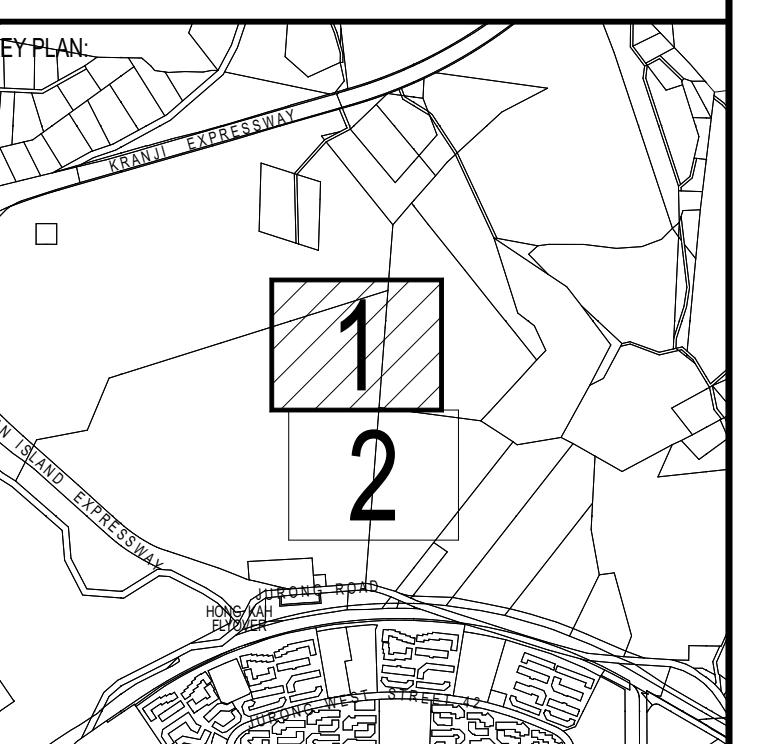


Appendices

A Topography

N
SVY21



NOTE:
 1. Horizontal Datum is in SVY21 Datum.
 2. Levels are based on S.A. SINGAPORE HEIGHT DATUM (SHD).
 3. Tree names are identified to the best of our knowledge and should be verified by Specialist. (Trees with Girth exceeding 0.3m).
 4. All dimensions shown hereon are in metres unless otherwise stated.

LEGEND
 BIG TREE
 TREE NO.
 PALM TREE
 SLOPE
 REV DATE AMENDMENTS
 Meters 5 0 5 10 15 20 25 Meters
 Scale 1:500


CLIENT:
 DHI Water & Environment (S) Pte Ltd
 2 Venture Dr,
 #18-18 Vision Exchange
 SINGAPORE 6777 6330

SURVEYOR:
 YIP SURVEYORS PTE LTD
 10 GENTING ROAD
 #01-01 THE BLUE Building
 SINGAPORE 349473
 TEL: 6743 0928 FAX: 6743 6732
 Email: office@yipsurveyors.com

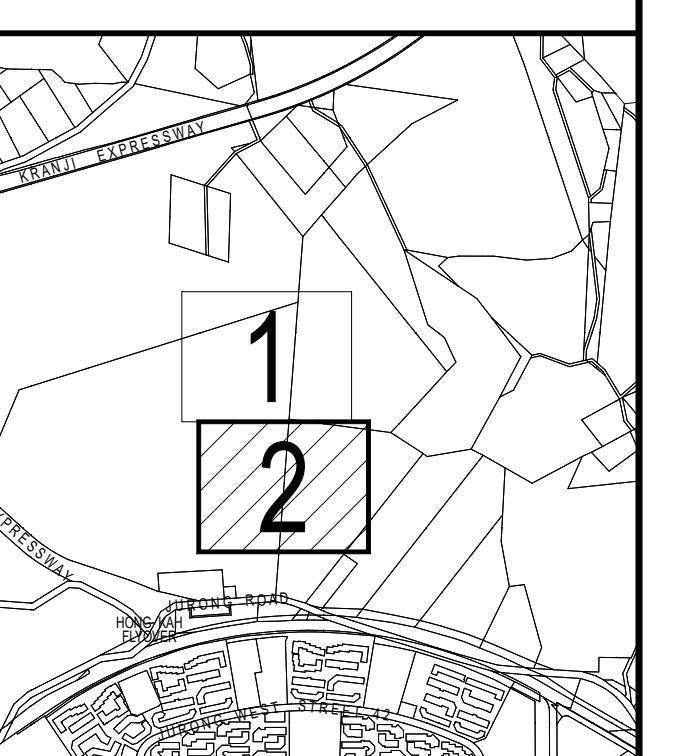
DRAWING TITLE:
 TOPOGRAPHICAL SURVEY PLAN
 (SHEET 1 OF 2)

SURVEYED BY: ALEX DRAWN BY: AA
 CHECKED BY: JENSEN DATE: 30 JAN 2024
 DRAWING NO: XIP80095TP2301 REVISION: 1/1000 SCALE: 1:500

Derek Chan Wei Hoong
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 M.S.I.S.V
 Eng. (Hons) Surveying and Spatial Information System (Aust)



N
SVY21



NOTE:
 1. Horizontal Datum is in SVY21 Datum.
 2. Levels are based on S.LA SINGAPORE HEIGHT DATUM (SHD).
 3. Tree names are identified to the best of our knowledge and should be verified by Specialist. (Trees with Girth exceeding 0.3m).
 4. All dimensions shown hereon are in metres unless otherwise stated.

LEGEND
 ● BIG TREE
 ○ TREE NO.
 ▲ PALM TREE
 ▽ SLOPE

REV DATE AMENDMENTS

Meters 5 0 5 10 15 20 25 Meters
Scale 1:500

CLIENT:
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Email: office@ipsurveyors.com

DRAWING TITLE:
TOPOGRAPHICAL SURVEY PLAN
(SHEET 2 OF 2)

SURVEYED BY: ALEX DRAWN BY: AA
CHECKED BY: JANSEN DATE: 30 JAN 2024

DRAWING NO: XIP80095TP2302 REVISION: 1:500

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B Ecology and Biodiversity

B.1 Flora Species List

Species	Origin	Status	Habit	Family
<i>Curculigo capitulata</i>	Native	Critically Endangered	Shrub	Hypoxidaceae
<i>Flemingia strobilifera</i>	Native	Critically Endangered	Shrub	Fabaceae
<i>Gnetum gnemon</i> var. <i>gnemon</i>	Native	Critically Endangered	Tree	Gnetaceae
<i>Peltophorum pterocarpum</i>	Native	Critically Endangered	Tree	Fabaceae
<i>Syzygium myrtifolium</i>	Native	Critically Endangered	Tree	Myrtaceae
<i>Xyris complanata</i>	Native	Critically Endangered	Herb	Xyridaceae
<i>Cratoxylum cochinchinense</i>	Native	Endangered	Tree	Hypericaceae
<i>Ficus caulocarpa</i>	Native	Endangered	Strangler	Moraceae
<i>Melicope lunu-ankenda</i>	Native	Endangered	Tree	Rutaceae
<i>Cissus repens</i>	Native	Vulnerable	Climber	Vitaceae
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Native	Vulnerable	Tree	Phyllanthaceae
<i>Goniophlebium percussum</i>	Native	Vulnerable	Epiphyte	Polypodiaceae
<i>Litsea umbellata</i>	Native	Vulnerable	Tree	Lauraceae
<i>Macaranga griffithiana</i>	Native	Vulnerable	Tree	Euphorbiaceae
<i>Scurrula ferruginea</i>	Native	Vulnerable	Epiphyte	Loranthaceae
<i>Selaginella willdenowii</i>	Native	Vulnerable	Climber	Selaginellaceae
<i>Acrostichum speciosum</i>	Native	Least Concern	Herb	Pteridaceae
<i>Adinandra dumosa</i>	Native	Least Concern	Tree	Pentaphylacaceae
<i>Alocasia longiloba</i>	Native	Least Concern	Herb	Araceae
<i>Alsophila latebrosa</i>	Native	Least Concern	Tree	Cyatheaceae
<i>Alyxia reinwardtii</i>	Native	Least Concern	Climber	Apocynaceae
<i>Amblovenatum opulentum</i>	Native	Least Concern	Climber	Thelypteridaceae
<i>Aphanamixis polystachya</i>	Native	Least Concern	Tree	Meliaceae
<i>Ardisia elliptica</i>	Native	Least Concern	Tree	Primulaceae
<i>Arthrophyllum jackianum</i>	Native	Least Concern	Tree	Araliaceae
<i>Asplenium longissimum</i>	Native	Least Concern	Epiphyte	Aspleniaceae
<i>Asplenium nidus</i> var. <i>musifolium</i>	Native	Least Concern	Epiphyte	Aspleniaceae
<i>Bridelia stipularis</i>	Native	Least Concern	Shrub	Phyllanthaceae
<i>Bridelia tomentosa</i>	Native	Least Concern	Tree	Phyllanthaceae
<i>Caryota mitis</i>	Native	Least Concern	Tree	Arecaceae
<i>Centotheeca lappacea</i>	Native	Least Concern	Herb	Poaceae
<i>Cinnamomum iners</i>	Native	Least Concern	Tree	Lauraceae
<i>Cissus hastata</i>	Native	Least Concern	Climber	Vitaceae
<i>Claoxylon indicum</i>	Native	Least Concern	Tree	Euphorbiaceae
<i>Clausena excavata</i>	Native	Least Concern	Shrub	Rutaceae
<i>Commersonia bartramia</i>	Native	Least Concern	Tree	Malvaceae
<i>Cyclosorus interruptus</i>	Native	Least Concern	Herb	Thelypteridaceae
<i>Cyrtophyllum fragrans</i>	Native	Least Concern	Tree	Gentianaceae
<i>Davallia denticulata</i> var. <i>denticulata</i>	Native	Least Concern	Epiphyte	Davalliaceae
<i>Dicranopteris linearis</i> var. <i>linearis</i>	Native	Least Concern	Climber	Gleicheniaceae
<i>Dillenia suffruticosa</i>	Native	Least Concern	Shrub	Dilleniaceae
<i>Erycibe tomentosa</i>	Native	Least Concern	Climber	Convolvulaceae
<i>Ficus fistulosa</i>	Native	Least Concern	Tree	Moraceae
<i>Ficus grossularioides</i> var. <i>grossularioides</i>	Native	Least Concern	Tree	Moraceae
<i>Ficus heteropleura</i>	Native	Least Concern	Climber	Moraceae
<i>Ficus microcarpa</i>	Native	Least Concern	Strangler	Moraceae
<i>Fimbristylis acuminata</i>	Native	Least Concern	Herb	Cyperaceae
<i>Flagellaria indica</i>	Native	Least Concern	Climber	Flagellariaceae
<i>Grona triflora</i>	Native	Least Concern	Herb	Fabaceae
<i>Gynochthodes coriacea</i>	Native	Least Concern	Climber	Rubiaceae
<i>Haplopteris ensiformis</i>	Native	Least Concern	Epiphyte	Pteridaceae
<i>Isachne globosa</i>	Native	Least Concern	Herb	Poaceae
<i>Ixonanthes reticulata</i>	Native	Least Concern	Tree	Ixonanthaceae

<i>Ixora congesta</i>	Native	Least Concern	Shrub	Rubiaceae
<i>Leea indica</i>	Native	Least Concern	Tree	Vitaceae
<i>Licuala spinosa</i>	Native	Least Concern	Shrub	Arecaceae
<i>Litsea elliptica</i>	Native	Least Concern	Tree	Lauraceae
<i>Lygodium flexuosum</i>	Native	Least Concern	Climber	Lygodiaceae
<i>Macaranga bancana</i>	Native	Least Concern	Tree	Euphorbiaceae
<i>Macaranga conifera</i>	Native	Least Concern	Tree	Euphorbiaceae
<i>Macaranga gigantea</i>	Native	Least Concern	Tree	Euphorbiaceae
<i>Macaranga hypoleuca</i>	Native	Least Concern	Tree	Euphorbiaceae
<i>Mallotus paniculatus</i>	Native	Least Concern	Tree	Euphorbiaceae
<i>Melastoma malabathricum</i>	Native	Least Concern	Shrub	Melastomataceae
<i>Neolitsea cassia</i>	Native	Least Concern	Tree	Lauraceae
<i>Nepenthes gracilis</i>	Native	Least Concern	Climber	Nepenthaceae
<i>Nephrolepis biserrata</i>	Native	Least Concern	Herb	Nephrolepidaceae
<i>Ottochloa nodosa</i>	Native	Least Concern	Herb	Poaceae
<i>Oxyceros longiflorus</i>	Native	Least Concern	Climber	Rubiaceae
<i>Paederia foetida</i>	Native	Least Concern	Climber	Rubiaceae
<i>Palhinhaea cernua</i>	Native	Least Concern	Herb	Lycopodiaceae
<i>Ploiarium elegans</i>	Native	Least Concern	Tree	Bonnetiaceae
<i>Pyrrosia longifolia</i>	Native	Least Concern	Epiphyte	Polypodiaceae
<i>Rhodamnia cinerea</i>	Native	Least Concern	Tree	Myrtaceae
<i>Scleria ciliaris</i>	Native	Least Concern	Herb	Cyperaceae
<i>Sphaerostephanos polycarpos</i>	Native	Least Concern	Herb	Thelypteridaceae
<i>Stenochlaena palustris</i>	Native	Least Concern	Climber	Blechnaceae
<i>Syzygium cerasiforme</i>	Native	Least Concern	Tree	Myrtaceae
<i>Syzygium grande</i>	Native	Least Concern	Tree	Myrtaceae
<i>Syzygium polyanthum</i>	Native	Least Concern	Tree	Myrtaceae
<i>Syzygium zeylanicum</i>	Native	Least Concern	Shrub	Myrtaceae
<i>Taenitis blechnoides</i>	Native	Least Concern	Climber	Pteridaceae
<i>Terminalia catappa</i>	Native	Least Concern	Tree	Combretaceae
<i>Tetracera indica</i>	Native	Least Concern	Climber	Dilleniaceae
<i>Triadica cochinchinensis</i>	Native	Least Concern	Tree	Euphorbiaceae
<i>Vitex pinnata</i>	Native	Least Concern	Tree	Lamiaceae
<i>Causonis trifolia</i>	Native	Data Deficient	Climber	Vitaceae
<i>Ceratopteris thalictroides</i>	Cryptogenic	-	Herb	Pteridaceae
<i>Eulophia graminea</i>	Cryptogenic	-	Herb	Orchidaceae
<i>Ficus benjamina</i>	Cryptogenic	-	Strangler	Moraceae
<i>Lygodium circinnatum</i>	Cryptogenic	-	Climber	Lygodiaceae
<i>Nephelium lappaceum</i> var. <i>lappaceum</i>	Cryptogenic	-	Tree	Sapindaceae
<i>Acacia auriculiformis</i>	Exotic	Naturalised	Tree	Fabaceae
<i>Acacia mangium</i>	Exotic	Naturalised	Tree	Fabaceae
<i>Adenanthera pavonina</i>	Exotic	Naturalised	Tree	Fabaceae
<i>Asystasia gangetica</i> subsp. <i>micrantha</i>	Exotic	Naturalised	Herb	Acanthaceae
<i>Cenchrus purpureus</i>	Exotic	Naturalised	Herb	Poaceae
<i>Cocos nucifera</i>	Exotic	Naturalised	Tree	Arecaceae
<i>Decalobanthus peltatus</i>	Exotic	Naturalised	Climber	Convolvulaceae
<i>Falcataria falcata</i>	Exotic	Naturalised	Tree	Fabaceae
<i>Hevea brasiliensis</i>	Exotic	Naturalised	Tree	Euphorbiaceae
<i>Ipomoea cairica</i>	Exotic	Naturalised	Climber	Convolvulaceae
<i>Leucaena leucocephala</i> subsp. <i>leucocephala</i>	Exotic	Naturalised	Tree	Fabaceae
<i>Miconia crenata</i>	Exotic	Naturalised	Shrub	Melastomataceae
<i>Mimosa pudica</i>	Exotic	Naturalised	Shrub	Fabaceae
<i>Nelsonia canescens</i>	Exotic	Naturalised	Herb	Acanthaceae
<i>Neptunia plena</i>	Exotic	Naturalised	Shrub	Fabaceae

<i>Ochna kirkii</i>	Exotic	Naturalised	Shrub	Ochnaceae
<i>Piper aduncum</i>	Exotic	Naturalised	Tree	Piperaceae
<i>Pityrogramma calomelanos</i>	Exotic	Naturalised	Herb	Adiantaceae
<i>Ptychosperma macarthurii</i>	Exotic	Naturalised	Tree	Arecaceae
<i>Spathodea campanulata</i>	Exotic	Naturalised	Tree	Bignoniaceae
<i>Spermacoce remota</i>	Exotic	Naturalised	Herb	Rubiaceae
<i>Struchium sparganophorum</i>	Exotic	Naturalised	Herb	Asteraceae
<i>Syngonium angustatum</i>	Exotic	Naturalised	Climber	Araceae
<i>Urochloa mutica</i>	Exotic	Naturalised	Herb	Poaceae
<i>Aglaonema commutatum</i>	Exotic	Casual	Herb	Araceae
<i>Andira inermis</i>	Exotic	Casual	Tree	Fabaceae
<i>Artocarpus heterophyllus</i>	Exotic	Casual	Tree	Moraceae
<i>Averrhoa carambola</i>	Exotic	Casual	Tree	Oxalidaceae
<i>Dracaena fragrans</i>	Exotic	Casual	Shrub	Asparagaceae
<i>Durio zibethinus</i>	Exotic	Casual	Tree	Malvaceae
<i>Elaeis guineensis</i>	Exotic	Casual	Tree	Arecaceae
<i>Epipremnum aureum</i>	Exotic	Casual	Climber	Araceae
<i>Philodendron hederaceum</i>	Exotic	Casual	Herb	Araceae
<i>Samanea saman</i>	Exotic	Casual	Tree	Fabaceae
<i>Syzygium jambos</i>	Exotic	Casual	Tree	Myrtaceae
<i>Bidens alba</i>	Exotic	Cultivated Only	Herb	Asteraceae
<i>Calla palustris</i>	Exotic	Cultivated Only	Herb	Araceae
<i>Callisia repens</i>	Exotic	Cultivated Only	Herb	Commelinaceae
<i>Calophyllum soulattri</i>	Exotic	Cultivated Only	Tree	Calophyllaceae
<i>Lagerstroemia loddonii</i>	Exotic	Cultivated Only	Tree	Lythraceae
<i>Syzygium aqueum</i>	Exotic	Cultivated Only	Tree	Myrtaceae
<i>Theobroma cacao</i>	Exotic	Cultivated Only	Tree	Malvaceae

CS Species with Cultivation Status

Species	Family	Origin	Status	Habit	Cultivation Status
<i>Cissus repens</i>	Vitaceae	Native	Vulnerable	Climber	Non-cultivated
<i>Cratoxylum cochinchinense</i>	Hypericaceae	Native	Endangered	Tree	Cultivated
<i>Curculigo capitulata</i>	Hypoxidaceae	Native	Critically Endangered	Shrub	Non-cultivated
<i>Ficus caulocarpa</i>	Moraceae	Native	Endangered	Strangler	Non-cultivated
<i>Flemingia strobilifera</i>	Fabaceae	Native	Critically Endangered	Shrub	Cultivated
<i>Glochidion zeylanicum var. zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	Non-cultivated
<i>Gnetum gnemon var. gnemon</i>	Gnetaceae	Native	Critically Endangered	Tree	Cultivated
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	Non-cultivated
<i>Litsea umbellata</i>	Lauraceae	Native	Vulnerable	Tree	Non-cultivated
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	Non-cultivated
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	Non-cultivated
<i>Peltophorum pterocarpum</i>	Fabaceae	Native	Critically Endangered	Tree	Cultivated
<i>Scurrula ferruginea</i>	Loranthaceae	Native	Vulnerable	Epiphyte	Non-cultivated
<i>Selaginella willdenowii</i>	Selaginellaceae	Native	Vulnerable	Climber	Non-cultivated
<i>Syzygium myrtifolium</i>	Myrtaceae	Native	Critically Endangered	Tree	Cultivated
<i>Xyris complanata</i>	Xyridaceae	Native	Critically Endangered	Herb	Non-cultivated

B.2 List and Locations of Flora Species of Conservation Significance

Species	Family	Origin	Status	Habit	Northing	Easting	Girth	Height
<i>Cissus repens</i>	Vitaceae	Native	Vulnerable	Climber	37852.34027	15528.16972	-	-
<i>Cissus repens</i>	Vitaceae	Native	Vulnerable	Climber	38014.32858	15559.78318	-	-
<i>Curculigo capitulata</i>	Hypoxidaceae	Native	Critically Endangered	Shrub	37863.5088	15523.27354	-	-
<i>Ficus caulocarpa</i>	Moraceae	Native	Endangered	Strangler	38150.3428	15352.01386	< 0.05	0.5
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38237.25708	15433.92626	0.1	3
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38119.60912	15351.90112	< 0.05	0.2
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38085.21131	15419.89679	< 0.05	1
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38110.8685	15365.81177	0.05	1.2
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38072.27489	15375.60335	0.05	1.5
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38057.68616	15382.50255	< 0.05	1.2
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38113.95865	15483.44388	< 0.05	0.3
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38057.68616	15382.50255	< 0.05	1
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38100.25964	15294.47533	0.2	3
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	37955.95775	15374.81886	0.2	4
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38149.57881	15240.50274	0.1	6
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38149.57866	15243.7301	< 0.05	0.5
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38142.60871	15247.51358	0.2	8
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38271.09613	15228.60065	< 0.05	1
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38055.482	15443.241	1.4	12
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38066.532	15455.532	0.7	12
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38163	15493.1	0.3	6
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38102.46	15300.99	0.3	6
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38123.02	15281.79	0.5	10
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	37943.89979	15371.70221	0.3	4
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38155.8	15232.98	0.3	6
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38152.361	15268.839	0.6	10
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38160.625	15230.375	0.7	8
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	37900.87961	15500.34982	0.05	1.5
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38204.95963	15578.82235	0.05	3
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38212.36376	15604.86419	0.2	10
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38192.68598	15629.90319	0.1	8
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38151.44158	15562.68304	0.7	10
<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38162.16689	15573.03336	< 0.05	0.6
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38110.8685	15365.81177	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38072.27489	15375.60335	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38036.00857	15363.80506	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38034.68145	15401.30923	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38043.42144	15400.97578	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38054.25593	15403.20206	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38028.04305	15449.163	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38200.09508	15550.66614	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38200.09508	15550.66614	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38201.30921	15550.44362	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	37912.71918	15415.88232	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	37990.00651	15437.92108	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	37990.33995	15441.37104	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	37987.13266	15452.16588	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	37983.36963	15453.05601	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	37979.83825	15456.61708	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	37925.7698	15397.29774	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	37922.88765	15390.39771	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	37980.4967	15450.16238	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38278.62258	15216.24799	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38199.10542	15505.81683	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38194.56265	15534.52905	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38194.56265	15534.52905	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38307.46467	15428.81029	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38276.50843	15432.70393	-	-
<i>Goniophlebium percussum</i>	Polypodiaceae	Native	Vulnerable	Epiphyte	38047.28349	15483.77464	-	-
<i>Litsea umbellata</i>	Lauraceae	Native	Vulnerable	Shrub	38122.36963	15382.3943	0.05	6
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38216.24459	15460.18936	< 0.05	1.9
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38195.45704	15433.70173	0.1	4
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38228.18322	15437.82094	0.05	1.5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38218.01713	15412.55798	0.05	1.5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38175.99397	15426.1332	0.05	1.6
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38193.12739	15505.92784	0.05	2
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38119.60911	15352.1237	< 0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38150.3428	15352.01386	< 0.05	0.5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38122.36963	15382.3943	< 0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38085.21131	15419.89679	< 0.05	1.2
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38091.51207	15455.95457	< 0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38138.51622	15357.13257	0.05	0.3
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38139.50867	15342.33124	< 0.05	2
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38072.27489	15375.60335	< 0.05	1

<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38099.69438	15489.89795	< 0.05	0.2
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38113.95865	15483.44388	< 0.05	4
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38118.37977	15478.65868	< 0.05	1.5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38187.16381	15393.30362	0.2	6
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38166.71073	15351.01303	< 0.05	0.1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38142.70906	15478.7711	< 0.05	0.4
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38143.59718	15514.82862	0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38182.18452	15440.26713	0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38181.18861	15531.85751	0.05	2
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38180.42062	15306.38699	0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38162.29232	15295.92501	< 0.05	0.3
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38095.5048	15299.03793	< 0.05	0.5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38115.84922	15288.91164	< 0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	37963.47075	15450.82931	< 0.05	1.5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	37944.89857	15419.77893	< 0.05	0.5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	37922.77664	15387.83807	< 0.05	0.5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38173.6831	15296.03684	< 0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38175.66741	15276.67274	< 0.05	0.6
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38183.08186	15280.01174	0.2	8
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38164.61175	15246.8469	< 0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38155.99241	15242.39495	< 0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38238.14498	15277.23214	< 0.05	0.5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38247.65441	15273.22621	0.2	4
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38271.20763	15220.81046	< 0.05	0.5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38152.34084	15238.72225	< 0.05	0.6
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38159.96913	15228.59536	< 0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38168.15	15369.35	0.9	4
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38157.36	15294.92	0.3	9
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38148.71	15308.29	0.5	10
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38134.18	15312.1	0.8	10
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38136.01	15315.37	0.5	10
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38127.57	15305.96	0.3	10
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38123.53	15301.98	0.4	12
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38126.78	15280.46	0.3	10
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	37911.9	15430.64	2	7
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	37909.95	15430.47	0.8	6
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38153.684	15274.588	0.5	12
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38138.681	15285.765	0.6	10
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	37896.34527	15547.75855	0.03	0.3
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	37889.93356	15505.13472	0.05	2
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38209.378	15633.79906	< 0.05	0.8
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38194.56265	15534.52905	< 0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38317.20181	15313.7385	< 0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38294.42837	15340.55794	< 0.05	2
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38293.42621	15366.71068	< 0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38330.80199	15436.04513	< 0.05	1
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38313.87804	15435.71047	< 0.05	0.6
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38299.7262	15416.67948	< 0.05	2
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38285.57426	15402.10003	< 0.05	3
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38256.71471	15359.80906	< 0.05	1.5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38277.17639	15419.12677	0.1	6
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38153.76436	15547.54791	0.1	5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38170.34801	15604.08323	< 0.05	2
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38169.57331	15618.66199	0.4	7
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38162.93851	15625.2277	0.4	12
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38155.64029	15630.90308	0.2	8
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38112.29698	15584.49377	0.4	7
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38125.23743	15516.3858	< 0.05	0.3
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38059.3344	15522.05845	< 0.05	2
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38047.06073	15518.38536	0.1	8
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38039.41363	15505.8094	< 0.05	0.5
<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38030.47304	15548.98894	< 0.05	0.3
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38143.81863	15338.43635	< 0.05	0.2
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38116.28966	15382.39402	< 0.05	0.2
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38034.68145	15401.30923	< 0.05	0.8
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38180.42062	15306.38699	< 0.05	0.5
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38095.5048	15299.03793	< 0.05	0.5
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38115.84922	15288.91164	< 0.05	0.5
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	37994.76298	15398.41386	< 0.06	0.8
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	37909.0661	15444.48332	< 0.05	0.3
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	37980.16304	15448.93819	< 0.05	1
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38159.19895	15247.62566	< 0.05	0.5
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38155.99241	15242.39495	< 0.05	1
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38149.57866	15243.7301	< 0.05	0.5
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38152.34084	15238.72225	< 0.05	0.6

<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38142.4975	15249.1829	<0.05	0.6
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38116.113	15376.963	0.5	6
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38114.887	15389.75	0.5	5
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38132.13	15377.084	0.4	8
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38117.871	15453.266	0.5	6
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38124.258	15456.812	0.4	8
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38074.777	15457.314	0.8	8
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38083.113	15463.852	0.3	10
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38081.463	15465.385	0.5	13
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38083.277	15475.12	0.3	11
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38084.536	15476.386	0.3	13
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38094.262	15476.167	0.7	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38094.72	15476.576	0.6	15
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38091.871	15484.926	0.5	15
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38119.425	15475.635	0.4	10
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38105.22	15466.855	0.8	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38100.843	15462.264	0.8	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38102.184	15464.35	0.5	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38169.98	15428.77	0.3	6
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38159.18	15298.65	0.6	10
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38156.9	15296.59	0.5	10
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38159.47	15305.73	0.6	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38168.2	15289.25	0.3	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38126.92	15304.02	1	13
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38122.86	15298.42	0.4	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38090.73	15318.18	1.2	13
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38120.04	15284.46	0.5	10
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38148.935	15259.045	0.6	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38143.495	15271.675	0.6	10
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38144.764	15274.976	0.7	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38144.528	15274.267	0.3	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38148.246	15272.779	0.6	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38145.238	15277.576	0.7	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38148.388	15274.875	0.6	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38148.13	15276.573	0.8	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38158.11	15285.909	0.4	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38160.196	15281.992	0.7	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38154.918	15293.63	0.3	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38147.718	15290.707	0.6	14
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38145.38	15297.805	0.3	10
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38145.758	15293.969	0.3	10
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38140.667	15291.336	0.4	10
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38145.087	15298.781	0.7	14
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38070.83245	15560.00838	0.8	12
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38055.02218	15517.49542	< 0.05	0.6
<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38062.21019	15504.14113	< 0.05	0.5
<i>Scurrula ferruginea</i>	Loranthaceae	Native	Vulnerable	Epiphyte	38222.76376	15584.05373	-	-
<i>Selaginella willdenowii</i>	Selaginellaceae	Native	Vulnerable	Climber	37841.2856	15476.53128	-	-
<i>Selaginella willdenowii</i>	Selaginellaceae	Native	Vulnerable	Climber	37836.96714	15463.6216	-	-
<i>Xyris complanata</i>	Xyridaceae	Native	Critically Endangered	Herb	38146.36065	15481.99864	-	-

B.3 List and Locations of Large Plant Specimens

Tag no.	Species	Family	Origin	Status	Habit	Girth/ spread (m)	Height (m)	Northing	Easting	Remarks
CTP5661	<i>Spathodea campanulata</i>	Bignoniaceae	Exotic	Naturalised	Tree	5	10	38242.12	15434.78	
CTP5667	<i>Falcataria falcata</i>	Fabaceae	Exotic	Naturalised	Tree	3.2	19	38214.82	15380.69	
CTP5687	<i>Falcataria falcata</i>	Fabaceae	Exotic	Naturalised	Tree	3.1	12	38177.53	15480.92	
CTP5688	<i>Spathodea campanulata</i>	Bignoniaceae	Exotic	Naturalised	Tree	3.6	10	38190.99	15506.49	
CTP5584	<i>Acacia auriculiformis</i>	Fabaceae	Exotic	Naturalised	Tree	3	16	38085.206	15472.871	
CTP5813	<i>Spathodea campanulata</i>	Bignoniaceae	Exotic	Naturalised	Tree	3	10	38179.51	15390.04	
CTP5819	<i>Falcataria falcata</i>	Fabaceae	Exotic	Naturalised	Tree	3	15	38214.89	15375.56	
CTP5822	<i>Falcataria falcata</i>	Fabaceae	Exotic	Naturalised	Tree	3.2	16	38202.82	15341.21	
CTP5825	<i>Falcataria falcata</i>	Fabaceae	Exotic	Naturalised	Tree	3.1	15	38191.26	15333.16	
CTP5834	<i>Spathodea campanulata</i>	Bignoniaceae	Exotic	Naturalised	Tree	3.6	12	38173.09	15312.03	
CTP5836	<i>Spathodea campanulata</i>	Bignoniaceae	Exotic	Naturalised	Tree	3.2	9	38185.94	15336.9	
CTP5864A	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	20	18	38187.49	15558.17	Access limited by water body
CTP5866A	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	4	13	38203.93	15522.36	Access limited by water body
CTP5867	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	4	12	38252.73	15274.16	
CTP5867A	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	9	16	38222.69	15485.48	Access limited by water body
CTP5869A	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	10	13	38241.76	15477.63	Access limited by water body
CTP5871A	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	5	13	38205.3	15302.49	Access limited by water body
CTP5931	<i>Spathodea campanulata</i>	Bignoniaceae	Exotic	Naturalised	Tree	3.4	8	37904.31	15372.05	
CTP5937	<i>Hevea brasiliensis</i>	Euphorbiaceae	Exotic	Naturalised	Tree	3.4	12	37898.53	15378.59	
CTP5945	<i>Spathodea campanulata</i>	Bignoniaceae	Exotic	Naturalised	Tree	3.5	15	37858.87116	15397.85104	
CTP5726	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	6	15	38238.133	15304.866	
-	<i>Acacia auriculiformis</i>	Fabaceae	Exotic	Naturalised	Tree	3.1	16	38246.99611	15278.90189	
-	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	12	16	38282.26346	15249.18955	
-	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	8	18	38278.62258	15216.24799	
-	<i>Spathodea campanulata</i>	Bignoniaceae	Exotic	Naturalised	Tree	3.2	16	38264.13673	15205.89747	
-	<i>Samanea saman</i>	Fabaceae	Exotic	Casual	Tree	4	20	38239.80783	15197.66097	
-	<i>Samanea saman</i>	Fabaceae	Exotic	Casual	Tree	3	20	38230.1879	15183.86074	
-	<i>Spathodea campanulata</i>	Bignoniaceae	Exotic	Naturalised	Tree	3	16	38257.16887	15165.94458	
-	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	5	18	38272.32265	15163.49696	
-	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	10	18	38286.25153	15192.21005	
-	<i>Spathodea campanulata</i>	Bignoniaceae	Exotic	Naturalised	Tree	3	16	38300.84829	15209.23788	
-	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	20	20	37881.30672	15462.06563	
-	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	12	20	37841.2856	15476.53128	
-	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	15	16	38162.1666	15579.37681	
-	<i>Falcataria falcata</i>	Fabaceae	Exotic	Naturalised	Tree	4	20	38017.09446	15527.39834	
-	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	20	18	37977.17546	15557.11054	
-	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	4	15	37985.24946	15513.70837	

B.4 List and Locations of Other Plant Specimens of Value

Tag no.	Species	Family	Origin	Status	Habit	Girth/ spread (m)	Height (m)	Northing	Easting
-	<i>Ardisia elliptica</i>	Primulaceae	Native	Common	Tree	0.05	0.5	38188.053	15404.433
-	<i>Ardisia elliptica</i>	Primulaceae	Native	Common	Tree	<0.05	0.2	38243.235	15235.499
-	<i>Ardisia elliptica</i>	Primulaceae	Native	Common	Tree	<0.05	0.2	38270.105	15224.26
-	<i>Ardisia elliptica</i>	Primulaceae	Native	Common	Tree	<0.05	1.2	38234.173	15190.872
-	<i>Ardisia elliptica</i>	Primulaceae	Native	Common	Tree	<0.05	0.5	38230.188	15183.861
-	<i>Ardisia elliptica</i>	Primulaceae	Native	Common	Tree	<0.05	0.3	38238.261	15176.182
-	<i>Ardisia elliptica</i>	Primulaceae	Native	Common	Tree	<0.05	0.5	38255.51	15162.828
-	<i>Ardisia elliptica</i>	Primulaceae	Native	Common	Tree	<0.05	0.5	38297.197	15194.993
CTP5567	<i>Ficus benjamina</i>	Moraceae	Cryptogenic	-	Strangler	2	16	38026.596	15426.488
CTP5864	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	2.8	10	38205.81	15533.83
CTP5870A	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	2	13	38232.73	15445.49
-	<i>Ficus microcarpa</i>	Moraceae	Native	Common	Strangler	2.5	18	38269.64787	15476.1061

