



**RED GAP RANCH
WATER RESOURCES ENVIRONMENTAL ASSESSMENT
PROJECT NO. 524900
SCOPE AND COST
May 20, 2013**

INTRODUCTION

Southwest Ground-water Consultants, Inc. (SGC) is pleased to present this scope and cost to complete the Red Gap Ranch (RGR) Water Resources Environmental Assessment, as defined in the Request for Statement of Qualifications (RFQ) Scope of Services (SOS) dated December 2012. In addition to the groundwater modeling task described in the SOS, the City of Flagstaff (City) has requested that SGC include a scope and cost for portions of the biological and cultural assessment tasks (Tasks 4 and 5) outlined in the Bureau of Reclamation Assistance Agreement (BOR Grant) R12AP32025. The scope and costs for these tasks have been prepared by SGC's subcontractor WestLand Resources, Inc.

SCOPE OF WORK

GROUNDWATER MODELING (BOR TASK 3)

The scope of work for groundwater modeling is based on the SOS and on the Task 3 description in the BOR Grant. SGC has divided the scope of work into seven (7) tasks, as described below.

Task 3-1 – Conceptual Model Development

This task will comprise the collection and analysis of hydrogeologic and streamflow data for the study area. Work will include:

- Meeting with City staff to gather data developed by the City on the study area, including but not limited to development plans, wells drilled by the City and previous RGR studies.
- Meet with the USGS to collect streamflow and other data from previous and ongoing programs in the study area. Discuss interpretation of hydrogeologic conditions and the conceptual model underlying the Northern Arizona Regional Groundwater Flow Model (NARGFM).
- Compile and interpret well logs, geologic, geophysical and pumping data. Construct maps, cross-sections and tables.
- Review previous studies and groundwater flow models including the HDR, USGS Papadopulos and AMEC report.

- Develop a conceptual model of the hydrogeologic system in the study area, with emphasis on:
 - Hydrogeologic conditions on the RGR
 - Groundwater – surface water interconnections
 - Area of Impact (AOI) of groundwater withdrawals at RGR
- Meet with the City to present and discuss the conceptual model. Identify desired model outputs and formats

Task 3-2 – Evaluate Flagstaff Model

This task will involve reviewing the existing Flagstaff Model and its relationship to the conceptual model developed in Task 1. Specific activities will include:

- Review of the model files, spreadsheets and documentation, including:
 - Aquifer parameters
 - Aquifer geometry
 - Simulation of streamflow
 - Water levels
 - Pumping files
 - Discretization
 - Representation of geologic structure
 - Water budgets
 - Calibration targets and statistics, with emphasis on the study area
- Document review and day-long meeting with City staff to present results

Task 3-3 – Recommend Refinements to the Flagstaff Model

The function of this task to conduct preliminary testing of proposed refinements and present any recommended refinements and changes to the CPTAC. The proposed refinements/changes would be presented to the City for review and concurrence prior to a formal presentation to the CPTAC. The CPTAC presentation would include:

- Overview of the work completed to date
- Description of the conceptual model, with emphasis on changes from the Flagstaff (and NARGFM) model
- Proposed model refinements (e.g. spatial and temporal discretization)
- Recommended spatial refinement method (i.e. nested model versus refined grid)
- Proposed method to simulate streamflow
- Results of preliminary testing
- Proposed model calibration parameters



- Proposed calibration targets, including:
 - 2012 water level data
 - USGS stream baseflow estimates
- Description of planned model outputs
- Schedule for completion of the model

Task 3-4 – Construct and Calibrate Model

Following agreement with the City and CPTAC on the model construction, SGC will make any agreed upon refinements and changes to the Flagstaff Model, perform model calibration and document the results. Work will include:

- Incorporate model refinements/changes
- Initiate model calibration and identify problems
- Address problems and recalibrate – an iterative process
- Calibrate model and present results to City staff (meeting)
- Present PEST parameter sensitivity data
- Conduct traditional sensitivity analysis and present results to city Staff (meeting)

Task 3-5 – Develop Scenarios

The RFQ SOS allowed up to five (5) scenarios to be modeled, three (3) of which were identified, including:

1. Baseline – Current pumping by all Indian and non-Indian to be held constant for 100 years. No RGR pumping.
2. Proposed RGR Groundwater Pumping – Assess the extent and amount of drawdown due to planned RGR pumping, with emphasis on groundwater-surface water interconnections.
3. Cumulative Impacts of RGR and Navajo Pumping – Assess the extent and amount of drawdown due to planned RGR *and Navajo* pumping, with emphasis on groundwater-surface water interconnections.

