Transaction or Request Lodgement Receipt

Transaction or Request Description:	ANZ to ANZ Transfer
Transaction or Request Status:	Posted
Date / Time:	14/01/2022 13:28
Transaction Number:	AEN00595

Transaction Details:

PAID DATE 18/1/22 CHQ. No. IB

Account Transfer of SBD 36,000.00

From Account: 5691140
To Account: 4223999

Notes for Recipient: INV#01/2022
Notes for Myself: INV#01/2022 SINU Dorm Assessment

Pay Date : 14/01/2022

Comments:
* * * * * * * * * * Authorisation Details * * * * * * * * * *
14/01/2022 13:28 Pauline Tovua
Authorisation Required for : Transfer Between My Accounts (2A)
14/01/2022 13:54 Christian Nieng
Authorised -Transfer Between My Accounts
Comments : verified
18/01/2022 17:04 Debbie Ofaeri Sifoni
Authorised -Transfer Between My Accounts
Comments : Checked
18/01/2022 17:04 Debbie Ofaeri Sifoni
Transaction Processed
* *

Your Reference

*** Important Information displayed on ANZ Internet Banking screen is not shown on this printout**

Held for Authorisation
Transaction Number AEN00595

Transaction Details

Account Transfer of SBD 36,000.00

From Account: 5691140
To Account: 4223999

Notes for Recipient: INV#01/2022
Notes for Myself: INV#01/2022 SINU Dorm Assessment

You can view the status and details of your transactions and requests for the last 12 months via ANZ Internet Banking.

Authorised

NATIONAL HOSTING AUTHORITY
EXECUTIVE DIRECTOR
SOL2023 PACIFIC GAMES

14/1/22

PAYMENT VOUCHER

Payment: Voucher No:	
NAME: Kenneth Bulehite	APPROVED BY EXECUTIVE DIRECTOR
Address:	Signed_____ Date 14/1/22
IF DIRECT CREDITS ISSUED: BANK REF #:_____ Signed_____	APPROVED BY FINANCIAL CONTROLLER Signed_____ Date 18/01/22.

NATIONAL HOSTING AUTHORITY
EXECUTIVE DIRECTOR
SOL2023 PACIFIC GAMES

NHA CODE	GL NAME	FULL DETAILS OF CLAIM	AMOUNT
6-2004 2-1440	Consultancy Fees Withholding Tax Payable	INV#01/2022 - Hydrology Assessment Report SINU PRC Site	$45,000.00 -$9,000.00

Cheque No: 873634 for $36,000.00 Date 14/01/2022

Signature of claimant_____

PRINT NAME: _____

Payment Voucher Prepared by_____ Date_____

Kenneth Bulehite

PO. Box 1424
Honiara
Solomon Islands
Email: ken.bulehite@gmail.com

Room A2, Supreme Plaza
Kukum Highway
Honiara
Solomon Islands
Mobile: +677 7486475 / 8590187

Date: 05 January 2022 **Invoice No: 01 / 2022**

Invoice

To	National Hosting Authority Sea King Building Honiara Solomon Islands	**Project Ref**	**NHA 2022 / 001**
Atten:	**Eldon Tepa**		
	Executive Director		

Items	**Details**	**Qty**	**Unit Rates SBD**	**Units**	**Amount SBD**
1	Being for undertake on the Hydrology Assessment Report for assessment of existing site drainage and calculation for drainage design for PRC Site, SINU, Kukum Campus. Report Attached	1	45,000.00	Lumpsum	45,000.00
	Total				**45,000.00**

Please make cheque payment or transfer payment to:

Account Name	Kenneth Bulehite
Account Number	4223999
Bank Name	ANZ Bank
Branch Name	Honiara
Type of Account:	Cheque / Debit Visa Card

Thank you

Kenneth Bulehite
Consulting Engineer

GL- 6-2004
Jb- 2-

NATIONAL HOSTING AUTHORITY

SOL2023 Pacific Games

COMPLIANCE CHECKLIST-LPO
(UP TO $100,000.00SBD)

Required Documents	Division	NHA Secretariat	Comments
Purchase Requisition & Payment Voucher	✓	✓	
Three Written Quotations and Bid Analysis	✓	✓	
Bid Waiver (must include grounds for waiver)			
Vendor Information Form (Company Profile should suffice)			
ICT Checklist (if for ICT goods)			
Original Invoice	✓	✓	
Compliance Checks required			
PR has been signed by authorized person	✓	✓	
Check amount on PR matches selected quotation	✓	✓	
Account code used is correct			
Name on PR matches quotation	✓	✓	
Check calculations on quotations are correct	✓	✓	
Check Bid waiver is for a valid reason	✓		
Check selection of supplier on bid analysis is justified	✓	✓	
Check expenditure is acceptable and proper use of NHA/SIG monies	✓	✓	
Check second and third quotes are from genuine suppliers	✓	✓	
Check price and rates are reasonable	✓	✓	
Check payment can't be made through petty cash	✓	✓	

Note: IF any of the above cannot be certified, please include an explanation as to why. This will speed up the compliance process.

Divisional Compliance Performed By

Signed: _____

Name and Position: L. Bird, P.M

Date: 13/01/22

NHA Compliance Performed By

Signed: _____

Name and Position: N. Nular. NHA

Date: 13/01/22

GAMES FACILITIES COMMITTEE-PROJECT MANAGEMENT UNIT

Serial No.: 0012

PURCHASE REQUISITION

REQUISITION NUMBER
Contract Payment: —
Number: 11/01/2022
Contract Name: —

QUANTITY	UNIT	DESCRIPTION (Full and clear details of payment)	PURCHASING OFFICER USE ONLY: SUPPLIER	ORDER NO.	COST
1	L.S	Payment for Stormwater Assessment conducted by Engineering Environmental Services Ltd (Mr. Kenneth Bulehite), for the PRC funded SINU Dormitories Project, final Hydrology report having been delivered to the PMU on 05/01/22.	Engineering Environmental Services Ltd (Mr. Kenneth Bulehite)	INVOICE 01/2022	$ 45,000.00
				Totals	$ 45,000.00

Approval is required to incur expenditure on the above

Estimated Cost (SBD$): $45,000.00 Date: 07 / 01 / 2022

Requisition Officer (Name): Peter Humaine Sign:

Account No.: 6-2004

Title: Consultancy fees -

Funds available on this account:

Supervisors Certification (Accountable Officer):

Certifying Officer (Name): Eldon Tepa Sign: 10/1/22

Position: Executive Director - PMU

Department / Commitee: PMU - GFC

Authority is granted for expenditure not exceeding:

SBD$

Signed: EXECUTIVE DIRECTOR

Name: CM

NATIONAL HOUSING AUTHORITY SOLOMON ISLANDS

Note: Authority for expenditure must be given by accounting officer or his/her deligated

Threshold and contract payments Checklist

Payment requires one quote ($10,000.00 below)	
Payment requires three quotes ($10,000.00 ~~below~~ above)	✓
Is it a ITB Contract Payment	
Is it a GTB Contract Payment	
Payment is a Bid waiver	

Compliance Check by — Signature

Name: Soleana Gagake Date: 07/01/2022

Position: Project Engineer - PMU

C/-P.O. Box 2443
Honiara
Solomon Islands

Phone:
677 7308800

Facebook page:
Sol2023 XVII Pacific Games

NATIONAL HOSTING AUTHORITY
XVII 2023 PACIFIC GAMES

NHA Ref: SVG-070122

MEMO

To: ED **Date**: January 7th, 2022

Thru: Eldon Tepa: _____ Date: 10/1/22
(Signature)

From: Soleana Gagahe: _____ Date: 07/01/2022
(Signature)

SUBJECT: Endorsement and approval of payment for Storm Water Assessment conducted by Engineering Environmental Services Ltd (Mr. Kenneth Bulehite)

Overview:

PMU have identified need for a Storm Water Assessment to be conducted for the PRC-funded SINU Dormitories Project. This assessment conforms mainly on the existing drainage system of the site, and the likely effects and recommendation during storms and volume of water discharges.

Having delivered an RFQ to three different suppliers for the task, namely:

- Engineering and Environmental Services Ltd (Kenneth Bulehite)
- DM Construction & Engineering
- Aqura Engineering & Consultancy

A comparative Bid Analysis has been carried out, from which the supplier Engineering and Environmental Services Ltd (Kenneth Bulehite) was deemed the best fit to conduct the Assessment, with the total value equivalent to **SBD$ forty-five thousand dollars only ($45,000.00).**

Therefore, I am requesting your approval of the budget and endorsement for this request.

Supplier: Engineering and Environmental Services Ltd (Kenneth Bulehite)
Amount: SBD$ 45,000.00

Please find attached relevant supporting documents.

DM Construction & Engineering

PO BOX 26

Honiara, Solomon Islands

Item No	Description	Unit	Quantity	Rate (SBD)	Amount (SBD)
1.0	**Feasibility & Site Assessment**	LS	1	$ 15,000.00	$ 15,000.00
2.0	**Structural Design,Analysis and Drawings**	LS	1	$ 25,000.00	$ 25,000.00
3.0	**Documentation & Report**	LS	1	$ 26,000.00	$ 26,000.00
				Sub-total (SBD)	***$ 66,000.00***
				Tax (10%)	$ 6,600.00
				Profit & Loss (15%)	$ 9,900.00
				Grand Total (SBD)	**$ 82,500.00**

Submitted by: Dickson Matewa (Managing Director) **Contact:** **(677) 79 75537**

Sign and dated:  ***21/12/2021***

AQURA ENGINEERING & CONSULTANCY,
HONIARA, SOLOMON ISLANDS
Tel: (677) 7138878 or 7183268,
Email: ekmaeniuta@gmail.com

QUOTE

Date: 20/12/2021

Client:
National Hosting Authority

Description of Services	Amount
1. Cost of Assessment and Design of Storm Water Drainage at PRC site at Kukum Campus, inclusive of Report and Documentation Preparation.	**SBD$ 78,000.00**
TOTAL AMOUNT (SBD)	**$78,000.00**

AQURA ENGINEERING & CONSULTANCY SOLOMON ISLANDS

Authorised by: Sign: ..... Date: .....

Managing Director (E. Maeniuta)

Payable to:

Cheque payable to: Aqura Engineering & Consultancy
ANZ Bank, Mendana Avenue, Honiara, Solomon Islands
Account Name: Aqura Engineering & Consultancy Account #: 5199497

National Hosting Authority Secretariat

Comparative Bid Analysis

(To Be Used for Purchases $10,000 - $100,000)

		Contractor 1:		Contractor 2:		Contractor 3:	
		ENGINEERING ENVIRONMENTAL SERVICES LTD (KENNETH BULEHITE)		AQURA ENGINEERING & CONSULTANCY		DM CONSTRUCTION & ENGINEERING	
Description of goods or service	**Quantity**	**Unit Price**	**Total**	**Unit Price**	**Total**	**Unit Price**	**Total**
Stormwater assessment to be conducted of existing site drainage and drainage design for PRC-funded SINU Dormitories Project.	1	$ 45,000.00	**$ 45,000.00**	$ 78,000.00	**$ 78,000.00**	$ 82,500.00	**$ 82,500.00**
Criteria for Selection:							
Meets Specifications:		Yes		Yes		Yes	
Delivery time:		Yes		Yes		Yes	
Reliable & Experience Contractor		Yes		Yes		Yes	
Cheapest		yes		no		No	

Recommended Supplier:	ENGINEERING ENVIRONMENTAL SERVICES LTD (KENNETH BULEHITE)
Reason (s) for recommending the supplier:	The TEC recommends ENGINEERING ENVIRONMENTAL SERVICES LTD to conduct the required Stormwater Assessment for the PRC-funded SINU Dormitories Project. We have selected this supplier for the reason that they have provided the lowest price for the service required. They have also proved to be reliable in conducting past assessments and works. Thus, the TEC has no hesitation in recommending ENGINEERING ENVIRONMENTAL SERVICES LTD for the job.

Prepared by: TEC

Name: Soleana Gagahe — Signature:

Name: Peter Himane — Signature:

Endorsed by FC — Signature:

Approved by (SPM/Executive Director):

Name: Mr. Eldon Tepa — Signature:

