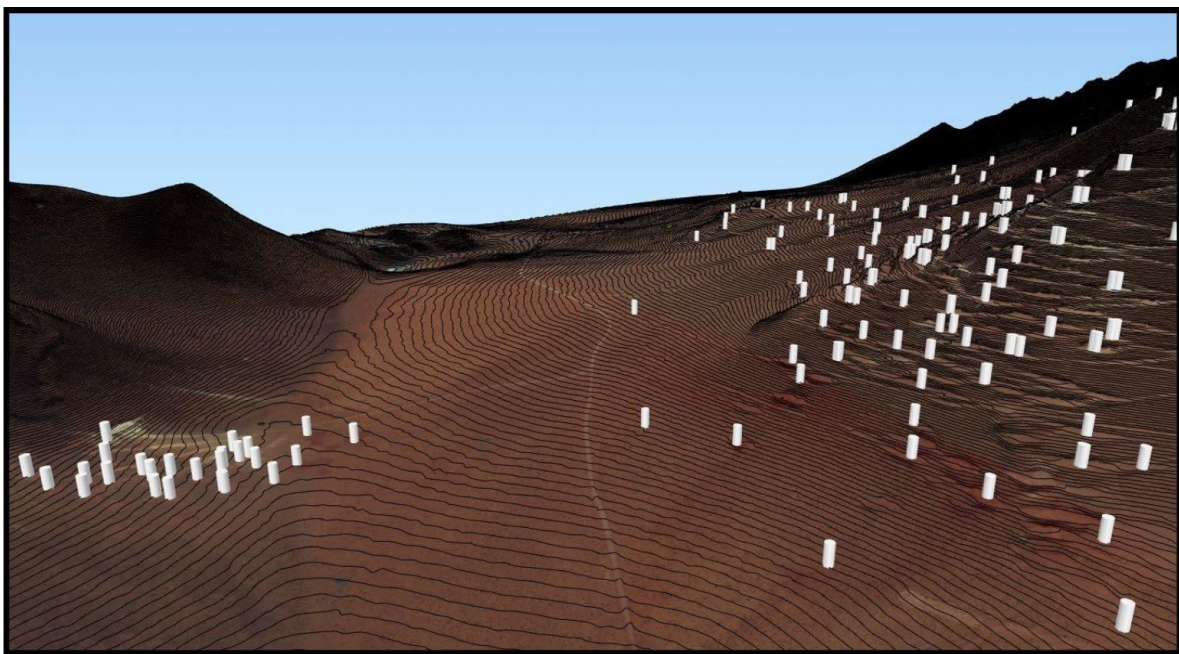


# PhotoSat surveying case history: AbraPlata Diablillos project in Argentina



by **Gerry Mitchell, P. Geo, PhotoSat President**  
*Vancouver, 2019*



3D view of the PhotoSat survey of the AbraPlata Diablillos Silver Project in Argentina showing one meter elevation contours and the drill hole locations.

In October, 2017, PhotoSat produced a 1m satellite survey grid, 1m contours, and a 50cm resolution colour satellite orthophoto for the Diablillos Silver Project in Argentina. The survey grid is accurate to better than 20cm in elevation. The precision colour orthophoto is accurate to better than 50cm horizontally.

PhotoSat used the satellite survey grid and precision orthophoto to review and adjust the survey coordinates of all of the existing Diablillos Project drill holes.

## **Diablillos ground survey data:**

There were three ground survey data sets for the Diablillos project:

- 5 ground reference targets established for the 2017 PhotoSat survey
- 39 drill hole collars for the 2017 drilling
- 206 drill hole collars for the 2006 drilling

## **Diablillos Project projection and datums:**

AbraPlata selected UTM Zone 19 South projection (SUTM19), WGS84 horizontal datum and the EGM2008 geoid as the vertical datum for all survey data for the Diablillos project.

- The five ground reference points collected by AbraPlata for the Diablillos project were provided in UTM Zone 19 South projection, WGS84 horizontal datum. Heights were given above the WGS84 ellipsoid and the EGM2008 geoid.
- The 2017 drill collar coordinates provided by AbraPlata were provided as UTM Zone 19 projection, WGS84 horizontal datum with elevations as heights above the WGS84 ellipsoid. PhotoSat converted the elevations to heights above the EGM2008 geoid.
- The 2006 drill collar coordinates were labelled as being in Argentina Zone 3 / POSGAR94 projection. PhotoSat determined that the 2006 drill collars were actually in Argentina Zone 3 / Campo Inchauspe projection. The elevations were heights above the International1924 ellipsoid. PhotoSat converted the data to UTM Zone 19 South, WGS84 horizontal datum, with the elevations as heights above the EGM2008 geoid.

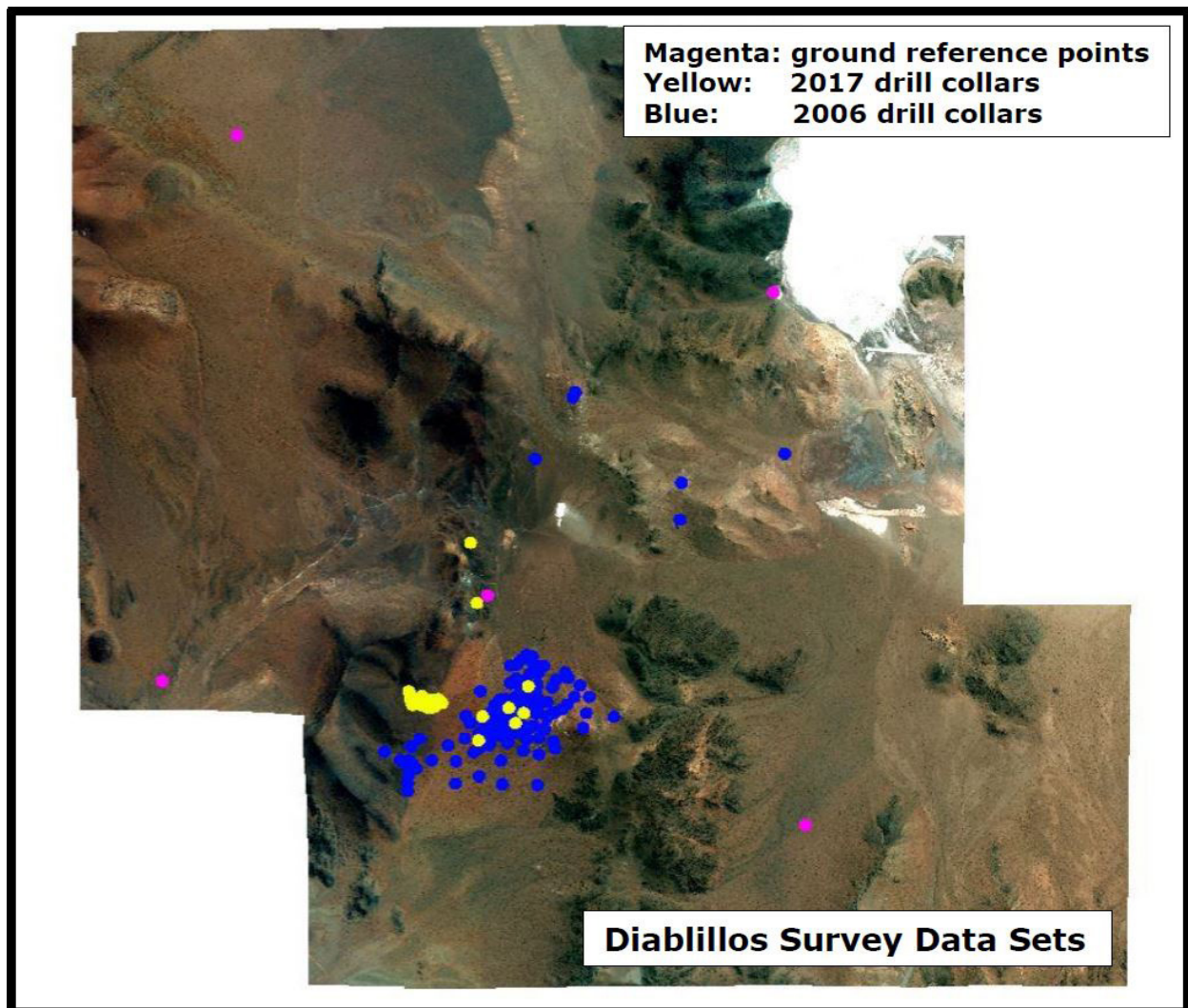
## **The 2017 drill hole collar elevations were selected as the elevation reference data set for the Diablillos Project**

The three Diablillos ground survey data sets have slightly different offsets relative to the PhotoSat survey. The 2017 drill hole survey data has the best statistical match to the PhotoSat survey.

