

Report on Archaeological Coring along the Aleipata Coast, 'Upolu, Sāmoa, September 2013

Summary

From 2-10 September 2013, Dr Ethan Cochrane (University of Auckland) and Matiu Matavai Tautunu (National University of Samoa), with the help of a local assistant, recovered 41 hand-driven archaeological cores along the eastern Aleipata coast to a maximum depth of 250 cm. The goal of archaeological coring was to locate subsurface beach deposits that may contain artefacts and other evidence of human activity approximately 2800 years before present (BP). Two areas, Satitōa and Ulutogia Villages, contain subsurface sand deposits that may preserve evidence of prehistoric human activity. Charcoal recovered from the Satitōa subsurface sand deposit was dated to 652-549 calibrated (cal) years BP and no other cultural material was recovered from any subsurface context. During archaeological coring surface artefacts including an adze fragment and other stone tool debris, plain pottery, and bone were recovered. Paramount chief, Togafau Siu, kindly granted permission to conduct the field work in Aleipata.

Field Work

Informal walking survey of the Aleipata coast (Figure 1) in June 2013 identified an emerged wave-cut notch and beachrock, and the modern topography suggested the area may contain buried paleobeach deposits. In September 2013 we conducted archaeological coring to identify the location of subsurface paleobeach deposits and other sediments. Cores were generally placed in transects perpendicular to the current coastline and across the break in slope from the coastal plain to the uplands (Figure 2 and Figure 3). This slope break was typically located 100-200 m from the active beach. Core locations were recorded with a GPS unit to approximately 25-50 cm horizontal and 100 cm vertical precision after differential correction.

Standard procedures were used to recover and describe cores. The auger was inserted into the ground until the bucket was filled with sediment and then removed. Successive bucket-loads of sediment were laid out on a prepared surface (typically banana leaves) and the depth was recorded whenever a change in sediment was encountered. Sediments corresponding to likely depositional units were described using an abbreviated United States Department of Agriculture (USDA) system

and grain sizes were estimated using the Wentworth scale. Only abbreviated descriptions were possible as the sediments were not examined in situ. Layer transitions were described when possible. Similarly labelled layers (e.g., Layer III) in different cores do not necessarily represent the same depositional unit. Table 1 lists the cores with their sediment data.

Core Descriptions

Cores are described in groups beginning with the most southern cores and moving north (Figure 2 and Figure 3).

Cores 14-18

Cores 14-18 (Figure 2) are located in the village of Vailoa and were excavated after consultation with the Vailoa Pulenu'u, Mr. Sa'ili.

Vailoa is at the southern end of the Aleipata coast and the coastal plain is narrower here than in villages to the north. The coastal plain eventually disappears in the southern-most village of Lalomanu. Additionally, at the southern end of the Aleipata coast the elevation increases more quickly as one moves inland from the beach.

Cores 14 and 15 are located on the coastal flat approximately 135 m inland from the modern beach and themselves 38 m apart. A single layer of silty clay loam was encountered in both cores and both cores were also abandoned before 1 m in depth due to increasing rock content which made further excavation impossible. Cores 16 and 17 are 21 m apart and located on top of a small rise in elevation. Core 16 recovered the same sediment found in cores 14 and 15 and was abandoned at 30 cmbs on either bedrock or a cobble to boulder sized rock (i.e., the rock was immovable and considerably larger than the auger-bucket width). Core 17 recovered two layers. The topmost layer, is the same silty clay loam encountered in cores 14-16. Beneath this, beginning at 100 cmbs, a sandy loam is present up to 204 cmbs at which point the core was abandoned due to increasing rock content that appeared to be decomposing bedrock. Core 18 is approximately 120 m north along the coastline from core 15 and within Vailoa village. A single layer of silty clay loam sediment was encountered to a depth of 160 cmbs at which point the core was abandoned due to increasing rock content that impeded further excavation. This rock appears to be decomposing bedrock.

Cores 19-22

Cores 19-22 (Figure 2) are located in Ulutogia Village and were excavated after consultation with the Ulutogia Pulenu'u, Mr. Fili. There is a low swampy area at the back of the coastal plain here with the slope break just to landward of the swampy area. Cores 19-22 were placed approximately 160 m from the coastline, landward of the slope break and swampy area as the surface elevation increases.

Core 19 recovered four layers of varying sand content. Layer I, the topmost, is divided into I and Ia. Layer I is a sandy loam that grades into Layer Ia, a loamy sand, with the transition most visible at approximately 60 cmbs. Layer Ia sits upon Layer II at 85 cmbs. Layer II is a poorly sorted coarse (0.5 - 1.0 mm) to medium (0.25 - 0.5 mm) subangular sand with very little fine (0.125 - 0.25 mm) sand. Layer II ends at the water-table at 100 cmbs. Layer III, from 100 - 195 cmbs is a sandy clay. Layer IV begins approximately 195 cmbs to an unknown depth. The high water content of Layer IV made it difficult to accurately record depth as it is likely that much sediment comes into the auger bucket from the saturated side-walls and not from increasing depth of the core. Layer IV is a poorly sorted very coarse (1.0 - 2.0 mm) to medium sand with less fine sediments (likely silt and clay) than Layer III. Coral fragments are present in Layer IV.

Core 20 was placed approximately 26 m upslope from core 19. A single layer of silty clay was encountered with increasing rock content beginning 140 cmbs and excavation halted at 155 cmbs as rock, presumably bedrock or cobble to boulder sized rocks, made further excavation impossible. Charcoal (undated) was recovered from the core at a depth of 105 cmbs.

Core 21 was placed between cores 19 and 20 and revealed the same layer profile as core 19. Layer I and Ia in core 21 was present from 0 – 50 cmbs with the depth of transition between I and Ia not determined. Layer II spanned 50 – 90 cmbs. Layer III was encountered from 90 – 185 cmbs and Layer IV from 185 cmbs to an unknown depth.

Core 22 was located approximately 40 m south of the rough transect of cores 19-21 and further inland than these cores. A single layer, identical to the silty clay layer of core 20, was recovered up to a depth of 240 cmbs at which point the core was abandoned due to impassable rock.

