Memo

July 27, 2016

To: Jeffrey McVeety, Brian Gauvreau, Jeremy Faulkner
Cc: Glenn McDowell, Sean Dickie, Andrew MacKie

Re: Narrow Vein Mining / SSW Face Probing Survey Test / Coleman 5850 Level

A one-day underground geophysical frequency-domain EM survey was completed on July 22nd, 2016 by Vale crew at Coleman mine, on 5850 Level, cut 32 ACC. The objectives of the survey were:

- To test a new 1 inch diameter conductivity/magnetic susceptibility borehole probe (SSW Face probe) manufactured by Instrumentation GDD Inc. The probe was deployed within 1.89 inch diameter boreholes that had been drilled by a Jumbo drill;
- To explore for the presence of conductors in the vicinity of the drift being developed.

Mineralization encountered on 5850 Level consists of veins of massive sulphides that consist of chalcopyrite, pentlandite, pyrrhotite, with PGEs (Pt, Pd, Co, Au) and are expected to be conductive. The survey aimed to identify and locate any conductive materials encountered while surveying four horizontal boreholes with the SSW Face probe (Figure 1). This information could be used to determine the future direction of the drift and to identify areas of potential mineralization while developing the drift.

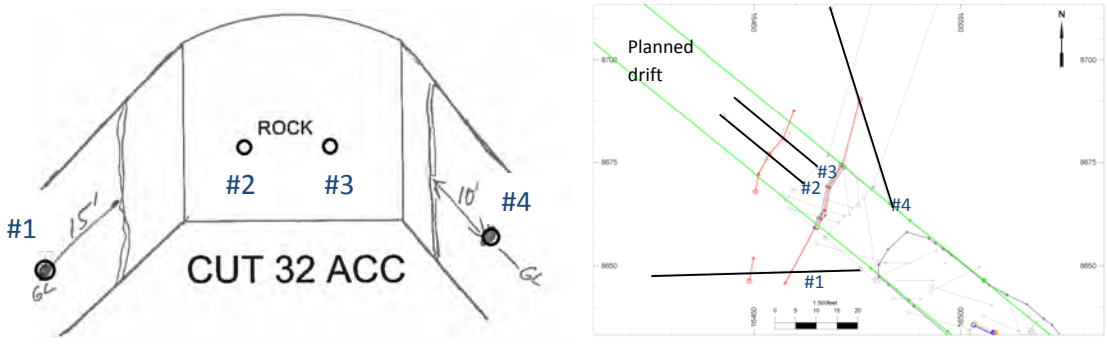

Figure 1: a) 3D view of the drift with the location of the 4 holes surveyed. b) Plan view of the drift with the location of the 4 holes surveyed.

Vale Technology Development (Canada) Limited
337 Power Street
Copper Cliff, ON P0M 1N0 Canada
T. (705) 682-8451 F. (705) 682-8243

For the purpose of this test, the probe was attached to the end of a series of rods to push it along the boreholes (Figures 2 and 3) with measurements taken every 0.5 feet along the boreholes. The length of every hole probed with the location of detected conductors are presented in Table 1.