The PhotoSat survey was adjusted vertically to match the mean of the 2017 drill hole elevations. After this adjustment, the standard deviation of the elevation differences between 38 of the 2017 drill hole elevations and the PhotoSat survey is 10cm.

## **Height adjustments of the Diablillos survey data to match to the 2017 drill collar elevations:**

- The elevations of the five, 2017 ground reference targets were adjusted 17cm down to match the elevations of the 2017 drill collars.
- The 206, 2006 drill collar elevations were adjusted 29cm down to match the 2017 drill collar elevations. After this adjustment, 195 of the 2006 drill collar elevations match the PhotoSat survey elevations to a standard deviation of 20cm.
- The adjusted coordinates for the drill collars and ground reference points are provided as Excel spreadsheets accompanying this report.



*Figure 1. The Diablillos survey area in Argentina. The ground reference survey points are shown in magenta. The 2017 drill collars are yellow. The 2006 drill collars are blue.*



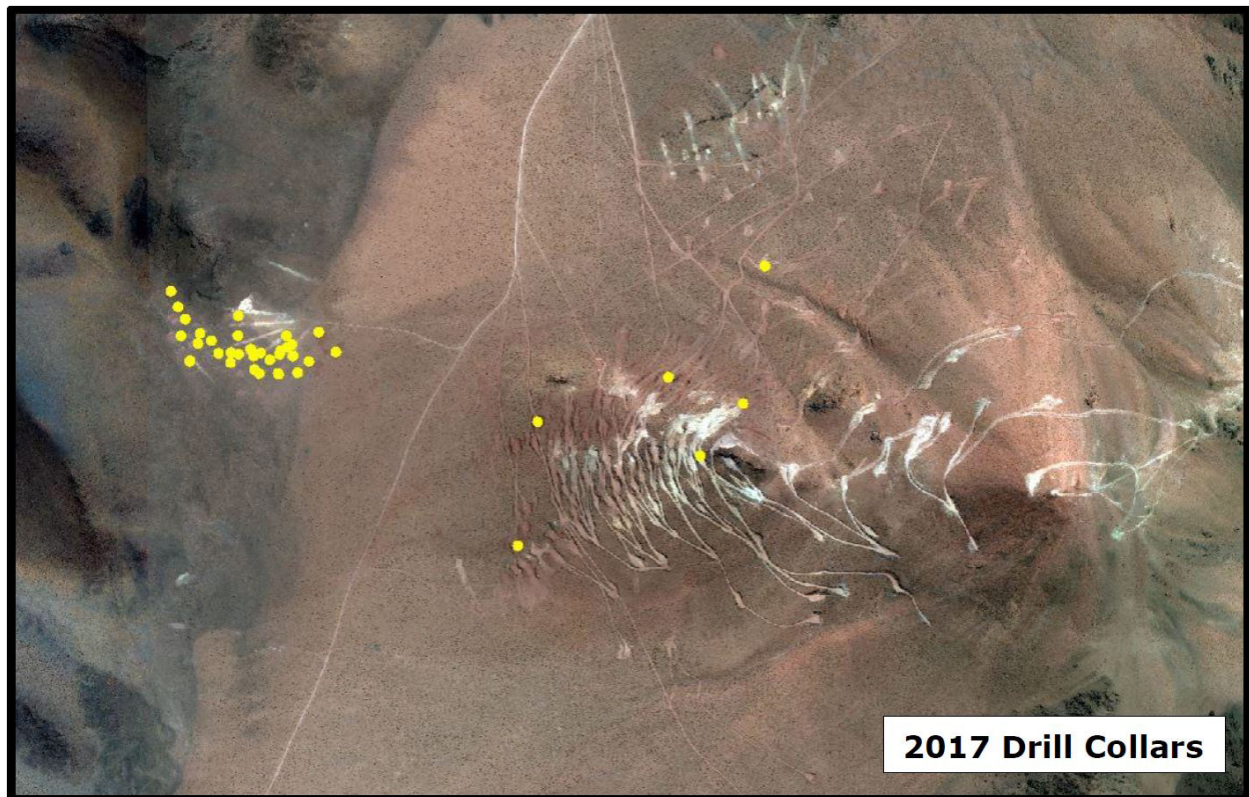


Figure 2. The 2017 drill collars overlaid on the September 12, 2017 orthophoto.

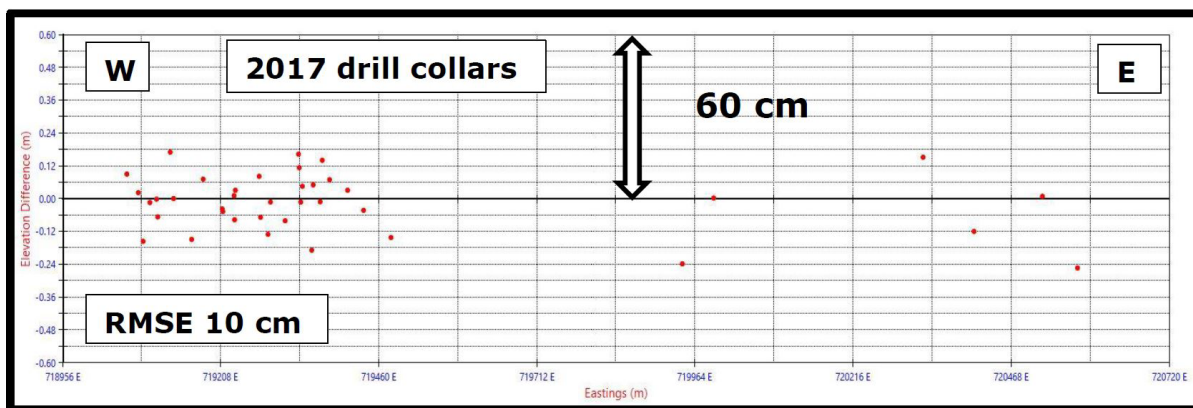


Figure 3. East west scatterplot of the vertical match between the 2017 drill collars and the PhotoSat survey. The standard deviation of the difference between the PhotoSat survey grid and the elevations of the 38, 2017 drill holes is 10cm.

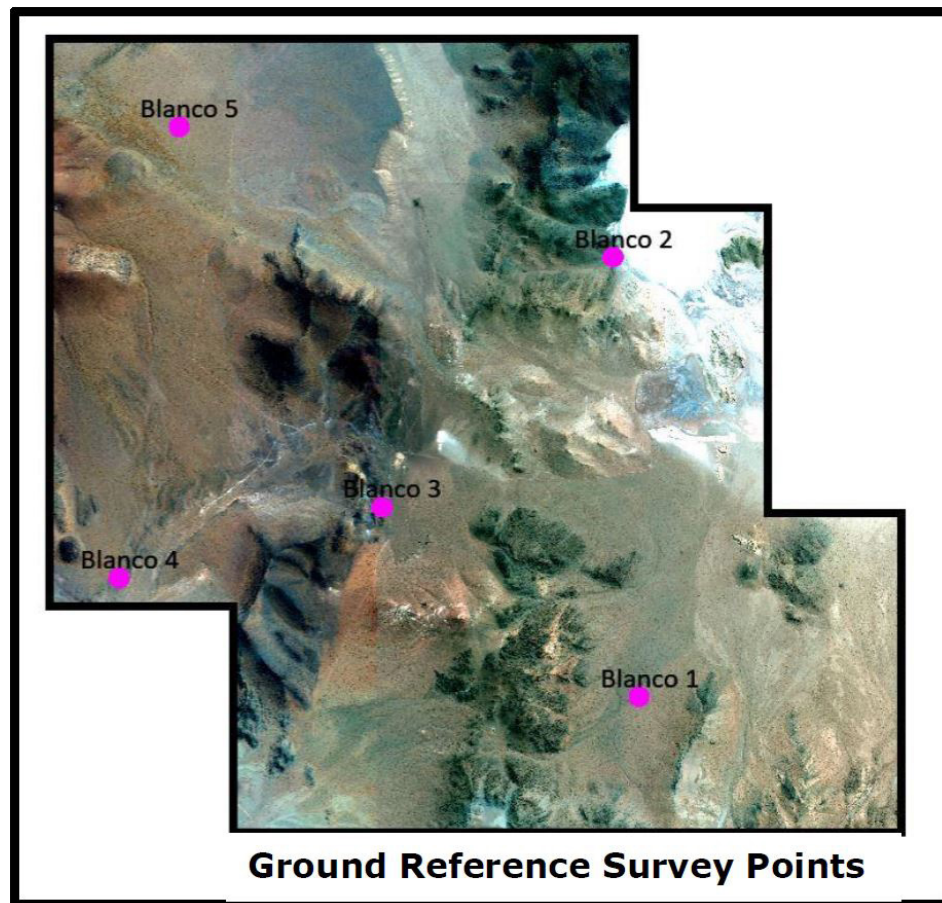


Figure 4. The ground reference survey points overlaid on the September 12, 2017 orthophoto. The PhotoSat survey was initially matched to these ground reference survey points. Then the elevations were adjusted downward 17cm to match the elevations of the 2017 drill collars.

