

APPENDIX 1: HAND SPECIMEN DESCRIPTIONS

HAND SPECIMEN DESCRIPTIONS OF CAYMAN TROUGH SAMPLES

611-1-1 Altered olivine gabbro: 4 lbs. Partly weathered, grains .5-2 cm in length, dark green. Some euhedral plagioclase, not aligned, white along fractures. Olivine partly oxidized to yellow-brown near surface. Sample contains some small fractures and 2 veins 1.5-2 cm wide of white plagioclase and a light green alteration phase.

611-2-1 Olivine-bearing metagabbro: 7 lbs. Minerals are dark green, white and orange-brown; grain size .5-1.5 cm and .1-2 cm. Plagioclase weakly aligned, some is white and fractured. 1 mm zones of alteration of mafic phases concentrated in area of sample where alteration increases, grain size decreases and abundance of mafics increases.

611-3-1 Metamicrogabbro: 7 lbs. Dark greenish gray, unweathered, grains less than .5 cm; diabasic texture with some larger plagioclase phenocrysts. A few fractures (perpendicular sets) with .3 cm wide alteration.

611-4-1 Altered orthopyroxene gabbro: 17 lbs. .4-1 cm grains. Banded rock with plagioclase rich and pyroxene-rich domains. Augen are rounded and aligned in a matrix of finer grained minerals. Mafic augen quite weathered, but mafics in matrix are not.

611-5-1 and 611-5-2 (originally one sample) Altered olivine gabbro: 24 lbs. Dark gray-green, medium grained. Subtle plagioclase/mafics layering. Some oxidation near surface. Grains subhedral-anhedral. Weathering along some fractures.

611-6-1 Altered olivine gabbro: 6 lbs. Blue gray with 1-3 cm grains, quite plagioclase rich. Olivine interstitial to plagioclase; weathered near surface. Fractures weakly aligned. No high-temperature alteration visible.

611-7-1 Ultramafic: 1 lb. Dark green, 3 mm rounded fragments in fine-grained matrix.

611-7-2 Amphibolite: 2 lbs. Dark, compositionally banded, fine-grained, with .2-.5 cm relicts. Plagioclase is very white and is less than 25% of rock.

612-1-1 Amphibolite: Grain size about 3 mm. Plagioclase very white. Planar preferred orientation developed. Very little weathering.

612-1-2 Amphibolite: Coarse to fine-grained, apparently granulated. Rock of amphibole and plagioclase. Planar preferred orientation weakly developed. Very little weathering.

612-2-1 Ultramafic: Dark green fine-grained rock with lineated altered olivine. Numerous 1-mm veins contain variously colored minerals.

612-2-2 Ultramafic: Dark green, fine-grained rock with lozenges of altered olivine and pyroxene. Some phenocrysts of a light gray mineral.

612-3-1 Gray rock, predominantly medium-grained, with range of textures: a) gabbroic -5 mm grains with weak preferred orientation; b) fine-grained banded portion, apparently sheared; c) medium-grained gabbroic rock with white plagioclase and green rims around pyroxene, set of conjugate fractures filled with dark green mineral.

612-3-2 Weathered gabbroid: Leucocratic, gneissic-textured rock of plagioclase, opaques, amphibole and pyroxene. Fractures filled by dark green mineral. Badly weathered.

612-4-1 Weathered metagabbro: Dark green and white, granulated with rounded augen of up to 7 mm. Green amphibole, brown pyroxene and white plagioclase. Friable and extensively weathered.

612-4-2 Weathered gabbroid: same as 4-1.

613-1-1 Altered orthopyroxene gabbro: Dark gray, medium-grained with anhedral plagioclase and mafics. Moderately weathered.

613-1-2 Altered olivine-bearing gabbroid: Light to dark gray, medium-grained, variably brecciated and granulated; plagioclase and pyroxene more altered in finer grained areas. No through-going fractures. Weakly weathered.

613-1-3 Metagabbro: Banded gneiss with .5-1 cm augen of pyroxene in fine grained matrix of white plagioclase and brown and green mafics. Extensive weathering of pyroxene.

