

# **Campus Transit Development Planning: A Case Study**

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Brookings Area Transit Authority

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## **Disclaimer**

The contents of this report do not necessarily represent the views or policies of the Brookings Area Transit Authority and are the sole responsibility of the Small Urban & Rural Transit Center, Upper Great Plains Transportation Institute, and the author.

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## Executive Summary

With 11,317 students, South Dakota State University is the largest institution of higher learning in South Dakota. Located in Brookings, in the east central part of the state, SDSU is South Dakota's land-grant university. As such, its mission includes education, research, and outreach to the entire state. SDSU has a staff of 1,626 full-time and 495 part-time employees and is currently experiencing rapid growth in the size of its student body and research spending.

Brookings is the fifth largest city in South Dakota with 18,715 residents. Like SDSU, Brookings is experiencing significant population and economic growth. In addition to South Dakota State University, Brookings is home to several large manufacturing concerns including Daktronics, Rainbow Play Systems, Larson, and 3M.

Brookings Area Transit Authority (BATA) provides demand-response, dial-a-ride services to Brookings and the nearby communities of Volga and White. Service is provided with a fleet of 13 vehicles, 10 of which are handicap accessible. BATA also provides service for the Safe Ride program in partnership with the South Dakota State University Student Association. Under the Safe Ride program, fixed-route service is provided between downtown Brookings and residential areas on Thursday, Friday, and Saturday evenings between 10 p.m. and 2:30 a.m. during the academic year. BATA is currently considering the introduction of weekday fixed-route service in Brookings.

This report presents the findings and recommendations of a study commissioned by the Brookings Area Transit Authority to identify the transportation needs and attitudes of members of the SDSU community. The report is intended to serve as a resource and guide in the development, implementation, and operation of a university community public transportation service. The study included a survey of SDSU students, faculty, and staff; open forum meetings; and a series of meetings by the study advisory board.

## Survey Findings

The study survey found significant interest in and support for expanded transit services for the South Dakota State University community.

Among student respondents:

- 67% stated they would use a parking lot shuttle
- 69% stated they would use transit to travel off-campus
- 77% stated they would use an on-campus circulator
- 73% stated they are willing to pay a semester fee, of those
- 78% are willing to pay a fee of \$20 or more per semester

Among faculty and staff respondents:

- 67% stated they would use a parking lot shuttle
- 75% stated they would use transit to travel off-campus
- 53% stated they would use an on-campus circulator
- 55% stated they would pay a fare of \$1 or more for off-campus trips
- 69% stated they would pay \$.50 or more to ride an on-campus circulator
- 63% stated they are willing to pay a semester fee, of those
- 64% are willing to pay a fee of \$25 or more per semester



## **Recommendations**

Given the findings of the study, including information gathered by the survey and open forum meetings, the Small Urban & Rural Transit Center recommends that a series of actions be taken and a number of issues be considered in order that the transportation needs of the South Dakota State University community be met efficiently.

### **Begin Formal Implementation Process**

It is recommended that BATA formally initiate a process to implement fixed-route transit service to meet the transportation needs of the SDSU community.

BATA should provide all reasonable assistance to SDSU student leaders as they work with the South Dakota Board of Regents to gain approval for a fee increase. BATA should immediately begin discussions with the SDSU administration, including the director of the physical plant, and the City of Brookings to identify and address any operational issues. BATA should immediately begin discussions with the South Dakota Department of Transportation and Federal Transit Administration to identify and address any operational, regulatory, and funding issues.

### **Phased-in Implementation**

It is recommended that BATA phase in new service to the SDSU community. This will allow for an adequate reserve to be funded, for vehicles to be procured as new routes are added, to provide BATA the ability to better manage the expansion of service, and to ensure that service is able to keep abreast of demand.

The first phase of implementation could include initiating one or two routes that provide service to the campus and immediate neighborhood. The initial level of service should be robust enough to attract riders so that the system can be sustained. Successive phases would consist of increasing the number of routes and areas served, the hours of service, and the number of vehicles in service during peak service.

Prior to implementation, additional efforts devoted to service design, financial planning, and marketing should be completed. This includes the finalization of route locations and the hours and levels of service, more precise estimation of revenues and expenses, and efforts to attract riders to the system.

### **Service Design**

It is recommended that, at a minimum, service be provided during the academic year and include

- at least two circulator routes serving the campus with no more than 15 minutes of headway between vehicles
- service to locations throughout Brookings, including weekend service
- extended service on Thursday, Friday, and Saturday evenings between downtown Brookings and students' residences (that service equivalent to the Safe Ride program be maintained).

Various service alternatives and their estimated costs are included in the study report for demonstrative purposes.

## **Student Funding**

It is recommended that student leaders pursue adoption of a \$2/credit hour fee to support new transit services. This equates to a \$24 per semester fee for full-time students. This level of funding is supported by the survey and is similar to levels found at other institutions with successful transit operations. This fee is expected to generate at least \$500,000 per year. These funds, combined with other local, state, and federal monies, will provide for a robust level of service.

## **UPASS**

It is recommended that the system make use of a UPASS program. Under a UPASS program, student fees cover the cost of their riders. Operationally, students visibly present or swipe their student ID following vehicle boarding and ride the bus fare free.

## **Fares and Passes**

It is recommended that fares of \$1 or \$2 per ride for non-students be charged. This is equivalent to the fare currently charged for demand-response trips and that being considered for the fixed-route service. BATA should work with SDSU to explore the introduction of semester passes for faculty and staff.

## **Additional Local Support**

It is recommended that BATA reach out to the City of Brookings, SDSU, employers, and community organizations to build support for the new transit service. As the proposed service would provide significant benefits to non-students, these other entities should be encouraged to provide an equitable level of financial support to the system. Efforts to coordinate with new and existing transportation service in Brookings should be made. The findings and recommendations of this report should be considered in the current transportation gap analysis study commissioned by the City of Brookings.

## **Additional Service**

It is recommended that BATA work with the City of Brookings, SDSU, employers, and community organizations to explore the funding and delivery of additional fixed-route service. This could include the addition or alteration of routes and the expansion to year-round service as opposed to that limited to the academic year.

## **Operating/Capital Cost Allocation**

It is recommended that at least 20% of the monies generated by the student fees and other local sources be set aside for capital costs. This would provide at least \$100,000 per year in local funds for vehicle procurement, construction, and planning. In order to assemble an adequate-sized fleet and construct supporting infrastructure, it may be necessary for twice that level to be set aside for capital during the system's early years.

## **Matching Funds**

In order to fully leverage local resources, matching funds for both operations and capital should be sought. Federal Section 5309 requires a 20% local match for the purchase of bus and bus facilities. Generally, Federal Section 5311 funds provide a maximum share of 50% for operating and 80% for capital and planning costs. In South Dakota, the shares are slightly higher to account for the large percentage of public lands in the state. For student fees alone, matching funds could provide an additional \$500,000 for operating and \$500,000 for capital expenses annually.

## **Alternative Fuels**

It is recommended that BATA investigate the operational, economic, and environmental impacts of the procurement of new vehicles powered by alternative fuels, such as biodiesel.

## **Technology**

It is recommended that BATA evaluate the adoption of technology in conjunction with the new service. This includes the use of fare boxes that read magnetic strips or proximity chips. This technology would allow for accurate reporting of trips and performance measurement. The adoption of real time arrival technology that can be displayed by message signs, Web browsers, and Web-enabled devices should also be considered.

## **Accessibility and the ADA**

It is recommended that BATA fully explore and take any actions necessary to comply with the Americans with Disabilities Act. This includes ensuring that the service meets accessibility standards and that complementary paratransit service requirements as described in 49CFR37 are met. BATA should consider the purchase of low-floor buses and work to ensure that all stops, both on and off campus, are accessible.



# 1. Introduction

Many university communities have characteristics including high density, land use, and travel patterns that make them amenable to transit service. However, not all university communities where these favorable attributes are found have transit service specifically targeting students, faculty, and staff. South Dakota State University, located in Brookings, South Dakota, is currently one such university community.

In 2006, the Brookings Area Transit Authority (BATA) identified the possibility that transportation needs of SDSU community members were going unmet. In response, BATA commissioned a study to determine the SDSU community's interest in and willingness to pay for transit service, to provide service design alternatives including operating cost estimates, to identify relevant issues, and to provide a framework for implementation of service. To achieve these ends, the study included a survey of SDSU students, faculty, and staff, public meetings, and the guidance of a study advisory board. This report presents the findings and recommendations of the study.

The survey found strong support for expanded transit service to the SDSU community. It also identified a willingness among students, faculty, and staff to pay for service. This included student support for the implementation of a semester fee to fund the new transit service. The expressed level of funding support, in the form of semester fees for students and fares or passes for faculty and staff, is adequate to provide robust, sustainable service when paired with monies available from other sources.

The report begins with an introduction to university community transportation and case studies on two successful university community transit systems. The intent is to provide an understanding of the benefits that can result from well-designed and operated systems as well as examples of alternative service designs. The third chapter of the report presents an overview of the South Dakota State University and Brookings communities as well as the Brookings Area Transit Authority, the public transportation agency in Brookings.

The methods and results of the survey are presented in Chapter 4. Chapter 5 includes coverage of issues that should be considered prior to the implementation of service in the Brookings area. Chapter 6 presents service alternatives for fixed-route service tailored to meet the needs of the SDSU community. The service alternatives are provided to demonstrate the level of service possible at different levels of funding. Route locations, hours of service, and operating cost estimates are included for three service alternatives. The final chapter of the report includes recommendations from the study. Given the findings of the study, it is recommended that BATA pursue implementation of fixed-route service to the South Dakota State University community.



## **2. Transit in University Communities**

University communities are unique environments; many have attributes which are favorable to transit. In university communities where transit service is provided unique sources of funding, system operation and governance are often in place. This chapter presents an introduction to public transportation provision in university communities and two case studies on successful university community transit systems.

### **2.1 University Transit**

University community attributes including land use, travel patterns, density, and centralized planning often provide the setting for successful transit operations. *TCRP Synthesis 39: Transportation on College and University Campuses* recently surveyed the field presenting information gathered from 30 university community transit systems. This section, based in part on this resource, provides an overview of the field.

#### **2.1.1 University Communities**

Universities are located in communities of all sizes, from rural towns with fewer than 5,000 residents to major metropolitan areas. This setting, in addition to their own internal environment, greatly affect the operation of the transit systems that serve them. The same is true for the size and composition of the university itself, ranging from large public universities with tens of thousands of students to smaller, private institutions.

#### **2.1.2 Service Types**

The transit service provided to university communities depends on many factors, including demand, funding, and priorities. Service may be limited to a single on-campus circulator or they may be a robust system with dozens of routes and vehicles in service during peak periods. Common service types located in university communities include the following:

- Campus circulators that travel relatively short fixed-route paths moving riders to locations on or adjacent to campus
- Parking lot shuttles which are similar to campus circulators and serve parking lots and on-campus locations
- Fixed-route service to off-campus locations that provides transportation to housing, and for employment, shopping, or recreational purposes
- Commuter service that provides transportation to locations relatively far from campus and the university, usually during peak periods in the early morning and afternoon
- Charter service that provides service for special events and student trips.

#### **2.1.3 Organization**

Transit systems that serve university communities differ from one another with regards to asset ownership, operation, and governance. Universities, transit agencies, private contractors, and local governments often own transit system assets. Similarly, the systems are often operated by

transit agencies, universities, or public contactors. At some universities, such as Northern Illinois University, students operate the system. University administrators and members of the student body often serve on transit operating boards in university communities.

#### **2.1.4 Finance**

Transit service at university communities is funded in a number of ways. University funds may be generated by students fees and parking revenue. Some universities allocate institutional funds to support transit. Local communities often support transit with property or sales tax revenues. State support may come from its general fund or designated sources, such as sales tax or vehicle registration fees. There are also federal programs that provide matching funds for operating, capital, and administrative costs.

Revenue is often generated with fares. Here again, transit systems serving university communities may be unique. In some systems, all riders are charged a fare; in others, all ride free. In many, students ride free as fees cover the cost of providing service. In some university communities, all students, faculty, and staff ride transit free or at a reduced cost.

#### **2.1.5 Parking**

There is a strong relationship between parking and transit in university communities. Parking shuttles provide mobility between lots and destinations. Parking fees are often used to fund transit. Increases in the cost of parking may shift drivers to other modes of travel, including transit. These shifts may also mitigate traffic concerns both on-campus and community-wide.

## **2.2 Western Illinois University and Go West Transit**

Western Illinois University is a public university located in Macomb, Illinois. WIU and Macomb are home to Go West Transit, a very successful public transportation service. WIU has a student body similar in size and composition to SDSU's. In the fall of 2006, WIU had an enrollment of 13,800 students, about 2,400 students more than SDSU. About 80% of both institutions' students are undergraduates. The Census estimated the 2005 population of Macomb at 18,587 residents, about 150 fewer than Brookings. Given the similarity between the communities, Go West Transit provides an insight into the service alternatives for SDSU and Brookings. It also provides an example of how a transit system can grow to meet its community's needs.

Go West Transit began providing on-campus circulator service in February 1999, nine months after WIU students' agreed to levy a per-credit fee on themselves. That fall, three additional routes were added and Go West began coordinating with the McDonough County Public Transportation system. In 2000, summer service was initiated. The next year, Go West received its first new vehicle.

In addition to other local, state, and federal sources, the system is currently funded with a \$2.19 per-credit fee paid by WIU students. In return, all students may ride any of the 11 routes in the system fare-free. Go West Transit trips originating on campus are free to all riders.

In the eight years since service began, Go West Transit has grown significantly. In 2006, ridership exceeded 1.35 million trips. Go West's fleet has grown to more than a dozen vehicles from the three it started with in 1999.



