

The Engineering Informer

March 14, 2023

MEMBERS OF THE
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS
SDES EASTERN CHAPTER NEWSLETTER
PO BOX 1512 SIOUX FALLS, SD 57101 | WWW.SDES.ORG

NSPE-SD EASTERN CHAPTER
SOUTH DAKOTA
ENGINEERING SOCIETY

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WebEx: In addition to our monthly in-person presentation, the meetings will also be broadcast on WebEx. See pages 4 and 18 of this newsletter for the WebEx log-in information.

WebEx Information will now remain the same

New Members

Samuel Johnson
Bayden Schneider
Isaac Buteyn
Mike Schmidt
Zachary Severson
Waylon Blasius
Cody Osthus
Justin Heim
Adam Slowey

PRESIDENT'S COLUMN

BY JOSHUA PETERSON, PE

We have made it to March and it feels like spring is just around the corner. Baseball spring training has started and March Madness is kicking off. Pretty soon we will be putting away our snow blowers and firing up our lawn mowers.

The awards banquet was a great success this past month. We had a great turnout and everyone enjoyed the new venue and entertainment at Great Shots. Thanks to Jed Reimnitz for organizing a great event and thanks to Wes Philips for managing the awards. Congratulations to everyone who won an Eastern Chapter award and good luck in the statewide competition.

Engineers Month was action packed with multiple events celebrating our field. Thanks to Erin Steever for organizing the STEM events and thanks to Krista May for running MATHCOUNTS. Also, thank you to everyone who volunteered to help at these events. Volunteers make these activities a success.

Happy Engineers Month! We have so many things planned that we couldn't fit it all into one week.

Thanks to Harry Johnston with the South Dakota Department of Transportation and Shannon Ausen with the City of Sioux Falls Engineering Division for speaking last month on the 2023 construction programs. Our next meeting is on March 14 at the 41st Street Pizza Ranch. Matt Pajl with HR Green will be presenting on the Collector Well #72 project in Sioux Falls.

Have a great day!



TREASURER'S REPORT

SCOTT LAVOY, PE

Previous General Fund Balance 2/1/2023 \$ 19,136.75

Deposits:

None

Total Deposits: _____ \$ -

Expenses:

Awards Banquet Golf \$ (1,434.44)

Awards Banquet Food and Room Rental \$ (1,573.10)

Total Expenses: _____ \$ (3,007.54)

Total General Fund Balance: _____ **\$ 16,129.21**

Previous Scholarship Fund Balance 2/1/2023 \$ 893.54

Deposits:

None

Total Deposits: _____ \$ -

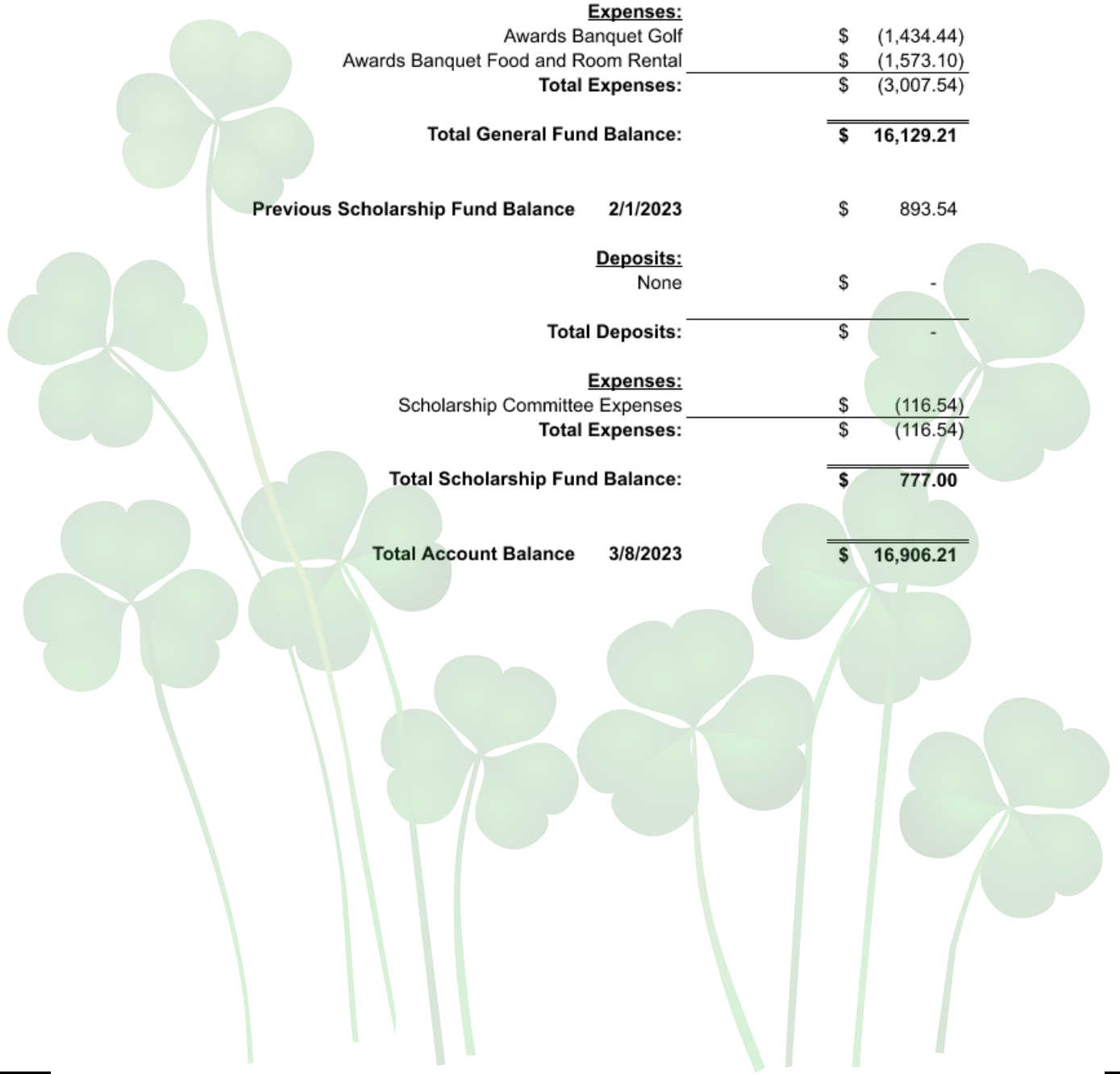
Expenses:

Scholarship Committee Expenses \$ (116.54)

Total Expenses: _____ \$ (116.54)

Total Scholarship Fund Balance: _____ **\$ 777.00**

Total Account Balance 3/8/2023 _____ **\$ 16,906.21**



UPCOMING EVENTS

- Tuesday, March 14th — March Monthly Meeting
- Monday, March 13th — [Early Bird Conference Registration Closes](#)
- April 4th-6th — [SDES Annual Conference](#) in Pierre
- Tuesday, May 10th — May Monthly Meeting

March 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

April 2023

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

MONTHLY MEETING

Please join us **in-person** for the monthly Eastern Chapter SDES Meeting at the 41st Street Pizza Ranch Meeting Room.

Tuesday, March 14th

Lunch starts at 11:30 am and the meeting begins at noon

Matt Pajl with HR Green will be presenting on the Collector Well #72 project in Sioux Falls.

We look forward to seeing you in person, but if you'd like to join us virtually via WebEx, please see the information below.

We have set up a recurring meeting for the rest of the year, so the meeting information will stay the same until the end of the year (May 2023). Members can also find the link if they log in to the website and click on Membership Meeting Information under the Members Only item in the left hand menu.

[https://sdes.webex.com/sdes/j.php?
MTID=mfa42a8810629c079a645361e2525d136](https://sdes.webex.com/sdes/j.php?MTID=mfa42a8810629c079a645361e2525d136)

Meeting number: 2464 774 4807

Password: ERt323BNuYv

Join by video system

Dial [24647744807@sdes.webex.com](tel:24647744807@sdes.webex.com)

You can also dial 173.243.2.68 and enter your meeting number.

Join by phone

1-650-479-3208 Call-in toll number (US/Canada)

Access code: 246 477 44807

BRIDGES, DDI AND 'KRISPY' SOIL BORINGS, OH MY! THE ADVENTURES OF E-WEEK STEM OUTREACH IN 2023

ERIN STEEVER, PE

Wow, I couldn't be more proud of our members than I am right now! SDES and South Dakota Section of ASCE teamed up to visit six of the Siouxland Library Branches and one of the Rapid City Libraries in February (and we have one more event on March 29th). Not only do we all have busy schedules with the current infrastructure funding and subsequent workload, we had an overwhelming number of new and repeat volunteers that took time out of their schedule to lead and help with these events. This was a new EWeek STEM Outreach format, and our volunteers took it in stride to successfully deliver an informative and fun event at each of the sites. Thanks to our volunteers, we may have fueled 126 future engineers – we saw 15-25 kids as most of the events, and many of them had a parent or guardian to join them in the fun.

"We are so appreciative to bringing these activities to Siouxland Libraries customers. Hopefully we can do more sessions in the future!" - Nicole Norton, Siouxland Libraries



Thank you to the following individuals and their respective employers for making this year's EWeek events a success:

Jacob Bettelyoun-Buysse, HR Green

Sam Cotter, HR Green

Liz Wunderlich, Retired

Thomas Desmarais, Self Employed

Luis Duque, Foothills Bridge Co

Krista May, IDG

Jessica York, HDR

Austin Hoellein, Bartlett & West

BRIDGES, DDI AND 'KRISPY' SOIL BORINGS, OH MY! THE ADVENTURES OF E-WEEK STEM OUTREACH IN 2023 (CONT.)

Vani Jain, HDR

Myron Adams, JSA

Paris Marcy, HDR

Brad Hartmann, FHU

Mike Schmidt, City of Sioux Falls

Wes Philips, City of Sioux Falls

Matt Pajl, HR Green

Karin Lang, Bartlett & West

I also want to thank Nicole Norton and Jamie Buswell with the Siouxland Libraries, and Alexandra Quinn at the Rapid City Public Library for welcoming us into their space for these somewhat messy but super fun activities.

For those of you interested in the activities, we had two tracks offered this year. First was a bridge track. Here we introduced them to the concepts of compression and tension while we constructed the Suspension Bridge Kit. This kit is made up of PVC pipe, Christmas tree bases, metal hooks, rope and UPS shipping boxes. It was built by Deidre Beck with grant funds from ASCE using plans found at www.discovere.org (keywords: build a cable stay bridge). It is reusable for a sustainable STEM activity that can be moved around the state and enjoyed for years. We were so excited to bring it back out this year!



