



# Sanford Center for Science Education

## **Market Assessment & Analysis Report**

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Prepared for: Black Hills State University and the  
Sanford Center for Science Education

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*Innovations in Science Learning*

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**Table of Contents**

Introduction and Institutional Profile ..... 1  
    Initial Plans for the Sanford Center for Science Education ..... 1  
    Local & Regional Context ..... 2  
    South Dakota Context ..... 3  
    National & International Context ..... 4

Preliminary On-Site Attendance Projections..... 6  
    Annual Attendance Projections ..... 6  
        Table 1: Annual Attendance Estimates for SCSE..... 7  
    Seasonal Trends..... 7  
        Table 2: Seasonal Attendance Estimates for SCSE..... 7  
    Visitor Segmentation ..... 8  
        Figure 1: Map of 55 Mile and 110 Mile Radii for Lead, SD ..... 8  
        Table 3: Annual School Group Attendance Estimates for SCSE ..... 9  
        Table 4: Population Estimates and Demographics for Counties within a 50 or 100 Mile Radius of Lead, SD ..... 10  
        Table 5: Proportion of Total Annual Attendance Attributable to Residents within 100 Miles of Lead ..... 11  
        Table 6: Distribution of Annual Attendance: School Groups, Residents & Tourists ..... 11  
        Table 7: Estimated SCSE Tourist Attendance as Percentages of Mount Rushmore & Homestake Visitor Center Attendance ..... 12  
    Five-Year Projections ..... 13  
        Table 8: 5-Year Attendance Projections for SCSE..... 13

Local & Regional Comparisons ..... 15  
    Figure 2: Map of Local Institutions within 25, 55, & 110 Mile Radii of Lead, SD ..... 15  
    Local Institutions ..... 16  
        Table 9: Local Institutions ..... 16  
    Regional Attractions ..... 17  
        Table 10: Major National Attractions ..... 18  
        Table 11: Regional Benchmark Institutions..... 19

National & International Industry Comparisons ..... 21  
    Geographic Comparison Sites ..... 22  
        Table 12: Geographic Comparison Sites Facilities & Admissions ..... 23  
    National Research Facilities ..... 24  
        Table 13: National Laboratories Educational Facilities & Admissions ..... 24  
        Table 14: Research Facilities Tour Information ..... 26  
        Table 15: Visitor Groups for National Research Facilities ..... 27  
        Table 16: National Research Facilities – Programs & Services ..... 28  
    National & International Observatories ..... 29  
        Table 17: National & International Observatories Educational Facilities & Admissions ..... 29  
        Table 18: Observatory Tour Information ..... 30  
        Table 19: Visitor Groups for National & International Observatories ..... 30

# MARKET ASSESSMENT & ANALYSIS REPORT

---

*Prepared for the Sanford Center for Science Education*

Table 20: National & International Observatories – Programs & Services .....	31
Initial Conclusions & Preliminary Recommendations .....	32
Preliminary Recommendations .....	32
References .....	35
Appendices .....	37
Appendix A: Development of the Regression Model.....	37
Appendix B: Development of Seasonal Projections .....	39
Appendix C: List of Public School districts within 100 miles of Lead.....	40
Appendix D: Development of 5-Year Projections.....	42
Appendix E: Summary of Underground Laboratory Educational Experiences.....	44

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## Introduction and Institutional Profile

This report provides attendance projections and industry analysis for the Sanford Center for Science Education (SCSE). The projections and analysis are grounded in an understanding of the broader context for the SCSE, including current plans for the facility and programming; local, regional, and state demographics; and national and international trends. The following sections summarize these important components of the institutional profile for the SCSE and define the characteristics and parameters that were used in the development of the attendance projections and for the identification of industry benchmark comparisons.

### INITIAL PLANS FOR THE SANFORD CENTER FOR SCIENCE EDUCATION

The SCSE will be the educational and outreach facility of the Deep Underground Science and Engineering Laboratory (DUSEL), now in a planning phase and scheduled for construction as early as 2012. The Homestake Mine at Lead, South Dakota, currently owned by the South Dakota Science and Technology Authority (SDSTA), has been selected as the potential site for the DUSEL and is planned to be the deepest underground research site in the world. The SCSE is envisioned as a vital and integrated educational and outreach arm of DUSEL.

Throughout this early planning process, SCSE is working closely with DUSEL, the Sanford Underground Laboratory at Homestake, and Black Hills State University. The Sanford Laboratory is undergoing a broad range of experiments at several levels of the Homestake mine from the surface to 4,850 feet underground to conduct both important research and initial feasibility of the DUSEL project. Black Hills State University is playing a lead role in planning the new science center, in addition to involvement in both science research and science education collaboratives with DUSEL and the Sanford Lab.

The breadth of research opportunities and collaborations offers rich content for exploration for the SCSE, including areas of physics, astrophysics, biology, geoscience and engineering. An educational and outreach facility has the potential to provide innovative experiences for the public, students, educators and the research community. Currently the mission of SCSE is to “share the excitement and promise of deep underground science and engineering at Homestake with learners of all ages worldwide.” Programming will be designed to draw on the unique expertise of DUSEL researchers, the rich cultural history of the Black Hills, and the geology and ecology of the region. Currently the following top priorities have been identified for SCSE:

1. Feature unique science and engineering taking place at DUSEL for teachers, K-12 and undergraduate students, and learners of all ages.
2. Embrace and reflect cultural and historical heritage of northern Black Hills, with special attention to American Indian audiences.
3. Provide highly memorable and educational underground experience/range of experiences, both physical and virtual.

In addition to a visitor center/interactive science center at the DUSEL site, the on-site experience is planned to include a signature underground experience for visitors. Based on assumptions provided for this study in November, 2009, the facility itself is planned to be approximately 35,000 to 45,000 sq ft, with up to 14,000 sq ft of exhibit space. The facility will also include a Commons shared with DUSEL (not included in the science center square footage), which would house a shared space for visitors and scientists, a cafeteria, and a 300-seat auditorium. This may include an underground experience for school groups and general public at 300 feet (not currently included in the DUSEL scope) and an underground experience for selected audiences at 4850 feet. In addition to these onsite visitor experiences, initial plans for the SCSE call for public programming that will incorporate a broad range of educational approaches, including K-12 teacher professional development, research experiences, camps and classes, and distance education.

### LOCAL & REGIONAL CONTEXT

The local and regional context for the SCSE will have important implications for the design of both the facilities and programs for the center. The SCSE will be situated in the town of Lead, South Dakota, a short drive from Deadwood, South Dakota, and will reside within the context of the Black Hills, Badlands, and Lakes tourist region of the state. The following sections outline important considerations related to population demographics, the local and regional educational system, and attractions and tourism in this region.

**Population Demographics.** The estimated 2008 population for Lead was 2,892, and the adjacent town of Deadwood, which is less than five miles away, had an estimated population of 1,283 (with an estimated 900 year-round residents). Both towns are located within Lawrence County, which had an estimated population of 23,524 in 2008 (US Census, 2008).

The populations of both towns are predominantly white/non-Hispanic (96%, compared to 67% for the US) with a low percentage of households with individuals under 18 years (35% for Lead and 23% for Deadwood, compared to 36% for the US). The percentage of individuals with a Bachelor's degree or higher is 15% for Lead and 18% for Deadwood, compared to 24% for the US (US Census Bureau, 2000). Within Lawrence County, the population is also predominantly white (96%), with 30% of households including individuals under 18 years and 24% of individuals with a Bachelor's degree (US Census Bureau, 2000).

**Educational System.** There are 13 public school districts within 50 miles of Lead and 11 districts that are greater than 50 miles but less than 100 miles from Lead. In closest proximity to the location of the SCSE are the Lead/Deadwood school district, which serves 840 students in 4 schools, the Spearfish school district, which serves 1,974 students in 4 schools, and the Mead school district, which serves 2,548 students in 13 schools (National Center for Education Statistics [NCES], 2007-2008). For the Lead/Deadwood school district the dropout rate is 7.1 % and 48.3% of students are eligible for the Free/Reduced Lunch program (NCES, 2007-2008).

## MARKET ASSESSMENT & ANALYSIS REPORT

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**Attractions & Tourism.** The Homestake Visitor's Center in Lead reported over 40,000 visitors for 2009, and Deadwood is estimated to receive more than 1.5 million visitors annually. Deadwood was designated as a national historic landmark in 1961, and legalization of gambling in Deadwood in 1989 resulted in revitalization and increased development in the city. In addition to the historical and gaming industry attractions in the Lead-Deadwood area, the area includes outdoor attractions: the Mystic Miner and Terry Peak Ski resorts are nearby; and the proposed site of the SCSE is within walking distance of the George S. Mickelson Trail. Also of note is the proximity to the town of Sturgis which brings an estimated 400,000 visitors to the area in August for the annual Sturgis Motorcycle Rally.

Situated in the Black Hills, Badlands, and Lakes region of South Dakota, Lead is within about 48 miles of the State's biggest tourist attraction, Mount Rushmore, which reported 2,416,870 visitors for 2008 (National Park Service [NPS], 2008). Other major tourist attractions in the area include the Crazy Horse Memorial, Badlands National Park, Wind Cave National Park, Devils Tower National Monument (WY), and Jewel Cave National Monument. The closest national airport is 45 miles from Lead, in Rapid City – the second largest city in South Dakota with a population of 63,997.

### SOUTH DAKOTA CONTEXT

In addition to considering factors related to the local and regional context, it is important to take a broader look at the South Dakota context in which the SCSE will reside. The following sections outline important considerations related to population demographics, attractions and tourism, the educational system, and significant scientific research initiatives at the state level.

**Population Demographics.** South Dakota has a closely matched urban and rural population split with an urban population of 391,427 and a rural population of 363,417 as reported in the 2000 Census. The state showed a 6.5% increase in population from 2000 for a 2008 estimate of 804,194. In 2007, the per capita personal income was \$33,934 with an unemployment rate of 3% in that same year. The largest cities are Sioux Falls (151,505), Rapid City (63,997), and Aberdeen (24,410) as reported in 2008 (US Census Bureau, 2009).

American Indians make up approximately 8% of the population, and represent the largest minority ethnic group in the state. Major American Indian groups include the Dakota, Lakota, and Nakota people – collectively, the Sioux (South Dakota Governor's Office of Economic Development, 2009).

**Attractions & Tourism.** Tourism is the second largest industry in South Dakota. Popular visitor destinations include Mount Rushmore National Monument, Crazy Horse Memorial, Badlands National Park, Black Hills National Forest, the Sturgis Motorcycle Rally, Historic Deadwood, the Lewis & Clark Trail, Fort Sisseton Historical Park, and the Laura Ingalls Wilder Homestead (South Dakota Governor's Office of Economic Development, 2009).

**Educational System.** Approximately 90% of the population of South Dakota has a high school degree, ranking South Dakota 14<sup>th</sup> in the nation (2006). In comparison to other

states in the nation, South Dakota ranks eighth for Math SAT scores; third for Reading SAT scores; sixteenth for ACT scores; and first for students per instructional computer and students per high-speed Internet-connected computer (South Dakota Governor's Office of Economic Development, 2009). For the National Assessment of Educational Progress (NAEP) results, 41% of eighth-graders scored at or above the proficient level in science for South Dakota, compared to 27% for the US (NAEP, 2005); and 42% scored at or above the proficient level in math, compared to 34% for the US (NAEP, 2009). The state has four major technical institutes, six public universities, eleven private colleges and universities, and three tribal colleges.

**Scientific Research Initiatives.** According to the South Dakota Governor's Office of Economic Development, becoming a leader in research and technology development is an important goal for the state. Since 2003 the State of South Dakota has allocated over \$163 million to these efforts, and between 2004 and 2006, the State legislature established six Research Centers of Excellence on the campuses of the state's public universities. These include: Infectious Disease Research & Vaccinology; Accelerated Applications at the Nanoscale; Light-Activated Materials; Signal Transduction; Bioprocessing Research & Development; and Drought Tolerance Biotechnology. The major research centers include Avera Research Institute, EROS Data Center, Sanford Lab, Sanford Research, and Sun Grant Initiative. More recently an additional center, the Center for Ultra-low Background Experiments at DUSEL (CUBED) has been established.

South Dakota is designated as an Experimental Program to Stimulate Competitive Research (EPSCoR) State by the National Science Foundation (NSF), NASA, and other agencies. In 1980, the NSF established the EPSCoR program to help states establish self-sustaining academic research enterprises with the competitive capability to contribute to the states' economic viability and development. Current goals for South Dakota EPSCoR include: 1) increasing South Dakota's science and technology research capacity; 2) providing educational opportunities for K-12, undergraduate, and graduate students; and 3) promoting science-based economic development for the state. The other EPSCoR states in the region include Montana, Nebraska, North Dakota, and Wyoming. South Dakota also has an active Space Grant Consortium supporting mostly undergraduate and some K-12 education across the State.

