce-eligible age group, retirees/others).

- Step 2: Direct Impact - The direct impact of the proposed transportation improvement on households and industry are estimated, based on the transportation models and TREDIS travel

cost module. The changes in the travel patterns, distances, used costs savings, cost for safety etc. are all derived from the travel cost module.

- Step 3: Wider Productivity Effects – This step considers other benefits due to the transportation improvements, such as costs savings in the industry due to improved market access, further reduction in production costs resulting in increased benefits, etc. These are measured based on changes in congestion and reliability, improved connectivity, and access to population and employment.

- Step 4: Regional Macroeconomics – This step calculates impacts from the changes in business investment patterns in the region, improved capacity of production, etc. on the larger economic region. The information from Step 1 and Step 3 are used to calculate the changes in flows through the economy, including changes in labor supply and demand, shifts in investment, inter-industry (indirect) supply chain impacts and wage spending (induced impacts).

Figure 2-2 shows the original trend in economy according to Step 1 and change in economy due to the transportation investment calculated in the Steps 2, 3 and 4. The impacts may be measured in terms of jobs, worker incomes, and value added (GDP) or business output.

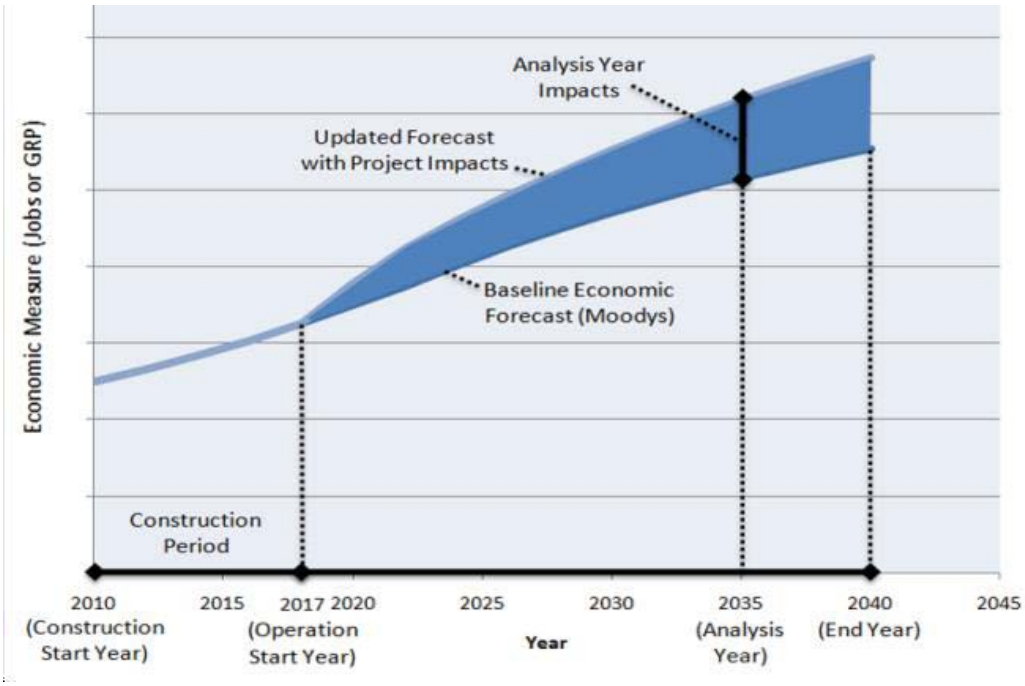

Figure 2-2: A schematic of change in Economy and Jobs due to a Transportation Investment (source [8])

2.3. Discussion - Economic Impacts and Copperwood Project

Copperwood project is an interesting case study from transportation perspective, as it requires specific improvements in the transportation facilities, but also has the flexibility to use road, multimodal (road/rail), and rail transportation. As mentioned in the beginning of the chapter,

transportation is mainly a cost item from Highland Copper perspective and as such, their modal selection process concentrates on minimizing the capital, operational, and maintenance cost over the project lifetime. However, since available capital early in the project is often limited and significant portion of the transportation capital costs tend to occur during that time frame, their overall analysis may place a higher priority on controlling the capital costs, even at the expense of long term operational/maintenance costs. The available state support from MDOT for transportation projects has also a role in the analysis. In Copperwood's case, there are two applicable MDOT programs, namely TEDF and FEDP and while neither of these programs can be expected to completely cover the costs needed, they both apply toward the initial capital costs. As such, they may have an effect on the final decisions by the Highland Copper.

The two MDOT programs available for support function independently, so obtaining funding from one program doesn't exclude potential funding from the other. Even the applicant for the funding (at least in Copperwood case) is different. Each program has their own purpose, budget levels, and evaluation criteria, outlined in the underlying legislation. Both programs place high emphasis on project's economic impact in their evaluation criteria, although only TEDF has a rigorous economic formula behind the evaluation. While it was mentioned in the previous paragraph that potential support from the state plays part in the selection between alternatives, the effect is somewhat limited, as in many cases this support only accounts for a small portion of the overall project cost.

Regardless the specific methods used in alternative selection or the sources of funding, it should be important from the societal perspective that the solution maximizes the positive and minimizes the negative impacts of the project to the general public (both economic and non-economic). In addition to economic considerations, the analysis should certainly incorporate LCA (or some other accounting method), so emissions from the solutions can be properly evaluated. Based on the literature review, there are several available methods and tools to perform economic analysis of transportation investments, including existing frameworks and some extensive datasets for road EIA, BCA and LCCA. However, it seems evident that most of them are more geared toward macro level analysis and it's unclear how applicable the national (in some cases international) datasets are for evaluating a fairly small, local development projects. It is also uncertain, whether all the required and reliable input data is available from the local sources to conduct the analysis and even if such data exists, specific software and user expertise are required to input the data and perform the analysis. In addition, the time required to perform such an analysis would be a practical concern considering that companies typically need commitments in short order to make site decisions. As shown in the LCA part of the study, similar demands for resources and data are also valid for the LCA analysis.

Overall, the challenges mentioned above make it is difficult to offer specific recommendations for Highland Copper, or for MDOT toward application of comprehensive economic analysis when selecting between preferred freight alternatives for local economic development. While not reviewed in detail, it may well be that the current methodologies applied by Highland Copper and MDOT (especially TEDF) are adequate to evaluate the economic aspects of the project. From MDOT's programmatic perspective, there might be a possibility to align the criteria between the MDOT funding programs (TEDF and FEDP) more closely with each other. This could include a detailed review of the similarities and differences outlined earlier in the report

and identification of items that could be approached in a similar manner under both programs. For example, since the FEDP doesn't currently utilize a specific economic model, an inclusion "rail applicable" criteria from TEDF program criteria could be investigated. Besides the alignment with TEDF, FEDP could benefit from investigation on how other states handle evaluations of their rail related economic development projects and whether/how economic analysis are performed in such occasions.

From the society perspective, one could question whether the current structure of TEDF and FEDP programs is ideal toward meeting the MDOT's mission "*to provide the highest quality integrated transportation services for economic benefit and improved quality of life.*" It could be speculated that to fully meet the mission, investment decisions should be made purely on the value proposition of the project (or project alternative) and be based on evaluations of project impacts from the full life cycle (economic and external) perspective. Such decision making would be a shift from the current policies/programs, as it would invite MDOT to compare the merits of modal alternatives side by side. Furthermore, the potential for a state support for one mode over another might influence the modal decisions made by the private industry stakeholders. The shift would most probably also require a legislative change, but those might align well with the objectives of the Fixing America's Surface Transportation (FAST) Act that claims to make North America's surface transportation more streamlined, performance-based, and multimodal. To meet the goals of both FAST Act and MDOT's mission, it seems essential that the mechanisms and programs for freight projects are also shaped in a fashion that maximizes economic and environmental benefits and disregards modal boundaries.

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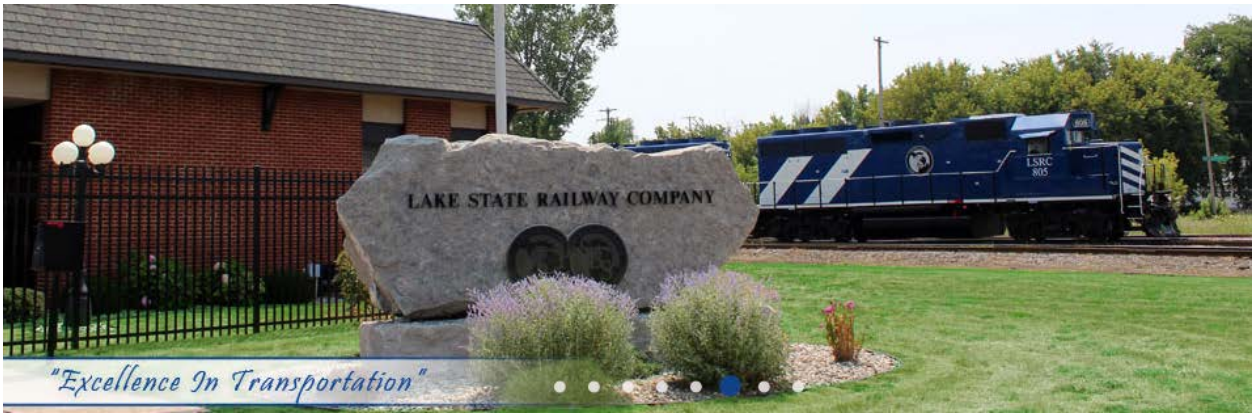
SECTION 3: Lake State Railway Company, Saginaw Yard Improvements



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Faculty Advisor: David Nelson, Senior Research Engineer, Dept of Civil and Environmental Engineering

3. Introduction

Michigan Technological University has been involved in rail related undergraduate student projects since the earliest days of the Rail Transportation Program (RTP). Although many of the projects have been in the civil engineering discipline, RTP has reached out across campus to the mechanical and electrical departments as well as the School of Business, and the fine arts department. Since 2012 these projects have often been at least partially funded from the NURail grant, and in 2013 and 2015 supplemental funding was provided by MDOT.

During the 2015-16 school year, 32 senior civil and environmental engineering students conducted "*Planning and Design Services for Improvements to the Lake State Railway Company (LSRC) Saginaw Yard*" as their senior design project (Figure 3-1). The project was divided to two semesters and each group worked for a single semester. In general, the fall groups were responsible for conceptual designs while the spring groups concentrated on providing more detail to the preferred alternatives. The yard is a facility inherited from CSX, and has long suffered from drainage issues that make track maintenance and operations difficult. The yard has a locomotive wash facility, but that facility is an open air operation, which creates operational issues during the winter months. While the yard is quite large, it is constrained on the west by Washington Ave, on the east by N. 23rd St, and on the south by Lapeer and Janes Avenues. LSRC is following the industry trend towards longer unit trains, but the constrained yard layout lacks a lead track long enough to build a unit train. The student project provided a "first look" at some alternatives for improving the track layout, creating an enclosed wash facility, and improving the drainage across the site. The four objectives for student work included:

- improvements to the rail system to allow storage of a 9,000-foot unit train in the yard;
- drainage improvements throughout the yard complex;
- design of a covered locomotive wash facility; and
- site work in the rail yard and the neighboring communities to improve yard access and allow LSRC to park the previously mentioned unit train.

