

7.5 Twin Cities Zone

The following table provides a list of transmission needs identified in the Twin Cities Zone and the map following the table shows the location of each item in the table. Each item is discussed in more detail in the sections following the map.

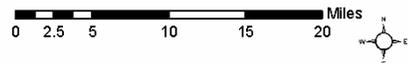
Twin Cities Zone

Tracking Number	Description	Projected In-Service Year	Need Driver	Section No.
2003-TC-N1	Aldrich to St. Louis Park	Phase 1 Completed March 2006 Phase 2 by 2018	Overloads during contingencies	7.5.2
2003-TC-N2	Eden-Prairie – Minnetonka Area	69 kV line reconductor and substation upgrade completed in 2007. Rebuild line to 115 kV in 2011 timeframe	Overloads from transmission outages and load growth	7.5.3
2003-TC-N3	Carver County – Waconia Area	2008	Load growth	7.5.4
2003-TC-N4	Chisago – Apple River	2010	Overloads and low voltages	7.5.5
2003-TC-N5	High Bridge – Rogers Lake 115 kV line (Need) King, High Bridge and Riverside Generation interconnection substations	2008	Generation outlet	7.5.6
2003-TC-N8	Long Lake – Oakdale – Tanners Lake-Woodbury 115 kV line	Completed & 2009	Thermal overloads from transmission outages	7.5.7
2003-TC-N9	Rush City-Forest Lake – Blaine	2008	Low voltage and line overloads	7.5.8
2003-TC-N10	Twin Cities 345/115 kV Transformer Capacity	To be Determined	Approaching emergency loading levels	7.5.9
2003-TC-N12	Elk River – Ramsey – Bunker Lake Area (Enterprise Park)	2009	Low voltage and line overloads	7.5.10
2003-TC-N13	Minnesota-Wisconsin Stability Interface	To be Determined	Regional constraint	7.5.11
2005-TC-N3	Champlin – Champlin Tap – Crooked Lake	2008	Overloads during transmission outages contingencies	7.5.12
2005-TC-N6	Yankee Doodle 115 kV substation conversion	2007 & To be Determined	Load growth	7.5.13
2005-TC-N7	Twin Cities Fault Current Issue	To be Determined	Load growth	7.5.14
2005-TC-N8	Minnesota River Generation substation interconnection	2008	Generation outlet	7.5.15
2005-TC-N12	Dakota County Generation	To be Determined	Load serving; transmission infrastructure investments needed to meet growth in demand for electricity in Minnesota and the region	7.5.16

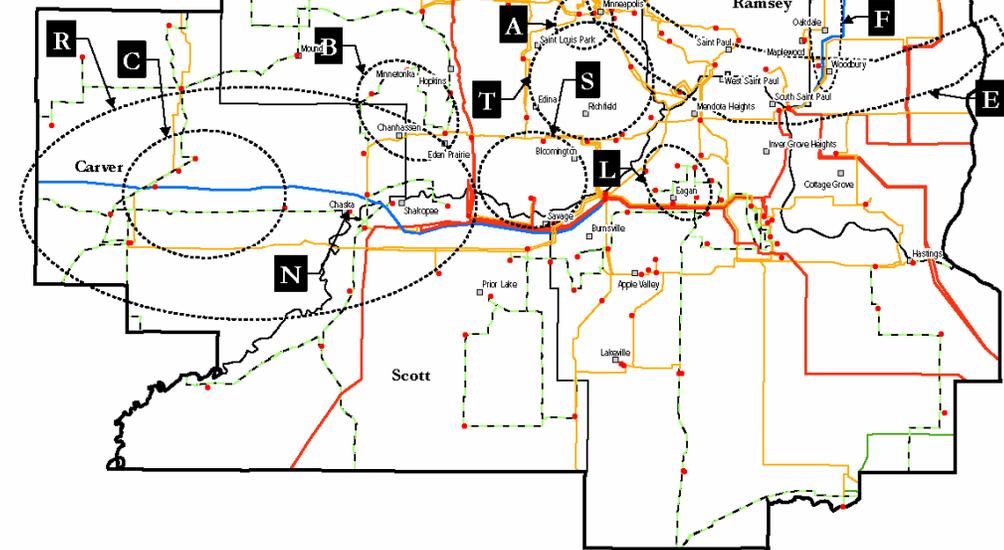
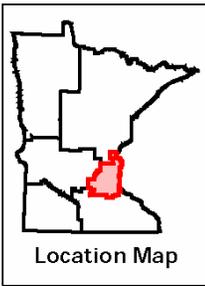
2005-CX-2 2005-CX-3	CapX 2020 Projects Brookings – Twin Cities 345 kV Twin Cities – LaCrosse 345 kV	2014		7.5.17
2007-TC-N1	Outer Metro 115 kV Development	To be Determined	Load serving infrastructure investments needed to meet growth in area demand	7.5.18
2007-TC-N2	Hyland Lake – Dean Lake Line Reconductor	2008	Load serving infrastructure investments needed to meet growth in area demand	7.5.19
2007-TC-N3	South Minneapolis Load-Serving	2010	Load serving; infrastructure investments needed to meet growth in area demand	7.5.20
2007-TC-N4	Arsenal Development and Load-Serving	To be Determined	Load serving infrastructure investments needed to meet growth in area demand	7.5.21

