

## **LOCAL VESSELS ADVISORY COMMITTEE**

### **Temporary Deployment of Scientific Research Buoy to the South-West of Tai A Chau**

#### **Purpose**

Members are invited to note the details of the temporary deployment of scientific research buoy to the south-west of Tai A Chau as set out in this information paper.

#### **Background**

2. The coastal waters around Hong Kong are affected by persistent and increasing eutrophication, a condition characterised by high concentration of nutrients in the water. This phenomenon may increase the likelihood of harmful algal blooms, which can lead to a rapid depletion of dissolved oxygen in the water due to the microbe decomposition when these algae die. Because of these phenomena, there will be large hypoxic areas which can lead to other ecosystem disruptions and worst of all, disrupt the environmental improvements achieved through the costly Harbour Area Treatment Scheme over the last decade.

3. In Hong Kong, the nutrient flux that causes eutrophication and hypoxia originates from nutrient runoff in the Pearl River and local sewage effluent. To add to the severity of this ecological disturbance, increasing discharge of organic pollutants into our waters further disrupt the balance of the coastal marine ecosystem and can make these harmful algal bloom events more severe. Moreover, the seasonal shifts in Hong Kong's oceanic currents help distribute the nutrients from the Pearl River estuary and this further interferes the impacts of eutrophication and hypoxia.

4. These key physical, biogeochemical, and pollution processes in which eutrophication leads to hypoxia have not been investigated in a comprehensive manner in our river-estuary-shelf (RES) waters, and they remain largely unresolved in similar ecosystems elsewhere in the world. Understanding the dynamics of harmful algae, nutrient-rich water, and pollutants interact by employing methods across multiple disciplines is crucial to predicting and mitigating the impacts of eutrophication, and it remains a huge scientific challenge regionally and globally.

5. The ultimate goal of this research study is to identify the factors driving the increasing eutrophication and hypoxia, and to provide analytical tools and a scientifically-based strategy for buffering and even reversing eutrophication and hypoxia and for ensuring the overall sustainability of the marine environment in Hong Kong.

6. To meet this need, a research project entitled “Diagnosis and Prognosis of Intensifying Eutrophication, Hypoxia and the Ecosystem Consequences around Hong Kong Waters: Coupled Physical-biogeochemical-pollution Studies” has been recently funded under the Theme-based Research Scheme 2016/17 (Reference no. : T21-602/16-R) by the Research Grant Council.

## **Proposal**

7. For the above research project, install scientific research buoys will be laid in Hong Kong and one laid in Zhuhai waters. All the scientific research buoys capture data in different locations for the research study which will be carried out for the coming five years. Scientific research buoys have been installed in various locations of China for environmental monitoring, such as the Guangdong Daya Bay Nuclear Power Station, Bo’ao Port in Hainan Province and Beihai Port in the Guangxi region. The buoy will conduct time-series monitoring of physical and biogeochemical parameters in the Hong Kong waters during the implementation of the project. The time-series monitoring will help characterise temporal variability of the three-dimensional flow field and associated biogeochemical parameters in the Hong Kong waters.

8. The proposed scientific research buoy is designed with standard safety features including lights, top mark, radar reflector and automatic identification system. Single sinker design is not suitable for the buoy because the single mooring chain will cause damage to the cables of sensors. Two sinkers total of 25 Metric Tons (12.5 Metric Tons each) and 68 metres apart are adopted. The final design is shown in **Appendix A** and **Appendix B**. This buoy will carry the instruments to measure parameters such as, water temperature, water conductivity, water pressure, water current, chlorophyll a and dissolved oxygen. The scientific research buoy is proposed to locate at 1.2 kilometers from the Lantau Channel and 2.5 kilometers from nearest underwater cables. The proposed location of the scientific research buoy is presented in **Appendix C**.

9. Regular maintenance service will be provided by the supplier. During the routine maintenance, if any chemical was used, it will be stored and disposed properly. Position of the buoy will be real time monitored by GPS device in the buoy. Any drift of the buoy from its original position for more than 100 meters, the supplier will perform inspection and relocate the buoy back to its original location within 24 hours if the weather allows. At the end of this project, the buoy and sinkers will be removed.

### **Consultation**

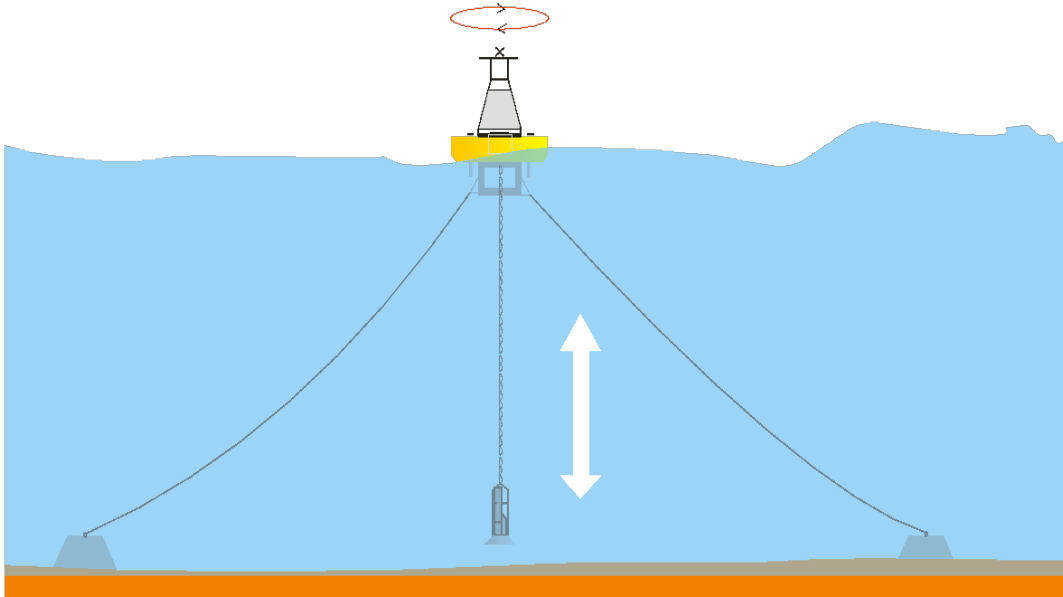
10. Relevant government departments including the Hong Kong Observatory, the Agriculture, Fisheries and Conservation Department, the Environmental Protection Department and the Lands Department were consulted on the proposal in January 2016. Further consultation with local fishermen organisations was conducted in July 2017. All parties expressed no objection to the proposed scientific research buoy.