### NATIONAL & INTERNATIONAL CONTEXT

Both the international network of underground laboratories and the broader context of science centers, visitor centers, and museums have important implications for the development of the SCSE. There are currently 19 major underground laboratories internationally, providing various degrees of educational outreach related to their scientific agendas. In 2000 nine of these institutions formed the Collaboration of European Low-Level Underground Laboratories (CELLAR) to facilitate joint research and collaboration. Given their range of experience with educational programming, existing underground laboratories and networks such as CELLAR, will be important sources of potential partners and resources for the SCSE.

With its public education agenda, the SCSE will also operate within a broader context of institutions that provide on-site and off-site public programming. Of particular relevance to the SCSE's mission to connect the public to cutting-edge research being conducted by

## MARKET ASSESSMENT & ANALYSIS REPORT

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DUSEL scientists, are other research institutions that provide public education programs and services, such as the Department of Energy Laboratories and NASA facilities across the country. To better understand the landscape of relevant public programming activities, following the preliminary attendance projections, this report provides important benchmark comparisons for local, regional, national, and international benchmark institutions.



### Preliminary On-Site Attendance Projections

This section presents preliminary annual attendance projections for the SCSE, and uses these projections as the basis for analyzing likely seasonal trends in attendance, examining visitor segmentation for the SCSE, and developing five-year attendance projections.

#### ANNUAL ATTENDANCE PROJECTIONS

Annual attendance projections for the SCSE were produced using the regression model described in Appendix A. The model was developed to provide attendance projections based on exhibit square footage and measures of regional demographics, population density, and tourism rates. A description of each of the inputs used to develop the SCSE attendance projections is provided below:

- *Exhibit Square Footage (10,000 sq. ft.)*. Plans for the SCSE as of November, 2009 call for up to 14,000 square feet of exhibit space. A conservative estimate of 10,000 square feet of exhibit space was used for the purpose of the model.
- *Percent of Total Students Participating in the Free & Reduced Lunch Program*. For the most recent academic year available in the National Center for Education Statistics database (NCES, 2007-2008), the percentage of students participating in the free and reduced lunch program for Lawrence County was 33%.
- *USDA Rural-Urban Continuum Code*. Based on the most recent USDA Rural-Urban Continuum code available (2003), Lawrence County is classified as a “nonmetro county with an urban population of 2,500-19,999, adjacent to a metro area.” This classifies the county as 6 on a scale from 1 (most urban) to 9 (most rural).
- *Per Capita Dollars Spent on Accommodations & Food Services*. Based on the most recent Economic Census data (2002), there were \$6,560.30 in accommodations and food services sales per capita for Lawrence County. In comparison to the other counties and independent cities included in the census, the per capita sales for Lawrence County rank 773 highest out of 2,943, reflecting the relatively high rate of tourism traffic through the area.

As described in Appendix A, the formula used to produce the *Projected* attendance estimate accounts for approximately 34% of the variability in attendance rates. The remaining variability in attendance rates is most likely due to programmatic and marketing considerations. Recognizing that actual attendance will vary from the *Projected* attendance for the SCSE based on programmatic and marketing decisions as yet to be determined, this report provides *Conservative* and *Possible* attendance estimates in addition to the *Projected* estimate. The *Conservative* and *Possible* projections were developed using an analysis of the residuals from the regression model to construct a range around the *Projected* value. The annual attendance estimates for the SCSE are provided in the table below.

**Table 1: Annual Attendance Estimates for SCSE**

Conservative	Projected	Possible
41,500	64,500	87,500

The *Conservative*, *Projected*, and *Possible* attendance estimates offer three different scenarios for visitation patterns for the SCSE. While the *Conservative* estimate may be achievable with limited marketing and programming, the *Possible* estimate would likely require extensive marketing efforts and strategically designed programming. The following sections use each of these scenarios as the basis for examining seasonal trends, visitor segmentation, and five-year projections for annual attendance for the SCSE.

## SEASONAL TRENDS

The following table provides monthly attendance estimates based on the *Conservative*, *Projected*, and *Possible* annual attendance estimates. As described in Appendix B, the monthly estimates were developed using five years of data for six cultural attractions in the Black Hills, Badlands, and Lakes region of South Dakota (Region 4).<sup>1</sup> These rates reflect a strong seasonal effect in attendance, with attendance for the months of May through September accounting for 85% of the total annual attendance.

**Table 2: Seasonal Attendance Estimates for SCSE**

Month	Rate	Conservative (41,500 annual)	Projected (64,500 annual)	Possible (87,500 annual)
January	1%	359	558	757
February	1%	569	884	1,199
March	2%	902	1,402	1,902
April	3%	1,178	1,831	2,483
May	11%	4,568	7,099	9,631
June	23%	9,558	14,856	20,153
July	23%	9,382	14,582	19,782
August	15%	6,326	9,832	13,338
September	14%	5,604	8,710	11,816
October	5%	2,065	3,210	4,354
November	1%	493	766	1,040
December	1%	496	771	1,045

The seasonal trend to visitor attendance will have important implications for both program and facilities planning. The SCSE will need to shift the focus of programming

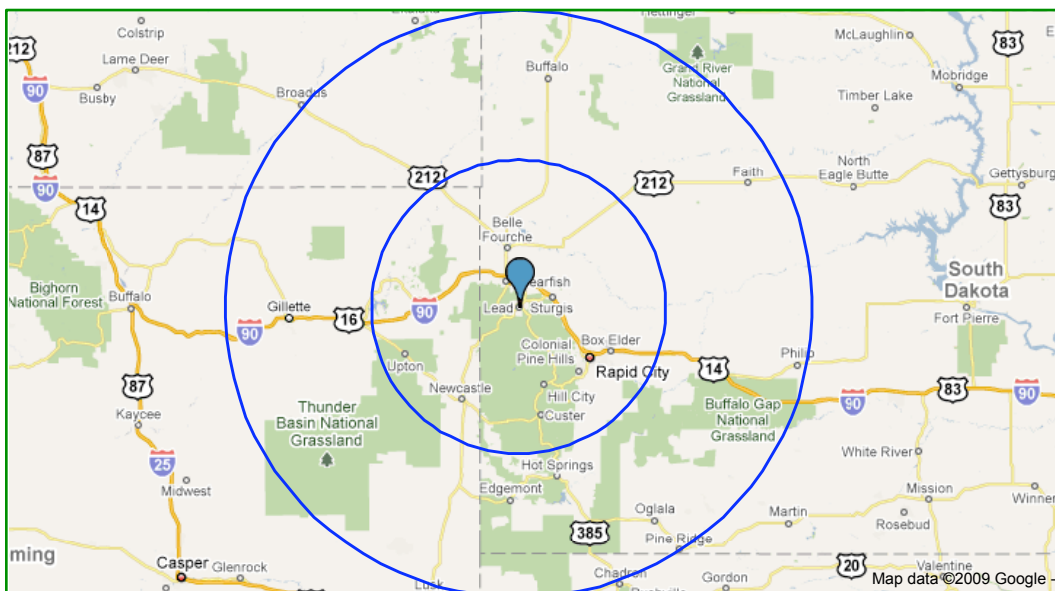
<sup>1</sup> Monthly attendance rates for 2004-2008 were obtained from the South Dakota Travel Monitoring System for: the Adams Museum, Badlands National Park, the Historic Adams House, Jewel Cave National Monument, Minuteman Missile National Historic Site, and Mount Rushmore National Memorial.

efforts throughout the year to accommodate the variations in on-site attendance. For example, programmatic efforts may shift between outreach/off-site efforts during the winter months and on-site services during the summer months, a pattern that will have important ramifications for SCSE staffing. In the case of facilities planning, the seasonal pattern indicates that applying the “design day” approach (Dexter Lord and Lord, 2001) to the *Possible* estimates requires that the SCSE facility accommodate up to nearly a thousand visitors on a given day<sup>2</sup>. However, using the same *Possible* attendance estimate scenario, the SCSE could also expect to see as few as 40 visitors on a Saturday during the winter season. This highlights the need for multipurpose spaces within the facility that can accommodate variations in programming and service needs throughout the year.

## VISITOR SEGMENTATION

The three major visitor segments that the SCSE will serve on-site include school groups, local and regional audiences, and tourist audiences. The geographic location of the SCSE is important in determining both the potential size and proportion of these visitor segments. The majority of school groups will travel no more than 2 hours for a one-day field-trip; local and regional audiences making a day trip to the SCSE are most likely to reside within one to two hours of the center, with a greater proportion of repeat visitors coming from within a one hour drive; and the SCSE’s location within the Black Hills, Badlands, and Lakes region of South Dakota, makes proximity to major tourist attractions, such as Mount Rushmore, an important factor in determining tourist visitation. Figure 1 below displays the 55 mile (corresponding to a one hour drive) and 110 mile (corresponding to a two hour drive) radii for the site of the SCSE.

**Figure 1: Map of 55 Mile and 110 Mile Radii for Lead, SD**



<sup>2</sup> Attendance for the “design day” is calculated based on the average weekly attendance estimate for the peak month (i.e. June/July) and assuming that 20% of these visitors visit SCSE on a Saturday.

The following sections outline the proportion of visitors that is likely to be attributable to each of the major visitor sectors and discuss the feasibility of these estimates based on industry standards for penetration rates within the geographic ranges defined above and the unique context of the SCSE.

**School Groups.** In comparison to other types of museums, the proportion of total attendance made up by school groups is highest among science and technology museums, a reflection of the industry’s emphasis on cultivating relationships with the educational system. School groups typically make up approximately 20% of the attendance for science and technology museums, compared to only 16% of that for history museums, which is the category of institutions with the next highest proportion of school groups (AAM, 2009). Table 3 below applies the science center industry standard of 20% to the *Conservative*, *Projected*, and *Possible* attendance estimates, and presents the potential penetration rates for public schools within the 100 mile and 50<sup>3</sup> mile radii of the SCSE based on these calculations.<sup>4</sup>

**Table 3: Annual School Group Attendance Estimates for SCSE**

	Conservative (41,500 total annual)	Projected (64,500 total annual)	Possible (87,500 total annual)
School Group Attendance	8,300	12,900	17,500
Penetration for Public Schools – 100 mi radius (144 schools, 35,839 students)	23%	36%	49%
Penetration for Public Schools – 50 mi radius (94 schools, 26,414)	31%	49%	66%

Source. School district enrollments from NCES, 2007-2008.

The penetration rates for public schools within a reasonable drive to the SCSE for a one-day field trip are useful for assessing the feasibility of obtaining the projected school group attendance figures<sup>5</sup>. Although the SCSE may seek to target a broad range of K-12 students through school group programs, the penetration rate for this audience will be affected by both 1) the number of schools seeking and supporting field trip experiences for students and 2) the grade spans to which the SCSE content and on-site experience most appeal.

Although most teachers and administrators value field trips as a supplement to in-class educational activities, time- and cost-constraints often reduce the number of classes that seek out these experiences. In particular, classes at the upper middle school and high school grade-levels are less likely to participate in field trips. This factor, coupled with

<sup>3</sup> These radii were used in place of the 55 and 110 mile radii to facilitate extraction of the data from the NCES database.

<sup>4</sup> Appendix C lists the 13 public school districts that are within 50 miles of Lead (including 10 in South Dakota and 3 in Wyoming) and the additional 11 districts that are greater than 50 miles but less than 100 miles from Lead (including 7 in South Dakota, 2 in Wyoming, and 2 in Montana).

<sup>5</sup> The SCSE may also draw school groups from private schools and home schooled students, but these students make up a small portion of the total student population.

## MARKET ASSESSMENT & ANALYSIS REPORT

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the degree of sophistication of the content planned for the SCSE, suggest that intensive outreach to schools and carefully designed exhibits and programs to engage younger audiences will be necessary if the SCSE is to achieve even the *Conservative* attendance estimates for school group audiences.

**Local/Regional Audiences.** Local and regional demographics play an important role in determining market penetration for science centers and museums. Despite on-going efforts among museums to engage underserved audiences, the majority of museum visitors tend to be well-educated and affluent groups with discretionary income to spend on educational experiences. Although the SCSE may ultimately reach underserved audiences through effective programming and outreach efforts, education and income-level remain important considerations when assessing the potential penetration for the SCSE within the local/regional populace.

