Appendix C – Alternatives Analysis Methodology

Technical Memorandum on Proposed Criteria and Measure of Effectiveness with Supporting Methodology

1.0 Introduction

The purpose of this task is to identify reasonable and feasible rail alternatives for the Milwaukee-Twin Cities Corridor. The alternatives analysis shall evaluate the Project Study Area of passenger rail alternatives that was previously identified under the Cooperative Agreement No. DTFR53-09-H-0009 between the Federal Railroad Administration and Wisconsin Department of Transportation (Midwest Regional Rail Initiative Phase 7).

2.0 Proposed Action

The goals and objectives of previous high speed intercity passenger rail studies conducted since 1989 in this corridor and throughout the MWRRI are reflected in the draft Purpose and Need developed for this project. As noted in the 2004 Executive Report for the Midwest Regional Rail Initiative, the primary purpose of the MWRRS is to meet current and future regional travel needs through significant improvements to the level and quality of service.

The draft Purpose and Need, developed by the Minnesota and Wisconsin Departments of Transportation, cites that the purpose of the proposed action is to meet future regional travel needs in the Milwaukee-Minneapolis/St. Paul corridor through improvements to the level and quality of regional passenger rail service and providing connections to other existing and planned transportation systems, including the Milwaukee-Madison Passenger Rail Connection, Northern Lights Express High Speed Passenger Rail, Commuter Rail, Light Rail Transit (LRT), Bus Rapid Transit, and the roadway network. The proposed action offers an opportunity to provide reliable and competitive passenger rail service as an attractive alternative transportation choice between Milwaukee and Minneapolis/St. Paul by achieving the following goals:

1. Decreasing travel times,
2. Increasing frequency of service,
3. Providing safe and reliable service,
4. Providing amenities to improve passenger ride quality and comfort.
5. Improved overall system connectivity in the interstate transportation network in conformance with statewide and regional transportation plans
6. Accessibility to major population centers,
7. An alternative that minimizes capital and operating costs, and
8. An alternative that avoids, minimizes, or mitigates environmental impacts

3.0 Identification of Potential Passenger Rail Alternatives

Each alternative rail route in the Project Study Area is initially evaluated using evaluation criteria and measure as detailed in Table 1. An evaluation matrix, attached as Appendix A, is completed and each route is measured and compared and given a qualitative rating. Unfavorable alternative rail routes are eliminated from further consideration. This screening results in the identification of the "potential passenger rail alternatives".

Table 1 –Evaluation Criteria and Measure to Identify Potential Passenger Rail Alternatives

Evaluation Criteria	Measure
Route Distances	Miles between end points of alternative routes
Route Populations	Population within a 20-mile bandwidth
Route Defects	Number of obstructions within abandoned right-of-way

The method used to reduce rail routes in the study area to the "potential passenger rail alternatives" will be presented to the public and stakeholders at seven (7) meetings throughout Minnesota and Wisconsin. Furthermore, the method that will be used to reduce the "potential passenger rail alternatives" to the set of "reasonable and feasible passenger rail alternatives" will be presented. Public input will be accepted. Any public input concerning additional routes that should be considered will be reviewed, and, if necessary, modifications will be made to the potential rail alternative results. Public input will be documented and included in the Alternative Analysis report as an Appendix.

4.0 Identification of Reasonable and Feasible Passenger Rail Alternatives

The "potential passenger rail alternatives" are further developed and subjected to a more robust quantitative screening and evaluation process to identify the "reasonable and feasible alternatives". The planning and engineering development of these routes includes:

1. Geometric data and information on the quantity of tracks, existing freight density and existing permissible freight speeds for each alternative are collected. Based on this technical data, the speed profiles and route travel times are developed for each alternative.
2. Population centers, interstate crossings, commercial airports for each route will be geographically illustrated.
3. Freight conflicts on each route, the extent of shared track usage, handoffs, and existing signals and communications systems for each route
4. Number of rail-rail crossings and number of at-grade crossings for each alternative rail route
5. Connections to commuter rail and other modes of transportation for each potential alternative rail route