Nearly every kid likes to play with food, and bridge activities typically draw a crowd, so for the second half of the bridge event we split the group into smaller teams for a gum drop and tooth pick bridge, but we stepped it up a notch and added Graham crackers, frosting and licorice rope. The kids were so creative with their Graham Cracker bridges, and it was fun to see how many of them held up to the test weight when we loaded them with 1" washers. By design, the washers each weigh in at 0.5 lbs to make for some fun math to add to the event's educational value.

BRIDGES, DDI AND 'KRISPY' SOIL BORINGS, OH MY! THE ADVENTURES OF E-WEEK STEM OUTREACH IN 2023 (CONT.)

The second track included a Diverging Diamond Interchange (DDI) and a geotechnical element. A brief and engaging PowerPoint showed the audience (kids and adults alike) about our inaugural full-scale DDIs installations here in Sioux Falls and Rapid City! A painted canvas of a DDI was paired with monster trucks for the kids to try out the interchange themselves. With inspiration from the new retaining wall installed on the southwest corner of the Sioux Falls DDI, we explored geotechnical engineering with a themed food activity. The kids took their own core samples using reusable plastic straws. Instead of core samples of soil, the cores were taken from multi-cereal layered Krispy Treats. A special thanks to Paris Marcy for 'baking' these treats.



Mixing food and engineering concepts was a win-win for all involved. My cup is overflowing with gratitude for all involved in this year's EWeek STEM Outreach event.

Thank you,

Erin Steever
Bartlett & West
SDES EWeek Coordinator and ASCE Region 7 Director



MATHCOUNTS

KRISTA MAY, PE



On behalf of the South Dakota Engineering Society, I want to thank all those that volunteered for this year's program. This year's competition was held on February 28, 2023 at Southeast Technical College in Sioux Falls.

The first-place team was Patrick Henry Middle School from Sioux Falls, and the second-place team was Yankton Middle School. The top two teams and top four individuals not on the top two teams advance to the State Competition on March 11th in Pierre. There they will compete against the top students from two other chapters in the state. The top four individuals from the State Competition will represent South Dakota at the 2023 Raytheon MATHCOUNTS National Competition May 13th - 16th.

Thank you to the following volunteers for helping with this year's competition:

Brad Ludens

Paris Marcy

Clint Ehlers

Karin Lang

Corey Maynard

Brad Hartman

Jessica Satiroff

Beth Kassing

Southeast Tech Students

Thank you again for supporting the MATHCOUNTS program in South Dakota. Your help is greatly appreciated!

Thank you also to our generous sponsors of the MATHCOUNTS program – we couldn't do what we do without your support!

Advanced Drainage Systems, Inc. – Sponsored the PIZZA for this year's competition.

Banner Associates

Carl V. Carlson Company

DGR Engineering

Geotek Engineering & Testing

HDR Engineering, Inc.

Helms & Associates

IMEG

Infrastructure Design Group, Inc.

JSA Consulting Engineers, Inc.

KMS Engineering

Sayre Associates

ENGINEERING AWARDS BANQUET—SCHOLARSHIP WINNERS

LANCE MAYER, PE

As part of the 2022-2023 scholarship program, the SDES-Eastern Chapter received 31 applications from area high school seniors and awarded \$10,000 in Engineering Scholarships (\$2,000 each) to the following five high school seniors:

Ethan Bruns, from Sioux Falls, SD, attends Sioux Falls Christian High School. Ethan is ranked 1st in his class and participates in several extracurricular activities including basketball, track and field, and baseball, along with volunteering at Active Generations as a Meal on Wheels worker, Miracle League, and Rake the Town. Ethan's most satisfying achievement are the awards he and his team received during the 2021-2022 high school basketball season. Their team upset many of their opponents to make it to the State tournament and he



established himself as a leader on the team. His interest in engineering comes from his satisfaction in being presented with a problem and working through it until the end. Ethan plans to attend South Dakota State University to study Civil Engineering.

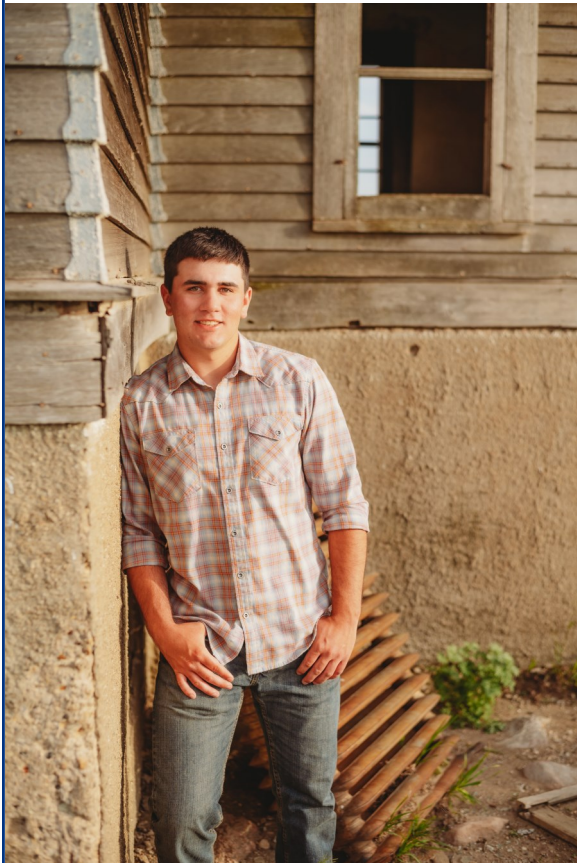


Owen Fink, from Bridgewater, SD, attends Bridgewater-Emery High School where he stands out academically while participating in several activities, including Sanford High School Research Program, Boys State, SDSU Science Camp, Quiz Bowl, High School Band, and Bridgewater-Emery FFA. Owen's most satisfying achievement is being selected as a 2022 Sanford PROMISE Scholar. During his 10-week internship, he researched tumor innervation in high-grade serous ovarian carcinoma. For his contributions, he is in the "Acknowledgements" section of a peer-reviewed manuscript currently being evaluated by the scientific journal Science Advances. Owen wants to become an engineer because he knows that, without exaggerating, engineering keeps our world moving. Owen plans to attend South Dakota State University to study Computer Engineering.

ENGINEERING AWARDS BANQUET—SCHOLARSHIP WINNERS

LANCE MAYER, PE

Samantha Winker, from Winfred, SD, attends Howard High School where she is ranked number 1 in her class while participating in several activities, including band, quiz bowl, Family, Career and Community Leaders of America, basketball statistician, shooting sports, oral interpretation, cheerleading, National Honor Society, and Student Council. Samantha's most satisfying achievement is earning a 4.0 GPA and being class valedictorian. She said that learning to organize and balance a full schedule was a challenging skill to learn; however, prioritizing school over everything else, although not always fun, was well worth the rewards. Getting to watch her dad build and fix machines is Samantha's biggest inspiration to pursuing an engineering degree. Her dream is to someday design and build a better aircraft. Samantha plans to attend South Dakota School of Mines and Technology to study Mechanical Engineering.



Cole Bisbee from Columbia, SD, has excelled academically as a senior at Groton Area High School and has been involved in wrestling, football, FFA, band, and is a fellowship of Christian Athletes Member. He has also volunteered his time with Adopt a Highway Clean-up, serving meals at a local church, Ag safety education, and helping with children's activities for their community Summer Festival. Cole's most satisfying achievement was recently winning the Business Is Great (BIG) Idea Ag Innovation Award. He came up with the idea for a self-powered punch while cutting hay after seeing a need for the tool and developed a design. After finding parts and creating a prototype, he welded it together to present at the competition. The judges were excited about Cole's product and suggested he look into getting a patent. This experience made Cole realize that engineering is the field he was meant to be in. Cole plans to pursue a degree in Environmental Engineering at South Dakota State University.

ENGINEERING AWARDS BANQUET—SCHOLARSHIP WINNERS

LANCE MAYER, PE



Benjamin Schaal, from Brookings, SD, attends Brookings High School where he stands out academically and participates in several activities in both his school and community. These activities include Student Council, Quiz Bowl, Orchestra, Cross Country, Nordic Skiing, Peer Tutor, Environmental Club, Swimming, Chess Club, debate, being a SD Legislative Senate Page, and volunteering at the Ivy Closet. Benjamin's most difficult struggle in high school was moving to Palmer, Alaska for the second semester of his junior year. This change of schools was hard as he had to leave behind friends, clubs, sports, and high school for a new environment. To meet the challenge, he quickly got involved in his new high school by joining the Nordic Ski Team and clubs. These actions helped him meet people, make friends, and become a part of the community. Benjamin's biggest struggle ultimately turned into one of his most cherished experiences. Benjamin plans to attend South Dakota State University and major in Civil Engineering.

Also, in 2023, the Eastern Chapter is sponsoring a \$450 Engineering Scholarship which was made available through a permanent endowed fund held within the South Dakota Community Foundation. **Krista Burkman** was the recipient selected by the Scholarship Committee and she presently attends South Dakota School of Mines and Technology planning to major in Mechanical Engineering.

In 2022, the Eastern Chapter sponsored a \$450 Engineering Scholarship which was made available through a permanent endowed fund held within the South Dakota Community Foundation. **Caleb Henderson** was the recipient selected by the Scholarship Committee and he presently attends South Dakota School of Mines and Technology planning to major in Electrical Engineering.

Congratulations to all the SDES - Eastern Chapter Scholarship Recipients!

SDS EASTERN CHAPTER'S SDSU ENDOWED SCHOLARSHIP

LANCE MAYER, PE



South Dakota State University Foundation
 Lohr Building | 815 Medary Avenue
 Brookings, SD 57006
 (605) 697-7475
www.boldandblue.org

Thank you, South Dakota Engineering Society - Eastern Chapter!

1998
 year scholarship was
 established

\$34,650
 committed to scholarship
 support

SD ENGINEERING SOCIETY EASTERN CHAPTER ENDOWED SCHOLARSHIP

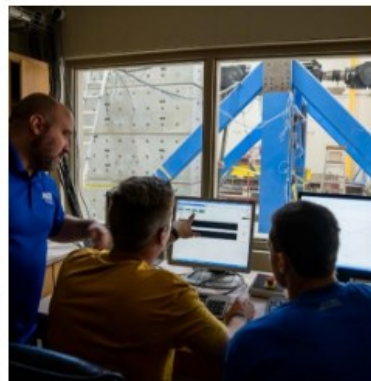
Overall Number of Scholarships Awarded: 44

Braeden Slagel, a **Civil Engineering** major from **Marshall, MN**, was the 2021/2022 and 2022/2023 scholarship recipient.

CURRENT SCHOLARSHIP SELECTION CRITERIA:

The recipient shall be a junior or senior pursuing a degree in mechanical, electrical, civil and environmental, or agricultural and biosystems engineering. The recipient must have a cumulative GPA of 2.5 or higher and demonstrate financial need.

