Southern California receives most of its water from three aqueducts: the California Aqueduct (collected from Northern California and the Sierra Nevadas), the Los Angeles Aqueduct (collected from the Eastern Sierra Nevadas), and the Colorado Aqueduct (collected from the Colorado River). Together, they supply the Los Angeles Metropolitan area with approximately 86% of its total water resources each year, with the LA aqueduct providing the majority. These aqueducts are inherently flawed, however, as they all cross the San Andreas Fault (a right-lateral strike slip fault) at some point, making them susceptible to severe damage during a major earthquake (>6.5 moment magnitude). This damage would effectively cut almost all of LA off from a steady supply of water for weeks or even months.

The city of Los Angeles is currently attempting to construct a “flexible” pipeline to pass over the San Andreas Fault that cannot be damaged by an earthquake, but the project costs upwards of $15 billion and will take decades to complete, according to recent articles by the LA Times. There is also no guarantee that the pipes will remain completely undamaged during a massive earthquake. As water infrastructure is southern California’s biggest vulnerability, other options must be explored.

In this study, we explore the option of creating new water reservoirs throughout the counties of Ventura, Los Angeles, and Orange that can safely store water for usage in the event of an earthquake. We also determine the best route for pipelines to connect these proposed reservoirs to the endpoint of the Los Angeles Aqueduct, the Sylmar Water Reservoir. While this option does not completely solve SoCal’s water problem, it can significantly hinder the impact that a “cut off” would have on the LA metropolitan area.

### Methodology

**Suitability Factors:** 10 factors were identified as critical when building a water reservoir, and the AHP calculator (bpmsq.org) was used to calculate their weights.

**Suitability Analysis:** Raster calculator was used to perform the suitability analysis. Table 1 provides the weights used for each factor and a description for the scores applied to each factor.

**Cost Path:** Another Suitability Analysis (not shown) was performed, as the weights for pipelines are different than those for reservoirs. Cost Back Link and Cost Path were then used to calculate the best routes for pipelines.

**Bedrock Geology** Regions covered by unconsolidated sediment are less suitable to build on than those covered by crystalline rock or consolidated sediment. They received a higher score.

**Fault Density** If there is motion along the San Andreas Fault, it can cause other minor faults to move as well. Regions containing more faults per sq. km. were assigned a higher suitability score.

**Tsunami Inundation Zones** Tsunamis can other polises or rupture hydrologic infrastructure. CGS Classification tsunami inundation zones were assigned high suitability scores.

**Landslide Zones** Regions classified as a Landslide Zone by USGS were assigned a high suitability score, as landslides can lead to the collapse of infrastructure during an earthquake.

**Liquefaction Zones** Regions classified as a Liquefaction Zone by CGS were assigned a high suitability score, as liquefaction can lead to the collapse of infrastructure during an earthquake.

**Liquefaction Zones** Regions classified as a Liquefaction Zone by CGS were assigned a high suitability score, as liquefaction can lead to the collapse of infrastructure during an earthquake.

**Road Density** Reservoirs should not be built on or near roads due to air pollution. Regions with more roads per sq. km. were assigned a higher suitability score.

**Population Density** Reservoirs should not be built on densely populated areas. Regions with more persons per sq. km. were assigned a higher suitability score.

**Proposed Reserves** Sites in close proximity to current major reservoirs were assigned a higher suitability score.

**Proposed Pipelines** Proposed pipelines should not cross the Los Angeles metropolitan area.

**Los Angeles Aqueduct** An Earthquake Hazard Assessment

### Conclusions

The results indicate that small clusters of area are suitable for building new water reservoirs in the LA metropolitan area, particularly in Ventura County. But, overall, these counties are not suitable for hydrologic infrastructure. The most important factors (slope, pop. density, road density, unconsolidated sediment, and fault density) are so abundant that proposed areas are mostly squeezed into small clusters of suitable area, which might still be susceptible to earthquake damage. Were these counties not so densely populated, it might be easier to build reservoirs in even more suitable areas.

Even though population and roads were weighted heavily in the cost path analysis, proposed routes for pipelines still go straight through the center of Los Angeles. While pipelines can be routed underground, the construction would present significant noise and dust problems for city residents.

This spatial analysis illustrates just how difficult it is to solve SoCal’s water problem. For future studies, more suitability factors should be employed and finer rasters should be considered to provide a more accurate assessment of hydrologic infrastructure suitability in SoCal.