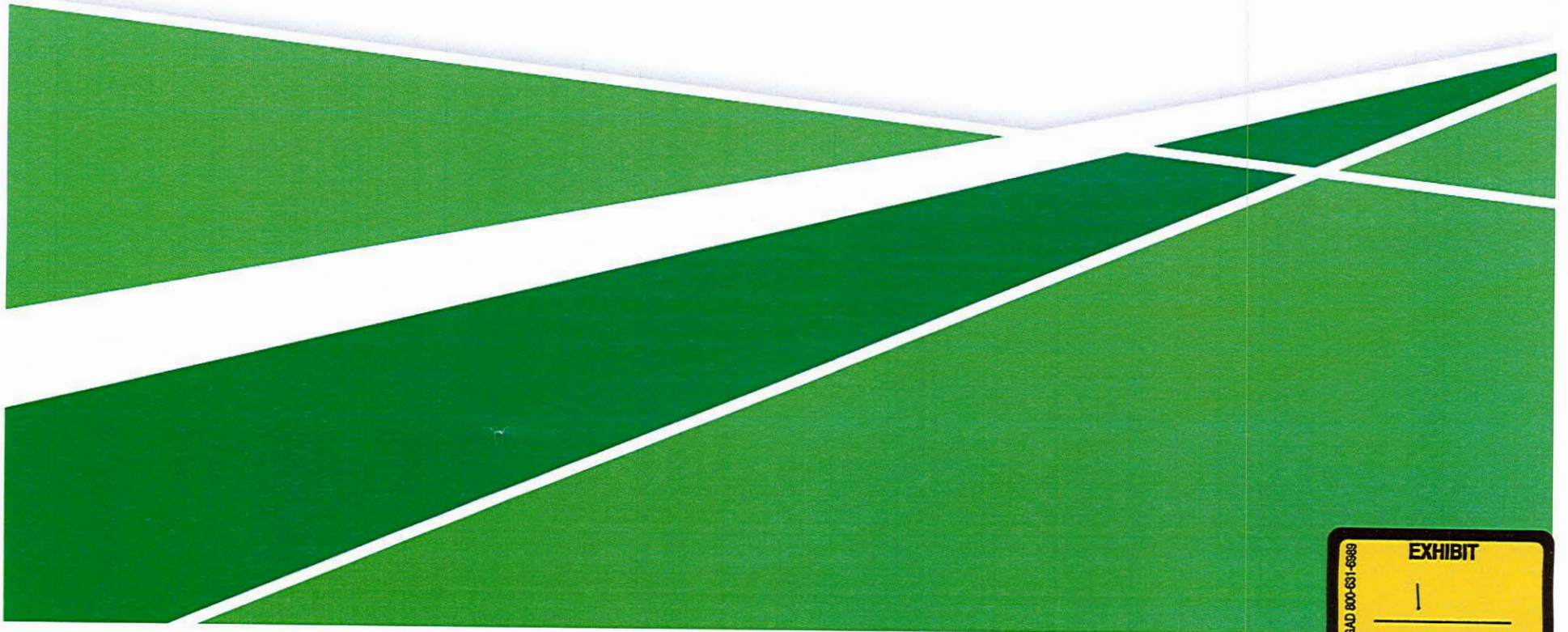


May 5, 2016



Ferebee Service
Hill City South Dakota



PENGAD 800-631-6888
EXHIBIT
1
5-5-14 w

Table of Contents

- Description of Service
- Area Map w/Cable Route
- Trouble Ticket Details 2013, 2014, 2015 & 2016
- Electrical Influences
- 2014 Lightning Remediation