6. Cost to upgrade each potential rail alternative based on existing track infrastructure conditions.
7. The operating maintenance and cyclic capital costs broadly estimated based using the Summary of Midwest Regional Rail System Maintenance Costs developed in MWRRI Phase 6 and is based upon the FRA Technical Monograph: Estimated Maintenance Costs for Mixed High Speed Passenger and Freight Rail Corridors dated August 2004.
8. GIS and Geospatial Data Collection and Mapping to assess the potential impacts of the following key environmental criteria on each alternative route: floodplains, wetlands, historic, cultural, and archaeological sites, 4(f)/6(f) protected properties, threatened or endangered species, hazardous materials, and areas that are likely to engender issues of environmental justice. Refer to the Methodology to Identify Environmental Concerns for the Milwaukee to Twin Cities Corridor attached as Appendix B.

The technical data developed for each "potential passenger rail alternative" will be used to evaluate and measure each route against a baseline route. The baseline route will be the MWRRI route using Canadian Pacific Railway from Milwaukee to Watertown; the right of way owned by WisDOT between Watertown and Madison; and the right of way of CPR from Madison to Portage-La Crosse to Minneapolis/St Paul.

The evaluation criteria and measure listed below in Table 2, developed from the goals and objectives associated with the MWRRI and the draft Purpose and Need, shall be modified as necessary based on the final purpose and need developed for this project. A corresponding evaluation matrix (Appendix A) and each route is measured and compared against the baseline and given a qualitative rating. Unfavorable alternative rail routes are eliminated from further consideration.

Table 2 - Evaluation Criteria and Measure to Identify Reasonable and Feasible Passenger Rail Alternatives

Evaluation Criteria	Measure
Route Characteristics	• Number of tracks • Horizontal and vertical curvature • Significant grades • Miles/Percent of single vs. double track • Miles/Percent abandoned and out-of-service track • Miles/Percent Class 1 main vs. secondary and shortline
Travel Time	• Travel time at 110 mph (after accounting for recovery, dwell, and handoff times)
Market Size	• Population centers served • 20-mile bandwidth • Intermodal station outside terminal area
Capital Cost	• Cost to upgrade to high-speed rail (order of

	magnitude) • Cost of additional right-of-way (order of magnitude) • Cost to acquire railroad right of way(order of magnitude) • Cyclic capital costs (order of magnitude)
Operating Costs	• Track maintenance costs (order of magnitude)
Safety	• Number of rail-rail crossings • Number of at-grade crossings
Reliability	• Freight conflicts (yards, etc.) • Shared track use (capacity) • Handoffs from Class 1-Class 1 • Handoffs from Class 1-shortline • Train Control • Public Ownership of Route
System Connectivity	• Commuter rail use • Modal connections
Environmental Features	• Potential impacts of: o Floodplains o Wetlands o Threatened or Endangered Species o Cultural resources o 4(f)/6(f) protected properties o Environmental justice o Hazardous materials

A workshop with representatives of FRA, MNDOT, and WisDOT will be held to review the data and rank the "potential passenger rail alternatives" and to identify the "reasonable and feasible passenger rail alternatives" for further analysis in the Tier 1 EIS.

The results of the workshop will be presented to the public and stakeholders at a second series of seven (7) meetings throughout Minnesota and Wisconsin. All public comments will be documented and modifications will be made by FRA, MNDOT, and WisDOT, if deemed necessary. Public comments will be included in the appendices of the Alternatives Selection Report.

5.0 Alternative Selection Report

An Alternatives Selection Report will be prepared and submitted to FRA for review and approval. The report will clearly indicate why and how the identified range of potential passenger rail alternatives were evaluated using the Measures of Effectiveness to identify the reasonable and feasible passenger rail alternatives for rigorous evaluation in the EIS.

