

2005 Project Abstract

For the Period Ending June 30, 2009

PROJECT TITLE: Enhancing Civic Understanding of Ground Water
PROJECT MANAGER: Patrick Hamilton
AFFILIATION:..... Science Museum of Minnesota
MAILING ADDRESS:..... 120 W. Kellogg Blvd.
CITY/STATE/ZIP:..... St. Paul, MN 55102
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WEBSITE:..... www.smm.org
FUNDING SOURCE:.....Environment and Natural Resources Trust Fund
LEGAL CITATION:ML 2006, Chap. 243, Sec. 20, Subd. 2.

APPROPRIATION AMOUNT: \$.....\$150,000

Overall Project Outcome and Results

Ground water is a resource in great and growing demand in Minnesota. Yet many citizens are unaware of the links between land use and ground water and the interconnections between ground water and surface water. The Science Museum of Minnesota, with the help of many partners, created outdoor ground water exhibits for visitors to the Museum and a ground water classroom program for delivery to schools throughout Minnesota.

The creation of the Ground Water Plaza in the Science Museum of Minnesota’s outdoor science park, the Big Back Yard, significantly leveraged resources provided by LCMR. The Minnesota Ground Water Association provided \$20,463 to drill the artesian well that provides the water for the ground water exhibits. A gift of \$10,000 from the Toro Giving Program and in-kind donations from numerous entities also helped make the Ground Water Plaza possible.

Since its opening in August 2007, the Ground Water Plaza has become one of the key educational attractions in the Big Back Yard. About 40,000 people visit the park each summer season. The Big Back Yard and the Ground Water Plaza have become so popular as a destination for field trips that the Museum now sets aside two full weeks each September for exclusive use of the park by schools.

The Ground Water Classroom Program began visiting schools throughout Minnesota in spring 2008. The program reached a total of 50 schools and 7,324 students through spring 2009. Although the LCMR project, Enhancing Civic Understanding of Ground Water has concluded, the ground water classroom program will continue to be offered to schools. It is now included under the Water Residency heading on Science Museum of Minnesota’s residency program website - <http://www.smm.org/schools/atyourschool/residencies/>.

Project Results Use and Dissemination

The Science Museum and the American Museum of Natural History in partnership produced an internationally traveling exhibit about water that opened in New York City in November 2007. Two Ground Water Plaza outdoor exhibit components were modified for indoor use and replicated for inclusion in the 7,000 square-foot water exhibition. The National Ground Water Association provided \$54,000 to cover the cost of building these two ground water components. Two copies of the Water exhibition with its ground water components were produced – one to tour North American venues and the second for overseas venues. To date, 712,000 people have seen the Water exhibition with its ground water components and several million more will as the show continues to tour for several more years.

LCCMR 2005 Work Program Final Report
ENHANCING CIVIC UNDERSTANDING OF GROUND WATER

Date of Report:..... August 3, 2009
LCCMR 2005 Work Program Final Report
Date of Work Program Approval:..... May 19, 2006
Project Completion Date:..... June 30, 2009

I. PROJECT TITLE: ENHANCING CIVIC UNDERSTANDING OF GROUND WATER

Project Manager: Patrick Hamilton
Affiliation:..... Science Museum of Minnesota
Mailing Address: Department of Environmental Sciences and Earth-system Science
Science Museum of Minnesota
120 W. Kellogg Blvd.
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Web Address:..... www.smm.org

Location:..... St. Paul, Ramsey County

Total Biennial Project Budget:.....LCMR Appropriation: \$150,000
Minus Amount Spent: \$150,000
Equal Balance: \$0

Legal Citation: ML 2006, Chap. 243, Sec. 20, Subd. 2.

Appropriation Language:

\$75,000 in fiscal year 2006 and \$75,000 in fiscal year 2007 are appropriated to the Science Museum of Minnesota to create groundwater exhibits and a statewide traveling groundwater classroom program. This appropriation is available until June 30, 2009, at which time the project must be completed and final products delivered, unless an earlier date is specified in the work program.

II. AND III. FINAL PROJECT SUMMARY:

Ground water is a resource in great and growing demand in Minnesota. Yet many citizens are unaware of the links between land use and ground water and the interconnections between ground water and surface water. The Science Museum of Minnesota, with the help of many partners, created outdoor ground water exhibits for visitors to the Museum and a ground water classroom program for delivery to schools throughout Minnesota.