Map ID	Tracking Number	Description
A	2003-TC-N1	Aldrich to St. Louis Park
B	2003-TC-N2	Eden Prairie-Minnetonka Area
C	2003-TC-N3	Carver County-Waconia Area
D	2003-TC-N4	Chisago-Apple River
E	2003-TC-N5	High Bridge - Rogers Lake 115 kV line (Need King, High Bridge and Riverside Generation interconnection substations)
F	2003-TC-N8	Long Lake-Oakdale-Tanners Lake-Woodbury 115 kV line
G	2003-TC-N9	Rush City-Forest Lake-Blaine
H	2003-TC-N10	Twin Cities 345/115 kV Transformer Capacity
I	2003-TC-N12	Elk River - Ramsey - Bunker Lake Area (Enterprise Park)
J	2003-TC-N13	Minnesota-Wisconsin Stability Interface
K	2005-TC-N3	Champlin - Champlin Tap - Crooked Lake
L	2005-TC-N6	Yankee Doodle 115 kV substation conversion
M	2005-TC-N7	Twin Cities Fault Current Issue
N	2005-TC-N8	Minnesota River Generation substation interconnection
O	2005-TC-N12	Dakota County generation
P	2005-CX-2	CapX 2020 Vision Plan Brookings - Twin Cities 345 kV
Q	2005-CX-3	CapX 2020 Vision Plan Prairie Island - LaCrosse 345 kV
R	2007-TC-N1	Outer Metro 115 kV Development
S	2007-TC-N2	Hyland Lake - Dean Lake Line Reconductor
T	2007-TC-N3	South Minneapolis Load-Serving
U	2007-TC-N4	Arsenal Development and Load-Serving

Minnesota Transmission >69kV Twin Cities Planning Zone



Legend	
●	Transmission Substation
□	Cities
---	Project Location
—	161kV AC
—	230kV AC
—	345kV AC
—	69kV AC
—	115kV AC
—	138kV AC
—	500kV AC
—	250kV DC
—	400kV DC



Grey shading denotes project not located on map because it encompasses too large an area.

7.5.1 Completed Projects

Some inadequacies in the Twin Cities Zone that were identified in the 2005 Biennial Report were alleviated through the construction and completion of specific projects over the last two years. Information about each of the completed projects is summarized briefly in the table below, and those matters will be removed from the list of inadequacies that are discussed in the 2007 Report. More detailed information about these projects and inadequacies can be found in the 2005 Report and in the PUC Docket for the matter if the project fell within the jurisdiction of the Public Utilities Commission, in which case the Docket Number is shown below. Also, additional information is available by contacting the designated person for the utility that was responsible for constructing the project.

Tracking Number	Utility	Description	PUC Docket	Date Completed
2003-TC-N6	Xcel Energy	Second circuit was added to existing 115 kV line between Red Rock and Rogers Lake in Dakota County	Permitted locally	2005
2003-TC-N7	GRE	New 115 kV line in Farmington area in Dakota County	Permitted by EQB	December 2006
2003-TC-N11	GRE	New 115 kV line between Plymouth and Maple Grove	TR-05-14	2006
2005-TC-N1	Xcel Energy	115 kV line between Inver Hills and Koch Refinery was reconductored and the substation was expanded and new transformers installed		Reconductoring completed in late 2006. Substation work completed mid-2007
2005-TC-N2	Xcel Energy	Structures replaced along Prairie Island – Red Rock 345 kV circuit	Minor Alteration	29 Structures replaced in 2005. 30 replaced by mid-2007.
2005-TC-N4	Xcel Energy	New combustion turbine at Blue Lake near Shakopee	CN-04-76	2005
2005-TC-N5	Xcel Energy	Eden Prairie – Edina 115 kV rebuilt to double circuit, double bundled higher capacity conductor		Mid-2007
2005-TC-N9	Xcel Energy Wright Hennepin Cooperative Electric Association	New Oakwood Substation built between Otsego and Albertville		2005
2005-TC-N10	Xcel Energy	Upgrade Goose Lake – Kohlman Lake 115 kV line		2006
2005-TC-N11	Xcel Energy	New distribution substation was added in West Hastings		Mid-2007

7.5.2 Aldrich to St. Louis Park

Tracking Number. 2003-TC-N1

Utility. Xcel Energy

Inadequacy. The Aldrich – St. Louis Park 115 kV line is subject to overload if another line in the area were to be out of service.

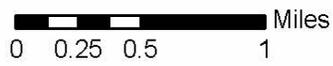
Alternatives. Two alternatives were identified – both alternatives involve the reconductoring of a 3.7 mile long portion of the Aldrich line to a higher capacity. Alternative 1 called for upgrading the line to an intermediate level in 2006 (310 MVA) and to a higher level by 2018 (348 MVA). Alternative 2 called for rebuilding the line to a higher level in 2006 (348 MVA). The alternatives differ in that Alternative 1 defers rebuilding of the line until more capacity is required.

A map of the area is shown on the following page.

Analysis. The need to upgrade the Aldrich/St. Louis Park line is documented in the Report of Study of Aldrich-St. Louis Park 115kV and Edina-Eden Prairie 115kV Transmission Line Upgrades (2005). The Aldrich/St. Louis Park line has been shown to overload when other system elements are out of service.

Schedule. Xcel Energy completed an upgrade of the line to a 310 MVA rating in March 2006. Approval from the Public Utilities Commission was not required to upgrade the line. The second phase of the plan – reconductoring the line to a higher capacity – will be further investigated when system planning studies demonstrate a need.

Minnesota Transmission >69 kV Twin Cities Planning Zone 03-TC-N1: Aldrich - St. Louis Park 115 kV