THANK YOU FOR MAKING A DIFFERENCE AT SDSU!



ENGINEERING AWARDS BANQUET—AWARD WINNERS

WES PHILIPS, PE

The Eastern Chapter Award Winners were recognized at the SDES Awards Banquet on February 25th, 2023.

Nominees for the Young Engineer of the Year Award are judged on education, collegiate achievements, professional society activities, technical society activities, civic and humanitarian activities, continuing competence, and engineering achievement. The Eastern Chapter is allowed to nominate up to two Young Engineers to the state society, in random order below.

The Young Engineer of the Year award was presented to **Tevis Holzer, PE**. Tevis is a Project Manager at Banner Associates, Inc. He graduated from South Dakota State in 2012. Tevis is active in Leadership Brookings, is a mentor to SDSU CEE students, and is active in ASCE, having served as President in 2014. He has presented on structural topics to ASCE and SDES and is a board member of the Brookings Area United Way. At Banner, Tevis works on structural design and project management of buildings, concrete tanks, signs, and other vertical structures. Prior to working at Banner he worked as a structural designers for Daktronics, and was involved in several NFL, NBA, NHL, college and high school displays.



Also receiving the Young Engineer of the Year award is **Matthew Brua, P.E.** Matthew is a Project Manager at HR Green. He graduated with his Master of Science degree from South Dakota State in 2012. Matthew is involved with various professional organizations, most notably with national level involvement in ASCE through the ASCE Transportation Policy Committee, Committee on America's Infrastructure and Legislative Fly-In. Matt is also the State Director for ACEC. At HR Green, he has worked on a wide variety of projects as a roadway engineer and project manager for SDDOT, TXDOT, MoDOT, MnDOT and City of Sioux City. Before working for HR Green, Matthew was a Senior Engineer in the detail design function group at MnDOT.

Nominees for the Engineer of the Year Award are judged on education, continuing competence, professional and technical society activities, awards and honors, civic and humanitarian activities, engineering achievements, professional experience, national organizational offices held, activities of unique quality, and any special advisory assignments. The Eastern Chapter is allowed to

ENGINEERING AWARDS BANQUET—AWARD WINNERS

WES PHILIPS, PE

The Engineer of the Year award was presented to **Erin Steever, P.E.** Erin is an Engineering Specialist for Bartlett & West. Erin graduated with a Master of Science degree from South Dakota State in 2005. Her service to professional and technical societies is admirable and impressive. She has served at all levels in ASCE, most recently on the Board of Direction for Region 7 and the Region 7 Governor. For SDES, Erin serves as the Events Coordinator for E-Week and has volunteered as a moderator for MATHCOUNTS and Events Coordinator for the Awards Banquet in the past. She is also active in the American Water Works Association, as a member of the Technical and Education Council. At Bartlett & West and throughout her career, Erin has worked on all aspects of numerous water and wastewater systems in our region.



Also receiving the Engineer of the Year award is **Kent Johnson, P.E.** Kent is a Project Manager within the Civil Department at Banner Associates. Kent graduated from South Dakota State with a Master of Science degree in 2002. Kent is a Certified Flood Plain Manager and is a regional expert in flood plain management, working on Federal, State, County, Municipal and private projects. Kent has been involved in SDES and ASCE activities and volunteer opportunities throughout his career. In the community, Kent serves at The Banquet and is a ministry volunteer at Trinity Lutheran Church in Tea.

ENGINEERING AWARDS BANQUET—AWARD WINNERS

WES PHILIPS, PE

The outstanding engineering achievement award was established to acknowledge the dynamic and innovative accomplishments of the engineering profession. Eligible projects must be in South Dakota. Projects that are designed by a firm in one Chapter, but constructed in another can be nominated in either Chapter. We had five worthy project nominations this year. The Eastern Chapter is allowed to nominate up to two projects to the state society for the Outstanding Engineering Achievement Award. The Outstanding Engineering Achievement Awards were presented to HDR for the South Dakota Electric Vehicle Infrastructure Deployment Study and Minnesota Avenue Phase 1 Project.

The South Dakota Electric Vehicle Deployment Study was developed to meet the requirements of the National Electric Vehicle Infrastructure Formula Program, under which the SDDOT will receive funding to deploy a statewide network of Direct Current Fast Charging infrastructure as a part of the national network. Project team members included Steve Hoff, PE, Dustin Hamilton, PE, Ben Pierce, Brenda Levos, Katie Angell, Ally Carson, Thomas Stout, Rob Mowat, Justin Robbins, Matthew Morrison, Josh Hellman, Sean Everett. Additional information on this project can be found in the following project nomination.

The Minnesota Ave Phase 1 from Russell Street to 2nd Street is the first project of four to revitalize this arterial corridor in Sioux Falls, SD. Leading from the Sioux Falls Regional Airport to the Downtown area of Sioux Falls, this flagship project consisted of design and construction for improvements to public utilities including sanitary sewer, water main and storm drainage and also the grading and resurfacing of the concrete corridor, accommodating approximately 10,000 vehicles per day. Primary team members include Paul Sanow, PE, TJ Yerdon, PE, CFM, Heather Burkman, Rich Liggett, Lance McQueen, PE, Lee Kaffar, Kent Ode, PE, Brenda Levos, Brian Jensen, PLS, Kevin Newman, PE, Abby Nelson, PE, CFM, Brent Scarborough. Confluence, Lightworks, AE2S, Geotek, American Engineering & Testing and Subsurface Utility Exploration assisted as subconsultants on the project. Additional information on this project can be found in the following project nomination.

Congratulations to our Eastern Chapter award winners! Our winners will be submitted to the State SDES awards committee. State SDES award winners will be presented at the Annual Conference, April 4-6, in Pierre. Thank you to the awards committee who assisted in reviewing and ranking the nominations and all who submitted the record number of nominations this year, keep it up!

TO LEARN MORE, PLEASE SEE THE ATTACHED ARTICLES AT THE END OF THIS NEWSLETTER.

YOU ARE INVITED: PLAY AN ACTIVE ROLE IN SDES!

JONATHAN WIEGAND, PE

The SDES State Board is always looking for its next leaders. If you are interested in serving on a state committee or the Board, please reach out to Nancy Hoines or any of the current Board members. These are great opportunities to be engaged with SDES statewide and give back to the South Dakota engineering community. They also provide a great starting point for NSPE leadership and committee opportunities. State Board leadership transitions each spring as part of the Annual Conference. Committees begin organizing over the summer months and members can be added throughout the year. Join us in leading SDES into the future!





Becca Kollars
City of Sioux Falls
 Project Manager
 Rbcca.bnntt@gmail.com

College and Major:



University of Kansas

Architectural
 Engineering

I was born in Sioux Falls, went to Roosevelt High School and I am a University of Kansas graduate. After college, my husband and I lived in Kansas City for a couple years before moving back to Sioux Falls to be closer to family (literally, we live 3 houses away from the house I grew up in). I have three kids in elementary school who enjoy board games, Legos, and playgrounds.

Family: Married with 3 Kids

Hometown: Sioux Falls

Job Title and Years With Firm: Engineering Project Manager, 5 months

Favorite Room in My House and Why: The Kitchen — I love to cook, bake, and eat .

My Normal Breakfast: Coffee

What do you collect? Cards (Holiday, birthday, etc.)

My Best Personality Trait: Honest

Favorite beverage: Apple Cider

Favorite TV Show: CSI

People may not know about me... I am licensed to drive a motorcycle

What made you want to be an engineer? The puzzle and problem solving

What do you like best about being an engineer? Finding solutions

Describe a significant event in your career. Passing the PE test

I hate it when... I'm signaling to change lanes and the car next to you speeds up

Favorite Place to Visit and Why: Lake Kampeska, a place to escape the bustle of everyday life and focus on family and time together.

2022-2023 OFFICERS AND CHAIRPERSONS

Officers

President	Josh Peterson, PE
President Elect	Devin Clay, PE
Vice President	Riley Rinehart, PE
Secretary/Treasurer	Scott LaVoy, PE
Chapter Director(1st term)	Elizabeth Sobania, EIT
Chapter Director(2nd term)	Kent Ode, PE
State Director	Abby Nelson, PE
Past President	Gabe Laber, PE

Committees

Nominating Committee	Lee Kaffar, BA
Mathcounts	Krista May, PE
Scholarship	Lance Mayer, PE
Events Coordinators	
E-Week	Erin Steever, PE
Winter Social	Kent Ode, PE
Golf Outing	Kent Ode, PE
Awards Banquet	Jedidiah Reimnitz, PE
Awards	Wes Philips, PE
Audio/Visual IT	Chad Stensland, PE
Newsletter	Vani Jain
Membership List	Myron Adam, PE

Eastern Chapter of SDES Goals

- To promote the licensed practice of engineering and to provide learning opportunities that enable licensed engineers to maintain practice competency;*
- To maintain high ethical standards for the practice of engineering and lead the profession in adhering to these principles:*
- To protect the public health, safety, and welfare; while being good stewards of the environment;*
- To incorporate engineering principles and perspectives in government decisions that protect the public; and*
- To consider community service a professional obligation.*

SDES Mission Statement

SDES is the state society of engineers from all disciplines that promotes the ethical and competent practice of engineering, advocates licensure, enhances the image of its members, and advocates legislation and public policy for the betterment of human welfare and the profession.

Webex Login Instructions

SDES March Monthly Meeting
Meeting available on Webex on
Tuesday, March 14th at Noon (CST)

Meeting number (access code):

2464 774 4807

Meeting password:

ERt323BNuYv

Join from the meeting link:

[Click Here](#)

For any and all newsletter articles, additions, edits, corrections, and important dates contact:

Vani Jain, Water/Wastewater Coordinator
 HDR
 101 S. Phillips Avenue, Suite 401
 Sioux Falls, SD 57104
 605-782-8140
 Vani.Jain@hdrinc.com

For all State Society membership information and other business, contact:

Nancy Hoines
 SDES Executive Director
 PO Box 1076
 Pierre, SD 57501
 605-951-1004
 sdengineeringsociety@gmail.com

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Thank you for your support of SDES!

Advertisement Sponsorships are available in our monthly newsletter. The newsletter is distributed to over 200 members of the chapter and posted on the SDES website. If you are interested in having your advertisement here, please contact Nancy Hoines via phone: 605-951-1004 or email: sdengineeringsociety@gmail.com.

Minnesota Avenue Phase 1, Russell Street to 2nd Street Reconstruction Project

Summary

The reconstruction of Minnesota Avenue from Russell Street to 18th Street consists of four phases. This project will revitalize vital arterial corridor in Sioux Falls, SD. Phase 1 included final design of the five-lane concrete street from Russell Street. This phase was planned for construction in 2022. This project allowed major street and infrastructure improvements to occur along this major City of Sioux Falls arterial corridor, leading from the Sioux Falls Regional Airport to the Downtown area of Sioux Falls. This flagship project consisted of design and construction for improvements to public utilities including sanitary sewer, water main and storm drainage and also the grading and resurfacing of a concrete corridor accommodating approximately 10,000 vehicles per day.

