

Form 9-1366
(Oct. 2005)

**U.S. Department of the Interior
U.S. Geological Survey
Joint Funding Agreement**

Customer #: SD009
Agreement #: 08C4SD000000033
Project #: 86489ZR, 00113
TIN #: 46-6000380
Fixed Cost Agreement Yes No

**FOR
WATER RESOURCES INVESTIGATIONS**

THIS AGREEMENT is entered into as of the 1st day of January, 2008, by the U.S. GEOLOGICAL SURVEY, UNITED STATES DEPARTMENT OF THE INTERIOR, party of the first part, and the City of Rapid City, South Dakota, party of the second part.

1. The parties hereto agree that subject to availability of appropriations and in accordance with their respective authorities there shall be maintained in cooperation for operation and maintenance of selected gaging stations, and for various hydrologic investigations including hydrogeologic data collection and analysis, ground-water tracers, numerical modeling, reconnaissance sampling for taste and odor causing organisms, storm water monitoring and preliminary paleoflood evaluation, herein called the program. The USGS legal authority is 43 USC 36C; 43 USC 50; and 43 USC 50b.
2. The following amounts shall be contributed to cover all of the cost of the necessary field and analytical work directly related to this program. 2(b) includes In-Kind Services in the amount of \$0.00.

(a) \$136,650.00 by the party of the first part during the period
January 1, 2008 to December 31, 2008

(b) \$140,000.00 by the party of the second part during the period
January 1, 2008 to December 31, 2008

- (c) Additional or reduced amounts by each party during the above period or succeeding periods as may be determined by mutual agreement and set forth in an exchange of letters between the parties.
- (d) The performance period may be changed by mutual agreement and set forth in an exchange of letters between the parties.

3. The costs of this program may be paid by either party in conformity with the laws and regulations respectively governing each party.
4. The field and analytical work pertaining to this program shall be under the direction of or subject to periodic review by an authorized representative of the party of the first part.
5. The areas to be included in the program shall be determined by mutual agreement between the parties hereto or their authorized representatives. The methods employed in the field and office shall be those adopted by the party of the first part to insure the required standards of accuracy subject to modification by mutual agreement.
6. During the course of this program, all field and analytical work of either party pertaining to this program shall be open to the inspection of the other party, and if the work is not being carried on in a mutually satisfactory manner, either party may terminate this agreement upon 60 days written notice to the other party.
7. The original records resulting from this program will be deposited in the office of origin of those records. Upon request, copies of the original records will be provided to the office of the other party.

Form 9-1366
continued

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- 8. The maps, records, or reports resulting from this program shall be made available to the public as promptly as possible. The maps, records, or reports normally will be published by the party of the first part. However, the party of the second part reserves the right to publish the results of this program and, if already published by the party of the first part shall, upon request, be furnished by the party of the first part, at costs, impressions suitable for purposes of reproduction similar to that for which the original copy was prepared. The maps, records, or reports published by either party shall contain a statement of the cooperative relations between the parties.
- 9. USGS will issue billings utilizing Department of the Interior Bill for Collection (form DI-1040). Billing documents are to be rendered quarterly. Payments of bills are due within 60 days after the billing date. If not paid by the due date, interest will be charged at the current Treasury rate for each 30 day period, or portion thereof, that the payment is delayed beyond the due date. (31 USC 3717; Comptroller General File B-212222, August 23, 1983).

U.S. Geological Survey
United States
Department of the Interior

City of Rapid City, SD

USGS Point of Contact

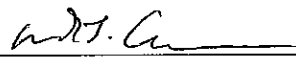
Customer Point of Contact

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Signatures

Signatures

By  Date 1/23/08
Name: Mark T. Anderson
Title: Director, SD Water Science Center

By _____ Date _____
Name:
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By _____ Date _____
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ATTEST: _____
Jim Preston, Finance Officer

**WORK PLAN FOR USGS ACTIVITIES DURING 2008 IN COOPERATION
WITH RAPID CITY, SOUTH DAKOTA**

Prepared for

City of Rapid City

by

U.S. Geological Survey

South Dakota Water Science Center

1608 Mountain View Road

Rapid City, South Dakota 57702

January 23, 2008

INTRODUCTION

The U.S. Geological Survey (USGS) and the city of Rapid City have had a long-term cooperative relationship to conduct hydrologic investigations to better understand the complex system that supplies water resources to Rapid City and the surrounding area. The 2008 Work Plan was designed to assist the City with hydrologic data and additional interpretive information that is relevant to (1) providing a sustainable, high-quality, regional water supply, (2) protecting ecological resources, and (3) assessing public safety. Funding will be provided through a 50/50 cost-share arrangement between USGS and Rapid City.