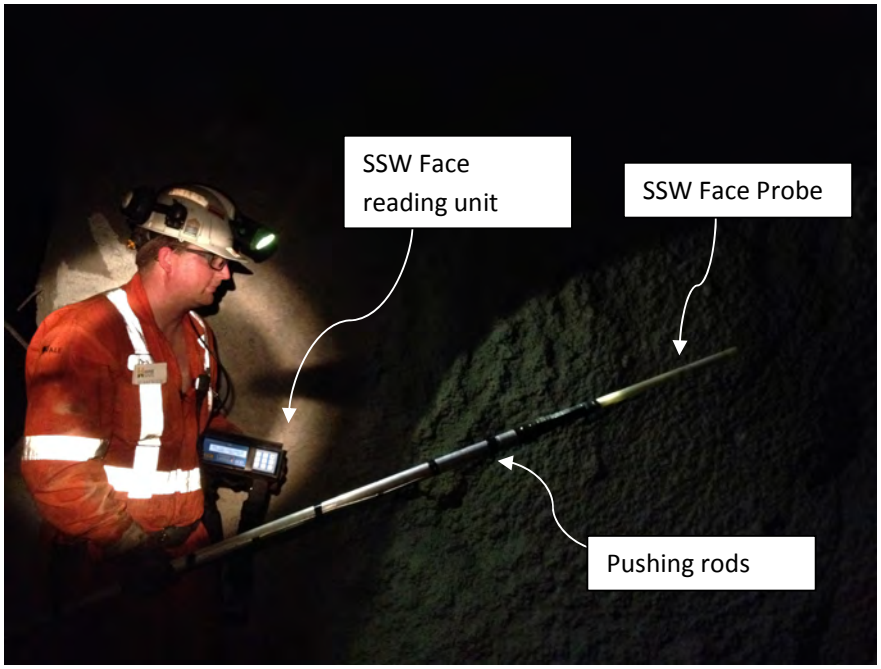

Figure 2. SSW Face Probe survey setup

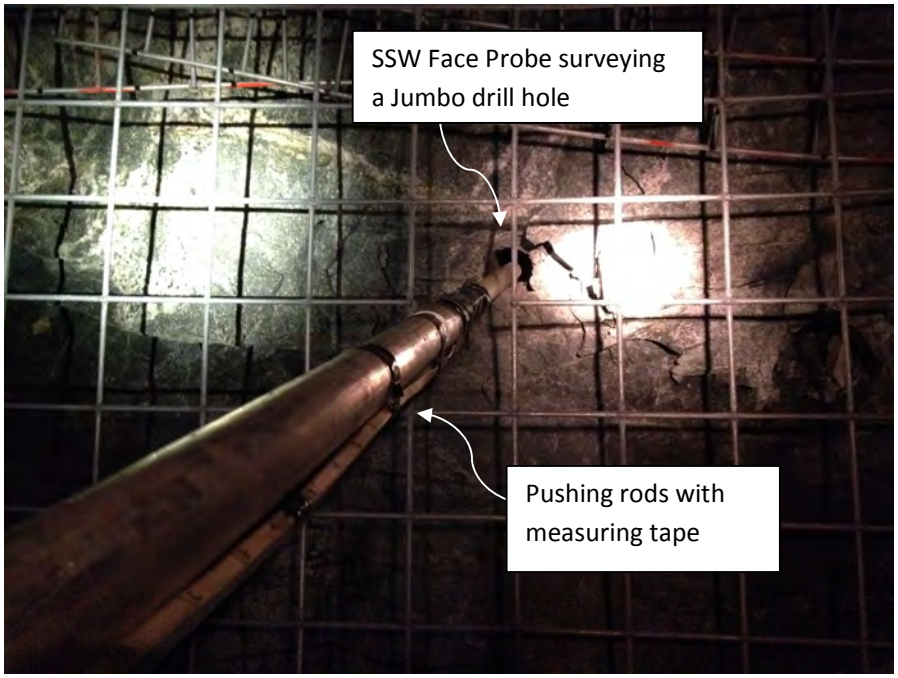

Figure 3. SSW Face Probe surveying a Jumbo hole

Borehole	Borehole Length (Feet)	Conductor Location (Feet)	Conductor Quality	Conductor Width (Feet)
Hole 1	49.5	16.5	Weak	0.5
		25	Weak	0.5
Hole 2	25	10.5	Strong	0.5
Hole 3	25	2.5	Weak	0.5
		3.5	Weak	0.5
		10.5	Strong	1
		16.5	Weak	0.5
Hole 4	49.5	25.5	Moderate	0.5

Table 1: Summary of the location and quality of conductors detected by the survey

The data from each borehole is presented in Figures 3 to 6. Each borehole was surveyed twice, and the data shows significant variability in the probes response to the surrounding geology.

The test detected the presence of highly conductive material intersected in two of the boreholes surveyed (boreholes #2 and #3). This conductor has a width of approximately 0.5 to 1 feet and is located 10 to 11 feet beyond the face wall. This conductor may represent a previously unidentified vein of mineralization, and will be intersected in the next round of blasting. The weaker conductors detected in boreholes #1 and #4 on the sides of the drift possibly represent veinlets or the thinning of a previously encountered vein. The location and direction of all the interpreted conductors is presented in Figure 7.

