

Section 10 Iwilei Geographic Zone (T-085 through T-095)

10.1 Overall Location

For reporting purposes for this AIS, the City Center Section 4 of the HHCTCP has been divided into 11 zones based on geographical and cultural boundaries. The Iwilei Geographic Zone runs from Dillingham Boulevard, just east of Akepo Lane at the north end and follows a curving path to the intersection of Nimitz Highway with Nuʻuanu Stream at the south end. The northern boundary represents the approximate northwest corner of the historic Kūwili Fishpond/historic shoreline, while the southern boundary is represented by the southern boundary of Kawa Fishpond/historic shoreline and Nuʻuanu Stream (see Vol. II Figure 12, Vol. II Figure 26, and Vol. II Figure 27). The Iwilei Zone corridor is located entirely within Honolulu Ahupuaʻa, although the present-day southern end of the zone was offshore in Traditional Hawaiian times.

The Iwilei Zone includes eleven AIS Test Excavations numbered T-086 through T-095 (see Vol. IVB Section 3). Test excavation numbering runs from northwest to southeast. The test excavations within the Iwilei Zone were located within TMKs [1] 1-5-007 (Dillingham Boulevard, Kaʻaahi Street, and Iwilei Road; owned by the City and County of Honolulu), [1] 1-5-007:016 (portions of Iwilei Station and transit corridor; land owned by Hawaiian Electric), [1] 1-5-007:021 (portion of Iwilei Station; land owned by Nuʻuanu Auto Company), [1] 1-5-007:001 (transit corridor portion; land owned by the State of Hawaiʻi), and [1] 1-5-008:020 (transit corridor portion; land owned by Jiriochi Otani Family, Ltd.).

10.2 Geography, Geology, and Land Forms

The Iwilei Zone is situated along the low-lying coastal flats immediately inland of Kapālama Basin and Honolulu Harbor and is less than 0.5 km from the shoreline. Elevations within the Iwilei Zone range from approximately 1.5 to 1.8 m amsl, and the average annual rainfall is approximately 730 to 790 mm (29 to 31 inches) (Giambelluca et al. 2011). The present-day topography of the Iwilei Zone is generally flat. As the Iwilei Zone traverses a predominantly urban landscape, vegetation in the immediate vicinity is minimal and primarily the result of landscaping including introduced (non-indigenous) trees, shrubs, and ground cover. Of particular note, are the numerous *kamani* trees that line much of Dillingham Boulevard. Nuʻuanu Stream marks the southern end of the Iwilei Zone as it empties into Honolulu Harbor.

According to the U.S. Department of Agriculture Soil Survey Geographic (SSURGO) Database (2001) and soil survey data gathered by Foote et al. (1972), soils within the Iwilei Zone consist predominantly of Fill land (FL), with a small area of Ewa silty clay loam (EmA) north of T-089 (Figure 196). Fill land soils are described as:

...areas filled with material dredged from the ocean or hauled from nearby areas, garbage, and general material from other sources... This land type is used for urban development including airports, housing areas, and industrial facilities [Foote et al. 1972:31].

Ewa silty clay loam soils are described as:

...well-drained soils in basins and on alluvial fans... [that] developed in alluvium derived from basic igneous rock... These soils are used for sugarcane, truck crops, and pasture. The natural vegetation consists of fingergrass, kiawe, koa haole, klu, and uhaloa [Foote et al. 1972:29].

10.3 Modern Land Use and Built Environment

The Iwilei Zone traverses an urban environment through the neighborhoods of Kapālama and Iwilei. The Iwilei Zone corridor begins at Dillingham Boulevard, just east of Akepo Lane, at the north end, cuts through a current parking lot to get to and then follow along Ka'aahi Street where it continues past the dead end and cuts through a current industrial lot and crosses Iwilei Road to connect to the Nimitz Highway off-ramp to Iwilei Road, and then continues onto Nimitz Highway to Nu'uaniu Stream at the south end. Parcels bordering the Iwilei Zone corridor contain largely industrial warehouses, with some bare lots, parking lots, and high-rise condominiums. A massive utility corridor is also present throughout the Iwilei Zone containing electrical, gas, water, sewer, and storm lines. The number and distribution of these existing utilities indicate that this portion of the transit corridor has been heavily disturbed in the past.

10.4 GPR Sediment Summary

Test excavations in the Iwilei Geographic Zone (Zone 5) revealed that the area was predominantly Fill land (FL) as predicted by the U.S.G.S Soil survey map of the zone (Figure 196). Naturally deposited sediments encountered during test excavations in this zone were generally too deep for the GPR to clearly read. The average depth of clean signal return for this area was approximately one meter. No naturally deposited sediments were located within the range of clean signal return. The area can be typified by containing multiple stratigraphic transitions representing multiple fill events. Representative signal texture profiles for Zone 5 are shown in Figure 197. Signal texture profiles were only collected if the signal return was clear and the stratum was at least 0.25 m thick.

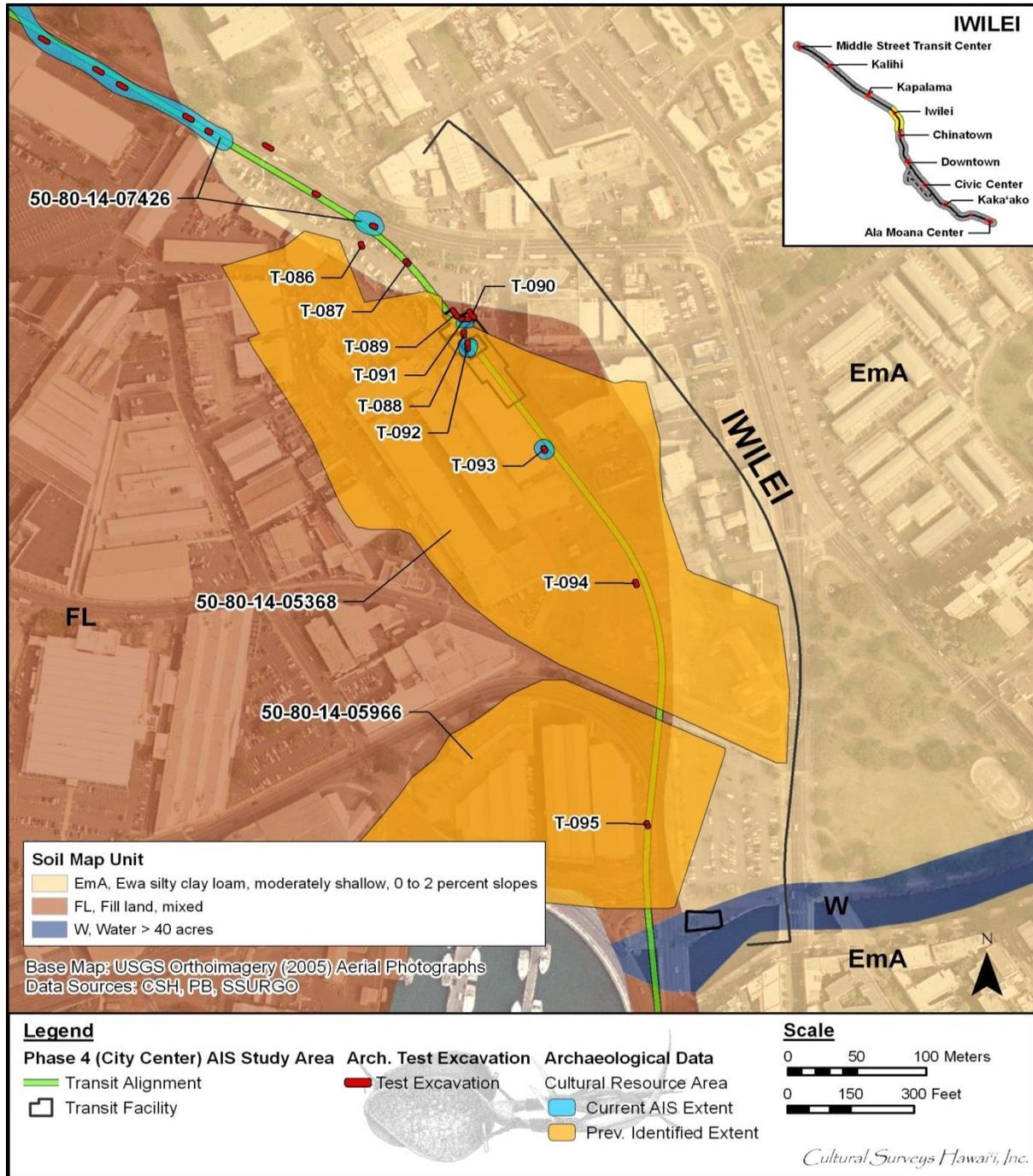


Figure 196. Aerial photograph (source: U.S.G.S. Orthoimagery 2005) with overlay of the Soil Survey of Hawai'i (Foote et al. 1972) showing sediment types within and in the vicinity of the Iwilei Zone AIS test excavations (T-086 through T-095) along the transit corridor and at the Iwilei Transit Station

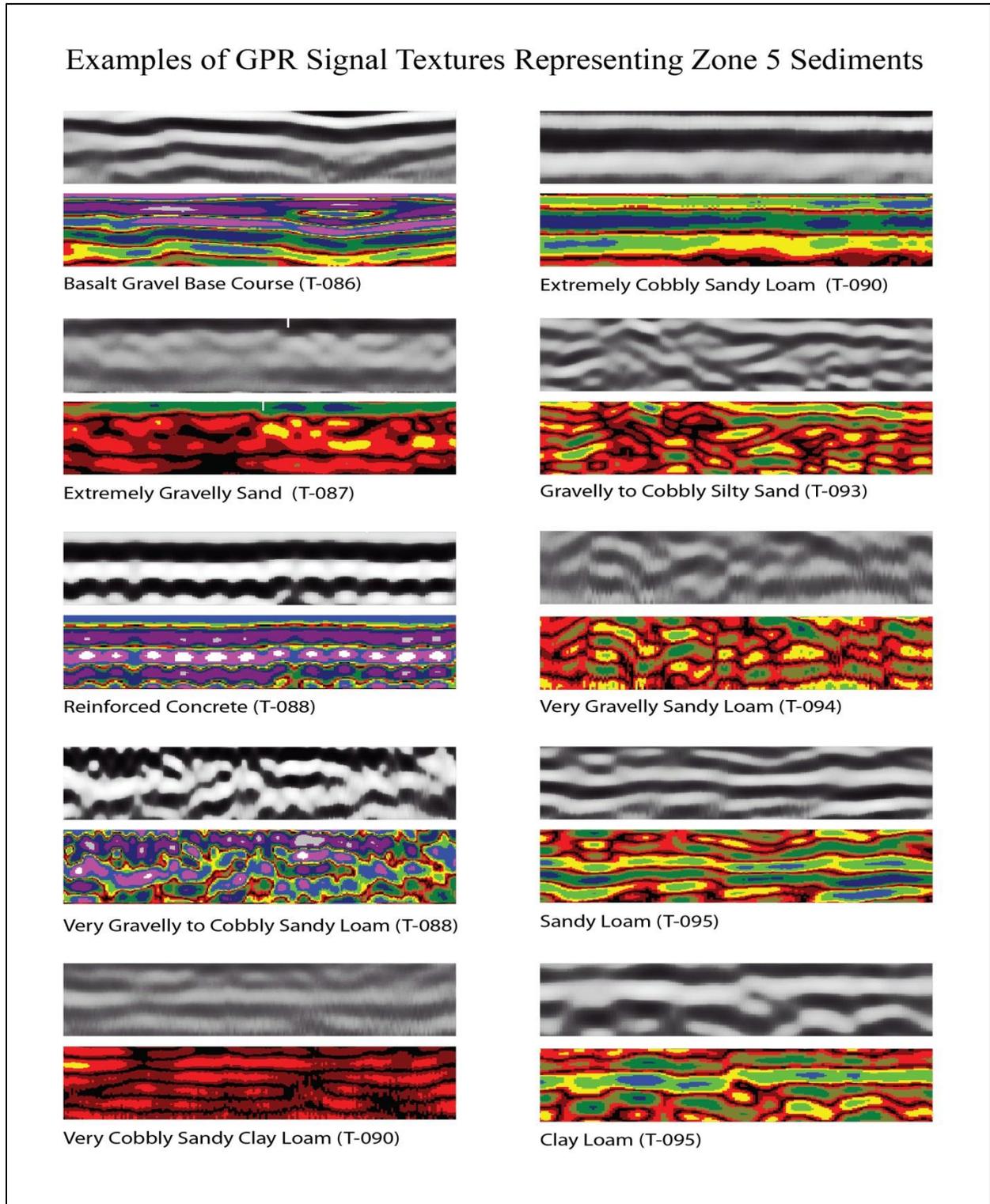


Figure 197. Examples of GPR signal textures representing Zone 5 sediments

Test Excavation 85

T-085 measured 0.9 m by 3.0 m and was oriented northwest to southeast and was located within the road cut of Dillingham Boulevard in the east bound center lane, 39.0 m southeast of Dillingham Boulevard and Akepo Lane intersection. The GPR grid measured 2.0 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: water line 3.1 m northeast and an electrical line 4.9 m southwest. A water utility transected the GPR grid and proposed excavation location therefore T-085 was relocated approximately 3.0 m to the southeast.