NATIONAL HOSTING AUTHORITY
Solomon Islands Government

ANNEX 4

REQUEST FOR QUOTATIONS – GOODS/SERVICES

20th December 2021

To All Bidders,

1. The National Hosting Authority has budget financing and intends to apply part of the proceeds of this financing to procure Goods/Services per the enclosed specifications, and now invites sealed bids for this purpose.
2. Your quotation, citing the above reference number, should reach the undersigned within 7 days from the date of this letter.
3. The goods shall be procured using the Simple Procurement Procedures specified in the Solomon Islands Government Procurement and Contract Administration Manual.
4. The Technical Specifications and Delivery Schedule are provided in the attached Schedule of Requirements.
5. This request for quotation has been addressed to three Suppliers of these goods/services.
6. The goods/services supplied under this contract shall conform to the standards provided in the attached Technical Specifications.
7. The Supplier is required to supply any equipment listed in the Technical Specifications together with the detailed operations and maintenance manuals, for each appropriate unit.
8. The Supplier shall warrant that any equipment supplied under the contract is new and unused.
9. Prices should be quoted for delivery to the Project Management Unit, National Hosting Authority, P.O.Box 2443, Honiara, Solomon Islands.
10. The validity for the quotation shall be thirty (30) days from the date of submitting the quotation.
11. One (1) original and one (1) copy of the quotation shall be submitted in a sealed envelope and addressed to the Project Management Unit, National Hosting Authority, Honiara, Solomon Islands.
12. Please indicate delivery schedule and after sales service (if relevant) available to National Hosting Authority, Honiara. Submission of a quotation is confirmation of the tenderer's compliance with, and acceptance of, the terms and conditions including the payment terms of this Request for Quotation.
13. The Purchase Order will be awarded on the basis of price, delivery dates, and quality offered against the Schedule of Requirements Technical Specifications.
14. The successful Supplier shall be notified in writing and furnished with a Local Purchase Order (LPO) and have an effective contract with the National Hosting Authority on receipt of the duly signed Local Purchase Order. The terms and conditions of this Request for Quotation shall form part of the contract. The Purchaser may terminate the contract if the Supplier fails to deliver any or all of the goods/services within the period specified, or within any extension thereof granted in writing by the Project Management Unit, National Hosting Authority. The Supplier shall not assign, in whole or in part, its obligation to perform under this contract, except with the written consent of the Project Management Unit.
15. Prices charged by the Supplier for the goods/services shall not vary from prices quoted. Prices shall therefore be fixed.
16. The Supplier's request for payment shall be made in writing, accompanied by an invoice and an LPO confirming delivery of the goods/services. All payments shall be made promptly and in no case later than twenty (20) days after delivery and acceptance of the goods. Payments will only be made by cheque or direct transfer into the Supplier's business bank account.

Please acknowledge the receipt of this letter and indicate your firm's interest in submitting quotations.

Soleana Gagahe
Project Engineer
Project Management Unit
National Hosting Authority

Schedule of Requirements

No.	Item Name	Specification	Quantity	Delivery Date
1.	Stormwater Assessment for SINU Dormitories Site	See attached Scope of Works	1	TBC
2.				
3.				
4.				
Etc				

PACIFIC GAMES
SOLOMON ISLANDS

PROJECT MANAGEMENT UNIT
GAMES FACILITIES COMMITTEE

SCOPING FOR SINU-KUKUM PRC SITE
STORM WATER ASSESSMENT

December 2021

SCOPE OF WORKS

1.0: Introduction:

The NHA through Project management Unit is requiring works and services for the Assessment and design of storm water for PRC Site at Kukum Campus. The works require shall conform mainly on the existing drainage system and the likely effects and recommendation during storms and volume of water discharges.

The Consultant is required to perform the services.

1. The works and services shall include but not limited to the Drainage Assessment of the proposed site to include.
    a) Assess all existing hydraulics associated with the site.
    b) Establish Rational Method and calculate the runoff coefficients and discharge for pre and post development conditions.
    c) Assess and make recommendations taking into consideration the existing Minor Drainage Network.
    d) Assess and make recommendations taking into consideration the existing Major Drainage Network.
    e) Assess and make recommendation of all water drainage network and identify Legal Point of Discharge (LPOD)
    f) Assess and make recommendation of water Site Overland Flow
    g) Assess and make recommendation for level of existing drainage and Legal Points of discharge to allow for construction sites manage their construction levels matching the existing or to be recommended findings.

1. SUBMISSION OF QUOTES

Qualified companies/agencies shall submit quotes for this service for consideration, interested bidders shall ensure rates and quantities included.

Provide additional pricing based showing all other costs such as additional overheads/disbursements as separate line items.

Proposals shall include description of methodology of how the assessments would be undertaken, conceptual work plan, and experience and references. Companies must provide indication of current general liability insurance in place.

2. EXPERIENCE

- Provide description of the company/agency. Provide TIN number. Provide overview of the company directors and general experience.

- Eligible service providers must be legally registered companies in Solomon Islands established for at least 3 years.

- Eligible companies must be of sound financial standing with at least 3 years audited accounts. Statements for last 3 years to be provided as well as showing current financial situation.

3. RESOURCES & EQUIPMENT

Provide description of all available equipment's under your control to be used for this work.

4. SKILLS & EXPERIENCE

Minimum requirements to meet qualifications

- Have professional and technical experts in the development of Environmental Assessments in the Solomon Islands.
- Have undertaken similar work in the Solomon Islands in the last 3 years.