B.5 Overall Tree Mapping

CTP5701	<i>Acacia mangium</i>	Fabaceae	Exotic	Naturalised	Tree	38164.116	15223.554	-	-	-	-	1.7	12	-
CTP5702	<i>Acacia auriculiformis</i>	Fabaceae	Exotic	Naturalised	Tree	38142.933	15247.797	-	-	-	-	1.1	8	-
CTP5703	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38148.935	15259.045	-	-	-	-	0.6	12	-
CTP5704	<i>Acacia auriculiformis</i>	Fabaceae	Exotic	Naturalised	Tree	38155.855	15267.989	-	-	-	-	1.4	12	Red weaver ant nest on trunk
CTP5705	<i>Cinnamomum iners</i>	Lauraceae	Native	Common	Tree	38162.637	15259.906	-	-	-	-	1.2	10	-
CTP5706	<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38152.361	15268.839	-	-	-	-	0.6	10	-
CTP5707	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38143.495	15271.675	-	-	-	-	0.6	10	-
CTP5708	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38144.764	15274.976	-	-	-	-	0.7	12	-
CTP5709	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38144.528	15274.267	-	-	-	-	0.3	12	-
CTP5710	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38148.246	15272.779	-	-	-	-	0.6	12	-
CTP5711	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38145.238	15277.576	-	-	-	-	0.7	12	-
CTP5712	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38148.388	15274.875	-	-	-	-	0.6	12	-
CTP5713	<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38153.684	15274.588	-	-	-	-	0.5	12	-
CTP5714	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38148.13	15276.573	-	-	-	-	0.8	12	-
CTP5715	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38158.11	15285.909	-	-	-	-	0.4	12	-
CTP5716	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38160.196	15281.992	-	-	-	-	0.7	12	-
CTP5717	<i>Falcatoria falcata</i>	Fabaceae	Exotic	Naturalised	Tree	38156.451	15294.159	-	-	-	-	2	20	-
CTP5718	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38154.918	15293.63	-	-	-	-	0.3	12	-
CTP5719	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38147.718	15290.707	-	-	-	-	0.6	14	-
CTP5720	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38145.38	15297.805	-	-	-	-	0.3	10	-
CTP5721	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38145.758	15293.969	-	-	-	-	0.3	10	-
CTP5722	<i>Ploiarium elegans</i>	Bonnetiaceae	Native	Common	Tree	38146.365	15290.361	-	-	-	-	0.4	14	-
CTP5723	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38140.657	15291.336	-	-	-	-	0.4	10	-
CTP5724	<i>Melicope lunu-ankenda</i>	Rutaceae	Native	Endangered	Tree	38145.087	15298.781	-	-	-	-	0.7	14	-
CTP5725	<i>Macaranga griffithiana</i>	Euphorbiaceae	Native	Vulnerable	Tree	38138.681	15285.765	-	-	-	-	0.6	10	-
CTP5898	<i>Glochidion zeylanicum</i> var. <i>zeylanicum</i>	Phyllanthaceae	Native	Vulnerable	Tree	38160.625	15230.375	-	-	-	-	0.7	8	-
CTP5899	<i>Macaranga gigantea</i>	Euphorbiaceae	Native	Common	Tree	38162.967	15231.328	-	-	-	-	1.1	12	-
CTP5900	<i>Acacia auriculiformis</i>	Fabaceae	Exotic	Naturalised	Tree	38163.002	15226.434	-	-	-	-	1.3	14	-

B.6 List of Recorded and Probable Fauna Species and Ecological Value

Faunal group	Total no. of recorded species (Present survey)	
	All species	CS species
Odonata	26	1
Dragonflies	18	0
Damselflies	8	1
Aculeata	10	0
Bees	5	0
Stinging Wasps	5	0
Butterflies	21	0
Fish	13	2
Decapod Crustaceans	1	0
Mollusc	7	0
Herpetofauna	18	0
Amphibians	9	0
Reptiles	9	0
Birds	46	7
Mammals	9	1
Non-volant Mammals	5	1
Bats	4	0
Total	151	11

No.	Type	Family	Scientific Name	Common Name	Global Status	National Status	Species of Conservation Significance	Distribution/Rarity	Native Status	Recorded in Present Surveys	Historical Observations	Source for Historical Observation	Ecological Value (Importance Score)
1	Damselfly	Coenagrionidae	<i>Agriocnemis femina</i>	Variable wisp	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
2	Damselfly	Coenagrionidae	<i>Archibasis melanocysana</i>	Blue-nosed sprite	Not Listed	Endangered	Yes	Restricted and Rare	Native	No	Yes	KJE Vehicular Interchange EIA	High (4)
3	Damselfly	Coenagrionidae	<i>Archibasis viola</i>	Violet sprite	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
4	Damselfly	Coenagrionidae	<i>Ceriagrion cerinorubellum</i>	Ornate coraltail	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
5	Damselfly	Coenagrionidae	<i>Ischnura senegalensis</i>	Common bluetail	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	J1002 JRL EIA	Medium (3)
6	Damselfly	Coenagrionidae	<i>Pseudagrion microcephalum</i>	Blue sprite	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	J1002 JRL EIA	Medium (3)
7	Damselfly	Platycnemididae	<i>Copera marginipes</i>	Yellow featherlegs	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	J1002 JRL EIA	Medium (3)
8	Damselfly	Platycnemididae	<i>Copera vittata</i>	Variable featherlegs	Least Concern	Vulnerable	Yes	Restricted and rare	Native	Yes	Yes	Tengah North EIS Report	High (4)
9	Damselfly	Platycnemididae	<i>Onychargia atrocyana</i>	Shorttail	Least Concern	Least Concern	No	Widespread but Uncommon	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
10	Dragonfly	Aeshnidae	<i>Anax guttatus</i>	Emperor	Least Concern	Least Concern	No	Widespread but Uncommon	Native	Yes	Yes	Tengah North EIS Report	Medium (3)
11	Dragonfly	Aeshnidae	<i>Gynacantha basiguttata</i>	Spoon-tailed duskhawk	Least Concern	Vulnerable	Yes	Restricted and Rare	Native	No	Yes	Camphora's unpublished data	High (4)
12	Dragonfly	Aeshnidae	<i>Gynacantha sp.</i>	Unidentified duskhawk	NA	NA	NA	Native	Yes	NA	NA	NA	Medium (3)
13	Dragonfly	Libellulidae	<i>Acisoma panorpoides</i>	Trumpet tail	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	J1002 JRL EIA	Medium (3)
14	Dragonfly	Libellulidae	<i>Agrionoptera insignis</i>	Grenadier	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	J1002 JRL EIA	Medium (3)
15	Dragonfly	Libellulidae	<i>Brachydiplax chalybea</i>	Blue dasher	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
16	Dragonfly	Libellulidae	<i>Cratilla metallica</i>	Dark-tipped forest skimmer	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
17	Dragonfly	Libellulidae	<i>Crocothemis servilia</i>	Common scarlet	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
18	Dragonfly	Libellulidae	<i>Hydrobasileus croceus</i>	Water monarch	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	No	NA	Medium (3)
19	Dragonfly	Libellulidae	<i>Neurothemis fluctuans</i>	Common parasol	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
20	Dragonfly	Libellulidae	<i>Orthetrum chrysostigma</i>	Spine-tufted skimmer	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
21	Dragonfly	Libellulidae	<i>Orthetrum glaucum</i>	Common blue skimmer	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
22	Dragonfly	Libellulidae	<i>Orthetrum sabina</i>	Variegated green skimmer	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
23	Dragonfly	Libellulidae	<i>Orthetrum testaceum</i>	Scarlet skimmer	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
24	Dragonfly	Libellulidae	<i>Pantala flavescens</i>	Wandering glider	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
25	Dragonfly	Libellulidae	<i>Potamarcha congener</i>	Common chaser	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
26	Dragonfly	Libellulidae	<i>Rhodothemis rufa</i>	Common redbolt	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
27	Dragonfly	Libellulidae	<i>Rhyothemis phyllis</i>	Yellow-barred flutterer	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
28	Dragonfly	Libellulidae	<i>Trithemis festiva</i>	Indigo dropwing	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah North EIS Report	Medium (3)
29	Dragonfly	Gomphidae	<i>Ictinogomphus decoratus melaenops</i>	Common Flangetail	Least Concern	Least Concern	No	Widespread and Common	Native	No	Yes	J1002 JRL EIA	Medium (3)
30	Dragonfly	Libellulidae	<i>Diplacodes trivialis</i>	Blue Percher	Least Concern	Least Concern	No	Widespread and Common	Native	No	Yes	J1002 JRL EIA	Medium (3)
31	Dragonfly	Libellulidae	<i>Lathrecista asiatica</i>	Scarlet Grenadier	Least Concern	Least Concern	No	Widespread and Common	Native	No	Yes	J1002 JRL EIA	Medium (3)
32	Dragonfly	Libellulidae	<i>Tholymis tillarga</i>	White-barred Dushhawk	Least Concern	Least Concern	No	Widespread and Common	Native	No	Yes	J1002 JRL EIA	Medium (3)
33	Dragonfly	Libellulidae	<i>Trithemis aurora</i>	Crimson Dropwing	Least Concern	Least Concern	No	Widespread and Common	Native	No	Yes	J1002 JRL EIA	Medium (3)
34	Dragonfly	Libellulidae	<i>Trithemis pallidinervis</i>	Dancing Dropwing	Least Concern	Least Concern	No	Widespread but Uncommon	Native	No	Yes	J1002 JRL EIA	Medium (3)

No.	Type	Family	Scientific Name	Common Name	Global Status	National Status	Species of Conservation Significance	Native Status	Recorded in Present Surveys	Historical Observations	Source for Historical Observation	Ecological Value (Importance Score)
1	Bee	Apidae	<i>Amegilla andrewsi</i>	Andrew's blue-banded digger bee	Not Listed	Least Concern	No	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
2	Bee	Apidae	<i>Amegilla insularis</i>	NA	Not Listed	Vulnerable	Yes	NA	No	Yes	Camphora's unpublished data	High (4)
3	Bee	Apidae	<i>Apis (Apis) cerana javana</i>	Asian honey bee	Not Listed	Least Concern	No	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
4	Bee	Apidae	<i>Apis (megapis) dorsata dorsata</i>	Giant honey bee	Not Listed	Least Concern	No	Native	Yes	Yes	Tengah North EIS Report	Medium (3)
5	Bee	Apidae	<i>Xylocopa latipes</i>	Broad-handed carpenter bee	Not Listed	Least Concern	No	Native	Yes	Yes	Tengah North EIS Report	Medium (3)
6	Bee	Halictidae	<i>Nomia strigata</i>	Pearly-banded bee	Not Listed	Least Concern	No	Native	Yes	Yes	Tengah North EIS Report	Medium (3)
7	Wasp	Sphecidae	<i>Isodontia diodon</i>	NA	Not Listed	Not evaluated	No	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
8	Wasp	Vespidae	<i>Parapolybia varia</i>	Lesser paper wasp	Not Listed	Not evaluated	No	NA	Yes	No	NA	Medium (3)
9	Wasp	Vespidae	<i>Parischnogaster nigricans</i>	NA	Not Listed	Not evaluated	No	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
10	Wasp	Vespidae	<i>Parischnogaster unicuspata</i>	NA	Not Listed	Not evaluated	Yes	Native	No	Yes	KJE Vehicular Interchange EIA	Medium (3)
11	Wasp	Vespidae	<i>Ropalidia stigma</i>	Stigma small paper wasp	Not Listed	Least Concern	No	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
12	Wasp	Vespidae	<i>Ropalidia sumatrae</i>	Sumatran small paper wasp	Not Listed	Least Concern	No	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)

No.	Type	Family	Scientific Name	Common Name	Global Status	National Status	Species of Conservation Significance	Distribution/Rarity	Native Status	Recorded in Present Surveys	Historical Observations	Source for Historical Observation	Ecological Value (Importance Score)
1	Butterfly	Hesperiidae	<i>Erionota sp.</i>	NA	NA	NA	NA	NA	NA	Yes	NA	NA	Medium (3)
2	Butterfly	Hesperiidae	<i>Pelopidas conjunctus conjunctus</i>	Conjoined swift	Not Listed	Near threatened	Yes	Moderately rare	Resident	No	Yes	Tengah South EIS Report	Medium (3)
3	Butterfly	Hesperiidae	<i>Pelopidas mathias mathias</i>	Small branded swift	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	Tengah South EIS Report	Medium (3)
4	Butterfly	Hesperiidae	<i>Potanthus omaha omaha</i>	Lesser dart	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
5	Butterfly	Hesperiidae	<i>Pseudocoladenia dan dhyana</i>	Fulvous pied flat	Not Listed	Near threatened	Yes	Moderately rare	Resident	No	Yes	KJE Vehicular Interchange EIA	Medium (3)
6	Butterfly	Lycenidae	<i>Anthene lycaenina miya</i>	Pointed ciliate blue	Not Listed	Least Concern	No	Moderately rare	Resident	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
7	Butterfly	Lycenidae	<i>Hypolycaena thecloides thecloides</i>	Dark tit	Not Listed	Least Concern	No	Moderately rare	Resident	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
8	Butterfly	Lycenidae	<i>Ionolyce helicon meruiana</i>	Pointed line blue	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
9	Butterfly	Lycenidae	<i>Jamides celeno aelianus</i>	Common caerulean	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
10	Butterfly	Lycenidae	<i>Miletus sp.</i>	NA	NA	NA	NA	NA	NA	NA	NA	NA	Medium (3)
11	Butterfly	Lycenidae	<i>Prosotas dubiosa lumpura</i>	Tailless line blue	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
12	Butterfly	Nymphalidae (Brush Foots)	<i>Athyma reta moorei</i>	Malay staff sergeant	Not Listed	Near threatened	No	Very rare	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
13	Butterfly	Nymphalidae (Brush Foots)	<i>Junonia atlites atlites</i>	Grey pansy	Not Listed	Least Concern	No	Moderately common	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
14	Butterfly	Nymphalidae (Brush Foots)	<i>Mycalexis perseoides perseoides</i>	Burmese bush brown	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
15	Butterfly	Nymphalidae (Brush Foots)	<i>Neptis hylas papaja</i>	Common sailor	Not Listed	Least Concern	No	Moderately common	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
16	Butterfly	Nymphalidae (Brush Foots)	<i>Orsotriaena medus cinerea</i>	Dark grass brown	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
17	Butterfly	Nymphalidae (Brush Foots)	<i>Tanaecia iapis puseda</i>	Horsfield's baron	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
18	Butterfly	Papilionidae (Swallowtails & Birdwings)	<i>Graphium sarpedon luctatius</i>	Common bluebottle	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
19	Butterfly	Papilionidae (Swallowtails & Birdwings)	<i>Papilio polytes romulus</i>	Common mormon	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
20	Butterfly	Papilionidae (Swallowtails & Birdwings)	<i>Troides helena cerberus</i>	Common birdwing	Not Listed / CITES protected (Appendix II)	Vulnerable	Yes	Moderately common	Resident	No	Yes	Tengah North EIS Report	High (4)
21	Butterfly	Pieridae (Whites & Sulphurs)	<i>Catopsilia pyranthe pyranthe</i>	Mottled emigrant	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
22	Butterfly	Pieridae (Whites & Sulphurs)	<i>Delias hyparete metarete</i>	Painted jezebel	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
23	Butterfly	Pieridae (Whites & Sulphurs)	<i>Eurema andersonii andersonii</i>	Anderson's grass yellow	Not Listed	Near threatened	No	Moderately common	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
24	Butterfly	Pieridae (Whites & Sulphurs)	<i>Eurema hecabe contubernalis</i>	Common grass yellow	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
25	Butterfly	Pieridae (Whites & Sulphurs)	<i>Leptosia nina malayana</i>	Psyche	Not Listed	Least Concern	No	Common	Resident	Yes	Yes	Tengah North EIS Report	Medium (3)
26	Butterfly	Riodinidae (Metalmarks)	<i>Taxila haquinus haquinus</i>	Harlequin	Not Listed	Critically Endangered	Yes	Moderately rare	Resident	No	Yes	KJE Vehicular Interchange EIA	High (4)

No.	Type	Family	Scientific Name	Common Name	Global Status	National Status	Species of Conservation Significance	Native Status	Recorded in Present Surveys	Historical Observations	Source for Historical Observation	Ecological Value (Importance Score)
1	Freshwater fish	Anabantidae (Climbing perches)	<i>Anabas testudineus</i>	Oriental climbing perch	Least Concern	Least Concern	No	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
2	Freshwater fish	Channidae (Snakeheads)	<i>Channa striata</i>	Common snakehead/aruan	Least Concern	Least Concern	No	Native	Yes	Yes	Tengah North EIS Report	Medium (3)
3	Freshwater fish	Cyprinidae (Carps and relatives)	<i>Barbodes rhombeus</i>	Indochinese spotted barb	Least Concern	Not Evaluated	No	Non-native	Yes	Yes	Tengah South EIS Report	Low (2)
4	Freshwater fish	Cyprinidae (Carps and relatives)	<i>Danio albolineatus</i>	Pearl danio	Not Listed	Not Evaluated	No	Non-native	Yes	Yes	J1002 JRL EIA	Low (2)
5	Freshwater fish	Cyprinidae (Carps and relatives)	<i>Rasbora borapetensis</i>	Red-tailed rasbora	Least Concern	Not Evaluated	No	Non-native	Yes	Yes	KJE Vehicular Interchange EIA	Low (2)
6	Freshwater fish	Osphronemidae (Gouramies and fighting-fishes)	<i>Betta imbellis</i>	Crescent betta	Least Concern	Endangered	Yes	Native	Yes	No	NA	High (4)
7	Freshwater fish	Osphronemidae (Gouramies and fighting-fishes)	<i>Trichopodus pectoralis</i>	Snakeskin gourami	Least Concern	Not Evaluated	No	Non-native	Yes	No	NA	Low (2)
8	Freshwater fish	Osphronemidae (Gouramies and fighting-fishes)	<i>Trichopodus trichopterus</i>	Threespot gourami	Least Concern	Vulnerable	Yes	Native	Yes	Yes	Tengah South EIS Report	High (4)
9	Freshwater fish	Osphronemidae (Gouramies and fighting-fishes)	<i>Trichopsis schalleri</i>	Mekong croaking gourami	Least Concern	Not Evaluated	No	Non-native	Yes	No	NA	Low (2)
10	Freshwater fish	Osphronemidae (Gouramies and fighting-fishes)	<i>Trichopsis vittata</i>	Striped croaking gourami	Least Concern	Least Concern	No	Native	Yes	Yes	Tengah North EIS Report	Medium (3)
11	Freshwater fish	Poeciliidae (Live-bearing toothcarps)	<i>Poecilia reticulata</i>	Guppy	Least Concern	Not Evaluated	No	Non-native	Yes	Yes	Tengah South EIS Report	Low (2)
12	Freshwater fish	Synbranchidae (Swamp-eels)	<i>Monopterus javanensis</i>	Sunda swamp eel	Least Concern	Least Concern	No	Native	Yes	Yes	Tengah North EIS Report	Medium (3)
13	Freshwater fish	Zenarchopteridae (Halfbeaks)	<i>Dermogenys collettei</i>	Sunda pygmy halfbeak	Least Concern	Least Concern	No	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
14	Freshwater fish	Poeciliidae (Live-bearing toothcarps)	<i>Gambusia affinis</i>	Mosquitofish	Least Concern	Not Evaluated	No	Non-native	No	Yes	J1002 JRL EIA	Low (2)
15	Freshwater fish	Cichlidae	<i>Oreochromis mossambicus</i>	Mozambique Tilapia	Vulnerable	Not Evaluated	No	Non-native	No	Yes	J1002 JRL EIA	Low (2)
16	Freshwater fish	Clariidae	<i>Clarias gariepinus</i>	African walking catfish	Least Concern	Not Evaluated	No	Non-native	No	Yes	J1002 JRL EIA	Low (2)
17	Freshwater fish	Cichlidae	<i>Oreochromis niloticus</i>	Nile tilapia	Least Concern	Not Evaluated	No	Non-native	No	Yes	J1002 JRL EIA	Low (2)
18	Freshwater fish	Cichlidae	<i>Parachromis managuensis</i>	Jaguar cichlid	Least Concern	Not Evaluated	No	Non-native	No	Yes	J1002 JRL EIA	Low (2)
19	Freshwater fish	Cichlidae	<i>Vieja synspila</i>	Redhead cichlid	Not Listed	Not Evaluated	No	Non-native	No	Yes	J1002 JRL EIA	Low (2)

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No.	Type	Family	Scientific Name	Common Name	Global Status	National Status	Species of Conservation Significance	Native Status	Recorded in Present Surveys	Historical Observations	Source for Historical Observation	Ecological Value (Importance Score)
1	Freshwater gastropod	Bithyniidae	<i>Bithynia sp.</i>	NA	NA	NA	No	Indeterminate	Yes	NA	NA	Medium (3)
2	Freshwater gastropod	Lymnaeidae	<i>Radix rubiginosa</i>	NA	Not Listed	Not Evaluated	No	Non-native	Yes	No	NA	Low (2)
3	Freshwater gastropod	Nassariidae	<i>Anentome helena</i>	Assasin snail	NA	NA	No	NA	Yes	No	NA	Medium (3)
4	Freshwater gastropod	Physidae	<i>Physa acuta</i>	NA	Not Listed	Not Evaluated	No	Non-native	Yes	No	NA	Low (2)
5	Freshwater gastropod	Planorbidae	<i>Gyraulus sp.</i>	NA	NA	NA	No	No	Yes	NA	NA	Low (2)
6	Freshwater gastropod	Thiaridae	<i>Melanoides tuberculata</i>	NA	Least Concern	Not Evaluated	No	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
7	Freshwater gastropod	Viviparidae	<i>Sinotaia guangdungensis</i>	NA	Least Concern	Not Evaluated	No	Non-native	Yes	No	NA	Low (2)

No.	Type	Family	Scientific Name	Common Name	Global Status	National Status	Species of Conservation Significance	Native Status	Recorded in Present Surveys	Historical Observations	Source for Historical Observation	Ecological Value (Importance Score)
1	Freshwater shrimp	Palaemonidae	<i>Macrobrachium lanchesteri</i>	Riceland shrimp	Least Concern	Not Evaluated	No	Non-native	Yes	Yes	KJE Vehicular Interchange EIA	Low (2)

No.	Type	Family	Scientific Name	Common Name	Global Status	National Status	Species of Conservation Significance	Distribution/Rarity	Primary Native Status	Recorded in Present Surveys	Historical Observation	Source for Historical Observation	Ecological Value (Importance Score)
1	Bird	Accipitridae	<i>Haliastur indus</i>	Brahminy kite	Least Concern (CITES protected (Appendix II))	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah South EIS Report	Medium (3)
2	Bird	Accipitridae	<i>Icthyophaga ichthyaetus</i>	Grey-headed fish eagle	Near Threatened (CITES protected (Appendix II))	Vulnerable	Yes	Uncommon	Resident breeder	Yes	Yes	Tengah South EIS Report	High (4)
3	Bird	Accipitridae	<i>Nisaetus cirrhatus</i>	Changeable hawk-eagle	Least Concern (CITES protected (Appendix II))	Vulnerable	Yes	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	High (4)
4	Bird	Accipitridae	<i>Spilornis cheela</i>	Crested serpent eagle	Least Concern (CITES protected (Appendix II))	Critically Endangered	Yes	Rare	Resident, breeding not proven	No	Yes	Tengah North EIS Report	High (4)
5	Bird	Acrocephalidae	<i>Acrocephalus orientalis</i>	Oriental reed warbler	Least Concern	Vulnerable	Yes	Common	Winter visitor	No	Yes	Tengah South EIS Report	High (4)
6	Bird	Aegithinidae	<i>Aegithina tiphia</i>	Common iora	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
7	Bird	Alcedinidae	<i>Alcedo atthis</i>	Common kingfisher	Least Concern	Vulnerable	Yes	Common	Winter visitor	No	Yes	Tengah North EIS Report	High (4)
8	Bird	Alcedinidae	<i>Alcedo meninting</i>	Blue-eared kingfisher	Least Concern	Endangered	Yes	Uncommon	Resident breeder	Yes	Yes	Tengah North EIS Report	High (4)
9	Bird	Alcedinidae	<i>Ceyx erithaca</i>	Black-backed dwarf kingfisher	Least Concern	Near Threatened	No	Uncommon	Winter visitor	Yes	No	NA	Medium (3)
10	Bird	Apodidae	<i>Aerodramus sp.</i>	Unidentified swiftlet	NA	NA	NA	NA	NA	Yes	NA	NA	Medium (3)
11	Bird	Apodidae	<i>Collocalia affinis</i>	Plume-toed swiftlet	Least Concern	Vulnerable	Yes	Uncommon	Resident breeder	No	Yes	Tengah North EIS Report	High (4)
12	Bird	Campephagidae	<i>Lalage nigra</i>	Pied triller	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
13	Bird	Caprimulgidae	<i>Caprimulgus macrurus</i>	Large-tailed nightjar	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
14	Bird	Charadriidae	<i>Vanellus indicus</i>	Red-wattled lapwing	Least Concern	Near Threatened	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
15	Bird	Cisticolidae	<i>Orthotomus atrogularis</i>	Dark-necked tailorbird	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
16	Bird	Columbidae	<i>Chalcophaps indica</i>	Common emerald dove	Least Concern	Least Concern	No	Uncommon	Resident breeder	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
17	Bird	Columbidae	<i>Ducula bicolor</i>	Pied imperial pigeon	Least Concern	Data Deficient	No	Uncommon	Introduced resident breeder	Yes	Yes	KJE Vehicular Interchange EIA	Low (2)
18	Bird	Columbidae	<i>Treron vernans</i>	Pink-necked green pigeon	Least Concern	Least Concern	No	Abundant	Resident breeder	Yes	Yes	Tengah South EIS Report	Medium (3)
19	Bird	Coracidae	<i>Eurystomus orientalis</i>	Oriental dollarbird	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah South EIS Report	Medium (3)
20	Bird	Corvidae	<i>Corvus macrorhynchos</i>	Large-billed crow	Least Concern	Vulnerable	Yes	Uncommon	Resident breeder	Yes	Yes	Tengah North EIS Report	High (4)
21	Bird	Corvidae	<i>Corvus splendens</i>	House crow	Least Concern	NA	No	Common	Introduced resident breeder	Yes	Yes	Tengah North EIS Report	Low (2)
22	Bird	Cuculidae	<i>Cacomantis merulinus</i>	Plaintive cuckoo	Least Concern	Least Concern	No	Uncommon	Resident breeder	Yes	Yes	Tengah South EIS Report	Medium (3)
23	Bird	Cuculidae	<i>Centropus sinensis</i>	Greater coucal	Least Concern	Near Threatened	No	Uncommon	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
24	Bird	Cuculidae	<i>Chrysococcyx xanthorhynchus</i>	Violet cuckoo	Least Concern	Vulnerable	Yes	Uncommon	Resident breeder	No	Yes	KJE Vehicular Interchange EIA	High (4)
25	Bird	Cuculidae	<i>Eudynamys scolopaceus</i>	Asian koel	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
26	Bird	Dicaeidae	<i>Dicaeum cruentatum</i>	Scarlet-backed flowerpecker	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
27	Bird	Dicruridae	<i>Dicrurus paradiseus</i>	Greater racket-tailed drongo	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
28	Bird	Estrildidae	<i>Lonchura atricapilla</i>	Chestnut munia	Least Concern	Vulnerable	Yes	Uncommon	Resident breeder	No	Yes	J1002 JRL EIA	High (4)
29	Bird	Hirundinidae	<i>Hirundo rustica</i>	Barn swallow	Least Concern	Near Threatened	No	Abundant	Winter visitor	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
30	Bird	Laniidae	<i>Lanius cristatus</i>	Brown shrike	Least Concern	Vulnerable	Yes	Common	Winter visitor	No	Yes	KJE Vehicular Interchange EIA	High (4)
31	Bird	Leiothrichidae	<i>Garrulax leucolophus</i>	White-crested laughingthrush	Least Concern	NA	No	Common	Introduced resident breeder	Yes	Yes	KJE Vehicular Interchange EIA	Low (2)
32	Bird	Megalaimidae	<i>Psilopogon lineatus</i>	Lineated barbet	Least Concern	NA	No	Common	Introduced resident breeder	Yes	Yes	KJE Vehicular Interchange EIA	Low (2)
33	Bird	Meropidae	<i>Merops viridis</i>	Blue-throated bee-eater	Least Concern	Least Concern	No	Common	Migrant breeder	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
34	Bird	Muscicapidae	<i>Copsychus saularis</i>	Oriental magpie-robin	Least Concern	Vulnerable	Yes	Uncommon	Resident breeder	No	Yes	Tengah North EIS Report	High (4)
35	Bird	Nectariniidae	<i>Anthreptes malaccensis</i>	Brown-throated sunbird	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
36	Bird	Nectariniidae	<i>Cinnyris jugularis</i>	Olive-backed sunbird	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
37	Bird	Oriolidae	<i>Oriolus chinensis</i>	Black-naped oriole	Least Concern	Least Concern	No	Abundant	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
38	Bird	Phasianidae	<i>Gallus gallus</i>	Red junglefowl	Least Concern	Near Threatened	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
39	Bird	Picidae	<i>Dinopium javanense</i>	Common flameback	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
40	Bird	Picidae	<i>Picus vittatus</i>	Laced woodpecker	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
41	Bird	Ploceidae	<i>Ploceus philippinus</i>	Baya weaver	Least Concern	Vulnerable	Yes	Uncommon	Resident breeder	No	Yes	Tengah North EIS Report	High (4)
42	Bird	Psittaculidae	<i>Loriculus galgulus</i>	Blue-crowned hanging-parrot	Least Concern (CITES protected (Appendix II))	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
43	Bird	Psittaculidae	<i>Psittacula alexandri</i>	Red-breasted parakeet	Near Threatened (CITES protected (Appendix II))	NA	No	Common	Introduced resident breeder	Yes	Yes	Tengah North EIS Report	Low (2)
44	Bird	Psittaculidae	<i>Psittacula longicauda</i>	Long-tailed parakeet	Vulnerable (CITES protected (Appendix II))	Near Threatened	Yes	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	High (4)
45	Bird	Psittaculidae	<i>Trichoglossus haematodus</i>	Coconut loriukeet	Least Concern (CITES protected (Appendix II))	NA	No	Uncommon	Introduced resident breeder	Yes	Yes	Tengah North EIS Report	Low (2)
46	Bird	Pycnonotidae	<i>Pycnonotus goiavier</i>	Yellow-vented bulbul	Least Concern	Least Concern	No	Abundant	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
47	Bird	Pycnonotidae	<i>Pycnonotus plumosus</i>	Olive-winged bulbul	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
48	Bird	Pycnonotidae	<i>Pycnonotus zeylanicus</i>	Straw-headed bulbul	Critically Endangered (CITES protected (Appendix II))	Endangered	Yes	Uncommon	Resident breeder	Yes	Yes	Tengah North EIS Report	High (4)
49	Bird	Rallidae	<i>Rallina fasciata</i>	Red-legged crake	Least Concern	Near Threatened	No	Uncommon	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
50	Bird	Rhipiduridae	<i>Rhipidura javanica</i>	Malaysian pied fantail	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
51	Bird	Rostratulidae	<i>Rostratula benghalensis</i>	Greater painted-snipe	Least Concern	Endangered	Yes	Rare	Resident breeder	No	Yes	Camphora's unpublished data	High (4)
52	Bird	Scolopacidae	<i>Actitis hypoleucos</i>	Common sandpiper	Vulnerable	Yes	Common	Winter visitor	No	Yes	Tengah North EIS Report	High (4)	
53	Bird	Strigidae	<i>Ketupa ketupu</i>	Buffy fish owl	Least Concern (CITES protected (Appendix II))	Vulnerable	Yes	Uncommon	Resident breeder	No	Yes	KJE Vehicular Interchange EIA	High (4)
54	Bird	Strigidae	<i>Otus lempiji</i>	Amur Paradise Flycatcher	Least Concern (CITES protected (Appendix II))	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
55	Bird	Strigidae	<i>Strix seloputo</i>	Spotted wood owl	Least Concern (CITES protected (Appendix II))	Vulnerable	Yes	Uncommon	Resident breeder	No	Yes	Tengah North EIS Report	High (4)
56	Bird	Sturnidae	<i>Acridotheres javanicus</i>	Javan myna	Vulnerable	NA	No	Abundant	Introduced resident breeder	Yes	Yes	Tengah North EIS Report	Low (2)
57	Bird	Sturnidae	<i>Aplonis panayensis</i>	Asian glossy starling	Least Concern	Least Concern	No	Abundant	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
58	Bird	Timaliidae	<i>Mixornis gularis</i>	Pin-striped tit-babbler	Least Concern	Least Concern	No	Common	Resident breeder	Yes	Yes	Tengah North EIS Report	Medium (3)
59	Bird	Zosteropidae	<i>Zosterops simplex</i>	Swinhoe's white-eye	Least Concern	Vulnerable	Yes	Common	Resident	Yes	Yes	Tengah North EIS Report	High (4)
60	Bird	Ciconiidae	<i>Mycteria cinerea</i>	Milky Stork	Endangered	NA	No	Common	Introduced resident breeder	No	Yes	J1002 JRL EIA	Low (2)
61	Bird	Ardeidae	<i>Ardea cinerea</i>	Grey Heron	Least Concern	Least Concern	No	Abundant	Resident breeder	No	Yes	J1002 JRL EIA	Medium (3)
62	Bird	Ardeidae	NA	Egret sp.	NA	NA	NA	NA	NA	No	Yes	J1002 JRL EIA	NA
63	Bird	Accipitridae	<i>Accipiter soloensis</i>	Chinese Sparrowhawk									

No.	Type	Family	Scientific Name	Common Name	Global Status	National Status	Species of Conservation Significance	Distribution/Rarity	Primary Native Status	Recorded in Present Surveys	Historical Observation	Source for Historical Observation	Ecological Value (Importance Score)
71	Bird	Picidae	<i>Yungipicus moluccensis</i>	Sunda Pygmy Woodpecker	Least Concern	Least Concern	No	Abundant	Resident breeder	No	Yes	J1002 JRL EIA	Medium (3)
72	Bird	Picidae	<i>Chrysophlegma miniaceum</i>	Banded Woodpecker	Least Concern	Least Concern	No	Uncommon	Resident breeder	No	Yes	J1002 JRL EIA	Medium (3)
73	Bird	Laniidae	<i>Lanius tigrinus</i>	Tiger Shrike	Least Concern	Near Threatened	No	Common	Winter visitor	No	Yes	J1002 JRL EIA	Medium (3)
74	Bird	Hirundinidae	<i>Hirundo tahitica</i>	Pacific Swallow	Least Concern	Least Concern	No	Abundant	Resident breeder	No	Yes	J1002 JRL EIA	Medium (3)
75	Bird	Phylloscopidae	<i>Phylloscopus borealis</i>	Arctic Warbler	Least Concern	Least Concern	No	Abundant	Winter visitor	No	Yes	J1002 JRL EIA	Medium (3)
76	Bird	Cisticolidae	<i>Prinia flaviventris</i>	Yellow-bellied Prinia	Least Concern	Near Threatened	No	Common	Resident breeder	No	Yes	J1002 JRL EIA	Medium (3)
77	Bird	Cisticolidae	<i>Orthotomus sutorius</i>	Common Tailorbird	Least Concern	Least Concern	No	Abundant	Resident breeder	No	Yes	J1002 JRL EIA	Medium (3)
78	Bird	Cisticolidae	<i>Orthotomus sericeus</i>	Rufous-tailed Tailorbird	Least Concern	Near Threatened	No	Uncommon	Resident breeder	No	Yes	J1002 JRL EIA	Medium (3)
79	Bird	Cisticolidae	<i>Orthotomus ruficeps</i>	Ashy Tailorbird	Least Concern	Least Concern	No	Common	Resident breeder	No	Yes	J1002 JRL EIA	Medium (3)
80	Bird	Monarchidae	<i>Muscicapa dauurica</i>	Asian Brown Flycatcher	Least Concern	Least Concern	No	Abundant	Winter visitor	No	Yes	J1002 JRL EIA	Medium (3)
81	Bird	Muscicapidae	<i>Ficedula zanthopygia</i>	Yellow-rumped Flycatcher	Least Concern	Least Concern	No	Common	Winter visitor	No	Yes	J1002 JRL EIA	Medium (3)
82	Bird	Nectariniidae	<i>Aethopyga siparaja</i>	Crimson Sunbird	Least Concern	Least Concern	No	Uncommon	Resident breeder	No	Yes	J1002 JRL EIA	Medium (3)
83	Bird	Estrildidae	<i>Lonchura punctulata</i>	Scaly-breasted Munia	Least Concern	Least Concern	No	Common	Resident breeder	No	Yes	J1002 JRL EIA	Medium (3)
84	Bird	Motacillidae	<i>Dendronanthus indicus</i>	Forest Wagtail	Least Concern	Least Concern	No	Uncommon	Winter visitor	No	Yes	J1002 JRL EIA	Medium (3)
85	Bird	Zosteropidae	<i>Zosterops palpebrosus</i>	Oriental White-eye	Least Concern	NA	No			No	Yes	J1002 JRL EIA	
86	Bird	Columbidae	<i>Spilopelia chinensis</i>	Spotted Dove	Least Concern	Least Concern	No	Abundant	Resident breeder	No	Yes	J1002 JRL EIA	Medium (3)
87	Bird	Psittaculidae	<i>Psittacula krameri</i>	Rose-ringed Parakeet	Least Concern	NA	No	Common	Introduced resident breeder	No	Yes	J1002 JRL EIA	Low (2)