Cores 25-28

Cores 25-28 (Figure 2) are located in Ulutogia Village, approximately 165 m from the coastline, and excavated with permission of the Pulenu'u. All contain terrigenous sediments apparently overlying decomposing bedrock. Core 25 has a top layer of silty clay that by approximately 130 cmbs contains increasing amounts of very coarse sand and loamy sediment. By 180 cmbs the core contains increasing amounts of pebbles (greater than 2 mm) to very coarse pebbles (maximum dimension of 64 mm) with increasing incidence of very coarse pebbles as depth neared 230 cmbs. At this depth the core was abandoned due to impassable sediments and rock. Cores 26-28 were placed in a transect from core 25 moving toward the current beach and all contained a top layer of silty clay similar to core 25. Each core was abandoned due to impassable rock at various depths – 165 cmbs, core 26; 45 cmbs, core 27; 120 cmbs, core 28 – but none revealed the increasingly large rocks with depth as in core 25. The water table was encountered in core 26 at 155 cmbs and at 110 cmbs in core 28.

Cores 23-24

Cores 23 and 24 are also located approximately 158 m from the coastline in Ulutogia Village and excavated with the permission of the Pulenu'u. The topmost layer of Core 23 consists of silty clay with the water table encountered at 140 cmbs and an abrupt transition at 160 cmbs to a second layer consisting of medium to fine subangular to angular sand. The core was abandoned at 235 cmbs due to increasing amounts of rock that made further excavation impossible. Subsurface water at this depth also made it difficult to determine if recovered sediments were brought up from penetration of the auger bucket or were coming in from the saturated sidewalls. In the sand layer there was also increasing angular coral clasts with depth.

Core 24 was excavated 8 m inland from core 23 and uncovered a single layer of silty clay with the water table encountered at 190 cmbs. Increasing rock content beginning at 170 cmbs forced the abandonment of the core by 250 cmbs.

Cores 11-13

Cores 11-13 were excavated in Satitua Village near the village's southern boundary and with the permission of Togafau Siu. The cores were placed in a transect across the slope break and with core 11 approximately 164 m from the current shore and cores 12 and 13 each 30 and 50 m closer to the shore, respectively. Core 11 revealed a single layer of silty clay loam with increasing rock content by 145 cmbs and the water table at 240 cmbs. Charcoal was recovered at 200 cmbs (undated). Layer I of core 12 was similar to the single layer of core 11. A second layer in core 12 was encountered at 180

cmbs with an abrupt (1 – 25 mm) transition between the two. Layer II is a medium (0.25 - 0.5 mm) to fine (0.125 – 0.25 mm) sand with approximately 25% angular to subangular coarse pebble (up to 32 mm length, Wentworth scale) coral fragments. Excavation was halted at 240 cmbs due to impassable rock. Core 13 is similar to core 12 in all respects except Layer II was encountered at 130 cmbs and excavation was halted at 205 cmbs. The water table was encountered in both cores 12 and 13 within Layer II, but the depth was not recorded.

Cores 5-7

Cores 5-7 were excavated in Satitōa Village and placed in a transect across the slope break. Core 5 is the most inland, approximately 290 m from the shore, with cores 6 and 7, placed 255 and 211 m from the shore, respectively. Each of these cores revealed a layer of silty clay that appears to lie above bedrock. Core 5 was abandoned after encountering impassable rock at 142 cmbs. Cores 6 and 7 encountered increasing concentrations of coarse sand at approximately 190 cmbs and very coarse pebbles by 215 cmbs. At approximately 250 cmbs both cores were abandoned due to impassable rock. The water table was encountered at 230 cmbs in core 7.

Cores 4, 8-9, 41

Cores 4 and 8 were placed on the coastal flat (ie, shoreward of the slope break) within a slightly raised area surrounded by an inundated or swampy surface approximately 177 m from the current shore. These cores are behind Togafau Siu's house. There is an elevation gain inland of the swampy area at the slope break. Core 4 was abandoned during excavation due to a tremendous rain storm that precluded recording any core data. Some basic observations about core 4 were made: beneath a humic layer there was a layer of clean white poorly sorted sand and below this, beginning at approximately 45 cmbs, there was a layer of brown to grey sand. Several days later core 8 was excavated approximately 5 m from core 4. Core 8 revealed four layers. Layer I is a clay loam topsoil overlying Layer II, a poorly sorted, very coarse to fine sand from 30-60 cmbs. Layer III is a sandy clay loam at the top of the layer and transitions to a sandy loam by the bottom of the layer. The distinctness of this transition could not be ascertained, but it is suspected to be gradual or diffuse. Charcoal was recovered from near the top of Layer III and returned an AMS radiocarbon date of 607 +/- 20 BP (Wk-38055; 652-580 and 571-549 cal BP, 2 σ). Layer IV, encountered at 105 cmbs, is a poorly sorted medium to fine sand. The water table was encountered at 110 cmbs and the bottom of Layer IV was not reached. The core was abandoned at some depth below 110 cmbs, but a final depth was not recorded as the water table made this impossible to determine.

Core 9 was placed in a garden, inland of the slope break, and approximately 22 m inland from core 8. Core 9 uncovered two layers, a topsoil layer to 75 cmbs and below this a sandy clay. The sand content of this bottom layer increases at approximately 150 cmbs and shell fragments also appear, beginning at this depth. The core was abandoned at 165 cmbs due to impassable rock. The water table was encountered at 100 cmbs.

Core 41 was placed just shoreward of Togafau Siu's house on the coastal plain, approximately 30 m from the coastline (no GPS point taken for core). Three sand layers were encountered. The top layer is a loamy sand of well-sorted medium to fine subangular to subrounded sand to approximately 106 cmbs with the water found in this layer at 66 cmbs. The second layer is a well-sorted medium to fine subangular to subrounded sand found to 140 cmbs. The bottom layer is a very coarse to medium

poorly-sorted angular to subangular sand with visible shell fragments. The final depth was not recorded as the auger was not gaining depth due to inundation of the sediment.