WEST RIVER ROAD

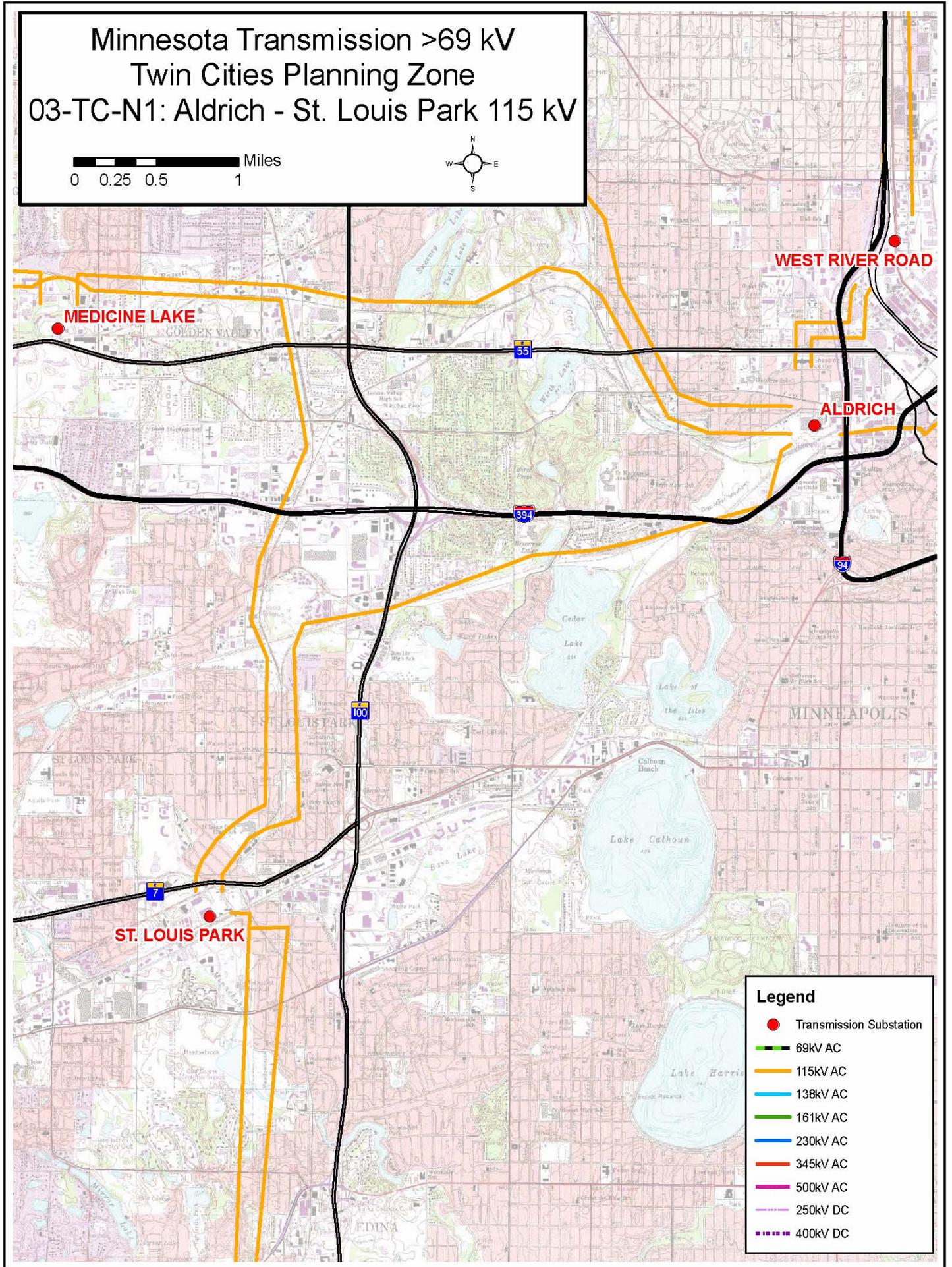
MEDICINE LAKE

ALDRICH

ST. LOUIS PARK

Legend

- Transmission Substation
- 69kV AC
- 115kV AC
- 138kV AC
- 161kV AC
- 230kV AC
- 345kV AC
- 500kV AC
- 250kV DC
- 400kV DC



7.5.3 Eden Prairie – Minnetonka Area

Tracking Number. 2003-TC-N2

Utility. Xcel Energy

Inadequacy. The Eden Prairie – Minnetonka Area is bordered by Minnetonka Boulevard on the north, the Minnesota River on the south, and Highway 169 on the east. The western boundary includes Lake Minnetonka and the area extending south from the west end of the lake. The area includes the cities of Chanhassen, Chaska, Eden Prairie, Hopkins, southern Minnetonka, and the smaller, south Lake Minnetonka communities of Deephaven, Excelsior, Greenwood, Shorewood, Tonka Bay and Victoria.

A contingency situation, *i.e.*, the loss of the Scott County – Chaska 69 kV line, could have caused overloading of the transformers at the Westgate substation. Loss of both Eden Prairie – Westgate 115 kV lines may cause low bus voltages in the area by 2008.

A map of the area is shown on the following page.

Alternatives. In the 2005 Report, Xcel Energy described two alternatives for addressing this situation, both involving the upgrade of existing transmission lines and substations. Xcel Energy elected to implement Alternative 2, which called for the Westgate – Deephaven – Excelsior – Scott County 69 kV line (15 miles) to be reconducted to 107 MVA capacity, although the line is limited to 84 MVA by substation equipment. Additional rebuilds to 115 kV capacity will incur in the future.

Analysis. Xcel Energy elected to pursue the second alternative because it allowed the utility to postpone some costs for another five years or more, until the loads at Deephaven and Excelsior require the rebuild, and to continue to evaluate the best course of action.

Distributed generation was not considered a viable alternative because the other alternatives can be implemented quickly and without requiring new right-of-way or additional land. Also, distributed generation is a less desirable resolution in this situation due to the uncertainty of the generation being on line when a transmission failure occurs. Further, any generation facilities that were installed would also need to be fairly large to match the deliverability capability of the transmission alternatives.