The creation of the Ground Water Plaza in the Science Museum of Minnesota’s outdoor science park, the Big Back Yard, significantly leveraged resources provided by LCMR. The Minnesota Ground Water Association provided \$20,463 to drill the artesian well that provides the water for the ground water exhibits. A gift of \$10,000 from the Toro Giving Program and in-kind donations from numerous entities also helped make the Ground Water Plaza possible.

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Since its opening in August 2007, the Ground Water Plaza has become one of the key educational attractions in the Big Back Yard. About 40,000 people visit the park each summer season. The Big Back Yard and the Ground Water Plaza have become so popular as a destination for field trips that the Museum now sets aside two full weeks each September for exclusive use of the park by schools.

The Ground Water Classroom Program began visiting schools throughout Minnesota in spring 2008. The program reached a total of 50 schools and 7,324 students through spring 2009. Although the LCMR project, Enhancing Civic Understanding of Ground Water has concluded, the ground water classroom program will continue to be offered to schools. It is now included under the Water Residency heading on Science Museum of Minnesota's residency program website - <http://www.smm.org/schools/atyourschool/residencies/>.

IV. OUTLINE OF PROJECT RESULTS:

Result 1: SMM Development of Outdoor Ground Water Education Exhibits

Description: The Science Museum of Minnesota will develop, design, fabricate, and install outdoor exhibits centered around a functioning artesian well. This work will include all outdoor signage and graphic display panels and includes all costs associated with the materials, supplies, and services needed to produce these exhibits and their interpretation.

Summary Budget Information for Result 1:	LCMR Budget	\$65,000
	Minus Amount Spent	\$65,000
	Balance	\$0

Completion Date:August 31, 2007

Result Status as of June 30, 2009

The development of the ground water classroom program did not end up requiring all of the resources originally budgeted for this work. The classroom program, furthermore, was delivered to 71 schools rather than the 72 initially forecasted. The resulting balance of \$3,527 was applied toward replicating one of the ground water exhibits in the Water traveling exhibition for year-around display in the Mississippi River Gallery inside the museum. This exhibit – porous stones – is based on the porous stone exhibits originally created for the outdoor Ground Water Plaza in the Big Back Yard. The total cost of the porous stones exhibit replica is about \$12,000, with \$8,500 of the total project cost being covered by funding from the National Center for Earth-surface Dynamics at the University of Minnesota.

Final Report Summary:

Since its opening in August 2007, the Ground Water Plaza has become one of the key educational attractions in the Museum's outdoor science park, the Big Back Yard. Exhibits were developed, designed, fabricated and installed for the purpose of helping museum audiences better understand 1) the interconnections between surface waters and water-table aquifers; 2) the hydrogeologic conditions that produce artesian well conditions; and 3) how water is able to flow through bedrock via primary and secondary porosity.

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The creation of the Ground Water Plaza significantly leveraged the resources provided by LCMR. The Minnesota Ground Water Association provided \$20,463 to drill the artesian well that provides the water for the ground water exhibits and that serves as the focal point for the whole plaza. A gift of \$10,000 from the Toro Giving Program and in-kind donations from numerous entities also helped make the Ground Water Plaza possible.

In September 2006, SMM and the American Museum of Natural History (AMNH) in New York City both learned that the other was developing a traveling exhibition about water. Both museums agreed in January 2007 to merge their separate exhibition projects into one collaborative traveling exhibition about water. In spring 2007, two exhibit components – porous stones and competing wells – being developed for the Ground Water Plaza were selected to be replicated for inclusion in the 7,000 square-foot traveling water exhibition. The National Ground Water Association agreed in September 2007 to provide \$54,000 to cover the cost of building these two ground water components for the Water exhibition (<http://www.amnh.org/exhibitions/water/>). Below is information on the international tour of the **Water** exhibit:

North America Tour

American Museum of Natural History	350,000 visitors
San Diego Natural History Museum.....	108,000 visitors
Science Museum of Minnesota, St. Paul.....	128,000 visitors
The Field Museum, Chicago	show in progress
Great Lakes Science Center, Cleveland.....	future venue
Natural History Museum, Dallas	future venue
Fernbank Science Center, Atlanta.....	future venue
Royal Ontario Museum, Toronto.....	future venue