## **2.3 Iowa State University and CyRide**

CyRide provides transit service to Iowa State University and the City of Ames. It is an excellent example of a successful, robust, and mature system in a university community. ISU, with 25,462 students, is more than twice the size of SDSU. Ames, Iowa, with 52,563 residents, is nearly three times as large as Brookings.

CyRide has provided transit service to ISU and the City of Ames since 1976. It has long provided robust service which was further expanded following a 2002 student referendum, which introduced a UPASS system to students. The UPASS program provides students fare-free access to the system. ISU students assess themselves with an approximately \$60 per semester fee to fund CyRide. Faculty and staff pay the same fare as the general public, while the university subsidizes half the cost of passes. All trips originating on campus are free to any rider.

In 2006, the City of Ames contributed over \$1 million to CyRide generated by a dedicated property mill levy. ISU provides \$500,000 in institutional funds each year. For 2006-2007, CyRide had a budget of over \$4 million.

CyRide currently operates 10 routes, all of which serve campus. Two routes are circulators which serve campus and near-campus areas during the fall and spring semesters. The eight remaining routes provide service between campus and locations throughout the city year round. CyRide also provides trips to the Des Moines Airport prior to and following Thanksgiving and semester breaks. CyRide has had ridership in excess of 4 million trips per year since 2003.



### 3. The South Dakota State University Community

An understanding of a community is necessary to design a transit system that efficiently meets its residents' needs. This chapter provides an introduction to South Dakota State University, the City of Brookings, and the Brookings Area Transit Authority. In many respects the SDSU/Brookings community is an ideal small urban setting for fixed-route service.

#### 3.1 South Dakota State University

With 11,317 students, SDSU is the largest institution of higher learning in South Dakota. Located on 260 acres in the Brookings, SDSU is the South Dakota's land-grant university. As such, its mission includes education, research, and outreach to the entire state. SDSU has a staff of 1,626 full-time and 495 part-time employees.

Since 2000, the student body has grown by nearly 30% and is currently experiencing record enrollment. SDSU's student body is classified as very high undergraduate by the Carnegie Foundation (2007). Its undergraduates are predominantly full-time four-year students.

SDSU is classified by the Carnegie Foundation as a research university with high research activity (2007). According to the National Science Foundation, research expenditures at SDSU reached \$32 million in 2005, nearly double its 2000 level (2005). The university is currently building the foundation for a research and technology park to leverage the expertise of SDSU faculty and students.

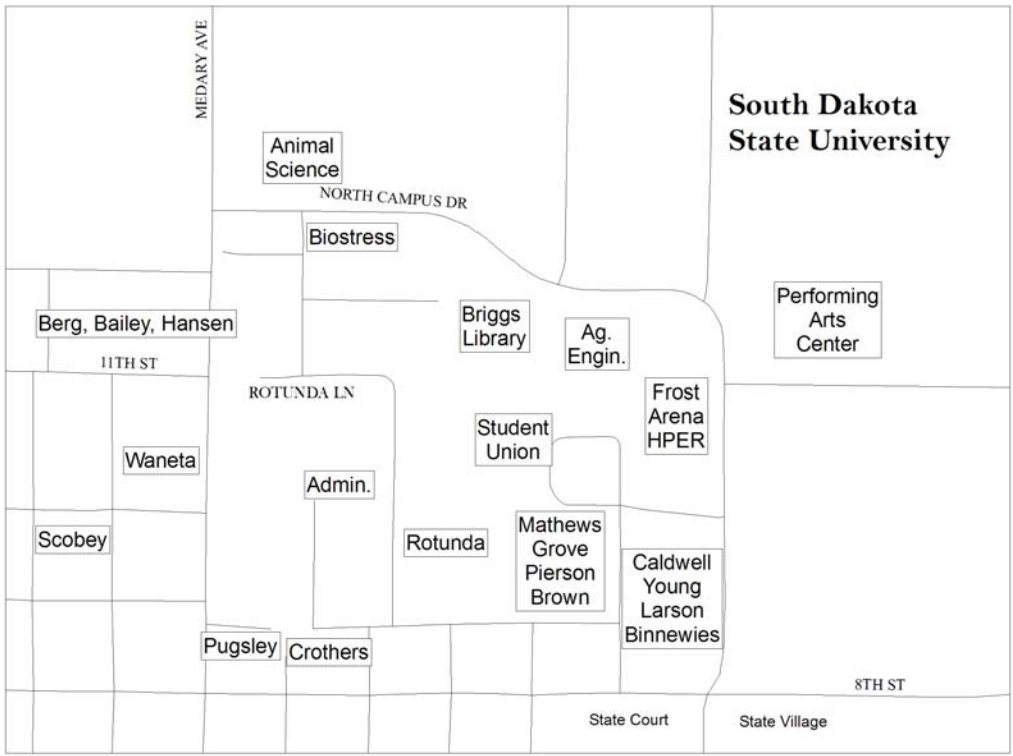


Figure 1 South Dakota State University & Main Buildings

### 3.2 City of Brookings

With 18,715 residents, Brookings is the fifth largest city in South Dakota. Like SDSU, Brookings is experiencing significant population and economic growth. Brookings' recent prosperity is due only in part to SDSU. The city is also home to several large manufacturing concerns including Daktronics, Rainbow Play Systems, Larson, and 3M. Together these companies employ over 5,000 employees at their Brookings facilities. Daktronics is a large employer of SDSU students. Many of these students work a weekday evening shift during the academic year. A map presenting the location of Brookings is presented in Figure 2.



**Figure 2** Brookings, South Dakota

Brookings provides services to its residents and those from the surrounding areas. It is home to Brookings Hospital and Brookings Clinic. While Sioux Falls, located 60 miles to the south, is a regional shopping center, Brookings provides many opportunities as well.

Brookings provides a wide range of cultural and recreational opportunities. Brookings also hosts a number of large scale events each year. Many are SDSU-related, such as Hobo Days and athletic competitions. Each July, the Brookings Summer Arts Festival brings tens of thousands of visitors to the community. The Swiftel Center serves as a venue for many local and regional events.

### **3.3 Brookings Area Transit Authority**

The Brookings Area Transit Authority (BATA) provides demand-response, dial-a-ride services to Brookings and the nearby communities of Volga and White. Service is provided with a fleet of 13 vehicles, 10 of which are handicap accessible. During 2006, BATA provided 97,451 trips to the elderly, disabled, youth, and the general public (South Dakota Department of Transportation 2007).

BATA had a 2006 budget of \$384,112, \$127,112 of which were local funds. Federal 5311 funds provided \$206,569; Title III-B \$9,168; and the State of South Dakota \$40,855. The budget included administration and operating costs of \$132,283 and \$251,828 respectively.

BATA provides service for the Safe Ride program in partnership with the SDSU Student Association. Under the Safe Ride program, fixed-route service is provided between downtown Brookings and residential areas on Thursday, Friday, and Saturday evenings between 10 p.m. and 2:30 a.m. during the academic year. The service has been well-received by the community and has helped foster a relationship between BATA and SDSU student leaders.

BATA is currently preparing for the introduction of fixed-route service in Brookings. Initially, service is scheduled to be delivered by a single route with a single vehicle. Service would be provided each weekday for approximately ten hours.



## 4. Study Survey

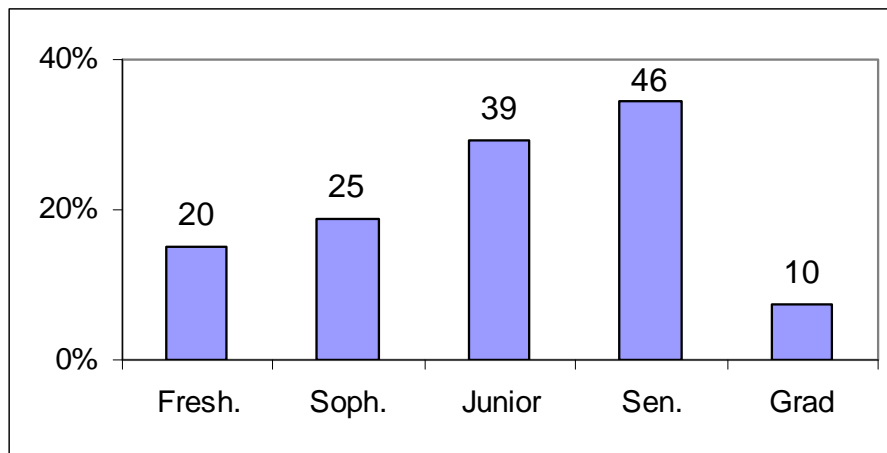
In order to gain an understanding of SDSU students, faculty, and staff members' transportation needs and attitudes towards transit, an online survey was conducted. The survey found significant support for transit service. It also provided insight into the type and level of service desired. In this chapter the methods and findings of the survey are presented.

### 4.1 Survey Methods

The survey was developed with guidance from a study advisory board and received required approval from both the North Dakota State University Institutional Review Board and the South Dakota Human Subjects Research Committee. The questions included in the survey are located in an appendix to this report. Students, faculty, and staff were invited to participate in the survey through a number of channels. The survey was available to be completed online from February 1 through March 31, 2007.

### 4.2 Student Results

One hundred forty-three SDSU students completed the study survey. Their classification by year is presented in Figure 3. The numbers above each bar correspond to the number of respondents in that class. Approximately 15% of student respondents were freshman, 18% were sophomores, 29% were juniors, and 34% were seniors. Graduate students made up 7% of student respondents. Each class was relatively well represented, although there was a disproportionate number of upper class respondents.



**Figure 3** Respondents by Class-Students

Of student respondents, 92% had access to a vehicle and 70% stated that it was their primary mode of transportation; 52% stated that transportation was considered when choosing where to live; 76% had a SDSU parking permit, but 39% of these students occasionally parked on the street; 43% stated that they change modes of transportation during inclement weather. The same percentage stated there were locations on campus which are too far to walk between.

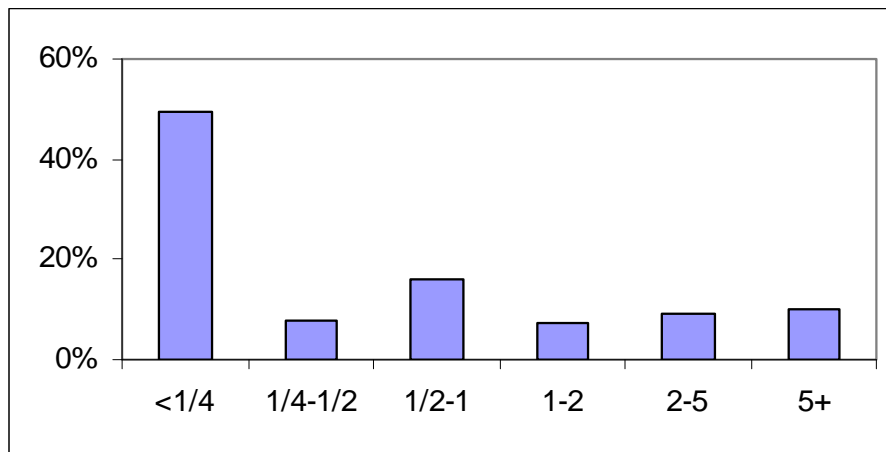
Students were asked to name which on-campus locations they felt were too far to walk between. The results are presented in Table 1. A number of combinations were noted. Most of these locations are more than one-quarter mile apart.

**Table 1** On-Campus Locations Too Far to Walk Between-Students

Ag Engineering /Crothers	Berg/PAC	HPER/Waneta
Ag Engineering/Union	BioStress/Wintrode	HPER/Shepard
Animal Science/Binnewies	Crothers/PAC	Library/Crothers
Animal Science/Crothers	Engineering/HPER	PAC/Scobey
Animal Science/Grove	Hansen/Union	PAC/Union
Animal Science/Scobey	Hansen, Berg, and Bailey/PAC	PAC/West
Animal Science/Union	Hansen/HPER	Scobey/Union
Berg/Wintrode	Hansen/Larson Commons	Student Health Services/Caldwell
Berg/Bailey/Union	HPER/Animal Science	Union/Waneta
Berg/HPER	HPER/Scobey	

Off-campus locations identified by students as potential stops included apartment complexes, Daktronics, downtown Brookings, the Brookings Hospital, HyVee, the Career Center, the Brookings Library, Pizza Hut, and Wal-Mart. Students also identified locations that should be served by an on-campus circulator. These included the Administration Building, Larson Commons, HPER, the library, parking lots, residence halls, and the student union.

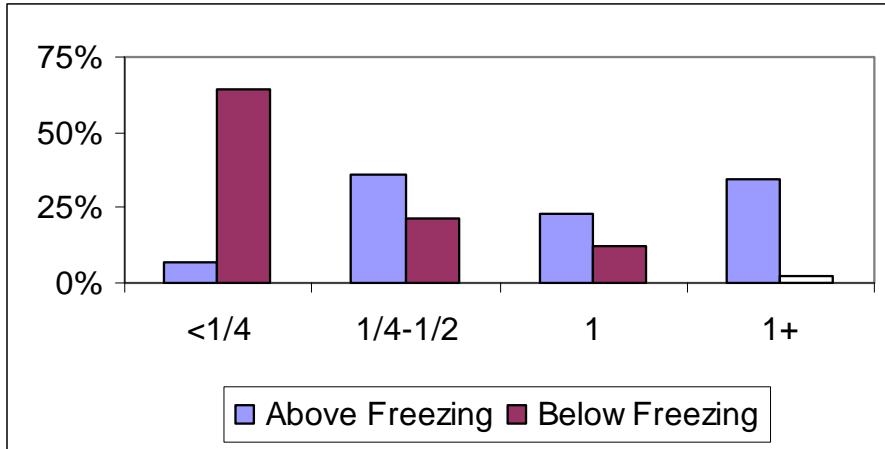
Students were asked what distance they live from the campus. The results are presented in Figure 4. Just less than 50% stated that they lived less than a quarter-mile from campus; 73% stated that they lived a mile or less away. These results support provision of disproportionate service near and on campus.