Customer Service Description

Circuit Number: 6055742637

Product Family: RES PRIMARY

CLLI Code: HLCYSDCO

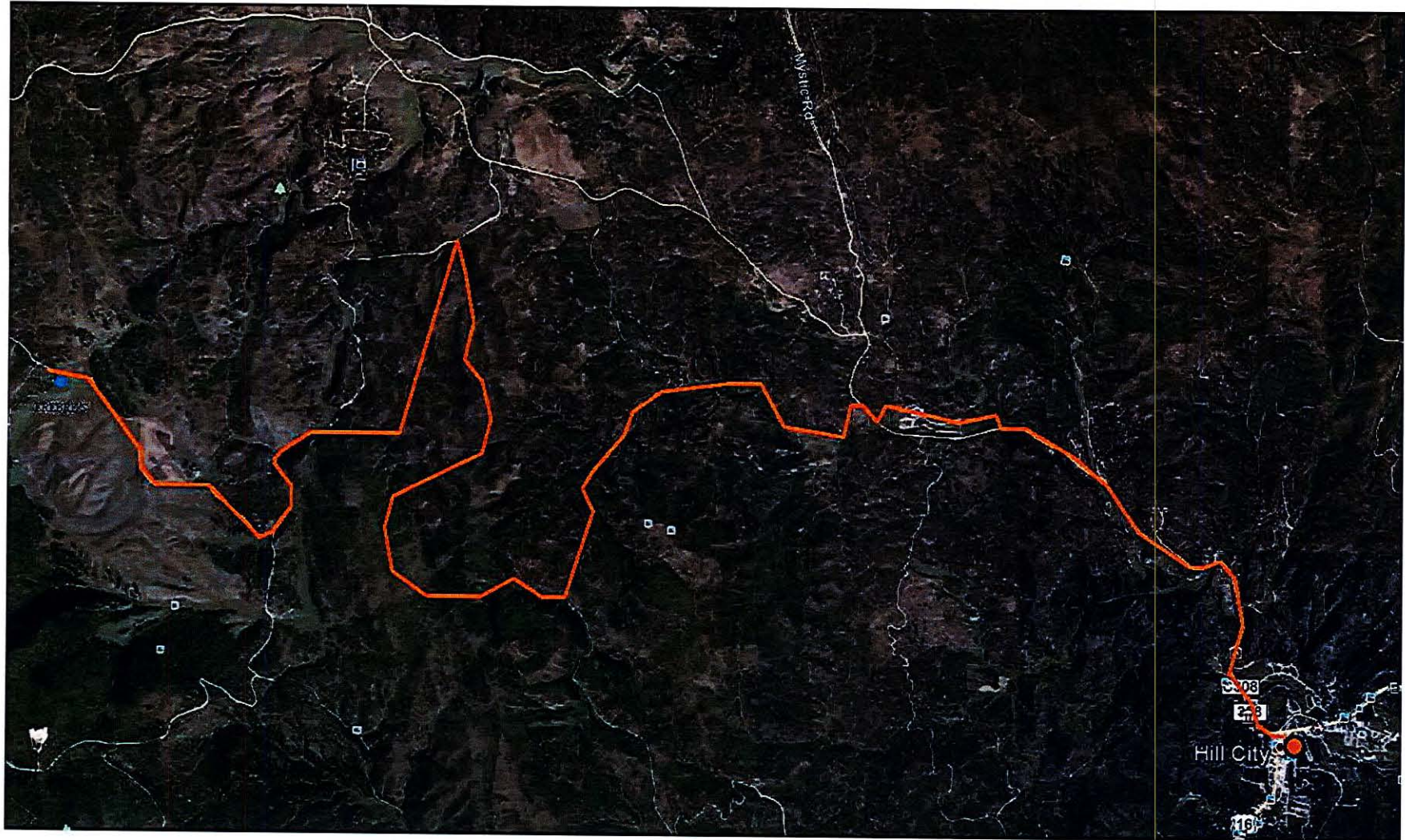
Customer Address: 11495 GILLETTE PRAIRIE RD
-MAPQUEST- HILL CITY, SD 57745-6512

GIS Coordinates: 44.004104 -103.790364

Billing Name: GEORGE FEREBEE

- The Ferebee's are served digital carrier system which is 77,980 feet or 14.76 miles from the Hill City Central Office located at 205 Walnut St.
- There are four carrier systems on this cable route serving 241 customers today.

Cable Route / Map



2013 Trouble Tickets

5 Trouble Tickets Total

- 2 No Trouble Found
- 2 Electronics
- 1 Cable Repaired

Report Date & Time	Commitment Date	Ticket Closed	Repair Notes
Friday July 20, 2013 - 12:10PM	7/22/2013	7/22/2013 - 12:50PM	Found OK - Suspect Cable Plant
Tuesday October 1, 2013 - 10:06AM	10/1/2013	10/1/2013 - 1:40PM	Replaced Digital Channel Card
Wednesday October 2, 2013 - 10:38AM	10/2/2013	10/2/2013 - 3:50PM	Replaced Digital Channel Card
Monday October 21, 2013 - 12:53PM	10/21/2013	10/21/2013 - 12:54PM	FE Closed Ticket - No Dispatch
Saturday December 7, 2013 - 8:40PM	12/9/2013	12/9/2013 - 4:20PM	Cable Trouble - Repaired

