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**HYDROGRAPH DEVELOPMENT-REACH 9  
CITY OF SPARKS, NEVADA**

THIS CONTRACT made and entered into on this 24th day of April, 2017, by and between the City of Sparks, Nevada, a municipal corporation, existing under and by virtue of the laws of the State of Nevada, hereinafter called "City", and **House Moran Consulting, Inc.**, a qualified consultant in the class of work required, hereinafter called "Consultant".

W I T N E S E T H

WHEREAS, the City desires to engage Consultant in the performance of providing Professional Services which are more fully described in Consultant's Proposal dated March 13, 2017, attached hereto and incorporated herein by reference. (Hereinafter referenced to as "Proposal");

WHEREAS, Consultant's legal status is an Independent Contractor and Consultant is in good standing in the State of Nevada;

WHEREAS, Consultant desires to perform the Program under the terms and conditions set forth herein;

NOW, THEREFORE, IT IS AGREED as follows:

**1. Scope of Work:**

The scope of work for this contract is generally defined as **Hydrograph Development-Reach 9**. The City's Contract Documents and Consultant's Entire Proposal are on file with the City of Sparks and may be located within "Attachment A." All terms, conditions and requirements contained in these Documents, including any and all addenda issued by the City, are hereby incorporated into this Contract. The work scope will include, but not be limited to the tasks outlined in Attachment A.

The Consultant shall perform within the time stipulated, the Contract as herein defined and shall provide and furnish any and all of the labor, materials, methods or processes, equipment implements, tools, machinery and equipment, and all utility, transportation and other services required to complete all of the work covered by the Contract in connection with strict accordance with the plans, specifications or proposals, which were approved by said City and are on file with the City, including any and all addenda issued by the City, and with the other contract documents hereinafter enumerated. Consultant will have the right to control or direct the manner and the order in which it provides the services contemplated under this Agreement.

Consultant represents and warrants that Consultant is engaged in an independent calling and has complied and will continue to comply with all local, state and federal laws regarding business permits and licenses that may be required to carry out the independent calling and to perform the services to be performed under this Agreement.

Consultant understands that the services it has been retained to perform may be dangerous or may entail a peculiar unreasonable risk of harm to others unless special precautions are taken and Consultant agrees to exercise reasonable care to take such precautions.



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**2. Payment for Project Services**

As full consideration for the Professional Services to be performed by Consultant, City agrees to pay Consultant as set forth in accordance with the Fee Schedule set forth in the proposal and not to exceed fee of **\$92,000.00** for the project. The City will not hire or directly compensate the Consultant's employees, assistants or subcontractors, if any. It is expressly understood and agreed that all work done by Consultant shall be subject to review as to its result by the City at the City's discretion. Payment of any invoice shall not be taken to mean that the City is satisfied with Consultant's services to the date of payment and shall not forfeit City's right to require the correction of any service deficiencies.

**3. Term**

This Agreement shall become effective upon contract execution and will continue in effect until

☐ **MO/DY/YR**, or

☒ The Project is completed (Approximately \_\_\_\_\_), or unless earlier terminated as provided herein.

**4. Time Devoted to Work:**

In performing the services contemplated under this Agreement, the services and the hours Consultant is to work on any given day will be on a mutually agreed upon basis, except for attendance at scheduled meetings, and City will rely upon Consultant to put in such number of hours as is reasonably necessary to fulfill the spirit and purpose of this Agreement.

City understands that Consultant is engaged in the same or similar activities for others and that City may not be Consultant's sole client or customer. However, Consultant represents and warrants that it is under no obligation or restriction, nor will it assume any such obligation or restriction, that would in any way interfere or be inconsistent with the services to be performed under this Agreement.

**5. No Unfair Employment Practices:**

In connection with the performance of work under this Agreement, Consultant agrees not to discriminate against any employee or applicant because of race, creed, color, national origin, sex, sexual orientation, disability or age. Any violation of these provisions by Consultant shall constitute a material breach of this contract.

**6. No Illegal Harassment:**

Violation of the City's harassment policy, which is incorporated by reference and available from the Human Resources Division, by the Consultant, its officers, employees, agents, consultants, subcontractors and anyone for whom it is legally liable, while performing or failing to perform Consultant's duties under this Contract shall be considered a material breach of this contract.

**7. Lawful Performance:**

Vendor shall abide by all Federal, State and Local Laws, Ordinances, Regulations, and Statutes as may be related to the performance of duties under this agreement. In addition, all applicable permits and licenses required shall be obtained by the vendor, at vendor's sole expense.

**8. Status of Consultant:**

It is the intent of the parties that Consultant shall be considered an independent contractor and that



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Consultant, and anyone else for whom it is legally liable, shall not be considered employees, servants or agents of the City for any purpose. Furthermore, this Agreement shall not be construed to create a partnership or joint venture between the Consultant and the City.

Neither Consultant nor any of its employees or contractors shall be eligible to participate in City's industrial insurance, unemployment, disability, medical, dental, life or other insurance programs, or any other benefit or program that is sponsored, financed or provided by City for its employees.

Consultant agrees that it shall be Consultant's exclusive responsibility to pay all federal, state, or local payroll, social security, disability, industrial insurance, self-employment insurance, income and other taxes and assessments related to this Agreement. Neither FICA (Social Security), FUTA (Federal Employment), nor local, state or federal income taxes will be withheld from payments to Consultant. Consultant shall at Consultant's expense pay and be fully liable and responsible for, and indemnify and hold harmless City from, any assessments, fines or penalties relating to Consultant's failure to uphold any of these responsibilities.

**9. City Ownership of Proprietary Information:**

All reports, drawings, plans, specifications, and other documents prepared by Consultant as products of service under this Agreement shall be the exclusive property of the City and all such materials shall be remitted to the City by Consultant in a timely manner upon completion, termination or cancellation of this Agreement. Consultant shall not use, willingly allow or cause to have such materials used for any purpose other than performance of Consultant's obligations under this Agreement without the prior written consent of the City.

**10. Public Records:**

Consultant understands that City is subject to the provisions of NRS 239.010. As such, the City may have the duty to disclose the Consultant's reports or recommendations.

**11. Insurance:**

BIDDERS' ATTENTION IS DIRECTED TO THE INSURANCE REQUIREMENTS BELOW. IT IS HIGHLY RECOMMENDED THAT BIDDERS CONFER WITH THEIR RESPECTIVE INSURANCE CARRIERS OR BROKERS TO DETERMINE IN ADVANCE OF BID SUBMISSION THE AVAILABILITY OF INSURANCE CERTIFICATES AND ENDORSEMENTS AS PRESCRIBED AND PROVIDED HEREIN. IF THE APPARENT LOW BIDDER FAILS TO COMPLY STRICTLY WITH THE INSURANCE REQUIREMENTS, THAT BIDDER MAY BE DISQUALIFIED FROM AWARD OF THE CONTRACT.

Should work be required on City premises or within the public right-of-way, upon award of the contract, the bidder shall provide proof of insurance for the types of coverage, limits of insurance and other terms specified herein, prior to initiation of any services under City, Bid, Proposal or Contract. Coverage shall be from a company authorized to transact business in the State of Nevada and the City of Sparks and shall meet the following minimum specifications:

Contractor shall at its own expense carry and maintain at all times the following insurance coverage and limits of insurance no less than the following or the amount customarily carried by Contractor or any of its



subcontractors, whichever is greater. Contractor shall also cause each subcontractor employed by Contractor to purchase and maintain insurance of the type specified herein. All insurers must have AM Best rating not less than A-VII, and be acceptable to the City. Contractor shall furnish copies of certificates of insurance evidencing coverage for itself and for each subcontractor. Failure to maintain the required insurance may result in termination of this contract at City's option. If Contractor fails to maintain the insurance as set forth herein, City shall have the right, but not the obligation, to purchase said insurance at Contractor's expense.

Contractor shall provide proof of insurance for the lines of coverage, limits of insurance and other terms specified below prior to initiation of any services. Coverage shall be from a company authorized to transact business in the State of Nevada and the City of Sparks. Contractor and any of its subcontractors shall carry and maintain coverage and limits no less than the following or the amount customarily carried by Contractor or any of its subcontractors, whichever is greater.