613-2-1 Altered olivine gabbro: 10 lbs. Green and white, medium to fine-grained, granulated. Some plagioclase is white and a few of mafic grains are weathered.

613-3-1 Weathered gabbroid: Light colored augen gneiss. Rounded pyroxene .5 cm, white plagioclase and opaques fine grained. Some weathering of pyroxene.

613-3-2 Ultramafic: Dark, fine-grained with tabular phenocrysts of

altered olivine and pyroxene in planar preferred orientation. Numerous small fractures. Extensively weathered. Minor plagioclase.

613-4-1, 4-2, 4-3 and 4-4 Ultramafics: total 8 lbs. Dark gray rock with phenocrysts of tabular olivine and pyroxene in serpentine matrix. Moderately weathered, planar preferred orientation.

613-5-1 Basalt: 5 lbs. Dark gray-green, holocrystalline with a few plagioclase phenocrysts.

614-1-1 Amphibolite: 1 oz. Fine-grained green and white, banded.

614-2-1 Amphibolite: Banded white and green, with augen of mafic minerals.

615-1-1 Altered olivine gabbro: Medium to coarse-grained. 1.5 cm and smaller laths of plagioclase, pyroxene is interstitial. Some oxidation of mafics is apparent up to 5 cm from rough surface.

615-2-1 Altered olivine gabbro: Equigranular, grains 1 cm. Pyroxene and plagioclase, minor olivine and blue-green mineral. Some weathering near rough surface.

615-2-2 Amphibolite: Dark, fine-grained. Lineated and rounded pyroxene, plagioclase and amphibole. Fractures subparallel and filled with dark minerals.

615-2-3 Altered gabbroid: Fine-grained gneissic sample with well defined compositional banding and extensive alteration.

615-3-1 Altered gabbroid: Grains .7-1 cm, highly altered, fractured and weathered.

615-3-2 Weathered gabbroid: Grains .1-2 cm and altered. Matrix predominantly of plagioclase. Fractures abundant and subparallel to very weak preferred orientation. Well weathered.

615-4-1 Altered olivine-bearing gabbroid: Grains less than 1 cm; isotropic, with plagioclase and pyroxene. Weathering near surface of sample and minor green alteration.

615-5-1 Amphibolite: Dark, very fine-grained, foliated and lineated. A few relict rounded mafics.

616-1-1 Ultramafic: 17 lbs. Gray-brown, with .7 cm grains of olivine and pyroxene in matrix of serpentine. Some weathering of large grains, they also are weakly lineated.

616-1-2 Altered troctolite: 7 lbs. 3 mm grains, salt-and-paper color, isotropic, with white and gray plagioclase. Minor alteration and some weathering along fractures. Weathering rind less than 5 mm.

616-2-1 Altered olivine-bearing gabbroid: Grains .2-1.5 cm. Plagioclase and olivine, partly recrystallized and altered. Reaction rim visible around olivine. One vein of very white plagioclase and green mafics. A few fractures present, some oxidation of olivine.

616-2-2 Altered olivine-bearing gabbroid: Isotropic rock with 1 cm plagioclase and .5 cm olivine and pyroxene. Some weathering of olivine. One vein of plagioclase and fibrous dark amphibole.

616-2-3 Altered olivine-bearing gabbroid: Coarse-grained gray rock with plagioclase, interstitial olivine and pyroxene, and greenish alteration. Olivine is weathered.

616-3-1 Ultramafic: 6 lbs. Light brownish-yellow matrix of fractured serpentine with large grains of altered mafics. Mafic grains are .4 cm and show weak lineation. Weathering is extensive.

616-4-1 Altered olivine-bearing gabbroid: 12 lbs. Gray, grains 1-.5 cm, isotropic. Subhedral gray plagioclase. Minor alteration of mafics, some fine fracturing with no associated alteration. Weakly weathered.

616-5-1 Altered olivine gabbro: Medium grained, gray. Granulated plagioclase and pyroxene with no preferred orientation. Slight alteration and weathering.