### **Way Forward**

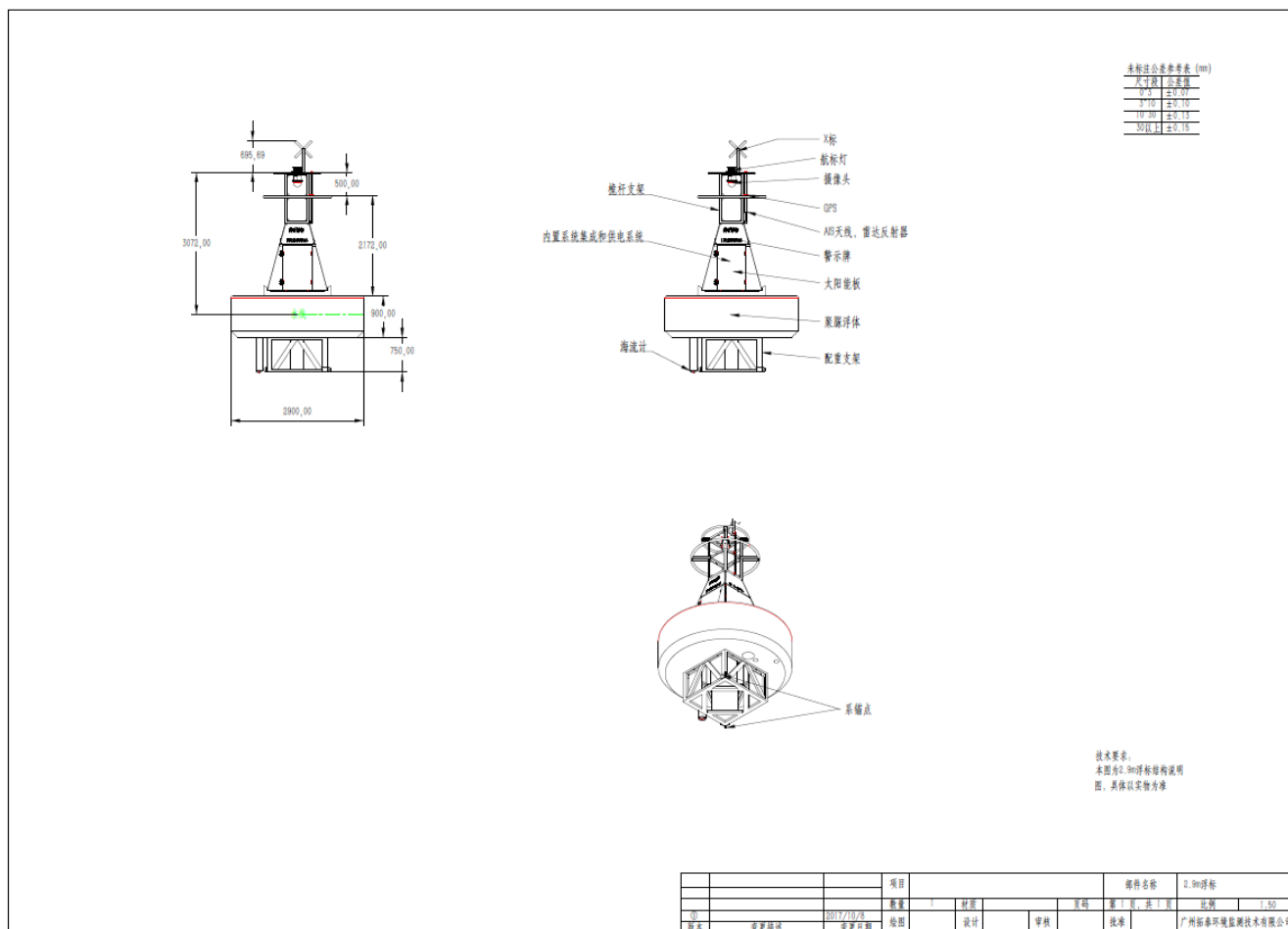
11. Members are invited to note the details described in paragraphs 7 to 9 above.

City University of Hong Kong  
The Hong Kong University of Science and Technology  
January 2018

*Dual Chain Design for the scientific buoy*



The design of the scientific buoy



*Location of laying the scientific buoy*

**22° 9.180' N, 113° 53.97' E (WGS 84 Datum)**



*Location of laying the scientific buoy and its distance to cable and channel*