Work in this task will include:

- Compiling the pumping values for all users in the study area
- Confirming the values to be used in Scenarios 1, 2 and 3
- Identify the other scenarios to modeled, if any
- Meet with City staff to finalize scenarios
- Present the Scenarios to the CPTAC



Task 3-6 – Run the Modeled Scenarios

The scenarios agreed upon in Task 5 will be modeled using the calibrated groundwater flow model. Results will be presented in maps, graphs and tables and will include:

- Predicted groundwater level and flow direction changes
- Predicted streamflow changes
- Capture zone analyses
- Water budgets
- Predictive uncertainty analyses

Results will be presented to City staff in two (2) meetings: 1) on completion of initial model runs and 2) after fine tuning of the initial results and subsequent model runs. Following concurrence with the City, the results will be presented to the CPTAC and the City Water Commission.

Based on comments from the CPTAC and City Water Commission an outline of the draft report will be presented to the City for approval.

Task 3-7 – Report

This task will document the results of the Groundwater Model Task and will include a draft and final report with relevant appendices. The report and model files will be provided as follows:

- 5-paper copies of DRAFT report
- 5-paper copies of FINAL report
 - Electronic files of FINAL report
 - Electronic model and supporting documentation files

A meeting will be held with City staff to review the draft report. Prior to preparation of the final report, a presentation on the model results will be made to the Water Commission and subsequently the City Council. In coordination with City staff, the final report outline will be finalized and a final report prepared. Following report completion, a walk-through of the model specifics will be provided to City Staff to facilitate the transfer and use of the model and associated software.

BIOLOGICAL RESOURCE INVESTIGATIONS (BOR TASK 4)

WestLand Resources, Inc. (WestLand) has prepared the following scope of services for the initiation of biological resource investigations for the 7,500-acre RGR owned by the City, and the analysis of potential impacts to biological resources from the development of pumping infrastructure and associated features at the RGR. WestLand understands the proposed infrastructure currently includes groundwater wells, an onsite water treatment facility, secondary pipelines from the wells to the treatment facility, onsite power distribution, and maintenance roads.



The current scope includes description of the existing environment of the RGR and a screening analysis of the potential for sensitive species identified in the BOR Grant (collectively, Species of Concern) to occur within the analyzed area. Data collected from the existing environment description and species screening will inform an analysis which will address the impacts of the infrastructure development on the biological resources of the RGR.

Task 4-1 – Existing Environment Description

WestLand will produce a description of the biological resources and existing environment of the 7,500-acre RGR. Completion of the description will require limited field reconnaissance of the analyzed area to verify field conditions and note any existing disturbance or alteration to the overall character of the area. The existing environment description will include the following:

- Broad characterization of vegetation community (using Brown, Lowe, and Pace)
- Identification of habitats listed as “unique” in the BOR Grant, particularly wetlands, seeps, and springs
- Description of the typical wildlife which may occur within the RGR, and identification of potential large mammal movement corridors, avian flyways, and/or important wildlife areas

Task 4-2 – Screening Analysis

WestLand will draft a screening analysis to identify the “potential to occur” for Species of Concern within the RGR. These Species of Concern are defined from the BOR Grant and include Federally listed threatened, endangered, and candidate species; U.S. Forest Service sensitive species; State-listed Wildlife of Special Concern; and species considered as endangered or sensitive by the Navajo Nation.