2014 Trouble Tickets

9 Trouble Tickets

- 3 No Trouble Found
- 2 Cable Issue
- 3 Lightning
- 1 Customer Issue

Report Date & Time	Commitment Date	Ticket Closed	Repair Notes
Monday January 20, 2014 - 8:12AM	1/21/2014	1/21/2014 - 4:20PM	Found OK - Supected Cable Plant
Sunday January 26, 2014 - 5:11PM	1/28/2014	1/28/2014 - 4:04PM	Repaired Ground in Go-Digital Control Pair
Wednesday February 5, 2014 - 7:47AM	2/5/2014	2/5/2014 - 4:25PM	Customer's Inside Wiring - Repaired (Rodents)
Saturday June 14, 2014 - 10:38PM	6/15/2014	6/15/2014 - 2:08AM	Line Tests OK - Left Message for Customer
Sunday June 15, 2014 - 4:01PM	6/17/2014	6/17/2014 - 1:05PM	Good To Home - Intermittent / Came Clear
Thursday June 26, 2014 - 10:22PM	6/27/2014	6/27/2014 - 2:26PM	Lightning Crashed Go Digital
Saturday June 28, 2014 - 6:34PM	7/1/2014	7/1/2014 - 12:00PM	Replaced Office Card and Fuses Remote Terminal
Saturday August 30, 2014 - 8:18PM	9/3/2014	9/3/2014 - 1:30PM	Replaced Office Card and Fuses Remote Terminal
Friday October 3, 2014 - 4:49PM	10/6/2014	10/6/2014 - 2:30PM	Grounded BSW at Terminal - fixed cable

2015 Trouble Tickets

8 Trouble Tickets

- 3 Go Digital
- 3 Cable Issues
- 2 No Problems Found

CenturyLink at no charge to the Ferebee's ran a 2nd line to their home in July and August while waiting on parts



Report Date & Time	Commitment Date	Ticket Closed	Repair Notes
Monday May 11, 2015 - 8:34AM	5/11/2015	5/11/2015 - 9:09AM	No Trouble Found
Tuesday June 9, 2015 - 10:30AM	6/10/2015	6/10/2015 - 6:19AM	Repaired F1 Cable
Thursday June 11, 2015 - 1:16PM	6/15/2015	6/19/2015 - 2:28PM	Washed Out Cable - Remote Area - No Truck Access
Friday June 26, 2015 - 10:42AM	6/26/2015	6/26/2015 - 2:46PM	No Trouble Found
Monday June 29, 2015 - 10:02AM	7/2/2015	7/2/2015 - 2:00PM	Cable Issue BSW - Moved Cust to Different Channel
Tuesday July 14, 2015 - 12:25PM	7/17/2015	7/17/2015 - 6:20PM	Replaced Powered Repeater
Monday July 27, 2015 - 7:25AM	7/28/2015	8/14/2015 - 5:52PM	2 Problems - 1 Add/Drop repeater at the Ferebee home and 1 after the home. Odd that a repeater after the home was causing issues - we had to order parts was the cause of the delay; all other customers working before and after the Ferebee's
Tuesday August 18th - 8:54AM	8/18/2015	8/21/15 - 9:27AM	One of the repeaters replaced on 8/14/2015 died - replaced out of spares.