Schedule. The 69 kV reconductor on the transmission line was upgraded and placed in service in the fall of 2006 and the substation upgrades were completed in spring 2007. The following schedule is anticipated for additional upgrades:

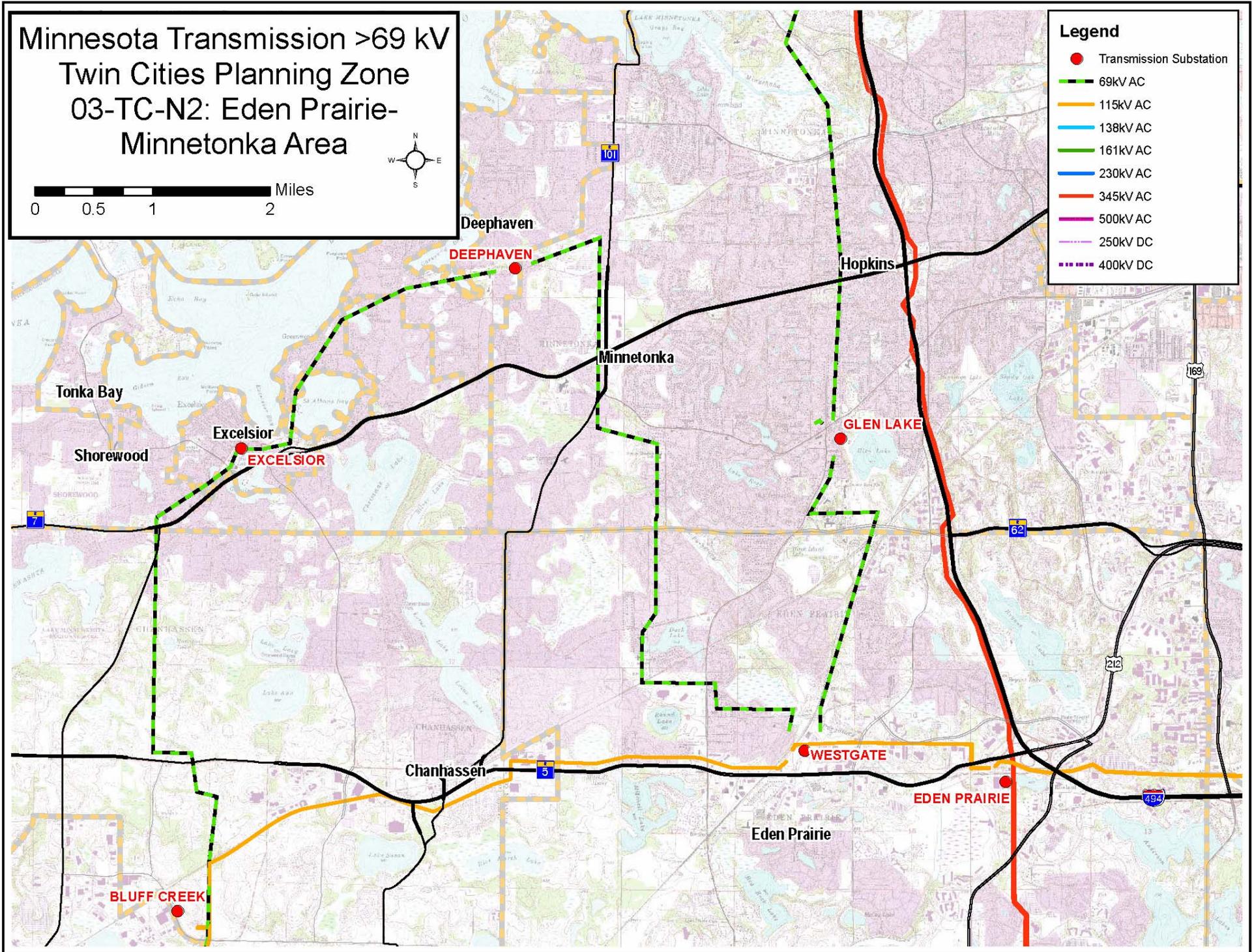
- Install a 115 kV capacitor at Westgate in 2008.
- Rebuild 15 miles of the Westgate-Deephaven-Excelsior-Scott County 69 kV line to 115 kV using 795 SSAC conductor to yield 310 MVA in 2012-2015.
- Upgrade Westgate-Eden Prairie 115 kV #1 and #2 to 600MVA in 2012-2015.

Minnesota Transmission >69 kV Twin Cities Planning Zone 03-TC-N2: Eden Prairie- Minnetonka Area



Legend

- Transmission Substation
- 69kV AC
- 115kV AC
- 138kV AC
- 161kV AC
- 230kV AC
- 345kV AC
- 500kV AC
- 250kV DC
- 400kV DC



7.5.9 Twin Cities 345/115 kV Transformer Capacity

Tracking Number. 2003-TC-N10

Utility. Xcel Energy and Great River Energy

Inadequacy. There are nineteen 345/115 kV or 230/115 kV transformers in the Twin Cities area. These transformers serve a majority of the Twin Cities load from remote generation from Xcel Energy's Allen S. King, Monticello, Prairie Island and Sherburne County plants, from Great River Energy's plants in North Dakota, and by hydropower from Manitoba.