Appendix A: Evaluation Matrix

Appendix B: Methodology to Identify Environmental Concerns

Appendix A – Evaluation Matrix

Identification of Potential Passenger Rail Alternatives Evaluation Criteria

Evaluation Criteria	Data Sources	Measure	Rail Alternatives																							Link to Purpose and Need
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
Prior Study Conclusions are Valid		MWRRI Project Notebook																										
Route Distance	**North American Railroad Map**																											**4.2.1 Travel Time**
		Route Distance (miles)																										
Route Population	**US Census data from the year 2000**																											**4.1 Travel Demand**
		Population centers served 20-mile bandwidth																										
Route Defects	**Commercially available maps and Track charts**																											**3.0 Minimize Capital Costs**
		Presence of buildings in abandoned right-of-way																										
RESULT																												

Identification of Reasonable and Feasible Passenger Rail Alternatives Evaluation Criteria

Evaluation Criteria	Data Sources	Measure	Rail Alternatives										Link to Purpose and Need
			1	4	5	6	7	8	9	11	13	14	
Route Characteristics	**Rail Corridor Alternatives Analysis Tool (RCAAT)**												**4.2.1 Travel Time**
		Number of tracks Horizontal and vertical curvature (degree of curvature) Significant grades (% of grade) Miles/Percent of single vs. double track Miles/Percent abandoned and out-of-service track Miles/Percent Class 1 main vs. secondary and shortline											
Travel Time	**RCAAT**												**4.2.1 Travel Time**
		Travel time at 110 mph (after accounting for recovery, dwell, and handoff times) (hours-minutes)											
Market Size	**US Census (2000)**												**4.1 Travel Demand**
		Population centers served 20-mile bandwidth Intermodal station outside terminal area											
Capital Cost	**Quandel Consultants**												**3.0 Minimize Capital Costs**
		Cost to upgrade to high-speed rail Cost of right-of-way Cyclic capital costs											
Operating Costs	**MWRRI Project Notebook**												**3.0 Minimize Operating Costs**
		Track maintenance costs											
Safety	**RCAAT**												**4.2 Competitive and Attractive Service**
		Number of railroad crossings Number of at-grade crossing											
Reliability	**Track Charts**												**4.2 Competitive and Attractive Service**
		Freight conflicts (yards, etc) Shared track use (capacity) Permissible freight speed (mph) Handoffs from Class 1 - Class 1 Handoffs from Class 1 - shortline Train Control (type)											
System Connectivity	**MWRRI Project Notebook and State Rail Plans**												**4.3 Intermodal Connectivity**
		Commuter rail use (type) Modal connections (type and number)											
Environmental													**3.0 Avoid or Minimize Environmental Impacts**
Floodplains	**Digital Flood Insurance Rate Maps (DFIRMS)**												
		Resource name Regulation status Length of encroachment (linear foot or miles) Area of encroachment (square foot)											
Wetlands	**National Weltands Inventory, Wisconsin and Minnesota Wetlands Inventory**												
		NWI Category Total linear miles of wetlands adjacent to route Impact Area (acres)											
Threatened or Endangered Species	**Federally listed T/E species and State listed T/E species**												
		List of state and federal listed species that occur within a mile of the corridors Miles/feet of critical habitat adjacent to corridor List of unprotected significant natural areas adjacent to corridors List of federal, state, county, local, and non-profit managed areas adjacent to corridors Areas impacted (acres)											
Cultural Resources	**National Register of Historic Places, NRHP Study List, WI and MN Historical Societies (SHPO)**												
		# of archaeological sites adjacent to corridor Number of eligible or NRHP listed historic sites adjacent to corridor Number of sites impacted											
Section 4(f)/6(f)	**USGS GAP**												
		Resource name Section 6(f) designation Number of sites adjacent to corridor Number of sites impacted											
Environmental Justice	**US Census (2000), Bureau of Labor and Statistics**												
		Number of block groups within ½-mile of the corridors that contain a majority of low income or minority populations											
Hazardous Materials	**US EPA, WI CLEAN, MN Pollution Control**												
		# and type of sites adjacent to, and within a 1/4-mile of corridors # and type of sites impacted											
RESULT		**Advance/ Do Not Advance**											

Appendix B – Methodology to Identify Environmental Concerns for the Milwaukee-Twin Cities Corridor

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Technical Memorandum

Subject:	**Milwaukee – Twin Cities Identification of Reasonable and Feasible Passenger Rail Alternatives** **Midwest Regional Rail Initiative – Phase VII** **Methodology to Identify Environmental Concerns**
Prepared For:	**Wisconsin DOT, Minnesota DOT, Federal Railroad Administration**
Prepared By:	**Quandel Consultants, LLC**
CC:	
Date:	**July 28, 2010, Revised August 25, 2010**

The purpose of this memorandum is to summarize a method that can be used to document and present the major environmental concerns associated with the nine route alternatives surviving the Identification of Potential Passenger Rail Alternatives screening process in the Milwaukee-Twin Cities high-speed rail corridor. The addition of a high-level environmental analysis during the Alternatives Analysis phase of project development is intended to assist in the route screening process as well as take steps to begin the NEPA process which will result in a Tier 1 EIS and Service Development Plan.