The scope presupposes that the Navajo Nation Department of Fish and Wildlife (NNDFW) maintains and can provide known ranges and occurrences of endangered or sensitive species on lands located in proximity to, but not on, the Navajo Nation itself. The list of species considered as “sensitive” is extensive and covers the Nation’s lands in four states, not all of which will be applicable to the area analyzed under these tasks. For this scope it is assumed that any sensitive species list provided by the Navajo Nation will contain no more than 30 species unique to the list to be included in the screening analysis. Species identified as sensitive by the Bureau of Land Management (BLM) will be excluded from the screening analysis, as lands managed by the BLM do not occur within any of the areas to be analyzed, nor between RGR and Flagstaff, along the path of any potential pipeline.

- Data compiled for the habitat description to inform the potential for any Species of Concern to occur within the analyzed area



- Screening analysis to be based on the best available biological data on each of the species' habitat requirements, known ranges, and records of occurrence
- Screening analysis findings will describe the potential for a species to occur within the analyzed area
- Analysis will include documentation of the data utilized to support that finding
- No species-specific survey is proposed under the current scope of work

Task 4-3 – Environmental Consequences Analysis

WestLand will utilize the results of the existing environment description and the screening analysis to describe the potential effects to biological resources, including Species of Concern, to be affected by the development of the pumping infrastructure and associated features at RGR. The effects analysis will include a summary of those physical changes to the biological resources of the RGR as a result of the infrastructure development, and will provide suggestions for potential mitigation opportunities which may be required to offset these impacts.

- Qualitative assessment of expected physical changes to the RGR as a result of infrastructure development
- Assessment and discussion of potential effects to vegetation, wildlife (including Species of Concern), and unique habitats as predicted by these physical impacts
- Provide recommendations for further analysis which may be warranted to quantify potential effects, particularly to Species of Concern and unique habitats
- Provide recommendations for mitigation which may be required to offset potential impacts of the infrastructure development

Task 4-4 – Report

The habitat description, screening analysis, and environmental consequences analysis will be provided as a single technical memorandum to the City and the BOR, suitable for reference in future National Environmental Policy Act (NEPA) documentation in support of an Environmental Impact Statement (EIS). Under this scope, WestLand will respond to one round of agency comments on the memorandum. Consultation with Federal, Tribal, or State wildlife regulatory agencies is not anticipated under this scope.

CULTURAL RESOURCE INVESTIGATIONS (BOR TASK 5)

WestLand has prepared the following scope of services for the initiation of cultural resource investigations for the RGR. As direct impact related to infrastructure development is not anticipated within a 2-mile radius of the Navajo Nation, the scope of this task is limited to the 5,500 acres of the RGR outside of this radius. Work under this scope includes a Class I Records Search of previously recorded cultural resources and surveys within 1 mile of the 5,500 acres and



targeted Class III pedestrian survey of the areas of direct impact anticipated under the proposed infrastructure development.

Task 5-1 – Class I Records Search

- Class I including the land area of the 5,500 acres and 1-mile buffer around the land area collectively
- Records search of the AZSITE on-line data base maintained by the Arizona State Museum (ASM)
- Records search of the Museum of Northern Arizona (MNA) site files
- Search of records stored at Northern Arizona University (NAU)
- Records search of the Navajo Nation Historic Preservation Department (NNHPD) files
- Records search of historic Government Land Office (GLO) maps
- Records search of historic topographic maps

Task 5-2 – Targeted Class III Survey

WestLand will conduct targeted Class III (100% coverage) pedestrian cultural resource survey to locate and evaluate all cultural resources within the areas of direct impact anticipated under the proposed infrastructure development. WestLand understands the City is currently working to develop Geographic Information System (GIS) linework for the areas of proposed infrastructure development, which include groundwater wells, an onsite water treatment facility, secondary pipelines from the wells to the treatment facility, onsite power distribution, and maintenance roads. The proposed scope of Class III survey assumes approximately 60 miles of 120-foot-wide corridor survey for proposed linear features and approximately 20 acres of block coverage for associated structures within the overall 5,500 acres. Class III survey coverage of the entire 5,500-acre area is not proposed under this scope. Class III survey work includes:

- Submit a Notice of Intent to survey to ASM
- Conduct a 100% pedestrian cultural resources inventory survey of areas of impact to ASM and BOR standards
- All discovered archaeological sites, historic age features, and historic age structures will be recorded in the field and evaluated for their eligibility of inclusion on the National Register of Historic Places (NRHP).
- All previously recorded sites will be re-recorded to assess any changes in the site integrity since the initial recording and to re-evaluate the site in terms of the NRHP eligibility criteria.