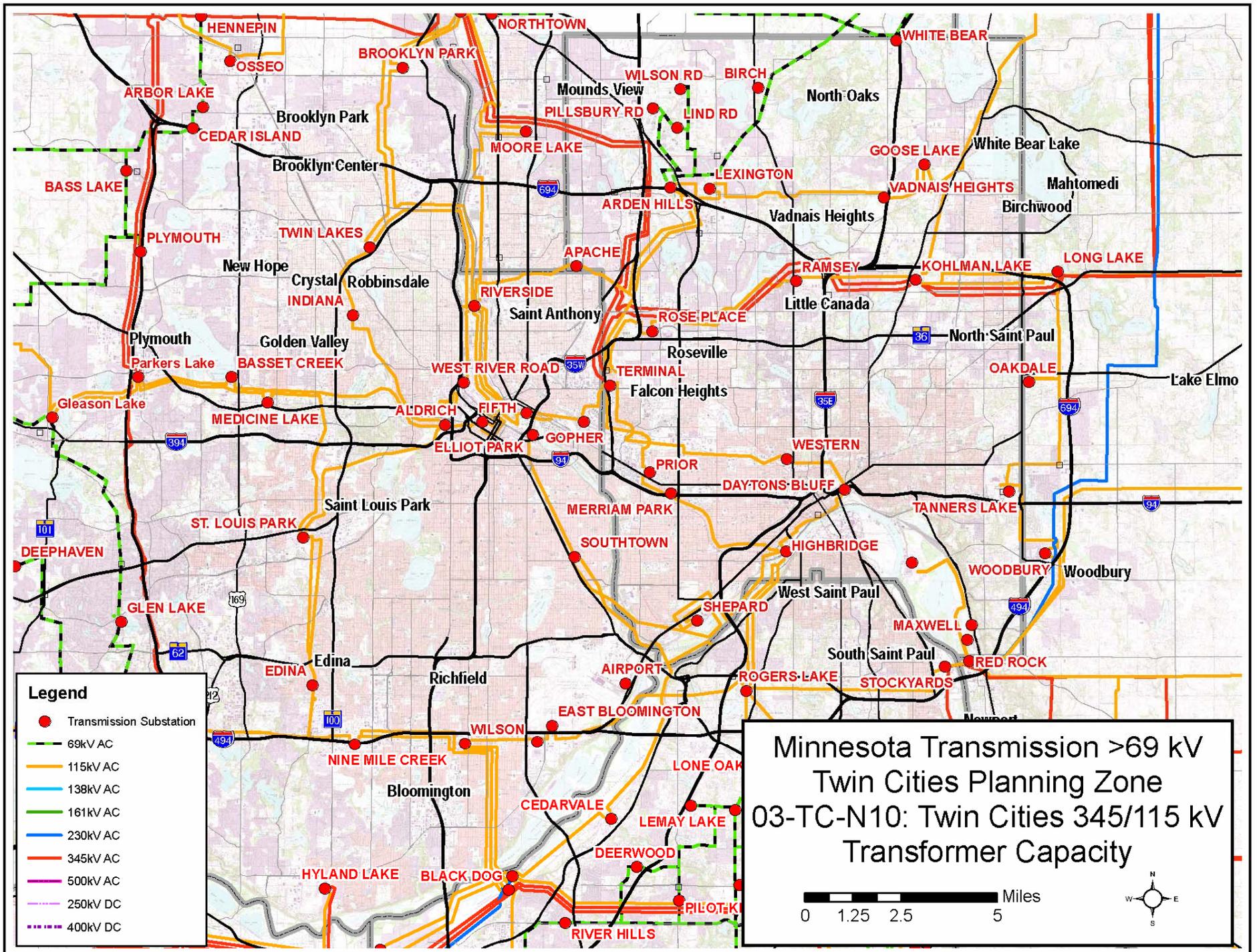
Xcel Energy has made an initial assessment of the loading on these transformers. A number of the transformers are near their emergency loading criteria. However, this is very dependent on Twin City generation schedules.

A map of the area is shown on the following page.

Alternatives. The two alternatives are (1) to replace existing transformers with larger capacity units or (2) install additional units at the affected substations.

Analysis. This is an ongoing situation that Xcel Energy and Great River Energy continuously monitor.

Schedule. The utilities expect that additional transformer capacity may be needed beginning in the 2009-2010 timeframe. The utilities expect that once it is determined that a new transformer is required at a substation, that the replacement can occur within six months. The utilities believe that no Certificate of Need or Route Permit will be required to replace a transformer at a substation. Precise scheduling information will be available when a specific need is foreseen.



7.5.11 Minnesota – Wisconsin Stability Interface

Tracking Number. 2003-TC-N13

Utility. Several

Inadequacy. The Minnesota-Wisconsin Stability Interface (MWSI) is a measure of the power flowing from or through the Twin Cities area to areas south and east. The MWSI is presently a regional constraint that limits the delivery of power in MAPP and MISO. The MWSI has transmission reservations that exceed the capacity of the interface. This constraint limits the implementation of new wholesale transactions and the construction of new generation within Minnesota, even to serve Minnesota load, because parallel path flows (loop flows) often impact this interface.

Alternatives. A number of proposals under consideration for various purposes will help to increase the MWSI and thus alleviate the present constraint. These include the 345 kV CapX line from the southeast Twin Cities to Rochester and on to LaCrosse (Tracking No. 2005-CX-3). Other Rochester area lines would provide some expansion as well (Tracking No. 2003-SE-N1). In addition, American Transmission Company (ATC) is nearing completion of a 345 kV line from the Arrowhead Substation in northeast Minnesota to the Gardner Park Substation in east central Wisconsin.

Analysis. The MWSI constraint is a factor that all utilities continue to consider as they conduct their studies and determine appropriate transmission infrastructure to construct.

Schedule. There is no schedule specifically for the MWSI constraint but other projects affect the ability of the transmission grid to transfer power between the Twin Cities and areas to the south and east. In addition, a working group made up of engineers from Xcel Energy, Minnesota Power, and American Transmission Company is currently conducting a study which will establish a new MWSI limit upon completion of the Arrowhead – Gardner Park 345 kV line.