**Figure 4** Distance to Campus (Miles) – Students

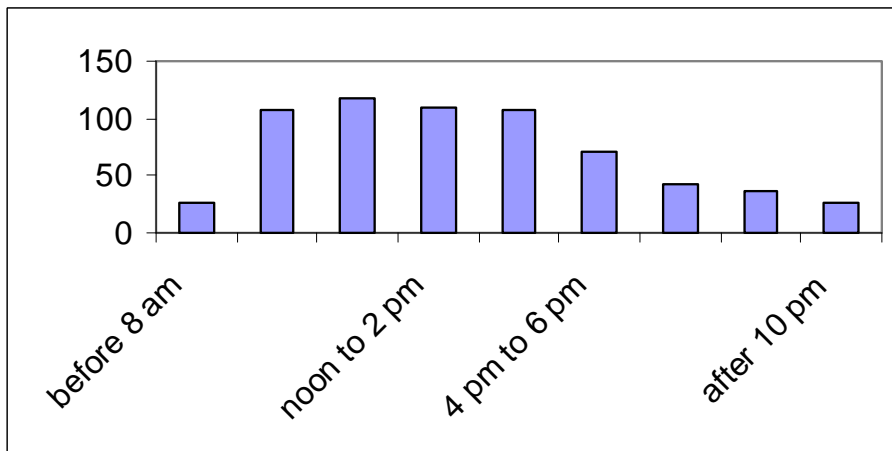


To aid in the determination of the location of routes and stops, students were asked the maximum distance they are willing to walk when temperatures are above and below freezing. The results are presented in Figure 5. 55% stated that they are willing to walk a mile or more when the temperature is above freezing. However, 64% stated that one-quarter mile or less was the maximum distance they would be willing to walk if the temperature is below freezing. These results demonstrate the demand for transportation alternatives in the winter for those students averse to walking long distances but are required to do so.



**Figure 5** Maximum Walking Distance (Miles) – Students

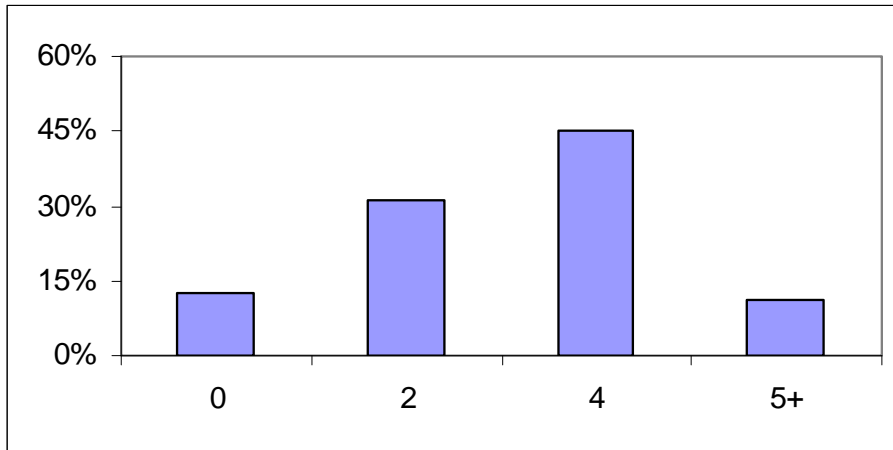
To determine when students might travel to and from campus or make use of on-campus circulators, respondents were asked to identify what times they are on campus. Their responses are presented in Figure 6. Most students responded that they were on campus between 8 a.m. and 4 p.m. However, many students stated they were on campus before 8 a.m. or after 10 p.m.



**Figure 6** Time On Campus – Students

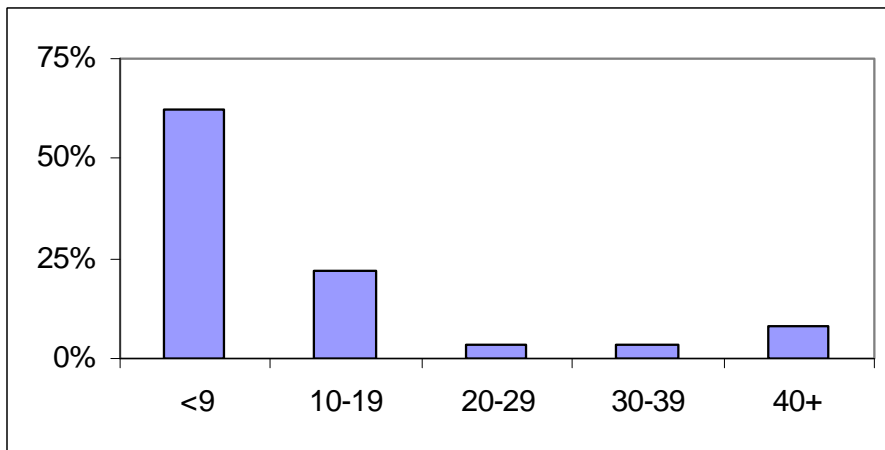
The results indicate that there might be significant demand for commuting trips between 8 and 10 a.m. and again from 4 and 6 p.m. Similarly, there appears to be a need for circulator service between 8 a.m. and 6 p.m. There may also be adequate demand for service into the late evening.

The survey asked students how many daily trips to and from campus they made on average. According to the results presented in Figure 7, 12% stated that they averaged no trips (live on campus), 31% averaged two trips, 45% averaged four trips, while 12% averaged five or more trips. As most of the respondents traveled to or from campus each day there appears to be need for off-campus service.



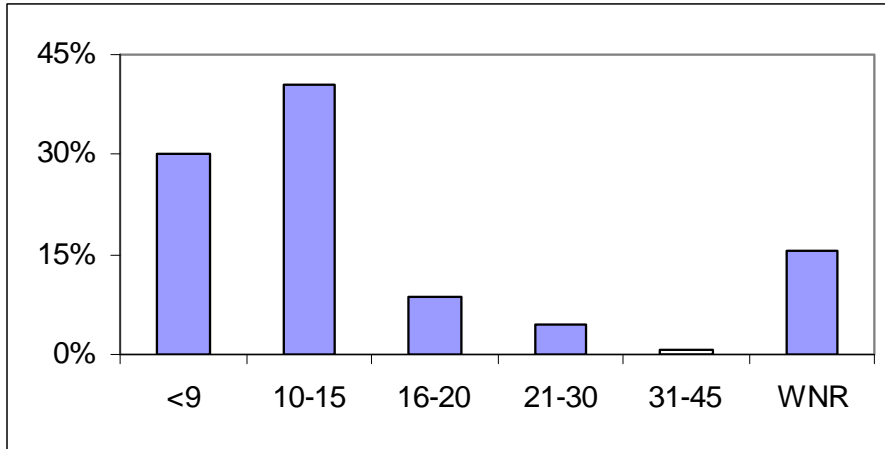
**Figure 7** Daily Trips to Campus-Students

Students who traveled to campus by car were asked how long their commute to campus took. According to the responses presented in Figure 8, 62% stated their commute was nine minutes or less; 22% stated their commute lasted between 10 and 19 minutes.



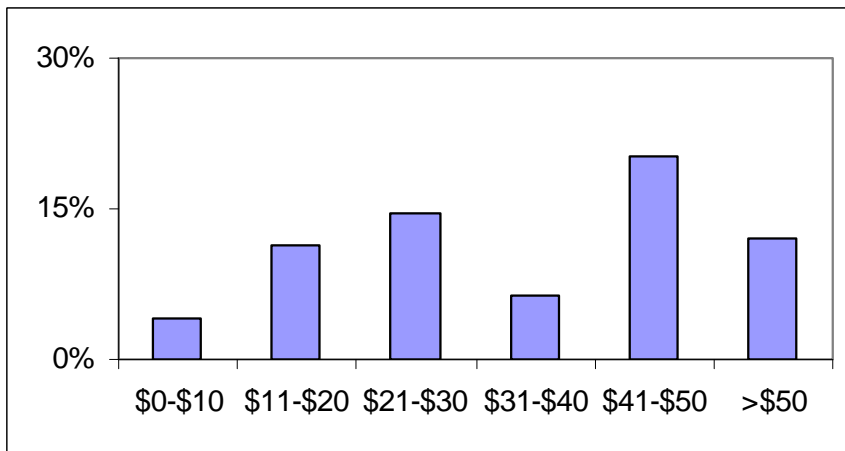
**Figure 8** Commute Time to Campus (Minutes) – Students

The survey asked students what length of bus trip, in minutes, would be acceptable for traveling to campus. Figure 9 presents their responses. Among respondents, 30% stated they felt that nine minutes or less was acceptable; 40% felt that between 10 and 15 minutes was acceptable, and, 15% stated that they would not ride the bus. Comparing these responses with how long students currently commute by personal automobile, it appears that a relatively large percentage of SDSU students are willing to travel by bus versus automobile when the trip is the same or slightly longer in length.



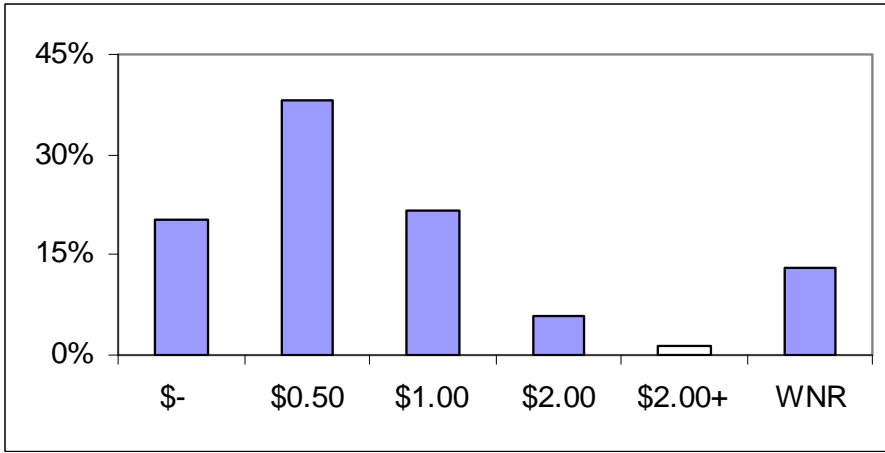
**Figure 9** Acceptable Bus Travel Time to Campus (Minutes) – Students

Among the students, 73% stated that would be willing to pay a semester fee to support the provision of transit services. These students were asked what level of support was acceptable. The results, as presented in Figure 10 indicate that 78% were willing to pay \$20 or more. These results are supportive of implementation of service and pursuit of a semester fee to support transit.



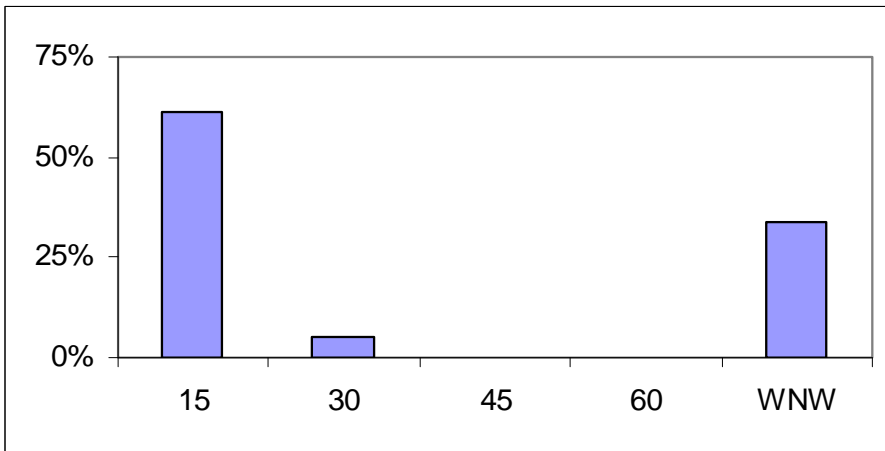
**Figure 10** Acceptable Semester Fee – Students

Students were asked what they thought was an acceptable fare for intra-city bus service. The results, presented in Figure 11, show that 38% felt a fare of \$.50 was acceptable and 21% felt a \$1.00 fare was acceptable. These results are also supportive of additional transit service.



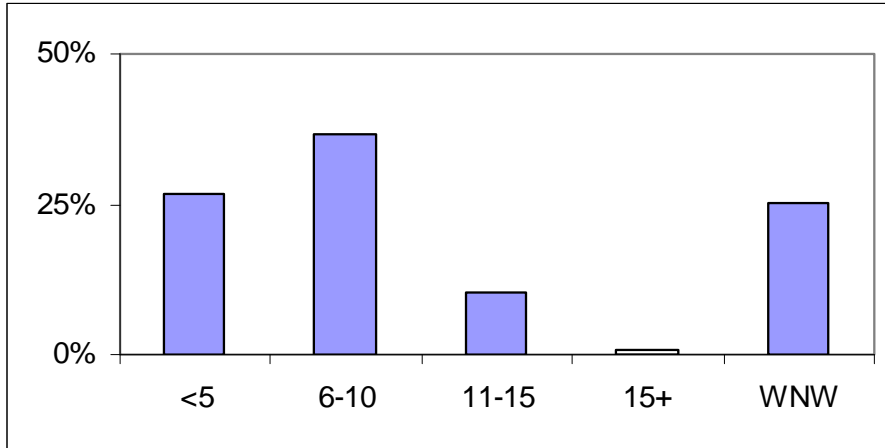
**Figure 11** Acceptable Fare for Intra-city Bus Service – Students

The survey asked students how long they would be willing to wait for the next bus for cross-town routes. The results, presented in Figure 12, indicated that 61% would wait 15 minutes and 33% would not wait. SDSU students have some patience for transit service.