The results presented here are based on the amplitude of the probe response. Further work is required to develop a correlation between mineralization grade and the measured probe response. This calibration can be determined by surveying assayed boreholes and building a relationship between probe response and grade.

For future use of the SSW Face probe a winch adapted for this style of work could be employed, giving direct measurements associated with the depth measured every 0.1 foot. The readings would be taken automatically and recorded for analysis. Regardless of the deployment method, the probe provides immediate direct feedback to the equipment operator, allowing real-time identification of conductors. Therefore, it is possible to make fast decisions regarding the development of the drift and for the identification of mineralization and waste rock.

Frédéric Gaucher and Sean Dickie, P. Geo
Project and Area Geophysicists
Brownfield Exploration, North Atlantic
Vale Technology Development (Canada) Limited
337 Power Street
Copper Cliff, ON, P0M 1N0 Canada

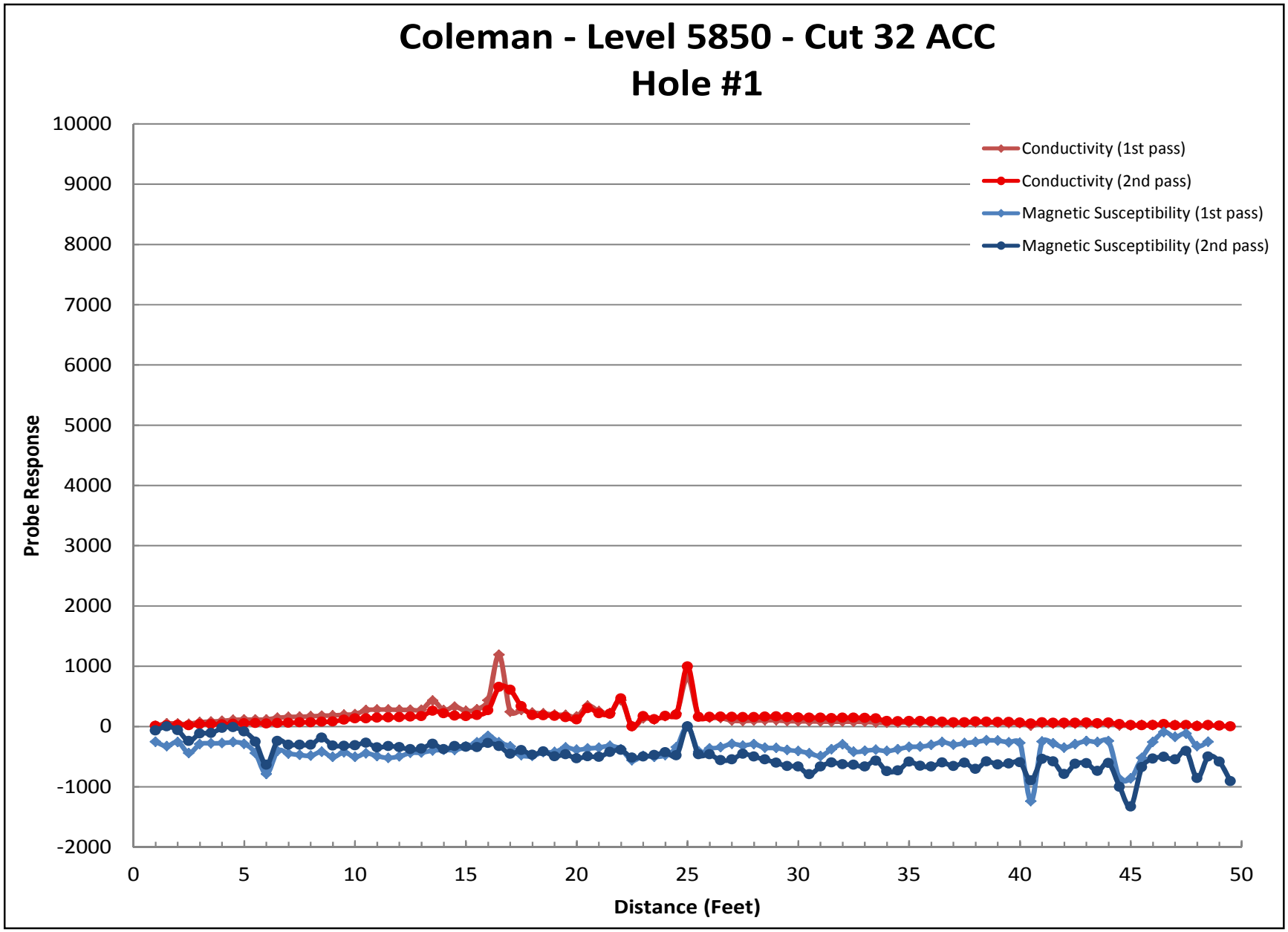