Another key element of this corridor was the improvements to the walkability of a residential area of Sioux Falls. Pedestrian activity in this area, which includes daily access to numerous adjacent commercial properties and Hawthorne Elementary just west of the corridor, was recognized early in the design as a Complete Streets aspect requiring attention. Uniquely situated in this corridor are businesses, employing several workers and serving many patrons, requesting ease of access and parking, both that had to be considered in the design. The implementation of ADA compliance and pedestrian-controlled crossings was also inherent to the successful design.

Access management, which included a new raised median, was incorporated to improve safety for commuters and pedestrians alike. A new signalized intersection was strategically located at Brookings Street to identify a location where pedestrians can cross the arterial at a controlled intersection. Key improvements include pedestrian and commuter safety, enhanced corridor aesthetics, private and public utility upgrades, including the full replacement of the existing sanitary sewer main and three existing water mains, and the existing 36-inch diameter concrete transmission main to a 42-inch cathodically-protected ductile watermain. Other important project features include significant private utility coordination and replacement, removal of on-street parking, streetscaping, traffic signals and IT conduit, street lighting including accent lighting, pavement markings, permanent street signs, topsoil, seeding, and landscaping. Specific locations of trees were identified to improve on the sustainability of the corridor, which was highly accepted by the adjacent property owners. Public involvement throughout the design and construction of the corridor played a key role in the seamless construction. Consistent communication conveying the intent of the project to stakeholders created a smooth transition from the design to the implementation of each design aspect of the project.



Project Description

1. Application of Engineering Principles: Starting with the implementation of the design elements during the Preliminary Design of the overall corridor from Russell to 18th Street, it was apparent that the decisions made in Phase 1 would influence each phase and be carried throughout the Minnesota Avenue Corridor. The overall objective of this street reconstruction would shape an arterial for many years and generations to come. The principles applied included engineering design standards and a few exceptions best suited for this unique arterial. This was a difficult project due to work area available and the number of utilities existing in the corridor.

Utility Design At first glance, the sanitary sewer on this project seems pretty typical. The sewer was not deeper than 15 feet and the largest diameter pipe was no larger than 8 inches. However, with a closer look into the sanitary design it doesn't take one long to understand the complexity this portion of the project actually presented.

Constructability is a consideration on typical projects that may be taken for granted. Managing the project design by considering the feasibility of construction from each angle, at the end of the day, reduced risk and greatly increased the chances of delivering this successful project. Through traffic could not be shut down during construction; therefore, the constructability of the sanitary sewer became a major concern. The sewer runs down the centerline of the roadway, which meant the design team would need to excavate a trench for a 15-foot deep sanitary sewer directly adjacent to active traffic. Considering the complexity and dangers of this effort, the team recognized the importance of communication early on with contractors to verify this work could be completed safely and effectively. We ultimately created typical sections to show the excavation area and its proximity to traffic, using jersey barriers along the length of the project to optimize safety during construction, and highlighted the importance of having multiple crews on site so that the sanitary sewer could be completed ahead of the other utilities.



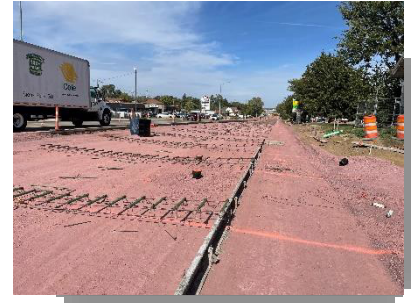
The installation of other utilities on this project also played a key role in the design of the sanitary sewer. The corridor of Minnesota Avenue is unique compared to other arterials in the City due to the number of residential properties in the area. This meant that the team had to connect to almost 90 sanitary sewer services along the length of the ½ mile project. Typically, residential conditions consist of one water main crossing over the sewer services with the water main located a couple feet higher than the sewer services. However, the installation of a 42-inch watermain drastically impacted this project norm. The design team recognized early on that they would have to design the sanitary sewer and 42-inch watermain in coordination with each other to reduce conflicts with services crossing underneath the large diameter water main. The team accomplished this by reflecting the

profiles of the two pipes on top of each other and making design changes to conditions where pipes overlapped. This level of design is critical, but the execution of installing the pipes at the correct elevations is even more critical. Working closely with the survey and construction management teams, our designers decided that all utilities would need to be staked out every 50 feet to verify accuracy of the pipe installation. In order to mitigate errors in the field, our team also made the extra effort to create profiles along the inverts of all utilities so elevation callouts could be added and used as an added reference during construction.

Existing storm pipe within the project needed to be replaced due to the age of the existing drainage system and anticipated utility sequencing challenges. Additional trunk capacity was needed in all evaluated drainage areas. The complexity of the storm grades and the depths required, coupled with the challenges of the water main and sanitary sewer required meticulous and continual utility coordination. Since a change in one area would have a ripple effect on design, the ability to communicate quickly and effectively coupled with exercising flexibility and a change in design was a necessity on this project.

Grading/Model. Minnesota Avenue is a utility-driven project. Utilities are typically highlighted when discussing this project because of how rare it is to have the opportunity to install a 42-inch diameter watermain pipe in this area. However, the grading portion of this project was no small feat either.

Typical arterial streets have a 100-foot right-of-way and primarily have commercial properties adjacent to the roadway. This section of Minnesota Avenue has an 80-foot right-of-way and is dominated by residential properties. This is relevant because almost every individual property in this area has a driveway or stairs or retaining walls along Minnesota Avenue. These items act as constraints when laying out the design of the corridor.



There were nearly 30 driveways and 25 staircases along the length of this project that needed to be reviewed over the course of the design. While driveways can typically be reconstructed, several of the driveways in Phase 1 were adjacent to retaining walls running the length of the driveway. Existing elevations had to be maintained or there would have been large costs for replacement. Factors, including elevations and cost, influenced decisions early in the design process requiring staircases to remain in place. ADA concerns also influenced design due to very limited room for adjustments to the existing elevations around these features. These design challenges required our team of professionals to meticulously check and recheck these elevations throughout final plans. Revisions to the design were isolated only to the cross slope of the boulevard or the roadway elevations, as necessary.

Drainage was also a significant consideration in the grading design. This corridor is a relatively flat area which helps in certain areas of the design, but can hinder drainage. With this area being so flat, there was not much room for additional grading beyond the roadway. In addition, curb elevations could not be any higher than the existing curb. This idea is not uncommon and something that is done on the majority of roadway reconstruction projects. However, what makes this unique is that parking lanes along the length of the project were being removed. This meant that if the design team kept the same centerline elevation and cross slopes, they would actually be raising the elevation of the curb approximately three inches. This small elevation difference was the determining factor in adjacent properties draining to the street.

Due to varying cross slopes throughout the corridor and the past asphalt overlays, designing around these drainage concerns could not simply be addressed by lowering the centerline a few inches. Utilities and other constraints previously discussed did not allow for the roadway to be lowered as necessary. In order to make sure we were not creating drainage concerns outside of the roadway, calculations of the existing ground elevation to the proposed ground elevation at the outside edge of the right-of-way to the curb and gutter were completed several times on each lot. If locations indicated an unacceptable outcome, the profile and cross slopes were modeled and revised.

Cement Treated Subgrade. The decision to use cement-treated subgrade instead of a typical aggregate base course layer increased the efficiency and constructability of this project. With such a tight-working corridor, our team knew that it would be difficult and cumbersome to keep a steady flow of trucks coming in to unload the material necessary for base course installation. Also, installing a thick section of base course on top of a woven barrier fabric is a significant undertaking that would have taken several days and crews to complete.



With the help of Geotek providing soil borings and recommendations, our design team designed a typical section that limited the amount of base course needed, increasing the efficiency of the entire project. Another added benefit our team designed around was the weather. Installation of aggregate base course requires dry subgrade and any rain can delay construction. However, rain is very beneficial to cement-treated base. Wet conditions are ideal for this process and even if it is a dry summer, water can be added to subgrade during the installation to combat the dry conditions. With such a tight project window for completion, the design team knew that weather delays could potentially delay project down to the point of missing the completion deadline.

The decision to use cement treated subgrade instead of a full aggregate base course section ultimately paid off, since it produced a cost-effective and high-quality product that did not slow down in the rain that fell multiple days during construction.

Streetscaping/Accent Lighting

Incorporation of streetscape features was a challenge on this project due to the limited right-of-way width. While pedestrian safety was a paramount goal, current project streetscape features were focused on visual aspects since the corridor currently has a relatively low pedestrian demand. Streetscape features include corridor identity, wayfinding, accent lighting, and street trees. The streetscape has the width to add pedestrian amenities as the corridor redevelops in the future.

- Pedestrian Safety

Prior to reconstruction, sidewalks on both sides of the road were only 5-feet wide resulting in pedestrians walking dangerously close to vehicular traffic. By eliminating underutilized on-street parking and maintaining 11-foot lane widths, the project was able to provide 6-foot wide sidewalks with a 4-foot boulevard buffer at the back of curb. Colored concrete was placed in the boulevard because of concerns related to maintaining vegetation or street trees so close to such a heavily-traveled roadway with snow removal operations and heavy use of road salts. However, a street-tree pilot program was implemented to see if challenges could be overcome using an unconventional planting system.



Pedestrian crossings of Minnesota Avenue have long been a risky venture, often with pedestrians stopped in an unprotected center turn lane waiting for an opportunity to complete their journey across the street. Protected pedestrian points-of-refuge have been provided at breaks in the raised concrete median so a pedestrian can safely wait for an opportunity to complete a crossing. In addition to traffic control benefits, the raised concrete median also reduces random mid-block pedestrian crossings, which are especially dangerous at night.

- Corridor Identity

Corridor identity and branding was created for use throughout the current project and future Minnesota Avenue reconstruction projects. Confluence created a Minnesota Avenue logo that was incorporated into wayfinding signage, pedestrian signage, and backlit panels on retaining wall accents. Consistent use of materials including perforated stainless steel and color changing lighting also contribute to the identity.



- Wayfinding

Wayfinding signage directs pedestrians and drivers to community points of interest such as parks, business districts, and historical features. Wayfinding signage use will become more frequent during reconstruction phases through the downtown area.

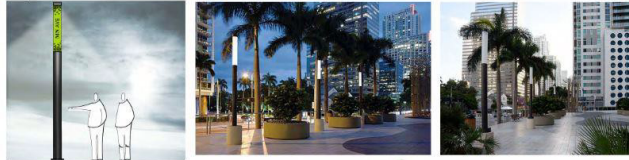
- Accent Lighting

Accent lighting was used as a technique to improve the experience for travelers from the airport into downtown, especially during long winter nights and after trees have lost their leaves. Decorative color changing light fins were incorporated onto light poles to create a unique experience for those approaching downtown. Additionally, the same color changing capabilities were incorporated into retaining wall accents and pedestrian lights located at primary intersections.