The project stakeholders have identified seven (7) "Show Stopper" environmental factors to analyze at this stage of the alternatives analysis. The process of selecting reasonable and feasible alternatives for this federally designated corridor will be enhanced through this cursory environmental evaluation, which will present a comparative analysis between studied routes identifying the potential affected natural and human environmental conditions.

The key environmental issues to be evaluated in this assessment will include: Floodplains/Floodways, Wetlands, Threatened and Endangered Species, Historic/Cultural/Archaeological Resources, Section 4(f) and 6(f) Properties, Environmental Justice, Hazardous Material/Waste Constraints.

Affected Environment

The identification and presentation of the affected environment will be primarily GIS-based, supplemented with field observations at specific unique or sensitive areas. Geospatial data will be collected from the appropriate regulatory agencies and their subsequent databases. The collected data will then be combined using GIS software to produce a single-source, continuous strip map, centered on the rail corridor under study. The corridor map will be broken into a string of 11x17 color prints at a scale of 1:24,000 for the ease of distribution. This scale allows for approximately 6 miles of track length and 3.5 miles of lateral offset from the track centerline per page. For comparison purposes the estimated potential for environmental impacts of the proposed improvements within each study area will be based on three primary considerations: the actual footprint of possible improvements based on a

200-foot conceptual engineering corridor, the possibility of proximity impacts, and the fact that at this level of review the locations of many features are approximate. Proximity impacts come in several forms depending on the environmental feature being considered. Therefore, a potential impact zone or evaluation buffer width greater than the 200-foot conceptual engineering corridor will be used to evaluate possible impacts to known environmental features. This increased width allows for inclusion of features near and possibly within the future design corridor, and provides a "worst case" representation of the known environmental constraints possibly affected within each study area. The proposed method presents the project stakeholders with a detailed graphical representation of the defined environmental factors for use in their review of the potential route alternatives.

The types and amount of information available in geospatial format are in constant flux due to the rapid enhancement of federal and state initiatives to produce reliable and accessible digital GIS data. The most up to date information available during the contract timeframe will be used to represent existing conditions. Because of the broad scope of the National Environmental Policy Act, and the vast amounts of potential natural and human environmental resource impacts stemming from infrastructure enhancements such as rail corridor development, the need for a clear definition of relevant Tier 1 EIS data is of utmost importance. Therefore, the proposed Tier 1 EIS GIS map discussed in this memo will be limited to the types of data defined in the following text and Table 1 found in the Appendix.

Base Map Data: USGS 7.5 Minute

The existing environmental factors data will be placed in layers on a base layer which will consist of the USGS scanned Digital Raster Graphic (DRG) Topographic Quadrangle Maps, otherwise known as 'TopoQuads'. These high-resolution, 1:24,000 scale maps include information such as political boundaries, surface water boundaries and features, transportation features, general land use, significant community facilities, topography and other useful information. These maps were most recently updated in the 1970s and 1980s. Although many features may have changed since the latest revisions of the USGS TopoQuads, they do provide a reliable, government-certified base reference layer which will give the final map product a uniform background upon which the collected GIS data can be viewed. See the Appendix for a full list of features shown on the TopoQuads.

Environmental Data

Floodplains and Floodways:

Potential 100-year flood plains and flood hazard zones will be shown using the information from FEMA's National Flood Hazard Layer (NFHL) which depicts Digital Flood Insurance Rate Maps (DFIRM). This data will identify potential impacts to groundwater, streams, rivers, and standing bodies of water affected by high-speed train system alternatives. Floodplains and floodways will be quantified in terms of the number of linear miles of floodplains and floodways within a 200-foot band of the project centerline (100 ft. offsets from the project centerline).