Cores 1-3, 10

Cores 1-3 and 10 were placed along a transect across the slope break and extending onto the coastal flat. Core 1, approximately 170 m from the coastline, uncovered two layers; Layer I, a sandy clay loam extending to the water table at 40 cmbs, and Layer II, a fine to medium, well-sorted subangular sand existing below this. A final depth was not obtained due to the difficulty of estimating depth within a sand layer below water table. Core 2 was placed 98 m inland from core 1, the farthest inland core on this transect, just up on the slope break in a banana garden. Two layers were identified, a sandy clay loam to 85 cmbs and then a sandy clay below this, with the water-table encountered at 123 cmbs. The core was abandoned at 145 cmbs as it was difficult to determine if further depth was being made by the auger under the water-table. Core 3 was placed between cores 1 and 2 in an attempt to relocate the core 1 sand layer. Core 3 uncovered strata similar to core 1: a sandy loam up to 50 cmbs, at which point the water-table was encountered along with the same Layer II as in core 1. At approximately 145 cmbs pockets (2 cm length) of loamy sand were encountered in the core, although the core was abandoned by 148 cmbs, due to inability to estimate increasing depth of core under the water-table and the likelihood that increasing depth was not being attained by the auger. Core 10 was excavated several days later in a raised planting bed approximately 10 m shoreward from core 3. The core uncovered three layers, a top 10 cm of medium to fine sand, likely from the 2009 tsunami, a sandy loam from 10-65 cmbs, and a poorly-sorted coarse to fine sand with some coarse pebble, angular to subangular coral fragments and very few coarse pebble subangular basalt fragments. This does not seem to be the same deposit as Layer IV in core 8.

Cores 29-33

Cores 29-33 were excavated within Sāle'a'aumua Village with the permission of the Pulenu`u. The coastal plain is much wider and more swampy here than to the south. Core 29 was excavated on the coastal plain (ie, not on the initial slope break), 367 m from the coastline. A top layer of silty clay was revealed to a depth of 145 cmbs, with charcoal noted at 30 cmbs and the water-table at 40 cmbs. By 85 cmbs there is a minor sand component along with the silty clay. A second layer, beginning at 145 cmbs was identified by a darker grey colour and is a sandy clay. The core was abandoned at 190 cmbs due to impassable rock. Cores 30-32 were placed approximately 120 m further inland.

Core 30 was placed on the inland side of a presumed water course (now dry). Core 31 was placed shoreward of the water course on a slight rise in elevation, thought to be a possible ancient dune, and core 32 was placed shoreward of core 31 on top of the possible dune. All three of these cores encountered a single layer of silty clay with excavation abandoned at 170 and 195 cmbs for cores 30 and 31, respectively, due to impassable rock. Core 32 was abandoned at 280 cmbs as this approached the limit of the auger extensions. Core 33 was excavated on the coastal plain, approximately 45 m shoreward of core 32, and recovered the same silty clay layer to approximately 205 cmbs where the core was abandoned due to impassable rock.

Cores 34 and 35

These cores were excavated in Sāle'a'aumua Village. Core 34 was located 227 m from the coastline, just to shoreward of the slope break and revealed a single layer of silty clay before being abandoned at 110 cmbs due to impassable rock. Core 35 was placed approximately 70 m shoreward of core 34

and revealed two layers. The top layer is a sandy loam up to 90 cmbs where the water-table begins. Between 90 and 155 cmbs there is a very diffuse transition to a bottom layer comprised of poorly sorted very coarse to medium terrigenous sand. The sand is grey-green in colour with approximately 30% of the sand grains coloured black. The core was abandoned at 200 cmbs as no more depth was being made by the auger.

Cores 36-40

These cores were located in Sāle'a'aumua Village around the slope break between cores 34-35 and 29-33. The GPS points for cores 36-41 were not correctly taken so precise locations are not possible. Core 36 was excavated at the base of the slope break at the edge of a swampy area just to shoreward. The core revealed two layers similar to core 29, a layer of silty clay to 95 cmbs and then a layer of sandy clay. The core was abandoned at 120 cmbs due to impassable rock.

Cores 37 and 38 were excavated in undulating “hills” of terrigenous sediments that lie between the slope break and a more steady elevation rise to inland. The swampy area remains to shoreward of the slope break. These cores were placed here to determine if there is a subsurface cultural deposit as there were several surface finds in the vicinity, including bone, a broken adze, lithic flakes, and a plainware pottery sherd (Table 2). Both cores revealed a single layer of silty clay with occasional charcoal flecking and bottomed out on impassable rock at 190 cmbs and 100 cmbs, respectively.

Cores 39 and 40 were excavated inland from cores 37 and 38 on gently sloping elevation gain to inland. Both cores revealed a single layer of silty clay that bottomed out on increasing and impassable rock at 60 and 120 cmbs, respectively.

Interpretation of Core Descriptions

In general, the base of the slope break is the area most likely to contain possibly anthropogenic calcareous sand sediments within 2-3 m of the surface (e.g., cores 1-4, 8-10, 12, 13, 19, 23, and 21). These sand strata also typically incorporate some terrigenous sediments or are capped by terrigenous sediments. Additionally, in many places the surface is swampy near the base of the slope break, suggesting a slight elevation gain as one moves from the slope break to the coastal plain and towards the ocean. The following paragraphs summarize the subsurface layer descriptions from south to north. Figure 4 displays the general distribution of subsurface terrigenous and reef-derived sediments in the southern portion of the project area..

The sediments recovered from cores 14-18 seem to derive from colluvial deposition associated with surrounding slopes and perhaps in situ decomposition of bedrock. The sandy loam in core 17 is perplexing as it is capped by silty clay loam and appears to overlie decomposing bedrock. Perhaps the sandy loam is partially derived from wind-blown beach sands. It seems unlikely that paleobeach sediments underlie this sandy loam layer with a similar sand transport agent contributing to both. It is possible that in the past the area around Vailoa Village was a rocky headland with few if any beaches.

Cores 19 and 21 likely record an ancient beach deposit, increasing terrigenous deposition and then tsunami related sediments. The deepest layer, Layer IV, is a paleobeach of unknown age. Layer III formed through increasing terrigenous sediment input, perhaps a result of forest clearance and subsequent erosion of inland sediments. The greater sand content of Layer II relative to III, suggest there was a change in beach formation over the time period represented by Layers IV to II with the beach present at Layer IV times, terrigenous deposition outpacing calcareous sand deposition during

Layer III times, and then increased calcareous sand input again during Layer II times. Without direct observation of the Layer II-III interface it is difficult to determine if Layer II is a tsunami deposit, although it could possibly derived from such an event. Layer I/Ia may represent a tsunami deposit, specifically as the tsunami wave subsides, a water transport agent of decreasing energy that leaves a deposit of finer sediments (sandy loam) grading to coarser sediments (loamy sand). Regardless, Layers IV and III in these cores may have formed during a time of human presence in the area. Core 20 is inland on the same transect as cores 19 and 21 and, along with core 22, uncovered terrigenous sediments similar to cores 14-18.