616-5-2 Altered olivine gabbro: Coarse grained with subhedral plagioclase. Little alteration, moderate weathering.

616-6-1 Altered gabbroid: 8 lbs. Finely banded rock of mafics and plagioclase.

616-6-2 Altered olivine-bearing gabbroid: 8 lbs. Medium-fine grained; mafic-rich; isotropic. Several fractures filled with dark mafics. Weathered.

616-7-1 Altered gabbroid: 22 lbs. Medium-fine grained, with variable development of preferred orientation. Some alteration and minor filled fractures.

616-7-2 Altered gabbroid: 17 lbs. Medium-fine grained, recrystallized, some alteration evident.

620-1-1 Ultramafic: 3 lbs. Dark green, fine-grained matrix with large grains of lighter serpentine scattered throughout.

620-2-1 Basalt: 1 lb. Very fine-grained, green. No veins or cracks.

620-3-1 Altered gabbro: 14 lbs. 1-3 cm mafic phenocrysts in deformed finer grained matrix. Strong foliation developed, weakly altered.

620-3b. Ultramafic: 4 lbs. Dark green, fine grained matrix. Possible sulfides. Sheared and deformed.

620-5-1 Altered olivine-bearing gabbroid: 3 lbs. Grains .5-1 cm. Alteration moderate, plagioclase is gray. Weathering of cracks and pyroxene.

620-5-2 Ultramafic: 11 lbs. Dark green.

620-6-1 Rodingitized gabbroid: 1 lb. Fine-grained with strung-out crystals of plagioclase and mafics.

620-7-1 Altered gabbroid: 5 lbs. Coarse-grained plagioclase and pyroxene. Some recrystallization but remains isotropic. Well altered and weathered.

621-1-1 Ultramafic: less than .5 lb. Greenish serpentized matrix with blebs of whitish translucent material.

621-2-1 Altered olivine gabbro: 22 lbs. Grains .5-1.5 cm; gray; isotropic; of plagioclase and pyroxene. Minor alteration, weathering near surface.

621-3-1 Altered troctolite: 30 lbs. Medium-grained, isotropic, plagioclase-rich. Also contains pyroxene, light grass green alteration mineral, weathered olivine.

621-3-2 Altered olivine-bearing gabbroid: 3 lbs. Medium-grained, isotropic rock of plagioclase, pyroxene, grass-green alteration mineral.

621-4-1 Altered olivine-bearing gabbroid; 621-4-2 Altered olivine gabbro and 621-4-3 Altered troctolite: 3 lbs total. Medium grained with some pyroxene grains larger than 2 cm. Sheared and altered.

621-5-1 Altered troctolite: 12 lbs. Medium-grained, isotropic rock of plagioclase and altered mafics.

621-6-1 Altered troctolite: 3 lbs. Medium-grained, isotropic rock of plagioclase, altered olivine and grass-green mineral.

621-7-1 Altered olivine-bearing gabbroid: 4 lbs. Medium-grained, isotropic, predominantly of plagioclase and pyroxene. Relatively unaltered.

622-1-1 Altered olivine-bearing gabbroid: 2 lbs. 1 cm grains, plagioclase rich, isotropic. Several filled fractures.

622-1-2 Altered gabbroid: 4 oz. Medium-grained, moderately altered.

622-1-3 Altered breccia: 14 lbs. Green, fine-grained, highly deformed, with relict plagioclase. No preferred orientation. Several veins and cracks.

622-2-1 Altered gabbroid: 9 lbs. Green, fine to medium grained. One portion has rounded phenocrysts of mafic mineral in dark fine matrix. Texture changes abruptly to highly sheared light-colored minerals. Mafics are altered. Very few cracks or veinlets.

622-2-2 Altered gabbroid: 3 lbs. Altered mafic phenocrysts of 1-3 cm in foliated matrix of plagioclase and mafics. Phenocrysts connected by cracks and are altered.

622-3-1 Rodingitized gabbroid: 7 lbs. Several fragments with discontinuous layering of greenish, brown and reddish horizons.