Figure 3-1: LSRC Saginaw Yard

3.1. Original Scope of Work

The anticipated outcomes of the Capstone Senior Design team are as follows:

a) Site visit and survey: The team will visit the site to fully understand the yard operations and local community issues. They will take any survey measurements necessary to adequately define the current yard conditions, and supplement the survey with a set of digital photographs.
b) Final scope definition: The team will use the preliminary scope and the information gathered during the site visit to define the work package that will be accomplished in this project. Anticipated scope will include extending lead track to 9,000 feet, including closure or grade separation at Lapeer Rd; constructing all-weather shelter for locomotive service activities; and correcting drainage issues in the north classification track area. Additional work may include removing a deteriorated warehouse structure, correction of additional drainage issues, and improved access to the central part of the yard, especially for grain truck access to the grain transload area.
c) Preliminary Design: The team will produce preliminary design documents showing the work required to meet the final project scope.
d) Documentation/Final Report: The team will compile a comprehensive final report with all design information and results. Additionally, the team will conduct one design review, prepare a final project poster, and make a final presentation to the project sponsor.

3.2. Scope Changes

As the work progressed the student team discovered that a 9,000-foot lead track would not be possible, so the scope was altered to look for the longest possible lead track within the confines of the existing yard. Closure of grade crossings at Lapeer Ave and N. 23rd St were investigated as alternatives to provide a longer lead.

3.3. Summary of Outcomes

The initial site visits confirmed the scope outlined in the project description. In addition, LSRC asked the team to look for potential to reuse the floor slab of an old warehouse facility on site, and to take a preliminary look at improvements to the locomotive turntable.

The following paragraphs and attached posters (Appendix A) summarize project activities and final outcomes of each team's work. Complete technical reports have been submitted to LSRC to be used at their discretion. It must be remembered that the work was done by students and the main objective was to allow them to apply their engineering education to a real world project. Thus, the findings and outcomes should not be considered as professional documents, but rather information provide a solid foundation for LSRC in the continuing development of their project.

3.3.1. Track Improvements

After investigation of the site and available options, it was recognized that a 9,000-foot storage track was not possible without closing either N. Washington Ave or Janes Ave, leading into revision of scope that attempted to maximize the length of storage track within the remaining yard area. During the conceptual phase, the best option provided 7,600 feet of storage in the East Yard between Janes Ave and Washington Ave after track modifications, but this was reduced to 7,300 feet during the detailed design phase. 7,300 feet meets the current LSRC needs, and allows

them to handle over 110 car trains, while providing room for storage of two trains. The plan also allows for continuous rail operations, even during construction. A schematic drawing was developed to illustrate the East and Receiving yard tracks and operations (Figure 3-2). Total project costs for rail work were estimated at $1.4 million during the conceptual phase and later revised to $1.6 million. The final report includes cost estimates for the planned work, and a phasing plan showing how the work could be accomplished over an extended period of time if necessary.

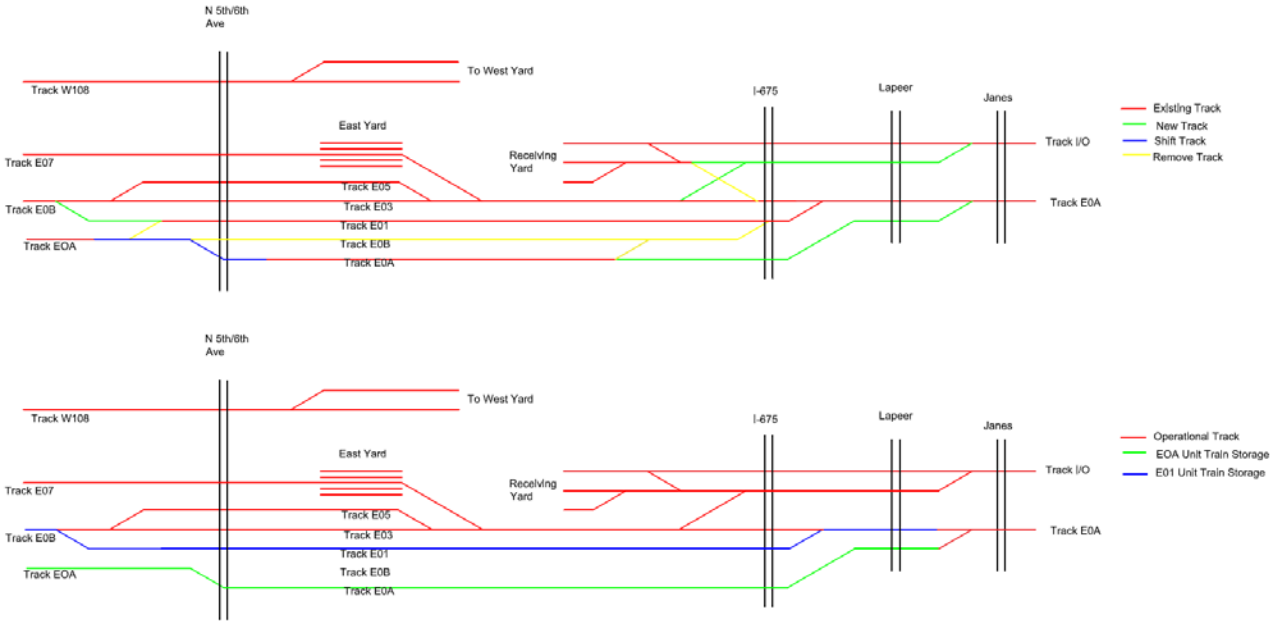


Figure 3-2: East Yard Rail Schematic

3.3.2. Structural Improvements

This group investigated several options for the wash facility, including pre-engineered steel buildings and individual design/construction packages. They found that a pre-engineered facility would be the preferred option. As preliminary design efforts progressed the LSRC staff expressed an interest in including several improvements, including an inspection pit for minor maintenance activities and an elevated wash platform to provide access to the upper sides and top of the locomotive during the wash operations. The preliminary plan that included the layout for a basic wash facility was estimated to cost nearly $1 million, constructed over two or more years. The final plan increased the cost to just over $2 million, but included inspection pits for both tracks in the wash bay, drainage improvements to support the inspection pits, heating, and the wash platform and associated wash equipment. It also included costs for providing more separation between the tracks which allowed better access to the locomotives during the wash process (Figure 3-3).

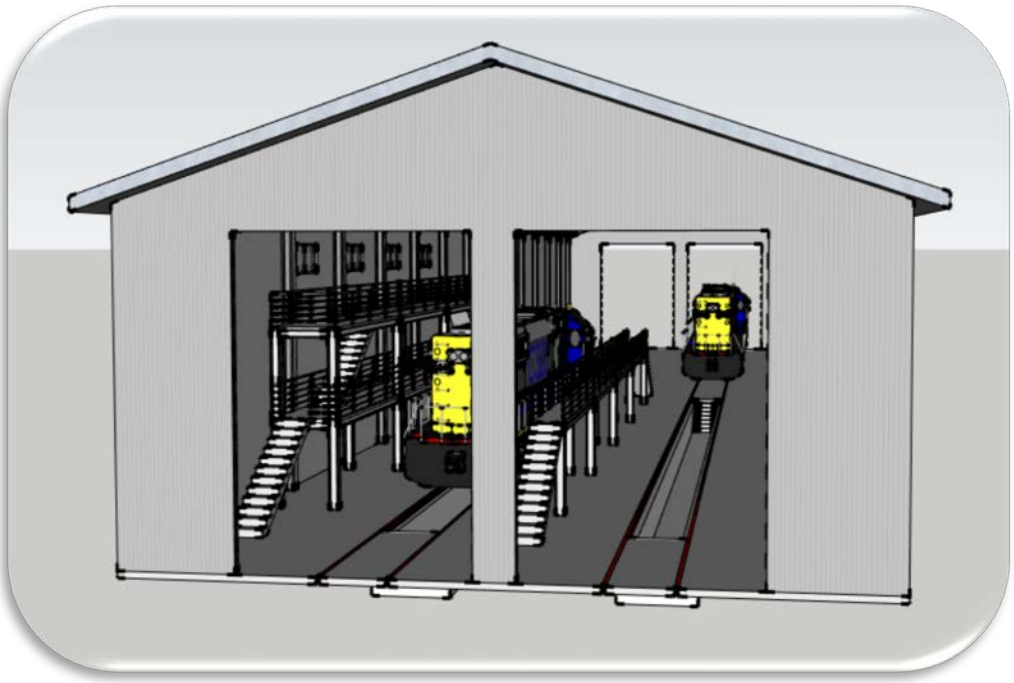


Figure 3-3: Locomotive Wash Facility Rendering

The preliminary analysis of the old warehouse determined the facility's current condition was beyond repair and recommended that the building and floor slab be demolished, crushed, and used as fill inside the existing foundation walls. A floor cap on top of this would allow use as a loading dock for rail operations and addition of a pre-engineered steel warehouse could provide covered storage. Conceptual level costs indicated a total cost for a pre-engineered warehouse on the slab would run nearly $1 million.

3.3.3. Drainage Improvements

The drainage group investigated ways to remove the standing water that collects on the site after major rain events, and during the spring snow melt. They devised a preliminary plan that would provide surface drainage to catch basins established within the yard. The catch basins would be connected to the existing Saginaw combined sewer system at points around the perimeter of the yard. Surface drainage would take place on the existing access roads within the yard that would be regraded to improve surface flow. Preliminary costs for this work ran approximately $400,000 (maintained in final cost estimate) and could be phased over a period of years to gradually improve the drainage with a reduced annual capital expenditure. Final plans included directional boring from the street side to minimize operational impacts in the yard, grading and drainage for a new access route between the two-unit train tracks, and installation of under-drains where possible (Figure 3-4). A phasing plan was provided that would allow construction over a period of years with recognition that costs would increase as project length was extended.

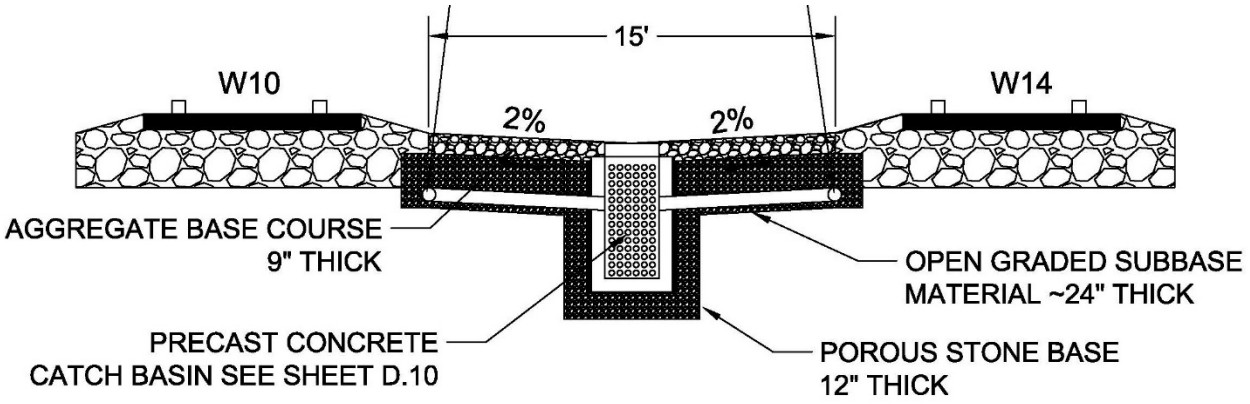


Figure 3-4: Proposed Drainage Detail

3.3.4. Site Improvements

This team focused on improvements to yard access, and to work required to support the proposed unit train operation. Early on the rail and site teams recognized that the rail crossing at either Lapeer or N. 23rd street would need to be closed to allow a parked unit train operation. They conducted traffic counts during the field trip, reviewed traffic data from the City and Michigan DOT (MDOT), and concluded that one or both could be closed with minimal impact on current traffic operations as both crossings have low traffic volumes. As MDOT provides a payment to communities that close rail crossings, with a bonus for closing more than one, the team recommended closing both crossings. Their preliminary design work focused on the infrastructure changes needed to successfully close either location. They also proposed a set of local infrastructure improvements that might help secure support for the closures from the local community. Conceptual level costs for the work associated with the crossing closures was a little over $400,000, which could be offset somewhat by the MDOT incentives that could be as much as $300,000. As plans were refined the team also reviewed safety issues related to the existing crossings, the crossing closure areas, and local pedestrian traffic. This team recommended closure of two crossings, the first at Lapeer St, the second at N. 23rd St. Although only the Lapeer St closure is required for the current unit train proposal, the N. 23rd closure would allow more flexibility in the yard operations and advancing both in a single public process may save time and resources. The team's work also revealed a level of trespassing activity in the yard area which could be addressed through infrastructure changes, combined with coordination with local police and stepped up law enforcement. Proposed infrastructure improvements include fencing like that illustrated by the red line in Figure 3-5, vegetative barriers at crossing closure locations, creation of park areas with parking on some of the abandoned street pavement, and installation of vehicle gates at yard entrances. Final estimated costs for the site work associated with the crossing closures is a little over $300,000.