A review of amplitude slice maps indicated a linear feature but was not encountered due to the relocation of the excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 198).

GPR depth profiles for T-085 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 199). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs. An anomaly was observed in the profile but was not encountered due to the relocation of the excavation. The maximum depth of clean signal return was approximately 1.0 mbs.

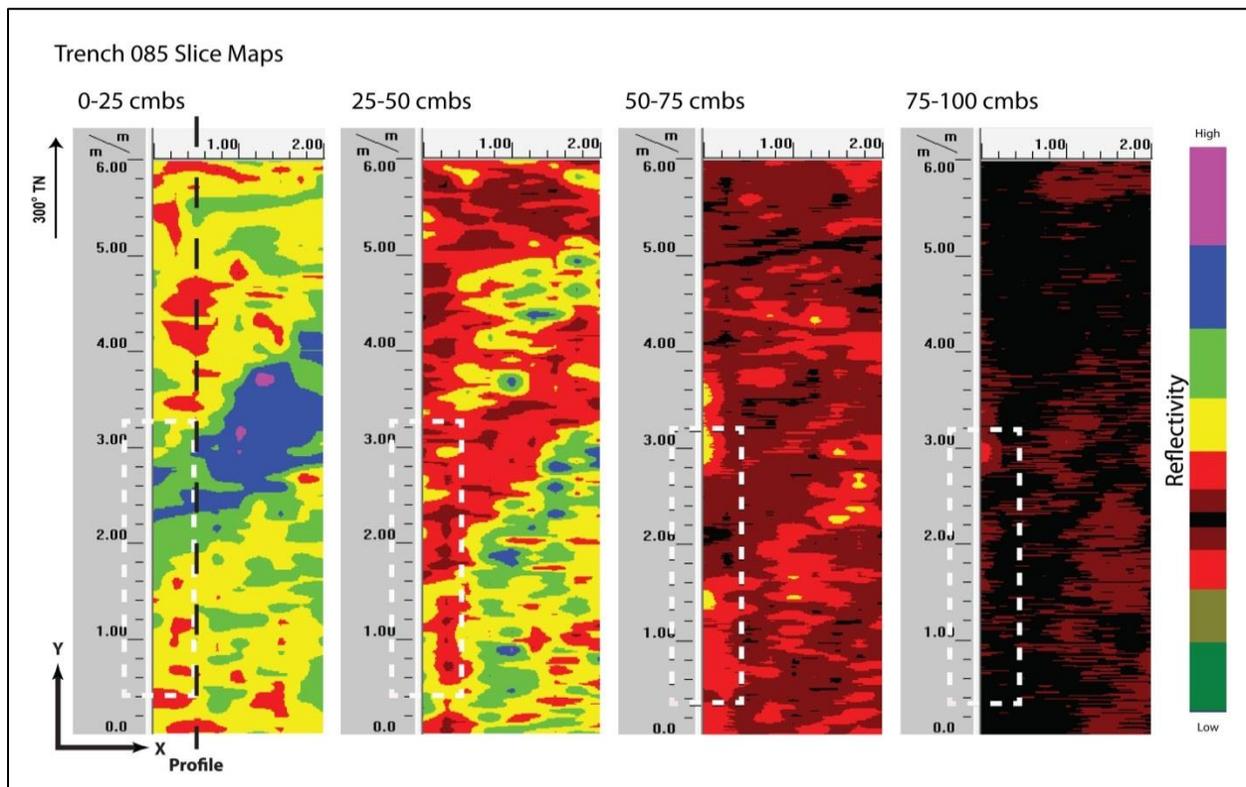


Figure 198. Slice maps of T-085 at 25cm depth intervals

Due to the relocation of T-085, this profile does not represent the exact location but does represent the immediate area. A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 199). Strata included a layer of asphalt on top of extremely gravelly sand fill followed by gravelly sandy loam fill that continued down to 1.9 mbs. This was beyond the maximum clean signal return depth. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. No discrete objects were observed in the GPR results or subsequent excavation.

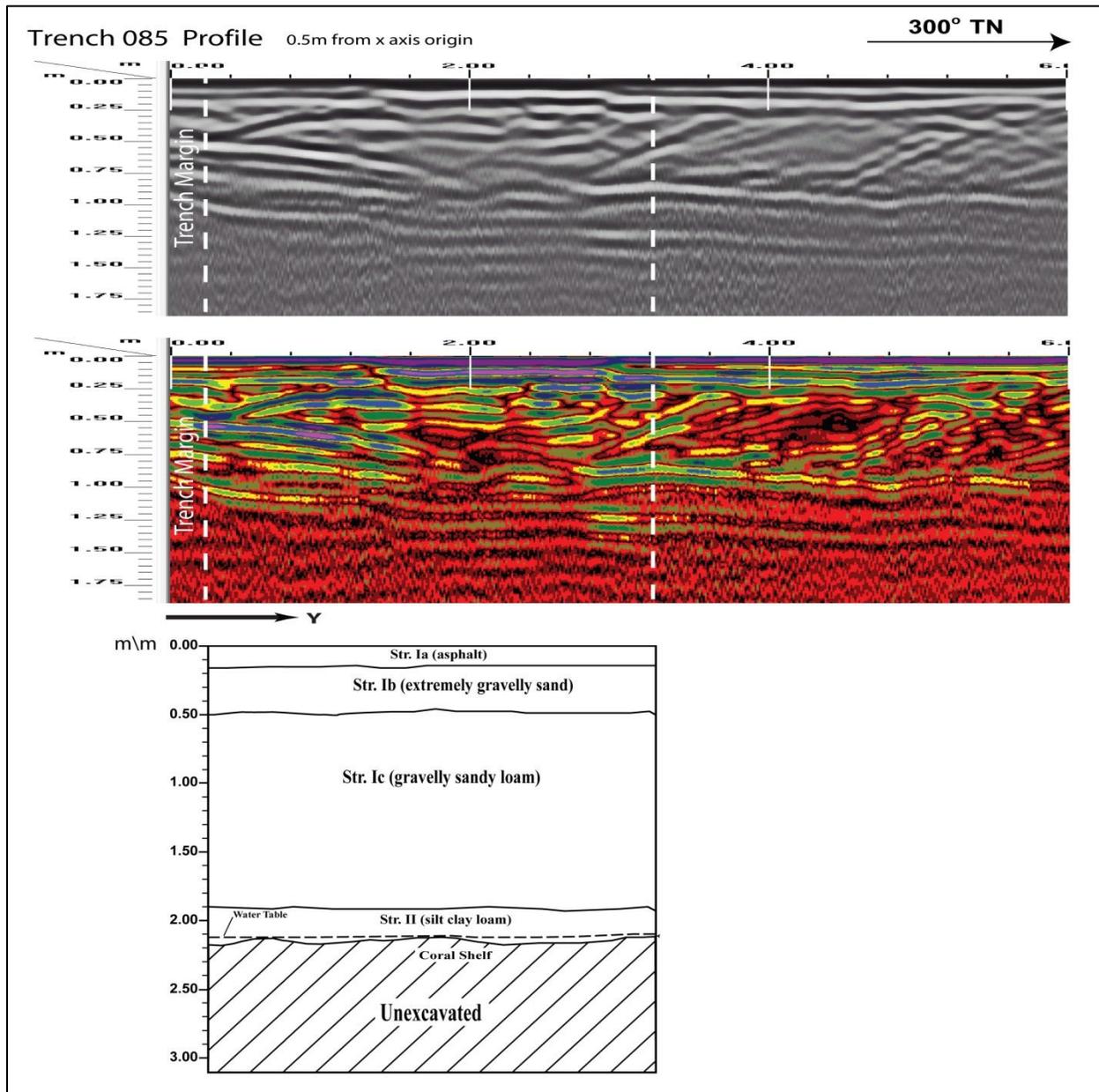


Figure 199. Visual comparison of excavated profile and GPR signal profile of T-085

Test Excavation 86

T-086 measured 0.9 m by 3.0 m and was oriented northwest to southeast and was located within a parking lot 8 m south of Dillingham Boulevard, 100.0 m west of Dillingham Boulevard and Kaaahi Street. The GPR grid measured 4.0 m by 10.0 m with 25.0 spacing between Y transects and 1.0 m between X transects. Utilities located near the excavation include a water drain 8.0 m northeast. An irrigation line was encountered 0.50 mbs in the northwest corner and a steel structure beam was encountered 0.78 mbs running diagonally through center of the excavation location.

A review of amplitude slice maps indicated several linear features and a utility and structure beam were encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth with the exception of a HECO box and several utilities. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.50 mbs (Figure 200).

GPR depth profiles for T-086 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 201). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.1 mbs and again around 0.7 mbs. An anomaly was observed in the profile but was not within excavation boundaries and two voids were observed in the profile that could correspond to the objects encountered during excavation. The maximum depth of clean signal return was approximately 0.9 mbs.

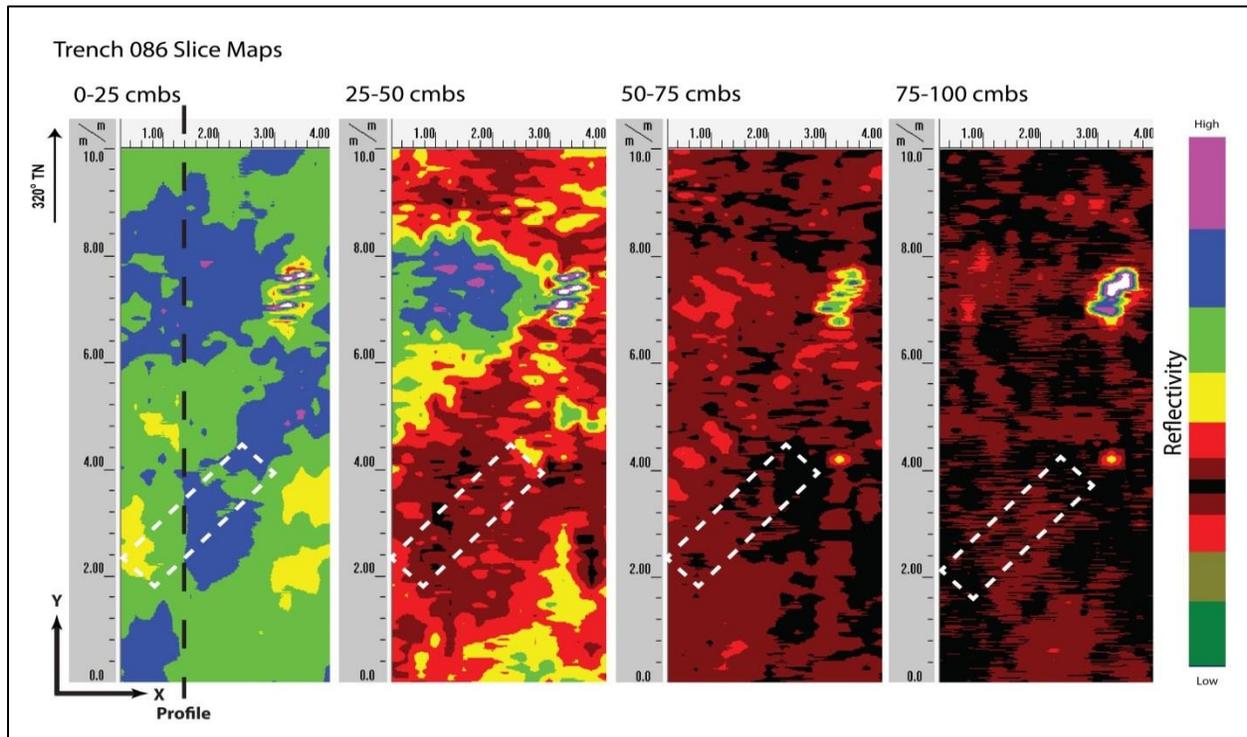


Figure 200. Slice maps of T-086 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 201). Strata Ia to Ie were clearly observed and occurred at the ground-truthed depths. Stratum Ic, very gravelly loamy sand fill, was less than 10 cm in thickness but does correspond to some slight banding around 0.6 mbs. Strata Id and Ie were side by side and were comprised of very gravelly to cobbly loam fill and gravelly silty loam fill, respectively. A slight void was observed in the profile between the the strata but it was difficult to interpret it as such. An irrigation line and a steel beam were found 0.5 and 0.78 mbs, respectively. These two objects correspond to slight voids observed in the profile. All other sediment transitions occurred below the maximum depth of clean signal return. No other discrete objects were observed in the GPR results or subsequent excavation.