Applicable to this Contract	Insurance Type	Minimum Limit	Insurance Certificate	Additional Insured	Waiver of Subrogation
Yes	General Liability/Umbrella (Excess) Liability	\$2,000,000	✓	✓	✓
Yes	Automobile Liability	\$1,000,000	✓	✓	
Yes	Workers' Compensation	Statutory	✓	N/A	✓
Yes	Employer's Liability	\$1,000,000	✓	N/A	
Yes	Professional Liability	\$1,000,000	✓	N/A	N/A
No	Pollution Legal Liability	\$1,000,000	✓	N/A	N/A

#### **Commercial General Liability**

Contractor shall carry and maintain Commercial General Liability (CGL) and, if necessary to meet required limits of insurance, commercial umbrella/excess liability insurance with a total limit of not less than the limits specified herein.

For contracts that are for the construction or improvement of public facilities, the Contractor shall obtain and maintain products and completed operations liability coverage through the statute of repose after completion of the project.

There shall be no endorsement or modification of the CGL limiting the scope of coverage for liability arising from pollution, explosion, collapse, underground property damage, employment-related practices, or damage to the named insured's work unless Subcontractor carries and maintains separate policies providing such coverage and provides Contractor evidence of insurance confirming the coverage.



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***Minimum Limits of Insurance***

**\$2,000,000** Each Occurrence Limit for bodily injury and property damage

**\$2,000,000** General Aggregate Limit

**\$2,000,000** Products and Completed Operations Aggregate Limit

**\$10,000** Medical Expense Limit

If Commercial General Liability Insurance or other form with a general aggregate limit is used, it shall be revised to apply separately to this PROJECT or LOCATION.

***Coverage Form***

Coverage shall be at least as broad as the unmodified Insurance Services Office (ISO) Commercial General Liability (CGL) "Occurrence" form CG 00 01 04/13 or substitute form providing equivalent coverage and shall cover liability arising from premises, operations, independent contractors, products-completed operations, personal and advertising injury, and liability assumed under an insured contract (including the tort liability of another assumed in a business contract).

***Additional Insured***

City, its officers, agents, employees, and volunteers are to be included as insureds using the applicable ISO additional insured endorsement(s) or substitute forms providing equivalent coverage, in respects to damages and defense arising from: activities performed by or on behalf of Contractor, including the insured's general supervision of Contractor; products and completed operations of Contractor; premises owned, occupied, or used by Contractor. The coverage shall contain no special limitations on the scope of protection afforded to City, its officers, employees, or volunteers. Additional insured status for City shall apply until the expiration of time within which a claimant can bring suit per applicable state law.

Any failure by the Contractor to comply with reporting provisions of the policies shall not affect its obligations to the additional insureds.

***Primary and Non-Contributory***

Contractor's insurance coverage shall apply as primary insurance with respect to any other insurance or self-insurance programs afforded to City, its officers, agents, employees, and volunteers. There shall be no endorsement or modification of the CGL to make it excess over other available insurance; alternatively, if the CGL states that it is excess or pro rata, the policy shall be endorsed to be primary with respect to the additional insured. Any insurance or self-insurance maintained by City, its officers, employees, or volunteers shall be excess of Contractor's insurance and shall not contribute with it in any way.

***Separation of Insureds***

Contractor's insurance shall apply separately to each insured against whom a claim is made or suit is brought, except with respect to the limits of the insurer's liability.

***Waiver of Subrogation***

Contractor waives all rights against City and its agents, officers, directors and employees for recovery of damages to the extent these damages are covered by the commercial general liability or commercial umbrella liability insurance maintained pursuant to this agreement. Insurer shall endorse CGL policy as required to waive subrogation against the City with respect to any loss paid under the policy.



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***Endorsements***

A policy form or endorsement is required confirming coverage for all required additional insureds. The endorsement for CGL shall be at least as broad as the unmodified ISO additional insured endorsement CG 20 10 11/85 or substitute forms providing additional insured coverage for products and completed operations.

A waiver of subrogation in favor of City shall be endorsed to the policy using an unmodified Waiver of Transfer of Rights of Recovery of Others to Us ISO CG 24 04 05 09, or a substitute form providing equivalent coverage.

If any underground work will be performed, Contractor shall maintain electronic data liability insurance applicable to the Project and insuring against liability arising out of the loss of, loss of use of, damage to, corruption of, inability to access, or inability to manipulate electronic data. This coverage shall be maintained with a limit of liability of not less than \$1,000,000 and provide coverage at least as broad as electronic data liability coverage form CG 04 37 (or substitute form providing equivalent coverage).

**Business Automobile Liability*****Minimum Limits of Insurance***

**\$1,000,000** Combined Single Limit per accident for bodily injury and property damage or the limit customarily carried by Contractor, whichever is greater. No aggregate limit may apply. Coverage may be combined with Excess/Umbrella Liability coverage to meet the required limit.

***Coverage Form***

Coverage shall be at least as broad as the unmodified Insurance Services Office (ISO) Business Automobile Coverage form CA 00 01 10/13, CA 00 25 10/13, CA 00 20 10/13 or substitute form providing equivalent coverage. Such insurance shall cover liability arising out of any auto (including owned, hired, and non-owned autos).

Pollution liability coverage at least as broad as that provided under the ISO pollution liability—broadened coverage for covered autos endorsement (CA 99 48) shall be provided, and the Motor Carrier Act endorsement (MCS 90) shall be attached for all contracts involving transportation of “hazardous material” as this term is defined by applicable law, including, but not limited to, waste, asbestos, fungi, bacteria and mold.

***Additional Insured***

City, its officers, agents, employees, and volunteers are to be included as insureds with respect to damages and defense arising from the ownership, maintenance or use of automobiles owned, leased, hired, or borrowed by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to City, its officers, employees, or volunteers. Additional insured status for City shall apply until the expiration of time within which a claimant can bring suit per applicable state law.

***Endorsements***

A policy endorsement is required listing all required additional insureds. The endorsement for Business Automobile Liability shall be at least as broad as the unmodified ISO CA 20 48 10/13 or a substitute form confirming City’s insured status for Liability Coverage under the Who Is An Insured



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Provision contained in Section II of the coverage form ISO CA 00 01 10/13.

**Workers' Compensation and Employer's Liability**

Contractor shall carry and maintain workers' compensation and employer's liability insurance as required by NRS 616B.627 or provide proof that compliance with the provisions of Nevada Revised Statutes Chapters 616A-D and all other related chapters is not required. It is understood and agreed that there shall be no coverage provided for Contractor or any Subcontractor of the Contractor by the City. Contractor agrees, as a precondition to the performance of any work under this Agreement and as a precondition to any obligation of the City to make any payment under this Agreement to provide City with a certificate issued by an insurer in accordance with NRS 616B.627 and with a certificate of an insurer showing coverage pursuant to NRS 617.210.

It is further understood and agreed by and between City and Contractor that Contractor shall procure, pay for and maintain the above mentioned coverage at Contractor's sole cost and expense.

Should Contractor be self-funded for workers' compensation and employer's liability insurance, Contractor shall so notify City in writing prior to the signing of this Contract. City reserves the right to approve said retentions, and may request additional documentation, financial or otherwise, for review prior to the signing of this Contract.

Nevada law allows the following to reject workers' compensation coverage if they do not use employees or subcontractors in the performance of work under the contract:

- Sole proprietors (NRS 616B.627 and NRS 617.210)
- Unpaid officers of quasi-public, private or nonprofit corporations (NRS 616B.624 and NRS 617.207)
- Unpaid managers of limited liability companies (NRS 616B.624 and NRS 617.207)
- An officer or manager of a corporation or limited liability company who owns the corporation or company (NRS 616B.624 and NRS 617.207)

If a contractor has rejected workers' compensation coverage under applicable Nevada law, the contractor must indicate the basis for the rejection of coverage and complete, sign and have notarized an Affidavit of Rejection of Coverage. The Affidavit must be completed, signed and notarized prior to performance of any work.