The fall structures and spring site teams also took a preliminary look at the work required to rehab the existing locomotive turntable. They recommended a two-phase approach that would allow continued access to at least two stalls in the round house during construction. Turntable work should take place after the construction of the new locomotive wash and inspection facility, as that facility could be used for some locomotive maintenance activities during rehab of the turntable.

Figure 3-5: Proposed Site Security Upgrades

3.4. Conclusion and Statement by the Lake State Railway Company on project outcomes

In conclusion, the students provided a first look toward various improvements at the LSRC property. Overall, the project would be dependent on the closing of the Lapeer St crossing, which would require a public process to get buy in from the City of Saginaw. The student work could be provided as a starting point to an engineering firm for final design work, and eventual construction if LSRC and the City agree, and if funding is available.

Overall, this project was considered a win-win situation. LSRC got a valuable first look at some alternatives for yard improvements and the students got an excellent opportunity to work through the issues associated with developing a project "from the ground up". The following is a statement by the LSRC on their perspective to the project outcomes.

"The collaboration with Michigan Tech student teams encouraged our company to put serious consideration for the planned improvements. While the company didn't proceed with all recommendations, an immediate outcome was to use the work as a foundation for detailed analysis

on improvement needs and opportunities with an engineering consultant. This analysis resulted in an approximately $2 million investment that concentrates on track modifications and improvements and results in significantly better track utilization and operational efficiencies in the yard. The project is in progress and may continue in the form of drainage improvements, as also recommended by the students."

SECTION 4: Michigan Rail Conference

Pasi Lautala, Ph.D, P.E.
David Nelson, P.E.
Modeste Muhire, Graduate Student Assistant

4. Background

The annual Michigan Rail Conference (MRC) organized by the Michigan Tech Rail Transportation Program in collaboration with Michigan Department of Transportation started in 2013 with a goal of bringing together different stakeholders in Michigan to discuss ways toward stronger rail transportation system. The annual conferences locations have been rotated across the state. The 2013 conference took place in Lansing at the Lansing Community College West Campus, with over 170 participants, including the speakers/ presenters and those who used a real time webcast provided as part of the program. The following conference took place in Warren at the Macomb Community College, and had over 130 attendees. MRC 2015 was held in Grand Rapids at the Grand Valley State University Eberhard Center, with over 90 people in attendance. The fourth annual MRC, hosted by Northern Michigan University at Marquette, had over 190 participants. All major players in the rail transportation industry have participated, including railroad companies, consultants, suppliers, government institutions, and community representatives.

4.1. Development of Michigan Rail Conference 2013-2016

Table 4-1 summarizes the key aspects of the conference and how it has evolved over the past four years. The final program of each year's conference is provided in Appendix B. The format of the conference ensures that different perspectives and sides are explored in order to get an accurate picture of state of the railroad transportation in the state. The topics typically covered include passenger and freight rail, rail crossing safety, and upcoming trends in rail. The importance of the conference can be highlighted by the increasing level of support it has received from the major stakeholders in the rail industry. For instance, the organizing committee has grown from six people at the start to twenty people from different stakeholder groups and the private sponsorships levels have been steady since their introduction in the second conference in 2014. The following paragraphs provide additional discussion on the conference development.

Table 4-1: Michigan Rail Conference Summary table (2013 to 2016)

	MRC 2013	MRC 2014	MRC 2015	MRC 2016
LOCATION	Lansing, MI	Warren, MI	Grand Rapids, MI	Marquette, MI
Conference Theme				
Attendance (presenters and total)	113 in-person, 33 real-time webcast attendees, and 29 speakers	133 in person and 29 speakers	61 people and 29 speakers	140 people and 32 speakers
Plenary Sessions	State of Rail in Michigan	Rail Education and Work Force Development in Michigan	Gathering Momentum, Challenges and Opportunities before us	Future of Rail in Michigan
	Rail-A key Element of the Transportation System	Opportunities for Building Collaborative partnerships	Railroad-Highway Grade Crossings	Preserving, Maintaining and Enhancing Michigan Rail assets
	FRA update			
Breakout session titles and panel discussion topics	Freight Rail Transportation and Economic Development	Railroad as part of Supply Chains	Railroad shipper panel	UP Rail Operators
	Rural and Light Density Freight Rail	Rail Transit, Commuter Rail, and other Passenger Rail Development	Passenger rail panel	Passenger Operations in an Era of Lean Public Investment
	Michigan Passenger Rail Projects	Transloads and Rural Development	Trends in Rolling stock	UP Shippers
	Terminal Development	Passenger Rail, Economic Development and the brain drain	Rail Advocacy Groups, Challenges and Opportunities	Economic Development

	MRC 2013	MRC 2014	MRC 2015	MRC 2016
	Rail and Transit Oriented Development	An overview of Rail Funding Programs and Practices		UP Tech Companies Supporting the Rail Industry
				Shortline Operations
Keynote Speaker	**Tom Carper, Amtrak** *Amtrak Passenger Rail Transportation Update*	**Tony Hatch, ABH-Consulting** *Railroad Renaissance in the New Energy World*	**Joe Szabo, Chicago Metropolitan Agency for Planning** *Strengthening the Region's Rail Network*	**Mr Tom Baldini -Board of Trustees Michigan Tech** *Last 30 years of UP Economic Development* **Mr. Frank Patton , Great Lakes Basin Transportation** *Great Lakes Basin RR*
Organizing Committee	Please refer to the attached conference agenda	Please refer to the attached conference agenda	Please refer to the attached conference agenda	Please refer to the attached conference agenda
Sponsorship		Norfolk Southern, Amtrak, CSX, Corridor Capital, Talgo, CN, CP, Balfour Beatty, Transystems, Bergmann Associates	Keolis, Quandel Consultants, Amtrak, NS, CSX, Lake State Railway, Talgo, Bergmann Associates, TransSystems, Customer First, Wake Up Washtenaw, Gorail, Sawyer, ERS, HNTB, Siemens	Quandel, Escanaba&Lake Superior, CN, NS, Sawyer International Airport, Lake State Railway, CSX, Longyear, Watco companies, GATX, ERS, MARP, Bergmann Associates, GS Engineering
Field Trip		M-1 street car project, NS Livernois Rail Yard, Intermodal and Autorack Ops, Dearborn Amtrak station	Fulton Street Crossing Project, Steel Pro Grand Rapids Steel Distribution Facility, Amtrak station, Rapid Central Station, Grand Elk Terminal Facilities	Humboldt Mill, Mineral Range RR, KI Sawyer& Potlatch Rail Ops, E&LS Car Shop, CN Yard/ Rotary Dumper, Delta Manufacturing
Registration Fee	$50 (flat fee)	$75 (conference)/ $25 (Field trip)	$75 (Early registration)/ $100 (Regular)/ $125 (Late)/ $25 (field trip)	$100 (Early registration)/ $125 (Regular)/ $175 (Late)/ $35 (field trip)

	MRC 2013	MRC 2014	MRC 2015	MRC 2016
Other Development		• Field trips included as part of the conference as requested by previous attendees • Sponsorship Introduced		• Golf outing as an additional networking opportunity
Positive reviews	• Opportunity to learn about the industry • Networking opportunity • Great presentation	• Good networking opportunity • Good meeting layout • Good material	• Good networking event • Good update on rail issues in Michigan • Enjoyable conference	• Good material content • Smooth registration process • Great networking opportunity
Areas for improvement	• Increase options to attend sessions of interest • More involvement by private companies • More networking opportunities • Provide agenda in advance	• Provide list of attendees before the meeting • Target other states in the USA and in Canada using social media • More information about upcoming rail projects	• Field trips in more populated and industrial areas • more networking opportunities • a full day dedicated to field trips	• Provide agenda and the list of attendees well in advance • include open bar as a networking opportunity • more manageable agenda

The main objective of plenary sessions has been provided updates on general issues affecting rail transportation in the state and the nation. The breakout sessions have been loosely divided between passenger and freight areas, although several thematic sessions have also been included on annual basis. The conference has been able to attract well-knows experts as keynote and session speakers on versatile topics and the key entity in securing quality speakers and topics has been the conference organizing committee. As an additional service, those stakeholders who haven't been able to participate in the conference are provided both the presentation materials and recorded presentations through Michigan Tech's online Rail Learning system (http://rail-learning.mtu.edu/courses) [1].

From financial perspective, the main objective has been to maintain the registration fees low, so financial considerations won't limit public participation. One of the key strategies to do this has been organizing the conference at public institutions (universities and community colleges) which allow low costs for space and meals. At the same time, the conference has shifted toward financial sustainability by incorporating corporate sponsorship since 2014. Another major development since 2014 has been the inclusion of field trips which have been very popular (extra per person fee was introduced to cover the costs). Annually, almost 50 percent of participants have also come early/stayed for field trips. The latest developments have been the inclusion of student scholarships and golf outing. While neither has been greatly successful over their first years, the plan is to continue them in 2017 conference.

4.2. 2015-2016 Conference Feedback

Each conference has collected feedback from the participants to ensure annual improvement in conference organization. As revealed in Table 4-1, the content and networking opportunities have been regularly praised for the conference. Each year has also received numerous suggestions for improvements and organizing committee regularly tries to incorporate those in the next conference. For example, 2016 had extended field visits due to popular request in 2015.

4.3. Conclusion

Michigan Rail Conference has filled a void in the state as the leading annual event that allows multiple stakeholder groups to come together and discuss current topics affecting rail transportation. Michigan Tech's and MDOT's leadership, together with strong cooperation from numerous stakeholder groups has allowed versatile programs that have attracted variety of conference participants. As a testimony on the impact of the conference is the on-going discussion on expanding the conference in 2017 to include several mid-west states. There's clearly a need for this type of forum in the State of Michigan/Midwest and Michigan Rail Conference has successfully taken the first steps in fulfilling that need.

4.4. References

1. "Courses". *Michigan Tech High Speed Rail Learning System*. N.p., 2016. Web. 18 Oct. 2016.

