

1. INTRODUCTION

The Housing & Development Board (HDB), in collaboration with Enterprise Singapore (ESG), is launching a joint Innovation Call for Proposals from industry partners to develop and test-bed innovative solutions to inspect underground water detention tanks in HDB estates.

2. BACKGROUND

Water Detention Tank

Detention tanks collect and store storm water runoff during a storm event, then release it at controlled rates to the downstream drainage system, thereby attenuating peak discharge rates from the site. With such systems in place, the drainage system as a whole can cater for higher intensity storms brought about by increasing uncertainties due to climate change. Detention tanks may be located above ground on buildings, on ground levels and even underground. Figure 1 below shows an example of an on-site detention tank system.

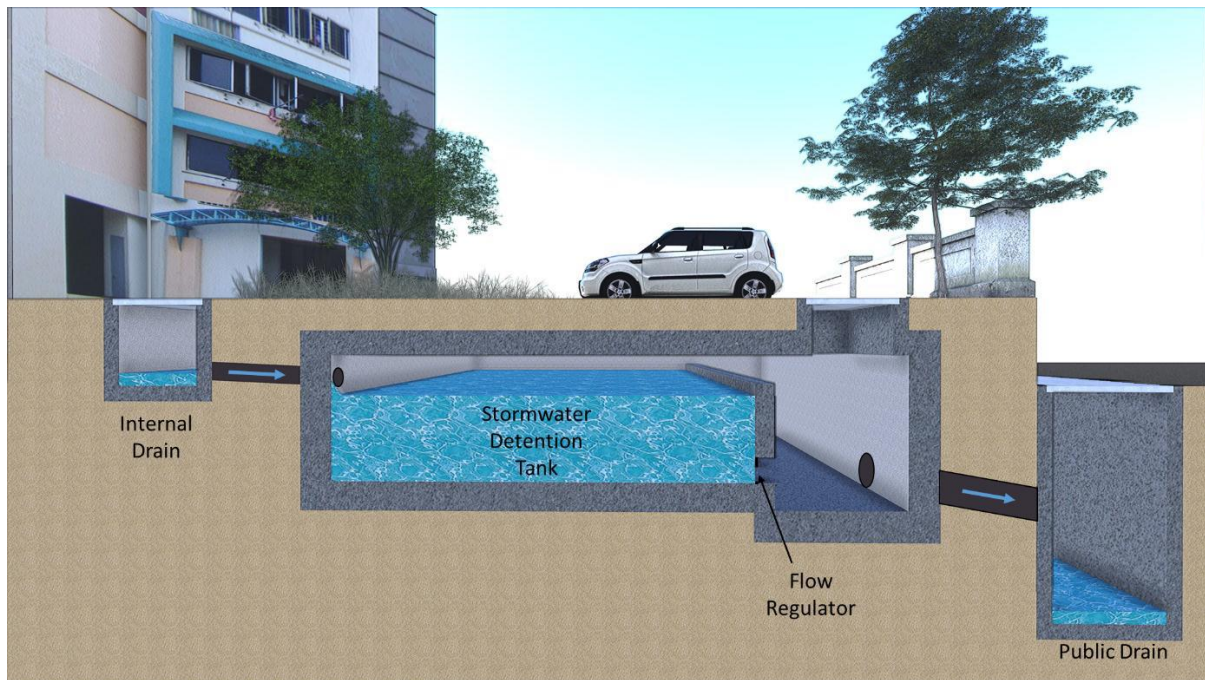


Figure 1: Schematic diagram of an underground detention tank

Water Detention Tank in HDB Estates

PUB's requirement states that detention system should be provisioned for new development with plan submission from 2014. This applies for HDB developments as well. It is expected that the number of completed water detention tanks available in HDB estates alone will be around 20 by end of 2019 (with around 160 more under construction). These are not inclusive of water detention tanks for other developments (e.g. private housing, schools etc.), and will continue to increase over the years. The number of detention tanks for each development and size of each tank varies. Typically, the tanks are situated underground with depth of up to 4m and breadth/width that can

range from 10m to 60m (typically 1000m³). There are designated maintenance access openings, typically about 0.9m x 0.9m, and usually with cat ladders provided for entry to the tanks.