623-1-1 Altered olivine-bearing gabbroid: 14 lbs. Medium-grained, green with oxidized mafics and reaction rims around feldspars.

623-1-2 Altered gabbroid: 11 lbs. Greenish, medium to fine-grained, isotropic and altered.

623-1-3 Altered olivine-bearing gabbroid: 2 lbs. Green, medium-grained, isotropic. Plagioclase apparently fresh. Some fractures with fillings.

623-1-4 Altered gabbroid: 4 lbs. Same as 1-2.

623-2-1 Altered gabbroid: 24 lbs. Coarse grained, green. Slickensides on outside surface. Altered.

623-3-1 Altered olivine-bearing gabbroid: 5 lbs. Medium-grained, greenish, and altered with abundant veins.

623-3-2 Altered troctolite: 16 lbs. 1 cm grains; plagioclase abundant and lath-shaped. Some alteration of interstitial mafic minerals.

623-4-1 Altered gabbroid: 2 lbs. Green, medium grained with micas visible. Considerably altered.

623-4-2 Altered gabbroid: 2 lbs. Green, medium grained. Reaction rims around plagioclase but less altered than 4-1.

623-4-3 Altered gabbroid: 2 oz. Same as 4-1.

623-5-1 Altered gabbroid: 6 lbs. Green, medium grained, cataclastic. Plagioclase rich, slightly altered.

623-6-1 Altered olivine gabbro: 4 lbs. Green, grains .5-1 cm. Altered mafics.

624-1-1 Ultramafic: 7 lbs. Lineated serpentinite, very weathered.

624-2-1 Ultramafic: 2 lbs. Dark green matrix with lineated relict mafics. Extensively weathered.

624-2-2 Greenstone: 3 oz. Talc and chlorite rock, light green and fine grained.

624-2-3 Altered olivine-bearing gabbroid: 2 oz. Too small to describe.

624-3-1 Altered basalt: 11 lbs. Fine-grained, greenish material cut by white veins.

624-3-2 Rodingitized gabbroid: 3 lbs. One large grain of mafic with aureole of green and pink material. Most of sample is cryptocrystalline white and gray material.

624-3-3 Ultramafic: 15 lbs. Fine-grained matrix with large relict mafic grains.

624-4-1 Altered basalt: 4 lbs. Fine grained, green and isotropic.

624-5-1 Altered gabbro: 2 lbs. Coarse grained, plagioclase-rich rock with interstitial pyroxene. Slightly altered.

624-6-1 Altered gabbroid: 4 lbs. No description available.

624-6-2 Ultramafic: 2 lbs. Sheared serpentine matrix with large relict mafic crystals.

624-7-1 Greenstone: 5 lbs. Medium-grained, altered. Numerous veins, some of which are offset.

624-8-1 Basalt: 11 lbs. Fine grained, vesicular, aphyric.

624-8-2 Altered basalt: 2 lbs. Fine grained, altered, vesicular, aphyric.

624-8-3 Sediment: 9 lbs.

625-1-1 Weathered basalt

625-2-1 Weathered basalt

625-3-1 Fresh (?) basalt

1977 DIVES IN DIVE AREA I

737-1-1 Altered gabbroid: 5 lbs. Lineated fibrous amphibole in matrix of fine grained plagioclase. Rather deformed but fairly fresh except for minor brown alteration in amphibole. Good cleavage faces in plagioclase. Unidentifiable mineral with typical bornite luster (purplish iridescence). Two amphiboles, one fibrous and one harder. Possibly two planar features. Very thin manganese crust; worm tracks.

737-1-2 Altered orthopyroxene gabbro: 15 lbs. Fine to medium grained, very altered, recrystallized. Great deal of serpentine. Lineated,

possibly deformed. Matrix appears to be granulated, recrystallized plagioclase. Possible quartz or clear plagioclase. Serpentine crystals are fairly large and kinked. Possible amphibole. Two intersecting 90° faces, lineation subparallel to one of the pairs of faces.