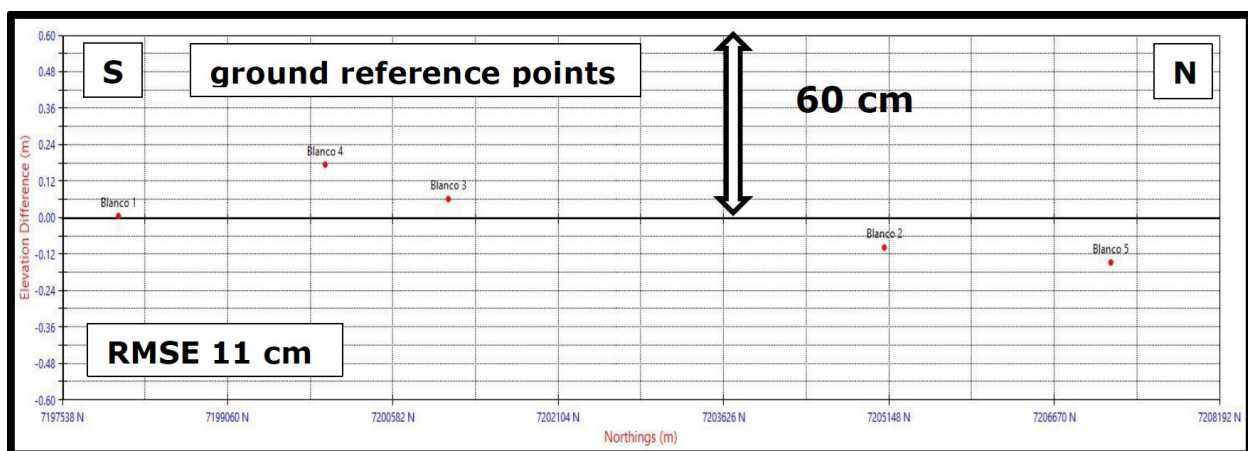


Figure 5. A north south scatterplot of the vertical match between the ground reference points and the PhotoSat survey.



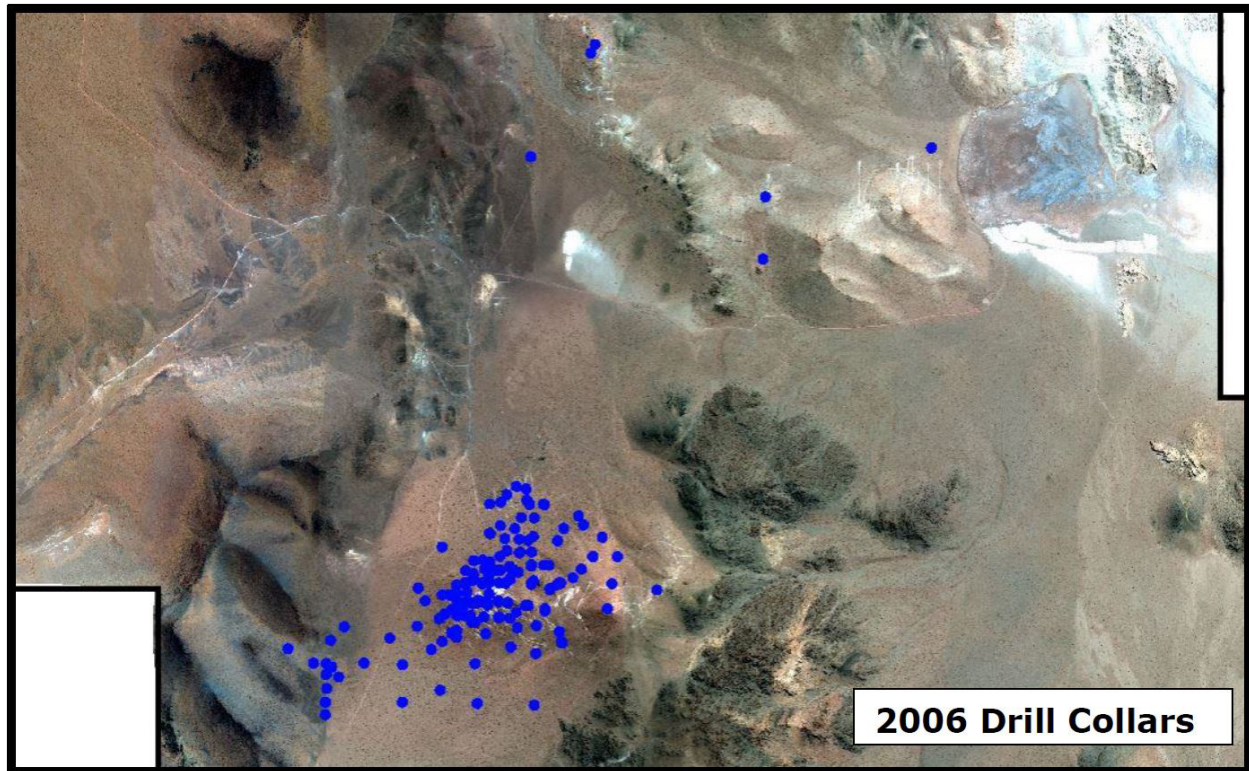


Figure 6. The 2006 drill collars overlaid on the September 12, 2017 orthophoto.