Table 4 displays the population estimate, median household income, and percentage of residents with at least a Bachelor's degree for the South Dakota and Wyoming counties within a 50 or 100 mile radius of Lead, sorted on median household income. As shown in the table, with the exception of Campbell County, WY, the median household income for all of the counties is below that for the United States as a whole. Likewise, with one exception (Pennington County, which includes Rapid City), the percentage of residents with a Bachelors degree or higher is at or below the percentage for the United States as a whole. These demographics suggest that estimates for penetration of the local and regional markets should be more conservative, given that museums traditionally attract individuals and families from higher income and education levels.

**Table 4: Population Estimates and Demographics for Counties within a 50 or 100 Mile Radius of Lead, SD**

Distance	County	Population (2008 est.)	Median Household Income (2007)	Bachelor's Degree or Higher (2000)
100 mi	Campbell County (WY)	41,473	\$77,830	16%
<b>United States</b>			<b>\$50,740</b>	<b>24%</b>
100 mi	Crook County (WY)	6,457	\$49,890	18%
100 mi	Custer County (SD)	7,811	\$48,539	24%
100 mi	Weston County (WY)	7,022	\$47,853	15%
50 mi	Meade County (SD)	23,989	\$46,063	17%
50 mi	Pennington County (SD)	98,533	\$44,296	25%
50 mi	Lawrence County (SD)	23,524	\$41,356	24%
100 mi	Fall River County (SD)	7,145	\$39,107	19%
50 mi	Butte County (SD)	9,593	\$38,513	12%
100 mi	Harding County (SD)	1,145	\$34,729	18%

Source. U.S. Census Bureau.

## MARKET ASSESSMENT & ANALYSIS REPORT

Prepared for the Sanford Center for Science Education

Industry standards suggest that the penetration rate for the market within a one-hour drive of a science center is often in the range of 2-3% and the penetration rate for the market within a two-hour drive is approximately 1% (Caulton, 1998). These rates are useful for considering the range of proportion of total attendance that might be attributable to local and regional audiences based on the *Conservative*, *Projected*, and *Possible* attendance scenarios. Table 5 displays proportion of total annual attendance attributable to local/regional audiences based on four alternative penetration rates for the region within a two-hour drive of Lead, SD, with the most likely scenario (2%) indicated in gray.

**Table 5: Proportion of Total Annual Attendance Attributable to Residents within 100 Miles of Lead**

Penetration Rate for Market within 100 miles (N=226,692)	Conservative (41,500 total annual)	Projected (64,500 total annual)	Possible (87,500 total annual)
1% (2,267)	5%	4%	3%
2% (4,534)	11%	7%	5%
5% (11,335)	27%	18%	13%
10% (22,669)	55%	35%	26%
15% (34,003)	82%	53%	39%

Source. County population from U.S. Census Bureau, 2008 estimates.

The alternative scenarios shown above include penetration rates up to 15% of the local/regional market, because one study of science center market penetration found that it is unlikely for science centers to achieve an annual attendance that is greater than 35% of the population of the Metropolitan Statistical Area in which the science center is located (Gilligan and Allen, 2003). Thirty-five percent (35%) of the closest MSA for Lead (the Rapid City MSA) corresponds to approximately 15% of the population within a two-hour drive of Lead. While this scenario is not likely for the SCSE, especially given the demographics for the region, it is shown here to indicate that even under extremely optimistic projections for the local/regional market penetration rates, local and regional audiences may only account for 53% of the *Projected* estimated attendance. Based on this analysis, achievement of the *Conservative*, *Projected*, or *Possible* attendance estimates relies heavily on serving a high proportion of tourist visitors at the SCSE. Table 6 summarizes the proportions of annual attendance attributable to each major visitor segment (school groups, local/regional residents, and tourists) under the scenario in which the SCSE captures 2% of the local/regional market.

**Table 6: Distribution of Annual Attendance: School Groups, Residents & Tourists**

	Conservative (41,500 total annual)	Projected (64,500 total annual)	Possible (87,500 total annual)
School Groups	20%	20%	20%
Local/Regional Residents	11%	7%	5%
Tourists	69%	73%	75%

## MARKET ASSESSMENT & ANALYSIS REPORT

Prepared for the Sanford Center for Science Education

**Tourists.** Under the scenario described in Table 6, tourists would make up 69% to 75% of the annual attendance for the SCSE. Given that the SCSE will be located near the I-90 corridor and within 50 miles of Mount Rushmore, the base from which this tourist sector will be drawn are tourists traveling by motor vehicle along this corridor. Results from the most recent South Dakota Office of Tourism Intercept Study for which detailed results are available (Binder & Schaap, 2008) indicate that the majority of these tourists originate from Minnesota (11%), Wisconsin (8%), Indiana (7%), or Illinois (6%), and most are traveling to a destination outside of South Dakota, with a plan to spend approximately 5 days in South Dakota. Thirty percent (30%) of the tourists traveling by car have one or more children in their party.

A 2007 Mount Rushmore Visitor Survey (NPS, 2007) provides further information on the tourist demographic from which the SCSE may capture the tourist audience. The majority of the Mount Rushmore visitor groups included four or more individuals (41%), with 81% of the visitor groups representing family groups. Twenty-nine percent (29%) of visitors were ages 15 or younger. The results of these two studies suggest that the group of tourists traveling through South Dakota includes a substantial proportion of families with school-age children (up to one-third) – a primary public audience for science centers.

Table 7 displays annual tourist attendance estimates for the *Conservative*, *Projected*, and *Possible* attendance estimates and presents the percentage of South Dakota tourists, Mount Rushmore visitors, and Homestake Visitor Center visitors that each of these estimates represents. As shown in the table, although the estimates for tourists make up only 2% to 3% of the total visitors to Mount Rushmore, both the *Projected* and *Possible* estimates would require the SCSE to see more tourists than the Homestake Visitor Center saw in 2009.

**Table 7: Estimated SCSE Tourist Attendance as Percentages of Mount Rushmore & Homestake Visitor Center Attendance**

	Conservative (41,500 total annual)	Projected (64,500 total annual)	Possible (87,500 total annual)
Estimated SCSE Tourists Annually	28,635	47,085	65,625
Mount Rushmore 2008 (2,416,870)	2%	3%	4%
Homestake Visitor Center 2009 (44,713)	64%	105%	147%

Source. Mount Rushmore attendance from NPS, 2009; Homestake Visitor Center attendance from correspondence with the Executive Director of the Visitor Center.

Based on this analysis, in order for the SCSE to achieve the *Projected* or *Possible* annual attendance estimates, SCSE will need to pursue new marketing strategies and partnerships to draw tourists to Lead. This highlights the need for partnerships with regional institutions such as the Journey Museum in Rapid City, the Mount Rushmore National Monument, and the Crazy Horse Memorial. The results from the 2007 Mount Rushmore Visitor Survey, which indicated that 48% of visitors to Mount Rushmore visited Deadwood on their trip to the Black Hills area, suggest that local partnerships with

Deadwood-based institutions, such as the Adams Museum, are equally as important as these regional partnerships.

## FIVE-YEAR PROJECTIONS

Museums typically experience a surge in attendance in their first year of opening that reflects the excitement generated locally and regionally around the new institution and the large pool of first-time visitors to the museum. During the second year of operation, the institution can expect annual attendance to decline as much as 15-25% from the first year attendance, with a recovery to the first year attendance numbers typically achieved by years 5 or 6 of operation (Marstine, 2006; Gilligan and Allen, 2003).

Table 8 provides annual attendance projections for the SCSE for the first five years after opening. The *Conservative*, *Projected*, and *Possible* attendance estimates developed for the SCSE reflect the expectations for a “normal” operating year and do not include an inflation factor for the opening-year effect. Therefore, in producing five-year attendance projections for the SCSE, these attendance estimates are used as the Year 2 estimates. A conservative assumption of a 15% decline between opening year and Year 2 is used, because the high proportion of tourist visitors to the SCSE will reduce the effect of the opening-year phenomena. After Year 2, growth in attendance is expected to follow industry trends, and a 3% annual increase is assumed for Years 3 through 5.<sup>6</sup>

**Table 8: 5-Year Attendance Projections for SCSE**

	Conservative	Projected	Possible
Opening Year	47,725	74,175	100,625
Year 2	41,500	64,500	87,500
Year 3	42,745	66,435	90,125
Year 4	44,027	68,428	92,829
Year 5	45,348	70,481	95,614

The attendance estimates result in a recovery of the Opening Year attendance estimates by Year 7. As discussed in Appendix D, it is important to interpret the 5-Year Attendance projections with caution because they do not factor in the key programmatic and marketing decisions that SCSE will make both during the planning phase for the institution and in the years that follow. Key factors that may affect baseline attendance figures or result in spikes or dips in annual attendance patterns include:

- **Facilities Planning.** Both changes in assumptions about total and exhibit square footage and decisions about the addition of theatre, classroom, or auditorium space will impact visitor attendance. Closures during renovation periods will result in dips in attendance and re-openings will

<sup>6</sup> Appendix D provides an analysis of relevant industry attendance trends over time, and describes the assumptions underlying the attendance growth rates for Years 3 through 5.



## MARKET ASSESSMENT & ANALYSIS REPORT

---

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likely create spikes in attendance. All-weather facility access will also be a factor.

- **Programmatic Decisions.** Ultimately programmatic decisions for SCSE will determine visitor interest and engagement. This includes not only decisions related to content for permanent and temporary exhibits, but also decisions about other offerings such as camps, classes, and outreach programs. These programs not only attract new visitors to the science center, but also keep repeat visitors engaged. Key programmatic decisions during the planning period can affect baseline assumptions about attendance, and further market research will be necessary to refine attendance projections based on proposed programs, products, and services.
- **Traveling Exhibitions & Special Events.** Traveling exhibitions help to stimulate repeat visitation at the science center and sometimes engage audiences who would not otherwise visit the institution. Mounting and marketing a “blockbuster” exhibit at the SCSE during the peak tourist season could result in spikes in annual attendance, but these can be costly and may require topics beyond DUSEL research arenas to create that effect.
- **Regional Partners and Competitors.** Relationships with regional partners and competitors will affect attendance patterns. For example, building strong relationships with regional institutions such as Mount Rushmore will support stronger attendance rates among the tourist sector. Such a relationship may also make SCSE attendance patterns subject to factors related to the partner. For example, a temporary closure of Mount Rushmore could result in a dip in SCSE attendance.
- **Strategic Marketing.** One study of factors related to attendance trends after expansion of science center facilities found that the greatest percent increase in opening-year attendance results from increasing advertising expenditures in that year (Gilligan and Allen, 2003). Strategic marketing decisions for the SCSE in advance of the opening will not only impact baseline attendance figures, but will also determine whether initial attendance figures are sustained over time.

The attendance estimates outlined in this section of the report provide a starting place for assumptions about the range of possibilities in annual visitor attendance for the SCSE. Key decisions related to the factors described above will ultimately determine how the SCSE performs relative to this range. The subsequent sections of this report are devoted to profiling important local, regional, national, and international benchmark institutions. These comparisons should inform decisions about facilities, programs, partnering, and marketing for the SCSE to ensure that the institution achieves its attendance targets.