No.	Type	Family	Scientific Name	Common Name	Global Status	National Status	Species of Conservation Significance	Distribution/Rarity	Native Status	Recorded in Present Surveys	Historical Observations	Source for Historical Observation	Ecological Value (Importance Score)
1	Frog	Dic平glossidae	<i>Fejervarya cancrivora</i>	Crab-eating frog	Least Concern	Least Concern	No	Ubiquitous and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
2	Frog	Dic平glossidae	<i>Limnonectes blythii</i>	Malayan giant frog	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
3	Frog	Eleutherodactylidae	<i>Eleutherodactylus planirostris</i>	Greenhouse frog	Least Concern	NA	No	Widespread and Common	Non-native	Yes	Yes	KJE Vehicular Interchange EIA	Low (2)
4	Frog	Microhylidae	<i>Microhyla butleri</i>	Painted chorus frog	Least Concern	Least Concern	No	Ubiquitous and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
5	Frog	Microhylidae	<i>Microhyla heymonsi</i>	Dark-sided chorus frog	Least Concern	Least Concern	No	Ubiquitous and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
6	Frog	Microhylidae	<i>Microhyla mukhlesuri</i>	Mukhlesur's chorus frog	Not Listed	NA	No	Ubiquitous and Common	Non-native	Yes	Yes	KJE Vehicular Interchange EIA	Low (2)
7	Frog	Ranidae	<i>Sylvirana guentheri</i>	Guenther's frog	Least Concern	NA	No	Widespread but Uncommon	Non-native	Yes	Yes	KJE Vehicular Interchange EIA	Low (2)
8	Frog	Rhacophoridae	<i>Polypedates leucomystax</i>	Four-lined tree frog	Least Concern	Least Concern	No	Ubiquitous and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
9	Toad	Bufo平idae	<i>Duttaphrynus bengalensis</i>	Bengal toad	Not Listed	NA	No	Ubiquitous and Common	Non-native	Yes	Yes	KJE Vehicular Interchange EIA	Low (2)
10	Frog	Dic平glossidae	<i>Fejervarya limnocharis</i>	Field Frog	Least Concern	Least Concern	No		Native	No	Yes	J1002 JRL EIA	Medium (3)
11	Frog	Microhylidae	<i>Kaloula pulchra</i>	Banded Bull Frog	Least Concern	NA	No		Non-native	No	Yes	J1002 JRL EIA	Low (2)

No.	Type	Family	Scientific Name	Common Name	Global Status	National Status	Species of Conservation Significance	Distribution/Rarity	Native Status	Recorded in Present Surveys	Historical Observation	Source for Historical Observation	Ecological Value (Importance Score)
1	Non-marine lizard	Agamidae	<i>Bronchocela cristatella</i>	Green crested lizard	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
2	Non-marine lizard	Scincidae	<i>Eutropis multifasciata</i>	Many-lined sun skink	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
3	Non-marine lizard	Scincidae	<i>Subdoluseps bowringii</i>	Supple skink	Least Concern	Least Concern	No	Ubiquitous and Common	Native	Yes	No	NA	Medium (3)
4	Non-marine lizard	Varanidae	<i>Varanus salvator</i>	Water monitor	Least Concern / CITES protected (Appendix II)	Least Concern	No	Ubiquitous and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
5	Non-marine snake	Colubridae (Ahaetullinae)	<i>Dendrelaphis caudolineatus</i>	Striped bronzeback	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
6	Non-marine snake	Colubridae (Ahaetullinae)	<i>Dendrelaphis pictus</i>	Painted bronzeback	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
7	Non-marine snake	Colubridae (Sibynophiinae)	<i>Sibynophis melanocephalus</i>	Black-headed collared snake	Least Concern	Vulnerable	Yes	Wide-ranging but Uncommon	Native	No	Yes	Camphora's unpublished data	High (4)
8	Non-marine snake	Cylindrophiidae	<i>Cylindrophis ruffus</i>	Red-tailed pipe snake	Least Concern	Vulnerable	Yes	Widespread but Rare	Native	No	Yes	Camphora's unpublished data	High (4)
9	Non-marine snake	Elapidae	<i>Ophiophagus hannah</i>	King cobra	Vulnerable / CITES protected (Appendix II)	Vulnerable	Yes	Restricted and Rare	Native	No	Yes	Camphora's unpublished data	High (4)
10	Non-marine snake	Pythonidae	<i>Malayopython reticulatus</i>	Reticulated python	Least Concern / CITES protected (Appendix II)	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
11	Non-marine turtle	Emydidae	<i>Trachemys scripta</i>	Red-eared slider	Least Concern	NA	No	Ubiquitous and Common	Non-native	Yes	Yes	Tengah South EIS Report	Low (2)
12	Non-marine turtle	Geomydidae	<i>Cuora couro</i>	Malayan box terrapin	Endangered / CITES protected (Appendix II)	Near Threatened	No	Wide-ranging and Common	Native	No	Yes	KJE Vehicular Interchange EIA	High (4)
13	Non-marine turtle	Geomydidae	<i>Heosemys grandis</i>	Giant asian pond turtle	Critically Endangered / CITES protected (Appendix II)	NA	No	Wide-ranging but Uncommon	Non-native	Yes	Yes	KJE Vehicular Interchange EIA	Low (2)
14	Non-marine turtle	Trionychidae	<i>Amyda cartilaginea</i>	Asian softshell turtle	Vulnerable / CITES protected (Appendix II)	Vulnerable	Yes	Restricted and Uncommon	Native	No	Yes	Tengah South EIS Report	High (4)
15	Non-marine lizard	Gekkonidae	<i>Cosymbotus platyurus</i>	Flat-tailed Gecko	Least Concern	Least Concern	No		Native	No	Yes	J1002 JRL EIA	Medium (3)
16	Non-marine lizard	Gekkonidae	<i>Gekko monarchus</i>	Spotted House Gecko	Least Concern	Least Concern	No		Native	No	Yes	J1002 JRL EIA	Medium (3)
17	Non-marine lizard	Gekkonidae	<i>Hemidactylus frenatus</i>	Common House Gecko	Least Concern	Least Concern	No		Native	No	Yes	J1002 JRL EIA	Medium (3)
18	Non-marine snake	Colubridae	<i>Ahaetulla prasina prasina</i>	Oriental Whip Snake	Least Concern	Least Concern	No		Native	No	Yes	J1002 JRL EIA	Medium (3)
19	Non-marine snake	Colubridae	<i>Oligodon octolineatus</i>	Striped Kukri Snake	Least Concern	Least Concern	No		Native	No	Yes	J1002 JRL EIA	Medium (3)
20	Marine snake	Homalopsidae	<i>Homalopsis buccata</i>	Puff-faced Water Snake	Least Concern	Vulnerable	Yes		Native	No	Yes	J1002 JRL EIA	High (4)
21	Non-marine snake	Elapidae	<i>Naja sumatrana</i>	Equatorial Spitting Cobra	Least Concern	Least Concern	No		Native	No	Yes	J1002 JRL EIA	Medium (3)
22	Non-marine lizard	Agamidae	<i>Calotes versicolor</i>	Changeable Lizard	Least Concern	NA	No		Non-native	No	Yes	J1002 JRL EIA	Low (2)
23	Non-marine lizard	Gekkonidae	<i>Hemidactylus brookii</i>	Brook's House Gecko	Least Concern	NA	No		Non-native	No	Yes	J1002 JRL EIA	Low (2)

No.	Family	Scientific Name	Common Name	Global Status	National Status	Species of Conservation Significance	Distribution/Rarity	Native Status	Recorded in Present Surveys	Historical Observation	Source for Historical Observation	Ecological Value (Importance Score)
1	Cercopithecidae	<i>Macaca fascicularis</i>	Long-tailed macaque	Endangered / CITES protected (Appendix II)	Least Concern	Yes	Widespread and Common	Native	Yes	Yes	Tengah North EIS Report	High (4)
2	Felidae	<i>Prionailurus bengalensis</i>	Leopard cat	Least Concern / CITES protected (Appendix I)	Critically Endangered	Yes	Restricted and Rare	Native	No	Yes	KJE Vehicular Interchange EIA	High (4)
3	Manidae	<i>Manis javanica</i>	Sunda pangolin	Critically Endangered / CITES protected (Appendix I)	Critically Endangered	Yes	Widespread but Rare	Native	No	Yes	KJE Vehicular Interchange EIA	High (4)
4	Muridae	<i>Rattus tiomanicus</i>	Malaysian wood rat	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	KJE Vehicular Interchange EIA	Medium (3)
5	Mustelidae	<i>Lutrogale perspicillata</i>	Smooth-coated otter	Vulnerable / CITES protected (Appendix I)	Endangered	Yes	Widespread but Rare	Native	No	Yes	KJE Vehicular Interchange EIA	High (4)
6	Sciuridae	<i>Callosciurus notatus</i>	Plantain squirrel	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
7	Tupaiidae	<i>Tupaia glis</i>	Common treeshrew	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
8	Viverridae	<i>Paradoxurus musangus</i>	Sumatran palm civet	Least Concern	Least Concern	No	Widespread but Uncommon	Native	Yes	Yes	Tengah South EIS Report	Medium (3)

No.	Family	Scientific Name	Common Name	Global Status	National Status	Species of Conservation Significance	Distribution/Rarity	Native Status	Recorded in Present Surveys	Historical Observation	Source for Historical Observation	Ecological Value (Importance Score)
1	Emballonuridae	<i>Saccopteryx saccolaimus</i>	Pouch tomb bat	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah South EIS Report	Medium (3)
2	Emballonuridae	<i>Taphozous melanopogon</i>	Black-bearded tomb bat	Least Concern	Least Concern	No	Widespread but Rare	Native	Yes	Yes	Tengah North EIS Report	Medium (3)
3	Pteropodidae	<i>Cynopterus brachyotis</i>	Lesser short-nosed fruit bat	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah North EIS Report	Medium (3)
4	Vespertilionidae	<i>Scotophilus kuhlii</i>	Lesser Asian house bat	Least Concern	Least Concern	No	Widespread and Common	Native	Yes	Yes	Tengah North EIS Report	Medium (3)

No.	Taxon	Scientific Name	Common Name	Source
1	Butterfly	<i>Mooreana trichoneura trichoneura</i>	Yellow flat	iNaturalist (2024) Observations: yellow flat. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=503375
2	Butterfly	<i>Pemara pugnans</i>	Pugnacious lancer	iNaturalist (2024) Observations: pugnacious lancer. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=429775
3	Bird	<i>Elanus caeruleus</i>	Black-winged kite	iNaturalist (2024) Observations: black-winged kite. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=5275
4	Bird	<i>Milvus migrans</i>	Black kite	iNaturalist (2024) Observations: black kite. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=5268
5	Bird	<i>Halcyon coromanda</i>	Ruddy kingfisher	iNaturalist (2024) Observations: ruddy kingfisher. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=2317
6	Bird	<i>Apus nipalensis</i>	House swift	iNaturalist (2024) Observations: house swift. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=6633
7	Bird	<i>Ardea purpurea</i>	Purple heron	Arcadis (2021) Proposed 1600/1200 MM diameter outlet potable water pipelines from Nanyang Service Reservoir to Pan Island Expressway. https://www.pub.gov.sg/-/media/PUB/PDF/NYSR.pdf
8	Bird	<i>Ixobrychus cinnamomeus</i>	Cinnamon bittern	iNaturalist (2024) Observations: cinnamon bittern. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=5007
9	Bird	<i>Cisticola juncidis</i>	Zitting cisticola	iNaturalist (2024) Observations: zitting cisticola. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=7697
10	Bird	<i>Ptilinopus jambu</i>	Jambu fruit dove	iNaturalist (2024) Observations: jambu fruit dove. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=2788

No.	Taxon	Scientific Name	Common Name	Source
11	Bird	<i>Treron curvirostra</i>	Thick-billed green pigeon	iNaturalist (2024) Observations: thick-billed green pigeon. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=3358
12	Bird	<i>Motacilla tschutschensis</i>	Eastern yellow wagtail	iNaturalist (2024) Observations: eastern yellow wagtail. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=145207
13	Bird	<i>Gallicrex cinerea</i>	Watercock	iNaturalist (2024) Observations: watercock. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=535
14	Bird	<i>Gallinula chloropus</i>	Common moorhen	iNaturalist (2024) Observations: common moorhen. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=201282
15	Bird	<i>Zapornia pusilla</i>	Baillon's crake	iNaturalist (2024) Observations: Baillon's crake. https://www.inaturalist.org/observations?place_id=6734&subview=map&taxon_id=508920

C Air Quality

TEST REPORT

Our Reference No. : **R237968** Date of Monitoring : 12/09/23 to 26/09/23
Project Code / Ref. : 61803268 Date Reported : 03/10/23

Customer Ref. No. : 6159746
Customer Name : DHI Water & Environment (S) Pte Ltd
Customer Address : 2 Venture Drive
#18-18 Vision Exchange
Singapore 608526

Attention To : Ms Vera Lim Shi Han

Subject : Baseline Air Quality Monitoring for Tengah

Description : Baseline Air Quality Monitoring for 2 locations, 1 week each



Toh Teck Yeow
Snr Manager, Env Services

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SCOPE OF WORK

Baseline Ambient Air Monitoring was carried out at total 2 locations over a period of 14 days.

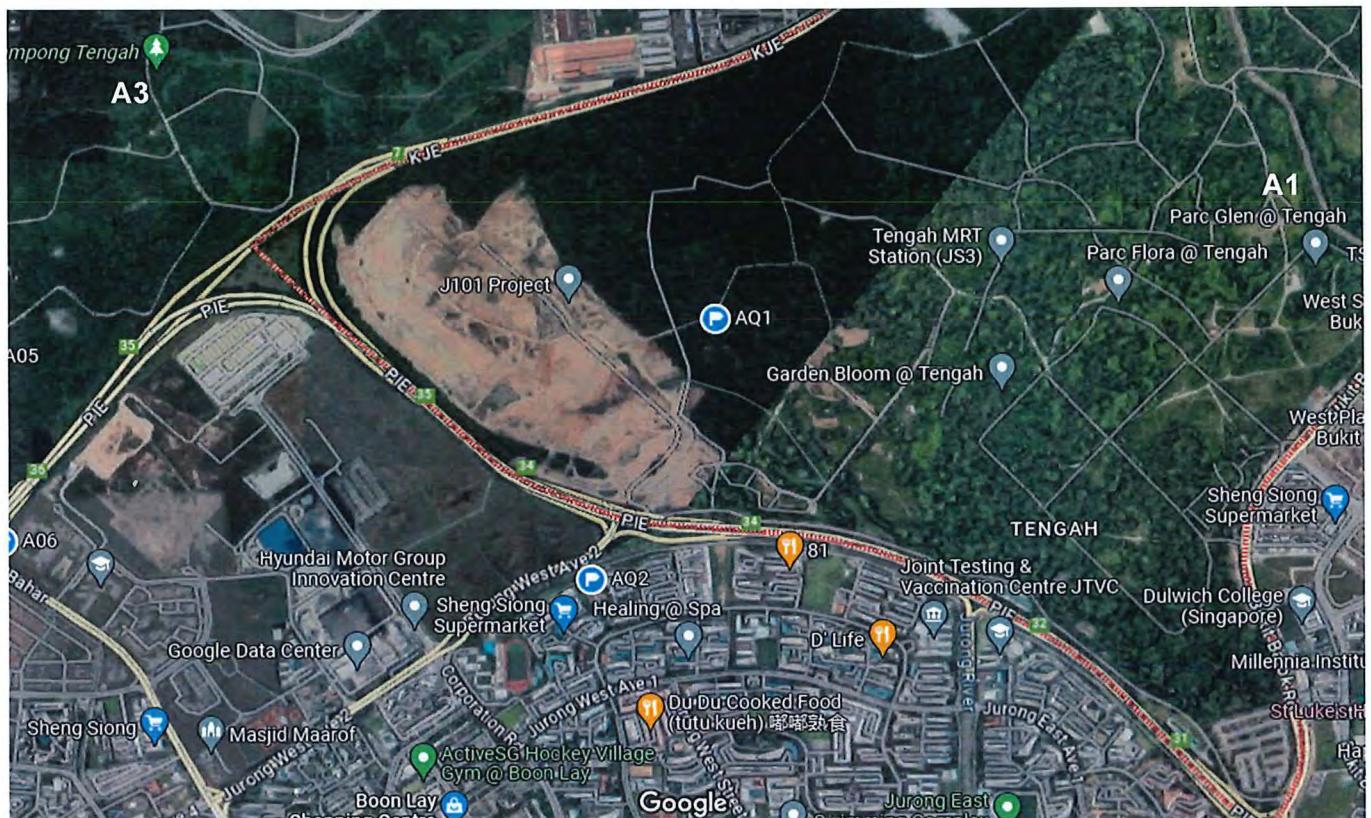
Table 1: Scope of work carried out

Location ID	Monitoring Period	Parameters	Measurement Range	Data Logging Interval	GPS Coordinates	
AQ1	12/09/23 To 18/09/23	PM ₁₀	0 to 10000 µg/m ³	10-min Avg	N 01°21'44.0" E 103°43'13.7"	
		PM _{2.5}	0 to 2000 µg/m ³			
		SO ₂	0 to 10000 ppb	5-min Avg		
		CO	0 to 12000 ppb			
		NO ₂	0 to 5000 ppb			
		O ₃	0 to 2000 ppb			
AQ2	20/09/23 To 26/09/23	PM ₁₀	0 to 10000 µg/m ³	10-min Avg	N 01°21'15.0" E 103°43'00.2"	
		PM _{2.5}	0 to 2000 µg/m ³			
		SO ₂	0 to 10000 ppb	5-min Avg		
		CO	0 to 12000 ppb			
		NO ₂	0 to 5000 ppb			
		O ₃	0 to 2000 ppb			



MONITORING LOCATIONS

The monitoring locations are shown in the Google Earth image below. Refer to Appendix B for deployment photos.



SAMPLING METHODOLOGY AND EQUIPMENT

PM10, PM2.5, SO₂, CO, O₃ and NO₂

SO₂, CO, O₃ and NO₂ were monitored using Kunak AIR Pro Air Quality Monitoring Station (Serial No: 0323230213). The weatherproof monitoring system was solar powered and consists of an Optical Particle Counter (Serial No: 177380709) capable of measuring particles from 0.3 µm up to 40 µm. PM1, PM2.5, PM4, PM10, Total Suspended Particles (TSP) while the electrochemical sensors for all 4 pollutants (Serial Numbers for SO₂: 3523120045, CO: 3023070042, O₃: 3323190104, NO₂: 3223160088), provides real time concentration readings accessible online. This instrument model is UKAS M-CERTS certified (certificate number: CSA MC230418/00).

Data logging were at 10-minute intervals for particulate matter and 5-minute for the 4 gas pollutants. The hourly and 24-hour daily averages were computed based on the averaging data obtained and the results were compared against the Singapore Ambient Air Quality Targets. Equipment calibration certificates are attached in Appendix A of this report.

SINGAPORE AMBIENT AIR QUALITY TARGETS

Table 2: The following table summarises the Singapore Ambient Air Quality Guidelines

Pollutant	Singapore Long Term Targets
Particulate Matter (PM _{2.5})	24-hour mean: 25 µg/m³
Particulate Matter (PM ₁₀)	24-hour mean: 50 µg/m³
Sulphur Dioxide (SO ₂)	24-hour mean: 20 µg/m³
Carbon Monoxide (CO)	8-hour mean: 10 mg/m³
	1-hour mean: 30 mg/m³
Nitrogen Dioxide (NO ₂)	1-hour mean: 200 µg/m³
Ozone (O ₃)	8-hour mean: 100 µg/m³



MONITORING RESULTS

The results for the various parameters monitored were summarised in the following tables. Raw Data are submitted electronically.

Table 3: Summary of 24-hour mean for PM₁₀, PM_{2.5} and SO₂ for AQ1

Pollutants	PM ₁₀	PM _{2.5}	SO ₂
Averaging Period	24 hours		
Unit	µg/m ³		
24-hr mean Pollutant concentrations for each day	12-Sep-23	21.3	16.7
	13-Sep-23	11.8	8.1
	14-Sep-23	13.5	9.7
	15-Sep-23	16.5	11.3
	16-Sep-23	19.5	< 8
	17-Sep-23	15.5	< 8
	18-Sep-23	14.4	27.19
Singapore's Ambient Air Quality Long Term Targets	50	25	20

Table 4: Summary of Maximum Pollutant Concentrations (CO, NO₂ and O₃) for AQ1

Pollutants	CO	CO	NO ₂	O ₃
Averaging Period	1 hour	8 hours	1 hour	8 hours
Unit	mg/m ³			µg/m ³
Maximum Pollutant concentrations for each day	12-Sep-23	0.58	0.40	19.36
	13-Sep-23	0.30	0.29	11.79
	14-Sep-23	0.35	0.31	13.93
	15-Sep-23	0.33	0.31	14.33
	16-Sep-23	0.33	0.32	17.71
	17-Sep-23	0.46	0.36	5.64
	18-Sep-23	0.61	0.42	31.58
Singapore's Ambient Air Quality Long Term Targets	30	10	200	100



Ref: R237968

Table 5: Summary of 24-hour mean for PM₁₀, PM_{2.5} and SO₂ for AQ2

Pollutants		PM ₁₀	PM _{2.5}	SO ₂
Averaging Period		24 hours		
Unit		µg/m ³		
24-hr mean Pollutant concentrations for each day	20-Sep-23	14.8	11.6	24.22
	21-Sep-23	14.6	10.3	62.88
	22-Sep-23	11.1	4.7	63.28
	23-Sep-23	20.5	15.3	66.59
	24-Sep-23	21.2	17.3	30.85
	25-Sep-23	19.9	16.4	57.05
	26-Sep-23	20.9	16.5	89.32
Singapore's Ambient Air Quality Long Term Targets		50	25	20

Table 6: Summary of Maximum Pollutant Concentrations (CO, NO₂ and O₃) for AQ2

Pollutants	CO	CO	NO ₂	O ₃
Averaging Period	1 hour	8 hours	1 hour	8 hours
Unit	mg/m ³		µg/m ³	
Maximum Pollutant concentrations for each day	20-Sep-23	1.05	0.74	71.74
	21-Sep-23	0.83	0.65	53.54
	22-Sep-23	0.63	0.41	65.12
	23-Sep-23	0.84	0.66	66.1
	24-Sep-23	0.95	0.81	49.67
	25-Sep-23	0.79	0.56	42.83
	26-Sep-23	0.63	0.51	51.64
Singapore's Ambient Air Quality Long Term Targets		30	10	200
				100



MCERTS Certificate for Kunak AIR Pro

Environment
Agency

PRODUCT CONFORMITY CERTIFICATE

This is to certify that the

Kunak AIR Pro

Manufactured by:

Kunak Technologies SL
*Parque Empresarial La Muga, 9
 Floor 4, Office 1 – Orcoyen
 Navarra
 Spain*

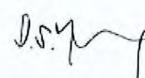
has been assessed by CSA Group
 and for the conditions stated on this certificate complies with:

MCERTS Performance Standards for Indicative Ambient Particulate Monitors, Environment Agency, August 2017, version 4

Certification ranges:

PM_{2.5} 0-1,500 µg/m³
 PM₁₀ 0-2,000 µg/m³

Project No.: 80150788
 Certificate No: CSA MC230418/00
 Initial Certification: 9 June 2023
 This Certificate issued: 9 June 2023
 Renewal Date: 8 June 2028


 Andrew Young
 Environmental Team Manager

MCERTS is operated on behalf of the Environment Agency by

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Approved Site Application

Any potential user should make sure, in consultation with the manufacturer, that the monitoring system is suitable for the intended application. For general guidance on monitoring techniques refer to the Environment Agency guidance available at www.mcerts.net

The indicative dust monitoring analyser(s) can be operated in one of two ways:

For qualitative measurements: Providing qualitative measurement data for the analysis of particulate pollution trends, and source identification studies based for example on pollution roses etc. Such application can rely on instrument factory calibration only.

For quantitative measurements: Providing measurement data with the uncertainty defined for indicative instruments (+/- 50%). This can be achieved on condition that each instrument used for measurement has been calibrated on the specific site where monitoring is taking place against a standard reference method for a period of two weeks and the resulting slope and intercept have been used for instrument calibration. Using non-standard filters and procedures for this purpose is not acceptable. To maintain the validity of data this calibration has to be repeated at least every twelve months or when the instrument is moved to a different site.

They **cannot** be used on national automatic monitoring networks for compliance reporting against the Ambient Air Quality Directives.

The field tests were carried out from the 1 April 2022 to the 7 February 2023 on two candidate 'Kunak AIR Pro' samplers, collocated with a Palas Fidas 200 (the reference method). The location of the field test was University of Manchester, Fallowfield, Manchester, UK. The serial numbers of the two 'Kunak AIR Pro' monitors were '0321 180036' and '0321 180037'.

Basis of Certification

This certification is based on the following test report(s) and on CSA Group's assessment and ongoing surveillance of the product and the manufacturing process:

Bureau Veritas, test report ref. AIR17810339, dated June 2023, "Kunak, Test of the Air Pro for use as an Indicative Monitor for PM₁₀ and PM_{2.5}"

Certificate No: CSA MC230418/00
 This Certificate issued: 9 June 2023

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Product Certified

The 'Kunak AIR Pro' measuring system consists of the following parts:

- Base Station includes data storage with eSIM cellular communications.
- Power Pack embedded in the base station.
- Particulate sensor cartridge to measure PM_{2.5} and PM₁₀.
- Solar protected shield.

Sensor type and firmware version

Alphasense OPC-N3 with firmware version 1.32.DT

Algorithm Version (note 5.)

KAIR_OP CN3_31

The particle firmware - Senor type OPC-N3 firmware version 1.17a.B with algorithm version KAIR_OP CN3_30.

This certificate applies to all instruments fitted with serial number 0321 180037 onwards.

Certificate No:
This Certificate issued:

CSA MC230418/00
9 June 2023

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Certified Performance

Test (<i>Laboratory</i>)	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Constancy of the sample volumetric flow					Not applicable Note 1	To remain constant within ± 3%
Tightness of the sampling system			1.44%			Leakage not to exceed 2% of sampled volume

Certificate No: CSA MC230418/00
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Test (Field)	Results expressed as % of the certification range				Other results	MCERTS specification
	<0.5	<1	<2	<5		
Intra-instrument uncertainty for the reference method						
PM ₁₀					0.33µg/m ³	≤2.5µg/m ³
PM _{2.5}					0.25µg/m ³	≤2.5µg/m ³
Intra-instrument uncertainty for the candidate method						
PM ₁₀					1.74µg/m ³ 2.47µg/m ³ 1.74µg/m ³	≤5µg/m ³ for all data as well as for the subsets: < or ≥ 30 µg/m ³
All data (n=306) ≥ 30 µg/m ³ (n=4) < 30 µg/m ³ (n=302)						
PM _{2.5}					0.81µg/m ³ 1.64µg/m ³ 0.75µg/m ³	≤5µg/m ³ for all data as well as for the subsets: < or ≥ 30 µg/m ³
All data (n=306) ≥ 18 µg/m ³ (n=14) < 18 µg/m ³ (n=292)						
Highest resulting uncertainty estimate comparison against data quality objective (Measurement Uncertainty)						
PM ₁₀					81.1% 12.2% (note 2) 46.6%	W _{CM} ≤50% W _{CM} ≤ W _{dpe} (W _{dpe} Measurement uncertainty defined as 50% for indicative instruments)
All data (n=306) All data (slope corrected) (n=306) ≥ 30 µg/m ³ (slope corrected) (n=4)						
PM _{2.5}					67.0% 10.6% (note 3) 40.9% (note 3)	
All data (n=306) All data (slope corrected) (n=306) ≥ 18 µg/m ³ (slope corrected) (n=14)						
Maintenance Interval					44 weeks Note 4	≥2 weeks

Note 1 - The Kunak AIR Pro utilises a fan and not a pump, therefore it was agreed that this test was not applicable.

Note 2 - This data was slope corrected by dividing by 0.596. All users must slope correct PM₁₀ data by dividing by 0.596 - It is recommended that the manufacturer program this value into their algorithm in order to avoid confusion to end users. End users should check with the manufacturers that this has been carried out.

Note 3 - This data was slope corrected by dividing by 0.667. All users must slope correct PM_{2.5} data by dividing by 0.667 - It is recommended that the manufacturer program this value into their algorithm in order to avoid confusion to end users. End users should check with the manufacturers that this has been carried out.

Note 4 - Maintenance - the manufacturer recommends that users clean the PM inlet if it becomes dirty. If a problem arises, such as sensor malfunction or obstruction, then the software will detect it automatically and will invalidate the measurements and advise the user to carry out specific maintenance. It is further recommended to change the PM sensor after 2 years operation.

Note 5 - The Kunak AIR Pro must be set up using the configuration, as follows; i) Alphasense OPC-N3 sensor with firmware version '1.32.DT', and ii) Algorithm version: KAIR_OP CN3_31. The firmware version incorporates slope correction – firmware version '31' is approved and no slope correction required.

Certificate No: CSA MC230418/00
This Certificate issued: 9 June 2023

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Description

The Kunak AIR Pro has a particulate matter sensor that consists of an optical particle counter (OPC) capable of measuring particles from 0.3µm up to 40µm. PM_{2.5} and PM₁₀ are calculated assuming a particle density profile.

The effect of humidity is corrected using the embedded algorithm. The particle size distributions are available on Kunak Cloud.

The Kunak AIR Pro communicates using GPRS, 3G, 4G, ethernet and Modbus RTE Slave. Secure encryption and direct communication protocols, results in bi-directional communications and facilitates remote configuration, firmware update and sensor calibration of the devices through the Kunak Cloud web platform.

Kunak AIR Pro is equipped with an internal rechargeable battery. The battery can be powered either through a small solar panel to facilitate the installation of the device or by an outdoor charger to via the main network.

General Notes

1. This certificate is based upon the equipment tested. The Manufacturer is responsible for ensuring that on-going production complies with the standard(s) and performance criteria defined in this certificate. The manufacturer is required to maintain an approved quality management system controlling the manufacture of the certified product. Both the product and the quality management system shall be subject to regular surveillance according to 'Regulations Applicable to the Holders of CSA Group Testing UK Ltd Certificates'.
2. The design of the product certified is defined in the CSA Group design schedule V00 for certificate no. CSA MC230418/00.
3. If a certified product is found not to comply, CSA Group should be notified immediately at the address shown on this certificate.
4. The certification marks that can be applied to the product or used in publicity material are defined in 'Regulations Applicable to the Holders of CSA Group Testing UK Ltd Certificates'.
5. This document remains the property of CSA Group and shall be returned when requested by CSA Group.

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Calibration Certificates for gas sensors

Characterization and Calibration Certificate



CHARACTERIZATION AND CALIBRATION CERTIFICATE

KUNAK TECHNOLOGIES S.L., as manufacturer of the product, certifies that the cartridge meets the internal manufacturing quality conditions, as well as the laboratory tests and the correct calibration of the cartridges according to the QA&QC proceedings.

Cartridges are tested according to the laboratory pre-test specified in CEN/TS 17660-1:2021 "Air quality - Performance evaluation of air quality sensor systems - Part 1: Gaseous pollutants in ambient air", regarding the Response Time (t90), Limit of Detection (LOD) and Repeatability (Rep).

CERTIFIED CARTRIDGE

Cartridge type: Sulphur dioxide (SO ₂)	Manufacture Date: 2023-06-19
P/N: K-SO2-A-01	Expiry Date: 2025-08-20
S/N: 3523120045	

TEST 1: ENVIRONMENTAL CHARACTERIZATION TEST

Typical baseline error in the whole temperature (<40°C) and humidity range.

Test	Cartridge S/N	Test results	Kunak requirement	STATUS
Environmental characterization	3523120045	11.00 ppb	< 15 ppb	PASS

TEST 2: LABORATORY TEST

The Response Time, the Limit of Detection and the Repeatability of the cartridge are calculated using certified gas bottles according to the CEN/TS 17660-1:2021.

- **Response Time:** The response time of the sensor systems is estimated using t90 (the time required for the sensor system to reach 90% of the final stable value).
- **Limit of Detection:** Value of the measured quantity that gives the probability of falsely asserting the absence or presence of a component.
- **Repeatability:** closeness of the agreement between the results of successive measurements of the same measure and carried out under the same conditions of measurement.

Test	Cartridge S/N	Kunak requirement	TS 17660-1:2021 requirement	STATUS
Response Time	3523120045	< 120 s	< 360 s	PASS
Limit of Detection	3523120045	< 3 ppb	< 10 ppb	PASS
Repeatability	3523120045	< 4 ppb	< 4 ppb	PASS

REMARKS

The results indicated refer exclusively to the cartridge subjected to the characterization and laboratory tests and described in this certificate.

Signature:

KUNAK TECHNOLOGIES, S.L.
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CHARACTERIZATION AND CALIBRATION CERTIFICATE

KUNAK TECHNOLOGIES S.L., as manufacturer of the product, certifies that the cartridge meets the internal manufacturing quality conditions, as well as the laboratory tests and the correct calibration of the cartridges according to the QA&QC proceedings.

Cartridges are tested according to the laboratory pre-test specified in CEN/TS 17660-1:2021 "Air quality - Performance evaluation of air quality sensor systems - Part 1: Gaseous pollutants in ambient air", regarding the Response Time (t_{90}), Limit of Detection (LOD) and Repeatability (Rep).

CERTIFIED CARTRIDGE

Cartridge type:	Carbon monoxide (CO)	Manufacture Date:	2023-06-19
P/N:	K-CO-A-01	Expiry Date:	2025-08-20
S/N:	3023070042		

TEST 1: ENVIRONMENTAL CHARACTERIZATION TEST

Environmental characterization test - not required for Carbon monoxide (CO) cartridges.

TEST 2: LABORATORY TEST

The Response Time, the Limit of Detection and the Repeatability of the cartridge are calculated using certified gas bottles according to the CEN/TS 17660-1:2021.

- Response Time:** The response time of the sensor systems is estimated using t_{90} (the time required for the sensor system to reach 90% of the final stable value).
- Limit of Detection:** Value of the measured quantity that gives the probability of falsely asserting the absence or presence of a component.
- Repeatability:** closeness of the agreement between the results of successive measurements of the same measure and carried out under the same conditions of measurement.

Test	Cartridge S/N	Kunak requirement	TS 17660-1:2021 requirement	STATUS
Response Time	3023070042	< 30 s	< 360 s	PASS
Limit of Detection	3023070042	< 10 ppb	< 150 ppb	PASS
Repeatability	3023070042	< 20 ppb	< 50 ppb	PASS

REMARKS

The results indicated refer exclusively to the cartridge subjected to the characterization and laboratory tests and described in this certificate.

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Cartridges are tested according to the laboratory pre-test specified in CEN/TS 17660-1:2021 "Air quality - Performance evaluation of air quality sensor systems - Part 1: Gaseous pollutants in ambient air", regarding the Response Time (t90), Limit of Detection (LOD) and Repeatability (Rep).

CERTIFIED CARTRIDGE

Cartridge type: Ozone (O3)	Manufacture Date: 2023-06-19
P/N: K-O3-A-01	Expiry Date: 2025-08-20
S/N: 3323190104	

TEST 1: ENVIRONMENTAL CHARACTERIZATION TEST

Typical baseline error in the whole temperature (<40°C) and humidity range.

Test	Cartridge S/N	Test results	Kunak requirement	STATUS
Environmental characterization	3323190104	4.46 ppb	< 7.5 ppb	PASS

TEST 2: LABORATORY TEST

The Response Time, the Limit of Detection and the Repeatability of the cartridge are calculated using certified gas bottles according to the CEN/TS 17660-1:2021.

- Response Time:** The response time of the sensor systems is estimated using t90 (the time required for the sensor system to reach 90% of the final stable value).
- Limit of Detection:** Value of the measured quantity that gives the probability of falsely asserting the absence or presence of a component.
- Repeatability:** closeness of the agreement between the results of successive measurements of the same measure and carried out under the same conditions of measurement.