2016 Trouble Tickets

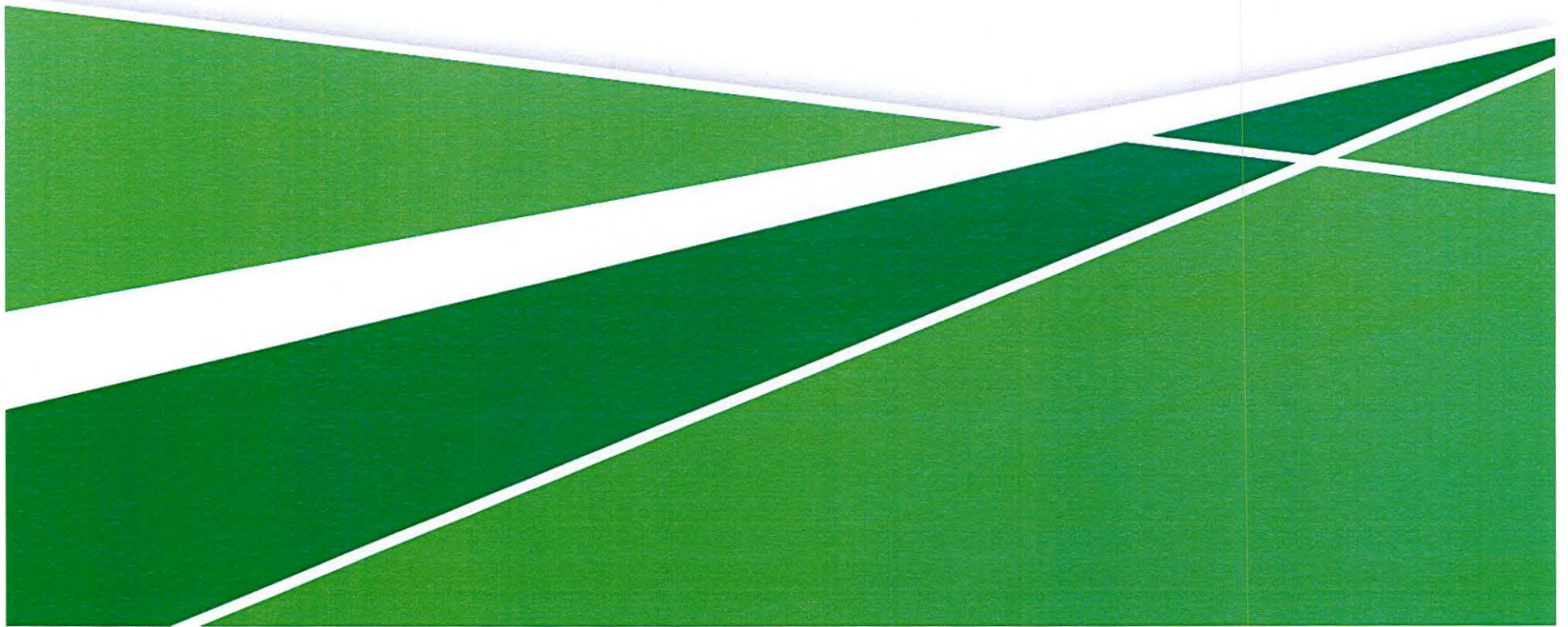
Report Date – 3/1/2016 737am

Commit Date – 3/7/2016

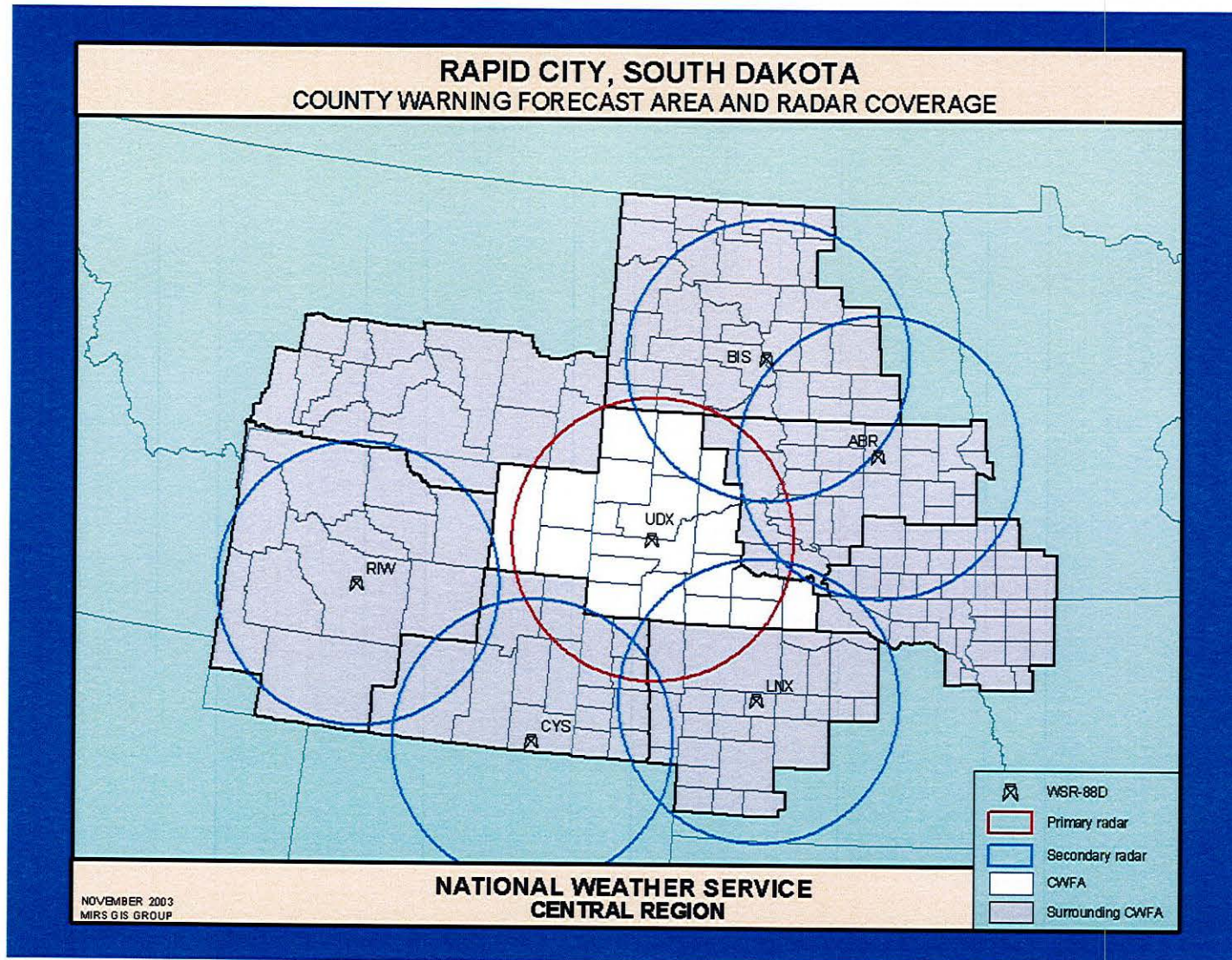
Ticket Closed – 3/1/2016 at 10:30am

Repairs Made – Replaced Blown Fuse in Power Cabinet
Thunderstorm