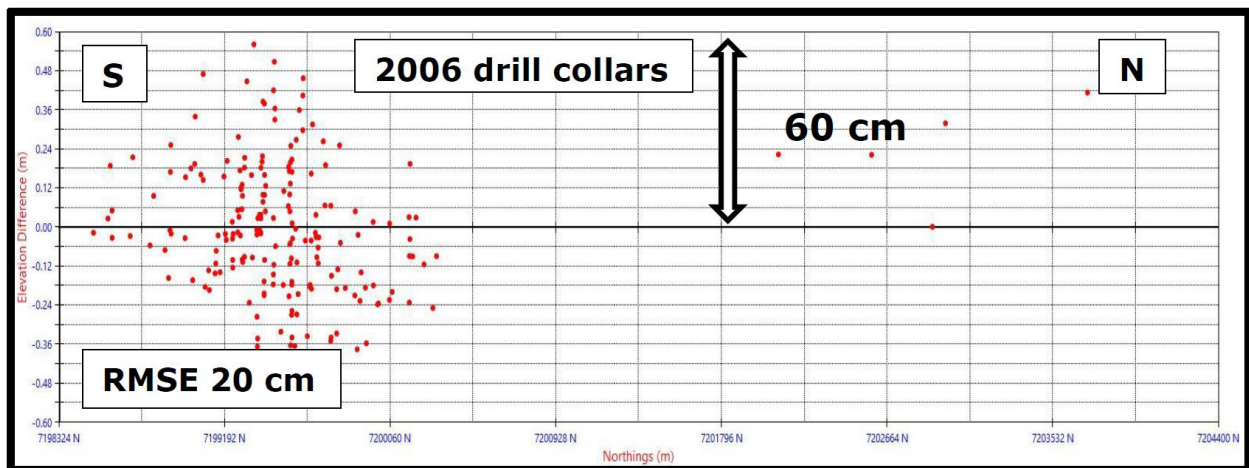


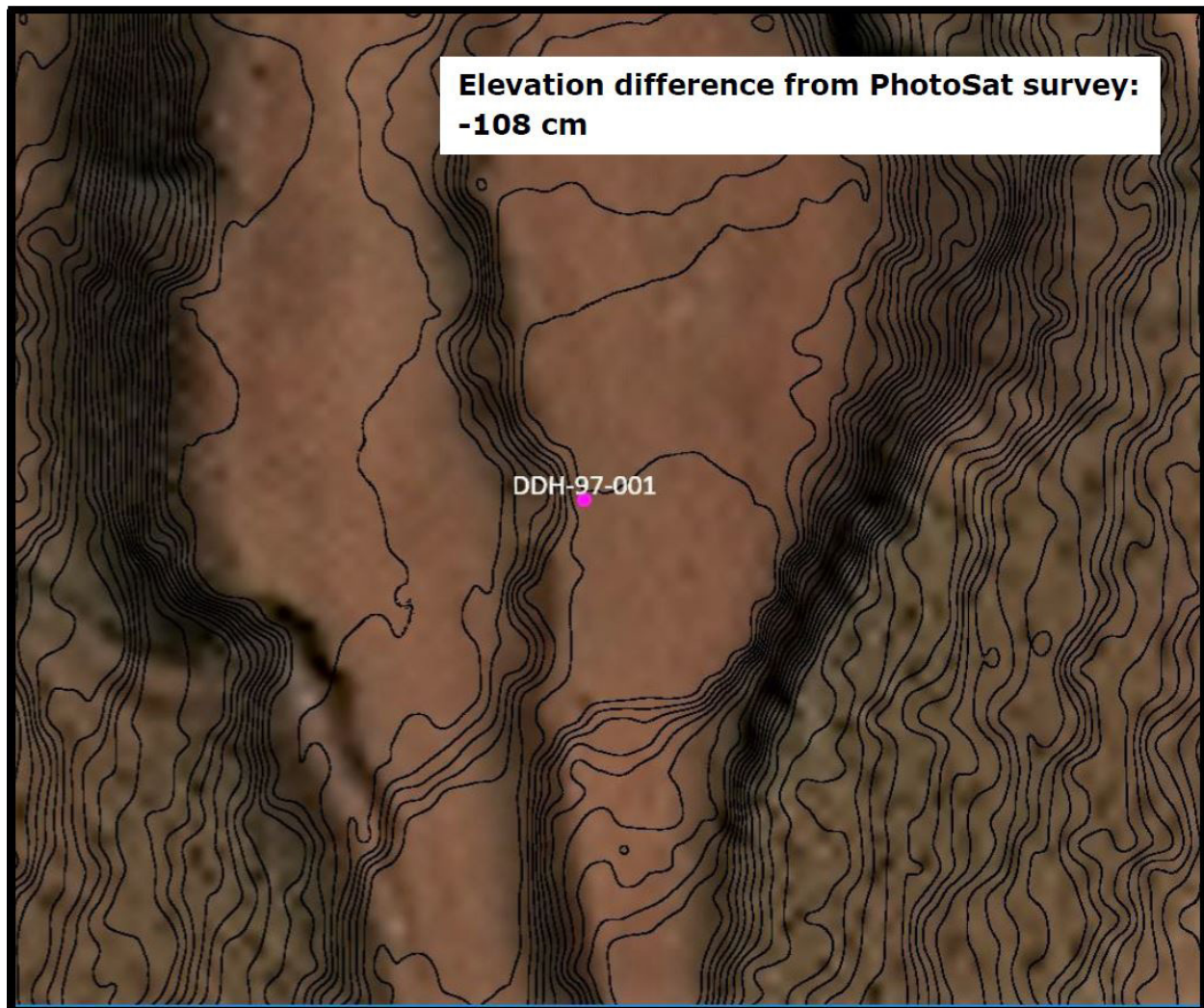
Figure 7. North south scatterplot of the vertical match between the 2006 drill collars and the PhotoSat survey. The standard deviation of the difference between the PhotoSat survey grid and the elevations of 195 of the 2006 drill collars is 20cm.

## Identification of Diablillos drill holes with probable survey errors:

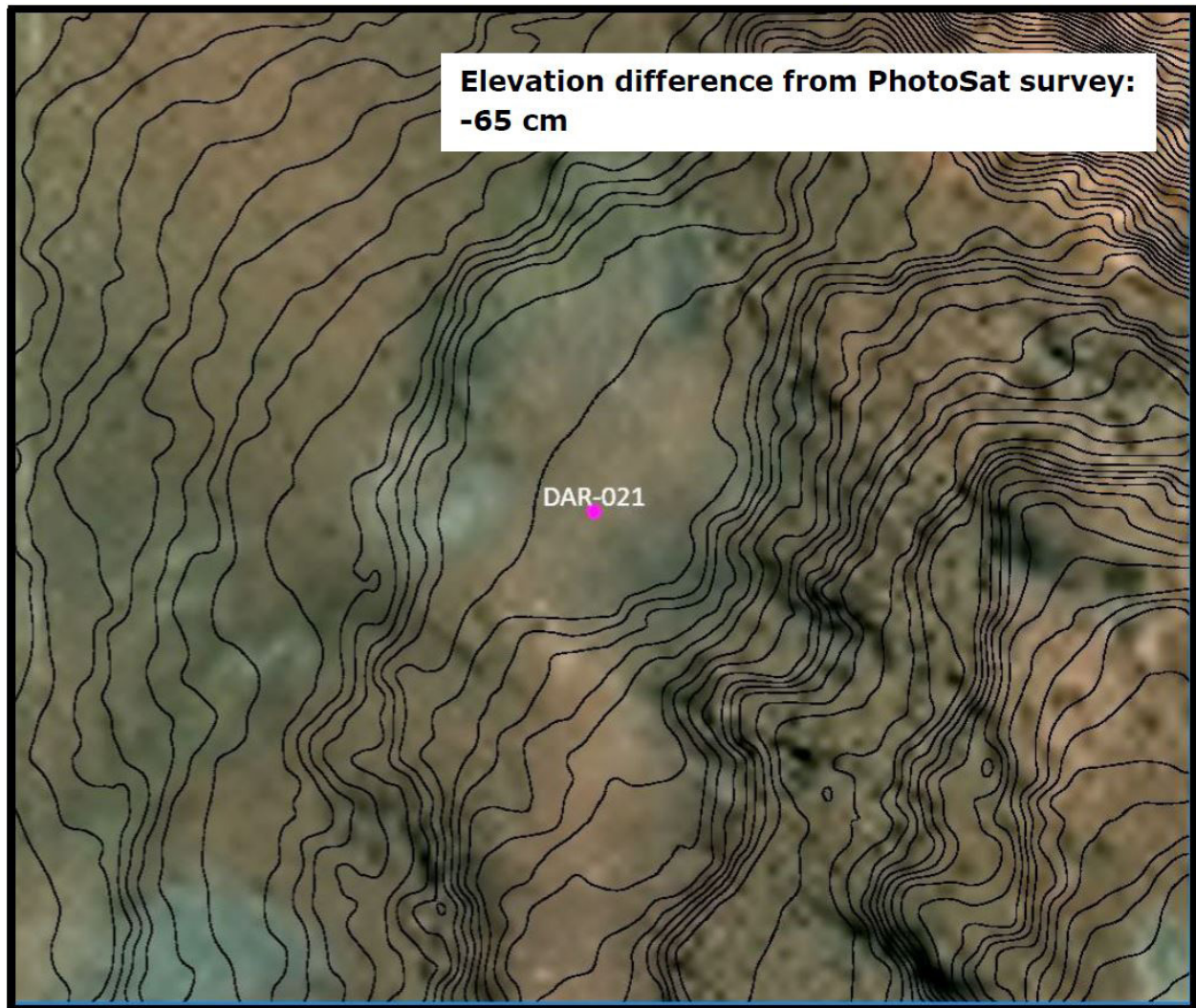
After the 2006 drill hole collars and the PhotoSat survey elevations were adjusted to match the 2017 drill hole collar elevations, PhotoSat reviewed the survey coordinates of all of the drill holes. All of the 2017 drill holes appear to have correct horizontal and vertical survey coordinates. 11 of the 206, 2006 drill holes had probable survey errors. These are detailed below:

<b>Point ID</b>	<b>Difference from PhotoSat survey (cm)</b>	<b>Comments</b>
DDH-97-001	-108	probable vertical drill hole collar survey error
DAR-021	-65	probable vertical drill hole collar survey error
DAR-040	-69	possible drill hole collar survey error, possible road building
RC-96-006	-169	probable horizontal drill hole collar survey error
RC-96-007	-76	probable horizontal drill hole collar survey error
RC-96-021	-69	probable vertical / horizontal drill hole collar survey error
RC-96-027	88	probable vertical / horizontal drill hole collar survey error
RC-96-030	-110	probable horizontal drill hole collar survey error
RC-97-054	63	probable vertical drill hole collar survey error
RC-97-063	-98	probable vertical / horizontal drill hole collar survey error
RC-97-090	86	probable vertical drill hole collar survey error