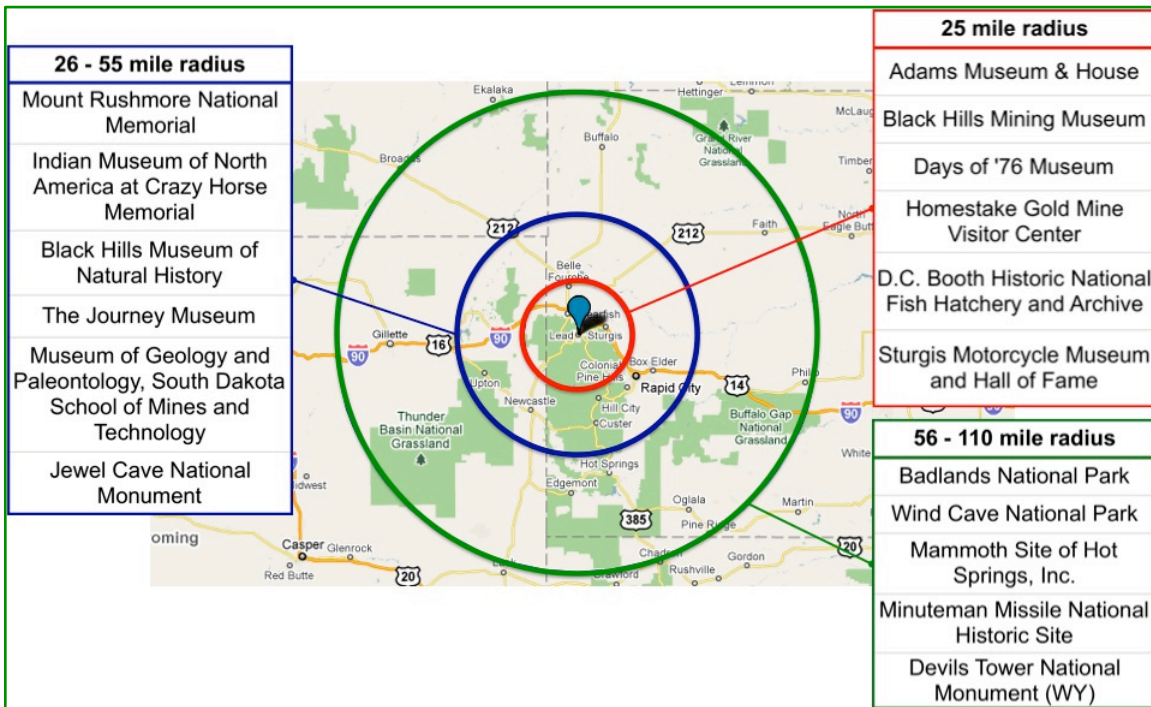
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## Local & Regional Comparisons

Local and regional institutions within the Black Hills, Badlands, and Lakes region of South Dakota were selected for enterprise comparisons. These institutions should be viewed as both potential competitors and partners. Data on these institutions inform assumptions about visitor attendance and provide useful pricing comparisons for the SCSE. For the purpose of this analysis, six institutions within a 25-mile radius of Lead were selected as local benchmark institutions and four institutions within a 110-mile radius of Lead were selected as regional benchmark institutions. In addition, comparisons of six national tourist destinations were included to inform planning for the tourist sector. Figure 2 shows each of the local and regional comparisons based on their distance from Lead.

**Figure 2: Map of Local Institutions within 25, 55, & 110 Mile Radii of Lead, SD**



LOCAL INSTITUTIONS

Local benchmarks are particularly useful for planning competitive admissions pricing, projecting attendance patterns, and identifying potential competitors and partners. Table 9 summarizes attendance, admission, and hours information for six institutions within 25 miles of the SCSE, with most of the institutions located in the Lead-Deadwood area.

**Table 9: Local Institutions**

Institution (Year founded)	Annual Attendance	On-Site Experience	Admission	Hours
D.C. Booth Historic National Fish Hatchery and Archive, Spearfish (1896)	150,000	Living fishery museum with interpretive programming; nature trail; 10-acre site.	Free	Grounds: dawn-dusk; Museum: May-Sept
Adams Museum (1930) & House (2000), Deadwood	82,500	Museum: Collection of artifacts related to history of the Black Hills; House: Victorian home tour	Free (Museum); Adults \$7 (House)	May-Sept 9-5; Oct-April 10-4
<b>SCSE</b>	<b>64,500</b>			
Homestake Gold Mine Visitor Center, Lead	44,713	Lead/Dead Visitor Information; Video describing history of the Homestake Mine; Open Cut viewing; Gold panning; Surface tour.	Free Tours: Adults \$6; Family \$20; Seniors \$5.25; Students \$5; Children under 6 Free	May-Sept 8-6; Oct-April 8-5
Sturgis Motorcycle Museum and Hall of Fame, Sturgis (2001)	26,000	Collection of motorcycles with interpretation of history of motorcycling.	Adults \$5; Seniors \$4; Children under 13 Free	Mon-Sun 10-4
Black Hills Mining Museum, Lead (1986)	20,000	12,000 sq. ft. exhibit space related to mining industry; Goldmine simulation tour; Gold panning	Adults \$6; Family \$20; Seniors \$5.50; Students \$5.25; Children under 7 Free	May-Sept 9-4; Oct-April Request
Days of '76 Museum, Deadwood (2004)	n/a	Historical collection of Deadwood artifacts (e.g. carriages, rodeo photos, costumes).	Free	April-Oct 9-5

Source. AAM (2009), institution websites, and telephone and email correspondence.

None of the institutions in the local area currently provide comparable on-site educational experiences to those planned for the SCSE. These comparisons suggest that the SCSE will occupy a unique niche within the local area, by providing opportunities for visitors to explore scientific content through interactive exhibits and experimental programming. Nonetheless, given that the SCSE will rely on a large proportion of tourists for its annual

## MARKET ASSESSMENT & ANALYSIS REPORT

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attendance, the SCSE must be sensitive to admissions pricing for the local institutions, because tourists are likely to make pricing comparisons when selecting local attractions to visit. With this in mind, it is important to note that the local benchmark institutions with the greatest annual attendance figures all offer free admission.

The seasonal trends in visitors to the local area are reflected in the Hours of Operation for the local benchmark institutions, with the majority of the institutions offering shorter opening times during the winter months. Adopting a similar approach for the SCSE would have important implications for staffing and programming. For example, the Adams Museum maintains a full-time staff of 10 but supplements with part-time staff during the summer, and structures programming to accommodate seasonal trends by offering more community outreach during the winter months.

Partnerships with Deadwood-based institutions will be especially important for drawing tourists to the SCSE, given that the town is a major tourist attraction for the State of South Dakota. Since limited stakes gaming was legalized in the town in 1989, funds from tax proceeds have supported a significant historic preservation effort for the town, which is designated as a National Historic Landmark. As a result, cultural attractions within the town have grown and continue to grow with new expansion efforts underway. For example, the Days of '76 Museum is currently engaged in a capital campaign to fund a new 32,000 square foot facility and the Adams Museum & House is planning for the opening of the Homestake Adams Research and Cultural Center, a facility that will include research space, classrooms, and a lecture hall. The growth and expansion of these Deadwood-based institutions highlights the importance of developing strong relationships with local partners to leverage opportunities for shared facilities and cross-marketing, and to prevent redundancy in programs and services.

In addition to considering the on-site visitor experiences provided by local institutions, it will be important for SCSE to consider the range of programs and off-site services offered by these institutions for planning purposes. Locally the Adams Museum & House is engaged in a number of these types of activities, including children's programs that typically sell out with 25 to 40 participants; lectures that attract 20 to 40 attendees; workshops for 15 to 20 participants; and concerts with audiences of 80 to 125.

### REGIONAL ATTRACTIONS

The regional attractions of interest for the SCSE include both national tourist destinations, such as Mount Rushmore, and regional benchmark institutions. They are discussed separately, because they inform different aspects of planning for the SCSE.

**National Tourist Destinations.** The major national destinations provide useful information related to the tourist visitor segment for the SCSE. Table 10 provides attendance, programming, admission, and hours information for the seven major national attractions in the Black Hills, Badlands, and Lakes region. With the exception of the Minuteman Missile National Historic site, all of these attractions feature outdoor experiences, and with the exception of the Crazy Horse Memorial, all of them are National Park Service sites. These attractions have very high attendance rates and are a major driver of the tourist industry in the Black Hills region.

# MARKET ASSESSMENT & ANALYSIS REPORT

Prepared for the Sanford Center for Science Education

**Table 10: Major National Attractions**

Institution (Year founded)	Annual Attendance	Programming	Admission	Hours
Mount Rushmore National Memorial, Keystone (1925)	2,416,870	lectures; films; summer evening amphitheater program; ranger conducted talks; permanent & temporary exhibits; film loan service.	Parking \$10	May-Aug 8am-10pm; Aug-Sept 8am-9pm; Oct-May 8am-5pm
Indian Museum of North America at Crazy Horse Memorial, Crazy Horse (1972)	1,000,000	Native American Cultural Center; conference facilities; outreach programs	Car \$27; Adults \$10; Children Under 6 Free; American Indians Free	Visitor Complex: Oct-Memorial Day 8am-5pm
Badlands National Park, Interior (1939)	845,734	slide talks; guided nature walks; hikes; night prowls & night sky observation; nature trails; fossil preparation demonstrations; films; touch screens.	Car \$15; Adults \$7	Ben Reifel Visitor Center: April-Oct 8am-5pm; Oct-April 8am-4pm;
Wind Cave National Park, Hot Springs (1903)	573,433	guided cave tours; lectures; campfire programs.	<i>Museum</i> Free; <i>Cave Tour</i> Adults \$9; Children 6-16/Seniors \$4.50	Daily 8am-4:30pm
Devils Tower National Monument, WY (1906)	336,303	hiking trails; rock climbing; interpretive programs	Car \$10; Adult \$5	Visitor Center: April/Nov Wed-Sun 9-5pm; May/Sept-Oct 9-5pm; June-Aug 8am-7pm; Dec-March Closed
Jewel Cave National Monument, Custer (1908)	100,481	cave tours; special events.	<i>Tour</i> Adults \$8; Children 6-16 /Seniors \$4; Children Under 6 Free	Visitor Center: May-Jun/Aug-Sept 8:30-5:30; Jun-Aug 8:30am-7pm; Oct-April 8:30-4:30
<b>SCSE</b>	<b>64,500</b>			
Minuteman Missile National Historic Site, Philip (1999)	30,615	tours	Free	Memorial Day to Labor Day Mon-Sat 8-4:30; Sept-May Mon-Fri 8-4:30

*Source.* All annual attendance figures for National Parks and Monuments are from the 2008 NPS recreational visitor counts (NPS, 2009). The annual attendance figure for Crazy Horse Memorial is from the 2010 AAM Directory. Sources for other data include AAM (2009), institution websites, and telephone and email correspondence.

## MARKET ASSESSMENT & ANALYSIS REPORT

Prepared for the Sanford Center for Science Education

The information on the national tourist attractions should inform plans to capture tourist audiences for the SCSE. Strategically planning peak-season programs and events to coordinate with operational hours and programs at these major tourist attractions and developing partnerships with these organizations will support efforts to capture the tourist market. With tourist audiences projected to make up over 60% of the annual attendance for the SCSE, an investment in activities that target these audiences will likely pay off. For example, developing a set of small DUSEL exhibits that can be installed in these sites would serve the dual purposes of informing a broader audience about the science of DUSEL and marketing the SCSE on-site experience to tourists at these destinations.

**Regional Benchmark Institutions.** Like the local benchmark institutions, the regional benchmark institutions provide essential pricing comparisons for the SCSE and lend insight into visitation patterns. Table 11 summarizes attendance, admissions, and operating hours information for the four regional benchmark institutions. As shown in the table, the attendance projections for SCSE place them in the middle of these institutions. The institutions with the highest annual attendance figures are in the southern area of the Black Hills region: the Mammoth Site is within a 20 minute drive of Mount Rushmore; the Black Hills Museum of Natural History is within a 20 minute drive of Wind Cave National Park; and both sites are less than a one hour drive from the Crazy Horse Memorial. The sites with the lower attendance figures are both located in Rapid City. This pattern highlights the significance of proximity to major national destinations as a factor for determining tourist traffic for regional institutions.

**Table 11: Regional Benchmark Institutions**

Institution (Year founded)	Annual Attendance	On-Site Experience	Admission	Hours
Mammoth Site of Hot Springs, Inc., Hot Springs (1975)	99,286	36,000 sq. ft. visitor center; Columbian mammoth exhibit; ice-age exhibit hall; tours of research areas; visiting scientist program	Adults \$8; Seniors \$7.50; Children 5-12 \$6; Children Under 5 Free	April-May/Sept-Oct 9-5pm; May-Aug 8-8pm; Nov-Mar 9-3:30pm
Black Hills Museum of Natural History, Hill City (1990)	76,465	4,000 sq. ft exhibit space featuring dinosaur and invertebrate fossil collection; field research station	Adults \$7.50; Seniors/Military \$6; Children 6-15 \$4; Children under 6 Free	Summer Mon-Sat 9-7, Sun 10-6; Fall Mon-Sat 9:30-5; Winter Mon-Fri 10-4:45, Sat 11-5; Spring Mon-Sat 9:30-5; Sun 12-4
<b>SCSE</b>	<b>64,500</b>			
The Journey Museum, Rapid City (1997)	31,896	Delivers content from prehistoric and historic collections through pioneer and Lakota themes	Adults \$7; Seniors \$6; Students \$5; Children under 11 Free	Summer Daily 9-5pm; Winter Mon-Sat 10-5pm, Sun 1-5pm
Museum of Geology and Paleontology, Rapid City (1885)	23,000	Permanent and temporary exhibits; new facility offers public viewing windows into laboratories	Free	Summer Mon-Fri 9-5pm, Sat 9-6pm, Sun 12-5pm; Winter Mon-Fri 9-4pm, Sat 10-4pm

Source. AAM (2009), institution websites, and telephone and email correspondence.

