A gravity survey was conducted by the Utah Geological Survey (UGS) in the Tularosa, New Mexico study area to delineate basement/subsurface structures. A total of 189 new gravity stations were acquired during the 2016 field season. Field measurements were made using a Scintrex CG-5 Autograv (precision of 1 μGal, accuracy of 5 μGal) following the methods of Gettings and others (2008) and using an absolute gravity base station located near Salt Lake City. Elevation control was established through post-processing of data collected by Trimble GeoXH GPS equipment for a minimum duration of 10 minutes and processed using Pathfinder Office Software tied to local CORS GPS base stations. We report better than 10 cm vertical accuracy for all stations. Based on the vertical gravity gradient (0.3086 mGal/m) this procedure results in a gravity accuracy of better than 0.03 mGal (30 μGal).

Initial processing of the gravity data is followed by the calculation of terrain corrections, the Complete Bouguer gravity anomaly (CBGA), the horizontal gravity gradient. Inner-zone terrain corrections (0 to 67 m) were calculated by hand based on field terrain surveys using the methods of Gettings(2017). Outer-zone terrain corrections were computed using the methods of Gettings (2017) for each station from 67 m to 166.7 km using 90 m Shuttle Radar Topography Mission (SRTM) elevation data. CBGA values were computed using the methods outlined in Hinze et. al (2005). UGS gravity data were combined with legacy data from the Pan American Center for Earth and Environmental Studies (PACES, http://research.utep.edu/default.aspx?tabid=37229) to improve data coverage in the Steptoe Valley, Nevada study area. Gravity anomaly and outer-zone terrain correction values were recalculated for the legacy data using the above methods before merging with newly collected UGS data. We conducted a gravity survey in the study area to delineate basement/subsurface structures.

Simplified 2D gravity model of a transect in the study area was created using a variable thickness sedimentary layer overlying bedrock. The gravity anomaly values along the transect were adjusted for regional effects using low-order polynomials and subsequently modeled using the Semi-Automated Marquardt Inversion code (SAKI) of Webring (1985). The sediment and bedrock density contrasts were held constant for specific interval depths (for sediment layers) and based on estimated values from local geological information, samples, and drill logs of equivalent geographic areas containing sedimentary basins. A density-depth profile was developed using deep well data and densities were assigned in 500 m intervals for the basin fill as follows: 2.0, 2.16, 2.235, 2.31, 2.385, and 2.395 g/cm^3. Bedrock unit for the Tularosa study area was assigned a density value of 2.67 g/cm^3.

Bedrock outcrops on the margins of the valley and interpretations from geologic maps were used as depth-to-bedrock control points for the model to check layer density picks. The profile shows asymmetric basin comprised of a more steeply-dipping interface on the west side of the valley compared to more gently-dipping interfaces on the east side. The basin fill thickness at this location is estimated at a maximum just shy of 1.6 km near the center of the cross-section where the maximum gravity signal is approximately 27 mGal. Further north, the gravity anomaly signal is larger indicating sediments are potentially thicker. On the east side of the Organ mountains the gravity anomaly shows the start of a similar signal amplitude in the Tularosa basin. However, accurate measurements would be required further to the east in order to constrain the Tularosa basin anomaly and have better controls for a future basin model.

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