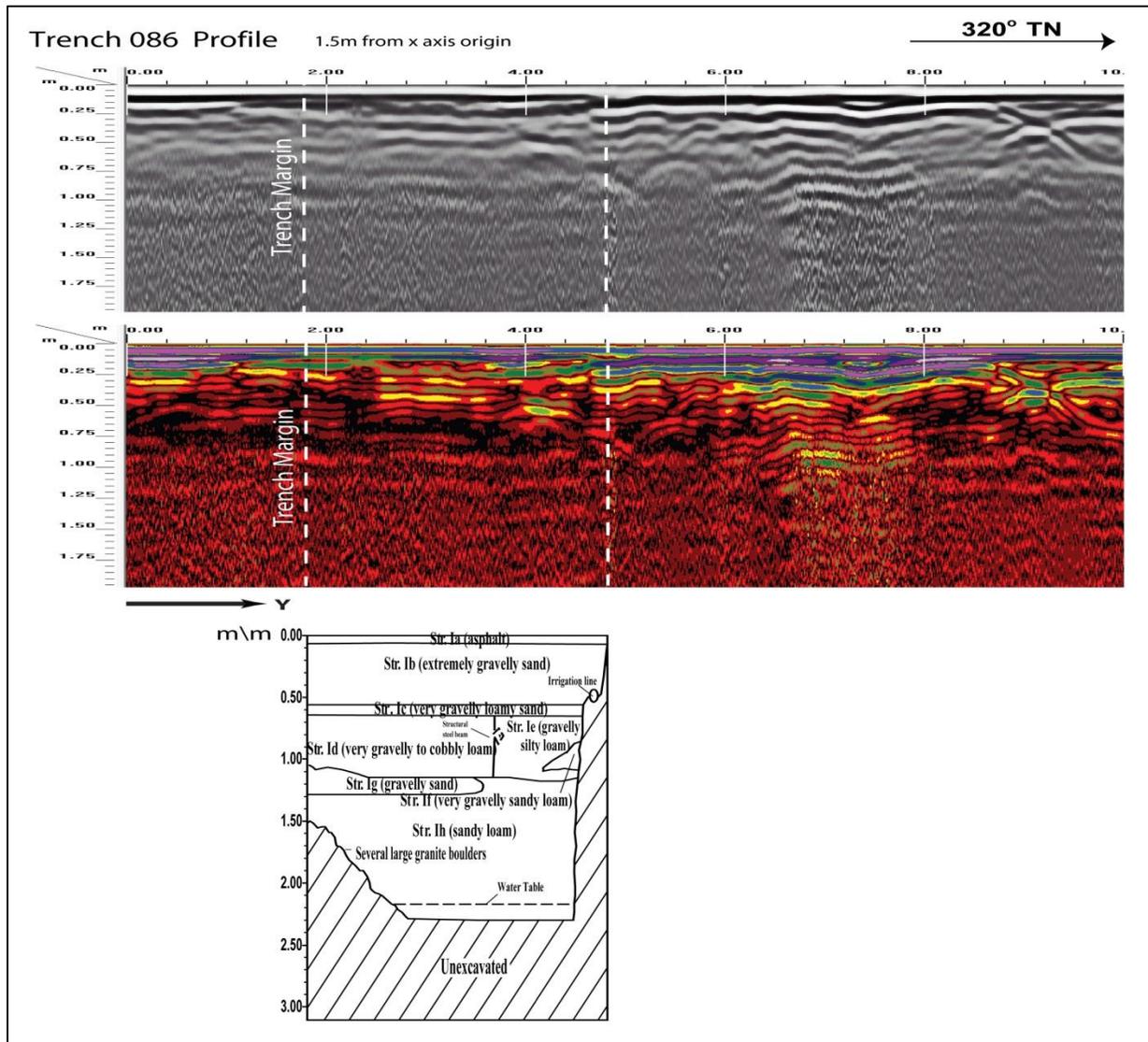


Figure 201. Visual comparison of excavated profile and GPR signal profile of T-086

Test Excavation 87

T-087 measured 0.6 m by 3.0 m and was oriented northwest to southeast and was located 7.0 m south of Dillingham Boulevard, in a parking lot 68.0 m west of Dillingham Boulevard and Kaaahi Street intersection. The GPR grid measured 3.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include a sewer line 3.2 m south.

A review of amplitude slice maps indicated a linear feature but was not within excavation boundaries. Reflectivity was relatively uniform throughout the grid and decreased with depth with the exception of the utility. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 202).

GPR depth profiles for T-087 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 203). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.2 mbs and again around 0.5 mbs. An anomaly was observed in the profile but was not within excavation boundaries. The maximum depth of clean signal return was approximately 0.8 mbs.

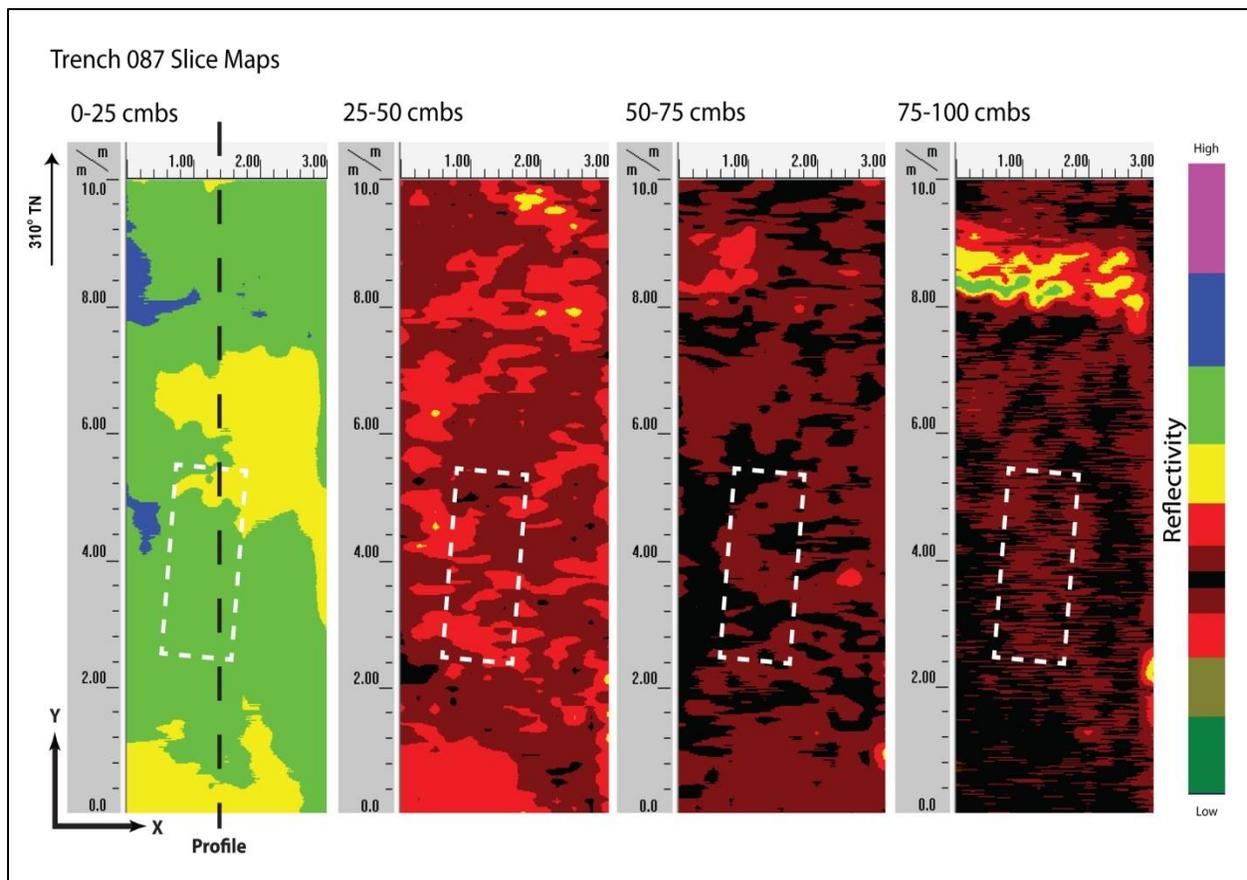


Figure 202. Slice maps of T-087 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a strong correlation in stratigraphic transitions (Figure 203). Strata Ia to Ic were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in Stratum Ib which was extremely gravelly sand. Horizontal banding was apparent for Stratum Ic. All other sediment transitions occurred below the maximum depth of clean signal return. No discrete objects were observed in the GPR results or subsequent excavation.

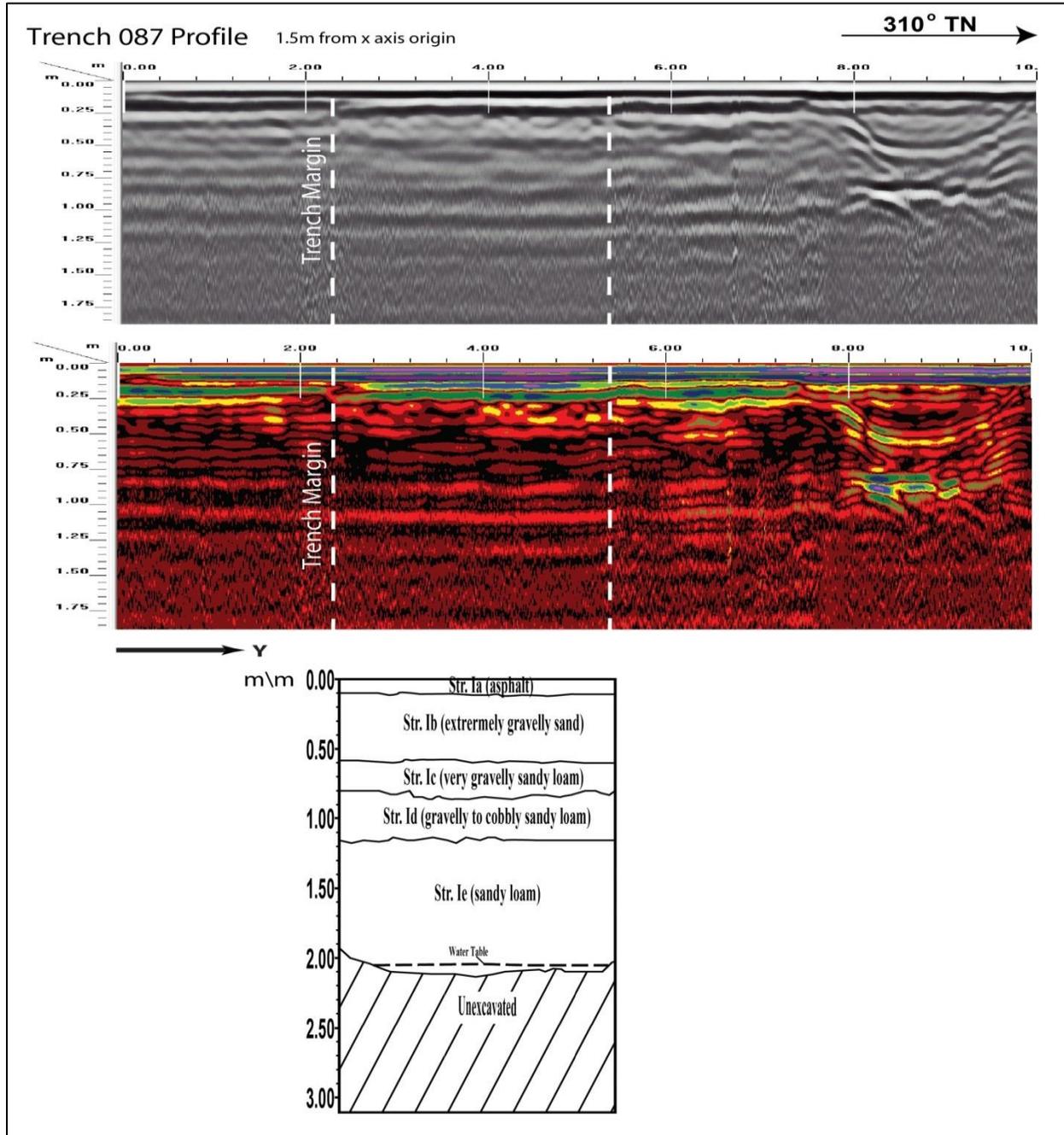


Figure 203. Visual comparison of excavated profile and GPR signal profile of T-087

Test Excavation 88

T-088 measured 0.9 m by 3.0 m and was oriented north to south and was located 31.0 m northwest of Kaaahi Street and Kaamahu Place intersection, within a parking lot northwest of Kaamahu Place. The GPR grid measured 5.2 m by 17.5 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: storm drain 5.9 m north. A large pipe was encountered 0.93mbs in the center of the excavation. Two concrete slabs were encountered, one 0.95 mbs in the center of the excavation and adjacent to the pipe and the other 0.33 mbs in the northwest end of the excavation.

A review of amplitude slice maps indicated no linear features although several utilities were encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 204).

GPR depth profiles for T-088 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 205). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.5 mbs. No utilities were observed in the profile although several utilities were encountered during excavation. The maximum depth of clean signal return was approximately 1.0 mbs.