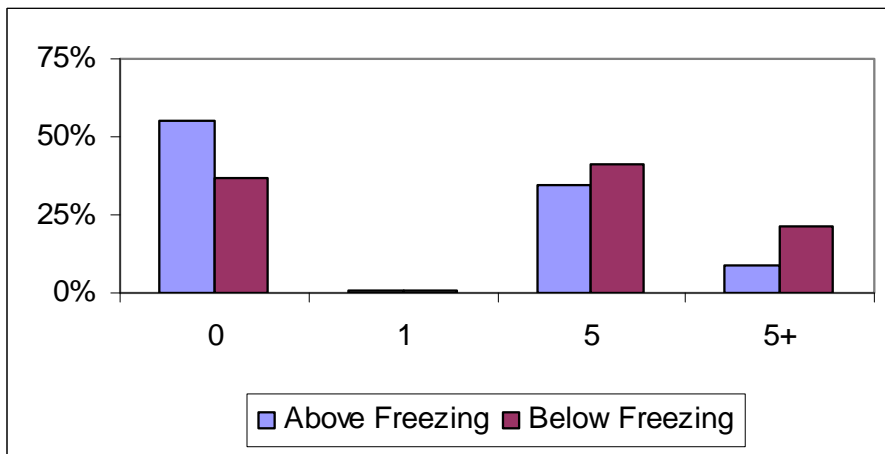
**Figure 12** Wait for Next Bus (Minutes) – Students

Students were asked how long they would wait for a circulator on campus. The results are presented in Figure 13. Among the respondents, 26% would wait five minutes or less while 37% would wait between six and 10 minutes, and 25% stated they would not wait. Patience for on-campus circulator service is relatively low. Efforts should be made to provide service at relatively regular intervals no more than ten minutes apart to attract riders.



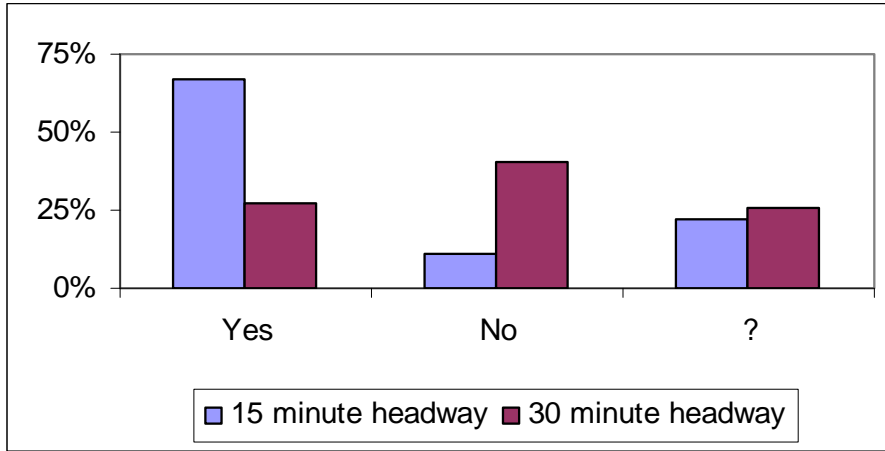
**Figure 13** Wait for Next Circulator (Minutes) – Students

The survey asked students how many times they would use the circulator per week depending on the temperature. Figure 14 presents the students’ responses. Among the respondents, 45% would use it five or more times per week when it was above freezing, and 62% would use it five or more times per week when it was below freezing. The weather has a significant affect on expected ridership. If realized, these levels of circulator ridership are quite high.



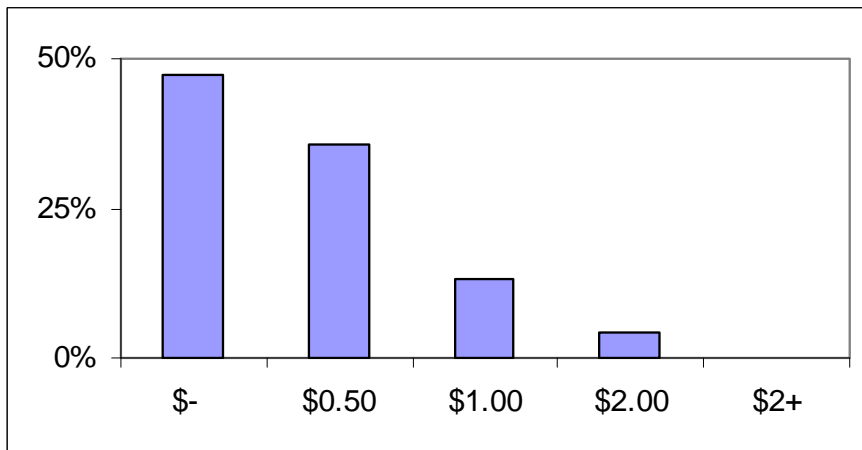
**Figure 14** Circulator Use per Week – Students

The survey asked students if they would use an off-campus shuttle, which visited periodically. The results are presented in Figure 15. Among respondents, 66% would use an off-campus parking shuttle if the site was visited every 15 minutes and 11% if it was visited every 30 minutes. Again, SDSU students will wait, but not long, for service.



**Figure 15** Off-campus Parking Shuttle Use – Students

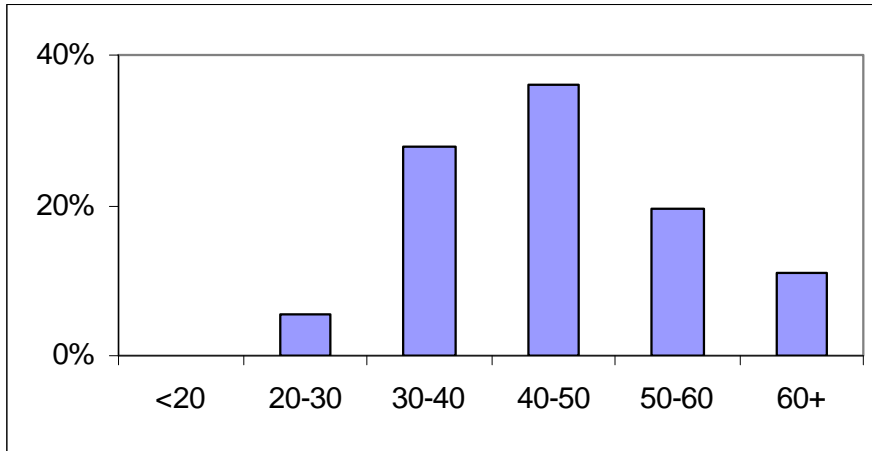
Students were asked what fare they would be willing to pay for a trip on a campus circulator. Figure 16 presents the responses to the question. Among respondents, 47% were not willing to pay for a fare and 35% would be willing to pay \$.50 per trip. Given their interest in circulator service, but aversion to fares, this response provides support for a pass system.



**Figure 16** Circulator Fare – Students

### 4.3 Faculty and Staff Results

Thirty-six South Dakota State University faculty and staff responded to the survey. Their distribution by age is presented in Figure 17. Faculty and staff ages 40 to 50 made up the largest group with 36% of the respondents.



**Figure 17** Respondents by Age – Faculty and Staff

Of faculty and staff respondents, 92% had access to a vehicle, 70% travel primarily by car, 42% considered transportation when choosing where to live, 89% owned a campus parking permit, and only 19% occasionally parked on the street. Also, 33% change their mode of travel during inclement weather.

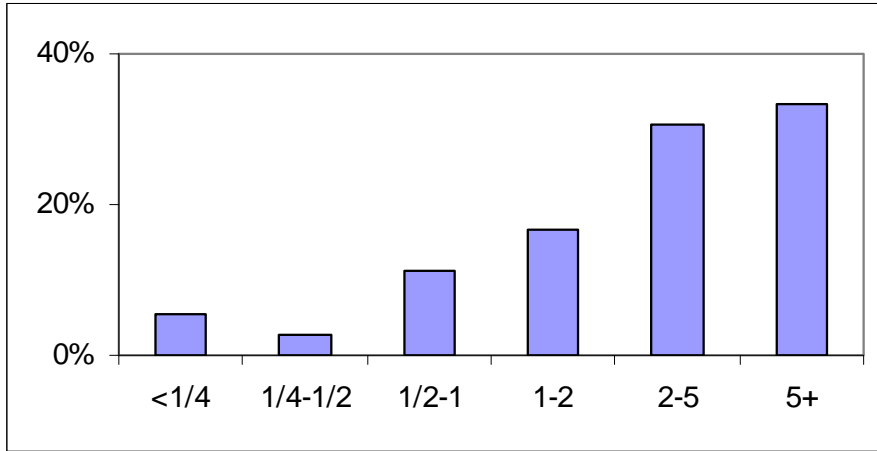
Among faculty and staff, 44% felt there are locations on campus which are too far to walk between. They were also asked to identify these locations. Their responses are presented in Table 2.

**Table 2** On-Campus Locations Too Far to Walk Between – Faculty and Staff

Administration/HPER	Harding/Dairy Micro	Medary/PAC
Administration/Performing Arts	HPER/Pugsley	PAC/Administration
Animal Science to Engineering	HPER/Scobey	PAC/Scobey
Berg/HPER	Larson/Wenona	

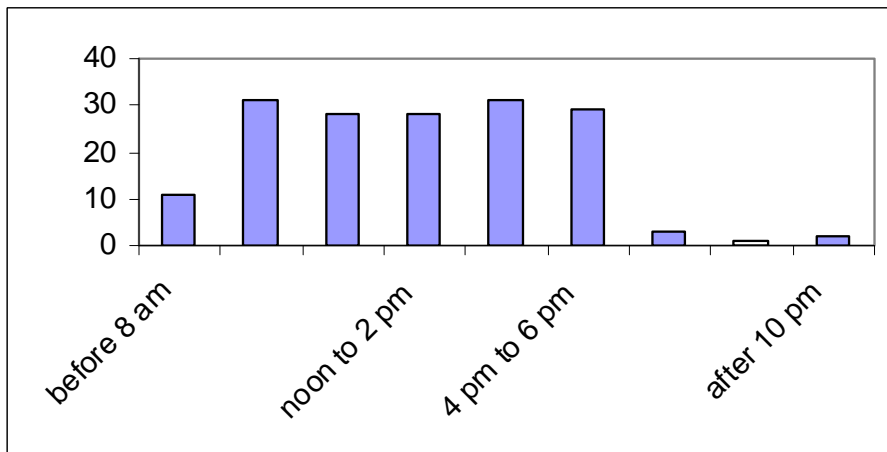
Faculty and staff were also asked to identify off-campus locations that should be served by transit. They identified apartment complexes, the Brookings Hospital, downtown Brookings, Hy-Vee, the Career Center, Pizza Hut, and Wal-Mart. On-campus locations identified included the library, HPER, parking lots, Crothers, the Union, HPER, Biostress, and residence halls.

Faculty and staff were asked how far they live from campus. The results are presented in Figure 18. Less than 20% live within one mile of campus. One-third live five miles or more from SDSU. To attract faculty and staff commuters to transit would require routes traveling relatively far from campus.



**Figure 18** Distance to Campus (Miles) – Faculty and Staff

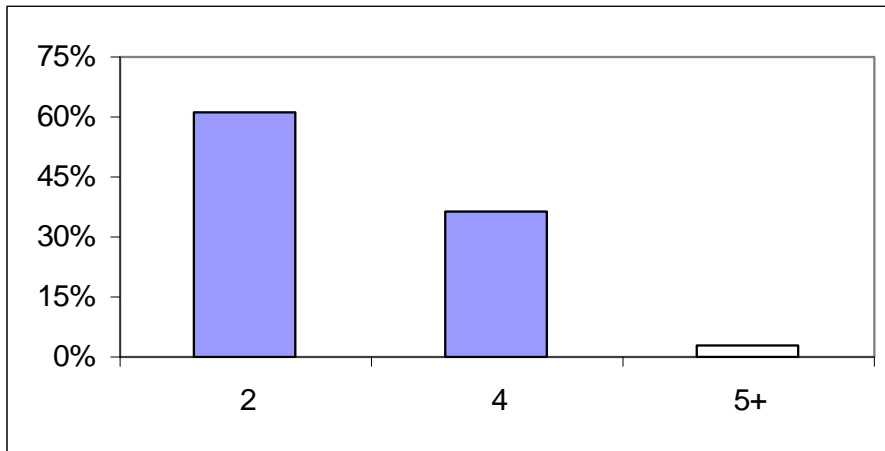
Faculty and staff were asked what times they are normally on campus. The results are presented in Figure 19. Most respondents were on campus between 8 a.m. and 6 p.m. This behavior lends support to commuter service.



