AGENDA
SHAKOPEE PUBLIC UTILITIES COMMISSION
REGULAR MEETING
JULY16, 2018

1. **Call to Order** at 5:00pm in the SPUC Service Center, 255 Sarazin Street.

2. **Approval of Minutes**

3. **Communications**
   - 3a) Reverend Pond Statue Letter
   - 3b) APPA Rodeo Acknowledgement Letter
   - 3c) APPA National Conference Letter

4. **Approve the Agenda**

5. **Approval of Consent Business**

6. **Bills: Approve Warrant List**
   - 6a) July 2, 2018
   - 6b) July 16, 2018

7. **Liaison Report**

8. **Reports: Water Items**
   - 8a) Water System Operations Report – Verbal
   - C=> 8b) Quarterly Nitrate Results

9. **Reports: Electric Items**
   - 9a) Electric System Operations Report – Verbal
   - 9b) SPU Long Range Planning Study – Final Draft
   - 9c) LED Streetlight Bid Award

10. **Reports: Human Resources**

11. **Reports: General**
    - C=> 11a) Quarterly Website Analytics

12. **New Business**

13. **Tentative Dates for Upcoming Meetings**
    - Regular Meeting -- August 6
    - Mid Month Meeting -- August 20
    - Regular Meeting -- September 4 (Tuesday)
    - Mid Month Meeting -- September 17

14. **Adjourn** to 8/6/18 at the SPUC Service Center, 255 Sarazin Street

MINUTES

OF THE

SHAKOPEE PUBLIC UTILITIES COMMISSION
(Regular Meeting)

President Weyer called the regular session of the Shakopee Public Utilities Commission to order at the Shakopee Public Utilities meeting room at 5:00 P.M., June 18, 2018.

MEMBERS PRESENT: Commissioners Joos, Hennen and Weyer. Also present, Finance Director Schmid, Planning & Engineering Director Adams, Line Superintendent Drent, Water Superintendent Schemel and Marketing/Customer Relations Director Walsh. Commissioners Amundson and Meyer were absent as previously advised.

Motion by Joos, seconded by Hennen to approve the minutes of the June 4, 2018 Commission meeting. Motion carried.

There were no Communication items.

President Weyer offered the agenda for approval.

Motion by Joos, seconded by Hennen to approve the agenda as presented. Motion carried.

Motion by Joos, seconded by Hennen to approve the Consent Business agenda as presented. Motion carried.

President Weyer stated that the Consent Items were: Item 8b: Monthly Production Dashboard and Item 11a: May 2018 Financial Results.

The warrant listing for bills paid June 18, 2018 was presented.

Motion by Joos, seconded by Hennen to approve the warrant listing dated June 18, 2018 as presented. Motion carried.

There was no Liaison Report

Water Superintendent Schemel provided a report of current water operations. There was a watermain break June 17 on Hansen Avenue. The repair will be made on June 20.

Item 8b: Monthly Production Dashboard was received under Consent Business.

Line Superintendent Drent provided a report of current electric operations. There were nine electric outages in the past month. Three were storm related, one was caused by a contractor, three were squirrels, one was a hawk and with the final outage a cause was not determined. Pole replacements continue and construction projects were updated.

Customer Relations/Marketing Director Walsh provided a presentation on the SPU State Conservation Improvement Program.

Item 11a: May 2018 Financial Results was received under Consent Business.

The tentative commission meeting dates of July 2 and July 16 were noted.

The July 2 Commission will be canceled.

Motion by Joos, seconded by Hennen to adjourn to the July 16, 2018 meeting. Motion carried.

Commission Secretary: John R. Crooks

SHAKOPEE

3a

June 6, 2018

Mr. John Crooks
Shakopee Public Utilities Commission (SPUC)
255 Sarazin Street
Shakopee, MN 55379

Dear John,

The City of Shakopee appreciates SPUC's generous donation of $4,000.00 to the Reverend Pond Statue project.

Your donation will help fund the creation of the statue concept, foundry and installation costs.

When installed, the Pond Statue will greatly complement the recently unveiled bronze statue of Chief Ŝakpe in downtown Shakopee. With the addition of the Pond Statue, two of Shakopee's prominent historical figures will be celebrated and Shakopee will continue to embrace its history.

Again, I thank you for your donation and your continued community support.

Kindest regards,

Bill Mars,
Mayor, City of Shakopee
Tax ID 41-6005539

AMERICAN PUBLIC POWER ASSOCIATION
Powering Strong Communities

3b

2451 Crystal Drive
Suite 1000
Arlington, VA 22202-4804
202-467-2900
www.PublicPower.org

June 15, 2018

John Crooks
Utilities Manager
Shakopee Public Utilities Commission
P.O. Box 470
255 Sarazin Street
Shakopee, MN 55379-0470

Dear John:

On behalf of the American Public Power Association (Association), I would like to congratulate Shakopee Public Utilities Commission's team #136, Greg Drent, Jamie VonBank, Justin Rotert, and Mike Enright, for achieving a perfect score at the 2018 Public Power Lineworkers Rodeo, hosted by ElectriCities of North Carolina, Inc., North Carolina Association of Municipal Electric Systems, and the Town of Wake Forest in Raleigh/ Wake Forest in North Carolina. Shakopee Public Utilities Commission is one of only twenty teams that accomplished a score of 500 this year in the team competition, and, in doing so, outperformed top competitors from across the nation. Additionally, the Association would like to thank your utility for supporting this event. Each year, the Association strives to provide an environment for professional lineworkers to learn, network, and compete with peers from across the national public power community. We hope that we succeeded in this goal while providing a valuable experience for all individuals involved.

Shakopee Public Utilities Commission's journeyman team demonstrated precision, agility, and, most importantly, safety throughout the completion. This year, almost 400 competitors – 65 journeyman teams and 144 apprentices – from across the country proved their dedication to and pride for the work they do on public power's behalf. To review all results, please visit PublicPower.org/Rodeo.

I hope your lineworkers enjoyed their experience in North Carolina and that they will join us for the 2019 Public Power Lineworkers Rodeo, hosted by Colorado Springs Utilities, March 29-30, 2019 in Colorado Springs, CO.

Thanks again for supporting the 2018 Public Power Lineworkers Rodeo.

Sincerely,

Michael J. Hyland

Michael J. Hyland
Senior Vice President, Engineering Services
American Public Power Association

Crooks, John

3c

From: Heidi Lambert <HLambert@publicpower.org>
Sent: Friday, July 6, 2018 9:30 AM
To: Crooks, John; David.Niles@avantenergy.com
Cc: Lauren.Blank@avantenergy.com
Subject: Thank you!

Hi John and David,

It was great meeting you in New Orleans. Thank you so much for making time to speak to our members and for putting together such a thorough presentation! You had great energy, engaging presentation styles and very interesting information to share (with helpful insights and ideas). I know our members really enjoyed the session and it was nice to see some Q&A at the end. MMPA and Shakopee are strong and successful examples for other APPA members to learn from and you both did a wonderful job of conveying the passion and enthusiasm you have for your work!

I hope to work with you both again sometime. Have a great weekend!

--Heidi

Heidi Lambert
Director of Education

American Public Power Association
2451 Crystal Dr., Suite 1000
Arlington, VA 22202
P: 202/467-2921

Proposed As Consent Item

SHAKOPEE PUBLIC UTILITIES COMMISSION

"Lighting the Way - Yesterday, Today and Beyond"

8b

MEMORANDUM

TO: John R. Crooks, Utilities Manager

FROM: Lon R. Schemel, Water Superintendent

SUBJECT: Nitrate Results Update -- Advisory

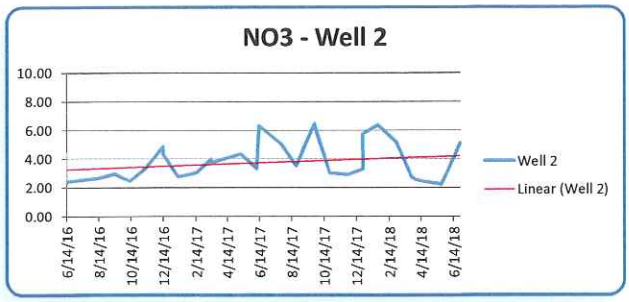
DATE: July 5, 2018

Attached are the latest nitrate test results for the wells. The analyses provided are for the prior 2 years of data collected with trend graphs.

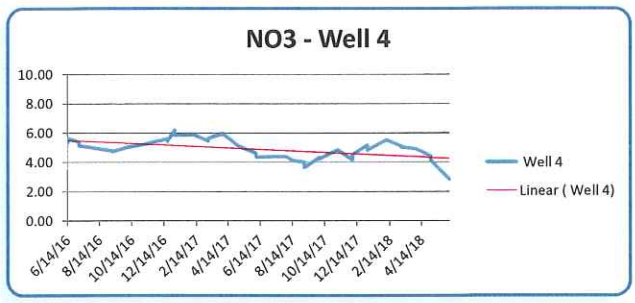
Post Office Box 470 ◆ 255 Sarazin Street ◆ Shakopee, Minnesota 55379-0470
(952) 445-1988 ◆ (952) 445-7767
www.shakopeeutilities.com

Shakopee Public Utilities Commission
Water Department
Nitrate Results
Reported in mg/L

Location	Sample Collected	Results Received	Results	Lab	Run Time
2	6/14/16	6/20/16	**2.32**	MVTL	168 hrs prior
2	6/14/16	7/22/16	**2.40**	MDH	
2	8/9/16	8/22/16	**2.60**	MVTL	132 hrs prior
2	9/13/16	9/28/16	**2.94**	MVTL	168 hrs prior
2	9/13/16	10/24/16	**2.90**	MDH	
2	10/11/16	10/17/16	**2.42**	MVTL	192 hrs prior
2	11/8/16	11/17/16	**3.28**	MVTL	168 hrs prior
2	12/13/16	12/19/16	**4.82**	MVTL	192 hrs prior
2	12/13/16	2/9/17	**4.30**	MDH	
2	1/10/17	1/20/17	**2.73**	MVTL	168 hrs prior
2	2/14/17	3/6/17	**3.02**	MVTL	168 hrs prior
2	3/14/17	3/23/17	**3.98**	MVTL	168 hrs prior
2	3/14/17	4/24/17	**3.70**	MDH	
2	5/9/17	5/25/17	**4.33**	MVTL	168 hrs prior
2	6/8/17	6/28/17	**3.30**	MDH	168 hrs prior
2	6/8/17	7/27/17	**3.40**	MDH	
2	6/13/17	6/20/17	**6.28**	MVTL	192 hrs prior
2	7/25/17	8/1/17	**5.00**	MVTL	192 hrs prior
2	8/22/17	8/28/17	**3.50**	MVTL	168 hrs prior
2	9/26/17	10/4/17	**6.42**	MVTL	168 hrs prior
2	9/26/17	10/20/17	**6.30**	MDH	
2	10/24/17	11/17/17	**3.00**	MVTL	168 hrs prior
2	11/28/17	12/11/17	**2.90**	MVTL	168 hrs prior
2	12/26/17	1/9/18	**3.28**	MVTL	168 hrs prior
2	12/26/17	2/20/18	**5.70**	MDH	
2	1/23/18	2/20/18	**6.32**	MVTL	168 hrs prior
2	2/27/18	3/9/18	**5.14**	MVTL	168 hrs prior
2	3/27/18	5/31/18	**2.70**	MDH	
2	4/3/18	4/10/18	**2.55**	MVTL	168 hrs prior
2	4/24/18	5/9/18	**2.37**	MVTL	168 hrs prior
2	5/22/18	5/31/18	**2.21**	MVTL	168 hrs prior
2	5/22/18	6/14/18	**2.20**	MDH	
2	6/26/18	7/2/18	**5.07**	MVTL	264 hrs prior



Location	Sample Collected	Results Received	Results	Lab	Run Time
4	6/14/16	6/20/16	**5.35**	MVTL	168 hrs prior
4	7/5/16	7/12/16	**5.37**	MVTL	168 hrs prior
4	7/5/16	11/10/16	**5.10**	MDH	
4	6/14/16	7/22/16	**5.60**	MDH	
4	9/6/16	9/12/16	**4.73**	MVTL	220 hrs prior
4	9/6/16	2/9/17	**4.70**	MDH	
4	10/11/16	10/17/16	**5.04**	MVTL	168 hrs prior
4	10/11/16	11/10/16	**5.00**	MDH	
4	12/20/16	12/27/16	**5.57**	MVTL	168 hrs prior
4	12/20/16	2/9/17	**5.40**	MDH	
4	1/3/17	1/16/17	**6.15**	MVTL	168 hrs prior
4	1/3/17	5/4/17	**5.80**	MDH	
4	2/7/17	2/14/17	**5.84**	MVTL	168 hrs prior
4	3/7/17	3/16/17	**5.42**	MVTL	168 hrs prior
4	3/7/17	4/24/17	**5.60**	MDH	
4	4/4/17	4/10/17	**5.91**	MVTL	168 hrs prior
4	5/2/17	5/10/17	**5.10**	MVTL	168 hrs prior
4	6/5/17	7/27/17	**4.60**	MDH	
4	6/6/17	6/14/17	**4.33**	MVTL	168 hrs prior
4	7/5/17	7/20/17	**4.35**	MVTL	168 hrs prior
4	8/1/17	8/7/17	**4.35**	MVTL	168 hrs prior
4	8/14/17	10/20/17	**4.10**	MDH	
4	9/5/17	9/26/17	**3.99**	MVTL	168 hrs prior
4	9/5/17	9/26/17	**3.60**	MDH	
4	10/3/17	10/20/17	**4.29**	MVTL	168 hrs prior
4	10/3/17	11/17/17	**4.20**	MDH	
4	11/7/17	3/2/18	**4.83**	MVTL	168 hrs prior
4	12/5/17	12/22/17	**4.12**	MVTL	192 hrs prior
4	12/5/17	1/8/18	**4.50**	MDH	
4	1/2/18	1/16/18	**5.15**	MVTL	168 hrs prior
4	1/2/18	2/20/18	**4.80**	MDH	
4	2/6/18	2/20/18	**5.50**	MVTL	168 hrs prior
4	3/6/18	3/26/18	**5.09**	MVTL	168 hrs prior
4	3/6/18	3/26/18	**5.00**	MDH	
4	4/3/18	4/10/18	**4.89**	MVTL	168 hrs prior
4	5/1/18	5/9/18	**4.40**	MVTL	168 hrs prior
4	5/1/18	6/26/18	**4.10**	MDH	
4	6/5/18	6/14/18	**2.80**	MVTL	168 hrs prior

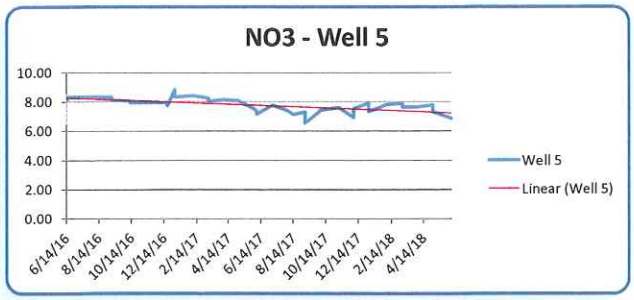


MVTL = Minnesota Valley Testing Laboratories
MDH = Minnesota Department of Health
TCWC = Twin City Water Clinic

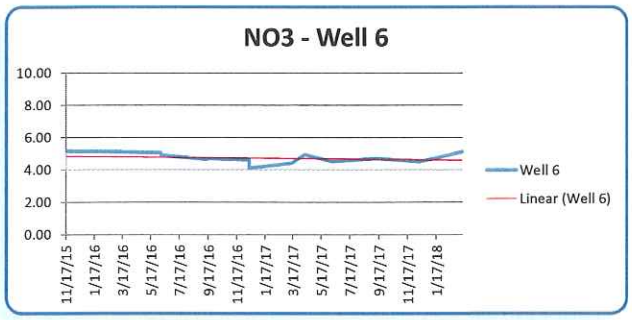
Run times will represent the well being in step 1 for one week (168 hrs)

Shakopee Public Utilities Commission
Water Department
Nitrate Results
Reported in mg/L

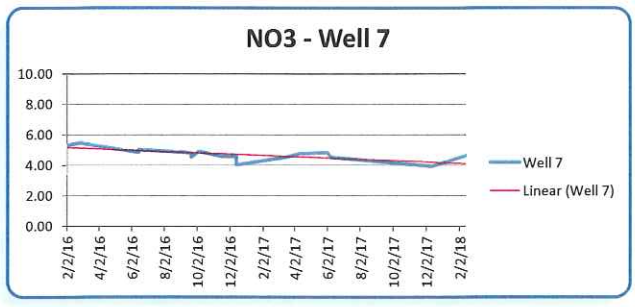
Location	Sample Collected	Results Received	Results	Lab	Run Time
5	6/14/16	6/20/16	**8.08**	MVTL	168 hrs prior
5	6/14/16	7/22/16	**8.30**	MDH	
5	9/6/16	9/12/16	**8.30**	MVTL	96 hrs prior
5	9/6/16	2/9/17	**8.10**	MDH	
5	10/11/16	10/17/16	**8.03**	MVTL	168 hrs prior
5	10/11/16	11/10/16	**7.90**	MDH	
5	12/20/16	12/27/16	**7.94**	MVTL	168 hrs prior
5	12/20/16	2/9/17	**7.70**	MDH	
5	1/3/17	1/16/17	**8.80**	MVTL	168 hrs prior
5	1/3/17	5/4/17	**8.30**	MDH	
5	2/7/17	2/14/17	**8.39**	MVTL	168 hrs prior
5	3/7/17	3/18/17	**8.22**	MVTL	168 hrs prior
5	3/7/17	4/24/17	**8.00**	MDH	
5	4/4/17	4/10/17	**8.12**	MVTL	168 hrs prior
5	5/2/17	5/10/17	**8.04**	MVTL	168 hrs prior
5	6/5/17	7/27/17	**7.40**	MDH	
5	6/6/17	6/14/17	**7.12**	MVTL	168 hrs prior
5	7/5/17	7/20/17	**7.74**	MVTL	168 hrs prior
5	8/1/17	8/7/17	**7.40**	MVTL	168 hrs prior
5	8/14/17	10/20/17	**7.10**	MDH	
5	9/5/17	9/26/17	**7.27**	MVTL	168 hrs prior
5	9/5/17	9/26/17	**6.50**	MDH	
5	10/3/17	10/20/17	**7.33**	MVTL	168 hrs prior
5	10/3/17	11/17/17	**7.40**	MDH	
5	11/7/17	3/2/18	**7.57**	MVTL	168 hrs prior
5	12/5/17	12/22/17	**6.89**	MVTL	192 hrs prior
5	12/5/17	1/8/18	**7.50**	MDH	
5	1/2/18	1/16/18	**7.88**	MVTL	168 hrs prior
5	1/2/18	2/20/18	**7.30**	MDH	
5	2/6/18	2/20/18	**7.80**	MVTL	168 hrs prior
5	3/6/18	3/26/18	**7.84**	MVTL	168 hrs prior
5	3/6/18	3/26/18	**7.60**	MDH	
5	4/3/18	4/10/18	**7.62**	MVTL	168 hrs prior
5	5/1/18	5/9/18	**7.75**	MVTL	168 hrs prior
5	5/1/18	6/26/18	**7.30**	MDH	
5	6/5/18	6/14/18	**6.83**	MVTL	168 hrs prior



6	11/17/15	11/23/15	**5.15**	MVTL	144 hrs prior
6	6/7/16	6/14/16	**5.04**	MVTL	195 hrs prior
6	6/7/16	7/22/16	**4.90**	MDH	
6	9/13/16	9/28/16	**4.64**	MVTL	216 hrs prior
6	9/13/16	10/24/16	**4.70**	MDH	
6	12/13/16	12/19/16	**4.60**	MVTL	240 hrs prior
6	12/13/16	2/9/17	**4.10**	MDH	
6	3/14/17	4/24/17	**4.40**	MDH	168 hrs prior
6	4/11/17	4/17/17	**4.94**	MVTL	168 hrs prior
6	6/8/17	7/27/17	**4.50**	MDH	168 hrs prior
6	9/12/17	10/20/17	**4.70**	MDH	168 hrs prior
6	12/12/17	1/8/18	**4.50**	MDH	168 hrs prior
6	3/13/18	4/10/18	**5.10**	MDH	168 hrs prior