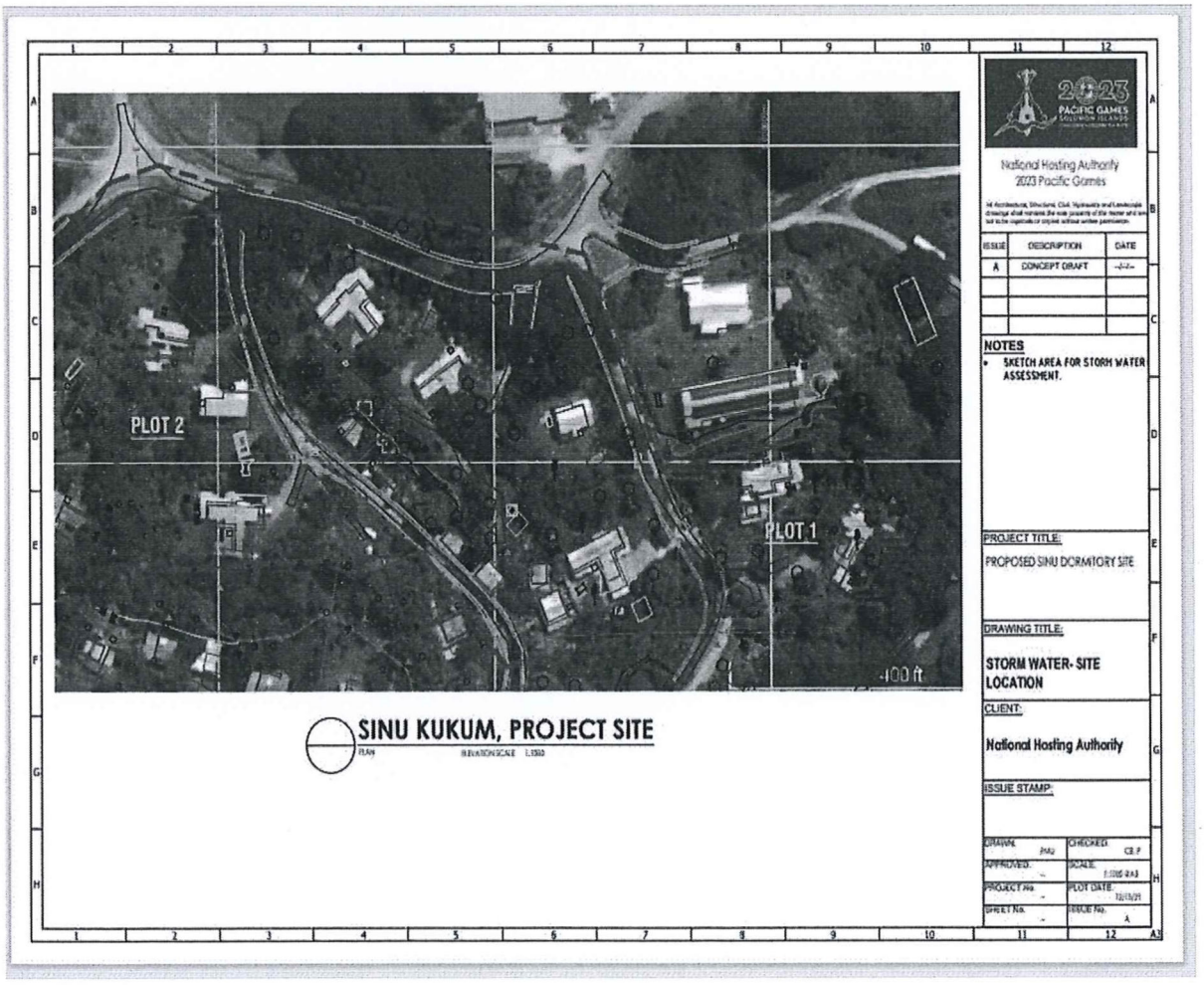
5. ASSESSMENT

- Sol2023 will have the sole rights to assess proposals based on qualifications, work plan, pricing, availability of contractors and personnel to meet Sol2023 schedule, and related references from previous contracts.

2.0: Site and Existing Conditions.

SITES

The required services are for SINU Kukum campus area. For more information, refer attached site plan provided.



PLAN FORM 1 (A3) WARNING: CREASING OR FOLDING WILL LEAD TO REJECTION Sheet 1 of 1 sheets

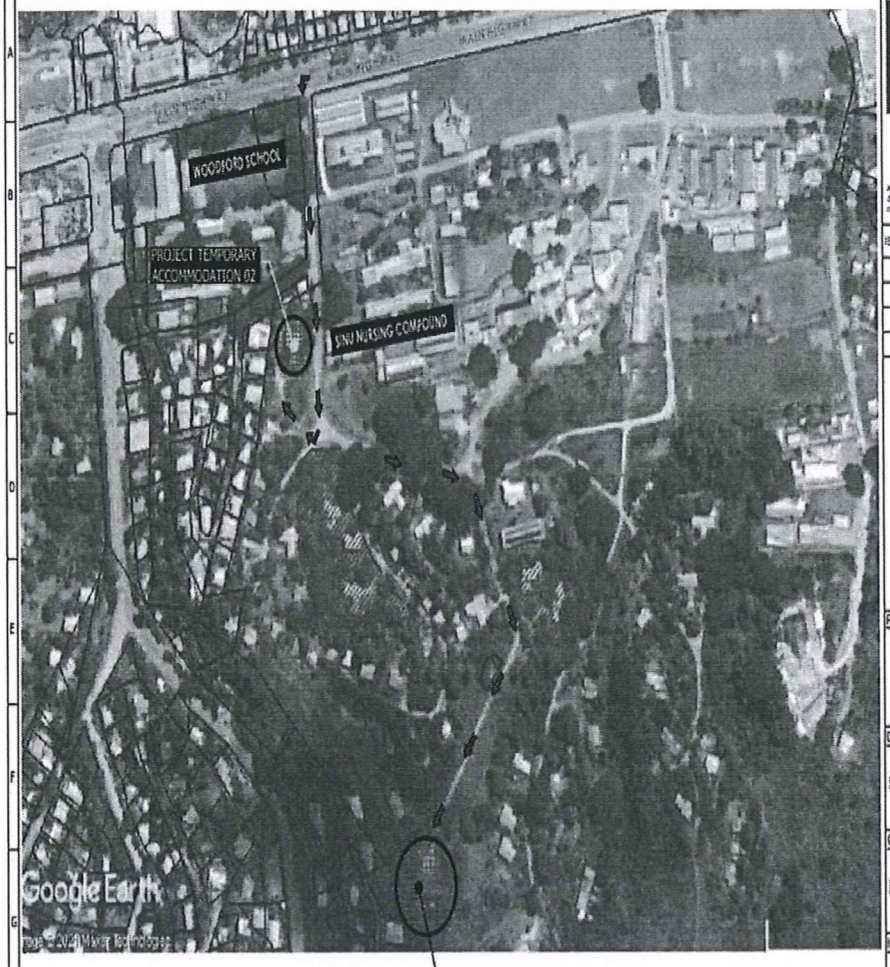
AZIMUTH SURVEYS

SITE TOPOGRAPHICAL PLAN OF SINU DORMITORY

LGA:
Locality: SINU KUKUM CAMPUS
Subdivision No:

Survey Datum:
GUX1 ASTRO UTM
MSL

Client: NHA 2023



PRC KUKUM, DORMATORY SITE PLAN

National Hosting Authority
2023 Pacific Games

ISSUE	DESCRIPTION	DATE
A	CONCEPT DRAFT	-/-/-

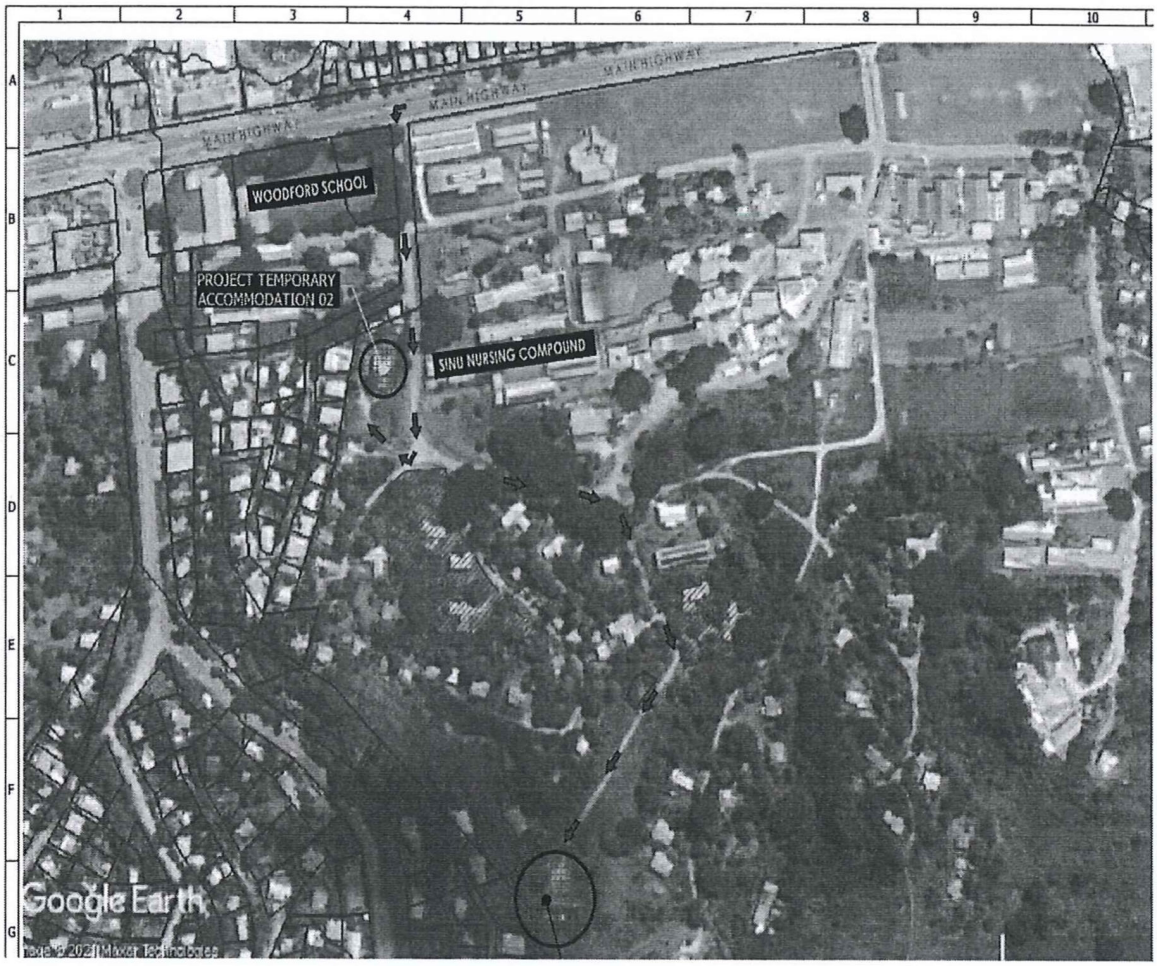
PROJECT TITLE:
PROPOSED SINU DORMITORY
PRC SITE

DRAWING TITLE:
SITE LOCATION

CLIENT:
National Hosting Authority

ISSUE STAMP:

DRAWN: PHI	CHECKED: CB P
APPROVED: -	SCALE: 1/1000 @A3
PROJECT No. -	PLOT DATE: 11/2023
SHEET No. -	ISSUE No. A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MAIN HIGHWAY
MAIN HIGHWAY
WOODFORD SCHOOL
PROJECT TEMPORARY ACCOMMODATION 02
SINU NURSING COMPOUND
Google Earth

HYDROLOGY REPORT

SINU-KUKUM PRC SITE

Engineering Environmental Services Limited

Table of Contents

I. List of Figures

II. List of Tables

1. Introduction

This report is being prepared for the hydrology analysis of the surface runoff for a major development at the PRC Kukum Site area for the South Pacific Game 2023 to be hosted in Honiara, Solomon Islands.

2. Scope of Works

The following were the scope of work that is required to be provided

- ✓ Report on existing hydraulics as in building design for Kukum Campus PRC Site
- ✓ Report and make recommendation the existing Minor Drainage Network
- ✓ Report and make recommendation the existing Major Drainage Network
- ✓ Recommendation of all water drainage network and identify Legal Point of Discharge (LPOD)
- ✓ Recommendation of water Site Overland Flow.

3. Rainfall Situation in Solomon Islands

Guadalcanal is part of the Solomon Islands that are experiencing high annual rainfall. Rainfall throughout the year for Honiara, Solomon Islands, there are 327.8 rainfall days, and 2474mm (97.4") of precipitation is accumulated. The month with the least sunshine in Honiara is January with an average of 6.8h of sunshine

Table 1 Rainfall Situation in Solomon Islands

Variable	Historical, mm	Change, %	Change, mm	Projected, mm
Annual	2,050	3	61.6	2,114
Wet Season	1,420	3	42.6	1,462
Dry Season	625	3	18.8	644

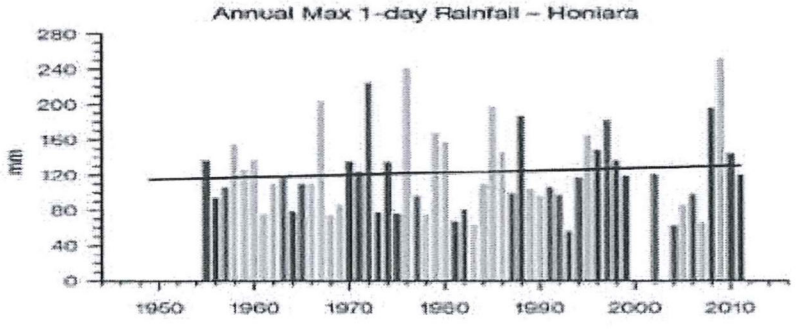

Figure 1: Graph of Honiara Rainfall Data

Rainfall situation in Solomon Islands is showing a general slight increase with inclination of rainfall. It is showing that over the years.

4. Geology of the Area

The geology of the area is Honiara Beds (Qplh), which are capped by Honiara Reef Limestone (Qpr). Most of the coast and low lying areas were fringed with dead coral (Qr) which are swamped by alluvium (Qa) which are derived from surrounding rivers and streams. The structural geology is controlled essentially by faulting, NNW trending faults are the most persistent along their strike.

5. Discharge Consideration

It is important to estimate the maximum discharge for small catchment. There are several methods to calculate the maximum flood. The purpose of this project Rational Methods is used due to reason that it can use a single rain gauge station and also it can produce maximum discharge for each of the small catchment.

6. Rational Method

Rational Method is the most rational method of calculating peak discharge for any small catchment. It is a useful for design of structures for a small catchment. Structures such as culvert, storm water drainage etc.