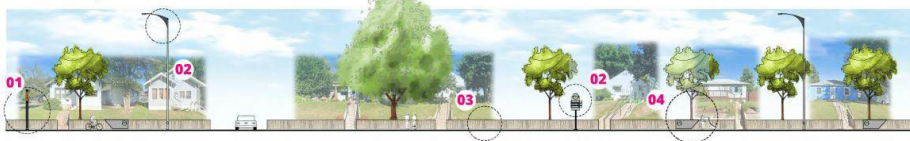
Implementing the light fins proved to be a challenge for the design team. City maintenance teams requested the light poles be as standard as possible, with the same bolt pattern, so a stock replacement pole could be quickly installed in case of emergency. Because of the increased weight and wind load of the fins, this took much discussion with the pole manufacturer and ultimately was able to be achieved with the same bolt pattern but an increased pole thickness.

Design and fabrication of the custom light fin fixtures also took extended coordination with lighting manufacturers, lighting suppliers and a local fabricator to utilize LEDs and lighting controls from the theater industry into an exterior, roadway application. Mockups were required and reviewed on site to confirm the desired design effect could be achieved prior to releasing fabrication for the entire project.

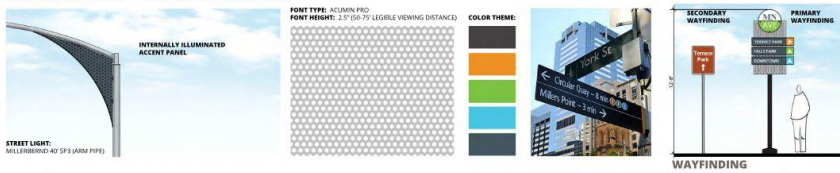
01 | LIGHT COLUMN + CORRIDOR BRANDING



RIALTA RW484CC | LIGHT COLUMN



02 | WAYFINDING + CORRIDOR BRANDING



13 | Lighting and Wayfinding Signage
North Minnesota Avenue Reconstruction
Sioux Falls, South Dakota | 15248-01

- Street Trees
Incorporation of street trees was a project goal and a difficult task because of the limited amount of right-of-way and the environmental challenges of growing trees within a 4-foot wide boulevard. For the most part, a setback of at least 10 feet was available beyond the sidewalk on this project phase. As a result, street trees for this project were planted primarily on private property within a 10-foot construction easement. Contractor maintenance and warranty requirements were extended to two years for these trees. Knowing that future project phases near downtown would not have the luxury of planting trees within a 10-foot setback, a street tree pilot program was incorporated to test success of street trees along the Minnesota Avenue Corridor.
- Street Tree Pilot Program
Confluence introduced the Stockholm structural soil system to projects in downtown Sioux Falls beginning in 2006. The system uses rip rap as a structural support for the sidewalk with an infill of specially mixed and non-compacted planting soil as a media to encourage root growth. Drain tile allows road salts to flush through the soil in spring. Trees are planted in tree grates and the boulevard above the root zone consists of concrete pavers. Pavers are wet cast and sealed to hold up to road salts. Paver joints are specially designed to allow water through to the root zone. Five trees were planted with this system along Minnesota Avenue. In addition, Sioux Falls Parks & Recreation planted five trees of the same size and species elsewhere in the parks system to compare growth over time.
- Future Redevelopment
It is difficult to significantly improve the visual quality of the corridor without the ability to improve existing development along the corridor. Much of the private property is still held by many separate owners and some of the rental properties are either vacant or do not receive much maintenance. City of Sioux Falls Planning is working on a corridor study to encourage redevelopment north of W 3rd Street. The streetscape design was limited to work within the existing right-of-way and is primarily focused on visual aspects to improve the experience from the airport to downtown. As future redevelopment occurs, the streetscape has the width and is set up to be able to adapt to increased pedestrian use.

2. Originality and Innovation: The impression of a gateway from the Sioux Falls Regional Airport to the Downtown Commercial District was established with a Landscape Master Plan starting in 2013 by the City of Sioux Falls developed by Confluence. Ultimately, HDR's partner on this project, Confluence, established this plan through a publicly-vetted process involving numerous stakeholders and public meetings helping to shape the outcome of the project. Features including pedestrian lighting, retaining wall accent panels with lit Minnesota Avenue placards, 8-foot tall cylinder pedestrian bollard lights, accent panels on the streetlights, tree planters, and colored concrete outlined many innovative concepts atypical to an arterial reconstruction. Adding accent lighting to an ordinary arterial such as Minnesota Avenue creates a safety element greatly accepted by the public.

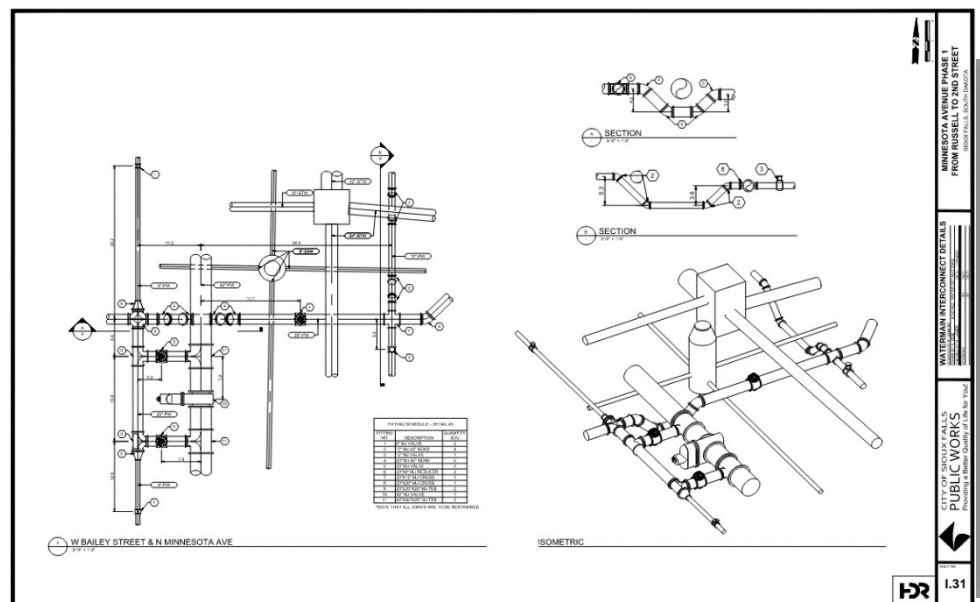
The raised median incorporated salvaged historic cobblestone to create a vertical element aesthetically improving an otherwise horizontal visual. The colored concrete in the boulevard throughout the entire project is an uncommon approach to add a flair to the break between the curb and gutter and the pedestrian path. The application of this integral "coffee" colored ribbon of concrete frames the separation of traffic and pedestrian traffic. The previous back-of-curb 4-foot pedestrian pathway compared to the now separated 6-foot pedestrian path establishes a safer route for everyday foot traffic. Walkability of this arterial has now been encouraged as a key part of the Complete Streets.

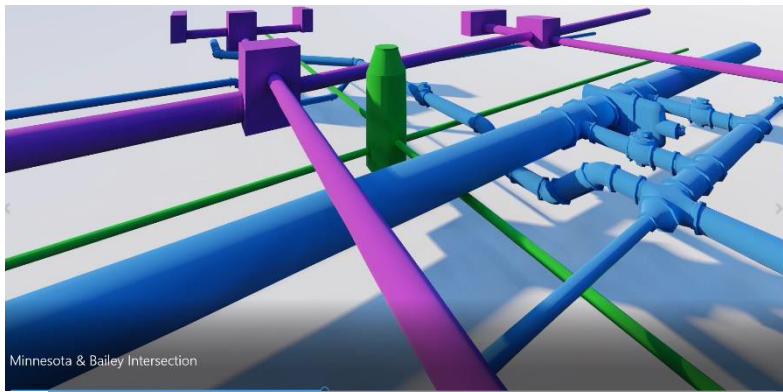
3. Complexity: This arterial corridor was an established narrow 80-foot right-of-way which presented many challenges to the design and constructability of the corridor. Early in the design, it was necessary to establish the continued commuter and pedestrian traffic use during construction. The option to shut down traffic was also eliminated early in discussion. Removal of on-street parking from the corridor allowed for better use of this area. At the same time, the construction of the sanitary sewer alignment down the middle of the corridor and installation of three separate watermains and an upgraded storm sewer system had to be planned.



Early in the preliminary design phase it was determined that upsizing the 36-inch water transmission main to a 42-inch transmission main was not the only challenge. The placement of the water transmission line was in the center of the road, the depth of the water transmission line when upsized just happened to occupy the same area that the design team wanted to place the sanitary sewer service crossings. This placement, the need to keep access to residents and businesses open, and complicated utilities issues challenged the design.

The placement of dual water mains on either side of the street allowed for the construction to take place with minimal service impact. The upgraded storm sewer drainage design with additional crossings was also impacted by the location of the water transmission line. It limited depth and pipe size in crossing locations. It was a challenge to keep utilities in their respective spaces to avoid conflict. The design team utilized 3D views as well as clash detection to identify potential issues and resolve them prior to construction. With differing walls and street elevations on either side of the road, the team had to warp the road to meet design criteria and achieve ADA compliance. The intent was to minimize landowner impact so all the wall sections and grading tie in locations





were checked and double checked to verify minimal impact when possible. We again reviewed the entire model in a 3D environment to verify tie ins.

To verify complex water connections and tie ins, a process design team was utilized to build 3D models of the fitting and valve configurations to specifications to verify accuracy and understandability for construction. Sometimes a picture is worth a couple thousand dollars when working with pipe fittings.

4. Social Significance: A significant goal of the Minnesota Avenue Phase 1 reconstruction was to consider the existing residential neighborhood and incorporate an improved arterial corridor. With revitalization being a key component for future planning and zoning, a balance of present and future goals was discussed and presented at public open houses. To be sensitive to family homes that were built in the 50's and 60's still owned and lived in by original owners in the neighborhood or now converted to rentals, was a key consideration of our team when designing the new arterial.

Since this project had such a large impact on the public, our team provided a robust public outreach plan which included preparing for and facilitating public meetings, creating meaningful and easily-understood content for the project website, and helping the City effectively communicate project progress and goals to interested stakeholders. The website of marketing tools and content developed by our team can be viewed here: <https://www.siouxfalls.org/minnesota-phase1>.