Abbreviations and Acronyms

CN	CN Railway (corporate parent is "CN Railway Company")

E&LS	Escanaba and Lake Superior
FRA	Federal Railroad Administration
LLC	Limited Liability Company
LS&I	Lake Superior and Ishpeming Railroad
MDNR	Michigan Department of Natural Resources
MDOT	Michigan Department of Transportation
MRR	Mineral Range Railroad
NURail	National University Rail Center
RTP	Rail Transportation Program (at Michigan Technological University)
OST-R	USDOT Office of the Assistant Secretary for Research
DOT	Department Of Transportation
UTC	University Transportation Center
NCHRP	National Cooperative Highway Research center
LCA	Life Cycle Assessment
LCCA	Life Cycle Cost Analysis
EIA	Economic Impact Analysis
BCA	Benefit Cost Analysis
FHWA	Federal Highway Administration
USEPA	United States Environmental Protection Agency
ASCE	American Society of Civil Engineers
LSRC	Lake State Railway Company
TRT	TRT International, an international freight forwarding company based in US
MHF	MHF services, a packaging, transportation and logistics provider
RailTEC	University of Illinois Rail Transportation and Engineering Center
CSX	CSX Corporation, rail-based transportation services provider

TEDF	Transportation Economic Development Fund (State of Michigan)
FEDP	Freight Economic Development Fund (State of Michigan)
FITSEVAL	Florida Intelligent Transportation Systems Evaluation tool
ITS	Intelligent Transportation Systems
IDAS	ITS Deployment Analysis System
HERS-St	Highway Economic Requirements System - State version
MBCA	Multimodal Benefit Cost analysis
CAL-BCA	California Benefit Cost Analysis tool
SEAT	Simplified Economic Analysis Tool
TREDIS	Transportation Economic Development Impact System
SEMCOG	Southeast Michigan Council of Governments
VMT	Vehicle Miles Travelled
VHT	Vehicle Hours Travelled
HOV	High Occupancy Vehicle
HOT	High Occupancy Toll
NPV	Net Present Value
VOC	Volatile Organic Compound
CO_2	Carbon Di-Oxide
FAF	Freight Analysis Framework
GDP	Gross Domestic Product
MRC	Michigan Rail Conference
UP	Upper Peninsula of Michigan
CP	Canadian Pacific Railway
NS	Norfolk Southern Railway
ERS	Engineered Rail Solutions

HNTB	HNTB Corporation, an architecture, civil engineering consulting and construction management firm
GATX	GATX Corporation, a leading railcar lessor company
MARP	Michigan Association of Railroad Passengers
GHG	Green House Gas
NO_x	Mono Nitrogen Oxides (NO, NO_2)
ISO	International Organization for Standardization
GREET	Greenhouse gases, Regulated Emissions and Energy in Transportation, a full life-cycle model from Argonne National laboratory
GWP	Global Warming Potential
IPCC	International Panel on Climate Change
HP	Horse power
HMA	Hot Mix Asphalt
RTC	Rail Traffic Controller, a computer program that simulates movement of trains rail networks

Appendix A – Final Student Team Posters

Appendix B – Michigan Rail Conference Final Programs 2013-2016

Lake State Railway Development Project
Drainage Improvements

CE4905 Advisor: David Nelson
Jed Mattmiller (PM), Adam Danielson, Samuel Pilla

Client Background

- Lake State Railway Company (LSRC)
  - LSRC owns and operates about 300 miles of track
  - Tracks serve Bay City, Midland, Flint, Gaylord, and Alpena
  - Common products include coal, chemicals, fertilizer, steel and grain
- Project: Drainage System Design
- Location: Saginaw, MI

Location of LSRC Rail Yard

LSRC Rail Yard

Project Scope

- Assess the drainage problems that LSRC has been experiencing
- Design a drainage solution for the LSRC rail yard in Saginaw Michigan
- Determine the drainage areas where water can be discharged into a drainage system
- Determine pipe sizes that will have the capacity for the hundred year storm

Frozen Storm Water

Frozen Track Switch

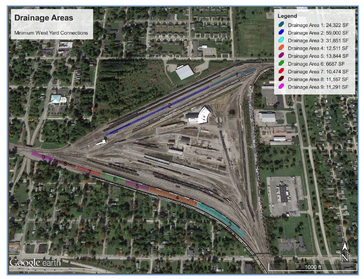
Site Visit

Objectives

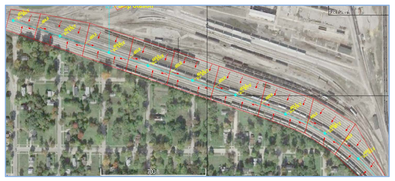
- Receive an overall understanding of the railyard and its operations
- Assess the drainage issues in the East Yard
- Assess the drainage issues in the Center Yard
- Assess the drainage issues in the West Yard
- Perform measurements on existing drainage structures
- Meet with the Engineering Department at the City of Saginaw

Drainage Areas

- Each access road was divided into several drainage areas
- The East Yard had 7 drainage areas
- The West Yard had 2 drainage areas
- Each drainage area was graded to a central drainage point
- Each drainage point will have a catch basin



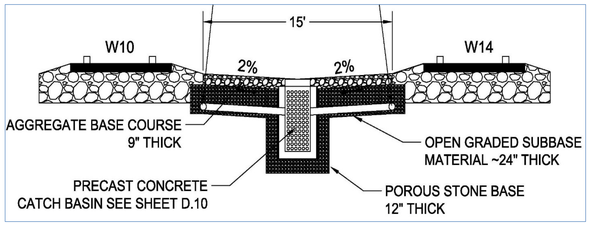
Drainage Areas



Grading Scheme in East Yard

Pipe Design

- Manning's equation was used to determine minimum pipe diameter
- 10 inch pipes will be used through out the yard to ensure ease of construction
- Pipe lengths were determined based on distance from catch basin to city storm sewer manhole



Detailed Catch Basin Cross Section With Underdrain

Additional Considerations

- The rail yard has to maintain capacity to store rail cars
- Water pooling is saturating the subgrade and fouling the ballast
- During the winter the stagnant water in the access roads is a safety hazard due to freezing
- Due to freezing, switches in the yard are at risk of being inoperable

Recommendations

East Yard

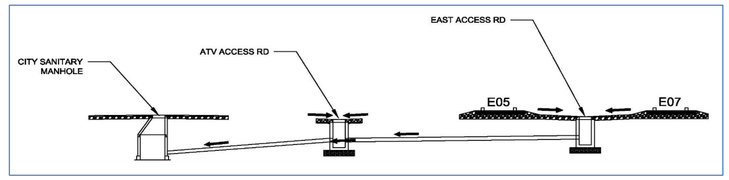
- Grade the access road to create low points
- Place catch basins that lead to combined city sewer system
- Additional underdrain
- Place catch basins in parallel ATV access road

Center Yard

- Maintain current system

West Yard

- Grade access road to create low points
- Place catch basins that discharge to combined city sewer system
- Additional underdrain



General Cross Section of Drainage Pipe in East Yard

Cost Analysis

- Phase 1.1- Improvements to the East Yard
- Phase 2- Improvements to the West Yard
- Phase 1.2- Improvements to ATV Access Road

Cost Estimate	
Phase 1.1	$160,000
Phase 2	$235,000
Phase 1.2	$75,000
Total	$470,000

Conclusions

AJS has assessed Lake State's drainage issues and has developed detailed improvement plans to correct them. With the implementation of the drainage improvements, rainfall on the access roads will be discharged into the city combined sewer system.

Lake State Railway Development Project
General Site Improvements

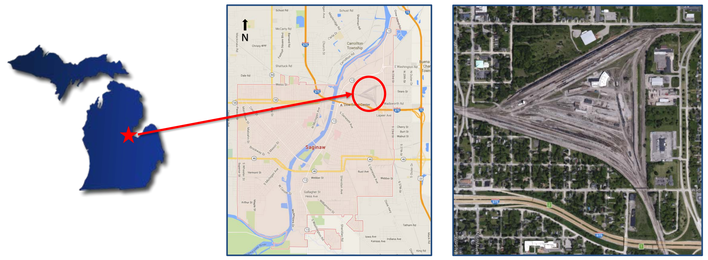
CE4905 Advisor: David Nelson

Allen Eizember (PM), Mikalah Blomquist, Nicole Phillips, Jacob Wood

KEWEENAW BAY CONSULTING

Client Background

- Lake State Railway Company (LSRC)
  - LSRC owns and operates about 300 miles of track
  - Tracks serve Bay City, Midland, Flint, Gaylord, and Alpena
  - Common products include coal, chemicals, fertilizer, steel & grain
- Project: Development Plan & Conceptual Design
- Location: Saginaw, MI



Saginaw, MI

LSRC Railyard

Project Scope

- Improvements required to support the unit train concept
- Provide residents with community improvements
- Site plans and construction details for work supporting crossing consolidation
- Investigate improvements to the locomotive turntable support infrastructure
- Explore snow removal options for the locomotive turntable pit

Site Visit

- Perform Visual Inspection of:
  - Road crossings conditions
  - Access to railyard
  - Pedestrian movement
  - Fencing locations
  - Security options
- Conduct traffic studies on intersections of Lapeer Ave., Janes Ave., and North 23rd St.
- Locomotive turntable inspection and measurements

Existing Condition of LSRC Turntable

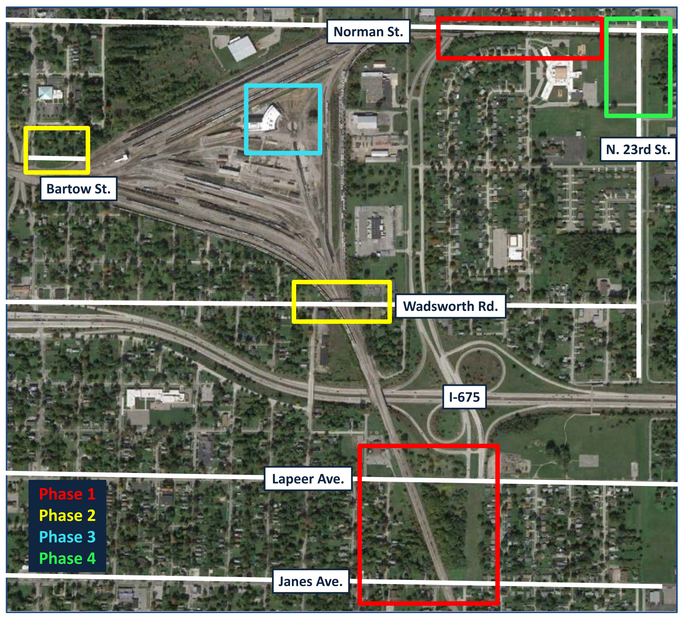
Pedestrian Overpass at Norman St

Cost Analysis

- MDOT provides funding incentives for crossing closures:
  - Ranging from $50,000 to $150,000
  - Additional 25% is available for two simultaneous road closures
  - Incentives go toward transportation related projects determined by the City of Saginaw
- Cost Estimate:
  - Phase 1: Lapeer Ave. Closure and Norman St. Improvements
  - Phase 2: LSRC Access Road Entrances at Bartow St. and Wadsworth Rd
  - Phase 3: LSRC Turntable Renovation and Ramp Installation
  - Phase 4: North 23rd St. Closure
  - Phase 5: Additional Considerations

Cost Estimate	
Phase 1	$ 148,000
Phase 2	$ 83,000
Phase 3	$ 76,000
Phase 4	$ 36,000
Total Cost (Phase 1-4) with Contingency	**$ 376,000**
Phase 5	$ 85,000

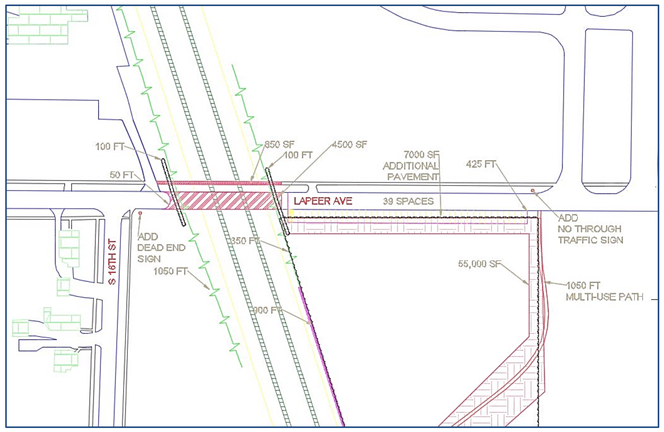
Proposed Site Plan



Recommended LSRC Railyard Improvements

Recommendations

- Road closures at Lapeer Ave. and North 23rd St.
  - Closures will not interfere with emergency or operational vehicle access to the yard



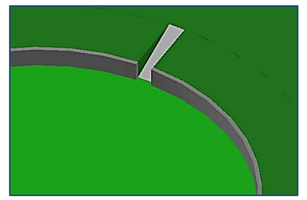
Lapeer Ave. Crossing Improvements

- Addition of multi-use path and sidewalk rehabilitation
- Installation of:
  - Chain link and Montage Invincible Fence around site
  - Security cameras with Passport IS Roll Gate at access roads

Passport IS Roll Gate

Montage Invincible Fence

- Turntable retaining wall renovation and snow removal ramp construction



Turntable Snow Removal Ramp

Precast Concrete Retaining Wall

Conclusion

- KBC is proposing multiple improvements for the storage of unit trains and upgrades around the railyard. Closures are recommended at Lapeer Ave and North 23rd St. Turntable design focused on the retaining wall renovation and construction of a snow removal ramp.