7.5.14 Twin Cities Fault Current Issue

Tracking Number. 2005-TC-N7

Utility. Xcel Energy and Great River Energy

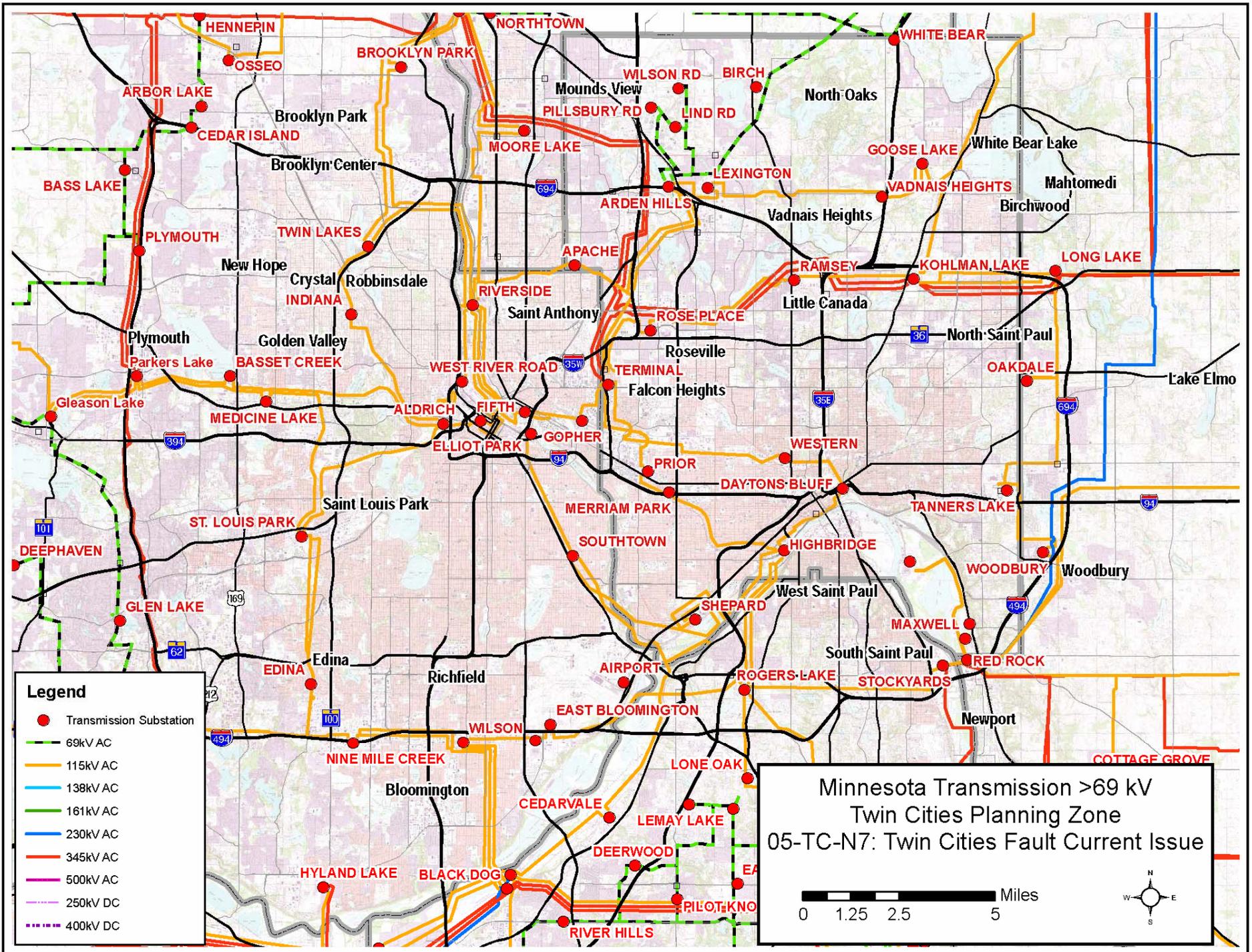
Inadequacy. General fault current levels on the system in the Twin Cities are increasing as transmission lines and generation are added to the transmission system. The grounding capability in the inner Twin Cities substations may be exceeded as loads continue to increase. At present there is no immediate need to address this concern. As transmission and generation facilities are added to the transmission grid, planning engineers will continue to monitor the fault currents that will result. When a potential problem is detected, a specific study will be launched to address the need.

A map of the area is shown on the following page.

Alternatives. Sectionalizing the system may be needed to decrease the fault current levels, but no alternatives have been identified or evaluated.

Analysis. These issues have not yet been evaluated at this early stage of the planning process. Until possible solutions are identified, it is not possible to determine the possible environmental impacts.

Schedule. The date for the planning study will be determined when a specific need is identified.



7.5.17 CapX 2020 Projects

Tracking Number. 2005-CX-2 (Brookings – Southeast Twin Cities 345 kV)
2005-CX-3 (Twin Cities – LaCrosse 345 kV)

Discussion. The CapX 2020 Projects are discussed in detail in Section 5. One of the three CapX lines is a 345 kV line from Brookings, South Dakota, to the Southeast Twin Cities. Another CapX line located partially in the Twin Cities Zone is a 345 kV line from Brookings, South Dakota, to the Southeast Twin Cities.

7.5.18 Outer Metro 115 kV Development (Hennepin, Scott and Carver counties)

Tracking Number. 2007-TC-N1

Utility. Great River Energy

Inadequacy. The study region has been subdivided into three areas:

Area 1 – between the City of Glencoe and West Waconia. Based on the study results, the City of Glencoe would experience low voltages during the loss of its primary 115 kV source from McLeod. The loss of the 115 kV source from the Carver County Substation also results in a number of thermal and voltage problems in the area. Due to the age of the system in the region, the 69 kV lines in this area have been a source of poor reliability in the past.

Area 2 – between West Waconia and Scott County. This area is found to be a high load growth corridor. Minnesota Valley Electric Co-op is building a new distribution substation to meet the load growth in the area. The City of Chaska is proposing to build a new Bio Technology Campus near the City, which is expected to add 25 to 40 MW of new load to the area by 2015.

Area 3 – between Scott County and Westgate. This area is found to experience thermal overloads on the 115 and 69 kV lines between Scott County and Westgate under certain contingencies.

A map showing the area is found on the following page.

Alternatives. Two transmission alternatives have been studied as a long-term solution to the inadequacies in the region. Both alternatives consist of the construction of several sections of 115 kV lines.

Alternative 1: This alternative involves three sections of 115 kV lines.

(1) Rebuild the existing 69 kV line to 115 kV capability from City of Glencoe to Biscay Junction to Young America to West Waconia and add a new 115/ 69 kV substation near the City of Glencoe and a new 115 to 69 kV step down transformer at West Waconia.