7	2/2/16	2/8/16	**5.29**	MVTL	192 hrs prior
7	3/1/16	3/8/16	**5.45**	MVTL	140 hrs prior
7	3/1/16	8/30/16	**5.40**	MDH	
7	6/14/16	6/20/16	**4.81**	MVTL	188 hrs prior
7	6/14/16	7/22/16	**5.00**	MDH	
7	9/20/16	9/28/16	**4.79**	MVTL	216 hrs prior
7	9/20/16	10/24/16	**4.50**	MDH	
7	10/4/16	10/12/16	**4.89**	MVTL	216 hrs prior
7	11/15/16	11/21/16	**4.55**	MVTL	168 hrs prior
7	12/13/16	12/19/16	**4.55**	MVTL	240 hrs prior
7	12/13/16	2/9/17	**4.00**	MDH	
7	3/14/17	4/24/17	**4.50**	MDH	168 hrs prior
7	4/11/17	4/17/17	**4.74**	MVTL	168 hrs prior
7	6/1/17	7/27/17	**4.80**	MDH	168 hrs prior
7	6/8/17	7/27/17	**4.50**	MDH	168 hrs prior
7	9/12/17	10/3/17	**4.20**	MDH	168 hrs prior
7	12/12/17	1/8/18	**3.90**	MDH	168 hrs prior
7	2/13/18	3/26/18	**4.60**	MDH	168 hrs prior

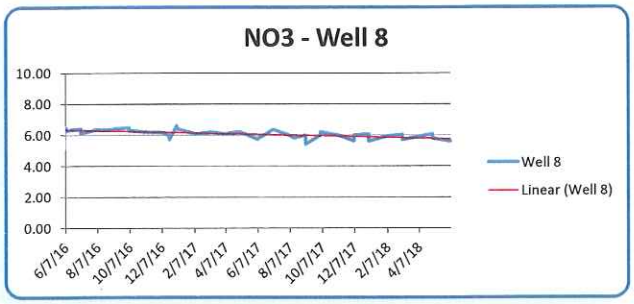


MVTL = Minnesota Valley Testing Laboratories
MDH = Minnesota Department of Health
TCWC = Twin City Water Clinic

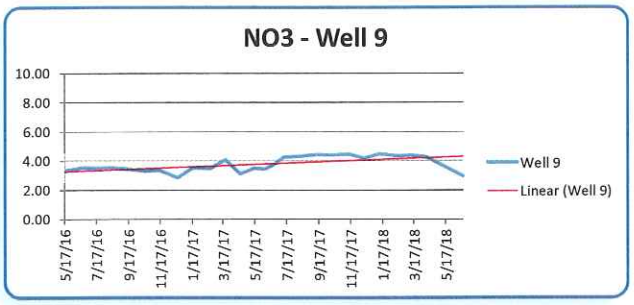
Run times will represent the well being in step 1 for one week (168 hrs)

Shakopee Public Utilities Commission
Water Department
Nitrate Results
Reported in mg/L

Location	Sample Collected	Results Received	Results	Lab	Run Time
8	6/7/16	6/14/16	**6.44**	MVTL	310 hrs prior
8	6/7/16	7/22/16	**6.30**	MDH	
8	7/5/16	7/12/16	**6.40**	MVTL	190 hrs prior
8	7/5/16	11/10/16	**6.10**	MDH	
8	8/2/16	8/9/16	**6.33**	MVTL	192 hrs prior
8	9/6/16	9/12/16	**6.36**	MVTL	140 hrs prior
8	9/6/16	2/9/17	**6.40**	MDH	
8	10/4/16	10/12/16	**6.48**	MVTL	168 hrs prior
8	10/4/16	11/10/16	**6.30**	MDH	
8	11/1/16	11/7/16	**6.20**	MVTL	144 hrs prior
8	12/6/16	12/12/16	**6.17**	MVTL	216 hrs prior
8	12/20/16	12/27/16	**5.95**	MVTL	168 hrs prior
8	12/20/16	2/9/17	**5.70**	MDH	
8	1/3/17	1/16/17	**6.59**	MVTL	168 hrs prior
8	1/3/17	5/4/17	**6.40**	MDH	
8	2/7/17	2/14/17	**6.08**	MVTL	168 hrs prior
8	3/7/17	3/18/17	**6.16**	MVTL	168 hrs prior
8	3/7/17	4/24/17	**6.20**	MDH	
8	4/4/17	4/10/17	**6.07**	MVTL	216 hrs prior
8	5/2/17	5/10/17	**6.22**	MVTL	168 hrs prior
8	6/6/17	6/14/17	**5.71**	MVTL	168 hrs prior
8	6/8/17	7/27/17	**5.80**	MDH	168 hrs prior
8	7/5/17	7/20/17	**6.36**	MVTL	144 hrs prior
8	8/1/17	8/7/17	**6.03**	MVTL	216 hrs prior
8	8/14/17	10/20/17	**5.80**	MDH	
8	9/5/17	9/26/17	**5.98**	MVTL	216 hrs prior
8	9/5/17	9/26/17	**5.40**	MDH	
8	10/3/17	10/20/17	**6.00**	MVTL	168 hrs prior
8	10/3/17	11/17/17	**6.20**	MDH	
8	11/7/17	3/2/18	**5.97**	MVTL	168 hrs prior
8	12/5/17	12/22/17	**5.61**	MVTL	192 hrs prior
8	12/5/17	1/8/18	**6.00**	MDH	
8	1/2/18	1/16/18	**6.07**	MVTL	168 hrs prior
8	1/2/18	2/20/18	**5.60**	MDH	
8	2/6/18	2/20/18	**5.94**	MVTL	168 hrs prior
8	3/6/18	3/26/18	**6.03**	MVTL	168 hrs prior
8	3/6/18	3/26/18	**5.70**	MDH	
8	4/3/18	4/10/18	**5.88**	MVTL	168 hrs prior
8	5/1/18	5/9/18	**6.08**	MVTL	168 hrs prior
8	5/1/18	6/26/18	**5.80**	MDH	
8	6/5/18	6/14/18	**5.59**	MVTL	168 hrs prior



Location	Sample Collected	Results Received	Results	Lab	Run Time
9	5/17/16	6/2/16	**3.30**	MDH	
9	6/21/16	6/28/16	**3.51**	MVTL	144 hrs prior
9	7/19/16	7/25/16	**3.47**	MVTL	168 hrs prior
9	8/16/16	8/22/16	**3.49**	MVTL	192 hrs prior
9	9/20/16	9/28/16	**3.39**	MVTL	240 hrs prior
9	10/18/16	10/24/16	**3.27**	MVTL	168 hrs prior
9	11/15/16	11/21/16	**3.32**	MVTL	168 hrs prior
9	12/20/16	12/27/16	**2.81**	MVTL	144 hrs prior
9	1/17/17	1/27/17	**3.49**	MVTL	168 hrs prior
9	2/21/17	3/3/17	**3.46**	MVTL	168 hrs prior
9	3/21/17	3/27/17	**4.06**	MVTL	168 hrs prior
9	4/18/17	4/24/17	**3.09**	MVTL	168 hrs prior
9	5/16/17	5/25/17	**3.47**	MVTL	168 hrs prior
9	6/5/17	6/28/17	**3.40**	MDH	168 hrs prior
9	6/20/17	6/27/17	**3.69**	MVTL	168 hrs prior
9	7/11/17	7/20/17	**4.23**	MVTL	144 hrs prior
9	8/8/17	8/14/17	**4.27**	MVTL	168 hrs prior
9	9/12/17	9/26/17	**4.40**	MVTL	132 hrs prior
9	10/10/17	10/20/17	**4.38**	MVTL	144 hrs prior
9	11/14/17	11/21/17	**4.43**	MVTL	168 hrs prior
9	12/12/17	12/22/17	**4.14**	MVTL	168 hrs prior
9	1/9/18	1/16/18	**4.45**	MVTL	168 hrs prior
9	2/13/18	2/20/18	**4.33**	MVTL	168 hrs prior
9	3/13/18	3/26/18	**4.36**	MVTL	168 hrs prior
9	4/10/18	4/18/18	**4.23**	MVTL	168 hrs prior
9	6/19/18	6/26/18	**2.92**	MVTL	96 hrs prior



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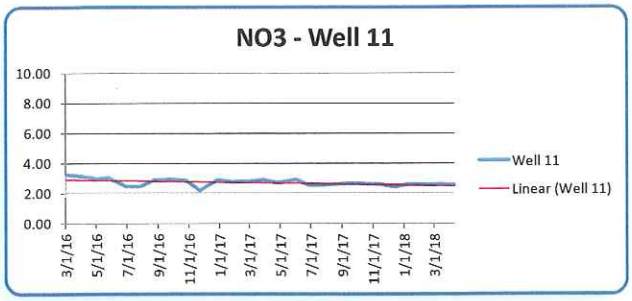
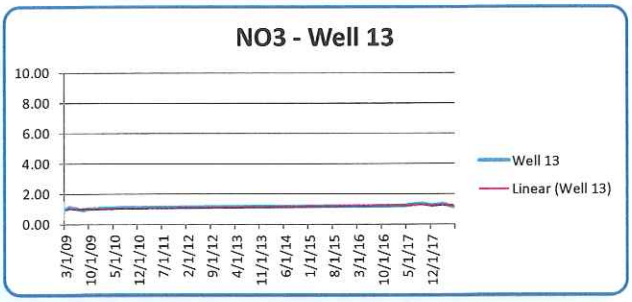
TCWC = Twin City Water Clinic

Run times will represent the well being in step 1 for one week (168 hrs)

Shakopee Public Utilities Commission
Water Department
Nitrate Results
Reported in mg/L

Location	Sample Collected	Results Received		Results	Lab	Run Time
10	4/17/12	4/20/12	<	**1.00**	TCWC	158 hrs prior
10	1/21/14	1/29/14	<	**1.00**	TCWC	144 hrs prior
10	3/25/14	4/1/14		**3.61**	MVTL	96 hrs prior
10	4/23/14	5/7/14	<	**0.20**	MVTL	24 hrs prior
10	4/23/14	6/16/14	<	**0.05**	MDH	*
10	6/16/15	6/26/15	<	**0.05**	MVTL	144 hrs prior
10	4/11/17	4/17/17	<	**0.05**	MVTL	168 hrs prior
11	3/1/16	3/8/16		**3.23**	MVTL	60 hrs prior
11	4/26/16	5/2/16		**2.99**	MVTL	192 hrs prior
11	4/26/16	5/26/16		**2.90**	MDH	
11	5/24/16	6/2/16		**3.02**	MVTL	264 hrs prior
11	6/28/16	7/6/16		**2.42**	MVTL	216 hrs prior
11	7/26/16	8/1/16		**2.40**	MVTL	126 hrs prior
11	8/23/16	8/31/16		**2.85**	MVTL	168 hrs prior
11	9/27/16	10/3/16		**2.89**	MVTL	168 hrs prior
11	10/25/16	10/31/16		**2.84**	MVTL	192 hrs prior
11	11/22/16	12/1/16		**2.15**	MVTL	216 hrs prior
11	12/27/16	1/4/17		**2.86**	MVTL	168 hrs prior
11	1/24/17	2/7/17		**2.72**	MVTL	216 hrs prior
11	2/28/17	3/8/17		**2.77**	MVTL	168 hrs prior
11	3/28/17	4/3/17		**2.87**	MVTL	168 hrs prior
11	4/25/17	5/4/17		**2.67**	MVTL	216 hrs prior
11	5/23/17	5/30/17		**2.83**	MVTL	168 hrs prior
11	6/1/17	6/15/17		**2.90**	MDH	192 hrs prior
11	6/27/17	7/5/17		**2.50**	MVTL	168 hrs prior
11	7/11/17	7/20/17		**2.50**	MVTL	168 hrs prior
11	8/8/17	8/14/17		**2.55**	MVTL	168 hrs prior
11	9/12/17	9/26/17		**2.62**	MVTL	168 hrs prior
11	10/10/17	10/20/17		**2.61**	MVTL	144 hrs prior
11	11/14/17	11/21/17		**2.57**	MVTL	168 hrs prior
11	12/12/17	12/22/17		**2.39**	MVTL	168 hrs prior
11	1/9/18	1/16/18		**2.57**	MVTL	168 hrs prior
11	2/13/18	2/20/18		**2.54**	MVTL	168 hrs prior
11	3/13/18	3/26/18		**2.59**	MVTL	168 hrs prior
11	4/10/18	4/18/18		**2.53**	MVTL	168 hrs prior
12	12/17/13	12/23/13		**3.01**	TCWC	144 hrs prior
12	1/21/14	1/29/14		**1.70**	TCWC	168 hrs prior
12	2/4/14	2/10/14		**2.21**	TCWC	144 hrs prior
12	4/23/14	5/7/14		**1.27**	MVTL	192 hrs prior
12	4/23/14	6/16/14		**1.30**	MDH	*
12	8/12/14	8/20/14		**2.10**	MVTL	162 hrs prior
12	9/23/14	10/2/14		**2.28**	MVTL	132 hrs prior
12	10/13/15	10/19/15		**2.35**	MVTL	126 hrs prior
12	4/11/17	4/17/17		**0.92**	MVTL	168 hrs prior
12	9/5/17	9/26/17		**0.72**	MVTL	168 hrs prior
12	12/5/17	12/22/17		**0.72**	MVTL	168 hrs prior
13	3/12/09	3/26/09		**0.96**	MVTL	46 hrs prior
13	4/14/09	4/27/09		**1.10**	MVTL	60 hrs prior
13	8/4/09	8/12/09		**0.90**	MVTL	1013 hrs prior
13	9/24/09	10/5/09		**0.98**	MVTL	51 hrs prior
13	7/14/10	7/27/10		**1.07**	MVTL	42 hrs prior
13	3/11/11	3/16/11		**1.08**	MVTL	100 hrs prior
13	4/11/17	4/17/17		**1.19**	MVTL	48 hrs prior
13	9/5/17	9/26/17		**1.35**	MVTL	128 hrs prior
13	12/5/17	12/22/17		**1.20**	MVTL	168 hrs prior
13	3/6/18	3/26/18		**1.32**	MVTL	168 hrs prior
13	6/5/18	6/14/18		**1.11**	MVTL	24 hrs prior
14	4/23/14	6/16/14	<	**0.05**	MDH	*
14	4/11/17	4/17/17	<	**0.05**	MVTL	20 hrs prior
14	9/5/17	9/26/17	<	**0.05**	MVTL	24 hrs prior
14	12/5/17	12/22/17	<	**0.05**	MVTL	168 hrs prior
14	3/6/18	3/26/18	<	**0.05**	MVTL	168 hrs prior
14	6/5/18	6/14/18	<	**0.05**	MVTL	24 hrs prior





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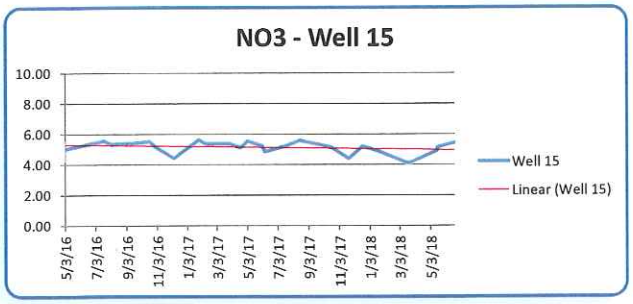
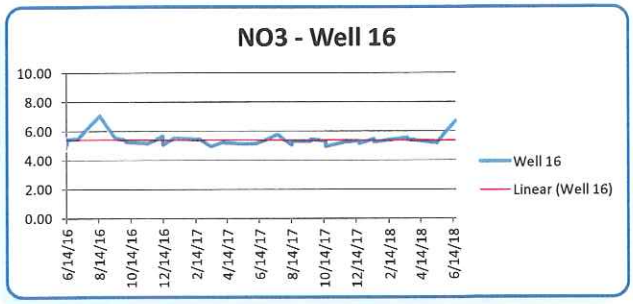
Shakopee Public Utilities Commission
Water Department
Nitrate Results
Reported in mg/L

Location	Sample Collected	Results Received	Results	Lab	Run Time
15	5/3/16	5/9/16	**5.00**	MVTL	288 hrs prior
15	5/3/16	5/26/16	**5.00**	MDH	
15	7/19/16	7/25/16	**5.52**	MVTL	144 hrs prior
15	8/2/16	8/9/16	**5.29**	MVTL	120 hrs prior
15	9/27/16	10/3/16	**5.41**	MVTL	216 hrs prior
15	10/18/16	10/24/16	**5.48**	MVTL	216 hrs prior
15	11/1/16	11/7/16	**5.08**	MVTL	192 hrs prior
15	12/6/16	12/12/16	**4.38**	MVTL	168 hrs prior
15	1/24/17	2/7/17	**5.58**	MVTL	168 hrs prior
15	2/7/17	2/14/17	**5.34**	MVTL	168 hrs prior
15	3/28/17	4/3/17	**5.35**	MVTL	168 hrs prior
15	4/18/17	4/24/17	**5.08**	MVTL	168 hrs prior
15	5/2/17	5/10/17	**5.50**	MVTL	144 hrs prior
15	6/1/17	6/15/17	**5.20**	MDH	168 hrs prior
15	6/6/17	6/14/17	**4.80**	MVTL	168 hrs prior
15	7/18/17	7/24/17	**5.20**	MVTL	168 hrs prior
15	8/15/17	8/21/17	**5.54**	MVTL	168 hrs prior
15	9/19/17	9/26/17	**5.32**	MVTL	168 hrs prior
15	10/17/17	11/17/17	**5.10**	MVTL	168 hrs prior
15	11/21/17	12/11/17	**4.36**	MVTL	168 hrs prior
15	12/19/17	12/27/17	**5.17**	MVTL	192 hrs prior
15	1/16/18	2/20/18	**4.88**	MVTL	168 hrs prior
15	3/20/18	3/27/18	**4.04**	MVTL	168 hrs prior
15	5/15/18	5/31/18	**4.88**	MVTL	168 hrs prior
15	5/15/18	5/31/18	**5.10**	MDH	
15	6/19/18	6/26/18	**5.40**	MVTL	408 hrs prior



16	6/14/16	6/20/16	**5.05**	MVTL	360 hrs prior
16	6/14/16	7/22/16	**5.40**	MDH	
16	7/5/16	7/12/16	**5.45**	MVTL	312 hrs prior
16	8/16/16	8/22/16	**7.01**	MVTL	120 hrs prior
16	9/13/16	9/28/16	**5.50**	MVTL	168 hrs prior
16	9/13/16	10/24/16	**5.50**	MDH	
16	10/4/16	10/12/16	**5.35**	MVTL	168 hrs prior
16	10/4/16	11/10/16	**5.20**	MDH	
16	11/15/16	11/21/16	**5.10**	MVTL	144 hrs prior
16	12/13/16	12/19/16	**5.63**	MVTL	312 hrs prior
16	12/13/16	2/9/17	**5.00**	MDH	
16	1/3/17	1/16/17	**5.49**	MVTL	168 hrs prior
16	2/21/17	3/3/17	**5.39**	MVTL	168 hrs prior
16	3/14/17	4/24/17	**4.90**	MDH	168 hrs prior
16	4/4/17	4/10/17	**5.17**	MVTL	168 hrs prior
16	5/16/17	5/25/17	**5.07**	MVTL	168 hrs prior
16	6/8/17	7/27/17	**5.10**	MDH	168 hrs prior
16	7/18/17	7/24/17	**5.72**	MVTL	168 hrs prior
16	8/14/17	10/20/17	**5.00**	MDH	
16	8/15/17	8/21/17	**5.28**	MVTL	168 hrs prior
16	9/19/17	9/26/17	**5.25**	MVTL	168 hrs prior
16	9/19/17	10/20/17	**5.40**	MDH	
16	10/17/17	11/17/17	**5.29**	MVTL	168 hrs prior
16	10/17/17	3/9/18	**4.90**	MDH	
16	11/21/17	12/11/17	**5.21**	MVTL	168 hrs prior
16	12/19/17	12/27/17	**5.29**	MVTL	192 hrs prior
16	12/19/17	2/20/18	**5.10**	MDH	
16	1/16/18	2/20/18	**5.44**	MVTL	168 hrs prior
16	1/16/18	3/9/18	**5.20**	MDH	
16	3/20/18	3/27/18	**5.53**	MVTL	168 hrs prior
16	3/20/18	5/31/18	**5.40**	MDH	
16	5/15/18	5/31/18	**5.14**	MVTL	168 hrs prior
16	5/15/18	6/26/18	**5.20**	MDH	
16	6/19/18	6/26/18	**6.65**	MVTL	408 hrs prior