***Minimum Limits of Insurance***

Workers' Compensation:	Statutory Limits
Employer's Liability:	<b>\$1,000,000</b> Bodily Injury by Accident – Each Accident
	<b>\$1,000,000</b> Bodily Injury by Disease – Each Employee
	<b>\$1,000,000</b> Bodily Injury by Disease – Policy Limit

***Coverage Form***

Coverage shall be at least as broad as the unmodified National Council on Compensation Insurance (NCCI) Workers Compensation and Employer's Liability coverage form WC 00 00 07/11 or substitute form providing equivalent coverage.



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**OTHER INSURANCE COVERAGES (IF APPLICABLE)**

**Professional Liability Insurance (if Applicable)** \$1,000,000 per occurrence limits of liability or whatever limit is customarily carried by the Contractor, whichever is greater, for design, design-build or any type of professional services with a minimum of three (3) years reporting of claims following completion of the project.

**Contractors Pollution Liability Insurance (If Applicable)-** \$1,000,000 per occurrence and \$2,000,000 aggregate or whatever amount is acceptable to the City for any exposure to "hazardous materials" as this term is defined in applicable law, including but not limited to waste, asbestos, fungi, bacterial or mold.

Lower tier sub-subcontractors, Truckers, Suppliers: Evidence confirming lower tier subcontractors, truckers and suppliers are maintaining valid insurance prior to beginning work on the project to meet the requirements set forth herein on Subcontractor, including but not limited to all additional insured requirements of Subcontractor.

**ALL COVERAGES**

Coverage shall not be suspended, voided, canceled, or non-renewed by either CONTRACTOR or by the insurer, reduced in coverage or in limits except after thirty (30) days' prior written notice has been given to CITY except for ten (10) days' notice for nonpayment of premium.

**OTHER INSURANCE PROVISIONS**

Should City and Contractor agree that higher coverage limits are needed warranting a project policy, project coverage shall be purchased and the premium for limits exceeding the above amount may be borne by City. City retains the option to purchase project insurance through Contractor's insurer or its own source.

Any failure to comply with reporting provisions of the policies shall not affect coverage provided to City, its officers, agents, employees, or volunteers.

**ACCEPTABILITY OF INSURERS**

Insurance is to be placed with insurers with a Best's rating of no less than A-VII and acceptable to the City.. City, with the approval of the Risk Manager, may accept coverage with carriers having lower Best's ratings upon review of financial information concerning Contractor and insurance carrier. City reserves the right to require that Contractor's insurer be a licensed and admitted insurer in the State of Nevada, or on the Insurance Commissioner's approved but not admitted list.

**VERIFICATION OF COVERAGE**

Contractor shall furnish City with certificates of insurance and with original endorsements affecting coverage required by this contract. The certificates and endorsements for each insurance policy are to be signed by a person authorized by that insurer to bind coverage on its behalf.

Prior to the start of any Work, Contractor must provide the following documents to City of Sparks, Attention: Purchasing Division, P.O. Box 857, Sparks, NV 89432-0857:





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- A. Certificate of Insurance.** Contractor must provide a Certificate of Insurance form to the City of Sparks to evidence the insurance policies and coverage required of Contractor.
- B. Additional Insured Endorsements.** An original Additional Insured Endorsement, signed by an authorized insurance company representative, must be submitted to the City of Sparks, by attachment to the Certificate of Insurance, to evidence the endorsement of the City of Sparks as additional insured.
- C. Policy Cancellation Endorsement.** Except for ten (10) days' notice for non-payment of premium, each insurance policy shall be endorsed to specify that without thirty (30) days prior written notice to the City of Sparks, the policy shall not be suspended, voided, cancelled or non-renewed, and shall provide that notices required by this paragraph shall be sent by certified mailed to the address specified above. A copy of this signed endorsement must be attached to the Certificate of Insurance.
- D. Bonds (as Applicable).** Bonds as required and/or defined in the original bid documents.

**All certificates and endorsements are to be addressed to the City of Sparks, Purchasing Division and be received and approved by City before work commences.** The City reserves the right to require complete certified copies of all required insurance policies at any time.

### **SUBCONTRACTORS**

Contractor shall include all Subcontractors as insureds under its policies or shall furnish separate certificates and endorsements for each Subcontractor. All coverages for Subcontractors shall be subject to all of the requirements stated herein.

### **MISCELLANEOUS CONDITIONS**

1. Contractor shall be responsible for and remedy all damage or loss to any property, including property of City, caused in whole or in part by Contractor, any Subcontractor, or anyone employed, directed, or supervised by Contractor.
2. Nothing herein contained shall be construed as limiting in any way the extent to which Contractor may be held responsible for payment of damages to persons or property resulting from its operations or the operations of any Subcontractors under it.
3. In addition to any other remedies City may have if Contractor fails to provide or maintain any insurance policies or policy endorsements to the extent and within the time herein required, City may, at its sole option:
  - a. Purchase such insurance to cover any risk for which City may be liable through the operations of Contractor under this Agreement and deduct or retain the amount of the premiums for such insurance from any sums due under the Agreement;
  - b. Order Contractor to stop work under this Agreement and/or withhold any payments which become due Contractor here under until Contractor demonstrates compliance with the requirements hereof; or,
  - c. Terminate the Agreement.



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**12. Indemnity:**

To the fullest extent permitted by law, upon award, Contractor shall hold harmless, indemnify, defend and protect City, its affiliates, officers, agents, employees, volunteers, successors and assigns ("Indemnified Parties"), and each of them from and against any and all claims, demands, causes of action, damages, costs, expenses, actual attorney's fees, losses or liabilities, in law or in equity, of every kind and nature whatsoever ("Claims") arising out of or related to any act or omission of Contractor, its employees, agents, representatives, or Subcontractors in any way related to the performance of work under this Agreement by Contractor, or to work performed by others under the direction or supervision of Contractor, including but not limited to:

1. Personal injury, including but not limited to bodily injury, emotional injury, sickness or disease, or death to persons;
2. Damage to property of anyone, including loss of use thereof;
3. Penalties from violation of any law or regulation caused by Contractor's action or inaction;
4. Failure of Contractor to comply with the Insurance requirements established under this Agreement;
5. Any violation by Contractor of any law or regulation in any way related to the occupational safety and health of employees.

In determining the nature of the claim against City, the incident underlying the claim shall determine the nature of the claim, notwithstanding the form of the allegations against City.

If City's personnel are involved in defending such actions, Contractor shall reimburse City for the time and costs spent by such personnel at the rate charged City for such services by private professionals.

**In cases of professional service agreements, requiring professional liability coverage:**

If the insurer by which a Consultant is insured against professional liability does not so defend the City and applicable agents and/or staff, and the Consultant is adjudicated to be liable by a trier of fact, the City shall be entitled to reasonable attorney's fees and costs to be paid to the City by the Consultant in an amount which is proportionate to the liability of the of the Consultant.

Nothing in this contract shall be interpreted to waive nor does the City, by entering into this contract, waive any of the provisions found in Chapter 41 of the Nevada Revised Statutes.

**13. Material Breach of Contract:**

In the event Consultant fails to deliver the product and services as contracted for herein, to the satisfaction of the City of Sparks or otherwise fails to perform any provisions of this Contract, the City, after providing five (5) days written notice and consultant's failure to cure such breach, may without waiving any other remedy, make good the deficiencies and deduct the actual cost of providing alternative products and/or services from payment due the Consultant. Non-performance after the first notice of non-performance shall be considered a material breach of contract.

**14. Termination:**

The City may terminate the Contract for material breach of contract upon ten (10) days written notice and recover all damages, deducting any amount still due the Consultant from damages owed to the City, or



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seek other remedy including action against all bonds. The Consultant may terminate the Contract for material breach of contract upon thirty (30) days written notice to the City.