Michigan Tech

Rail Transportation Program
Michigan Tech Transportation Institute • Michigan Technological University

MDOT Michigan Department of Transportation

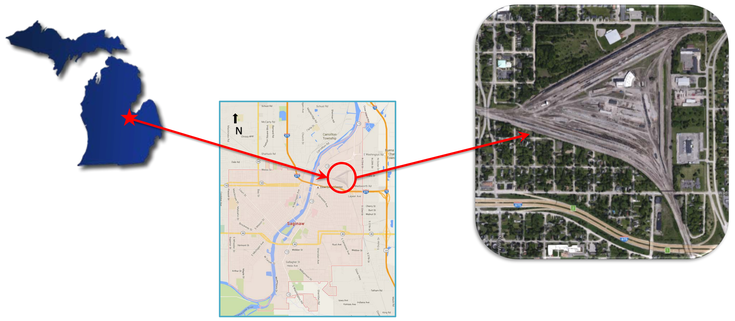
NURail Center

Lake State Railway Development Project
Structural Improvements

CE4905 Advisor: David Nelson
Joseph Meemken (PM), Jacob Logan, Zachary Scalzo

Client Background

- Lake State Railway Company (LSRC)
  - LSRC owns and operates about 300 miles of track
  - Tracks serve Bay City, Midland, Flint, Gaylord, and Alpena
  - Common products include coal, chemicals, fertilizer, steel and grain
- Project: Development Plan & Conceptual Design
- Location: Saginaw, MI



Project Scope

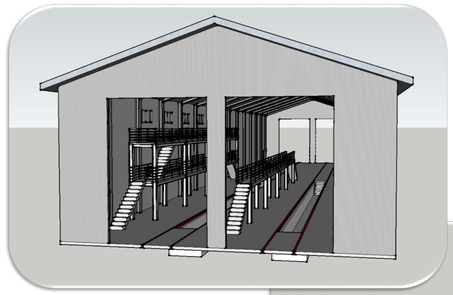
- Structural Improvements within the rail yard
- Provide an indoor locomotive washing area
- Provide a way for the employee to wash the entire locomotive efficiently and safely
- Encompass an area for the locomotives to be inspected and maintained
- Provide an indoor storage area for locomotives to be kept warm and out of the weather
- Design a facility that will provide space to be utilized for storage and equipment mobility

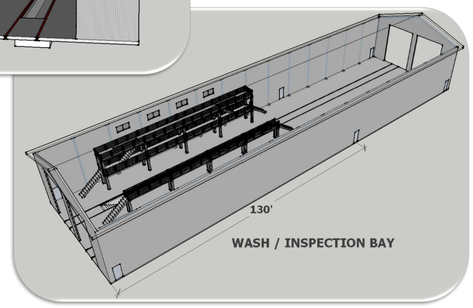
Site Visit

- Determine the operations of the existing Locomotive Wash Station
- Measure rail spacing as well as any obstructions within the proposed building area
- Understand the operations of the existing facilities on site
- Determine the provisions for the new facility from the client and the rail yard employees

Locomotive Wash / Inspection Facility

- Encompasses an area to wash locomotives indoor
- Provides the ability to inspect and maintain the locomotives as needed
- Provides space for the movement of materials and equipment within the building
- Includes space for storage of tools and supplies used in daily operations

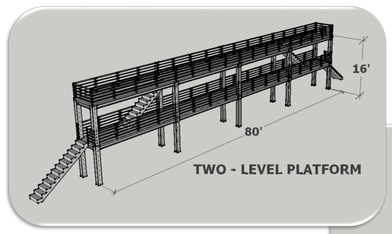


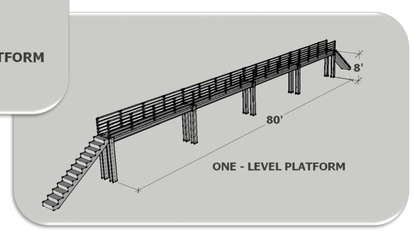


Wash Area Total Cost	
$	1,375,000

Wash Platforms

- Provides access to the entire locomotive exterior
- Allows employees to wash the locomotive efficiently and safely
- Adequate storage space beneath the platform for tools and supplies

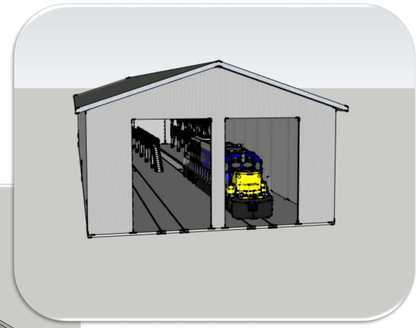


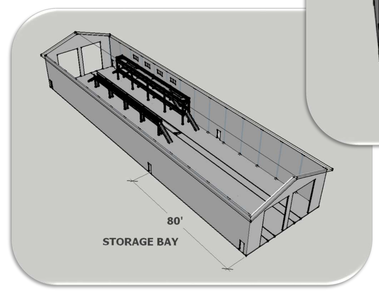


Two - Level Cost	$	133,000
One - Level Cost	$	59,000
Platform Total Cost	$	192,000

Locomotive Storage Area

- Adequate storage space for 2 locomotives
- Provides space for mobility of equipment
- Allows locomotives to be stored in heated space to minimize fuel consumption



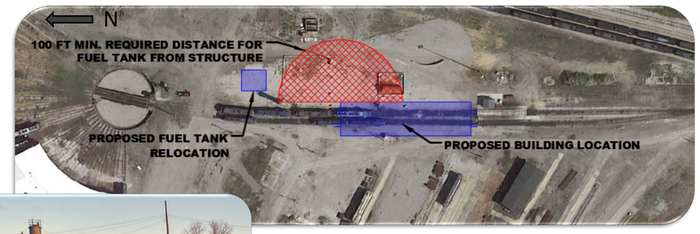


Storage Area Total Cost	
$	505,000

Final Cost Analysis

- Existing fuel tank needs to be relocated 100 ft. away from the proposed building

Wash Area Cost	$	1,375,000
Two - Level Platform Cost	$	133,000
One - Level Platform Cost	$	59,000
Storage Area Cost	$	505,000
Fuel Tank Relocation Cost	$	32,000
TOTAL COST	$	2,104,000



Future Opportunities

- Expansion of storage area to accommodate four locomotives

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MDOT Michigan Department of Transportation
NURail Center

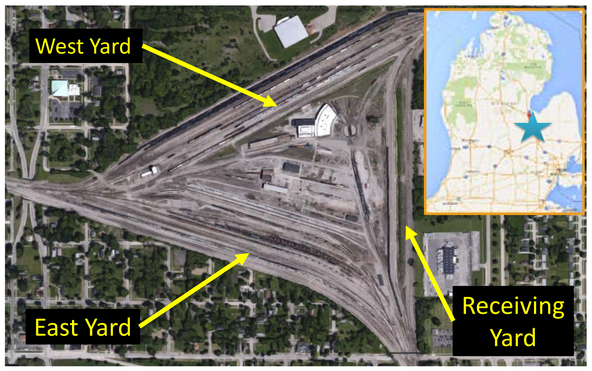
Lake State Railway Development Project
Railyard Improvements

CE4905 Advisor: David Nelson
Alec Sturos (PM), Kris Turunen, Tyler Arends, Luke Tolkkinen

Introduction

- Lake State Railway is a short line railway company operating in the Eastern part of Lower Michigan.
- Own and operate roughly 300 miles of track.
- Services extend all the North to Gaylord and as far South as Alpena.
- Serve grain, fertilizer, coal, chemical, and steel industries.
- 45,000 car loads in 2014 and expected to grow rapidly.

Scope of Project

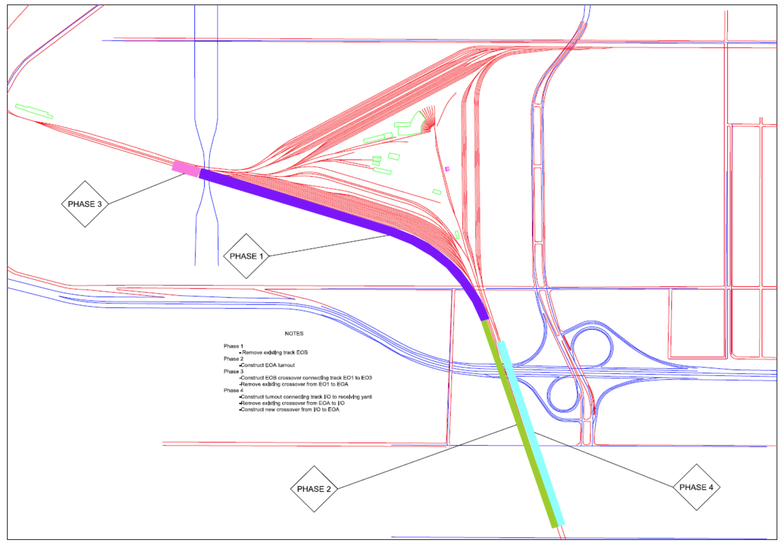


- Lake State Railway would like to accommodate unit trains from both the coal and grain industries
- Rail operations must continue throughout the yard.
- Must limit obstructions to surrounding roads and pedestrian travel.

Site Visit

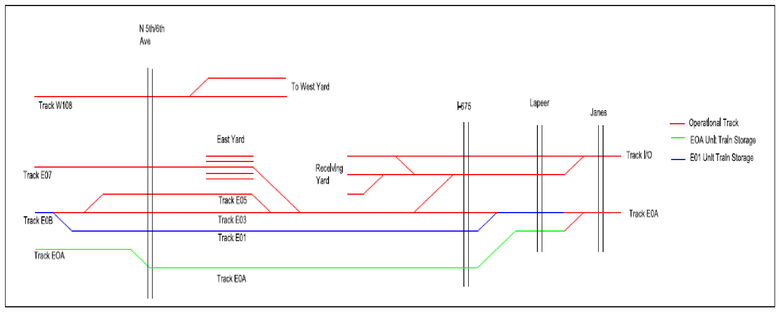
- Visited Railyard on January 29th, 2016
- Completed relative survey for rail elevations
- Discussed proposed design options
- Determined client needs from Mr. John Rickoff

Recommended Railyard Phasing Plan



Final Design Schematic

- A Schematic is a linear representation of the rail yard
- It is used to for easier comprehension of the improvements to the railyard
- Below is our schematic after the improvements have been made
- With the changes being made, two unit trains will be stored on tracks EOA (Green) and EO1 (Blue)
- Each track allows for 7300 ft. of storage



Recommended Design

- **East Yard Unit Storage**
  - Closes Lapeer Ave. South of yard
  - Provides an excess amount of salvaged track to reduce costs
  - Does not interfere with existing operations
  - Follows all CSX guidelines

Overall Costs

Material	Total Cost
New Track	$ 148,500.00
Relay Track	$ 460,625.00
Salvage Track	$ 9,212.50
Ties	$ 299,968.00
Plates	$ 93,568.00
Spikes	$ 15,984.00
Anchors	$ 2,600.00
Joint Bars	$ 23,836.00
Bolts	$ 2,090.00
Welding	$ 94,400.00
Ballast	$ 82,800.00
Subballast	$ 71,750.00
Subtotal:	$ 1,305,333.50
20% Contingency:	$ 261,066.70
Total Cost:	$ 1,566,400.20

Acknowledgements

Our team would like to thank Mr. David Nelson for his assistance, as well as Mr. Robert Goodheart from Pathfinder Engineering. We would also like to thank our client, Mr. John Rickoff of Lake State Railway for his cooperation and advice during this partnership.