Wetlands:

Wetlands, which are regulated under the Clean Water Act, will be portrayed using data from the US Fish

& Wildlife Service's National Wetland Inventory and the state DNR wetland inventories. The intent is to determine the approximate number and extent of wetland crossings (direct and indirect impacts) and wetland habitat types impacted by high-speed train system alternatives. Wetlands will be quantified by the acreage and category of NWI resources within a 200-foot band of the project centerline (100 ft. offsets from the project centerline).

Threatened and Endangered Species:

Threatened and endangered species of wildlife and plants, which are protected under the Endangered Species Act, will be depicted from data collected from the federally and state recognized threatened and endangered species lists. The main source for this information is The US Fish and Wildlife Service and state DNRs. The map will identify general locations of threatened and endangered species and sensitive habitat. Threatened and endangered species will be quantified by linear miles of critical habitat within a 1500-foot band of the project centerline (750 feet on each side of the project centerline).

Historic/Cultural/Archaeological Resources:

Any building, site or district protected by the National Historic Preservation Act will be shown on the map. These protected sites include anything listed on or eligible for the National and State Register of Historic Places, as defined by the National Park Service (NPS) and State Historical Preservation Offices (SHPO). Additionally, the map will portray areas with historic and prehistoric archaeological sensitivity affected by the proposed alignments. These areas are listed and monitored by the NPS and SHPO and covered by 4(f) protected land legislation. Impacts to cultural resources, particularly historic properties and districts include not only direct impacts to the historic property itself, but also indirect affects due to changes to the character, setting, and audible and visual landscape surrounding the property. Archaeological or structure data that intersect or fall on federally recognized tribal land are usually not shared by data providers. Historic, cultural, and archaeological properties will be quantified in terms of the number of sites within a 1500-foot band of the project centerline (750 feet on each side of the centerline.)

4(f)/6(f)-Protected Properties:

The corridor maps will depict any 4(f)/6(f) land protected by DOT Act of 1966 in a one-half mile buffer from track centerline. 4(f) protected properties are any publicly-owned land of a public park, recreation area, or wildlife and waterfowl refuge of national, State or local significance or any land of an historic site of national, State, or local significance (as determined by the Federal, State, or local officials having jurisdiction over the park, area, refuge, or site) within the meaning of section 4(f) of the DOT Act (49 U.S.C. 303(c)) as amended by the 2008 FHWA Final Rule located at 23 CFR 774 § 774.11. The Final Rule defines 4(f) lands further as:

- Federal lands or public land holdings (e.g. State forests)
- Historic Sites (see Historic and Cultural Resources)
- Archeological Sites (see Historic and Cultural Resources)
- Federally designated Wild and Scenic Rivers

- Section 4(f) applies to those portions of federally designated Wild and Scenic Rivers that are otherwise eligible as historic sites, or that are publicly owned and function as, or are designated in a management plan as, a significant park, recreation area, or wildlife and waterfowl refuge.

The source for 4(f) land GIS data is primarily mapping information collected by the National Gap Analysis Program (GAP), a USGS initiative. It is a nationwide program that collects and shares land management data for the purpose of enhancing biodiversity and reducing the number of species added to the threatened and endangered list. Although private conservancy lands are collected by the GAP stewards, they will not be included in this analysis.

Additionally, any 6(f) lands discovered along the corridor will be documented. 6(f) lands are defined as any recreational area or facility which was acquired or developed using Land and Water Conservation Fund (L&WCF) assistance through the NPS. The NPS will be relied upon for geospatial identification of any 6(f) lands that may be impacted by the proposed rail corridor.

Section 4(f) and 6(f) properties will be quantified as the number of properties adjacent to each alternative.

Environmental Justice:

The environmental justice analysis is based on identifying the presence of minority and low income populations within the defined study area. Concentrations of minorities and other special population groups in the study will be identified through analysis of U.S. Census 2000 data at both the county and the census tract level. The individual tract data will be compared to the countywide data to determine if any of the tracts would qualify as having large concentrations of minority or low income populations. The federal guidance for evaluating environmental justice issues is found in Guidance for Federal Agencies on Key Terms in Executive Order 12898, which was developed by the Interagency Working Group on Environmental Justice, August 1995. Based on this guidance, a tract in this study is categorized as having a large concentration of either minority or low income population if:

- At least 50 percent of the population in the census tract is minority or low income; or
- The minority or low income population in the tract is at least 10 percent greater than the average of the minority or low income population in the county.