Notwithstanding the preceding paragraph, the City may immediately terminate the Agreement, and Consultant waives any and all claim(s) for damages, upon the Consultant's receipt of notice under the following conditions:

- a) If funding is not obtained, continued, or budgeted at levels sufficient to allow for purchase of the services contemplated under this Agreement per Section 23 of this Agreement;
- b) If any federal, state or local law, including but not limited to, statutes, regulations, ordinances and resolutions, is interpreted by a third party judicial, legislative or administrative authority in such a way that the services contemplated under this Agreement are no longer authorized for purchase or appropriate for City financial participation;
- c) If Consultant fails to comply with any local, state or federal law regarding business permits and licenses required to perform the services to be performed under this Agreement or
- d) If it is found that any quid pro quo or gratuities were offered or given by the Consultant to any officer or employee of the City with a view towards securing favorable treatment with respect to awarding, extending, amending or making any determination with respect to the performance of this Agreement.

The indemnity and conflict resolution obligations of this Agreement shall survive the termination of this Agreement and shall be binding upon the parties' and the parties' legal representatives, heirs, successors and assigns.

The City may terminate this agreement for any reason without penalty upon giving thirty (30) days written notice to the Consultant. In the event of termination, the full extent of City liability shall be limited to an equitable adjustment and payment for materials and/or services authorized by and received to the satisfaction of the City prior to termination.

#### **15. Licenses and Permits:**

The Consultant shall procure at his own expense all necessary licenses and permits and shall adhere to all the laws, regulations and ordinances applicable to the performance of this Contract.

All consultants doing business within the City of Sparks are required to obtain and maintain a current business license from the City of Sparks prior to commencement of this contract. Per Sparks Municipal Code Section 5.08.020A: "It is unlawful for any person to transact business in the City without first having obtained a license from the City to do so and without complying with all applicable provisions of this title and paying the fee therefore."

#### **16. Drafting Presumption:**

The parties acknowledge that this Agreement has been agreed to by both parties, that both parties have consulted or have had the opportunity to consult with attorneys with respect to the terms, and that no



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presumption shall be created against the City as the drafter of the Agreement.

**17. Governing Law:**

The laws of the State of Nevada shall govern this Agreement without regard to conflicts of law principles.

**18. Jurisdiction and Venue:**

Any action or proceeding seeking to enforce any provision of, or based on any right arising out of, this Agreement must be brought against either of the parties in the courts of the State of Nevada, County of Washoe. Each of the parties consents to the jurisdiction of the court (and of the appropriate appellate court) in any such action or proceeding and waives any objection to venue laid therein.

**19. Claims:**

Pursuant to NRS 268.020, which the parties agree to abide by contractually, all demands and accounts against the City must be presented to the Council, in writing, within six (6) months from the time the demands or accounts become due. No demand or account may be audited, considered, allowed or paid by the City unless this requirement is strictly complied with.

**20. Assignment:**

All of the terms, conditions and provisions of this Contract, and any amendments thereto, shall inure to the benefit of and be binding upon the parties hereto, and their respective successors and assigns. The Consultant shall not assign this Contract without the written consent of the City which will not be unreasonably withheld.

**21. Notices:**

All notices required to be given in writing by this Contract shall be deemed to be received (i) upon delivery if personally delivered, or (ii) when receipt is signed for if mailed by certified or registered mail, postage prepaid, or by express delivery service or courier, when addressed as follows (or sent to such other address as a Party may specify in a notice to the others):

CITY OF SPARKS - PURCHASING DIVISION  
431 PRATER WAY  
PO BOX 857  
SPARKS, NV 89432-0857

Jeff House  
House Moran Consulting  
10399 Double R. Blvd., #110  
Reno, NV 89521

**22. Entire Contract:**

This Contract and all associated documents associated by reference constitute the entire agreement of the parties and shall supersede all prior offers, negotiations, agreements and contracts whether written or oral. Any modifications to the terms and conditions of this Contract must be in writing and signed by both parties.

**23. Waiver:**

No waiver of any term, provision or condition of this Contract, whether by conduct or otherwise, in any one or more instances, shall be deemed to be nor shall it be construed as a further or continuing waiver of any such term, provision or condition of this Contract. No waiver shall be effective unless it is in writing and signed by the party making it.



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**24. Annual Appropriation of Funds:**

Multi-year contracts and leases are subject to annual appropriation of funds by the City Council. The City plans and makes appropriations to the City Budget with respect to a fiscal year that starts July 1<sup>st</sup> and ends June 30<sup>th</sup> of each year. Payments made under term contracts and leases are considered items of current expense. Purchase Orders are funded when issued; therefore, they are current expense items and are not subject to any subsequent appropriation of funds. Continuance of a multi-year contract beyond the limits of funds available shall be contingent upon appropriation of the requisite funds in the ensuing fiscal year and the termination of this contract by lack of appropriation shall be without penalty.

**25. Severability:**

If any part of this Contract is found to be void it will not affect the validity of the remaining terms of this Contract which will remain in full force and effect.

**26. Headings:**

Paragraph titles or captions contained in this Contract are inserted only as a matter of convenience and for reference only, and in no way define, limit, extend, or describe the scope of this Contract or the intent of any provision hereof.

**27. Singular Includes the Plural; Gender; Title Reference:**

Whenever the singular number is used in this Contract and when required by the context, the same shall include the plural, and the use of any gender, be it masculine, feminine or neuter, shall include all of the genders, and the word "person" or "entity" shall include corporation, firm, partnership, or any other combination or association.

The use of the title "Bidder", "Vendor", "Contractor" or "Consultant" within this contract or associated bid documents shall be deemed interchangeable and shall refer to the person or entity with whom the City of Sparks is contracting for the service or product referenced within this contract.

**28. Execution:**

The parties agree to execute such additional documents and to take such additional actions as are reasonably necessary or desirable to carry out the purposes hereof. They also agree, acknowledge and represent that all corporate authorizations have been obtained for the execution of this Contract and for the compliance with each and every term hereof. Each undersigned officer, representative or employee represents that he or she has the authority to execute this Contract on behalf of the party for whom he or she is signing.



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IN WITNESS WHEREOF, the City of Sparks has caused this Contract to be executed by its officers thereunto duly authorized and the Consultant has subscribed same, all on the day and year first above written.

\_\_\_\_\_  
(Consultant)

CITY OF SPARKS, NEVADA  
A Municipal Corporation

By: \_\_\_\_\_

By: \_\_\_\_\_  
Geno R. Martini, Mayor

\_\_\_\_\_  
(Title)

APPROVED AS TO FORM

ATTEST:

\_\_\_\_\_  
City Attorney

\_\_\_\_\_  
Teresa Gardner, City Clerk



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**Attachment A**

Price and scope per written proposal provided by House Moran Consulting, dated March 13 2017 (attached).



**House Moran Consulting, Inc.**  
Professional Engineering Services

16073929 - 1210 Flood

Proj "Reach 9 Analysis"  
KS FLOOD Projects in IFSA1  
#130243

130244.

## ATTACHMENT A

March 13, 2017

Mr. John Martini, PE  
Community Services Director  
City of Sparks  
431 Prater Way  
Sparks, NV 89431

**RE: Reach 9 Regional Flood Control Channel  
Peak Flow Hydrographs Development at Key Locations**  
Optional Task No. 1 - 2017 Storm Frequency Analysis  
Optional Task No. 2 - Regional Impact Storm Development  
Optional Task No. 3 - Reach 9 Sediment Transport/Accumulation Analysis

Dear Mr. Martini:

Pursuant to our recent conversations, House Moran Consulting, Inc. (House Moran) is pleased to present the following proposal to the City of Sparks (City) to compute peak flow hydrographs (Analysis) at key locations to be determined by the City, for Reach 9 Regional Flood Control Facility, located in Impact Fee Service Area Number 1 (IFSA #1) of the City. Reach 9 is located west of Pioneer Meadows, north of Terra Del Sol Parkway, south of La Posada Drive/Eagle Canyon Road. It begins at Pyramid Highway, proceeding to the east, turning south to the Pioneer Meadows Detention Pond. On the following page, Figure 1 - IFSA #1 Regional Flood Control Facilities, shows the location of Reach 9, and the Regional Flood Control Facilities network.