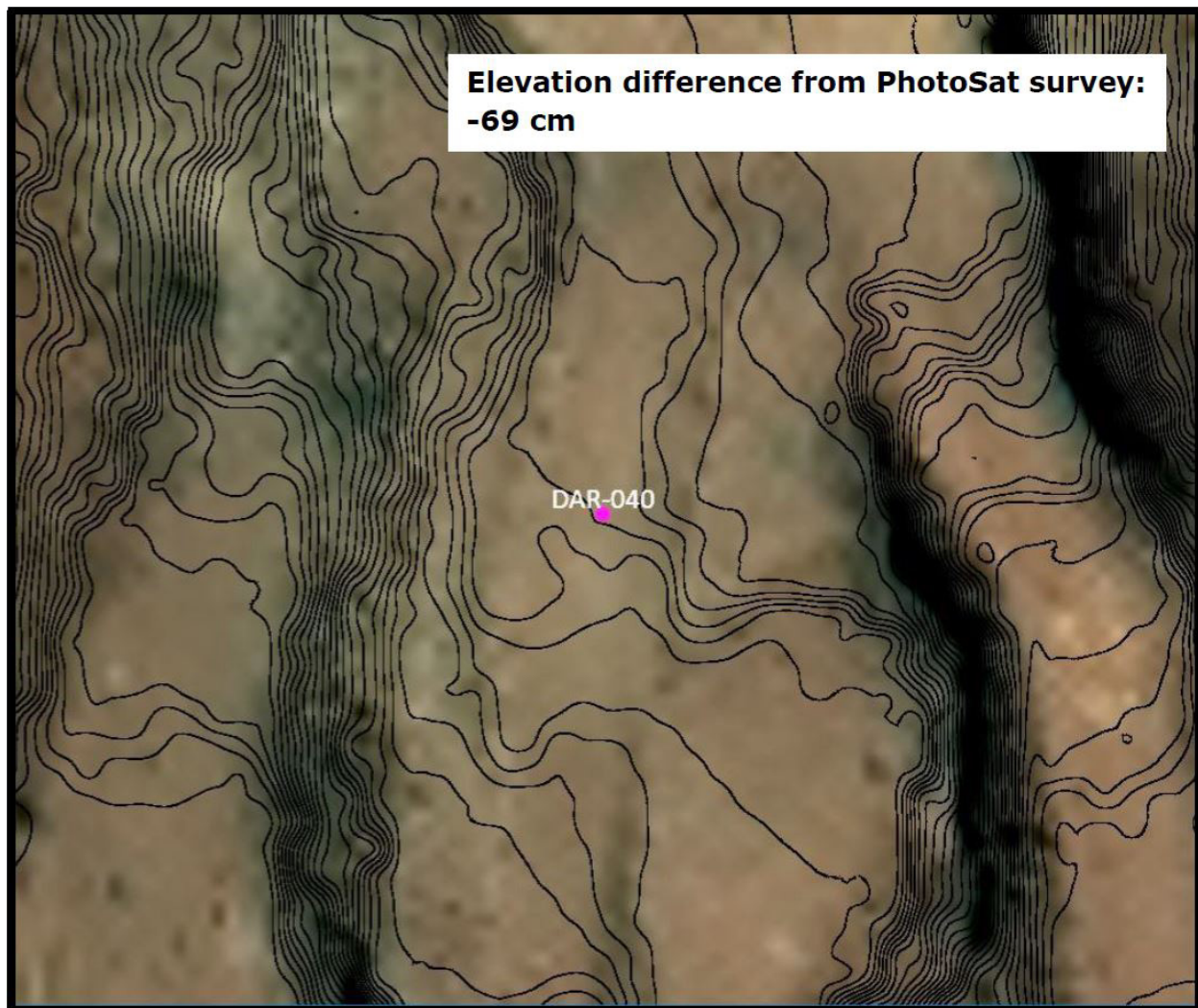


*Figure 8. Drill hole collar DDH-97-001 overlaid on the orthophoto, displayed with 20cm contours. This drill hole collar has a probable vertical survey error.*



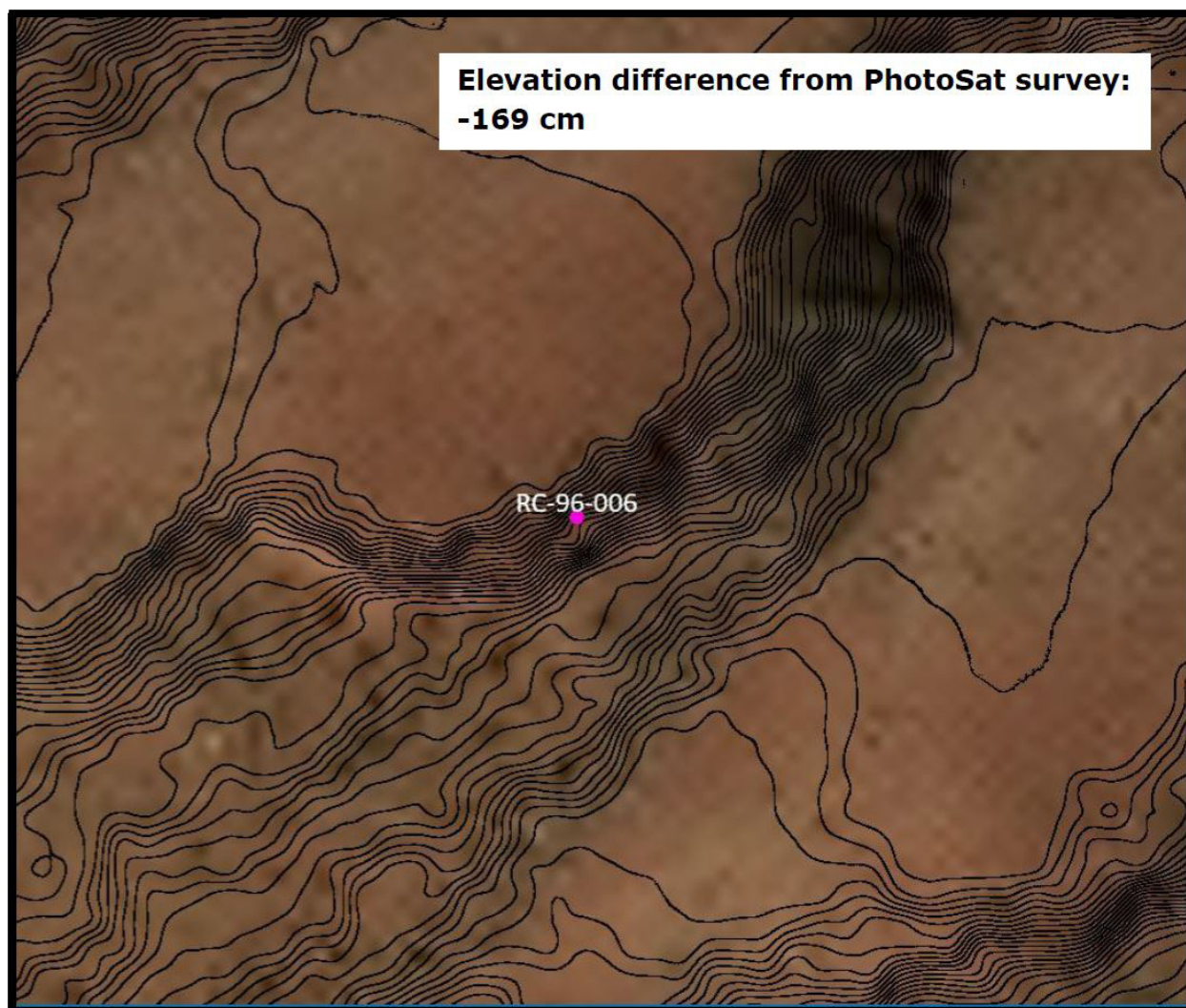
*Figure 9. Drill hole collar DAR-021 overlaid on the orthophoto, displayed with 20cm contours. This drill hole collar has a probable vertical survey error.*