## MARKET ASSESSMENT & ANALYSIS REPORT

---

*Prepared for the Sanford Center for Science Education*

Although all of the regional benchmark comparisons deliver scientific content, they are primarily concerned with geological and paleontological phenomena. Like the analysis of the local benchmark comparisons, this analysis again suggests that the SCSE has the potential to occupy a unique niche within the Black Hills market by using interactive exhibits and programs to deliver content that focuses on cutting-edge scientific research. This presents the SCSE with the opportunity to distinguish itself from local and regional institutions by exploring innovative delivery mechanisms to communicate complex scientific topics to the general public.

Although distinguishing itself from local and regional competitors is essential, it is equally important for the SCSE to be attentive to the historical and cultural themes that local and regional institutions use to tie their educational experiences to the Black Hills region of South Dakota. Tourists seek experiences in South Dakota that are fundamentally connected to the region, and all of the local and regional benchmark institutions support visitor experiences that are grounded in the history and culture of the region. With this in mind, to encourage tourist traffic and provide a meaningful visitor experience for residents, the SCSE will need to work to integrate content themes related to the rich cultural and historical heritage of the area. Collaborations with the Homestake Adams Research and Cultural Center in Deadwood, which is home to the archival collection of the Homestake Mining Company, with the Crazy Horse Memorial, and with Tribal organizations in the State of South Dakota would likely be useful in this process.

### National & International Industry Comparisons

A review of the educational programming available through international underground research facilities provides a starting place for understanding the potential for public programming related to DUSEL. Appendix E provides a table of underground laboratories, with descriptions of their current educational programs and services. The majority of the underground laboratories do not provide on-site visitor experiences. Among the underground laboratories, the most extensive educational programming is currently being provided by the Belgian Nuclear Research Center, the Boulby Underground Laboratory, the Gran Sasso National Laboratory, the Modane Underground Laboratory, SnoLab, the Soudan Underground Mine Laboratory, and the Waste Isolation Pilot Plant.

Given the somewhat limited nature of educational programming among the underground laboratories, a broader look at industry trends was necessary. To better understand the potential for the SCSE related to attendance, admissions pricing, audiences, and K-12 school group and public programming, three types of institutional comparisons were selected: geographic comparison sites, national research facilities, and national and international observatories. Each of these groups of industry comparisons is briefly described below.

**Geographic Comparison Sites.** To specifically explore the factors affecting attendance patterns for facilities serving rural audiences and tourists, five sites were selected as geographic comparisons. All of these sites focus on geological, paleontological, and astronomical topics:

- *Museum of the Rockies, Bozeman, MT*
- *New Mexico Museum of Space History, Alamogordo, NM*
- *Wild Center, Tupper Lake, NY*
- *Fairbanks Museum and Planetarium, St. Johnsbury, VT*
- *College of Eastern Utah Prehistoric Museum, Price, UT*

**National Research Facilities.** The eight national research comparisons were selected for their association with a research facility. Each of these sites include in their mission an interest in educating the public on the research being conducted at their respective research facilities. As such, these comparisons provide important insights into how the SCSE can effectively connect public audiences to on-going, scientific research and build relationships between scientists and the public. All of the national comparison sites are supported by the U.S. government, except for the Ocean Science Exhibit Center, which is a visitor center associated with the private, yet heavily government-funded, Woods Hole Oceanographic Institute. The following is a list of the eight national sites that are included here as national research benchmarks.

- *American Museum of Science & Energy (AMSE) in Oak Ridge, Tennessee*
- *Bradbury Science Museum in Los Alamos, New Mexico*
- *Global Health Odyssey Museum in Atlanta, Georgia*
- *Lederman Science Center in Batavia, Illinois*



## MARKET ASSESSMENT & ANALYSIS REPORT

---

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- *National Center for Atmospheric Research (NCAR) Mesa Lab in Boulder, Colorado*
- *National Renewable Energy Laboratory (NREL) Visitors Center in Golden, Colorado*
- *Stennisphere Visitor Center in Hancock County, Mississippi*
- *Ocean Science Exhibit Center in Woods Hole, Massachusetts*

**National and International Observatories.** The observatories were chosen as comparisons because of their link to on-site research facilities and remote locations. They lend insights into both opportunities for connecting the public with authentic scientific research and into factors affecting tourist visitation patterns. The following is a list of the four observatories included as benchmark institutions.

- *Angel Ramos Foundation Visitor Center in Arecibo, Puerto Rico*
- *Frank N. Bash Visitor Center in Fort Davis, Texas*
- *Kitt Peak National Observatory in Kitt Peak, Arizona*
- *Parkes Observatory in Parkes, Australia*

The following sections summarize important industry trends related to each of these groups of institutional comparisons. While the review of the geographic comparisons focuses on an exploration of attendance trends for the geographically comparable institutions, the reviews of the national research facilities and national and international observatories takes a broader look at attendance patterns, public tour offerings, on-site audience, and K-12 school group and public programming for the institutions.

### GEOGRAPHIC COMPARISON SITES

A review of the AAM database of science-related institutions located in regions with a comparable population density to the SCSE location (based on their Urban-Rural Continuum Code) reveals that the only institutions with an annual attendance of 200,000 visitors or more are State and National Parks and Monuments (e.g. Morrow Mountain State Park, 201,970; Bandelier National Monument, 300,000; Petrified Forest National Park, 580,000; Mesa Verde National Park Museum, 623,000; and Canyon de Chelly National Monument, 1,000,000). In addition, even at the lower attendance levels, the institutions with a science-related mission in these regions tend to be nature centers or paleontology museums/sites.

In an effort to better understand the factors that contribute to attendance patterns for institutions with a science-related mission that serve tourists and rural audiences, the institutions listed in Table 12 were selected as geographic comparisons for the SCSE. It is important to note, that although these comparison institutions may reflect factors related to attendance trends for SCSE, they do not provide comparable educational experiences (they focus on geological, paleontological, and astronomical topics).

**Table 12: Geographic Comparison Sites Facilities & Admissions**

National Laboratory Comparisons	Annual Attendance	Building Square Footage		Admissions	Gift Shop	Other
		Gross	Exhibit			
Museum of the Rockies Bozeman, MT	116,180	94,800	32,600	Adult \$8.00 Child \$4.00	✓	Classroom, Planetarium
New Mexico Museum of Space History Alamogordo, NM	100,000	40,000	30,000	Adult \$3.00 Child \$2.50 Senior Citizen \$2.75	✓	Classroom, Theater, Planetarium
Wild Center Tupper Lake, NY	76,000	54,000	35,000	Adult \$14.00 Child \$9.00 Senior Citizen \$12.00	✓	Aquarium, Theater, Science Park
<b>SCSE</b>	<b>64,500</b>					
Fairbanks Museum and Planetarium St. Johnsbury, VT	40,000	21,500	18,000	Adults \$6; senior citizens & children 5- 17 \$4	✓	Planetarium
College of Eastern Utah Prehistoric Museum Price, UT	40,000	25,000	n/a	Adults \$5.00 Child \$2.00 Senior Citizen \$4.00	✓	Classroom, Art gallery

Source. AAM (2009), institution websites, and telephone and email correspondence.

The geographic comparison sites with the greatest annual attendance figures all see a high percentage of their annual attendance as tourists to the region: the Museum of the Rockies and the Wild Center estimate that up to 75% of their attendance is made up of tourists, and the New Mexico Museum of Space History estimates that up to 85% of their attendance is made up of tourists. The Museum of the Rockies works to attract tourists through partnerships with Yellowstone National Park and had recently developed a Yellowstone themed exhibit.

Although the attendance figures for the Museum of the Rockies are no doubt impacted by the museum’s Bozeman location (a city of approximately 87,000 residents in 2008 according to the US Census Bureau), the Museum nonetheless provides useful examples of how institutions can work to engage local rural and underserved audiences through ongoing outreach activities and public programs. The Museum of the Rockies offers an extensive range of outreach programs to K-12 schools and public audiences that reaches most of the communities with the State of Montana, including delivering educational trunks to schools around the state, providing free lectures to the public by resident and visiting paleontologists, and partnering with Montana State University to

## MARKET ASSESSMENT & ANALYSIS REPORT

Prepared for the Sanford Center for Science Education

offer university classes. The Museum of the Rockies has also developed a major fund-raising initiative, the *Opening Doors for School Children Fund*, to provide free admission to all students in Montana’s public school system. They note that the number of school group visitors has soared since this program began in 2005. They have also worked to engage American Indian audiences and incorporate American Indian themes through activities such as the development of a Native American Games Trunk, an exhibit hall devoted to American Indian themes, and on-going work to ensure that they address Montana’s Indian Education for All Standards.

### NATIONAL RESEARCH FACILITIES

Table 13 presents a description of the educational facilities available at the national research institutions included as comparisons, sorted by their annual attendance. Annual attendance figures for the national research facilities range from 22,400 (Lederman Science Center) to 85,000 (NCAR Visitor Center), with the attendance projections for SCSE falling near the average of 50,863. The American Museum of Science and Energy (at Oak Ridge National Laboratory) is the only site that charges a general admission fee, and this site reported a drop in attendance after they instituted this fee.

**Table 13: National Laboratories Educational Facilities & Admissions**

National Laboratory Comparisons	Annual Attendance	Building Square Footage		Auditorium seats	Admissions	Gift Shop	Other
		Gross	Exhibit				
NCAR Visitor Center Boulder, CO	85,000	n/a	10,000	120	Free	√	Classroom, Simulator
Bradbury Science Museum Los Alamos, NM	81,000	26,000	11,000	72	Free		Classroom, Theater
American Museum of Science and Energy Oak Ridge, TN	75,000	53,000	27,500	300	Adult \$5; Child \$3; Senior \$4	√	Classroom
<b>SCSE</b>	<b>64,500</b>	<b>35,000</b>	<b>10,000</b>	<b>300</b>			
Global Health Odyssey Museum Atlanta, GA	56,000	19,000	4,500	400	Free		Classroom
Stennis Space Center Hancock County, MS	40,000	14,000	13,000	250	Free	√	Simulator
NREL Golden, CO	25,000	6,900	2,346	75	Free		
Ocean Science Exhibit Center, Woods Hole, MA	22,500	n/a	n/a	45	Free	√	
Lederman Science Center, Batavia, IL	22,400	9,000	5,000	850*	Free	√	Classroom

Source. AAM (2009), institution websites, and telephone and email correspondence.

## MARKET ASSESSMENT & ANALYSIS REPORT

---

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All of the national comparison sites either have an auditorium in their building or have access to an auditorium in their adjacent research facility. Four out of eight national comparison sites also have a classroom within their visitor center for onsite classes. These facilities are of special note, because they support these institutions' efforts to engage the public through lecture series and classes that connect public audiences with the research agenda at their facilities.

**Connecting the Public with Scientists.** The majority of the national research facilities offer programs in which the public can interact with the scientists working at the facility, typically in the form of public lectures series. Examples of these programs include:

- *Global Health Odyssey Museum.* The Global Health Odyssey Museum allows teachers to interact with CDC researchers through their "Science Ambassadors" program. Students interact with the researchers at CDC during their camps. In addition, some of the public tours offered at the Global Health Odyssey Museum are guided by CDC staff members.
- *Lederman Science Center.* The Lederman Science Center ensures that all of their programs allow the public to interact with scientists working at the facility. Notably, the "Ask-A-Scientist" Program on select Sunday afternoons allows the public to talk directly with the scientists working at the facility. The Lederman Science Center also provides a once-a-month "behind-the-scenes" tour, in addition to their public tours.
- *NCAR Visitor Center.* The NCAR Visitor Center ensures that students interact with scientists at their facility during all of the scheduled field trips. In addition, NCAR tailors their group tours to the needs of the group. If the group has a strong interest in learning more detailed information about the scientists' work, the center will allow the tour group to interact with relevant scientists.

Although the majority of the national research facilities do offer programs in which the public can interact with scientists, representatives from these organizations emphasized the need to carefully balance public programming objectives with demands on the scientists' time. They also noted that many scientists would prefer not to interact with the public very often and that it is important to find ways to provide the public with a window into the work the scientists conduct without interfering with the scientists' work schedule.

**Public Tours of Research Facilities.** All except one of the national research sites (Bradbury Science Museum) provide tours of their facilities, and none of them charge for the tour. The number of visitors per year who attend the tours ranges from 225 to 32,000 visitors. This wide range in tour attendance is largely attributable to how the tours are structured, with some institutions offering tours only by special arrangement (such as the Ocean Science Exhibit Center) and others making the tour a highly integrated part of the visitor experience (such as the Stennis Space Center).