### ANALYSIS OVERVIEW

#### Peak Flow Hydrographs Development at Key Locations

The purpose of the Analysis is compute peak flow hydrographs at key locations to be determined by the City, where (1) Reach 9 channel will cross new/proposed roadways, and (2) where new/proposed developments will tie into the Reach 9 channel via stormwater infrastructure discharge points. Hydrographs are graphs showing the rate of flow (discharge) versus time at a specific point in a stream, channel, or stormwater infrastructure.

House Moran Consulting, Inc.

10399 Double R Boulevard, Suite 100, Reno, NV 89521

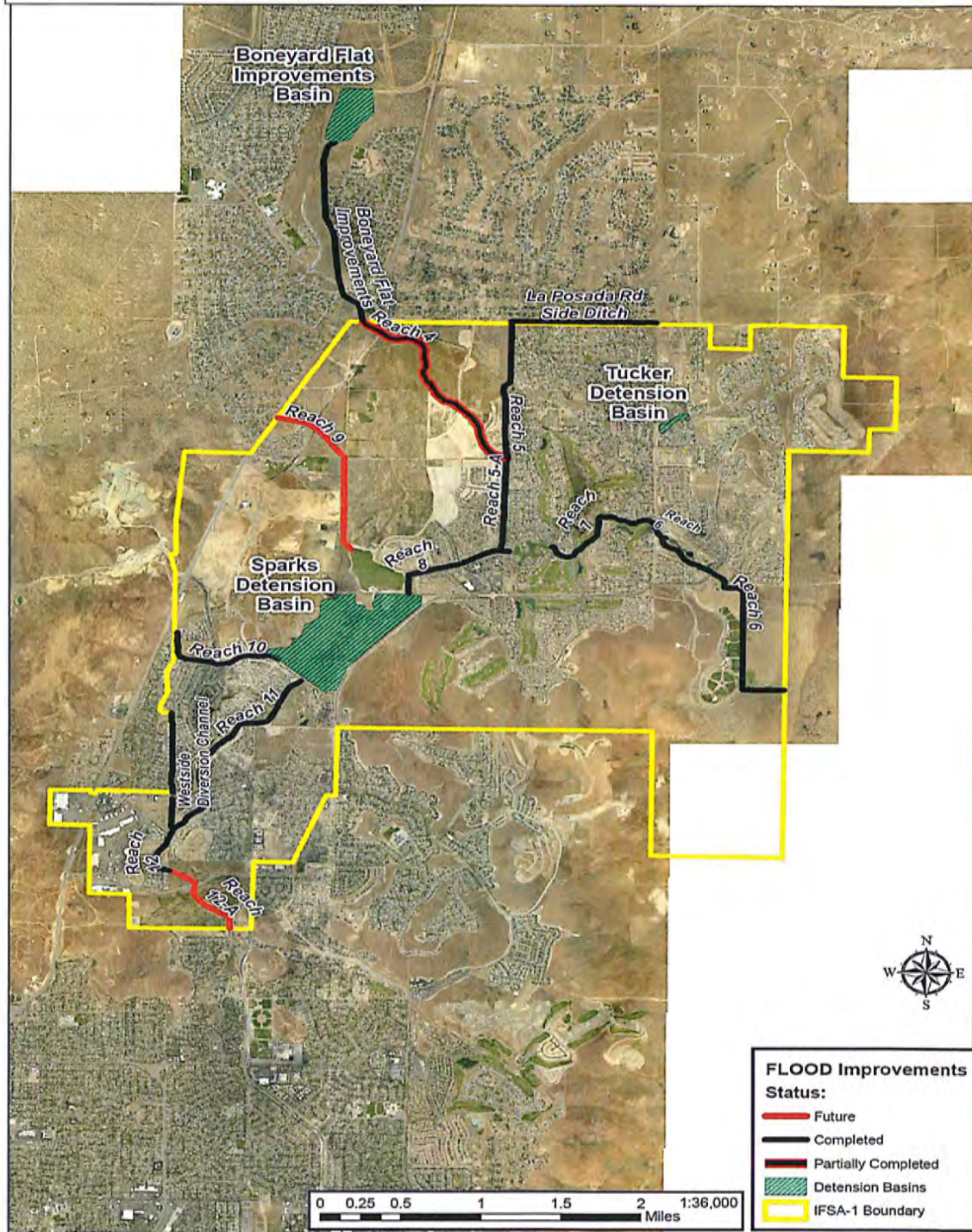
(775) 293-4000

Jhouse@housemorconsulting  
com





FIGURE 1 – IFSA #1 Regional Flood Control Facilities



FILE: C:\GIS\Current Projects\TRAIL\_Data\_For\_IFSA-1\Flood\_Control\_Facilities\_IFSA-1\_06302013.mxd





The area integrated under the hydrograph curve represents the volume of runoff, explicitly tied to peak flow for each computational time interval throughout the storm event being evaluated.

At the City's request, House Moran will utilize the U.S. Army Corps of Engineers HEC-HMS Version 4.2 hydrologic model. HEC-HMS along with its predecessor HEC-1, is widely used and accepted throughout the United States, and has been the most commonly used hydrologic model in the region. HEC-HMS is a product of the Hydrologic Engineering Center (HEC) within the USACE. The software is public domain and can be downloaded from HEC's website (<http://www.hec.usace.army.mil/software/hec-hms>). It is designed to simulate the precipitation-runoff processes of dendritic drainage basins and can be calibrated using radar and gage data from actual storm events. HEC-HMS is a lumped-parameter model, meaning dependent variables are a function of time alone, which requires solving a set of ordinary differential equations, thus simplifying the computational platform in the precipitation-runoff process. Of particular importance, HEC-HMS includes numerous watershed abstraction, rainfall transformation, and runoff hydrograph routing method pairing options – making it exceptionally versatile for the Reach 9 watershed complexities being evaluated.

For the Analysis, House Moran will use Green and Ampt (G&A) watershed abstraction, Snyder Unit Hydrograph (UH) rainfall transformation, and Muskingum-Cunge hydrograph routing methods, in concert with USACE's extension to Environmental Systems Research Institute's (ESRI's) ArcMap GIS software, HEC-GeoHMS, that provides geospatial tools for processing terrain data, delineating sub-basins, and setting up model connectivity.

The Scope of Services, Schedule, and associated Fee for the Peak Flow Hydrographs Development are provided below. At the end of this document, the Scopes of Services, Schedules, and associated Fees are also provided for Optional Task No. 1 - 2017 Storm Frequency Analysis, Optional Task No. 2 - Regional Impact Storm Development, and Optional Task No. 3 - Reach 9 Sediment Transport/Accumulation Analysis.

## **SCOPE OF SERVICES**

### **TASK 1 – DATA COLLECTION AND PARAMETRIC DEVELOPMENT**

House Moran will compile existing data developed from several previous studies in the project area to revise the hydrologic model inputs. Whenever possible, ESRI Geographic Information System (GIS) software applications will be utilized to obtain, organize, arrange, synthesize, and analyze the data collected for this Analysis. The following subsections of this report outline the nature and extents of this data.

#### **Task 1A – Topography**

- Elevation data;





- ❖ Latest available airborne laser altimetry and mapping and/or LiDAR (Light Detection and Ranging) survey data and Digital Terrain Model (DTM) data in AutoCAD and ESRI shapefile formats; and
- ❖ USGS National Elevation Dataset (NED) as One Arc-Second (approximately 30-meter) Digital Elevation Model (DEM), to augment topographic coverage in the absence of suitable City/Washoe County DTM information in certain areas.
- ❖ GIS data from the City (land use, zoning, master planning, roads, parcels, streams);
- ❖ NOAA Atlas 14 Volume 1 Version 5 precipitation data;
- ❖ NEXRAD precipitation data for 2017;
- ❖ USGS National Hydrography Dataset; and
- ❖ NRCS SSURGO Soils Data.