2013 Annual Michigan Rail Conference Program

Lansing Community College
West Campus Conference Center

August 27th, 2013

Welcome

Conference Co-Chairs Nikkie Johnson and Pasi Lautala

The Michigan Rail Conference is the first step in a collaborative effort to bring stakeholders together to discuss issues related to passenger and freight rail transportation development in the State of Michigan. Rail transportation is drawing notable attention in the United States and the State of Michigan is no exception. A glance at the program demonstrates how vast and widespread the issues related to rail transportation are and we hope that today will initiate meaningful discussions among stakeholders that continue well beyond the conference. A single day is not sufficient to address every topic of interest, so we used a stakeholder survey to identify the topics in greatest demand. We have been able to recruit a remarkable group of nationally recognized speakers who are eager to share their expertise toward the development of rail in Michigan.

We are deeply indebted to our speakers for volunteering their time, to our conference content committee who selected the final topics and presenters, and to our conference organizing team from Michigan Department of Transportation and Michigan Technological University, who handled all coordination under tight time lines. We also want to acknowledge the financial support from the Michigan Department of Transportation, U.S. Department of Transportation through the National University Rail Center (NURail), and Michigan Technological University in making this first conference a reality. We are excited to see so many stakeholders participate in the conference, either in person or via our live web conference and we hope that today turns into an annual event to support the development of the rail transportation system in Michigan.

Welcome to the conference!

Organizers and Content Committee

Jon Cool, Michigan Railroads Association

Ron DeCook, DeCook Governmental Policy & Strategies

Tim Fischer, Michigan Environmental Council

Nikkie Johnson, MDOT

Pasi Lautala, Michigan Tech Rail Transportation Program

Dennis Neilson, Michigan State University

Michigan Rail Conference Program

Morning Session

7:30 AM - 8:15 AM	**Breakfast**
8:15 AM - 8:30 AM	**Welcome and Safety Briefing** Safety Briefing and Opening Statement, Pasi Lautala, Michigan Technological University Welcome Note by State Senator Tom Casperson, Chair, Senate Transportation Committee
8:30 AM - 10:15 AM	**Plenary Sessions** **Moderator: Pasi Lautala, Michigan Technological University** *State of Rail in Michigan*, Joe Schwarz, Former Michigan Congressman and Governor's Special Advisor on Rail *Rail- A Key Element of the Transportation System*, Anne Canby, OneRail Coalition *FRA Update*, Tammy Wagner, Federal Railroad Administration
10:15 AM - 10:30 AM	**Break**
10:30 AM - 11:30 AM	**Panel Discussion: Freight Rail Transportation and Economic Development** **Moderator: Scott Pohl, WKAR Public Media from Michigan State University** Jim Byrum, MABA Bruce Southerland, MAC, Inc. Dale Yates, CSX John Rickoff, Lake State Railway Roger Velliquete, Great Lakes Packing Libby Ogard, PrimeFocus LLC David Closs, Michigan State University
11:30 AM - 12:45 PM	**Box Lunch & Keynote Speaker** Welcome Note by State House Representative Wayne Schmidt, Chair, House Transportation Committee Keynote Address: *Amtrak Passenger Rail Transportation Update*, Tom Carper, Amtrak

Keynote Speaker
Tom Carper
Amtrak

Afternoon Session

Breakout Sessions (Passenger & Freight)		
12:45PM - 2:00 PM	**Freight Breakout 1** **Rural and Light Density Freight Rail** **Moderator: Jon Cool, Michigan Railroads Association** *Northern Michigan Rail Studies*, Tim Hoeffner, MDOT; Pasi Lautala, Michigan Technological University *Freight Rail Economic Development*, Libby Ogard, PrimeFocus LLC *CN Midwest Developments*, Tom Tisa, CN	**Passenger Breakout 1** **Michigan Passenger Rail Projects** **Moderator: Tim Fischer, Michigan Environmental Council** *Ann Arbor to Detroit Commuter Rail*, Mayor John O'Reilly, City of Dearborn *Woodward Avenue Light Rail*, Heather Carmona, M-1 Rail *MDOT Accelerated Rail Update*, Tim Hoeffner and Mohammed Alghurabi, MDOT
2:00 PM - 2:15 PM	**Break**	

continued →

afternoon session continued

Breakout Sessions (Passenger & Freight)		
2:15PM - 3:30 PM	**Freight Breakout 2** **Terminal Development** **Moderator: Nikkie Johnson, MDOT** *The Detroit Intermodal Terminal (DIFT)*, Terry Stepanski, MDOT *Improving Rail Freight at the Detroit-Windsor Border*, Marge Byington, Continental Rail Gateway *Rail Transloading Facilities: Development, Promotion and Operation*, B. Allen Brown, Railmark Holdings	**Passenger Breakout 2** **Rail and Transit Oriented Development** **Moderator: Ron DeCook, DeCook Governmental Policy and Strategies** *The River District: Implementing a New Vision for Portland, Oregon's North Downtown*, Roger Millar, Smart Growth America *Place Based Economic Development: The Case for Transit-Orientated Development*, Laura Aldrete, Parsons Brinckerhoff *Transit Oriented Development and Amtrak Service Expansion,* Tom Carper, Amtrak
3:30 PM - 4:00 PM	**Wrap Up and Next Conference Discussions**	

(6.5) Professional Development Hours (PdH) available for participation including Certificate of Completion. Certificates will be provided when conference evaluation forms are turned in at the end of the conference. Acceptance of this certificate of attendance is at the discretion of each individual licensing, credentialing or certifying body. Some certifying bodies require pre-approval of professional development hours. Documentation requirements also vary. Please note that individuals are responsible for maintaining their own professional development hours documentation.

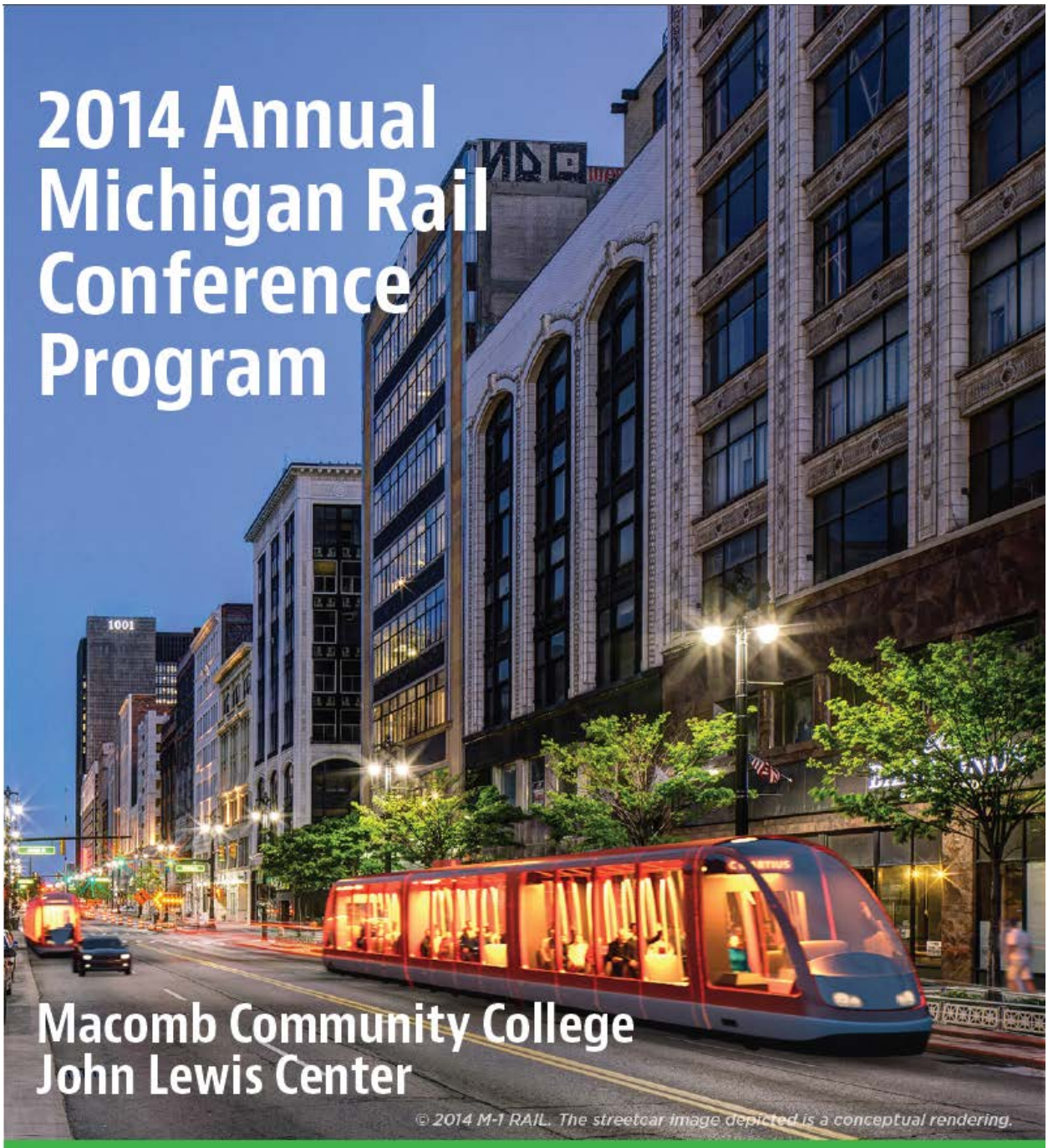
2013 Annual Michigan Rail Conference Collaborators:

MDOT
Michigan Department of Transport

NURail Center

Rail Transportation Program
Michigan Tech Transportation Institute • Michigan Technological University
Michigan Tech

2014 Annual Michigan Rail Conference Program



Macomb Community College
John Lewis Center

© 2014 M-1 RAIL. The streetcar image depicted is a conceptual rendering.

August 26 - 27th, 2014

Welcome

A special greeting from conference co-chairs:

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Welcome to the conference!