**Table 14: Research Facilities Tour Information**

National Research Facility	Annual Attendance	% of Visitors taking tours	Restrictions	Hours/Seasons
NCAR Boulder, CO	85,000	18% of visitors	None	Daily or by reservation
Bradbury Science Museum Los Alamos, NM	81,000	<i>No Tours Available.</i>		
American Museum of Science and Energy Oak Ridge, TN	75,000	<5% of visitors	10 years of age or older and a U.S. citizen	Monday-Friday 12-12:30, Summer Only
<b>SCSE</b>	<b>64,500</b>			
Global Health Odyssey Museum Atlanta, GA	56,000	30% of visitors	Provide government-issued i.d. and recommend middle school age or older	9 tours a week
Stennis Space Center Hancock County, MS	40,000	>80%	None	4 days a week
NREL Golden, CO	25,000	-----	Only for businesses and NREL stakeholders	Once a month or by reservation
Ocean Science Exhibit Center Woods Hole, MA	22,500	<1%	None	By reservation, Summer Only
Lederman Science Center Batavia, IL	22,400	n/a	High school age or older for specialty tour	5 per month or by reservation

Source. AAM (2009), institution websites, and telephone and email correspondence.

The Stennis Space Center requires visitors to participate in a tour to access the visitor center (unless they arrive by school or charter bus). This approach has the advantage of connecting the visitor to the scientific endeavors occurring in the community upon their arrival. While it is unlikely that an underground tour could, or should, be integrated into the SCSE experience in this manner, alternative approaches for providing visitors with the research context in which the visitor center is situated upon their arrival is an important consideration in the development of both the SCSE facilities and programs.

The policies for age restrictions for the national research facility tours are useful for informing decisions related to the underground tour experience at the SCSE. It is notable that not all of the age restrictions are related to safety considerations. The Odyssey Museum tour at the CDC, for example, discourages the participation of children below middle school age due to concerns that the content matter of the tours is too sophisticated to engage young audiences. As the underground tour experience for SCSE is developed it will be important to match the visitor experience to the target

## MARKET ASSESSMENT & ANALYSIS REPORT

Prepared for the Sanford Center for Science Education

audience. One important consideration is that the older demographic to which the tour is most likely to appeal is not the same demographic that is typically drawn to a hands-on science center (i.e. families with young children). Strategic development of on-site exhibits and programming will help to ensure a broad appeal for the SCSE on-site visitor experience.

**On-site Audiences.** The national research facility comparisons provide important insights into the types of audiences that are drawn to educational experiences connected to a research facility. Table 15 shows the annual attendance, school group attendance, primary visitor groups reported, and the geographical context of the national research facilities. The national research facilities vary widely in the primary groups that they serve, with some primarily serving tourist and local audiences and others targeting school groups and businesses. These variations likely reflect both the programmatic foci of these institutions (e.g. institutions that have devoted more resources to developing relationships with schools will likely see a greater percentage of school groups) and the location of the center (e.g. institutions that are located near a major tourist attraction are likely to see a higher percentage of tourist traffic).

**Table 15: Visitor Groups for National Research Facilities**

National Comparison	Annual Attendance	Annual School Group Attendance	Primary Visitor Group(s)	Nearby Attraction
NCAR Boulder, CO	85,000	12,000 (14%)	Local (50%); Tourists (50%)	Boulder (15 min)
Bradbury Science Museum Los Alamos, NM	81,000	2430 (3%)	Local (50%); Tourists (50%)	Bandelier National Monument (30 min); Santa Fe (50 min); Albuquerque (110 min)
American Museum of Science and Energy Oak Ridge, TN	75,000	15700 (21%)	Local (>50%); Tourists (<50%)	Knoxville (30 min); Smoky Mountains (110 min)
<b>Sanford Center Lead, SD</b>	<b>64,500</b>			
Global Health Odyssey Museum Atlanta, GA	56,000	42,000 (75%)	School groups (75%)	Emory University (1 min); Atlanta (15 min)
Stennis Space Center Hancock County, MS	40,000	10,500 (26%)	Tourists (75%)	I-10 Mississippi Welcome Center (25 min)
NREL Golden, CO	25,000	5,000 (20%)	Local/Businesses	The Rockies (15 min); Denver (20 min); Boulder (40 min)
Ocean Science Exhibit Center Woods Hole, MA	22,500	3,000 (13%)	Tourists (>50%)	Martha's Vineyard (55 min)
Lederman Science Center Batavia, IL	22,400	15,000 (67%)	School groups (67%)	Chicago (60 min)

Source. AAM (2009), institution websites, and telephone and email correspondence.

## MARKET ASSESSMENT & ANALYSIS REPORT

Prepared for the Sanford Center for Science Education

In addition to programmatic decisions, strategic partnerships have likely influenced the percentage of the audience groups seen by these institutions. For example, the American Museum of Science and Energy has forged relationships with the local visitor's bureau; the Bradbury Science Museum has partnered with a historical museum within walking distance of their location; and the Ocean Science Exhibit Center has partnered with the MIT Museum and the Ocean Explorium, a nearby institution.

The school groups visiting the national research facilities are primarily drawn from their local regions, and April tends to be the peak month for school group attendance. While the Stennis Space Center primarily serves elementary to middle school students, the National Laboratories primarily serve students in the middle school grades. This is likely due to the sophistication of the content presented through these educational experiences, and helps to inform decisions about the audiences that the SCSE will likely attract in absence of efforts to develop unique experiences to engage younger audiences.

**K-12 School & Public Programs.** The national research facilities offer a number of educational opportunities that extend their reach beyond their on-site programs. Although only one of the national facilities tracks overall attendance beyond general admission for the on-site experience, the breadth of program offerings among these institutions suggests that these on- and off-site K-12 school and public programs make up a substantial component of these enterprises. Table 16 summarizes the K-12 school and public program offerings for these institutions, sorted by their annual onsite attendance.

**Table 16: National Research Facilities – Programs & Services**

National Comparison	Annual Attendance	After-School	Classes/Demonstrations	Curriculum Materials	K-12 Outreach	Science Camps	Teacher Workshops
NCAR Boulder, CO	85,000		√		√	√	
Bradbury Science Museum Los Alamos, NM	81,000		√	√	√	√	√
American Museum of Science and Energy Oak Ridge, TN	75,000		√	√	√	√	√
Global Health Odyssey Museum Atlanta, GA	56,000	√	√	√	√	√	√
Stennis Space Center Hancock County, MS	40,000	√	√	√	√	√	√
NREL Golden, CO	25,000		√	√	√		√
Ocean Science Exhibit Center Woods Hole, MA	22,500		√	√			√
Lederman Science Center Batavia, IL	22,400	√	√	√	√	√	√

Source. AAM (2009), institution websites, and telephone and email correspondence.

NATIONAL & INTERNATIONAL OBSERVATORIES

Table 17 describes the educational facilities available at the national and international observatories included as comparisons, sorted by their annual attendance. The two sites with the highest attendance are both international sites, Parkes Observatory in Australia and Angel Ramos Foundation Visitor Center in Puerto Rico. Two of the four observatories charge a general admission fee, and the other two charge a fee for a tour instead.

**Table 17: National & International Observatories Educational Facilities & Admissions**

Observatories	Annual Attendance	Building Square Footage		Admission	Auditorium Seats	Gift Shop	Other
		Gross	Exhibit				
Parkes Observatory	110,000	n/a	n/a	Free*	-----	√	Theater
Angel Ramos Foundation Visitor Center	95,000	10,000	3,500	Adult \$6; Child \$4; Seniors \$4	40		Theater
<b>Sanford Center</b>	<b>64,500</b>						
Frank N. Bash Visitor Center	56,000	12,000	5,500	Adult \$8-10; Child \$7-8; Seniors discount	-----		Classroom, Theater
Kitt Peak National Observatory	50,000	5,265	2,500	Free*	-----		-----

Source. AAM (2009), institution websites, and telephone and email correspondence.

\* Institution charges a fee for the tour.

**Public Tours of Observatory Facilities.** Table 18 summarizes facility tour information for the national and international observatories. The two observatories that offer facility tours each use a different model for admissions pricing: the Frank N. Bash Observatory charges an admission fee for the visitor center, but does not charge a fee for the tour; and the Kitt Peak Observatory does not charge a general admission fee but does charge a tour fee. In choosing a pricing model for general admission and tours, the SCSE will need to explore alternative scenarios with attention to the implications of tour pricing for both general attendance and tour attendance as well as test a range of options with target market sectors to identify the most appropriate revenue-generating model.



**Table 18: Observatory Tour Information**

Observatory	Annual Attendance	Tour Fee	% of Visitors taking tours	Hours/Seasons
Parkes Observatory	110,000	<i>No Tours Available.</i>		
Angel Ramos Foundation Visitor Center	95,000	<i>No Tours Available.</i>		
<b>SCSE</b>	<b>64,500</b>			
Frank N. Bash Visitor Center	56,000	Free with General Admission*	60%	Daily
Kitt Peak National Observatory	50,000	Adults \$5.75-7.75; Children \$3-4.00	5-6%	Daily

Source. AAM (2009), institution websites, and telephone and email correspondence.

\* Additional \$7 fee for facility tour and Star Party.

**On-site Audiences.** The observatories were selected for their remote locations, so, like the SCSE, these institutions reside in areas with a small local population to draw from. As a result, the majority of visitors across the national and international observatories are tourists – frequently retirees. These observatories tend to be one of many stops during a tourist’s travels, typically as a part of a cross-country trip by motor vehicle. Some tourists also seek out these destinations because of their interest in astronomy, a popular science field.

**Table 19: Visitor Groups for National & International Observatories**

Observatory Comparison	Annual Attendance	Annual School Group Attendance	Primary Visitor Group (s)	Nearby Attraction
Parkes Observatory	110,000	38,500	Tourists (65%)	Goobang National Park (40 min); Sydney (330 min)
Angel Ramos Foundation Visitor Center	95,000	n/a	Tourists (>50%)	Caverns site (30 min); San Juan (60 min)
<b>Sanford Center</b>	<b>64,500</b>			
Frank N. Bash Visitor Center	56,000	5,500	Tourists (95%)	Big Bend National Park (240 min); Carlsbad Caverns National Park (280 min)
Kitt Peak National Observatory	50,000	1,213	Tourists (50%); Families (< 50%)	Tucson (60 min)

Source. AAM (2009), institution websites, and telephone and email correspondence.

## MARKET ASSESSMENT & ANALYSIS REPORT

Prepared for the Sanford Center for Science Education

The Angel Ramos Foundation and the Frank N. Bash Visitor Center are the only sites that reported a significant proportion of school group visitors. This is probably due to both the low population density of the areas from which these sites draw and may also reflect choices for programmatic emphasis. The sophistication of the content at these facilities, and the lack of an emphasis on interactive exhibits, likely makes them less of an attraction for families with young children as well.

**K-12 School & Public Programs.** Like the national research facilities, the observatories are engaged in a number of K-12 school and public programming activities beyond their on-site visitor experiences. However, the observatories are less likely to provide camps and after-school programs compared to the national comparison sites because their remote locations make these programs logistically challenging.

**Table 20: National & International Observatories – Programs & Services**

Observatory Comparison	Annual Attendance	After-School	Classes/Demonstrations	Curriculum Materials	K-12 Outreach	Science Camps	Teacher Workshops
Parkes Observatory	110,000		√		√		
Angel Ramos Foundation Visitor Center	95,000		√			√	√
<b>Sanford Center</b>	<b>64,500</b>						
Frank N. Bash Visitor Center	56,000		√	√	√		√
Kitt Peak National Observatory	50,000		√	√	√	√	

Source. AAM (2009), institution websites, and telephone and email correspondence.

### Initial Conclusions & Preliminary Recommendations

This report suggests a *Projected* SCSE attendance of 64,000 visitors per year with a *Conservative* estimate of what should be achievable with limited marketing and programming of 41,500 visitors and a *Possible* estimate that would require extensive marketing efforts and strategic programming of 87,500. These estimates provide a starting place for the range of possibilities in annual attendance for the SCSE. Key decisions related to facilities planning, programmatic offerings, exhibits and special events, regional partners and competitors, and strategic marketing will ultimately determine how the SCSE performs relative to this range. Important findings from the analyses of seasonal variations in attendance; visitor segmentation; and local, regional, national, and international industry benchmarks suggest:

- The annual attendance projections require a high penetration rate for regional school group audiences. Applying the science center industry standard that suggests 20% of annual attendance is made up of school groups, would require the SCSE to reach 23% of the public school students within a 100 mile radius of the SCSE for the *Conservative* attendance projection and nearly 50% of public school students within a 100 mile radius for the *Possible* attendance projection.
- The tourist segment will make up the largest proportion of visitors under all of the attendance projection scenarios: 69% for the *Conservative* scenario, 73% for the *Projected* scenario, and 75% for the *Possible* scenario.
- Seasonal variations in attendance will be an important factor in planning for the SCSE. Under the *Projected* scenario the SCSE may see nearly 15,000 visitors during the month of June and fewer than 600 during the month of January.
- The SCSE will occupy a unique niche among educational institutions within its local and regional environment. The majority of the institutions in the local area present historical and cultural content and the majority of regional institutions that address scientific content are primarily concerned with geological and paleontological phenomena.