Overseas Tour:

Singapore Science Center	126,000 visitors
5 th Annual World Water Forum, Istanbul, Turkey	show in progress
National Museum of Australia, Canberra.....	future venue
Instituto Sangari, São Paulo, Brazil.....	future venue

Total Water exhibition visitation to date..... 712,000 visitors

Result 2: SMM Development of Classroom Ground Water Education Programs

Description: The Science Museum of Minnesota will develop, design and fabricate classroom activities about how water actually moves underground. The focal point will be the development of a 3D visualization of ground water flow. This work will include all interpretive materials and consumable supplies needed to perform the classroom activities.

Summary Budget Information for Result 2:

LCMR Budget	\$20,200
Minus Amount Spent	\$20,200
Balance	\$0

Completion Date:August 31, 2007

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Result Status as of June 30, 2009

The incorporation of a 3D GeoWall display system into the ground water classroom program did not prove to be as useful as originally anticipated. While students enjoyed the additional element of 3D display, classroom spaces and configurations often were not conducive to the use of the portable GeoWall.

Final Report Summary:

Although the LCMR project, Enhancing Civic Understanding of Ground Water has concluded, the ground water classroom program will continue to be offered to schools. It is now included on SMM's residency program website - <http://www.smm.org/schools/atyourschool/residencies/>.

Result 3: Delivery Costs for Presenting Ground Water Education Programs to Schools Statewide.

Description: \$900 reimbursement to the Museum for each school to which it delivers the ground water education classroom program for a maximum of 72 schools statewide.

Summary Budget Information for Result 3:

LCMR Budget \$64,800
Minus Amount Spent \$64,800
Balance \$0

Completion Date: June 30, 2009

Result Status as of June 30, 2009

SMM originally estimated that the Ground Water Classroom Program would reach 8,600 6th through 12th grade students. The program instead reached 7,324. SMM decided to target this program to 8th grade earth science students because this grade provided the strongest alignment to state science standards and the greatest opportunity to build partnership between classroom teachers and local Soil and Water Conservation Districts. Focusing the program on just one grade resulted in fewer potential students as program recipients. Further reducing the numbers of students reached is that smaller rural schools often have less than 120 students in eighth grade or in middle school science classes.

Final Report Summary:

Region	School	City	# of Days	Sessions Taught	# of Students
1	Lafayette High School	Red Lake Falls	1	3	53
2	Little Falls Community Middle	Little Falls	1	5	350
2	Little Falls Community Middle	Little Falls	1	4	350
2	Little Falls Community Middle	Little Falls	1	5	350
2	Swanville Elementary	Swanville	1	4	100
2	Cyrus Elementary School	Cyrus	1	1	17
2	Minnewaska Intermediate School	Glenwood	1	3	75
2	Glacial Hills Elementary	Starbuck	1	1	14

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2	Morris Area High School	Morris	1	5	150
2	Staples-Motley Middle School	Motley	1	4	120
2	Long Prairie-Grey Eagle Middle	Long Prairie	1	6	200
2	New York Mills High School	New York Mills	1	2	60
2	Osakis High School	Osakis	1	3	62
2	Discovery Middle School	Alexandria	1	5	130
2	Discovery Middle School	Alexandria	1	3	78
2	Discovery Middle School	Alexandria	1	3	78
2	Evansville High School	Evansville	1	1	18
2	Prairie Wind Middle School	Perham	1	3	125
2	Rothsay Public School	Rothsay	1	1	9
2	Breckenridge Elementary	Breckenridge	0.5	3	54
2	St. Mary's School	Breckenridge	0.5	1	17
2	Campbell-Tintah Public School	Campbell	1	1	9
3	Chisago Lakes Middle School	Lindstrom	1	5	145
3	Chisago Lakes Middle School	Lindstrom	1	5	145
3	William Kelley High School	Silver Bay	1	2	31
3	Two Harbors High School	Two Harbors	1	4	88
3	Mora High School	Mora	1	5	141
3	Rush City High School	Rush City	1	3	63
3	North Branch Middle School	North Branch	1	5	151
3	North Branch Middle School	North Branch	1	5	155
4	Belgrade-Brooten-Elrosa Elementary	Brooten	1	4	100
4	Buffalo Community Middle School	Buffalo	1	5	145
4	Buffalo Community Middle School	Buffalo	1	5	145
4	Buffalo Community Middle School	Buffalo	1	5	145
4	Albany High School	Albany	1	3	90
4	South Junior High School	St. Cloud	1	5	160
4	South Junior High School	St. Cloud	1	5	160
4	Chaska Middle School West	Chaska	1	2	60
4	Chaska Middle School West	Chaska	1	5	125
4	Chaska Middle School West	Chaska	1	5	125
4	Anwatin Middle School	Minneapolis	1	5	151
5	Cedar Mountain High School	Morgan	1	1	35
5	Redwood Valley Middle School	Redwood Falls	1	5	146
5	ECHO Charter School	Echo	0	1	25