Moving north, cores 23 and 12-13, also revealed subsurface calcareous sand layers but with less complicated depositional histories compared to cores 19 and 21. These three cores reveal top layers of terrigenous sediments capping lower layers of calcareous sand with very little to no terrigenous input. The transition between the upper terrigenous and lower calcareous sand layer in these cores is abrupt suggesting a rapid change in depositional environment. These three cores with calcareous sands are surrounded, to the south by a group of cores (25-28), inland on the same coring transects (cores 11 and 24) and to the north by a group of cores (5-7) by terrigenous sediments overlying increasingly rocky deposits. This might indicate that the ancient coastline from Vailoa Village to Satitōa Village had pockets of sand beaches separated by small headlands or ridges of terrigenous sediment.

Cores 1-4 and 8-10 all recovered subsurface calcareous sand layers with varying terrigenous inputs (e.g., sandy clay loams and sand loams). Layer III in core 8 appears to be anthropogenic. The top of the layer seems to show evidence of soil formation indicating relative stability. Charcoal recovered from near the top of the layer (i.e., approximately 60 cmbs) produced a radiocarbon date range of 650-550 BP.

Further north, north of the government pier, cores 29-34 revealed terrigenous sediments overlying increasingly rocky deposits. As the coastal plain is much wider here cores may not have been placed far enough inland to characterize the subsurface at the inland margin of the coastal plain. Core 35 revealed grey-green terrigenous sands suggesting a lack of reef-derived beach in the immediate area. Cores 36-40 in this area were placed inland of the slope break to characterize the subsurface in an area of surface artefact finds.

Future Research

With funding from the University of Auckland and collaboration from staff at the National University of Sāmoa, field work in Aleipata will continue in 2014 with the goal of beginning controlled archaeological excavations in areas that may contain cultural deposits. The areas of priority are, in order, (1) near core 8 in Satitōa Village, (2) near cores 19 and 21 in Ulutōgia Village, and (3) near cores 12-13 and 23 also in Satitōa Village. Excavations in these areas will require the use of pumps as significant deposits are likely beneath the water-table. Future excavation should also examine possible subsurface deposits associated with the surface finds, including the lithic artefacts and pottery shred, in Sāle'a'mua and Malaelā Villages.

Several cores above the slope break recovered only terrigenous sediments and it is possible that anthropogenic beach deposits lie below the greatest depth reached in these cores. A mechanical digger or excavator should be used to test for anthropogenic beach deposits in these areas as such deposits have been found deeply buried by terrigenous sediments at other Pacific island sites.

A future project involving work on coastal geomorphology, paleocoastline reconstruction, and paleoenvironmental reconstruction (e.g., plant microfossils) is necessary to develop a more accurate understanding of the environment of Sāmoa's first colonizers and further pinpoint the locations of archaeological colonization deposits in Aleipata.



Figure 1. Map of east coast of Aleipata showing villages for proposed archaeological research. Yellow contours are 20 m intervals. Basemap comprised of IKONOS image and 2001 orthophotos