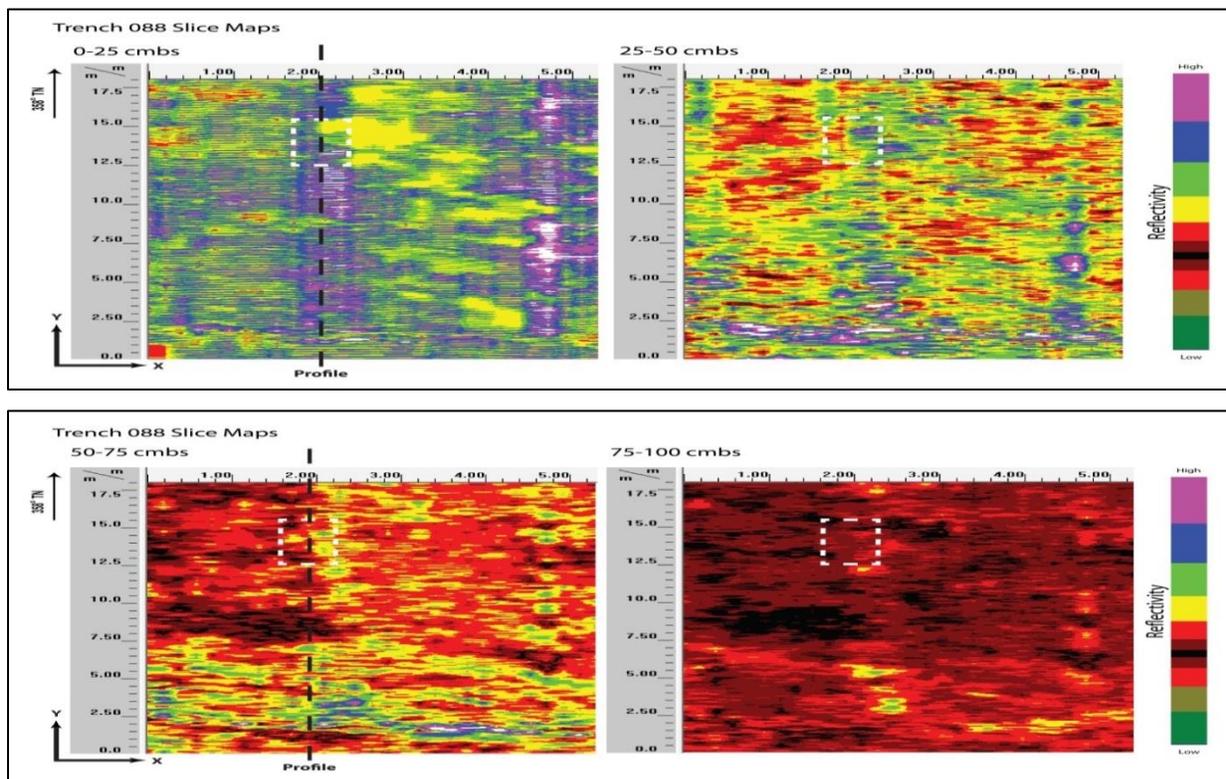


Figure 204. Slice maps of T-088 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 205). Strata included: concrete, very gravelly to cobbly sandy loam fill, asphalt, very gravelly sand, very gravelly to cobbly loamy sand fill, sandy clay loam fill, and extremely stony sand. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. Two concrete slabs and a large pipe were found 0.33, 0.95 and 0.93 mbs, respectively. These utilities did not show up on the slice maps or profile. No other sediment transitions or discrete objects were observed in the GPR results or subsequent excavation.

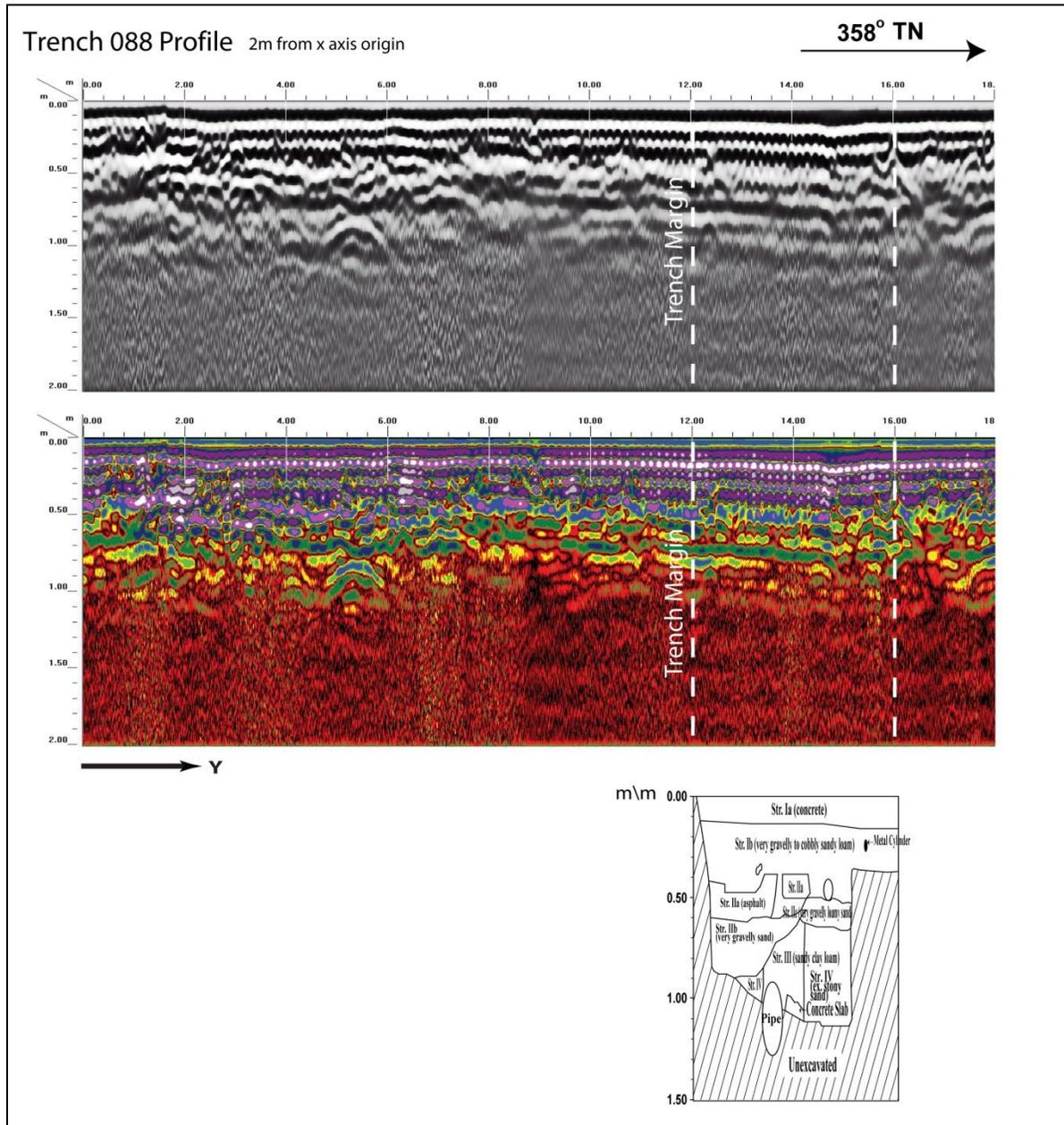


Figure 205. Visual comparison of excavated profile and GPR signal profile of T-088

Test Excavation 89

T-089 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located in a parking lot 50 m southwest of Dillingham Boulevard and Kaaahi Street intersection. The GPR grid measured 3.0 m by 10.0 m with 0.25 m spacing between Y transects and 1.0 m transects between X transects. Utilities located near the excavation include a sewer line 1.8 m northwest. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 206).

GPR depth profiles for T-089 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 207). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 1.1 mbs.

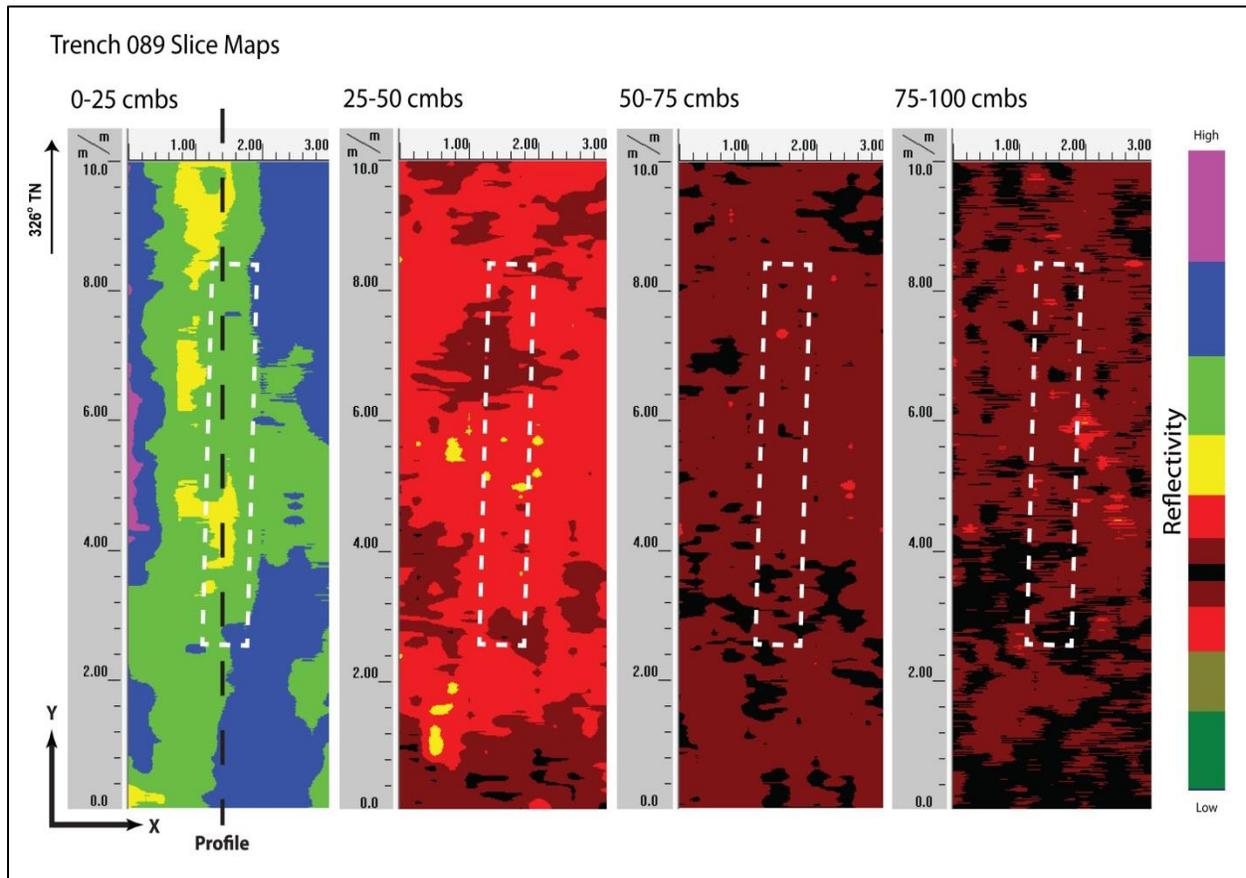


Figure 206. Slice maps of T-089 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 207). Strata Ia to Ib were all clearly observed and occurred near the ground-truthed depths. T-089 was comprised of multiple thin layers of fill events that continue down to 2.0 mbs. Strata Ic through Ih were not clearly observed and do not occurred at the ground-truthed depths. All other sediment transitions were below the the depth of maximum signal return. No discrete objects were observed in the GPR results or subsequent excavation.

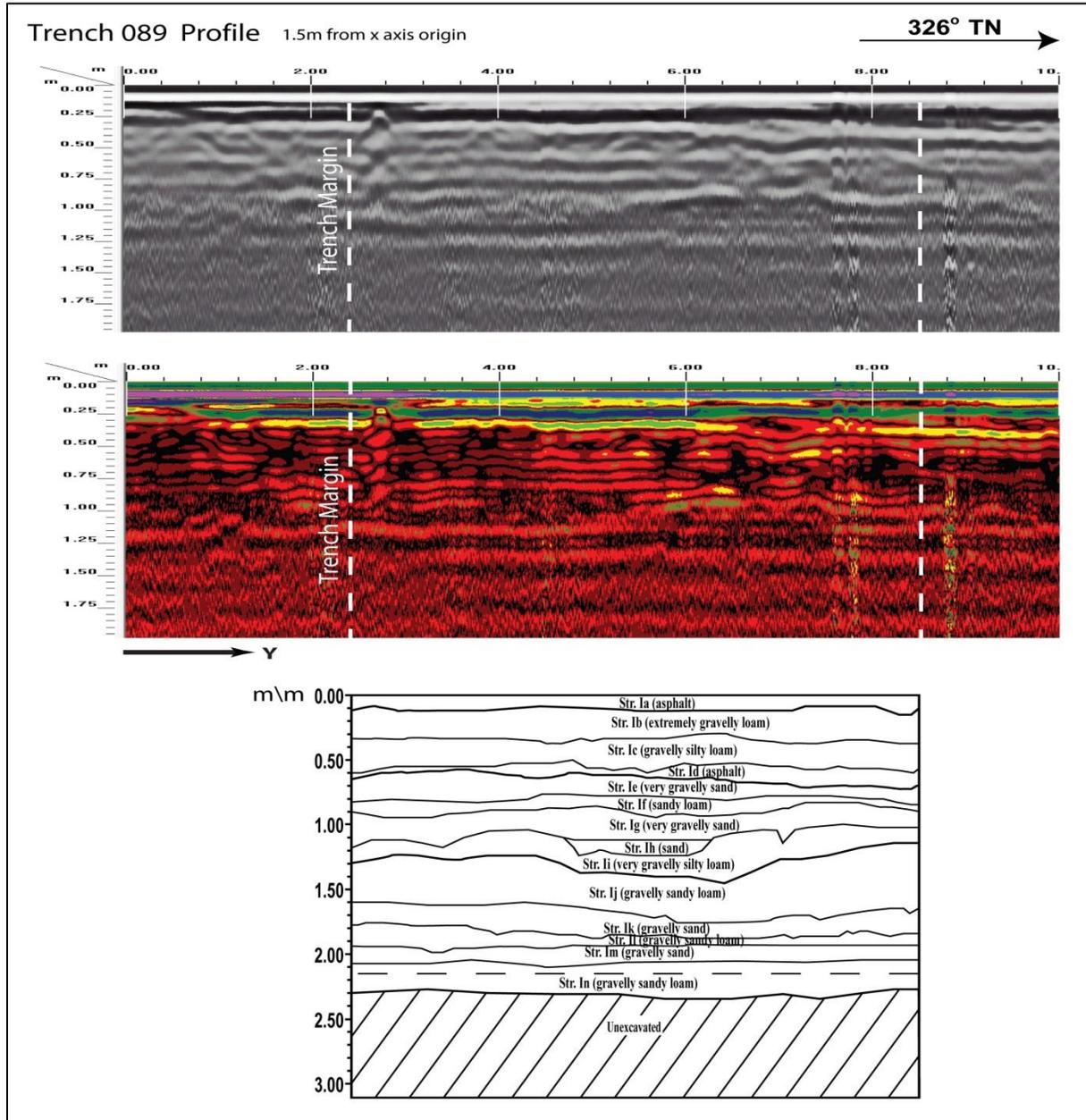


Figure 207. Visual comparison of excavated profile and GPR signal profile of T-089

Test Excavation 90

T-090 measured 0.6 m by 6.0 m and was oriented northwest to southeast and was located 38.0 m northwest of Kaamahu Place and Kaaahi Street intersection, within the HECO parking lot. The GPR grid measured 8.0 m by 14.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: storm drain 2.8 m south. A concrete jacket, concrete slab and an electrical pipe encountered approximately 1.0 mbs in the center to northeastern end of the excavation.