These key findings provide the foundation for the following set of preliminary recommendations to inform future planning for the SCSE.

### PRELIMINARY RECOMMENDATIONS

**Recommendation 1: Facilities Size & Design.** Plans at the end of 2009 calling for a total facility size of 35,000-40,000 square feet and an exhibit space of 14,000 square feet are appropriate. Planning for the facility should include expansion possibilities to accommodate growth in visitation over time, and should ensure that the facility includes multi-purpose spaces to accommodate programmatic flexibility and seasonal variations in attendance.

Based on the review of the international and national benchmark institutions, two important features that should be included in the design of the facility are access to the nearby George S. Mickelson Trail and maximizing the institutions' proximity to the

## MARKET ASSESSMENT & ANALYSIS REPORT

---

*Prepared for the Sanford Center for Science Education*

DUSEL laboratories. The industry review suggests that given its location in a region that draws tourists for the scenic beauty, providing visitors with a connection to outdoor areas may be an important attractor for the SCSE. Likewise, it will be equally important to ensure that visitors experience the feel of the research community in which the SCSE is situated, both through tours of the underground facilities, and through other features such as the shared commons where visitors and researchers can mingle. These two components of the on-site experience are features that are most likely to make the SCSE a destination attraction by offering authentic educational experiences unavailable at other venues.

Although locating the SCSE at the site of the DUSEL laboratories will enhance the appeal of the visitor experience, it will require that access to the DUSEL campus accommodate visitor traffic to the center. With 20% of the *Projected* visitor attendance made up of school groups and an additional 75% made up of tourists, it will be essential to ensure that the road to the facility be easily accessible by school buses, tourist buses, and recreational vehicles. With appropriate planning and signage the visitor experience at DUSEL could begin upon arrival in Lead and continue on the journey up the hill with arrival at the SCSE on the DUSEL campus. Such planned and easy access will be essential to ensure that the SCSE achieves its annual attendance targets.

**Recommendation 2: Admissions Pricing.** The SCSE must be sensitive to admissions pricing for local and regional institutions, because tourists are likely to make pricing comparisons when selecting attractions to visit. The local benchmark institutions in the Lead-Deadwood area with the highest annual attendance all offer free admission to visitors. Adult admission for other local institutions ranges from \$5 to \$6, and adult admission for regional benchmark institutions ranges from \$7 to \$8. Market research should be undertaken to understand willingness to pay among the various visitor sectors in support of the development of a full admissions pricing model.

**Recommendation 3: Local & Regional Partnerships.** Developing strategic partnerships with local and regional institutions will be essential to ensure that the SCSE achieves its mission and on-site attendance targets. With the tourist audience projected to make up over 60% of the annual on-site attendance, the SCSE will need to leverage relationships with other institutions to ensure a broad exposure and reach in the tourist market. Partnerships with other institutions provide opportunities for the SCSE to strengthen connections to the rich cultural and historical background of the region and to cross-market to tourist groups. For example, developing a set of small DUSEL/SCSE exhibits for installation in select regional locations would serve the dual purpose of informing a broader audience about DUSEL and marketing the SCSE on-site experience to tourists at these locations. Potential partnerships should be explored with institutions such as the Mount Rushmore National Monument, the Crazy Horse Memorial, the Journey Museum, and the Adams Museum, to name a few.

**Recommendation 4: The Educational Enterprise.** Current plans for the SCSE call for the development of a center for science education that includes not only on-site visitor experiences but also K-12 teacher professional development programs, educational programming for undergraduate and graduate students, camps and classes, and outreach activities such as distance learning. This report focused primarily on the on-site experience and touches only briefly on the broad range of potential educational activities

## MARKET ASSESSMENT & ANALYSIS REPORT

---

*Prepared for the Sanford Center for Science Education*

that can engage public audiences in science-learning. To build a robust educational enterprise, the SCSE should undertake further research to explore current initiatives in each of the program areas of interest, with special attention to:

- *Programs for engaging the public with scientists;*
- *Partnerships between other museums and educational institutions;*
- *Programs to engage American Indian audiences.;*
- *Traveling exhibits and online media; and*
- *Programs working with undergraduate and graduate students.*

The unique context of the SCSE makes this work particularly important. The low population density and demographics of the region suggest that extensive outreach efforts will be needed to engage national and international as well as local and regional audiences in SCSE activities. Developing off-site programming for schools will also help to increase school group onsite attendance for the center. In addition, with American Indians making up the largest ethnic minority in the state, careful planning will provide the SCSE with the opportunity to serve as a national model for reaching this important underserved audience.

### **Recommendation 5: Need for Market Research and Strategic Business Planning.**

The work presented in this Market Assessment Report provides an early framework for a more comprehensive strategic planning process for the SCSE. As the SCSE planning process moves forward, the attendance projections and analysis provided in this report should serve as the foundation for a robust business planning process that ensures authentic stakeholder engagement, critical analysis, and development of successful enterprise strategies, as well as the creation of a sound financial model. This business planning process must be grounded in comprehensive market research that explores the interests and needs of local, regional, tourist, and school group audiences. This market research is an essential next step in the planning process for the SCSE and should begin immediately to keep pace with and inform the development of future plans for the SCSE.

## MARKET ASSESSMENT & ANALYSIS REPORT

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Prepared for the Sanford Center for Science Education

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*Prepared for the Sanford Center for Science Education*

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Appendices

APPENDIX A: DEVELOPMENT OF THE REGRESSION MODEL

The preliminary attendance projections were calculated from a regression model that was developed from a database of institutions from the American Association of Museums (AAM) Directory and the Association of Science-Technology Centers (ASTC) Sourcebook. The database included all of the institutions within the United States within the AAM category of *Science*, that were classified as *Academies, Associations, Institutes, and Foundations; Aeronautics and Space Museums; Anthropology and Ethnology Museums; Aquariums, Marine Museums and Oceanariums; Archaeology Museums and Archaeological Sites; Geology, Mineralogy and Paleontology Museums; Medical, Dental, Health, Pharmacology, Apothecary, and Psychiatry Museums; Natural History and Natural Science Museums; and Science Museums and Centers.*

The original AAM file included 1,419 cases in these categories, but only 245 of the cases included a record of the exhibit square footage for the institution. Data from the ASTC Sourcebook was used to increase the number of cases with a record of exhibit square footage to 364.

The purpose of the regression modeling effort was to develop an equation to predict annual visitor attendance, based on known characteristics of an institution related to 1) the facility; 2) regional demographics; 3) regional population density; and 4) tourism rates. The following table identifies the variables selected to reflect each of these characteristics and their associated sources<sup>7</sup>:

Variable Description	Source
<b>Facility:</b> <i>Institution- Exhibit Square Footage</i>	AAM (2009); ASTC (2009)
<b>Regional Demographics:</b> <i>County - Percent of Students Participating in Free &amp; Reduced Lunch</i> Children from families with incomes at or below 130% of the poverty level are eligible for free meals. Those with incomes between 130% and 185% of the poverty level are eligible for reduced-price meals.	National Center for Education Statistics (NCES), Common Core Dataset (2007-2008)
<b>Regional Population Density:</b> <i>County - USDA Rural-Urban Continuum Code</i> The Rural-Urban Continuum Codes were developed by the USDA as a classification scheme that distinguishes metropolitan counties by the population size of their metro area, and nonmetropolitan counties by degree of urbanization and adjacency to a metro area or areas. The metro and nonmetro categories are subdivided into three metro and six non-metro groupings, resulting in a nine-part county codification.	United States Department of Agriculture (2003)
<b>Tourism Rates:</b> <i>County - Per Capita Dollars Spent on Accommodations &amp; Food Services</i>	2002 US Economic Census

<sup>7</sup> The most recent data available at the time of the report were used in the analysis. Note that although the overall data from the 2007 US Economic Census were available at the time of the report, county-level data from the 2007 Economic Census were not available.



## MARKET ASSESSMENT & ANALYSIS REPORT

---

*Prepared for the Sanford Center for Science Education*

For each institution in the combined AAM/ASTC database, data from the sources listed above were merged into the dataset to create a file that included all of the variables of interest. This dataset served as the basis of the regression modeling procedure.

Approximately 20% of institutions in the sample were randomly selected for exclusion from the sample used to develop the regression model, so that they could be retained to independently validate the model (the split samples validation methodology). For the sample included in the modeling procedure, a standard multiple regression was performed between attendance as a dependent variable and the independent variables listed in the table above.

Results of the evaluation of assumptions for the regression procedure led to the transformation of each of the independent variables to reduce skewness and kurtosis. In addition, outliers were removed from the analysis. Based on the identification of outliers, only those institutions with an annual attendance of less than 500,000 and greater than or equal to 1,000 were included in the development of the regression model.

The final regression model is based on 241 institutions, and includes the variables *exhibit square footage* ( $\beta = .432$ ,  $p < .001$ ), *percent of students in the free and reduced lunch program* ( $\beta = .104$ ,  $p = .049$ ), *USDA Rural-Urban Continuum Code* ( $\beta = -.294$ ,  $p < .001$ ), and *Per capita dollars spent on accommodations and food services* ( $\beta = .119$ ,  $p = .029$ ).  $R$  for the regression was significantly different from zero,  $F(4, 236) = 32.49$ ,  $p < .001$ , with  $R^2$  at .36. The adjusted  $R^2$  of .34 indicates that the variables included in the model account for more than a third of the variability in annual visitor attendance.

The cross validation procedure was undertaken with the 50 institutions that were randomly selected for exclusion from the sample used to develop the model. A predicted annual attendance figure was generated for each institution using the regression equation generated from the sample of 241 institutions. The correlations between the predicted attendance and actual attendance for these institutions yielded a cross-validity coefficient of .695, and an  $R^2$  of .48. Thus, the cross-validation sample is better predicted by the regression equation than the sample that was used to generate the equation. This is a favorable finding, suggesting that the regression equation can be used to predict attendance for other samples.

APPENDIX B: DEVELOPMENT OF SEASONAL PROJECTIONS

Monthly attendance estimates were developed for the SCSE by applying the attendance rates for each month to the annual estimates. The monthly attendance rates were developed from an analysis of five years (2004-2008) of monthly attendance data for the Adams Museum, Badlands National Park, the Historic Adams House, Jewel Cave National Monument, Minuteman Missile National Historic Site, and Mount Rushmore National Memorial, based on data obtained from the South Dakota Travel Monitoring System.

As shown in the following table, across the five years of data for the six institutions, there was very little variability in the attendance rates attributed to each month. One notable difference concerns the rates for the summer months at the Adams Museum. The attendance rates for this attraction tended to be higher than that of the other Region 4 attractions for the month of May and lower than the other attractions for the month of August. Based on interviews with the Adams Museum staff, these differences in attendance patterns are likely due to the museum’s proximity to the Sturgis Motorcycle Rally, which occurs in mid-August, and corresponds to the end of the peak tourist season for the museum. Given that the location for the SCSE is likely to make it subject to similar patterns, the attendance figures for the Adams Museum were selected to serve as the basis of the monthly attendance projections for the SCSE.

	Range Across 6 Attractions/5 Years	Median Across 6 Attractions/ 5 Years	Overall Region - 2008	Adams Museum - 2008
January	Less than 1% - 3%	1%	1%	1%
February	Less than 1% - 2%	1%	1%	1%
March	1% - 4%	2%	2%	2%
April	2% - 5%	3%	3%	3%
May	5% - 14%	8%	8%	11%
June	15% - 24%	20%	16%	23%
July	22% - 40%	26%	26%	23%
August	13% - 26%	21%	23%	15%
September	5% - 14%	11%	14%	14%
October	2% - 5%	4%	4%	5%
November	1% - 4%	2%	1%	1%
December	Less than 1% - 2%	1%	1%	1%

Source. Analysis based on data from the South Dakota Travel Monitoring System (Center for Business Entrepreneurship and Tourism, Black Hills State University, 2009).