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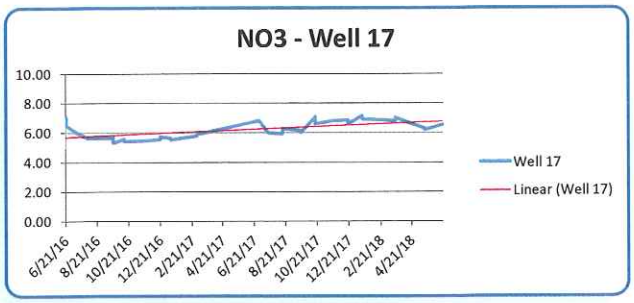
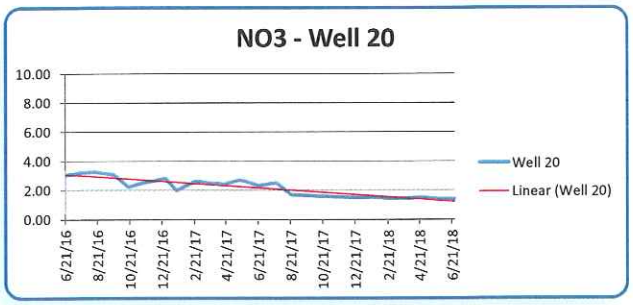
Shakopee Public Utilities Commission
Water Department
Nitrate Results
Reported in mg/L

Location	Sample Collected	Results Received	Results	Lab	Run Time
17	6/21/16	6/20/16	**7.04**	MVTL	312 hrs prior
17	6/21/16	8/30/16	**6.50**	MDH	
17	7/12/16	7/18/16	**5.98**	MVTL	216 hrs prior
17	7/12/16	11/10/16	**6.00**	MDH	
17	8/2/16	8/9/16	**5.62**	MVTL	120 hrs prior
17	9/20/16	9/28/16	**5.64**	MVTL	216 hrs prior
17	9/20/16	10/24/16	**5.30**	MDH	
17	10/11/16	10/17/16	**5.54**	MVTL	144 hrs prior
17	10/11/16	11/10/16	**5.40**	MDH	
17	11/22/16	12/1/16	**5.44**	MVTL	192 hrs prior
17	12/20/16	12/27/16	**5.53**	MVTL	192 hrs prior
17	12/20/16	2/9/17	**5.70**	MDH	
17	1/10/17	1/20/17	**5.61**	MVTL	168 hrs prior
17	1/10/17	5/4/17	**5.50**	MDH	
17	2/28/17	3/8/17	**5.75**	MVTL	168 hrs prior
17	3/7/17	3/18/17	**6.05**	MVTL	168 hrs prior
17	3/7/17	4/24/17	**5.90**	MDH	
17	6/30/17	7/27/17	**6.80**	MDH	168 hrs prior
17	7/18/17	7/24/17	**5.97**	MVTL	168 hrs prior
17	8/14/17	10/20/17	**5.90**	MDH	
17	8/15/17	8/21/17	**6.27**	MVTL	168 hrs prior
17	9/19/17	9/26/17	**6.13**	MVTL	168 hrs prior
17	9/19/17	10/20/17	**6.00**	MDH	
17	10/17/17	11/17/17	**7.06**	MVTL	168 hrs prior
17	10/17/17	3/9/18	**6.60**	MDH	
17	11/21/17	12/11/17	**6.79**	MVTL	168 hrs prior
17	12/19/17	12/27/17	**6.85**	MVTL	192 hrs prior
17	12/19/17	2/20/18	**6.60**	MDH	
17	1/16/18	2/20/18	**7.12**	MVTL	168 hrs prior
17	1/16/18	3/9/18	**6.90**	MDH	
17	3/20/18	5/31/18	**6.80**	MDH	
17	3/20/18	3/27/18	**7.00**	MVTL	168 hrs prior
17	5/15/18	5/31/18	**6.27**	MVTL	168 hrs prior
17	5/15/18	6/26/18	**6.20**	MDH	
17	6/19/18	6/26/18	**6.52**	MVTL	408 hrs prior



20	6/21/16	6/28/16	**3.03**	MVTL	768 hrs prior
20	7/19/16	7/25/16	**3.19**	MVTL	144 hrs prior
20	8/16/16	8/22/16	**3.23**	MVTL	159 hrs prior
20	9/20/16	9/28/16	**3.05**	MVTL	216 hrs prior
20	10/18/16	10/24/16	**2.20**	MVTL	144 hrs prior
20	11/15/16	11/21/16	**2.49**	MVTL	192 hrs prior
20	12/27/16	1/4/17	**2.79**	MVTL	168 hrs prior
20	1/17/17	1/27/17	**1.97**	MVTL	168 hrs prior
20	2/21/17	3/3/17	**2.60**	MVTL	168 hrs prior
20	3/21/17	3/27/17	**2.47**	MVTL	168 hrs prior
20	4/18/17	4/24/17	**2.40**	MVTL	168 hrs prior
20	5/16/17	5/25/17	**2.68**	MVTL	168 hrs prior
20	6/5/17	6/28/17	**2.50**	MDH	144 hrs prior
20	6/20/17	6/27/17	**2.30**	MVTL	168 hrs prior
20	7/25/17	8/1/17	**2.49**	MVTL	144 hrs prior
20	8/22/17	8/28/17	**1.67**	MVTL	192 hrs prior
20	9/26/17	10/4/17	**1.61**	MVTL	168 hrs prior
20	10/24/17	11/17/17	**1.56**	MVTL	168 hrs prior
20	11/28/17	12/11/17	**1.51**	MVTL	168 hrs prior
20	12/26/17	1/9/18	**1.46**	MVTL	168 hrs prior
20	1/23/18	2/20/18	**1.51**	MVTL	168 hrs prior
20	2/27/18	3/9/18	**1.41**	MVTL	168 hrs prior
20	3/27/18	4/10/18	**1.43**	MVTL	168 hrs prior
20	4/24/18	5/9/18	**1.49**	MVTL	168 hrs prior
20	5/22/18	5/31/18	**1.42**	MVTL	168 hrs prior
20	5/22/18	6/14/18	**1.40**	MDH	
20	6/26/18	7/2/18	**1.39**	MVTL	72 hrs prior



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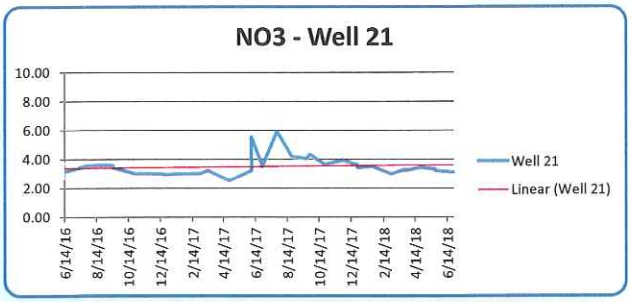
Shakopee Public Utilities Commission
Water Department
Nitrate Results
Reported in mg/L

Location	Sample Collected	Results Received	Results	Lab	Run Time
21	6/14/16	6/20/16	3.12	MVTL	144 hrs prior
21	7/26/16	8/1/16	3.52	MVTL	211 hrs prior
21	8/23/16	8/31/16	3.57	MVTL	162 hrs prior
21	9/13/16	9/28/16	3.54	MVTL	216 hrs prior
21	9/13/16	10/24/16	3.40	MDH	
21	10/26/16	11/7/16	2.97	MVTL	120 hrs prior
21	11/22/16	12/1/16	2.98	MVTL	120 hrs prior
21	12/20/16	12/27/16	2.94	MVTL	144 hrs prior
21	12/20/16	2/9/17	2.90	MDH	
21	1/24/17	2/7/17	2.97	MVTL	168 hrs prior
21	2/28/17	3/8/17	2.98	MVTL	168 hrs prior
21	3/14/17	4/24/17	3.20	MDH	168 hrs prior
21	4/25/17	5/4/17	2.48	MVTL	168 hrs prior
21	6/6/17	6/28/17	3.20	MDH	144 hrs prior
21	6/6/17	7/27/17	5.50	MDH	
21	6/27/17	7/5/17	3.48	MVTL	168 hrs prior
21	7/25/17	8/1/17	5.90	MVTL	144 hrs prior
21	8/22/17	8/28/17	4.18	MVTL	192 hrs prior
21	9/19/17	10/20/17	4.00	MDH	
21	9/26/17	10/4/17	4.29	MVTL	168 hrs prior
21	10/24/17	11/17/17	3.61	MVTL	168 hrs prior
21	11/28/17	12/11/17	3.90	MVTL	168 hrs prior
21	12/26/17	1/9/18	3.58	MVTL	168 hrs prior
21	12/26/17	2/20/18	3.40	MDH	
21	1/23/18	2/20/18	3.49	MVTL	168 hrs prior
21	2/27/18	3/9/18	2.95	MVTL	168 hrs prior
21	3/27/18	4/10/18	3.28	MVTL	168 hrs prior
21	3/27/18	5/31/18	3.20	MDH	
21	4/24/18	5/9/18	3.40	MVTL	168 hrs prior
21	5/22/18	5/31/18	3.30	MVTL	168 hrs prior
21	5/22/18	6/14/18	3.20	MDH	
21	6/26/18	7/2/18	3.07	MVTL	240 hrs prior



Combined Discharge - Wells 6-7-10

CD 1	6/21/16	6/28/16	3.23	MVTL	162 hrs prior
CD 1	7/12/16	7/18/16	3.26	MVTL	212 hrs prior
CD 1	8/9/16	8/22/16	3.17	MVTL	165 hrs prior
CD 1	9/13/16	9/28/16	3.07	MVTL	168 hrs prior
CD 1	10/25/16	10/31/16	3.01	MVTL	144 hrs prior
CD 1	11/8/16	11/17/16	3.14	MVTL	368 hrs prior
CD 1	12/13/16	12/18/16	2.95	MVTL	168 hrs prior
CD 1	1/10/17	1/20/17	2.96	MVTL	168 hrs prior
CD 1	2/14/17	3/6/17	4.35	MVTL	168 hrs prior
CD 1	3/14/17	3/23/17	3.11	MVTL	168 hrs prior
CD 1	4/11/17	4/17/17	3.11	MVTL	120 hrs prior
CD 1	5/9/17	5/25/17	3.19	MVTL	212 hrs prior
CD 1	6/5/17	6/28/17	2.60	MDH	168 hrs prior
CD 1	6/13/17	6/20/17	3.03	MVTL	168 hrs prior
CD 1	7/11/17	7/20/17	3.12	MVTL	168 hrs prior
CD 1	8/8/17	8/14/17	3.08	MVTL	168 hrs prior
CD 1	9/12/17	9/26/17	3.03	MVTL	168 hrs prior
CD 1	10/10/17	10/20/17	3.09	MVTL	168 hrs prior
CD 1	11/14/17	11/21/17	3.16	MVTL	168 hrs prior
CD 1	12/12/17	12/22/17	3.00	MVTL	168 hrs prior
CD 1	1/9/18	1/16/18	3.23	MVTL	168 hrs prior
CD 1	2/13/18	2/20/18	3.18	MVTL	168 hrs prior
CD 1	3/13/18	3/26/18	2.42	MVTL	168 hrs prior
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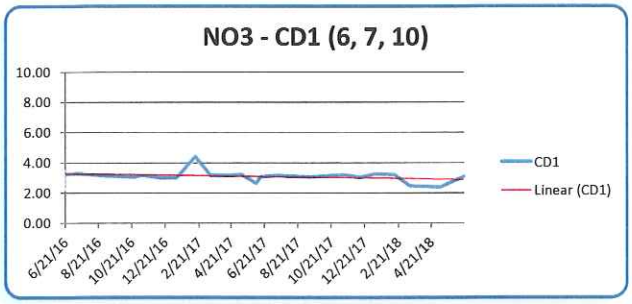
CD 1	6/19/18	6/26/18	3.05	MVTL	168 hrs prior



Combined Discharge - Wells 12-13-14

CD 2	6/16/2015	6/26/2015	1.26	MVTL	126 hrs prior
CD 2	8/4/2015	8/10/2015	1.35	MVTL	168 hrs prior
CD 2	9/15/2015	9/22/2015	1.15	MVTL	144 hrs prior
CD 2	10/6/2015	10/14/2015	1.25	MVTL	208 hrs prior
CD 2	12/22/2015	12/30/2015	1.03	MVTL	168 hrs prior
CD 2	1/5/2016	1/13/2016	1.08	MVTL	192 hrs prior
CD 2	2/23/2016	2/29/2016	1.03	MVTL	208 hrs prior
CD 2	3/22/2016	3/28/2016	0.96	MVTL	288 hrs prior
CD 2	4/12/2016	4/19/2016	1.07	MVTL	120 hrs prior
CD 2	5/10/2016	5/16/2016	0.98	MVTL	165 hrs prior
CD 2	5/10/2016	6/2/2016	0.97	MDH	
CD 2	7/12/2016	7/18/2016	0.93	MVTL	170 hrs prior
CD 2	10/11/2016	10/17/2016	0.87	MVTL	168 hrs prior
CD 2	11/8/2016	11/17/2016	0.91	MVTL	168 hrs prior
CD 2	1/10/2017	1/20/2017	0.92	MVTL	216 hrs prior
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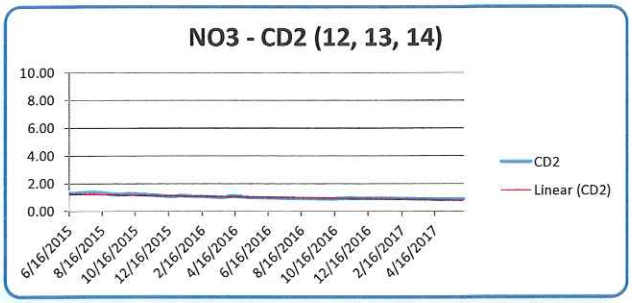
CD 2	6/8/2017	6/28/2017	0.86	MDH	144 hrs prior



MVTL = Minnesota Valley Testing Laboratories
MDH = Minnesota Department of Health
TCWC = Twin City Water Clinic

Run times will represent the well being in step 1 for one week (168 hrs)

SHAKOPEE PUBLIC UTILITIES
MEMORANDUM

TO: John Crooks, Utilities Manager

FROM: Joseph D. Adams, Planning & Engineering Director

SUBJECT: Long Range Plan for Electric Utility

DATE: July 13, 2018

ISSUE

Attached is an abbreviated version of the final long range plan from Leidos Engineering's Kevin Favero, submitted for the Commission's review and acceptance.

BACKGROUND

The long range plan is a guide for the electric utility as we move forward into the future. The plan identifies and estimates the cost and timing of additional facilities to serve projected load growth. Load growth projections are based on the City's latest development guides.

We asked the Commission's consultant to look forward to full development of the Shakopee Public Utilities electric service territory, including areas now in Jackson township outside the corporate limits of the City of Shakopee that are planned for eventual annexation. Once areas outside the SPU service territory are annexed into Shakopee, the service territory rights become eligible for acquisition by SPU.

We also asked Leidos to evaluate options in case of a loss of our current Blue Lake substation capacity, since Xcel Energy has made past requests to SPU to abandon our facilities in their substation.

DISCUSSION

The full report is over 1,200 pages, including all of the appendices that evaluate all possible contingency conditions under each growth scenario and how service could best be restored during such contingencies. The full report is available of course if desired. Staff believes the abbreviated report should suffice for discussion purposes.

Kevin Favero SPU" s long time engineering consultant oversaw the report's preparation and will present the report to the Commission and answer questions.

REQUESTED ACTION

Staff requests the Commission accept the report as is or direct staff to add clarifying information as deemed necessary.

Final Report

Long-Range Plan

Shakopee Public Utilities
Shakopee, Minnesota

SHAKOPEE PUBLIC UTILITIES

July 2018

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Final Report

Long-Range Plan

Shakopee Public Utilities
Shakopee, Minnesota

SHAKOPEE PUBLIC UTILITIES

July 2018

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This report has been prepared for the use of the client for the specific purposes identified in the report. The conclusions, observations and recommendations contained herein attributed to Leidos constitute the opinions of Leidos. To the extent that statements, information and opinions provided by the client or others have been used in the preparation of this report, Leidos has relied upon the same to be accurate, and for which no assurances are intended and no representations or warranties are made. Leidos makes no certification and gives no assurances except as explicitly set forth in this report.

July 12, 2018

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Joe Adams
Shakopee Public Utilities
255 Sarazin Street
Shakopee, MN 55379

Subject: **SPU Long Range Planning Study – Final Report**

Dear Mr. Adams:

Attached is the final report of the Long Range Planning Study for the SPU electric distribution system. This study investigates planning options for the ultimate system load growth under two load growth scenarios (Scenario A and Scenario B), including six areas to be annexed in the western portion of Shakopee, over a study period through 2033. The Scenario A and Scenario B load growth scenarios reflect different load growth amounts in the Shakopee Mdewakanton Sioux Community (SMSC) areas.

West Shakopee Substation

Forecast load growth in the six annexed areas and western portion of Shakopee exceeds the capacity of existing SPU Shakopee Substation and South Shakopee Substation, thereby requiring a new West Shakopee Substation to be developed.

Blue Lake Substation

A portion of load in eastern Shakopee is served by two circuits from the Blue Lake Substation, which is owned by Xcel Energy. SPU and Xcel have been in discussions concerning the abandonment of Blue Lake capacity by SPU or alternatively the expansion of Blue Lake Substation capacity to accommodate both Xcel and SPU load requirements and the associated long-term commitment by SPU to the associated costs.

Xcel has not indicated a definitive date for SPU to abandon its Blue Lake capacity or alternatively commit to long-term costs for expansion. Xcel has not provided a cost estimate for such expansion. Under **Plan 1**, SPU would continue to use Blue Lake capacity at current cost levels. Under **Plan 4**, SPU would increase its use of Blue Lake capacity in conjunction with a reinforcement upgrade by Xcel Energy and higher annual payments based on the new costs.

East Shakopee and Pike Lake Substations

This study investigated two options if SPU were to abandon its capacity in Blue Lake Substation:

- A second power transformer and circuits from the existing SPU Pike Lake Substation (**Plan 2**)
- A new East Shakopee Substation and circuits (**Plan 3**)

Under Scenario A load growth, there is little difference in estimated cumulative annual costs over the study period between Plan 2 and Plan 3. Plan 4 (Blue Lake reinforcement upgrades by Xcel) has a significantly higher cost than Plan 2 and Plan 3. A new East Shakopee Substation is recommended (Plan 3) based on the operating and flexibility advantages of the East Shakopee Substation versus additions at the Pike Lake Substation. The development of a new East Shakopee Substation can be approached in stages, with first identifying and possibly purchasing a site, and then abandoning the Blue Lake capacity when load growth requires the new substation construction.

Under Scenario B load growth, the estimated 15-year cumulative annual costs of Plan 2 are $3.4 million (12%) less than for Plan 3. To date the load density in the residential SMSC area north of Pike Lake Substation is approximately 42% of the Scenario A load growth density and approximately 21% of the Scenario B load growth density. If SPU pursues Plan 3 and the Scenario B load growth density is achieved, the additions at Pike Lake Substation can be made to serve the additional load growth, but the cost would be higher than for Plan 2.

For all plans considered, SPU would extend new circuits from existing substations to serve load growth.

Thank you for the assistance provided by you and the SPU staff. After you have had a chance to review the study results, let us know when you would like to discuss this further.

Sincerely,

Leidos Engineering, LLC

Kevin Favero

Kevin Favero, P.E.
Senior Project Manager

Long-Range Plan
Shakopee Public Utilities

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Introduction

Sound system planning is essential to provide management with guidance to economically develop the Shakopee Public Utilities (SPU) electric distribution system to ensure reliable and low-cost service to SPU electric customers. The planning should provide for an orderly development of the electric system such that the new investment in facilities is in step with load growth and revenue. System planning should include the following:

- Improvements in the quality of service to customers as improvement opportunities occur
- Expansion of the existing system beyond the present design requirements
- Economic evaluation of the construction of new facilities to meet the required capacity and evaluation of associated system energy losses

By using this approach, interim changes and system additions will be compatible with the capacity level needs as system load growth occurs.