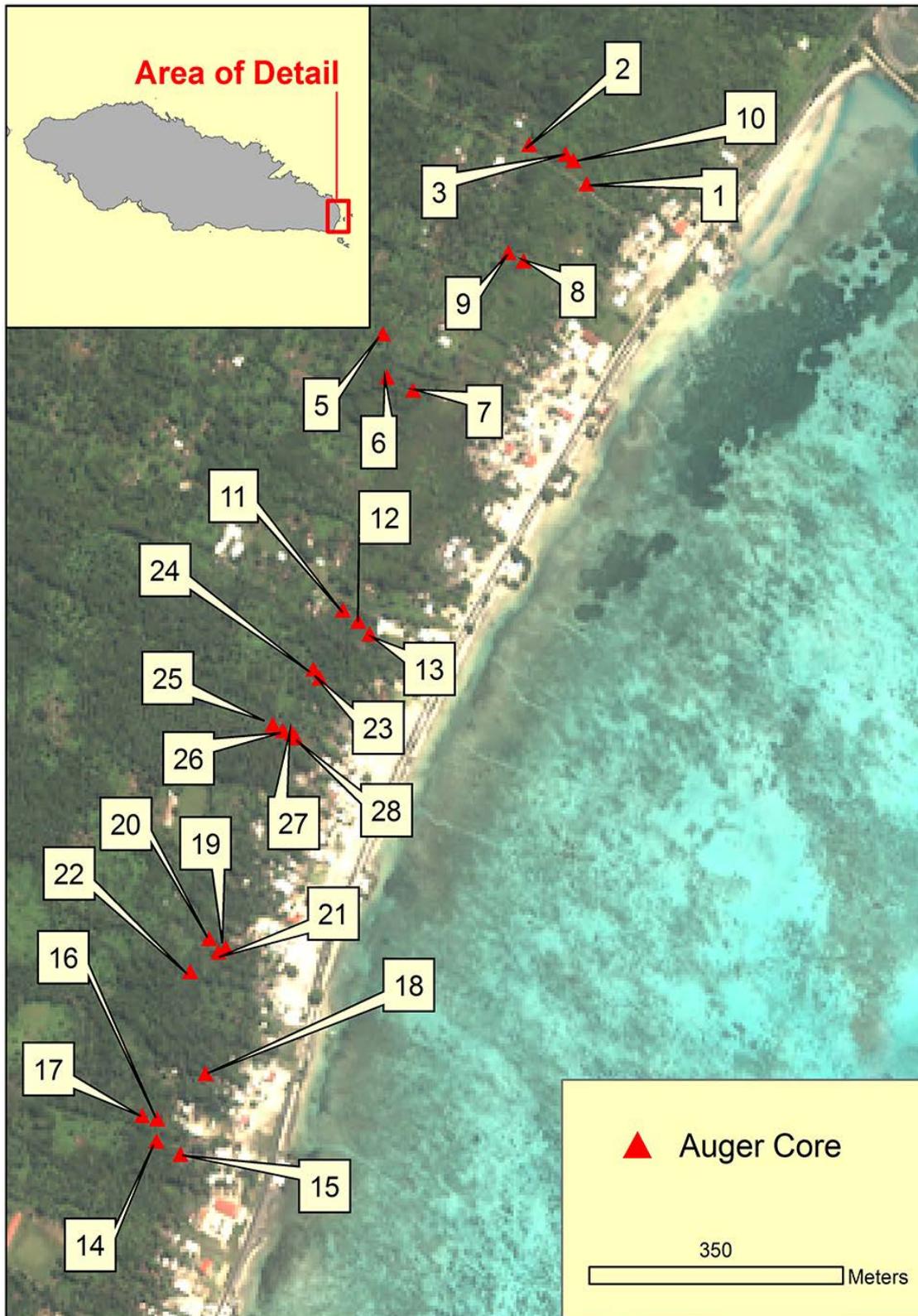


Figure 2. 2013 Auger core locations in the southern portion of the project area

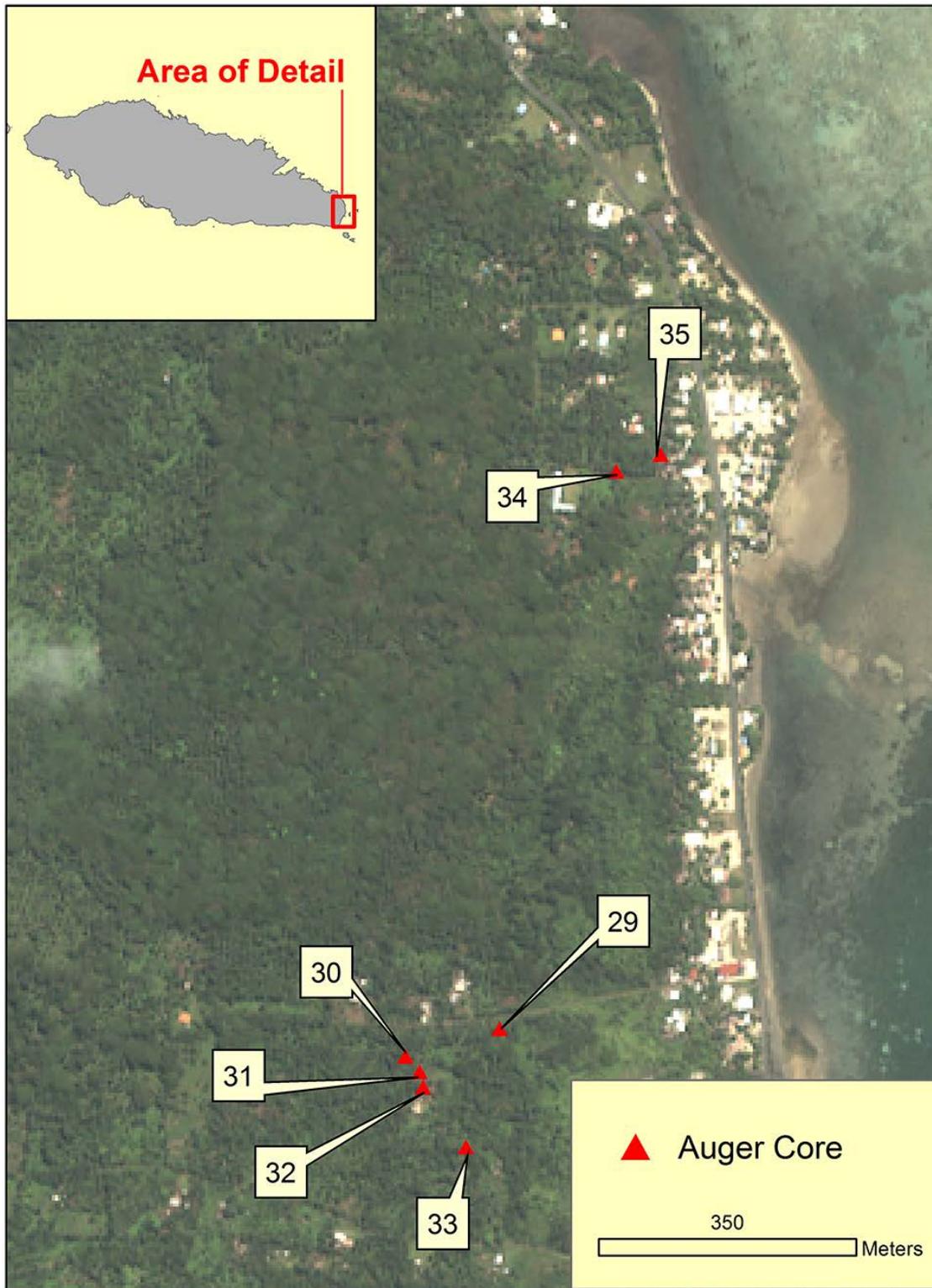


Figure 3. 2013 Auger core locations in the northern portion of the project area

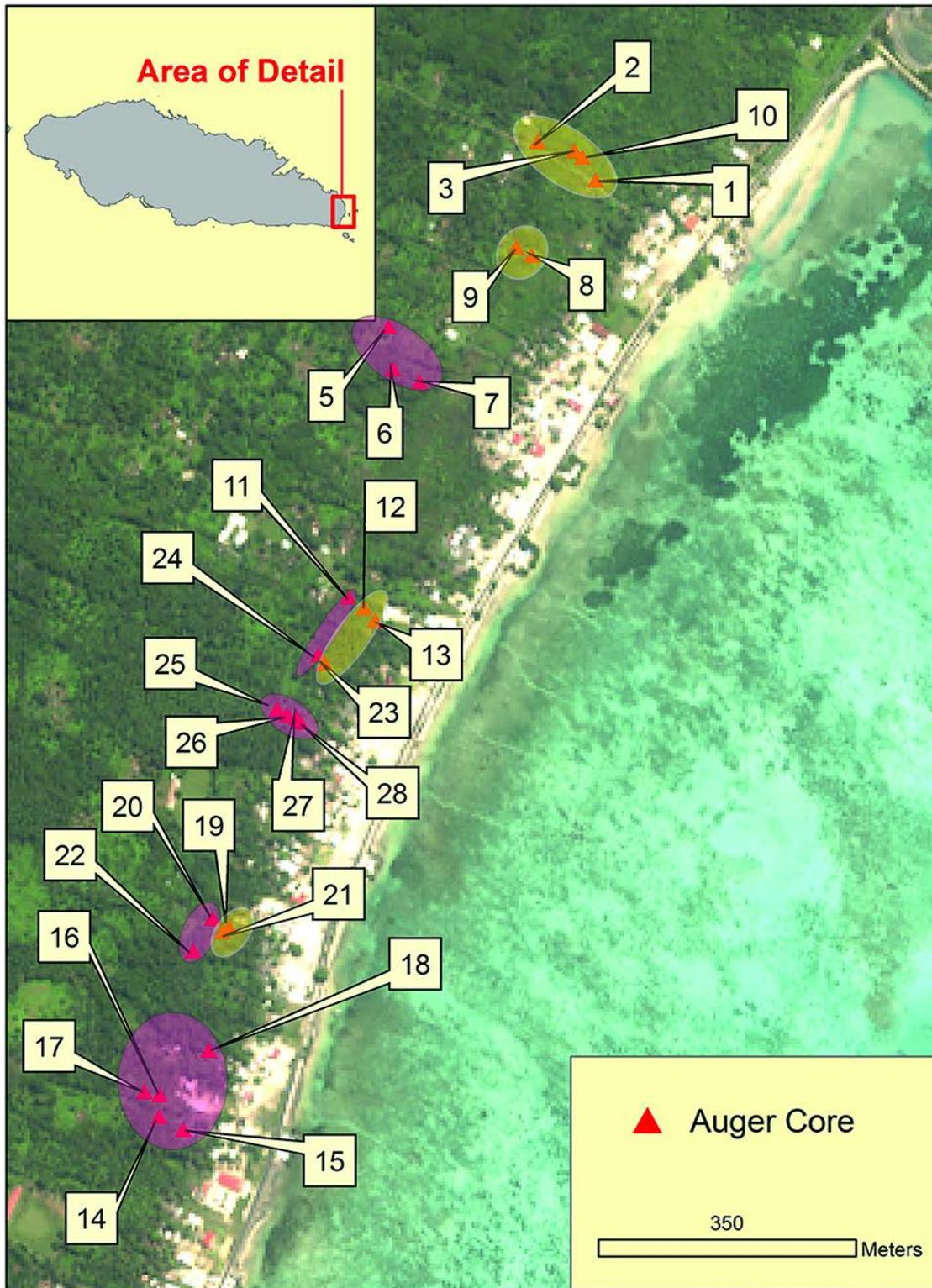


Figure 4. 2013 Auger core locations in the southern portion of the project area colour-coded for subsurface terrigenous sediments (pink) and subsurface reef-derived sands (yellow).

Table 1. 2013 Aleipata Core Data.

Field Season Year	Core N ^o	Layer	Level	Depth (cmbs)	Colour	Texture	Consistence	Additional Description	Date Recover (m/d/y)	Comments
2013	1	1		000-040	10YR 2/1	sandy clay loam	mfr		9/02/2013	
2013	1	2		040-000	2.5YR 6/2	medium to fine subangular sand	mfr	This sediment is at the water table	9/02/2013	
2013	2	1		000-085	10YR 3/2	sandy clay loam	mfr	Gardening topsoil	9/02/2013	
2013	2	2		085-145	10YR 3/2	sandy clay	mfr	Water table at 123 cmbs	9/02/2013	Core abandoned at 145 cmbs as no longer bringing up sediment
2013	3	1		000-050	10YR 3/2	sandy loam	mfr		9/02/2013	
2013	3	2		050-145	10YR 6/3	medium to fine subangular sand		Well-sorted sand; increased silt-clay at 145 cmbs	9/02/2013	Pockets of loamy sand at 145 cmbs; pockets are 2 cm in longest dimension; core abandoned as no longer gaining depth