### **Task 1B – Sub-Basins**

ESRI's ArcHydro tools will be used in ArcGIS desktop software to delineate sub-basins with drainage areas of approximately  $\frac{1}{4}$  mi<sup>2</sup> or less for use in HEC-HMS. Existing stream centerlines obtained from the City's GIS will be edited in more detail around the developed areas and Regional Flood Control Facilities where much of the flow travels in channels. The City's Digital Terrain Model (DTM) will be used to create a Triangulated Irregular Network (TIN) representing the ground surface. A Digital Elevation Model (DEM) or elevation grid will be generated from the TIN. The stream centerlines will then be burned into the DEM using an ArcHydro process. The sub-basins will be generated in ArcHydro using this data. The sub-basins will then be exported with the software extension in ArcGIS to HEC-GeoHMS. The sub-basins will be merged and split as-needed to finalize their boundaries. HEC-GeoHMS will then be used to generate the schematic for the HEC-HMS model. The hydrologic data and the schematic will be exported to create a HEC-HMS basin model for each sub-basin delineation size.

### **Task 1C – Soils**

Digital soils coverage of the Reach 9 Analysis area will be obtained from the NRCS Soil Survey Geographic (SSURGO) Database. Additionally, ArcGIS shapefile coverage from the "Washoe County, Nevada, South Part" soil survey compiled in ArcMap GIS. The G&A parameters (Saturated Hydraulic Conductivity, Wetting Front Capillary Suction, and Volumetric Soil Moisture Deficit) will be estimated in ArcGIS for each of the sub-basins in the study area using the SSURGO soils data. The soil textures for each Map Unit Symbol (MUSYM) will be extracted from the SSURGO database. Each MUSYM is comprised of one or more soil components that have a soil texture description and an estimated percentage of the overall MUSYM. The soil textures will be converted to a base soil texture associated with standard soil properties. These soil components are further categorized into one of thirteen common soil textures that will be used in the G&A watershed abstraction parameter development for the hydrologic modeling in this Analysis. Twelve of which include: loams, sands, silts, clays, and combinations thereof. The thirteenth soil texture is a classification for rock outcroppings.

The initial Saturated Hydraulic Conductivity (Ksat), Wetting Front Capillary Suction (PSIF), and Volumetric Soil Moisture Deficit (Dtheta) will be calculated for each component and averaged





together to estimate composite values for each MUSYM, and based on one or more of five sources, (1) regionally calibrated values from several previous studies by House Moran staff, (2) USACE Engineer Manual 1110-2-1417, Flood-Runoff Analysis, Table 6-2, and (3) Rawls, W. J., and Brakensiek, D. L. (1982). “Prediction of Soil Water Properties for Hydrologic Modeling”, and (4) Heath, Basic Groundwater Hydrology, USGA Water Supply paper 2220 (1982), and (5) Drainage Design Manual for Maricopa County, Arizona (2009).

#### **Task 1D - Land Use**

Since the primary goal of this Analysis is to provide peak flow hydrographs at key locations, based on full build-out conditions within the Reach 9 watershed, only future watershed conditions and land uses will be considered. For the hydrologic modeling discussed in the Analysis, future conditions land uses and watershed data will be developed from the following information provided by the City’s GIS department:

- ◆ Aerial photography;
- ◆ Parcel and property line data;
- ◆ City Master Plan; and
- ◆ City zoning and land use designations.

Additional resources will be used to develop the vegetative coverages estimated for the hydrologic modeling areas, including: (1) The National Atlas of the United States (USDI, 2014), (2) USGS National Elevation Dataset (NED) as One Arc-Second (approximately 30-meter) DEM, and (3) field investigations. The land use datasets will be merged to produce a comprehensive GIS land use layer with complete coverage for all studied areas.

For modeling purposes, generalized land uses will be categorized into a limited number of Land Use Descriptions to characterize and categorize the different dominant land uses found in the watershed. Like the SSURGO soils data described above, the Land Use Description and corresponding Land Use Code data is not used directly in the hydrologic modeling described herein. Instead, this land use data is used to develop a variety of hydrologic modeling parameters used in this Analysis.

ESRI ArcMap will be used to develop modeling input parameters for the sub-basin, soil, and land use layers defined above. Within GIS, these layers are intersected to produce and/or calculate area-weighted averages for each desired parameter for each defined sub-basin. Look-up tables will be developed to assign modeling parameter values to collected data – namely soil surface textures and land use categories. The look-up tables will contain the area-weighted modeling parameters as calculated for each sub-basin using intersecting GIS layers.

#### **Task 1E – Rainfall Data**

Excluding the more detailed rainfall data synthesis and statistical analysis performed in the OPTIONAL TASKS described at the end of this document, design storms for the 2-, 10-, 50-, and 100-year frequency events will be generated using average rainfall values from NOAA Atlas 14 Volume 1, Version 5. ArcGIS will be used to calculate the area-weighted average NOAA



Atlas 14 precipitation corresponding depths. This data represents expected total rainfall depths (in inches) at the sub-basin centroids for the given design storms and storm durations.

For hydrologic modeling purposes, these rainfall depths will be used to develop custom, balanced design storm hyetographs for each sub-basin for the 2-, 10-, 50-, and 100-year return periods of interest. The balanced storm uses incremental rainfall depths arranged with the highest increment occurring in the middle of the storm and the second and third ranked incremental depths placed before and after the first. This procedure is continued until the entire storm duration is covered. This method will be used because it provides a conservative, theoretical storm distribution with the highest rainfall intensities possible.

Prior to the development of the individual rainfall hyetographs for the HEC-HMS sub-basins, an ARF will be evaluated for application to the rainfall depths for each sub-basin. The concept behind ARFs is the common assumption, that design storms uniformly and simultaneously impact each of the watershed sub-basins. This assumption can be overly conservative and reductions to total rainfall depths may be warranted. When appropriate, the use of ARFs reduces the total rainfall depths for the given storm durations – with larger reductions applied to the shorter duration and smaller reductions assigned to the longer durations. NOAA Atlas 14 does not address ARFs, but its predecessor, NOAA Atlas 2, included curves for ARFs based on watershed area and storm durations. This information will be used if applicable for rainfall depths in the Reach 9 watershed.

#### **Task 1F – Green and Ampt Watershed Abstraction**

Watershed abstraction is a term used to describe the rainfall that is not converted to runoff. Rainfall can be abstracted through interception, infiltration, surface storage, evaporation, and evapotranspiration. The G&A watershed abstraction method is a physically-based model that applies Darcy's law and the principle of conservation of mass in a finite-difference formulation. The model works under the assumption that water enters the soils as a sharp, vertical wetting front that travels as a function of the hydraulic conductivity. G&A parameters in a sub-basin are estimated as a function of the soil texture. The following parameters are used:

- ◆ Saturated Hydraulic Conductivity (Ksat) – The infiltration rate of the soil once it is saturated, in inches per hour;
- ◆ Wetting Front Capillary Suction (PSIF) – Characteristic suction head of the soil, in inches; and
- ◆ Volumetric Soil Moisture Deficit (Dtheta) – This dimensionless value represents the initial soil moisture conditions. It is equal to the effective soil porosity times the difference in final and initial volumetric soil saturations.





### **Task 1G - Snyder Unit Hydrograph Rainfall Transformation**

Rainfall transformation, as it relates to rainfall-runoff modeling, refers to the process of converting excess rainfall into stormwater runoff, typically in the form of a runoff hydrograph. The excess rainfall is determined from the watershed abstraction method used in the model. For the Reach 9 watershed HEC-HMS model, the Snyder Unit Hydrograph (UH) method has been selected. Like the multiple watershed abstraction and hydrograph routing options in HEC-HMS, there are several options for selecting a rainfall transformation method. The Snyder UH method was selected because of its mountainous pedigree and the reliable input parameters available for this particular region.

The Snyder UH method, as proposed by F.F. Snyder in 1938, was developed from studies of basins in the Appalachian Mountain region and uses a synthesized hydrograph approach derived from specific physical watershed measurements. Snyder UH methods have successfully been used on numerous FEMA flood studies and NDOT offsite drainage studies in northern Nevada for almost 20 years.