Inspection and Maintenance of Water Detention Tanks

Regular inspections and maintenance can help to ensure that the detention tank system is able to perform as required during a storm event. The detention tank systems should be inspected at least once a month for the physical condition of the tank (including structural damage), stagnant water, clogging at trash racks or inlet and outlet structures, sedimentation, condition of ancillary fittings and clear access of pathways and openings. A sample of an operations and maintenance checklist for an on-site storm water detention system can be found in Appendix A.

3. PROBLEM STATEMENT

For manual inspection and maintenance of such underground tanks, inspectors may face potential hazards such as confined space, shortage of air supply, build-up of undesirable gases, pest infestation, risk of falling etc.

4. OBJECTIVE

The objective of this innovation call is to seek solutions that can perform inspection of the underground water detention tanks according to the requirements with minimal or no need for an inspector to enter the tanks. The efficiency and cost of the solution should be equal, or better than, performing manual inspection.

5. TECHNICAL REQUIREMENTS

The inspection device shall be able to

- Check physical dimension of the tank (height, width, breadth), and quality of finishes like squareness, alignment, surface evenness. Tolerance shall be as follows:

Performance Criteria	Requirement
Cross-sectional dimensions of cast-in place and precast elements	+10mm / -5mm
Invert level/ Gradient flow according to drawing	-
Allowable variation of casted floor level from intended level	± 10mm
Allowable variation of beam soffit level from intended level	± 10mm
Allowable variation of ceiling from horizontality	3mm per 1m, max 20mm

- Map out 3D profile of underground detention tank
- Navigate autonomously, scan and check the ensure quality of concrete finish, e.g. no spalling concrete, no honeycomb, no bulging of structural elements, smooth cold joint and formwork joint, no foreign objects on surface (e.g. formwork, nails etc), no visible leakage or crack at ceiling or wall.

- Verify that there is no stagnant water, no remaining water at inlet/outlet of tank, no pest infestation
- Reduce and/or eliminate the need for human to operate the device within the underground storm water detention tank

6. FUNDING SUPPORT

This Grant Call is targeted at local SMEs / startups with the following funding support for successful applicants:

Organisation Type	Funding Supported
Local ¹ SMEs / startups	Up to 70% of qualifying project cost

For consortium of different companies / IHLs / RIs², they shall appoint a lead company (Principal Investigator) for the purpose of submitting their joint proposal which shall set out clearly the role / contribution of each company. As this Grant Call targets SMEs / startups to commercialise the solutions developed, IHLs and RIs³ should not be appointed as PIs.

Foreign companies are invited to submit proposals. However, to qualify for Government funding, foreign technology providers should work with local SMEs / startups. Funding awarded cannot be used to support overseas R&D activities. All funding awarded must be used to carry out the R&D activities in Singapore.

Budget for the entire project shall be broken down into the following categories:

Category	Description
Expenditure on Manpower	This only applies to staff directly involved in the project. For avoidance of doubt, this does not include employees employed for other job functions and / or job scopes outside of the proposal.
Equipment / Software	Core equipment/tools required for developing frontend / backend application (e.g. software / mobile application) and / or prototyping. This includes purchase price, and costs related to R&D and test-bed phases (e.g. delivery, installation, handling, etc.). Only project related technical software and equipment that is non-existing within the organisation may be supported. Equipment needed for eventual scaling up or deployment

¹ For SMEs, the companies must fulfil the following criteria: (a) Registered and operating in Singapore; (b) Have minimum 30% local ordinary shareholding; and (c) Have group annual sales turnover of not more than \$100 million or group employment of not more than 200 employees.

² This grant call is open to companies and IHLs/RIs working with the industry. Research consortia comprising the above organisations are permitted. Publicly-funded research performers (partnering with local SMEs/startups) could receive funding support of up to 100% of qualifying project cost for the public research performers.

³ For proposals with publicly-funded research performers, they are required to seek endorsement from their designated Innovation & Enterprise Office (IEO) (Part J of the application form), and to be submitted separately.



Category	Description
	is not included. Operational costs such as cost of capital works, general infrastructure, general purpose IT communication equipment, office software and equipment, and furniture and fittings, etc. will not be supported.
Testing and Certification	Third-party testing and certification services to ensure that proposed solutions comply with required standards and regulations.
Consultancy (Professors / Experts)	Consultancy or advisory cost for Professors / Experts may be supported if specifically, relevant to meeting the milestones and deliverables of the project.
Others	Other costs involved in the project, such as IP-related costs etc.