Test	Cartridge S/N	Kunak requirement	TS 17660-1:2021 requirement	STATUS
Response Time	3323190104	< 120 s	< 360 s	PASS
Limit of Detection	3323190104	< 3 ppb	< 10 ppb	PASS
Repeatability	3323190104	< 4 ppb	< 4 ppb	PASS

REMARKS

The results indicated refer exclusively to the cartridge subjected to the characterization and laboratory tests and described in this certificate.

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KUNAK TECHNOLOGIES S.L., as manufacturer of the product, certifies that the cartridge meets the internal manufacturing quality conditions, as well as the laboratory tests and the correct calibration of the cartridges according to the QA&QC proceedings.

Cartridges are tested according to the laboratory pre-test specified in CEN/TS 17660-1:2021 "Air quality - Performance evaluation of air quality sensor systems - Part 1: Gaseous pollutants in ambient air", regarding the Response Time (t90), Limit of Detection (LOD) and Repeatability (Rep).

CERTIFIED CARTRIDGE

Cartridge type: Nitrogen dioxide (NO2)	Manufacture Date: 2023-06-14
P/N: K-NO2-A-01	Expiry Date: 2025-08-20
S/N: 3223160088	

TEST 1: ENVIRONMENTAL CHARACTERIZATION TEST

Typical baseline error in the whole temperature (<40°C) and humidity range.

Test	Cartridge S/N	Test results	Kunak requirement	STATUS
Environmetal characterization	3223160088	5.19 ppb	< 16 ppb	PASS

TEST 2: LABORATORY TEST

The Response Time, the Limit of Detection and the Repeatability of the cartridge are calculated using certified gas bottles according to the CEN/TS 17660-1:2021.

- Response Time:** The response time of the sensor systems is estimated using t90 (the time required for the sensor system to reach 90% of the final stable value).
- Limit of Detection:** Value of the measured quantity that gives the probability of falsely asserting the absence or presence of a component.
- Repeatability:** closeness of the agreement between the results of successive measurements of the same measure and carried out under the same conditions of measurement.

Test	Cartridge S/N	Kunak requirement	TS 17660-1:2021 requirement	STATUS
Response Time	3223160088	< 120 s	< 360 s	PASS
Limit of Detection	3223160088	< 3 ppb	< 10 ppb	PASS
Repeatability	3223160088	< 4 ppb	< 4 ppb	PASS

REMARKS

The results indicated refer exclusively to the cartridge subjected to the characterization and laboratory tests and described in this certificate.

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Photos: Ambient Air Monitoring Station at AQ1 (12/09/23 to 18/09/23)



Photos: Ambient Air Monitoring Station at AQ2 (20/09/23 to 26/09/23)



D Noise

N1

Date	Day	Time	0	5	10	15	20	25	30	35	40	45	50	55	LAeq 1 hr	LAeq 12 hr
7/9/2023	1	0:00														
7/9/2023	1	1:00														
7/9/2023	1	2:00														
7/9/2023	1	3:00														
7/9/2023	1	4:00														
7/9/2023	1	5:00														
7/9/2023	1	6:00														
7/9/2023	1	7:00														
7/9/2023	1	8:00														
7/9/2023	1	9:00														
7/9/2023	1	10:00														
7/9/2023	1	11:00														
7/9/2023	1	12:00		67.7	57.2	51.7	51.9	52.7	52.1	51.6	51.2	51.4	51.2	51.4	58.5	
7/9/2023	1	13:00	50.9	51.4	51.8	51.7	52.3	51.7	52.2	52	50.8	49.4	49.9	50.9	51.3	
7/9/2023	1	14:00	53.6	51.6	53.5	53.7	52.7	52	52.6	52.2	51.5	52.7	50.9	51.7	52.5	
7/9/2023	1	15:00	52.2	51.8	51.7	53.3	53.1	52.4	52.4	54.1	53	52.1	53.3	51.5	52.6	
7/9/2023	1	16:00	51.4	51.3	52.1	52	52.1	51.3	51.1	50.8	52.8	53.9	52.1	52.2	52.0	
7/9/2023	1	17:00	50	51	52.2	52.8	52.7	51.4	50	50.2	51.2	52.1	52.4	51.9	51.6	
7/9/2023	1	18:00	51.6	51.8	51.1	51.9	51.7	52	50.9	52.5	51.6	50.8	51	50.9	51.5	
7/9/2023	1	19:00	52	54.1	52.5	53.5	55.7	57	57.6	58.4	58.5	58.4	58.5	58	56.8	
7/9/2023	1	20:00	57.9	57.9	57.6	58.6	58.1	58.1	58	58.5	58.3	58.9	58.2	58.6	58.2	
7/9/2023	1	21:00	59.5	58.7	59.7	59.5	59.9	60	60.2	59.9	59.6	60.4	59.3	60.5	59.8	
7/9/2023	1	22:00	61	61.8	60.6	58.7	60.7	60.5	60.4	59.2	60.1	59.8	58.9	59.9	60.2	
7/9/2023	1	23:00	58.6	58	58.3	57.4	56.5	55.7	55.2	55.7	55.8	56.1	56	56.4	56.8	
8/9/2023	2	0:00	56.1	56.7	56.7	55.9	55.2	55.9	55.9	56.3	55.8	54.8	56.9	55.4	56.0	
8/9/2023	2	1:00	55.3	55.3	54.7	54.5	54.8	55.3	55.4	55.3	55.4	55.1	54.7	54.5	55.0	
8/9/2023	2	2:00	54	53.8	53.9	53.5	53.6	53.5	53.8	53.2	54.1	54.2	54.6	54.9	53.9	
8/9/2023	2	3:00	55	54.6	54.5	53.8	53.9	53.9	53.9	53.9	54.6	54.3	53.7	53.2	54.1	
8/9/2023	2	4:00	54.3	54.2	56.1	58.6	55.2	54.7	54.9	55.2	54.1	53.6	53.8	54.5	55.2	
8/9/2023	2	5:00	53.3	53.4	53.9	54.2	54.1	54.3	53.8	53.8	52.2	53.7	53.7	52.4	53.6	
8/9/2023	2	6:00	52.7	53.1	53.2	53.2	52.8	52.9	52.4	52.2	52.8	52.6	53.7	52.9	52.9	
8/9/2023	2	7:00	52.2	52.4	52.5	53.8	52.3	54	53.2	53.1	53.4	52.9	53.1	52.8	53.0	
8/9/2023	2	8:00	53.1	58	53.8	51.9	52.8	53.2	53.7	53.4	53.1	53.7	55	52.7	54.0	
8/9/2023	2	9:00	56.4	55.8	54.4	54.2	54.3	54.4	55.1	56.1	54.5	52.8	53	53.4	54.7	
8/9/2023	2	10:00	54.3	53.3	52.5	53.7	53	53.9	54.5	53.6	54.1	55	52.9	53.6	53.8	
8/9/2023	2	11:00	54	53.5	52.3	52.1	51.2	51.9	51.1	51.8	51.2	49.2	51.8	52.2	52.0	
8/9/2023	2	12:00	53.1	52.8	52.7	52.3	52.4	52.8	52.8	51.2	50.9	50	51	50.6	52.0	
8/9/2023	2	13:00	51.5	51.6	49.1	52.1	52.2	54.5	54.2	54.7	53.9	52.4	53.7	52.9	53.0	
8/9/2023	2	14:00	50.8	52.4	54	52.4	52.7	53.1	51.9	51	51.5	51.6	53	53.5	52.4	
8/9/2023	2	15:00	54.7	55.3	54.4	55.1	54.5	54.1	53.7	52.9	54.4	55.6	55.5	53.9	54.6	
8/9/2023	2	16:00	52.2	51.8	51.8	52.6	53.3	53.6	55.8	55.5	54.4	55.1	54.8	54.4	54.0	
8/9/2023	2	17:00	54.9	53.1	52.1	52.2	51.8	52	51.4	51.9	52.2	53.1	52.1	52	52.5	
8/9/2023	2	18:00	52.7	51.8	51.9	50.3	50.7	52.3	51.4	53	51.8	51.9	52.8	52.9	52.0	
8/9/2023	2	19:00	52.8	53.7	52.9	52.9	51.9	52.5	52.2	52	52.6	52.4	53.2	53	52.7	
8/9/2023	2	20:00	53.4	53.7	53.9	53.8	54	54.2	53.6	53.3	54.7	54.5	55.6	54.4	54.1	

8/9/2023	2	21:00	54.5	54.5	54.3	54.9	55	55.5	55.2	54.7	54.5	54.7	54.2	55.5	54.8
8/9/2023	2	22:00	56	56.2	56.3	56.2	56.1	56.1	56.2	56.2	56.3	56.4	56.4	56.4	56.2
8/9/2023	2	23:00	56.3	56.4	55.9	56	56.1	55.9	56.3	56.3	56.9	57.3	57.4	57.2	56.5
9/9/2023	3	0:00	57.3	57	56.9	56.9	56.9	57.1	56.9	56.8	56.7	56.5	56.3	55.1	56.7
9/9/2023	3	1:00	55.2	55.5	55.9	55.5	55.6	55.8	56.1	55.9	55.6	56.1	55.9	55.8	55.7
9/9/2023	3	2:00	54.8	54.6	54.3	54.3	54.3	54.6	53.5	53.6	53.5	52.9	52.6	53.3	53.9
9/9/2023	3	3:00	53.2	53.1	52.5	53.2	53.5	53.3	53.1	53.2	53.4	54	54.1	54.9	53.5
9/9/2023	3	4:00	53.4	52.6	53.1	53.4	54.2	53.7	53.1	54.3	53.6	53	52.7	53	53.4
9/9/2023	3	5:00	53.2	53.1	52.5	53	52.9	52.2	53.4	53.9	53.5	53.3	53.7	54.4	53.3
9/9/2023	3	6:00	54.3	54.1	51.7	52.1	54.2	52.7	52	51.8	50.8	51	51.8	51.8	52.5
9/9/2023	3	7:00	50.5	50.9	52.2	50.9	51.1	50.9	52.5	53.2	51	53.2	53.7	52.4	52.0
9/9/2023	3	8:00	52.8	50.1	53.1	53.9	51.8	51.6	61.4	73.2	74.2	74.2	74.6	74.4	70.4
9/9/2023	3	9:00	73.5	71.4	70.7	71.1	73.2	67.8	66.1	69.2	68.6	62.3	61.1	64.2	69.7
9/9/2023	3	10:00	65.8	65.9	54.5	52.1	53.4	50.8	52.6	57.1	61.9	61.4	59.9	61.9	60.8
9/9/2023	3	11:00	59.2	56.6	55.3	55.4	60.9	63.3	62.2	61.7	57.8	57.6	59	63.2	60.3
9/9/2023	3	12:00	60.4	56.5	54.5	54.3	53.5	51.3	51.7	50.4	51.7	51.5	52.4	51.2	54.4
9/9/2023	3	13:00	49.9	50.8	50.2	49.6	50.9	51.2	51.6	52	51.9	51.1	51.4	51.3	51.1
9/9/2023	3	14:00	52.2	52.7	52.1	52.9	52.1	53	52.5	53	52.9	53.5	53.4	52.6	52.8
9/9/2023	3	15:00	52.3	53.6	53.4	52.9	51.8	51.8	52.6	53	54.1	52.9	53.1	53.7	53.0
9/9/2023	3	16:00	53.4	53.8	54.5	53	53.4	53.9	53.4	55.6	53.3	53.5	54.5	55.3	54.0
9/9/2023	3	17:00	52.5	52.3	52.9	53.8	53.3	52.9	53.7	53.4	55	54.9	54.4	55.4	53.8
9/9/2023	3	18:00	56.1	56.9	55.4	53.2	51.7	53	53.1	53.2	53.4	53.2	54.6	53.9	54.2
9/9/2023	3	19:00	53.9	53.8	53.9	56.4	56.3	60.4	64.4	67.9	66.8	66.8	67.6	68.3	64.5
9/9/2023	3	20:00	68.6	69	70.1	69.6	70.3	70.3	70.5	70.9	70.8	70.5	70.4	71.1	70.2
9/9/2023	3	21:00	71	70.8	70.3	71.4	70.5	70.7	70.6	69.8	70	70.5	69.4	70.5	70.5
9/9/2023	3	22:00	69.5	70.3	69	68.1	69	68.5	68.6	67.9	68.6	67.6	68.7	68.9	68.8
9/9/2023	3	23:00	67.6	68.5	67.1	68.7	68.2	67.8	69.9	71.1	71.3	71.5	69.3	69.8	69.5
10/9/2023	4	0:00	71.5	71.9	69.4	69.5	68.5	72.3	71.7	70.5	67.1	67.1	68	66.4	69.9
10/9/2023	4	1:00	68.6	65.3	64.3	63.9	66	67.3	67.5	67.7	69.1	68.6	61.7	69.9	67.2
10/9/2023	4	2:00	68.4	66.2	65.3	66.3	67.4	65.5	67.9	66.9	69.1	69.6	67	69.2	67.6
10/9/2023	4	3:00	67.6	68.2	68.3	65.8	64.4	63.1	62.1	65.8	66.3	65.3	60.4	59.7	65.5
10/9/2023	4	4:00	60	59.8	60.3	60.9	58.8	56.7	57.7	59.5	60.5	59.6	60.6	60.6	59.7
10/9/2023	4	5:00	54.8	57.8	61.7	60.3	62.5	62.7	59.6	59.5	58.6	61.2	60.9	59.4	60.4
10/9/2023	4	6:00	59.8	58.1	60.4	60.1	58.4	56	54.9	55.2	58	54.2	54.1	53.6	57.6
10/9/2023	4	7:00	54.1	51.7	52.5	51.5	51.7	52.8	52.5	53.1	52.7	52.5	52.4	52.6	
10/9/2023	4	8:00	52.6	52.4	53.3	52.4	52.5	53.7	53.7	53.6	52.7	52.5	55	57.2	53.7
10/9/2023	4	9:00	53.8	52	52.9	52.3	51.8	52.9	52.9	52.7	55	52.1	52.9	52.9	52.9
10/9/2023	4	10:00	52.6	52.4	52.3	52.2	52.8	51.4	52.6	52.5	52.7	52.9	52.1	51.9	52.4
10/9/2023	4	11:00	52.2	52.1	51.4	51.5	52	51.9	52	51.3	51.1	52.2	52.6	52.3	51.9
10/9/2023	4	12:00	52.5	53.3	51.9	52.1	52.3	52.5	53.1	51.7	51.3	51.5	53.3	52.3	52.4
10/9/2023	4	13:00	52.2	53.1	52	51.3	51.3	50.9	50	48.6	51.2	51.7	52.9	53.3	51.7
10/9/2023	4	14:00	53	50.9	50.5	51.3	51.5	51	51.1	50	50.6	50.2	50.8	50.7	51.0
10/9/2023	4	15:00	50.8	50.9	50.7	51.9	50.6	50.3	49.2	49.6	49.3	49.1	55	48	50.8
10/9/2023	4	16:00	48.3	49	59.1	56.1	56.1	57.3	52.6	51	50.6	50.1	50.7	50.2	54.1
10/9/2023	4	17:00	50.7	51	51.6	53.3	53.5	52	51.2	53.8	52.2	53.1	52.9	52.4	
10/9/2023	4	18:00	53.7	53.3	54.1	53.9	53.9	53.5	52.8	52.7	53	53.9	54.4	53.5	53.6
10/9/2023	4	19:00	54.1	54	53.7	54	57.4	59.8	60.8	61.1	60.3	60.6	60.7	60.2	59.0

54.7

63.1

67.5

52.6

10/9/2023	4	20:00	60.8	60	59.4	60.2	60.1	60.9	60.4	60.3	60.7	60.8	60.4	59.3	60.3
10/9/2023	4	21:00	60.6	61.5	60.6	60.6	62.1	59.8	59	58	60.5	58.8	61.5	60.6	60.4
10/9/2023	4	22:00	61.2	60.1	60.1	61.3	59.7	58.8	60.9	58	57.5	59.8	57.9	58.9	59.7
10/9/2023	4	23:00	59.7	58.2	57.8	57.4	56.8	56.8	56.1	57.8	56.9	57.1	56.2	55.7	57.3
11/9/2023	5	0:00	55.5	55.5	55.3	55.2	55.7	55.9	55.9	56.1	56.5	56.1	55.7	55.6	55.8
11/9/2023	5	1:00	55.9	56.6	56.7	56.5	55.8	56.3	56	56	56.2	56.2	55.8	55.1	56.1
11/9/2023	5	2:00	55.5	55.9	55.4	55.9	55.3	54.5	54.4	54	53.5	55.2	54.6	56.2	55.1
11/9/2023	5	3:00	54.1	53.5	53.2	53.1	53.2	54.3	55.3	55.8	55.9	56	56.1	56.3	54.9
11/9/2023	5	4:00	55	53.5	52.7	53.2	54	54.4	54.2	54.2	54.4	54.6	54.3	54.7	54.1
11/9/2023	5	5:00	54.6	54.1	54.1	53.4	52.4	52.6	52.4	52	52.3	53	54.9	54.8	53.5
11/9/2023	5	6:00	53.6	53.9	54.7	54.4	52.9	54	54.4	54.6	54.8	54.7	55	54.7	54.3
11/9/2023	5	7:00	54.3	53.9	53.6	53.5	53.7	53.7	54.1	54	53.7	53	52.4	53.1	53.6
11/9/2023	5	8:00	54	53.5	54.5	54.1	52.7	53.4	53.1	52.8	53.3	54.1	54.9	54.7	53.8
11/9/2023	5	9:00	54.2	53.6	54.5	55.5	54.3	54.6	54.4	54.6	55.5	53.5	53.2	53.2	54.3
11/9/2023	5	10:00	53.6	53.4	54.5	53.1	57.1	53.5	53.7	53.5	54.8	62	61.3	60.9	57.4
11/9/2023	5	11:00	56.8	58.2	54	52.6	52.5	52.5	53.6	54	54.2	54	66.4	53.2	58.0
11/9/2023	5	12:00	54.5	57.9	62.6	55.2	55.1	54.9	55.1	55.6	52.4	53.4	66.4	53.9	58.9
11/9/2023	5	13:00	53.2	52.1	51.9	56.7	52.9	57	53.6	59.1	63.2	53.9	53	53.7	56.6
11/9/2023	5	14:00	53.2	52.3	52.6	58	52.7	51.7	51.6	53.7	52.9	53.3	53.2	74.3	63.9
11/9/2023	5	15:00	55.1	57.9	54	53.8	51.9	52.7	52.6	53.8	52.4	53.6	53.7	56.6	54.4
11/9/2023	5	16:00	54.1	74.4	69.8	50.7	51.3	52.4	57.1	52.5	58	52.5	75.5	55.4	68.0
11/9/2023	5	17:00	52.3	66.4	54.4	51.5	70.6	55.2	56	64	58	65.8	52.5	52.2	63.1
11/9/2023	5	18:00	53.8	51.5	52.1	52.7	52.7	52.9	52	52	52.7	53.3	52.6	53	52.7
11/9/2023	5	19:00	53	52.6	52.7	52.8	53	53.2	54.4	55.6	54.7	54.8	54.9	67.3	58.3
11/9/2023	5	20:00	75.5	59	56.9	58.8	57.3	57.9	62.8	62.6	63.7	64.6	62.6	55.7	66.2
11/9/2023	5	21:00	55.3	55.5	55.3	55.1	54.9	55.4	56	54.6	54.5	54.5	54.5	55.3	55.1
11/9/2023	5	22:00	55.2	55.2	54.9	54.8	54.5	55.2	55	55.1	56	56	55.7	55.2	55.3
11/9/2023	5	23:00	54.9	55.3	55	55	55	55.1	55.6	55.8	55.7	55.7	55.2	54.6	55.3
12/9/2023	6	0:00	54.1	54.7	54.7	54.4	54.3	54	54.3	54.4	54.3	54.5	54.6	54.5	54.4
12/9/2023	6	1:00	54.6	55.1	54.8	54.3	54.5	54.7	54.6	54.5	54.9	55.1	55.3	55.3	54.8
12/9/2023	6	2:00	55.6	55.9	55.8	56.1	55.9	55.5	55.6	55.9	55	55.1	55.8	54.6	55.6
12/9/2023	6	3:00	55.1	54.6	54.2	54.5	55	55.6	55.6	55.2	54.9	55.1	54.9	54.3	54.9
12/9/2023	6	4:00	54.2	54.5	54.4	54.5	54.6	55	55.1	54.7	54.9	55.9	55.7	55.7	55.0
12/9/2023	6	5:00	55.5	55.1	54.9	54.7	54.3	54.5	54.8	54.5	54.4	54	53.2	53.6	54.5
12/9/2023	6	6:00	53.3	53.9	53.8	53.8	53.7	53.8	52.7	53.1	52.1	49.1	51.5	53.1	53.0
12/9/2023	6	7:00	49.6	49.7	51	51	51	51.6	51.4	51.6	51.3	52.5	52.7	52.5	51.4
12/9/2023	6	8:00	52	52.3	52.7	52.6	52.9	52.9	52.6	54.3	54.2	67.2	63.9	53.3	59.1
12/9/2023	6	9:00	67	53.5	53.8	53.5	53.9	55.9	53.4	53.4	54.4	62.8	52.7	53.6	58.9
12/9/2023	6	10:00	54.9	53.1	54.5	52.9	53.3	52.9	54.8	54.2	52.7	53.7	53.6	53.3	53.7
12/9/2023	6	11:00	53.5	54.2	53.8	54.3	53.6	52.5	53.3	53.6	54.4	52.5	54.8	52.4	53.6
12/9/2023	6	12:00	51.8	52.9	55.3	53	52.8	52.9	52.5	52.1	51.5	52.8	55.1		53.1
12/9/2023	6	13:00													
12/9/2023	6	14:00													
12/9/2023	6	15:00													
12/9/2023	6	16:00													
12/9/2023	6	17:00													
12/9/2023	6	18:00													

57.4
60.8
58.2
56.0

N2

Date	Day	Time	0	5	10	15	20	25	30	35	40	45	50	55	LAeq 1 hr	LAeq 12 hr
7/9/2023	1	0:00														
7/9/2023	1	1:00														
7/9/2023	1	2:00														
7/9/2023	1	3:00														
7/9/2023	1	4:00														
7/9/2023	1	5:00														
7/9/2023	1	6:00														
7/9/2023	1	7:00														
7/9/2023	1	8:00														
7/9/2023	1	9:00														
7/9/2023	1	10:00														
7/9/2023	1	11:00														
7/9/2023	1	12:00														
7/9/2023	1	13:00				72.7	70.1	59.2	59.2	59.6	60	59.7	59.4	57.8	65.9	61.3
7/9/2023	1	14:00	57.2	57.4	56.9	57	57.7	65.8	61.6	58.7	58.5	59.1	59.1	58.3	59.9	
7/9/2023	1	15:00	58.9	59.6	58.3	61	58.5	56.6	56.7	58.5	59.3	59.5	61.1	58.7	59.1	
7/9/2023	1	16:00	58.5	58.5	59.4	58	59.6	57.6	57.5	58.2	60.1	61.2	57.1	61.8	59.2	
7/9/2023	1	17:00	59.8	58.7	58	58.6	58.5	58	57.9	60.4	59.6	58.6	59	58.7	58.9	
7/9/2023	1	18:00	58	58.5	58.2	60.1	59.1	59.5	59.1	59.7	59.5	58.1	57.1	57.7	58.8	
7/9/2023	1	19:00	58.4	57.2	57	56.8	56.6	57.1	56.9	57.3	57.1	56.7	57.6	59.2	57.4	
7/9/2023	1	20:00	57.8	56.9	56.5	57.7	58.2	56.7	57.2	56.7	57.6	56	56.3	57.1	57.1	
7/9/2023	1	21:00	57.3	57.9	58.7	57.7	57.7	57.3	56.3	55.9	56.3	55.3	55.4	55.6	56.9	
7/9/2023	1	22:00	54.5	55.2	54.5	56.3	54.6	55.9	55.6	55.4	54.6	55	55.4	55.6	55.3	
7/9/2023	1	23:00	55.3	54.8	54.9	55.7	54.7	55.2	54.9	55	54.8	54.3	54.3	56.7	55.1	
8/9/2023	2	0:00	54.3	54	53.7	53.9	54.4	54.2	54	54.1	54	52.4	52.8	52.8	53.8	55.0
8/9/2023	2	1:00	52.9	53.5	53	53.7	52.2	52.5	52.1	51.8	51.8	52.3	51.6	52	52.5	
8/9/2023	2	2:00	51.7	52	51.9	51.3	52	52.4	51.8	51.7	52.2	52.9	50.9	51.5	51.9	
8/9/2023	2	3:00	50.8	51.3	50.3	50.5	51.6	50.7	50.8	50.5	51.9	51.5	50.8	51.5	51.0	
8/9/2023	2	4:00	52	51.2	50.9	51.5	52.2	52.1	51.8	53	51.8	53.3	53.7	53.2	52.3	
8/9/2023	2	5:00	53.9	54.1	53.3	54	53.1	54.3	53.7	54.8	54.7	54.9	54.6	54.6	54.2	
8/9/2023	2	6:00	54.9	55.7	55.8	55.8	55.7	56.3	55.5	56	57.9	59.2	57.7	57.7	56.7	
8/9/2023	2	7:00	57.6	57.8	57.9	58.2	58.3	58.3	58	58.5	58.8	58.9	59.1	58.2	58.3	
8/9/2023	2	8:00	58.2	59.9	59.7	59.9	60.3	61.3	62.8	68	61.9	59.9	63.6	62.5	62.4	
8/9/2023	2	9:00	64.7	62.8	62.2	61.2	60.1	62	60.9	60.8	60.9	61.6	61.8	61.5	61.9	
8/9/2023	2	10:00	59.9	60	58.8	59.4	58.7	60.3	59.4	59.3	59.9	59	61.7	57.5	59.6	
8/9/2023	2	11:00	57.4	61.1	62.4	63.1	61.6	61.3	60.7	57.8	60.2	62.2	62.4	62.2	61.3	
8/9/2023	2	12:00	57.7	57.6	57.5	56.6	55.7	55.6	55.7	55.5	57.3	55.3	55.3	56.2	56.4	60.6
8/9/2023	2	13:00	56.9	56.7	56.6	56.6	56.8	56.6	59.3	58.8	58.5	58.8	58.4	57.4	57.7	
8/9/2023	2	14:00	60.3	58.6	57.4	59.4	56.6	56.9	59	59.6	57	57.3	57.7	57.5	58.3	
8/9/2023	2	15:00	58.6	58.2	57.3	57.7	56.8	57	60.8	57.1	57.3	57.7	59.4	58.1	58.2	
8/9/2023	2	16:00	58.2	58.4	58.1	57.8	58	58.6	58.7	58.9	59.7	59.9	59.2	62.2	59.2	
8/9/2023	2	17:00	65.9	64.1	67.3	67.6	61.3	61	58.2	60.5	61.1	61.3	62.2	64.5	63.8	
8/9/2023	2	18:00	67.5	63.3	62.6	62.3	61.9	65.2	60.3	60.2	59	60	59.6	58.4	62.6	
8/9/2023	2	19:00	60.1	59	60.1	63	59.5	59.6	62.3	58.7	58.1	58.2	58.3	58.8	59.9	
8/9/2023	2	20:00	59.1	59.1	59.5	59.4	59.3	59.7	56.4	56.1	56.3	57	56.8	55.7	58.1	

8/9/2023	2	21:00	55.2	57.7	56.4	55.8	55.6	56.2	56.9	55.7	55.7	55.5	57.6	55.7	56.2
8/9/2023	2	22:00	55	55	55.7	56	55.5	55.3	55.8	55.3	54.8	55.8	54.6	54.4	55.3
8/9/2023	2	23:00	54.7	55.1	54	55	54.7	54.2	56.2	54.2	54.1	54.3	54.2	54.4	54.6
9/9/2023	3	0:00	54.9	53.8	54.1	53.5	53.9	57.1	53.8	54.8	53.6	53.5	53	52.9	54.2
9/9/2023	3	1:00	53.4	53.2	54.6	52.9	52.8	52.9	52.6	51.7	51.9	51.7	51	51.4	52.6
9/9/2023	3	2:00	51.2	51.1	52.1	52.4	52	51.9	53.2	50.7	51.6	51.2	51.2	52	51.8
9/9/2023	3	3:00	51.3	52.2	51.4	51.1	50.9	52.3	51.7	51.9	50.9	51.7	51.3	52.4	51.6
9/9/2023	3	4:00	51.3	51.9	51.9	52.5	52.6	51.9	51.2	52.1	51.6	52	51.3	51.4	51.8
9/9/2023	3	5:00	51.9	52.7	52.1	52.4	51.5	52.7	53.4	52.6	53.3	53.4	53.8	53.3	52.8
9/9/2023	3	6:00	53.7	53.8	53.9	54.4	54.7	54	55.5	55.1	56.9	57.2	55.9	55.9	55.2
9/9/2023	3	7:00	56.1	56	56.6	57	56.7	56.9	57	57	57.4	57.8	57.5	56.9	
9/9/2023	3	8:00	57.9	58.4	59.4	61.3	60.4	68.3	73.5	75.1	75	74.8	74.8	73	71.7
9/9/2023	3	9:00	70.5	69.5	69.2	69.2	63.5	62.3	71.7	70.9	70.4	67.2	67.9	62.8	68.8
9/9/2023	3	10:00	61.2	62.7	63.3	62.6	66.6	67.7	65.7	63.6	62.1	62.2	64.1	64.7	64.5
9/9/2023	3	11:00	62.2	63.5	62.2	65.3	66.8	64.5	63.9	62.2	62.2	65	64.8	62.4	64.1
9/9/2023	3	12:00	59.8	58.8	58.5	58.9	58	58	57.6	58.6	58.3	58.6	59.3	59.4	58.7
9/9/2023	3	13:00	60.3	61.3	60.9	61.1	64	60.4	61	61.1	61	62.3	60.7	60.5	61.3
9/9/2023	3	14:00	60.2	61.3	61.2	60.2	60.3	60.6	62.9	61.9	62.5	61	60.1	60.4	61.1
9/9/2023	3	15:00	59.6	59.9	60.3	61.2	59.5	59.6	58.7	58.6	58.9	60.4	59.2	57.9	59.6
9/9/2023	3	16:00	59.9	59	58.6	58.6	58.9	64.1	65.6	61.5	58.6	57.5	58.5	58	60.7
9/9/2023	3	17:00	58.9	58.1	58.5	58.2	58.1	58	57.9	58.4	58.5	59.1	59	59.1	58.5
9/9/2023	3	18:00	58.5	59.4	57.9	58.2	60.1	59.3	60.6	59.3	58.9	58.1	59	59.4	59.1
9/9/2023	3	19:00	59.1	59.3	63.8	60.3	60.8	60.6	58.4	57.6	57	57.6	56.5	58.4	59.6
9/9/2023	3	20:00	56.9	56.6	57.5	56.9	56.8	58	57.3	56.9	58.4	57.1	56.5	58.3	57.3
9/9/2023	3	21:00	56.1	57	58.7	55.9	56.2	56.2	55.8	56.2	56	56.1	57.5	56.3	56.6
9/9/2023	3	22:00	56.3	55.6	56.1	57	56.6	56.4	56	56.1	55.8	55.4	56	55.7	56.1
9/9/2023	3	23:00	55.7	55.7	56.4	56	55.8	56.4	58.1	56.4	56.1	55.9	55.2	55	56.1
10/9/2023	4	0:00	55.4	54.1	55.7	54.8	53.9	55.4	54.9	54.7	55.1	54.9	54.8	54.5	54.9
10/9/2023	4	1:00	54.1	55.2	54.6	54.3	53.5	53.3	53.6	53.5	53.5	54.3	54.1	52.9	54.0
10/9/2023	4	2:00	52.6	53.1	52.7	53.2	53.6	53.6	53.5	52.2	54.6	53.6	52.9	53.2	53.3
10/9/2023	4	3:00	52.5	52.4	52.6	52.9	53	52.8	52.3	52.3	52.3	51.8	53	52	52.5
10/9/2023	4	4:00	51.9	53.2	53.4	52.9	55.2	52.5	51.8	52	53	52.2	52.3	52.2	52.8
10/9/2023	4	5:00	52.7	53.2	52.8	52.7	53.5	52.8	53.5	53	53.6	54	53.8	54	53.3
10/9/2023	4	6:00	53.9	54.3	54.4	54	54	54.3	54.1	54.4	55	56	55.4	55.6	54.7
10/9/2023	4	7:00	54.7	55.1	55.8	56.4	56	57.2	56	56.1	56.2	57.1	56.3	57.2	56.2
10/9/2023	4	8:00	58.9	56.3	58.3	56.9	58.1	57	56.3	56.3	57.1	57.8	59.2	58.5	57.7
10/9/2023	4	9:00	57.3	58.1	57.8	57.8	57.5	57.5	57.3	57.8	57.9	57.2	56.4	57.2	57.5
10/9/2023	4	10:00	58.4	61.7	57.5	56	56.4	57.4	57.9	55.8	56.4	57.7	59.5	55.7	57.9
10/9/2023	4	11:00	57.5	55.7	56	57.3	58.1	57	56.4	55.8	54.5	54.8	57	56.9	56.5
10/9/2023	4	12:00	55.2	56.2	56.2	56.1	56.2	57.4	57.5	55.5	55.6	57.1	55.8	55.2	56.2
10/9/2023	4	13:00	55.8	55.9	56	56.5	55.5	57.6	60.8	55.9	56.1	56.6	56.9	61.2	57.5
10/9/2023	4	14:00	57.1	56.7	58.2	58.3	57.5	56.4	57.9	57.4	58.3	58.2	57.1	56.8	57.5
10/9/2023	4	15:00	59.4	57.9	57.2	58.5	56.2	56.9	56	55.6	56.9	57.8	57.3	56.8	57.3
10/9/2023	4	16:00	56	55	55.9	56.1	57.8	56.1	55.7	55.6	54.7	55	55.9	55.7	55.9
10/9/2023	4	17:00	55.7	56.5	55.6	55.3	55	55.5	55.5	55.8	55.7	56	57.1	56.3	55.9
10/9/2023	4	18:00	55.7	55.8	55.7	55.5	55.4	55.2	56.2	55.8	56	56.1	60	56.8	56.4
10/9/2023	4	19:00	56.5	56.3	56.9	55.4	56	55.6	55.3	55.7	55.8	56.7	56.9	56.8	56.2

55.3

64.7

55.6

56.9

10/9/2023	4	20:00	57.6	57.2	57.3	56.9	56.9	57	57.7	56.5	57.2	57.4	55.9	56.9	57.1
10/9/2023	4	21:00	56.7	58.5	56.3	56.1	56.8	56.8	56.1	56.5	56.4	57.2	56.7	56.6	56.8
10/9/2023	4	22:00	58.1	56.2	56.1	56.3	55.6	57.9	55.3	55.9	55.3	56	55.4	55	56.2
10/9/2023	4	23:00	55.6	55.4	55.3	54.1	54.1	54.4	54.1	53.9	59.1	54.2	53.5	54.6	55.2
11/9/2023	5	0:00	53.3	54	52.8	53.2	52.7	53.1	52.8	53.4	53.1	53	53.5	53.4	53.2
11/9/2023	5	1:00	54	52	52.7	52	52.9	51.9	52.5	51.6	51.8	52.6	51.4	51.5	52.3
11/9/2023	5	2:00	51	51.9	52.8	52.4	51.1	52.3	53.3	52.2	50.8	51	50.6	51.1	51.8
11/9/2023	5	3:00	51	51.8	51.1	51.2	49.9	50.1	50.7	50.2	51	50.5	50.3	50.2	50.7
11/9/2023	5	4:00	50.1	50.7	50.7	52.4	51.1	51.3	51.8	51.8	51.7	51.7	52.9	52.5	51.6
11/9/2023	5	5:00	52.7	53.1	53	53.4	52.9	52.7	53.4	53.2	53.4	53.9	54.2	54.3	53.4
11/9/2023	5	6:00	54.5	54.9	55.8	55	55.7	55.6	55.8	56.3	57.1	57.9	57.1	57.6	56.2
11/9/2023	5	7:00	57.7	57.6	57.8	58.3	57.3	57.6	56.8	56.9	57.5	56.9	56.7	57	57.4
11/9/2023	5	8:00	58.7	58.3	58.7	59.4	60	60.1	58.5	57.9	58.1	58.9	58.6	59.6	59.0
11/9/2023	5	9:00	61.3	59	60.2	59	61.3	59.1	58.7	64.6	58	62.5	59.3	58.7	60.6
11/9/2023	5	10:00	58.6	57.6	62.7	66.8	58	57.8	58.1	56.9	61.1	65.5	57.5	57.5	61.3
11/9/2023	5	11:00	59.5	60.8	61	61.3	60.6	61.1	60.4	60.5	60.2	60.5	64.8	59.9	61.1
11/9/2023	5	12:00	60.6	64.7	60.3	59.4	60	59.5	60.3	60.1	61.4	59.6	66.4	60.7	61.7
11/9/2023	5	13:00	59.9	60.4	60.8	61.6	61	61.5	60.7	62.4	67.9	60.8	60.4	60.1	62.2
11/9/2023	5	14:00	62	60.8	61.9	61.8	61.5	61.8	63	62.3	63	62.2	61.7	76	66.8
11/9/2023	5	15:00	63.2	62.8	62.7	62.3	62.3	62.2	61.3	61.4	60.6	60.1	60.2	60.6	61.8
11/9/2023	5	16:00	60	73.4	68.3	58.5	58.4	59.1	58.4	60.6	59	59.6	76.7	58.3	68.4
11/9/2023	5	17:00	58.5	65.2	58.7	62	70	61.9	59	69.7	67.1	65.3	59.6	59.5	65.0
11/9/2023	5	18:00	58.2	57.9	59.3	58.8	60.1	59.5	59.5	59.1	58.9	60.5	59.5	59.3	59.3
11/9/2023	5	19:00	59.4	59.2	58.1	57.5	57.2	58.3	58.8	62.2	61.1	58.2	57.1	71.6	62.9
11/9/2023	5	20:00	71.7	59.7	58.8	60	57.9	59.7	65.1	62.4	63.4	65.6	57.9	56.9	64.1
11/9/2023	5	21:00	57.6	55.7	56.9	57.9	58.1	55.5	56.8	55.5	55.2	55.3	56	55.1	56.4
11/9/2023	5	22:00	55.1	55.6	56.4	56	55.3	56.3	55.9	55.7	55.2	55.4	55.2	55.9	55.7
11/9/2023	5	23:00	55.7	55	55.9	55.5	54.9	55.8	54.8	55.4	54.7	54	54.2	54.8	55.1
12/9/2023	6	0:00	54.5	54.2	54.4	54	54	53.7	52.9	53.5	55.2	53.2	53.6	53.1	53.9
12/9/2023	6	1:00	55.8	53.2	52.7	52.4	52.8	52.5	53.1	52.4	52.2	52.5	53.1	52.1	53.0
12/9/2023	6	2:00	52.2	52.8	52.7	52.6	53	53.1	53.3	52.1	51.9	52.3	52.5	52.1	52.6
12/9/2023	6	3:00	52.5	51.5	52.4	52.1	51.3	51.8	51.4	51.9	52.7	54.2	53.5	53	52.4
12/9/2023	6	4:00	52.7	52.9	51.7	52.3	52.4	52.8	52.3	52.4	52.1	53.4	52.4	52.8	52.5
12/9/2023	6	5:00	53.3	53.7	53.4	53.5	52.8	53.8	54.2	54.4	54.3	54.2	53.3	54.8	53.8
12/9/2023	6	6:00	54.5	55	55.2	55.5	55.3	56.2	56.3	56.6	57	57.3	57.7	58.1	56.4
12/9/2023	6	7:00	57.8	57.8	58	58.6	58.6	58.7	58.4	58.4	57.9	57.5	57.2	57.2	58.0
12/9/2023	6	8:00	57.5	58.8	59.2	58.5	58.6	59.4	59.8	61	64.3	68.3	59.2	60.3	61.8
12/9/2023	6	9:00	66.1	63.9	58.9	62.8	60.6	60.3	59.2	57.9	60.2	63.1	60.4	61.7	61.9
12/9/2023	6	10:00	61.2	59.6	61.6	60.6	62.8	60.4	62.2	61.9	59.1	58.3	57.8	57.7	60.6
12/9/2023	6	11:00	58.1	58.1	60.4	59.9	57.6	56.8	57.1	57.8	57.9	57.7	57.4	57.8	58.2
12/9/2023	6	12:00	56.7	56.1										56.4	
12/9/2023	6	13:00													
12/9/2023	6	14:00													
12/9/2023	6	15:00													
12/9/2023	6	16:00													
12/9/2023	6	17:00													
12/9/2023	6	18:00													

54.8

63.3

57.8

60.0

E Water Quality and Hydrology

E.1 Water Quality Sampling Results

TEST REPORT

Our Reference No. : R237823
 Project Code / Ref. : Tengah

Date Received : 27/09/2023
 Date Commenced : 27/09/2023
 Date Reported : 09/10/2023

Customer Ref. No. : 61803268
 Customer Name : DHI Water & Environment (S) Pte Ltd
 Customer Address : 2 Venture Drive
 #18-18 Vision Exchange
 Singapore 608526

Attention To : Dr. Aloysius Teo
 Sample Description : 3 Water samples as per received.