(2) Build a double circuit 115/69 kV line between West Waconia and Scott County, involving several substations. Several options are available to accomplish this step. A double circuit 115/69 kV line could be built from West Waconia south to Carver County and terminate the existing 69 kV line. A new 115 kV circuit from the West Waconia substation eastward could be constructed by converting the existing 69 kV line through Augusta and then to Scott County. The section of new 115 kV line between Augusta and Scott County could be double circuited with the existing 115 kV line from Carver County to Scott County. An alternative is to convert the entire 69 kV line from August to Victoria tap to Chaska to Scott County.

(3) Convert the 69 kV line connecting Scott County, Excelsior, Deephaven, and Westgate to 115 kV.

Alternative 2: This alternative also involves three sections of 115 kV lines.

(1) Rebuild the existing 69 kV line from City of Glencoe to Biscay Junction to Young America to Carver County to 115 kV. This also involves adding a new 115/69 kV substation at Biscay Junction and a new 115/69 kV transformer at West Waconia.

(2) Convert the existing 69 kV line to 115 kV from Carver County to Augusta to Victoria tap to Minnesota River. For this alternative, it is assumed that the city of Chaska will be served from the 69 kV lines.

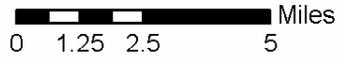
(3) Rebuild the existing 115 kV line from Scott County to Minnesota River to Bluff Creek to a higher capacity and upgrade some of the 69 kV facilities between Scott County and Westgate.

Analysis. As the study region is close to the Twin Cities Metropolitan Area, the analysis to date has focused on various transmission options to address the situation in this high-growth area. Initial results show that a 115 kV system should be adequate to address the need for more energy. The economic and environmental analysis and impacts of any new transmission lines are yet to be determined.

Further study is required to determine the details of the 115/69 kV substation near the City of Glencoe and transmission service to the City of Chaska. Also, the options for serving the new Bio Technology Park in Chaska need to be examined in more detail.

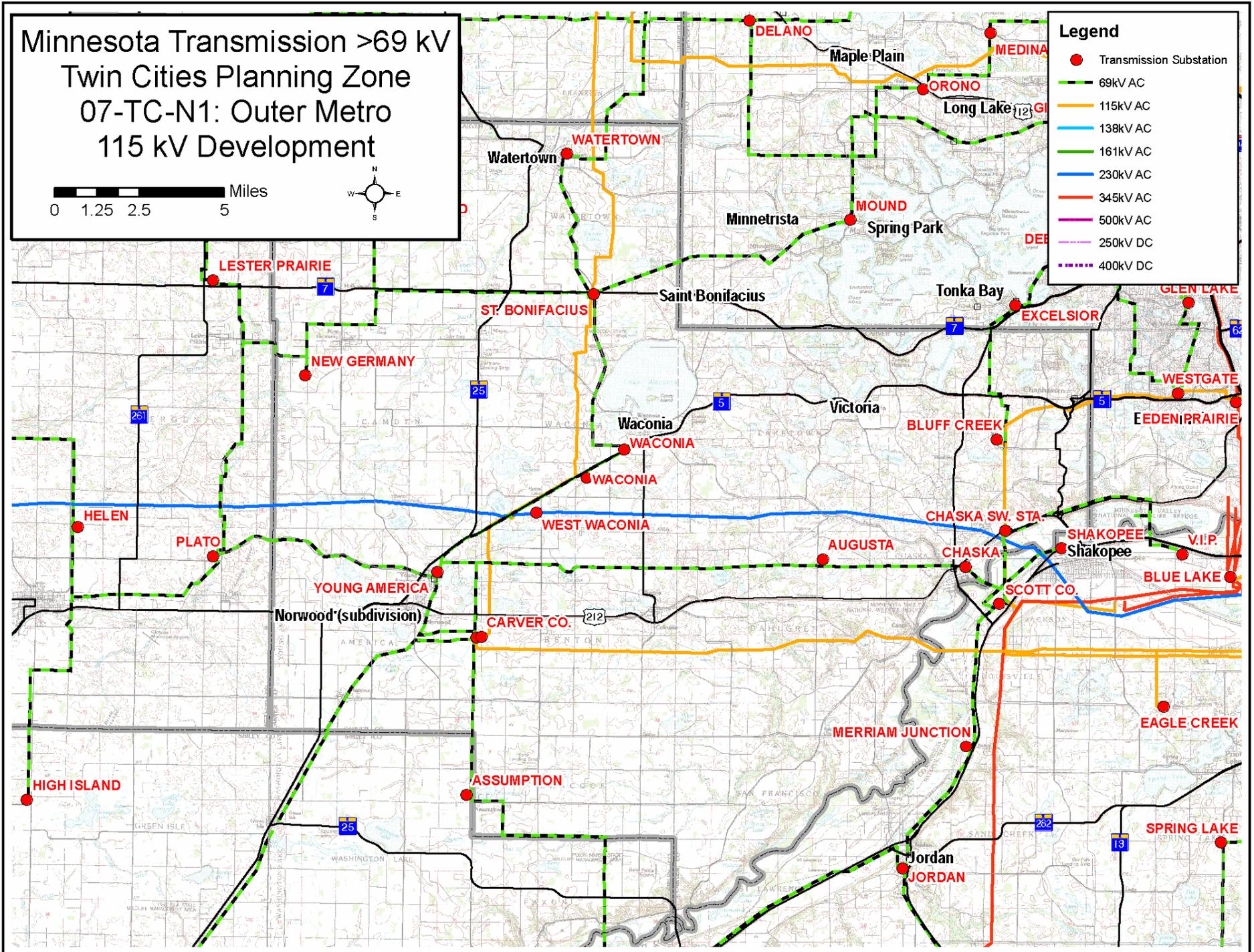
Schedule. While the in service date of any new project is still to be determined, planning studies indicate that improvements will be needed in the 2011 or 2012 timeframe.