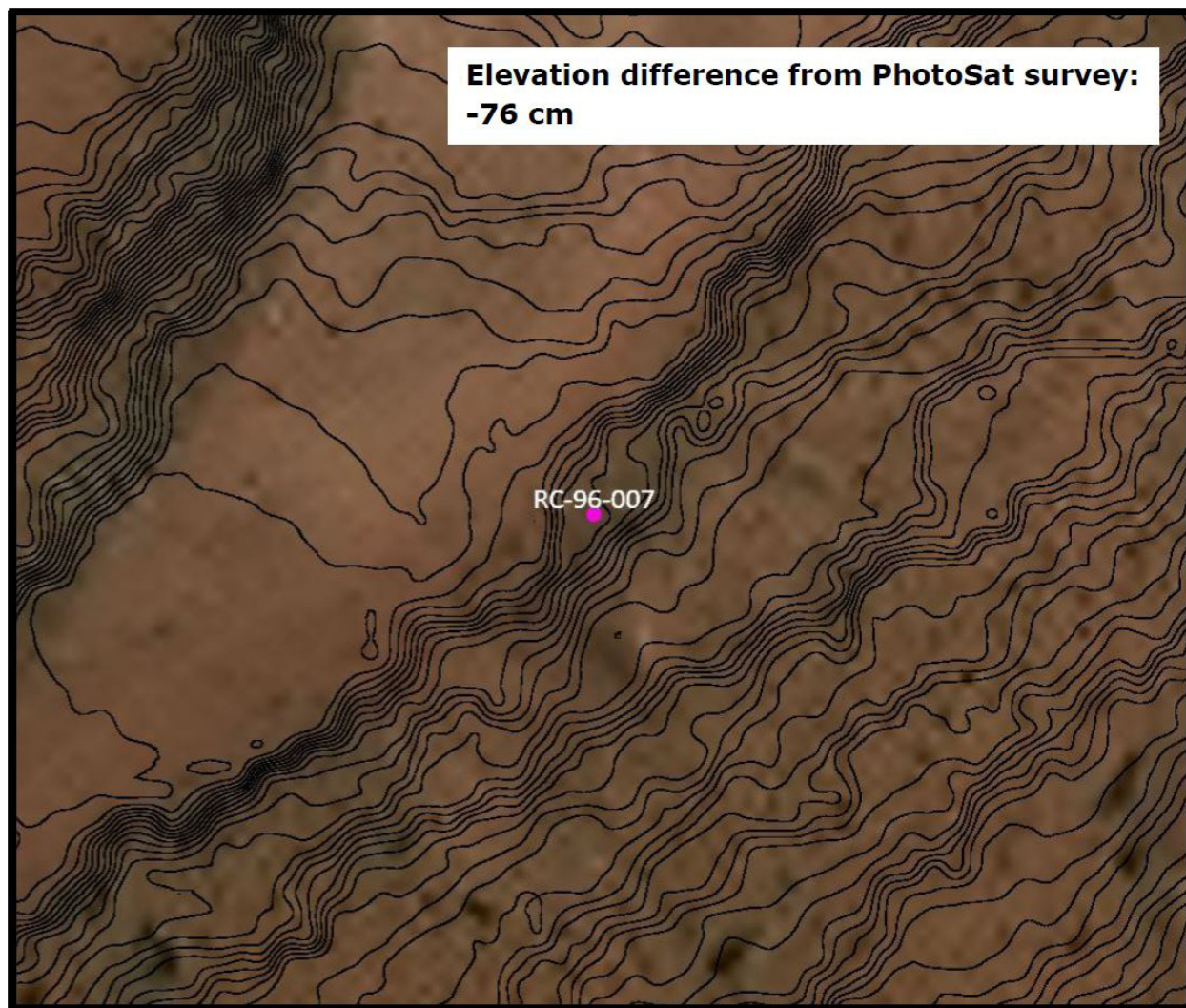


*Figure 10. Drill hole collar DAR-040 overlaid on the orthophoto, displayed with 20cm contours. This drill hole collar has a possible survey error or possibly the surface has been changed by road works.*



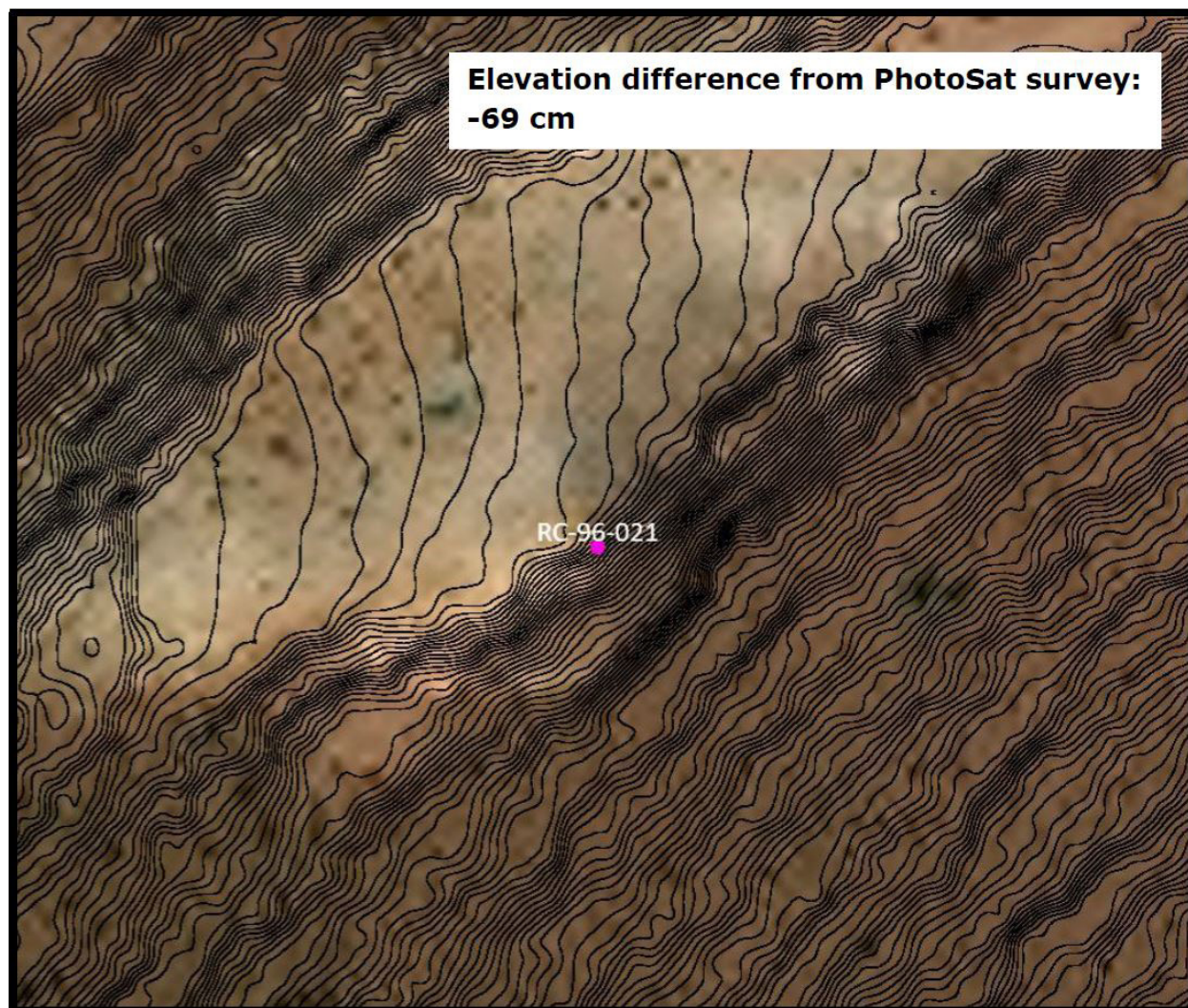


*Figure 11. Drill hole collar RC-96-006 overlaid on the orthophoto, displayed with 20cm contours. This drill hole collar has a probable horizontal survey error as it would not have been located on a slope.*



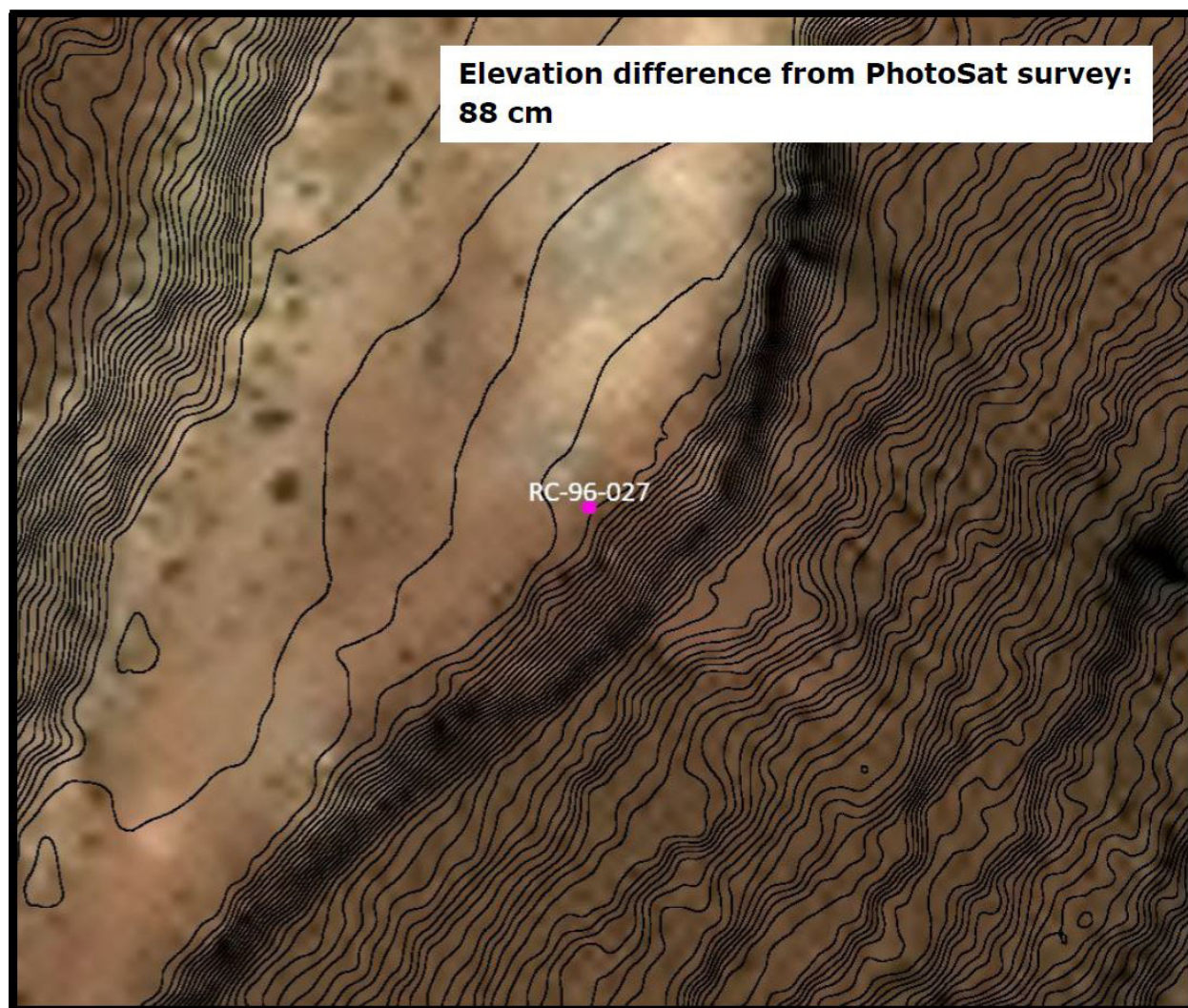
*Figure 12. Drill hole collar RC-96-007 overlaid on the orthophoto, displayed with 20cm contours. This drill hole collar has a probable horizontal survey error as it would not have been located on a slope.*