737-2-1 Amphibolite: 9 lbs. Green hornblende, plagioclase, chlorite, veined with chlorite. Apparent brittle fracture. Coarsely crystalline. Twin lamellae on plagioclase faces visible, plagioclase is smokey gray. No apparent lineation or foliation. Recrystallized amphibole retains pyroxene crystal shape.

738-1-1 Altered olivine gabbro: 29 lbs. Pyroxene and olivine gabbro, medium to coarse grained. On various faces, amphibole and plagioclase form crystals which appear to be deposited in void space. Some alteration does penetrate the rock, but not very far. Actinolite and hornblende both visible in "cracks". Actinolite is fibrous and dark green. Some surfaces have pale bluish green "clays" and dull green minerals (epidote?). Some alteration and recrystallization of plagioclase to fine-grained white plagioclase and amphibole visible on ends of small piece. Slickensides on upper surface of large sample. No obvious penetrative fabric.

738-1-2 Altered gabbro: 1.25 lbs. Pyroxene gabbro, medium to coarse grained. Fresh, although one entire surface coated by dark greenish, needle-like amphibole and white altered plagioclase (generally smaller grains than in rest of rock). No apparent penetrative fabric.

739-1-1 Altered olivine gabbro: 16 lbs. Loose block. Knobby upper surface of encrusted Mn cementing small pieces. Anorthositic, olivine

is major mafic phenocryst, minor pyroxene or amphibole. Very coarse grained, relatively unaltered. Small corner shows olivine is weathered. Appears isotropic.

739-2-1 Altered gabbroid: 5 lbs. Vein of chlorite and plagioclase (well segregated) visible on one end. Very coarse grained. Large crystals of pyroxene or mica and plagioclase. Possibly quite altered. Possibly quite altered. Isotropic, possibly cumulate.

739-2-2 Altered troctolite: 18 lbs. Medium-grained, isotropic, fresh, plagioclase rich. Weathered rind. Plagioclase has well developed twin lamellae. Olivine and pyroxene mafics are interstitial to plagioclase. Uralitic alteration of augite.

739-3-1 Altered olivine-bearing gabbroid: 16 lbs. Medium grained, plagioclase rich with olivine and pyroxene. Zeolites along internal fractures, isotropic. Some rimming of pyroxene and olivine by secondary? phases. Some weathering of mafic phases.

739-4-1 Altered gabbroid: 7 lbs. and 739-4-2 Altered gabbro: 7 lbs. Both samples from an apparent dike. Long massive blades of amphibole, minor plagioclase. Amphibole up to 7-8 cm long. Highly fractured, possibly sheared.

739-4-3 Altered troctolite: 1.25 lbs. and 739-4-4 Altered troctolite: 3.25 lbs. Medium grained, olivine and pyroxene rock, isotropic and weathered.

739-5-1 Weathered gabbroid: 5 lbs. Medium grained, with possible foliation. Fresh at one end, possibly altered at the other.

739-6-1 Altered olivine gabbro: 9 lbs. Very coarse pyroxene; plagioclase and olivine. Isotropic, possibly cumulate, unaltered.

739-7-1 Altered gabbroid: 10 lbs. White plagioclase, some green amphibole. Isotropic plagioclase and pyroxene, medium to coarse grained.

740-1-1 Altered gabbroid: .25 lbs. Medium to fine grained, altered. Very altered plagioclase, hornblende with relict pyroxene form. Surface is coated with secondary minerals.

740-2-1 Altered gabbroid: about 80 lbs. Coarsely crystalline, badly altered, possibly chloritized. Plagioclase, hornblende and remnant pyroxene. Isotropic, weathered to brownish material - possible talc or serpentine. No actinolite apparent.

740-3-1 Altered gabbroid: 50 lbs. Very coarsely crystalline, pyroxene several cms. Very badly weathered, ferromanganese staining on one side, sediment on the other. Plagioclase is in linear bands with very fine grained bands of mafic minerals.