Task 5-3 – Cultural Resource Report

WestLand will prepare a cultural resource report documenting the results of the Class I Records Search and the Class III Survey performed for the RGR. The report will be written to National



Historic Preservation Act Section 106 and BOR standards, suitable for reference in future NEPA documentation in support of an EIS. A draft of the report will be provided to the City and the BOR. Under this this scope, WestLand will respond to one round of agency comments on the draft document. The final report will be registered with ASM, and registration will include payment of the ASM project registration fee.

SCHEDULE

The proposed project schedule is given on the next page. Meeting dates are approximate and will depend on project progress and participant availability. Total estimated time to complete the project is seven (7) months.

COST

Estimated project costs are summarized below. SGC has made every effort to identify work tasks and assign the appropriate level of effort. However, groundwater modeling and NEPA compliance tasks are subject to uncertainty due to the fact that the results of early tasks can modify the work needed in subsequent tasks. To account for this uncertainty SGC recommends the budget include a contingency of ten (10) percent.

TASK	HOURS	COST
GROUNDWATER MODELING		
3-1 Conceptual Model Development	120	\$14,150
3-2 Evaluate Flagstaff Model	200	\$22,025
3-3 Recommend Refinements	133	\$26,040
3-4 Calibrate Model	280	\$30,550
3-5 Develop Scenarios	150	\$17,950
3-6 Run Modeled Scenarios	380	\$42,450
3-7 Model Report	230	\$38,935
Subtotal	1,493	\$192,100
BIOLOGICAL RESOURCES		
4-1 Existing Environment	108	\$12,728
4-2 Screening Analysis	96	\$9,400
4-3 Environmental Consequences	88	\$8,605
4-4 Report	22	\$2,267
Subtotal	314	\$33,000
CULTURAL RESOURCES		
5-1 Class I Records Search	45	\$4,353
5-2 Targeted Class III Survey	190	\$15,635
5-3 Report	40	\$6,012
Subtotal	275	\$26,000
Contingency (10%)		\$25,110
TOTAL	2,082	\$276,210



SCHEDULE

TASK	WEEKS AFTER AUTHORIZATION																														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
GROUNDWATER MODELING																															
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4-1 Existing Environment																															
4-2 Screening Analysis																															
4-3 Environmental Consequences																															
4-4 Biological Resource Report																															
CULTURAL RESOURCES																															
5-1 Class I Records Search																															
5-2 Targeted Class III Survey																															
5-3 Cultural Resources Report																															
City Staff Meetings	1					2		3		4							5		6						7				8		
CPTAC Meetings										1									2						3						
Council/CWC Meetings																										1				2	



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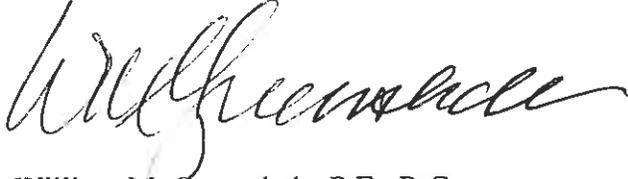
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Southwest Ground-water Consultants, Inc. and WestLand Resources, Inc. appreciate the opportunity to submit this proposal and look forward to being of service to the City of Flagstaff. If you have any questions do not hesitate to contact us at 602-955-5547.

Sincerely,

Southwest Ground-water Consultants, Inc.



William M. Greenslade, P.E., R.G.
Principal/Senior Hydrogeologist