**Figure 19** Time On Campus – Faculty and Staff

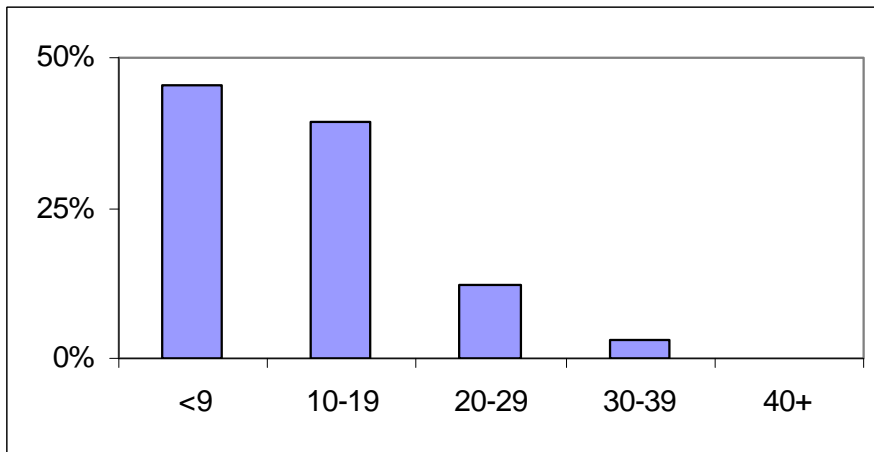


SDSU faculty and staff were asked how many daily trips they make to and from campus. Figure 20 presents indicates 60% average two trips, 36% four trips, while 4% average five or more trips.



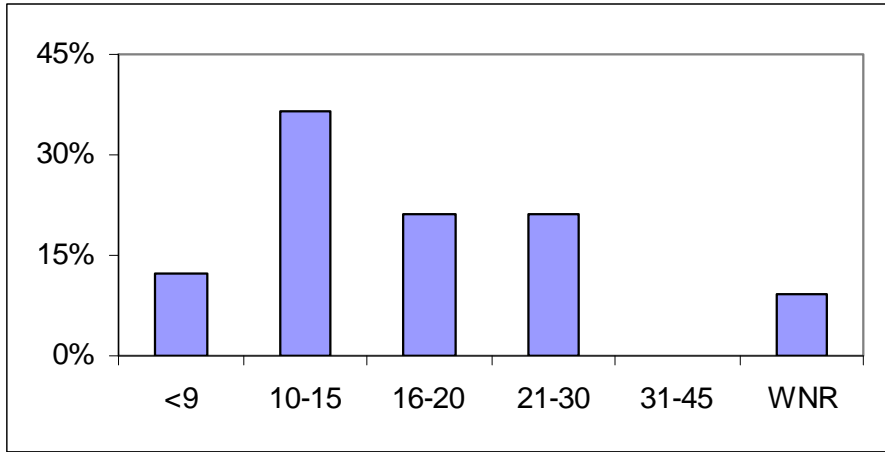
**Figure 20** Daily Trips to Campus – Faculty and Staff

The survey asked faculty and staff the travel time of their commute to campus. The results are presented in Figure 21. 45% stated their commute lasts nine minutes or less. 40% stated their commute lasts between 10 and 19 minutes.



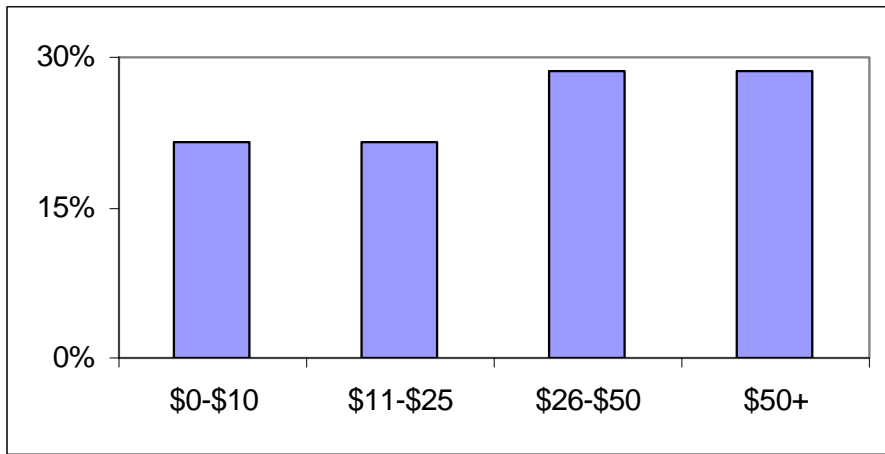
**Figure 21** Commute Time to Campus – Faculty and Staff

Faculty and staff were asked what length of travel time by bus would be acceptable for trips between campus and their residences. The results are presented in Figure 22. Among respondents, 12% said nine minutes or less was an acceptable travel time. 36% said between 10 and 15 minutes was acceptable, and 21% said between 16 and 30 minutes was acceptable. Like students, faculty and staff are willing to accept trips by bus which are the same as or slightly longer than to their commute by automobile.



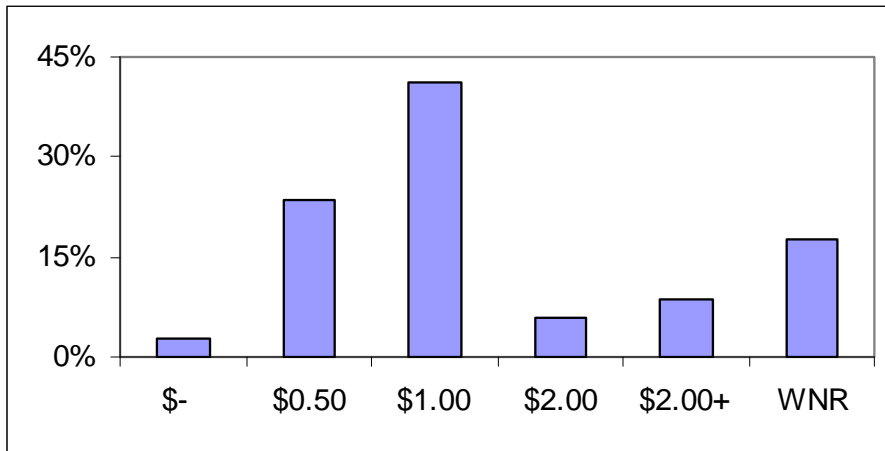
**Figure 22** Acceptable Bus Travel Time to Campus (Minutes) – Faculty and Staff

The 63% of faculty and staff respondents who were willing to pay a semester fee were asked what amount was acceptable. The results presented in Figure 23, indicate that 57% would be willing to pay \$26 per semester or more. This provides support to the implementation of a semester pass program for faculty and staff.



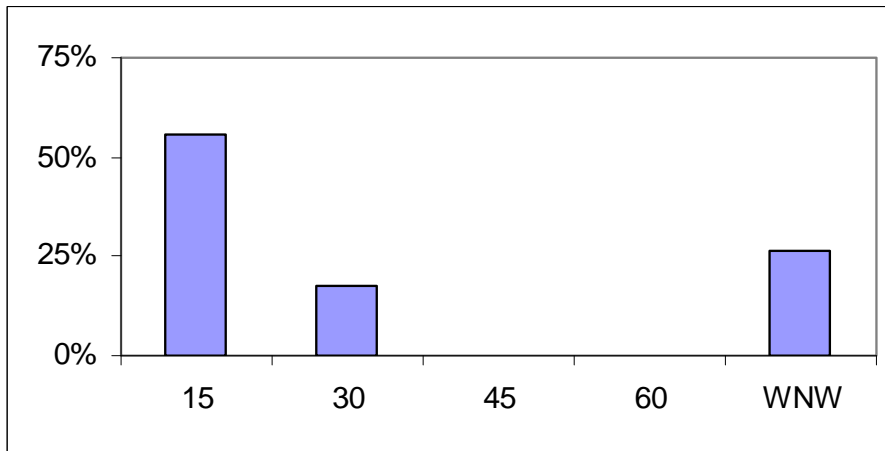
**Figure 23** Acceptable Semester Fee – Faculty and Staff

Faculty and staff were asked what they felt was an acceptable fare for intracity bus service. According to the results presented in Figure 24, 41% said a \$1 fare was acceptable.



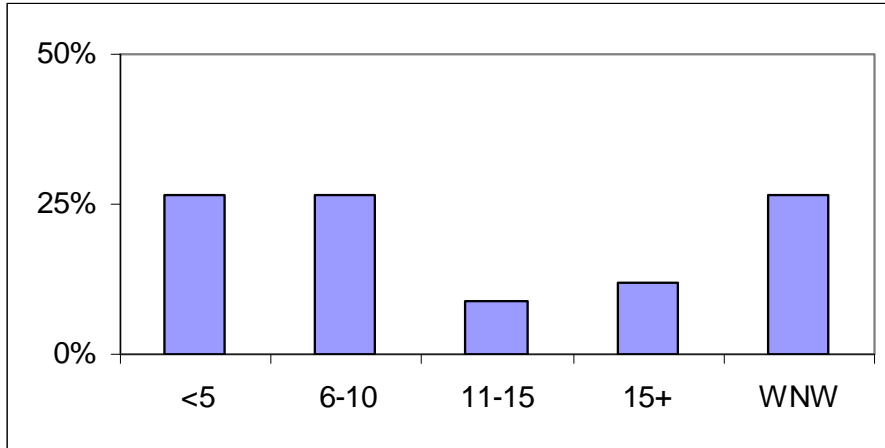
**Figure 24** Acceptable Fare for Intracity Bus – Faculty and Staff

Faculty and staff were asked how long they would wait for the next bus. The results presented in Figure 25 indicate that 56% would be willing to wait 15 minutes.



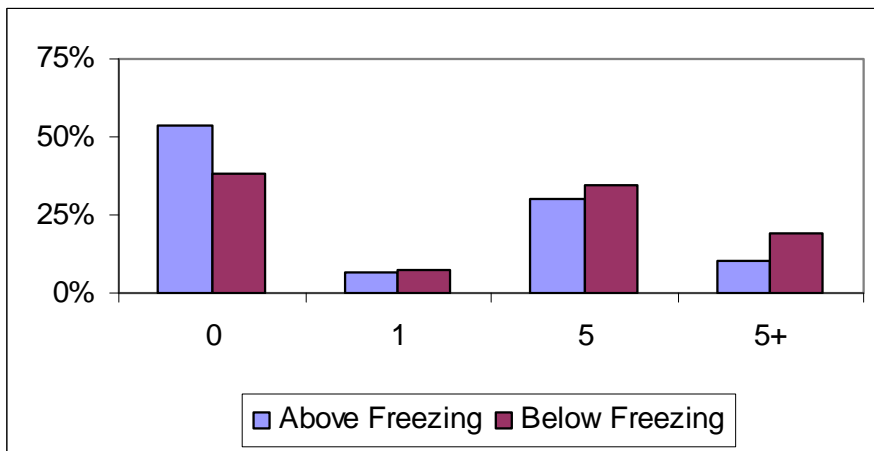
**Figure 25** Wait for Next Bus (Minutes) – Faculty and Staff

SDSU faculty and staff were asked how long they would be willing to wait for the next campus circulator. The results presented in Figure 26 indicate that 25% would be willing to wait five minutes or less, the same percentage were willing to wait between six and 10 minutes, and 25% were not willing to wait for the next circulator. Faculty and staff are less likely to wait than students. This response supports circulator service frequencies of ten minutes or less.



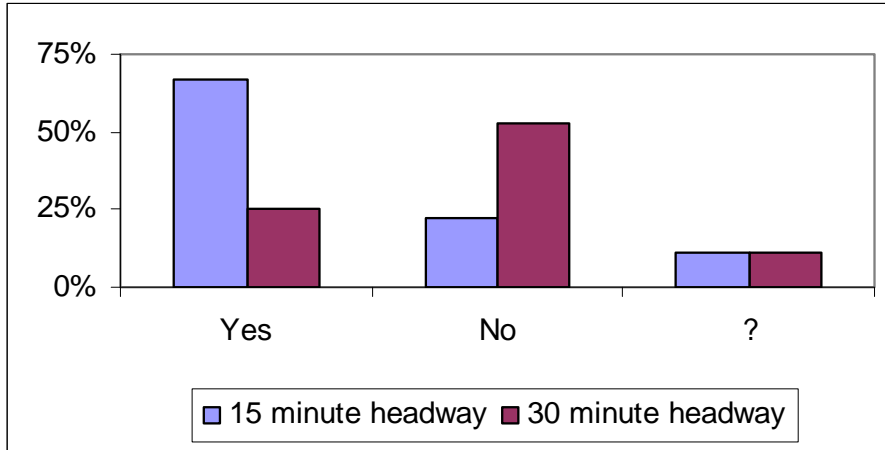
**Figure 26** Wait for Next Circulator – Faculty and Staff

The survey asked SDSU faculty and staff how many times they would use a campus circulator depending on the temperature. The results presented in Figure 27 indicate that 40% would use the circulator five times or more when the temperature was above freezing. This percentage increased to 54% when the temperature was below freezing. These numbers are supportive of transit service.



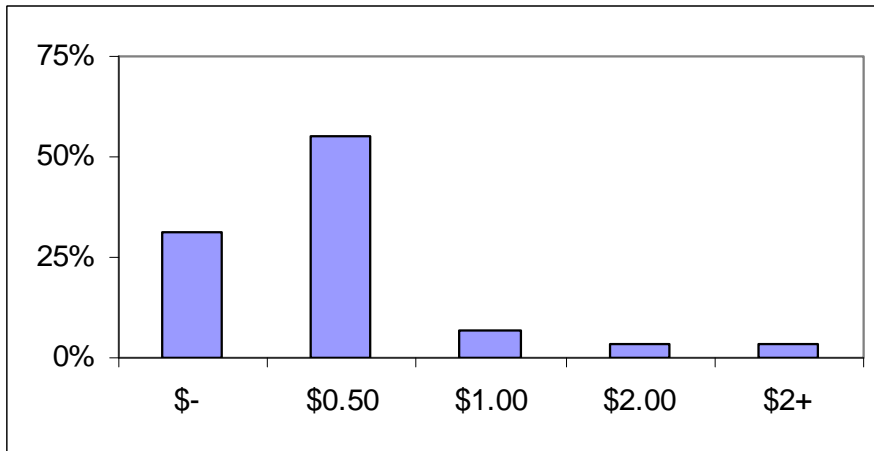
**Figure 27** Circulator Use per Week – Faculty and Staff

Faculty and staff were asked if they would be willing to use an off-campus parking shuttle depending on how often it was visited. The results presented in Figure 28 indicated that 66% would use the shuttle if the lot was visited every 15 minutes. Only 20% would use the lot if the shuttle was visited every 30 minutes. Like SDSU students, faculty and staff will wait, but not long, for parking shuttle service.