SPU has retained Leidos Engineering (Leidos) to prepare a distribution system planning study for the ultimate load development in the SPU service territory based on a 15-year planning period through 2033.

Purpose of Report

The purpose of this Long-Range Plan is to provide general guidance in system planning for SPU. This plan makes allowances for changes that are forecast to occur and prepares the system for the future by the timely installation of required facilities to provide sufficient and reliable service to its customers. Periodic reviews of the long-range plan will be required to examine the applicability of the plan considering actual system developments and load growth.

Summary of Report, Conclusions, and Recommendations

The existing SPU electric system was analyzed and the findings are detailed in Section 1. Planning criteria were developed based on SPU's system reliability and performance goals to evaluate potential alternatives to serve the future planning load. The criteria developed are consistent with the criteria used for the SPU annual system operating analyses and were used to control costs while meeting the goals. Section 2 details the planning criteria.

The SPU electric system was analyzed to serve a forecasted system peak demand of 225.2 MVA in year 2033 under Scenario A. An alternate forecast, Scenario B, was

developed based on a higher load density in the Shakopee Mdewakanton Sioux Community (SMSC) territory resulting in a forecasted system peak demand of 236.2 MVA. The forecasted system peak demand for both scenarios was developed based on six annexation areas, multiple non-load areas, multiple spot loads, and base growth. For the annexation and non-load areas, Leidos identified representative SPU existing feeder[1] load density to estimate the load growth for the areas. The load forecast is based on the information below:

- **Existing Load**—The recorded non-coincident peak load for the SPU electric system during July 2016 totaled 113.2 MVA[2]. Load transfers between circuits since the recorded non-coincident peak load were accounted for in the load forecast.
- **Annexation Areas**—Totaling approximately 2,280 acres, the city of Shakopee is forecasted to annex six areas in Jackson Township, three of which are already in the SPU service territory. Load growth in those three areas is included in the non-load areas described below. The other three areas are forecasted to be annexed into the City first and then brought into the SPU service territory by 2030 with combined existing and potential future load growth totaling 23.2 MVA.
- **Non-Load Areas**—Totaling approximately 6,169 acres, the undeveloped (non-load or NL) areas in SPU's existing service territory totaling 56.0 MVA of potential future load growth for Scenario A and 67.1 MVA for Scenario B.
- **Spot Loads**—SPU identified expansion of existing customer sites or known developments (spot loads) totaling 14.0 MVA of potential future load growth.
- **Base Growth**—A compounded annual growth of 1% was assumed totaling 18.0 MVA of potential future load growth on existing feeders.

A map of the Existing and Future Load Areas can be found in Appendix A. Future load areas include annexation areas (A through F) and non-load (NL) areas in the existing SPU service territory.

Without the addition of new facilities, loading on power transformers and/or circuits served by the Shakopee, South Shakopee, Dean Lake, and Pike Lake Substations are forecasted to be over capacity during the study period through 2033. Based on these forecasted overloads, additional transformer and feeder capacity will be required to serve the projected load.

[1] Feeders are primary voltage circuits served from electric substations. Electric substations transform high voltage from transmission lines to lower primary circuit voltage.
[2] MVA = Mega-volt-amperes, which is a measure of electrical load or capacity.

Blue Lake Substation

SPU and Xcel Energy have been in discussions pertaining to SPU abandoning its capacity in Blue Lake Substation, which is owned by Xcel Energy, or alternatively, the expansion of the Blue Lake Substation to be able to serve SPU loads. However, Xcel Energy has not given notice of a specific date by which SPU must vacate its capacity in the Blue Lake Substation or commit to the cost of an expansion in the Blue Lake capacity.

Xcel has not provided an estimate of the costs for the expansion of Blue Lake Substation. Costs for Blue Lake capacity for this study are based on the following:

- Plan 1 – Blue Lake capacity costs are based on current payment levels to Xcel Energy assuming the SPU Blue Lake load does not increase and no Blue Lake reinforcements are needed.
- Plan 4 – Blue Lake capacity costs are based on a Leidos-prepared indicative planning level estimate for reinforcement upgrades and allocation of costs between SPU load and Xcel load. The Leidos-prepared estimate is not based on input from Xcel as to the facilities needed for reinforcement and should be considered to be a very preliminary estimate.

East Shakopee Substation

For purposes of this study, it has been assumed that if SPU abandons its capacity in Blue Lake Substation, one alternative would be to construct a new substation in the eastern portion of Shakopee (the East Shakopee Substation or ES substation). The ES substation is assumed to be in service in 2021, which would provide time for identifying and procuring a substation site, designing the substation, and constructing the substation.

Potential sites for the East Shakopee Substation are shown in Appendix W. Selection of a site will depend on many factors such as proximity to an existing transmission line, the approval of Xcel to tap that line for new substation load, the proximity to residential and commercial retail customers, the ability to route exit circuits to serve load and to provide backup ties with circuits from other substations, and the willingness of the site owner to sell the property for the development of a substation.

Some of the potential sites shown in Appendix W are under development and are no longer available as a substation site. These have been marked with an X.

Pike Lake Substation Expansion

If SPU abandons its capacity in Blue Lake Substation, another alternative investigated in this study is to install the second power transformer and switchgear building in the existing SPU Pike Lake Substation and install Pike Lake circuits to serve the load currently served by the Blue Lake circuits.

West Shakopee Substation

The total forecast load of 25 MVA in the three annexation areas that are projected to be brought into the SPU service territory plus the load in the other three annexation areas is too great to be served by existing SPU substation facilities. There is limited capacity available in the Shakopee Substation circuits. Also, the South Shakopee Substation capacity, with the addition of two circuits, is expected to ultimately serve load growth in the area near to the South Shakopee Substation.

Circuits from the South Shakopee Substation would be installed to serve the existing load in the annexed areas until a new substation in west Shakopee (the West Shakopee Substation or WS Substation) could be built—forecast to be needed in 2022, which provides time for identifying and procuring a substation site, designing the substation, and constructing the substation.

Potential sites for the West Shakopee Substation are shown in Appendix W. Selection of a site will depend on many factors such as proximity to an existing transmission line, the approval of Xcel to tap that line for new substation load, the proximity to residential and commercial retail customers, the ability to route exit circuits to serve load and to provide backup ties with circuits from other substations, and the willingness of the site owner to sell the property for the development of a substation.

Interconnecting the West Shakopee Substation to the 115 kV transmission line between Scott County Substation and Dean Lake Substation will need to take into consideration the load of the substations already connected to the line, which include the Dean Lake Substation and the Hyland Lake Substation, as well as the potential for connecting the East Shakopee Substation.

Summary of Plans

The basic development characteristics of the plans that were evaluated are summarized as follows:

Plan 1

- New circuits from existing substations
- Keep Blue Lake capacity and circuits at current payment levels
- New West Shakopee Substation to serve load in the Annexation Areas
- New Pike Lake Substation power transformer and circuits (for Scenario B load levels only)

Plan 2

- New circuits from existing substations
- New Pike Lake Substation power transformer to serve Blue Lake circuits and other load
- New West Shakopee Substation to serve load in the Annexation Areas

Plan 3

- New circuits from existing substations
- New East Shakopee Substation to serve Blue Lake circuits and other load
- New West Shakopee Substation to serve load in the Annexation Areas
- New Pike Lake Substation power transformer and circuits (for Scenario B load levels only)

Plan 4

- New circuits from existing substations
- New Blue Lake Substation reinforcement upgrades, which include two larger power transformers and associated high voltage and medium voltage upgrades
- New West Shakopee Substation to serve load in the Annexation Areas
- New Pike Lake Substation power transformer and circuits (for Scenario B load levels only)

A more detailed description of the plans is provided in Section 2 of this report.

Economic Summary of Plans

The following table provides a summary of the 15-year costs of the plans considered for this analysis:

Table ES-1
Estimated 2033 Cumulative Annual Costs Comparison

Plan	Description	2033 Cumulative Investment	2033 Cumulative Annual Cost[a]	Cumulative Annual Cost Difference from Plan 1	Cumulative Annual Percent Cost Difference from Plan 1
Plan 1A	West Shakopee	$16,176,394	$28,345,133	-	-
Plan 2A	West Shakopee and 2nd Transformer at Pike Lake	$20,779,310	$33,139,770	$4,794,637	17%
Plan 3A	West Shakopee and East Shakopee	$23,318,447	$34,342,004	$5,996,872	21%
Plan 4A	Upgrade Blue Lake Substation	$21,325,651	$38,012,156	$9,667,023	34%
Plan 1B	West Shakopee	$20,515,753	$29,586,087	-	-
Plan 2B	West Shakopee and 2nd Transformer at Pike Lake	$21,183,073	$33,555,276	$3,969,189	13%
Plan 3B	West Shakopee and East Shakopee[b]	$23,391,455	$34,666,946	$5,080,859	17%
Plan 4B	Upgrade Blue Lake Substation	$26,196,126	$41,379,328	$11,793,240	40%

Notes:
a. Includes Annual Carrying Costs, Blue Lake Annual Costs, and Annual Cost of Losses.
b. For Plan 3B, the second transformer at Pike Lake will need to be installed to serve the increased load of the SMSC areas during a contingency outage of the first transformer at Pike Lake.

Findings and Conclusions

The following findings and conclusions are based on the scenarios and plans evaluated and the assumptions described herein:

- If the Blue Lake Substation capacity is abandoned, additional substation capacity will be required.
- The forecast load in the Annexation Areas coupled with other load growth exceeds the existing spare capacity at the Shakopee and South Shakopee Substations, thereby requiring capacity additions in the western portion of Shakopee to serve forecasted load.
- The existing load density of circuit PL-77, which serves load in an SMSC residential area, is 6.3 kVA per acre of developed land. The 15 kVA per acre density for SMSC area under Scenario A provides a reasonable level for a moderate increase in density with mostly residential and some commercial load. The 30 kVA per acre of density for SMSC areas under Scenario B provides a reasonable level for more aggressive increase in density that could reflect large commercial loads.
- The potential growth in the SMSC areas for Scenario B near Pike Lake will exceed the existing capacity at Pike Lake Substation.
- **Under Scenario A**, Plan 1 has the lowest estimated cumulative 15-year annual cost. Estimated cumulative annual costs for Plan 2 are $4.8 million or 17% higher than for Plan 1.
- **Under Scenario A**, estimated cumulative annual costs for Plan 3 are $6.0 million or 21% higher than for Plan 1.
- **Under Scenario A**, estimated cumulative annual costs for Plan 4 are $9.7 million or 34% higher than for Plan 1.
- **Under Scenario A**, estimated cumulative annual costs for Plan 3 are $1.2 million or 4% higher than for Plan 2.
- **Under Scenario A**, estimated cumulative annual costs for Plan 3 are $3.7 million or 11% higher than for Plan 4.
- **Under Scenario A**, estimated cumulative annual costs for Plan 4 are $4.9 million or 14% higher than for Plan 2.
- **Under Scenario B**, Plan 1 has the lowest estimated cumulative 15-year annual cost. Estimated cumulative annual costs for Plan 2 are $4.0 million or 13% higher than for Plan 1.
- **Under Scenario B,** estimated cumulative annual costs for Plan 3 are $5.1 million or 17% higher than for Plan 1.
- **Under Scenario B**, estimated cumulative annual costs for Plan 4 are $11.8 million or 34% higher than for Plan 1.

- **Under Scenario B**, estimated cumulative annual costs for Plan 3 are $1.1 million or 3% higher than for Plan 2.
- **Under Scenario B**, estimated cumulative annual costs for Plan 3 are $6.7 million or 19% higher than for Plan 4.
- **Under Scenario B**, estimated cumulative annual costs for Plan 4 are $7.8 million or 23% higher than for Plan 2.
- **Plan 1** is the lowest-cost alternative, but it requires that the aggregate SPU and Xcel Energy load at Blue Lake does not increase enough to require a Blue Lake reinforcement.
- **Under Plan 2**, potential benefits include increased capacity at Pike Lake to facilitate restoration of power for transformer outages and marginally lower cost than for Plan 3.
- **Under Plan** 2, potential problems include longer feeder distances to serve the Blue Lake circuits and possible feeder routing issues. Due to long feeder lengths, using Pike Lake circuits to back up Dean Lake circuit DL-48, previously connected to Blue Lake circuit BL-20, could be problematic during heavy load conditions.
- **Under Plan 3**, potential benefits include increased flexibility when serving load in the northeast portion of SPU's service territory, including backup to Dean Lake Substation circuits previously connected to Blue Lake circuits, and shorter feeder lengths, which is expected to reduce exposure to load outages and to reduce voltage drop for serving other circuits during contingencies. The new East Shakopee Substation circuits would also be used to back up Pike Lake Substation circuits.
- **Under Plan 3,** flexibility to install additional transformer capacity at Pike Lake Substation is maintained for Scenario B load growth in the area around Pike Lake.
- **Under Plan 3**, potential problems include finding a site for the East Shakopee Substation and contingency transformer outage issues at Pike Lake in Scenario B. Plan 3B requires the installation of the second transformer at Pike Lake, which increases the overall cost of the plan.
- **Under Plan 4**, potential benefits include increased flexibility when serving load in the northeast portion of SPU's service territory, including backup to Dean Lake Substation circuits, and shorter feeder lengths.
- **Under Plan 4,** flexibility to install additional transformer capacity at Pike Lake Substation is maintained for Scenario B load growth in the area around Pike Lake.
- **Under Plan 4**, potential problems include additional annual carrying costs for Blue Lake Substation upgrades and contingency transformer outage issues at Pike Lake in Scenario B. Plan 4B requires the installation of the second transformer at Pike Lake, which increases the overall cost of the plan.

Recommendations

Based on the forecast system deficiencies and the above findings and conclusions, an expansion plan was selected that includes the following:

- New feeder additions out of South Shakopee, Dean Lake, Pike Lake, and West Shakopee Substations
- Construction of the West Shakopee Substation to serve load growth in the western portion of the SPU service territory and Annexation Areas
- Identification and possible purchase of land for an East Shakopee Substation in preparation for the potential of abandoning the SPU capacity in Blue Lake
- Construction of the East Shakopee Substation to serve load in the northeast portion of the SPU service territory if Blue Lake Substation capacity is abandoned
- Additional transformer capacity at Pike Lake Substation if Scenario B load growth is achieved
- Various distribution improvements, including switching, re-conductoring (replacing existing circuit conductors with larger conductors) to relieve overloading and improve conditions for contingency switching, and installing additional phase conductors to existing single-phase and two-phase circuits

Under the proposed expansion plan (Plan 3), total estimated cumulative capital expenditures through 2033 are estimated to be $34.3 million for Scenario A and $34.7 million for Scenario B, as shown in the table above and in Appendix V.

General Basis of Study

In the preparation of this Report, including the results and findings contained herein, Leidos relied on certain assumptions, considerations, and forecasts with respect to conditions that may occur in the future. While these considerations, assumptions, and forecasts are reasonable based on information known as of the date of this study, actual field conditions of the electric system were not verified and may differ from those assumed. Future standards, load growth, and system changes may alter the results and findings. In addition, field conditions encountered during design may impact some of the projects.

Section 1
ANALYSIS OF EXISTING SYSTEM AND BASIC DATA

1.1 Introduction

The existing SPU electric service territory is approximately 65% developed (based on a total area of 17,537 acres) with a 2016 recorded non-coincident electric circuit summer peak demand of 113.2 MVA. SPU is interested in identifying a program for supplying the electric system load when the SPU service territory is completely developed (the "ultimate electric system load"). This analysis was performed to project the ultimate SPU electric system load and identify a cost-effective approach to serve it.

SPU provided an up-to-date distribution system computer-based WindMil model for analyzing load flow and voltage drop on primary voltage distribution circuits. This model was revised for forecast load growth to perform the long-range analysis of the system.

The distribution system is operated at primary voltages of 13.8 kV[3] and 12.47 kV over approximately 361 miles of distribution lines. The distribution system consists of 91 miles of overhead distribution lines and 270 miles of underground distribution lines. The installed overhead conductor sizes range up to 477 kcmil ACSR[4] and the underground cable sizes range from #1/0 AL to 750 kcmil[5] aluminum.

1.2 Existing System Loading

1.2.1 Existing Substation Analysis

Table 1-1 below provides a summary of substation voltages, capacities, and historical peak demands. This analysis used the forecast non-coincident circuit summer peak loads for 2016 as the base load. The forecast 2016 non-coincident circuit peak loads used as a base for this analysis totaled 113.2 MVA as summarized in Table 1-1 below.

[3] kV = kilo-volts = 1,000 volts, which is a measure of electrical potential between circuit phases.
[5] ACSR = Aluminum conductor steel reinforced.
[6] kcmils = 1,000 circular mils.

Table 1-1
Substation Voltages, Capacities, and Historical Peak Demands

Substation	Voltage (kV)	Transformer Capacity (MVA)[a]	2016 Peak (MVA)[b]	Power Factor[6] @ Peak	Percent Loaded[c]
Shakopee – 0s Circuits	115 x 69 - 12.47	28	16.6	97%	59%
South Shakopee – 30s Circuits	115 - 12.47	28	17.1	96%	61%
South Shakopee – 80s Circuits	115 - 12.47	28	7.1	92%	25%
Blue Lake – 20s Circuits	115 -13.8	8.3	8.3	95%	32%
Dean Lake – 40s Circuits	115 -13.8	46.7	24.2	99%	52%
Dean Lake – 50s Circuits	115 -13.8	46.7	20.1	96%	43%
Dean Lake – 90s Circuits	115 -13.8	46.7	5.7	98%	12%
Pike Lake - 70s Circuits	115 -13.8	46.7	13.4	95%	29%
Total	-	**298.8**	**113.2**	**96%**	**38%**

Notes:
a. Except for Blue Lake, represents the maximum continuous load rating of the power transformer. For Blue Lake, represents the aggregate capacity limit of the two Blue Lake circuits as agreed to with Xcel Energy.
b. Peak demand and power factor based on historical metered data provided by SPU for 2016.
c. Equals 2016 Peak/Transformer Capacity.

1.2.2 Existing Circuit Analysis

Leidos used SPU's recorded non-coincident peak load during July 2016 as the base load. The 2016 non-coincident peak loads used as a base for this analysis totaled 113,241 kVA.[7] (113.2 MVA) as summarized in Table 1-2 below. The loading criteria targets a 50% maximum load level to allow for each feeder to back up another feeder based on the emergency rating of the feeder.

[6] Power factor = MW/MVA where MW = mega-watts a measure of electrical energy delivery.
[7] kVA = kilo-volt-ampere, which is a measure of electrical load or capacity; 1,000 kVA = 1 MVA.

Table 1-2
SPU Electric System Non-Coincident Peak Loads

Substation/ Feeder	Feeder Capacity (kVA)[a]	Actual 2016 Peak (kVA)	Power Factor[b]	Percent Loaded[f]
Shakopee				
SH-07	11,300	3300	98%	29%
SH-08	11,300	5000	98%	44%
SH-09	11,300	4300	98%	38%
SH-10	11,300	3980	95%	35%
South Shakopee				
SS-31	11,300	1400	97%	12%
SS-32	11,300	5400	96%	48%
SS-33	11,300	4200	89%	37%
SS-34	11,300	6100	95%	54%
SS-81	11,300	3800	97%	34%
SS-82	11,300	3320	92%	29%
Blue Lake				
BL-20	12,500	4800	93%	38%
BL-22	12,500	4200	96%	34%
Dean Lake				
DL-41	12,500	3600	99%	29%
DL-42	12,500	141	100%	1%
DL-43	12,500	5300	98%	42%
DL-44[c]	12,500	1400	99%	11%
DL-46	12,500	2600	97%	21%
DL-47	12,500	6800	99%	54%
DL-48	12,500	4400	99%	35%
DL-51	12,500	5200	99%	42%
DL-52	12,500	2800	95%	22%
DL-55	12,500	2200	96%	18%
DL-56	12,500	4700	100%	38%
DL-57	12,500	2200	93%	18%
DL-58	12,500	3000	93%	24%
DL-92[d]	12,500	3300	98%	26%
DL-96[e]	12,500	2400	96%	19%

Substation/ Feeder	Feeder Capacity (kVA)[a]	Actual 2016 Peak (kVA)	Power Factor[b]	Percent Loaded[f]
Pike Lake				
PL-71	12,500	5900	92%	47%
PL-72	12,500	10	100%	0.1%
PL-73	12,500	2900	96%	23%
PL-74	12,500	1980	100%	16%
PL-75	12,500	1790	90%	14%
PL-77	12,500	820	94%	7%
	Total:	**113,241**		

Notes:

a. Emergency peak rating of feeder per the loading criteria to allow for contingencies. Rating is equal to 522 amps emergency rating for 750 kcmil aluminum underground cables and for Blue Lake voltage regulators.
b. The power factor was taken from the WindMil model provided by SPU.
c. Load moved from DL-53.
d. Load moved from DL-45.
e. Load moved from DL-44.
f. Equal to Actual 2016 Peak/Feeder Capacity.