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5	St. John's Lutheran School	Redwood Falls	0	1	21
5	Wabasso School	Wabasso	1	4	96
5	Milroy Public School	Milroy	0	1	19
5	Red Rock Central School	Lamberton	0	1	40
5	Lac Qui Parle Valley High School	Madison	1	3	90
5	Dawson-Boyd High School	Dawson	1	2	34
5	Montevideo Middle School	Montevideo	1	4	128
5	MACCRAY Junior High School	Clara City	1	2	64
5	RTR Middle School	Russell	1	2	40
5	Canby High School	Canby	1	2	51
5	Marshall Middle School	Marshall	1	3	75
5	Marshall Middle School	Marshall	1	3	75
5	Yellow Medicine East High School	Granite Falls	1	3	74
5	JCC Middle School	Lakefield	1	3	77
5	Luverne Middle School	Luverne	1	4	100
6	Butterfield-Odin School	Butterfield	1	2	60
6	Madelia Public School	Madelia	1	4	90
6	St. Peter High School	St. Peter	1	3	60
6	St. Peter High School	St. Peter	1	3	60
7	Hollandale Christian School	Hollandale	1	1	18
7	Southwest Middle School	Albert Lea	1	5	129
7	Lanesboro Public Schools	Lanesboro	0.5	2	48
7	Rushford-Peterson Schools	Peterson	0.5	2	50
7	Mabel-Canton Schools	Mabel	1	1	17
7	Houston High School	Houston	1	2	32
7	Mabel-Canton Schools	Mabel	1	1	20
8	Laporte School	Laporte	1	4	100
8	Nevis School	Nevis	1	5	125
8	Park Rapids Century School	Park Rapids	1	5	125
8	Lake of the Woods Middle School	Baudette	1	2	43
8	Robert J. Elkington Middle School	Grand Rapids	1	5	160
8	Robert J. Elkington Middle School	Grand Rapids	1	4	128
8	Park Rapids Century School	Park Rapids	1	5	125

Grand Total

# of Days	Sessions Taught	# of Students
71	251	7,324

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V. TOTAL LCMR PROJECT BUDGET:

All Results: Personnel:	\$53,037
All Results: Development:	\$32,163
All Results: Other (72 schools @ \$900 for each school outreach program):	\$64,800
TOTAL LCMR PROJECT BUDGET:	\$150,000

Explanation of Capital Expenditures Greater than \$3,500

No capital expenditures greater than \$3,500 are anticipated.

VI. OTHER FUNDS & PARTNERS:

- A. Project Partners:** All project partners are donating their services to the project.
GeoWall Consortium, Department of Geology and Geophysics, University of Minnesota – Donation of GeoWall programming assistance
GJG Environmental Consultants – Donation of advisory assistance
Metropolitan Council Environmental Services – Donation of advisory assistance
Minnesota Association of Soil & Water Conservation Districts – Donation of school outreach assistance
Minnesota Department of Agriculture – Donation of ground water testing and advisory assistance
Minnesota Department of Transportation – Donation of bedrock core samples
Minnesota Ground Water Association – Donation of fundraising assistance
Minnesota Pollution Control Agency – Donation of advisory assistance
Pace Analytical Services, Inc. – Donation of ground water testing

B. Other Funds Being Spent During the Project Period: \$54,000 from the National Ground Water Association to replicate two of the Ground Water Plaza exhibit components for the touring Water exhibition.