The peak value of runoff is given by

$$Q = AIR$$

Where;

A = Area of the Catchment Area

I = Imperviousness factor (Runoff Coefficient)

R = Rainfall Intensity

$$Q = KAIR$$

K = Dimensional Constant (is taken as 0.277)

Therefore, we have three main parameters for estimating the maximum discharge, i.e. A; Catchment Area, I; Impervious Factor, and R; Intensity of Rainfall. The following parameters were considered below.

7. Catchment Area

Catchment Area is the area supplying the water between the ridge lines to the possible outlets. Depending on the type of soil and development within the catchment area, the time in which the water travels from the ridges to the outlet is also an important consideration.

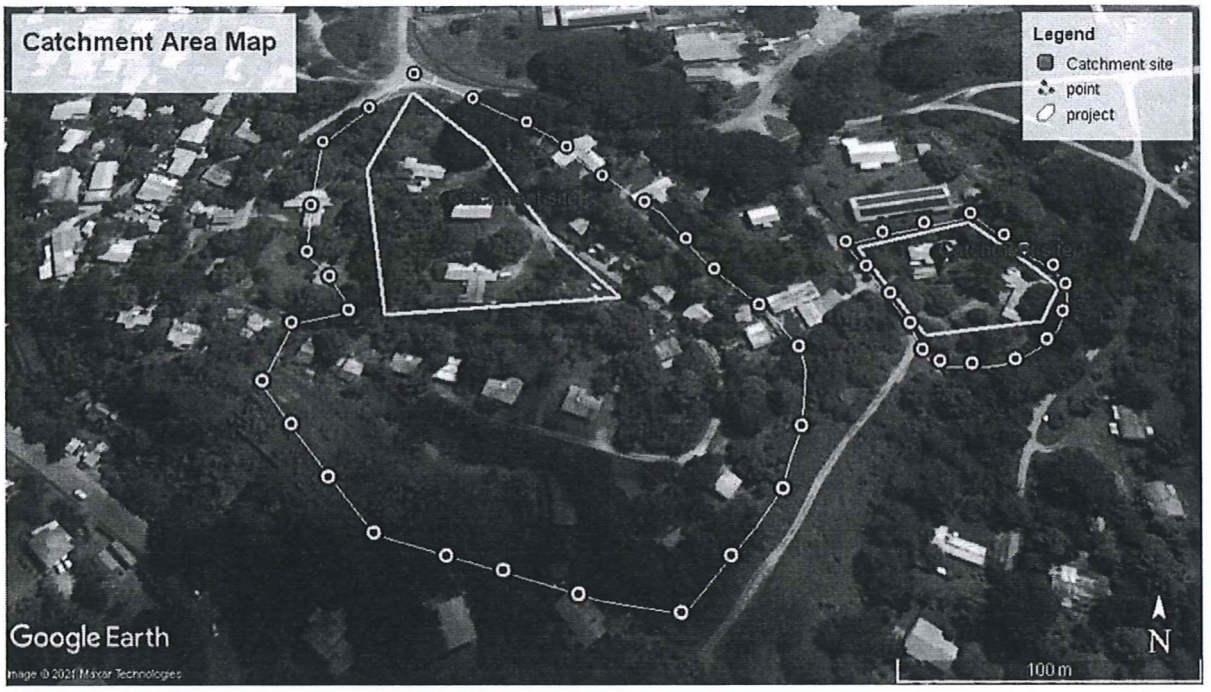

Figure 2: Map of the Catchment Area

The estimate of the catchment area is based on the google earth map. The contour of the topographical survey does not cover most of the area concern to estimate the maximum discharge.

The catchment areas were done basically using contour of the google earth maps and contour. Tabulated below are the Catchment Area for each of the catchment that is identified.

Table 2: Tabulated Catchment Area

Location	Catchment Area km^2
Site No.1	
Residential	0.0039
Site No.2	
Residential	0.033

8. Rainfall Intensity

Rainfall intensity is very important parameter that needs proper evaluation and assessment of rainfall data. Solomon Islands Meteorological Services had measured daily rainfall throughout the country. The rainfall recorded by the Solomon Islands Meteorological Services also produces 3 hourly rainfall measurements. The analysis will include intensity duration and frequency (recurrence interval, probability and design period). However due to limitation of the time and requested, the following values were estimated base on the experience and especially for drainage consideration.

Table 3: Tabulated Rainfall Intensity

Return Period (Years)	Rainfall Intensity (mm/hr)
20	25
100	50

9. Imperviousness Factor (Runoff Coefficient)

The runoff coefficient represent the integrated effect of the catchment loss and it is very much dependents on the nature of the surface, surface slope and rainfall intensity.

It accounts for water that percolates into exposed soil and other porous surfaces, that which is lost by evaporation of both and the water held in puddles and depression of both pervious and imperviousness surface.

Table 4: Tabulated Runoff Coefficient Values

Development	Description	I Value
Suburban	Residential Houses, with hilly terrain etc	0.50
Heavy Improved Area	Highly developed area with building and concrete	0.65
Isolated Single House	Building at level ground area	0.40

10. Surface Runoff

Surface runoff calculations were done with the three main parameters for Return Period 20 years and 100 years. As mentioned above the parameters were also estimated due to limited time. However, below are the tabulated results of the surface runoff for the two catchment areas.

Table 5: Tabulated Runoff for 20 years Return and 100 years Return Period

Location	Catchment Area km2	Flow Rate (m3/sec) 20 years	Flow Rate (m3/sec) 100 years
Catchment Site 1	0.0039	0.018	0.035
Catchment Site 2	0.033	0.149	0.297

Table 6: Roughness Coefficient (n) of various surfaces

Channel Surface	Manning's Roughness Coefficient (n)
Asbesto	0.011
Cement	0.015
Concrete, Steel forms	0.011
Concrete wooden forms	0.015
Corrugated metal	0.022
Steel Coal tar enamel	0.01
Wood stave	0.012