1.3 Projected System Loading

1.3.1 Load Density Projections

The 2018 Substation Forecast shown in Appendix C and summarized in Table 1-3 below projects the coincident system peak loads through 2033. The system forecast was allocated to the SPU substations based on load growth potential as described in more detail below and the SPU staff knowledge of expected spot load additions in the SPU service territory.

The load forecast is based on a Load Level and the anticipated year in which such Load Level is forecasted to be achieved. However, loads may develop more quickly or more slowly than anticipated. If the actual load develops as projected in the load forecast, the year given will match the Load Level. To avoid the impression that facilities need to be constructed for a specific year versus a specific load level, this report refers to Load Level and the anticipated year.

The load density for existing load areas was used to estimate load density for undeveloped areas (the non-load or NL areas shown in Appendix A). Appendix B provides a list of each undeveloped area and the existing load area whose load density was used to estimate load density for each undeveloped area. The load density, in kVA per acre, for each undeveloped area was multiplied by the area, in acres, of each undeveloped area to arrive at the projected potential ultimate load growth for that area.

Table 1-3 below is a presentation of the Load Level projections of the SPU system non-coincident substation peak demands.

Table 1-3
Peak System Planning Loads

Load Level	Anticipated Year	Non-Coincident Peak Demand (MVA)		
		Actual[a]	Scenario A Forecast	Scenario B Forecast
---	2016	113.2	---	---
0	2018	---	130.9	132.2
5	2023	---	173.2	177.7
10	2028	---	198.8	206.6
15	2033	---	224.5	235.6

Note:
a. Peak was recorded in 2016.

The service area was reviewed with management and staff of SPU relative to potential load growth. Each substation service area was examined based on historical load growth and load growth potential. A projected load for each substation was determined for each Load Level, as shown in Appendix C.

Annexation Areas

The SPU service territory is projected to expand to serve six areas (A through F) being annexed by the city of Shakopee in Jacksonville Township. These annexation areas are on the western side of Shakopee with Annex Areas A, E, and F already included in the SPU service territory. The six annexation areas, totaling approximately 2,280 acres, are forecasted to be served by SPU by 2020 totaling 23.2 MVA of existing and potential future load growth in the areas not already included in the SPU non-load areas as summarized in Table 1-4 below.

Table 1-4
Annexation Areas in Jackson Township

Annexation	Annexation Area (acres)[a]	Forecasted Load (MVA)	Year Annexed
Annex A	-[b]	-	2019
Annex B	436	10.2	2019
Annex C	313	2.5	2019
Annex D	1,497	10.2	2019
Annex E	-[c]	-	2019
Annex F	36	0.3	2019
	Total:	**23.2**	

Notes:
a. This includes areas not already covered by existing SPU circuits or undeveloped areas within SPU's service territory.
b. Annex A's area is within non-load Area B (NL-B).
c. Annex E's area is within non-load Area C (NL-C), and SPU circuits SS-32, SS-33, and SS-34.

Non-Load Areas

For the Shakopee Mdewakanton Sioux Community (SMSC) areas, non-load areas NL-H, NL-J, NL-L, NL-M, and NL-Y SPU confirmed with Leidos a load density of 15 kVA per acre load growth for NL-H, NL-J, NL-L, and NL-M and a load density of 10 kVA per acre load growth for NL-Y to be used to estimate the projected ultimate load growth in Scenario A. To investigate the effect of a higher load growth in the SMSC area, Scenario B was developed based on load growth of 30 kVA per acre for non-load areas NL-J, NL-L, and NL-M.

The undeveloped (non-load or NL) areas in SPU's service territory, totaling approximately 6,169 acres, are forecasted to have a potential growth of 56.0 MVA for Scenario A and 67.1 MVA for Scenario B.

Spot Load

SPU identified expansion of existing customer sites or known developments totaling 14.0 MVA. These Spot Loads were projected based on potential development plans as expressed by developers, potential installations on vacant parcels, or the load density of the surrounding area. The projected spot load growth in existing areas is summarized in Table 1-5 below.

Table 1-5
SPU 2016 Spot Load Projection

Spot Load	Feeder	Location	Forecasted Load (MVA)	Starting Load Level
Amazon	DL-96	4th Ave & Shenandoah Dr	2.6	LL0
St. Francis Hospital	SS-32	17th Ave & Marschall Rd	1.5	LL3
Residential Expansion	PL-77	McKenna Rd & Tinta Ln	1.3	LL0
NL-C School	SS-32	130th St W & Townline Ave	2.0	LL5
SL-1	DL-44	12th Ave E	0.1	LL1
SL-2	DL-44	12th Ave E	0.1	LL3
SL-3	DL-44	12th Ave E	0.2	LL5
SL-4	DL-46	Dean Lakes Blvd	2.0	LL4
SL-5	SS-32	Vierling Dr W	1.3	LL0
SL-6	SH-10	Sarazin St	0.8	LL0
SL-7	BL-22	Stagecoach Rd	1.6	LL0
SL-8	SS-32	County Road 78 & County Road 15	0.5	LL1
		Total	**14.0**	

Base Growth

The base growth is projected based on a compounded annual growth of 1% per circuit. Growth could occur in existing load areas due to the addition of new electrical appliances, electric vehicle charging equipment, and other electrical equipment by customers, the development of a small number of undeveloped lots, expansion by some customers, etc. The 1% annual base growth is assumed to be the net growth after growth is offset by the replacement of existing appliances and equipment with more energy efficient equipment over time and other energy reduction approaches under the SPU programs designed to meet the 1.5% annual energy reduction target under the Minnesota conservation improvement program (CIP).

1.3.2 Projected Substation Analysis

Table 1-6 below provides an overview of the existing substation capacity compared to the projected design load in 2033 (Load Level 15). At the projected design load, Shakopee and South Shakopee Substations are expected to exceed 100% of substation capacity, and Pike Lake and Dean Lake Substation are expected to exceed 75% of substation capacity. Projected overloaded facilities and associated percent loading are shown in red.

Table 1-6
Existing Substation Capacity and Projected Loading

Substation/Feeder	Peak Load (MVA)			
	Transformer Capacity (MVA)[a]	Projected LL15[b]	Power Factor @Peak	Percent Loaded[c]
Shakopee – 0s Circuits	28	41.0	97%	146%
South Shakopee – 30s Circuits	28	49.4	96%	176%
South Shakopee – 80s Circuits	28	11.1	92%	40%
Blue Lake – 20s Circuits	18.8	12.1	95%	64%
Dean Lake –40s Circuits	46.7	43.0	99%	92%
Dean Lake –50s Circuits	46.7	24.6	96%	53%
Dean Lake –90s Circuits	46.7	10.5	98%	22%
Pike Lake - 70s Circuits A[d]	46.7	33.5	95%	72%
Pike Lake- 70s Circuits B[d]	46.7	44.4	95%	95%

Notes:
a. Except for Blue Lake, represents the maximum continuous load rating of the power transformer. For Blue Lake, represents the sum of the normal ratings of the two Blue Lake circuits.
b. Projected demand based on the 2017 Load Forecast adjusted projections.
c. Equals Projected LL15/Transformer Capacity.
d. Differing load densities were used for the Shakopee Mdewakanton Sioux Community (SMSC) territory.

1.3.3 Projected Circuit Analysis

Table 1-7 below provides an overview of the existing circuit capacity compared to the projected design load in 2032 (Load Level 15). At the projected design load, SH-07, SS-31, SS-32, and PL-72B are expected to exceed 100% of circuit capacity, and SH-08, SS-33, SS-34, SS-81, DL-41, DL-47, DL-96, PL-71, PL-72A, PL-77A, and PL-77B are expected to exceed 50% of circuit capacity. The loading criteria targets a 50% maximum load level to allow for each feeder to back up another feeder based on the emergency rating of the feeder. Projected overloaded facilities and associated percent loading are shown in red.

Table 1-7
SPU Electric System Forecasted Non-Coincident Peak Loads

Substation/ Feeder	Feeder Capacity (kVA)	Projected 2032 Peak (kVA)	Power Factor[a]	Percent Loaded[b]
Shakopee				
SH-07	11,300	24,658	98%	218%
SH-08	11,300	5,846	98%	52%
SH-09	11,300	5,027	98%	44%
SH-10	11,300	5,453	95%	48%
South Shakopee				
SS-31	11,300	14,437	97%	128%
SS-32	11,300	20,913	96%	185%
SS-33	11,300	6,910	89%	61%
SS-34	11,300	7,132	95%	63%
SS-81	11,300	5,743	97%	51%
SS-82	11,300	5,382	92%	48%
Blue Lake		12,122		
BL-20	12,500	5,612	93%	45%
BL-22	12,500	6,510	96%	52%
Dean Lake				
DL-41	12,500	9,009	99%	72%
DL-42	12,500	4,265	100%	34%
DL-43	12,500	6,197	98%	50%
DL-44	12,500	5,437	99%	43%
DL-46	12,500	5,040	97%	40%
DL-47	12,500	7,950	99%	64%
DL-48	12,500	5,144	99%	41%
DL-51	12,500	6,080	99%	49%
DL-52	12,500	4,374	95%	35%
DL-55	12,500	2,572	96%	21%
DL-56	12,500	5,495	100%	44%
DL-57	12,500	2,572	93%	21%
DL-58	12,500	3,507	93%	28%
DL-92	12,500	3,858	98%	31%
DL-96	12,500	6,606	96%	53%
Pike Lake				
PL-71	12,500	6,898	92%	55%
PL-72A[c]	12,500	8,712	100%	70%
PL-72B[d]	12,500	14,712	100%	118%
PL-73	12,500	5,691	96%	46%

Substation/ Feeder	Feeder Capacity (kVA)	Projected 2032 Peak (kVA)	Power Factor[a]	Percent Loaded[b]
PL-74	12,500	2,725	100%	22%
PL-75	12,500	2,093	90%	17%
PL-77A[c]	12,500	7,339	94%	59%
PL-77B[d]	12,500	12,309	94%	98%

Notes:
a. The power factor was taken from the WindMil model provided by SPU.
b. Equal to Projected 2023 Peak/Feeder Capacity.
c. Load for Scenario A.
d. Load for Scenario B.

1.4 Summary of Overload Violations

1.4.1 Substation Overload Violations

At Load Levels 0, 5, 10, and 15, each of the eight transformers at the five substations was analyzed with respect to loading conditions. The analysis is summarized in Table 1-8 below.

Table 1-8
SPU Substation Violations Summary

Load Level	Anticipated Year	Number of Transformers Exceeding 100% Capacity	
		Scenario A	Scenario B
LL0	2018	0	0
LL5	2023	1	1
LL10	2028	2	2
LL15	2033	2	2

1.4.2 Circuit Overload Violations

At Load Levels 0, 5, 10, and 15, each of the 33 circuits was analyzed with respect to loading conditions. The analysis is summarized in Table 1-9 below.

Table 1-9
SPU Substation Violations Summary

Load Level	Anticipated Year	Number of Circuits Exceeding 50% Capacity	
		Scenario A	Scenario B
LL0	2018	3	3
LL5	2023	7	7
LL10	2028	9	11
LL15	2033	13	13

Section 2
ALTERNATE PLANS

2.1 System Development Plans

Various alternative plans and associated costs were evaluated to meet the future system facility requirements. The purpose of this section is to describe the alternative plans investigated and to identify a preferred plan that is forecast to serve the SPU system load on a cost-effective and reliable basis as the system expands for each of the planning load levels while meeting the planning criteria as described in Section 2.3 below.

2.2 Plan Selection

The alternatives considered serving the long-range planning load from the following:

- The existing substation locations, with distribution line and power transformer capacity increases
- The existing substation locations with load transferred between the substations to limit capacity increases of power transformers and distribution lines
- New substation locations to serve projected load where the rated capacity of the existing substation is projected to be exceeded
- New substations and circuits to improve conductor loading on the distribution system

Each exploratory plan considers the major facilities and operating conditions required to provide a transition from the existing to the projected system planning load. System deficiencies identified were addressed in each plan. The proposed circuit load distribution for each plan can be found in Appendix D through Appendix K.

A summary of the plans evaluated is given below. The plans are designated with an A or B to indicate Scenario A or Scenario B load levels. For example, Plan 1A is Plan 1 based on Scenario A load levels and Plan 1B is Plan 1 based on Scenario B load levels. The basic development characteristics of the plans that were evaluated are summarized as follows:

Plan 1

- New circuits from existing substations
- Keep Blue Lake capacity and circuits
- New West Shakopee Substation to serve load in the Annexation Areas
- New Pike Lake Substation power transformer and circuits (for Scenario B load levels only)

Plan 2

- New circuits from existing substations
- New Pike Lake Substation power transformer to serve Blue Lake circuits and other load
- New West Shakopee Substation to serve load in the Annexation Areas

Plan 3

- New circuits from existing substations
- New East Shakopee Substation to replace Blue Lake Substation source
- New West Shakopee Substation to serve load in the Annexation Areas
- New Pike Lake Substation power transformer and circuits (for Scenario B load levels only)

Plan 4

- New circuits from existing substations
- New Blue Lake Substation reinforcement upgrades
- New West Shakopee Substation to serve load in the Annexation Areas
- New Pike Lake Substation power transformer and circuits (for Scenario B load levels only)

A more detailed description of the plans is provided as follows.

Plan 1A: Upgrades to existing facilities to correct substation and distribution system deficiencies for Scenario A, including the following:

- **Load Level 1 (2019)**
  - **SS-83 (Future WS-01 and WS-13)** West from South Shakopee Substation along transmission line right-of-way to County Road 15 and north along County Road 15 to Oak Road.
    - Provide a tie with SS-32 by installing a new switch at Oak Road to allow load to be served by SS-83 during contingency. Once the West Shakopee Substation is built, this switch will provide a tie with WS-13.

- From Oak Road, continue north along County Road 15 to County Road 78, west along County Road 78 to County Road 69, and north along County Road 69 to 125th Street to serve undeveloped areas Annexation A and NL-B.
- The section of SS-83 north of County Road 78 will be served by West Shakopee Transformer 1 and Control Building 1 by feeder WS-01 in Load Level 9.
- The section of SS-83 east of County Road 69 and south of County Road 78 will be served by West Shakopee Transformer 2 and Control Building 2 by feeder WS-13 in Load Level 6.

- **SS-84 (Future WS-02)** West from South Shakopee Substation along transmission line right-of-way to County Road 15 and north along County Road 15 to County Road 78, west along County Road 78 to County Road 69, and north along County Road 69 to 125th Street to serve undeveloped areas Annexation A and NL-B.

- **DL-47** Close switch SW-916 on Valley Industrial Boulevard South and install a switch on line section OHPRI-244. Open the new switch to allow DL-55 to feed the existing load west of CEVA Logistics.

- **Load Level 4 (2022)**
  - **PL-71** Close switch SW-263 on Canterbury Road and install a switch on line section OHPRI-4172 on Canterbury Road just north of Valley View Road to allow DL-42 to serve SMSC Organics Recycling Facility and other load north of Valley View Road.
  - **Install West Shakopee Substation Transformer 1 and Control Building 1**
  - **WS-01** South from West Shakopee Substation along County Road 69 and east along County Road 16 (17th Avenue) extension for the West End Concept to Marystown Road to feed existing circuit SS-32 north of Highway 169.
    - In Load Level 9, WS-01 will serve a portion of the undeveloped area Annexation A and NL-B.
  - **WS-01 (Future WS-13)** South from West Shakopee Substation along County Road 69 to 125th Street to feed SS-32 and to serve undeveloped areas in Annexation F, NL-C, and the future school in NL-C. In Load Level 1 this is built to connect to SS-83 at 125th Street. Once the NL-B load is switched to WS-02, the circuit from 125th Street to Oak Road on County Road 15 will be utilized for WS-13.
    - Convert overhead single-phase conductor to underground three-phase 500 MCM from line sections OHPRI-1463 to OHPRI-1450 along County Road 78 from County Road 69 to County Road 15.
    - Open switch SW-918 located near South Shakopee Substation on County Road 79. This will allow SS-32 to be routed south as described below under SS-32.

- Provide a tie with SS-83 by installing a switch at Oak Road.
- This section of WS-01 will be served by West Shakopee Transformer 2 and Control Building 2 in Load Level 6.

- **WS-02** South from West Shakopee Substation along County Road 69 and east along County Road 16 (17th Avenue) extension for the West End Concept (planned development) to Marystown Road to feed existing circuit SS-32 south of Highway 169 to County Road 78 and to serve undeveloped area NL-B.
  - Switch service for SS-84 (Future WS-02) to the second West Shakopee transformer.
- **WS-03** North from West Shakopee Substation along County Road 69 and west along Highway 169 to County Road 41 to serve undeveloped area in Annexation D.
  - Provide a tie with SH-07 by extending WS-03 north along County Road 69 and west to the reconductored end of SH-07 as described below. Install a new switch to allow load to be served by SH-07.
- **WS-03 (Future WS-12)** South from West Shakopee Substation along County Road 69 to serve a portion of undeveloped area in Annexation B, which is west of County Road 69.
  - This section of WS-03 will be served by the second West Shakopee transformer in Load Level 6.
- **WS-04** North from West Shakopee Substation along County Road 69, west of Highway 169, and northwest along County Road 41 to serve undeveloped area in Annexation D. Initially tie WS-04 to WS-03 and ultimately to a circuit served by the second West Shakopee transformer.
- **WS-04 (Future WS-11)** South from West Shakopee Substation along County Road 69 and west along County Road 78 to serve a portion of undeveloped area in Annexation B.
  - This section of WS-04 will be served by the second West Shakopee transformer in Load Level 6.
- **SH-07** Reconductor overhead and underground line sections OHPRI-2113 to UGPRI-54369 along River Valley Road and Chaparral to 4/0 AL.
- **SS-84** East from South Shakopee along transmission line right-of-way through Stonebrooke Golf Course to County Road 17, south along County Road 17 to County Road 42, and approximately 700 feet east along County Road 42 to line section UGPRI-52876.
  - Open switch SW-777 on County Road 42 just east of County Road 17 and install a switch on line section UGPRI-52876 at County Road 17 and County Road 42. Close the new switch to allow SS-84 to feed existing circuit SS-31 south of County Road 42 and to serve undeveloped areas NL-F, NL-G, and a portion of NL-H.

- **SS-32** Install a switch at South Shakopee Substation at line section OHPRI-1536 to separate SS-34 into SS-34 (north) and SS-32 (south).
  - Reconductor to 500 kcmil aluminum the underground line sections UGPRI-11093 to UGPRI-13799 from the South Shakopee Substation along Townline Avenue (County Road 79) to the overhead portion of existing SS-34 south of South Shakopee Substation.
  - Convert overhead conductor to underground 500 kcmil aluminum from line sections OHPRI-1536 to OHPRI-1701 south along Townline Avenue (County Road 79).
  - Convert overhead single-phase conductor to underground three-phase 500 kcmil aluminum from line sections OHPRI-1727 to OHPRI-1553 along Townline Avenue (County Road 79) and OHPRI-3361 to OHPRI-3171 along County Road 14.
  - The switch located on County Road 14 east of County Road 79 will provide a tie with SS-31 (Future SS-84) during contingency.

- **Load Level 6 (2024)**
  - Install West Shakopee Substation Transformer 2 and Control Building 2.
  - **WS-11** Switch service for WS-04 (Future WS-11) to the second West Shakopee transformer.
  - **WS-12** Switch service for WS-03 (Future WS-12) to the second West Shakopee transformer.
  - **WS-13** Switch service for WS-01 (Future WS-13) and SS-83 (Future WS-13) to the second West Shakopee transformer.