Minnesota Transmission >69 kV
 Twin Cities Planning Zone
 07-TC-N1: Outer Metro
 115 kV Development



Legend

- Transmission Substation
- 69kV AC
- 115kV AC
- 138kV AC
- 161kV AC
- 230kV AC
- 345kV AC
- 500kV AC
- - - 250kV DC
- - - 400kV DC



7.5.20 South Minneapolis Load-Serving Study

Tracking Number. 2007-TC-N3

Utility. Xcel Energy

Inadequacy. Loading on Xcel Energy's 12.4 kV distribution system in south Minneapolis has reached levels where numerous single contingencies can lead to overloads elsewhere in the system. Many of the distribution substations served by the south Minneapolis transmission loop have either reached their capacities or will in the near future, as Xcel Energy is forecasting 100 MW of load growth in south Minneapolis over the next ten years due to redevelopment in many areas of the city.

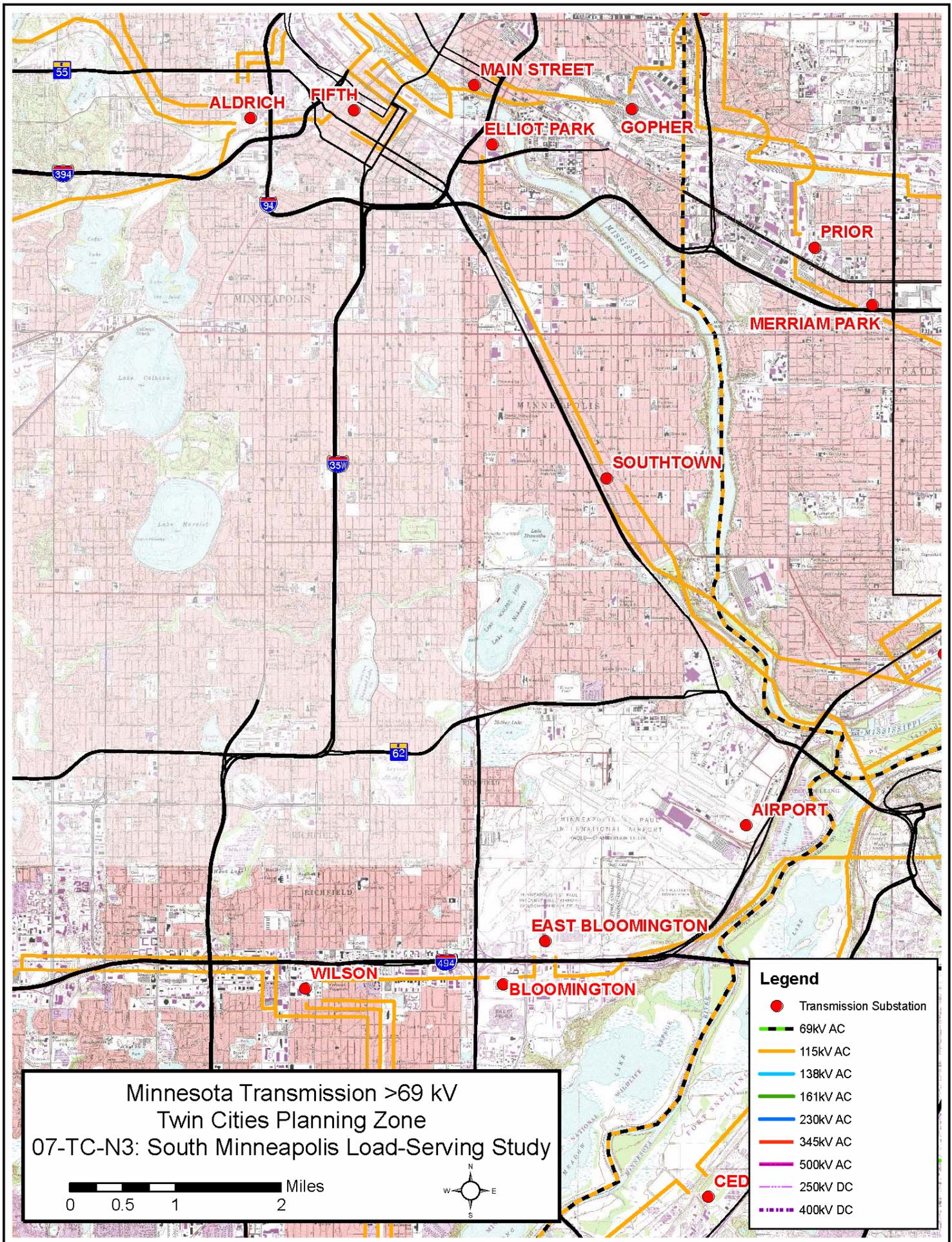
A map of the area is shown on the following page.

Alternatives. Initial investigation and scoping discussions have led to the development of three potential alternatives:

- (1) Construct a new 115 kV line from a new Hiawatha Substation along Highway 55 to a new Oakland Substation near Lake Street and I-35W. The line would then continue south to a new Highway 62 Substation near Highway 62 and Nicollet Avenue. The line would continue to its final termination at a new Penn Lake Substation near I-494 and Sheridan Avenue.
- (2) Similar to Option 1, but the final 115 kV line would stretch from Highway 62 Substation to the existing Wilson Substation near I-494 and Wentworth Avenue.
- (3) Construct two smaller 115 kV loops with new 115 kV lines running from Hiawatha to Oakland to Elliot Park and a second loop from Penn Lake to Highway 62 to Wilson.

Analysis. A load-serving study examining the alternatives is underway and is expected to be completed in early 2008.

Schedule. To address near-term load-serving needs, it is anticipated that the first portions of this development will need to be in service in 2010.



Minnesota Transmission >69 kV
 Twin Cities Planning Zone
 07-TC-N3: South Minneapolis Load-Serving Study

0 0.5 1 2 Miles

N
 W E
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- Legend**
- Transmission Substation
 - 69kV AC
 - 115kV AC
 - 138kV AC
 - 161kV AC
 - 230kV AC
 - 345kV AC
 - 500kV AC
 - - - 250kV DC
 - · · 400kV DC