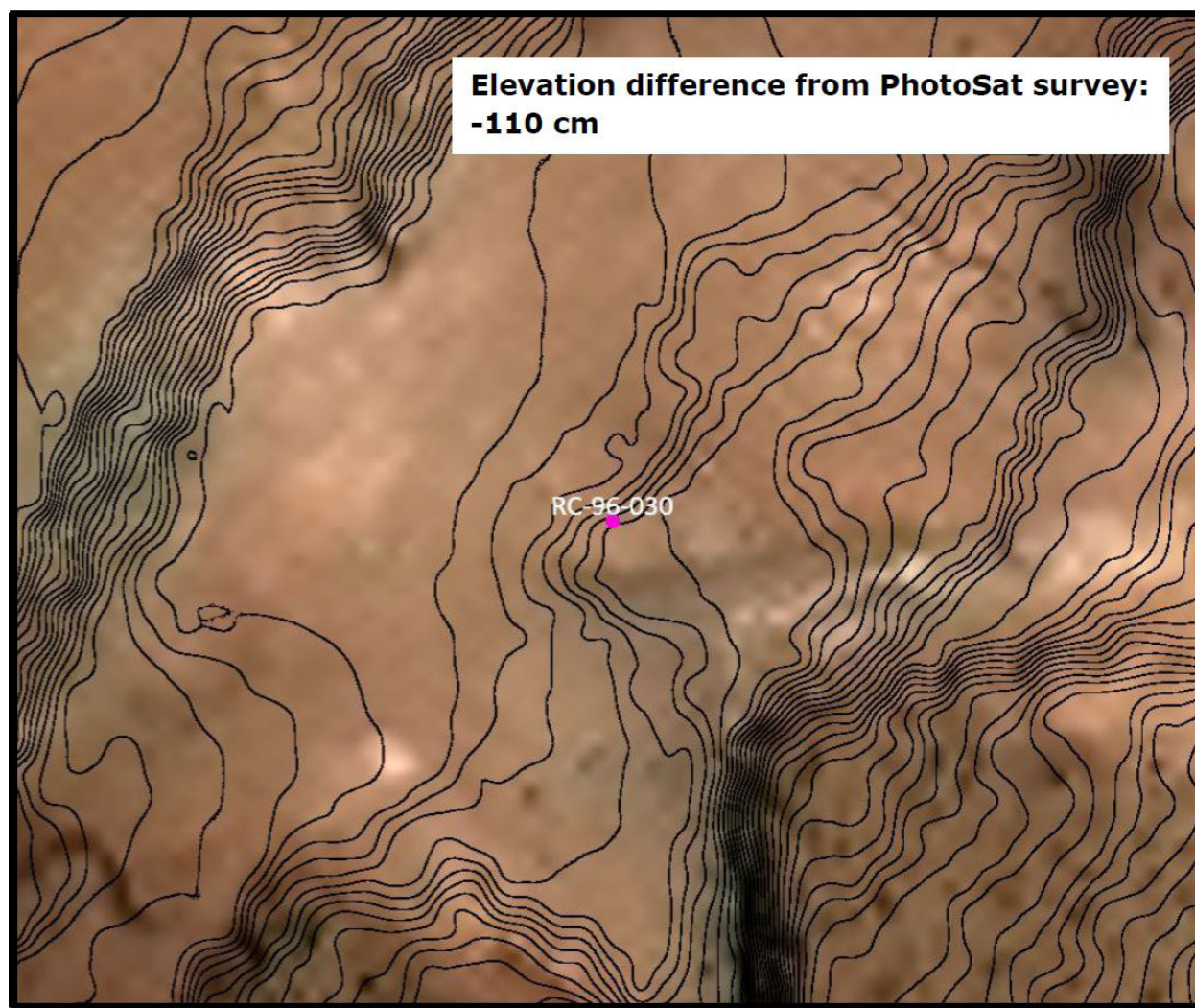


*Figure 13. Drill hole collar RC-96-021 overlaid on the orthophoto, displayed with 20cm contours. This drill hole collar has a probable vertical / horizontal survey error as it would not have been located on a slope.*



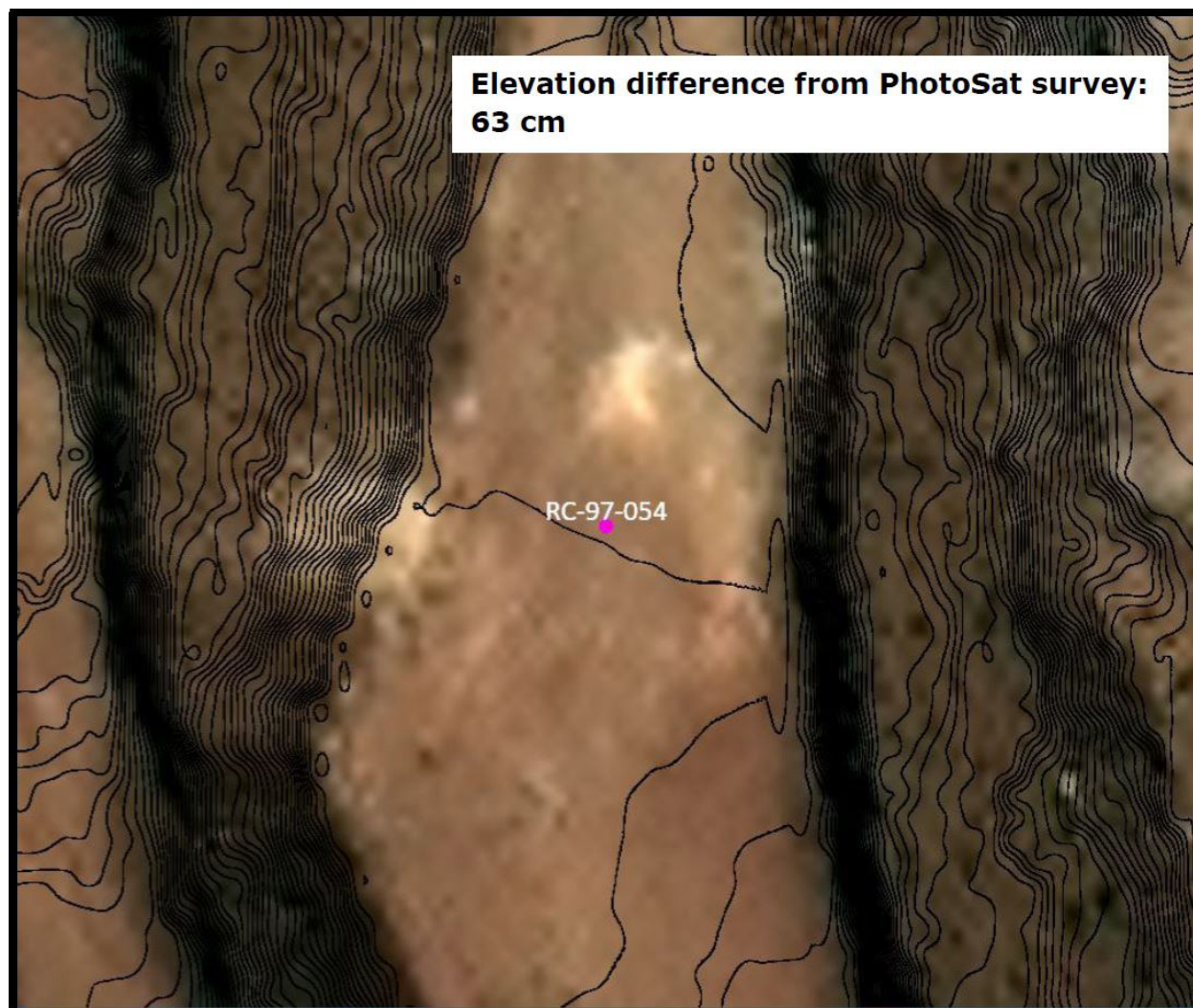


*Figure 14. Drill hole collar RC-96-027 overlaid on the orthophoto, displayed with 20cm contours. This drill hole collar has a probable vertical / horizontal survey error.*