A key aspect in designing this corridor was prioritizing this stretch of roadway as a gateway for stakeholders, citizens, business owners and patrons, and visitors to want to use it to access Downtown adventures and amenities. Amenities and attractions include popular public venues such as the Levitt at Sioux Falls and the River Greenway and private entities currently experiencing rapid expansion of safe housing like Cherapa Place, a lively and vibrant urban neighborhood situated along the banks of the Big Sioux River. With Sioux Falls hosting downtown events throughout the year, most frequently in the summer, like Hot Harley Nights/Hot Summer Nights/Parades within Falls Park, this project helped the City with their desire to develop a corridor to welcome residents and visitors to the area.

Our design considerations to provide a well-maintained and accessible corridor would not be prudent without consideration of safety. It was critical to back up our design by maintaining multi-modal safety for the traveling public. Our team closely followed a complete streets checklist to make sure we focused on not only designing an aesthetically-pleasing corridor, but, more importantly, one that was safely traveled by multi-modal traffic.

This project fosters a welcoming and easily-accessible downtown to continue to be a popular tourist destination and a wonderful place to enjoy time with family and friends increasing the social significance of this project.

RUSSELL STREET TO 18TH STREET

 <p>More lighting for safety</p>	 <p>Update aging water main and infrastructure</p>
 <p>Upgraded and consolidated access</p>	 <p>Enhanced aesthetics such as trees, benches and new bus stops</p>

5. Economic Impact: Downtown Sioux Falls is an area of improved commercial and residential properties and has become a popular destination for a demographic fairly new to the area. The City has grown, and downtown is thriving. Complimentary access to this downtown area includes the improvements to arterials such as Minnesota Avenue starting upon arrival at the airport. The City desired this project to allow Minnesota Avenue to become a true gateway to a flourishing downtown. Downtown revitalization has been a significant focus for the community, and the new Steel District plans to welcome three new restaurants (among other businesses) in 2023. These new businesses coupled with events at Falls Park and downtown, will encourage thousands to visit this area of the community in the coming years. By focusing on the positive social impacts of this project and prioritizing an optimistic and robust communications campaign, the economic impact of a project like this has a trickle-down effect.

With an increase in participation in these downtown events, businesses likely benefit from the increase of foot traffic and willingness and desire of consumers to be downtown. The Minnesota Avenue project concentrates design on key elements like enhanced pedestrian facilities, new sidewalks, accent lighting, improved streetscaping, and bus stops. These improvements increase the desire to be downtown. This in turn benefits businesses that are looking to expand their reach and patronization. Approachable and safe areas that surround places like restaurants, breweries, and shops create a comfort for people to want to visit. Minnesota Avenue now lends itself to the idea that the City wants to grow and expand these areas in a positive direction.

South Dakota Electrical Vehicle Infrastructure Deployment Study

SUMMARY

The South Dakota Electric Vehicle Infrastructure Deployment Plan (Plan) was developed by HDR and SDDOT to meet the requirements for the National Electric Vehicle Infrastructure (NEVI) Formula Program established under the Infrastructure Investment and Jobs Act (IIJA), Public Law 117-58 (Nov. 15, 2021). Upon approval of its Plan, each State will receive NEVI Program formula funding to deploy a statewide network of Direct Current Fast Charging (DCFC) infrastructure as part of a national network. South Dakota is expected to receive \$4 to \$5 million in Federal funding per year between 2022 and 2026 for a total of approximately \$29 million. The NEVI Program requires that each state develop a plan outlining how the formula funding would be utilized.

Currently, there is a very low adoption of electric vehicles (EV) in South Dakota. In 2022, there were only 1,429 EV passenger vehicles in the State, which represents 0.12% of all State passenger vehicle registrations. This rate is expected to grow over the next decade as new EVs are introduced into the market, although the adoption of EVs in South Dakota will likely remain relatively low compared to the national average and States with a denser population base. By 2026, the number of registered EVs in the State is expected to reach 22,000 passenger vehicles or 0.56% of all passenger vehicle registrations. In short, while there is no doubt that there will be national build-out and adoption of EVs over the next several years, adoption in South Dakota will likely lag behind the national curve and remain relatively modest even under the most aggressive growth projections.

EV adoption and therefore usage of EVs within the State are expected to remain low for the next five years. This low adoption and usage within the State may make the return-on-investment unattractive to the private sector, upon which the SDDOT is relying to meet the 20% matching requirements. Peak demand electricity costs also have a significant impact on return-on-investment. These challenges impact both large and small businesses but may be particularly challenging for small and disadvantaged businesses to meet. Deployment of a full NEVI Program-compliant EV DCFC infrastructure consisting of four 150kW chargers is expected to cost between \$700,000 and \$1,200,000 per location. This level of deployment may not be suitable for South Dakota, especially on State highways and other non-Interstate locations.

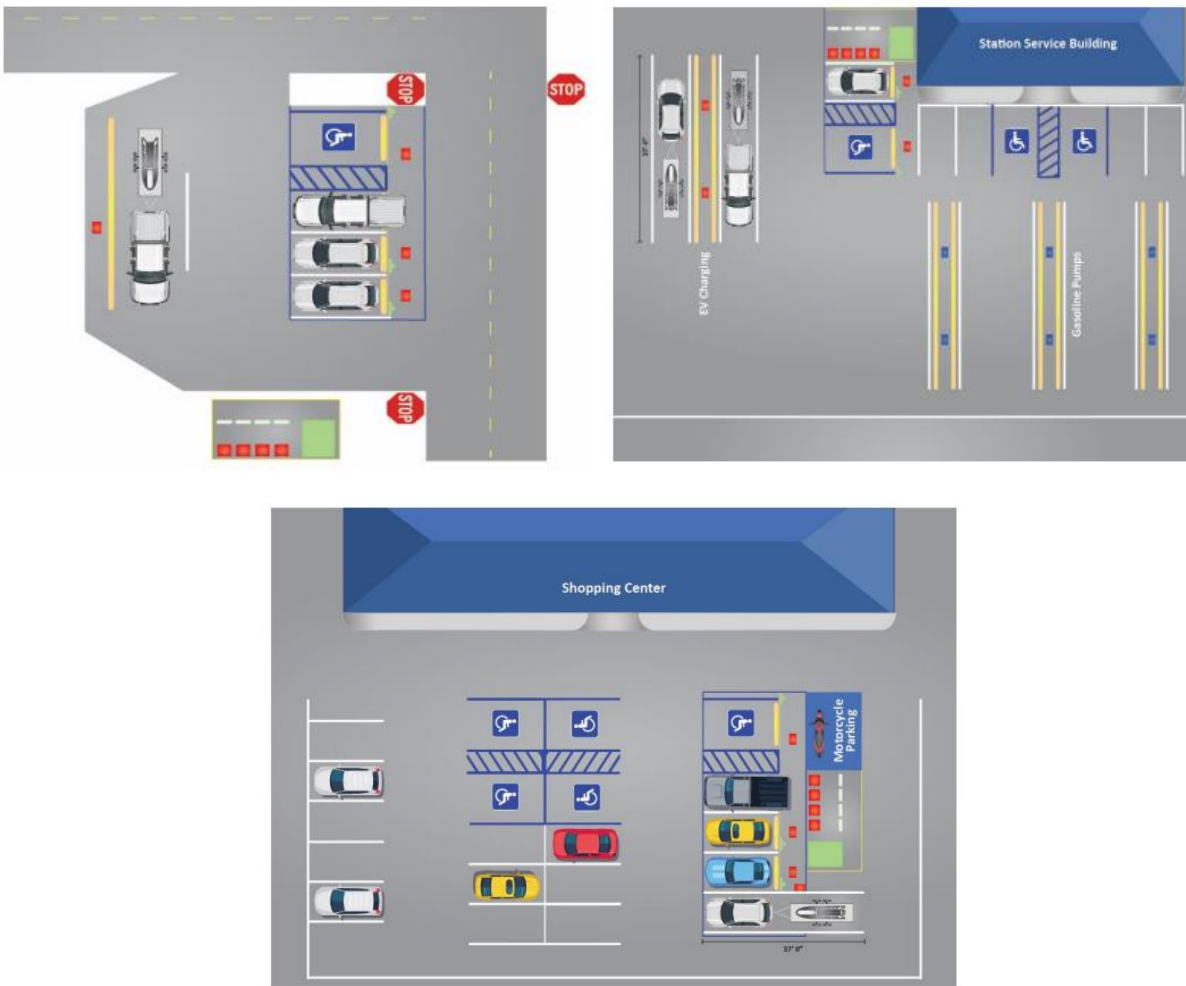
SDDOT estimates that a minimum of 13 additional EV DCFC infrastructure locations will be needed to achieve "EV Corridor Ready" status on the four Alternative Fuel Corridors (Interstates) in the State. Infrastructure is expected to be installed at locations along the Interstates no sooner than FY24, which will allow for a measured and thoughtful approach for implementation. Following the completion of the Interstate build-out, additional locations on non-AFCs will be deployed based upon funding availability and private sector interest. No State highway funds will be used for meeting the 20% matching requirement. The 20% match will be met by the private sector who will be awarded grants corresponding to the 80% Federal NEVI Program funds under a competitive grant application process.

Developing strategies to be compliant with the Federal requirements, while simultaneously overcoming the very real issues with deployment of Direct Current Fast Chargers in a predominantly rural State, is challenging. Adding to this challenge was the requirement to develop and submit this plan to the Joint Office on an accelerated timeline of five months. While these challenges are real, they can be overcome. In this Plan, SDDOT has provided potential strategies, if accepted by the Joint Office, that can be used to address the challenges. Additional strategies will emerge over time. By taking a measured and stepped approach to this program, SDDOT will be in position to capitalize on new strategies and guidance as they emerge.

Application of Engineering Principles

The development of the South Dakota Electric Vehicle Infrastructure Deployment Plan applied engineering principles from several different engineering disciplines including electrical, mechanical, and civil.

Electrical and Mechanical. Electrical and mechanical engineering principles were applied with regard to the understanding and use of electric vehicles including different EV vehicle types and charging requirements. Application of these principles assisted in developing the framework for anticipated charging demand, evaluating impacts on the existing electrical grid, identifying future power requirements, and determining the feasibility of providing service to charging locations. A key engineering design principle of keeping things simple, providing clear and unambiguous designs, and being able to accommodate change were used to create illustrative conceptual designs of EV charging stations that were both compliant with the Federal NEVI guidelines, and specific to South Dakota. For example, many of these conceptual designs incorporated elements that provided for charging by longer vehicles (e.g., RVs) or vehicles pulling trailers without the need for a disconnect. Other design principles included recommended placement of electrical transformers and charging ports to facilitate snow removal. Additionally, in consideration of the expected low adoption of EVs in South Dakota, the conceptual designs incorporated a feature that complied with Federal and State ADA regulations, but also maximized charger utilization by non-ADA vehicles.