**Figure 28** Off-campus Parking Shuttle Use-Faculty and Staff

Faculty and staff were asked what fare they would be willing to pay for circulator service. The results presented in Figure 29 indicate that 55% would be willing to pay \$.50 per ride and 31% would not pay a fare for circulator service.



**Figure 29** Circulator Fare – Faculty and Staff



## **5. Service Design and Implementation Issues**

This chapter discusses pertinent service design and implementation issues. Many of the issues are general in nature while others are unique to the SDSU community. These include the need for student fee increase approval by the South Dakota Board of Regents, employment of students by Daktronics, and the existing SDSU Safe Ride program.

### **5.1 Student Fees and UPASS**

Unique in the field of transit, student fees are a common source of funding for university community transit. In many cases, student referendums are held to approve the levying of fees. In South Dakota, approval of the South Dakota Board of Regents, which governs public institutions of higher education in the state, is required for student fee increases.

UPASS programs involve the use of student fees to cover the full cost of student rides. Upon boarding the bus, students visibly present or swipe their student ID and ride the bus fare free. The benefits of the UPASS program, including quick boarding and guaranteed funding, have led to widespread adoption of the model in university communities.

### **5.2 Matching Federal Funds**

While student fees are expected to be the primary source of revenue for expanded service to the SDSU community, two grant programs administered by the Federal Transit Administration should be fully considered to provide additional funding. Each program is referred to by its section in Chapter 49 of the U.S. Code: Section 5309 and Section 5311. Section 5309 provides funding for capital improvements while Section 5311 provides funds for transit operations in small urban and rural communities with populations less than 50,000. Section 5311 funds may be used for capital, operating, or administrative purposes. In South Dakota, the Department of Transportation administers both programs.

#### **5.2.1 Section 5309 Buses and Bus Facilities**

Section 5309 provides funds for capital expenditures, including the purchase of buses and related equipment and the construction of bus facilities. While the Secretary of the Department of Transportation has the discretion to administer program funds, the annual appropriation is fully earmarked by Congress. Section 5309 funds provide a maximum federal share of 80%, leaving state and local entities responsible for 20%. Local requests are made as part of the consolidated state application. In recent years the SDDOT has been the recipient of most of the state's 5309 funds.

#### **5.2.2 Section 5311 Rural and Small Urban Areas**

Section 5311 provides funding for transit service in small urban and rural areas. Funding is determined by formula and is a function of each state's non-urban population. States are required to distribute funds to local transit properties according to an established annual program in a fair and equitable manner that encourages coordination. Section 5311 funds may be used for capital, operating, and administrative expenses. Federal Section 5311 funds provide a maximum share of 50% for operating and 80% for capital and planning. Due to the large amount of federal lands in the state, South Dakota is eligible to use the sliding scale match, which slightly reduces the level

of local match required for 5311 funds. The maximum share for South Dakota is 51.76% for operating and 82.82% for capital and planning expenses.

### **5.3 Vehicle Procurement**

Expanding transportation alternatives to the SDSU community in the form of fixed-route transit will require BATA to procure additional vehicles. The precise number depends on the level of service provided. Not all vehicles should be expected to be in service during peak periods to allow for preventative and routine maintenance as well as to ensure the continuation of service in the event of an in-service breakdown or similar incident.

Generally, it is recommended that small fleets maintain a spare ratio of at least two vehicles or 20% of the fleet, whichever is greater. Since proposed service will have an initial fleet of fewer than 10 vehicles, two spare vehicles should suffice. Larger vehicles in BATA's existing fleet could be considered as spares if they are not expected to be in service during peak periods. Of course, adequate spares should be available for BATA's existing service.

### **5.4 Advertising Opportunities**

Advertising revenue can be a significant source of revenue for transit agencies. Transit advertising is often located on vehicle exteriors or interiors as well as on benches and shelters. Exterior vehicle wraps can annually generate advertising revenue of \$12,000 or more per vehicle. Transit agencies often limit the number of fully wrapped vehicles. Placement of exterior and interior bus placards usually entails a monthly advertising rate which depends on the number of vehicles on which they are located.

Most transit agencies and other public entities that provide advertising opportunities have policies regarding content in place. Policies often prohibit sexually oriented advertising and tobacco or alcohol advertising. Having policies in place eliminates the appearance of subjectivity when accepting or declining advertising offers. Discounted advertising rates are provided by some transit agencies to non-profit groups or for public service announcements.

### **5.5 Daktronics Student Shift**

Daktronics, a large manufacturer of display panels based in Brookings, employs over 500 students. Many of these employees are SDSU students who work a weekday evening shift during the school year. This shift begins as a primary day shift ends, causing parking problems and bottleneck issues on nearby roads. Students identified the Daktronics complex as a needed in the study survey.

### **5.6 Safe Ride Service**

The Safe Ride service is a program delivered by the Brookings Area Transit Authority in partnership with the SDSU Student Association. Under the Safe Ride program, fixed-route service is provided between downtown Brookings and residential areas on Thursday, Friday, and Saturday evenings between 10 p.m. and 2:30 a.m. during the academic year. The Safe Ride program has been well received by the SDSU student body and the Brookings community.



## **5.7 Central Campus**

SDSU's long-range plan includes transitioning to a pedestrian campus and limiting central campus vehicle traffic to service vehicles. One variant of the pedestrian campus model that has been successful at other universities allows central campus access to transit vehicles. This allows for the benefits of controlled access, limits the number of vehicles, and provides increased mobility to the university community. One example of this is at Iowa State University. In the case of SDSU, this could take the form of allowing transit vehicles access to Rotunda Lane.

## **5.8 System Promotion and Education**

Promoting the presence and use of a transit system is necessary to build community support and attract riders. This is especially true in the case of university communities where there are large annual movements of individuals into and out of the community as well as large numbers of visitors. There are many ways that this issue could be addressed, including the production of promotional and marketing materials, marketing campaigns, and travel training of students, faculty, and staff. The latter could be accomplished during student or new hire orientation.

## **5.9 Accessibility**

Given the considerable effort required to provide mobility and the benefits of inclusion, it is important that transit service be accessible to all members of the community. Accessibility is also required by the Americans with Disabilities Act (ADA). The ADA applies to vehicles and facilities as well as the service itself. It requires that complementary paratransit service be provided to individuals who are unable to use the fixed-route system.

Vehicles with low-floor buses eliminate the need for traditional wheelchair lifts while speeding the boarding and alighting of passengers and have been gaining population in recent years. BATA's existing service and fleet, which includes a number of accessible vehicles, should be suitable to meet the complementary paratransit requirements of the ADA at minimal additional expense. Improved customer service results from accessible stops and shelters. Providing information and training often increase ridership and minimize challenges faced by riders and transit service providers.

## **5.10 Alternative Fuels**

With increasing concerns about energy independence and the environment, interest in and use of alternative fuels in the United States has been growing. Public transportation has been a leader in the use of alternative fuels, including demonstration projects involving biodiesel, liquid natural gas (LNG), battery electric, and hydrogen power sources. Federal 5309 funds are available for the procurement of vehicles that make use of various fuels or technologies for service in areas where federal air quality standards are not met. As Brookings is not defined as a non-attainment area, these monies are unavailable locally.

For the SDSU/Brookings community, the use of biodiesel is especially promising. In addition to its economic and environmental benefits, the local presence of major production facilities and the prominence of agriculture within South Dakota make its use favorable. The use of biodiesel for powering transit buses is quite common, especially in the Midwest. Blends of 5% or 20 % biodiesel with conventional diesel, referred to as B5 and B20, are prevalent. Vehicles can run on 100% biodiesel with appropriate engine modifications. Use of biodiesel results in lower carbon

monoxide, particulate matter, and hydrocarbon emissions. Low level blends of biodiesel provide an increase in engine lubricity. In cold weather, high level blends require additives to prevent the fuel from gelling.

## **5.11 Technology**

The adoption of technology in transit can increase its efficiency and improve levels of customer service. While many technologies are used to complement fixed-route service, in the context of university transportation, two deserve additional consideration. These technologies, electronic fare collection and transit traveler information systems, may be deployed in different ways but provide the same functionality.

### **5.11.1 Electronic Fare Collection**

For fixed-route service, a transit fare collection management system manages the electronic collection of fares onboard vehicles. It allows individuals to use a traveler card or other electronic payment device, which is scanned by readers located on the transit vehicle. This information can later be communicated from the vehicle to the transit management system.

The use of electronic fare collection complements the UPASS program as it allows students, faculty, and staff to use their university-issued IDs as their pass. This allows for quick boarding, which is important during peak periods and provides low-cost information collection. This information can be used to communicate the relative success of the system, for performance management, and reporting.

### **5.11.2 Transit Traveler Information Systems**

Transit traveler information systems provide users ready access to service information at stops and onboard vehicles. This may include stop annunciation, arrival signs, and real-time schedule displays. This information may also be delivered to users by Web-enabled devices and Web browsers.

The SDSU/Brookings community has three distinct advantages if the development and operation of a transit traveler information system were to occur. First, much of the infrastructure needed to support a transit traveler information system is in place on the SDSU campus. Second, the presence of Swiftel, which provides local telecommunications, including municipal wireless service. Third, Daktronics, a local Brookings company, is a global leader in the production of real-time display panels.

## 6. Service Alternatives

When designing a new transit service, there is a need to balance the level and type of service with demand and funding while accommodating unique local characteristics. In this chapter, three service alternatives are presented to provide an understanding of the level of service that can be delivered at various levels of funding. The alternatives are constructed from a combination of five routes: two campus circulator routes and three city service routes. The location of the routes combined with level of service, measured as number of vehicles serving a route at a given time, days and hours of service, and cost per hour, allows for the estimation of operating costs.

Operating budgets in this chapter are based on vehicle-hour costs of \$40. This hourly cost includes an accounting of all vehicle operating costs, driver compensation, insurance, maintenance, and miscellaneous expenses. It is also expected to cover the incremental cost of administration of the expanded service. A new transit bus is estimated to cost between \$300,000 and \$350,000 depending on its specifications.

### 6.1 Campus Circulator Routes

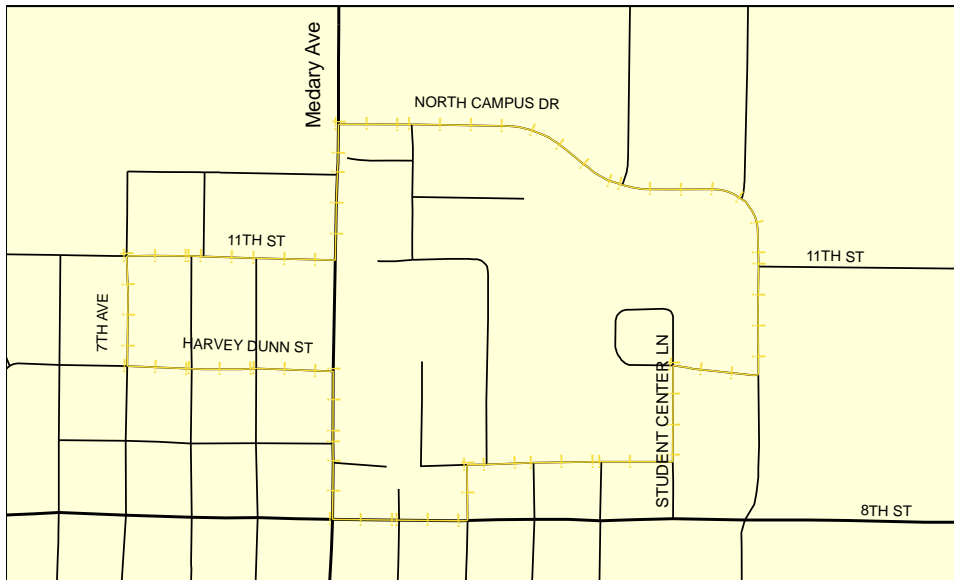
As indicated above, the proposed transit system includes two campus circulator routes: the Blue and Yellow Routes. Conceptually, these circulator routes will travel many of the same streets, but in opposite directions. This allows riders the opportunity to avoid lengthy trips that initially travel away from their desired destination.

The Blue Route serves the SDSU campus, peripheral parking lots, campus apartments located on 22<sup>nd</sup> Avenue, and Wal-Mart. The route is 4.5 miles long, which is estimated to be able to be traveled in approximately 20 minutes. A map of the Blue Route is presented in Figure 30.



Figure 30 Blue Route Map

The Yellow Route provides service to the SDSU campus. The route is three miles long, which is estimated to be able to be traveled in 15 minutes. A map of the Yellow Route is presented in Figure 31.



**Figure 31** Yellow Route Map

For the circulator routes, a single vehicle providing 10 hours of service on 150 days of instruction during the academic year requires 1,500 hours of service at a cost of \$60,000. Service provided between 7 a.m. and 5 p.m. would allow students, faculty, and staff to travel on and near campus during traditional work/class hours.

One bus providing 16 hours of service on each day of instruction during the academic year requires 2,400 hours of service. At a cost of \$40 per hour, this service costs \$96,000. Service between 7 a.m. and 11 p.m. would provide increased service for evening classes, extracurricular events, study, and recreation.