- **Load Level 7 (2025)**
  - **DL-97** Northwest from Dean Lake Substation along Eagle Creek Boulevard, northeast along Vierling Drive East, and northeast along 12th Avenue to Shenandoah Drive.
    - Connect DL-97 to the circuit north of switch SW-835 at Shenandoah Drive and Eastway Ave. Install a switch on line section OHPRI-2015 on 4th Avenue East. Open the new switch to allow DL-97 to serve a portion of undeveloped area NL-Q, undeveloped area NL-S, and a small portion of existing DL-41.

- **Load Level 9 (2027)**
  - **WS-01** Switch service for SS-83 (Future WS-01) to WS-01.
  - **BL-22** Close switch SW-726 on County Road 21 and open SW-312 on County Road 18 to allow PL-75 to feed the existing load on Crossings Boulevard west of County Road 18.
  - **SS-83** East from South Shakopee along transmission line right-of-way through Stonebrooke Golf Course to County Road 17, south along County

Road 17 to County Road 42, and approximately 700 feet east along County Road 42 to line section UGPRI-52883.

  - Open switch SW-445 on County Road 42 just east of County Road 17 and install a switch on line section UGPRI-52883 at County Road 17 and County Road 42. Close the new switch to allow SS-83 to feed existing circuit SS-31 east of County Road 17 and to serve a portion of undeveloped area NL-I.

- **DL-91 Contingency Tie Feeder** Southeast from Dean Lake Substation along Eagle Creek Blvd to Canterbury Road South, south along Canterbury Road to County Road 16, and west along County Road 16 to Dean Lakes Trail to provide a tie with DL-58 at the 165/344 and 567/116/928 Switchgears.

- **Load Level 11 (2029)**
  - **PL-76** North from Pike Lake Substation along County Road 21 and west along Tinta Lane to McKenna Road to serve undeveloped areas NL-Y and NL-L.
- **Load Level 12 (2030)**
  - **SH-08** Open switch SW-526 located at County Road 17 and 4th Avenue.
    - Close switch SW-349 located at 4th Avenue and west of Sarazin Street to allow SH-10 to serve a portion of SH-08.
- **Load Level 13 (2031)**
  - **DL-94 Contingency Tie Feeder** Southeast from Dean Lake Substation along Eagle Creek Blvd to Canterbury Road South, south along Canterbury Road South to Shakopee Gravel to provide a tie with DL-42 at the 914/263 Switchgear.

Plan 2A – Capacity at Blue Lake Substation Removed, Served by Pike Lake: Plan 2A includes the projects listed in Plan 1A, with the exception of the DL-91 and DL-94 feeder additions, with additional feeders from Pike Lake needed to serve BL-20 and BL-22 at the projected load levels for Scenario A, including the following:

- **Load Level 3 (2021)**
  - **Install Pike Lake Substation with Transformer 2 and Control Building 2.**
  - **PL-61** North from Pike Lake Substation along County Road 21 and west along Southbridge Parkway to Old Carriage Road to feed existing circuit BL-20.
  - **PL-62** North from Pike Lake Substation along County Road 21 and east along County Road 16 to County Road 18 to feed existing circuit BL-22.

Plan 3A – Capacity at Blue Lake Substation Removed, Served by East Shakopee: Plan 3A includes the projects listed in Plan 1A, with the exception of the DL-91 and DL-94 feeder additions, with the new substation East Shakopee needed to serve BL-20 and BL-22 at the projected load levels for Scenario A, including the following:

- **Load Level 3 (2021)**
  - Install East Shakopee Substation with Transformer 1 and Control Building 1
  - **ES-21** Northwest from East Shakopee Substation to feed existing circuit BL-20.
  - **ES-22** Northwest from East Shakopee Substation to feed existing circuit BL-22.
  - **ES-23** South from East Shakopee Substation to the 436/300/820 switchgear to feed existing circuit PL-74.
    - Open switch 543 at the 358/140/543 switchgear. This will allow ES-23 to serve the existing load of PL-74 and serve as a tie in the case of an outage at East Shakopee.
  - **ES-24** South from East Shakopee Substation to Southbridge Parkway, southeast along Southbridge Parkway to Old Carriage Road, and east along Old Carriage Road to the 449/606 switchgear to feed existing circuit PL-75.
    - Open switch 807 at the 807/144/726 switchgear. This will allow ES-24 to serve the existing load of PL-75 and serve as a tie in the case of an outage at East Shakopee.

Plan 4A – Upgrade Blue Lake Substation: Plan 4A includes the projects listed in Plan 1A, with the exception of the DL-91 and DL-94 feeder additions, with new feeders needed to serve PL-74 and PL-75 at the projected load levels for Scenario A to serve as tie feeders in the case of an outage at Blue Lake, including the following:

- **Load Level 4 (2021)**
  - Upgrade Blue Lake Substation Capacity.
  - **BL-23** South from Blue Lake Substation to the 436/300/820 switchgear to feed existing circuit PL-74.
    - Open switch 543 at the 358/140/543 switchgear. This will allow BL-23 to serve the existing load of PL-74 and serve as a tie in the case of an outage at Blue Lake.
  - **BL-24** South from Blue Lake Substation to Southbridge Parkway, southeast along Southbridge Parkway to Old Carriage Road, and east along Old Carriage Road to the 449/606 switchgear to feed existing circuit PL-75.
    - Open switch 807 at the 807/144/726 switchgear. This will allow BL-24 to serve the existing load of PL-75 and serve as a tie in the case of an outage at Blue Lake.

Plan 1B: Upgrades to existing facilities to correct substation and distribution system deficiencies at the projected load levels for Scenario B. Plan 1B includes the projects listed in Plan 1A, with the exception of the DL-91, DL-94, and PL-76 feeder additions, and includes the following additional projects:

- **Load Level 6 (2024)**
  - **PL-76** North from Pike Lake Substation along County Road 21 and west along Tinta Lane to McKenna Road to serve a portion of undeveloped area NL-J and undeveloped area NL-Y.
- **Load Level 7 (2025)**
  - **Install Pike Lake Substation with Transformer 2 and Control Building 2.**
  - **PL-64** North from Pike Lake Substation along County Road 21 to serve a portion of undeveloped area NL-M.
- **Load Level 11 (2029)**
  - **PL-63** West from Pike Lake Substation along transmission line right-of-way to McKenna Road, north along McKenna Road to serve a portion of undeveloped area NL-J. Continue West to Canterbury Road to provide tie with DL-42.

Plan 2B – Capacity at Blue Lake Substation Removed, Served by Pike Lake: Plan 2B includes the projects listed in Plan 1A, with the exception of the DL-91, DL-94, and PL-76 feeder additions, and Plan 1B with additional feeders from Pike Lake needed to serve BL-20 and BL-22 at the projected load levels for Scenario B, including the following:

- **Load Level 3 (2021)**
  - **PL-61** North from Pike Lake Substation along County Road 21 and west along County Road 18 to Old Carriage Road to feed existing circuit BL-20.
  - **PL-62** North from Pike Lake Substation along County Road 21 and east along County Road 16 to County Road 18 to feed existing circuit BL-22.

Plan 3B – Capacity at Blue Lake Substation Removed, Served by East Shakopee: Plan 3B includes the projects listed in Plan 1A, with the exception of the DL-91, DL-94, and PL-76 feeder additions, with the new substation East Shakopee needed to serve BL-20 and BL-22 at the projected load levels for Scenario B, including the following:

- **Load Level 3 (2021)**
  - **Install East Shakopee Substation with Transformer 1 and Control Building 1.**
  - **ES-21** Northwest from East Shakopee Substation to feed existing circuit BL-20.

- **ES-22** Northwest from East Shakopee Substation to feed existing circuit BL-22.
- **ES-23** South from East Shakopee Substation to the 436/300/820 switchgear to feed existing circuit PL-74.
  - Open switch 543 at the 358/140/543 switchgear. This will allow ES-23 to serve the existing load of PL-74 and serve as a tie in the case of an outage at East Shakopee.
- **ES-24** South from East Shakopee Substation to Southbridge Parkway, southeast along Southbridge Parkway to Old Carriage Road, and east along Old Carriage Road to the 449/606 switchgear to feed existing circuit PL-75.
  - Open switch 807 at the 807/144/726 switchgear. This will allow ES-24 to serve the existing load of PL-75 and serve as a tie in the case of an outage at East Shakopee.

- **Load Level 6 (2024)**
  - **PL-76** North from Pike Lake Substation along County Road 21 and west along Tinta Lane to McKenna Road to serve a portion of undeveloped area NL-J and undeveloped area NL-Y.
- **Load Level 13 (2031)**
  - **ES-25 Contingency Tie Feeder** South from East Shakopee Substation to Southbridge Parkway, southwest along Southbridge Parkway to County Road 21, and south along County Road 21 to Tinta Lane to provide a tie with PL-77 at the 130/747 switchgear.

Plan 4B – Upgrade Blue Lake Substation: Plan 4A includes the projects listed in Plan 1B with new feeders needed to serve PL-74 and PL-75 at the projected load levels for Scenario A to serve as tie feeders in the case of an outage at Blue Lake, including the following:

- **Load Level 3 (2021)**
  - Upgrade Blue Lake Substation Capacity.
  - **BL-23** South from Blue Lake Substation to the 436/300/820 switchgear to feed existing circuit PL-74.
    - Open switch 543 at the 358/140/543 switchgear. This will allow BL-23 to serve the existing load of PL-74 and serve as a tie in the case of an outage at Blue Lake.

- **BL-24** South from Blue Lake Substation to Southbridge Parkway, southeast along Southbridge Parkway to Old Carriage Road, and east along Old Carriage Road to the 449/606 switchgear to feed existing circuit PL-75.
  - Open switch 807 at the 807/144/726 switchgear. This will allow BL-24 to serve the existing load of PL-75 and serve as a tie in the case of an outage at Blue Lake.

- **Load Level 10 (2028)**
  - **DL-91 Contingency Tie Feeder** Southeast from Dean Lake Substation along Eagle Creek Blvd to Canterbury Road South, south along Canterbury Road to County Road 16, and west along County Road 16 to McKenna Road Northwest, and south along McKenna Road to Tinta Lane to provide a tie with PL-77 at the 191/434/650/925 switchgear.

2.3 Service During Contingency Outages

The criteria used for circuit loading in this analysis is consistent with the study criteria used for the April 2010 Ultimate Electric System Load Analysis and subsequent annual operating studies. The circuit loading criteria limits loading of each circuit to approximately 50% of its circuit emergency rating to enable each circuit to be capable of backing up another circuit without exceeding its emergency rating of approximately 12,000 kVA. Under the planning criteria, the peak load of certain circuits is allowed to exceed 50% of its circuit emergency rating provided there is a circuit whose load is limited to a level which allows it to provide emergency backup.

For this study the highest loaded circuits under normal conditions (no outages) forecast for ultimate peak load conditions are SS-32 with 6,201 kVA, SS-34 with 5,991 kVA, SS-81 with 5,743 kVA, WS-01 with 6,414 kVA, WS-02 with 5,758 kVA, and PL-77B with 6,609 kVA of load. The remaining circuits have a forecast ultimate peak load that is less than 50% of its circuit rating.

Leidos performed contingency analysis for Plan 1A, 2A, 3A, 4A, 1B, 2B, 3B, and 4B. The results can be found in Appendix L through Appendix S. With the exception of a West Shakopee Substation outage in Plans 1 through 4 for Scenarios A and B, an East Shakopee Substation outage in Plan 3B, a Blue Lake Substation outage in Plan 4B and a Pike Lake Substation outage in Plans 3A, 4A and 4B, the SPU Ultimate Load can be served for an outage of each substation control building without exceeding the emergency rating of a circuit and without exceeding the maximum continuous load rating of a power transformer.

For the West Shakopee Substation outage in Plans 1 through 4 for Scenarios A and B, feeder SS-81 reaches a peak loading of 102% of the emergency rating.

For the Pike Lake Substation outage in Plan 3A, feeder ES-24 reaches a peak loading of 104% of the emergency rating. The maximum continuous load rating of the East Shakopee power transformers is not exceeded.

For the Pike Lake Substation outage in Plan 4A, feeder BL-24 reaches a peak loading of 104% of the emergency rating. The maximum continuous load rating of the Blue Lake power transformers is not exceeded.

For the Pike Lake Substation outage in Plan 4B, the Dean Lake power transformer reaches a peak loading of 105% of the normal rating.

For the East Shakopee Substation outage in Plan 3B, the Pike Lake power transformer reaches a peak loading of 106% of the normal rating.

For the Blue Lake Substation outage in Plan 4B, the Pike Lake power transformer reaches a peak loading of 106% of the normal rating.

The circuit loadings that exceed normal ratings for various contingency outages are summarized in Tables 2-1 through 2-6 below. The percent overload for circuits that exceed 100% of emergency ratings is shown in red below.

Table 2-1
Summary of Circuit Loadings for Substation Outages for Plan 1A at Ultimate Load

Outage	Circuit	Peak Loading as a Percentage of Normal Rating at LL15 (%)	Peak Loading as a Percentage of Emergency Rating at LL15 (%)
Shakopee Substation Control Building 1	WS-03	186	93
	DL-52	154	77
	SS-33	174	87
	DL-96	169	85
Blue Lake Control Building 1	PL-73	182	91
	PL-74	133	67
South Shakopee Substation Control Building 1	PL-71	176	88
	SS-84	196	98
	SH-09	186	93
	DL-43	195	97
South Shakopee Substation Control Building 2	SS-33	196	98
	DL-92	148	74
	PL-71	150	75
	SS-32	189	94
	DL-43	195	97
Dean Lake Substation Control Building 1	DL-96	160	80
	PL-71	179	89
	DL-52	169	85
	DL-92	149	74
	DL-58	137	68
	DL-55	168	84
	BL-20	172	86
	PL-73	182	91
Dean Lake Substation Control Building 2	DL-44	184	92
	SH-08	171	85
	DL-92	136	68
	DL-97	178	89
	DL-48	123	62
	PL-72	152	76
Dean Lake Substation Control Building 3	SH-10	196	98
	DL-45	62	31
	DL-52	156	78
Pike Lake Substation Control Building 1	DL-42	189	94
	DL-58	169	85
	BL-22	182	91
	BL-20	191	95
	DL-94	68	34
	DL-91	55	27
West Shakopee Substation Control Building 1	WS-14	114	57
	SS-81	204	102
	SH-07	169	85
	WS-11	177	88
West Shakopee Substation Control Building 2	WS-04	177	88
	WS-02	192	96
	SS-33	186	93
	SH-07	169	85

Table 2-2
Summary of Circuit Loadings for Substation Outages for Plan 2A at Ultimate Load[a]

Outage	Circuit	Peak Loading as a Percentage of Normal Rating at LL15 (%)	Peak Loading as a Percentage of Emergency Rating at LL15 (%)
Pike Lake Substation Control Building 1	DL-42	179	89
	DL-58	152	76
	PL-61	137	68
	PL-62	182	91
	PL-63	78	39
	PL-65	83	41
	PL-67	44	22
Pike Lake Substation Control Building 2	PL-73	182	91
	PL-75	137	68

Note:
a. Plan 1A and Plan 2A's contingency analysis are the same for the Shakopee, South Shakopee, Dean Lake, and West Shakopee Substations. The Blue Lake feeders have been replaced by Pike Lake feeders.

Table 2-3
Summary of Circuit Loadings for Substation Outages for Plan 3A at Ultimate Load[a]

Outage	Circuit	Peak Loading as a Percentage of Normal Rating at LL15 (%)	Peak Loading as a Percentage of Emergency Rating at LL15 (%)
Pike Lake Substation Control Building 1	DL-42	179	89
	DL-58	152	76
	ES-22	182	91
	ES-24	104	207
East Shakopee Substation Control Building 1	DL-48	172	86
	PL-73	182	91
	PL-74	44	22
	PL-75	47	23

Note:
a. Plan 1A and Plan 3A's contingency analysis are the same for the Shakopee, South Shakopee, Dean Lake, and West Shakopee Substations. The Blue Lake feeders have been replaced by East Shakopee feeders.

Table 2-4
Summary of Circuit Loadings for Substation Outages for Plan 4A at Ultimate Load[a]

Outage	Circuit	Peak Loading as a Percentage of Normal Rating at LL15 (%)	Peak Loading as a Percentage of Emergency Rating at LL15 (%)
Pike Lake Substation Control Building 1	DL-42	179	89
	DL-58	152	76
	BL-22	182	91
	BL-24	207	104
	DL-48	172	86
	DL-92	149	72
Blue Lake Substation Control Building 1	DL-48	172	86
	PL-73	182	91
	PL-74	44	22
	PL-75	47	23

Note:
a. Plan 1A and Plan 4A's contingency analysis are the same for the Shakopee, South Shakopee, Dean Lake, and West Shakopee Substations.

Table 2-5
Summary of Circuit Loadings for Substation Outages for Plan 1B at Ultimate Load[a]

Outage	Circuit	Peak Loading as a Percentage of Normal Rating at LL15 (%)	Peak Loading as a Percentage of Emergency Rating at LL15 (%)
Pike Lake Substation Control Building 1	DL-42	179	89
	DL-58	152	76
	BL-22	182	91
	PL-63	92	46
	BL-20	137	68
	PL-64	182	91
	PL-65	106	53
Pike Lake Substation Control Building 2	PL-74	92	46
	PL-77	197	98

Note:
a. Plan 1A and Plan 1B's contingency analysis are the same for the Shakopee, South Shakopee, Dean Lake, Blue Lake, and West Shakopee Substations.

Table 2-6
Summary of Circuit Loadings for Substation Outages for Plan 2B at Ultimate Load[a]

Outage	Circuit	Peak Loading as a Percentage of Normal Rating at LL15 (%)	Peak Loading as a Percentage of Emergency Rating at LL15 (%)
Pike Lake Substation Control Building 1	DL-42	179	89
	DL-58	152	76
	PL-62	182	91
	PL-67	44	22
	PL-61	137	68
	PL-65	91	46
	PL-66	106	53
Pike Lake Substation Control Building 2	PL-75	137	68
	PL-73	182	91
	PL-74	92	46
	PL-77	197	98

Note:
a. Plan 1A and Plan 2B's contingency analysis are the same for the Shakopee, South Shakopee, Dean Lake, and West Shakopee Substations. The Blue Lake feeders have been replaced by Pike Lake feeders.

Table 2-7
Summary of Circuit Loadings for Substation Outages for Plan 3B at Ultimate Load[a]

Outage	Circuit	Peak Loading as a Percentage of Normal Rating at LL15 (%)	Peak Loading as a Percentage of Emergency Rating at LL15 (%)
Pike Lake Substation Control Building 1	DL-42	179	89
	DL-58	152	76
	ES-22	182	91
	ES-23	183	91
	ES-24	138	69
	ES-25	106	53
East Shakopee Substation Control Building 1	DL-48	172	86
	PL-73	182	91
	PL-74	92	46
	PL-75	138	69

Note:
a. Plan 1A and Plan 3B's contingency analysis are the same for the Shakopee, South Shakopee, Dean Lake, and West Shakopee Substations. The Blue Lake feeders have been replaced by East Shakopee Feeders.

Table 2-8
Summary of Circuit Loadings for Substation Outages for Plan 4B at Ultimate Load[a]

Outage	Circuit	Peak Loading as a Percentage of Normal Rating at LL15 (%)	Peak Loading as a Percentage of Emergency Rating at LL15 (%)
Pike Lake Substation Control Building 1	DL-42	179	89
	DL-48	172	86
	DL-58	152	76
	BL-22	182	91
	BL-23	183	91
	BL-24	138	69
	DL-91	106	53
East Shakopee Substation Control Building 1	DL-48	172	86
	PL-73	182	91
	PL-74	92	46
	PL-75	138	69

Note:
a. Plan 1A and Plan 4B's contingency analysis are the same for the Shakopee, South Shakopee, Dean Lake, and West Shakopee Substations.