Examples of illustrative conceptual designs of EV charging stations created as part of the project that were both compliant with the Federal NEVI guidelines, and specific to South Dakota.

Civil Engineering. Civil engineering principles were used in assisting with the traffic/EV forecasting process, site development layouts/concepts for the different charging configurations and coordination efforts with regard to the existing transportation system. This was a particularly instrumental and critical component of the planning process as the expected utilization for each Interstate Interchange was estimated by applying various adoption rates from the surrounding states in combination with tourism and travel patterns within South Dakota. Seasonality, a critically important factor in South Dakota, due to the heavy tourism volumes were estimated through application of historical trends in travel patterns. Ultimately, the estimates of usage were used to examine the relative financial viability (a surrogate for private sector interest) of various interchanges using a developed return-on-investment calculator. These estimates and tools provide SDDOT with a pathway for implementation options, including bundling sites with low financial viability with high-viability sites; varying the required matching percentages between sites, and other such strategies, as identified and described in the plan, to attract private sector interest.

Originality and Innovation

There are very real and significant challenges identified for the deployment of the required NEVI Program-Compliant charging locations in South Dakota. EV adoption and therefore usage of EVs within the State is expected to remain low for the next five years. This low adoption and usage within the State may make the return-on-investment unattractive to the private sector, who the SDDOT is relying upon to meet the 20% matching requirements. Peak demand electricity costs also have a significant impact on this same return-on-investment. These challenges impact both large and small businesses but may be particularly challenging for small and disadvantaged businesses in the State to meet. Deployment of a full NEVI Program-compliant EV DCFC infrastructure consisting of four 150kW, simultaneous chargers is expected to cost between \$700,000 and \$1,200,000 per location. This level of deployment may not be suitable for South Dakota, especially on State highways and other non-Interstate locations.

As a result of these challenges, the South Dakota EV Infrastructure Deployment Plan required foresight, originality, and innovation to develop possible strategies to overcome the primary identified challenges.

The first challenge was to attract private business interest due to potential low return on investment. While some potentially high-volume charging stations may be profitable, with the 50 mile spacing required by the NEVI program, there would likely be less interest in the low volume rural locations where the initial infrastructure costs may be higher. To combat this issue, the SDDOT proposed to maintain the overall 20% matching funds requirement across the program but vary the match requirements by location to incentivize private investment. Locations that are expected to have lower utilization would require <20% in matching funds, which would be offset by higher matching requirements (i.e., >20%) at locations with expected higher utilization or charges per day. The exact match requirements for a specific location will be determined by SDDOT on an ongoing basis as a function of EV adoption rates and analysis of the data collected from deployed chargers.

Another challenge included creating opportunities for small or disadvantaged businesses. SDDOT wants to deliver the best network of EV DCFC infrastructure to the traveling public as possible and be inclusive and creative with engaging private partners to invest in the program. SDDOT estimates that the anticipated costs for a complete NEVI Program-compliant EV DCFC infrastructure location would be between \$700,000 and \$1.2 million, depending upon location conditions. With a 20% match, this would equate to an investment of \$140,000 to \$240,000 by a private entity. Recognizing that this may be a challenging investment for many small businesses, SDDOT proposed to meet the NEVI Program guidelines at an EV DCFC infrastructure location by allowing multiple private entities to provide physically separated DCFC charging ports at individual sites within the overall geographic location, provided that

each site meets the remaining NEVI Program requirements. SDDOT believed that this will enhance competition among private entities and reduce overall costs, while providing accessibility to the NEVI Program funds for small or disadvantaged businesses. Another possible solution suggested was to allow for a phased number of charging ports at a location as they become cost-effective with the increase in the EV fleet/usage.

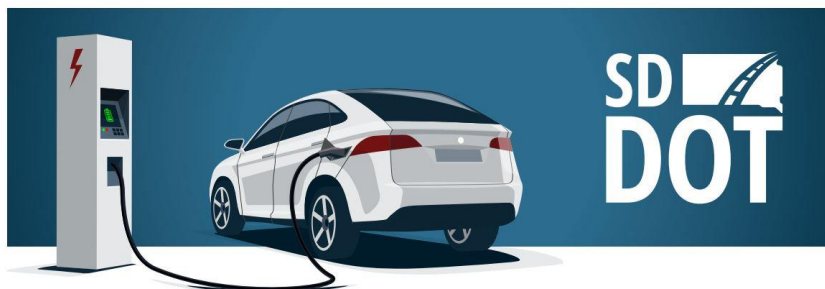
Complexity

The entirety of the project was complex due to the short timeline to develop the plan. Drafting a plan within five-month timeframe is challenging as it relates to identifying challenges, strategizing solutions and verifying enough time for reviews and edits. Throughout this process, our team was preparing this plan while the federal program/plan guidelines were not fully developed and were continuing to emerge during the plan writing process. Our team collaborated throughout development of the plan to incorporate necessary edits as guidance came out during the process. Developing strategies to address challenges unique to rural states was also a complex task. The overall guidelines that were published did not necessarily consider some of these rural challenges, requiring our team to leverage experience from other states as well as knowledge of what the federal reviewers would and would not accept to identify workable solutions.

Reaching the public throughout the state and obtaining input and feedback within a five-month timeframe was also a challenge for the project team. Explaining the importance of this project, demonstrating funding that will come into the state as a result of this effort and obtaining input on charging station locations was a tall task to accomplish in a short amount of time. The project team held multiple public meetings at locations across the state to get this information out to the public. In addition, we developed multiple communication tools to help educate the public including boards, handouts and a detailed project website complete with a list of frequently asked questions. Gathering input from the public was also very important to the success of the study, and leveraging technology allowed our team to send surveys to recipients from all walks of life, and compile the results to inform the data that was incorporated into the plan.

SOUTH DAKOTA EV FAST CHARGING PLAN

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About Electric Vehicles and Charging Stations

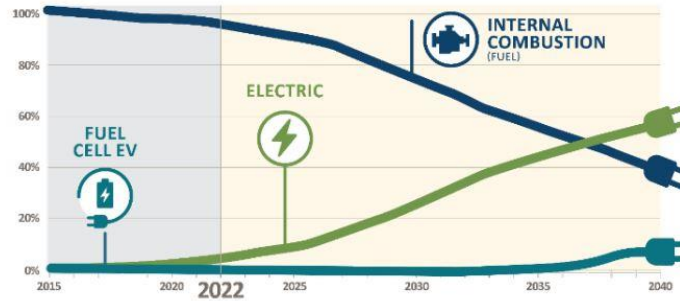
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US EV Sales Projection

Pressure is being put on the EV market as consumer demand for EVs increases and the cost of production of batteries decreases.

Global Share of Total Annual Passenger Vehicle Sales by Drive Train



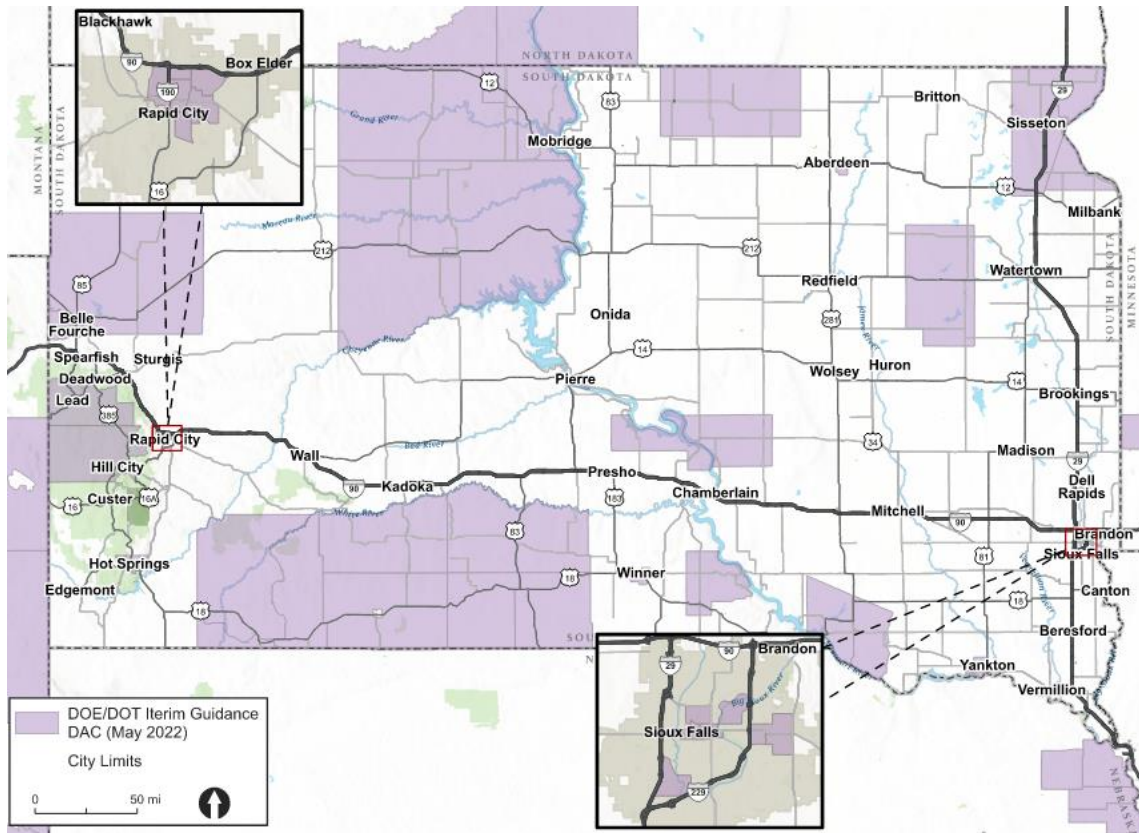
Example graphics from the SDDOT EV plan website to help explain this complex project in terms easily understood by the general public.

Social Significance

The Justice40 Initiative, established in January 2021 by Presidential Executive Order 14008 on Tackling the Climate Crisis at Home and Abroad, provides a goal that at least 40 percent of the overall benefits of certain Federal investments flow to Disadvantaged Communities (DAC). The Interim Implementation Guidance for the Justice40 Initiative (released July 2021) and the NEVI Guidance (released in February 2022 and June 2022) identifies clean transportation as a Justice40-covered program.

The SDDOT supports equity considerations when planning investments in EV infrastructure. As identified during the development of the Plan, there is the expectation that there will be growth in the adoption of EVs in South Dakota along with the surrounding States. As additional EV makes and models come to market, EV adoption will increase and a secondary vehicle market in EVs will continue to emerge. SDDOT is committed to the concept that investments in publicly-funded EV infrastructure as part of this Program continue to benefit all populations across the State both today and in the future.