WORK PLAN ACTIVITIES FOR 2008

Planned activities for 2008 are described in seven categories below. Monitoring of Rapid Creek streamflow and water-levels in the Madison and Minnelusa aquifers are described in sections (1) *streamflow gaging* and (2) *hydrogeologic data collection and analysis*. Study efforts to characterize the Madison and Minnelusa aquifers are described in sections (3) *ground-water tracers* and (4) *numerical modeling*. This effort includes the publication of two scientific reports that describe ground-water mixing at a city production well and numerical modeling of the aquifers. Documentation of analysis of algae and water samples from Rapid Creek for taste and odor causing organisms is described in section (5) *reconnaissance sampling of taste and odor causing organisms*. Analysis of storm water runoff is an important issue for Rapid City in the coming years and preliminary sampling and planning efforts are described in section (6) *storm water monitoring*. A reconnaissance investigation of the feasibility of studying large historic flood events in Rapid Creek is described in section (7) *preliminary paleoflood evaluation for Rapid Creek*. Total proposed funding for the program and an approximate distribution of funding between these programmatic areas are discussed in the final section of this work plan.

(1) Streamflow Gaging

The proposed streamflow-gaging program (table 1) would essentially be identical to the 2007 program, with an inflationary increase of 3.1 percent in the annual operational cost of a gage. Total funding from the City for the gaging program would consist of \$19,931 that would be matched by USGS with \$16,581 of Federal Matching Funds and \$3,350 from the National Stream Information Program (NSIP).

Proposed gaging program for water year 2008 -- City of Rapid City

Site/Cooperators	Unmatched Federal	Local & State Cooperators	USGS Match	Total
Rapid Creek at Rapid City (06414000)				
US Army Corps of Engineers	\$6,700			\$6,700
USGS NSIP Funding			\$3,350	\$3,350
Rapid City		\$3,350		\$3,350
Subtotals	\$6,700	\$3,350	\$3,350	\$13,400
Rapid Creek below Sewage Plant (06418900)				
Rapid City		\$6,700	\$6,700	\$13,400
Subtotals		\$6,700	\$6,700	\$13,400
Rapid Creek near Farmingdale (06421500)				
DENR		\$3,350	\$3,350	\$6,700
Rapid City		\$3,350	\$3,350	\$6,700
Subtotals		\$6,700	\$6,700	\$13,400
Rapid Creek at Water Treatment Plant (06413720; telemetry and stage record)				
Rapid City		\$2,200	\$2,200	\$4,400
Subtotals		\$2,200	\$2,200	\$4,400
2 gages - Rapid Cr blw Pactola (06411500) and Castle Cr blw Deerfield (06410000; operated March thru Sept))				
USBR	\$5,776			\$5,776
Rapid City		\$4,331	\$4,331	\$8,662
SDGF&P		\$2,165.50	\$2,165.50	\$4,331
RVWCD		\$2,165.50	\$2,165.50	\$4,331
Subtotals	\$5,776	\$8,662	\$8,662	\$23,100
Summary of funding for all gages				
	Rapid City	Others	USGS	Total
Rapid Creek at Rapid City	\$3,350	\$6,700	\$3,350	\$13,400
Rapid Creek below Sewage Plant	\$6,700		\$6,700	\$13,400
Rapid Creek near Farmingdale	\$3,350	\$3,350	\$6,700	\$13,400
Rapid Creek at Water Treatment Plant	\$2,200		\$2,200	\$4,400
Rapid Creek below Pactola and Deerfield	\$4,331	\$10,107	\$8,662	\$23,100
Total Funding	\$19,931	\$20,157	\$27,612	\$67,700

(2) Hydrogeologic Data Collection and Analysis

Water-level monitoring will be continued at nine observation wells that are completed in the Madison and Minnelusa aquifers. Selected new wells completed in the Madison and Minnelusa aquifers will be inventoried and relevant information will be entered into the USGS ground-water data base. Site visits will be made to determine accurate locations, land-surface and water-level altitudes. Water samples will be collected from production well RC-12 when production begins to document initial concentrations for selected age-dating and environmental tracers. The purpose of this limited sampling would be to provide base line data for potential future analysis of ground-water mixing for well RC-12, which would be similar to the analysis being published for RC-11, as described under the next heading (*Ground-water Tracers*).

(3) Ground-water Tracers

Ground-water tracing efforts will include publication of a scientific journal article describing changes in ground-water mixing with time for Rapid City production well RC-11. The analysis models a time-series of age-dating tracers and categorizes the age distribution of the water over time. A draft of the article has been prepared and submitted to the Water Resources Research Journal. The only work that remains for 2008 will include making revisions in response to outside technical reviews and final formatting of the document for publication.