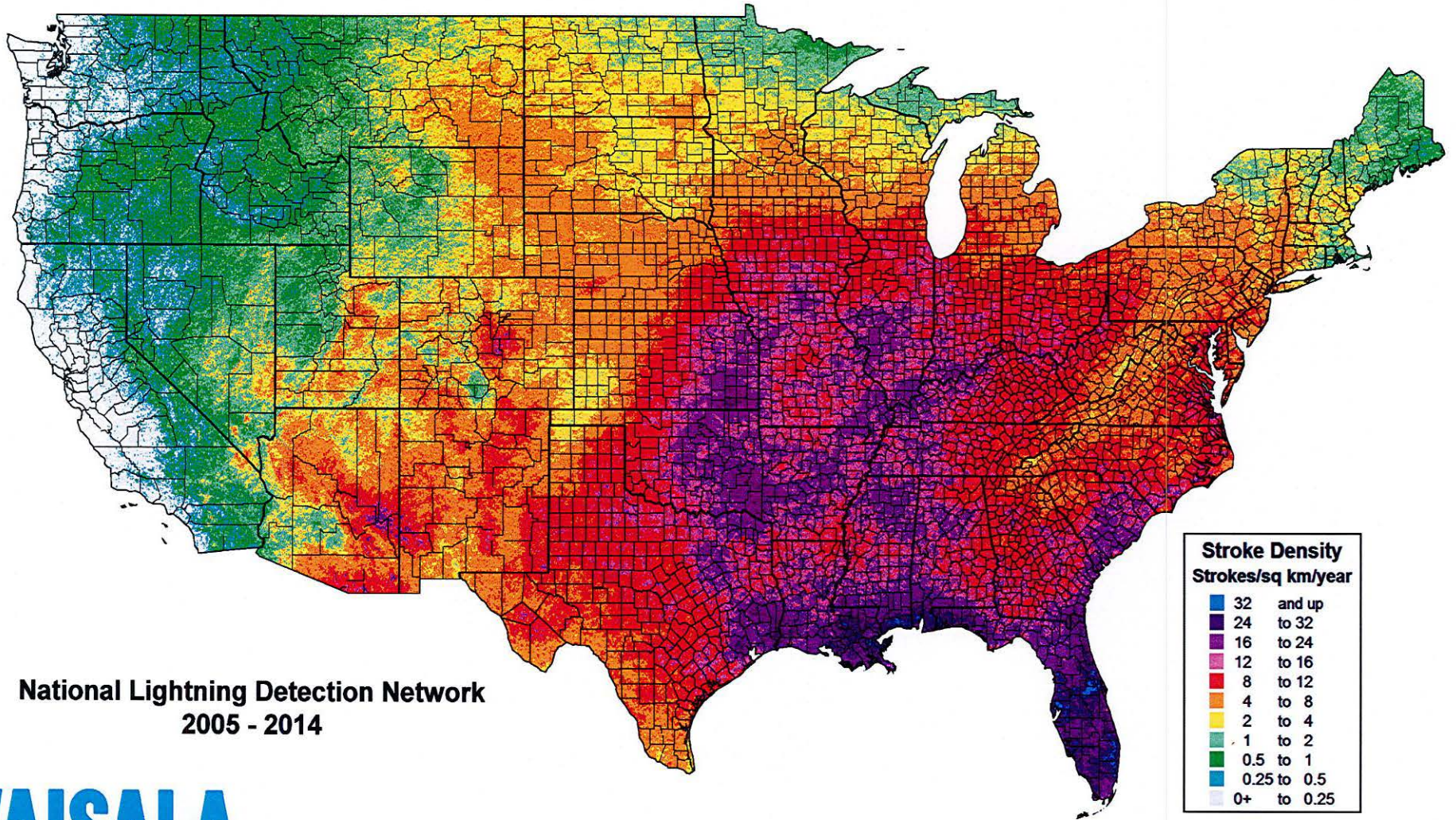
Lightning Area & Remediation Actions



Radar Coverage – Pennington County



Historic Lightning Strike Map

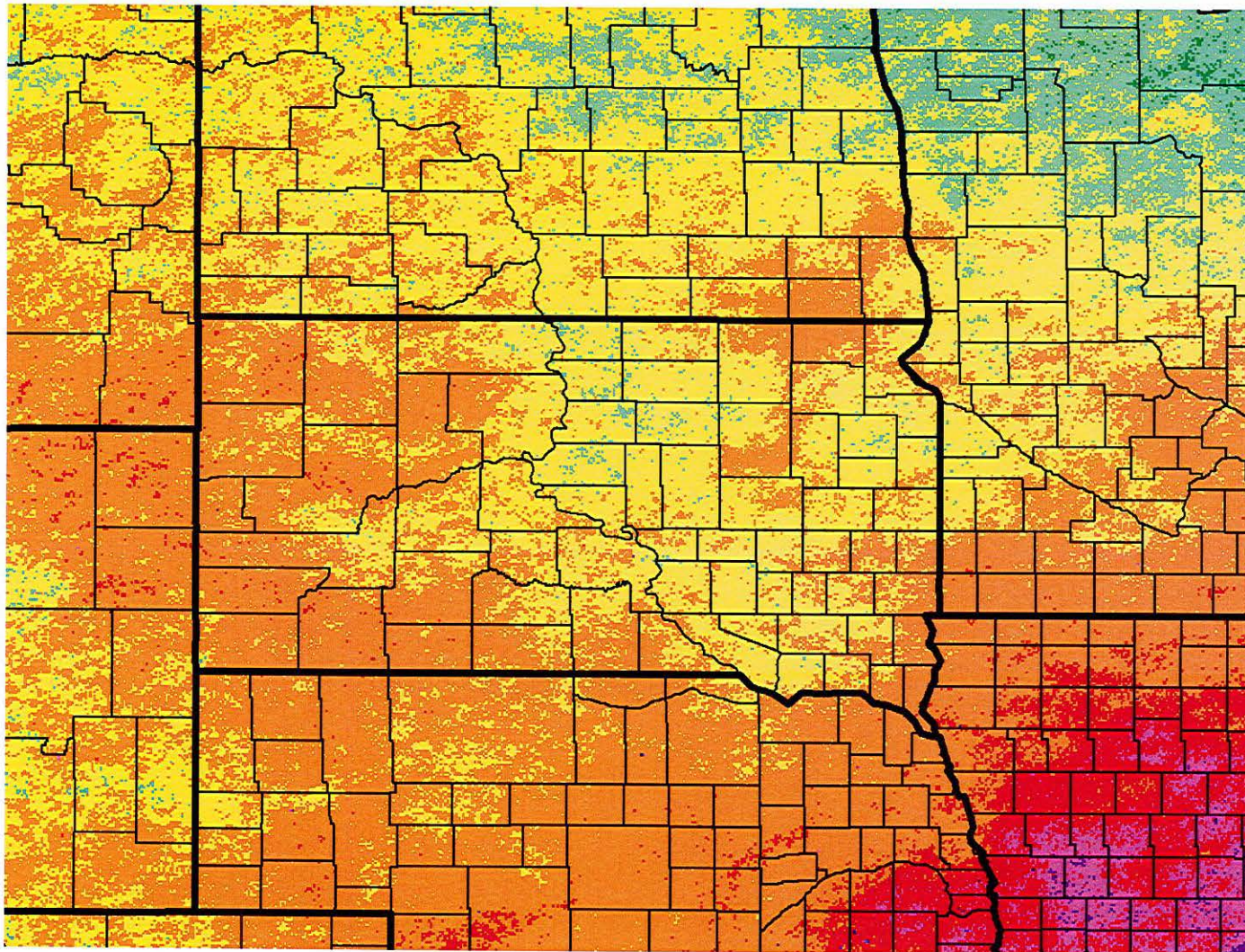


National Lightning Detection Network
2005 - 2014

VAISALA

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2005 – 2014 Lightning Strike / Stroke Map Enlarged



- ❖ According to NOAA: Black Hills storms produce twice the amount of ground strikes per year compared to the surrounding region (besides Colorado).