A review of amplitude slice maps indicated a linear feature but not within excavation boundaries. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 208).

GPR depth profiles for T-090 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 209). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs. No utilities were observed in the profile however some metal piping and concrete slabs were revealed during excavation. The maximum depth of clean signal return was approximately 1.0 mbs.

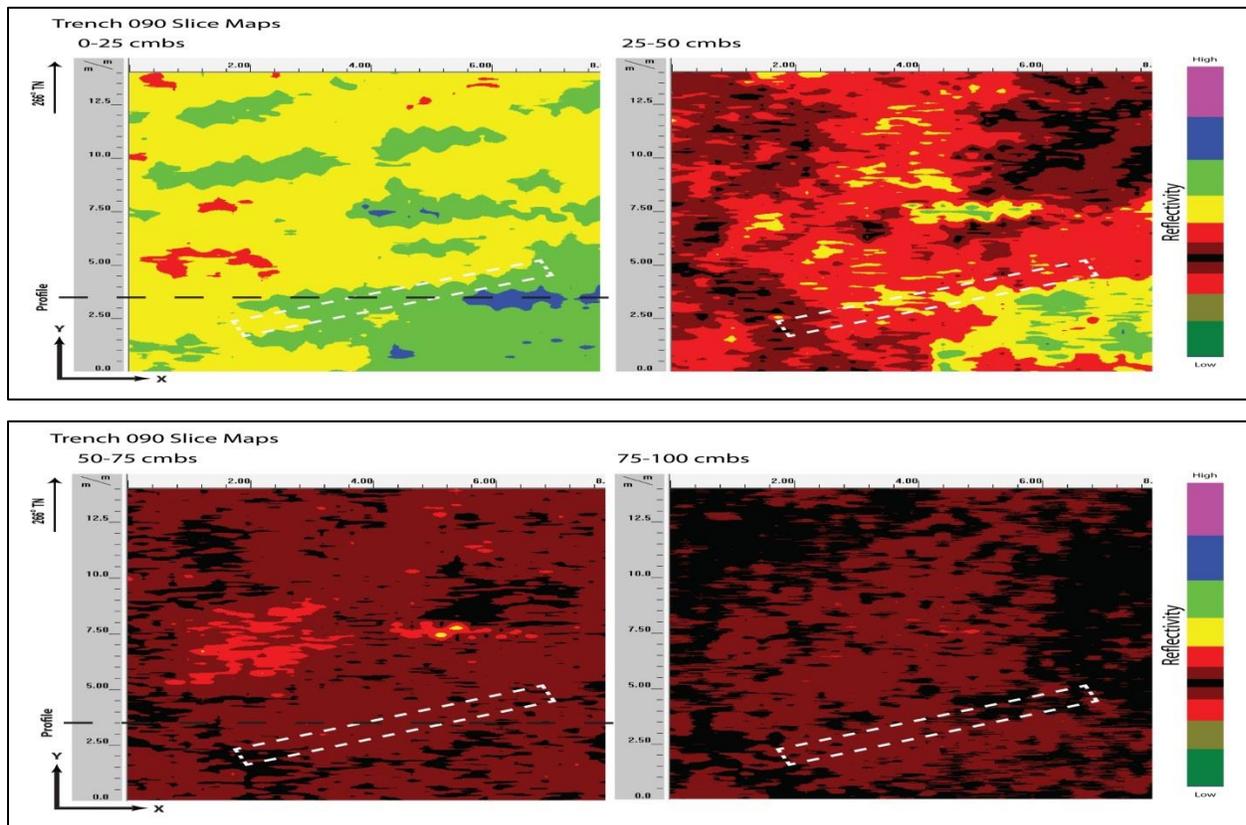


Figure 208. Slice maps of T-090 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 209). Strata Ia to Ib were all clearly observed and occurred near the ground-truthed depths. Strata included a layer of asphalt on top of extremely cobbly sandy clay fill. Strata Ic to If were not clearly observed and do not occurred at the ground-truthed depths. All other sediment transitions occurred below the maximum clean signal return depth. Several utilities and concrete slabs were found during excavation at 1.0 mbs. These utilities were not observed in the profile because they were at the maximum clean signal return depth. No other discrete objects were observed in the GPR results or subsequent excavation.

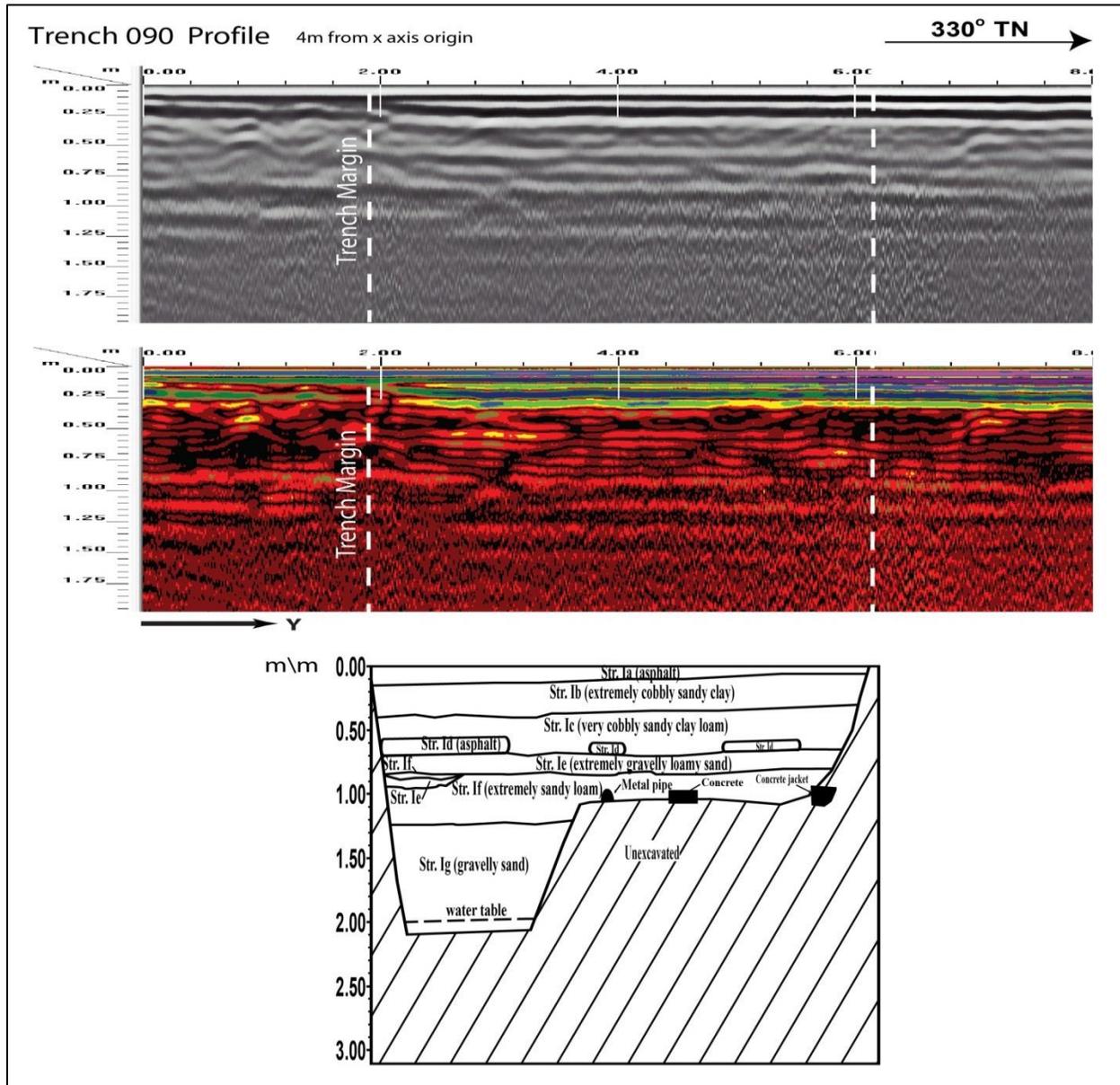


Figure 209. Visual comparison of excavated profile and GPR signal profile of T-090

Test Excavation 91

T-091 measured 0.6 m by 6.0 m and was oriented east to west and was located 40.0 m northwest of Kaamahu Place and Kaaahi Street intersection, within the HECO parking lot. The GPR grid measured 8.0 m by 14.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: storm drain 1.5 m south. No utilities transected the excavation location.

A review of amplitude slice maps indicated a linear feature but not within excavation boundaries. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.5 mbs (Figure 210).

GPR depth profiles for T-091 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 211). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 1.0 mbs.

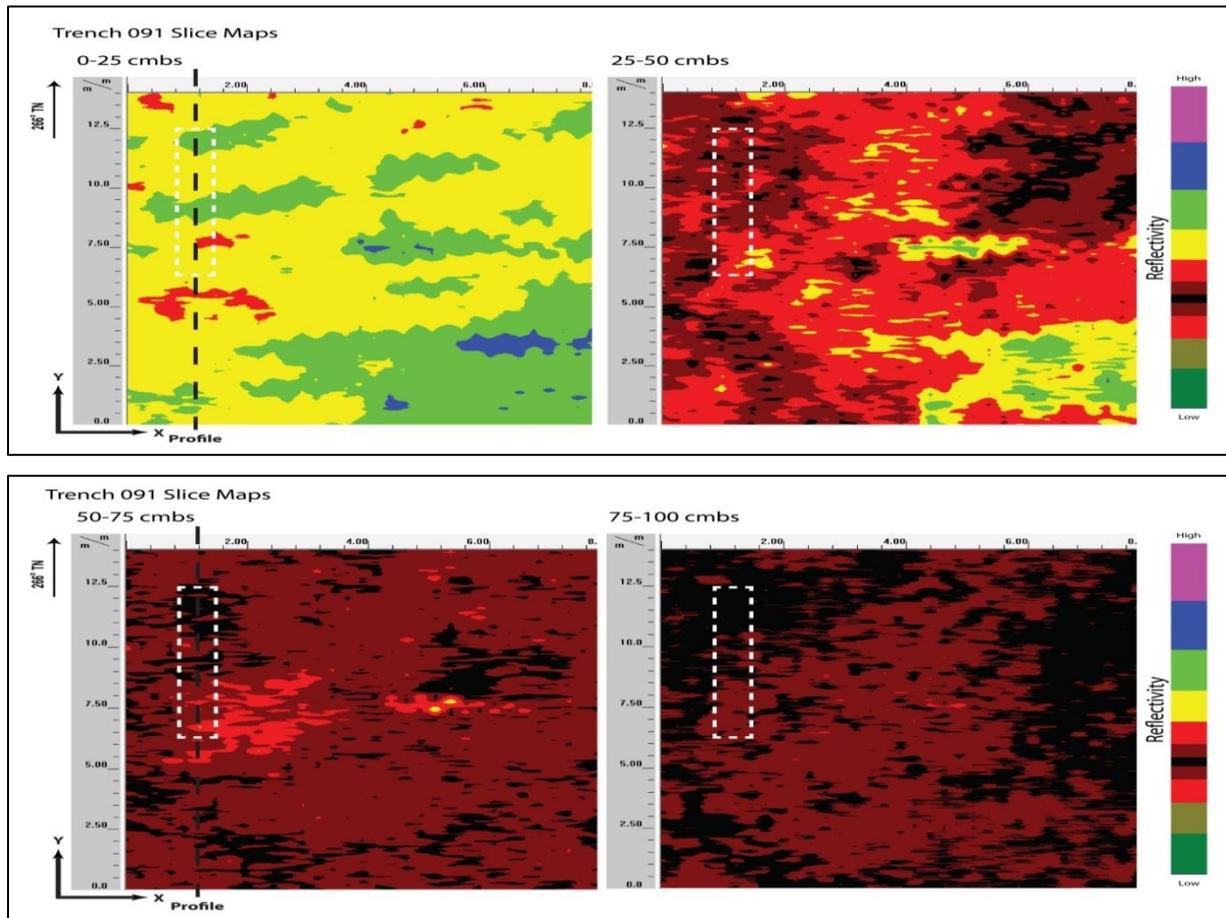


Figure 210. Slice maps of T-091 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 211). Strata included: asphalt, very gravelly sandy loam fill, concrete, sandy clay loam fill, asphalt, gravelly sand fill, silty sandy loam fill, very gravelly sand fill, very gravelly sandy loam fill, gravelly sandy cinder and a natural clay loam. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. Rusted steel debris was found 1.4 mbs. This debris was well below the maximum depth of clean signal return. No other sediment transitions or discrete objects were observed in the GPR results or subsequent excavation.