### **Task 1H - Muskingum-Cunge Runoff Hydrograph Routing Method**

HEC-HMS provides the option of using one of several different hydrograph routing methods. Given the predominantly natural terrain and limited land uses in the Reach 9 watershed, the Muskingum-Cunge eight-point routing method has been selected. The Muskingum-Cunge routing method is a combination of the conservation of mass and the iterative diffusion of the conservation of momentum at every time step within the channel. HEC-HMS requires the following routing parameters for each Muskingum-Cunge routing reach:

- ◆ Channel length;
- ◆ Channel slope;
- ◆ Manning's  $N$  roughness coefficient for the channel and overbank areas; and an
- ◆ Eight-point cross-section of channel and effective overbank flow areas.

ESRI ArcGIS will be utilized to determine average reach cross-sections, channel lengths, and routing reach slopes for each of the routing reaches defined for the Reach 9 HEC-HMS model. During development of parameters for the reaches, field visits will be conducted to assess typical channel cross-sections and estimate Manning's  $N$  roughness coefficients for the reach channel and overbank areas. It is important to note that for the Muskingum-Cunge method, the Manning's  $N$  values are selected to reflect average conditions throughout the entire routing reach, including sections with incised or broadened channels, and areas of varying floodplain widths.

The properties established for each of the eight-point cross-sections (one for each routing reach) are average or generalized longitudinal and cross-sectional characteristics for each reach intended to reflect the general properties of the entire reach. These generalizations distinguish this approach for the detail and precision found in a typical hydraulic water surface profile analyses - where reaches can include numerous cross-sections with each cross-section defined by potentially dozens of points and varying roughness coefficients. In the Muskingum-Cunge





method, only eight cross-sectional points are used, and only single values of Manning's 'N' can be provided to describe the main channel, left overbank, and right overbank segments of each cross-section. Because hydrologic hydrograph routing, like the Muskingum-Cunge method, uses reach-averaging concepts, it is not intended that the single definable location is constant and fixed for the entire routing reach.

## **TASK 2 - HEC-HMS MODEL**

HEC-HMS incorporates several different precipitation-runoff algorithms to produce hydrographs for individual sub-basins and will route these hydrographs in-time through conveyance systems in the Analysis area. This routing accounts for peak flow attenuation and hydrograph timing created by channel reaches and storage areas. All of the aforementioned modeling parametric values will be entered into the model, and the model executed for each storm frequency, under full build-out future conditions. Accordingly, peak flow hydrographs will be developed for each of the key locations to be determined by the City.

A key assumption is inherent in the modeling presented in this section of the proposal, specifically, it is assumed that the runoff results from the HEC-HMS model using rainfall input data from a specified recurrence interval share the same recurrence interval. That is, the 100-year HEC-HMS model, using 100-year rainfall input data, produces runoff results (peak flows and flood hydrographs) that also have a 100-year return period. It is acknowledged and recognized there is not always a direct correlation between return period of the input rainfall data and the peak flow results generated. This issue may be due to antecedent moisture conditions or rain-on-snow events. Ideally, models can be calibrated using both rainfall and stream gage data from the watershed so that more direct correlations can be established.

## **TASK 3 – FINAL REPORT**

This document will include an Executive Summary, details of parameter development, modeling methodologies, results summary tables, detailed hydrograph plots at all key locations requested by the City, exhibits, tables, mapping, and support documentation.

## **OPTIONAL TASK NO. 1 - 2017 Storm Frequency Analysis**

At the City's request, House Moran will collect available radar/gage data and conduct a statistical recurrence frequency analysis, and develop rainfall depth grids and return period contour maps for the 60-day period of record, January and February 2017, that produced flooding in Sparks. NEXRAD (NEXt-Generation RADar) data for this time period will be obtained from the National Oceanic and Atmospheric Administration (NOAA) - National Climate Data Center (NCDC) Data Inventory. The raw radar data is a measure of the radar return intensity, Z (dBZ). The radar intensity values are converted to rainfall intensities, R (in/hr) using proven Z to R relationships. The NCDC also provides estimates of adjusted radar values based on a network of ground-based precipitation gages over the entire radar scan, which includes numerous data validations and adjustments to the radar-based rainfall estimates.





A radar map of the instantaneous precipitation rate will be compiled for the City that will illustrate storm accumulation over the 60-day time period. Point precipitation gage data can be used to calibrate the NEXRAD data for the same storms, creating a Gage Adjusted Radar Rainfall (GARR) data set. Radar is a valuable tool that can be used to improve the estimation of rainfall between gages, providing a high resolution of the spatial and temporal variability of rain falling over an area. However, radar is not a consistent estimator of actual rainfall amounts hitting the ground. Point precipitation gages can be used to “adjust” or “calibrate” radar data to match the rainfall amounts. When this is done using a Uniform Adjustment Factor (UAF), a GARR data set is created that estimates the volume of rain that fell in the event both spatially and temporally similar as the NEXRAD data set. A radar-gage bias will be determined by using NOAA Digital Instantaneous Precipitation Rate - NEXRAD Level 3 Gage Adjusted Radar Rainfall (GARR), based on NOAA’s Automated Surface Observation System (ASOS) to verify and adjust the Z-R relationship derived from the raw radar readings. Additional bias correction of the radar-based rainfall estimates will be computed, as needed, in specific areas within the City where data is either not consistent with co-located ground gages, and/or not available.

For this analysis, gages from multiple sources will be used, such as NOAA National Weather Service (NWS) Advanced Hydrologic Prediction Service (AHPS), Weather Underground, and numerous local municipal precipitation gages. The frequency will be estimated by comparing the total precipitation depth over the 60-day duration to the average rainfall values found in the NOAA Atlas 14 Volume 1, Version 5 Precipitation Frequency Data Server (PFDS) Point Precipitation Frequency Estimates, based on analysis of partial duration series (PDS) datasets.

#### **Deliverable**

A statistical recurrence frequency analysis, rainfall depth grids, and return period contour maps for the 60-day period of record, January and February 2017.

#### **OPTIONAL TASK NO. 2 - Regional Impact Storm Development**

At the City’s request, the results of OPTIONAL TASK NO. 1 – 2017 Storm Frequency Analysis and previous summer Storm Frequency Analyses performed by House Moran staff, can serve as the cornerstones for the development of a Regional Impact Storm (RIS) for the City; a hypothetical storm event (or series of events) to be used as the precipitation input to evaluate land use changes in the City. The RIS will be developed using statistical analysis of historical storm frequency, depths, and distributions, but is not intended to be representative of a particular precipitation frequency or return period (e.g., 100-year storm). The RIS will include both temporal and spatial distributions.

Utilizing the historical data available through past studies in the region, and data from the development of the OPTIONAL TASK NO. 1 – 2017 Storm Frequency Analysis, this task will include an analysis of existing research and studies regarding typical storm patterns within the City and extend as necessary throughout the Truckee River Watershed.

The development of the RIS will take into consideration the following:





- ♦ Spatial distribution;
- ♦ Temporal distribution;
- ♦ Design storm size;
- ♦ Storm movement (direction and speed);
- ♦ Duration of event; and
- ♦ Areal reduction.

#### Previous Events and Studies

It will also be helpful to perform a critical duration analysis to determine the storm duration that produces the highest peak flows in the City. In order to account for all of the above considerations, the proposed RIS will utilize several existing documents in the development of this hypothetical storm event, including:

- ♦ NOAA, National Weather Service, 2006. NOAA Atlas 14 - Precipitation-Frequency Atlas of the United States, Volume 1 Version 5: Semiarid Southwest (Arizona, Southeast California, Nevada, New Mexico, Utah);
- ♦ NOAA, National Weather Service, 1984. Hydrometeorological Report No. 49 (HMR-49) – Probable Maximum Precipitation Estimates for the Colorado River and Great Basin Drainages; and
- ♦ NOAA, National Weather Service, 1981. Hydrometeorological Report No. 50 (HMR-50) – Meteorology of Important Rainstorms in the Colorado River and Great Basin Drainages.

Typically, considering flooding events on the Truckee River, general (frontal) storm events are evaluated. Convective (cloudburst) events are smaller in area, but higher rainfall intensity and may result in more severe local flooding, as experienced in the City many times in the past. HMR-50, a companion document to HMR-49, provides examples and definitions of both the local and general storms of interest. HMR-50 defines a general-storm as “a storm that produces significant precipitation over at least several hundred square miles and lasts at least a day”. HMR-50 defines a local-storm as “a period of unusually heavy rains exceeding 3.00” in 3 hours or less, that are reasonably isolated from surrounding rains, and these rains are usually not associated with any organized meteorological system”. Accordingly, the RIS analysis will produce a matrix of both frontal and convective storms within the City, with the intent of synthesizing a hybrid frontal-convective RIS, based on historical statistical and critical duration analysis.