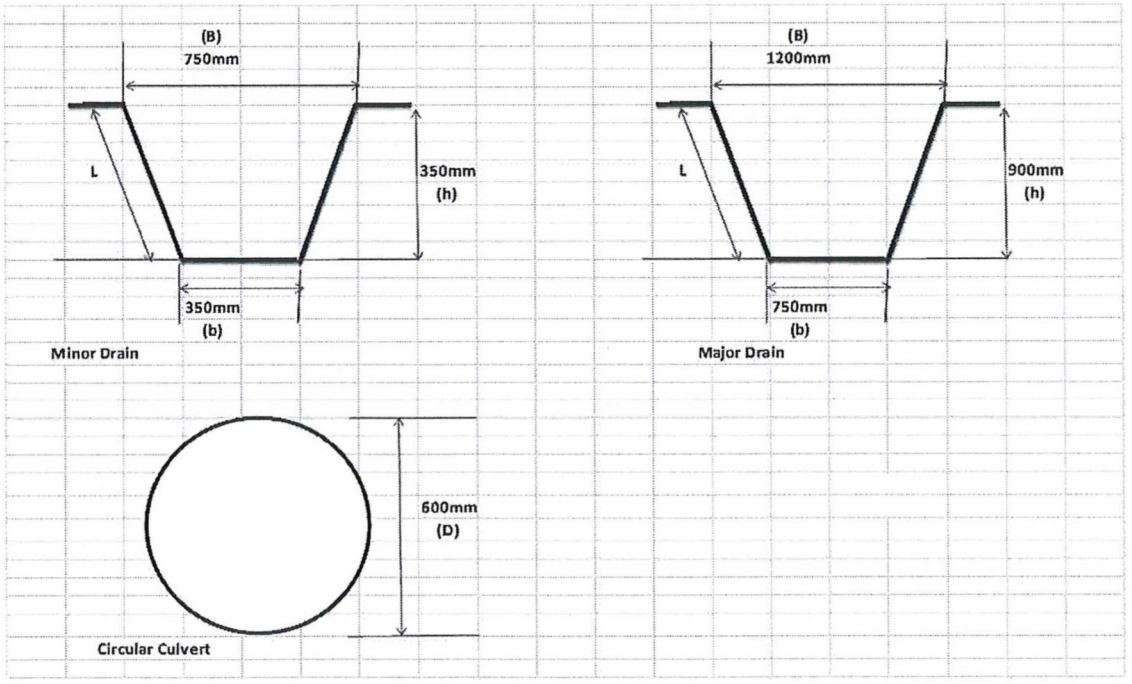

Figure 3: Cross -Sectional Area of existing drains and culverts

11. Computation of Normal Depth (h_n) - Trial & Error Approach

The normal depth (h_n) is an important parameter in the design of the channel section, however in our case the assessment of existing channels or drains. And direct analytic solution of normal depth solution is not possible but requires the method of trial and error approach.

The Manning's Equation in SI Units is

$$Q = (1.00/n)\ A\ (R_h^{2/3})\ S^{1/2}$$

Where;

Q = the volumetric flow rate of water passing through the channel reach in m^3/sec.

n = Manning's roughness coefficient for channel surface (a dimensionless, empirical constant).

A = the cross-sectional area of flowing water and in m^2.

R_h = the hydraulic radius in m. (R_h = A/P) where A is CSA of flowing water in m^2 and P is the wetted perimeter of the CSA of flowing water and in m.

S = the bottom slope of the channel, in m/m (dimensionless)

Now the known parameters for Site.No.1 drainage system are; Q, the total discharge is taken as 0.018m^3/sec; b, the bottom width is 350mm; B, width of the liquid surface at maximum flow is 750mm; S_o, the bottom slope is taken as 1/20 (0.05); n, the surface roughness coefficient is 0.012 (concrete).

With all known parameters and rearranging Manning's equation we can determine the normal depth (h) using the trial and error approach.

$$Q = (1.00/n)\ A\ (R_h^{2/3})\ S^{1/2}$$

$$AR^{2/3} = nQ / S_0^{1/2}$$

$$= (0.012 \times 0.018) / 0.05^{1/2}$$

$$= 0.000216 / 0.2236$$

$$\mathbf{AR^{2/3} = 0.000966}$$

Now assume several values of h and compute the section factor $AR^{2/3}$ unit the computed value of $AR^{2/3}$ is close to 0.000966.

Table 7: Computation of normal depth (h) for Site No.1

h(m)	$A(m^2)$	P(m)	$R_h(m)$	$AR^{2/3}$	Remarks
0.05	0.01893	0.465	0.0407	0.1183	h too high
0.02	0.00723	0.3961	0.0183	0.000501	h too small
0.025	0.00911	0.4076	0.0223	0.000722	
0.029	0.0106	0.4168	0.0254	0.000917	
0.03	0.01101	0.4191	0.0263	0.000973	
0.0296	0.0109	0.4182	0.0261	0.000958	
0.0297	0.01095	0.4184	0.02617	0.000965	very close

Hence, the normal depth, h_n = **0.0297m.**

And for Site No.2 drainage system, the known parameters are; Q, the total discharge is taken as $0.149m^3/sec$; b, the bottom width is 350mm; B, width of the liquid surface at maximum flow is 750mm; S_o, the bottom slope is 1/60 (0.017); n, the surface roughness coefficient is 0.012 (concrete).

$$AR^{2/3} = nQ / (S_0^{1/2})$$

$$= (0.012 \times 0.149) / 0.017^{1/2}$$

$$= 0.001788 / 0.129$$

$$\mathbf{AR^{2/3} = 0.01385}$$

Table 8: Computation of normal depth (h) for Site No.2

h(m)	$A(m^2)$	P(m)	$R_h(m)$	$AR^{2/3}$	Remarks
0.05	0.01893	0.46515	0.04069	0.002240	h too small
0.10	0.04071	0.580307	0.070152	0.006925	
0.20	0.09284	0.810615	0.11453	0.02189	h too large
0.15	0.06535	0.69546	0.093966	0.01351	h is closest
0.155	0.06796	0.70697	0.096128	0.01426	