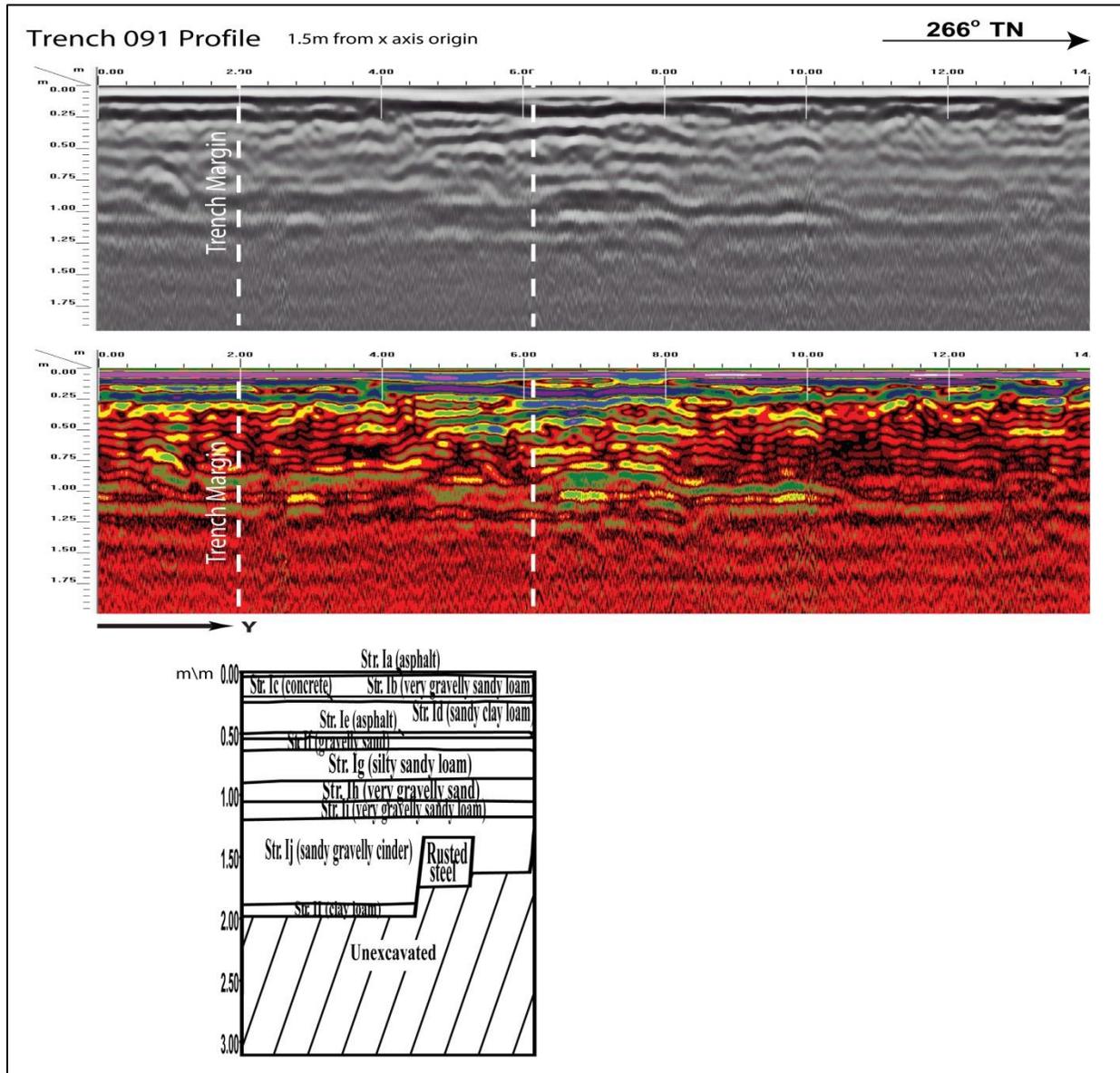


Figure 211. Visual comparison of excavated profile and GPR signal profile of T-091

Test Excavation 92

T-092 measured 0.6 m by 6.0 m and was oriented north to south and was located 28.0 m northwest of Kaamahu Place and Kaaahi Street intersection, within a parking lot west of Kaaahi Street. The GPR grid measured 5.2 m by 18.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: sewer line 1.5 m south. A metal utility pipe and a concrete slab were encountered approximately 0.7 mbs in the southern end of the excavation.

A review of amplitude slice maps indicated linear features not it was not encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.75 mbs (Figure 212).

GPR depth profiles for T-092 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 213). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs and again around 0.5 mbs. Various anomalies were visible in the GPR profile and these anomalies do correspond with the asphalt and concrete slabs revealed during excavation as well as an abandoned utility pipe. The maximum depth of clean signal return was approximately 1.0 mbs.

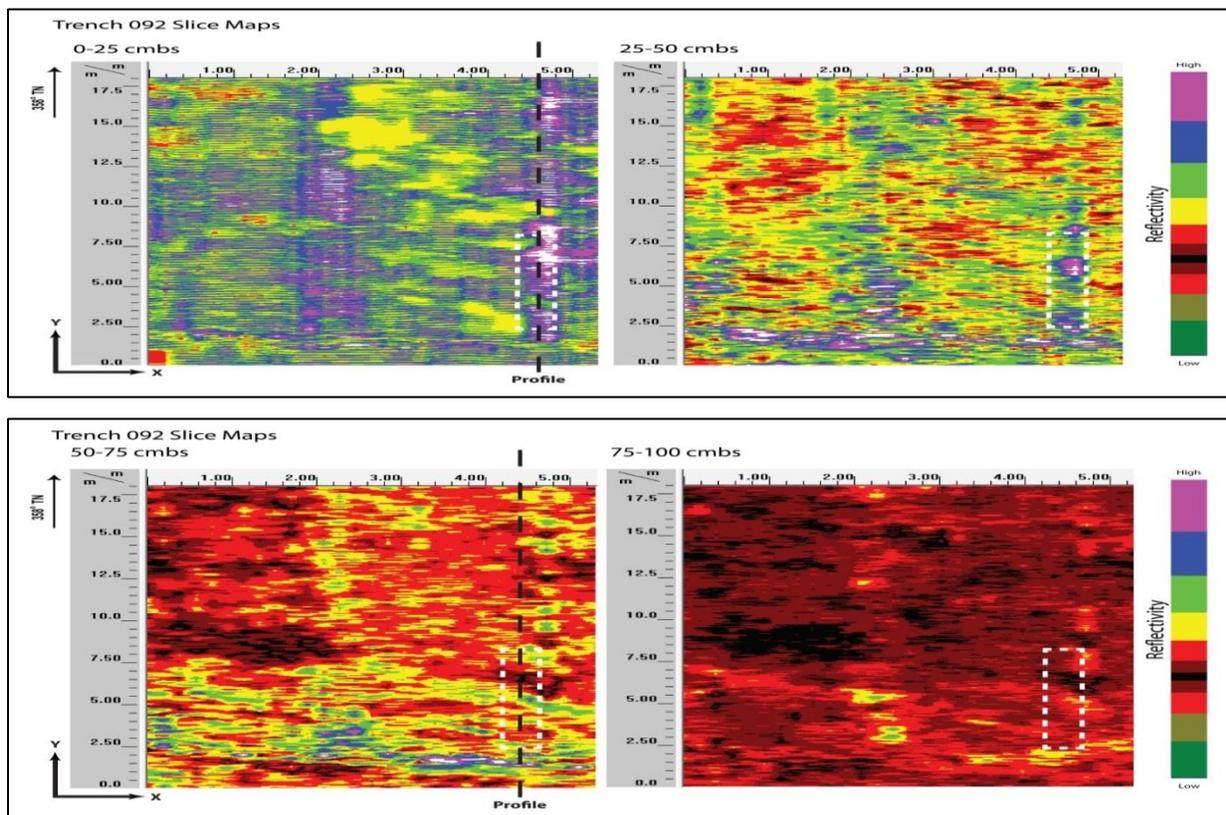


Figure 212. Slice maps of T-092 at 25 cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 213). Strata included: concrete, sandy clay loam fill, gravelly sandy clay fill, asphalt, very gravelly sand fill, gravel, extremely gravelly clay fill, sandy loam fill, clay fill, sandy loam fill, and a natural clay. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. A metal pipe and a concrete slab were found 0.7 mbs. The pipe and slab correspond to a hyperbola anomaly and an increase in reflectivity in the same area they were found on the profile map. No other sediment transitions or discrete objects were observed in the GPR results or subsequent excavation.

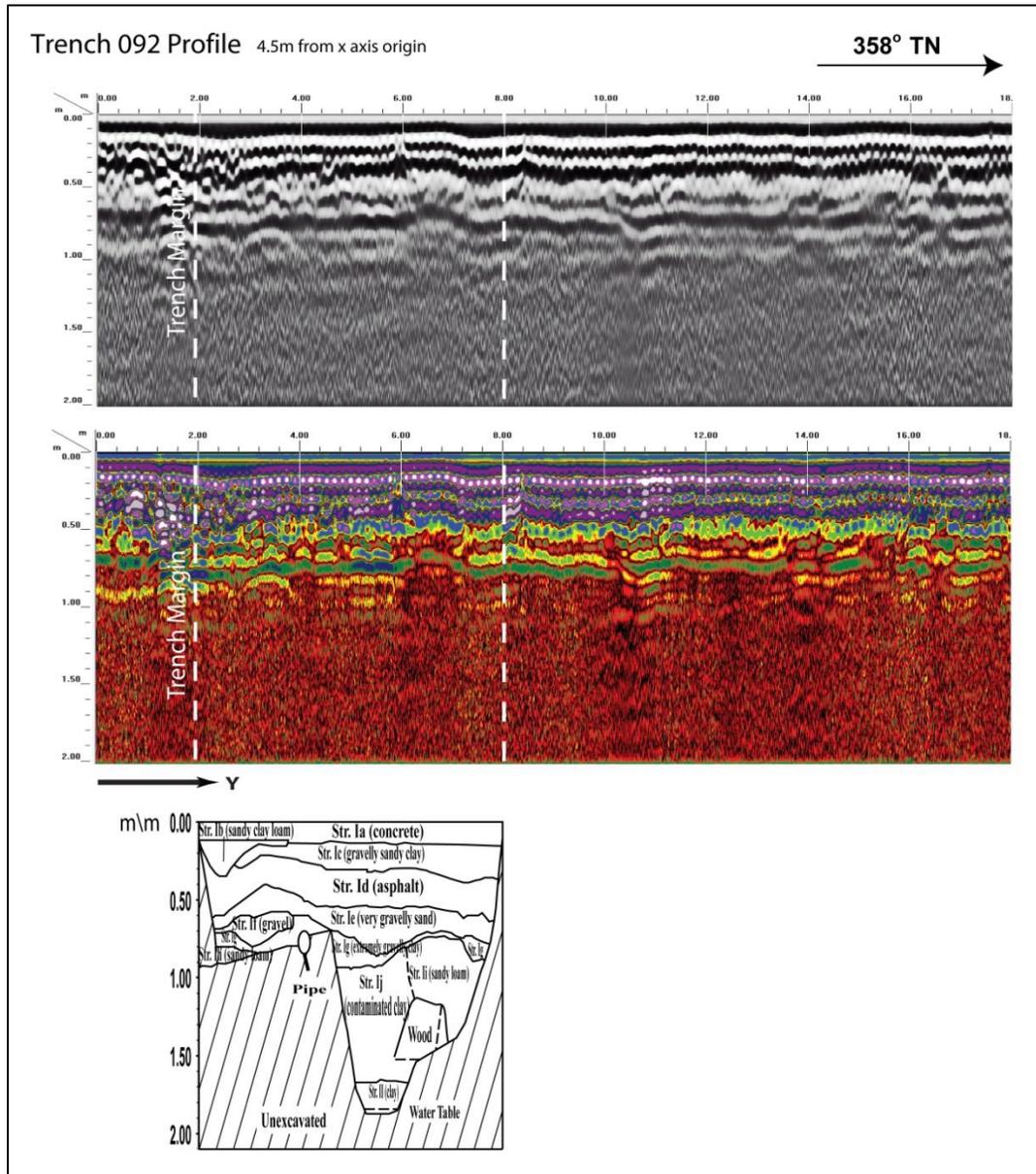


Figure 213. Visual comparison of excavated profile and GPR signal profile of T-092

Test Excavation 93

T-093 measured 0.9 m by 3.0 m and was oriented northwest to southeast and was located on the sidewalk 0.8 m southwest of Kaaahi Street. The GPR grid measured 1.4 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include: water line 10.0 m northeast. No utilities transected the GPR grid or excavation location.