As shown in the above tables, many of the contingency outages result in exceeding the normal rating of certain circuits. The emergency rating of circuits is only nominally exceeded for a couple of cases. The outage of the West Shakopee Control Building 1 is projected to result in SS-81 exceeding the emergency rating with a loading percentage of 102%. The outage of the Pike Lake Control Building in Plan 3A and 4A is projected to result in ES-24 and BL-24 exceeding the emergency rating with a loading percentage of 104% for both feeders respectively.

2.4 Substation Loading Criteria

The substation loading criteria limits loading on two transformers in substations with two or more transformers to 150% of the maximum continuous rating of one transformer, subject to being able to use circuit ties to transfer load within 2 hours and reduce loading to 140% of the maximum continuous rating of one transformer. The above substation criteria is based on the assumption an emergency mobile transformer would be available within one load cycle (24 hours) to be placed in service to replace the outaged transformer. To provide for the potential of an emergency transformer not being available at the time of the outage, an additional criterion has been established by SPU which requires the loading on all SPU transformers remaining in service to be reduced to 100% of maximum continuous rating within 24 hours.

The above criteria limits loading on power transformers to a level and a time duration that allows a nominal reduction in the transformer insulation life due to the increase in temperature associated with loading to a level that exceeds the maximum nameplate rating of the transformer. To help reduce the potential length of time of operating at an elevated oil and winding temperature and the corresponding reduction in insulation life, SPU should continue to investigate the installation of remote or automatic switching between circuits to facilitate the transfer of load from one substation to another as loading on the SPU substations increases.

2.4.1 Scenario A Plans Substation Loading

For the proposed system configuration under Plans 1A, 2A, 3A, and 4A, the following substations have two or more power transformers: South Shakopee, Dean Lake, Pike Lake and West Shakopee. The installation of the second transformer at the Pike Lake Substation is exclusive to Plan 2A. Plans 1A, 2A, 3A, and 4A include the installation of the West Shakopee Substation and associated circuits. The projected ultimate base loading on each power transformer in these substations is summarized in Table 2-9 below.

Table 2-9
Projected Ultimate Base Load in Substations with Two or More Power Transformers for Scenario A Plans

	South Shakopee	Dean Lake	Pike Lake[b]	West Shakopee
Transformer 1 Load (kVA)	22,728	38,072	32,759	21,972
Transformer 2 Load (kVA)	20,017	26,667	11,292	15,800
Transformer 3 Load (kVA)	-	14,884	-	-
Transformer Rating[a] (kVA)	28,000	46,700	46,700	28,000
150% of Transformer Rating (kVA)	42,000	70,050	70,050	42,000
Total Load above 150% of Rating[c] (kVA)	745	0	0	0
140% of Transformer Rating (kVA)	39,200	65,380	65,380	39,200
Total Load above 140% of Rating[c] (kVA)	3545	0	0	0

Notes:
a. Rating shown is maximum continuous rating for one power transformer.
b. Exclusive to Plan 2A.
c. For Dean Lake, the total load is equal to the sum of Transformer 3 load plus Transformer 1 load. Transformer 3 is available to automatically backup either Transformer 1 or Transformer 2. For a single contingency outage, only one power transformer is assumed to be out of service.

The projected ultimate total load on the Dean Lake, Pike Lake and West Shakopee Substations does not exceed the 150% loading criterion. The projected ultimate total load on the South Shakopee Substation exceeds the 150% loading criterion by 745 kVA, which is approximately equivalent to 7% of the loading on one circuit

South Shakopee Substation exceeds the 140% loading criterion by 3545 kVA, which is approximately equivalent to 31% of the loading on one circuit.

2.4.2 Scenario B Plans Substation Loading

For the proposed system configuration under Plans 1B, 2B, 3B, and 4B, the following substations have two or more power transformers: South Shakopee, Dean Lake, Pike Lake and West Shakopee. The installation of the second transformer at the Pike Lake Substation is exclusive to Plans 1B and 2B. Plans 1B, 2B, 3B, and 4B include the installation of the West Shakopee Substation and associated circuits. The projected ultimate base loading on each power transformer in these substations is summarized in Table 2-10 below.

Table 2-10
Projected Ultimate Base Load in Substations with Two or More Power Transformers for Scenario B Plans

	South Shakopee	Dean Lake	Pike Lake (Plan 1B)[b]	Pike Lake (Plan 2B)[b]	West Shakopee
Transformer 1 Load	22,728	38,072	35,039	35,039	21,972
Transformer 2 Load	20,017	26,667	8,700	19,992	15,800
Transformer 3 Load	-	14,884	-	-	-
Transformer Rating[a]	28,000	46,700	46,700	46,700	28,000
150% of Transformer Rating	42,000	70,050	70,050	70,050	42,000
Total Load above 150% of Rating[c]	745	0	0	0	0
140% of Transformer Rating	39,200	65,380	65,380	65,380	39,200
Total Load above 140% of Rating[c]	3545	0	0	0	0

Notes:
a. Rating shown is maximum continuous rating for one power transformer.
b. Pike Lake's loading in Plan 2B is different than Plan 1B due to the installation of PL-61 and PL-62.
c. For Dean Lake the total load is equal to the sum of Transformer 3 load plus Transformer 1 load. Transformer 3 is available to automatically backup either Transformer 1 or Transformer 2. For a single contingency outage, only one power transformer is assumed to be out of service.

The projected ultimate total load for Scenario B is the same as Scenario A for the South Shakopee, Dean Lake, and West Shakopee Substations. Under Scenario B, the ultimate load for the Pike Lake Substation is higher than under Scenario A due to the higher load densities for the SMSC areas. The Pike Lake projected loading does not exceed the 150% or 140% loading criterion.

Section 3
COST SUMMARY AND ANALYSIS

3.1 Economic Analysis

After the alternatives were identified through discussions among the SPU and Leidos project team, the technical and economic analysis for each alternative was prepared, as follows:

- The projected load was allocated to the existing electric distribution system as modeled on Milsoft Integrated Solutions, Inc.'s WindMil 8.6 software.
- In areas where the system did not meet the planning criteria identified in Section 2, load was transferred or improvements were selected. Computerized load-flow, and loss calculations were then prepared to determine whether each alternative provided adequate service to the customers.

Substation and distribution cost estimates were developed by Leidos for initial capital cost with review by SPU staff. Cost of losses were estimated using projected peak load data, an estimate of annual losses based on a 30% annual loss factor, and annual purchased power costs from 2017. The costs for Blue Lake Substation capacity were estimated based on current payments to Xcel Energy in the amounts of $24,000 per year plus $0.47 per kW of peak load per month. Annual carrying costs are estimated to be 7% per year based on 3% annual interest rate, 3% annual depreciation, and 1% annual O&M costs. Other applicable costs were also estimated for each alternative.

- A comparative cost summary was prepared for each plan. The assumptions used in the analysis are summarized in Appendix T.

Cost analyses were prepared for each alternative based on the plans and loading presented in Section 2. The cost calculations and detailed cost estimates are provided in Appendix T, Appendix U, and Appendix V. Table 3-1 below summarizes the estimated cost differences for each of the system plans. Tables 3-2 and 3-3 below summarize the estimated total investment by year and the cumulative estimated annual costs of each plan.

Table 3-1
Estimated 2032 Cumulative Annual Costs Comparison

Plan	Description	2033 Cumulative Investment	2033 Cumulative Annual Cost[a]	Cumulative Annual Cost Difference from Plan 1	Cumulative Annual Percent Cost Difference from Plan 1
Plan 1A	West Shakopee	$16,176,394	$28,345,133	-	-
Plan 2A	West Shakopee and 2nd Transformer at Pike Lake	$20,779,310	$33,139,770	$4,794,637	17%
Plan 3A	West Shakopee and East Shakopee	$23,318,447	$34,342,004	$5,996,872	21%
Plan 4A	Upgrade Blue Lake Substation	$21,325,651	$38,012,156	$9,667,023	34%
Plan 1B	West Shakopee	$20,515,753	$29,586,087	-	-
Plan 2B	West Shakopee and 2nd Transformer at Pike Lake	$21,183,073	$33,555,276	$3,969,189	13%
Plan 3B	West Shakopee and East Shakopee[b]	$23,391,455	$34,666,946	$5,080,859	17%
Plan 4B	Upgrade Blue Lake Substation	$26,196,126	$41,379,328	$11,793,240	40%

Notes:

a. Includes Annual Carrying Costs, Blue Lake Annual Costs, and Annual Cost of Losses.

b. For Plan 3B, the second transformer at Pike Lake will need to be installed to serve the increased load of the SMSC areas during a contingency outage of the first transformer at Pike Lake.

Table 3-2
Estimated Total Investment by Year

Year	Plan 1A	Plan 2A	Plan 3A	Plan 4A	Plan 1B	Plan 2B	Plan 3B	Plan 4B
2019	$1,288,324	$1,288,324	$1,288,324	$1,288,324	$1,288,324	$1,288,324	$1,288,324	$1,288,324
2020	-	-	-	-	-	-	-	-
2021	-	$4,602,916	$7,142,053	$5,149,257	-	$4,602,916	$7,142,053	$5,149,257
2022	$10,122,241	$10,122,241	$10,122,241	$10,122,241	$10,122,241	$10,122,241	$10,122,241	$10,122,241
2023	-	-	-	-	-	-	-	-
2024	$3,223,941	$3,223,941	$3,223,941	$3,223,941	$3,542,693	$3,542,693	$3,542,693	$3,542,693
2025	$386,635	$386,635	$386,635	$386,635	$4,486,039	$550,442	$386,635	$4,486,039
2026	-	-	-	-	-	-	-	-
2027	$577,023	$577,023	$577,023	$577,023	$404,480	$404,480	$404,480	$404,480
2028	-	-	-	-	-	-	-	$531,116
2029	$369,521	$369,521	$369,521	$369,521	$671,976	$671,976	-	$671,976
2030	-	-	-	-	-	-	-	-
2031	$208,708	$208,708	$208,708	$208,708	-	-	$505,029	-
2032	-	-	-	-	-	-	-	-
2033	-	-	-	-	-	-	-	-
Total:	**$16,176,394**	**$20,779,310**	**$23,318,447**	**$21,325,651**	**$20,515,753**	**$21,183,073**	**$23,391,455**	**$26,196,126**

Note:
The escalation rate per year used during calculation of project costs is 3%.

Table 3-3
Estimated Cumulative Annual Costs[a]

Year	Plan 1A	Plan 2A	Plan 3A	Plan 4A	Plan 1B	Plan 2B	Plan 3B	Plan 4B
2019	$930,308	$981,586	$921,992	$919,221	$847,385	$987,592	$935,620	$938,623
2020	$1,885,132	$1,989,227	$1,868,252	$1,862,625	$1,716,798	$2,001,418	$1,895,917	$1,902,012
2021	$2,865,203	$3,345,904	$3,339,445	$3,484,971	$2,608,896	$3,364,466	$3,381,568	$3,544,943
2022	$4,579,831	$5,410,074	$5,516,235	$5,932,743	$4,232,911	$5,435,199	$5,573,249	$6,013,916
2023	$6,321,233	$7,502,541	$7,719,368	$8,414,454	$5,880,983	$7,534,425	$7,791,721	$8,517,465
2024	$8,315,885	$9,849,830	$10,175,311	$11,156,416	$7,801,817	$9,910,989	$10,285,775	$11,304,233
2025	$10,365,878	$12,254,203	$12,686,266	$13,956,002	$10,062,066	$12,356,312	$12,835,315	$14,436,257
2026	$12,444,994	$14,689,497	$15,226,006	$16,786,962	$12,348,468	$14,832,771	$15,414,129	$17,600,352
2027	$14,594,499	$17,197,031	$17,835,788	$19,690,531	$14,690,121	$17,369,614	$18,051,409	$20,825,692
2028	$16,774,667	$19,737,368	$20,476,109	$22,627,183	$17,059,286	$19,939,489	$20,719,746	$24,122,031
2029	$19,012,499	$22,337,360	$23,173,751	$25,623,681	$19,504,041	$22,590,425	$23,420,072	$27,500,147
2030	$21,283,082	$24,972,154	$25,903,793	$28,655,079	$21,978,204	$25,276,404	$26,153,346	$30,913,946
2031	$23,602,007	$27,657,402	$28,681,814	$31,736,938	$24,482,656	$27,998,479	$28,955,908	$34,364,401
2032	$25,955,677	$30,379,572	$31,494,208	$34,855,627	$27,018,305	$30,757,731	$31,793,426	$37,852,517
2033	$28,345,133	$33,139,770	$34,342,004	$38,012,156	$29,586,087	$33,555,276	$34,666,946	$41,379,328

Note:
Includes Annual Carrying Costs, Blue Lake Annual Costs, and Annual Cost of Losses.

As shown in Table 3-1, **under Scenario A**, Plan 1 has the lowest estimated cumulative 15-year annual cost. Estimated cumulative annual costs for Plan 2 are $4.8 million or 17% higher than for Plan 1. Estimated cumulative annual costs for Plan 3 are $6.0 million or 21% higher than for Plan 1. Estimated cumulative annual costs for Plan 4 are $9.7 million or 34% higher than for Plan 1. Estimated cumulative annual costs for Plan 3 are $1.2 million or 4% higher than for Plan 2. Estimated cumulative annual costs for Plan 3 are $3.7 million or 11% higher than for Plan 4. Estimated cumulative annual costs for Plan 4 are $4.9 million or 14% higher than for Plan 2.

Under Scenario B, Plan 1 has the lowest estimated cumulative 15-year annual cost. Estimated cumulative annual costs for Plan 2 are $4.0 million or 13% higher than for Plan 1. Estimated cumulative annual costs for Plan 3 are $5.1 million or 17% higher than for Plan 1. Estimated cumulative annual costs for Plan 4 are $11.8 million or 34% higher than for Plan 1. Estimated cumulative annual costs for Plan 3 are $1.1 million or 3% higher than for Plan 2. Estimated cumulative annual costs for Plan 3 are $6.7 million or 19% higher than for Plan 4. Estimated cumulative annual costs for Plan 4 are $7.8 million or 23% higher than for Plan 2.

3.2 Preferred Plan

If SPU is able to retain the Blue Lake Substation capacity at the existing rates of payment, Plans 1A and 1B are the most economical options.

Based on the technical and economic analysis described herein and the abandonment of the Blue Lake Substation capacity, Plans 3A and 3B were selected for the Preferred Plans. If the Blue Lake Substation capacity is abandoned, the addition of the East Shakopee in conjunction with new circuits to serve the Blue Lake circuits, these plans provide SPU sufficient capacity and optimal contingency switching.

With the current plan of Blue Lake abandonment, Plans 1A and 1B were excluded from Leidos' selection process. For Scenario A, Plan 3A's estimated cost is $1.2 million more than Plan 2A and offers similar capacity and increased system reliability. For Scenario B, Plan 3B's estimated cost is $1.1 million more than Plan 2B. Plan 3's ability to serve the potential ultimate load of both scenarios with little differences between Plan 3A and 3B make it the best option moving forward.

Detailed information on the substation, and distribution improvements required for the Preferred Plans is given in Section 2, and includes the following:

- New feeder additions out of South Shakopee, Dean Lake, Pike Lake, and West Shakopee Substations
- Construction of the West Shakopee Substation to serve load growth in the western portion of the SPU service territory and Annexation Areas
- Identification and possible purchase of land for an East Shakopee Substation in preparation for the potential of abandoning the SPU capacity in Blue Lake
- Construction of the East Shakopee Substation to serve load in the northeast portion of the SPU service territory if Blue Lake Substation capacity is abandoned
- Additional transformer capacity at Pike Lake Substation if Scenario B load growth is achieved
- Various distribution improvements, including switching, re-conductoring (replacing existing circuit conductors with larger conductors) to relieve overloading and improve conditions for contingency switching, and installing additional phase conductors to existing single-phase and two-phase circuits

9c

SHAKOPEE PUBLIC UTILITIES

"Lighting the Way – Yesterday, Today and Beyond"

July 12, 2018

TO: John Crooks, Utilities Manager

FROM: Greg Drent, Electric Superintendent

Subject: LED Street Light Collector Street Lights

Overview:

As part of the 2018 budget, we are scheduled to change out the streetlights in Shakopee. We had DGR Engineers assist us in providing a bid document and evaluations for the lights. The sealed bids were opened up on Monday July 9 at 1:30p.m, in the commission room. We are pleased with the number of bids that came in as we had four bidders on the collector streetlights with nine different bids. We had a couple of bids that did not meet our specs and therefore did not qualify. The low bid that meets our specs is from Irby with an American Electric Lighting fixture at a cost of $251.29 per fixture. This price is within our budget for the project. The conservation fund is approved by the state to pay 75% of the cost of the fixture and install cost and the remaining 25% is out the of operation budget. We have set up a work order and are tracking all expenses for this project. We will also be bringing the post top fixtures purchase to the next commission meeting for your approval.

Attached is a copy of the bid tabulation form we used to evaluate the bids. As you can see, the two low bidders did not have enough lumens and the third place bid was not rectilinear so those bids were not accepted.

Action requested:

Approve entering into a purchase agreement with Irby for 475 American Electric Lighting Fixtures, model #ATB2-40LEDE10, at a cost of $128,165.75

Post Office Box 470 • 255 Sarazin Street • Shakopee, Minnesota 55379-0470
(952) 445-1988 • Fax (952) 445-7767 • www.spucweb.com

RP3 Reliable Public Power Provider

Supplier	Manufacturer	Model	Running Wattage	LPW	LUM	LEAD TIME	Purchase Price (each)	S&H CHGS	Life Running Cost ($9.95 per W)	TOC (EACH)	TOC Rank	Exceptions (If Yes see Quote)	Comments
IRBY	AEL	ATB0-30BLEDE13-MVOLT-R3-DDBMPP7NLXL	126	118	14850	4-6 WKS	$200.00	$ -	$ 939.30	**$ 1,139.30**	**1**		150 LUMENS SHORT OF 15,000 and HIGH Driver Current
RESCO	AEL	ATB0-30BLEDE13-MVOLT-R3-DDBMPP7NLXL	126	118	14850	5-8 WKS	$215.50	$ -	$ 939.30	**$ 1,154.80**	**2**		150 LUMENS SHORT OF 15,000 and HIGH Driver Current
WESCO	EATON/COOPER	ARCH-M-AF48-130-D-U-T3-10K-4N7-K-BZ-U79980	131	123	16149	6-7 WKS	$208.56	$ -	$ 976.57	**$ 1,185.13**	**3**		NOT RECTILINEAR
IRBY	AEL	ATB2-40LEDE10-MVOLT-R3-DDBMPHKXLP7NL-RFD277552	133	122	16249	4-6 WKS	$251.29	$ -	$ 991.48	**$ 1,242.77**	**4**		RFD277552 IS FACTORY SET AT DESIRED LUMEN OUTPUT
BORDER STATES	AEL	ATB2-40BLEDE10-MVOLT-R3-DDBMPP7NLXL-RFD277552	133	122	16249	6 WKS	$266.58	$ -	$ 991.48	**$ 1,258.06**	**5**		RFD277552 IS FACTORY SET AT DESIRED LUMEN OUTPUT
RESCO	AEL	ATB2-40LEDE10-MVOLT-R3-DDBMPHKXLP7NL	133	122	16249	5-8 WKS	$270.75	$ -	$ 991.48	**$ 1,262.23**	**6**		
WESCO	LEOTEK	EC7-18M2-MV-NW-3-FDB-700-PCR7	160	103	16550	6-7 WKS	$250.27	$ -	$ 1,192.76	**$ 1,443.03**	**7**		
BORDER STATES	EATON/COOPER	NVN-AF-03-D-U-T3-10K-4N7-IP66-K-BZ-U79979	166	109	18119	6 WKS	$308.81	$ -	$ 1,237.49	**$ 1,546.30**	**8**		
WESCO	EATON/COOPER	NVN-AF-03-D-U-T3-10K-4N7-IP66-K-BZ-U79979	166	109	18119	6-7 WKS	$318.72	$ -	$ 1,237.49	**$ 1,556.21**	**9**		

DISQUALIFIED
LOW BID

	4380	**hrs**
$	0.0740	**per kwh**
	23	**Yrs (100,000 hrs)**
$	7.45	**Lifetime Energy Cost per W**

Proposed As Consent Item

11a

SHAKOPEE PUBLIC UTILITIES
MEMORANDUM

TO: John R. Crooks, Utilities Manager

FROM: Lon R. Schemel, Water Superintendent

SUBJECT: **WEBSITE UPDATE**

DATE: July 5, 2018

This update is for March 29, 2018, to July 4, 2018.