Using data from the mapping tool developed by Argonne National Laboratory, SDDOT has identified the DACs_ within South Dakota (Argonne National Laboratory Interactive Electric Vehicle Charging Justice40 Map – see below). The DACs are spread throughout the State in both urban zones (Rapid City, Sioux Falls, etc.) and large rural zones that include Tribal lands and Tribal reservations.



Interactive Electric Vehicle Charging Justice40 Map
Source: Argonne National Laboratory

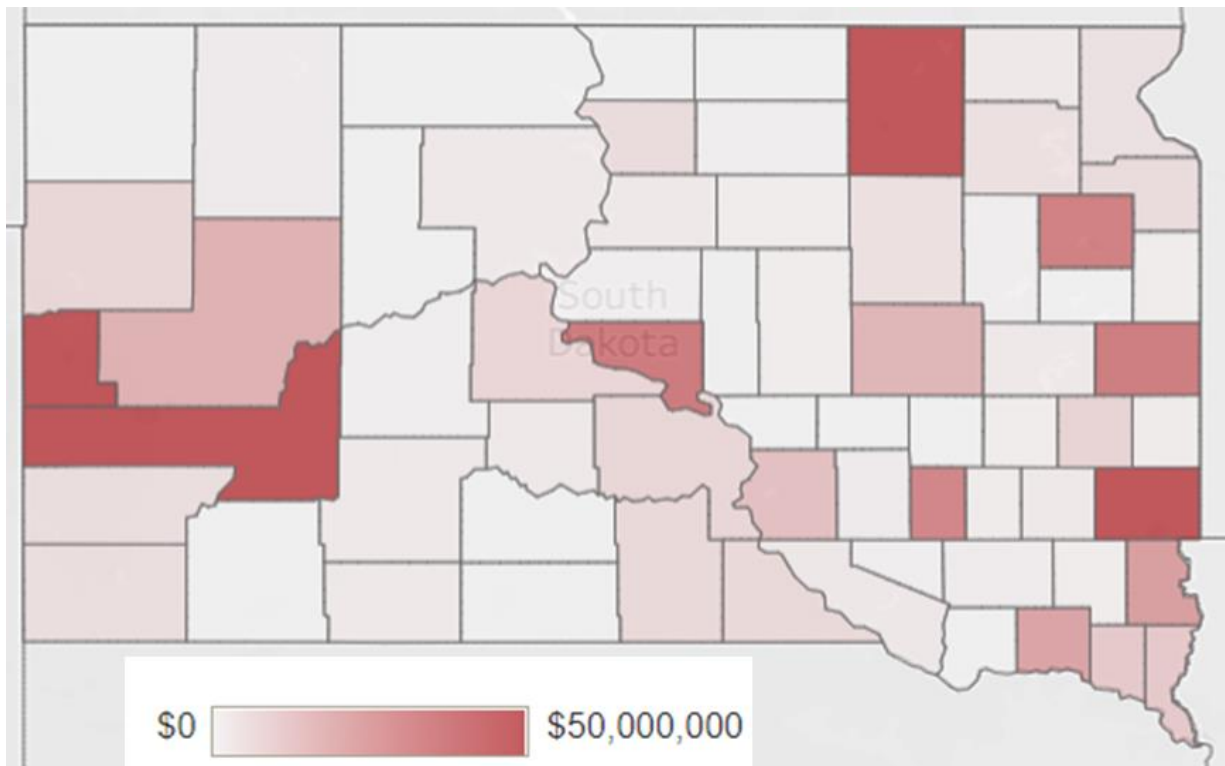
Under the scenario involving a minimal build-out needed for all Interstate corridors to be certified as EV Corridor Ready, 3 of the 13 minimum set locations would fall within a DAC, and a fourth could be in near proximity within Sioux Falls. This would represent 28% of the total NEVI Program funding being placed into or near Justice40 communities during the AFC build-out phase. Other components of this Plan that are designed to achieve the goals of the Justice40 Initiative include:

- Providing priority to placement of EV DCFC infrastructure within a Justice40 Zone.
- Splitting locations into multiple sites, as described in the innovation section, to facilitate the investment and involvement of DAC businesses.
- Continued engagement and coordination with DACs regarding EV and other infrastructure improvements throughout the State.

Economic Impact

The tourism industry will be supported by the entire South Dakota EV DCFC infrastructure network and its connectivity to the national network. Assessing the specific benefits to a DAC because of the EV DCFC infrastructure was challenging. However, it is worthwhile to note that many of the Justice40 Zones are located at or near a large number of South Dakota's primary tourist attractions, such as the Black Hills National Forest, Mount Rushmore, Custer State Park, Crazy Horse Memorial, etc. As EV adoption increases among South Dakota residents and among tourists from neighboring States, particularly

Minnesota and Colorado, tracking of EV DCFC infrastructure usage along with annual volumes of tourists from these States at these attractions will allow SDDOT to estimate the percentage of tourism that was supported by the EV DCFC infrastructure network. In turn, econometric tools, such as those used annually by the South Dakota Department of Tourism, were then applied to assess the impact of tourism on the GDP of South Dakota at large, which will serve as a surrogate for estimating the impact on DACs as these again encompass or are nearby many of the primary tourist destinations. More specifically, the South Dakota Department of Tourism currently captures and estimates tourism spending by category and city/county (below), which can be roughly mapped to DACs.¹



Estimated Tourism Revenue by County, January 1 through April 30, 2022

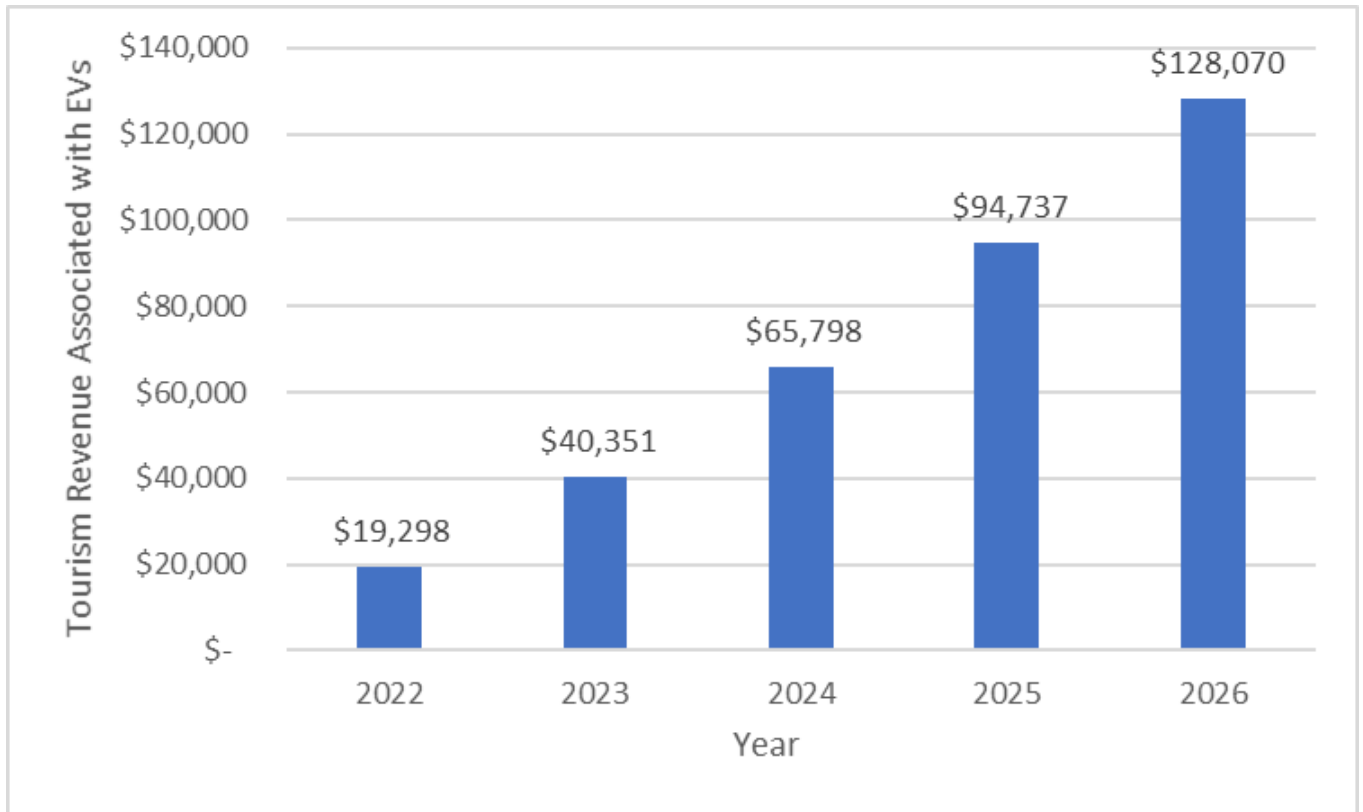
Source: *South Dakota Department of Tourism. Available at: <https://sdvisit.com/research-reports>*

To estimate the economic impacts of the EV DCFC infrastructure on DACs, the expected EV traffic that is supported by the infrastructure will be calculated and proportioned to the tourism revenue. The following example uses this methodology described to project benefits to DACs in Pennington County.

Pennington County is the second-most populous county in South Dakota. The county includes the cities of Box Elder, Hill City, New Underwood, and Rapid City. The County seat, Rapid City, is the second most populous city in South Dakota. Pennington County has the top tourist attraction in South Dakota (Mount Rushmore) and contains parts of the Badlands National Park, Black Hills National Forest, and Minuteman Missile National Historic Site. The County has two DACs, in Black Hills National Forests and Rapid City. As of July 2022, Pennington County had around \$35 million in taxable sales. Using the previously defined origin and destination method of using EVs traveling from nearby States to Rapid City, the estimated

¹ <https://sdvisit.com/research-reports>

Rapid City gross tourism revenue from EVs is a yearly average of around \$92,000 over the next five years. This estimate assumed a total number of out-of-State EV trips as 1,307,187 and a percentage of trip Origin/Destination distribution for Rapid City out-of-State EVs based on a previously defined Origin/Destination matrix, resulting in approximately 39,900 Rapid City EV trips yearly by out-of-State visitors. Dividing the total Pennington County tourism revenue of \$35 million by the number of visitors, the revenue per trip is estimated to be around \$877. The existing calculated trips to the County were removed from the NEVI benefits to achieve the annual revenue generated from the EV DCFC infrastructure deployment (below).



Estimated Benefits for the Rapid City DAC Based Upon EV Tourism

It is worthy to note that although each State was required to provide a narrative in their plan for describing a mechanism for measuring the economic benefits to DACs, the South Dakota plan is the only one that provided a definitive, quantifiable equation for the calculation of benefits to these communities.

Finally, now that plan was approved by Joint office, within the required timeframe, South Dakota is now eligible to begin the program and receive federal funds to assist with the build out of the charging network state-wide. Capturing this funding for the state will have important implications now and into the future.