2013	4	1		000-020	10YR 3/2	sandy clay loam	mfr	Gardening topsoil	9/02/2013	
2013	4	2		020-045		medium to coarse sand		Poorly-sorted sand	9/02/2013	Likely tsunami deposit
2013	4	3		045-180		sand		brown to grey sand	9/02/2013	Core abandoned as we were caught in the biggest downpour I have ever experienced. Further recording impossible. Not possible to take GPS point. Layer III is old beach sand; there are shells, some cowrie; nothing suggest organically enriched; some terrigenous rock; 1-3 cm long dimension
2013	5	1		000-142	10YR 3/2	silty clay loam	mfr	Appears to be A horizon developed from bedrock	9/03/2013	Rock content increased with depth and core abandoned on bedrock
2013	6	1		000-250	10YR 3/2	silty clay loam	mfr	Appears to be A horizon developed from bedrock	9/03/2013	Same sediment as Core 5; 190 cmbs hitting mottles/blobs of coarse sand that may be decomposing bedrock; 215 cmbs hit more small cobbles of bedrock; at 250 increasing decomposing bedrock and core abandoned.
2013	7	1		000-250	10 YR 3/2	silty clay loam	mfr	Appears to be A horizon developed from bedrock	9/03/2013	NOTE: listed as "pointgeniri" in GPS; Same as Core 6