The project duration, including completion of the final report and all miscellaneous project activities, **shall not exceed 18 months**. The proposed project schedule must be realistic, allowing sufficient time for the preparation of final report and for the review of project results.

7. ASSESSMENT CRITERIA

Proposals will be evaluated against the following criteria:

- a) Level of Innovation (20%)
 - Significance of innovation compared to existing technology in the market
 - Viability of technology
 - Show potential implementation/ development for carrying out inspection at areas other than underground tank
 - Demonstrate productivity gain (e.g. reduction in manpower, better job conditions for inspectors etc)
- b) Operational Feasibility (30%)
 - Address the challenges and objective
 - Poses minimal/ no nuisance and disruption to operation
 - Minimal lead time to commence inspection
 - Generate result/ report on same day of inspection
 - Provide technical service support with incremental improvement approach by taking its relevance to authority or industry's needs
- c) Economic Benefits & Commercialisation Potential (20%)
 - Estimated operating, lift cycle costs and return on investment
 - Cost and viability to produce the proposed technology for more user utilization
 - Continuous improvement of the proposed technology to phase with authority industry's need
- d) Capacity & Team Profile (20%)
 - The project team have the requisite capabilities and resources to undertake the project
 - The project team have the necessary and complementary expertise that are well-suited to the project

- e) Proposal Clarity (10%)
- Concise and clear outline of the proposed innovation by formulating different phases/stages for implementation and improvement

8. INDUSTRY BRIEFING

An industry briefing will be held to provide potential proposers with more information. Details of the briefing are as follows:

Date:	12 February 2019
Time:	3 pm
Location:	HDB Hub Basement 1, Bedok Room 480 Lorong 6 Toa Payoh Singapore 310480

Please register your interest to the technical briefing [here](#) ('CREATE' an account in the portal before logging in and click 'REGISTER'). Registration will close on 8 February 2019.

9. SUBMISSION PROCEDURE

The Principal Investigators (PIs) should submit electronic applications to the Gov-PACT portal using the Application Form together with all supporting documents. PIs are to state clearly how the proposals address the requirements in the Problem Statement. Separate submissions outside of the above channel will not be considered.

The deadline for online submissions is on 18 March 2019, 12 pm, Singapore time (UTC +8).

10. CONTACT PERSON

For further queries on this Grant Call, please email:

- a. HDB (HDB_BQGBIT@hdb.gov.sg) for matters pertaining to problem statements.
- b. IPI Singapore (gov-pact@ipi-singapore.org) for assistance on:
 - i. Using the IPI portal for registration of technical briefing registration, submission of proposal, etc
 - ii. Matching technology partners to collaborate for this Grant Call
 - iii. Funding enquiry



Appendix A – Sample of operations and maintenance checklist for an on-site storm water detention system

Development Address & MCST no.:

Location of Detention Tank:

Name of O&M Supervisor:

Contact Number:

Date of Inspection:

S/N	DESCRIPTIONS	Yes/No/NA	Inspection Findings / Follow Up Actions
1	Monthly/after significant storm events		
a	No stagnant water in tank		
b	No residual water at inlet/outlet structures		
c	No mosquito breeding		
d	No pest infestation within the system		
e	No clogging at inlet/outlet structures/trash racks		
f	No excessive sediment build up in tanks		
g	Inspect, lubricate and conduct routine test to check reliability of pump(s)		
h	Check condition and conduct function test of all pump starters and their controls including level control systems		
i	Standby generator load test		
j	Structural integrity of tank and features are not compromised (check for cracks/leaks)		
k	No obstruction of maintenance access/openings		
l	Access into the detention tank system is secure (out of bounds to public and unauthorised personnel)		
2	Yearly/as required (before year-end monsoon season)		
a	Desilting of detention tank has been carried out, trash screens have been cleaned		
b	Inspect, service, replace, lubricate and test performance of pump(s)		
c	Inspect protective devices such as overload, earth fault, residual current relays (<u>LEW to certify the safety and condition of the electrical equipment</u>)		
d	Check condition and conduct function test of all pump starters and controls including level control systems. Replace faulty and worn out parts if required.		
e	Standby generator: service engine, top up engine oil, check radiator, chargers, batteries, starting system, etc.		