C. Past Spending: The Minnesota Ground Water Association has raised \$24,255 as of 6/5/06 for *Result 1: Hands-On Outdoor Ground Water Education*. These funds were used to drill and finish off an artesian well in the Big Back Yard and to make other improvements to the Ground Water Plaza.

D. Time: July 1, 2006 through June 30, 2009. 36 of the proposed 72 school outreach programs are scheduled to take place during the 2008-2009 school year at a cost of \$32,400.

VII. DISSEMINATION:

Final Report Summary:

The Science Museum and the American Museum of Natural History in partnership produced an internationally traveling exhibit about water that opened in New York City in November 2007. Two Ground Water Plaza outdoor exhibit components were modified for indoor use and replicated for inclusion in the 7,000 square-foot water exhibition. The National Ground Water Association provided \$54,000 to cover the cost of building these two ground water components. Two copies of the Water exhibition with its ground water components were produced – one to tour North American venues and the second for overseas venues. To date, 712,000 people have seen the Water

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exhibition with its ground water components and several million more will as the show continues to tour for several more years.

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VIII. REPORTING REQUIREMENTS

Periodic work program progress reports will be submitted no later than January 31, 2007; October 31, 2007; June 30, 2008; February 28, 2009. A final work program report and associated products will be submitted by June 30, 2009.

Attachment A: Budget Detail for ML 2006, Chp. 243, Sec. 20, Subd. 2
 Project Title: ENHANCING CIVIC UNDERSTANDING OF GROUND WATER
 Project Manager Name: Patrick Hamilton

Trust Fund Appropriation: \$75,000 in fiscal year 2006 and \$75,000 in fiscal year 2007 are appropriated to the Science Museum of Minnesota to create groundwater exhibits and a statewide traveling groundwater classroom program. This appropriation is available until June 30, 2009, at which time the project must be completed and final products delivered, unless an earlier date is specified in the work program.

2005 LCMR Proposal Budget	Result 1 Budget:	Amount Spent (6/30/09)	Balance (6/30/09)	Result 2 Budget:	Amount Spent (6/30/09)	Balance (6/30/09)	Result 3 Budget:	Amount Spent (6/30/09)	Balance (6/30/09)	
BUDGET ITEM	Hands-On Outdoor Ground Water Education			Ground Water Classroom Program Development			Ground Water Classroom Program On The Road			TOTAL FOR BUDGET ITEM
PERSONNEL: Staff Expenses, wages, salaries –	36,852	36,852	0	16,185	16,185	0		0	0	53,037
Patrick Hamilton, project manager - responsible for all aspects of this project										0
Bette Schmit, exhibit developer - will develop the outdoor ground water exhibit										0
Peder Thompson, prototyper - will create the hands-on interactive experiences										0
Cary Forss, exhibit designer - will prepare a design for the outdoor ground water exhibit										0
Christine Johnson, graphic designer - will prepare the outdoor graphic panels										0
Tim Motzko, graphic labor - will print and mount the outdoor graphic panels										0
Dan Dahm, project production manager - will oversee exhibit construction										0
TBD, fabricators - will construct and install the outdoor ground water exhibits										0
Larry Thomas, director of school outreach - will develop the ground water program										0
TBD, education program developer - will assist Thomas in the program development.										0
Other direct operating costs - exhibit materials, supplies, and services and school outreach program materials, supplies, and services	11,148	11,148	0	4,015	4,015	0		0	0	15,163
Construction of outdoor ground water exhibit patio	17,000	17,000	0					0	0	17,000
Other - \$900 reimbursement to the museum for each school to which it delivers the ground water classroom program for a maximum of 72 schools statewide: • \$100 for six contact hours in each school (rate incorporates travel time to and from the school) = \$600 • Per diem for meals, lodging, and mileage - per commissioners' plan • Trip preparation work and coordination work with the MN Assoc. of Soil & Water Cons. Dist. of 4 hours per school venue @ \$24/hr. plus benefits = \$120							64,800	64,800	0	64,800
COLUMN TOTAL	65,000	65,000	0	20,200	20,200	0	64,800	64,800	0	150,000



SMM ground water classroom program @ William Kelley High School, Silver Bay (11-20-08)



SMM ground water classroom program @ Lafayette High School, Red Lake Falls (10-24-08)



SMM ground water classroom program @ Lafayette High School, Red Lake Falls (10-24-08)



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