Field Season Year	Core N ^o	Layer	Level	Depth (cmbs)	Colour	Texture	Consistence	Additional Description	Date Recover (m/d/y)	Comments
2013	8	1		000-030	10YR 3/2	clay loam	mfr	Gardening topsoil	9/03/2013	
2013	8	2		030-060	10YR 7/3	v. coarse to fine sand	mlo	Poorly-sorted; appears to be tsunami deposit	9/03/2013	
2013	8	3		060-105	10YR 3/2 - 5/2	sandy clay loam - sandy loam	mfr - mvfr	A horizon on sand	9/03/2013	First colour/texture/consistence descriptions are for top of layer grading into the second descriptions. Several chunks charcoal (cat 20131000) recovered from sandier bottom of layer, not the more clayey top.
2013	8	4		105-110	2.5YR 7/2	medium to fine sand	wso	Sand with visible coarse shell pieces	9/03/2013	Core abandoned at water table 110 cmbs
2013	9	1		000-075	10YR 3/2	sandy clay loam	mfr	Gardening topsoil	9/03/2013	
2013	9	2		075-165	10YR 3/3	sandy clay	wss	Mixture of terrigenous sediment and reef sands	9/03/2013	Coral in layer; water table 100 cmbs; sandier at 150 cmbs with shells, but sediment is largely terrigenous; abandoned at 165 cmbs as impassable rock with more small cobbles close to this depth; could be approaching bedrock at 165 cmbs; sand may be anthropogenic or aeolian
2013	10	1		000-010	10YR 4/2	medium to fine sand	mlo	Likely tsunami deposit	9/03/2013	
2013	10	2		010-065	10YR 3/2	sandy loam	mfr	Sandy terrigenous sediment	9/03/2013	
2013	10	3		065-155	2.5Y 6/3	coarse to fine sand		White-grey sand with rocks; poorly sorted	9/03/2013	Ancient beach deposit?; water table at 80 cmbs; core abandoned at 155 cmbs as not gaining depth; poorly sorted with abundant small to large pebble (2 cm max dimension) and angular to subangular coral fragments; some subangular basalt fragments (max dimension 3 cm). Seemingly not same deposit as Core 8, Layer 4
2013	11	1		000-240	7.5YR 2.5/3	silty clay loam	mfr	Appears to be A horizon developed from bedrock	9/04/2013	Slightly increasing rock content at 145 cmbs; charcoal chunks at 200 cmbs; water table at 240 cmbs and core abandoned
2013	12	1		000-180	7.5YR 2.5/3	silty clay loam	mfr		9/04/2013	Same as Layer I in Core 11

Field Season Year	Core N°	Layer	Level	Depth (cmbs)	Colour	Texture	Consistence	Additional Description	Date Recover (m/d/y)	Comments
2013	12	2		180-240	10YR 7/3	medium to fine sand	wpo	Non-cultural (?) sand; abrupt transition from L1	9/04/2013	Water table at 180 cmbs; seems like non-cultural sand; abrupt transition from Layer 1 suggests rapid change in depositional environment; BOE is bedrock; deposits contains 25% angular-subangular coral cobbles (up to 3 cm longest dimension); sand more yellow, less grey than Core 8 sand
2013	13	1		000-130	7.5YR 2.5/3	silty clay loam	mfr		9/04/2013	
2013	13	2		130-205	10YR 7/3	medium to fine sand	wpo	Non-cultural (?) sand; abrupt transition from L1	9/04/2013	Water table at 130 cmbs; same as Layer 2, Core 12; BOE at rock, can't tell if coral or terrigenous.
2013	14	1		000-082	7.5YR 2.5/1	silty clay loam	mfr	BOE is increasing rock, possibly bedrock	9/04/2013	
2013	15	1		000-040	7.5YR 2.5/1	silty clay loam	mfr	Same as core 14	9/04/2013	
2013	16	1		000-030	7.5YR 2.5/1	silty clay loam	mfr	Same as core 14	9/04/2013	
2013	17	1		000-100	7.5YR 2.5/1	silty clay loam	mfr	Same as core 14	9/04/2013	
2013	17	2		100-204	10YR 4/3	sandy loam	mvfr		9/04/2013	Core abandoned as seems to be coming down on decomposing bedrock and hard to imagine beach sediments underneath.
2013	18	1		000-160	7.5YR 2.5/1	silty clay loam	mfr	BOE is increasing decomposing rock	9/05/2013	Cores 14-18 found no sand. Perhaps this area always rock headland?
2013	19	1		000-060	10YR 3/2	sandy loam	mvfr		9/05/2013	Layers 1 and 1a likely associated with tsunami and scoured off unknown thickness of Layer 3
2013	19	1a		060-085	10YR 4/2	loamy sand	mlo		9/05/2013	Layers 1 and 1a likely associated with tsunami and scoured off unknown thickness of Layer 3
2013	19	2		085-100	2.5Y 7/2	coarse to medium subangular sand	mlo	Sediment is poorly sorted, some fine sand, silts	9/05/2013	Increasing sand content with Layer 2 perhaps associated with beach progradation and/or change in relative subsidence-emergence
2013	19	3		100-195	2.5Y 4/2	sandy clay	wss	water table at 100 cmbs	9/05/2013	Increasing terrigenous deposition after Layer 4

Field Season Year	Core N°	Layer	Level	Depth (cmbs)	Colour	Texture	Consistence	Additional Description	Date Recover (m/d/y)	Comments
2013	19	4		195-195	2.5Y 6/2	very coarse to medium sand		poorly sorted	9/05/2013	Less silts and clays and more sand and corals than layer 3, Core 19; excavation stopped as not gaining depth; likely ancient beach deposit with increasing terrigenous deposition resulting in Layer 3;
2013	20	1		000-155	10YR 3/2	silty clay	mfi, ws	Increased rock @ 140 cmbs, BOE likely bedrock	9/05/2013	Charcoal recovered at 105 cmbs; rocks at 140 cmbs; Core 20 is 25 m upslope from Core 19 and has very different sediment profile
2013	21	1		000-050	10YR 4/2	sandy loam to loamy sand	mvfr to mlo	Core 21 same as Core 19	9/05/2013	
2013	21	2		050-090	2.5Y 7/2	coarse to medium subangular sand	mlo	Core 21 same as Core 19	9/05/2013	Layer 2-3 transition depth not measured. This is guess.
2013	21	3		090-185	2.5Y 4/2	sandy clay	wss	Core 21 same as Core 19	9/05/2013	Layer 2-3 transition depth not measured. This is guess.
2013	21	4		185-185	2.5Y 6/2	very coarse to medium sand		Core 21 same as Core 19	9/05/2013	
2013	22	1		000-240	10YR 3/2	silty clay	mfi, ws	Increased rock @ 140 cmbs, BOE likely bedrock	9/05/2013	Same as Core 20.
2013	23	1		000-160	10YR 3/2	silty clay	mfi, ws	Layer 1-2 transition is abrupt	9/06/2013	
2013	23	2		160-235	2.5Y 6/3	medium to fine subangular to angular sand		Core abandoned at 235 cmbs, no depth gain	9/06/2013	Water table makes it difficult to bring up sand. Also impassable rock at 235 cmbs, not clear if bedrock; appears to be increasing angular coral clasts with depth; not convinced this is cultural sand, no evidence of organics
2013	24	1		000-250	10YR 3/2	silty clay	mfi, ws	Water table @ 190 cmbs; increase rock @ 170 cmbs	9/06/2013	Abandoned due to rock; never got to sand layer even though sand reached in Core 23, 8 m away toward water.
2013	25	1		000-130	10YR 3/2	silty clay	mfi, ws		9/06/2013	
2013	25	2		130-180		loamy v. coarse sand			9/06/2013	