#### Spatial Distribution

The NOAA Atlas 14 precipitation frequency maps and GARR can be used as general guides in varying the rainfall depths, and will account for the rain shadow effect created by the Sierra Nevada Mountains.



### Temporal Distribution

There are several different methods that can be used to develop the temporal distribution of a hypothetical storm event, including: (1) NRCS TR-55 distributions, (2) frequency (or balanced storm), and (3) Huff distributions from NOAA Atlas 14, Volume 1. We recommend using the frequency (or balanced storm) method for reasons stated below.

Based on several studies in the region, we have found the frequency or balanced-storm method is best suited to create a custom rainfall distribution using statistical data, such as the precipitation-duration-frequency data from NOAA Atlas 14. This method ranks the 5-, 10-, 15-, 30-, and 60-minute time intervals and beyond, along with the 2-, 3-, 6-, 12-, 24-, and 48-hour and beyond rainfall intensities, and places the highest 5-minute intensity at the middle of the storm hyetograph. The second and third ranked values are placed before and after the highest value. This is continued until all of the values are used. This method creates an idealized hyetograph with the most intense storm possible for the given frequency and duration. This method has the advantage of being independent of the storm duration. This method could be modified to shift the peak intensity to occur earlier or later.

### Areal Reduction

NOAA Atlas 14 provides depth-duration-frequency grids for return period frequencies from 1- to 1000-years and durations from 5-minutes to 60-days. These values are based on point rainfall estimates. For models over 10 square miles, it is suggested to apply an Areal Reduction Factor (ARF) to the point estimates. The ARF is calculated using the total watershed area.

An alternative method is to use the idealized local-storm isohyetal pattern described in HMR-49. This method develops ellipses with a 1.5 to 1 ratio based on large historical storm events in the Colorado River and Great Basin Drainages. A series of ellipses are layered on top of one another and each is assigned an ARF based on the total area of the ellipse. The result is a series of rings with decreasing values of ARF. This series of ellipses can be overlaid with the NOAA Atlas 14 point rainfall values to create a hypothetical storm. This method would be most useful to evaluate a local-storm or convective storms by itself or in addition to a hybrid general-convective storm event.

### Storm Movement

Storm movement will be included in the RIS to account for the typical west to east progression of storm events within the Truckee River watershed. An average speed and direction will be determined from previous studies and OPTIONAL TASK NO. 1 – 2017 Storm Frequency Analysis. The precipitation input data is a time series table linked to a grid that covers the watershed. The time series will be delayed more as the storm moves from grid cells in the west to the east.

### Snowmelt

Snowmelt and rain-on-snow will not be considered in this analysis, unless the City wants to expand the Scope of Services to include a more regional (Truckee River Watershed) approach.





### **Deliverable**

A hybrid frontal-convective RIS, based on historical statistical and critical duration analysis.

### **OPTIONAL TASK NO. 3 - Reach 9 Sediment Transport/Accumulation Analysis**

At the City's request, House Moran will prepare an assessment of the potential for sedimentation - produced, transported, and accumulated within the Reach 9 watershed to provide essential data, that in conjunction with hydrograph development Scope of Services, will provide Standard Project Flood Hydrograph Adjustments (SPFHAs) to account for structure clogging potential at the key hydrograph locations. The beginning point of this sediment analysis is located at the Lemmon Valley-Golden Valley ridge line, proceeding perpendicular to the ridge line and east (downhill) through Sonoma Highlands to Pyramid Highway, about 5 miles in total distance. From Pyramid Highway where Reach 9 begins, the study will continue east and south through new developments, to Pioneer Meadows Detention Pond, Sparks Detention Basin, and continuing through the IFSA #1 Regional Flood Control Facilities network of channels, Reach 11, Reach 12, and lastly Reach 12-A, until the water is conveyed in the Sparks Boulevard roadside channel, and proceeding to the endpoint of this analysis at the culvert under Baring Boulevard and Sparks Boulevard intersection near Reed High School. The above-listed IFSA #1 Regional Flood Control Facilities downstream of Pyramid Highway are important components of the City's flood control asset management network. Accordingly, protection from sedimentation in Reach 9 is vital to maintain flood flow capacity, forecasting Operations and Maintenance (O&M) activities and costs, and protecting properties along the Reach 9 corridor.

As part of this assessment, comprehensive analyses of the watershed characteristics such as elevation, slope, stream network, land uses, soils, and vegetative cover will be determined. Also, using the definitions and zone classification provided by the Natural Resources Conservation Service (NRCS), combined with the land use, vegetative cover, and soils examinations, the geomorphic watershed features will be divided into three physiographic zones (Erosional Zone, Transport Zone, and Depositional Zone).

### **Deliverable**

Sediment transport and accumulation will be determined, and SPFHAs determined for adjusting structure sizing criteria and long-range O&M activities.

### **SERVICES NOT INCLUDED**

The Scope of Services does not include the following three items:

- Hydraulic modeling of Reach 9 channel to determine channel sizing unless OPTIONAL TASK NO. 3 – Reach 9 Sediment Transport/Accumulation Analysis is authorized. Channel hydraulics are a requirement of in-channel erosion and sediment transport mechanisms; and
- All field location surveying to be performed by the City or others (not a part of this Scope of Work and Fee.
- Correction of City baseline data and GIS layers used for query and analytical purposes.



### **INFORMATION PROVIDED BY CITY**

House Moran shall be entitled to rely on the completeness and accuracy of the information provided by the City, and the City's consultants or representatives. The City shall provide information requested by House Moran during the project, including but not limited to the following:

- Previous H&H analyses, master plan reports, flood studies, land development tentative maps and associated drainage and hydrology reports, and capital improvement plan information; and
- Available GIS data required for query and analytical purposes, as described in the Scope of Services above.

### **SCHEDULE**

The schedule to perform the work as outlined below from Notice-to-Proceed (NTP) is as follows:

<b>Schedule</b>	
Reach 9 Peak Flow Hydrographs Development	8 Weeks
Optional Task No. 1 - 2017 Storm Frequency Analysis	6 Weeks
Optional Task No. 2 - Regional Impact Storm Development	4 Weeks
Optional Task No. 3 - Reach 9 Sediment Transport/Accumulation Analysis	8 Weeks

### **FEES**

The fees for the work described herein is shown in the table below, on a lump sum basis. These fees will not be exceeded without prior written authorization from the City. The project will be billed monthly on a percent complete basis. These fees also include any professional civil engineering support by others (if needed) to meet the Project/Optional Tasks Schedules.

<b>Fees</b>	
Reach 9 Peak Flow Hydrographs Development	\$28,000
Optional Task No. 1 - 2017 Storm Frequency Analysis	\$20,000
Optional Task No. 2 - Regional Impact Storm Development	\$16,000
Optional Task No. 3 - Reach 9 Sediment Transport/Accumulation Analysis	\$28,000

### **CLOSURE**

In addition to the matters set forth herein, our Agreement shall include and be subject to, and only to, the City's Professional Service Contract, in which the City's Terms & Conditions are hereby acknowledged, incorporated by reference, and accepted by House Moran. This Proposal serves as Attachment A of the City's Professional Service Contract.





If the City concurs with all the foregoing and wishes to direct us to proceed with the services contained herein, please have authorized persons execute the City's Professional Service Contract, and send 2 copies to House Moran for signatures. We have previously provided our Certificate of Insurance and City of Sparks Business License information. House Moran's receipt of the City's Purchase Order will serve as our NTP. We appreciate the opportunity to provide these services to the City and continue our excellent, long-standing working relationship. If you have any questions, please give me a call at 775-293-4000.

Very truly yours,

HOUSE MORAN CONSULTING, INC.

Jeff House, CFM  
Chief Executive Officer