A review of amplitude slice maps indicated no linear features which might have indicated the presence of utilities. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.75 mbs (Figure 214).

GPR depth profiles for T-093 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 215). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.25 mbs. No utilities were observed in the profile. The maximum depth of clean signal return was approximately 1.25 mbs.

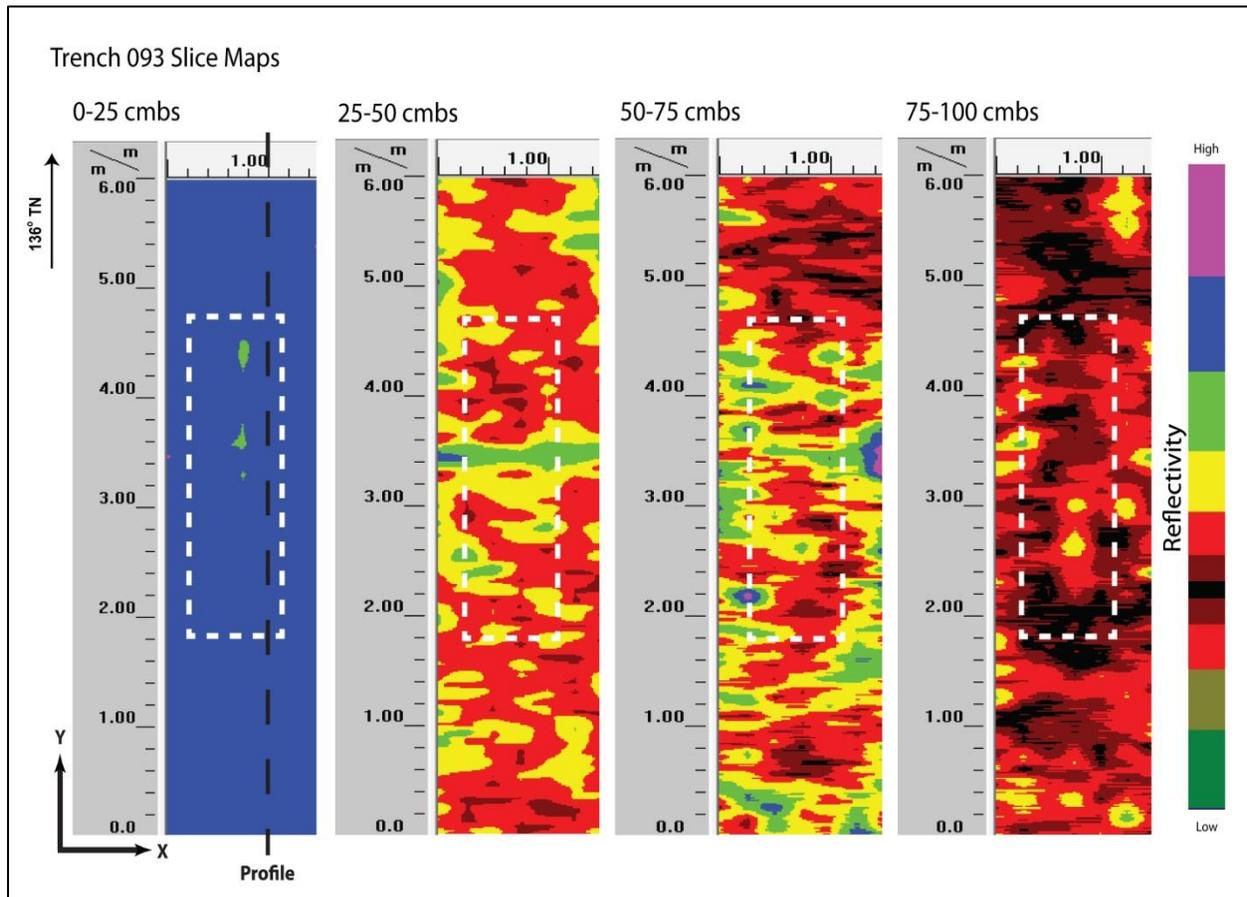


Figure 214. Slice maps of T-093 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 215). Strata Ia to Ic were clearly observed and occurred at the ground-truthed depths. Textural changes in the form of multiple small hyperbolas were apparent in the transition to Stratum Ic. Strata included: concrete, extremely gravelly loamy sand fill, stony sandy loam fill, very gravelly sand fill, contaminated sandy loam fill, very gravelly sand fill, sandy loam fill, silty clay fill, silty sand fill, natural silty clay, and then another natural silty clay. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. No other sediment transitions or discrete objects were observed in the GPR results or subsequent excavation.

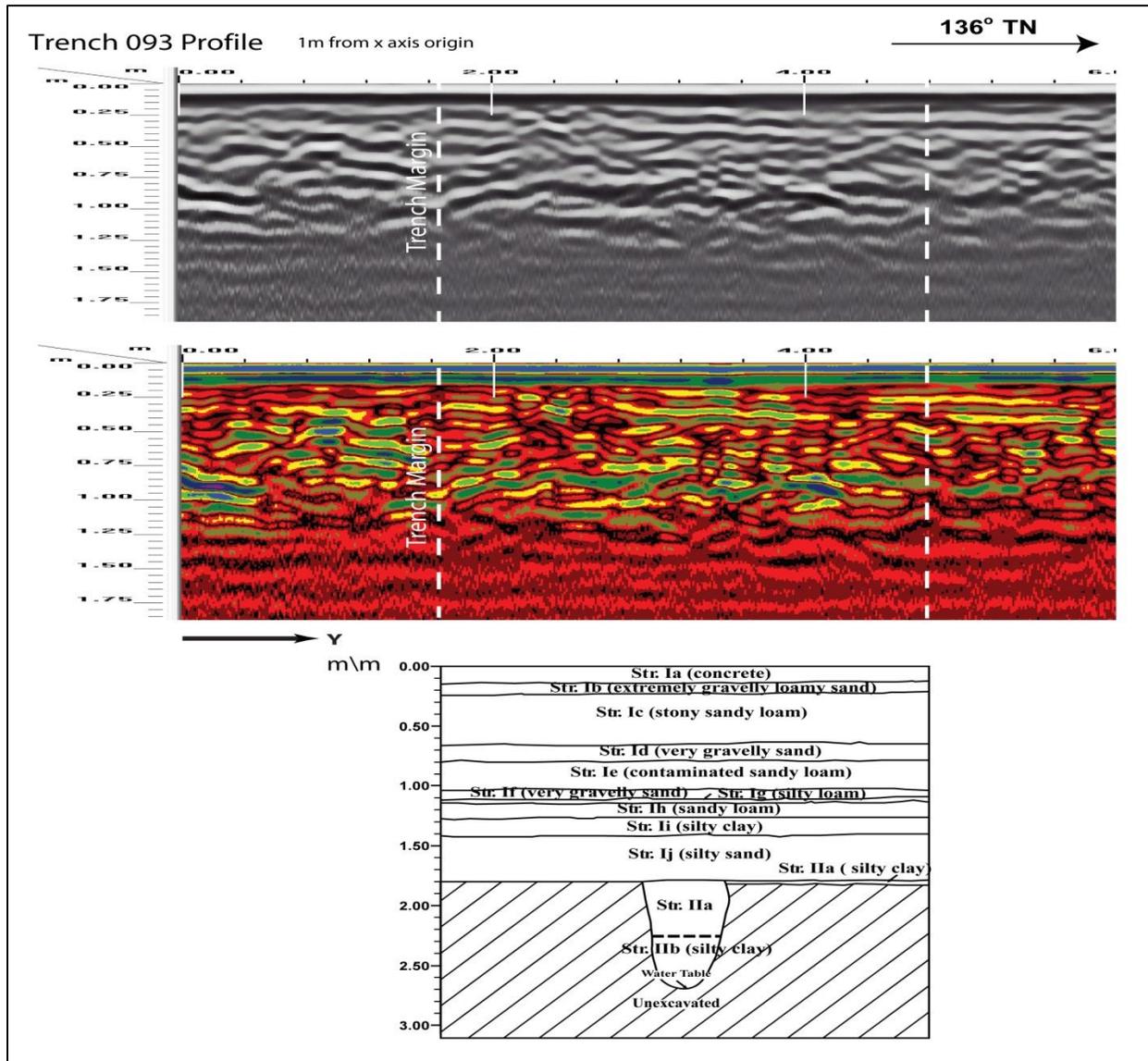


Figure 215. Visual comparison of excavated profile and GPR signal profile of T-093

Test Excavation 94

T-094 measured 0.9 m by 3.0 m and was oriented north to south and was located on a private lot between Kaaahi Place and Iwilei Road. The GPR grid measured 2.5 m by 8.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include a storm drain 7.3 m southwest. Large pieces of concrete were encountered 0.3 mbs in the southern end of the excavation.

A review of amplitude slice maps indicated a linear feature but was not encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.75 mbs (Figure 216).

GPR depth profiles for T-094 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 217). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.2 mbs. No utilities were observed in the profile although a large piece of concrete was found during excavation. The maximum depth of clean signal return was approximately 1.0 mbs.

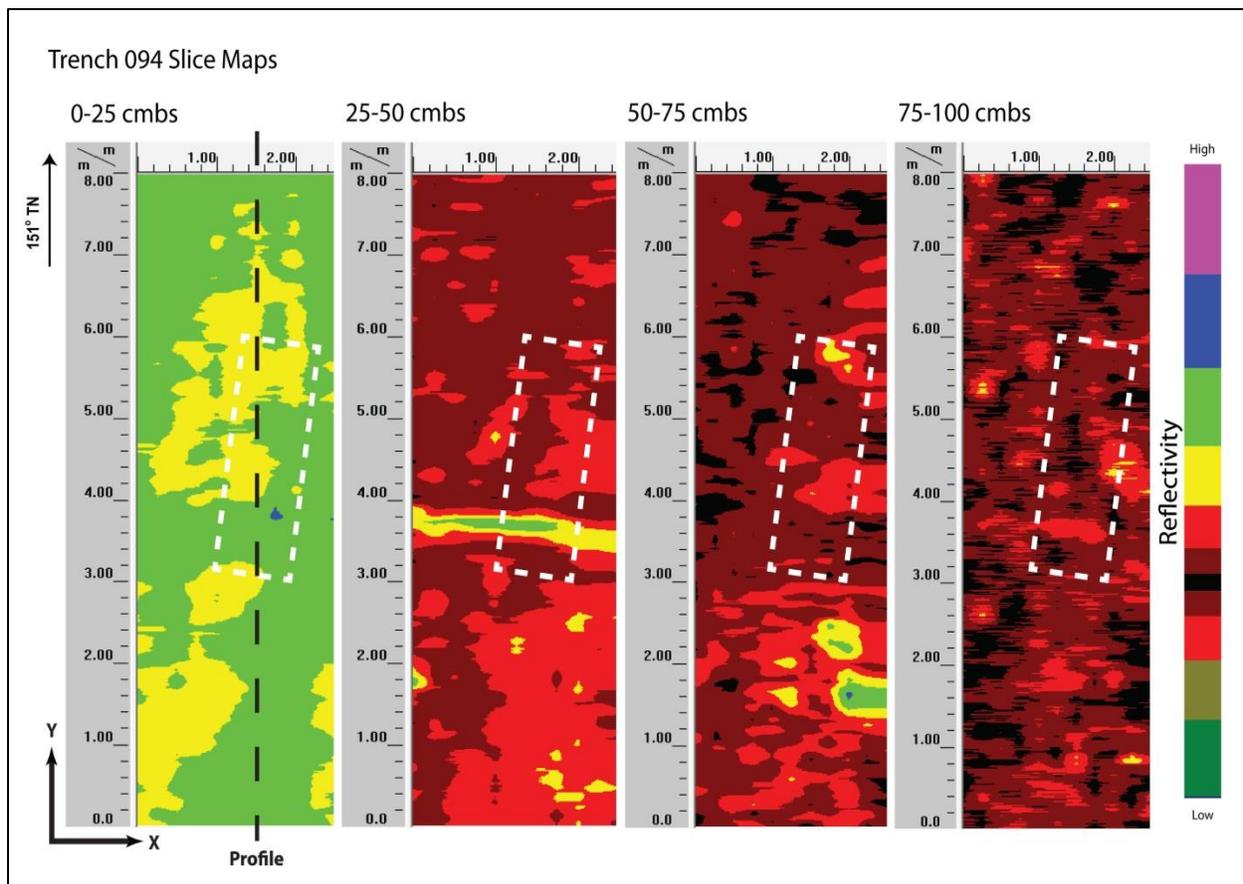


Figure 216. Slice maps of T-094 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a weak correlation in stratigraphic transitions (Figure 217). Strata included: extremely gravelly sand, asphalt, very gravelly sandy loam fill, very gravelly clay loam fill, silty clay loam fill, and then gravelly sandy loam fill. These transitions were not clearly depicted in the GPR profile at the depths that they occurred. A large piece of concrete was found 0.3 mbs. The concrete was not observed in the profile. This may be due to the fact that the concrete did not have reinforced steel (rebar) or that the concrete was a similar density as the surrounding stratum. No other sediment transitions or discrete objects were observed in the GPR results or subsequent excavation.