RESULTS : Refer to Page 2



Chong Vui Ket, Xavier
Senior Chemist



Renugopal
Principal Microbiologist

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LA-2015-0595-F

LA-2015-0595-F-1

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R237823

RESULTS

Test Parameter	Unit	Test Method	Sample 1	Sample 2	Sample 3	LOR
			WQ 1 (Dry)	WQ 2 (Dry)	WQ 3 (Dry)	
			Sampling Date: 27/09/2023			
Total Suspended Solids, TSS	mg/L	APHA 2540D	8.40	64.0	3.00	1
Total Dissolved Solids, TDS	mg/L	APHA 2540C	121	168	181	1
Biochemical Oxygen Demand, BOD5	mg/L	APHA 5210B	1.31	3.15	0.69	0.2
Total Organic Carbon, TOC	mg/L	APHA 5310B	2.95	13.8	9.50	1
Nitrate as NO3-N	mg/L	APHA 4500-NO3 (I)	0.064	0.047	0.029	0.01
Nitrate as NO2-N	mg/L	APHA 4500-NO3 (I)	ND	0.023	ND	0.01
Ammonia as NH3-N	mg/L	APHA 4500-NH3 (H)	0.41	0.22	0.085	0.01
Phosphate as PO4-P	mg/L	APHA 4500-P (G)	0.030	0.17	0.068	0.01
Total Nitrogen, TN	mg/L	APHA 4500-P (J)	0.64	1.26	0.61	0.01
Total Phosphorus, TP	mg/L	APHA 4500-P (J)	0.034	0.40	0.090	0.01
Dissolved Arsenic as As	µg/L	APHA 3125B	1.02	13.8	5.25	0.3
Dissolved Cadmium as Cd	µg/L	APHA 3125B	ND	ND	ND	0.15
Dissolved Chromium as Cr	µg/L	APHA 3125B	ND	0.39	0.18	0.15
Dissolved Copper as Cu	µg/L	APHA 3125B	0.43	0.76	0.79	0.15
Dissolved Nickel as Ni	µg/L	APHA 3125B	ND	ND	ND	3.0
Dissolved Zinc as Zn	µg/L	APHA 3125B	4.07	ND	ND	1.5
Dissolved Lead as Pb	µg/L	APHA 3125B	ND	ND	ND	0.15
Dissolved Mercury as Hg	µg/L	APHA 3125B	ND	ND	ND	0.15
Chlorophyll-a	µg/L	APHA 10150C	0.83	50.7	1.21	0.1
Oil & Grease [#]	mg/L	Accredited In-house Method MLS-SOP-WQ-033 Rev 0 (adapted from APHA 5520C)	ND	ND	ND	0.1
Faecal Coliform	cfu/100mL	APHA 9222D	230	500	120	1
E-Coli	cfu/100mL	APHA 9222H	130	320	70	1
Enterococci	cfu/100mL	APHA 9230C	330	480	310	1

Note:

1. APHA is a standard method for Determination of Water and Waste Water (APHA 23rd Edition, 2017)
2. APHA is a standard method for Determination of Water and Waste Water (APHA 24th Edition, 2023)
3. LOR = Limit of Reporting. This value may also represent Detection Limit required for the project.
4. "ND" = Not detected. The data reported is less than the LOR.
5. "#"=For Oil & Grease or TPH by In-house method MLS-SOP-WQ-033 Rev 0 (adapted from APHA 5520C), the qualitative and quantitative tests are based on the Reference Oil recommended in APHA 5520C.

TEST REPORT

Our Reference No. : R239082
 Project Code / Ref. : Tengah

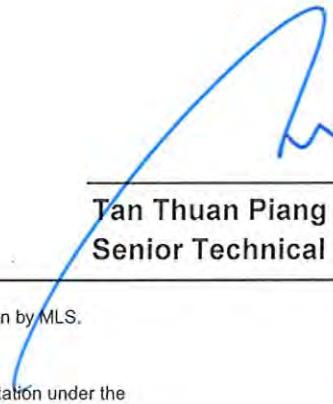
Date Received : 21/11/2023
 Date Commenced : 21/11/2023
 Date Reported : 29/11/2023

Customer Ref. No. : 61803268
 Customer Name : DHI Water & Environment (S) Pte Ltd
 Customer Address : 2 Venture Drive
 #18-18 Vision Exchange
 Singapore 608526

Attention To : Mr. Shane Chiok
 Sample Description : 2 Water samples as per received.

RESULTS : Refer to Page 2


Renugopal
 Principal Microbiologist


Tan Thuan Piang
 Senior Technical Manager

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R239082

RESULTS

Test Parameter	Unit	Test Method	Sample 1	Sample 2	LOR
			WQ 1 (DRY/ WET)	WQ 2 (DRY/ WET)	
			Sampling Date: 21/11/2023		
Total Suspended Solids, TSS	mg/L	APHA 2540D	122	47.3	1
Total Dissolved Solids, TDS	mg/L	APHA 2540C	45.0	43.0	1
Biochemical Oxygen Demand, BOD5	mg/L	APHA 5210B	1.37	1.41	0.2
Total Organic Carbon, TOC	mg/L	APHA 5310B	6.03	8.72	1
Nitrate as NO3-N	mg/L	APHA 4500-NO3 (I)	0.28	0.78	0.01
Nitrate as NO2-N	mg/L	APHA 4500-NO3 (I)	0.017	0.020	0.01
Ammonia as NH3-N	mg/L	APHA 4500-NH3 (H)	0.058	0.17	0.01
Phosphate as PO4-P	mg/L	APHA 4500-P (G)	0.030	0.033	0.01
Total Nitrogen, TN	mg/L	APHA 4500-P (J)	2.00	1.95	0.01
Total Phosphorus, TP	mg/L	APHA 4500-P (J)	0.19	0.065	0.01
Dissolved Arsenic as As	µg/L	APHA 3125B	2.08	6.11	0.3
Dissolved Cadmium as Cd	µg/L	APHA 3125B	ND	ND	0.15
Dissolved Chromium as Cr	µg/L	APHA 3125B	0.27	0.24	0.15
Dissolved Copper as Cu	µg/L	APHA 3125B	3.81	4.81	0.15
Dissolved Nickel as Ni	µg/L	APHA 3125B	ND	ND	3.0
Dissolved Zinc as Zn	µg/L	APHA 3125B	1.92	10.8	1.5
Dissolved Lead as Pb	µg/L	APHA 3125B	0.39	ND	0.15
Dissolved Mercury as Hg	µg/L	APHA 3125B	ND	ND	0.15
Chlorophyll-a	µg/L	APHA 10150C	7.59	1.87	0.1
Oil & Grease [#]	mg/L	Accredited In-house Method MLS-SOP-WQ-033 Rev 0 (adapted from APHA 5520C)	0.28	ND	0.1
Faecal Coliform	cfu/100mL	APHA 9222D	1,600	1,700	1
E-Coli	cfu/100mL	APHA 9222H	500	100	1
Enterococci	cfu/100mL	APHA 9230C	10,000	11,000	1

Note:

1. APHA is a standard method for Determination of Water and Waste Water (APHA 23rd Edition, 2017) for Enterococci only.
2. APHA is a standard method for Determination of Water and Waste Water (APHA 24th Edition, 2023)
3. LOR = Limit of Reporting. This value may also represent Detection Limit required for the project.
4. "ND" = Not detected. The data reported is less than the LOR.
5. "#"=For Oil & Grease or TPH by In-house method MLS-SOP-WQ-033 Rev 0 (adapted from APHA 5520C), the qualitative and quantitative tests are based on the Reference Oil recommended in APHA 5520C.

TEST REPORT

Our Reference No. : R240 1765

Date Received : 04/03/2024

Project Code / Ref. : Tengah

Date Commenced : 04/03/2024

Customer Ref. No. : 61803268

Date Reported : 15/03/2024

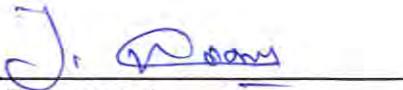
Customer Name : DHI Water & Environment (S) Pte Ltd

Customer Address : 2 Venture Drive
#18-18 Vision Exchange
Singapore 608526

Attention To : Mr. Shane Chiok

Sample Description : 2 Water samples as per received.

RESULTS : Refer to Page 2



Renugopal

Principal Microbiologist



Tan Thuan Piang

Senior Technical Manager

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RESULTS

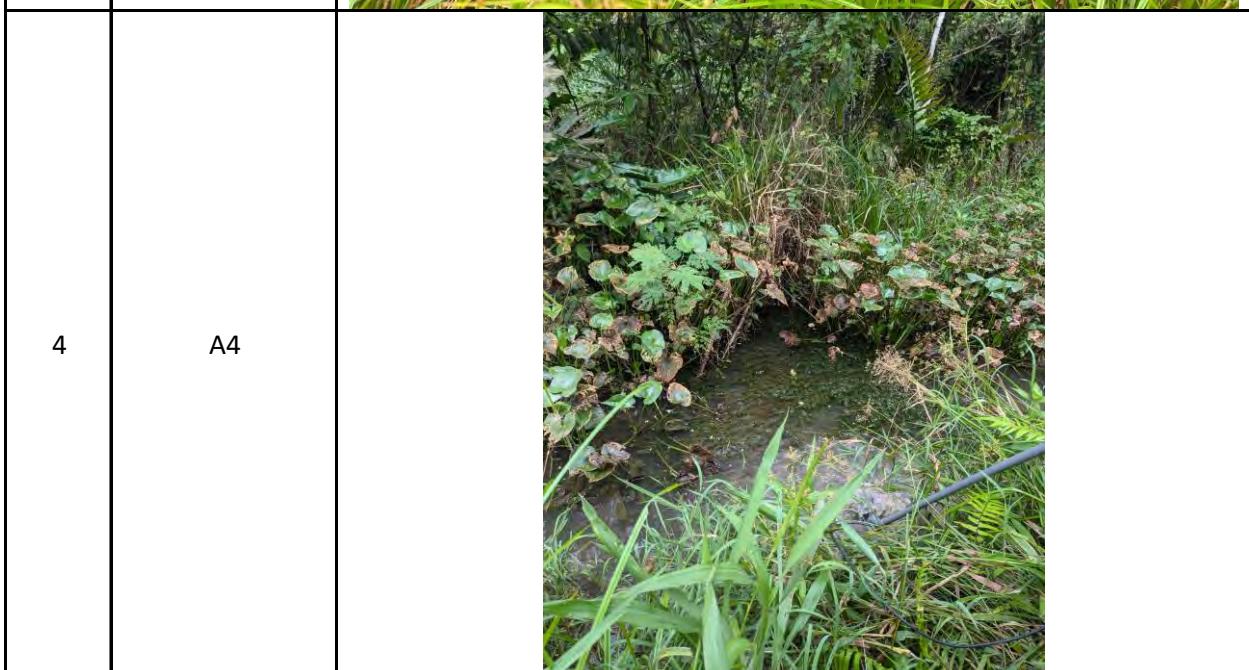
Test Parameter	Unit	Test Method	Sample 1	Sample 2	LOR
			WQ 3 (WET)	WQ 4 (WET)	
			Sampling Date: 04/03/2024		
Total Suspended Solids, TSS	mg/L	APHA 2540D	344	11.8	1
Total Dissolved Solids, TDS	mg/L	APHA 2540C	169	144	1
Biochemical Oxygen Demand, BOD5	mg/L	APHA 5210B	1.72	1.19	0.2
Total Organic Carbon, TOC	mg/L	APHA 5310B	8.00	5.94	1
Nitrate as NO3-N	mg/L	APHA 4500-NO3 (I)	0.095	0.12	0.01
Nitrate as NO2-N	mg/L	APHA 4500-NO3 (I)	0.013	0.014	0.01
Ammonia as NH3-N	mg/L	APHA 4500-NH3 (H)	0.019	0.12	0.01
Phosphate as PO4-P	mg/L	APHA 4500-P (G)	0.066	0.055	0.01
Total Nitrogen, TN	mg/L	APHA 4500-P (J)	0.83	0.72	0.01
Total Phosphorus, TP	mg/L	APHA 4500-P (J)	0.068	0.056	0.01
Dissolved Arsenic as As	µg/L	APHA 3125B	8.49	3.25	0.3
Dissolved Cadmium as Cd	µg/L	APHA 3125B	ND	ND	0.15
Dissolved Chromium as Cr	µg/L	APHA 3125B	0.69	0.23	0.15
Dissolved Copper as Cu	µg/L	APHA 3125B	2.75	2.05	0.15
Dissolved Nickel as Ni	µg/L	APHA 3125B	ND	ND	3.0
Dissolved Zinc as Zn	µg/L	APHA 3125B	ND	8.09	1.5
Dissolved Lead as Pb	µg/L	APHA 3125B	ND	ND	0.15
Dissolved Mercury as Hg	µg/L	APHA 3125B	ND	ND	0.15
Chlorophyll-a	µg/L	APHA 10150C	2.05	4.32	0.1
Oil & Grease [#]	mg/L	Accredited In-house Method MLS-SOP-WQ-033 Rev 0 (adapted from APHA 5520C)	0.40	ND	0.1
Total Petroleum Hydrocarbons as TPH [#]	mg/L		0.13	ND	0.1
Faecal Coliform	cfu/100mL	APHA 9222D	22,000	2,000	1
E-Coli	cfu/100mL	APHA 9222H	21,000	2,000	1
Enterococci	cfu/100mL	APHA 9230C	6,000	4,900	1

Note:

1. APHA is a standard method for Determination of Water and Waste Water (APHA 24th Edition, 2023)
3. LOR = Limit of Reporting. This value may also represent Detection Limit required for the project.
4. "ND" = Not detected. The data reported is less than the LOR.
5. "#"=For Oil & Grease or TPH by In-house method MLS-SOP-WQ-033 Rev 0 (adapted from APHA 5520C), the qualitative and quantitative tests are based on the Reference Oil recommended in APHA 5520C.

E.2 Stream Characterisation Sampling Points

S/N	Sampling Point	Photo(s)
1	A1	
2	A2	



5	A9	
6	A10	

7	A11	
8	A12	

9	A13	
10	A14	

11	A15	
12	A15B	

13	A16A	
14	A16B	

15	A17A	
16	A17B	

17	A25		
18	A26		

19	A30-31 (Downstream)		
20	B1A		

21	B1B	
22	B2	



F Vibration



SETSCO

TEST REPORT
(This Report is issued subject to the terms & conditions set out below)
ON
GROUND VIBRATION MONITORING

Setsco Services Pte Ltd
531 Bukit Batok Street 23
Singapore 659547
Tel : (65) 6566 7777
Fax: (65) 6566 7718
www.setsco.com
Business Reg. No. 186900268D

Our Reference : **MA-8500284077/SAH/1**

Your Reference : **6159745**

Report Date : **03/10/2023**

Page 1 of 32

Measured for : **DHI WATER & ENVIRONMENT (S) PTE LTD**
2 Venture Drive
#18-18 Vision Exchange
Singapore 608526

Attn: Ms. Umairah Abdul Karim (irah@dhigroup.com)

Date of Measurement : **29th September 2023 to 1st October 2023**

Place of Inspection : **Tengah Forest (1.36231° N, 103.72049° E)**
Accessed from TP3 Gate (Tengah)

Sahlan Bin Ismail
Testing Officer

Almond Soon
Senior Engineer
Maintenance Testing Department
Mechanical Technology Division

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Introduction

SETSCO SERVICES PTE LTD was appointed by DHI WATER & ENVIRONMENT (S) PTE LTD to carry out Ground Vibration Monitoring at **Tengah Forest (1.36231° N, 103.72049° E)**

Project

Environmental Baseline Survey

Scope of Measurement

In this monitoring the evaluation of ground vibration is based on the maximum values of the three components of the vibration velocity that is Vertical, Longitudinal and Transverse direction {V (z-axis), L (x-axis) and T (y-axis)}.

The measurement in this three directions would be monitored at location specified in the 'Date of Measurement and Test Locations' section.

The measurement would be in frequency range of 1Hz to 100Hz, velocity-time domain with a minimum trigger level set at **0.3 mm/s**. The monitoring of vibration was conducted based on client's request. The dominant frequency with the corresponding peak particle velocity would be tabulated. The vibration meter was set on continuous and histogram monitoring with readings taken every 5 seconds interval.

Objective of Measurement

The objective of this monitoring at **Tengah Forest (1.36231° N, 103.72049° E)** was to determine the level of the vibration for the purpose of environmental baseline survey.

Measurement Equipment Specification

The measurement equipment for the vibration test measurements are as follows:

- INSTANTEL INC Ground Vibration Monitoring Equipment (Vibration Sensor Tri-axial)

Calibration Certification of the equipment/s is provided in 'Appendix 1- Calibration Certificates' section.



Date of Measurement and Test Locations

The measurements were conducted from 29th September 2023 to 1st October 2023 at **Tengah Forest (1.36231° N, 103.72049° E)**.

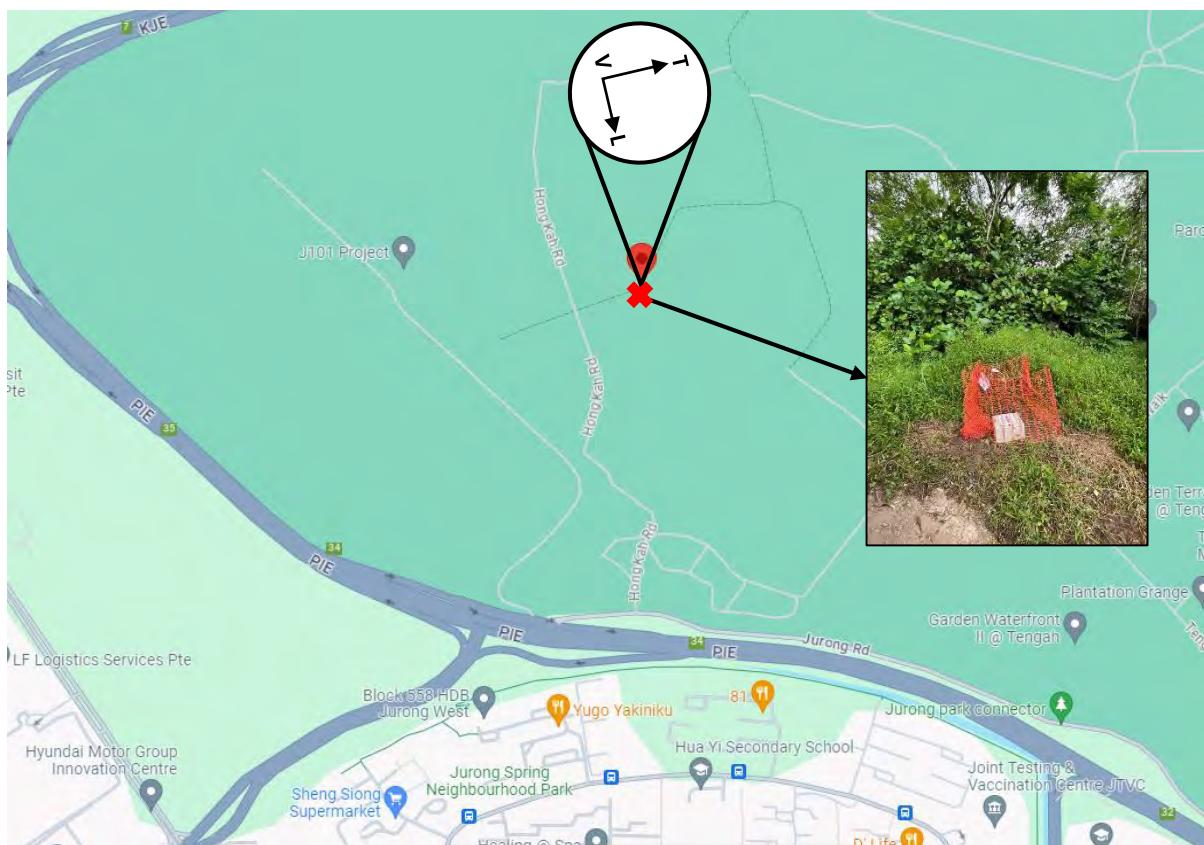


Figure 1: Test Location & Direction of Measurement

Results & Conclusion

For the results of the measurement, refer to the 'Vibration Measurement Data' section.

Interference from sources (e.g. wildlife etc.) could lead to several higher than usual reading/s and are unavoidable due to the nature of the deployment location and the sensitivity of ground vibration monitoring.

The details of the measurement show the frequency with the corresponding peak particle velocity in Vertical, Longitudinal and Transverse direction.



Vibration Measurement Data



Start
 Finish
 Number of Intervals/Interval
 Sample Rate
 Setup File Name
 Operator
 Job Number

September 29, 2023 10:35:14
 October 1, 2023 18:47:14
 40464.00/5 sec
 1024 sps
 N/A
 -
 1

Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes No text to be displayed.
 Post Event Notes Tengah Forest (1.36231° N, 103.72049° E)

Geophone
 Peak Particle Velocity
 Zero Crossing Frequency
 Date
 Time
 Sensor Check
 Frequency
 Overswing Ratio

	Tran	Vert	Long
Peak Particle Velocity	0.698 mm/s	0.571 mm/s	>100 Hz
Zero Crossing Frequency	64.0 Hz	>100 Hz	>100 Hz
Date	Sep 30, 2023	Sep 30, 2023	Sep 30, 2023
Time	11:22:54	10:59:14	11:26:39
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum

0.749 mm/s at September 30, 2023 11:10:59

Event Report



Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.2 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230929103514.IDFH





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Long at September 29, 2023 19:59:57
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



Serial Number: BE13706
 Model Number: MiniMate Plus 10.72.8.17
 Battery Level: 6.6 volts
 Unit Calibration: February 24, 2023 by Absolute Instrument Systems
 Event File Name: BE13706_20230929195957.IDFW

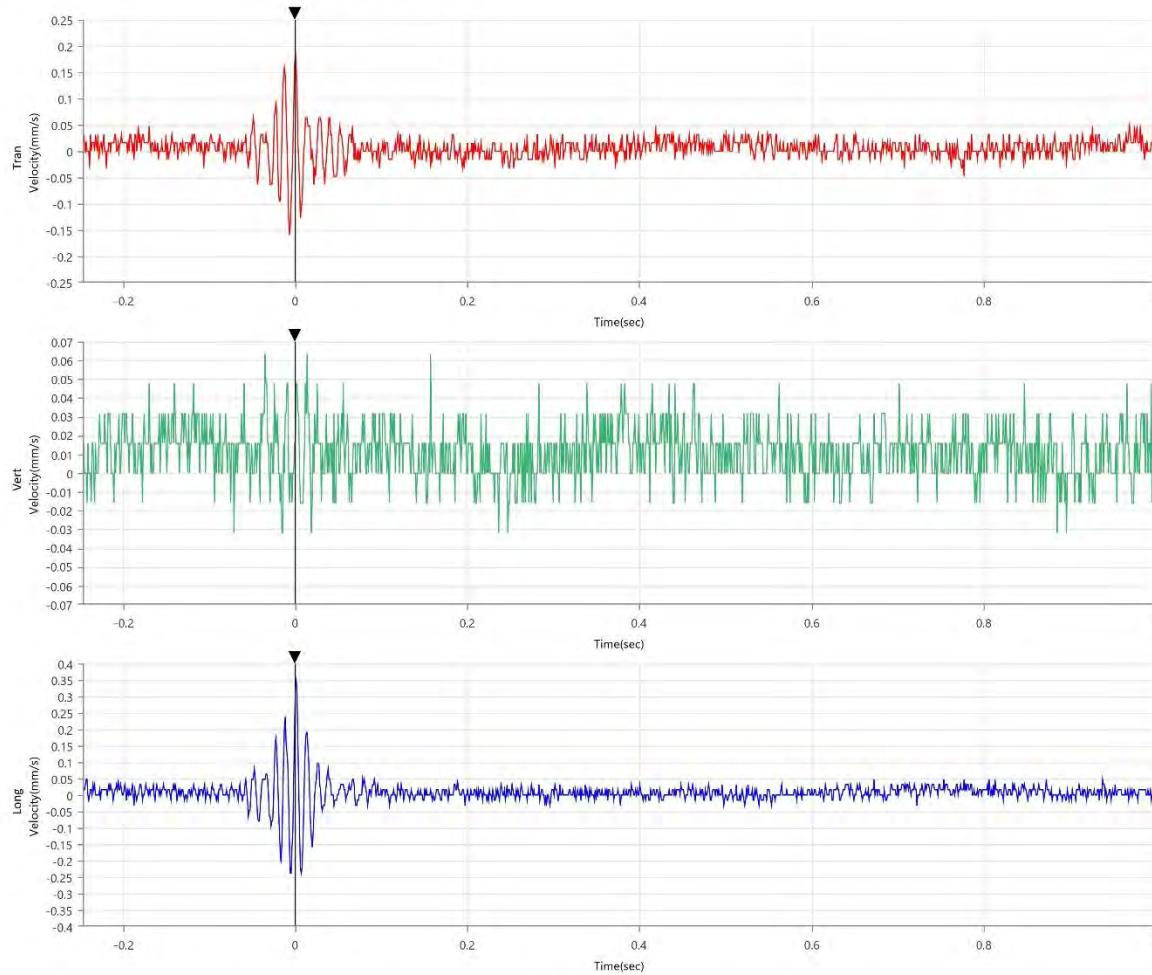
Notes:
 Location:
 Client:
 User Name:
 General:

Extended Notes: Combo Mode September 29, 2023 10:35:13

Post Event Notes: No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.190 mm/s	0.063 mm/s	0.349 mm/s
Zero Crossing Frequency	85.3 Hz	73.1 Hz	73.1 Hz
Time (Relative to Trigger)	0.000 sec	-0.035 sec	0.001 sec
Peak Acceleration	0.010 g	0.007 g	0.017 g
Peak Displacement	0.000 mm	0.000 mm	0.001 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum: 0.387 mm/s at 0.001 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Long at September 29, 2023 19:59:57
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

FFT Report

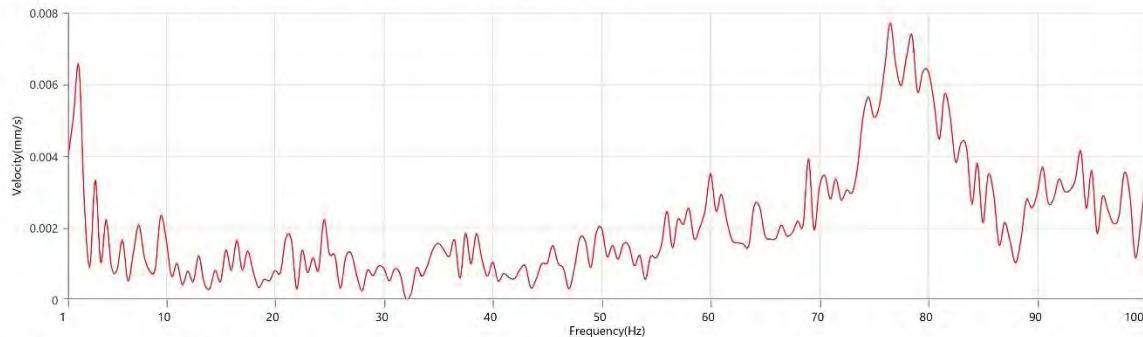
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230929195957.IDFW

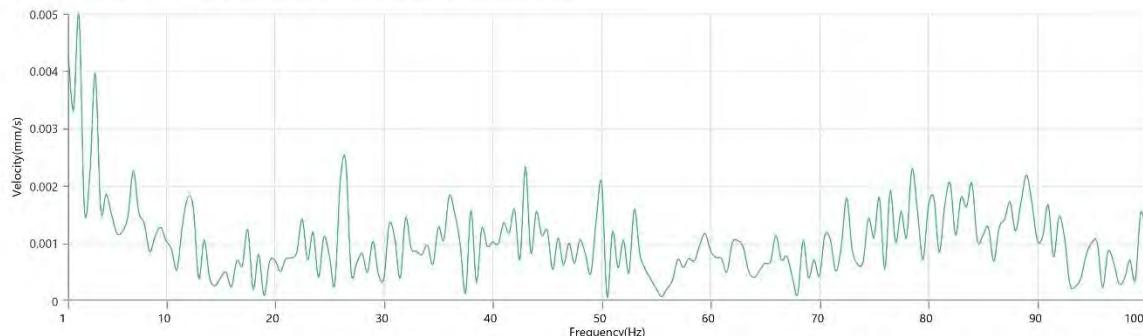
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

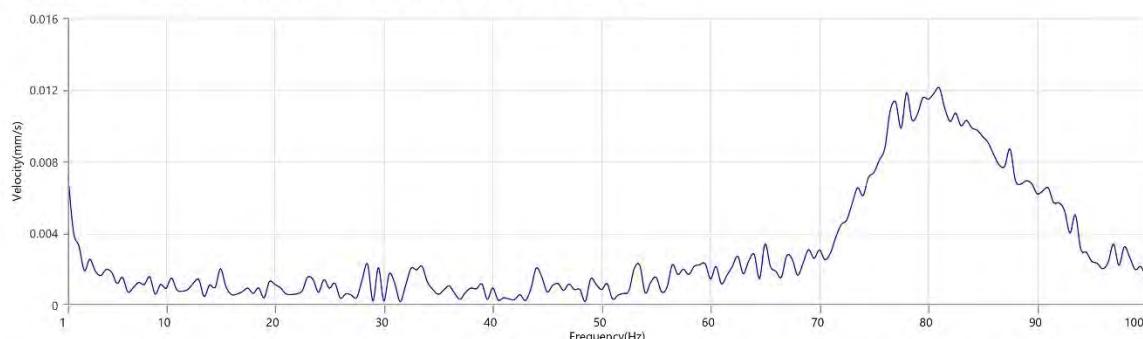
Tran - Dominant Frequency 76.5 Hz, Amplitude 0.008 mm/s (Peak Particle Velocity: 0.190 mm/s)



Vert - Dominant Frequency 2.0 Hz, Amplitude 0.005 mm/s (Peak Particle Velocity: 0.063 mm/s)



Long - Dominant Frequency 81.0 Hz, Amplitude 0.012 mm/s (Peak Particle Velocity: 0.349 mm/s)





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Vert at September 30, 2023 10:53:44
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930105344.IDFW

Notes
 Location:
 Client:
 User Name:
 General:

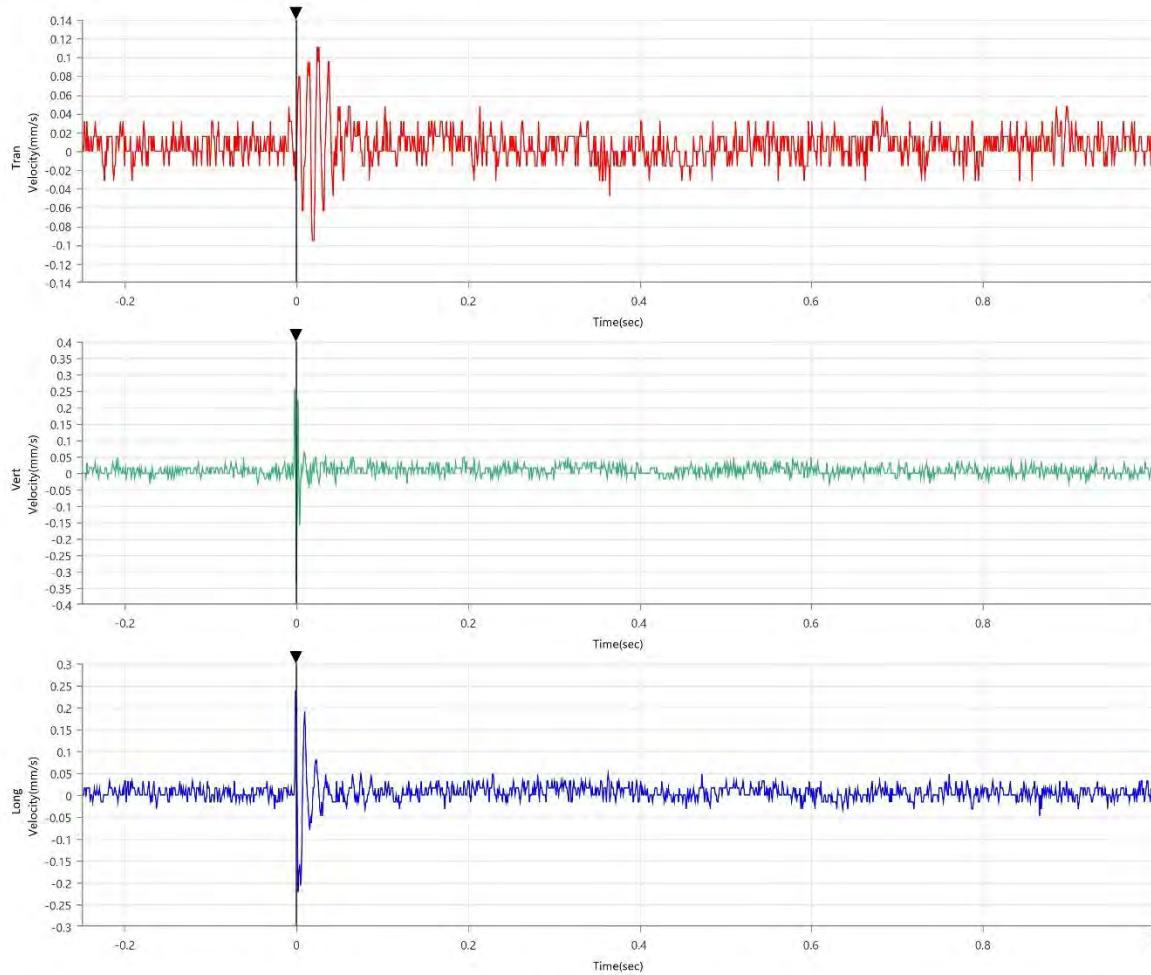
Extended Notes Combo Mode September 29, 2023 10:35:13

Post Event Notes No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.111 mm/s	0.333 mm/s	0.238 mm/s
Zero Crossing Frequency	85.3 Hz	>100 Hz	>100 Hz
Time (Relative to Trigger)	0.024 sec	0.000 sec	-0.001 sec
Peak Acceleration	0.010 g	0.045 g	0.027 g
Peak Displacement	0.000 mm	0.000 mm	0.000 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum

0.401 mm/s at 0.000 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Vert at September 30, 2023 10:53:44
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 1

FFT Report

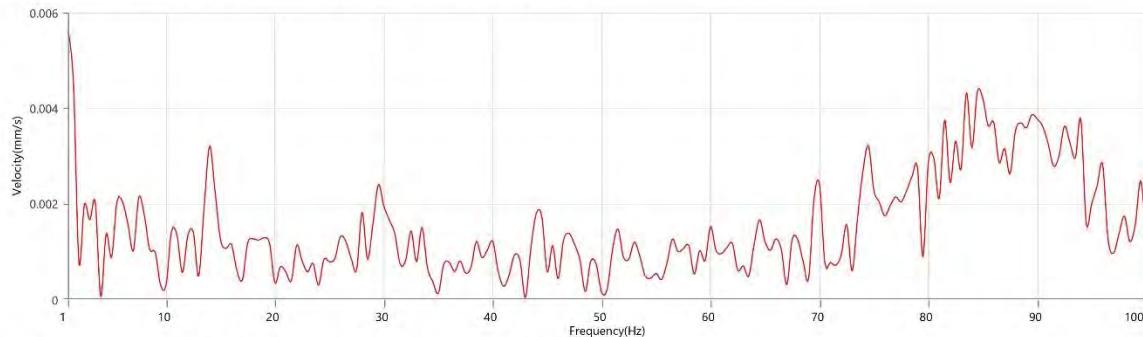
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930105344.IDFW

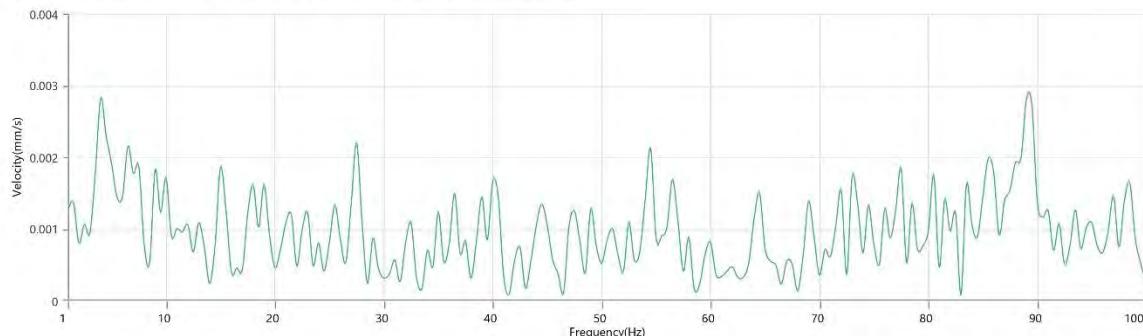
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

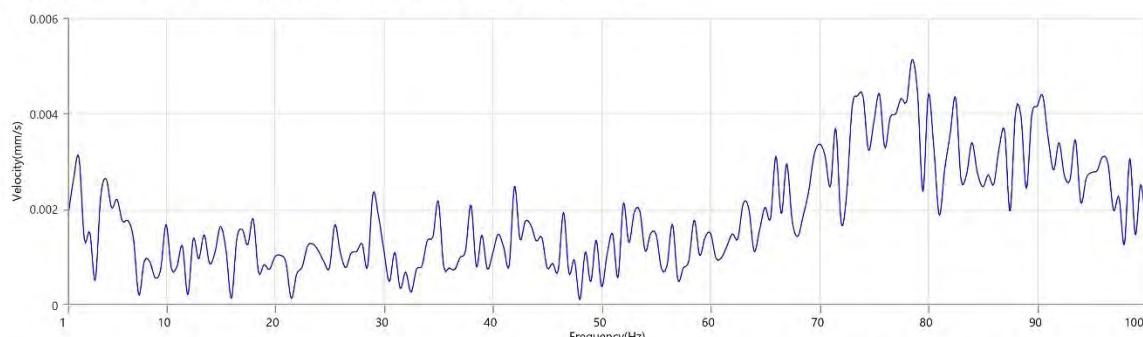
Tran - Dominant Frequency 1.0 Hz, Amplitude 0.006 mm/s (Peak Particle Velocity: 0.111 mm/s)



Vert - Dominant Frequency 4.0 Hz, Amplitude 0.003 mm/s (Peak Particle Velocity: 0.333 mm/s)



Long - Dominant Frequency 78.5 Hz, Amplitude 0.005 mm/s (Peak Particle Velocity: 0.238 mm/s)





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Long at September 30, 2023 10:56:19
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



Serial Number: BE13706
 Model Number: MiniMate Plus 10.72.8.17
 Battery Level: 6.6 volts
 Unit Calibration: February 24, 2023 by Absolute Instrument Systems
 Event File Name: BE13706_20230930105619.IDFW

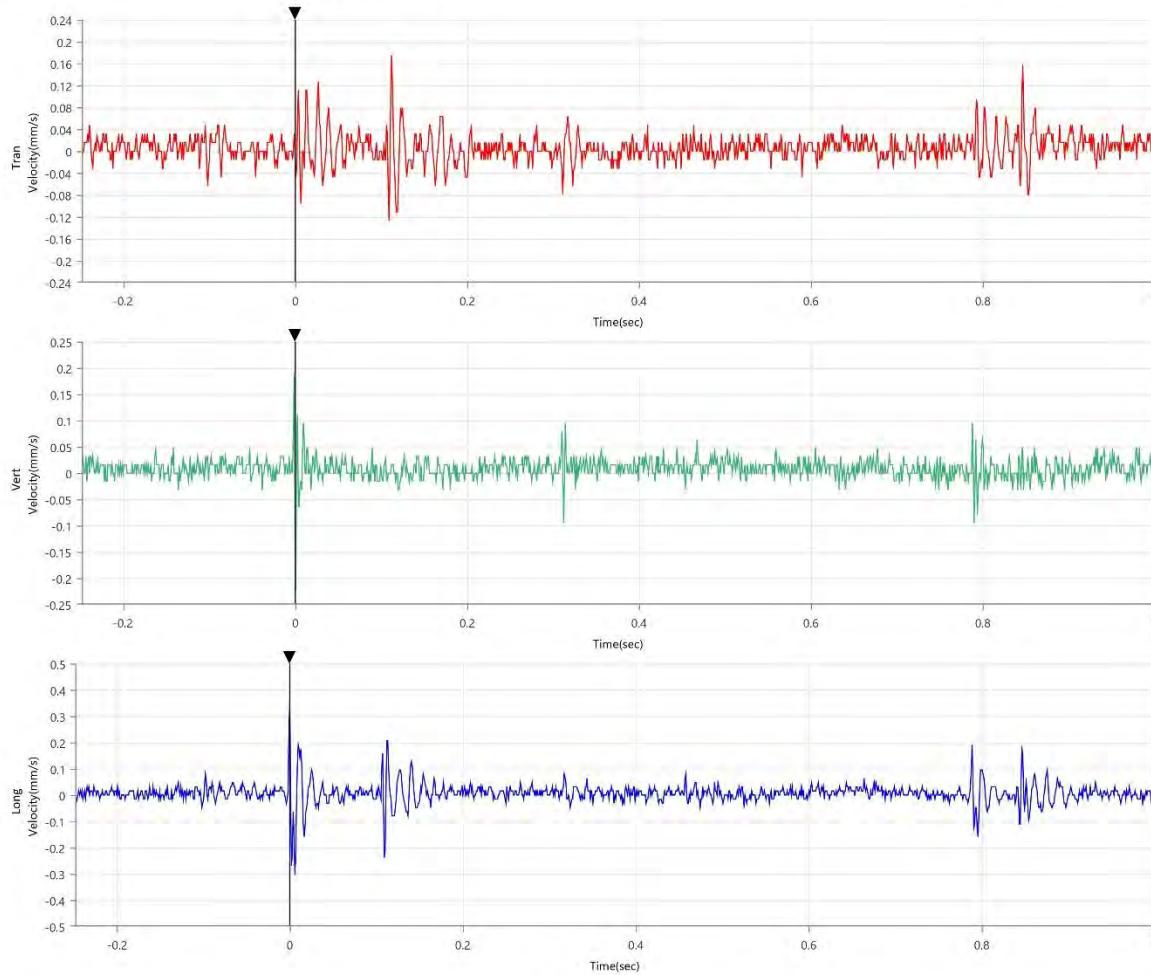
Notes:
 Location:
 Client:
 User Name:
 General:

Extended Notes: Combo Mode September 29, 2023 10:35:13
 Post Event Notes: No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.175 mm/s	0.222 mm/s	0.365 mm/s
Zero Crossing Frequency	>100 Hz	>100 Hz	>100 Hz
Time (Relative to Trigger)	0.112 sec	0.001 sec	0.000 sec
Peak Acceleration	0.015 g	0.031 g	0.036 g
Peak Displacement	0.000 mm	0.000 mm	0.000 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum

0.382 mm/s at 0.000 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Long at September 30, 2023 10:56:19
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

FFT Report

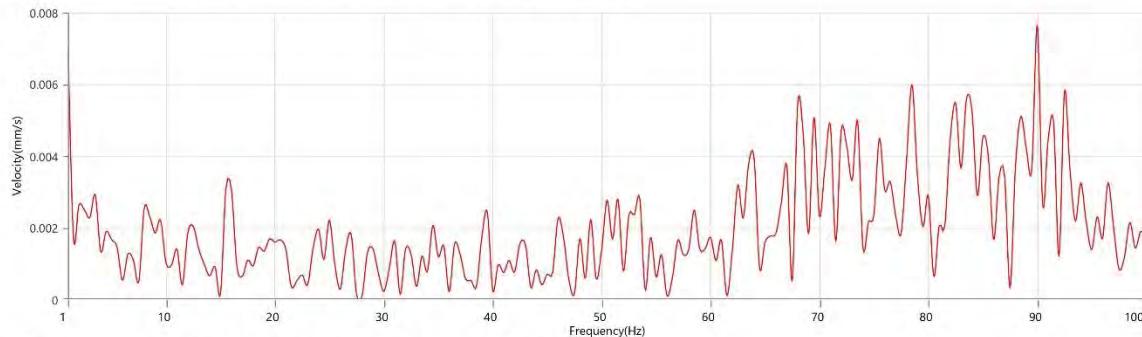
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930105619.IDFW

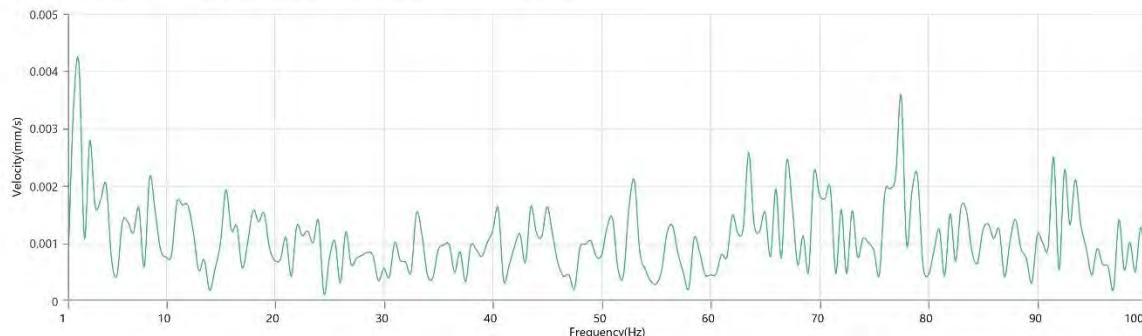
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

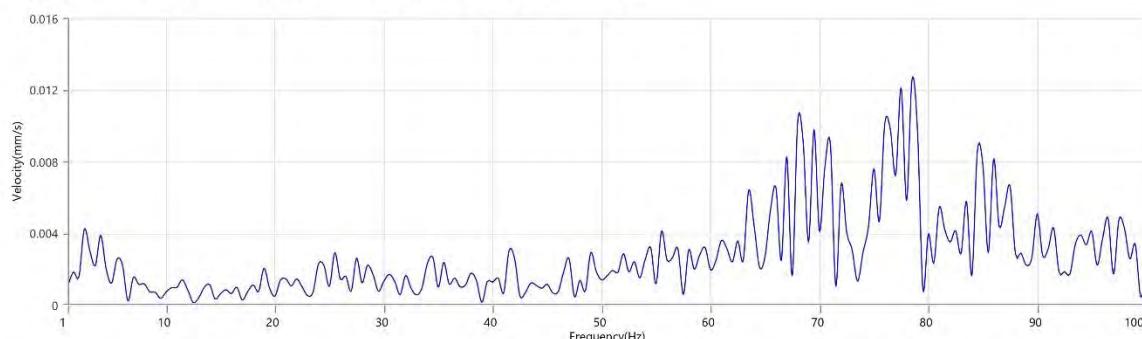
Tran - Dominant Frequency 90.0 Hz, Amplitude 0.008 mm/s (Peak Particle Velocity: 0.175 mm/s)



Vert - Dominant Frequency 2.0 Hz, Amplitude 0.004 mm/s (Peak Particle Velocity: 0.222 mm/s)



Long - Dominant Frequency 78.5 Hz, Amplitude 0.013 mm/s (Peak Particle Velocity: 0.365 mm/s)





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Long at September 30, 2023 10:56:21
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930105621.IDFW

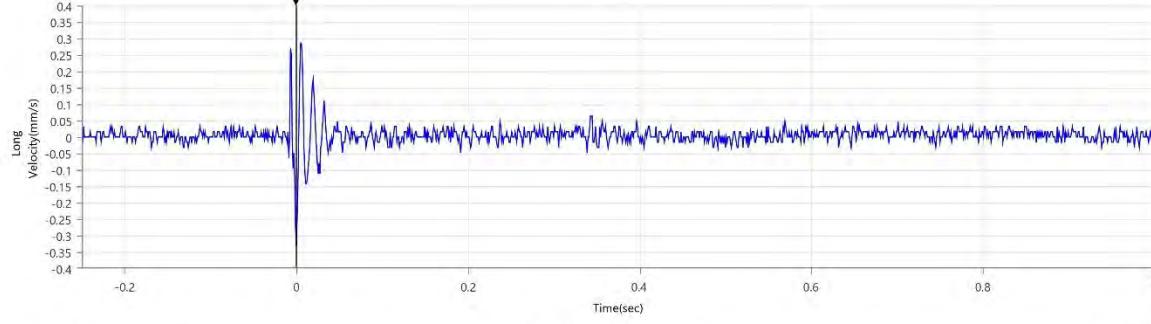
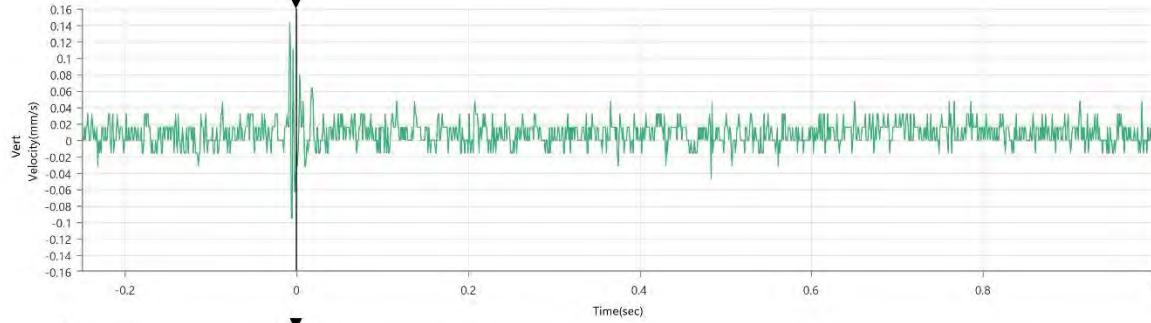
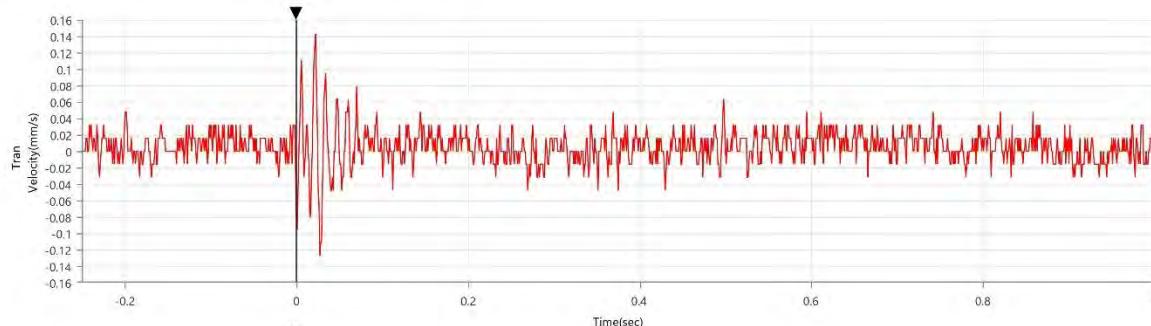
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.143 mm/s	0.143 mm/s	0.333 mm/s
Zero Crossing Frequency	73.1 Hz	>100 Hz	73.1 Hz
Time (Relative to Trigger)	0.022 sec	-0.008 sec	0.000 sec
Peak Acceleration	0.008 g	0.022 g	0.028 g
Peak Displacement	0.000 mm	0.000 mm	0.001 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum

0.343 mm/s at 0.000 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Long at September 30, 2023 10:56:21
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

FFT Report

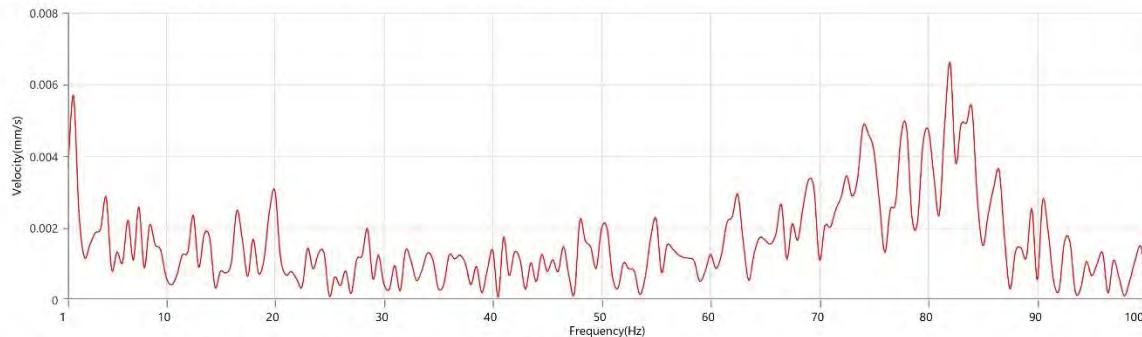
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930105621.IDFW

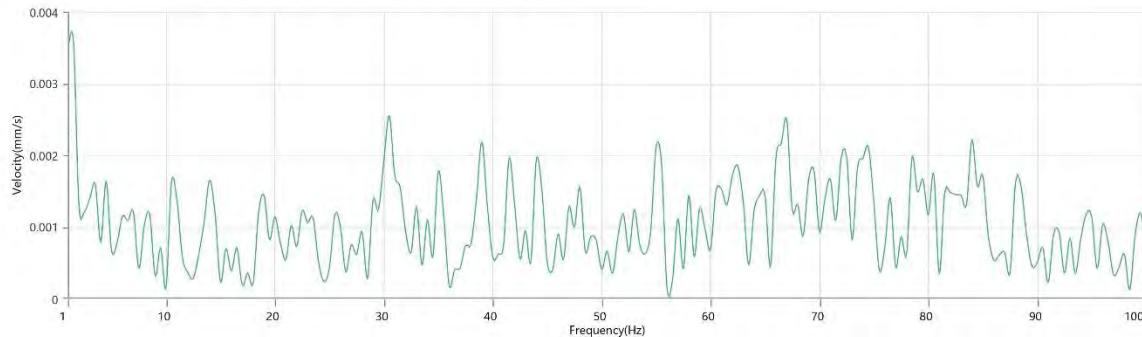
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

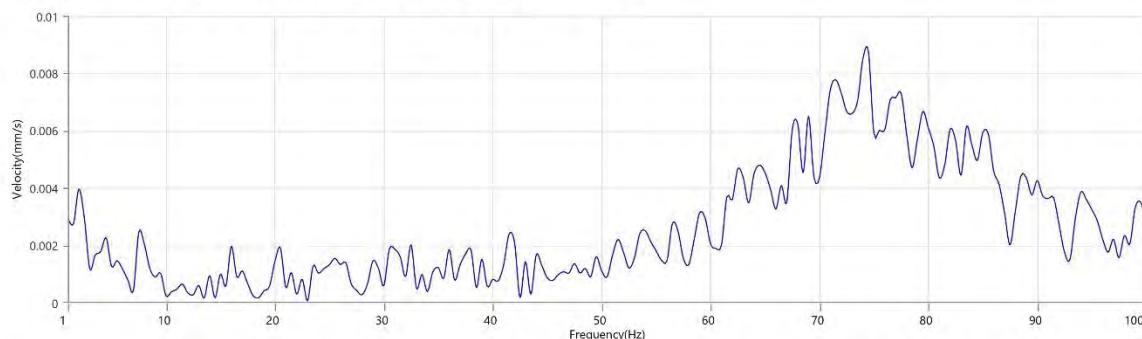
Tran - Dominant Frequency 82.0 Hz, Amplitude 0.007 mm/s (Peak Particle Velocity: 0.143 mm/s)



Vert - Dominant Frequency 1.5 Hz, Amplitude 0.004 mm/s (Peak Particle Velocity: 0.143 mm/s)



Long - Dominant Frequency 74.5 Hz, Amplitude 0.009 mm/s (Peak Particle Velocity: 0.333 mm/s)





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Long at September 30, 2023 10:56:57
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930105657.IDFW

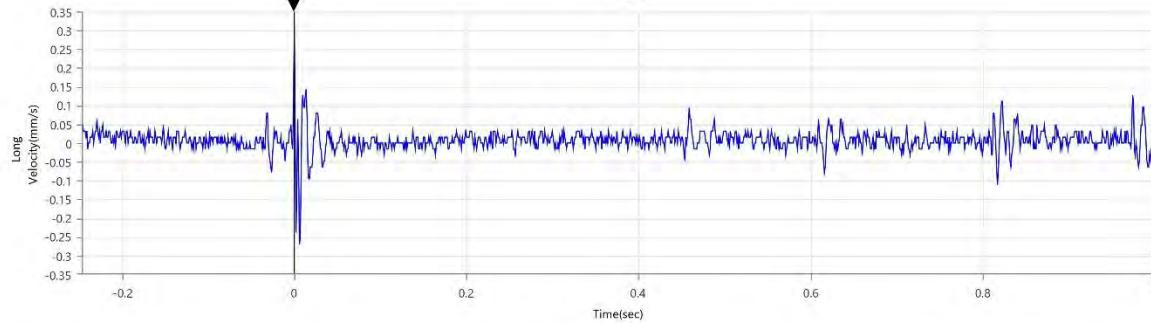
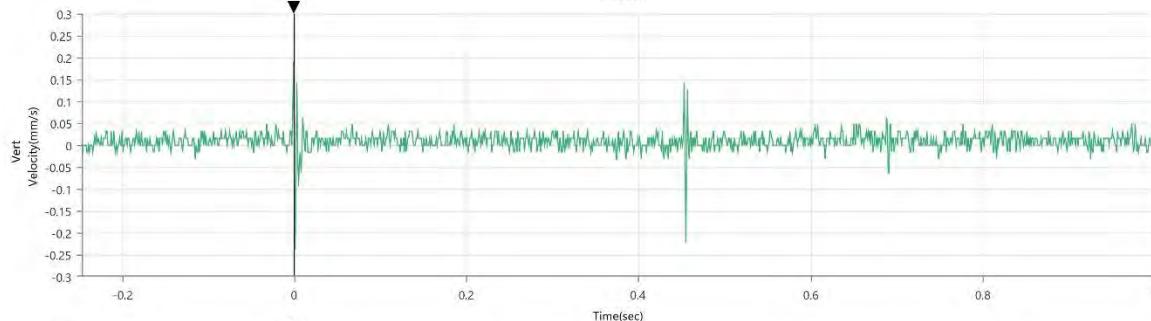
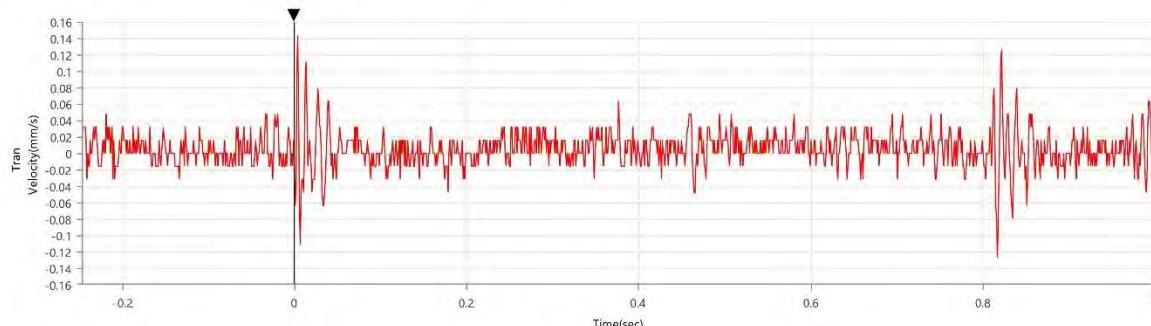
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.143 mm/s	0.238 mm/s	0.317 mm/s
Zero Crossing Frequency	>100 Hz	>100 Hz	>100 Hz
Time (Relative to Trigger)	0.004 sec	0.001 sec	0.000 sec
Peak Acceleration	0.015 g	0.025 g	0.030 g
Peak Displacement	0.000 mm	0.000 mm	0.000 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum

0.321 mm/s at 0.000 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Long at September 30, 2023 10:56:57
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

FFT Report

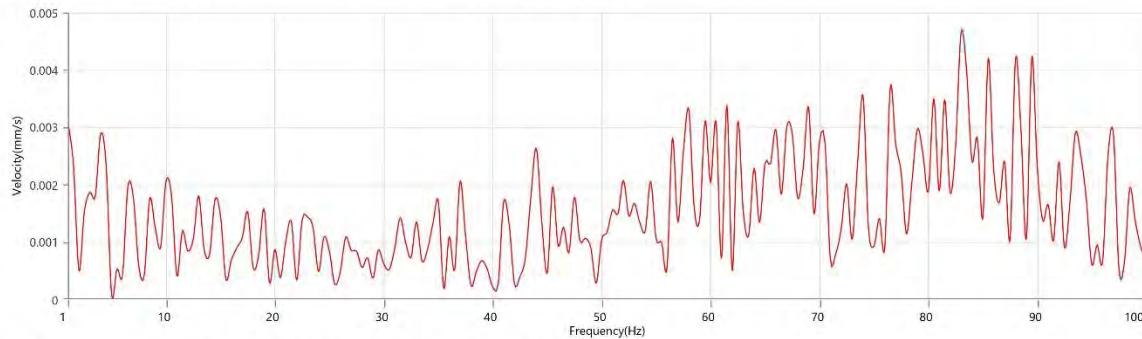
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930105657.IDFW

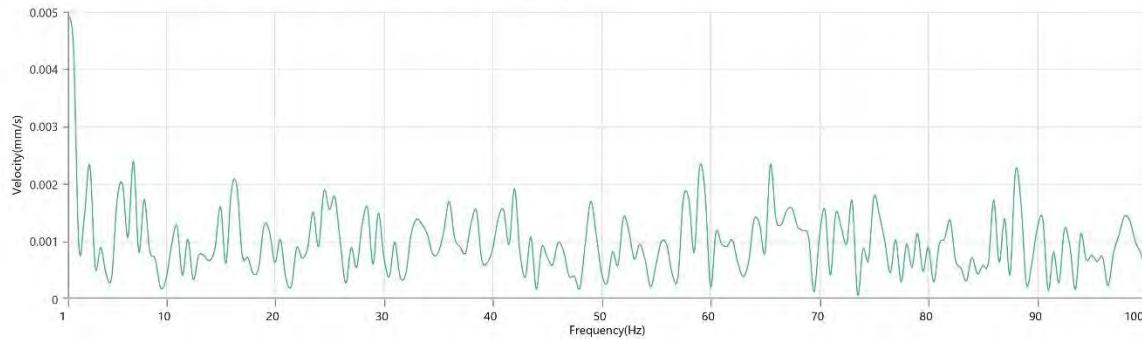
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

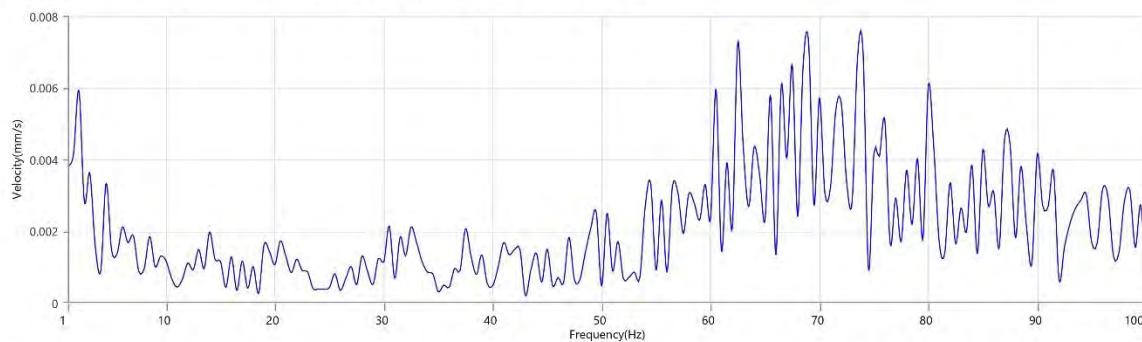
Tran - Dominant Frequency 83.0 Hz, Amplitude 0.005 mm/s (Peak Particle Velocity: 0.143 mm/s)



Vert - Dominant Frequency 1.0 Hz, Amplitude 0.005 mm/s (Peak Particle Velocity: 0.238 mm/s)



Long - Dominant Frequency 69.0 Hz, Amplitude 0.007 mm/s (Peak Particle Velocity: 0.317 mm/s)





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Long at September 30, 2023 10:58:12
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



Serial Number: BE13706
 Model Number: MiniMate Plus 10.72.8.17
 Battery Level: 6.6 volts
 Unit Calibration: February 24, 2023 by Absolute Instrument Systems
 Event File Name: BE13706_20230930105812.IDFW

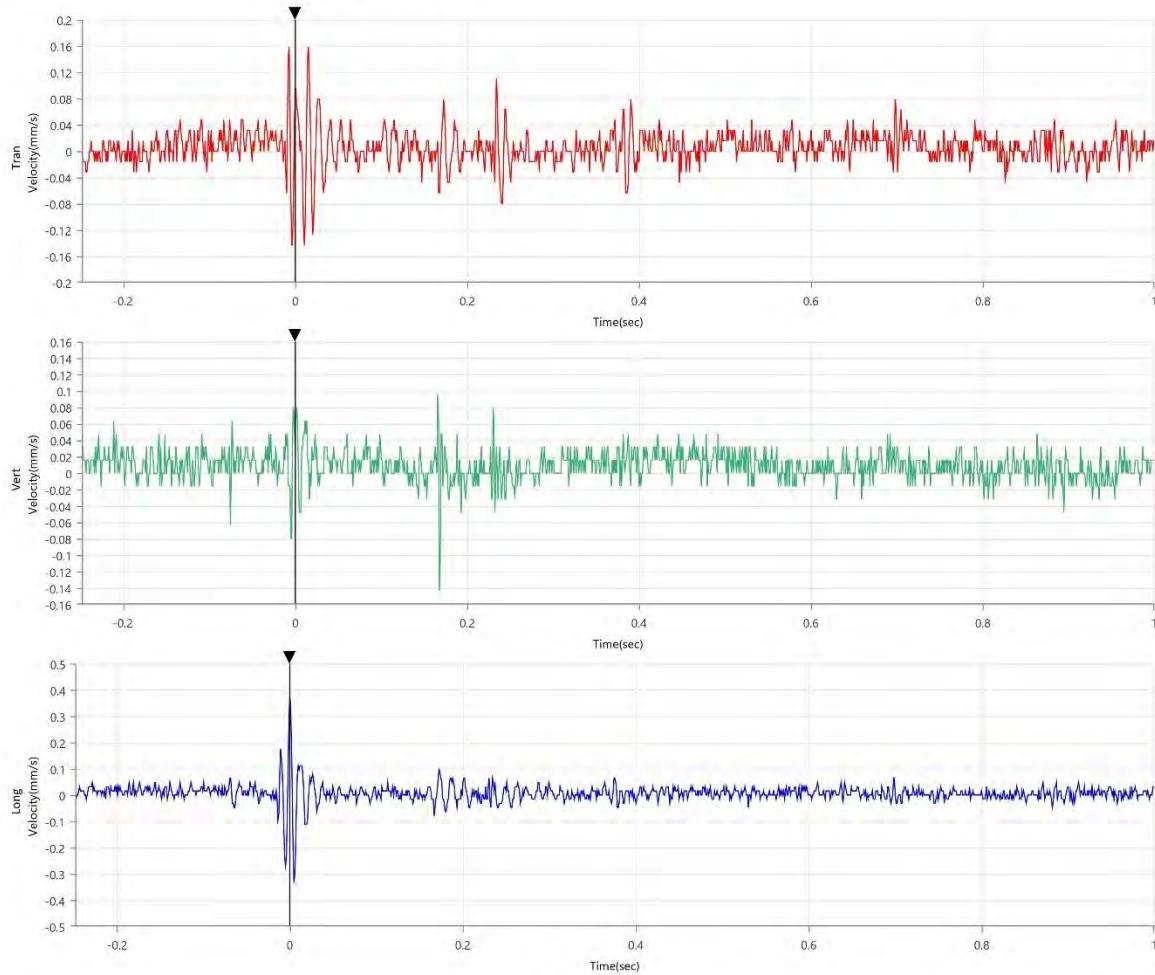
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes: Combo Mode September 29, 2023 10:35:13
 Post Event Notes: No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.159 mm/s	0.143 mm/s	0.381 mm/s
Zero Crossing Frequency	>100 Hz	>100 Hz	>100 Hz
Time (Relative to Trigger)	-0.007 sec	0.168 sec	0.000 sec
Peak Acceleration	0.013 g	0.022 g	0.023 g
Peak Displacement	0.000 mm	0.000 mm	0.001 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum

0.394 mm/s at 0.000 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Long at September 30, 2023 10:58:12
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

FFT Report

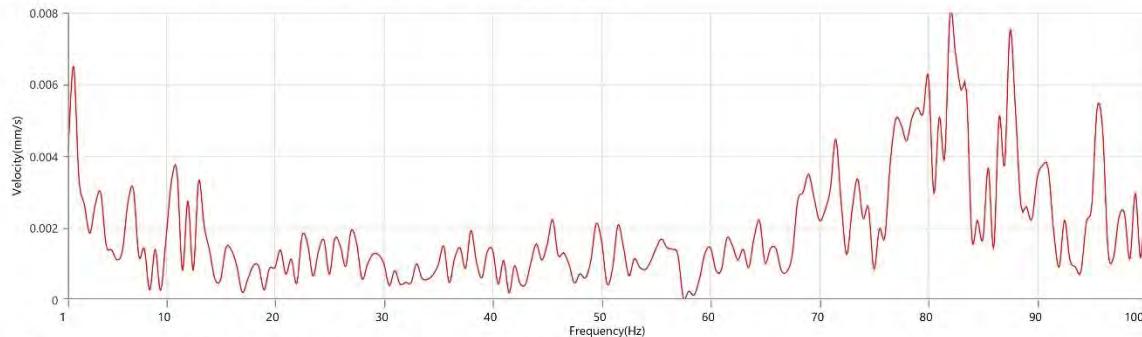
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930105812.IDFW

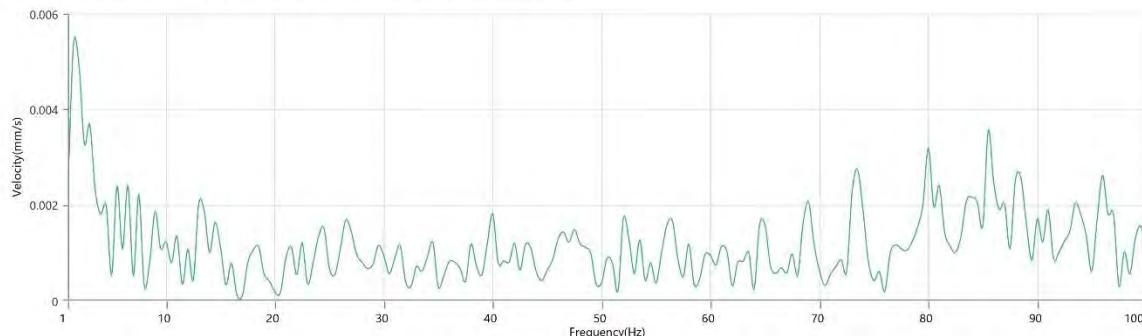
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

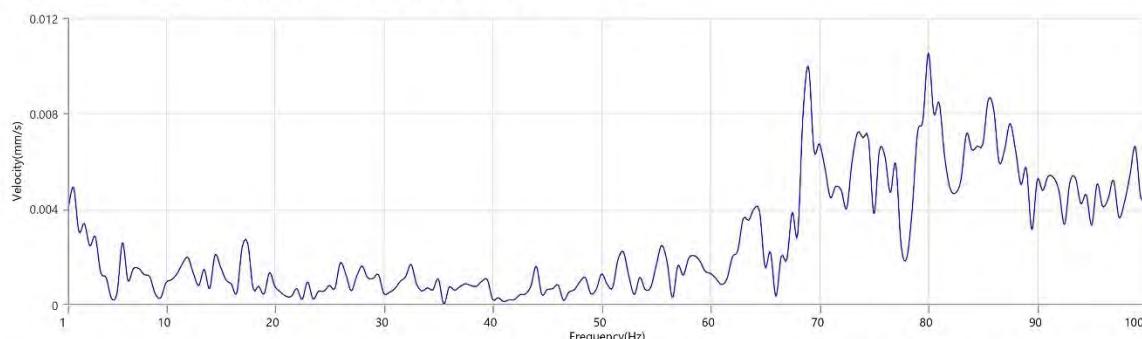
Tran - Dominant Frequency 82.0 Hz, Amplitude 0.008 mm/s (Peak Particle Velocity: 0.159 mm/s)



Vert - Dominant Frequency 1.5 Hz, Amplitude 0.005 mm/s (Peak Particle Velocity: 0.143 mm/s)



Long - Dominant Frequency 80.0 Hz, Amplitude 0.011 mm/s (Peak Particle Velocity: 0.381 mm/s)





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Vert at September 30, 2023 10:58:53
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



Serial Number: BE13706
 Model Number: MiniMate Plus 10.72.8.17
 Battery Level: 6.6 volts
 Unit Calibration: February 24, 2023 by Absolute Instrument Systems
 Event File Name: BE13706_20230930105853.IDFW

Notes:
 Location:
 Client:
 User Name:
 General:

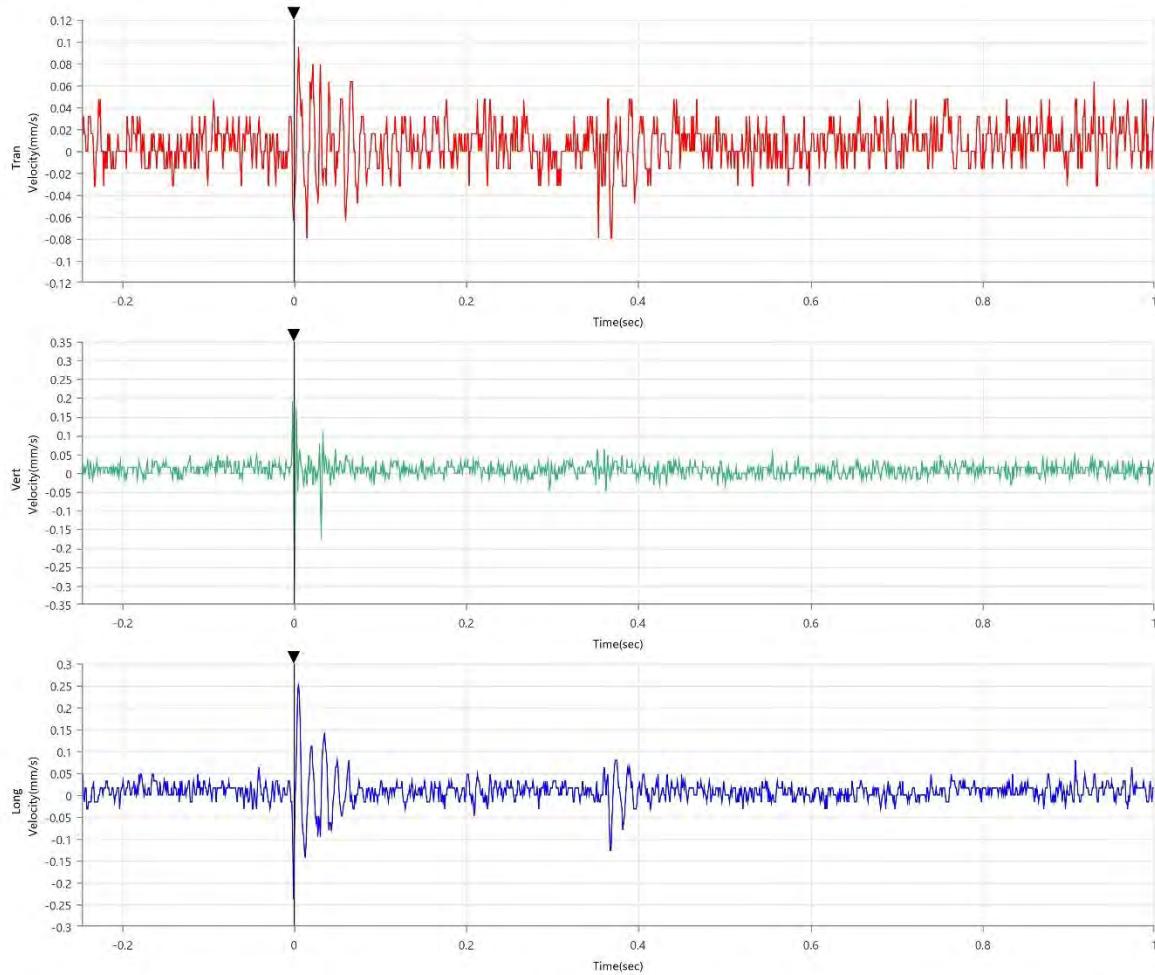
Extended Notes: Combo Mode September 29, 2023 10:35:13

Post Event Notes: No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.095 mm/s	0.317 mm/s	0.254 mm/s
Zero Crossing Frequency	73.1 Hz	>100 Hz	64.0 Hz
Time (Relative to Trigger)	0.005 sec	0.000 sec	0.005 sec
Peak Acceleration	0.008 g	0.036 g	0.015 g
Peak Displacement	0.000 mm	0.000 mm	0.001 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum

0.340 mm/s at 0.000 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Vert at September 30, 2023 10:58:53
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

FFT Report

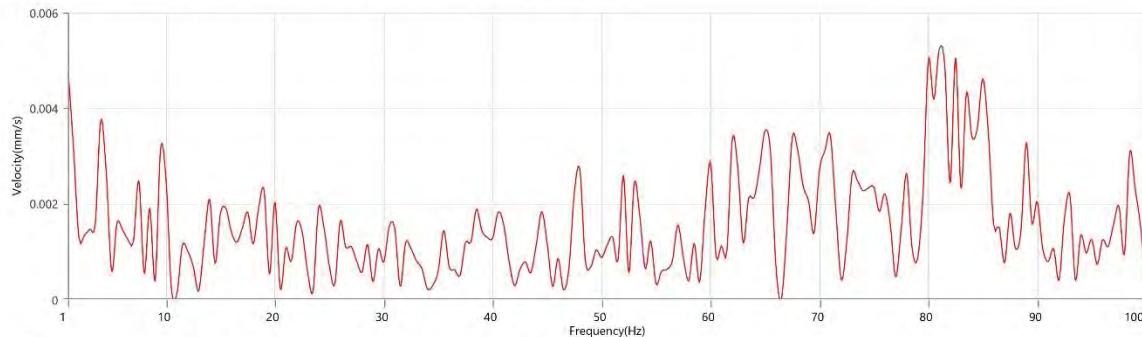
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930105853.IDFW

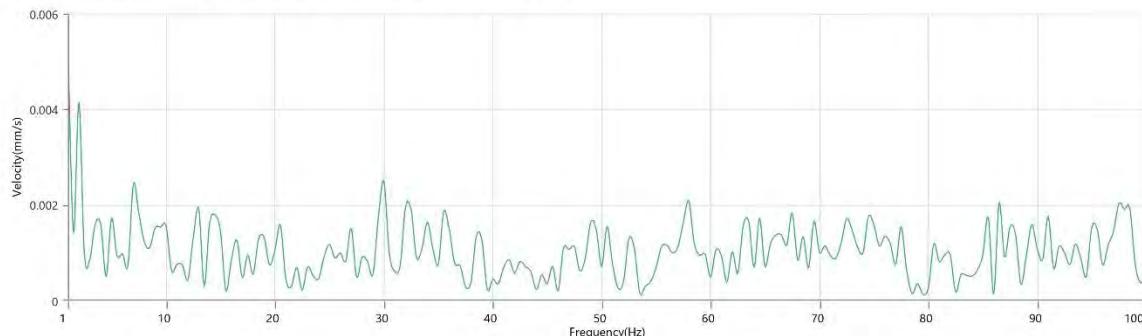
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

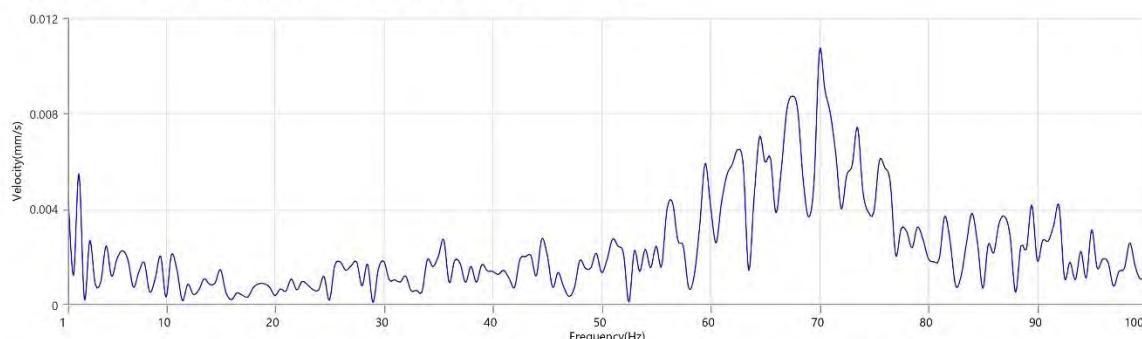
Tran - Dominant Frequency 81.0 Hz, Amplitude 0.005 mm/s (Peak Particle Velocity: 0.095 mm/s)



Vert - Dominant Frequency 1.0 Hz, Amplitude 0.005 mm/s (Peak Particle Velocity: 0.317 mm/s)



Long - Dominant Frequency 70.0 Hz, Amplitude 0.011 mm/s (Peak Particle Velocity: 0.254 mm/s)





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Vert at September 30, 2023 10:59:07
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



Serial Number: BE13706
 Model Number: MiniMate Plus 10.72.8.17
 Battery Level: 6.6 volts
 Unit Calibration: February 24, 2023 by Absolute Instrument Systems
 Event File Name: BE13706_20230930105907.IDFW

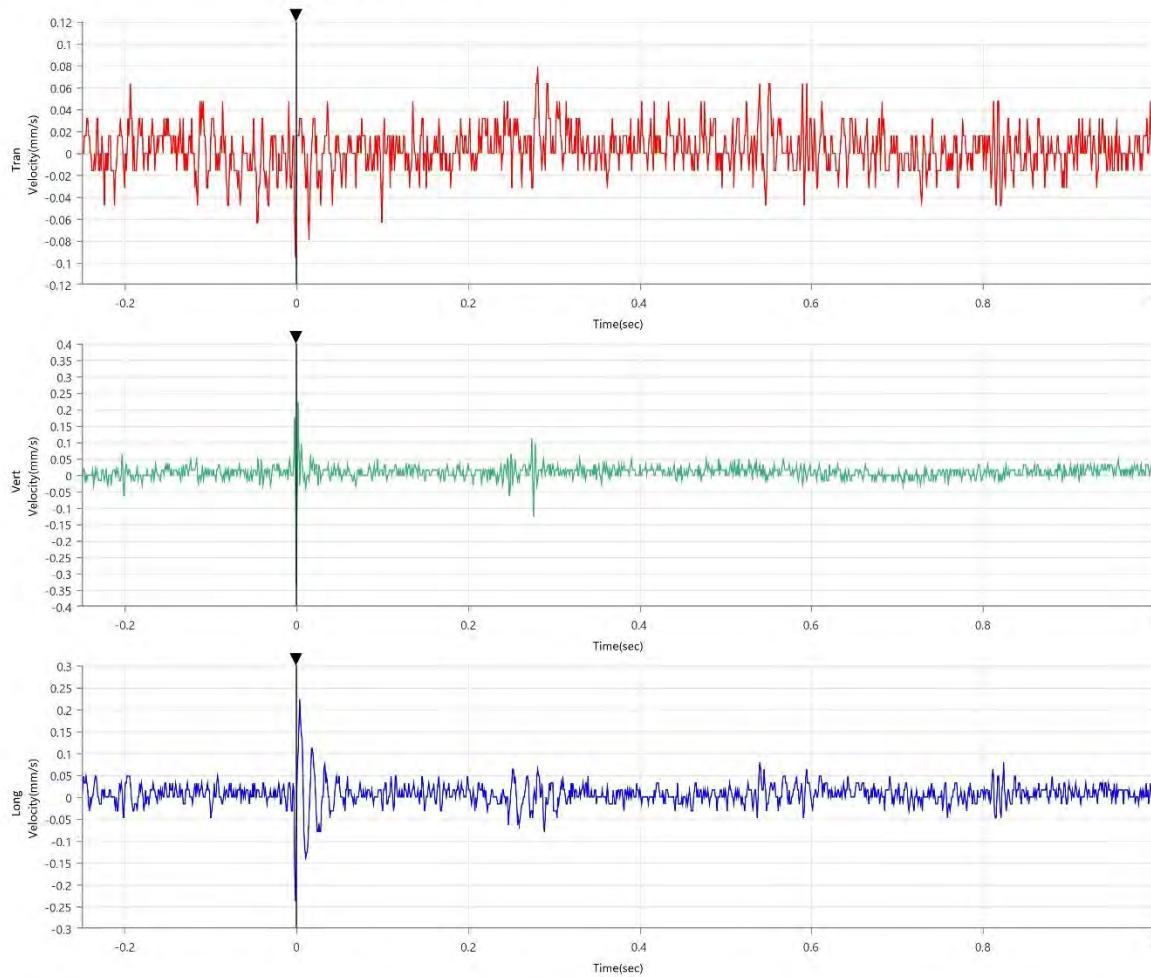
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes: Combo Mode September 29, 2023 10:35:13
 Post Event Notes: No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.095 mm/s	0.333 mm/s	0.238 mm/s
Zero Crossing Frequency	>100 Hz	>100 Hz	>100 Hz
Time (Relative to Trigger)	-0.001 sec	0.000 sec	-0.001 sec
Peak Acceleration	0.012 g	0.031 g	0.020 g
Peak Displacement	0.000 mm	0.000 mm	0.000 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum

0.340 mm/s at 0.000 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Vert at September 30, 2023 10:59:07
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

FFT Report

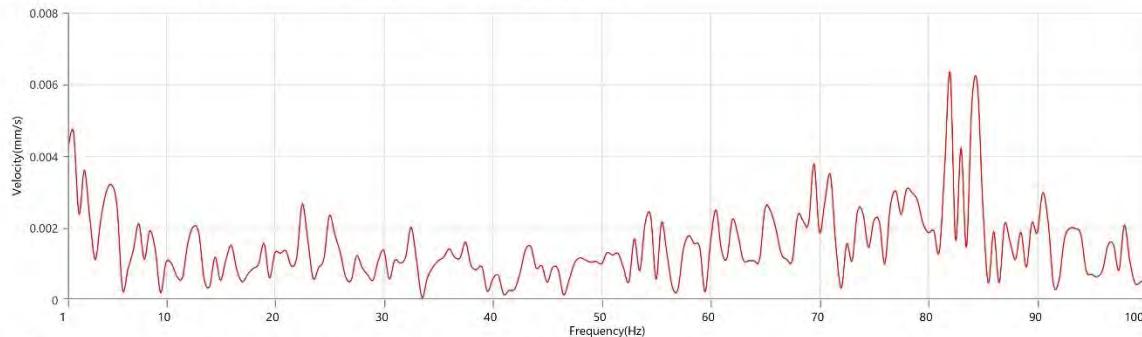
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930105907.IDFW

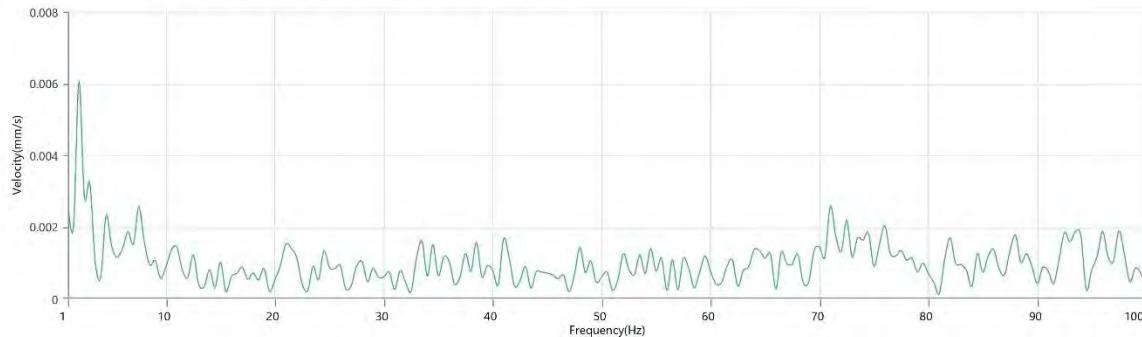
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

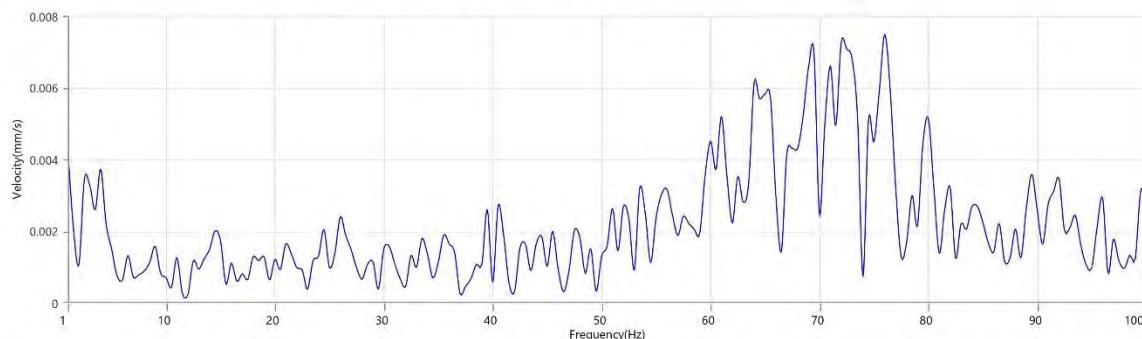
Tran - Dominant Frequency 82.0 Hz, Amplitude 0.006 mm/s (Peak Particle Velocity: 0.095 mm/s)



Vert - Dominant Frequency 2.0 Hz, Amplitude 0.006 mm/s (Peak Particle Velocity: 0.333 mm/s)



Long - Dominant Frequency 76.0 Hz, Amplitude 0.007 mm/s (Peak Particle Velocity: 0.238 mm/s)





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Vert at September 30, 2023 10:59:13
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



Serial Number: BE13706
 Model Number: MiniMate Plus 10.72.8.17
 Battery Level: 6.6 volts
 Unit Calibration: February 24, 2023 by Absolute Instrument Systems
 Event File Name: BE13706_20230930105913.IDFW

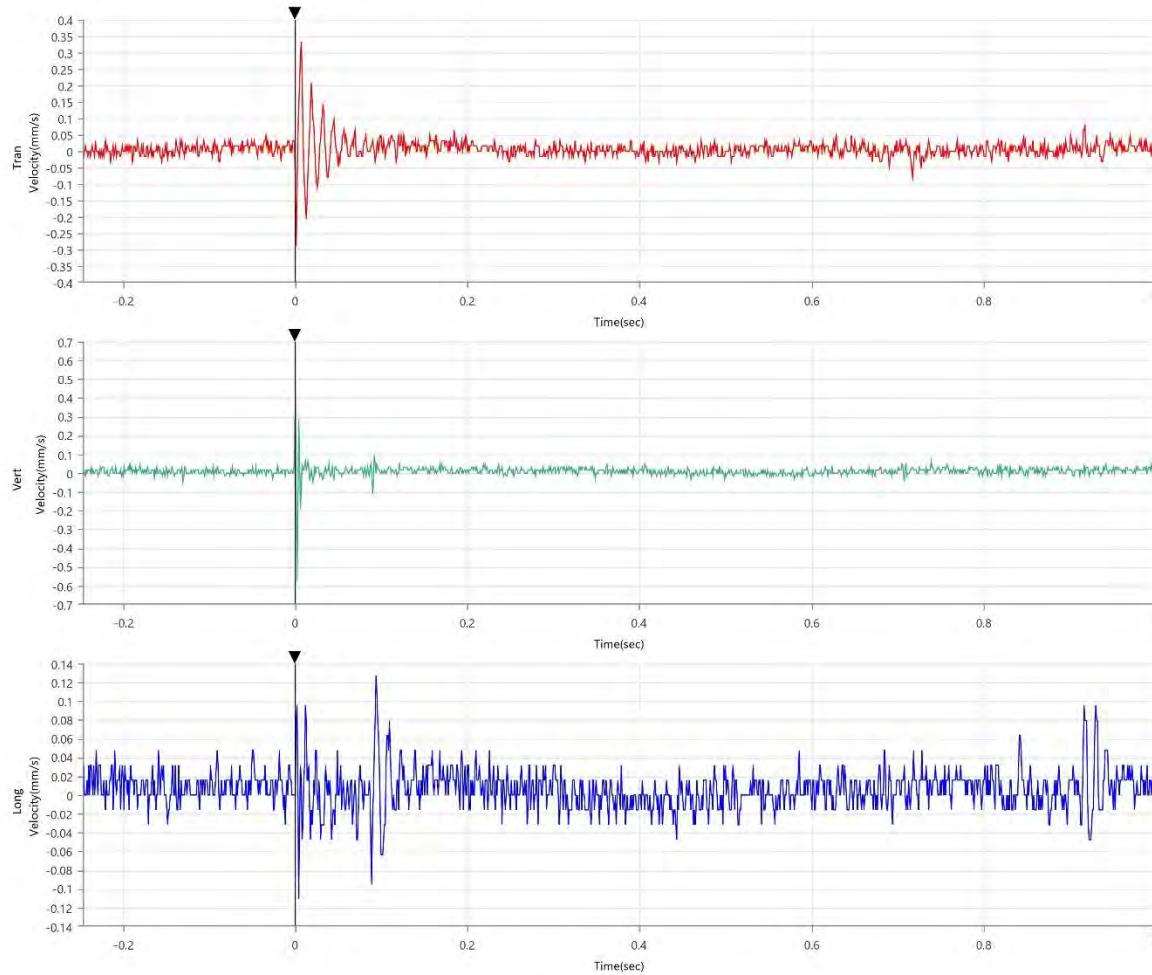
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes: Combo Mode September 29, 2023 10:35:13

Post Event Notes: No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.333 mm/s	0.571 mm/s	0.127 mm/s
Zero Crossing Frequency	73.1 Hz	>100 Hz	64.0 Hz
Time (Relative to Trigger)	0.007 sec	0.002 sec	0.094 sec
Peak Acceleration	0.018 g	0.056 g	0.013 g
Peak Displacement	0.001 mm	0.000 mm	0.000 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum: 0.590 mm/s at 0.002 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Vert at September 30, 2023 10:59:13
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

FFT Report

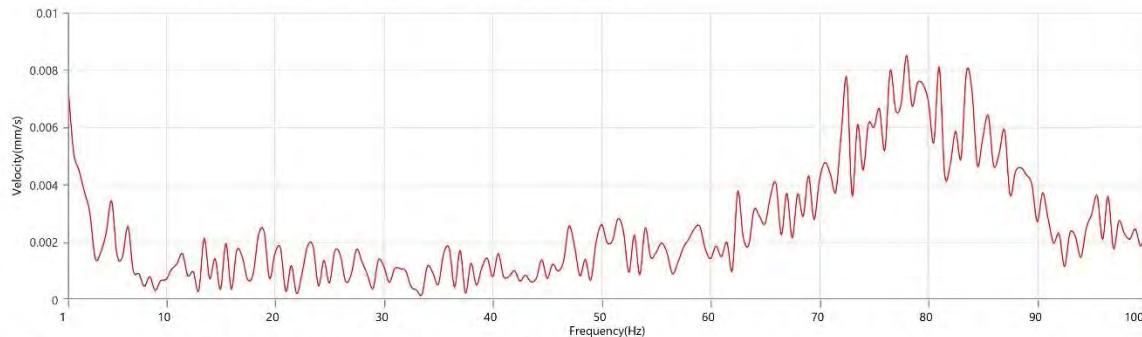
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930105913.IDFW

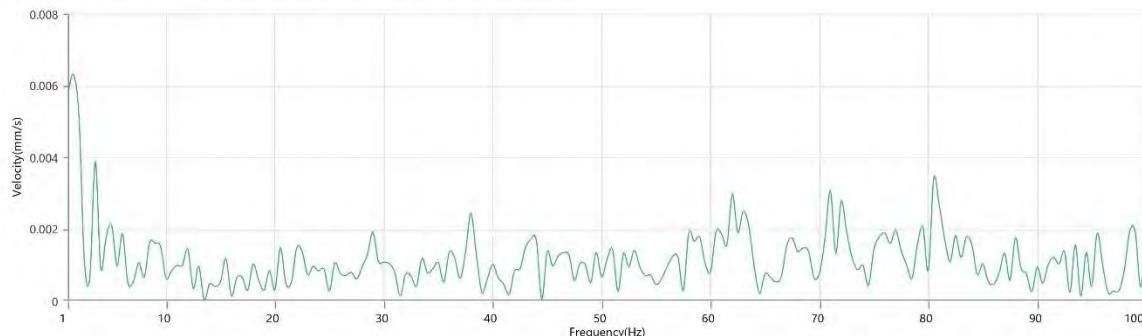
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

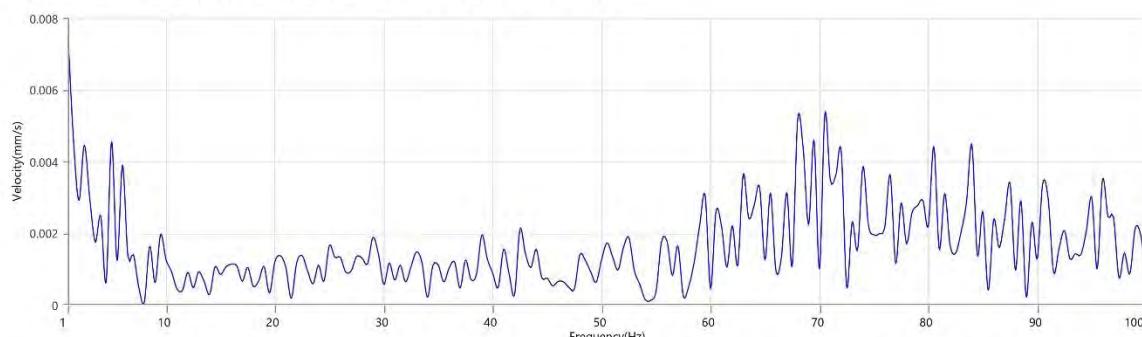
Tran - Dominant Frequency 78.0 Hz, Amplitude 0.008 mm/s (Peak Particle Velocity: 0.333 mm/s)



Vert - Dominant Frequency 1.5 Hz, Amplitude 0.006 mm/s (Peak Particle Velocity: 0.571 mm/s)



Long - Dominant Frequency 1.0 Hz, Amplitude 0.008 mm/s (Peak Particle Velocity: 0.127 mm/s)





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Tran at September 30, 2023 11:09:05
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



Serial Number: BE13706
 Model Number: MiniMate Plus 10.72.8.17
 Battery Level: 6.6 volts
 Unit Calibration: February 24, 2023 by Absolute Instrument Systems
 Event File Name: BE13706_20230930110905.IDFW

Notes:
 Location:
 Client:
 User Name:
 General:

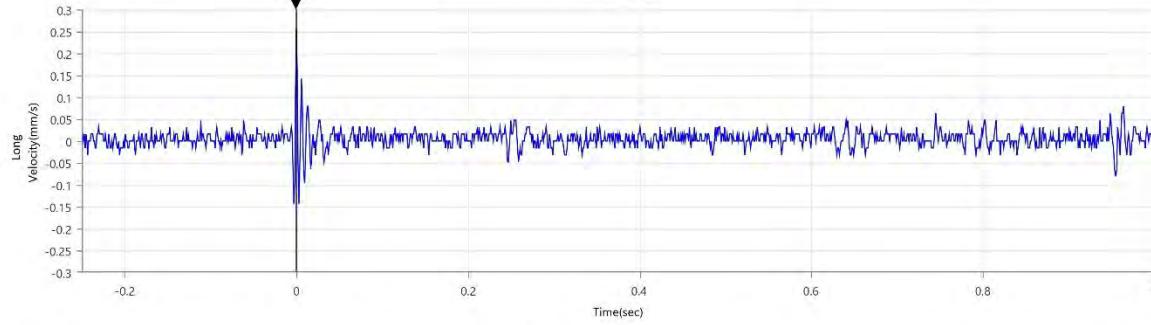
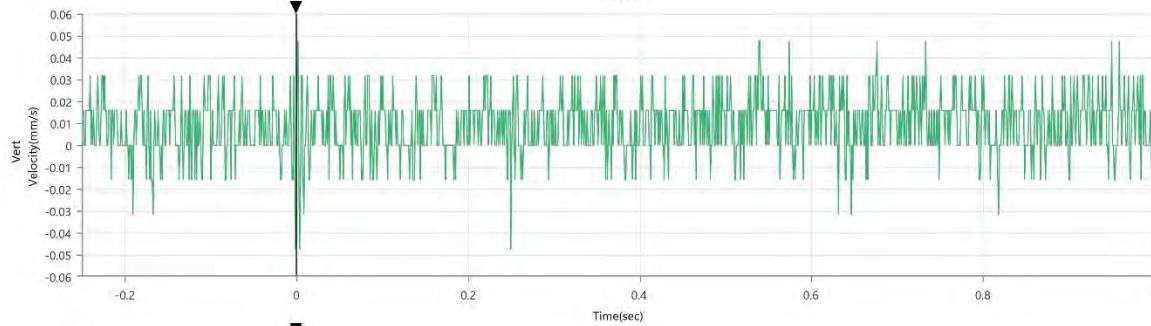
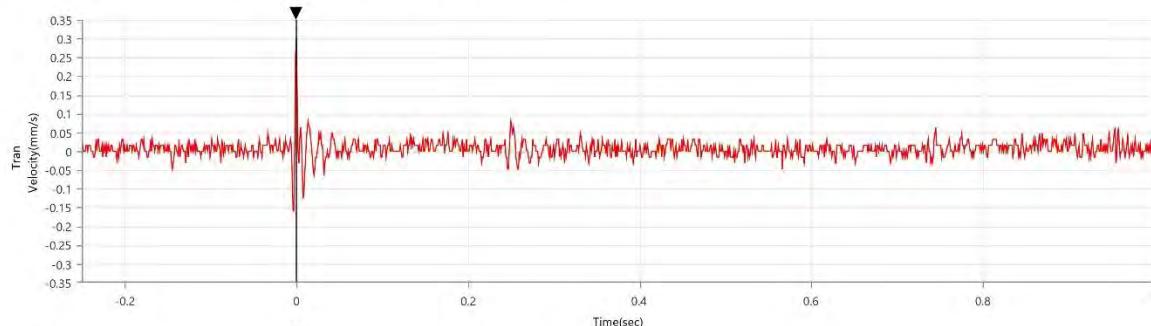
Extended Notes: Combo Mode September 29, 2023 10:35:13

Post Event Notes: No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.302 mm/s	0.048 mm/s	0.254 mm/s
Zero Crossing Frequency	>100 Hz	>100 Hz	>100 Hz
Time (Relative to Trigger)	0.000 sec	-0.001 sec	0.000 sec
Peak Acceleration	0.025 g	0.007 g	0.022 g
Peak Displacement	0.000 mm	0.000 mm	0.000 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum

0.396 mm/s at 0.000 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Tran at September 30, 2023 11:09:05
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

FFT Report

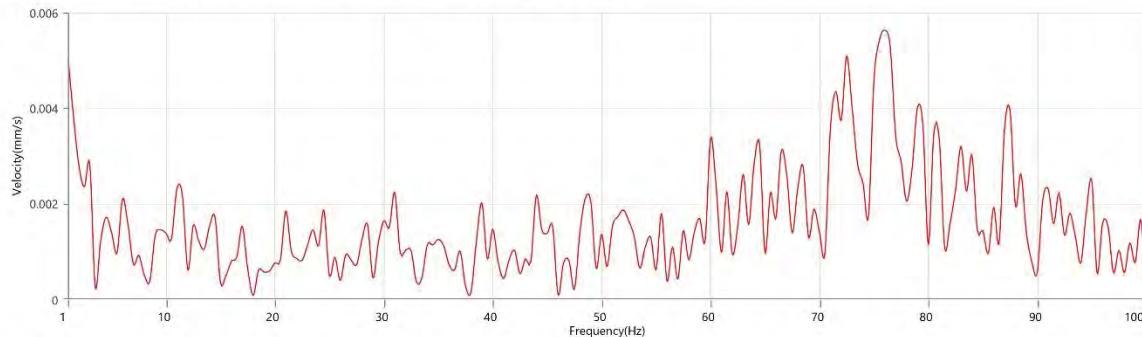
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930110905.IDFW

