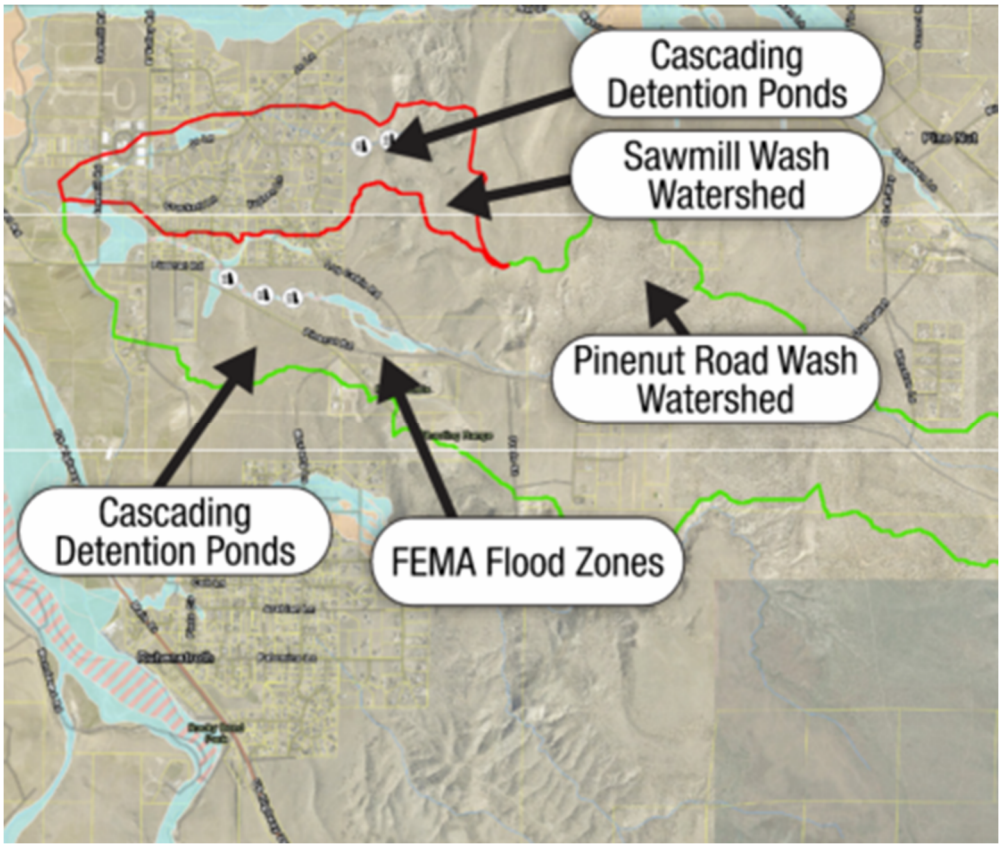
Carson Water Subconservancy District

Pinenut/Sawmill Wash Detention and Flood Control Basin Design

Business/Technical Plan of Work

Project Understanding

Kimley-Horn understands that the Carson Water Subconservancy District (CWSD) and Douglas County (County) are exploring the construction of detention and flood control facilities to manage flood flows from the Sawmill Wash and Pine Nut Road Wash watersheds. The initial step in this process involves studying the contributing watersheds up to the point where the two washes converge, ultimately flowing into the Allerman Canal system. Once the flows are estimated, this project will produce a feasibility study with a preliminary design for detention basins designed to alleviate/reduce the downstream flooding impacts. The exhibit below illustrates the watershed boundaries and the general location of proposed detention ponds, east and south of Pinion Ridge subdivision.



The scope of work for the study/plan would incorporate the follow tasks:

Task 1. Project Management

- Project management includes onsite project meeting and presentation time, coordination with the subconsultants, and uploading the appropriate project data into FEMA Mapping Information Platform (MIP). The MIP tasks will only require the study data, a project narrative and self-certification forms to be uploaded to the MIP and will not include metadata. In addition, this task includes preparation of monthly project progress reports, invoicing, contract management, internal meetings with staff, and Quality Control/Quality Assurance reviews by senior staff.
- Kimley-Horn will collect the applicable topography data from CWSD, County, and USGS. No new aerial photogrammetry or LiDAR topographic data will be collected for this project.

Task 2. Data Collection

- Kimley-Horn will collect, review, and process existing data provided by CWSD, Douglas County, and other sources as necessary to determine applicability of use for this effort. Data may include previous studies, GIS layers, and survey data. For hydrology and hydraulic modeling, it is assumed that models developed for Pinenut Road Wash will be provided by CWSD, and Kimley-Horn is expected to use these models for the study.
- As part of the effort to understand the existing watershed conditions and to evaluate the existing drainage facilities, up to one (1) site visit will be performed. Kimley-Horn will document the data collection effort in the Technical Report, provided in Task 6, along with the inclusion of photographs taken during the site visit. Kimley-Horn will conduct up to one (1) field assessment/field survey to collect relevant data. Kimley-Horn's site visit is anticipated to document up to 14 culverts. This data gathered will consist of approximate size, slope measurements using tape measure, and metal digital level. The scope of work under this task does not include aerial topography or field topographic surveys.