- Nikkie Johnson and Pasi Lautala

Michigan Rail Conference Technical Program | August 26th

7:30 - 8:00 AM | Breakfast

8:00 - 8:15 AM | Welcome & Safety Briefing

8:15 - 8:30 AM | Welcomes from Visiting Dignitaries

8:30 – 10: 00 AM | Plenary Session – Rail Education & Work Force Development In Michigan

Pasi Lautala -
Assistant Professor and Director, Rail Transportation Program,
Michigan Technological University
"University Railroad Engineering Programs"

Frank Dunbar -
District Provost, Regional Program Planning,
Wayne County Community College District
"Community College Programs for Rail Transit Technicians"

Nicholas Little -
Managing Director, Railway Management Program,
Michigan State University
"University Railroad Management Programs"

David Peterson -
Program Director,
University of Wisconsin – Madison, Engineering and Professional Development
"TRB Rail Workforce Development Study and UW-M Continuing Education Program"

10:00 – 10:15 AM | Break

10:15 –11:30 AM | Plenary Panel Discussion – Opportunities for Building Collaborative Partnerships

John Varda -
Managing Partner/CEO, Ross and Stevens, S.C
"Shipper's Perspective (WI Central Group)"

Derrick James
Director, Government Affairs (Midwest), AMTRAK
"Passenger Perspective"

Pete Fontana
Industrial Dev. Mgr., Norfolk Southern Railroad
"Freight Perspective"

Tim Hoeffner
Director, Office of Rail, MDOT
"State DOT Perspective"

Libby Ogard
President, Prime Focus, LLC.
"Consultant Perspective"

11:30 AM –12:30 PM | Networking Lunch

12:30 – 2:00 PM | Breakout Sessions* #1 – Railroads as part of Supply Chains

Peter Anastor
Managing Director, Logistics, Supply Chain and Manufacturing, MEDC
"How Supply Chain Collaboration can Reduce Cost, Time and Risk"

Rick Chapla
VP, Business Development, The Right Place, Inc.
"Grand Rapids Intermodal Terminal Development"

John Taylor
Chair, Dept. of Marketing and Global Supply Chain Mgmt, Wayne State University

Roger Huff
Ford Manager, Global Customs, Material Export Operations and Logistics, Ford
"Railroads as Part of Automotive Supply Chain"

Breakout Sessions* #2 – Rail Transit, Commuter Rail, & other Passenger Rail Development

Tim Fischer
Chief Administrative Officer, M-1 Street Car
"M1 Progress and Start Plan"

James Bruckbauer
Transportation Policy Specialist, Michigan Land Use Institute
"Getting Back on Track: Uncovering the Potential for Trains in Traverse City"

Kristian Foondle
Rail Project Manager, MDOT
"WALLY Feasibility Study"

Phil Pasterak
Senior VP/Transit & Rail Manager, Parsons Brinkenhoff
"Commuter Rail Development Experiences from Other States"

2:00 – 2:15 PM | Break

2:15 – 3:30 PM | Breakout Sessions* #3 – Transloads & Rural Development

Shasta Duffey
VP Sales and Marketing, Grand Elk RR
"Local Railroads Perspective"

Pasi Lautala
Assistant Professor and Director, Rail Transportation Program, Michigan Technological University
"The Upper Peninsula of Michigan Freight Rail Study"

Nikkie Johnson
Freight Rail Economic Development & Operations Program Manager, MDOT
"Northern Michigan Freight Rail Needs Analysis"

Frederick Schlemmer
CFO, SteelPro
"Rail Transportation – Transload Operator Perspective"

Breakout Sessions* #4 – Passenger Rail, Economic Development & the Brain Drain

Ben Sperry
Asst. Professor, Dept. of Civil Engineer, Ohio University
"Michigan Amtrak Services: Passenger Characteristics and Economic Impacts"

Kevin Brubaker
Deputy Director Environmental Law & Policy Center, Chicago
"Michigan manufacturing capacity for High Performance Train Parts"

Richard Murphy
Program Coordinator, Michigan Municipal League
"Rails Role in Placemaking and Talent Attraction"

Derrick James
Director, Government Affairs (Midwest), AMTRAK
"Economic Development from Rail Operations in Michigan"

3:30 – 3:45 PM | Break

3:45-4:30 PM | Closing Session

Libby Ogard

"An Overview of Rail Funding Programs and Practices"

Wrap up by Conference Chair

Conference Feedback and Next Conference Discussion

4:30 – 5:30 PM | Business Break and Networking

5:30 – 7:00 PM | Dinner & Keynote Speaker

Tony Hatch
CEO, ABH Consulting

"Railroad Renaissance in the New Enegry World"

*** brief presentations followed by panel discussion***

Field Trip Schedule | August 27th

- 7:30 AM | Depart Macomb Community College
- 8:00 – 8:30 AM | M-1 Streetcar Project
- 8:45 – 9:15 AM | Livernois Rail yard and Intermodal Ops visit
- 9:35 – 10:05 AM | Tour Station
- 10:05 – 10:15 AM | Break
- 10:30 – 11:00 AM | Observe/Discuss Autorack ops.
- 11:10 – 11:30 AM | Allen Road Yard visit/discussion
- 9:15 – 9:35 AM | Travel to new Dearborn Amtrak Station
- 11:30 – Noon | Return to Macomb Community College

Map

We can certify up to 6.5 hours of contact time to use towards professional development. Check at conference registration as you leave the conference to get a certificate.

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Michigan Tech Rail Transportation Program

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2014 Annual Michigan Rail Conference Organizers:

MICHIGAN RAIL CONFERENCE

Conference Program

3rd Annual Michigan Rail Conference

Grand Valley State University, Grand Rapids, MI

August 19 - 20th, 2015

Welcome

A special greeting from conference co-chairs:

We're pleased to welcome you to the Michigan Rail Conference. We're also excited to introduce Grand Rapids as the third host city for the conference, as we believe that recent rail development in the region provides a perfect setting toward continuing dialog on the future of Michigan's rail transportation system.

Based on the positive feedback on last year's conference topics and format, we have sustained our panel-oriented structure for the sessions and we hope that it facilitates an active dialog between the audience and presenters. Some of the topics covered today have already been touched in two earlier conferences, but we're especially excited to include new areas in this year's program, including rolling stock trends and transportation challenges beyond the boundaries of rail transportation.

As always, we are deeply indebted to our speakers for volunteering their time and expertise and to our Conference Planning Committee that included several new members (please review the names on the last page of the program). We would like to thank Grand Valley State University for hosting the event, Experience Grand Rapids for providing their local expertise for the preparations, and our industry stakeholders for providing their facilities for field visits. We'd also like to recognize Dave Nelson and his team from Michigan Tech, who handled all key logistics and coordination for the conference. Finally, we would like to recognize our industry sponsors, the Michigan Department of Transportation, and the U.S Department of Transportation through the National University Rail Center (NURail). Without their financial support, we could not have organized the conference while keeping the registration fees at a minimum.

If the best way to success is increased knowledge, we strongly believe that today's discussions on rail transportation systems and related technologies, challenges and advances are a step to right direction. Since we can only address a limited number of topics in a single day, we will "stay on track" toward our ultimate vision; making the Michigan Rail Conference the primary rail event for the State of Michigan. We hope you enjoy the 3rd Annual Michigan Rail Conference and we hope even more that you'll return next year to the 4th Annual Michigan Rail Conference, in Michigan's beautiful Upper Peninsula!

Welcome to the conference!

- Nikkie Johnson and Pasi Lautala

Michigan Rail Conference Field Visit | August 19th

1:00 – 4:30 PM | See back page for schedule

Michigan Rail Conference Technical Program | August 20th

7:30 – 8:00 AM | Breakfast

8:00 – 8:15 AM | Welcome & Safety Briefing

Pasi Lautala
Assistant Professor & Director, Rail Transportation Program, Michigan Tech Univ.

Nikkie Johnson
Freight Rail Economic Development & Operations Program Manager, MDOT

8:15 – 8:30 AM | Welcome from Visiting Dignitaries

State Senator Peter MacGregor
Senate District 28

State Representative Winnie Brinks
House District 76

8:30 – 10:00 AM | Plenary Session – Gathering Momentum, Challenges and Opportunities Before Us

Polly Kent
Michigan DOT Intermodal Policy Division Administrator
"Transportation Funding Picture"

David Austin
Analyst, Congressional Budget Office, Microeconomic Studies Division
"Pricing Freight Transport to Account for External Costs"

Andy Doctoroff
Special Projects Advisor, Office of Governor Snyder
"Statewide Logistics and Supply Chain Asset Study"

10:00 – 10:15 AM | Break

10:15 – 11:30 AM | Plenary Panel Discussion – Railroad-Highway Grade Crossings

Curtis Stewart
Education Chairman, Michigan Operation Lifesaver
"OLS Perspective"

Kris Foondle
Local Crossing Project Manager, MDOT Office of Rail
"State DOT Perspective"

Stephen Klinger
Highway Crossing Signal Engineer, NS Railroad
"Class 1 Perspective"

John Chipala
Chief Engineer, WATCO Ann Arbor Railroad
"Short Line Perspective"

David Nelson
Senior Research Engineer, Michigan Tech
"Crossing Research in the U.S."

11:30 AM – 1:00 PM | Networking Lunch and Keynote Speaker – Mr. Joe Szabo

Executive Director
Chicago Metropolitan Agency for Planning
"Strengthening the Region's Rail Network"

1:00 – 2:30 PM | Breakout Sessions* #1 – Railroad Shipper Panel

Brian Brink
Vice President, Brink Farms
"Agri-Business Perspective"

TBD
CHS/Hamilton Farm
"Agricultural Co-operative"

Nikkie Johnson
Economic Development & Freight Operations PM
"Rail Related Economic Development"

Randy Warner
North American Logistics Supervisor at Amway
"Local Shipper Perspective"

I. Howard Smith
Wayne County Community College District Rail Program Faculty
"Auto Industry Perspective"

1:00 – 2:30 PM | Breakout Sessions #2 – Passenger Rail

Joe McAndrew
Policy Director, Transportation for America
"US Trends in Passenger Rail"

Michael Benham
Special Assistant for Strategic Planning, Ann Arbor Area Transportation Authority
"North South Commuter Rail"

Kathy Waters
American Public Transportation Association
"APTA Perspective"

David Simpson
Chair, TRB Committee on Intercity Passenger Rail
"TRB Rail Perspective"

2:30 – 2:45 PM | Break

2:45 – 4:15 PM | Breakout Sessions* #3 – Trends in Rolling Stock

Mark Duve
Mechanical Engineer of Locomotive Design, NS Railroad
"Trends in Power"

Tom Klimek
VP Marketing, Escanaba & Lake Superior Railroad
"Freight Car Manufacturing in Michigan"

Matt Keck
Senior Sales Representative, The Andersons
"Car Owner Perspective"

Josh Coran
Director of Operations, Talgo Inc.
"Passenger Rolling Stock"

Larry Salci
Management Consultant – Transportation
"Passenger Fleet Overview"

2:45 – 4:15 PM | Breakout Sessions* #4 – Rail Advocacy Groups, Challenges and Opportunities

Larry Krieg
Chair, Michigan Association of Railroad Passengers
"MARP Perspective"

Jennifer Kalczuk
Chair APTA Marketing and Communications Committee
"APTA Perspective"

Michael Lamb
Friends of WALLY
"Friends Perspective"

Larry Lloyd
State Director for Michigan, GoRail
"Freight Rail Advocacy"

Jim Bruckbauer
Policy Specialist, Groundwork Center for Resilient Communities
"Traverse City By Train?"

4:15 – 4:30 PM | Break

4:30 – 5:00 PM | Closing Session

Rick Chapla
VP, Strategic Initiatives, The Right Place
"Closing Thoughts from Grand Rapids"

Wrap-Up, Feedback and 2016 Conference Discussion by Conference Chair

5:00 – 6:00 PM | Networking Reception

brief presentations followed by panel discussion

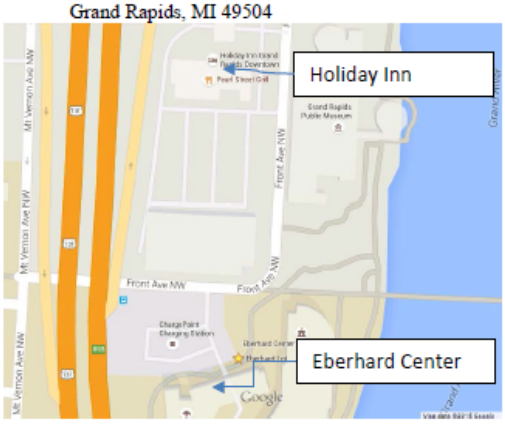
Field Trip Schedule | August 19th

1:00 PM	Depart - Front of Eberhard Center
1:05 PM	Fulton Street Grade Crossing Project
1:30 PM	Steel Pro, Grand Rapids Steel Distribution Facility
2:10 PM	AMTRAK Station and the Rapid Central Station
3:15 PM	Railroad-Highway Grade Crossing
3:30 PM	Grand Elk Terminal Facilities
4:30 PM	Return to Eberhard Center

We can certify up to 6.5 hours of contact time to use towards professional development.
Check at conference registration as you leave the conference to get a certificate.