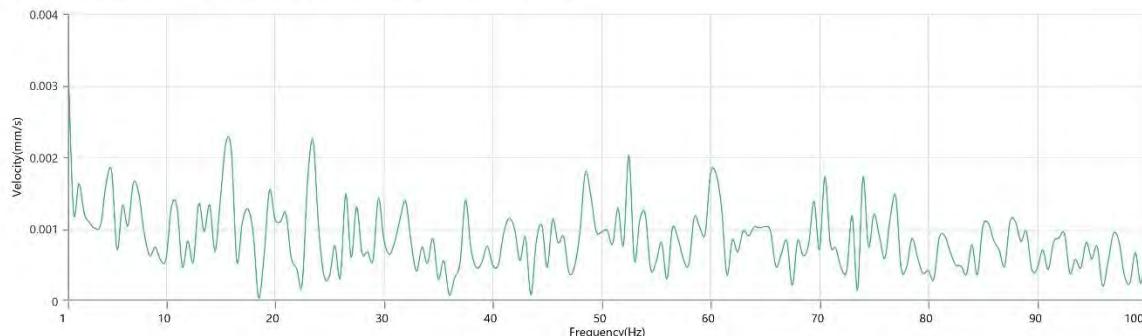
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

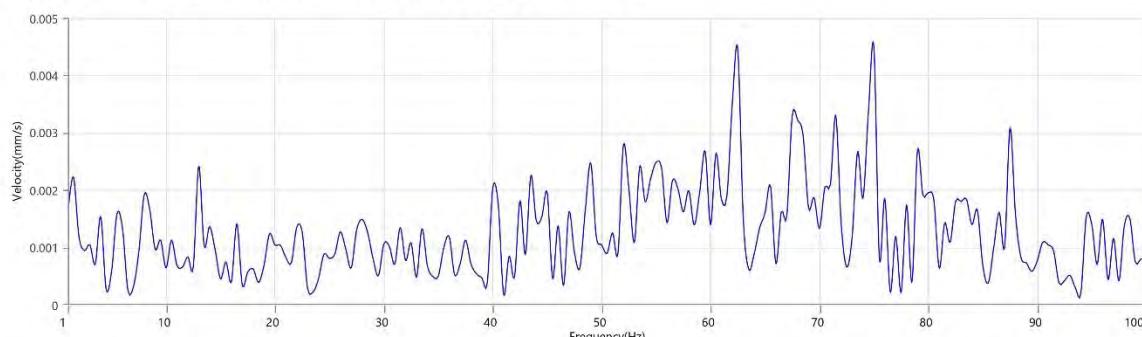
Tran - Dominant Frequency 76.0 Hz, Amplitude 0.006 mm/s (Peak Particle Velocity: 0.302 mm/s)



Vert - Dominant Frequency 1.0 Hz, Amplitude 0.003 mm/s (Peak Particle Velocity: 0.048 mm/s)



Long - Dominant Frequency 75.0 Hz, Amplitude 0.004 mm/s (Peak Particle Velocity: 0.254 mm/s)





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Tran at September 30, 2023 11:10:13
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



Serial Number: BE13706
 Model Number: MiniMate Plus 10.72.8.17
 Battery Level: 6.6 volts
 Unit Calibration: February 24, 2023 by Absolute Instrument Systems
 Event File Name: BE13706_20230930111013.IDFW

Notes
 Location:
 Client:
 User Name:
 General:

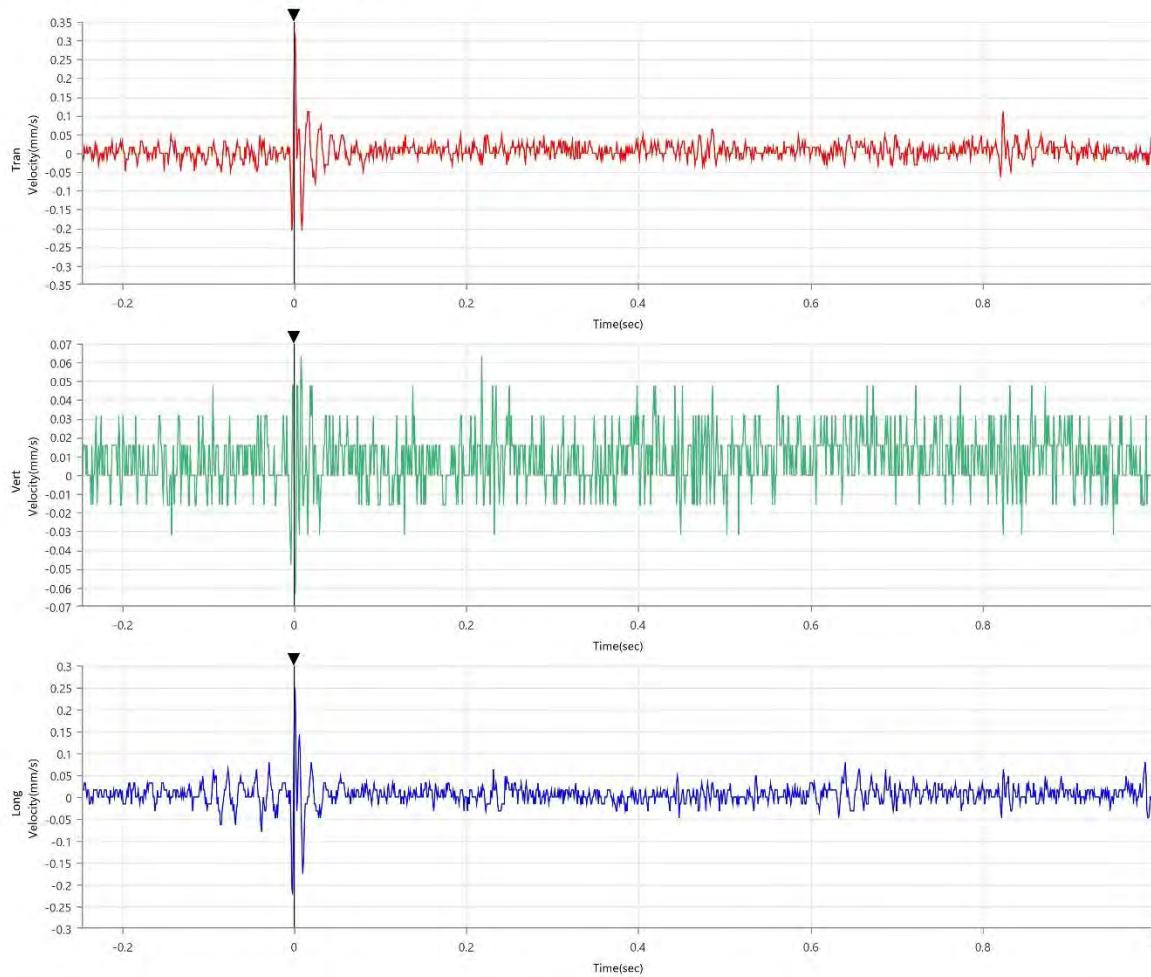
Extended Notes: Combo Mode September 29, 2023 10:35:13

Post Event Notes: No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.317 mm/s	0.063 mm/s	0.254 mm/s
Zero Crossing Frequency	>100 Hz	>100 Hz	>100 Hz
Time (Relative to Trigger)	0.000 sec	0.001 sec	0.000 sec
Peak Acceleration	0.027 g	0.010 g	0.027 g
Peak Displacement	0.000 mm	0.000 mm	0.000 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum

0.409 mm/s at 0.000 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Tran at September 30, 2023 11:10:13
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

FFT Report

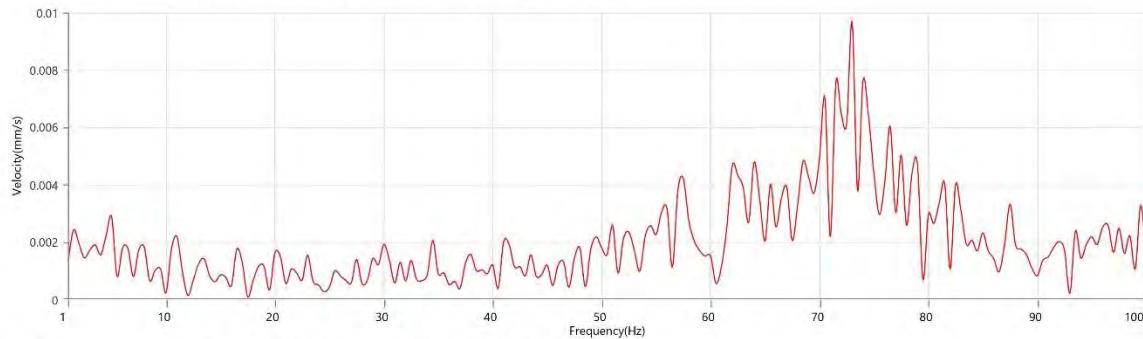
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930111013.IDFW

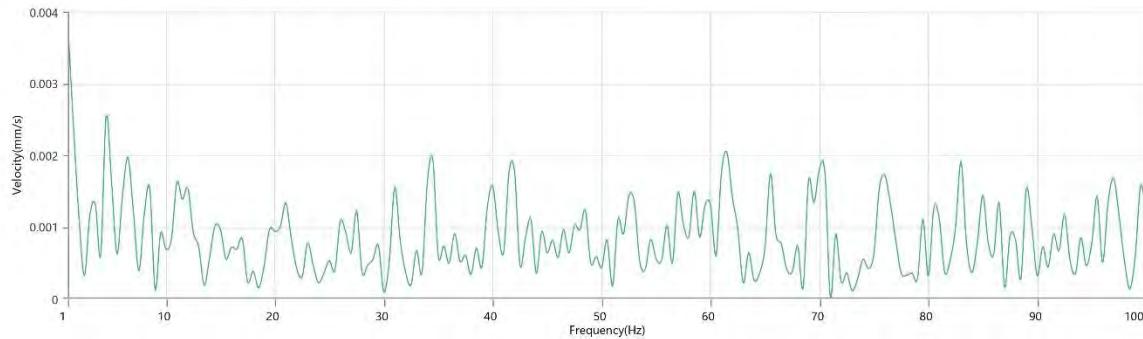
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

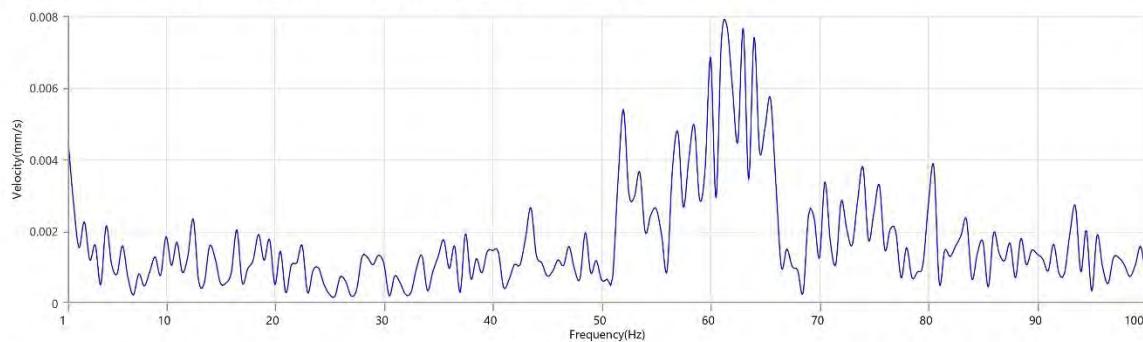
Tran - Dominant Frequency 73.0 Hz, Amplitude 0.010 mm/s (Peak Particle Velocity: 0.317 mm/s)



Vert - Dominant Frequency 1.0 Hz, Amplitude 0.004 mm/s (Peak Particle Velocity: 0.063 mm/s)



Long - Dominant Frequency 61.5 Hz, Amplitude 0.008 mm/s (Peak Particle Velocity: 0.254 mm/s)





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Tran at September 30, 2023 11:10:21
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



Serial Number: BE13706
 Model Number: MiniMate Plus 10.72.8.17
 Battery Level: 6.6 volts
 Unit Calibration: February 24, 2023 by Absolute Instrument Systems
 Event File Name: BE13706_20230930111021.IDFW

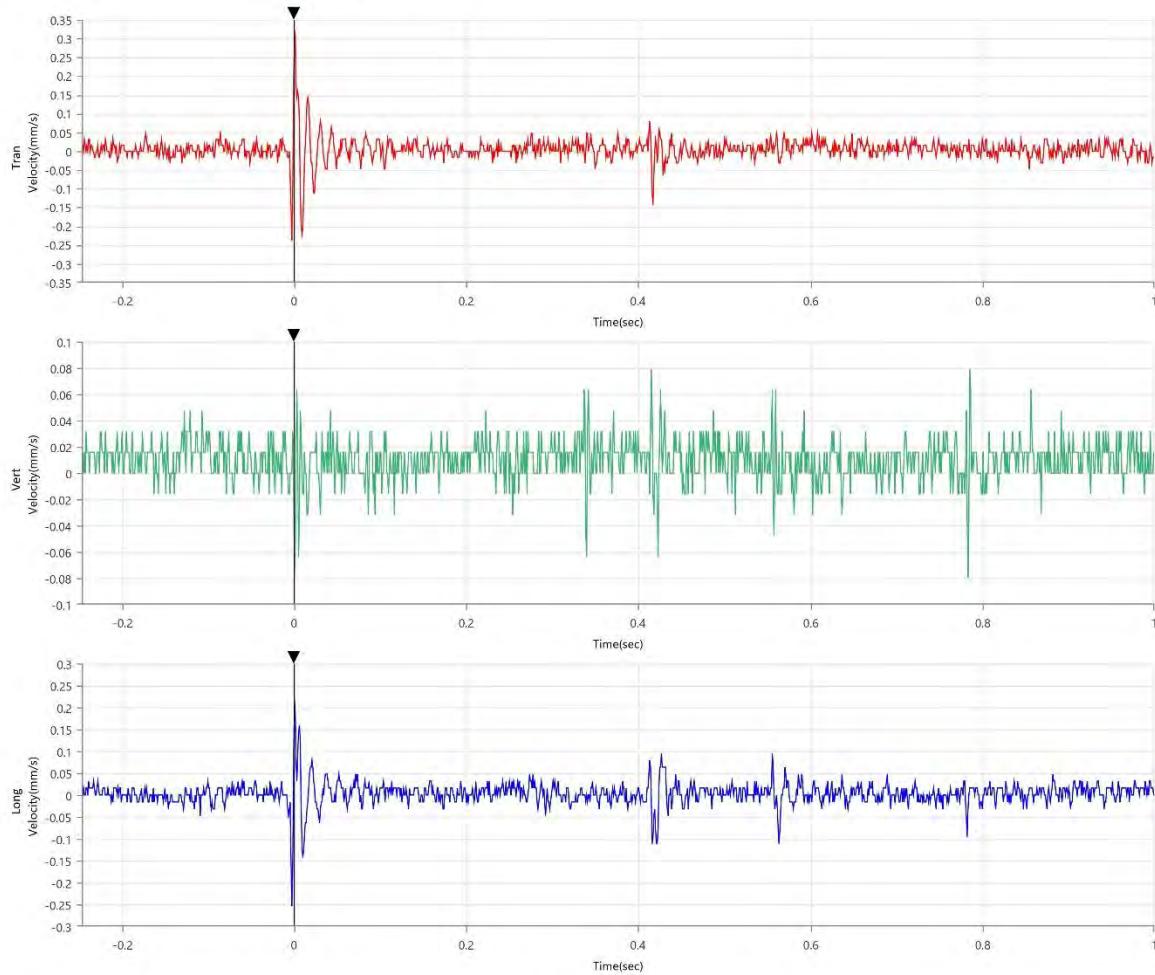
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes: Combo Mode September 29, 2023 10:35:13

Post Event Notes: No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.317 mm/s	0.079 mm/s	0.254 mm/s
Zero Crossing Frequency	64.0 Hz	>100 Hz	>100 Hz
Time (Relative to Trigger)	0.000 sec	0.000 sec	-0.003 sec
Peak Acceleration	0.028 g	0.012 g	0.023 g
Peak Displacement	0.001 mm	0.000 mm	0.001 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum: 0.396 mm/s at 0.000 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Tran at September 30, 2023 11:10:21
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

FFT Report

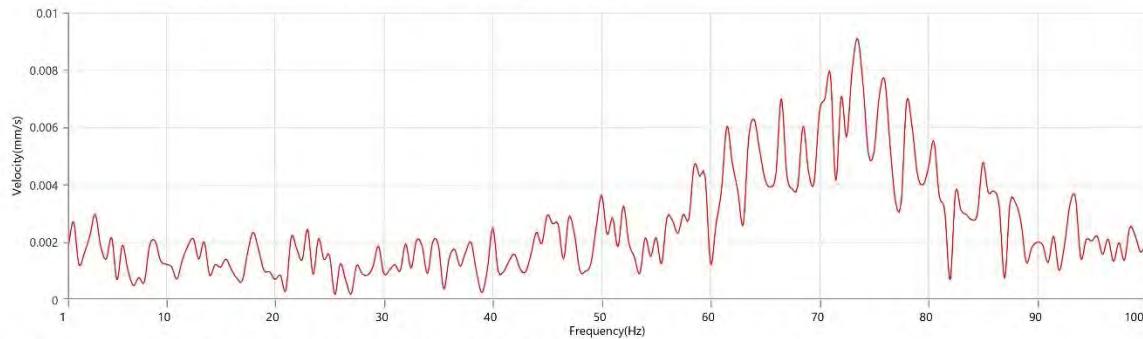
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930111021.IDFW

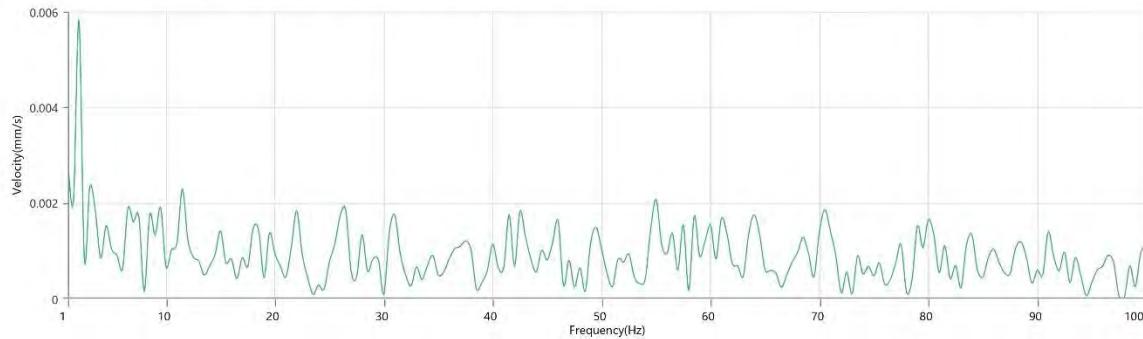
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

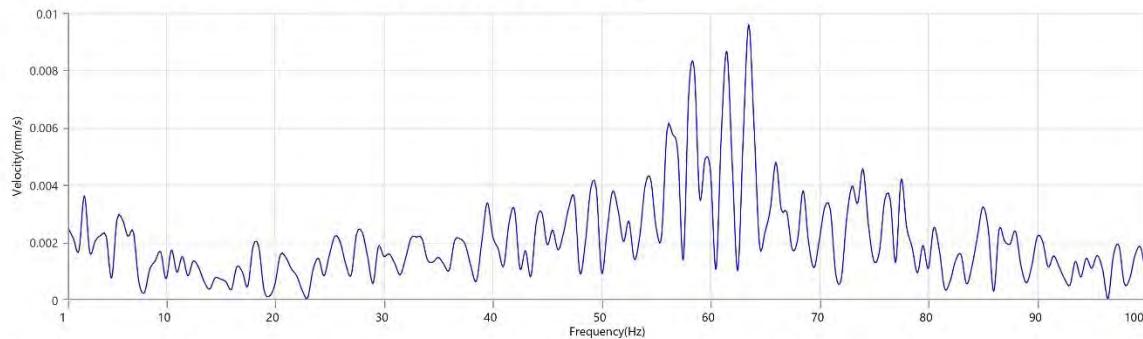
Tran - Dominant Frequency 73.5 Hz, Amplitude 0.009 mm/s (Peak Particle Velocity: 0.317 mm/s)



Vert - Dominant Frequency 2.0 Hz, Amplitude 0.006 mm/s (Peak Particle Velocity: 0.079 mm/s)



Long - Dominant Frequency 63.5 Hz, Amplitude 0.010 mm/s (Peak Particle Velocity: 0.254 mm/s)





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Tran at September 30, 2023 11:10:52
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

Event Report



Serial Number: BE13706
 Model Number: MiniMate Plus 10.72.8.17
 Battery Level: 6.6 volts
 Unit Calibration: February 24, 2023 by Absolute Instrument Systems
 Event File Name: BE13706_20230930111052.IDFW

Notes
 Location:
 Client:
 User Name:
 General:

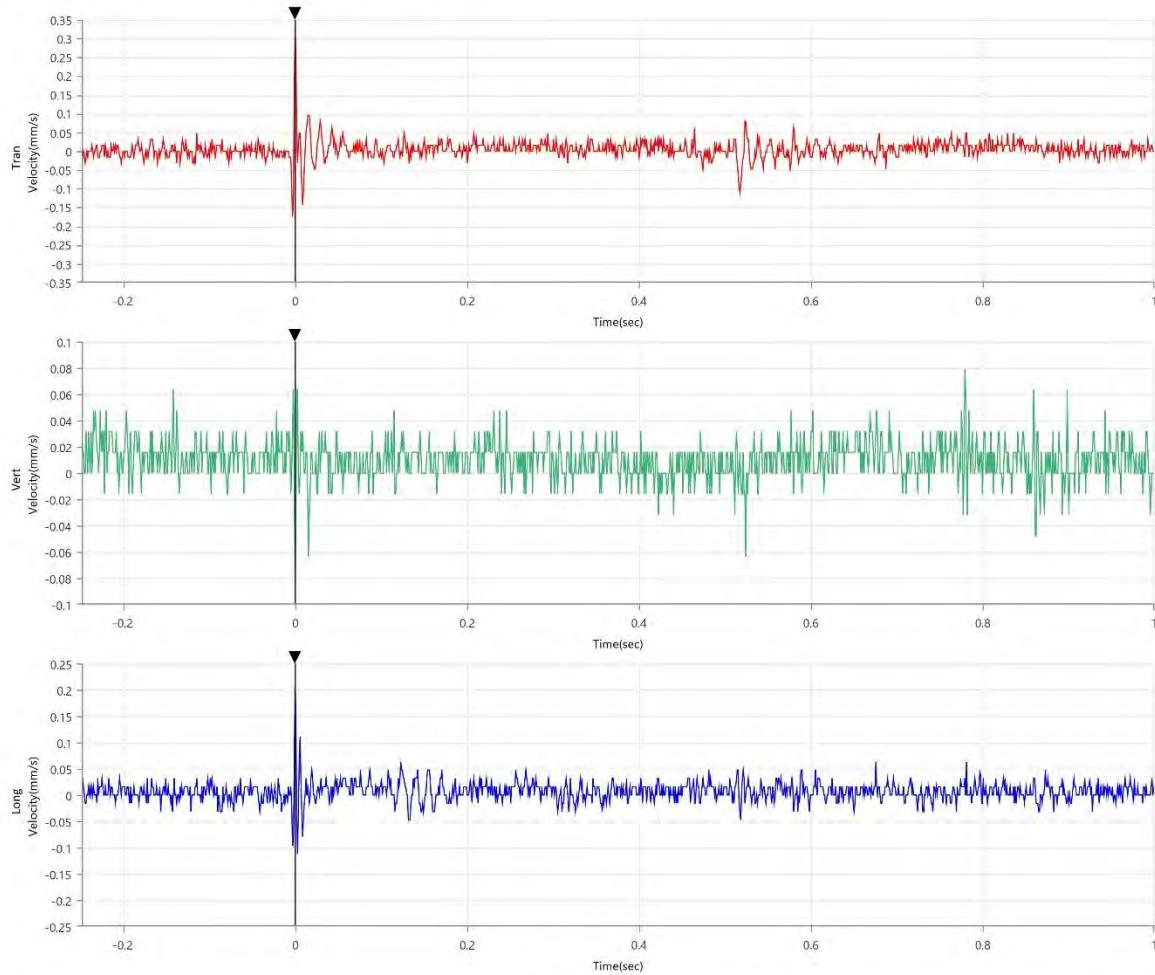
Extended Notes: Combo Mode September 29, 2023 10:35:13

Post Event Notes: No text to be displayed.

Geophone	Tran	Vert	Long
Peak Particle Velocity	0.317 mm/s	0.079 mm/s	0.206 mm/s
Zero Crossing Frequency	>100 Hz	>100 Hz	>100 Hz
Time (Relative to Trigger)	0.000 sec	0.000 sec	0.000 sec
Peak Acceleration	0.030 g	0.012 g	0.018 g
Peak Displacement	0.000 mm	0.000 mm	0.000 mm
Sensor Check	Passed	Passed	Passed
Frequency	7.4 Hz	7.5 Hz	7.7 Hz
Overswing Ratio	3.7	3.4	3.8

Peak Vector Sum

0.387 mm/s at 0.000 sec





Waveform Trigger Source
 Trigger Level(s)
 Pre-Trigger/Record Time
 Sample Rate
 Setup File Name
 Operator
 Job Number

Tran at September 30, 2023 11:10:52
 Geo 0.300 mm/s
 0.25 sec/1.00 sec (Fixed)
 1024 sps
 N/A
 -
 1

FFT Report

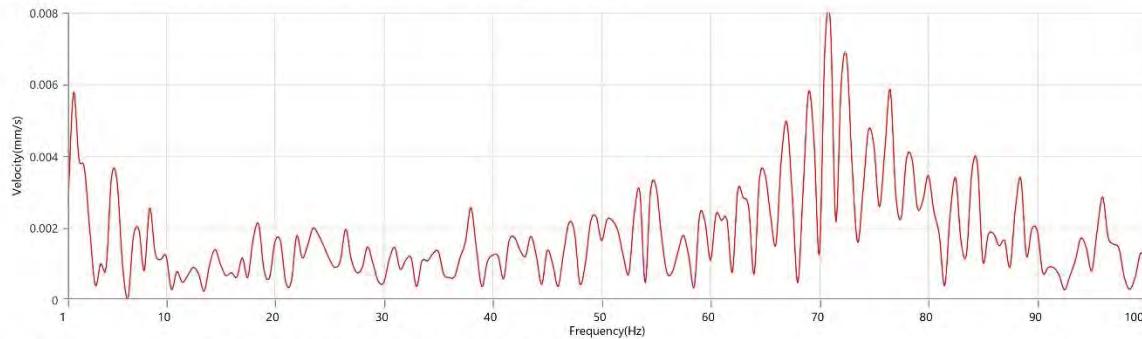
Serial Number
 Model Number
 Battery Level
 Unit Calibration
 Event File Name

BE13706
 MiniMate Plus 10.72.8.17
 6.6 volts
 February 24, 2023 by Absolute Instrument
 Systems
 BE13706_20230930111052.IDFW

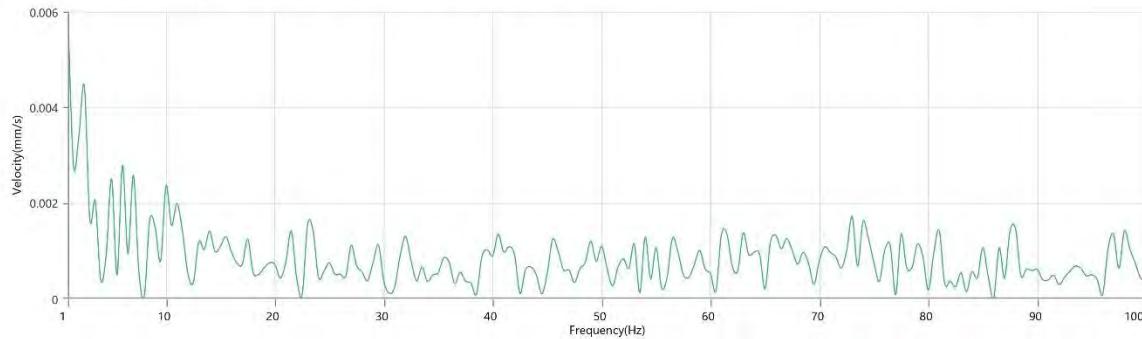
Notes
 Location:
 Client:
 User Name:
 General:

Extended Notes Combo Mode September 29, 2023 10:35:13
 Post Event Notes No text to be displayed.

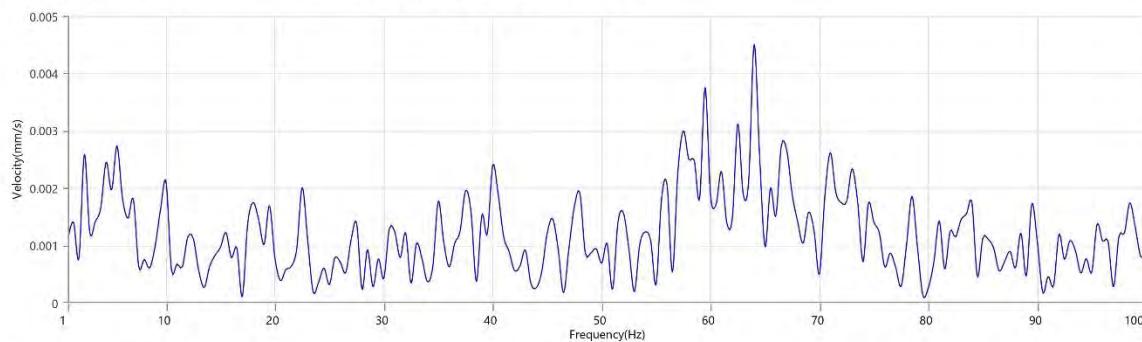
Tran - Dominant Frequency 71.0 Hz, Amplitude 0.008 mm/s (Peak Particle Velocity: 0.317 mm/s)



Vert - Dominant Frequency 1.0 Hz, Amplitude 0.006 mm/s (Peak Particle Velocity: 0.079 mm/s)



Long - Dominant Frequency 64.0 Hz, Amplitude 0.004 mm/s (Peak Particle Velocity: 0.206 mm/s)



Appendix 1 – Calibration Certificate



Calibration Certificate

Calibration Number: 230202730683

Customer Name : Setsco Services Pte Ltd
Customer Address : 531 Bukit Batok Street 23
 Singapore 659547
Manufacturer : Instantel
Item Description : Vibration Monitor
Model Number : Minimate Plus
Serial Number : BE13706 (PM-001)
Sub-Assemblies S/N : BG12625

Job Reference No: 23020273
Certificate Issue Date: 08/03/2023
Calibration Date: 24/02/2023
Test Conditions:
 Ambient Temperature: 23 °C
 Relative Humidity: 60 %R.H.
 Pressure: 100.7 kPa

This certificate provides traceability of measurement to the International System of Units (SI).
 Absolute Laboratories Pte. Ltd. certifies that the above product listed was calibrated in compliance with
 a quality management system using the applicable and approved Absolute Laboratories Pte. Ltd.
 calibration procedures as specified.

The reported expanded uncertainty is based on the standard uncertainty multiplied by a factor $k = 2$ (degrees of freedom = ∞), which corresponds to a level of confidence of approximately 95%.

Calibration Method:

The instrument was calibrated following AL calibration procedure WI- 26-Rev-1

Calibration Equipment(s) Used			
Apparatus	Serial Number	Cal Due Date	Certificate Number
Auto Zero & Gain Test Jig	718A1501-15	26/08/2023	220802772161
DC Power Supply	740622	07/03/2024	230300740647
Digital Multimeter	MY57225429	12/03/2023	1-16721054926-1

Ambient Condition Range:
 Temperature: (20-26)°C , Humidity: (25-70)%RH, Pressure: (80-105)kPa

Calibration By :

Ang Siong Cheaw
 Calibration Officer

Reviewed/Approved By :

Rodrigo Manansala
 Approving Officer

This calibration document shall not be reproduced except in full, without written approval of Absolute Laboratories Pte. Ltd.

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WI-26-CR-1-Rev-0

Absolute Laboratories Pte. Ltd.
 11 Kallang Place #06-02 Singapore 339155
 Tel: 65 6296 8012 Fax: 65 6296 3242

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..... End of Report

G List of Past Environmental Studies

A list of past environmental studies (e.g. baseline studies, BIAs, EIAs), along with their relevant survey dates and features are included in Table 1.

The study boundary of the following past environmental studies overlapping with the Tengah HVP EIA study area has been utilised as secondary data for this Project:

- Tengah Environmental Baseline Study (Tengah EBS) (HDB, 2017)
- Tengah South Environmental Impact Study (Tengah South EIS) (HDB, 2021)
- EIA for J1002 Jurong Region Line Mainline and Depot (Contract 2) (J1002 EIA) (LTA, 2018)
- EIA at DE170 Construction of Tengah Vehicular Interchange at KJE (LTA, 2023)
- Tengah Camera Trapping Study (NParks, 2017)

Table 1 Baseline environmental and ecological data from past studies conducted in and around the Project.

Study	Project	Overlap with Tengah HBP Study Area	Survey Date(s)	Baseline surveys conducted	
HDB	Tengah Environmental Baseline Study (HDB, 2017)	Full overlap	Jul – Nov 2016	Flora and Fauna Topography Hydrology	
	Tengah North EIS (HDB, 2021a)	No	Jan – Aug 2020	Tengah North EIS only	Tengah North and South
	Tengah South EIS (HDB, 2021b)	Partial overlap	2021	Geomorphology, Soil and Hydrogeology Waste management Visual and Landscape	Airborne noise Air quality Surface hydrology Water quality Ecology and Biodiversity
LTA	EIA for J1002 Jurong Region Line Mainline and Depot (Contract 2) (LTA, 2018)	Partial overlap	2016	Airborne noise Ground-borne noise and vibration Air quality Soil and groundwater quality	

				Water quality Biodiversity Waste management Vector control
	EIA at DE170 Construction of Tengah Vehicular Interchange at Kranji Expressway (LTA, 2023)	No	Mar – Nov 2022	Geomorphology, Soil and groundwater Water quality and waterbodies Ecology Air quality Airborne noise Ground-borne noise and vibration Waste
NParks	Tengah Camera Trapping Study (NParks, 2017b)	Full overlap	2016	Camera trap protocol: 40 cameras deployed continuously for a month
PUB	EIS for Proposed 1600/1200 MM Diameter Outlet Potable Water Pipelines from Nanyang Service Reservoir to Pan Island Expressway (PUB, 2021)	No	2020	Hydrology and water quality Biodiversity Airborne noise Ground vibration Air quality

Table 2 Overview of reviewed survey methodologies and spatial coverage for secondary data

Receptor	Survey technique	Items Studied in each Study				
		Current Baseline Surveys (2023)	Tengah Baseline Study (HDB, 2017)	Tengah South EIS (HDB, 2021b)	J1002 JRL EIA (LTA, 2018)	Tengah Camera Trapping Study (NParks, 2017b)
Terrestrial Flora/ Habitats	Vegetation and habitat mapping	✓	✓	✓	✓	
	Visual transect surveys	✓	✓	✓	✓	
	Vegetation plots	✓	✓	✓	✓	
	Arboricultural assessments		✓			
	Historical land use study	✓	✓	✓	✓	
Terrestrial Fauna	Line transects / point counts	✓	✓	✓	✓	
	Camera trapping	✓	✓	✓		✓
	Acoustic surveys (Bats only)	✓	✓	✓		
	Harp trapping (Bats only)	✓				
Physical Environment	Air quality	✓		✓	✓	
	Airborne noise	✓		✓	✓	
	Surface water quality	✓		✓	✓	
	Surface hydrology	✓	✓	✓		
	Ground-borne vibration				✓	
	Ambient light	✓				
	Ambient temperature	✓				
	Topography		✓			