Task 3. Hydrologic Modeling

- Perform limited verification and/or refinement of the watershed boundary as deemed necessary by Kimley-Horn, land use, soils data, precipitation data, and routing information of the effective/existing Pinenut Road Wash hydrologic model provided by CWSD/County.
- Kimley-Horn will make further modifications to the effective Pinenut Road Wash hydrologic model to include adjacent Sawmill Road Wash watershed from the upland

watershed boundary to the confluence of these two watersheds, just upstream of Allerman Canal.

- Kimley-Horn will document the estimation of hydrologic model parameters, hydrologic analyses findings, including key exhibits in the Technical Report.
- This Task assumes that the effective/existing hydrologic model of Pinenut Road Wash provided by the CWSD/County is functional and can be operated without any errors and represents the effective/existing conditions as depicted in FEMA FIS/FIRMs. If the Client provided models are not operable, and Kimley-Horn needs to rebuild the models, the effort required to rectify the models shall ne considered as additional scope of work and Kimley-Horn will provide these services for an additional fee, as agreed upon through a scope amendment executed by the Client and Kimley-Horn.

Task 4. Hydraulic Modeling

- A two-dimensional hydraulic model of the downstream reaches of Sawmill Wash and Pine Nut Wash will be developed using the HEC-RAS V 6.5. A terrain model representing the current conditions of the downstream floodplain will be created by using the USGS topographic data or CWSD/County provided topographic data. This terrain will then be integrated into the HEC-RAS geometry.
- A computational mesh with an appropriate grid size will be selected and refined in key areas of interest, such as near hydraulic structures, elevated terrains, or steep slopes. Internal boundary conditions will be incorporated to represent structures like elevated roadways with culvert crossings, levees, walls, and other barriers that affect flow.
- Land-use data will be obtained from the Douglas County GIS portal, and appropriate roughness coefficients following standard engineering practices, based on terrain and vegetation types, will be assigned within the model.
- External boundary conditions will include outflow hydrographs from hypothetical detention ponds located upstream and normal depth conditions downstream.
- An appropriate time step will be determined for the model, based on grid size and flow velocity, to satisfy Courant conditions.
- The hydraulic model will then be executed to simulate the propagation of flow hydrographs through the downstream floodplain.
- The results will be processed using HEC-RAS and ArcGIS to approximate anticipated flow depths (water surface elevations) and the extent of the floodplain.
- Finally, the floodplain boundaries obtained from this modeling will be compared with the effective FEMA Flood Insurance Rate Maps (FIRMs) to assess the impacts of the proposed flood control reservoirs upstream of the Pinion Ridge subdivision.

Task 5. Conceptual Designs

- The capacities of the existing downstream storm conveyance system will be compared to the attenuated peak runoff discharge from the detention ponds. This analysis will identify any necessary new stormwater conveyance systems and upgrades to the

current infrastructure. Kimley-Horn will recommend stormwater conveyance improvements, which may include approximate sizes of culvert crossings, drainage channel/ditch sections, inlet locations to convey the revised flows.

- Following the evaluation of the H&H model results, any recommended modifications will be made to maximize the reduction of floodplain extents, thereby potentially removing as many properties and structures as possible from the SFHA.
- Kimley-Horn will develop conceptual level plan sheets for the detention basin design using the readily available topographic data obtained from the County and CWSD. Plan sheets will show plan and profile considering known right-of-way and utility constraints. Notes, details, and specifications will not be included.
- Kimley-Horn will compile collected data, analyses, and design into a basin feasibility report for submittal to the County. Kimley-Horn will submit a draft report and final report that addresses all comments. It is assumed that all submittals will be electronic, and that up to one round of comments will be addressed

Task 6. Technical Report

- Kimley-Horn will compile all collected data, analyses, and design into a summary report for submittal and approval to the County and CWSD. Kimley-Horn will submit a draft report and final report that addresses all comments. It is assumed that all submittals will be electronic, and that one round of comments will be addressed. A preliminary estimate of probable construction costs will be included in the Technical Report.

Task 7. Public Outreach

- Kimley-Horn will assist CWSD and the County in conducting up to one (1) public meeting to present the results of flood risk mitigation and conceptual designs. The public meeting will focus overall mitigation solutions and recommendations. Kimley-Horn anticipates attending this meeting in person but can facilitate virtually as needed. Kimley-Horn will prepare public meeting materials including display boards, meeting invitation language, PowerPoint presentation, and any required handouts. Kimley-Horn can also present technical data at the meeting if desired by the County. It is assumed that the CWSD will secure facilities to host in person public meetings, and that CWSD will assist with public meeting preparation and provide Kimley-Horn at least two weeks of lead time before the scheduled meetings.
- In addition to the public meeting described above, Kimley-Horn will give up to one (1) presentation to the CWSD Board and another presentation to Douglas County Board of Commissioners.

KIMLEY-HORN ALLOWANCES

- Expenses anticipated for this project include telecommunications, in-house production, printing, travel expenses, mileage, postage, supplies and project related computer time. These expenses are lumped into the tasks' budget.

OTHER EXCLUSIONS

- Geotechnical and Environmental services
- Topographic & Aerial mapping services
- Cost/benefit analyses

Kimley-Horn will perform the services in Tasks 1 - 7 for the total lump sum labor below.

Task 1	Project Management	$6,500
Task 2	Data Collection	$11,000
Task 3	Hydrologic Modeling	$30,000
Task 4	Hydraulic Modeling	$33,000
Task 5	Conceptual Designs	$11,000
Task 6	Technical Report	$12,500
Task 7	Public Outreach	$6,000
Total Lump Sum Fee		**$110,000**