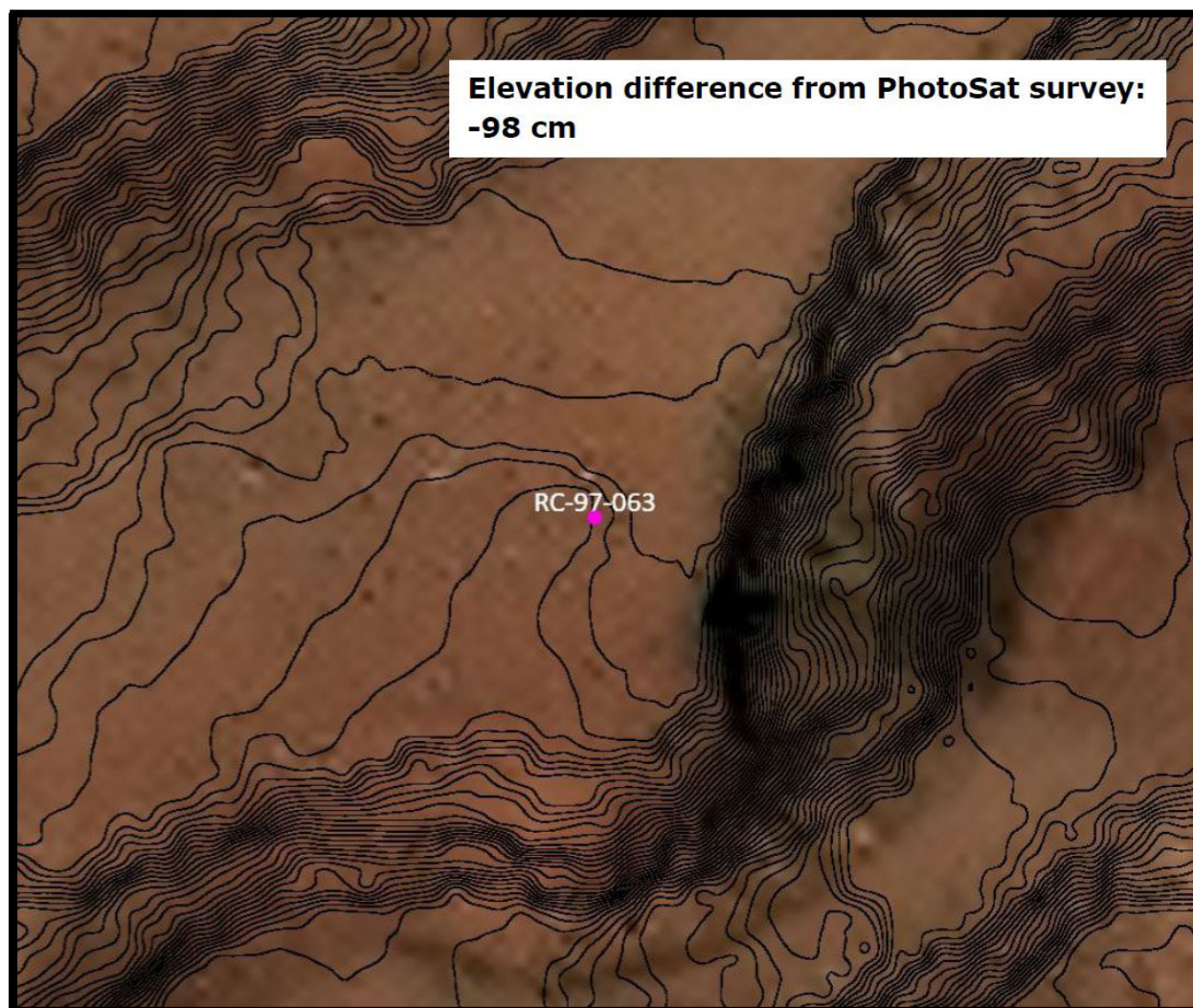
*Figure 15. Drill hole collar RC-96-030 overlaid on the orthophoto, displayed with 20cm contours. This drill hole collar has a probable horizontal survey error.*



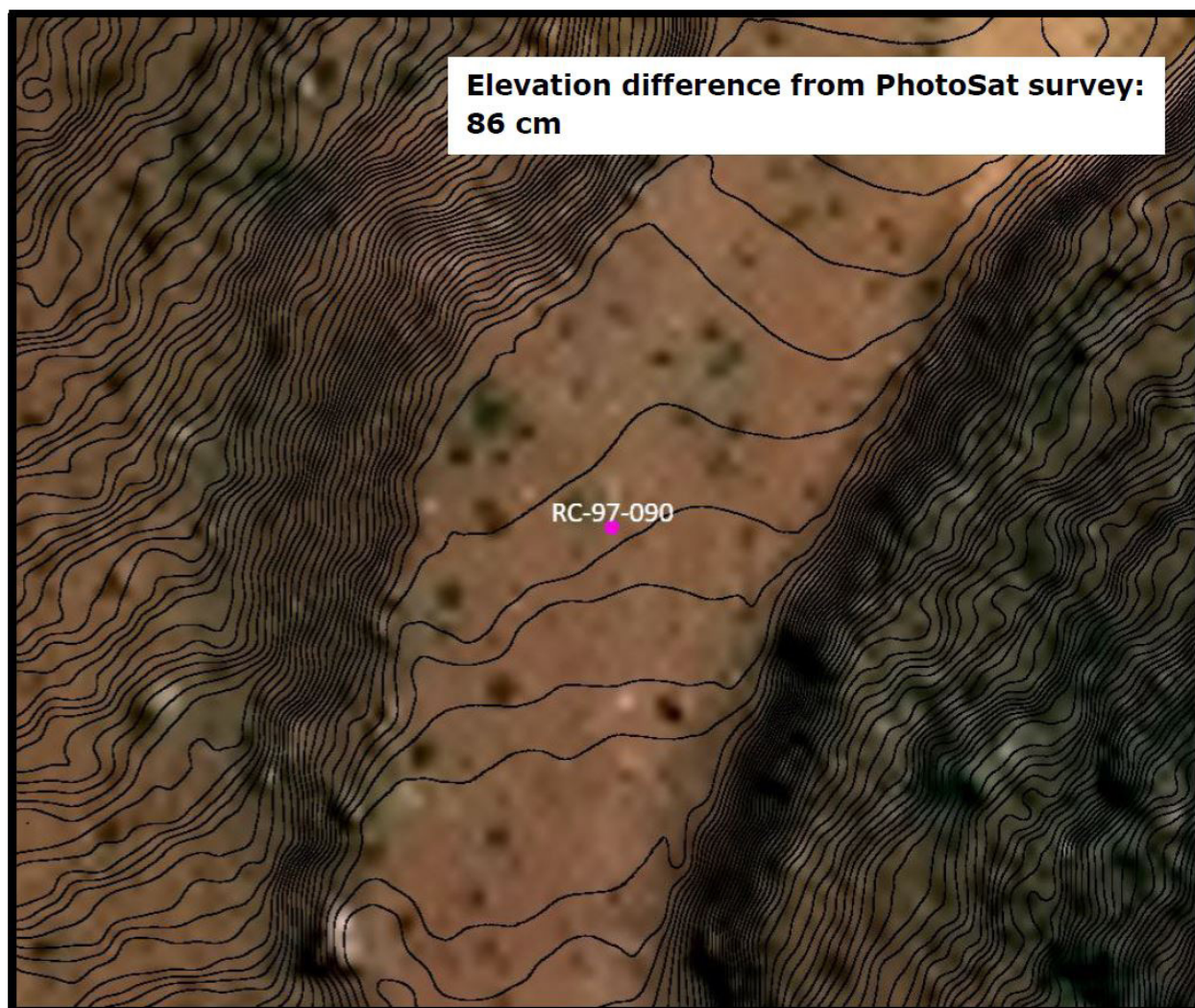


*Figure 16. Drill hole collar RC-97-054 overlaid on the orthophoto, displayed with 20cm contours. This drill hole collar has a probable vertical survey error.*





*Figure 17. Drill hole collar RC-97-063 overlaid on the orthophoto, displayed with 20cm contours. This drill hole collar has a probable vertical / horizontal survey error.*



*Figure 18. Drill hole collar RC-97-090 overlaid on the orthophoto, displayed with 20cm contours. This drill hole collar has a probable vertical survey error.*