(4) Numerical Modeling

Numerical modeling efforts during 2008 will include completion of a draft USGS report documenting calibrated steady state and transient models of the Madison and Minnelusa aquifers. Following the ensuing review and revision process, this document will be published as a USGS Scientific Investigations Report. An analysis of the effects of pumping and drought stress on water levels and artesian spring discharges (including the Jackson/Cleghorn spring complex) will be included in the report. Future uses of the model could include an analysis of water-level declines and reductions in spring discharges that could be expected from additional pumping withdrawals.

(5) Reconnaissance Sampling for Taste and Odor Causing Organisms

Micro-organisms are present in some natural water and streambed sediments that can cause taste and odor problems when the water is chlorinated and finished for drinking water. During periods of high water demand, primarily during the irrigation season, Rapid City augments its ground-water supply with surface-water from Rapid Creek. Taste and odor problems have

occurred in the past in Rapid City (1988 and 1999). In 2007, eleven sites in Rapid Creek and Canyon Lake were sampled and analyzed for the algal species present in the water column and attached to surfaces in the stream. This analysis includes quantification of cyanobacteria species, which are known to release taste and odor compounds. The information will be documented in 2008 with a USGS data series report that will be published online. This report will include a site location map, description of sites, and summaries of sampling methods. The results of laboratory analyses for phytoplankton and periphyton algae in samples will be presented in Microsoft Excel spreadsheet format.

(6) Storm Water Monitoring

Rapid City is in the process of implementing programs to improve storm water quality, in response to Phase 2 Storm Water guidelines issued by the U.S. Environmental Protection Agency. The City has requested that the USGS provide assistance in developing strategies for a storm water monitoring plan and in implementing a monitoring program. USGS staff will work with City staff to evaluate existing relevant information, strategize regarding monitoring needs, and work towards implementation of appropriate monitoring programs.

(7) Preliminary Paleoflood Evaluation for Rapid Creek

The USGS recently completed a reconnaissance-level paleoflood study for the Black Hills area, in cooperation with the South Dakota Department of Transportation (SDDOT). Results are reported in Completion Report No. SD2005-12F that is available on the SDDOT Office of Research web page at:

[http://www.state.sd.us/Applications/HR19ResearchProjects/oneproject_search.asp?projectnbr=S
D2005-12](http://www.state.sd.us/Applications/HR19ResearchProjects/oneproject_search.asp?projectnbr=S
D2005-12)

USGS and DOT currently are engaged in a planning process to begin full-scale implementation of paleoflood investigations for several selected drainages in the Central Black Hills area. Rapid Creek has been identified as one of several potential priority drainages. A paleoflood investigation for Rapid Creek would be very complicated because: (1) a paleoflood record (derived from geologic deposits) for Rapid Creek at Rapid City could potentially extend as much as many thousands of years before present; (2) however, a large part of the drainage area has been regulated by Pactola Reservoir since the 1950s. Preliminary reconnaissance efforts along Rapid Creek have indicated that sufficient paleoflood evidence may exist to resolve these

complications; however, additional evaluation is necessary, prior to implementation of a full-scale paleoflood investigation.

PLANNED 2008 FUNDING BY TASK

Approximate funding allocations among planned program activities for 2008 are listed in Table 2. Planned work efforts and associated funding are to be on a calendar year basis for 2008, with the exception of Item 1 (*streamflow gaging*), which will be for water year 2008 (Oct. 1, 2007 through Sept. 30, 2008). A 50/50 cost share between Rapid City and USGS is identified for all program components. This distribution of program funding is subject to modification during 2008, depending on possible changes in priorities established through discussions with Rapid City staff.

Table 2. Planned allocation of funding for 2008 work activities

Item number	Proposed activity	Rapid City share	USGS share	Total
1	Streamflow gaging ¹	\$19,931	\$16,581	\$36,512
2	Hydrogeologic data collection and analysis	\$20,000	\$20,000	\$40,000
3	Ground-water tracers	\$5,000	\$5,000	\$10,000
4	Numerical modeling	\$45,000	\$45,000	\$90,000
5	Reconnaissance sampling for taste and odor causing organisms	\$10,000	\$10,000	\$20,000
6	Storm water monitoring	\$30,069	\$30,069	\$60,138
7	Preliminary paleoflood evaluation	\$10,000	\$10,000	\$20,000
Totals to be shown on Joint Funding Agreement		\$140,000	\$136,650	\$276,650

¹ Additional funding of \$3,350 for the streamflow gaging program will be provided by USGS through the NSIP program, to accomplish an effective 50/50 match.