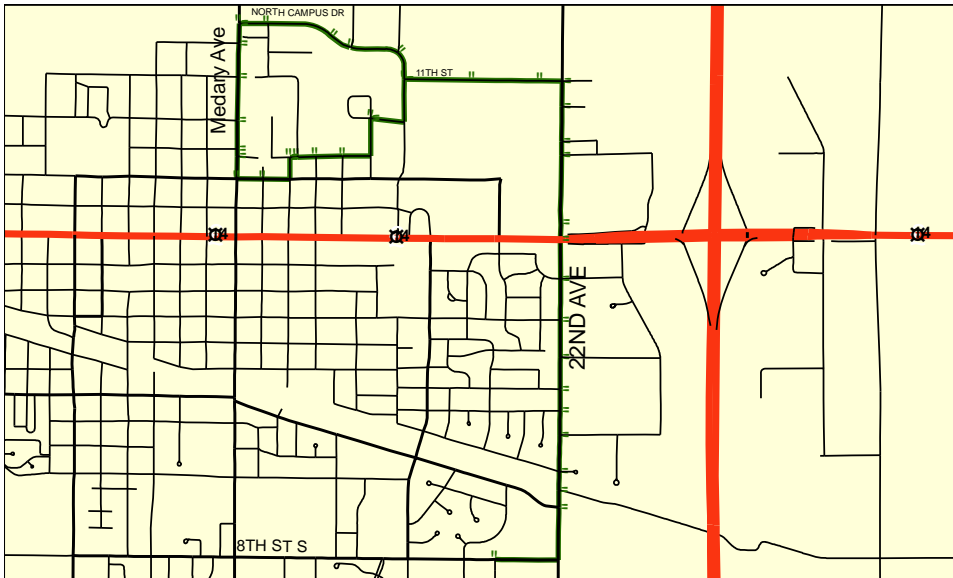
Limited service on weekends and holidays would provide students the ability to travel for study, recreation, and extracurricular events. Five hours of service during the approximately 70 weekend days and holidays would require 350 vehicle hours and cost \$14,000. Increasing the number of vehicles on a particular route may be necessary to meet demand during peak periods, such as the early morning and late afternoon as students, faculty, and staff commute to and from campus.

## 6.2 City Routes

Routes serving off-campus locations provide transportation options to students living off campus, commuting faculty and staff, and students who need access to shopping and employment centers and places of recreation. Each of the three following routes travel through campus providing additional service for trips with on-campus origins and destinations.

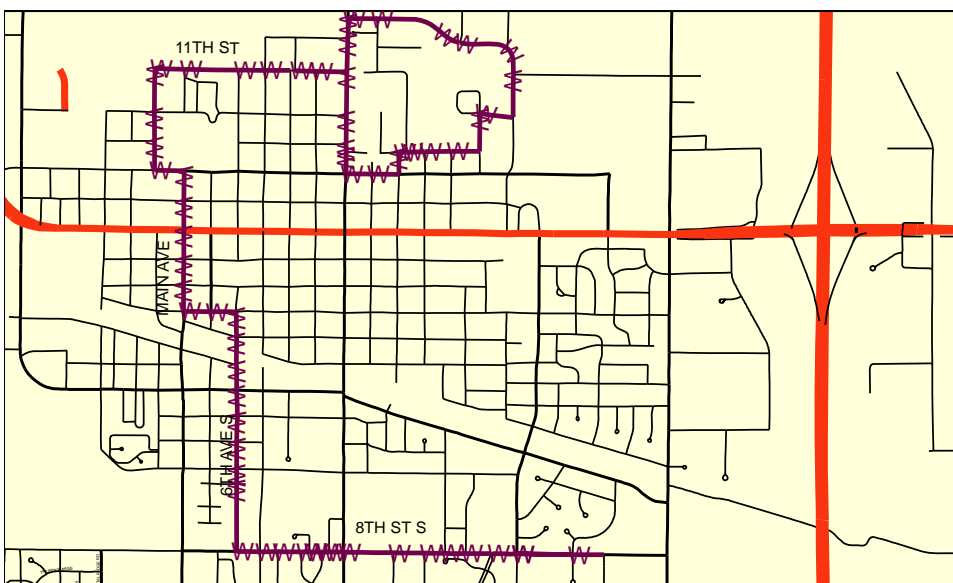
The Eastside Route provides service to the SDSU campus, peripheral parking areas, near campus apartments, Wal-Mart, the Brookings Hospital, Hy-Vee, and the Brookings Mall. It is estimated that the 6-mile route can be traveled in 30 minutes. It travels in the opposite direction of the Blue

Route described earlier. This is done to provide riders the option to travel immediately in the direction of their intended destination. For the Eastside Route, this characteristic is especially valuable to residents of the apartments on 22<sup>nd</sup> Avenue. A map of the Eastside Route is presented in Figure 32.



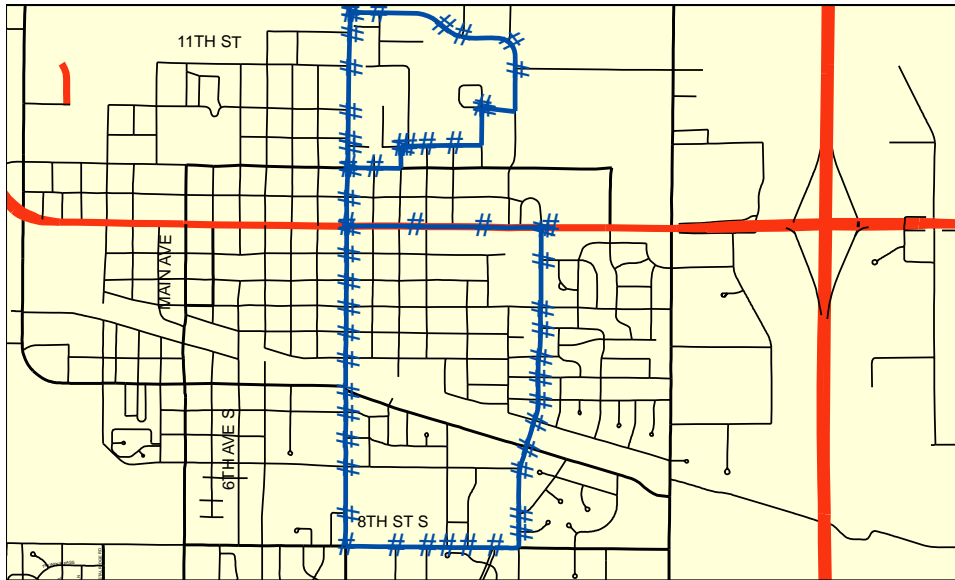
**Figure 32** Eastside Route Map

The Downtown Route provides service to the SDSU Campus, nearby apartments, downtown Brookings, the Brookings Public Library, the Brookings County Courthouse, Hy-Vee, and the Brookings Mall. This 9-mile route has an estimated running time of 40 minutes. A map of the Downtown Route is presented in Figure 33.



**Figure 33** Downtown Route Map

The Central Route provides service to the SDSU campus, apartments, and commercial properties on 6<sup>th</sup> Street. The route is six miles long and has an estimated running time of 30 minutes. A map of the Central Route is presented in Figure 34.



**Figure 34** Central Route Map

A single vehicle providing 16 hours of service on days of instruction during the academic year would require 2,400 vehicle-hours at a cost of \$96,000. Twelve hours of service on weekends and holidays during the academic year would cost \$33,600 for 840 hours of service. Year-round service with 16 hours of service on weekdays and 12 hours on weekends and holidays would require 5,360 vehicle hours and cost \$214,400.

### 6.3 Three Service Alternatives

Even when limiting routes to the five described above, there are still numerous possible combinations of service. Three service design alternatives are presented in Table 3. The following paragraphs describe these three design options and related hours of service, operating costs, and vehicle requirements.

Alternative A provides a minimum level of service focused on moving on-campus riders. Between 7 a.m. and 5 p.m. on days of instruction, two vehicles service the Yellow and Blue Route and one vehicle serves the Eastside Route. This results in at least two vehicles traveling both clockwise and counter-clockwise across campus at no more than 8-minute intervals. In the survey, students stated they would wait more than 10 minutes. From 5 p.m. and 11 p.m. during evenings on days of instruction and 1 p.m. and 6 p.m. on weekends and holidays, the Yellow Route and Eastside Route operate. During the summer months and university breaks, the Eastside Route provides 16 hours of service on weekdays and 12 hours of service on weekends and holidays. The annual cost of Service Alternative A is estimated to be \$540,400. At peak periods, five vehicles are in service.

Alternative B adds the year-round Downtown Route to Alternative A. This provides more robust service during the fall and spring semesters as well as the summer. Service Alternative B is

estimated to cost \$768,800 annually. At peak periods, six vehicles are in service for Alternative B.

Alternative C includes the addition of year-round Central Route service to the Alternative B. It is estimated to cost \$983,200 annually. Seven vehicles are required during periods of maximum service.

**Table 3** Service Design Alternatives and Estimated Operating Costs

Route		Hours of Service	Service Design			
			A	B	C	
Yellow	Academic	Days of Instruction	7 a.m. - 11 p.m.	\$ 96,000	\$ 96,000	\$ 96,000
	Year		7 a.m. -5 p.m.	\$ 60,000	\$ 60,000	\$ 60,000
		Weekends & Holidays	1 p.m.-6 p.m.	\$ 14,000	\$ 14,000	\$ 14,000
Blue	Academic	Days of Instruction	7 a.m. - 11 p.m.	\$ 96,000	\$ 96,000	\$ 96,000
	Year		7 a.m. -5 p.m.	\$ 60,000	\$ 60,000	\$ 60,000
		Weekends & Holidays	1 p.m.-6 p.m.		\$ 14,000	\$ 14,000
Eastside	Year	Weekdays	7 a.m. - 11 p.m.	\$ 156,800	\$ 156,800	\$ 156,800
	Round	Weekends & Holidays	11 a.m. - 11 p.m.	\$ 57,600	\$ 57,600	\$ 57,600
Downtown	Year	Weekdays	7 a.m. - 11 p.m.		\$ 156,800	\$ 156,800
	Round	Weekends & Holidays	11 a.m. - 11 p.m.		\$ 57,600	\$ 57,600
Central	Year	Weekdays	7 a.m. - 11 p.m.			\$ 156,800
	Round	Weekends & Holidays	11 a.m. - 11 p.m.			\$ 57,600
				\$ 540,400	\$ 768,800	\$ 983,200
Vehicle Hours of Service				13,510	19,220	24,580
Maximum Number of Vehicles in Service				5	6	7

\*@\$40 per vehicle hour



While the service design alternatives presented include estimates of vehicles required, it may be optimal to increase the number of vehicles during peak periods to improve system efficiency. This would require higher initial vehicle procurement costs. However, the increased service could be accomplished by increasing service during peak demand periods and decreasing them during other times with no change in operating costs.

## **6.4 Estimating Ridership**

While the study survey provided some insight into potential ridership, making accurate estimates for new service is difficult. A well-designed system that meets the community's needs could be expected to match the levels of ridership seen elsewhere. Go West Transit, which provides service to Western Illinois University, has ridership rates of nearly 100 rides per student each year. For CyRide and Iowa State, the rate is over 160 rides per student.

The service alternatives presented in the previous section are not as robust as those seen in some mature systems. Expecting ridership at SDSU to match their levels with one of the three alternatives might be overly optimistic. A ridership rate of 50 rides per student is a more attainable, but still ambitious goal. This level of usage would equal total ridership in excess of 500,000 trips per year. This rate is equivalent to what Go West Transit experienced at Western Illinois in 2000 when providing 12,000 vehicle hours of service (Miller 2001).

## **6.5 System Revenue**

Although required when designing new or expanded transit service, estimates of revenues are often difficult to determine. Traditional sources of revenue for public transportation agencies include state and local funds, federal assistance, as well as fare revenue and advertising. In university and college communities, additional sources, such as student or parking fees or discretionary institutional funds, are often available.

In the case of the SDSU community, a number of entities, including the South Dakota Board of Regents, the South Dakota Department of Transportation, the City of Brookings, and the SDSU administration may have a role in generating transit system revenues. The approval of the South Dakota Board of Regents is required for increases in SDSU student fees. The SDDOT allocates federal transit funds according to its management plan. The City of Brookings and the administration of SDSU have discretionary control over limited levels of funding. A case must be made to each organization for funds, and there is no guarantee that any will be provided.

The ability to levy student fees is critical to the development of a new fixed-route system serving the SDSU community. In addition to generating funds to cover the cost of students' rides, fees can be used to attract federal transit funds managed by the state. In turn, the City of Brookings and the administration at SDSU may provide monies to reach a level of relative equity in local funding or to expand service to meet specific unmet community or institutional needs.

The number of credit hours delivered by SDSU has steadily grown over the past decade (South Dakota State Board of Regents 2007). In the fall of 2006, SDSU students enrolled for 129,039 state-supported credits. Extrapolating this over the entire year, including the spring semester and summer sessions, results in a conservative estimate of approximately 270,000 credit hours delivered annually by SDSU. A \$1 per credit hour student fee assessed across SDSU students would generate \$270,000 annually. A \$2 fee would generate \$540,000. This level of funding

would be able to cover the operating costs of Service Alternative A described earlier in this section. It would not cover the initial cost of vehicle procurement.

In South Dakota, Federal Section 5311 funds provide a maximum share of 51.76% for operating and 82.82% for capital and planning expenses. Allocation of 5311 funds for the expanded service would be subject to availability and would be determined by the SDDOT's state management plan. A \$2 fee generating \$540,000 would likely strain currently available 5311 funds. Consequently, it is possible that the expanded service would not receive the maximum federal share.