Stroke Density Strokes/sq km/year

Dark Blue	32	and up
Dark Purple	24	to 32
Medium Purple	16	to 24
Light Purple	12	to 16
Red	8	to 12
Orange	4	to 8
Yellow	2	to 4
Light Green	1	to 2
Green	0.5	to 1
Light Blue	0.25	to 0.5
White	0+	to 0.25

June 26, 2014 Outage Detail – Lightning Strikes



LIAS Report ID: 439
Delivery Date: 25 Apr 2016

USPLN LIAS - Lightning Incident Archival Search Report

The United States Precision Lightning Network has provided the following lightning stroke detection information for the LIAS report.

LIAS Summary

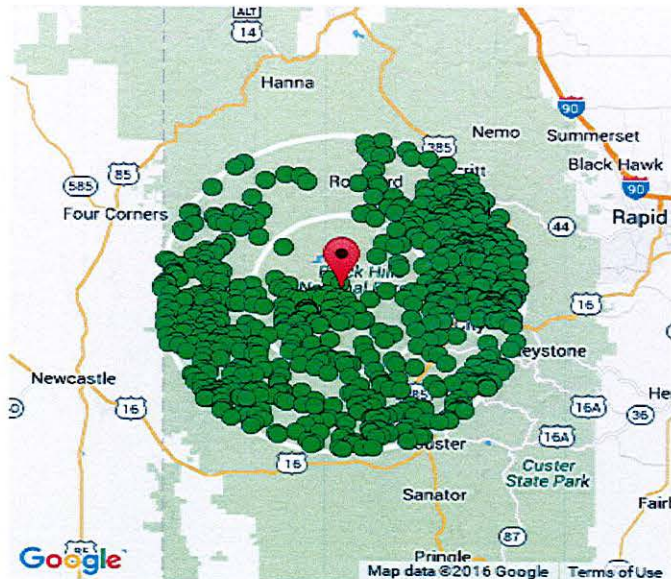
Customer Information Kevin Ancell
kevin.ancell@centurylink.com

Search Parameters Time: 06/25/2014, 00:00:00 to 06/28/2014, 00:00:00
Time Zone: Mountain
Coords: 43.97098 lat, -103.75970 lon
Address: 11495 Gillette Prairie Road, Hill City SD 57745

Results 690 cloud-to-ground events were detected by the USPLN

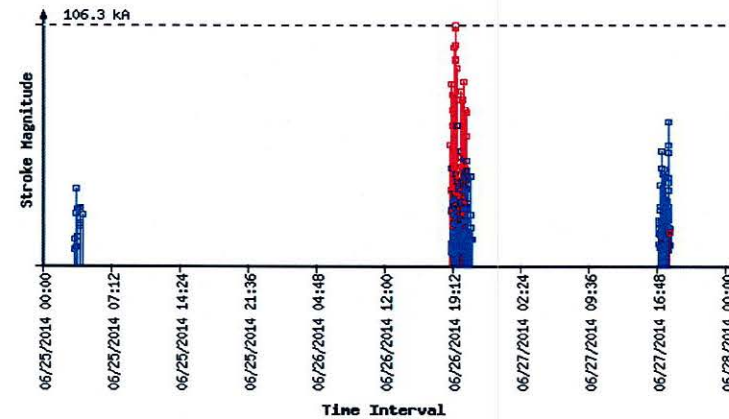
Please visit our FAQ for answers to frequently asked questions. If you require further assistance, please contact the USPLN at www.uspln.com/contact.html or call 878-963-6648.

LIAS Stroke Map



LIAS Report ID: 439
Delivery Date: 25 Apr 2016

LIAS Event Timeline



LIAS Result Parameters

LIAS Stroke Data

Date	Time	Latitude	Longitude	Amplitude(kA)	Distance(Miles)
06/25/2014	03:16:10	43.82631	-103.80508	-7.8	10.3
06/25/2014	03:16:10	43.82037	-103.82482	-13.0	10.9
06/25/2014	03:29:02	43.79428	-103.75191	-23.9	12.3
06/25/2014	03:29:17	43.77084	-103.81628	-35.1	14.2
06/25/2014	03:31:37	43.76030	-103.76224	-8.8	14.6
06/25/2014	03:37:04	43.78205	-103.79595	-26.1	13.2
06/25/2014	03:38:54	43.79919	-103.75630	-9.0	11.9
06/25/2014	03:38:54	43.80377	-103.77942	-14.0	11.6
06/25/2014	03:54:19	43.82013	-103.73507	-26.8	10.5
06/25/2014	03:54:19	43.83104	-103.73039	-19.4	9.8
06/25/2014	03:55:15	43.82266	-103.72807	-18.6	10.4
06/25/2014	03:56:34	43.83145	-103.71702	-25.5	9.9
06/25/2014	04:11:58	43.88653	-103.71441	-23.6	6.3
06/26/2014	18:59:01	44.11700	-103.97393	54.1	14.7
06/26/2014	19:00:49	43.95338	-104.04853	-7.0	14.5
06/26/2014	19:01:48	43.98603	-104.04940	34.6	14.5
06/26/2014	19:01:51	43.90253	-104.02841	-9.3	14.2
06/26/2014	19:02:54	43.96070	-104.04786	-7.6	14.4
06/26/2014	19:03:35	44.08091	-104.01346	-7.2	14.8
06/26/2014	19:03:44	43.85334	-104.00189	-9.3	14.6