## MARKET ASSESSMENT & ANALYSIS REPORT

Prepared for the Sanford Center for Science Education

### APPENDIX C: LIST OF PUBLIC SCHOOL DISTRICTS WITHIN 100 MILES OF LEAD

The following table lists the 13 public school districts that are within 50 miles of Lead (including 10 in South Dakota and 3 in Wyoming) and the additional 11 districts that are greater than 50 miles but less than 100 miles from Lead (including 7 in South Dakota, 2 in Wyoming, and 2 in Montana). These school districts form the base of public school students within a reasonable distance for a one-day field trip to the SCSE.

District	Distance to Lead (mi)	Schools	Teachers	Total Students
LEAD-DEADWOOD SCHOOL DISTRICT 40-1 (SD)	0	4	90	840
SPEARFISH SCHOOL DISTRICT 40-2 (SD)	11.1	4	143	1974
MEADE SCHOOL DISTRICT 46-1 (SD)	13	13	192	2548
BELLE FOURCHE SCHOOL DISTRICT 09-1 (SD)	22.1	5	96	1275
CROOK COUNTY SCHOOL DISTRICT #1 (WY)	30.3	10	99	1111
NEWELL SCHOOL DISTRICT 09-2 (SD)	30.3	3	35	359
HILL CITY SCHOOL DISTRICT 51-2 (SD)	30.6	3	41	477
RAPID CITY AREA SCHOOL DISTRICT 51-4(SD)	33.7	29	874	13249
DOUGLAS SCHOOL DISTRICT 51-1 (SD)	37.6	6	188	2289
CUSTER SCHOOL DISTRICT 16-1 (SD)	41.2	6	74	944
WESTON COUNTY SCHOOL DISTRICT #1 (WY)	44.4	5	70	787
NEW UNDERWOOD SCHOOL DISTRICT 51-3 (SD)	49.4	3	21	291
WESTON COUNTY SCHOOL DISTRICT #7 (WY)	49.8	3	27	270
ALZADA ELEM (MT)	62.2			
HOT SPRINGS SCHOOL DISTRICT 23-2 (SD)	65.1	4	55	848
EDGEMONT SCHOOL DISTRICT 23-1 (SD)	72.7	3	14	126
ELK MOUNTAIN SCHOOL DISTRICT 16-2 (SD)	72.7	2		22
WALL SCHOOL DISTRICT 51-5 (SD)	79.5	4	24	253
HARDING COUNTY SCHOOL DISTRICT 31-1 (SD)	79.7	6	20	216

## MARKET ASSESSMENT & ANALYSIS REPORT

---

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District	Distance to Lead (mi)	Schools	Teachers	Total Students
CAMPBELL COUNTY SCHOOL DISTRICT #1 (WY)	79.5	20	584	7589
HAWKS HOME ELEM (MT)	82.8	1	1	9
OELRICHS SCHOOL DISTRICT 23-3 (SD)	85.1	3	15	126
NORTHEAST WYOMING BOCES (WY)	86.3	2	0	15
FAITH SCHOOL DISTRICT 46-2 (SD)	96.7	4	18	212
BIDDLE ELEM (MT)	99.6	1	1	9

*Source.* NCES, 2007-2008.

**APPENDIX D: DEVELOPMENT OF 5-YEAR PROJECTIONS**

After the opening year the annual attendance trends for the SCSE are expected to follow the broader trends for the industry. Three data sources are useful for gauging trends over time for the SCSE: 1) A cohort of 125 institutions that completed the Museum Financial Information Survey (MFI) in years 2002, 2005, and 2008 provides the best available source of museum industry attendance data over time (AAM, 2009); 2) attendance data from the Adams Museum provides information on attendance trends for the closest comparably sized institution to the planned site of the SCSE; and 3) the National Park Service (NPS) dataset provides attendance trends for four national parks and monuments in the region of South Dakota where the SCSE will be located (Region 4 - Black Hills, Badlands, and Lakes region of South Dakota).

The table below displays the percentage change in annual attendance for each institution from 2000 through 2008. The raw attendance figures for each institution were used to forecast annual attendance estimates for years 2009 through 2013, and the annual percent change for the forecasted attendance values is shown in the table for years 2009 through 2013. The forecasting methodology used to develop the projected values is comparable to that employed by the NPS to provide two-year forecasts for park and monument attendance<sup>8</sup>. However, the projections provided by NPS are based on five years of data, and those provided here use nine years of data.

**Percentage Change in Annual Attendance for Local and AAM Institutions**

Year	AAM MFI Change	Adams Museum Change	Rushmore Change	Badlands Change	Jewel Cave Change	Wind Cave Change
2000	N/A	N/A	-5%	16%	-4%	-12%
2001	1%	N/A	2%	-14%	-3%	-3%
2002	-4%	11%	14%	-5%	5%	25%
2003	10%	-4%	3%	-4%	-4%	8%
2004	-2%	17%	-8%	7%	-14%	-32%
2005	16%	4%	0%	-3%	-6%	3%
2006	-6%	13%	-2%	-8%	-5%	-3%
2007	-6%	2%	-7%	6%	8%	2%
2008	6%	-5%	-4%	-5%	-5%	-5%
<b>Forecasted Change from Previous Year</b>						
2009	3%	12%	6%	-5%	-9%	-2%
2010	2%	5%	-1%	-3%	-5%	-4%
2011	2%	4%	-1%	-3%	-5%	-4%
2012	2%	4%	-1%	-3%	-5%	-4%
2013	2%	4%	-1%	-3%	-6%	-4%

Source. Analysis based on data from NPS (2009) and Merritt & Katz (2009).

<sup>8</sup> A least squares linear regression analysis was performed for the time series data.

## MARKET ASSESSMENT & ANALYSIS REPORT

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As shown in the table, there is considerable variability in the change in attendance figures over time and between institutions. This variability makes it challenging to determine a reliable rate of change for future attendance for the SCSE. Nonetheless, some observations about the institutions and their observed and projected changes in attendance inform the selection of an appropriate value to support the development of five-year attendance estimates for the SCSE:

- The greatest growth in attendance is predicted for the Adams Museum, which saw large increases in annual attendance in both 2004 and 2006. These increases were probably partially attributable to the airing of the HBO series *Deadwood* during these years (the more modest increase in attendance for 2005 is likely due to the closure of the museum for renovation for three months during that year).
- The attendance trends for all of the NPS sites result in projections for decreases in attendance in the upcoming years. These projections are based on a decreasing trend in annual attendance for these sites since 2004, which probably corresponds to the slowing overall economy during this time-period.
- The projected attendance for the AMM MFI institutions shows a modest 2% to 3% increase in attendance per year. These projections are based on a group of institutions of various disciplines that reported a median attendance of 90,044 for fiscal years 2006-2008 and a media total square footage of 50,000 square feet.

Applying the different rates of growth to the SCSE attendance projections results in very different attendance scenarios, and it is unlikely that the factors associated with the growth in attendance for the institutions presented in the table accurately reflect the characteristics that will impact the growth trend for the SCSE. The projections for the Adams Museum are likely to be overly optimistic due to the phenomena of the HBO series, and those for the NPS sites are likely to be overly conservative because these sites are more subject to the declines in the overnight travel industry than the SCSE will be, and the model does not account for the economic recovery.

Based on these considerations and industry guidelines that suggest that museums typically see attendance figures comparable to those of their opening year by Year 5 or Year 6, an annual increase of 3% percent per year is used to produce the SCSE attendance estimates for Years 3 through 5. It is important to note that these estimates should be interpreted with caution, because they are higher than the forecasting models that factor the recent economic recession would predict. In addition, they do not reflect the as yet undetermined programmatic and marketing decisions that the SCES will make.

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### APPENDIX E: SUMMARY OF UNDERGROUND LABORATORY EDUCATIONAL EXPERIENCES

Institution	Description of Public Education Programs & Services
<b>Aspo Underground Laboratory Stockholm, Sweden</b>	Onsite exhibits Guided tours by reservation only
<b>Baksan Institute for Nuclear Research of the Russian Academy of Sciences Prielbrusye, Russia</b>	<i>Public program descriptions unavailable</i>
<b>Bore Underground Laboratory Bore, Italy</b>	<i>Underground laboratory description unavailable</i>
<b>Boulby Underground Laboratory Sheffield, United Kingdom</b>	<ul style="list-style-type: none"> <li>• Guided tours by reservation only</li> <li>• Currently installing live webcams within their underground laboratories for public viewing via their website</li> <li>• Presentations by staff/scientists</li> </ul>
<b>Canfranc Underground Laboratory Estacion, Spain</b>	<ul style="list-style-type: none"> <li>• May have tours available (website under construction)</li> </ul>
<b>Gran Sasso National Laboratory Assergi, Italy</b>	<ul style="list-style-type: none"> <li>• Group tour of external and underground structures on Saturdays and Sundays for a maximum of 46 people per day; Individual tours are provided on the first Sunday of every month.                             <ul style="list-style-type: none"> <li>○ Tour is free</li> <li>○ Must be 14 years of age or older</li> <li>○ Tour-bus accessible</li> </ul> </li> </ul>
<b>Grimsel Underground Laboratory Grimsel, Switzerland</b>	Online media center available via website 2 hour tour offered to the public <ul style="list-style-type: none"> <li>○ Tours offered Tuesday – Friday from June to October</li> <li>○ Admission is free</li> <li>○ Optional visitor to the Crystal Cave available</li> </ul>
<b>Hades Underground Laboratory- Belgian Nuclear Research Center Mol, Belgium</b>	<ul style="list-style-type: none"> <li>• No general public access</li> <li>• Bachelor, Masters, or PhD students have the opportunity to conduct their research work at its laboratories</li> </ul>
<b>Horonobe Underground Research Center Horonobe-cho, Japan</b>	General public access available
<b>Kamioka Observatory Hida Gifu, Japan</b>	<ul style="list-style-type: none"> <li>• Guided tours by reservation for research/university groups</li> <li>• Provides live feed of observatory at seven different museums</li> <li>• Website posts photos of the observatory for use by teachers and students</li> </ul>
<b>Laboratoire Souterrain de Modane Modane, France</b>	<ul style="list-style-type: none"> <li>• Guided tours available                             <ul style="list-style-type: none"> <li>○ Available Monday – Friday, 2pm – 5pm</li> <li>○ Free admission</li> </ul> </li> <li>• Virtual tour of the lab available via website</li> <li>• Onsite exhibits</li> <li>• School outreach</li> </ul>

## MARKET ASSESSMENT & ANALYSIS REPORT

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Institution	Description of Public Education Programs & Services
<b>Mont Terri Underground Laboratory</b> Mont Terri, Switzerland	Guided tours available <ul style="list-style-type: none"> <li>○ Free admission</li> </ul>
<b>National Earthquake Laboratory in South African Mines (NELSAM)</b> Bloemfontein, South Africa	<i>Public program descriptions unavailable</i>
<b>SnoLab</b> Greater Sudbury, Ontario, Canada	<ul style="list-style-type: none"> <li>• Partners with the Science North/Dynamic Earth, an interactive science center in Sudbury, Canada, to publicly display their work</li> <li>• Tours by reservation for research/university groups</li> <li>• Develops curriculum materials for students and teachers as an outreach initiative</li> <li>• Hosts Neutrino Geoscience meeting</li> </ul>
<b>Soudan Underground Laboratory</b> Minnesota Ely, Minnesota	Provides three types of tours: a tour of the Underground Mine, a tour of the High Energy Physics Lab, and a self-guided audio tour of the surface. <ul style="list-style-type: none"> <li>○ Group prices: nine dollars for a non-student and four dollars for a student, group size must be 10 people or more</li> <li>○ Individual price: ten dollars for an adult and six dollars for a child.</li> <li>○ The tours are generally provided Memorial weekend through September, every day of the week between 10 am and 4pm.</li> </ul>
<b>Tournemire Underground Laboratory</b> Tournemire, France	<i>Underground laboratory description unavailable</i>
<b>Tono Underground Laboratory</b> Tono, Japan	<i>Underground laboratory description unavailable</i>
<b>The Waste Isolation Pilot Plant (WIPP)</b> Carlsbad, New Mexico	<ul style="list-style-type: none"> <li>• Exhibit space within a separate office building               <ul style="list-style-type: none"> <li>○ Free admission</li> <li>○ 140-seat auditorium featuring behind-the-scenes video at the plant</li> <li>○ Occasional lectures</li> </ul> </li> </ul>
<b>Yucca Mountain Underground Laboratory</b> Yucca Mountain, Nevada	Online media center available via website

Source. Websites and telephone and email correspondence with the institution





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