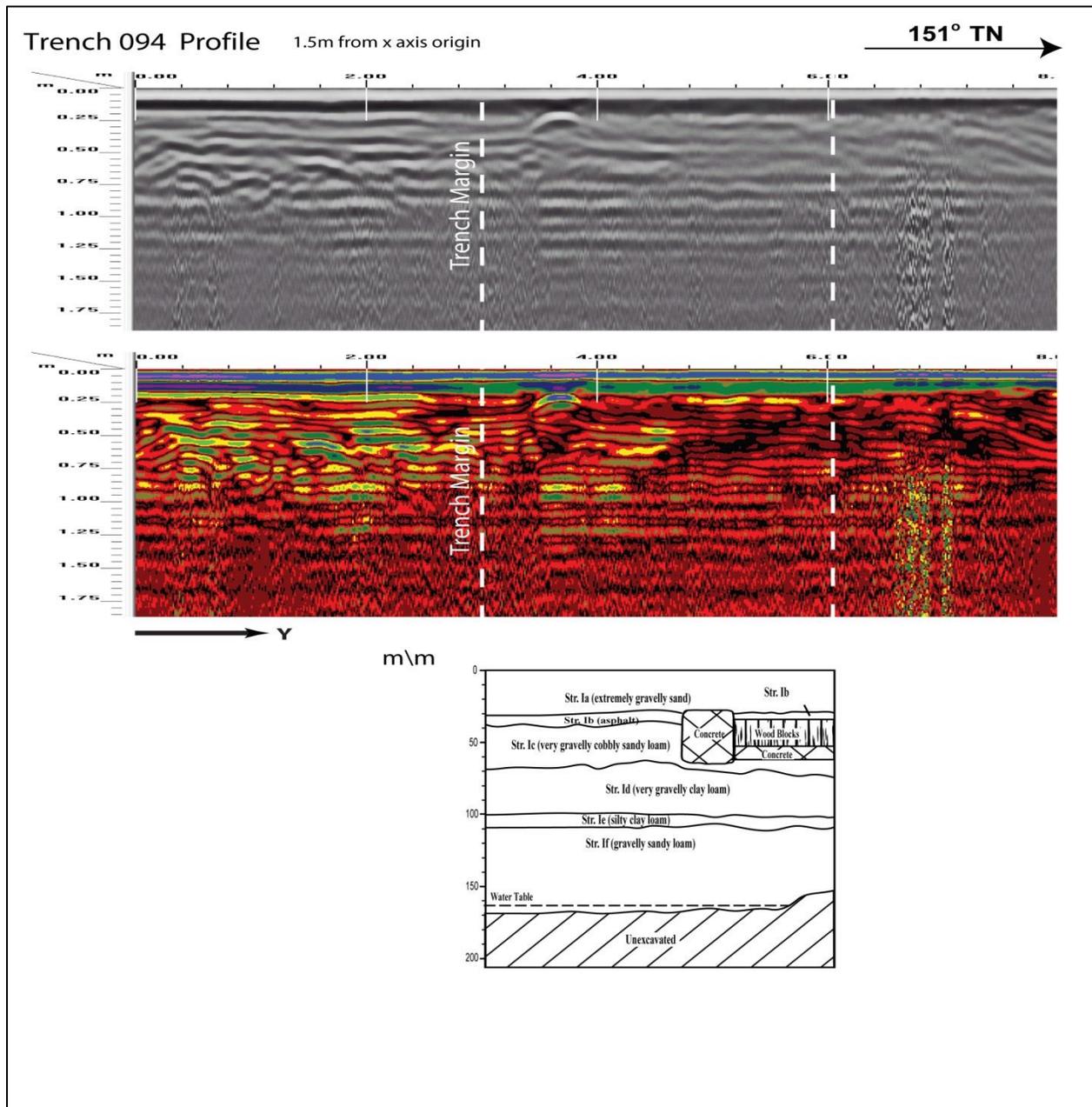


Figure 217. Visual comparison of excavated profile and GPR signal profile of T-094

Test Excavation 95

T-095 measured 0.9 m by 3.0 m and was oriented northwest to southeast and was located 3.5 m west of Nimitz Highway and within HIGA Meat Processing parking lot. The GPR grid measured 2.5 m by 6.0 m with 0.25 m spacing between Y transects and 1.0 m spacing between X transects. Utilities located near the excavation include a water line 3.0 m east. A concrete slab was encountered approximately 0.5 mbs on the northern end of the excavation.

A review of amplitude slice maps indicated a linear feature which might correspond to the concrete encountered during excavation. Reflectivity was relatively uniform throughout the grid and decreased with depth. A transition from higher reflectivity to lower reflectivity was observed at approximately 0.25 mbs (Figure 218).

GPR depth profiles for T-095 identified horizontal banding, commonly associated with stratigraphic layering, throughout the survey area (Figure 219). This banding corresponded to variations of density and chemical composition within fill deposits. The profile also indicated a change in reflectivity which occurred around 0.15 mbs. No utilities were observed in the profile although a concrete slab was encountered during excavation. The maximum depth of clean signal return was approximately 1.0 mbs.

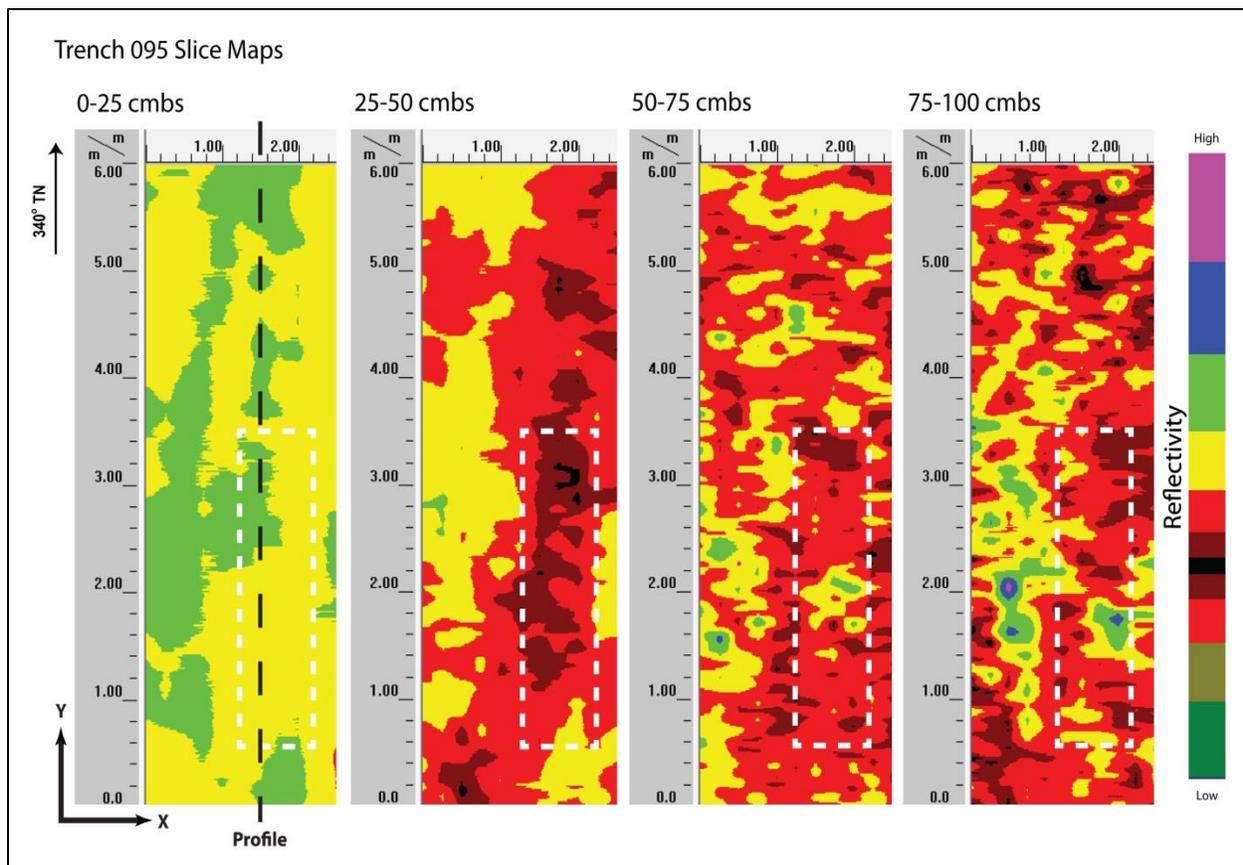


Figure 218. Slice maps of T-095 at 25cm depth intervals

A visual comparison of the excavated profile and the GPR signal profile showed a moderate correlation in stratigraphic transitions (Figure 219). Strata Ia to Ic were all clearly observed and occurred near the ground-truthed depths. Strata Id to Ig were not clearly observed and do not occurred at the ground-truthed depths. A concrete slab was found 0.5 mbs. The concrete slab was not observed in the profile. This may be due to the fact that the concrete did not contain reinforced steel (rebar) or that it had a similar density as the surrounding stratum. No other discrete objects or other stratigraphic transitions were observed in the GPR results or subsequent excavation.

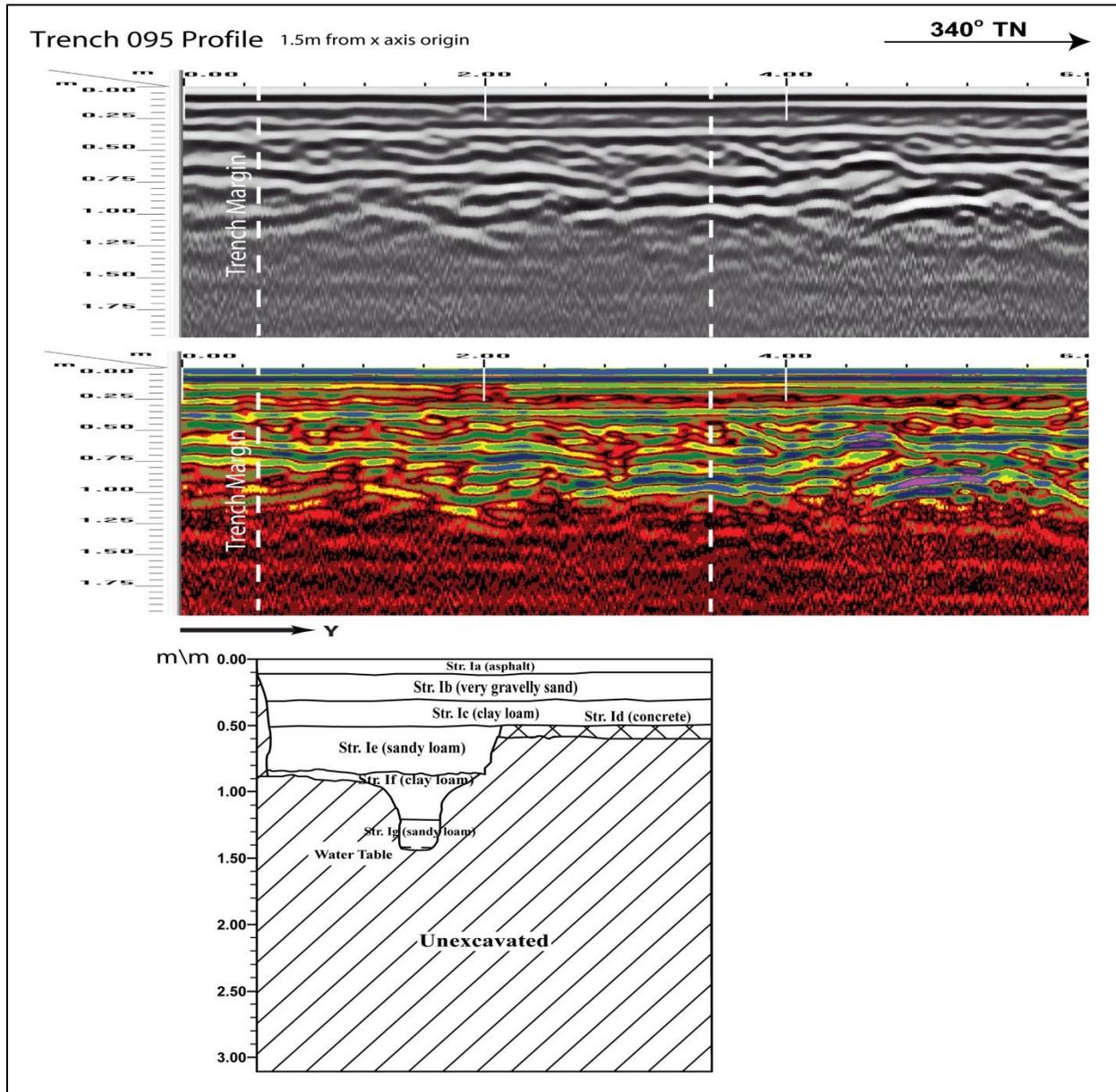


Figure 219. Visual comparison of excavated profile and GPR signal profile of T-095