Low income populations will be indentified with the annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty. Minority population is defined as "any readily identifiable groups of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who will be similarly affected by a proposed program, policy, or activity". Minorities include: Black, Hispanic, Asian American, American Indian and Alaskan Native.

Environmental justice areas also include all Economically Distressed Areas (EDAs). EDAs are defined in

the Public Works and Economic Development Act of 1965, amended in 1994. These areas are defined as areas that have a per capita income of 80 percent or less of the national average or if it has an unemployment rate that is, for the most recent 24-month period, at least 1 percent greater than the national average unemployment rate based on unemployment rates available from the U.S Bureau of Labor and Statistics.

The graphical representation of Environmental Justice data will be in the form of census block groups obtained from the US Census of 2000 depicting information as defined above. Environmental Justice populations will be quantified in terms of the number of block groups within a 1-mile band of the project centerline (2640 ft. on either side of the project centerline).

Hazardous Materials/Waste Constraints:
Hazardous materials/waste constraints will be identified as the number of superfund sites adjacent to each alternative route.

A rudimentary sample of the aforementioned proposed map is included in the Appendix. This sample shows one 11x17 sheet at the recommended scale showing data which is available to us at this time. The map is intended to show a rough representation of how GIS data and labels will look when placed over the USGS TopoQuad base layer. For comparative purposes, summary tables quantifying the affected environments identified by the GIS mapping will be supplied to the stakeholders.

Environmental Consequences

The next step beyond identifying the major environmental concerns in the rail corridor is identifying the coincidence of engineering improvements required to upgrade a route to high speed passenger rail operations and the sensitive environmental elements in the route and noting the potential impact.

APPENDIX

Table 1: GIS DATA COLLECTION

Data Category		Data Shown on Map	Data Sources
POLITICAL BOUNDARIES		State County Municipal	USGS ESRI
SURFACE WATER FEATURES		Rivers/streams Standing bodies of water (lakes)	USGS ESRI DNR FEMA
PROPERTY		Schools Hospitals Gov't facility Military Base Churches	USGS ESRI
TRANSPORTATION		Airport Interstate State Highway County Highway Local Roads	USGS ESRI
ENVIRONMENTAL	**Floodplains/ Floodways**	National Flood Hazard Layer (NFHL) Base Floodplain Elevations Q3 Flood zones	Digital Flood Insurance Rate Maps (DFIRMS)
	Wetlands	Marine Estuarine Riverine Lacustrine Palustrine	National Weltands Inventory Wisconsin Wetlands Inventory Minnesota Wetlands Inventory
	Threatened and Endangered Species	National Threatened/Endangered Species State Threatened/Endangered Species	Federally listed T/E species State listed T/E species
	Cultural Resources (Historic & Archeological)	Federally Registered Historic Properties State Listed/Eligible Historic Properties Native American Graves Historical Archaeology Sites Prehistoric Archaeology sites	National Register of Historic Places NRHP Study List WI Historical Society (SHPO) MN Historical Society (SHPO)
	Section 4(f)/6(f) Properties	Parks/ Recreational Land (Publically owned) Wildlife/waterfowl refuges Historically significant property Forests Tribal land DNR managed land Nature Conservation property Wild and scenic rivers	USGS GAP
	Environmental Justice	Minority Population block groups Poverty/ Low Income block groups Economically Distressed Areas	US Census (2000) Bureau of Labor and Statistics
	Hazardous Material/Waste Constraints	National Priorities List Superfund Sites (CERCLIS) RCRA CORRACTS State Hazardous Waste Sites LUST sites State Landfills	US EPA WI CLEAN MN Pollution Control

County Forest

County Forest

California

FAIRCHILD STATION

BUFFALO RIVER STATE TRAIL

Fairchild Pond

EAU CLAIRE CO
JACKSON CO

NORTH WESTERN

C & N W

OLD RAILROAD GRADE

Legend

- NRHP Listed Building
- EPA Listed Site
- Proposed High Speed Rail Route
- 4(f) Land
- Protected Areas

0 0.15 0.3 0.6 Miles

Example GIS Map for Tier 1 EIS