Conference Location:

Eberhard Center
Grand Valley State University
301 West Fulton
Grand Rapids, MI 49504



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Conference Planning Committee

Jon Cool	Nikkie Johnson	Ron DeCook	Shasta Duffey
Frank Dunbar	Nicholas Little	Pasi Lautala	Peter Fontana
Jennifer Kalczuk	Elizabeth Treutel	Derrick James	Libby Ogard

NURail Center
Rail Transportation Program
Michigan Tech Transportation Institute • Michigan Technological University
MDOT Michigan Department of Transportation

MIRC 2016

MICHIGAN RAIL CONFERENCE

Aug. 17-18 • Marquette, MI

Conference Program

4th Annual Michigan Rail Conference

Northern Michigan University, Marquette, MI

August 17—18, 2016

Welcome

A Special Greeting from the Conference Co-Chairs:

We're excited to welcome you to the 4th Annual Michigan Rail Conference and it is our privilege to bring our conference to the beautiful Marquette in the Upper Peninsula (UP) of Michigan. While UP is today probably most notorious of its nature and beauty, rail transportation has and continues to form an important part of transportation network.

This year's conference will continue its action-packed schedule and versatile array of topics that includes a specific UP twist. We also recognize and highlight the connection between rail transportation and other modes, as well as its importance as part of the economic development.

Despite our remote location from metropolitan areas, we have a stunning group of speakers, who volunteer their time and expertise in expanding the understanding of rail transportation in state. We are also greatly in debt to the members of our Conference Planning Committee that its work for organizing this year's conference as soon as 2015 conference was completed and to Dave Nelson and his team from Michigan Tech whose sound coordination turns all the pieces into a complete conference experience. Northern Michigan University (NMU) has been an excellent partner in setting up the event, but perhaps the greatest thank you goes to our sponsors and field visit hosts, the Michigan Department of Transportation (MDOT), and the U.S Department of Transportation through the National University Rail Center (NURail). It is this support that allows us to keep the conference costs down, making it available to a great range of stakeholders.

As conference co-chairs, we believe that Michigan Rail Conference provides an important platform to continue the development of rail transportation in Michigan. We are confident that you'll find the day of discussions captivating and we hope that following field visits can demonstrate the importance of rail transportation in the UP. We also hope that you take the information and message from the conference and use it in your daily activities to educate others in the aspects related to rail transportation, and to guide the discussions related to the topic…….and more than anything else, we hope we will also see you in the 5th Annual Michigan Rail Conference.

Welcome to the conference!

Michigan Rail Conference Technical Program | August 17th

7:15 – 7:45 AM **Breakfast & Registration** **(Lakes Rooms)**

8:00 – 8:15 AM **Welcome & Safety Briefing** **(Lakes Rooms)**

Pasi Lautala
Assistant Professor & Director – Rail Transportation Program, Michigan Tech

Nikkie Johnson
Freight Rail Economic Development & Operations Program Manager, MDOT

8:15 – 8:30 AM **Welcome from Visiting Dignitaries** **(Lakes Rooms)**

8:30 – 9:45 AM **Plenary Session – Future of Rail in Michigan** **(Lakes Rooms)**

Moderator: Nick Little, Michigan State University

Tim Hoeffner
Director, MDOT Office of Rail
"State Perspective"

Keith Borman
VP & General Consul, American Short Line and Regional Railroad Association
"Freight Rail Perspective"

Ray Lang
Chief – State Government Relations, Amtrak
"Passenger Perspective"

9:45 – 10:00 AM **Break** **(Vendor Area, Lakes Rooms)**

10:00 – 11:15 AM **Plenary Panel Discussion – Preserving, Maintaining and Enhancing Michigan Rail Assets** **(Lakes Rooms)**

Moderator: Nikkie Johnson, MDOT

Libby Ogard
President, PrimeFocus LLC
"Financing Rail Infrastructure Improvements"

Pasi Lautala
Assistant Professor & Director – Rail Transportation Program, Michigan Tech
"Michigan Infrastructure Commission/ Supply Chain Commission"

Leslie Blakey
President, Coalition for America's Gateways and Trade Corridors
"FAST Act Impacts"

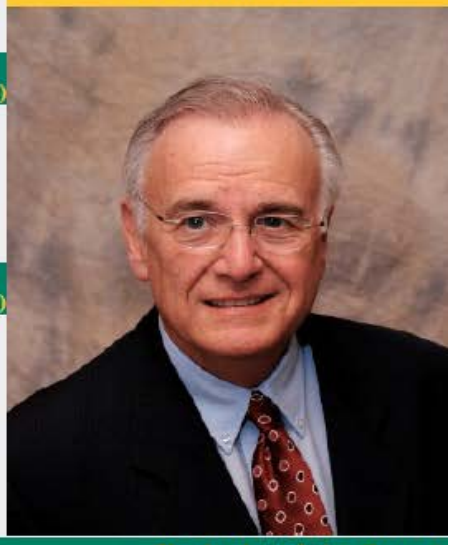
Kris Foondle
Project Manager
MDOT Office of Rail
"New Crossing Surface Program"

11:15 AM – 12:45 PM Networking Lunch and Keynote Speaker (Lakes Rooms)

Introduction by: Jeff Ratcliffe, Keweenaw Economic Development Alliance

Mr. Tom Baldini
Member – Board of Trustees, Michigan Tech
"Last 30 Years of U.P. (Economic) Development"

Mr. Tom Baldini
Board of Trustees, Michigan Tech



12:45 – 2:00 PM Breakout Session #1A – UP Rail Operators (Lakes Rooms)

Moderator: David Nelson, Michigan Tech

Brian Buchanan
Manager Network Strategies
CN Railroad

Tom Klimek
Vice President – Marketing
Escanaba & Lake Superior (E&LS) Railroad

Clint Jones
President
Mineral Range Railroad

12:45 – 2:00 PM Breakout Session #1B – Passenger Operations In an Era of Lean Public Investment (Pioneer Rooms)

Moderator: Kajal Ravani, Trans4M

Chad Cushman
VP – Business
Indian Trails, Inc.
"Amtrak Thruway in theUP: Private Operators Providing Public Service"

Chris Bagwell
Executive VP and General Manager
Great Lakes Central Railroad
"GLCR: Restoring Passenger Service in Northern Lower Michigan"

Larry Krieg
Chairman, Mich Assoc of Rail Passengers
"Michigan Passenger Rail Overview"

Frank Loetterle, PhD, AICP
Project Manager—Passenger Rail Office,
Minnesota DOT
"Northern Lights Express"

2:00 – 2:15 PM Break (Vendor Area, Lakes Rooms)

2:15 – 3:30 PM Breakout Sessions #2A – UP Shippers (Lakes Rooms)

Moderator: Libby Ogard, Prime Focus, LLC

Jake Hayrynen
Forest Products Manager
JM Longyear

Joe Petrocik
Transportation Coordinator
Eagle Mine, Lundin Mining

Scott Robbins
Director of SFI and Forest Policy
Michigan Forest Products Council

2:15 – 3:30 PM Breakout Sessions* #2B – Economic Development (Pioneer Rooms)

Moderator: Shasta Duffey, Watco Companies

Gabe Meyer
Attorney/Advisor
Surface Transportation Board
"New Developments in Rail/Trail/Rail"

Mike Logan
Vice President – Mechanical Engineering Escanaba &Lake Superior Railroad
"Rolling Stock Rehab/Modification"

Wendy Gehlhoff
Director
Florence County Economic Development
"Rail Development in Rural MI/WI (Northwoods Rail Transit Commission)"

Jodi Heath
Shortline Development Manager, Norfolk Southern
"Class I Railroad Perspective"

3:30 – 3:45 PM Break (Vendor Area, Lakes Rooms)

3:45 – 5:00 PM Breakout Sessions* #3A – UP Tech Companies Supporting the Rail Industry (Lakes Rooms)

Moderator: Aaron Dean, Michigan Tech

Justin LaCosse
Project Engineer, GS Engineering

Steve Mattson
President, GLSV Inc.

Phil LaTendresse
Engineering Manager, Pettibone Traverse Lift, LLC

Glen Barna
President, IR Telemetrix Inc.

Mr. Frank Patton
Great Lakes Basin Transportation, Inc.

3:45 – 5:00 PM Breakout Sessions* #3B – Shortline Operations (Pioneer Rooms)

Moderator: Alex Lakenen, Michigan Tech

Keith Borman
VP & General Counsel, American Short Line and Regional Railroad Association
"ASLRRA Perspective"

Richard Kedzior
Railroad Programs Specialist, Wisconsin DOT
"State of Wisconsin Experience"

John Rickoff
CEO, Lake State Railway
"Michigan Railroads Association (MRA)"

Shasta Duffey
V.P. Marketing & Sales, Watco Companies
"Shortline Holding Company"

5:00 – 5:30 PM Closing Session (Lakes Rooms)

Wrap-Up by Conference Chair, Pasi Lautala
Conference Feedback and Next Conference Discussion

5:30 – 6:30 PM Social Period & Student Posters

6:30 – 8:00 PM Dinner and Keynote Speaker (Lakes Rooms)

Introduction by: Libby Ogard, Prime Focus, LLC

Mr. Frank Patton
Managing Partner, Great Lakes Basin Transportation, Inc.

Field Visit| August 18th (preregistration Required)

TIME	DETAILS
7:15 am - 7:30 am	Departure from Marquette (depending on location)
8:10 am – 9:30 am	Humboldt Mill and Mineral Range
10:00 am - 11:20 am	KI Sawyer & Potlatch
12:00 pm - 3:30 pm	Escanaba Visits (E&LS Car Shop, CN Yard/Rotary Dumper, Delta Manufacturing)
4:30 pm - 4:45 pm	Return to Marqutte

**Times are estimated, visits done in assigned subgroups

Driving Directions to the University Center, NMU

- Once in Marquette, follow the signs for "Downtown Marquette"
- Once on W. Washington St, turn North onto N. 4th Street (opposite Little Caesar's)
- N. 4th Street becomes Presque Isle Ave.
- Turn left onto W. Kaye Ave (the University Center will be on the right)

Conference Location: University Center, NMU

1401 Presque Isle Ave, Marquette, MI 49855

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Conference Planning Committee

Laurel Burchfield—Trans4M, Jon Cool—Michigan Railroad Association, Aaron Dean—Michigan Tech, Ronald DeCook—Strategic Communications Solutions, Shasta Duffey—Watco Companies, Frank Dunbar—Wayne County Community College District, Derrick James—Amtrak, Nikkie Johnson—MDOT, Jennifer Kalczuk—The Rapid—Grand Rapids, Amanda Kerttu—Michigan Tech, Tom Klimek—Escanaba & Lake Superior Railroad, Larry Krieg—Michigan Association of Rail Passengers, Pasi Lautala—Michigan Tech, Nicholas Little—Michigan State University, Larry Lloyd—GoRail, David Nelson—Michigan Tech, Libby Ogard—Prime Focus LLC, Jeff Ratcliffe—Keweenaw Economical Development Alliance, Kevin Soucie—Canadian National Railroad