Hence, the normal depth, h_n = **0.15m.**

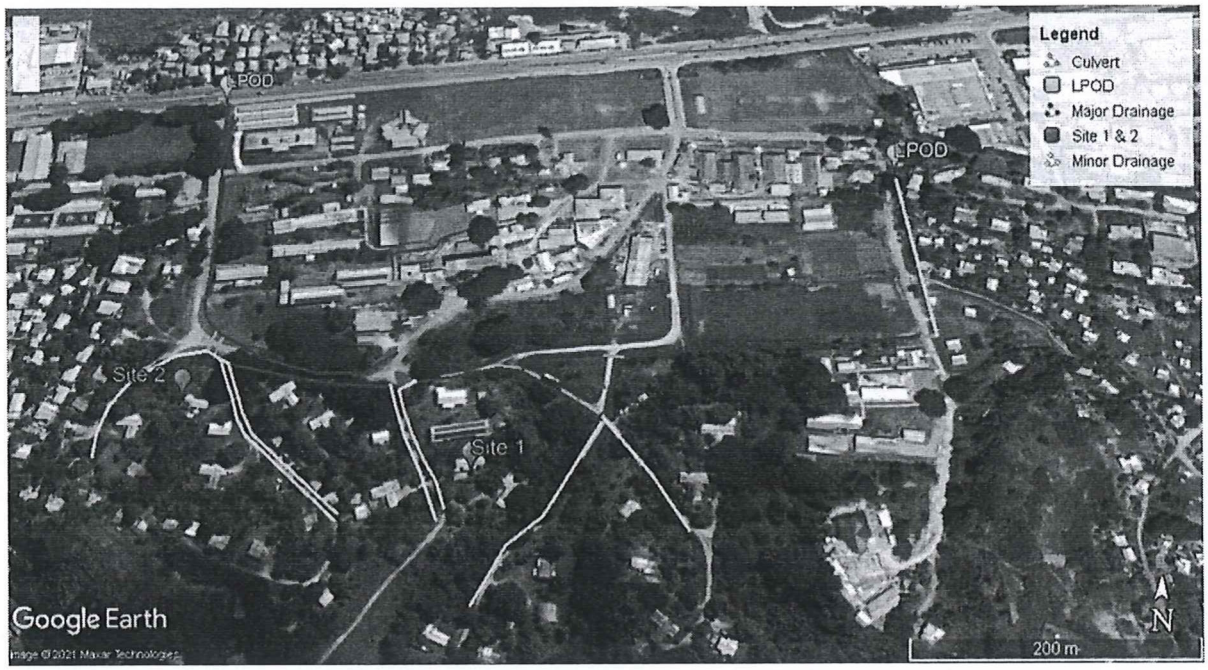

Figure 4: Map of the Drainage System Network

12. Concluding Remarks

The following remarks are made with regards to the existing layout and condition of the drainage system.

12.1 Catchment Site No.1

- Other surface runoffs within Catchment Site 1 will also be directed to the road drainage system.
- A section of the drainage channel is blocked with gravel/silt deposits and also a concrete culvert under road crossing is suspected to be block as well.
- The drainage system has been neglected from inspection and general maintenance for quite some time.
- All runoff's from the site and surrounding hilly terrain and valley collectively will finally be discharged to the stream (LPOD) at the eastern side of the campus.

12.2 Catchment Site No.2

- Surface runoff from Residential and surrounding Ridge Area shall also be directed to the existing road drainage system.
- Some sections of the minor drainage system have fractured structure causing the slope side of the trapezoidal drain to collapse deforming the drainage system.
- Also downstream section of the drainage channel is blocked with gravel/silt deposits.
- A section towards the inlet of the double concrete culvert road crossing is covered and both culvert inlets blocked with soil sediments and other debris.
- Generally, maintenance work has never been done and especially after every heavy or severe storm to remove/clear debris and soil sediments from the drainage system.
- All runoff's from the site and surrounding areas on the western side to be discharge to the Kukum highway drainage system (LPOD).

13. Recommendations

- All existing drainage system can accommodate all storm water runoffs from both development sites. That is for Site No.1, the Total Discharge from the catchment is 0.018m^3/sec and the Normal Depth (h_n) computed from the trail & error approach is only 0.0297m (2.97cm) therefore the system is ok. And for Site No.2 the Total Discharge of the catchment is 0.149m^3/sec and the Normal Depth (h_n) computed is 0.15m (15cm) therefore the system is also ok.
- Post development data is unavailable at this point in time however some percentage (%) allowance can be considered for the total discharge. The existing channels can still accommodate additional discharge.
- All drainage sections with defects: fracture, cracks or deformity to be demolished and reconstructed to existing design.
- The layout of the major drainage system is also design to capture all surface runoffs from surrounding slopes and hilly terrains. And bulk of the overland flow occurs on the eastern side with valley's and mass low lying area including the farm-land. Should all the drainage system be cleared and maintained at all-times, flooding is not going to be an issue.
- All soil sediments and debris need to be removed manually or using machinery, cleared and carted far from the drain to allow free flow of runoffs.
- A preventative maintenance schedule for the entire drainage system to be prepared by relevant authority. It should provide guidance to the schedule of routine maintenance and also routine inspection programme to ensure failures are located quickly and corrected appropriately.

C4

NATIONAL HOSTING AUTHORITY
SOLOMON ISLANDS GOVERNMENT

COMPLIANCE CHECKLIST – ADVANCE PURCHASES
(Up to $100,000 SBD)

PMU

Required documents:	FI Ref	Department/ Committee	Procurement	Finance
Purchase Requisition (PR) & Payment Voucher (PV)	P7 35	✓		
Pro-forma Invoice	P7 99	✓		
Three Written Quotes and Bid Analysis (if above $10,000 and these goods/services are not waived in FI's -Domestic Travel, Hotel Accom, Freight, Market and Perishable Goods)	P7 9, P7 10 & P7 13	✓		
One written Quote if it is less than $10,000.00		N/A		
Bid Waiver (if not following prescribed procurement method in the FI's)	P7 10.3 & 10.4, P7 7.1 (f)	N/A		
Vendor Information Form (for new vendor)		N/A		
ICT Checklist attached (if for ICT equipment)		N/A		
Compliance checks required:(Procurement)				
Check supplier doesn't accept LPO's				
Check no other supplier will supply same goods using an LPO				
PR has been signed by authorized person (and not approving payment to themselves)	P7 44			
Check amount on PR matches Pro-forma Invoice				
Account code used is correct	P7 38.5(e)			
Vendor name on PR matches Pro-forma Invoice	P7 38.5(e)			
Check calculations on Pro-forma Invoice are correct	P7 43.2(c)			
Check Bid Waiver is for a Valid Reason				
Check selection of supplier is justified on Bid Analysis				
Check Expenditure is acceptable and proper use of SIG money	P7 43.2(a)			
Check second and third quotes are from genuine suppliers				
Check price and rates are reasonable	P7 43.2(b)			
Data information for preparation of PV/Cheque by Finance department				
Amount in Requisition matches PV				
Account code in Requisition matches PV				
Vendor name in Requisition matches PV				
Item code and Units entered (eg box, each) correctly				
Description has enough detail				
Budget OK				

Compliance check for signing of Cheques				
Amount in Requisition matches PV				
Vendor name in Requisition matches PV				
Item code correct				
Account code used is correct				

Note: If any of the above is not able to be certified please include an explanation of why. This will speed up the compliance process.

PMC

~~Committee~~ Compliance performed by:

Signed: _____

Name and Position: Soleana Cagahe - Project Engineer

Date: 07/01/2021

Procurement Compliance performed by:

Signed: _____

Name and Position: _____

Date: _____

Finance Compliance performed by:

Signed: _____

Name and Position: _____

Date: _____