740-4-1 Altered olivine-bearing gabbroid: 2 lbs. Medium grained, weathered plagioclase-amphibole rock. One surface appears to be slickensided. Isotropic, may contain pyroxene. Greenish altered plagioclase.

740-5-1 Altered breccia: 6 lbs. Gabbro breccia from fault zone, contains feldspar and possible quartz. Badly weathered ground mass.

740-6-1 Altered gabbroid: Very altered, one face slickensides with secondary chlorite. Interior coarsely crystalline, fairly fresh. Abundant feldspar and amphibole. Isotropic. Only the one surface

appears to be chloritized, with secondary minerals forming along it. Probable pyroxene. Texture apparently resembles feathery texture of some Andean gabbros.

740-7-1 Altered gabbroid: 10 lbs. Coarse grained, isotropic pyroxene gabbro. Green amphibole alteration visible, in places rimming pyroxene, in others isolated phase in plagioclase. On outside surface 2 veins or other type of recrystallized zones visible - primarily of plagioclase. Plagioclase and pyroxene intergrown.

741-1-1 Altered olivine gabbro: 6 lbs. Actually sample 2 of voice logs. Coarsely crystalline, deformed pyroxene rock, not particularly altered.

741-1-2 Altered olivine-bearing gabbroid: 6 lbs. Coarsely crystalline, deformed, with pyroxene and some brown hornblende in zone of intense deformation.

741-2-1 Altered gabbroid: 3 lbs. Deformed and altered with well developed foliation. Foliation not parallel to the "joint" surfaces of the sample. Alteration is visible - brown hornblende, green amphibole or chlorite. Possibly some relict olivine.

741-2-2 Altered olivine gabbro: 14 lbs. Medium to coarse grained rock with pyroxene and olivine. High strain zone contains some green amphibole. Brown hornblende distributed throughout sample.

741-3-1 Altered olivine-bearing gabbroid: 11 lbs. Medium grained, deformed, with pyroxene and olivine. Olivine strung out, pyroxene augen, finely recrystallized plagioclase. Some brown hornblende not rimming pyroxene or olivine.

741-4-1 Altered olivine gabbro: 11 lbs. Coarse grained, with olivine and predominant plagioclase. Very minor pyroxene. Actinolite-talc assemblage, rimming some of the olivine. Isotropic.

741-5-1 Amphibolite: 37 lbs. Medium to coarse grained with intergrown pyroxene and plagioclase. Green amphibole rims the pyroxene.

741-6-1 Amphibolite: 4 lbs. Various small pieces from the same place - Sheared and foliated with thin compositional bands.

742-1-1 Altered olivine gabbro: 13 lbs. Coarse grained rock with olivine and pyroxene. Plagioclase quite euhedral. Interstitial pyroxene may partially rim olivine. Does not appear altered.

742-2-1 Altered gabbroid: 1.25 lbs. Coarse grained with pyroxene as mafic. Locally recrystallized. Amphibole as alteration of pyroxene.

742-3-1 Altered olivine-bearing gabbroid: 12 lbs. Medium to coarse grained pyroxene-olivine rock. Some greenschist alteration along outside of sample. Subhedral to anhedral plagioclase. Higher proportion of mafics than normal.

742-3-2 Altered basalt: 22 lbs. Fine grained, probably talus.

742-3-3 Altered gabbroid: 15 lbs. Medium to coarse grained with resorbed pyroxene and plagioclase, some greenish alteration.

742-4-1 Altered gabbro: 8 lbs. Coarse grained, somewhat altered. Quite pyroxene-rich, apparently deformed.

742-4-2 Altered gabbroid: 12.5 lbs. Plane of slickensides through center of rock. Medium to coarse grained, altered with pyroxene as mafic mineral.

742-5-1 Altered olivine-bearing gabbroid: 2.5 lbs. Medium grained rock with olivine and amphibole. Locally altered, isotropic.

742-5-2 Altered olivine gabbro: 23 lbs. Coarse grained with olivine and pyroxene, some local green amphibole alteration. One grain of pyroxene split by vein of plagioclase along cleavage plane.