## **6.6 Facility Needs**

Provision of a sustainable level of fixed-route service to the SDSU community would require BATA to significantly increase the size of its fleet, most likely by at least a half-dozen vehicles. An increase of this magnitude would greatly strain BATA's existing maintenance facility. BATA does not have the capacity to store additional vehicles. As a result, providing fixed-route service to the SDSU community would likely require the eventual expansion of BATA's current, or construction of a new, maintenance and storage facility.

If the level of service and ridership rates for the new service reach those at Western Illinois University and Iowa State University, construction of an on- or near-campus intermodal facility may be warranted. Intermodal facilities provide a location for transfers between pedestrian, bicycle, automobile, and transit modes. Many provide services and amenities, including ticket booths, waiting areas, restrooms, food service, newsstands, and gift shops.

## **7. Recommendations**

This chapter presents study recommendations. These recommendations are based on the findings of the study, including information gathered by the survey and open forum meetings and the guidance of the study advisory committee. They include both steps that need to be taken as well as issues that require consideration in order for the transportation needs of the SDSU community to be met efficiently. First and foremost, it is recommended that the process to prepare for the delivery of fixed-route service tailored to the needs of SDSU students, faculty, staff, and visitors continue.

### **7.1 Begin Formal Implementation Process**

It is recommended that BATA formally initiate a process to implement fixed-route transit service to meet the transportation needs of the SDSU community. The study survey found significant support for both the need for service and the willingness to pay for service. Doing so successfully will require the simultaneous, coordinated effort of many organizations and individuals.

BATA should provide all reasonable assistance to SDSU student leaders as they work with the South Dakota Board of Regents to gain approval for a fee increase. Implementation of a student fee is necessary for the delivery of a robust service. During the study, student leaders demonstrated significant interest in the opportunities for transit at SDSU. However, in order for a student fee increase to occur, the approval of the South Dakota Board of Regents is required. BATA should provide the resources needed so that a case for transit at SDSU can be presented to Board.

BATA should immediately begin discussions with the SDSU administration, including the director of the physical plant and the City of Brookings, to identify and address any operational issues. The implementation and operation of service will require an ongoing partnership among the university, the city, and BATA. Identifying and addressing issues, such as stop locations, accessibility, and service policies are important as is establishing and maintaining a working relationship.

BATA should immediately begin discussions with the SDDOT and Federal Transit Administration to identify and address any operational, regulatory, and funding issues. BATA will need accurate estimates of the match that it can expect to receive in order to plan service. This includes a match for capital expenses, especially the procurement of vehicles, as well as for operating expenses. Following execution of a bid for new vehicles, it may take nine months or more until they are delivered. It is important that BATA is in compliance with all applicable regulations.

### **7.2 Phased-in Implementation**

It is recommended that BATA phase in new service to the SDSU community. This will allow for an adequate reserve to be funded, for vehicles to be procured as new routes are added, to provide BATA the ability to better manage the expansion of service, and to ensure that service is able to keep abreast of demand. It is important, however, that BATA provide a minimum level of service to attract enough riders to sustain the system.

The first phase of implementation could include initiating one or two routes that provide service to the campus and immediate neighborhood. Successive phases would then consist of increasing

the number of routes and areas served, the hours of service, and the number of vehicles in service. New phases could begin at the start of the academic year or between the fall and spring semesters.

Prior to implementation, additional efforts devoted to service design, financial planning and marketing should be completed. This includes the finalization of route locations and the hours and levels of service, more precise estimation of revenues and expense; and efforts to attract riders to the system. This work should be rigid enough to guide the effort, while flexible enough to allow service to efficiently meet the needs of the SDSU community.

### **7.3 Service Design**

It is recommended that, at a minimum, service be provided during the academic year and include

- at least two circulator routes serving campus with no more than 15 minutes of headway between vehicles
- service to locations throughout Brookings, including weekend service
- extended service on Thursday, Friday, and Saturday evenings between downtown and students' residences (that service equivalent to the Safe Ride program be maintained)

It is important that the service be tailored to meet the needs of the largest segment of the student body as possible. This will have a positive affect on student buy in and increase student ridership. Initial service should be designed to immediately attract a significant number of riders to the system.

Either a draft service design, including vehicle needs and cost estimates, should be finalized and agreed to by BATA and the SDSU student body leadership or regular open dialogue between the groups is necessary. A draft design could be used when communicating with the SDDOT and South Dakota Board of Regents regarding grant monies and the student fee increase. In the absence of a draft service design, open communications would ensure that BATA, student leadership, the SDDOT, and the Board of Regents are considering an equivalent level and type of service.

### **7.4 Student Funding**

It is recommended that student leaders pursue adoption of a \$2/credit hour fee to support new transit services. This equates to a \$24 per semester fee for full-time students. This level of funding is supported by the survey and is similar to levels found at other institutions with successful transit operations. This fee is expected to directly generate at least \$500,000 per year. These funds combined with other local, state, and federal monies will provide for a robust level of service.

Funding at levels significantly lower than \$2/credit hour will jeopardize the ability of BATA to deliver a level of service which will attract the amount of ridership needed to sustain the system. Funding at the \$2/credit hour rate or higher will demonstrate to others, including the SDDOT, the university administration, and the City of Brookings that SDSU students are making a significant commitment to transit. This demonstrated commitment should be used to leverage these organizations' and individuals' support.

## **7.5 UPASS**

It is recommended that the system make use of a UPASS program. Under a UPASS program, student fees cover the cost of their rides. Upon boarding the bus, students visibly present or an electronic reader scans their student ID. Students ride the bus fare free.

## **7.6 Fares and Passes**

It is recommended that fares of \$1 or \$2 per ride for non-students be charged. This is equivalent to that currently charged for demand-response trips and that being considered for the fixed-route service. The fare should reflect the cost of providing service and demand by non-students. BATA should work with SDSU to explore the introduction of semester passes for faculty and staff.

## **7.7 Additional Local Support**

It is recommended that BATA reach out to the City of Brookings, SDSU, large employers, and community organizations to build support for the new transit service. As the proposed service would provide significant benefits to non-students, these other groups should be encouraged to provide an equitable level of financial support to the system. Efforts to coordinate new and existing transportation service in Brookings should be made. The findings and recommendations of this report should be considered in the current transportation gap analysis study commissioned by the City of Brookings.

## **7.8 Additional Service**

It is recommended that BATA work with the City of Brookings, SDSU, employers, and community organizations to explore the funding and delivery of additional fixed-route service. This could include the addition or alteration of routes and the expansion to year round service as opposed to that limited to the academic year. This would provide those outside the SDSU community a reliable, robust service.

## **7.9 Capital Expense Allocation**

It is recommended that at least 20% of the monies generated by the student fees and other local sources be set aside for capital costs. This would provide at least \$100,000 per year in local funds for vehicle procurement, construction, and planning. In order to assemble an adequate-sized fleet and to construct supporting infrastructure, it may be necessary for twice that level to be set aside for capital during the system's early years.

## **7.10 Matching Funds**

In order to fully leverage local resources, matching funds for both operations and capital should be sought. Federal Section 5309 provides require a 20% local match for the purchase of bus and bus facilities. Generally, Federal Section 5311 funds provide a maximum share of 50% for operating and 80% for capital and planning. However, in South Dakota the shares are slightly higher to account for the large percentage of public lands in the state.

For student fees alone, matching funds could provide an additional \$400,000 for operating and \$400,000 for capital expenses annually. The actual level of matching funds is determined at the

discretion of the SDDOT. As stated previously, a case should be made immediately for the allocation of funds for the expanded service. A non-binding estimate by the SDDOT would assist in the planning of service.

### **7.11 Alternative Fuels**

It is recommended that BATA investigate the operational, economic and environmental impacts of the procurement of new vehicles powered by alternative fuels, such as biodiesel. For the SDSU community, biodiesel is especially promising given the presence of local production. This could include low level blends, such as B5 or B20, or 100% biodiesel.

### **7.12 Technology**

It is recommended that BATA evaluate the adoption of technology in conjunction with the new service. This includes the use of an electronic fare collection system. This technology would allow for the accurate reporting of student trips and performance measurement. The adoption of real time arrival technology that can be display by message signs or by Web browsers and Web-enabled devices should be considered. BATA should work with the SDSU community to discuss the opportunities provided by the adoption of technology and look to partner with organizations in their delivery.

### **7.13 Accessibility and the ADA**

It is recommended that BATA fully explore and take any actions necessary to comply with the Americans with Disabilities Act as they apply to complementary paratransit service as described in 49CFR37. BATA should also work to ensure that any new vehicles or facilities that are procured or constructed to support the new service comply with the ADA. BATA should consider the purchase of low-floor buses. BATA should work to ensure that all stops, both on and off campus, are accessible.

## References

Carnegie Foundation for the Advancement of Teaching. Carnegie Classifications Data File. Public-use data file. [http://www.carnegiefoundation.org/dynamic/downloads/file\\_1\\_568.xls](http://www.carnegiefoundation.org/dynamic/downloads/file_1_568.xls). June 12, 2007.

CyRide. Home page. <http://www.cyride.com/>. May 23, 2007.

Go West Transit. Home page. <http://www.student.services.wiu.edu/gowest/>. May 23, 2007.

Miller, J.H. 2001. Transportation on College and University Campuses. TCRP Synthesis 39. Washington, D.C.: Transit Cooperative Research Program.

National Science Foundation. Academic Research and Development Expenditures. Public-use data file. <http://www.nsf.gov/statistics/nsf07318/>. June 12, 2007.

South Dakota Department of Transportation. State of South Dakota Department of Transportation: Public and Specialized Transportation Fiscal Year 2006. <http://www.sddot.com/fpa/transit/docs/FY2006StatisticalReport.pdf>. June 12, 2007.

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## Appendix A: Survey Instrument

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Demographic Information

Age:

Gender:

Faculty/Staff or Student:

If student, which class:

General Travel Information

If student,

Do you have regular access to a motor vehicle while attending school?

Was transportation to and from campus a factor in choosing where to live?

How far do you live from campus? (in miles)

<1/4

1/4 - 1/2

1/2 - 1

1 - 2

2 -5

>5

When traveling to campus, where do you most often travel from?

Home

Place of work (if student)

Child care

Shopping

Other

What periods are you frequently on campus?

Before 8 a.m.

8 a.m. to 10 a.m.

10 a.m. to 12 noon

12 noon to 2 p.m.

2 p.m. to 4 p.m.

4 p.m. to 6 p.m.

6 p.m. to 8 p.m.

8 p.m. to 10 p.m.

After 10 p.m.

Which of the following modes of transportation do you use most often when traveling to campus?

- Auto
- Car Pool
- Motorcycle
- Bus
- Bicycle
- Walk
- Other

If you selected auto, how long does it typically take to travel from home to campus?  
(minutes)

- <9
- 10-19
- 20-29
- 30-39
- 40+

How many one-way trips do you typically make to and from campus per day?

Rate the importance of the following factors when deciding on a mode of transportation?

- Convenience
- Cost of Vehicle
- Cost of Parking
- Weather
- Parking Availability
- Time

Do you change modes of travel during winter or periods of inclement weather?

Walking

What would you consider a reasonable walking distance when the temperature is

Below Freezing

- <1/4 Mile
- 1/4 - 1/2 Mile
- 1/2 - 1 Mile
- 1 Mile

Above Freezing

- <1/4 Mile
- 1/4 - 1/2 Mile
- 1/2 - 1 Mile
- 1+ Mile

Are there any locations on campus which are too far to walk between?

If yes,  
Which locations?

Parking

Do you currently have a parking permit?

If yes,  
Which parking lot do you use?  
Do you still occasionally park on the street?

How do you rate the convenience of campus permit parking?

Very Poor  
Poor  
Fair  
Good  
Very Good

How do you rate the affordability of campus permit parking?

Very Poor  
Poor  
Fair  
Good  
Very Good

If you could park in designated off-campus parking lots adjacent to your route, would you be more willing to use the bus if the lot is limited every

15 Minutes  
30 Minutes

City-wide Fixed-Route Service

Are there any off-campus locations in Brookings that should be served by bus?

If yes,  
which locations.

What is an acceptable trip time between your home and campus by bus? (minutes)

< 9 minutes  
10-15 minutes  
16-20 minutes  
21-30 minutes  
31-45 minutes  
Will not ride

What fare would you be willing to pay for a ride for an intracity bus ride?

- \$0
- \$.50
- \$1
- \$2
- \$2+
- Will not ride

Would you be willing to pay a semester fee for free unlimited use of the bus around campus and throughout Brookings?

If yes,

What is the most you would be willing to pay per semester?

If you were to miss the bus, how long would you be willing to wait for the next bus?

- 15 Minutes
- 30 Minutes
- 45 Minutes
- 60 Minutes
- Would not wait

Would you be more willing to use the bus if you were able to participate in a Guaranteed Ride Home Program which, in the case of emergency, allowed you a reduced fare/free cab ride to leave work or campus?

### Campus Circulators

Definition of a circulator. A circulator is a bus that travels the same, short route usually without scheduled stops.

What stops, if any, would you like campus circulators to serve?

Please list...

How many times a week would you use a campus circulator when temperatures are

above freezing

below freezing

If you miss the campus circulator, how long would you be willing to wait for the next bus?

- <5 Minutes
- 6-10 Minutes
- 11-15 Minutes
- 15+ Minutes
- Would not wait

What fare would you be willing to pay for a ride for a campus circulator ride?

- \$0
- \$.50
- \$1
- \$2
- \$2+
- Will not ride

Bus Shelters

Should SDSU have bus shelters on campus?

If yes,

Where should they be located?

Should they be heated?

Benefits

What do you think are the main benefits of public transportation (on campus)?

- Reduce traffic congestion
- Safety
- Convenience
- Environmental concerns
- Save time
- Save money
- Reduce parking demand
- No Opinion
- Other