We now have enough data in Google Analytics to compare previous periods with previous years. These Google Analytics pages are compared to the previous year's period from March 29, 2017, to July 4, 2017.

SiteLock

SiteLock, the global leader in website security, protects you from hackers, spam, viruses, and scams, removes malware, and provides PCI Compliance.

SiteLock has verified this website: 07/05/2018

spucweb.com	✓
Company Name	Shakopee Public Utilities
Domain	spucweb.com
Verified spam-free	07/05/2018
Verified malware-free	07/05/2018

Got an online business? Get protected by SiteLock. >>>

FIND Malware & Threats

FIX Website Issues

PREVENT Website Attacks

ACCELERATE Performance

COMPLY with PCI

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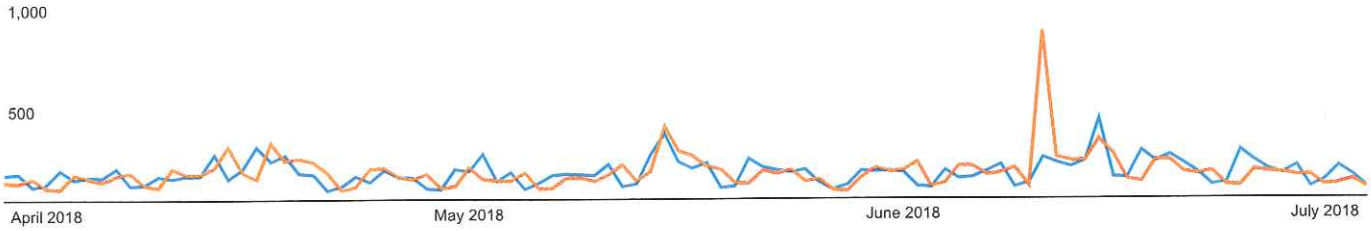
Audience Overview

All Users
+0.00% Users

Mar 29, 2018 - Jul 4, 2018
Compare to: Mar 29, 2017 - Jul 4, 2017

Overview

Mar 29, 2018 - Jul 4, 2018: Users
Mar 29, 2017 - Jul 4, 2017: Users



Users
-6.02%
8,328 vs 8,861

New Users
-7.60%
6,713 vs 7,265

Sessions
-3.70%
13,440 vs 13,956

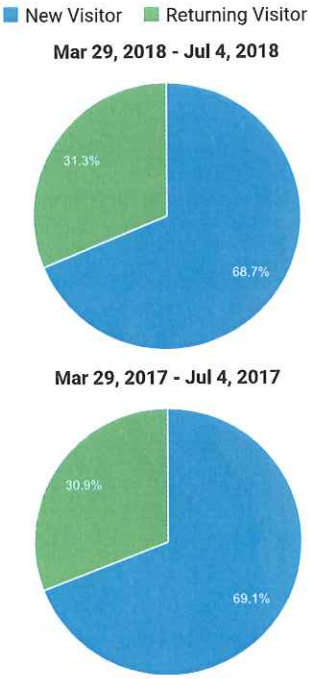
Number of Sessions per User
2.47%
1.61 vs 1.57

Pageviews
-24.41%
23,340 vs 30,876

Pages / Session
-21.51%
1.74 vs 2.21

Avg. Session Duration
-16.80%
00:01:56 vs 00:02:20

Bounce Rate
2.59%
30.52% vs 29.75%



	Language	Users	% Users
1.	en-us		
	Mar 29, 2018 - Jul 4, 2018	8,092	97.06%
	Mar 29, 2017 - Jul 4, 2017	8,753	98.90%
	% Change	**-7.55%**	**-1.86%**
2.	fr		
	Mar 29, 2018 - Jul 4, 2018	120	1.44%
	Mar 29, 2017 - Jul 4, 2017	2	0.02%
	% Change	**5,900.00%**	**6,269.20%**
3.	en-gb		
	Mar 29, 2018 - Jul 4, 2018	41	0.49%
	Mar 29, 2017 - Jul 4, 2017	20	0.23%
	% Change	**105.00%**	**117.61%**
4.	es-xl		
	Mar 29, 2018 - Jul 4, 2018	11	0.13%

Mar 29, 2017 - Jul 4, 2017	8	0.09%
% Change	37.50%	45.96%

5. en-in

Mar 29, 2018 - Jul 4, 2018	10	0.12%
Mar 29, 2017 - Jul 4, 2017	0	0.00%
% Change	100.00%	100.00%

6. es-419

Mar 29, 2018 - Jul 4, 2018	10	0.12%
Mar 29, 2017 - Jul 4, 2017	9	0.10%
% Change	11.11%	17.95%

7. c

Mar 29, 2018 - Jul 4, 2018	7	0.08%
Mar 29, 2017 - Jul 4, 2017	2	0.02%
% Change	250.00%	271.54%

8. es-es

Mar 29, 2018 - Jul 4, 2018	7	0.08%
Mar 29, 2017 - Jul 4, 2017	2	0.02%
% Change	250.00%	271.54%

9. es-us

Mar 29, 2018 - Jul 4, 2018	5	0.06%
Mar 29, 2017 - Jul 4, 2017	1	0.01%
% Change	400.00%	430.77%

10. en

Mar 29, 2018 - Jul 4, 2018	4	0.05%
Mar 29, 2017 - Jul 4, 2017	0	0.00%
% Change	100.00%	100.00%

SPUC
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GO TO REPORT

Users Flow

Mar 29, 2018 - Jul 4, 2018
Compare to: Mar 29, 2017 - Jul 4, 2017

All Users
+0.00% Sessions

SPUC
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GO TO REPORT

Devices

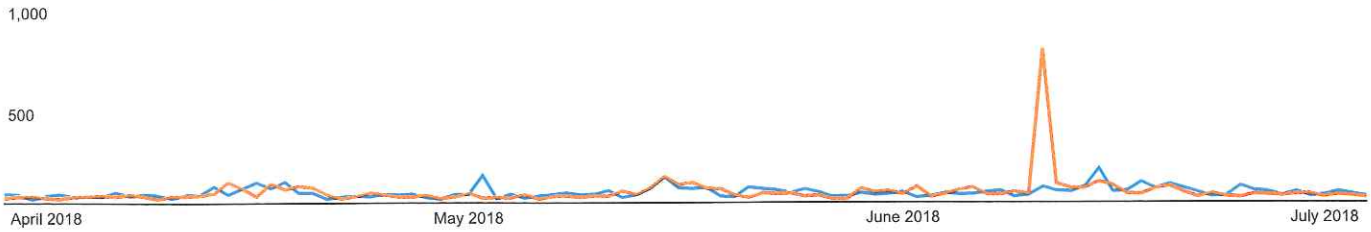
All Users
-3.29% Users

Mar 29, 2018 - Jul 4, 2018
Compare to: Mar 29, 2017 - Jul 4, 2017

Explorer

Summary

Mar 29, 2018 - Jul 4, 2018: Users
Mar 29, 2017 - Jul 4, 2017: Users



	Acquisition			Behavior			Conversions	eCommerce	
Mobile Device Info	Users	New Users	Sessions	Bounce Rate	Pages / Session	Avg. Session Duration	Transactions	Revenue	Ecommerce Conversion Rate
	13.74% 3,058 vs 3,545	17.70% 2,487 vs 3,022	9.34% 5,176 vs 5,709	0.69% 33.40% vs 33.18%	37.11% 1.67 vs 2.65	27.39% 00:01:52 vs 00:02:34	0.00% 0 vs 0	0.00% $0.00 vs $0.00	0.00% 0.00% vs 0.00%
1. Apple iPhone									
Mar 29, 2018 - Jul 4, 2018	**1,489** (48.28%)	1,225 (49.26%)	2,395 (46.27%)	35.74%	1.63	00:01:46	0 (0.00%)	$0.00 (0.00%)	0.00%
Mar 29, 2017 - Jul 4, 2017	**1,615** (45.39%)	1,374 (45.47%)	2,499 (43.77%)	32.13%	2.62	00:02:31	0 (0.00%)	$0.00 (0.00%)	0.00%
% Change	**-7.80%**	**-10.84%**	**-4.16%**	**11.23%**	**-37.81%**	**-29.61%**	**0.00%**	**0.00%**	**0.00%**
2. Apple iPad									
Mar 29, 2018 - Jul 4, 2018	**274** (8.88%)	209 (8.40%)	479 (9.25%)	36.12%	1.60	00:01:56	0 (0.00%)	$0.00 (0.00%)	0.00%
Mar 29, 2017 - Jul 4, 2017	**334** (9.39%)	255 (8.44%)	569 (9.97%)	35.33%	1.68	00:01:51	0 (0.00%)	$0.00 (0.00%)	0.00%
% Change	**-17.96%**	**-18.04%**	**-15.82%**	**2.24%**	**-4.60%**	**4.61%**	**0.00%**	**0.00%**	**0.00%**
3. Samsung SM-G955U Galaxy S8+									
Mar 29, 2018 - Jul 4, 2018	**82** (2.66%)	62 (2.49%)	163 (3.15%)	35.58%	1.69	00:01:46	0 (0.00%)	$0.00 (0.00%)	0.00%
Mar 29, 2017 - Jul 4, 2017	**29** (0.82%)	29 (0.96%)	51 (0.89%)	35.29%	3.55	00:02:31	0 (0.00%)	$0.00 (0.00%)	0.00%
% Change	**182.76%**	**113.79%**	**219.61%**	**0.82%**	**-52.29%**	**-30.05%**	**0.00%**	**0.00%**	**0.00%**
4. Microsoft Windows RT Tablet									
Mar 29, 2018 - Jul 4, 2018	**79** (2.56%)	58 (2.33%)	128 (2.47%)	20.31%	1.84	00:02:25	0 (0.00%)	$0.00 (0.00%)	0.00%
Mar 29, 2017 - Jul 4, 2017	**10** (0.28%)	7 (0.23%)	13 (0.23%)	15.38%	1.77	00:02:08	0 (0.00%)	$0.00 (0.00%)	0.00%
% Change	**690.00%**	**728.57%**	**884.62%**	**32.03%**	**4.21%**	**13.54%**	**0.00%**	**0.00%**	**0.00%**
5. Samsung SM-G950U Galaxy S8									
Mar 29, 2018 - Jul 4, 2018	**78** (2.53%)	56 (2.25%)	130 (2.51%)	28.46%	1.78	00:01:56	0 (0.00%)	$0.00 (0.00%)	0.00%

	Mar 29, 2017 - Jul 4, 2017	**11** (0.31%)	11 (0.36%)	20 (0.35%)	40.00%	3.00	00:00:57	0 (0.00%)	$0.00 (0.00%)	0.00%
	% Change	**609.09%**	**409.09%**	**550.00%**	**-28.85%**	**-40.77%**	**103.93%**	**0.00%**	**0.00%**	**0.00%**
6.	Samsung SM-N950U Galaxy Note8									
	Mar 29, 2018 - Jul 4, 2018	**73** (2.37%)	62 (2.49%)	123 (2.38%)	28.46%	1.74	00:02:00	0 (0.00%)	$0.00 (0.00%)	0.00%
	Mar 29, 2017 - Jul 4, 2017	**0** (0.00%)	0 (0.00%)	0 (0.00%)	0.00%	0.00	00:00:00	0 (0.00%)	$0.00 (0.00%)	0.00%
	% Change	**∞%**	**∞%**	**∞%**	**∞%**	**∞%**	**∞%**	**0.00%**	**0.00%**	**0.00%**
7.	Samsung SM-G930V Galaxy S7									
	Mar 29, 2018 - Jul 4, 2018	**62** (2.01%)	50 (2.01%)	127 (2.45%)	29.92%	1.71	00:01:32	0 (0.00%)	$0.00 (0.00%)	0.00%
	Mar 29, 2017 - Jul 4, 2017	**100** (2.81%)	93 (3.08%)	167 (2.93%)	35.93%	2.70	00:02:47	0 (0.00%)	$0.00 (0.00%)	0.00%
	% Change	**-38.00%**	**-46.24%**	**-23.95%**	**-16.72%**	**-36.73%**	**-44.88%**	**0.00%**	**0.00%**	**0.00%**
8.	Samsung SM-G950 Galaxy S8									
	Mar 29, 2018 - Jul 4, 2018	**43** (1.39%)	27 (1.09%)	85 (1.64%)	37.65%	1.58	00:01:32	0 (0.00%)	$0.00 (0.00%)	0.00%
	Mar 29, 2017 - Jul 4, 2017	**0** (0.00%)	0 (0.00%)	0 (0.00%)	0.00%	0.00	00:00:00	0 (0.00%)	$0.00 (0.00%)	0.00%
	% Change	**∞%**	**∞%**	**∞%**	**∞%**	**∞%**	**∞%**	**0.00%**	**0.00%**	**0.00%**
9.	(not set)									
	Mar 29, 2018 - Jul 4, 2018	**31** (1.01%)	27 (1.09%)	40 (0.77%)	37.50%	1.42	00:01:53	0 (0.00%)	$0.00 (0.00%)	0.00%
	Mar 29, 2017 - Jul 4, 2017	**71** (2.00%)	60 (1.99%)	115 (2.01%)	27.83%	3.12	00:03:34	0 (0.00%)	$0.00 (0.00%)	0.00%
	% Change	**-56.34%**	**-55.00%**	**-65.22%**	**34.77%**	**-54.35%**	**-47.26%**	**0.00%**	**0.00%**	**0.00%**
10.	Samsung SM-G935V Galaxy S7 Edge									
	Mar 29, 2018 - Jul 4, 2018	**31** (1.01%)	23 (0.92%)	54 (1.04%)	20.37%	1.65	00:01:32	0 (0.00%)	$0.00 (0.00%)	0.00%
	Mar 29, 2017 - Jul 4, 2017	**31** (0.87%)	23 (0.76%)	52 (0.91%)	25.00%	3.92	00:05:57	0 (0.00%)	$0.00 (0.00%)	0.00%
	% Change	**0.00%**	**0.00%**	**3.85%**	**-18.52%**	**-57.99%**	**-74.24%**	**0.00%**	**0.00%**	**0.00%**

Rows 1 - 10 of 473

SPUC
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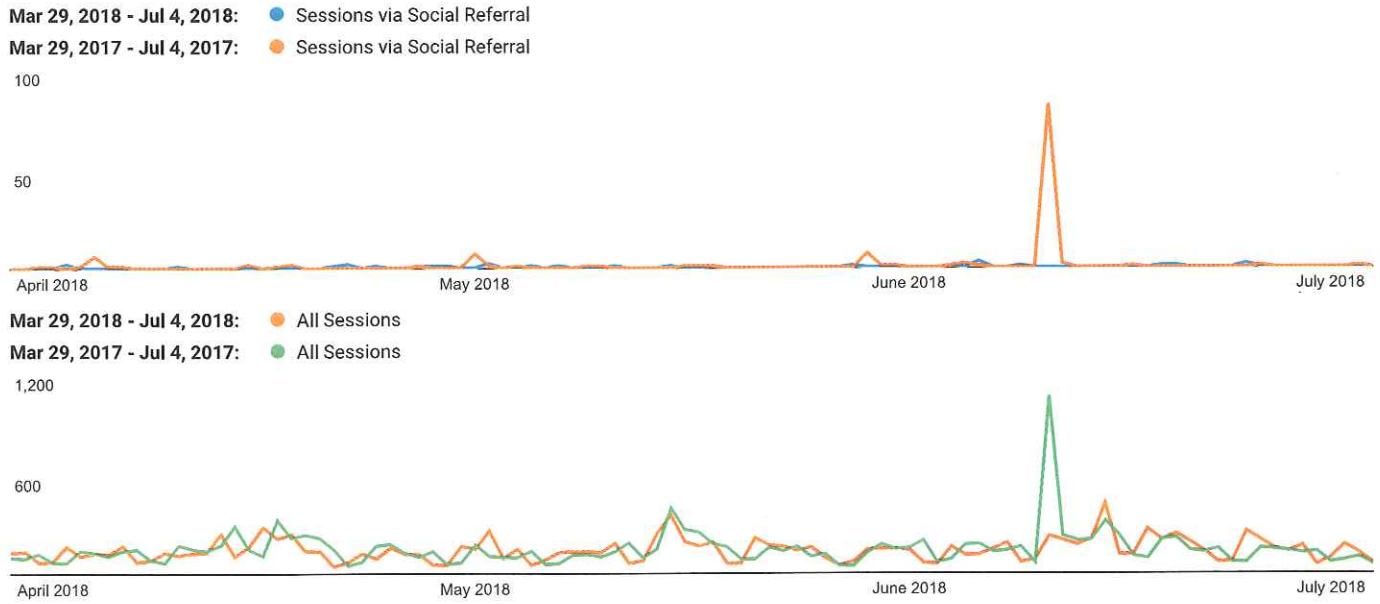
GO TO REPORT

Network Referrals

Mar 29, 2018 - Jul 4, 2018
Compare to: Mar 29, 2017 - Jul 4, 2017

All Users
+0.00% Sessions

Social Referral



Social Network	Sessions	Pageviews	Avg. Session Duration	Pages / Session
1. Facebook				
Mar 29, 2018 - Jul 4, 2018	**26** (96.30%)	40 (95.24%)	00:00:15	1.54
Mar 29, 2017 - Jul 4, 2017	**123** (98.40%)	179 (97.81%)	00:01:09	1.46
% Change	**-78.86%**	**-77.65%**	**-78.02%**	**5.72%**
2. LinkedIn				
Mar 29, 2018 - Jul 4, 2018	**1** (3.70%)	2 (4.76%)	00:00:24	2.00
Mar 29, 2017 - Jul 4, 2017	**2** (1.60%)	4 (2.19%)	00:00:22	2.00
% Change	**-50.00%**	**-50.00%**	**11.63%**	**0.00%**

Rows 1 - 2 of 2

SPUC
SPUC

GO TO REPORT

Social Users Flow

Mar 29, 2018 - Jul 4, 2018
Compare to: Mar 29, 2017 - Jul 4, 2017

All Users
+0.00% Sessions

SPUC
SPUC

GO TO REPORT

Demographics: Overview

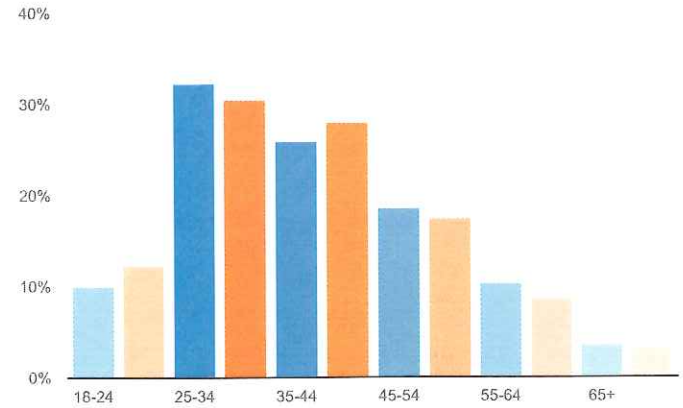
All Users
+0.00% Users

Mar 29, 2018 - Jul 4, 2018
Compare to: Mar 29, 2017 - Jul 4, 2017

Key Metric:

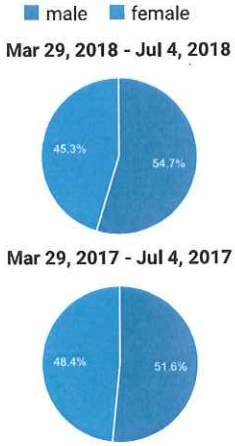
Age

49.96% of total users



Gender

48.57% of total users



Podcast Playlist

AUTO 6 18 2018

1 views
19 jun 2018

manage | embed

AUTO 6 4 2018

4 views
05 jun 2018

manage | embed

AUTO 5 21 2018

5 views
22 may 2018

manage | embed

AUTO 5 7 2018

3 views
09 may 2018

manage | embed

AUTO 4 16 2018

4 views
18 apr 2018

manage | embed

AUTO 4 2 2018

2 views
03 apr 2018

manage | embed

AUTO 3 19 2018

2 views
20 mar 2018

manage | embed

AUTO 2 20 2018

0 views
21 feb 2018

manage | embed

AUTO 2 5 2018

1 views
07 feb 2018

manage | embed