Grounding Study

Problem Description

- The customer: George Ferebee of Hill City, SD has reported frequent loss of voice service during severe weather. Mr. Ferebee is served by a Go-Digital pair gain system. The Go-Digital pair gain system is an electronic system that provides multiple voice circuits from a limited number of copper lines. One factor that contributes to the loss of voice service over digital systems is a failure to dissipate voltage caused by lightning strikes.
- To address the issues raised by Mr. Ferebee, CenturyLink sent Curt Erickson a bonding and grounding subject matter expert to test the ground field within the field and the Central Office.

Field Testing

- During the audit, Ohm readings were taken at each repeater site. During testing the repeater ground is disconnected to test the ground field.

RESULTS NEXT PAGE

Grounding Study Results

The results from each of the 6 sites are as follows:

- RPTR #1 = 70 Ohms.
- RPTR #2 = 44 Ohms.
- RPTR #3 = 81 Ohms - Total Bar with AC power connected 13 Ohms.
- RPTR #4 = 60 Ohms.
- RPRT #5 = 69 Ohms.
- RPTR #6 = Gate Locked and Chained, No Trespassing Signs.
- Ground reading should be under 25 Ohms. In each of these sites, the ground reading is significantly higher than specifications. Proper grounding allows high voltage impacts (lighting) a path to discharge to the ground field and a path back to CenturyLink's electronic equipment.

Central Office (CO) Testing

- Examine ground bar connectivity within the CO to ensure stray voltage was not being introduced into the CO. During the audit, it was discovered that additional grounding was necessary between the cable entrance ground and the main CO Ground Bar.

Grounding Recommendations

Field Recommendation

- Due to the area's rocky soil and high elevation, a traditional ground field may not be effective enough at power dissipation. To mitigate this geographic nuance, the ground field should consist of a 40 foot linear trench 40" deep. Using LOW OHMS CONCRETE (6 bags per Reaper) and # 2 solid tined copper conductor. The Low Ohm concrete should provide a more robust ground field at each repeater and reduce the Ohm reading closer to the standard of <25 Ohms. Once the ground field updates are complete, employ the High Voltage Protection plan for Go-Digital utilized to resolve a similar issue in New Mexico.

Central Office (CO)

- In the Central Office a new 2/0 ground cable should be placed from the Cable Entrance Ground Bar to the OPGP Bar (Central Office Ground Bar). This path allows any current fowling on the cable sheath to go directly out of the central office to the ground field or the main ground natural of the power CO.

Conclusion

- While these solutions do not address all the past trouble issues encountered by Mr. Ferebee, they should significantly improve the reliability of the Go-Digital system that currently serves Mr. Ferebee.

Hours and Investments

- Technician Hours – 178
- Technician Expense = \$15,130
- Grounding Remediation - 40ft trench, 40 inches deep, 18 inches wide, with 8 inches of Low Ohm Concrete in the bottom of the trench and a #2 solid copper tinned wire placed in the center of the low ohm concrete mix

**Total Spent on Grounding Mitigation & Trouble Tickets
2013, 2014 & 2015 = \$34,786.36**

Date	CMS#	Description	Invoice
12/9/2014	14279284	George Ferebee's Terminal – Grounding	\$ 2,101.00
12/9/2014	14279303	Castle Creek Road – Grounding	\$ 2,209.17
12/9/2014	14279315	East Slate Road – Grounding	\$ 2,149.98
12/9/2014	14279320	Williams Draw – Grounding	\$ 2,028.55
12/9/2014	14279326	12180 Deerfield Road (Wilson's) – Grounding	\$ 2,120.39
12/9/2014	14279336	Ground Enhancing Material	\$ 4,415.27
6/26/2015	15136679	Gillette Prairie Forestry Road (Ped Washed in Creek)	\$ 232.00
		Noise/Power Mitigation Specialist @\$550.00/day 8 days	\$ 4,400.00
Total For Grounding and Pedestal Washout			\$ 19,656.36