Field Season Year	Core N°	Layer	Level	Depth (cmbs)	Colour	Texture	Consistence	Additional Description	Date Recover (m/d/y)	Comments
2013	25	3		180-230		loamy v. coarse sand			9/06/2013	By 180 cmbs increasing subrounded small pebble to small cobble (max dimension 4 cm); by 230 cmbs much higher incidence of subangular to subrounded small cobbles (max dimension 5 cm); suggesting decomposing bedrock; core abandoned at 230 cmbs
2013	26	1		000-165	10YR 3/2	silty clay	mfi, ws	Water table @ 155 cmbs	9/06/2013	
2013	27	1		000-045				Core abandoned @ 45 cmbs due to rock	9/06/2013	
2013	28	1		000-120	10YR 3/2	silty clay	mfi, ws	Water table @ 110 cmbs	9/06/2013	Core abandoned at 120 cmbs due to rock
2013	29	1		000-145	10YR 3/2	silty clay	wp	At 85 cmbs there is very little sand content	9/09/2013	Water table at 40 cmbs; charcoal at 30 cmbs; possible charcoal at 85 cmbs
2013	29	2		145-190	2.5Y 2.5/1	sandy clay	wp	More granular than Layer 1	9/09/2013	Stopped at 190 cmbs due to rock. Increasing sand content might be aeolian.
2013	30	1		000-170	10YR 3/2	silty clay	mfi, ws	Basic top soil, increasing rock by 150 cmbs	9/09/2013	Stopped at 170 cmbs due to increasing rock content
2013	31	1		000-195	10YR 3/2	silty clay	mfi, ws	Basic top soil	9/09/2013	
2013	32	1		000-280	10YR 3/2	silty clay	mfi, ws		9/09/2013	Abandoned as no more depth extensions.
2013	33	1		000-205	10YR 3/2	silty clay	mfi, ws	Charcoal chunk at 70 cmbs	9/09/2013	Increasingly impassable rock at BOE so abandoned.
2013	34	1		000-110	10YR 3/2	silty clay	mfi, ws	Increasing rock @ 85 cmbs	9/09/2013	Core abandoned at BOE due to increasing rock
2013	35	1		000-090	5Y 4/1	sandy loam	mfr		9/09/2013	
2013	35	2		090-155				Very diffuse transition between Layer 1 and 3	9/09/2013	Not new depositional unit, just very diffuse transition between Layers 1 and 3
2013	35	3		155-200	Gley1 5/5G_1	very coarse to medium sand	wpo	Poorly sorted	9/09/2013	Predominantly terrigenous green beach sand with 30-40% black sand and shell; indicates a beach here without much coral formation

Field Season Year	Core N°	Layer	Level	Depth (cmbs)	Colour	Texture	Consistence	Additional Description	Date Recover (m/d/y)	Comments
2013	36	1		000-095	10YR 3/2	silty clay	mfi, ws		9/10/2013	
2013	36	2		095-120	2.5Y 2.5/1	sandy clay	wp		9/10/2010	
2013	37	1		000-190	10YR 3/2	silty clay	mfi, ws	Charcoal flecks @ 35 cmbs	9/10/2013	By 100 cmbs decomposing vesicular basalt large pebbles to small cobbles; BOE is increasingly impassable due to rock content.
2013	38	1		000-100	10YR 3/2	silty clay	mfi, ws	Small charcoal chunks @ 45 cmbs	9/10/2013	By 85 cmbs coming down on bedrock. Core placed to see if there is any subsurface habitation deposit.
2013	39	1		000-060	10YR 3/2	silty clay	mfi, ws		9/10/2013	BOE is probable bedrock
2013	40	1		000-120	10YR 3/2	silty clay	mfi, ws		9/10/2013	BOE is bedrock
2013	41	1		000-106	5Y 2.5/1 grading to 5Y 4/1, to 2.5Y 6/2	loamy sand	mvfr	Medium to fine subangular to subrounded well-sorted sand	9/10/2013	Water table @ 66 cmbs
2013	41	2		106-140	2.5Y 7/2	sand		Medium to fine subangular to subrounded well-sorted sand	9/10/2013	
2013	41	3		140-140	2.5Y 7/1	sand		V coarse to medium angular to subangular poorly-sorted sand	9/10/2013	Lots of shell pieces; abandoned due to collapsing sidewalls

Table 2. Catalogue of Recovered Items

Field Season	Catalogue N ^o	Site Designation	Collection Unit Type	Collect Unit Number	Layer	Level	Depth (cms)	Contents	Date Recovered	Date Lab	Comments
2013	20131000	Togafau	CORE	8	3	0	060-105	Charcoal	3/09/2013	30/10/2013	Two pieces, 0.02 g each, sent to Waikato for dating. Other pieces remain
2013	20131001	Findspot 2	Surface	2	0	0	-	Lithic	10/09/2013		Adze fragment, blade end
2013	20131002	Tongafau	CORE	4	0	0	-	Coral	2/09/2013		Likely coral fragment
2013	20131003	Findspot 1	Surface	0	0			Lithic	10/09/2013		Lithic flake and adze flake
2013	20131004	Satitua	CORE	11	1	0	240-240	Charcoal	4/09/2013		
2013	20131005	Ulutogia	CORE	20	1	0	105-105	Charcoal	5/09/2013		
2013	20131006	Findspot 1	Surface	2	0	0	-	Pottery	10/09/2013		plainware
2013	20131007	Findspot 1	Surface	0	0	0	-	Bone	10/09/2013		3 bone pieces and 1 tusk fragment