Figure 3: Conductivity and Magnetic Susceptibility response from borehole #1

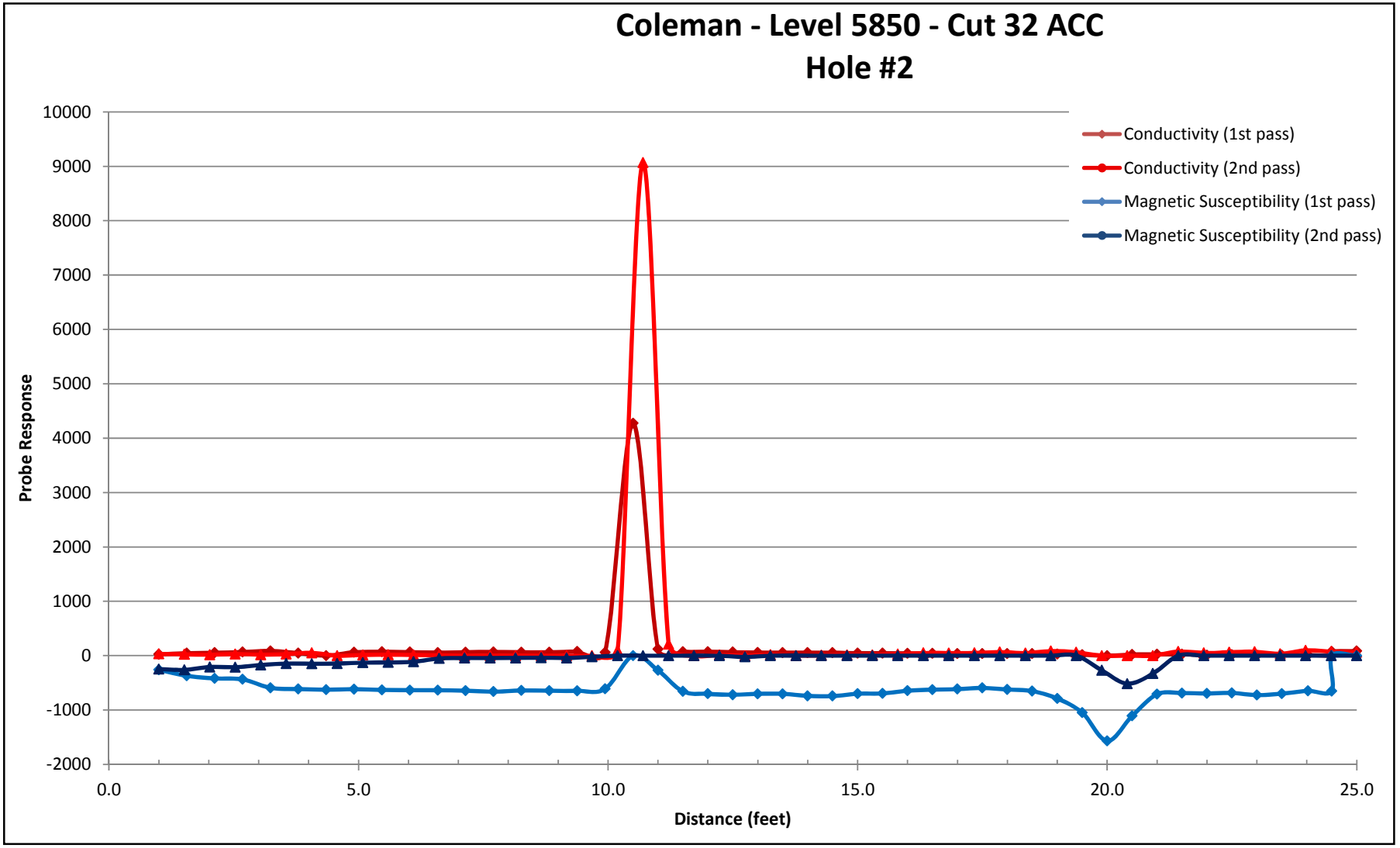

Figure 4 Conductivity and Magnetic Susceptibility response from borehole #2

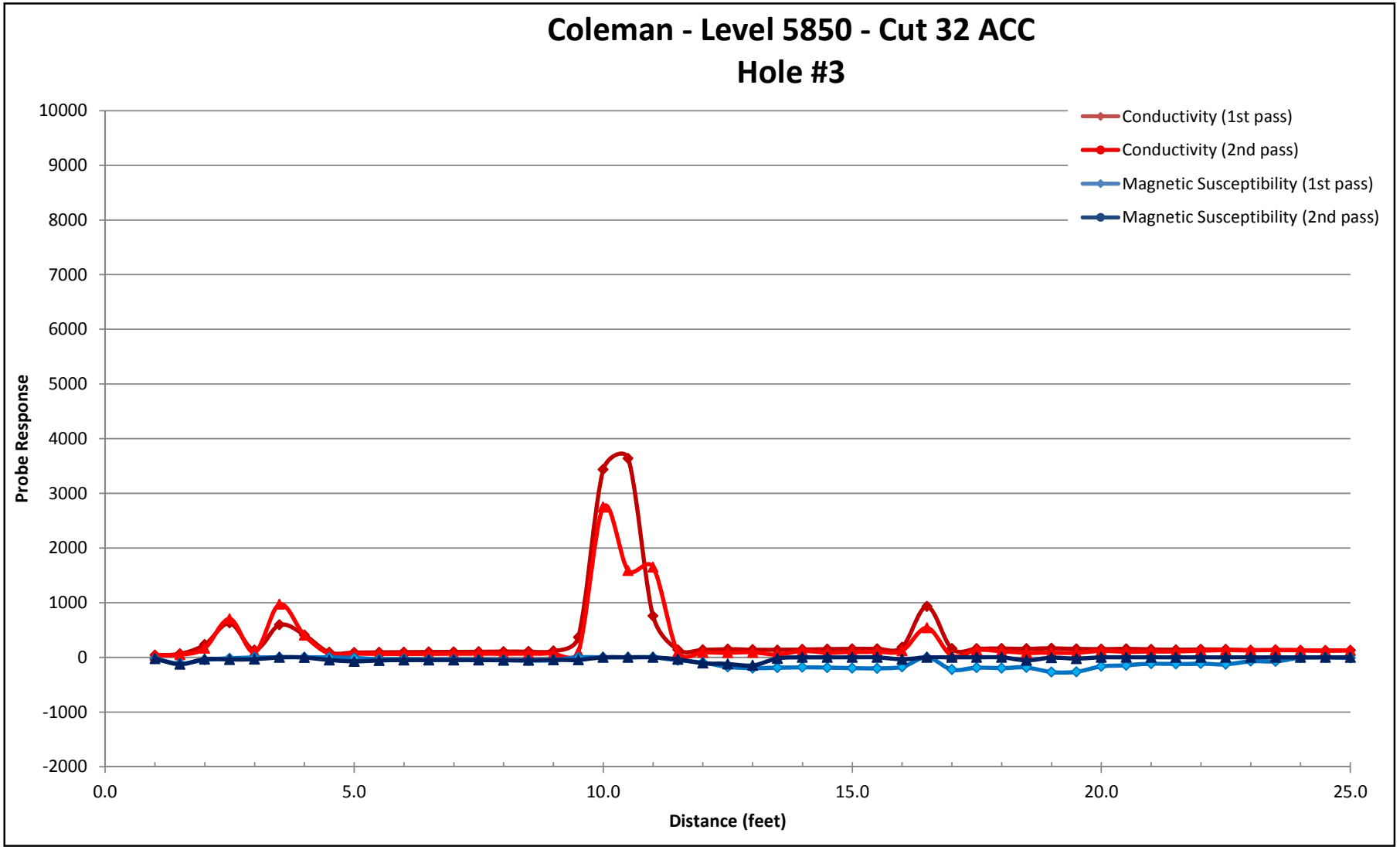

Figure 5: Conductivity and Magnetic Susceptibility response from borehole #3

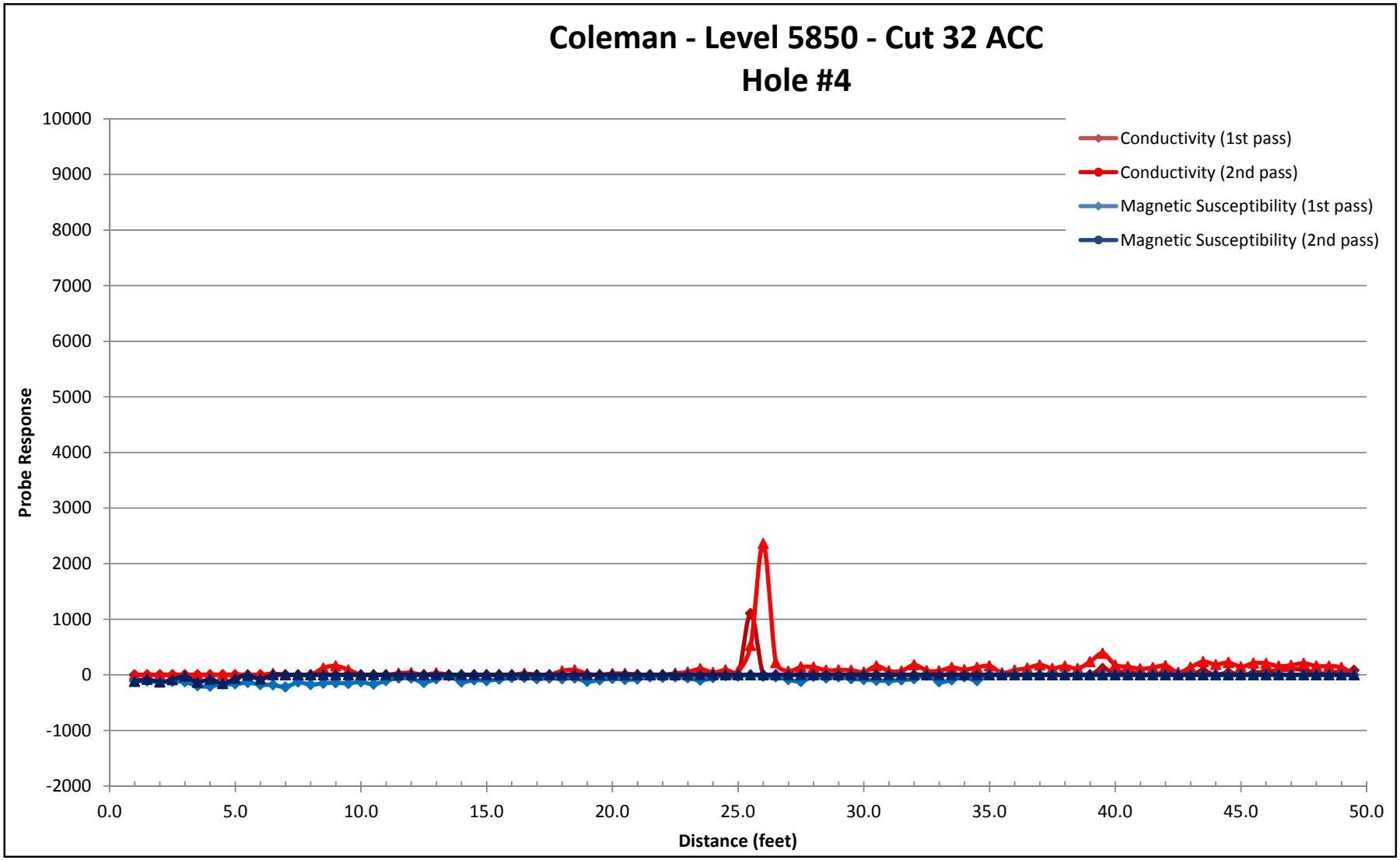

Figure 6: Conductivity and Magnetic Susceptibility response from borehole #4

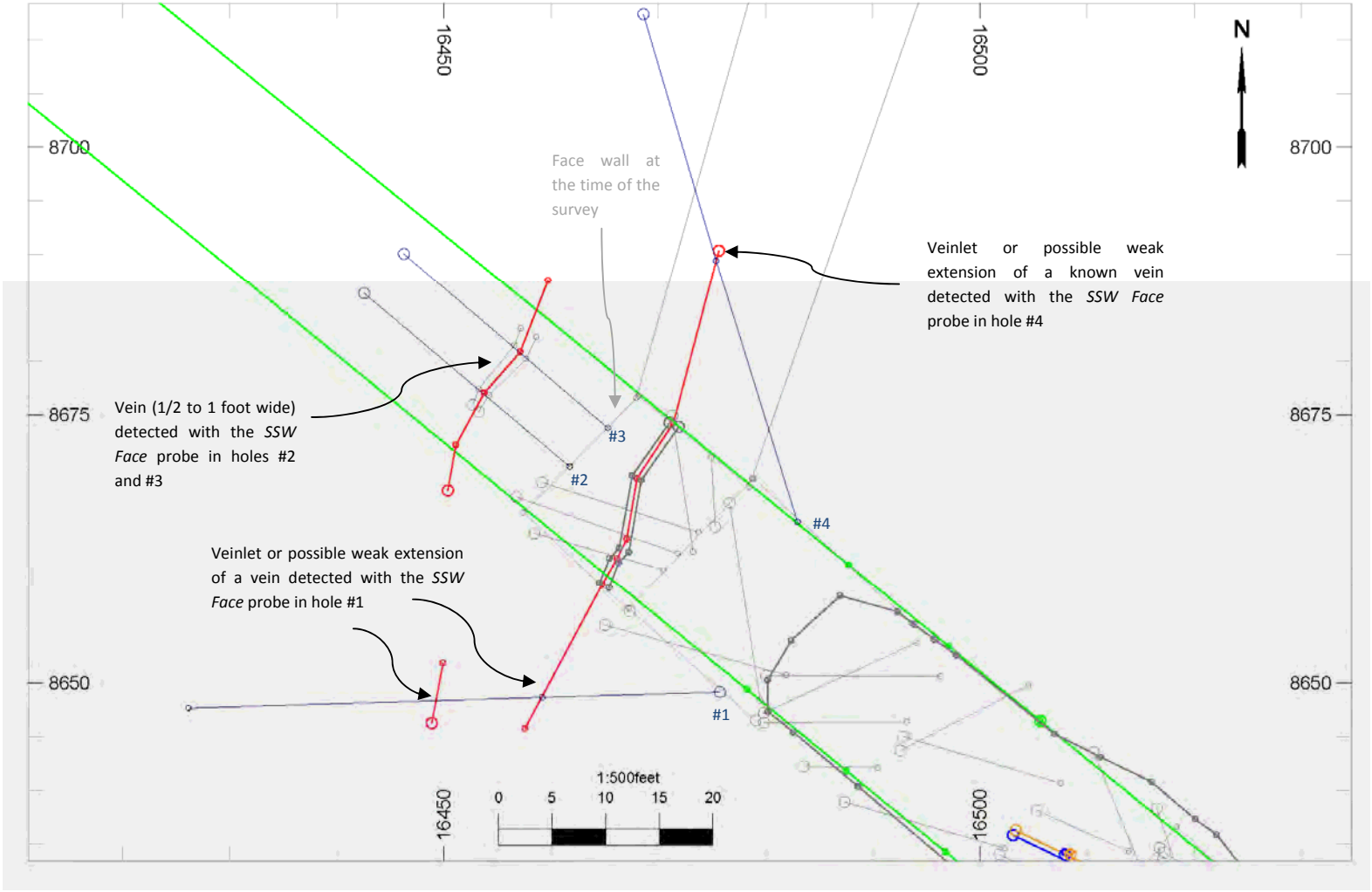

Figure 7: Results of the SSW Face survey.

The location and interpretation of conductive anomalies detected by the SSW Face probe. Note that boreholes #1 and #4 were placed approximately on the map, since the location of the collars were not logged precisely while surveying underground.